SPECIFICATIONS

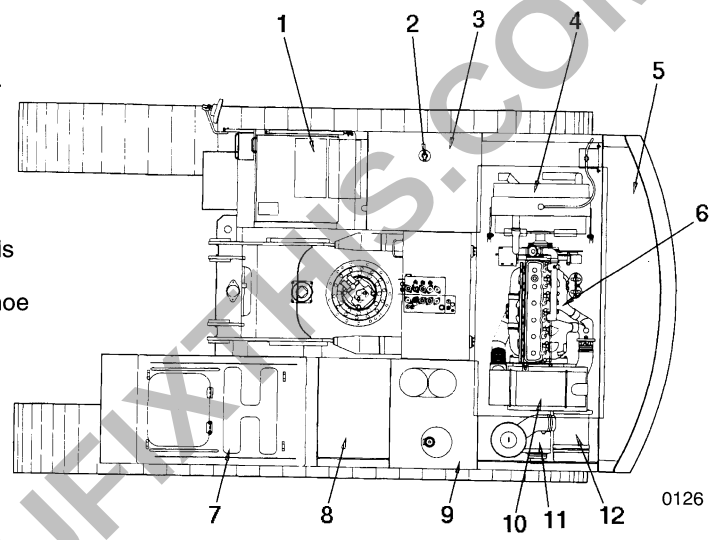
Excavator Machinery Plan

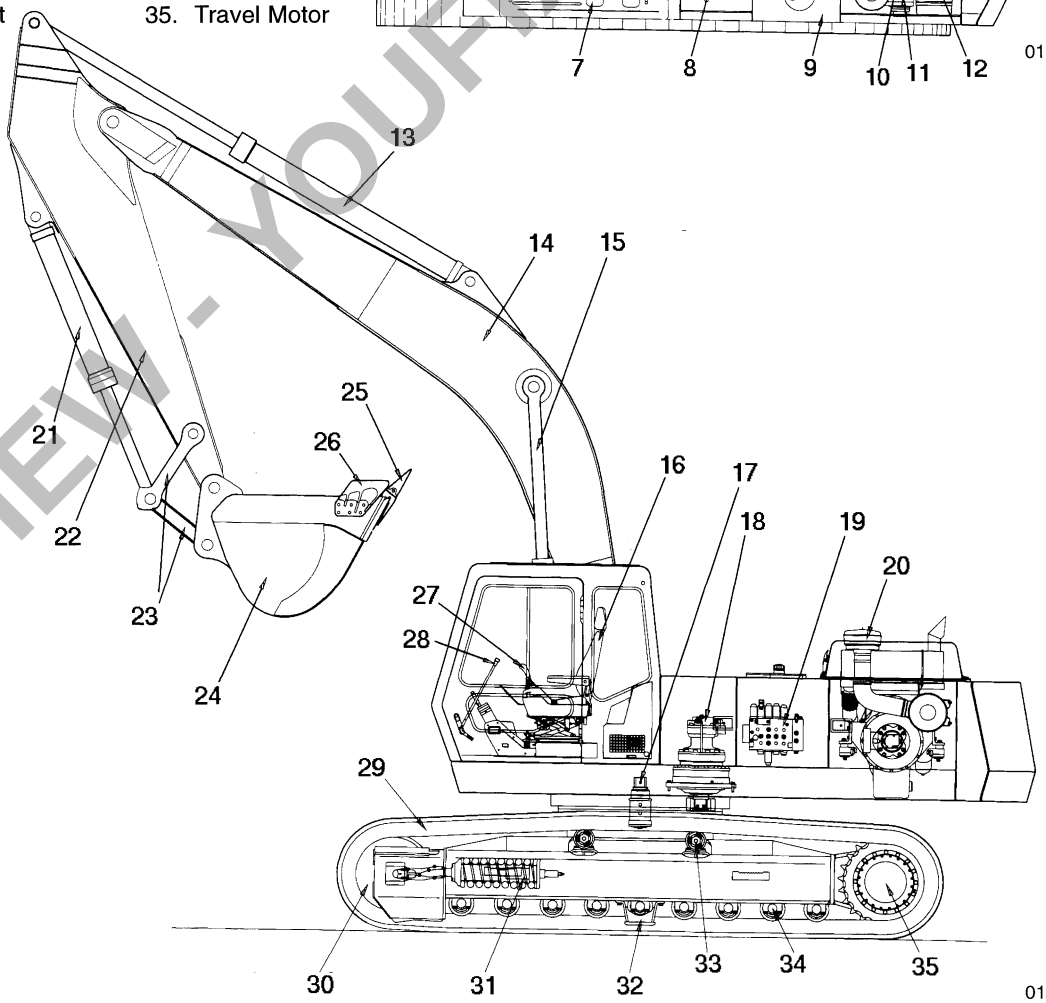
The Solar 220LC-III Excavator has 3 main component sections:

- The Upper Turntable
- The Lower Undercarriage and Track Frames
- The Excavator Front-end Attachment

The drawings identify main components and their locations (Figure 2-1).

1. Battery
2. Fuel Filler
3. Fuel Tank
4. Radiator & Oil Cooler
5. Counterweight
6. Engine
7. Cab
8. Storage
9. Hyd. Oil Tank
10. Muffler
11. Pumps
12. Air Cleaner
13. Arm Cylinder
14. Boom
15. Boom Cylinder
16. Seat
17. Center Joint
18. Swing Motor
19. Control Valves
20. Precleaner
21. Bucket Cylinder
22. Arm
23. Link
24. Bucket
25. Tooth Point
26. Side Cutter
27. Joystick Controls
28. Travel Lever
29. Track Link & Shoe
30. Idler
31. Track Adjuster
32. Track Guide
33. Upper Roller
34. Lower Roller
35. Travel Motor





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UPPER STRUCTURE

Operator's Cab Removal Procedure

An assist crane is required for this procedure. The cab top has four lift points. See Figure 3-1.

Before setting up the assist crane, prepare the cab shell for removal by disconnecting wiring connectors for:

- cab interior lighting
- external light wiring
- radio antenna and connections
- wiper/washer connections

NOTE

Control console wiring harnesses and hydraulic piping lines that pass through the floor of the cab do not need to be disassembled.

1. Rigging connections to the assist crane should be the responsibility of the lift crane crew, who must make sure that sling loads are equalized and will allow a straight, balanced, vertical lift; free of twist or side loads.

⚠CAUTION!!!

Avoid disassembling the cab if there are strong wind gusts, which could catch the large surface area of the cab shell and push it sideways during the lift.

