2.3 SPECIFICATIONS AND PERFORMANCE

SPEED AND GRADEABILITY

Model		E30B				E35B			
Applicable Machines		PW14-46519~				PX15-21105~			
Shoe Type		Rubber shoe		Iron shoe (OPT)		Rubber shoe		Iron 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
Gradeability	% (degree)	58(30)							

ENGINE

Model (YANMAR)		3TNV88-BPYB
Type		Water-cooled, 4-cycle type Swirl chamber type diesel engine
Number of cylinders-Bore X Stroke		3 - 88 dia. 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	$N-m/min^{-1}$ (lbf-ft/rpm)	98.0/1,440 (72.3/1,440)
Starting Motor	V X kW	12 X 1.7
Generator	V X A	12 X 55

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)

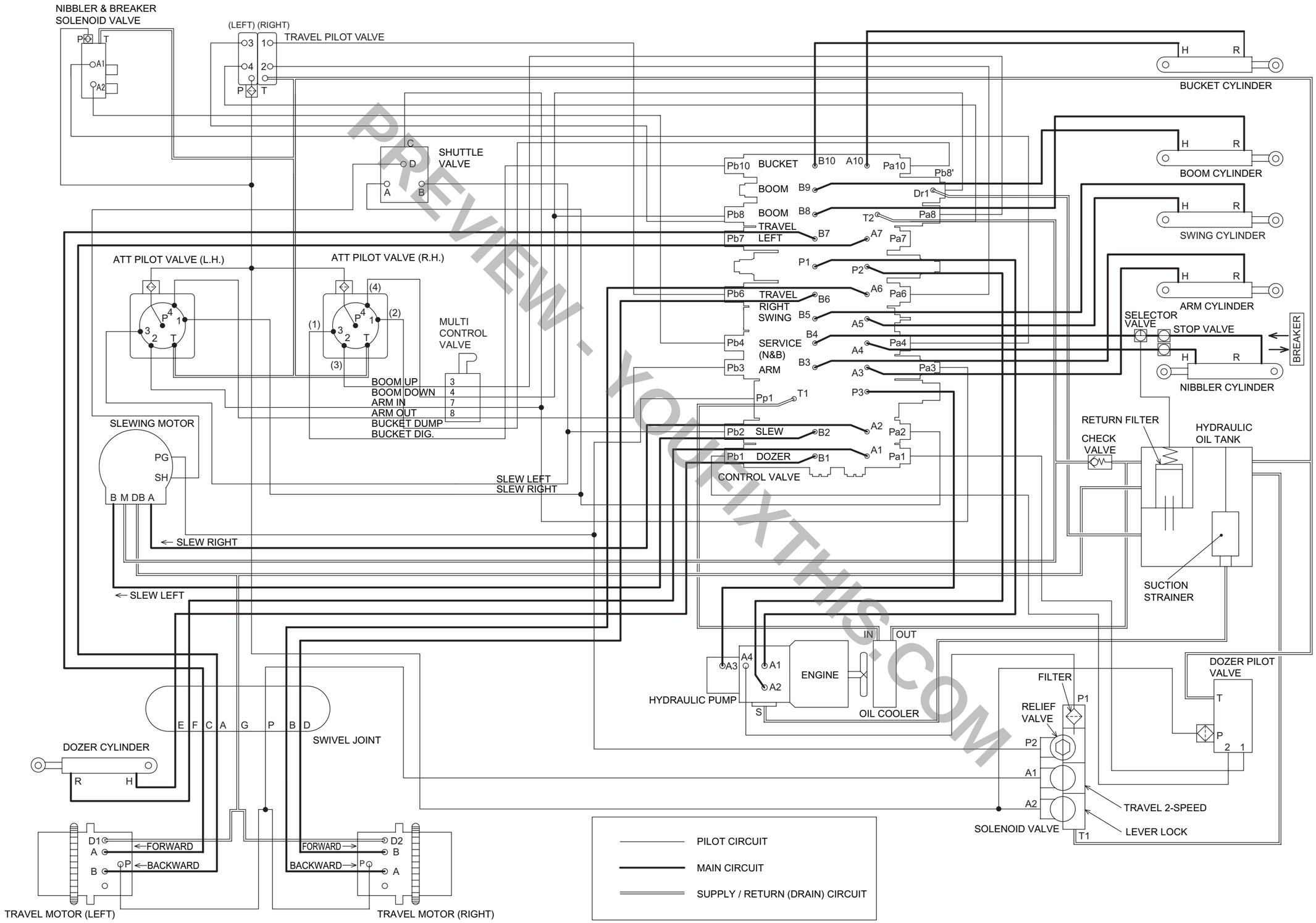
SIDE DIGGING & DOZER

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

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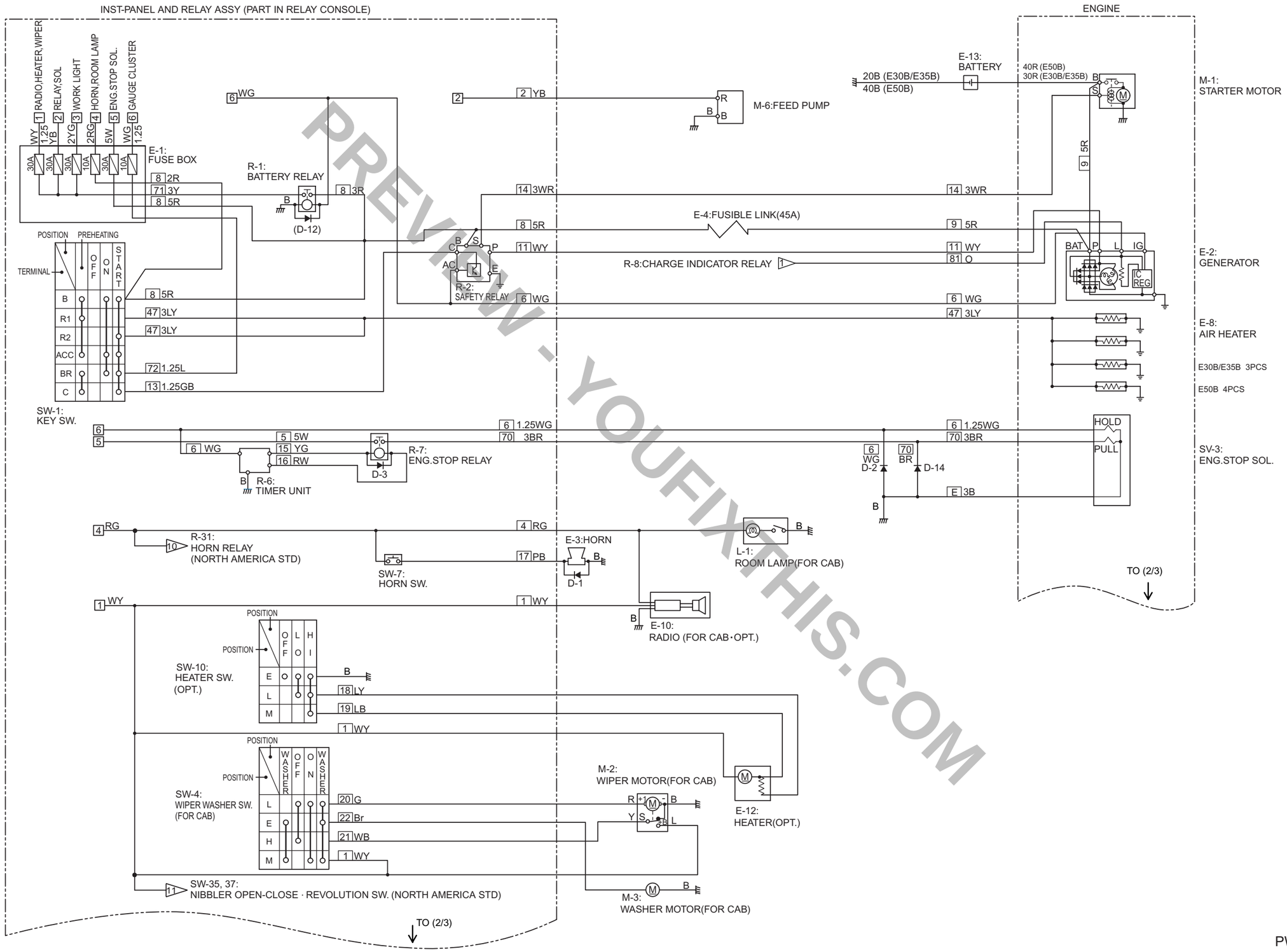
22.4 SCHEMATIC PIPING FOR HYDRAULIC SYSTEM



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23.2.3 ELECTRIC CIRCUIT DIAGRAM



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(1/3)
PW03Z00015P1 05

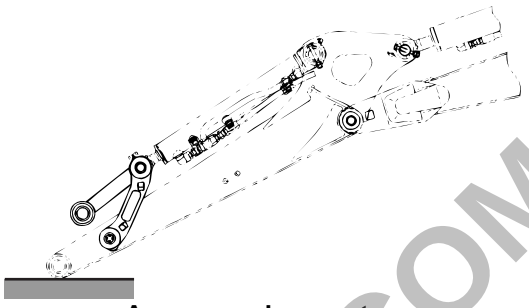
32.1.3 ARM

32.1.3.1 REMOVAL OF ARM

(1) Fully retract the arm and bucket cylinders then lower the arm tip to the ground.

