NEW HOLLAND

SHOP MANUAL

E30 AND E35
HYDRAULIC EXCAVATORS

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E30 AND E35
HYDRAULIC EXCAVATORS

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2.3 SPECIFICATIONS AND PERFORMANCE

2.3.1 SPEED AND GRADE ABILITY

Model		E30				E35			
Applicable Machines		PW11-30001~				PX12-11001~			
Shoe Type		Rubber shoe		steel shoe (OPT)		Rubber shoe		steel shoe (OPT)	
Shoe Type		Rubber shoe		steel shoe (OPT)		Rubber shoe		steel shoe (OPT)	
Slewing Speed	min^{-1} {rpm}	8.9 {8.9}				8.9 {8.9}			
Travel Speed	km/h (mph)	Low (1st)	High (2nd)	Low (1st)	High (2nd)	Low (1st)	High (2nd)	Low (1st)	High (2nd)
		2.5	4.5	2.5	4.5	2.5	4.5	2.5	4.5
Grade ability	% (degree)	58(30)							

2.3.2 ENGINE

Model (YANMAR)		3TNV88-PYB
Type		Water-cooled, 4-cycle type Swirl chamber type diesel engine
Number of cylinders-Bore x Stroke		3 - ø88 mm x 90 mm (3.46 in x 3.54 in)
Total Displacement	L	1.642 (100.2 cu in)
Output Rating	kW/min^{-1} {PS/rpm}	21.2/2,400 {29/2,400}
Maximum Torque	Nm/min^{-1} (lb ft/rpm)	98.4/1,440 (72.6/1,440)
Starting Motor	V x kW	12 x 1.7
Generator	V x A	12 x 55

2.3.3 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 (30)

2.3.4 SIDE DIGGING AND DOZER

Type		Boom swing by hydraulic cylinder	
Boom Swing Angle	Right	60°	
	Left	70°	
Stroke of Dozer (above/below)	mm (in)	560 / 410 (22.0/16.1)	540 / 440 (21.3/17.3)

2.3.5 WEIGHT

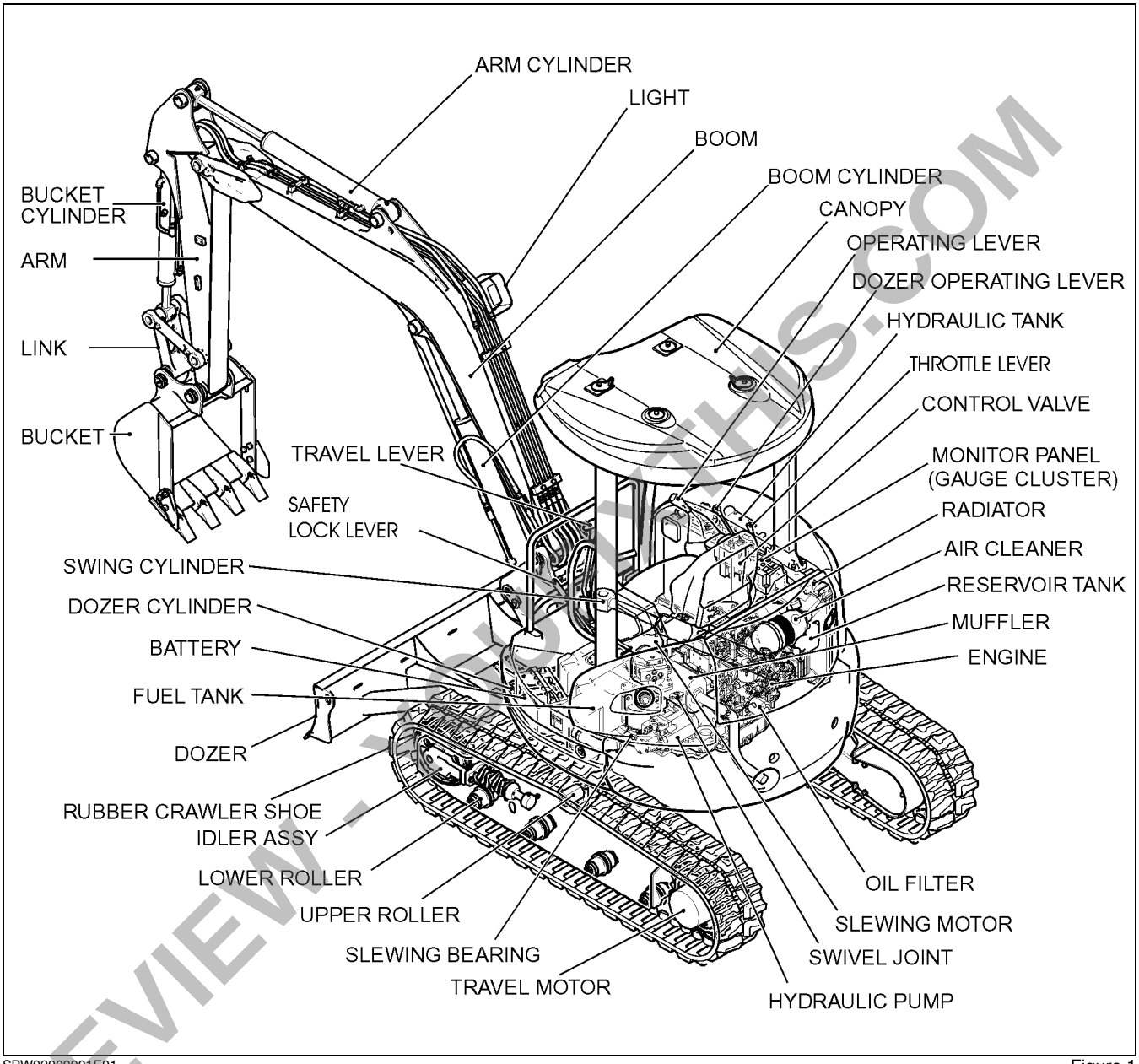
		RUBBER SHOE	STEEL SHOE	RUBBER SHOE	STEEL SHOE
Machine Weight	kg (lb)	3,030 (6680)	3,140 (6920)	3,610 (7960)	3,730 (8220)
Upper slewing body	kg (lb)	1,680 (3700)	1,680 (3700)	1,930 (4260)	1,930 (4260)
Travel system	kg (lb)	1,050 (2320)	1,160 (2560)	1,140 (2520)	1,260 (2780)
Attachment (Boom + STD Arm + STD Bucket)	kg (lb)	370 (815)		460 (1020)	
Oil & Water	kg (lb)	80 (175)		¨	

NOTE 1: *This figure is calculated with standard bucket.*

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2.1 COMPONENTS NAME



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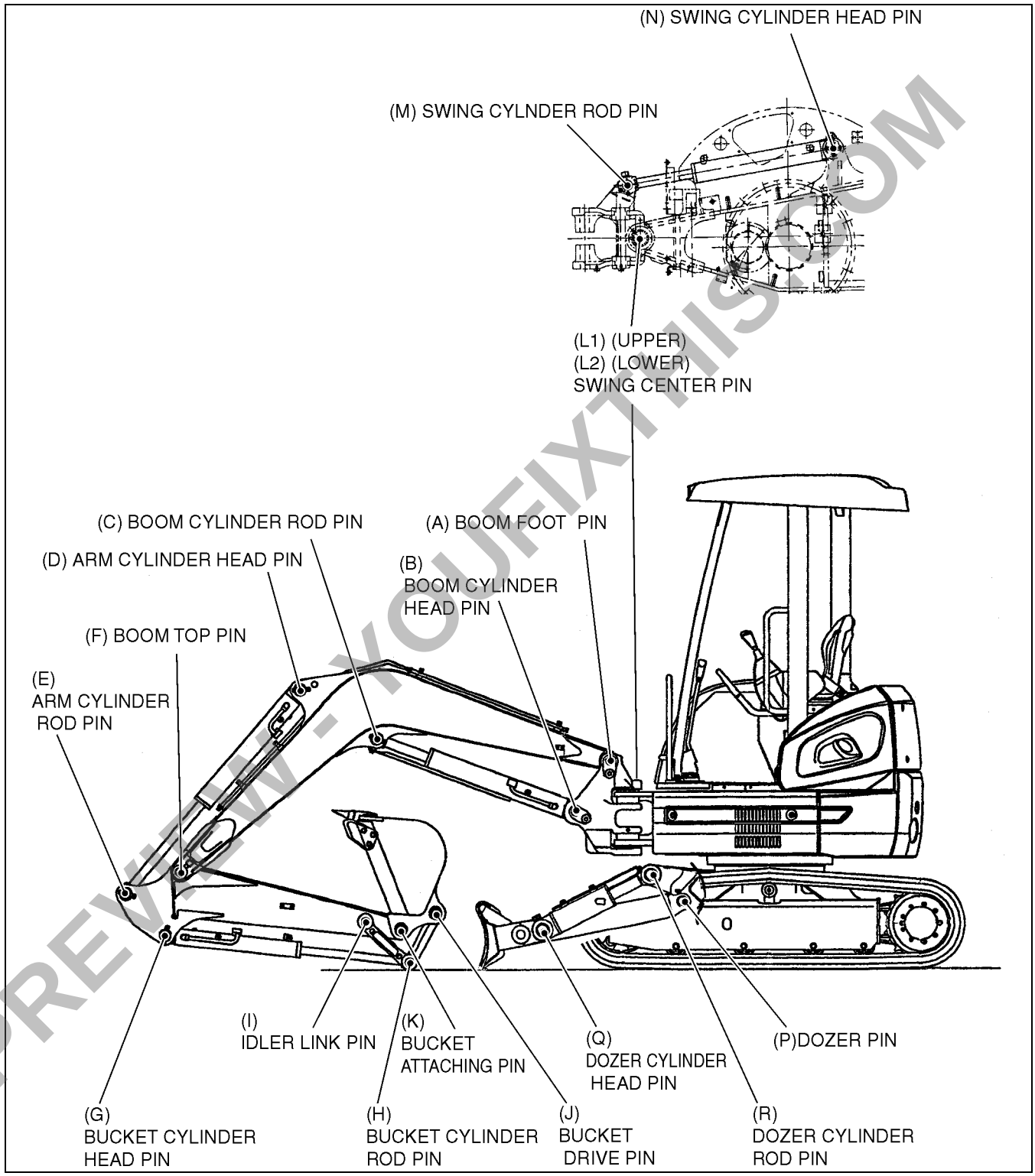
Figure 1

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32.1 REMOVING AND INSTALLING

32.1.1 ATTACHMENT ASSEMBLY AND NAME



SPW32000001E01

Figure 1

FIG. 32-1 ATTACHMENT NAME AND POSITION

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1.3 GENERAL PRECAUTIONS FOR REPAIRS

1.3.1 PREPARATION BEFORE DISASSEMBLING



1. Understand operating procedure

   Read OPERATOR'S MANUAL and this MANUAL carefully prior to operating the machine.