2. Lift the load hook to tighten slings and create very slight tension, before unbolting the 10 fasteners around the perimeter of the cab shell:
   (6) 16 mm x 2.0 mm hex bolts at cab corners and front and back,
   (3) 10 mm x 1.5 mm hex bolts on the door side of the cab,
   (3) 10 mm x 1.5 mm allen head bolts, 2 on the right side of the cab and 1 under the front window.
3. Unbolt corner fasteners first and work inward, leaving the two 10 mm right side allen head bolts and the center left side 10 mm bolt till last.
4. To verify a straight lift, stop lifting an inch or two above deck height, after all fastener connections have been unbolted.
5. Continue lifting with the assist crane to remove the cab shell. Lower the shell to a pre-prepared safe blocking support.
6. Reinstallation requires reversing disassembly steps.

Window and Gasket Replacement

The cab removal drawing also shows replacement glass and mating window gaskets and rubber trim pieces. Individual part numbers are included in the "Cab" section of the Solar 220LC-III Parts Book.

When replacing glass or weatherstrip gaskets, always:

- Make sure the window frame and rubber trim section are both clean.
- Use soap and water to lubricate both the rubber and glass for assembly.
- A sharp, curving metal hook and/or a straight, pointed awl can be helpful in easing window glass into position. Start from the bottom of the frame and work up.

NOTE

Refer to Figure 3-1 on the next page for both "Operator's Cab Removal" and "Window and Gasket Replacement."

IMPORTANT

When replacing window glass or making any type of structural repair to any part of the operator's cab, consider the cause of the damage and evaluate the potential for other threats or hazards in the operating environment. Refer to Page 3-3 (Falling Object Protective Structures) and make an evaluation to determine the need for additional protection for the operator.

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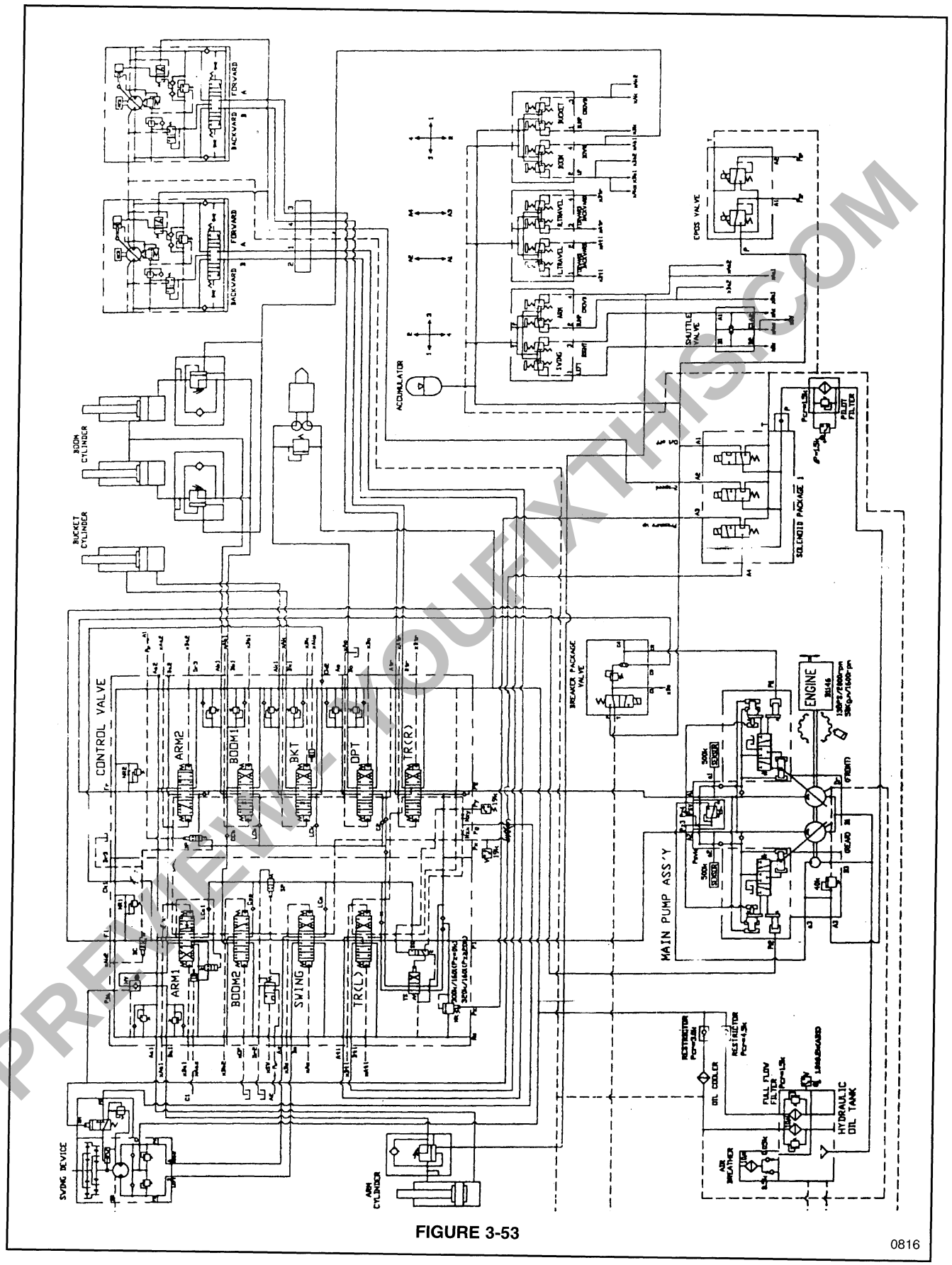


