NEW HOLLAND

Service Manual

NEW HOLLAND

Skid-Steer Loader
L-550 Series

40055510

Reprinted

INTRODUCTION

This service manual provides the technical information needed to properly service and maintain the Model L-555 skid-steer loader. Use it in conjunction with the operator's manual which is supplied with the loader. Keep both manuals available for ready reference.

Whenever working on Sperry New Holland equipment, left and right sides of the machine are determined by standing behind the unit, looking in the direction of travel.

For information on engine repair, refer to the manufacturer's service manual.

The easiest and least time-consuming removal, disassembly, and reassembly procedures are detailed in this manual. Modifying these procedures is not recommended.

The Model L-555 skid-steer loader has been designed with emphasis on safety for operator protection. However, careless and negligent operation can still result in serious injury to persons or property. Be sure to read and follow all safety instructions in this manual.

Your Sperry New Holland dealer is interested in your obtaining the most from your investment. He will be glad to answer any questions you may have about your loader. When major service is required, his staff of trained servicemen is ready to serve you.

When in need of parts, always order genuine Sperry New Holland service parts from your Sperry New Holland dealer. Be prepared to give your dealer the model and serial number of the engine and loader. Locate these numbers now and record them below.

Loader Model _____

Loader Serial Number _____

Engine Model _____

Engine Serial Number _____

CAUTION: THIS SYMBOL IS USED THROUGHOUT THIS BOOK WHENEVER YOUR OWN PERSONAL SAFETY IS INVOLVED. TAKE TIME TO BE CAREFUL!

ABOUT IMPROVEMENTS

Sperry New Holland is continually striving to improve its products. We must, therefore, reserve the right to make improvements or changes when it becomes practical and possible to do so, without incurring any obligation to make changes or additions to the equipment sold previously.

ALL SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

CONTENTS

PLEASE READ CAREFULLY!

INCLUDED THROUGHOUT THIS MANUAL AND ON MACHINE DECALS YOU WILL FIND PRECAUTIONARY STATEMENTS SUCH AS "CAUTION", "WARNING" AND "DANGER", FOLLOWED BY SPECIFIC INSTRUCTIONS.

THESE PRECAUTIONS ARE INTENDED FOR THE PERSONAL SAFETY OF YOU AND THOSE WORKING WITH YOU. PLEASE TAKE THE TIME TO READ THEM.

PERSONAL SAFETY!

CAUTION: THE WORD "CAUTION" IS USED WHERE A SAFE BEHAVIORAL PRACTICE ACCORDING TO OPERATING AND MAINTENANCE INSTRUCTIONS AND COMMON SAFETY PRACTICES WILL PROTECT THE OPERATOR AND OTHERS FROM ACCIDENT INVOLVEMENT.

WARNING: THE WORD "WARNING" DENOTES A POTENTIAL OR HIDDEN HAZARD WHICH HAS A POTENTIAL FOR SERIOUS INJURY. IT IS USED TO WARN OPERATORS AND OTHERS TO EXERCISE EVERY APPROPRIATE MEANS TO AVOID A SURPRISE INVOLVEMENT WITH MACHINERY.

DANGER: THE WORD "DANGER" DENOTES A FORBIDDEN PRACTICE IN CONNECTION WITH A SERIOUS HAZARD.

ADDITIONAL PRECAUTIONARY STATEMENTS SUCH AS "ATTENTION" AND "IMPORTANT" ARE FOLLOWED BY SPECIFIC INSTRUCTIONS. THESE STATEMENTS ARE INTENDED FOR MACHINE SAFETY.

MACHINE SAFETY!

ATTENTION: THE WORD "ATTENTION" IS USED TO WARN THE OPERATOR OF POTENTIAL MACHINE DAMAGE IF A CERTAIN PROCEDURE IS NOT FOLLOWED.

IMPORTANT: THE WORD "IMPORTANT" IS USED TO INFORM THE READER OF SOMETHING HE NEEDS TO KNOW TO PREVENT MINOR MACHINE DAMAGE IF A CERTAIN PROCEDURE IS NOT FOLLOWED.

IMPORTANT!

FAILURE TO FOLLOW THE "CAUTION", "WARNING", AND "DANGER" INSTRUCTIONS MAY POSSIBLY RESULT IN SERIOUS BODILY INJURY OR DEATH.

SAFETY INFORMATION

UNSAFE OPERATING PRACTICES AND IMPROPER USE OF THE LOADER AND ITS ATTACHMENTS ON THE PART OF THE OPERATOR CAN RESULT IN INJURIES. OBSERVE THE FOLLOWING SAFETY PRECAUTIONS AT ALL TIMES.

1. GIVE UNDIVIDED ATTENTION TO THE JOB AT HAND SO COMPLETE CONTROL OF THE LOADER IS MAINTAINED AT ALL TIMES.
2. DRIVE SLOWLY OVER ROUGH GROUND AND ON SLOPES. KEEP ALERT FOR HOLES, DITCHES AND OTHER IRREGULARITIES THAT MAY CAUSE THE LOADER TO OVERTURN.
3. AVOID STEEP HILLSIDE OPERATION WHICH COULD CAUSE THE LOADER TO OVERTURN.
4. REDUCE SPEED WHEN TURNING SO THERE IS NO DANGER OF THE LOADER OVER-TURNING.
5. ALWAYS LOOK BEHIND YOU BEFORE BACKING THE LOADER.
6. MAINTAIN PROPER TRANSMISSION OIL LEVEL TO PREVENT LOSS OF BRAKING CONTROL.
7. DO NOT ALLOW CHILDREN TO OPERATE THE LOADER OR RIDE ON THE LOADER AT ANY TIME.
8. DO NOT ALLOW ANYONE TO OPERATE THE LOADER WITHOUT PROPER INSTRUCTION. THIS MACHINE CAN BE DANGEROUS.

   OSHA REQUIRES THAT ALL OPERATORS BE INSTRUCTED ON THE PROPER OPERATION OF THE MACHINE BEFORE THEY OPERATE THE UNIT.
9. DO NOT ALLOW PASSENGERS TO RIDE ON THE LOADER AT ANY TIME. THEY COULD BE INJURED OR KILLED.
10. DO NOT OPERATE THE LOADER FROM ANY POSITION OTHER THAN THE OPERATOR'S SEAT WITH THE SEAT BELT SECURELY FASTENED OR YOU COULD BE RUN OVER OR CRUSHED.
11. BEFORE STARTING THE ENGINE, BE SURE ALL OPERATING CONTROLS ARE IN NEUTRAL.
12. NEVER OPERATE THE LOADER ENGINE IN A CLOSED BUILDING WITHOUT ADEQUATE VENTILATION. ENGINE FUMES COULD INJURE OR KILL YOU.
13. REFUEL THE LOADER OUTDOORS WITH THE ENGINE SHUT OFF. REPLACE THE FUEL CAP SECURELY. USE AN APPROVED FUEL CONTAINER. DO NOT SMOKE WHEN HANDLING FUEL. AVOID SPILLING FUEL.
14. AFTER OPERATING THE ENGINE, NEVER TOUCH THE MUFFLER, EXHAUST PIPE OR ENGINE UNTIL THEY HAVE HAD TIME TO COOL.
15. DRESS APPROPRIATELY - WEAR RELATIVELY TIGHT-FITTING CLOTHING WHEN OPERATING THE LOADER. LOOSE OR TORN CLOTHING CAN CATCH IN MOVING PARTS OR THE CONTROLS.
16. PULL LOADS ONLY FROM THE REAR HITCH YOKE.
17. BEFORE SERVICING THE LOADER OR ANY OF ITS ATTACHED EQUIPMENT, BE SURE THE ATTACHMENTS ARE LOWERED TO THE GROUND OR THE BOOM ARMS ARE SUPPORTED BY THE BOOM LOCKS, THE UNIT IS SECURELY BLOCKED, AND THE ENGINE IS TURNED OFF. IF THE MACHINE WOULD MOVE OR THE BOOM DROP UNEXPECTEDLY, YOU COULD BE KILLED.
18. DO NOT WORK UNDER OVERHANGS, ELECTRIC WIRES, OR WHERE THERE IS DANGER OF A SLIDE.