(2) Simultaneously shut off the engine and operate the arm control lever several times to release pressure in the circuit.
Then put the safety lock lever in the "Locked" position and depress the air breather on the hydraulic oil tank to release the pressure in the tank.

(3) Disconnect the two hoses connected to the bucket cylinder. Then apply plugs to the openings.
Tools : Spanner : 22 mm



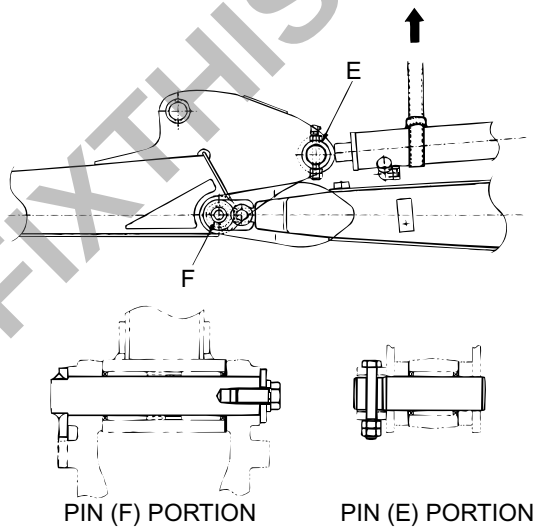
Arm removing posture

(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.
Tools : Spanner : 17 mm

(6) Place a square timber under the arm cylinder and lower the cylinder.

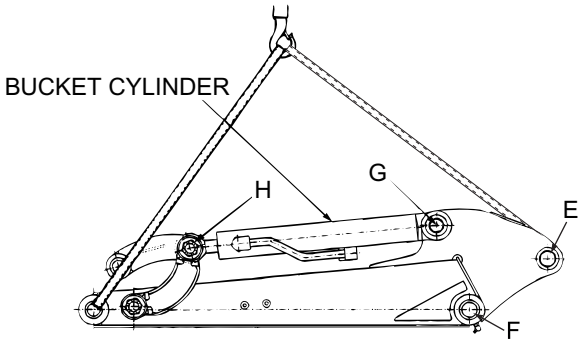
(7) Place pin (E) in its original position and use the capscrew and nuts to secure it. Use a rope to lift the arm and pin (E) up slightly, in order not to exert any load to the pin (F).



Sectional view of Installing Pin

(8) Remove the capscrew that holds pin (F) connecting the arm and boom, then pull off the pin (F).
Tools : Spanner : 24 mm

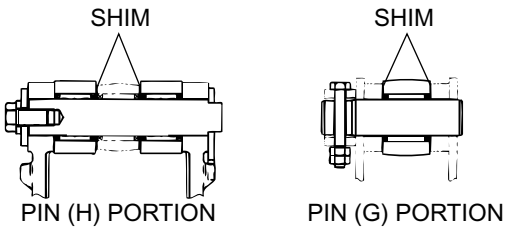
(9) Remove the arm assembly paying attention to the stability of arm.
Weight of arm assembly : approximately
120 kg (265 lbs) - E30B
140 kg (309 lbs) - E35B



Removal of Arm assembly

(10)Removal of Bucket Cylinder

1. Remove the capscrew that holds the rod pin (H) then pull off the pin (H).
Tools : Spanner : 24 mm
2. Remove the capscrew and nuts that holds the head pin (G) then pull off the pin (G).
Tools : Spanner : 17 mm
3. Apply a nylon sling to the tube of bucket cylinder, and remove the cylinder.
Weight ; approx. 20 kg (44 lbs)



Sectional view of Installing Pin

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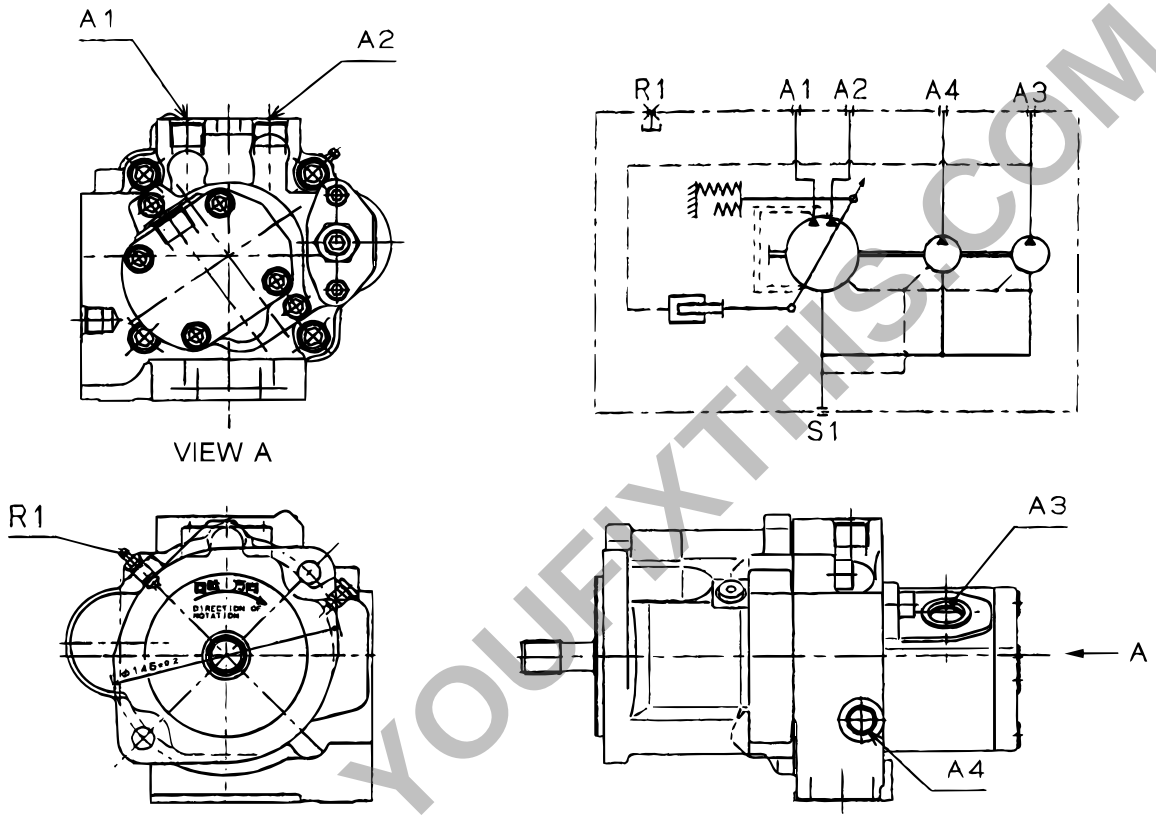
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24.1 HYDRAULIC COMPONENTS

24.1.1 HYDRAULIC PUMP

24.1.1.1 SUMMARY

(1) GENERAL VIEW



Hydraulic ports

No.	Ports name	Size
S1	Suction port	SAE 1 1/2
A1, A2	Delivery port	PF 1/2
A3	Delivery port	PF 1/2
A4	Pilot delivery port	PF 3/8
R1	Air bleeder port (with breather valve)	M10 × 1. 0