FIGURE 3-53

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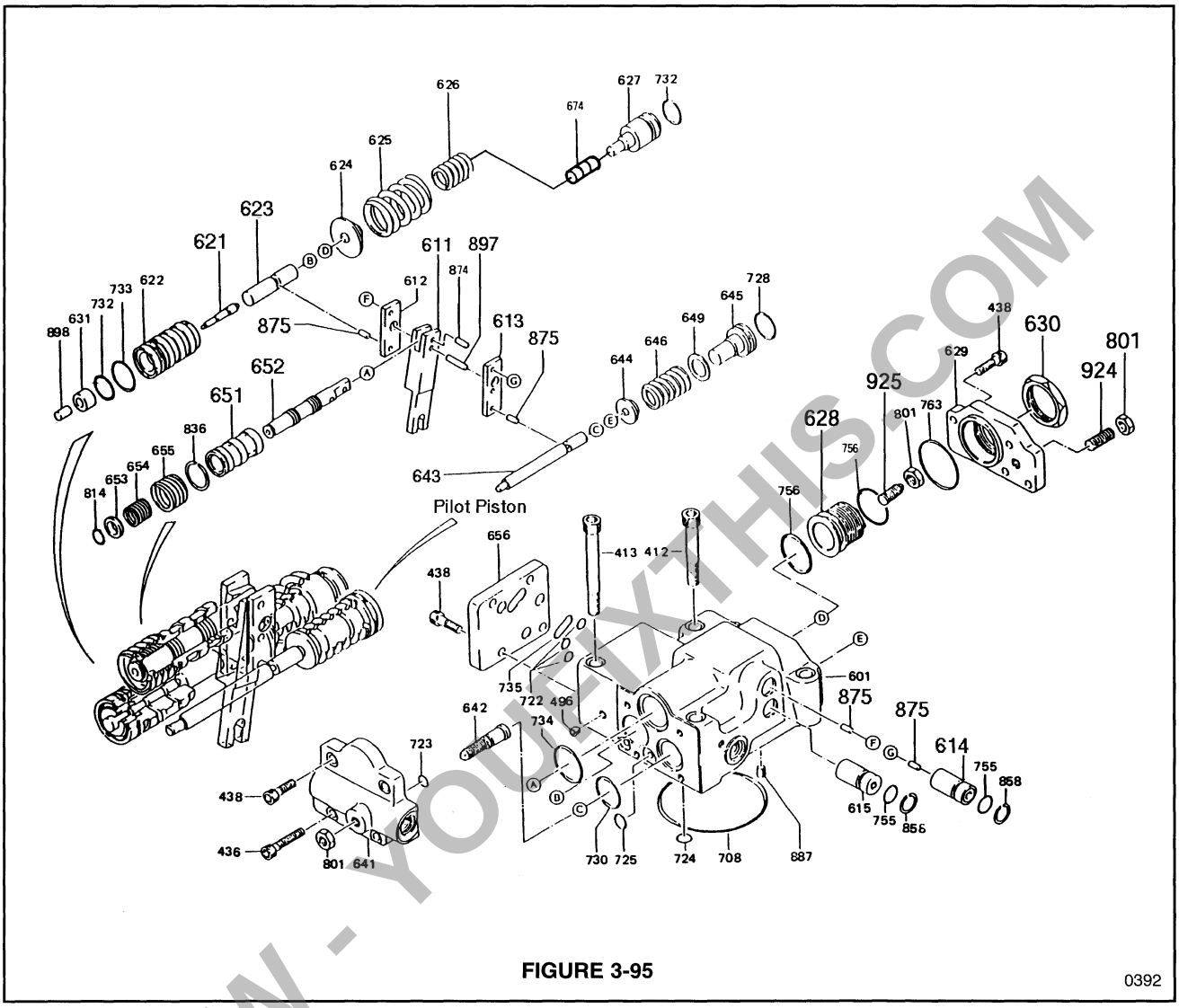


FIGURE 3-95

0392

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Maintenance Service and Repair Procedure

General Precautions

Fluid level and condition should always be checked whenever any other type of maintenance service or repair is being performed.

NOTE

If the excavator is being used in an extreme temperature environment (in subfreezing climates or in high temperature, high humidity tropical conditions), frequent purging of moisture condensation from the hydraulic reservoir drain tap should be a regular and frequent part of the operating routine. In more moderate, temperate climates, draining reservoir sediment and moisture may not be required more than once or twice every few months.

Inspect drained oil and used filters for signs of abnormal coloring or visible fluid contamination at every oil change. Abrasive grit or dust particles will cause discoloration and darkening of the fluid. Visible accumulations of dirt or grit could be an indication that filter elements are overloaded (and will require more frequent replacement) or that disintegrating bearings or other component failures in the hydraulic circuit may be imminent or have already occurred. Open the drain plugs on the main pump casings and check and compare drain oil in the pumps. Look for evidence of grit or metallic particles.

Vibration or unusual noise during operation could be an indication of air leaking into the circuit (refer to the Troubleshooting procedure), or it may be evidence of a defective pump. The gear-type pilot pump could be defective, causing low pilot pressure, or a main pump broken shoe or piston could be responsible.

NOTE

Indicated operating pressure, as shown on the multi-display digital gauge on the Instrument Panel ("F-Pump" and "R-Pump") will be reduced as a result of a mechanical problem inside the pump. However, pressure loss could also be due to cavitation or air leakage, or other faults in the hydraulic system.

Check the exterior case drain oil in the main pumps. If no metallic particles are found, make sure there is no air in the system. Unbolt and remove the tank return drain line from the top part of the swing motor, both travel motors and each main pump. If there is air in any one of the drain lines, carefully prefill the assembly before bolting together the drain line piping connections. Run the system at low RPM.

Troubleshooting – Main Pump

Problem	Possible Causes	Remedies
Engine overloading	Engine RPM control off	Readjust RPM control
	Pump regulator set too high	Readjust
	Pump inner parts worn or damaged	Look for impurities or particles inside the filter and rebuild, replace pump components, as required
	Pump regulator piping clogged or leaking	Repair or replace piping
Overloading on one pump only	Regulator	Regulator compensator piston or pin (898) sticking. Disassemble, clean.
Pump discharge output reduced, pressure does not increase	Pump regulator faulty or piping clogged, leaking or kinked	Repair or replace regulator or piping
	Pump inner parts worn or damaged	Look for particles inside the filter and rebuild or replace pump components
	Gear pump (pilot pump) worn or faulty	Check pilot pressure and make sure pilot piston, spool and/or QMC are not sticking before repairing or replacing pilot pump
	Accessory control valve faulty	Inspect valve (poppet, seat, spring)
Excessive vibration or noise	Cavitation	Look for leaks or evidence of air intrusion. Disconnect return lines, add clean oil and reassemble to bleed air
	Regulator or relief valve hunting	Check pressures and inspect for clogged or damaged inlet piping
	Broken or damaged piston, shoe, cylinder	Repair or replace damaged component.