19. WEAR AN APPROVED SAFETY HAT WHEN OPERATING THE MACHINE, AND WHILE IN ANY WORK AREA.
20. WEAR A SUITABLE HEARING PROTECTIVE DEVICE SUCH AS EAR MUFFS OR EAR PLUGS IF YOU ARE EXPOSED TO NOISE WHICH YOU FEEL IS UNCOMFORTABLE.
21. WHEN DRIVING THE LOADER ON A ROAD OR HIGHWAY, USE WARNING LIGHTS OR WARNING DEVICES AS MAY BE REQUIRED BY LOCAL OR STATE GOVERNMENTAL REGULATIONS. HEADLIGHTS AND WARNING LIGHT KITS ARE AVAILABLE THROUGH YOUR SPERRY NEW HOLLAND DEALER. SLOW MOVING VEHICLE SIGNS ARE SUPPLIED AS STANDARD EQUIPMENT.
22. KEEP THE LOADER CLEAN. DO NOT ALLOW TRASH, DEBRIS OR OTHER ARTICLES TO ACCUMULATE IN THE CAB OR FLOOR AREA THAT MAY HINDER SAFE MACHINE OPERATION.
23. NEVER OPERATE THE LOADER WITH ANY OF THE SHIELDING REMOVED. THE SHIELDS ARE THERE TO PROTECT YOU.
24. NEVER OPERATE THE LOADER WITHOUT THE WINDOWS AND/OR SCREENS IN PLACE.
25. READ ALL SAFETY MESSAGES ON THE LOADER.
26. OBSERVE ALL WEIGHT LOAD LIMITS ON DOCKS, BRIDGES, AND TEMPORARY BRIDGING.

OSHA REQUIREMENTS NOW MAKE IT THE EMPLOYER'S RESPONSIBILITY TO FULLY INSTRUCT EACH OPERATOR IN THE PROPER AND SAFE OPERATION OF ALL OPERATIVE EQUIPMENT. BOTH EMPLOYER AND EMPLOYEE SHOULD THOROUGHLY FAMILARIZE THEMSELVES WITH THE FOLLOWING SECTIONS.

CAUTION!

SOME PICTURES IN THIS MANUAL SHOW SAFETY SHIELDS REMOVED OR OPEN TO SHOW PARTS BEING SERVICED OR FOR CLARITY. ALL SHIELDS SHOULD BE CLOSED OR REPLACED PRIOR TO OPERATING THE MACHINE.

DANGER!

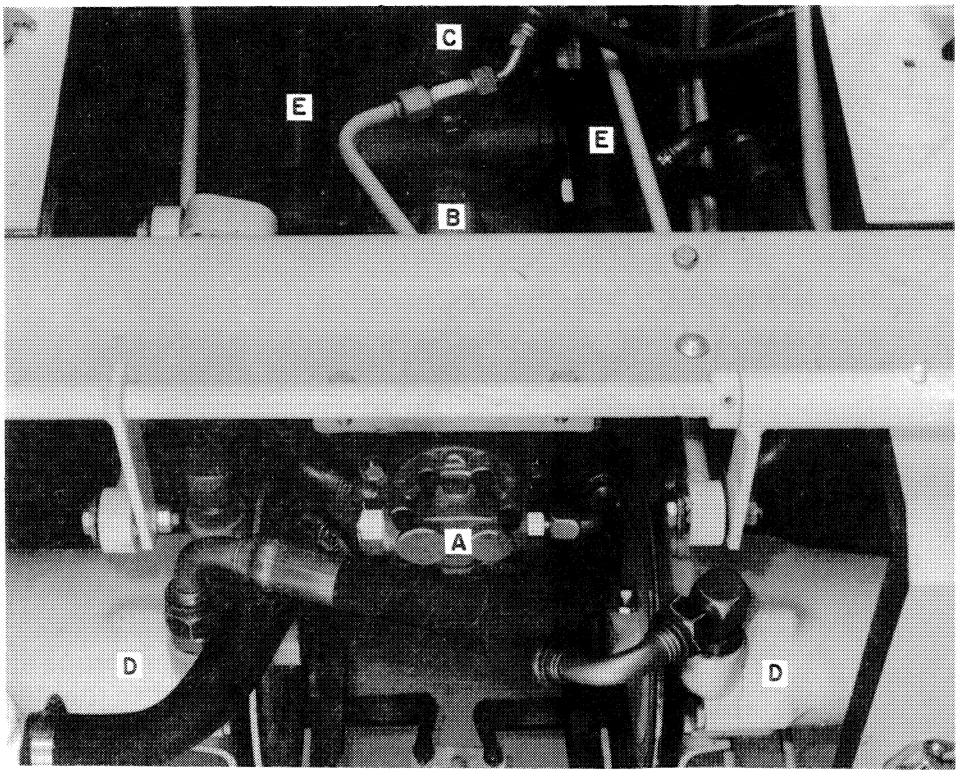
FASTEN SEAT BELT

BEFORE STARTING ENGINE!

THIS LOADER IS A VERY STABLE UNIT BUT IT CAN BE UPSET IF STOPPED SUDDENLY WHEN THE BUCKET IS RAISED AND LOADED.

THEREFORE, DO NOT START THE ENGINE BEFORE SECURELY FASTENING THE SEAT BELT, AND CARRY THE LOAD LOW.

SECTION 1
OPERATION



SHIELDS REMOVED FOR CLARITY. **FIGURE 1-1**

An understanding of the characteristics and principles of a hydrostatic drive will aid the operator and serviceman in obtaining maximum efficiency from the skid-steer loader.

Figures 1-1 and 1-2 give an overall view of the hydrostatic transmission and boom hydraulic systems of the skid-steer loader and point out the major components involved.

The Sperry New Holland loader features a fully hydrostatic drive with a tandem pump configuration. This arrangement consists of two variable displacement piston pumps, B and C, Figure 1-1, for operating the propulsion system and one gear pump for operating the hydraulic system, A, Figure 1-1. They are assembled as a unit and receive power directly from the engine. The two piston pumps are connected to two piston motors, D, Figure 1-1, (one for each final drive) by high pressure hoses.

The transmission pumps are controlled with two steering control levers. The control levers are connected to two neutralizers (spring-loaded shock absorbers), E, Figure 1-1, which automatically return the pintle arms to a positive neutral position. As the control levers are moved, they stroke the hydrostatic transmission pump pintle arms to the desired position. Hydrostatic pulsations and the torque feedback generated by drive train loads are resisted by the internal shock absorber neutralizer rather than by the operator's arms. This results in smoother operation and significantly less operator fatigue.

Skid-steer loader usage is typified by rapid changes of speed and direction, with accompanying low speeds at times of heavy loader power demands. It is under those conditions that a hydrostatic transmission is more efficient than a mechanical drive train.