2. Cleaning machines

   Remove soil, mud, and dust from the machine before service. This will prevent loss of work efficiency, damaged parts, and difficulty in rust prevention and dust protection while reassembling.

3. Inspecting machines

   Identify the parts to be disassembled before starting work, determine the disassembling procedure considering the workshop situations etc., request necessary parts in advance.

4. Record the following items
   A. Inspection date and place
   B. Model name, applicable machine number, and hour meter reading
   C. Trouble condition, place and cause.
   D. Visible oil leakage, water leakage and damage
   E. Clogged filters, oil level, oil quality, oil contamination and loose connections
   F. Is it a recurring fault at approximately the same amount of operating hours.

5. Arrangement and cleaning in service shop
   A. Tools required for repair work.
   B. Prepare space to place the disassembled parts.
   C. Prepare oil containers for draining oil etc.

1.3.2 SAFETY IN DISASSEMBLING AND ASSEMBLING



1. Wear appropriate clothes with long sleeves, safety shoes, safety helmet and protective glasses.
2. Suspend warning tag DO NOT OPERATE from the doorknob or the operating lever.
3. Stop the engine before starting inspection and maintenance.
4. Identify the location of a first-aid kit and a fire extinguisher, also who to contact in case of an emergency.
5. Choose a hard, level and safe place, and place the attachment on the ground securely.
6. Use a hoist to remove heavy parts (20 kg [45 lbs] or more) from the machine.
7. Use proper tools, and replace or repair defective tools.
8. Support the machine and attachment with supports or blocks if the work is performed in the lifted condition.

1.3.3 DISASSEMBLING AND ASSEMBLING HYDRAULIC EQUIPMENT



1. Removing hydraulic equipment
   A. Before disconnecting pipes, release the hydraulic pressure in the system.
   B. Carefully drain oil of the removed pipes into a containers without spilling on the floor.
   C. Install plugs or caps on the pipe ends to avoid oil spillage and contamination.
   D. Clean off the external surface of the equipment before disassembling, drain hydraulic and gear oil before placing component on the workbench.
2. Disassembling hydraulic equipment
   A. Do not modify the hydraulic equipment without the permission of the manufacturer. Manufacturer will not be responsible for the performance and function of the product after modification.
   B. When disassembling and reassembling for repair, refer the work to qualified personnel who have the knowledge or have completed the service training.
   C. Provide aligning marks to facilitate reassembly.
   D. Before starting the work, read the manual for disassembly procedures and decide whether the work can be performed by yourself or if assistance is required.
   E. Use the special jig or tools if they are specified.

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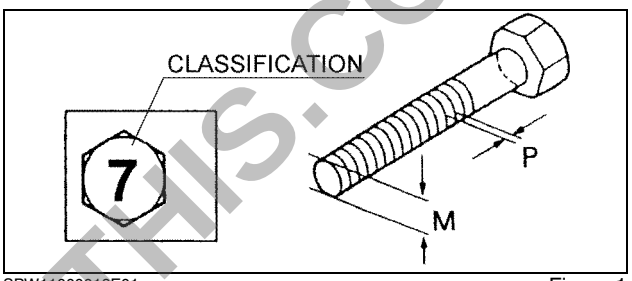
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11.1 TORQUE SPECIFICATIONS FOR CAPSCREWS AND NUTS

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 tightness and the loss of before starting work and at periodic maintenance. Retighten and replace as needed. For a new machine, check and retorque after the first 50 hours operation. Replace with genuine parts.

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

1. The table below is not applicable for the capscrews that secure plastic covers. For the tightening torque for such capscrews, contact your dealer. Over-tightening may cause damage to the plastic parts.
2. In case that the tightening torque is specified in the manual, use those torque values regardless to the table below.
3. 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, M5 or less.



SPW11000018E01 Figure 1

11.1.1 METRIC COARSE THREAD STANDARD TIGHTENING TORQUE VALUES

Make sure to tighten all Capscrews and Nuts to proper torque values.

METRIC COARSE THREAD STANDARD TIGHTENING TORQUE VALUES							
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)
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)

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2.5 TRANSPORTATION

2.5.1 LOADING MACHINE ON A TRAILER

A. Clean the trailer bed. Put chocks against truck wheels.

B. Use a ramp or loading dock. Ramps must be strong enough, have a low angle, and correct height. Load and unload machine on a level surface.

C. Center the machine on the trailer.

D. Lower all attachments.

E. Stop engine. Remove key from switch.

WARNING: *Do not put chains over or against hydraulic lines or hoses.*

F. Fasten machine to trailer with chains or cables.

During transportation, the bucket or attachments may hit the canopy or the cab. Therefore, set the machine in the transporting position by observing following points:

A. 1Extend the bucket cylinder fully.

B. Extend the arm cylinder fully.

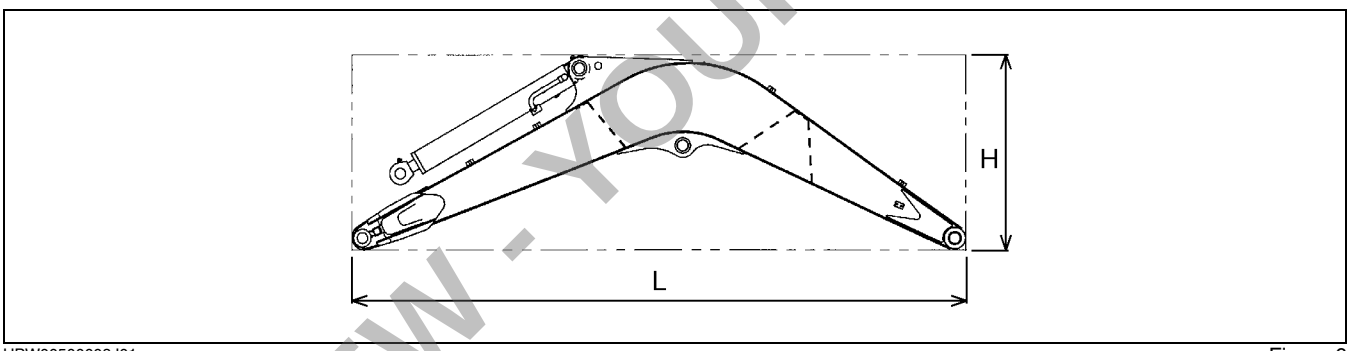
C. Lower the boom.

D. If machine cannot be transported with arm cylinder fully extended, remove bucket or attachment and extend arm cylinder.

2.5.2 TRANSPORTATION DIMENSION AND WEIGHT OF ATTACHMENT

2.5.2.1 BOOM WITH ARM CYLINDER

Model	E30	E35
L x H x W mm (ft•in)	2,390 x 870 x 320 (7’10.1”) (2’10.2”) (12.6")	2,590 x 810 x 320 (8’6.0”) (2’7.9”) (12.6")
Weight w/Arm cyl. kg (lb)	163 (360)	184 (405)

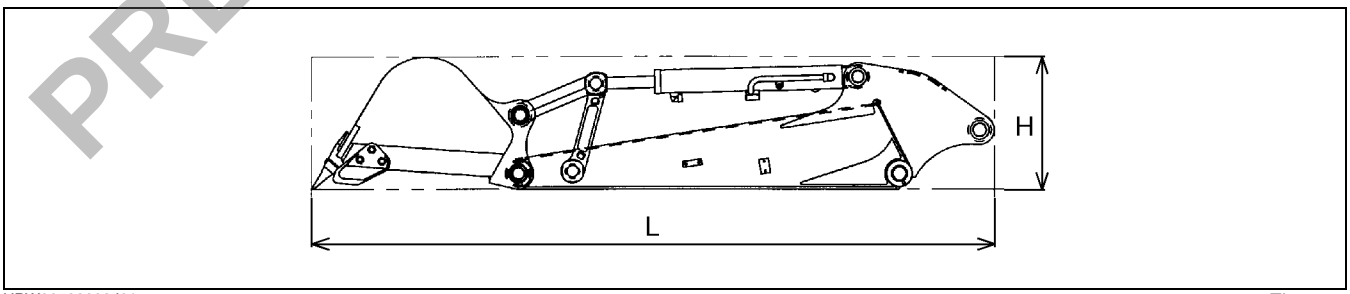


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Figure 6

2.5.2.2 ARM AND BUCKET (STANDARD BUCKET)

Model	E30	E35
L x H x W mm (ft•in)	2,190 x 450 x 500 (7’2.2”) (17.7") (19.7")	2,360 x 450 x 600 (7’8.9”) (17.7") (1’11.6”)
Weight kg (lb)	198 (435)	219 (485)