General view of hydraulic pump

(2) SPECIFICATIONS

Item	Model (Type)	AP2D18LV3RS7–898–0		
		Piston pump P1 + P2	Gear pump P3	Trochoid pump P4
Working pressure	MPa (psi)	23.0 (3340)	20.0 (2900)	3.5 (508)
Displacement	cc/rev (cu•in/rev)	16.0 (0.98)×2	8.6 (0.52)	5.1 (0.31)
Delivery flow	L/min (gal/min)	38.4 (10.1)×2	20.6 (5.44)	12.2 (3.22)
Control system		Total power shift control by tilting angle (power shift)		
Rated revolution	min^{-1}(rpm)	2400		
Weight	kg (lb)	27.5(60.6)		

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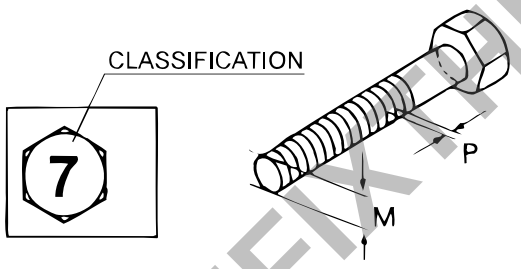
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11.1 TORQUE SPECIFICATIONS FOR CAPSCREWS & NUTS

The following Torque Specifications are provided for use when actual torque value of a fastener is not known. Check the capscrews and nuts for looseness before the start of daily work and at periodic maintenance. Retighten loosened ones, and install new ones if missing. For new machines, checking and retightening of capscrews and nuts must be carried out after the first 50 hours operation. For the replacement of capscrews and nuts, 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 plastic capscrews. Over-tightening may cause damage to plastic capscrews. For the tightening torque for plastic capscrews, consult with an authorized distributor.
- If the tightening torque is specified elsewhere in the manual, use the that torque value rather than that the one in the table..
- 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.



Note

Make certain to tighten all capscrews and nuts to proper torque values.

11.1.1 Metric Coarse Thread Standard Tightening Torque Values

Torque value Unit : N•m (lbf•ft)

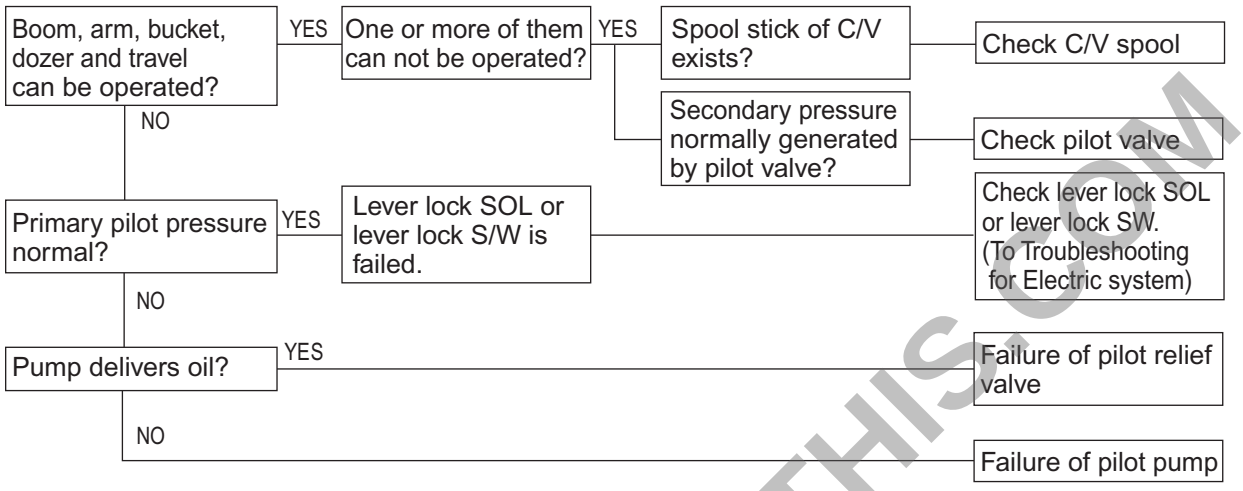
Classification		4.8T		7T		10.9T	
Nominal size		No lubrication	Oil lubrication	No lubrication	Oil lubrication	No lubrication	Oil lubrication
M6	P=1	4.4±0.5 (3.2±0.4)	3.7±0.4 (2.7±0.3)	9.6±1.0 (7.1±0.7)	8.1±0.8 (6.0±0.6)	17.4±1.8 (12.8±1.3)	14.7±1.5 (10.8±1.1)
M8	P=1.25	10.7±1.1 (7.9±0.8)	9.0±0.9 (6.6±0.7)	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)

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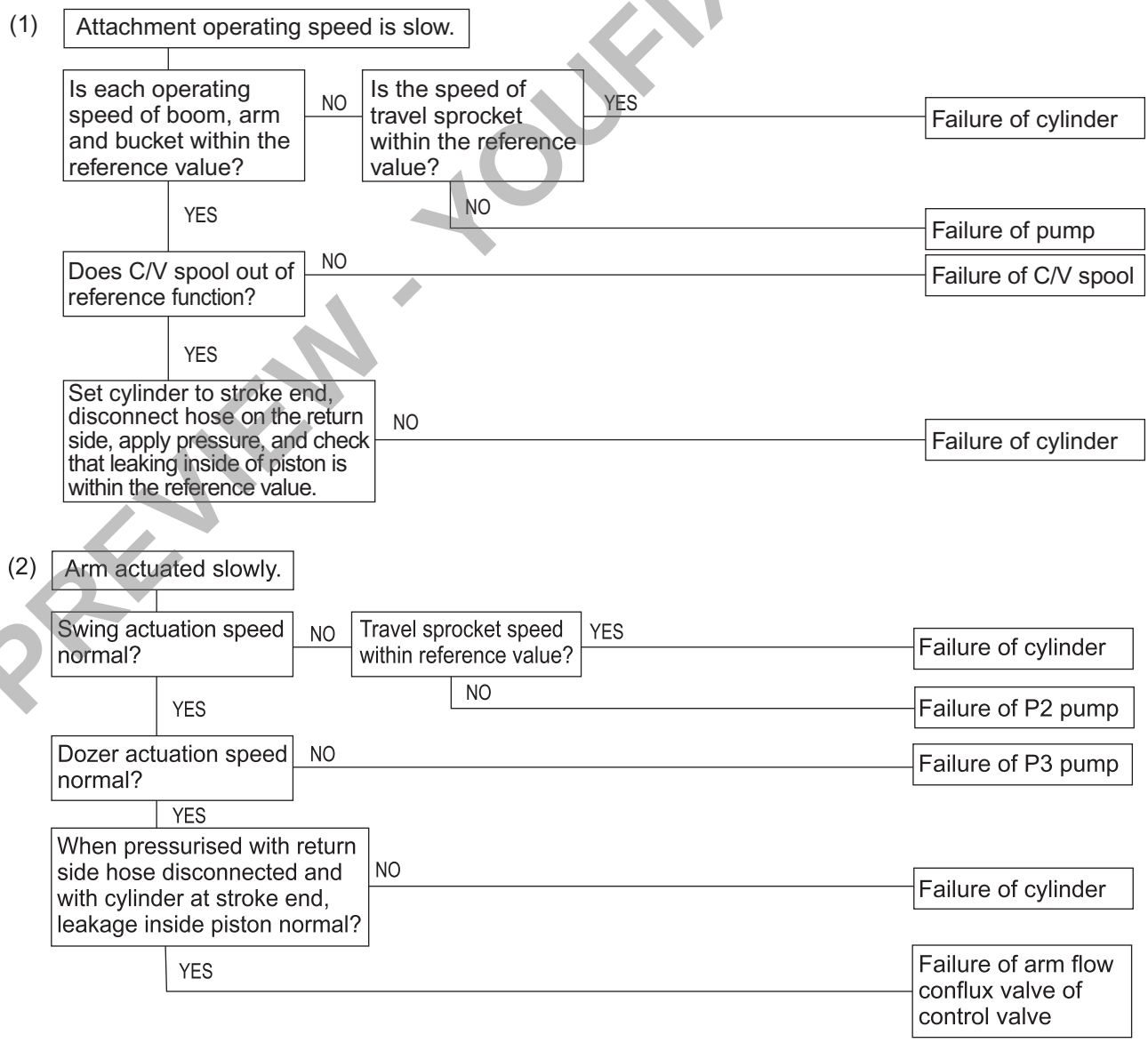
42.3 TROUBLESHOOTING