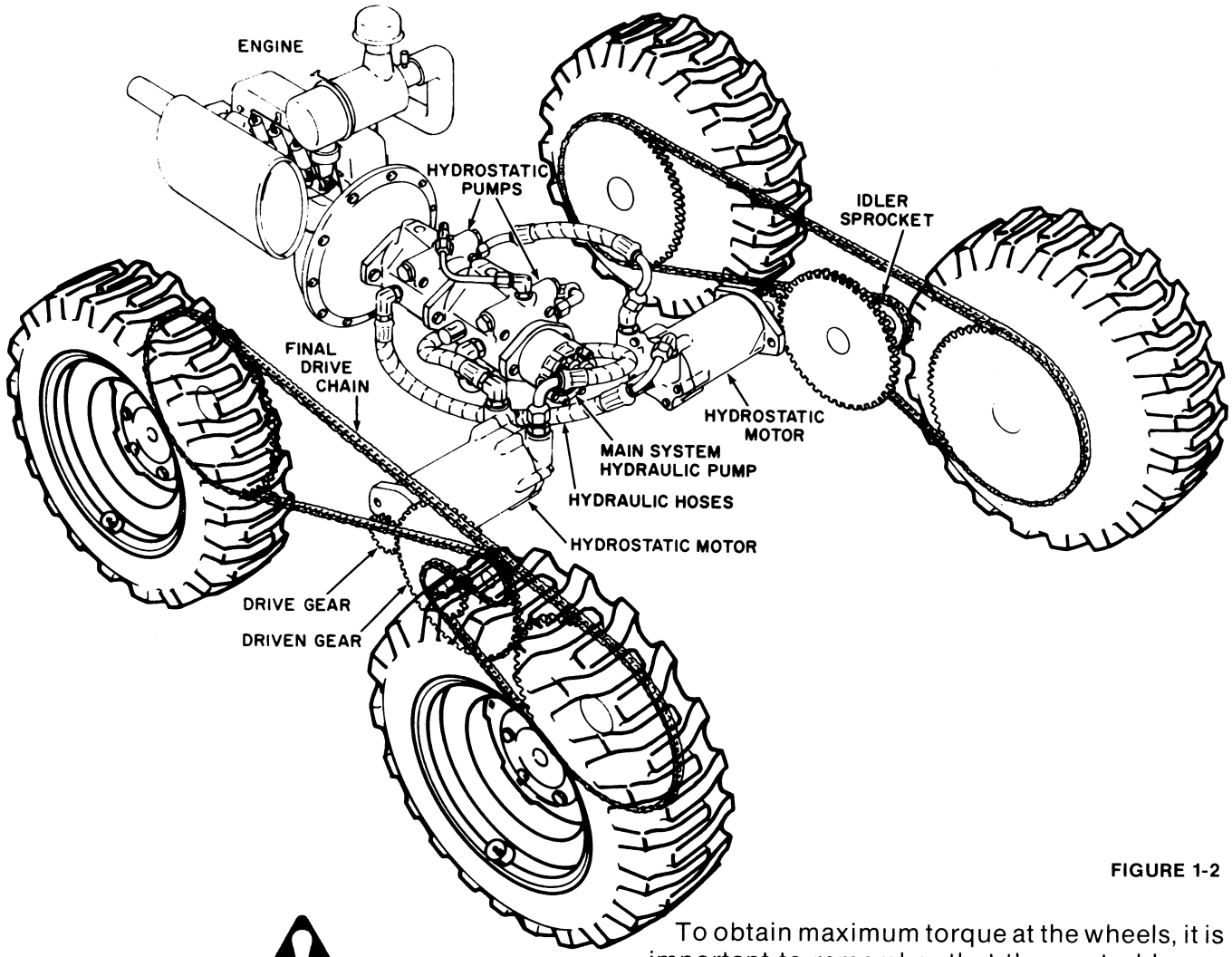


FIGURE 1-2

CAUTION!

BE A SAFE OPERATOR. Before attempting to operate the loader, thoroughly acquaint yourself with:

A. The safety information in the Operator's Manual and Skid-Steer Loader Safety Manual.

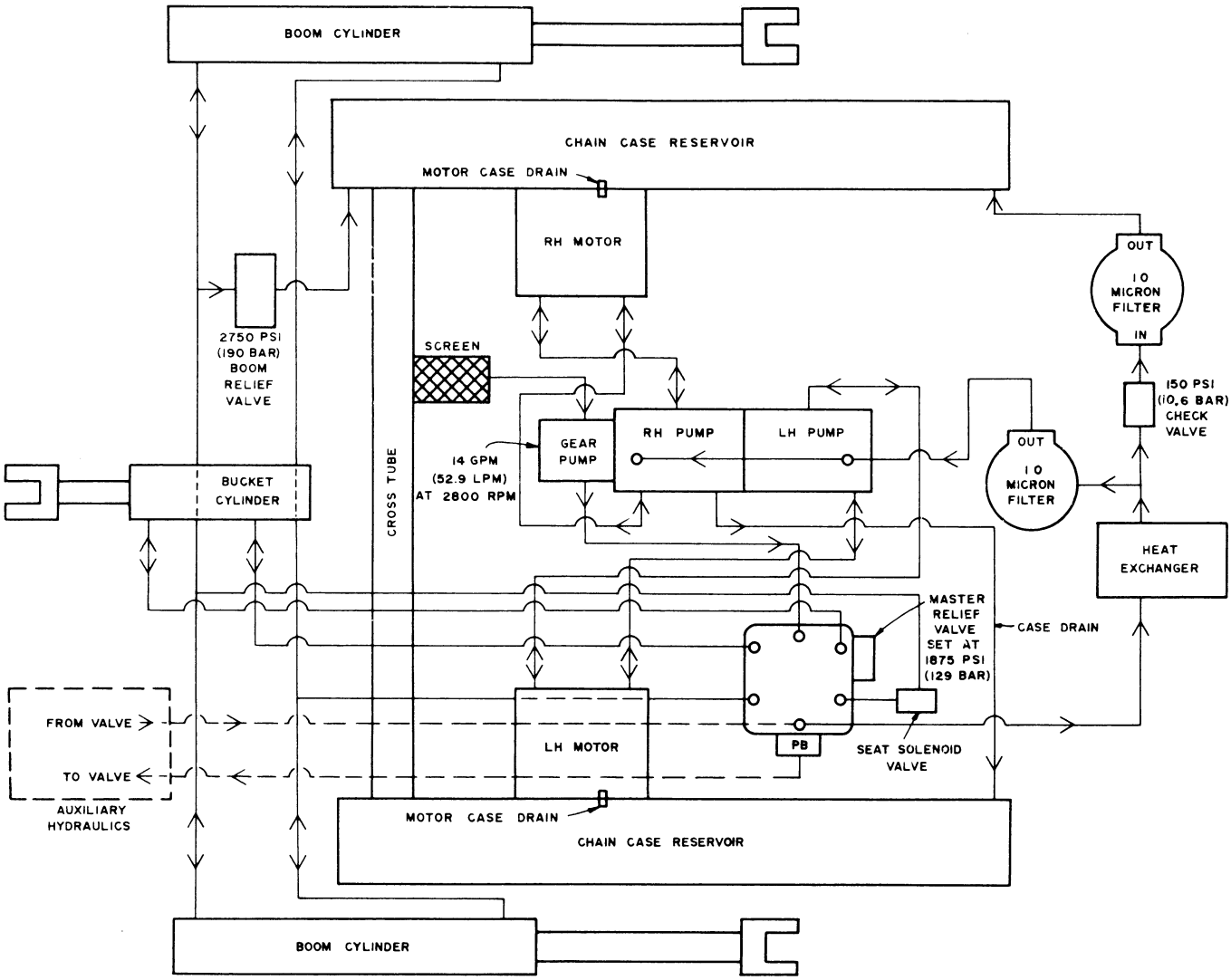
B. The operating instructions in the Operator's Manual.