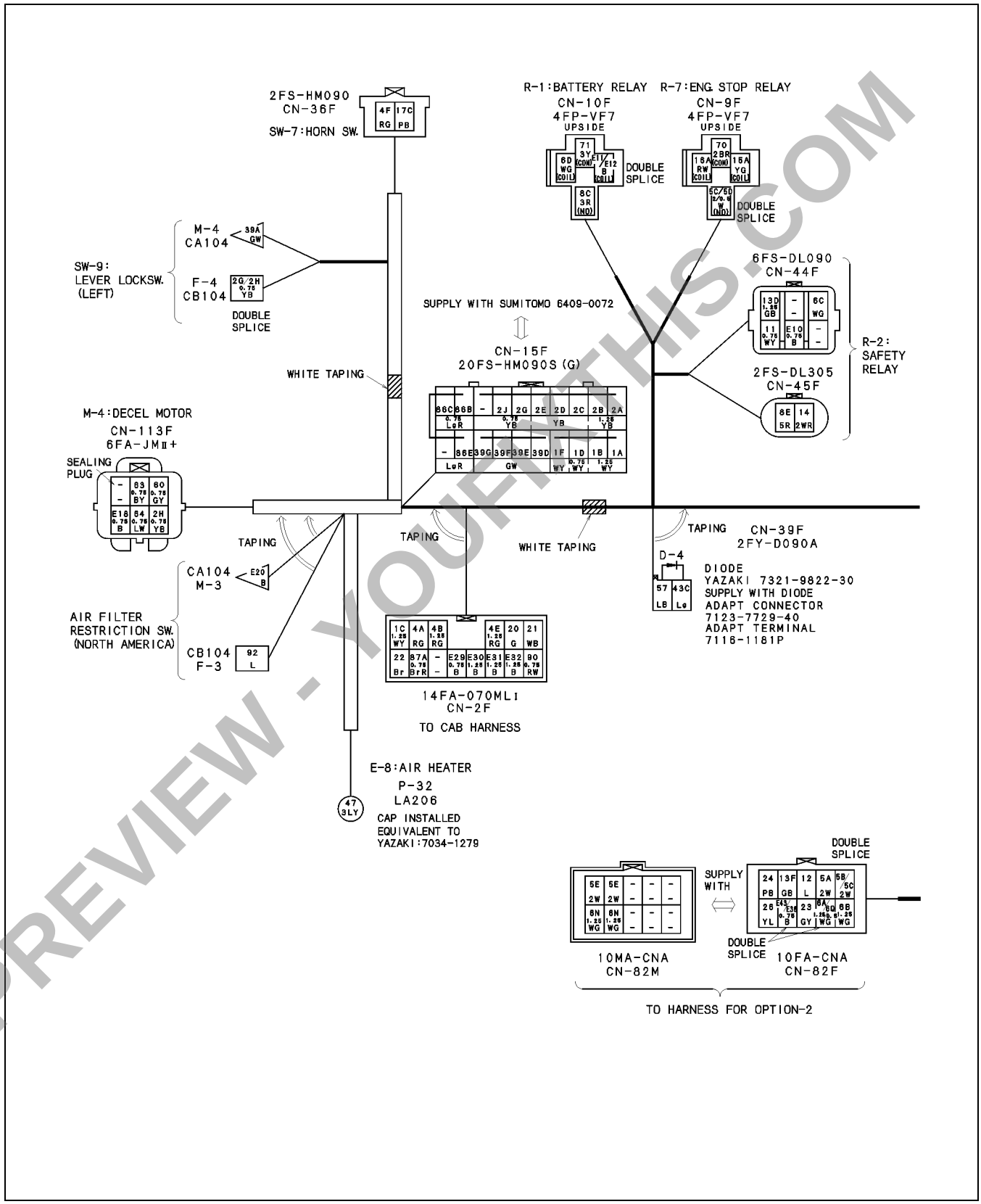
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Figure 7

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23.2.4 DETAIL OF HARNESS & CABLE

23.2.4.1 INST • MAIN HARNESS (NO. H-1)



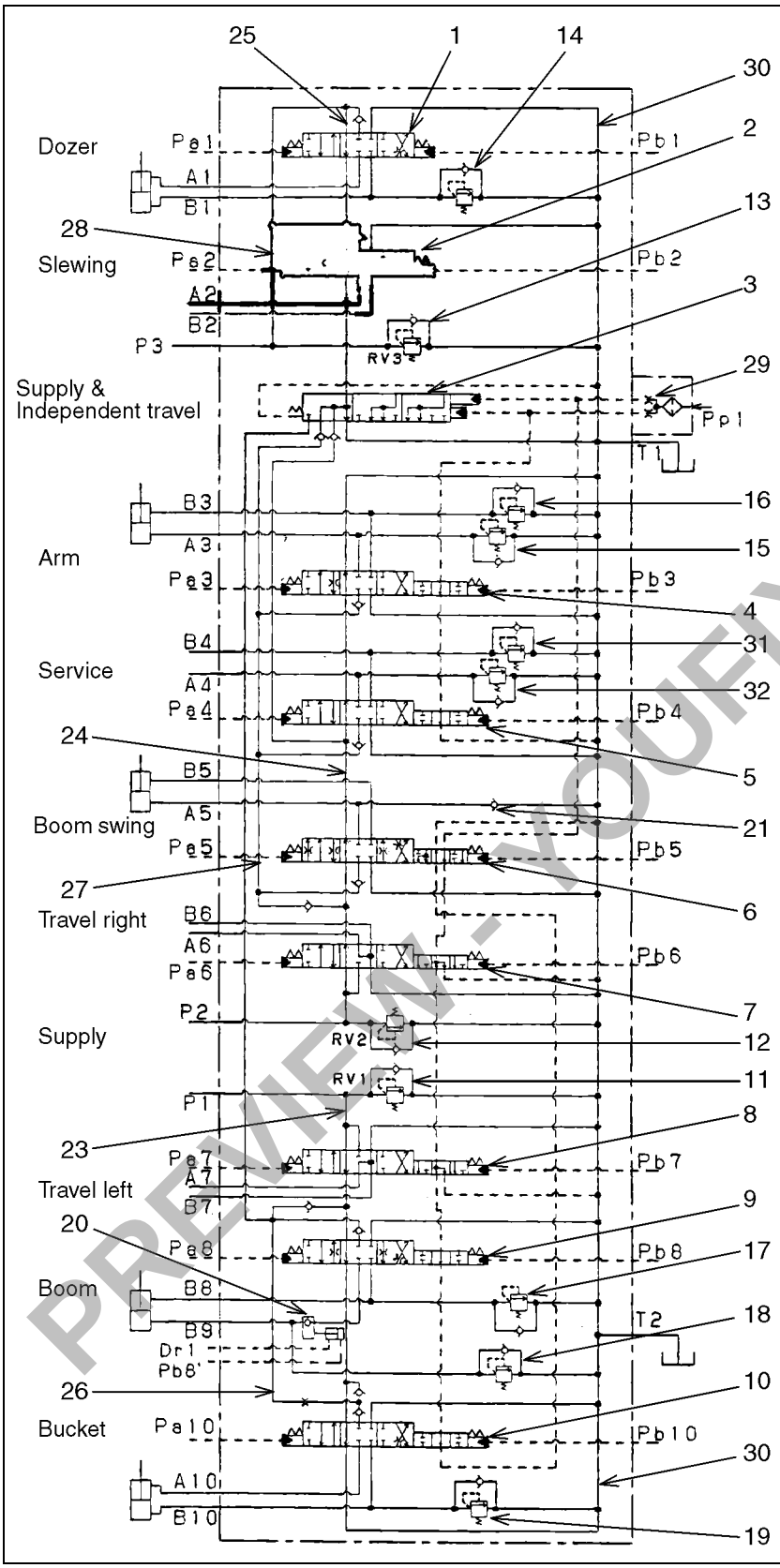
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Figure 25

FIG. 23-17 INST • MAIN HARNESS (NO. H-1) — (1/8)

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24.1.4.2 HYDRAULIC CIRCUIT



No.	NAME
1	Dozer spool
2	Slewing spool
3	Travel Independent & conflux spool
4	Arm spool
5	Service spool
6	Boom swing spool
7	Travel right spool
8	Travel left spool
9	Boom spool
10	Bucket spool
11	P1 (RV1) relief valve
12	P2 (RV2) relief valve
13	P3 (RV3) relief valve
14	B1 Over load relief valve
15	A3 Over load relief valve
16	B3 Over load relief valve
17	B8 Over load relief valve
18	B9 Over load relief valve
19	B10 Over load relief valve
20	Boom lock valve
21	Anti cavitation valve
22	
23	P1 by-pass passage
24	P2 by-pass passage
25	P3 by-pass passage
26	P1 parallel passage
27	P2 parallel passage
28	P3 parallel passage
29	PP1 Pilot passage
30	Tank passage
31	A4 over load relief valve
32	B4 over load relief valve

SPW24000066E01

Figure 30

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42.2 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 overload R/V	Travel straight valve	Travel spool	Attachment spool	Check valve	Shuttle valve	Slewing motor unit	Travel motor unit	Hydraulic cylinder
Attachment	1	(1)	Attachment operational failure	X							X	X					
		(2)	Travel speed is slow	X								X					X
		(3)	Attachment operating power is low				X		X								X
		(4)	Malfunction of attachment							X		X					X
Travel operation	2	(1)	Travel operational failure	X							X					X	
		(2)	Travel speed is slow.	X							X					X	
		(3)	Travel operating power is low				X									X	
		(4)	It deviates in travel independent operation	X						X	X					X	
Slewing operation	3	(1)	Slewing operational failure									X			X		
		(2)	Slewing speed is slow			X											
		(3)	Slewing operating power is low					X	X						X		
		(4)	Malfunction of slewing operation									X		X	X		
Pump	4	(1)	Engine speed is reduced due to pump load	X													
		(2)	Malfunction of pump	X	X	X											

Abbreviation

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

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22.3.4 SLEW OPERATING CIRCUIT

(Refer to Fold Out Schematics)

Pilot oil hydraulic system with operating lever

22.3.4.1 SLEW (LEFT) OPERATING CIRCUIT

1. PILOT CIRCUIT
   1. Slew Valve Spool Shifting

      Operating slew (left), the pilot secondary pressure is generated from the pilot valve (11), and supplied to the Pb2 port of control valve (2) through solenoid valve (27) to shift the slew valve spool.