42.3.1 ATTACHMENT

42.3.1.1 ATTACHMENT OPERATIONAL FAILURE (Excluding swing operations)



42.3.1.2 ATTACHMNT SPEED IS SLOW



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COMPACT HYDRAULIC EXCAVATOR

SERVICE MANUAL model E30B E35B

INDEX

1	SPECIFICATIONS SECTION
2	MAINTENANCE SECTION
3	SYSTEM SECTION
4	DISASSEMBLY SECTION
5	TROUBLESHOOTING
6	ENGINE SECTION
7	PROCEDURE OF INSTALLING OPTIONS SECTION

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NEW HOLLAND

Book Code No.**S5PW0033E02**

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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 firm level 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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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
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)

11.1.2 Metric Fine Thread Standard Tightening Torque values

Note

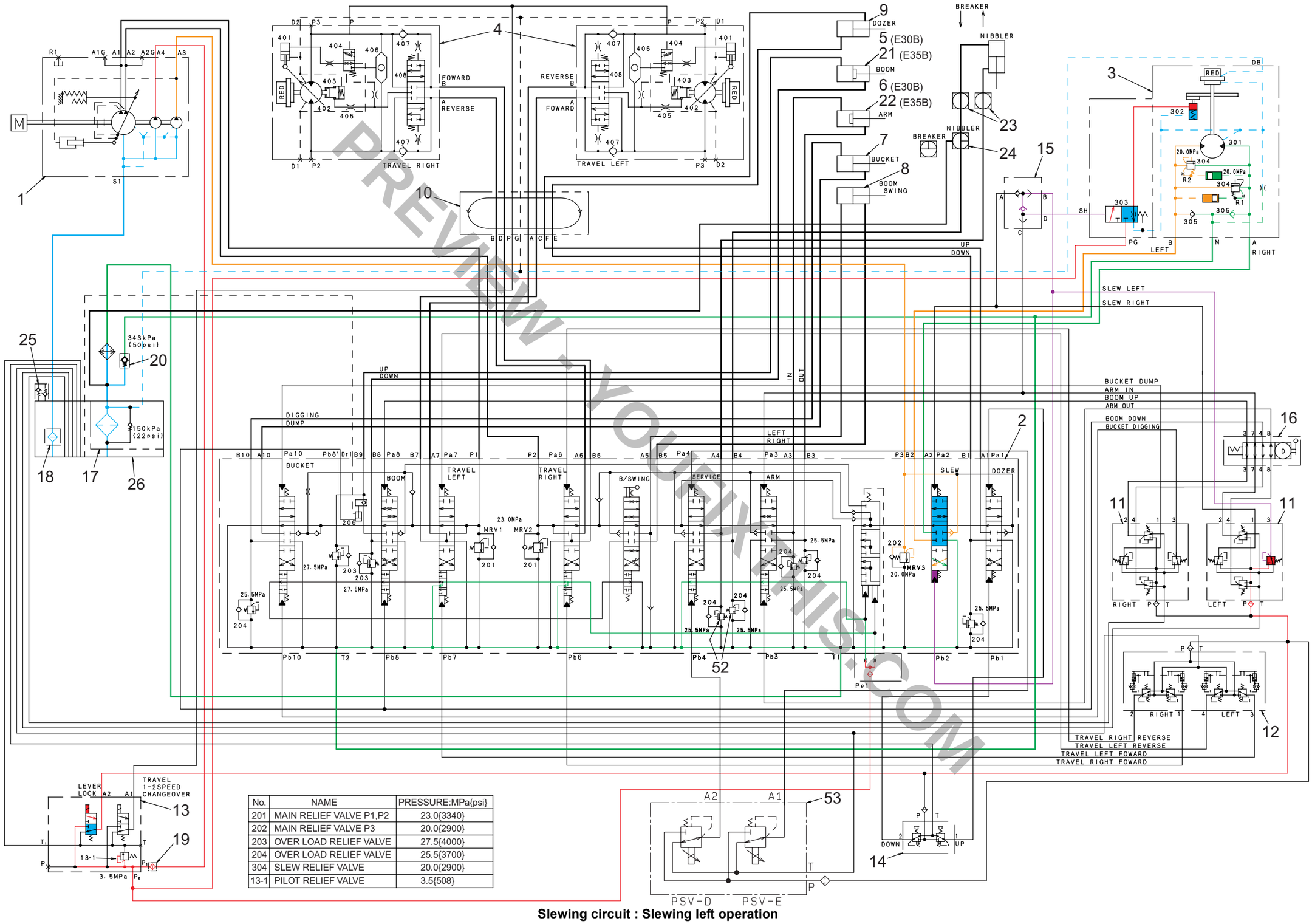
Make certain to tighten all capscrews and nuts to proper torque values.

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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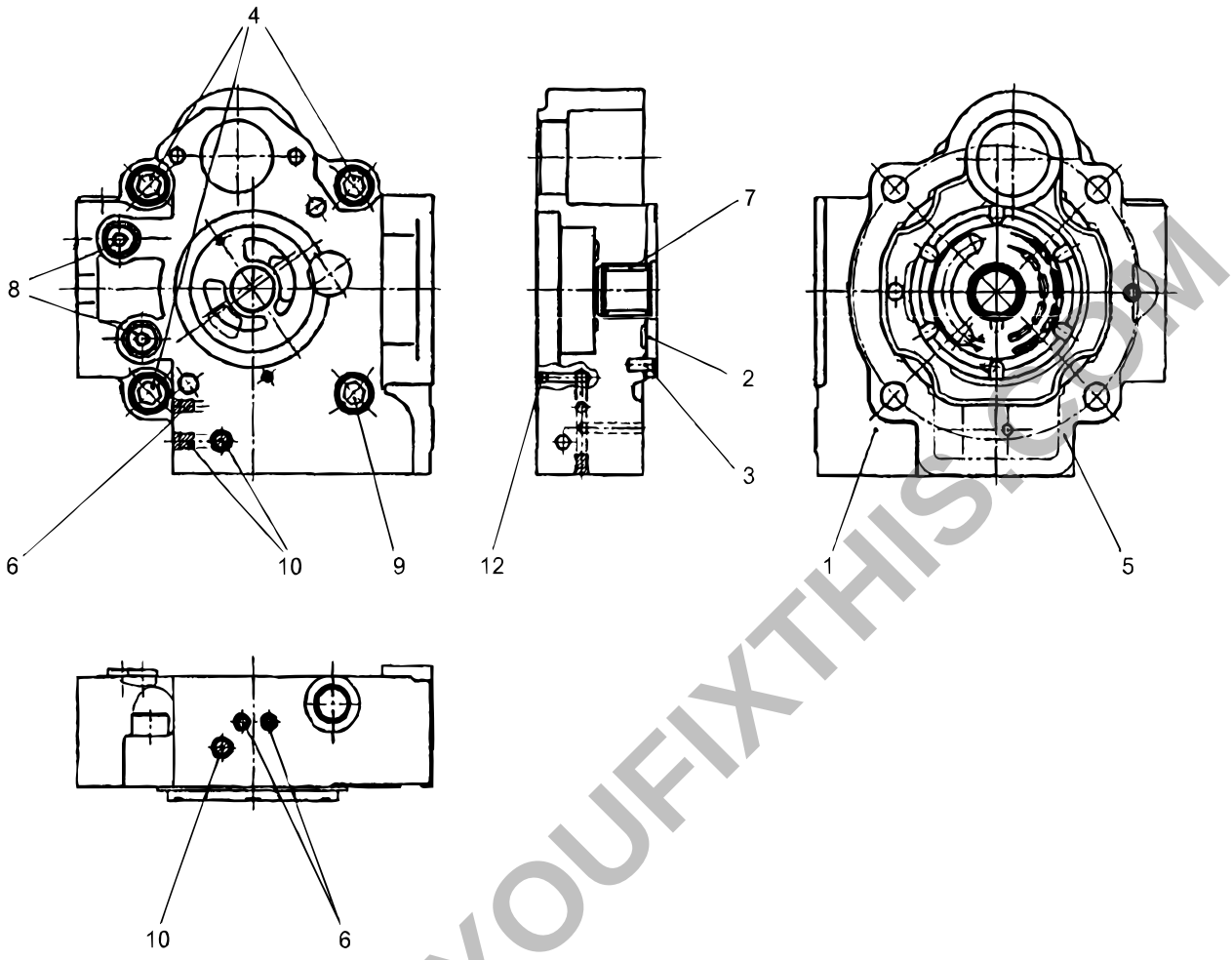
No.	NAME	PRESSURE:MPa{psi}
201	MAIN RELIEF VALVE P1,P2	23.0{3340}
202	MAIN RELIEF VALVE P3	20.0{2900}
203	OVER LOAD RELIEF VALVE	27.5{4000}
204	OVER LOAD RELIEF VALVE	25.5{3700}
304	SLEW RELIEF VALVE	20.0{2900}
13-1	PILOT RELIEF VALVE	3.5{508}