C. The controls on the loader.

When a loader digs into a pile of dirt, the operator strives to exert maximum tractive effort with very little speed. The variable displacement hydrostatic units are destroked so they drive the motors at the required slow speed while generating maximum torque. Minimum power losses occur because input speeds are reduced drastically below levels attainable with slipping clutches as used in mechanical drives.

To obtain maximum torque at the wheels, it is important to remember that the control levers should be close to the neutral position. This differs from a mechanical drive unit where the operator pushes the control levers as far forward as possible to prevent the clutches from slipping. The positiveness of the hydrostatic drive at low speeds allows the operator to ease the bucket into loads, rather than using the impact loading technique which is so often necessary when using mechanically driven units. This machine never has to be used as a ramrod - a practice that is hard on both the operator and machine.

Because of the positive relationship between the hydrostatic pumps and motors, the units work to aid deceleration of the machine when the pump is stroked toward neutral position. This is the automatic braking characteristic of the hydrostatic drive. Infinitely variable speed means a full range from full speed reverse through neutral to full speed forward and any speed in between, with no jumps, jerks, or flat spots. Fast shuttle loading work is accomplished with no lost time changing directions. The smooth power application thus gained from the transmissions gives maximum tractive effort on any terrain. The operator can ease the loader into a tough load without breaking traction because he has precise control.



L-555 HYDRAULIC DIAGRAM

FIGURE 1-3

Figure 1-3 shows the hydraulic circuit and components as used on an L-555 loader.

To trace the oil flow through the hydraulic system of the loader, start with the chain case reservoir on either side of the loader, Figure 1-3. A cross tube connects both chain cases and serves as a supply point for oil to the front gear pump.

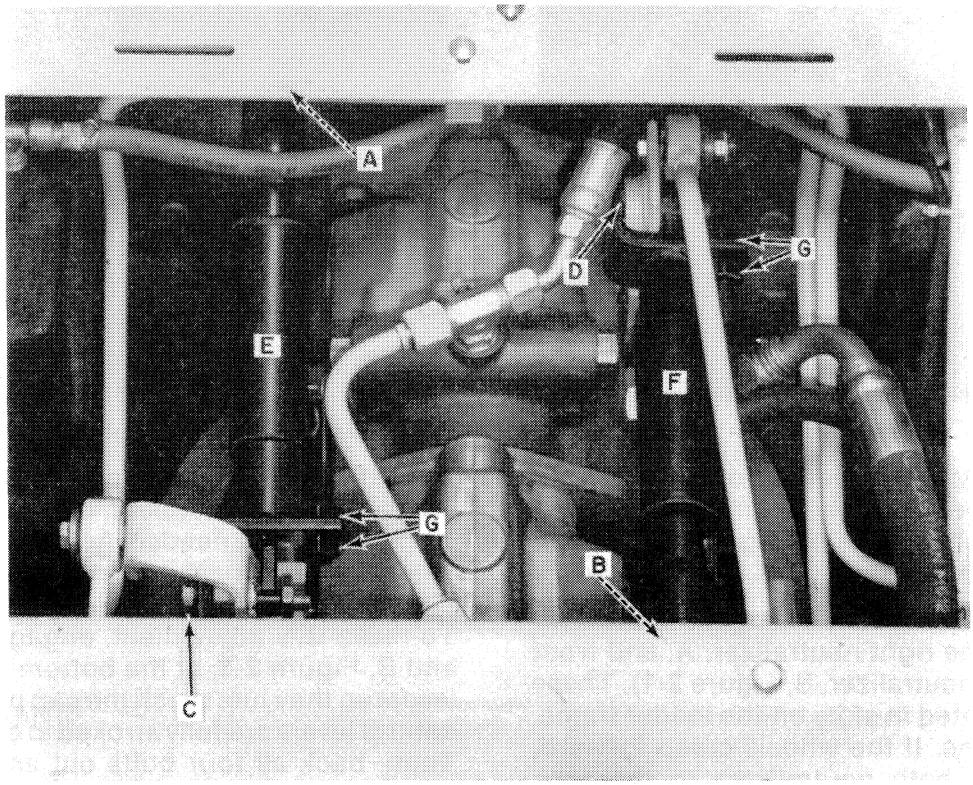
The loader lift system consists of the oil strainer, gear pump, control valve, boom cylinders, and bucket cylinder. Hydraulic oil is pulled from the chain case reservoir through the #100 mesh strainer screen and into the gear pump. The gear pump supplies oil to the main control valve with a master relief valve set at 1,875 psi (129 bar) to limit the maximum system pressure. Oil is then supplied to the boom or bucket cylinders on demand. Return oil from the open center control valve flows through the oil cooler before it is filtered through the 10-micron bypass type filter at the rear of the right chain case and returns to the chain case reservoir. If this filter element should become plugged, the oil will bypass through the filter base.

A pressure-beyond (PB) fitting supplies oil from the main control valve to the auxiliary hydraulic or auxiliary valve kit if these options have been installed.

The transmission system consists of a charge line filter, two variable displacement piston pumps, and two fixed displacement piston motors. The piston motors transfer power to each chain case where the wheels are driven by a gear and roller chain reduction.

Hydraulic oil is supplied to the 10-micron bypass charge line filter from the control valve return oil at 150 psi (10.35 bar) to provide adequate oil flow to the hydrostatic piston pumps. The left and right piston pumps supply oil to the piston motors whenever the steering levers are activated. A case drain line moves leakage oil from the piston pump cases to the reservoir. The piston motor cases drain directly into the reservoir through the output shaft bearings. The forward and reverse relief valves used on the transmission piston pumps are 3,000 psi (204 bar).

SECTION 2
STEERING ADJUSTMENTS



SHIELDS REMOVED FOR CLARITY. **FIGURE 2-1**

CAUTION: MAKE ALL ADJUSTMENTS WITH THE ENGINE STOPPED, UNLESS OTHERWISE SPECIFIED.

DRIVE CONTROL ADJUSTMENT PROCEDURE

If the machine creeps or the transmissions make a noise indicating they are being slightly stroked, a neutralizing adjustment is required.

CAUTION: TO MAKE A NEUTRALIZER ADJUSTMENT, BLOCK THE MACHINE OFF THE GROUND SO THE WHEELS TURN FREELY. RAISE THE BOOM AND PLACE IT ON THE BOOM LOCK PINS. WHEN THE ENGINE IS RUNNING, STAY CLEAR OF THE ROTATING WHEELS.

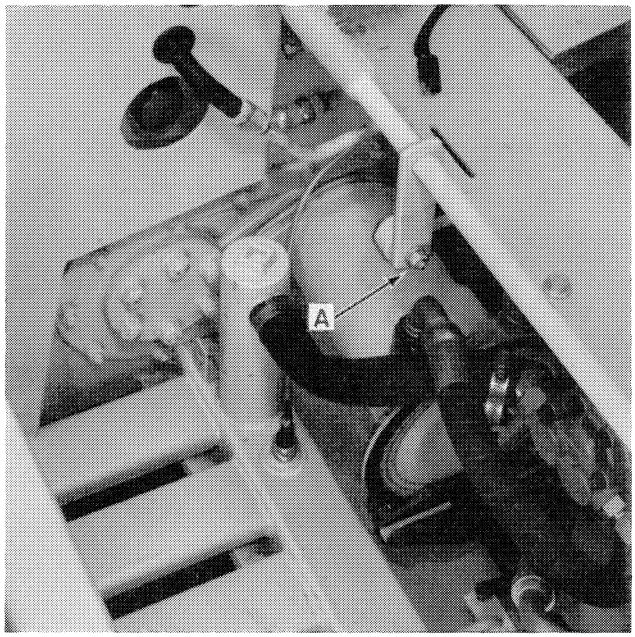
Neutralizer, E, Figure 2-1, controls the right drive wheels and neutralizer, F, Figure 2-1, controls the left drive wheels. Check for end-play in the neutralizer tube assembly first. If end-play is found, adjust nuts, G, on the side being adjusted until no end-play is present. Tighten nuts, G, securely.