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Main Pump Parts List

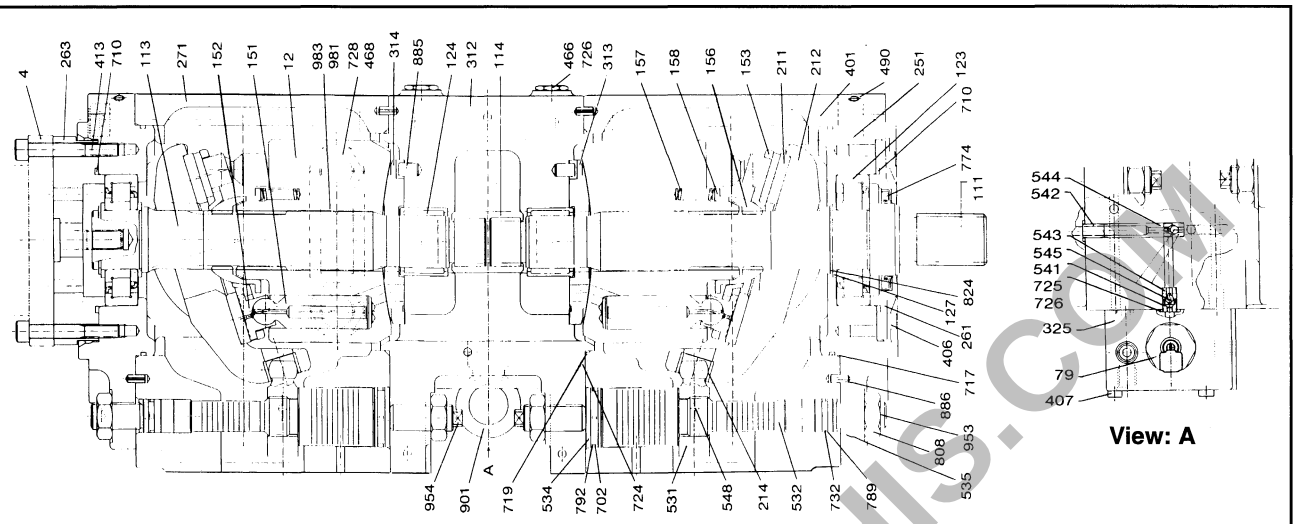


FIGURE 3-77

0385

Drawing Reference Number	Part	Quantity
4	Gear Pump	1
79	Electronic Proportioning Valve	1
111	Shaft (F)	1
113	Shaft (R)	1
114	Spline Coupling	1
123	Roller Bearing	2
124	Needle Bearing	2
127	Bearing Spacer	4
141	Cylinder Block	2
151	Piston	18
152	Shoe	18
153	Push Plate	2
156	Spherical Bushing	2
157	Cylinder Spring	18
158	Spacer	2
211	Shoe Plate	2
212	Swash Plate	2
214	Tilting Bushing	2
251	Support Plate	2
261	Seal Cover (F)	1
263	Rear Cover	1
271	Pump Casing	2
312	Valve Block	1
313	Valve Plate (R)	1
314	Valve Plate (L)	1
325	Valve Casing	1
401	Socket Bolt	8
406	Socket Bolt	4
407	Socket Bolt	3
413	Socket Bolt	2
466	VP Plug	2

Drawing Reference Number	Part	Quantity
468	VP Plug	2
490	Expander	23
531	Tilting Pin	2
532	Servo Piston	2
534	Stopper (L)	2
535	Stopper (S)	2
541	Seat	4
542	Spacer	2
543	Stopper	2
544	Stopper	2
545	Steel Ball	4
548	Feedback Pin	2
702	O-ring	2
710	O-ring	2
717	O-ring	2
719	O-ring	2
724	O-ring	16
725	O-ring	2
726	O-ring	3
728	O-ring	3
732	O-ring	2
774	Oil Seal	1
789	Backup Ring	2
792	Backup Ring	2
808	Nut	2
824	Snap Ring	11
885	Pin	2
886	Spring Pin	4
901	Eye Bolt	2
953	Set Screw	2
954	Adjusting Screw	2

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SAFETY

To the Operator

⚠ DANGER!!!

Unsafe use of the excavator could lead to serious injury or death. Operating procedures, maintenance and equipment practices or traveling or shipping methods that do not follow the safety guidelines on the following pages could cause serious, potentially fatal injuries or extensive damage to the machine or nearby property.

of a Daewoo Excavator

Please respect the importance of taking responsibility for your own safety, and that of other people who may be affected by your actions.

Basic Excavator Operating Safety

The safety information on the following pages is organized into five topic sections:

I. **General Safety Essentials**
II. **Operation**
III. **Equipment**
IV. **Maintenance**
V. **Shipping and Transportation**

General Safety Essentials

Accessory Applications

The excavator has been primarily designed for moving earth with a bucket. For use as a grapple or for other object handling, contact Daewoo. Lifting-work applications are permitted in approved lift configuration, to rated capacity only, with no side-loading. DO NOT use the machine for activities for which it was not intended. DO NOT use the bucket for lifting work, unless lift slings are used in the approved configuration.

Lifting

Lifting Mode capacity ratings that are printed at the end of this safety section are based on the machine being level, on a firm supporting surface, with hooks and slings attached in approved configuration. Loads must be balanced and supported evenly. Use taglines to keep the load steady if wind conditions and large surface area are a problem. Work crew hand signals, individual tasks and safe procedures should all be universally understood before the lift is made.

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Solar 220LC-III Excavator Rated Lift Capacity Tables (Continued)

Lift Ratings for Standard Configuration, Over FRONT ( ) in Kg (Lb)

Boom Length	Arm Length	Shoe Width	Counterweight	Bucket Size
5.7 m (18' 9")	2.9 m (9' 6")	600 mm (23.6")	3,500 kg (7,700 lb)	0.8 m^3 (1.0 yd^3) Std. Size

Lift Height	3.0 m Radius (10')	4.5 m Radius (15')	6.0 m Radius (20')	7.5 m Radius (25')	Maximum Reach
6.0 m (20')			* 3,921 kg (8,644 lb)		*2,204 kg (4.859 lb) @ 8.50 m (27' 11")
4.5 m (15')			* 4,452 kg (9,815 lb)	* 4,293 kg (9,464 lb)	*2,091 kg (4,610 lb) @ 9.11 m (29' 11")
3.0 m (10')		* 7,031 kg (15,500 lb)	* 5,361 kg (11,819 lb)	4,311 kg (9,504 lb)	*2,080 kg (4,586 lb) @ 9.41 m (30' 10")
1.5 m (5')		* 8,957 kg (19,746 lb)	6,134 kg (13,523 lb)	4,214 kg (9,290 lb)	*2,169 kg (4,782 lb) @ 9.39 m (30' 10")
Ground Line		9,710 kg (21,407 lb)	6,004 kg (13,236 lb)	4,131 kg (9,107 lb)	*2,323 kg (5,121 lb) @ 9.17 m (30' 1")
–1.5 m (–5')	* 9,252 kg (20,397 lb)	9,817 kg (21,642 lb)	5,930 kg (13,073 lb)	4,120 kg (9,083 lb)	*2,727 kg (6,012 lb) @ 8.52 m (27' 11")
–3.0 m (–10')	* 14,340 kg (31,614 lb)	* 9,727 kg (21,444 lb)	5,922 kg (13,056 lb)		*3,466 kg (7,641 lb) @ 7.51 m (24' 8")
–4.5 m (–15')	* 11,588 kg (25,547 lb)	* 7,937 kg (17,498 lb)			*4,998 kg (11,019 lb) @ 5.90 m (19' 4")

The preceding weight loads are in compliance with SAE (J1097) and ISO applicable, recommended standards for hydraulic excavators performing lifting operation on a firm supporting surface. An asterisk (*) next to the lift rating indicates rated load does not exceed 87% of hydraulic capacity. All other ratings have been determined not to exceed 75% of tipping capacity.