   2. Releasing the Slewing Brake

      The pilot primary pressure is always supplied to PG port on the timer valve (303).

      While operating the slew, the pilot secondary pressure is supplied to SH port on the timer valve (303) through the shuttle valve (15) to shift the spool.

      It supplies the pilot primary pressure 3.5 MPa (508 psi) to the slewing brake to release it.

   3. Activating the Slewing Brake

      When the slew lever is returned to neutral position to stop slewing, the pilot secondary pressure is stopped causing the timer valve (303) to shift, the pressurized oil to the brake is stopped.

      The oil in the brake cylinder is discharged due to spring force, and drained through the restrictor in the timer valve (303).

      The brake is activated with a lag time of 2.5 to 5.0 seconds to smoothly stop the slewing motion.

2. MAIN CIRCUIT
   1. Supply Circuit for Slewing Motor (3)

      The oil from the A3 port on hydraulic oil pump (1) is supplied to the B port on slewing motor (3) through the P3 port on control valve (2) and slew valve to drive the slewing motor.

   2. Slewing Motor (3)

      A. The relief valve (304) relieves rapidly increased pressure at start and stop of the machine to ease shock.

      B. The make-up valve (check valve) (305) has a function to replenish oil from the return oil circuit that is returned to the tank [T2 port on control valve (2)] to the slewing motor, to prevent the slewing motor from cavitation due to negative pressure generated because of the inertia of the slewing mass.

22.3.5 BUCKET OPERATING CIRCUIT

(Refer to Fold Out Schematics)

Pilot oil hydraulic system with operating lever

22.3.5.1 BUCKET DIGGING OPERATION CIRCUIT

1. PILOT CIRCUIT
   1. Bucket Spool Shifting

      When the operating lever is placed in the bucket digging position, pilot secondary pressure is generated from the pilot valve (11). The oil enters into the Pb10 port on control valve (2) and shifts the bucket valve spool.

2. MAIN CIRCUIT
   1. Supply Circuit for Cylinder (7)

      The oil from the A1 port on variable pump (1) enters P1 port on control valve (2). The oil from B10 port through bucket valve is supplied to the head side of bucket cylinder (7) to activate the digging work.

      The return oil from the rod side of cylinder (7) enters into A10 port on control valve (2) and returns to the tank through bucket valve.

22.3.5.2 BUCKET DUMPING OPERATING CIRCUIT

1. PILOT CIRCUIT
   1. Bucket Spool Shifting

      When the operating lever is placed in the bucket dumping position, the pilot secondary pressure oil is supplied from pilot valve (11) to the Pa10 port on control valve (2) to shift the bucket valve spool.

2. MAIN CIRCUIT
   1. Supply Circuit for Cylinder (7)

      Similar to bucket digging, the pressurized oil delivered from A1 port on variable pump enters P1 port on control valve (2).

      The oil supplied from A10 port through bucket valve enters the rod side of bucket cylinder (7) to activate the bucket dumping.

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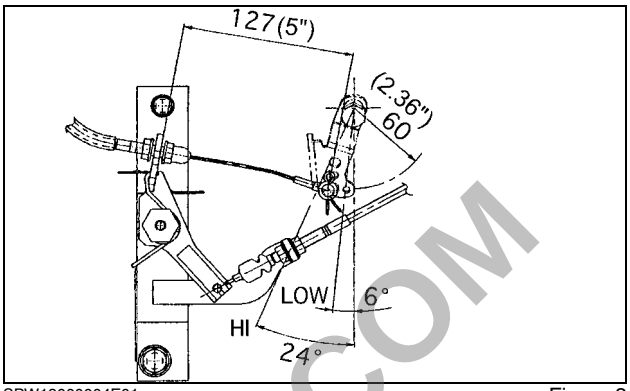
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4. Speed Adjustment

   Low / High Idling Speed is low;

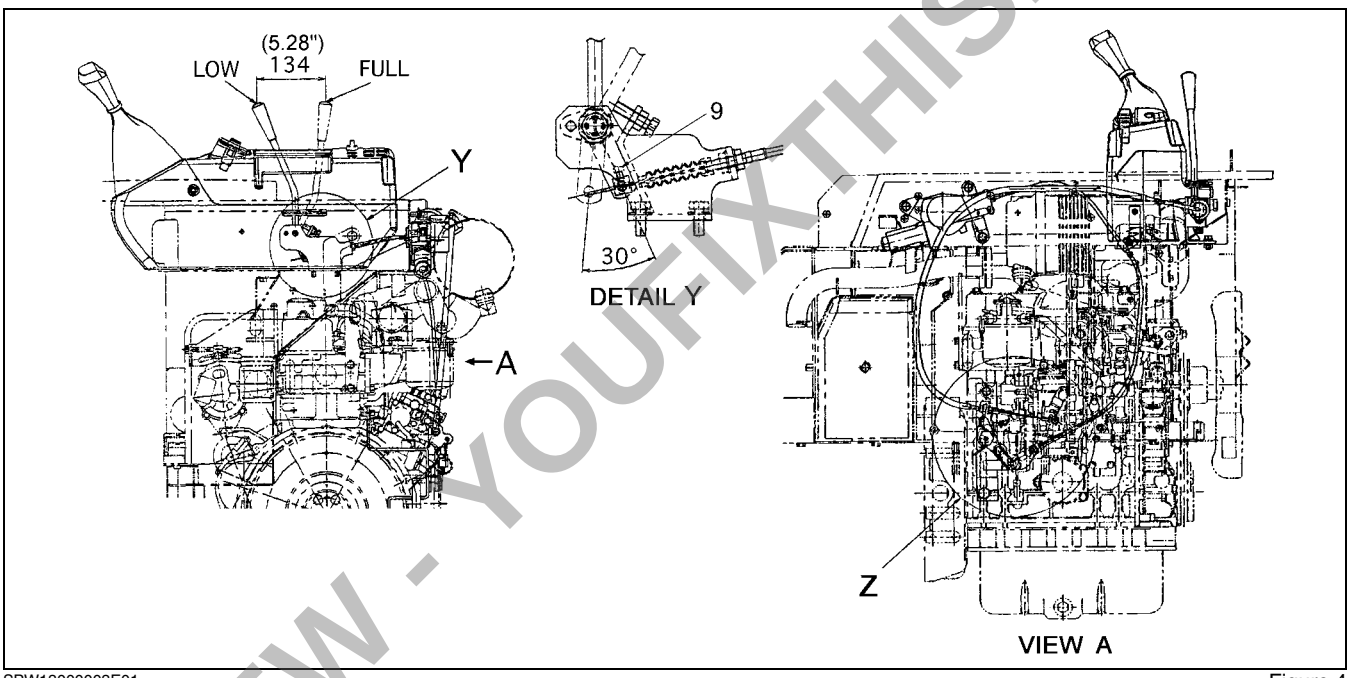
   The proper engine speed is obtained with the length of accelerator cable as shown. When the engine speed is lower than the standard speed, adjust the length of cable by loosening the capscrew (9) of throttle lever side.