If end-play in the neutralizer is present, the loader will react as follows:

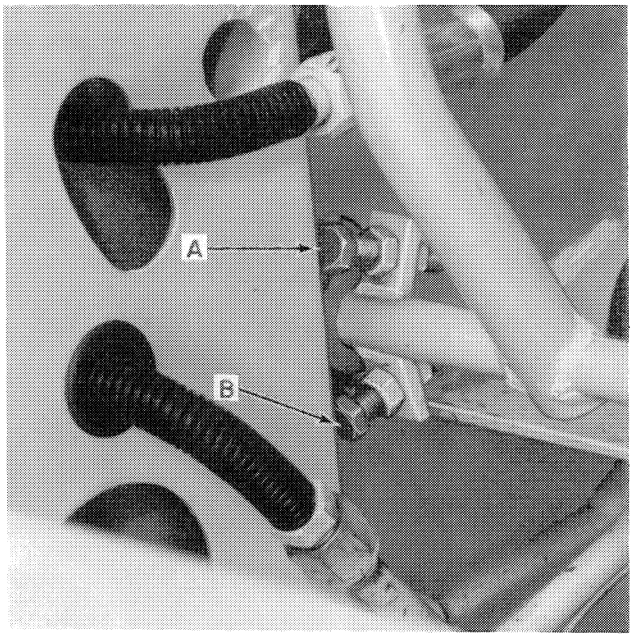
If the steering lever is pulled forward and released, the loader will creep forward. If the steering lever is pulled in reverse and released, the loader will creep in reverse.

This indicates the neutralizer is not returning to the same position each time.

If the loader only creeps in one direction after pulling the steering levers in forward and reverse, there is no end-play in the neutralizer and only the following creep adjustments should be made.



SHIELDS REMOVED FOR CLARITY. **FIGURE 2-2**



SHIELDS REMOVED FOR CLARITY. **FIGURE 2-3**

All end-play must be removed from the neutralizer tube assembly before adjusting the creep to insure that the steering levers return to the set position each time.

First, loosen the bolts retaining the neutralizer (rear end on the right neutralizer, A, and front end of the left neutralizer, B, Figure 2-1). These bolts are mounted in slots on the loader frame. Start the engine. If the wheels creep forward, adjust one or both neutralizers to the rear. Adjust the neutralizers to the front if the unit creeps rearward. Stop the engine. Retighten the hardware.

This procedure works best if the neutralizer hardware remains snug and the adjustment is achieved by bumping the control arms with the palms until proper adjustment is achieved. If more adjustment slot is needed, loosen bolt, C, Figure 2-1, on the pintle arm (also slotted) to gain additional creep adjustment. If, after adjusting the neutralizers, the control arms are not vertical, adjust the connecting link on the end of the right control handle so this is achieved, A, Figure 2-2. The handle joint is provided with a slot so the pivot bolt can be moved to gain the proper vertical adjustment.

If adjustment of the control arm yokes is necessary, readjustment of the control arm stop bolts will be needed. Adjustable stops have been provided for the control levers to prevent overloading of the internal transmission stops. To make this adjustment, engage the bolts, A and B, Figure 2-3, at the bottom of the control levers so they just touch the cab posts when the control levers are fully stroked in each direction. Then, back all four bolts out an additional ¼ turn so they, rather than the transmissions, provide the stop. Use the jam nuts to lock the bolts in place. Any further adjustment to provide equal speed of both sides at full stroke should be done by further backing the stop out on the faster side, thus matching the speed on the fastest side to the maximum speed of the slower side. Do this for both forward and reverse.

IMPORTANT: If external stops are not accurately set, the transmission pintle shaft and the rubber bushing in the control linkage may be damaged.

LABOR GUIDE

The following labor amounts are listed as a guide only. Working conditions and experience will vary the time it actually takes to complete each job.

Job	Man-Hours
Adjust neutral - both drives	1 hr.
Remove and rebuild one neutralizer assembly	1 hr.

SECTION 3
HYDROSTATIC TRANSMISSION REMOVAL

SPECIFICATIONS

A. HYDROSTATIC PUMPS

Hydrostatic pump to engine

Bell housing bolt torque, ½" x 1½" (Grade 5) ..... 40-45 ft. lbs. (54-61 N·m)

Hydrostatic pump mount to isolation mount (Reference Figure 3-12)

Bolt torque, ½" x 3" (Grade 5) ..... 40-47 ft. lbs. (89 N·m)

Hydrostatic pump isolation (Reference Figure 3-12)

Mount bolt torque, ⅜" x 2½" (Grade 5) ..... 27-31 ft. lbs. (36-41 N·m)

Flex plate ⅜" x ¾" self-locking screw, USR standard ..... 27-31 ft. lbs. (36-41 N·m)

B. HYDROSTATIC MOTORS

Hydrostatic motor housing to final drive chain housing,
carriage bolt, ½" x 1¾" (Grade 5) ..... 66 ft. lbs. (89 N·m)

CAUTION: BEFORE SERVICING THE LOADER OR ANY ATTACHED EQUIPMENT, BE SURE THE ATTACHMENTS ARE LOWERED TO THE GROUND OR THE BOOM ARMS ARE SUPPORTED BY THE BOOM LOCK PINS.

Before removing the hydrostatic transmission pumps or motors from the loader, make a complete check of the hydraulic system. Use the "Troubleshooting" section of this manual as a guide to eliminate external transmission failures. The hydrostatic pumps or motors can be removed independently of each other if the problem can be located in one component.

CAUTION: FOR EASIER ACCESS TO THE TRANSMISSION AREA, THE BOOM SHOULD BE RAISED AND RESTING ON THE BOOM LOCK PINS. IF THE LOADER MUST BE LIFTED OFF THE GROUND, ALWAYS USE JACK STANDS OR BLOCKS OF GOOD QUALITY. NEVER WORK BENEATH THE UNIT WHEN IT IS SUPPORTED BY THE HYDRAULIC SYSTEM.

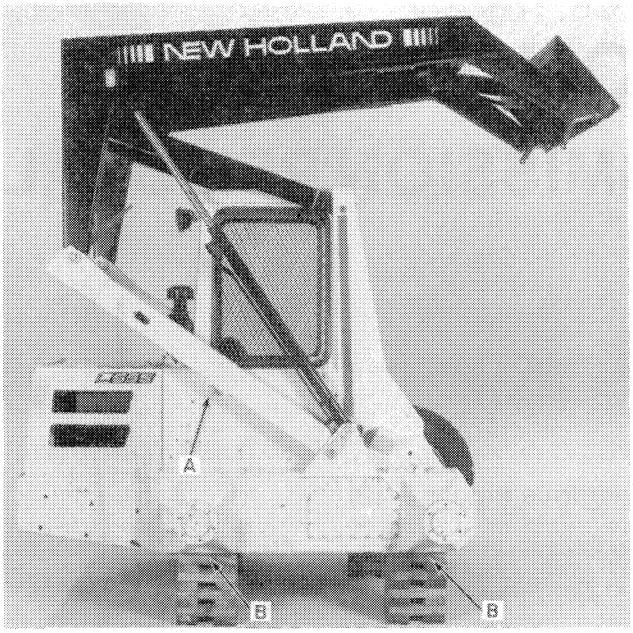
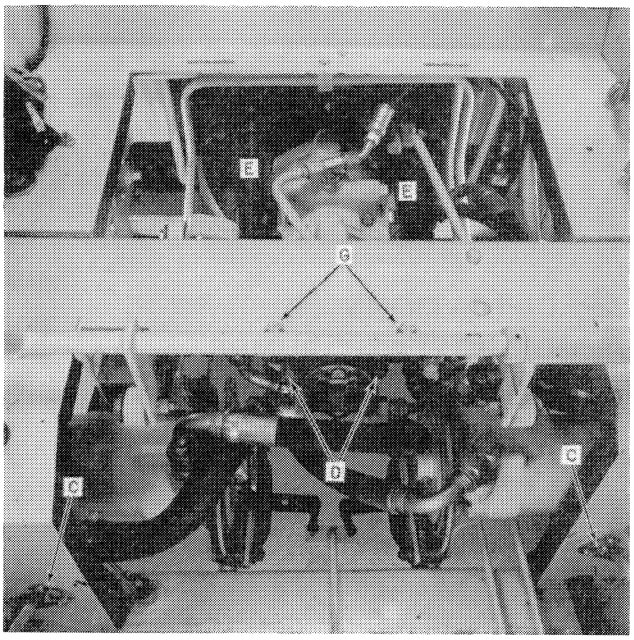