Do NOT attempt to lift or hold any load that exceeds rated load capacity at the specified distances (from the machine's rotation centerline and height – see "lift radius" and "lift height" in the reference drawing).

The weight of slings and any auxiliary lifting device (and/or the weight difference of any attachment heavier than standard configuration) must be deducted from the rated lift capacity to determine allowable net lifting load. The lift point should be located on the back of the bucket, as shown in the reference drawing on the facing page.

IMPORTANT

Engage the "Lifting Mode" control on the Instrument Panel before using the excavator for lifting work. Engine and hydraulic oil should both be fully warmed up to operating temperature before starting a lift.

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Accumulator

The accumulator is a gas-charged storage device designed to hold a reserve quantity of hydraulic fluid under pressure. Accumulators are used in hydraulic circuits in much the same way that condensers (or capacitors) are used to collect, store and maintain electrical charge in a circuit.

In a hydraulic circuit, minor variations or lags in pump output that might otherwise cause unsteady or irregular operation are made up from the supply of pressurized oil in the accumulator.

Accumulators are solidly constructed to resist the high operating pressures of the fluids they contain. There are only three main moving parts: a valve assembly at the top allows adding or expelling gas from the compressible, precharged upper chamber; a valve assembly at the bottom of the accumulator for passing hydraulic fluid in and out, and an elastic diaphragm to separate the two chambers. The flexible diaphragm changes shape to conform to the changing pressures and volumes of the two fluids in the upper and lower chambers.

The illustrations on this page show the position of the diaphragm in six possible positions:

1. With no gas charge in the upper chamber (0 psi, empty) and no oil in the bottom (0 psi, dry) the elastic diaphragm hangs loosely.
2. When the pre-pressure charge of gas (usually nitrogen) is introduced through the valve at the top of the accumulator, the diaphragm expands to maximum size. The valve button in the center of the diaphragm pushes into the fluid opening in the bottom chamber, sealing off the lower valve. If the pressure of the gas charge exceeds system oil pressure, no fluid enters the accumulator. The button also keeps the diaphragm from protruding into the lower valve opening.

NOTE

Precharge pressure is referred to as the "P1" pressure. The accumulator manufacturer's "P1" rated pressure should be stamped or marked on the accumulator's rating plate. Annual checks of actual precharge pressure should be made by tapping a hydraulic pressure gauge (and 3-way adapter coupling) into the valve on the bottom of the accumulator. When hydraulic fluid is pushed out the lower valve opening by the pressure of the gas charge on the other side of the diaphragm – and there is no counter-pressure from system oil – the valve button on the bottom of the diaphragm eventually seals off the lower oil passage. Just after the needle on the gauge reaches its highest point (when there is 0 psi resistance from hydraulic system pressure) pressure on the gauge will drop sharply to zero, as the accumulator is completely emptied of oil and the diaphragm button closes.

DIAPHRAGM TYPE ACCUMULATOR (Sectional Drawing)

1. Screw Plug
2. Sealing Ring
3. Diaphragm
4. Fluid Valve
5. Steel Pressure Vessel

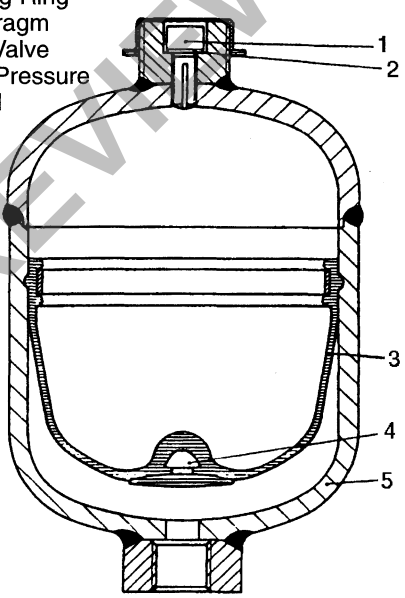
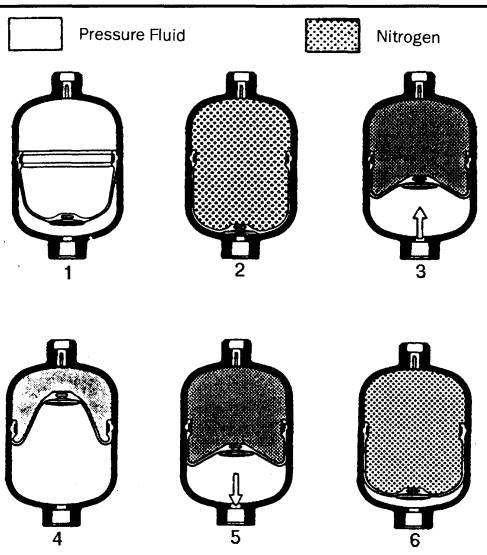


FIGURE 3-39 0360



1. Without Nitrogen Fill
2. Pre-pressurized With Nitrogen To Pre-pressure p1
3. Storage Of Pressure Fluid
4. Charged To Maximum Working Pressure p3
5. Discharge Of Pressure Fluid
6. Discharged Down To Minimum Working Pressure p2

FIGURE 3-40 0361

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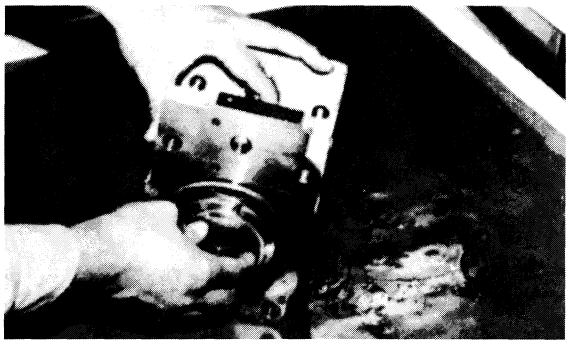


FIGURE 3-84 0403

NOTE

If a complete teardown and reassembly is being performed, the only parts which should NOT be loosened or removed are the hex nut (808) spring pin servo piston stoppers in the swash plate supports. (The preset discharge value would require recalibration if they were removed.) All of the other remaining parts may be withdrawn from the valve block – the needle bearing (124), spline coupling (114) and the pump casing – along with the stoppers (534, 535), servo piston (532) and tilting pin (531) from the top of the pump casing.