Slewing circuit : Slewing left operation

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(5) Cover

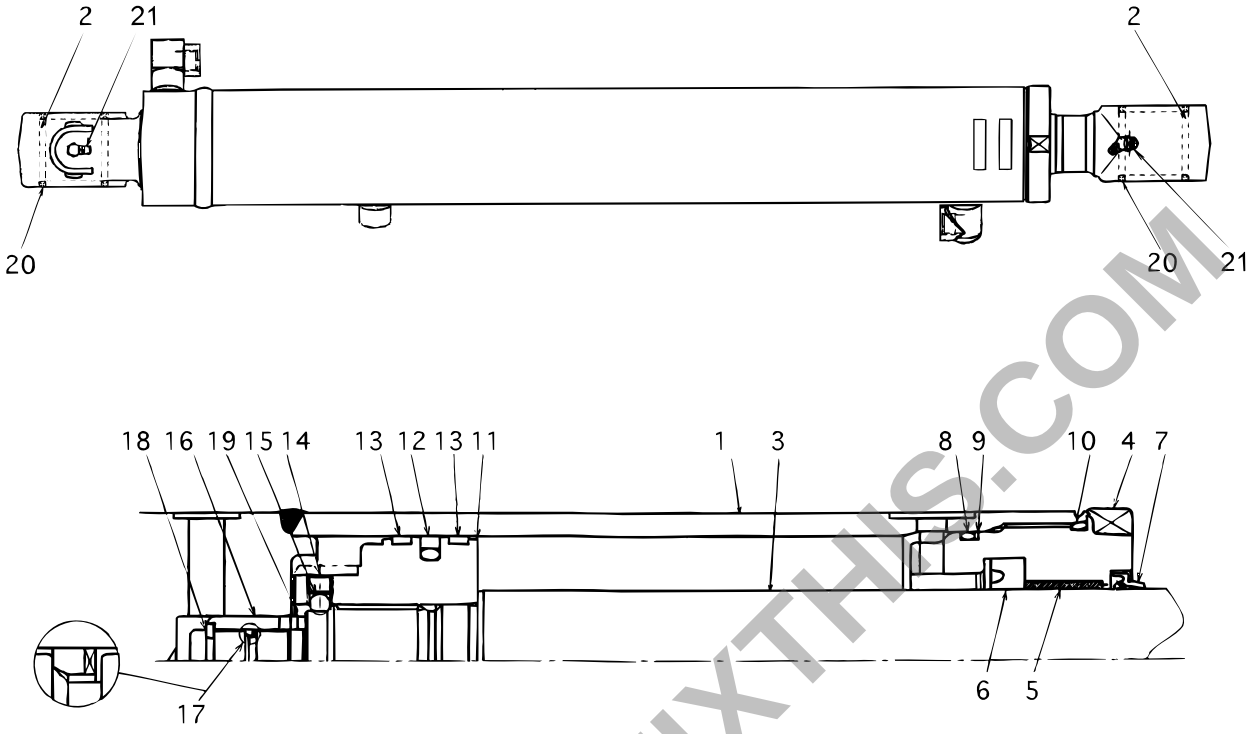


No.	NAME	Q'TY	No.	NAME	Q'TY
1	Cover	1	7	Bearing	1
2	Control plate	1	8	Plug	2
3	Parallel pin	1	9	Capscrew (M12X55)	1
4	Capscrew (M12X40)	3	10	Plug	3
5	Packing	1	12	Orifice	1
6	Plug	3			

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(2) Arm cylinder



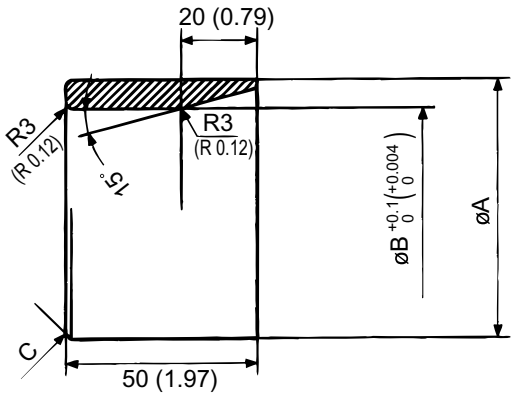
Construction of Arm cylinder

No.	NAME	Q'TY	No.	NAME	Q'TY	No.	NAME	Q'TY
1	CYLINDER TUBE ASSY	1	8	O-RING	1	15	STEEL BALL	1
2	PIN BUSHING	2	9	BACK-UP RING	1	16	CUSHION BEARING	1
3	PISTON ROD ASSY	1	10	O-RING	1	17	CUSHION SEAL	1
4	CYLINDER HEAD	1	11	PISTON	1	18	STOPPER	2
5	BUSHING	1	12	SEAL RING ASSY	1	19	SNAP RING	1
6	U-RING	1	13	SLIDE RING	2	20	DUST SEAL	4
7	WIPER RING	1	14	SETSCREW	1	21	GREASE NIPPLE	2

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(5) Reforming Jig (E) for Seal Ring (18)



Material : STKM13C or carbon steel tube

Unit : mm (in)

Applicable Cylinder		Dimension	
E30B	E35B		
(Tube dia ; ø65 (2.56)) Bucket		A	80.0 (3.15)
		B	65.0 (2.56)
(Tube dia ; ø75 (2.95)) Arm	——	A	90.0 (3.54)
		B	75.0 (2.95)
(Tube dia ; ø80 (3.15)) Boom Swing	Boom Arm Swing	A	95.0 (3.74)
		B	80.0 (3.15)
(Tube dia ; ø100 (3.94)) Dozer		A	115 (4.53)
		B	100 (3.94)

32.2.1.8 POSSIBLE CAUSES FOR TROUBLE AND REMEDY

Trouble Conditions	Major Possible Causes	Remedy
Oil leakage from sliding face of piston rod. (A ring shape oil is formed on piston rod and enlarged resulting dripping down of oil)	Foreign matter is caught by U-ring or wiper ring at its inside periphery.	Remove foreign matter.
	Scuffing or fault on U-ring or wiper ring at its inside periphery.	Replace each part with new one.
	Scuffing on sliding face of piston rod.	Grind sliding face with a fine oil stone. (less than 1.6S)
		If leakage is not stopped by grinding, replace seals such as U-ring, etc. with new ones.
		If leakage is not stopped by replacing seals, replace piston rod.
	Peeling off of hard chrome plating.	Re-plating of hard chrome on piston rod.
Oil leakage from outer periphery of cylinder head.	Damages on O-ring.	Replace.
	Damages on back-up ring.	Replace.
Oil leakage from welded portion.	Damages on welded portion on tube.	Replace.
Piston movement due to leakage. (For the case when static load that is equivalent to product of multiplication of max. working pressure and cylinder area, is applied to rod, max. movement of piston is larger than 0.5mm (0.02 in)) per 10 minutes.	Foreign matter is caught by sliding face of slide ring.	Remove foreign matter.
	Scuffing or faulty condition on sliding face of slide ring.	Replace.
	Scuffing on sliding face of seal ring assembly.	Replace.
	Damages on O-ring.	Replace.