FIGURE 3-1



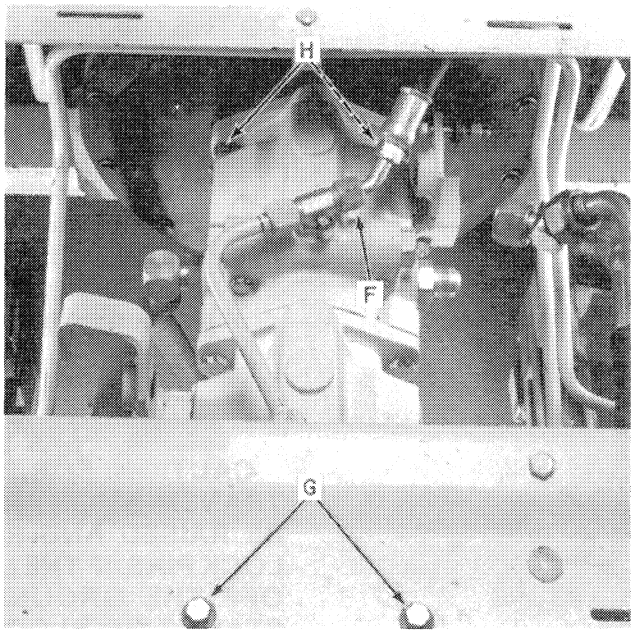
SHIELDS REMOVED FOR CLARITY. FIGURE 3-2

A. HYDROSTATIC PUMP REMOVAL

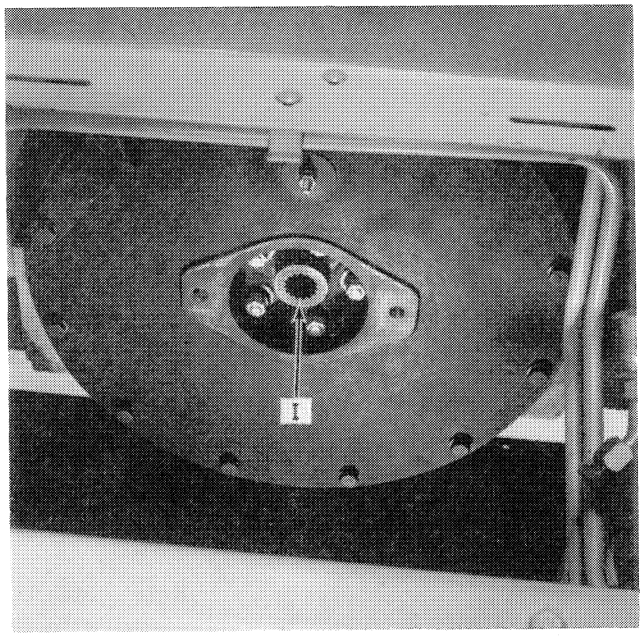
To insure maximum cleanliness of internal transmission parts, remove the tandem pump assembly as a unit, and plug all ports and lines as they are opened. Steam clean the loader before any repairs are made to the hydraulic system.

1. Raise the boom and extend the boom lock pins, A, Figure 3-1. Stop the engine. Turn the key to the "ON" position and work the boom and bucket pedals to relieve any residual hydraulic pressure before dismounting from the loader. Turn the ignition key off.
2. Jack up the loader and block it securely, B, Figure 3-1.

   NOTE: Hydrostatic pumps and motors can be removed without removing the fuel tank. Depending on the severity of the problem, you may want to remove the fuel tank at this time.
3. Remove the seat and front panel held by two overcenter latches, C, Figure 3-2.
4. Remove the suction hose and high pressure hose from the gear pump.
5. Remove the two cap screws, D, Figure 3-2, and slide the gear pump off the hydrostatic pumps.
6. Remove the steering neutralizers, E, Figure 3-2, from the pintle lever control arms.
7. Remove charge pressure line, F, Figure 3-3, and all hydraulic hoses from the hydrostatic pumps.
8. Remove the two mounting bolts, G, Figures 3-2 and 3-3.



SHIELDS REMOVED FOR CLARITY. FIGURE 3-3



SHIELDS REMOVED FOR CLARITY. **FIGURE 3-4**

9. Remove the two mounting bolts, H, Figure 3-3, and slide the hydrostatic pumps out of spline, I, Figure 3-4.
10. The complete hydrostatic pump assembly, Figure 3-5, can now be lifted out through the top or, if the belly pan and fuel tank have been removed, through the bottom.

B. HYDROSTATIC MOTOR REMOVAL

Drain the hydraulic oil before removing the hydrostatic motors. To insure maximum cleanliness of the internal transmission parts, plug all ports and lines as they are opened. Steam clean the loader before any repairs are made to the hydraulic system.