IMPORTANT

Separation of the servo pistons (532) and tilting pins (531) must be done with a special fixture. Loctite Assembly Compound 609 is required for reassembly – on the servo piston/tilting pin/feedback pin (538).

NOTE

Do not disassemble the needle bearings (124). They can only be replaced with new parts if they are excessively worn or have been damaged.

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7. Install the thrust plate (16).

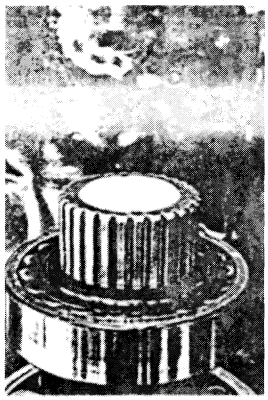


FIGURE 3-187 0604

8. Turn the assembly and check the distance between the end of the drive shaft and the sealing ring. It should be 80 mm (+0.3 mm, – 0.0 mm, or 3.1496").

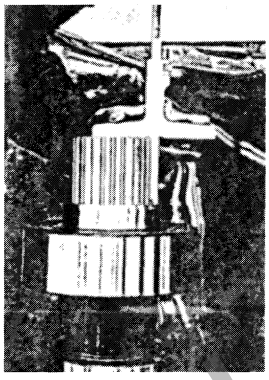


FIGURE 3-188 0605

9. Position the gearbox housing (2) horizontally. Make sure that the inside of the housing is clean and free of any stray contaminant particles.

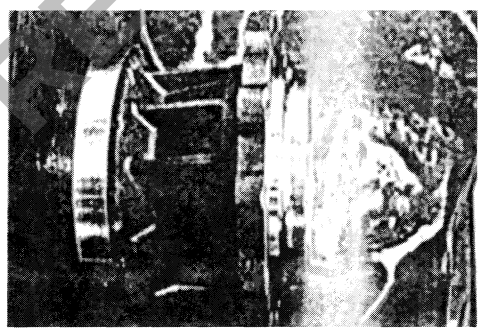


FIGURE 3-189 0606

10. Install the assembled drive shaft, with the bearings and other components in proper position, to the gearbox housing.

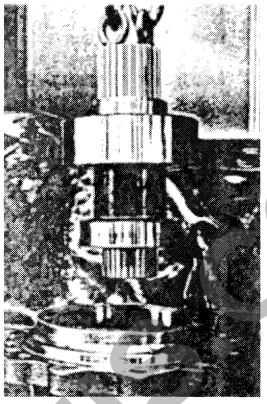


FIGURE 3-190 0607

11. Attach the O-ring (29).

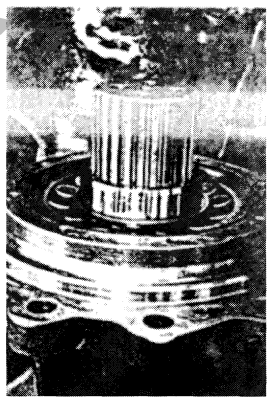


FIGURE 3-191 0608

12. Install the oil seal (27) in the front cover (1).

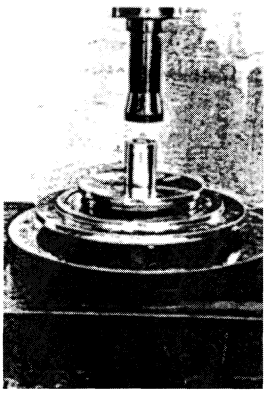


FIGURE 3-192 0609

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in the chamber pushes the swash plate to the minimum angle, increased speed/reduced torque operating position.

On flat, level ground, without a substantial load on the travel motor, the flow of oil to port B is controlled by a pilot-operated control valve (Item 163, Figure 4-10). When pilot pressure to port A is below 15 kg/cm^2 (213 psi), spring pressure from the valve set spring (166) blocks oil flow to port B. The travel motor swash plate remains at the maximum tilt position. If pilot pressure is supplied to the valve (163), the valve moves to the right, opening up oil flow between port B and chamber C to decrease the deflection angle of the swash plate, diminishing the displacement capacity of the motor and increasing rotational speed.

Travel Motor Final Drive (Gearbox)

Travel frame final drive is output through a three-stage planetary gearbox, progressively decreasing input speed through each step change (sun gear, planetary gear, ring gear). Torque multiplication, with a 41.78 final drive ratio, provides 3,443 kg/m (24,903 ft lb) of torque at low travel motor speed, and 2,244 kg/m (16,231 ft lb) in high speed.

The available high RPM output of the travel motor drive shaft is splined through the gearbox to increase the traction force and pulling capacity of the travel system. Gearbox output is transmitted to the travel frame crawler track through the drive sprocket.

Operation

The high speed output rotation of the travel motor drive shaft is directly transmitted to the sun gear, the smallest, fastest-turning gear in the center of the gearbox. It drives the three planetary gears. Figure 4-12 shows a slightly simplified version of the gearbox, with only two planetary gears (P1 and P2) illustrated. The planetary gears rotate the ring gear (R). These gears rotate in a single plane, and also revolve around the center axis of the gearbox in transmitting torque to the carrier.

Planetary rotation can be summarized in the following formula:

$$\text{Torque } P = 1\,\frac{R \times P_2}{S \times P_1}$$

R = Ring gear torque
S = Sun gear torque
P_1 = Planetary gear number 1
P_2 = Planetary gear number 2
C = Carrier

Along with planetary rotation of the gearbox, differential rotation takes place when the carrier, which is also connected to the input shaft, rotates. Differential rotation takes place when the outer (D) and inner (R) ring gears rotate at different speeds. Figure 4-13 shows a simplified, partial view of the gearbox, without the sun gear shown in Figure 4-12, but with both the outer (D) and inner (R) ring gears turning at different speeds, depending upon the rotation of the planetary gears (P1) and (P2) and carrier.

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2. Insert group seal into the roller and bushing.

NOTE

Apply clean engine oil to the joint side of the group seal. Apply grease to the group seal O-ring.