NOTE: *If the proper high idling speed is not obtainable, see the engine service manual.*



SPW13000004E01 Figure 3

DETAIL Z [WITH DECEL]



SPW13000003E01 Figure 4

FIG. 13-2 ACCELERATOR CABLE ADJUSTMENT

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(4) 3TNV88

Engine name		Unit	3TNV88								
Engine specification class		-	CL	VM							
Type		-	Vertical, in-line, 4-cycle, water-cooled diesel engine								
Combustion chamber		-	Direct injection								
Number of cylinders		-	3								
Cylinder bore×stroke		mm×mm	88×90								
Displacement		L	1.642								
Continuous rating	Revolving speed	Min^{-1}	1500	1800	-						
	Output	kW (hp)	12.3 (16.7)	14.8 (20.1)	-						
Rated output	Revolving speed	Min^{-1}	1500	1800	2000	2200	2400	2500	2600	2800	3000
	Output	kW (hp)	13.5 (18.4)	16.3 (22.1)	18.0 24.5)	19.9 (27.0)	21.6 (29.4)	22.6 (30.7)	23.5 (31.9)	25.2 (34.2)	27.1 (36.8)
Max. no-load speed (±25)		min^{-1}	1600	1895	2180	2400	2590	2700	2810	2995	3210
Ignition order		-	1-3-2-1(No.1 cylinder on flywheel side)								
Power take off		-	Flywheel								
Direction of rotation		-	Counterclockwise (viewed from flywheel)								
Cooling system		-	Radiator								
Lubrication system		-	Forced lubrication with trochoid pump								
Starting system		-	Electric								
Applicable fuel		-	Diesel oil-ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No.45 min.)								
Applicable lubricant		-	API grade class CD or CF								
Lubricant capacity (oil pan) *	Total	L	4.7								7.2
	Effective	L	1.8								3.5
Coolant water capacity (engine only)		L	2.0								
Engine dimensions ** (with flywheel housing)	Overall length	mm	589			564					
	Overall width	mm	486								
	Overall height	mm	622								
Engine mass (dry) ** (with flywheel housing)		kg	155								
Cooling fan (std.)		Mm	350 mm O/D, 6 blades pusher type								
Crankshaft V pulley diameter & Fun V pulley diameter (std.)		Mm	120×90			120×90					

* Engine oil capacity may differ from the above depending on an engine installed on a machine unit.
** Engine mass and dimensions without radiator

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THIS MANUAL EXPLAINS THE ENGINE PROPER AND IS FAITHFUL TO YANMAR DIESEL ENGINE'S SERVICE MANUALS.
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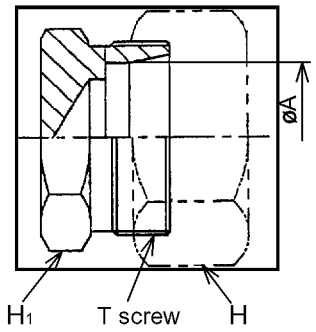
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11.5 PLUGS

11.5.1 PLUG FOR HYDRAULIC PIPE JOINT

11.5.1.1 CAP NUT (JOINT PLUG)

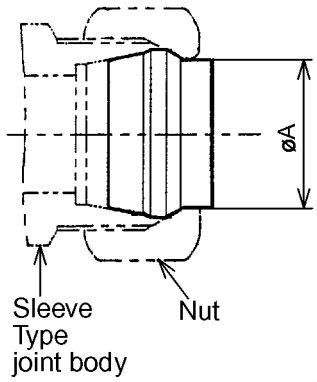


Applicable tube O. D : A	Cap nut parts No.	T screw	Opposing flats	
			H_1	H
6	ZF83H06000	M12 × 1.5	14	14
8	ZF83H08000	M14 × 1.5	17	17
10	ZF83H10000	M16 × 1.5	17	19
12	ZF83H12000	M18 × 1.5	19	22
15	ZF83H15000	M22 × 1.5	24	27
18	ZF83H18000	M26 × 1.5	27	32
22	ZF83H22000	M30 × 1.5	32	36
28	ZF83H28000	M36 × 1.5	38	41

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Figure 9

11.5.1.2 PLUG (TUBE PLUG)

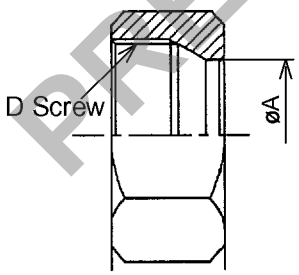


Applicable tube O. D : A	Plug parts No.
6	ZF83P06000
8	ZF83P08000
10	ZF83P10000
12	ZF83P12000
15	ZF83P15000
18	ZF83P18000
22	ZF83P22000
28	ZF83P28000

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Figure 10

11.5.1.3 NUT



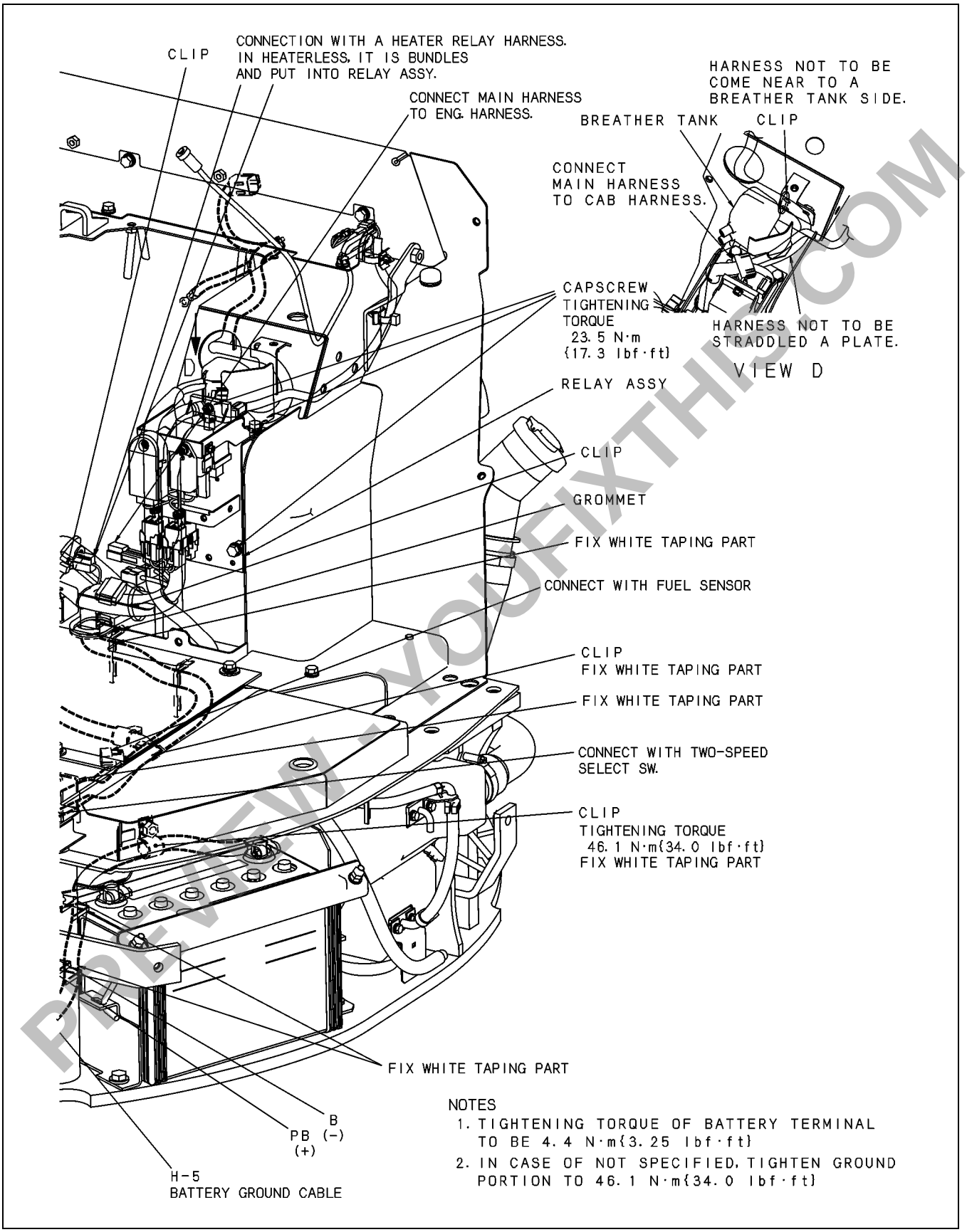
Applicable tube O. D : A	Nut parts No.	D screw	Opposing flats
6	ZF93N06000	M12 × 1.5	14
8	ZF93N08000	M14 × 1.5	17
10	ZF83H10000	M16 × 1.5	19
12	ZF93N12000	M18 × 1.5	22
15	ZF93N15000	M22 × 1.5	27
18	ZF93N18000	M26 × 1.5	32
22	ZF93N22000	M30 × 1.5	36
28	ZF93N28000	M36 × 1.5	41
32	ZF93N32000	M42 × 1.5	50
35	ZF93N35000	M45 × 1.5	55
38	ZF93N38000	M48 × 1.5	60

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Figure 11

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Figure 8

FIG. 23-2 UPPER FRAME PORTION (2/6)