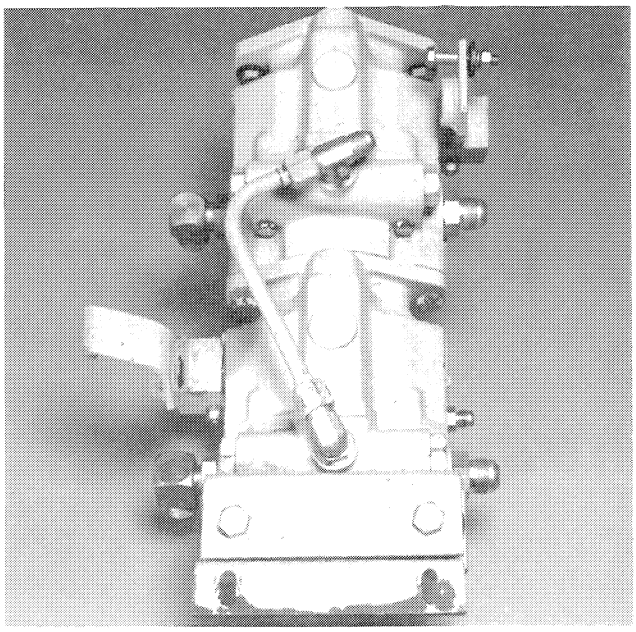
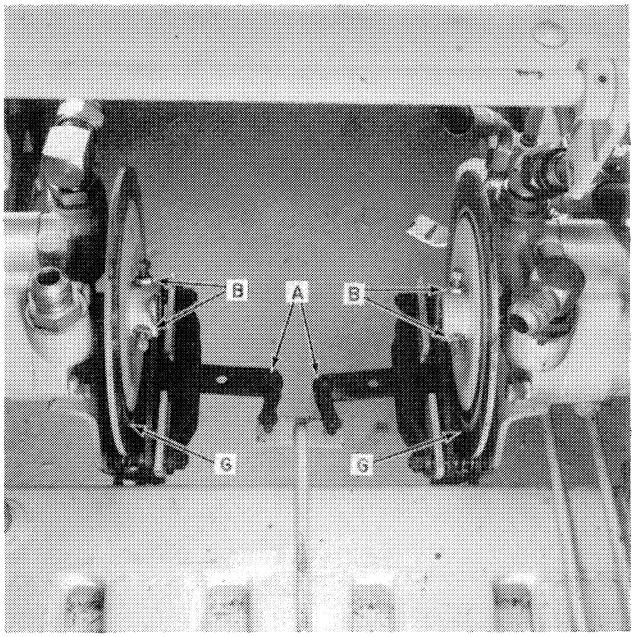
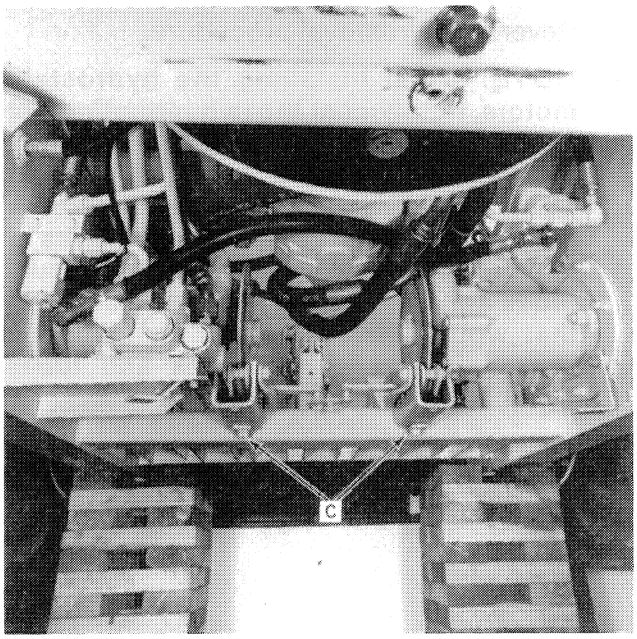


FIGURE 3-5

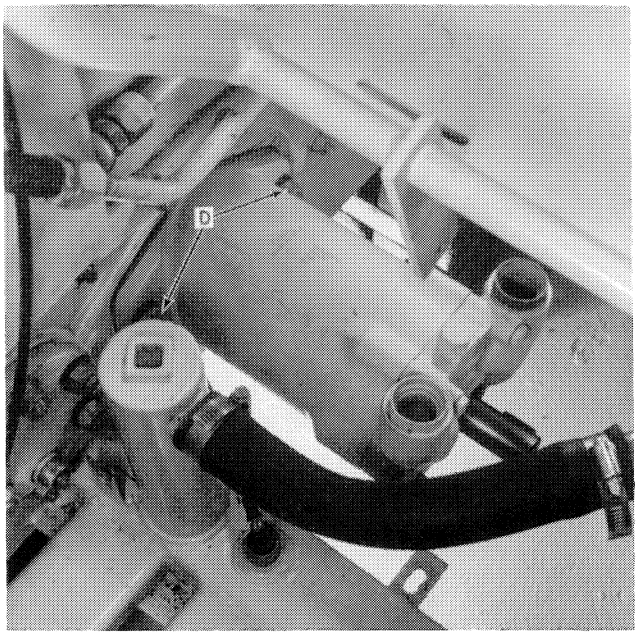


SHIELDS REMOVED FOR CLARITY. **FIGURE 3-6**

1. Follow steps 1, 2, and 3 in the "Hydrostatic Pump Removal" section.
2. Remove the brake assemblies.
   a. Remove the connector links, A, Figure 3-6.
   b. Loosen the 4 set screws, B, Figure 3-6.
   c. Remove the cap screws, C, Figure 3-7, and slide both brake assemblies off the keyed shafts of the hydrostatic motors. There may be one or two shim washers between the frame tab and brake assembly. Be sure the same number of shims are reinstalled on assembly.



SHIELDS REMOVED FOR CLARITY. **FIGURE 3-7**



SHIELDS REMOVED FOR CLARITY. **FIGURE 3-8**

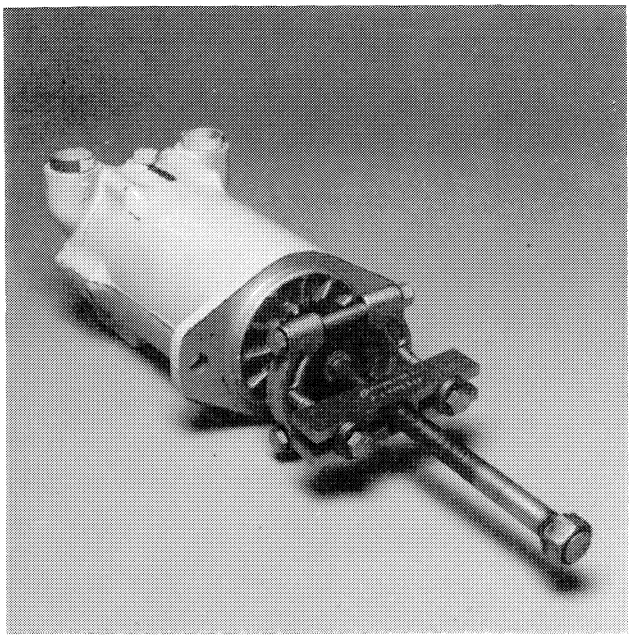


FIGURE 3-9

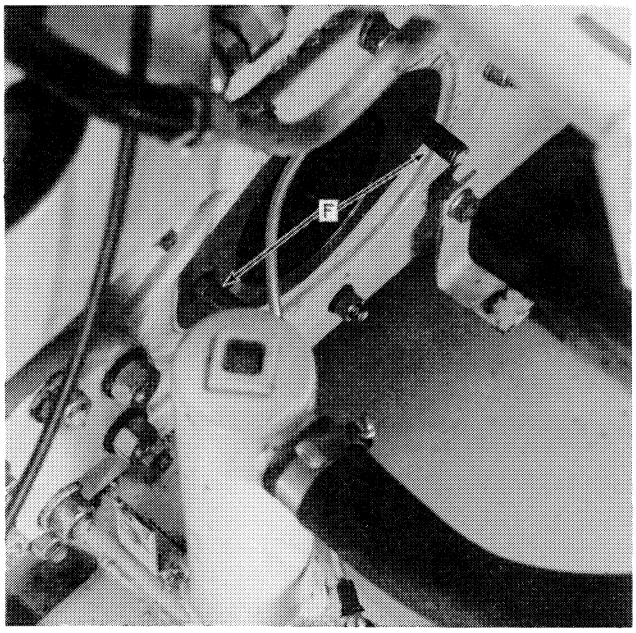
3. Remove the hydraulic hoses from the motors.
4. Remove the two bolts, D, Figure 3-8, and slide the hydrostatic motor out.

   NOTE: Figure 3-9 shows one hydraulic motor as it would look after removal. The pinion gear is shown being removed before disassembly. Figure 3-10 shows the chain case with the motor removed.