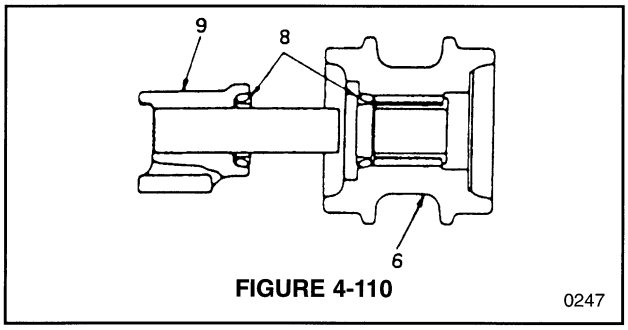


FIGURE 4-110 0247

3. Install the axle, washer (05) and bolt (04).

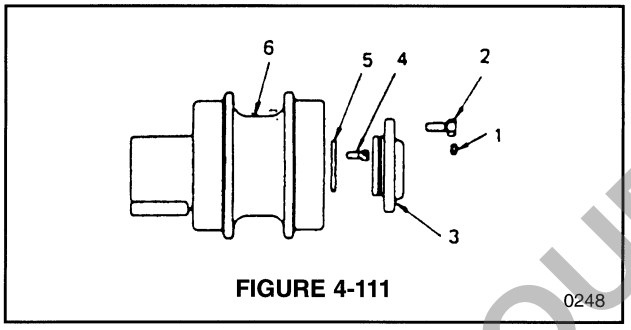


FIGURE 4-111 0248

4. Attach group seal (08) to the roller (06) and cover (03).
5. Insert the O-ring (11) to the cover. Attach cover (03) and bolt (02) to the roller.
6. Fill with engine oil.
7. Tighten plug (01).

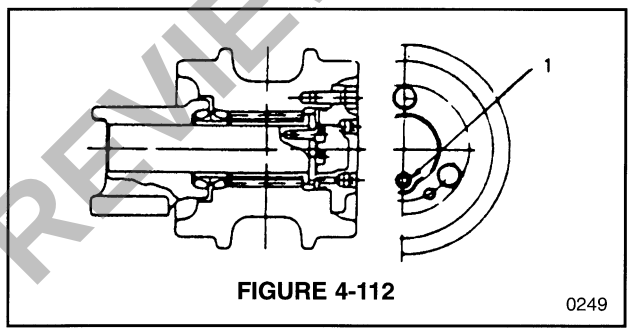


FIGURE 4-112 0249

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Swing Priority and Arm Crowd Recovery Function

Oil flow from the left side pump is distributed through the swing and arm (1) circuits, as previously outlined. Because arm crowd load pressure must decrease as oil flows to the swing circuit, a stroke limiter is installed in the arm (1) side of the circuit, reducing oil supply to arm (1) and allowing more oil supply to be available for swing function.

Oil output from the right side pump is supplied to the arm (2) cylinder directly. Oil returning from the cylinder does not go back to the reservoir but is resupplied to the cylinder, helping to maintain arm speed during operation.

1. Bucket 2-Speed Valve
2. Boom Priority Valve
3. Swing Priority Valve
4. Travel Control Valve
5. Arm-1
6. Arm-2
7. Boom-2
8. Boom-1
9. Swing
10. Bucket
11. Travel (L)
12. Option
13. Travel (R)

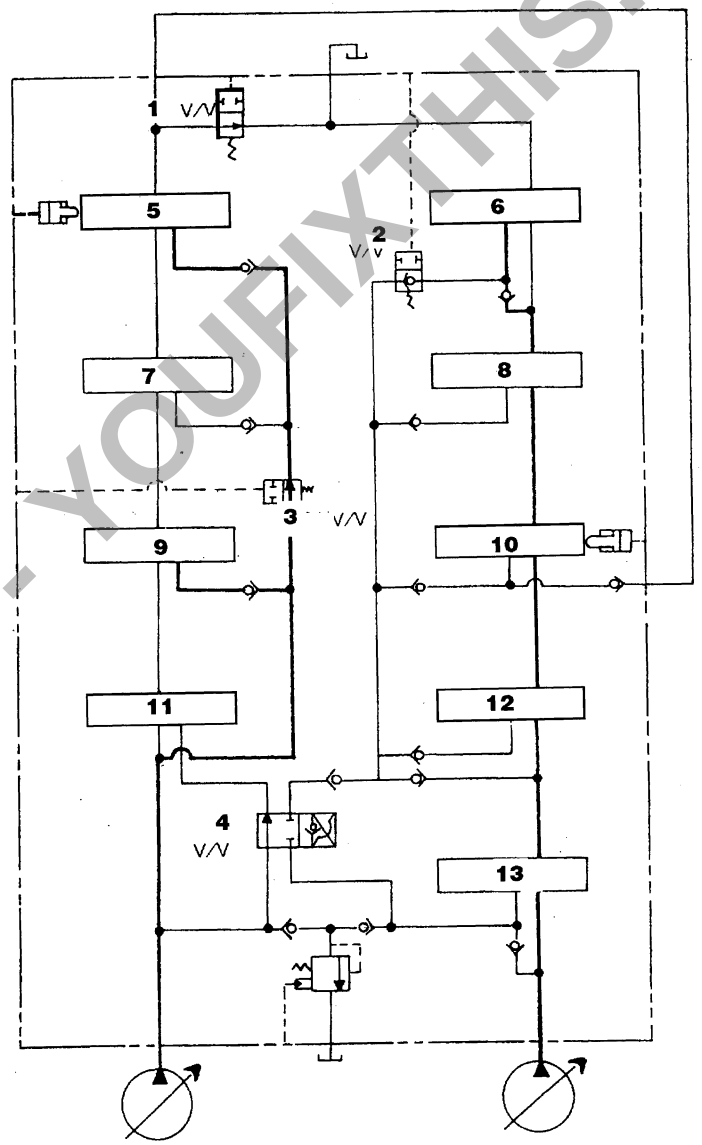


FIGURE 5-37

0308

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150 Operating Hours

Perform all Daily and 50 Operating Hour Maintenance Procedures

Change Fuel Filter Element

1. Locate the filter assembly inside the engine compartment (Figure 7-23). The filter is a canister and element assembly.
2. Position a small container under the filter assembly. Drain the canister by removing the drain plug.
3. Unscrew the filter assembly and remove the filter element and O-ring. Wipe out the filter canister to remove any sediment and reinstall the drain plug.
4. Insert the new filter element and O-ring. Reinstall the filter assembly onto the engine.