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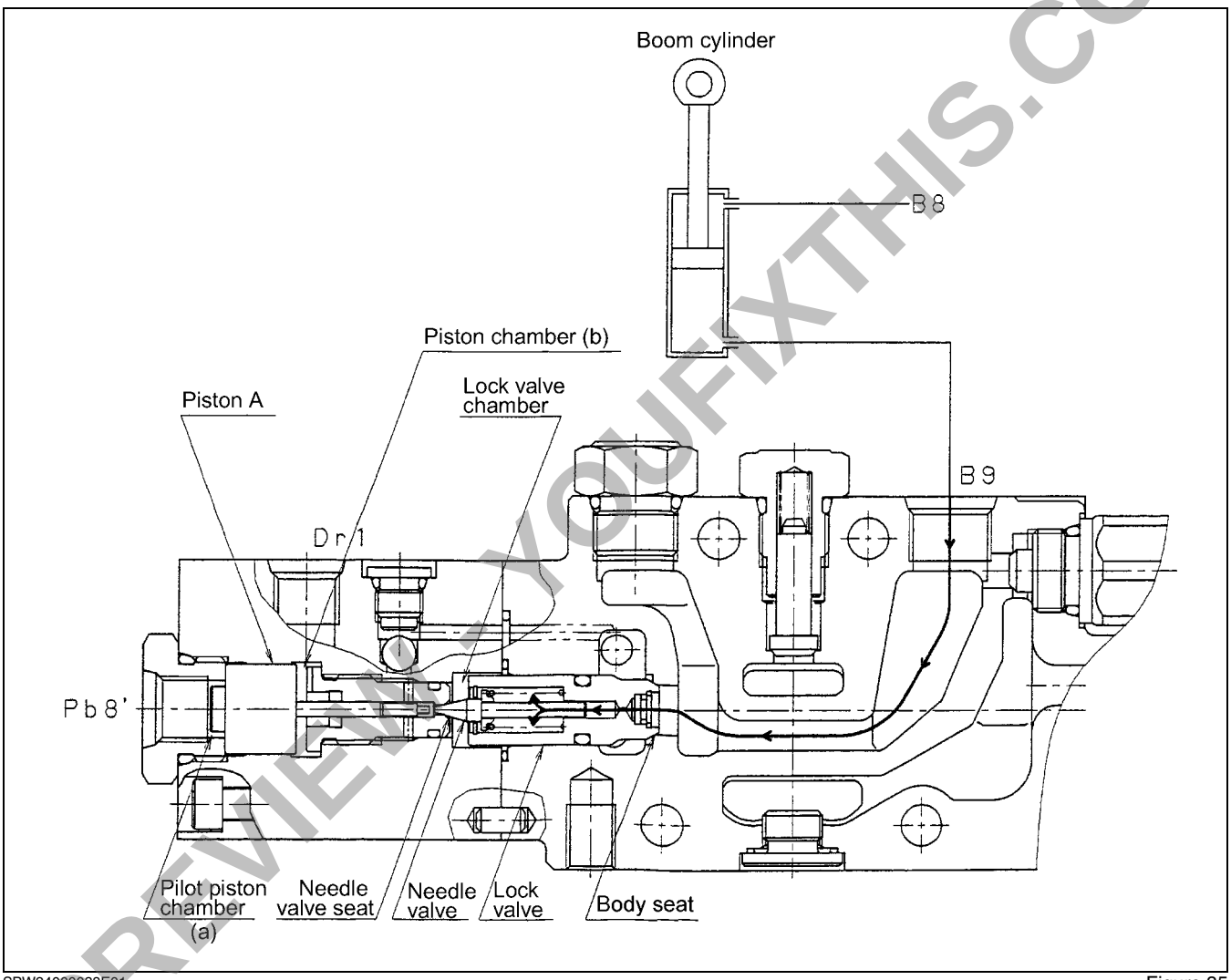
5. Function of Lock Valve

1. Piston Holding

When the boom spool is at neutral position, the pilot piston chamber (a) is connected to the drain passage through the pilot port (Pb8) for releasing lock valve. And the piston chamber (b) is also connected to the drain passage through the drain port (Dr1).

Piston (A) is held at the position shown in the figure.

The hydraulic pressure to hold the boom cylinder is applied to the lock valve chamber as shown in the figure, pressing the needle valve and lock valve to their seats respectively. This prevents leakage on the head side of boom cylinder, and also prevents the arm cylinder from movement due to leakage.



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Figure 35

FIG. 24-16 FUNCTION OF LOCK VALVE (PISTON HOLDING)

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31.1 GENERAL DISASSEMBLY AND ASSEMBLY

31.1.1 CONTENTS OF GENERAL DISASSEMBLY AND ASSEMBLY

This chapter is consist of three sections as follows.

1. ATTACHMENT.....Index No.: 32

   Part I: Removing and Installing Assembly

   Part II: Disassembling and Assembling Components

   1. Hydraulic cylinder
   2. UPPER SLEWING STRUCTURE Index No.: 33

   Part I: Removing and Installing Assembly

   Part II: Disassembling and Assembling Components

   1. Hydraulic pump
   2. Control Valve
   3. Pilot Valve (ATT)
   4. Pilot Valve (Travel)
   5. Slewing Motor
   6. Swivel Joint

2. TRAVEL SYSTEM.....Index No.: 34

   Part I: Removing and Installing Assembly

   Part II: Disassembling and Assembling Components

   1. Travel Motor

31.1.2 SPECIFICATION OF TIGHTENING TORQUE

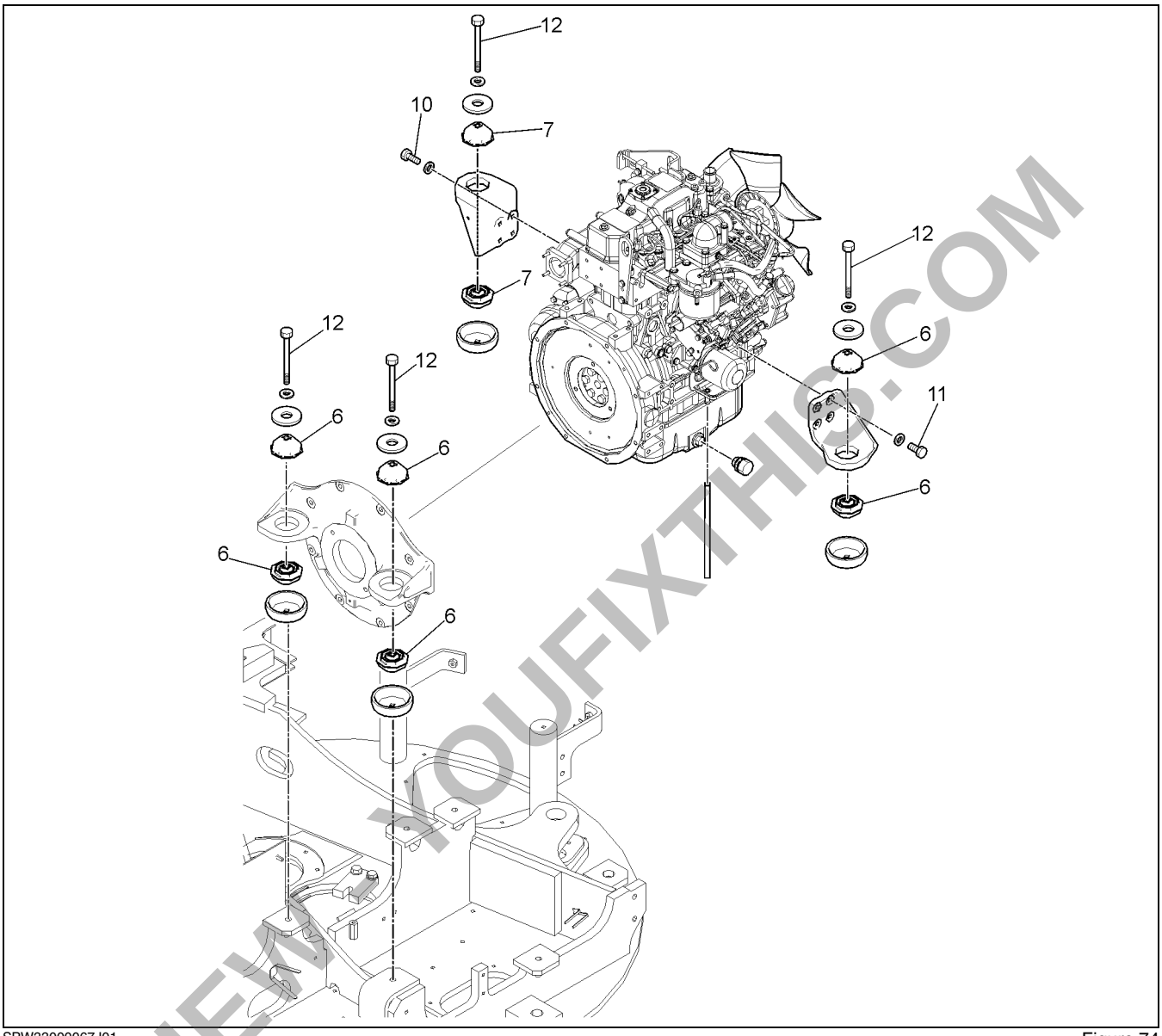
Tightening torque is indicated as follows, for example;
T=100Nm (73.8 lb. ft)

Tolerance is ± 10% unless otherwise specified.

- Refer Index No. 11 TOOLS for standard tightening torque.

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Figure 74

FIG. 33-59 ENGINE REMOVAL

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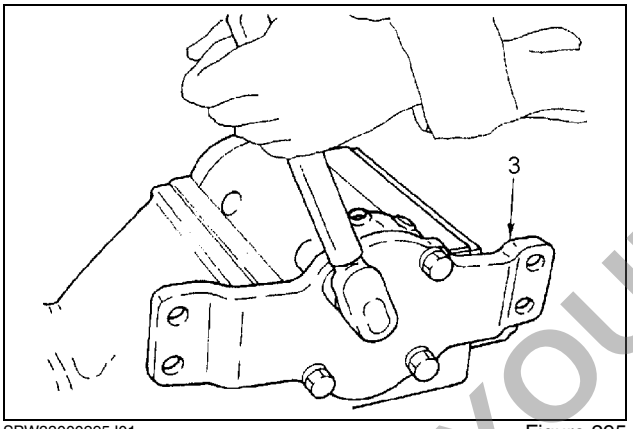
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33.2.8.2 DISASSEMBLY AND ASSEMBLY

33.2.8.2.1 GENERAL PRECAUTIONS

- For disassembly and assembly, select a clean area and prepare clean containers to put the removed parts.
- Clean around the ports.
- Clean the removed parts with cleaning solvent.
- Replace seals, apply grease during assembly.
- Check every part for severe wear and seizure, and remove any burrs, etc. with emery paper.
- Check that seal groove is free from foreign substances, dust, etc.