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10. Disassembling gear pump (GSP2)

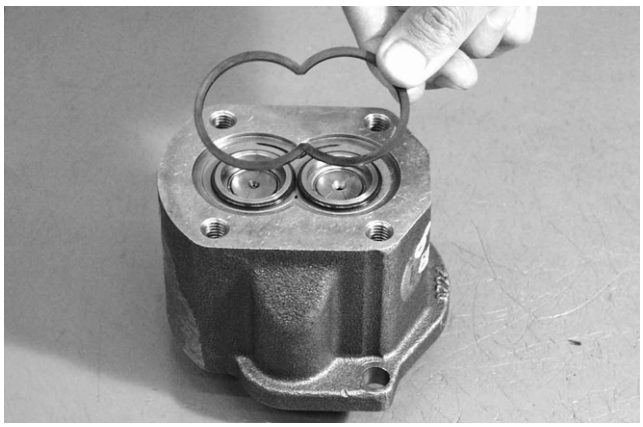
a. Loosen four socket bolts (M10X20).
Tools: Allen wrench: 8 mm



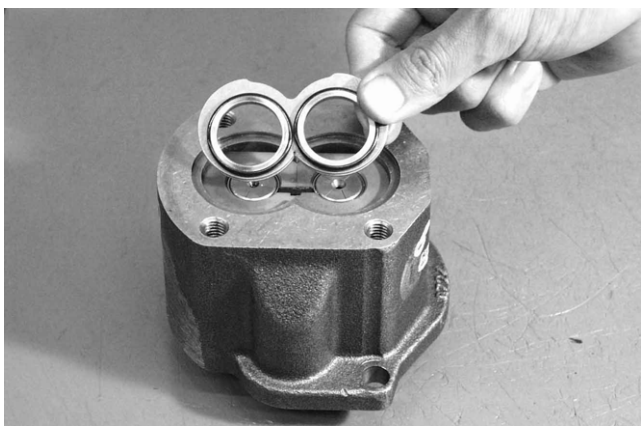
b. Remove the cover.



c. Remove the square ring.



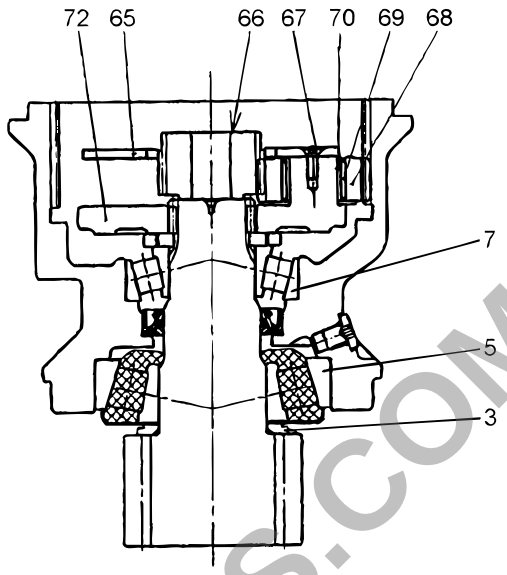
d. Remove two plates, guide and O-ring.



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2.
Remove sun gear (66).
3.
Remove holder (72) and other related parts.
4.
Fix holder (72) to a vise, and loosen screw (67) to remove thrust plate (65).
5.
Remove planetary gear (68),
needle bearing (69) and inner race (70).



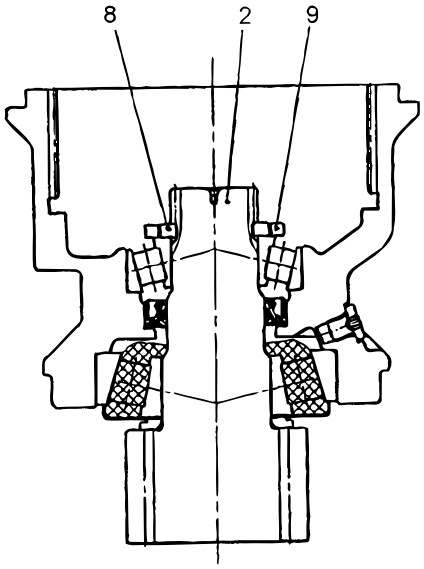
Note

Screw is difficult to remove because Loctite was applied to it at assembling. Warming up screw with a drier is effective for easy removal.

Note

For taper roller bearings (5 and 7) and collar (3), replace the body assembly.