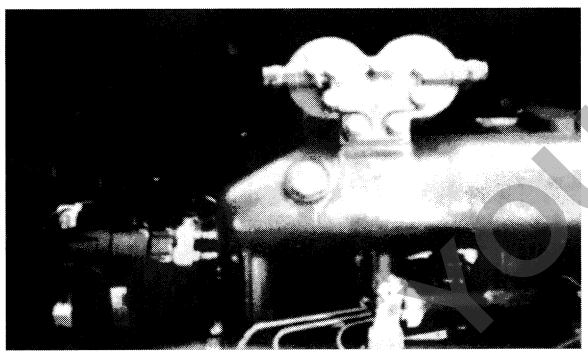


FIGURE 7-23 0576

5. Prime the fuel system by using the electric fuel feed pump. Crack the “Fuel Out” line fitting to allow air to escape and have an assistant crank the engine over. When fuel begins to come out of the fitting, stop cranking the engine and tighten the fuel line fitting. Repeat this procedure at the “Fuel Inlet” at the injection pump to make sure that all of the air has been purged from the fuel system lines.

Change Fuel Tank Suction Strainer

1. Completely drain the fuel tank and remove the access cover located on the bottom of the tank. The suction strainer is attached to the fuel tank access cover. See Figure 4-24.

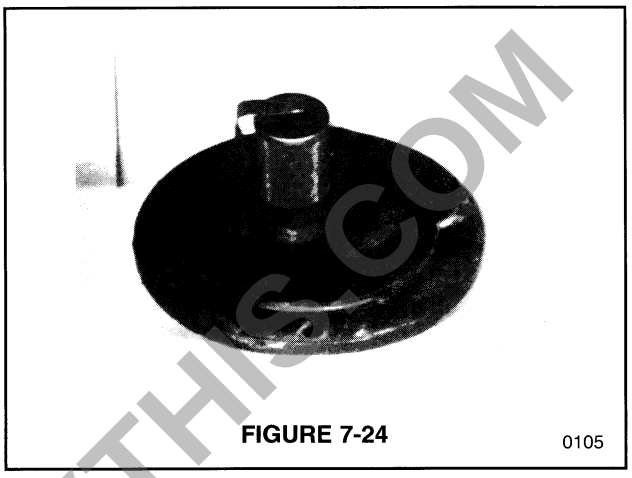


FIGURE 7-24 0105

2. Remove this strainer and clean it in fresh fuel.
3. Reattach the cover to the tank and securely tighten all of the bolts.
4. Refill the tank and inspect the cover to make sure that it is not leaking.

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Pump Regulator Adjustment (Continued)

NOTE

Regulator adjustments affect total cumulative horsepower, since each regulator compensates for the output of the other. It is ***not*** *necessary to adjust both regulators at the same time, but after checking or adjusting one of them, the remaining unit should also be checked.*

Start the engine and turn the engine speed dial to maximum. When normal operating temperature is reached, loosen the largest diameter locknut around the adjustment screw (628) for the outer regulator spring. Tightening the screw shifts the P/Q (Pressure/Flow) control curve to the right, and increases compensating control pressure, as shown in Figure 8-1.

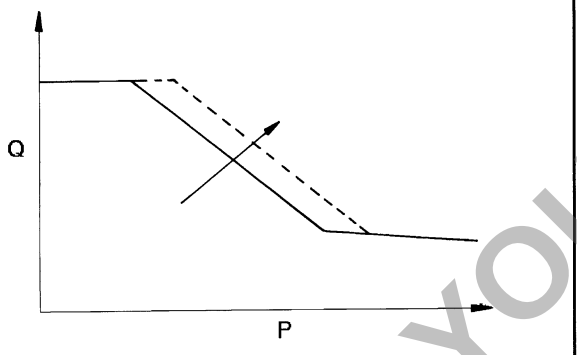


FIGURE 8-1 1927

On the other hand, if the persistent cause of performance problems is engine overloading, decreasing the adjustment by turning the larger diameter adjusting screw (628) out will decrease pump input horsepower. 1/4 turn on the adjusting screw is equal to approximately 17 horsepower.

IMPORTANT

Because changing the position of adjusting screw (628) also affects the setting of the adjustment for the inner spring, the smaller diameter adjusting screw (925), turn in the inner screw 198° (slightly more than 1/2 turn, 180°) *before* screw (628) is backed out 1/4 turn (90°).

NOTE

For each full turn of adjustment on the larger diameter screw (628), the square-tipped adjusting screw should be turned in the opposite direction 2.2 turns to avoid changing inner spring adjustment.

Pump input power adjustments are normally made in small increments, 1/4 turn (90°) or less, each time.

Turning the square-tipped, smaller diameter screw (925) clockwise moves the flow curve up, increasing flow and then input horsepower, as shown in Figure 8-2.

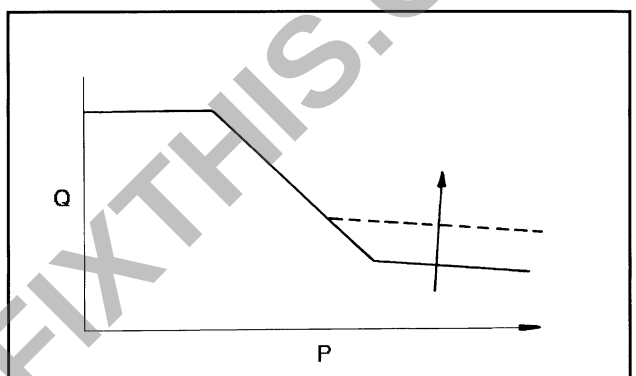


FIGURE 8-2 0485

The adjusting screw on the opposite side of the regulator (642) affects the delivery rate (Q) of the pump. Tightening the adjusting screw decreases the maximum cut flow (as shown in Figure 8-3) while backing out the screw increases cut flow delivery rate.

Balance both pumps for equal output.

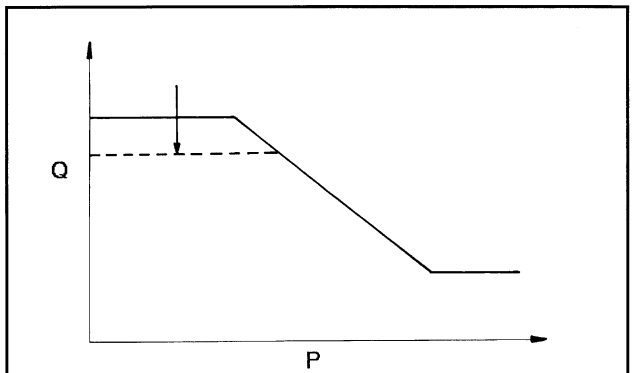


FIGURE 8-3 0486

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