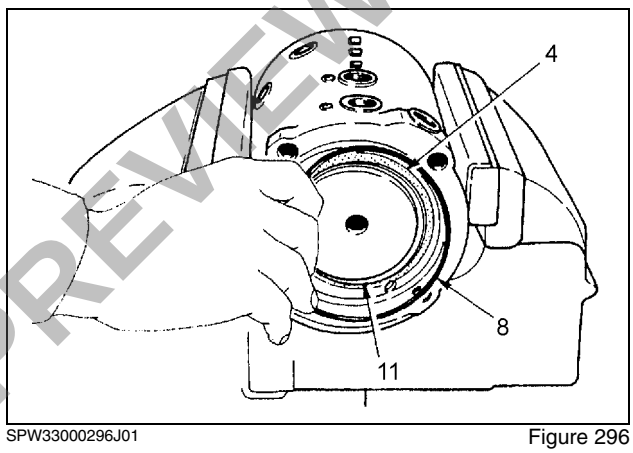
33.2.8.2.2 DISASSEMBLY



SPW33000295J01 Figure 295

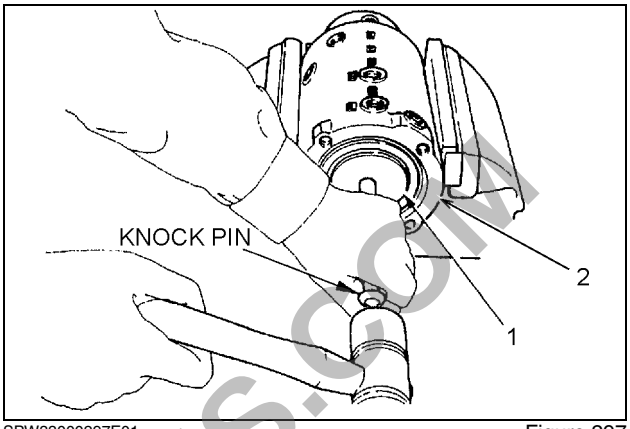
1. Mount the body (2) in a soft jawed vise. Loosen bolt and remove flange (3).

: 17 mm or : 17 mm



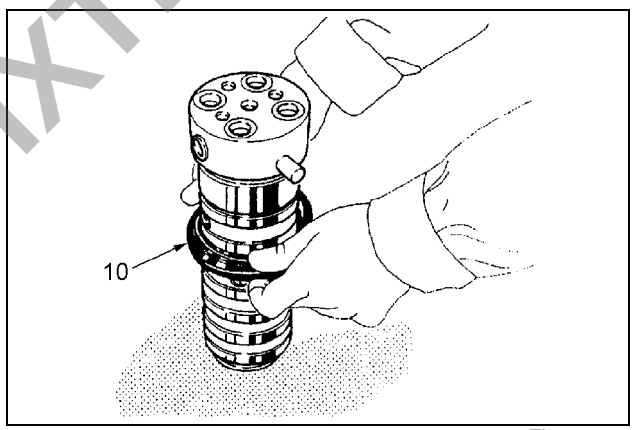
SPW33000296J01 Figure 296

2. Take out O-ring (8), snap ring (11) and thrust ring (4).



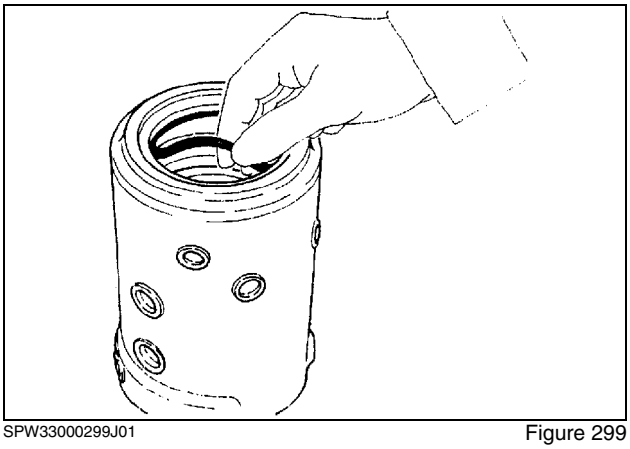
SPW33000297E01 Figure 297

3. Remove shaft (1) from the body (2).
   - Use a brass drift and drive the shaft from the body.



SPW33000298J01 Figure 298

4. Remove dust seal (10) from the shaft.



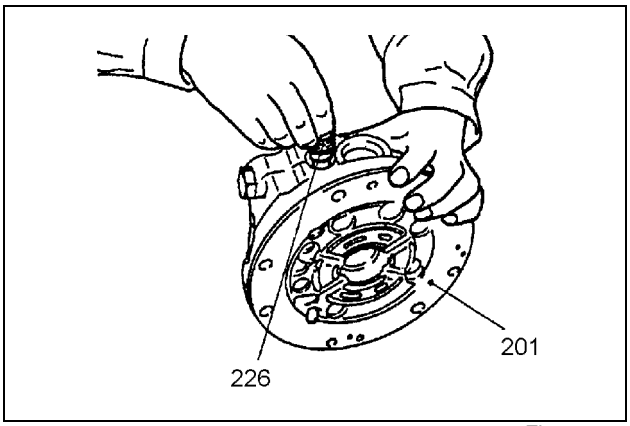
SPW33000299J01 Figure 299

5. Remove seals from the inside of the body.
   - Be sure of the position of seal, referring to the sectional drawing.

33.2.8.2.3 ASSEMBLING

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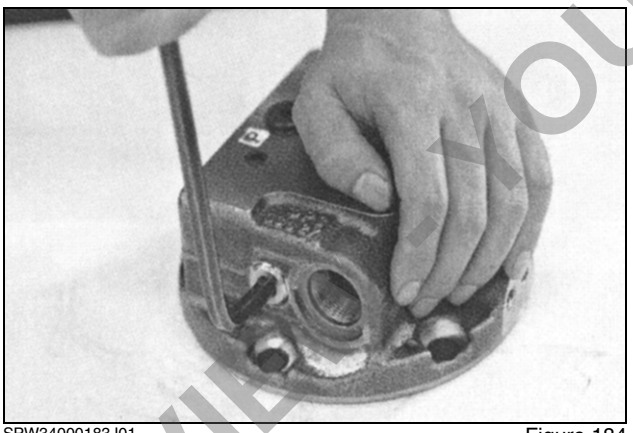
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SPW34000182J01 Figure 183

FIG. 34-162 INSERTING PLUG (226)

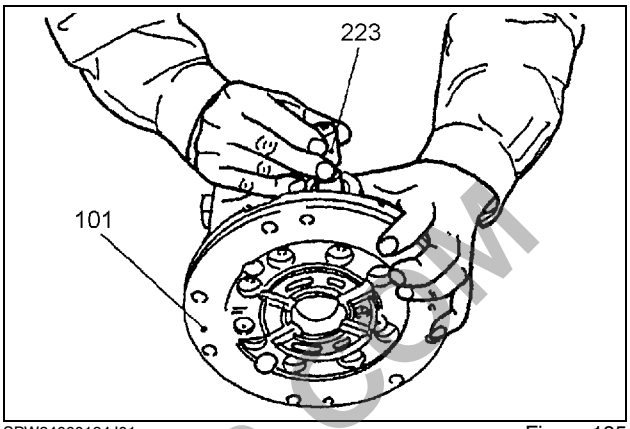
8. Assembling brake valve parts inside rear flange
   A. Install two O-rings (237) onto the two plugs (226).
   B. Coat the O-rings (237) with grease.
   C. Install the valve (227) and spring (230) onto the plug (226).
   D. Insert the plug (226) with the valve (227) and spring (230) into the rear flange (201).



SPW34000183J01 Figure 184

FIG. 34-163 TEMPORARILY TIGHTENING PLUG (226)

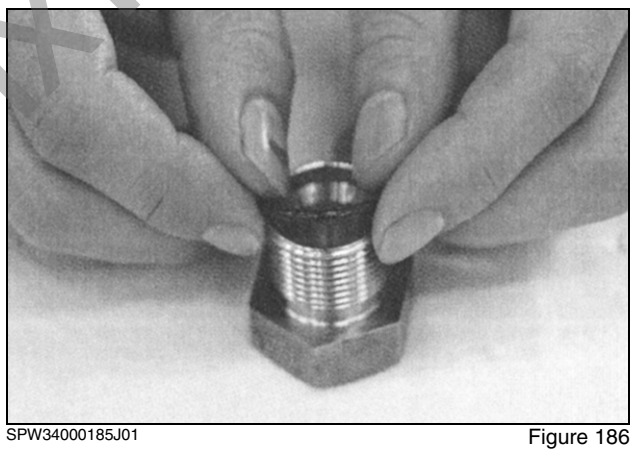
   E. After installing two plugs (226) into the rear flange (201), snug them using an Allen wrench.



SPW34000184J01 Figure 185

FIG. 34-164 INSERTING SPOOL (223)

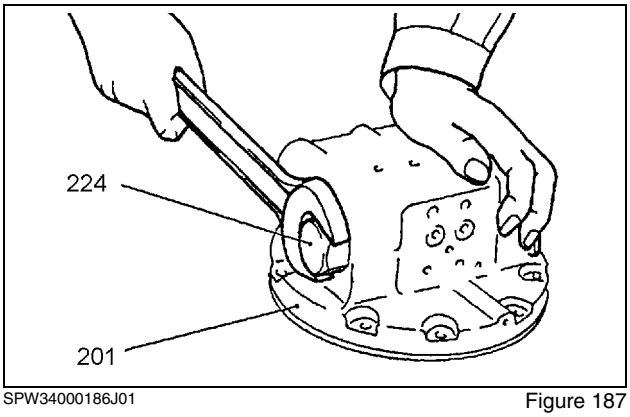
   F. Insert the spool (223) into the rear flange (201).
   G. Apply hydraulic oil to the spool and insert the spool into the rear flange.