6.
Remove collar (9) and shim (8).
7.
Remove pinion shaft (2).



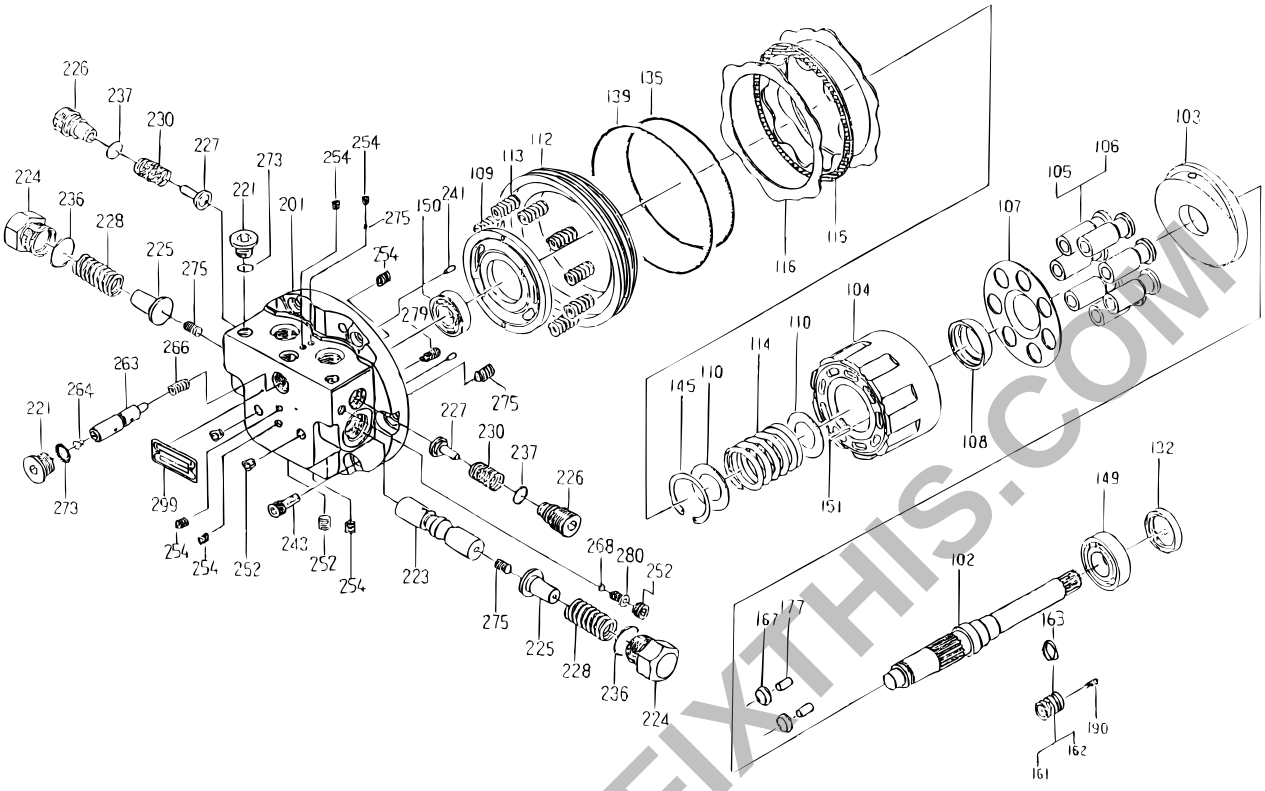
Note

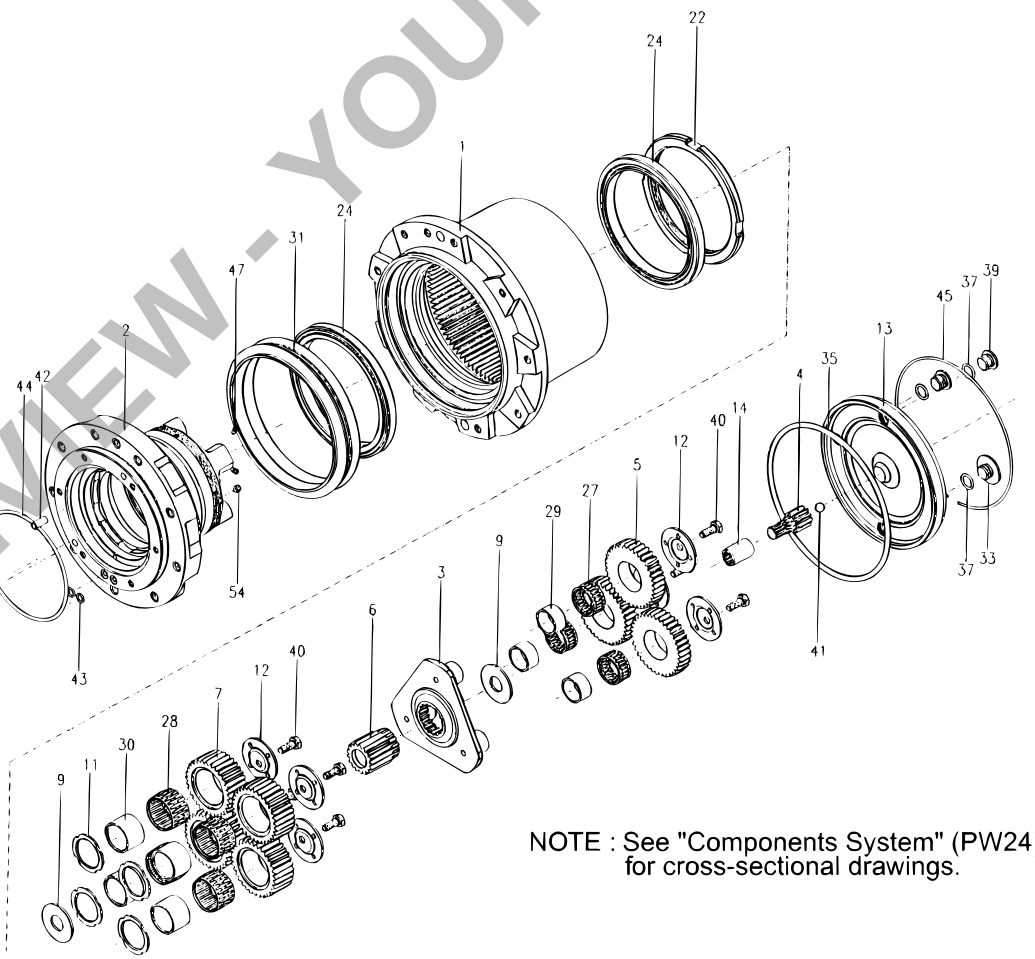
Be careful not to drop the shaft when removing. When it is difficult to pull it out, tap it by a hammer.

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(3) EXPLODED VIEW OF TRAVEL MOTOR AND REDUCTION UNIT





NOTE : See "Components System" (PW24) for cross-sectional drawings.

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Issue	Date of Issue	Applicable Machines	Remarks
First Edition	March, 2010	SK30SR-5 : PW14- SK35SR-5 : PX15-	S5PW4331E01 (KCM North America)
↑	↑	CX31B : PW14- CX36B : PX15-	↑ (CASE-NA)
↑	↑	E30B : PW14- E35B : PX15-	↑ (NH-NA)
Revision	June, 2010	SK30SR-5 : PW14-46519~ SK35SR-5 : PX15-21105~	S5PW4331E02 (KCM North America)
↑	↑	CX31B : PW14-46519~ CX36B : PX15-21105~	↑ (CASE-NA)
↑	↑	E30B : PW14-46519~ E35B : PX15-21105~	↑ (NH-NA)

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CAUTION

Do not operate the engine if the alternator is producing unusual sounds. Damage to the alternator will result.

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CAUTION

If the engine coolant pump must be replaced, replace the engine coolant pump as an assembly only. Do not attempt to repair the engine coolant pump or replace individual components.

0000041en

CAUTION

Use a new special O-ring between the engine coolant pump and the joint. Be sure to use the special O-ring for each engine model. Although the O-ring dimensions are the same as a commercially available O-ring, the material is different.

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CAUTION

Remove or install the high-pressure fuel injection lines as an assembly whenever possible. Disassembling the high-pressure fuel injection lines from the retainers or bending any of the fuel lines will make it difficult to reinstall the fuel lines.

0000047en

CAUTION

After marking the position of the pump drive gear, do not rotate the engine crankshaft. Rotating the crankshaft will cause the fuel injection pump to become misaligned.

0000048en

CAUTION

Do not use a high-pressure wash directly on the alternator. Water will damage the alternator and result in inadequate charging.

0000049en

CAUTION

Do not reverse the positive (+) and negative (-) ends of the battery cable. The alternator diode and stator coil will be damaged.

0000050en

CAUTION

When the battery indicator goes out, it should not come on again. The battery indicator only comes on during operation if the alternator fails. However, if an LED is used in the battery indicator, the LED will shine faintly during normal operation.

0000051en

CAUTION

Using a non-specified V-belt will cause inadequate charging and shorten the belt life. Use the specified belt.

0000052en

CAUTION

Agricultural or other chemicals, especially those with a high sulfur content, can adhere to the IC regulator. This will corrode the conductor and result in battery over-charging (boiling) and charging malfunctions. Consult Yanmar before using the equipment in such an environment or the warranty is voided.

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DANGER



FIRE AND EXPLOSION HAZARD!

- Diesel fuel is flammable and explosive under certain conditions.
- Only fill the fuel tank with diesel fuel. Filling the fuel tank with gasoline may result in a fire and will damage the engine.
- NEVER refuel with the engine running.
- Wipe up all spills immediately.
- Keep sparks, open flames or any other form of ignition (match, cigarette, static electric source) well away when refueling.
- NEVER overfill the fuel tank.
- Fill the fuel tank. Store any containers containing fuel in a well-ventilated area, away from any combustibles or sources of ignition.
- Failure to comply will result in death or serious injury.

0000005en

DANGER



FIRE AND EXPLOSION HAZARD!

- Diesel fuel is flammable and explosive under certain conditions.
- Before you operate the engine, check for fuel leaks. Replace rubberized fuel hoses every two years or every 2000 hours of engine operation, whichever comes first, even if the engine has been out of service. Rubberized fuel lines tend to dry out and become brittle after two years or 2000 hours of engine operation, whichever comes first.
- Failure to comply will result in death or serious injury.

0000015en

DANGER



FIRE AND EXPLOSION HAZARD!

- Diesel fuel is flammable and explosive under certain conditions.
- NEVER remove the fuel cap with the engine running.
- Failure to comply will result in death or serious injury.

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(Piston Ring Cont.)

Model	Inspection Item		Standard	Limit	Reference Page
4TNV106, 4TNV106T	Top Ring	Ring Groove Width	0.0992 - 0.1000 in. (2.520 - 2.540 mm)	-	*See Inspection of Pistons, Piston Rings and Wrist Pin on page 6-83.*
		Ring Width	0.0961 - 0.0969 in. (2.440 - 2.460 mm)	0.0953 in. (2.420 mm)	
		Side Clearance	0.0024 - 0.0039 in. (0.060 - 0.100 mm)	-	
		End Gap	0.0118 - 0.0177 in. (0.300 - 0.450 mm)	0.0213 in. (0.540 mm)	
	Second Ring	Ring Groove Width	0.0815 - 0.0821 in. (2.070 - 2.085 mm)	0.0860 in. (2.185 mm)	
		Ring Width	0.0776 - 0.0783 in. (1.970 - 1.990 mm)	0.0768 in. (1.950 mm)	
		Side Clearance	0.0031 - 0.0045 in. (0.080 - 0.115 mm)	0.0093 in. (0.235 mm)	
		End Gap	0.0177 - 0.0236 in. (0.450 - 0.600 mm)	0.0268 in. (0.680 mm)	
	Oil Ring	Ring Groove Width	0.1187 - 0.1193 in. (3.015 - 3.030 mm)	0.1232 in. (3.130 mm)	
		Ring Width	0.1169 - 0.1177 in. (2.970 - 2.990 mm)	0.1161 in. (2.950 mm)	
		Side Clearance	0.0010 - 0.0024 in. (0.025 - 0.060 mm)	0.0071 in. (0.180 mm)	
		End Gap	0.0118 - 0.0197 in. (0.300 - 0.500 mm)	0.0236 in. (0.600 mm)	

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Removal of Crankshaft

1. Remove the flywheel **(Figure 6-104, (1))** from the crankshaft.
2. Remove the bolts from the rear oil seal assembly **(Figure 6-104, (2-3))**. Remove the assembly from the engine.

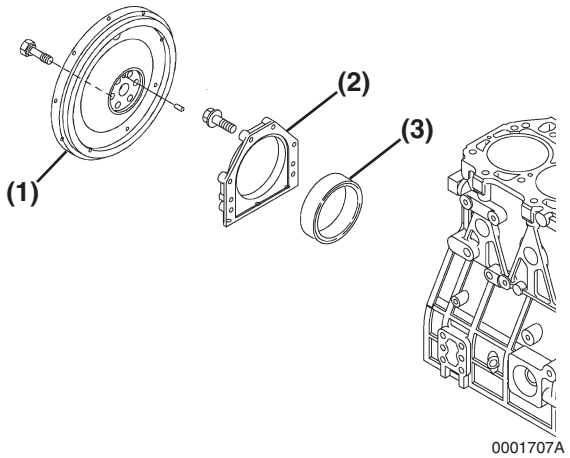


Figure 6-104

3. Before removing the main bearing caps, measure the crankshaft end play. Use either of the following two methods.
   - **Method A:** Install a dial gauge **(Figure 6-105, (1))** on the cylinder block. Move the crankshaft **(Figure 6-105, (2))** in and out to measure the end play. Record the measurement.

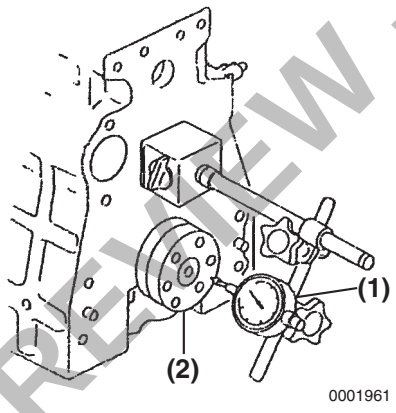


Figure 6-105

   - **Method B:** Use a feeler gauge to measure the clearance **(Figure 6-106, (3))** between the thrust bearing **(Figure 6-106, (1))** and crankshaft **(Figure 6-106, (2))**. Record the measurement. *See Thrust Bearing on page 6-15 for the service limit.*

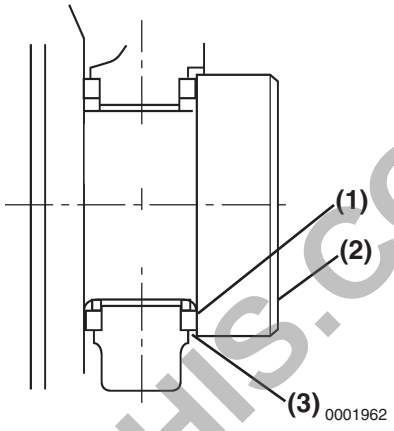


Figure 6-106

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Checking Fuel Injection Timing

Note: Some fuel may drain from the fuel injection pump during this process. Make provisions to contain any such spillage.

1. Turn off the fuel valve in the fuel supply hose and the fuel return hose.
2. Clamp shut the fuel injection pump fuel return hose leading to fuel filter **(Figure 7-39, (1))**.

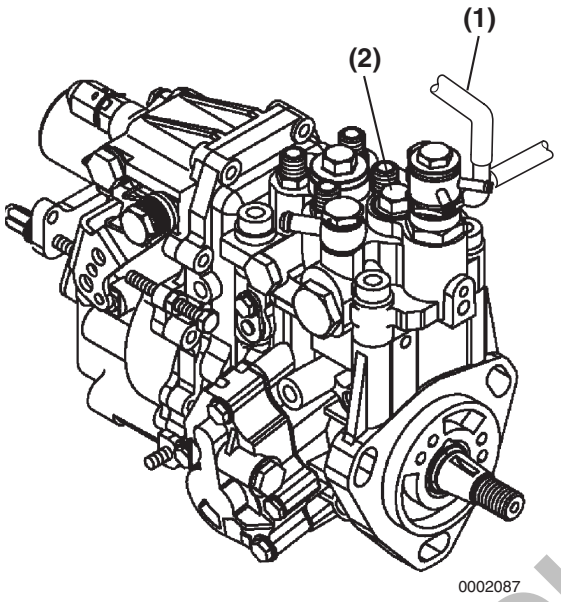


Figure 7-39

IMPORTANT

Clean the top of the fuel injection pump to prevent any contamination when the fuel injection pump plunger plug is removed.

3. Remove the forward fuel injection pump plunger plug **(Figure 7-39, (2))** on the top of the fuel injection pump.
4. Install a dial indicator adapter and clamp into the pump plunger opening.

Note: Use the Yanmar part no. 158090-51831 M14 adapter for the MP2 fuel injection pumps (TNV82 - 88 model engines) or Yanmar part no. 158090-51841 for the M16 adapter used on the MP4 fuel injection pumps (TNV94 - 106 model engines) and Yanmar part no. 23000-013000 plunger adapter clamp **(Figure 7-40,** (1)).

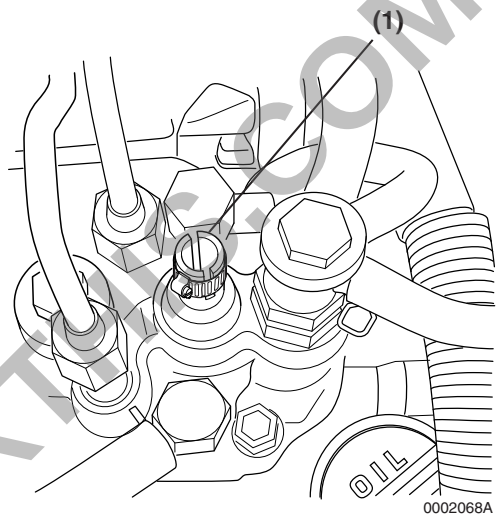


Figure 7-40

5. Install a dial indicator **(Figure 7-41, (1))**, Mitutoyo No. 2050SB or equivalent, with a 30 mm extension, Yanmar part no. 158090-51870 or Mitutoyo No. 303613, into the adapter. Secure with the Yanmar part no. 23000-013000 plunger adapter clamp **(Figure 7-40,** (1)) at approximately the mid-point of its travel.

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WASHING PROCEDURE

Note: Inspection, cleaning and repair of the internal turbocharger components must be performed by a qualified repair facility.

The washing procedure described in this section is intended to clean the impeller on the compressor only if the engine loses rpm, seems sluggish or has insufficient boost pressure. The process does not require disassembling any portion of the turbocharger.

Since washing is quick and easy, perform this procedure before considering replacement.

1. Start the engine and allow it to reach the normal operating temperature.

CAUTION

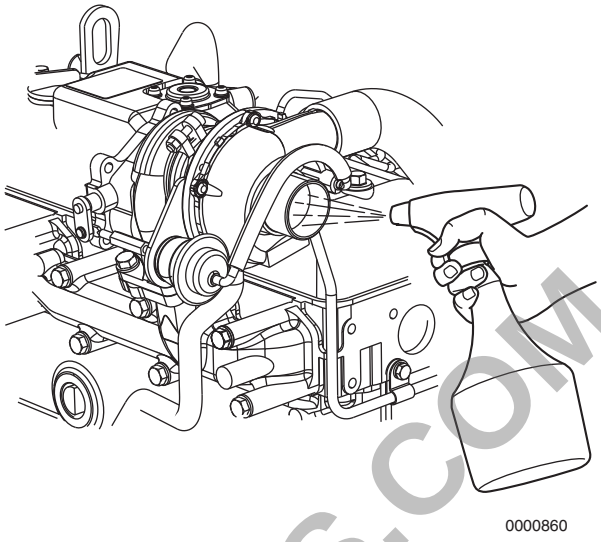
Avoid damage to the turbocharger or the engine. Do not spray blower wash fluid or water too quickly.

Use short strokes from a spray bottle to inject blower wash fluid or water into the turbocharger.

Spraying too much wash fluid or water, or spraying too quickly will damage the turbocharger.

0000063en

2. While the engine is operating at normal load (75 - 80% of maximum), slowly and evenly spray 2 - 3 oz (60 - 90 cc) of blower wash fluid over a period of ten to fifteen seconds into the air inlet **(Figure 10-3)**.



0000860

Figure 10-3

3. Continue to operate the engine under the same load for three to four minutes.
4. While the engine is still operating at normal load (75 - 80% of maximum), slowly and evenly spray 2 - 3 oz (60 - 90 cc) of clean water over a period of ten to fifteen seconds into the air inlet.
5. Continue to operate the engine under the same load for at least ten minutes to completely dry the air intake system and turbocharger.
6. Test the engine performance. If engine performance has not improved, repeat steps 2 through 6. If the engine performance does not improve after executing the washing process three times, replace the turbocharger or have it repaired by a qualified repair facility.

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