SPW34000185J01 Figure 186

FIG. 34-165 INSTALLING O-RING (236)

   H. Install the O-ring (236) onto plug (224).
   I. Install the spring retainer (225) and spring (228) into the plug (224).



SPW34000186J01 Figure 187

FIG. 34-166 TEMPORARILY TIGHTENING PLUG (224)

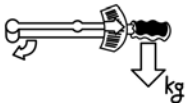
   J. Temporarily tighten two plugs (224) to the rear flange (201) with a wrench.

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(5) FASTENER TORQUE

⚠ WARNING



● Torqueing Fasteners

Always follow the torque values and procedures as designated in the service manual. Incorrect values, procedures and or tools may cause damage to the engine and or personal injury.

(6) Electrical

⚠ WARNING



● Short Circuits

Always disconnect the (-) Negative battery cable before working on the electrical system. An accidental “short circuit” may cause damage, fire and or personal injury. Remember to connect the (-) Negative battery cable (back onto the battery) last.
Fasten the terminals tightly.

⚠ WARNING



● Charging Batteries

Charging wet celled batteries produces hydrogen gas. Hydrogen gas is extremely explosive. Keep sparks, open flame and any other form of ignition away. Explosion may occur causing severe personal injury.

⚠ WARNING



● Battery Electrolyte

Batteries contain sulfuric acid. Do NOT allow it to come in contact with clothing, skin and or eyes, severe burns will result.

(7) WASTE MANAGEMENT

⚠ CAUTION

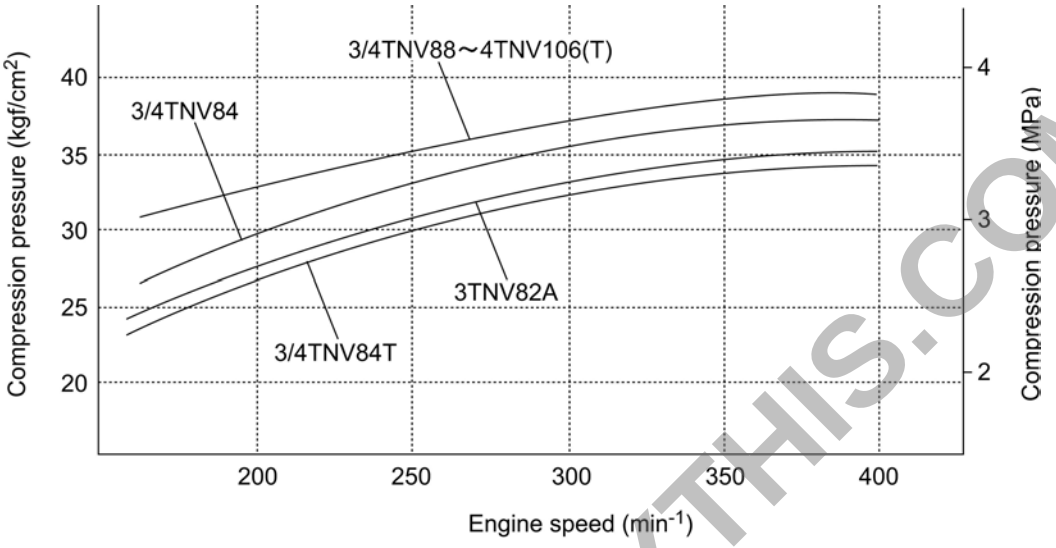
Observe the following instructions with regard to hazardous waste disposal. Negligence of these will have a serious impact on environmental pollution concerns.

1) Waste fluids such as lube oil, fuel and coolant shall be carefully put into separate sealed containers and disposed of properly.
2) Do NOT dispose of waste materials irresponsibly by dumping them into the sewer, overland or into natural waterways.
3) Waste materials such as oil, fuel, coolant, solvents, filter elements and batteries, must be disposed of properly according to local ordinances. Consult the local authorities or reclamation facility.

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(3) Engine speed and compression pressure (for reference)



(4) Measured value and troubleshooting

When the measured compression pressure is below the limit value, inspect each part by referring to the table below.

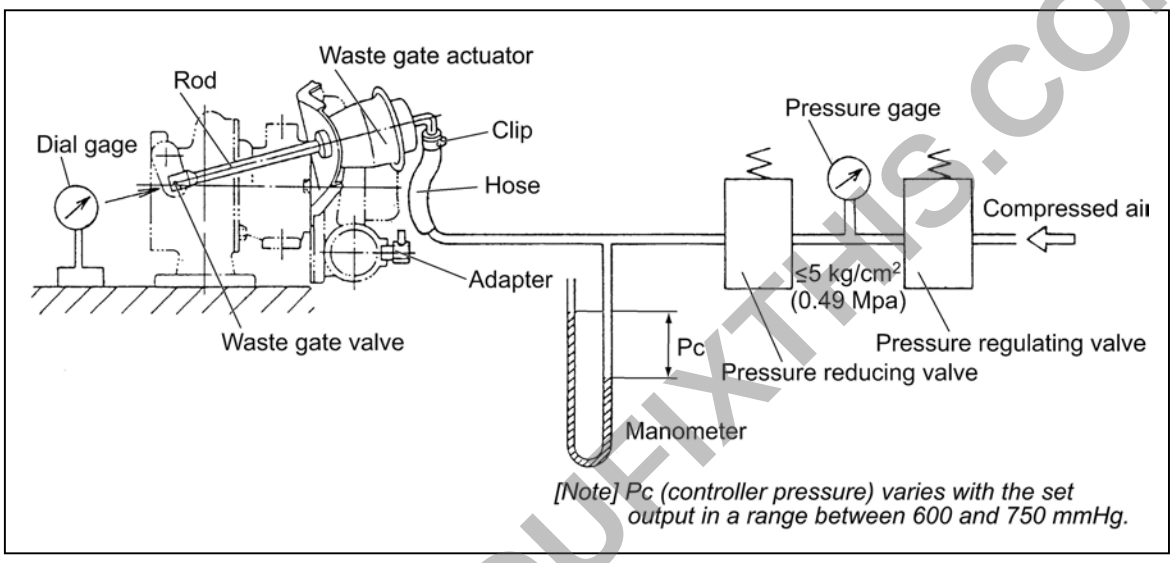
No.	Item	Cause	Corrective action
1	● Air cleaner element	● Clogged element ● Broken element ● Defect at element seal portion	● Clean the element. ● Replace the element.
2	● Valve clearance	● Excessive or no clearance	● Adjust the valve clearance. (See 3.5 in Chapter 3.)
3	● valve timing	● Incorrect valve clearance	● Adjust the valve clearance. (See 3.5 in Chapter 3.)
4	● Cylinder head gasket	● Gas leak from gasket	● Replace the gasket. ● Retighten the cylinder head bolts to the specified torque. (See 4.2(2)12) in Chapter 4.)
5	● Intake/exhaust vale ● Valve seat	● Gas leak due to worn valve seat or foreign matter trapping ● Sticking valve	● Lap the valve seat. (See 4.2(6) in Chapter 4.) ● Replace the intake/exhaust valve.
6	● Piston ● Piston ring ● Cylinder	● Gas leak due to scratching or wear	● Perform honing and use an oversized part. (See 4.4(5)-(5-1), (5-4) and (6) in Chapter 4.)

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(b) Measuring instruments and devices

Dial gage	Capable of measuring 0 to 10 mm (A flat head type is recommendable.)
Manometer	Mercury column or electrical type (capable of measuring 0 to 1500 mmHg)
Pressure regulating valve	Allowing gradual adjustment in a range between 0 and 2 kgf/cm^2 (0.196 Mpa)
Pressure reducing valve	Used for suppressing the air supply pressure at 5 kgf/cm^2 (0.49 Mpa) or less.
Pressure gage	Bourdon tube pressure gage (0 to 10 kgf/cm^2 (0.98 Mpa))



(c) Check method

1) Set the manometer control pressure (Pc) applied to the waste gate actuator to 0 and set the dial gage to the zero point.
2) Gradually open the pressure regulating valve and measure the Pc value when the actuator rod is operated by 2 mm.
3) For the hysteresis, let the rod move to 3 mm first. The gradually close the pressure regulating valve, measure the pressure when the rod is moved to 2mm and obtain the difference from the pressure measured in b. above.
4) Precautions

- Set the dial gage on the extension line of the actuator rod.
- The piping and joints shall completely be free from leak.
- Fix the turbocharger and dial gage securely.
- If an electric manometer is used, it shall have sufficient precision.
- Even when an electric manometer is used, use of a mercury column type manometer in combination is recommended for calibration and daily check.
- The speed for increasing/decreasing Pc by means of the pressure regulating valve shall be very slow near the measuring point. If the mm position is exceeded, restart from the beginning.
- Do not apply over 0.49 MPa (5 kgf/cm^2) to the actuator.

(2) Waste gate actuator leak test

Apply 0.12 Mpa (1.2kgf/cm^2) to the actuator and hold the state for minute. The actuator is good if the pressure then is 0.11 Mpa (1.1kgf/cm^2) or above.

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