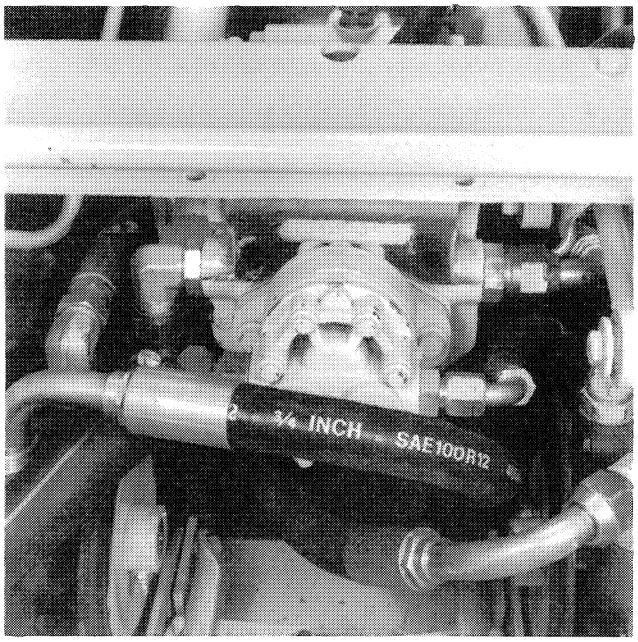
C. INSTALLATION OF HYDROSTATIC PUMP AND MOTORS

Reverse the removal procedure.

NOTE: When installing the hydrostatic motors, lightly coat the two mounting bolt studs, F, Figure 3-10, and the mounting surfaces with silicone sealer. The brake discs, G, Figure 3-6, must be centered in the brake pads by positioning the discs on the motor shafts. Be sure the hydraulic tubes and hoses are not rubbing anything that would damage them, including the brake discs or other hoses and tubes. Torque all hardware.



SHIELDS REMOVED FOR CLARITY. **FIGURE 3-10**



SHIELDS REMOVED FOR CLARITY. **FIGURE 3-11**

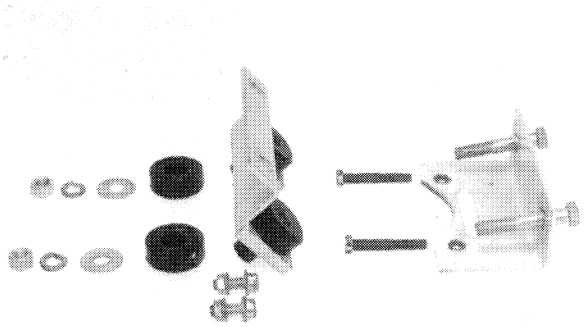


FIGURE 3-12

LABOR GUIDE

The following labor amounts are listed as a guide only. Working conditions and experience will vary the time it actually takes to complete each job.

Job	Man-Hours
Remove, repair and replace the tandem pumps	10 hrs.
Remove, repair and replace one hydrostatic motor	7 hrs.

SECTION 4
HYDROSTATIC PUMP OVERHAUL

SPECIFICATIONS

Pump housing to valve plate bolts 3/8" x 2" or 3/8" x 2½" Grade 5 cap screw	27-31 ft. lbs. (37-42 N·m)
Hydrostatic pump coupler bolts ½" x 1¼" Grade 5 cap screw	55-60 ft. lbs. (74-81 N·m)
Front transmission mount bolts ½" x 3" Grade 5 cap screw	40-47 ft. lbs. (54-64 N·m)
Transmission to flywheel cover bolts 3/8" x 1" UNF	40-47 ft. lbs. (54-64 N·m)
Engine mount bolts 5/8" x 3¾"	75-82 ft. lbs. (101-111 N·m)

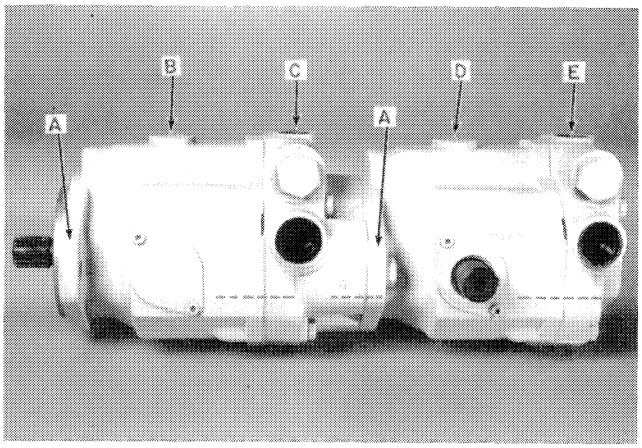


FIGURE 4-1

The complete hydrostatic pump assembly, Figure 4-1, consists of these main components: the left transmission pump, B, the left valve block, C, the right transmission pump, D, and the right valve block, E.

The valve blocks carry high pressure oil from the pumps to the motors via high pressure hoses. Low pressure oil from the motors flows back to the pumps through the valve blocks to complete the closed loop circuit.

NOTE: Dealer adjustment requests for oil leak repairs, other repairs, or overhaul of transmission pumps must include the model number of the transmission and the date code. These are stamped in the flange of the pump housings, A, Figure 4-1.

A. DISASSEMBLY

1. Clean complete pump assembly, B, Figure 4-1, before teardown.
2. To insure proper reassembly, use a screwdriver to scratch lines across the pump housing and valve plates as shown by the dotted lines in Figure 4-1.
3. As the transmission pump is being overhauled, lay the parts on a clean wooden bench top or heavy cardboard to prevent damage to the machined surfaces.

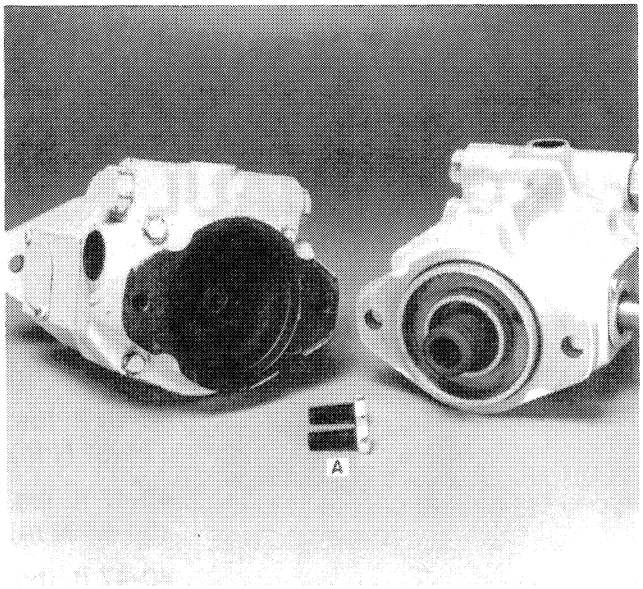


FIGURE 4-2

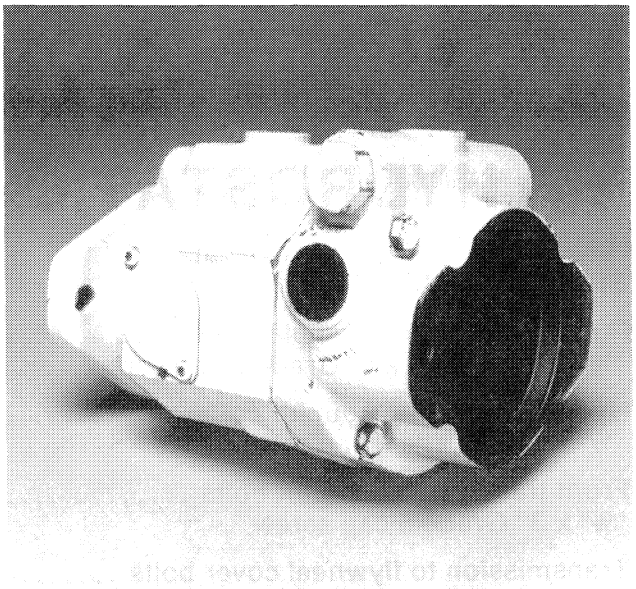


FIGURE 4-4

4. Remove the two bolts, A, Figure 4-2, and tap the housings with a plastic or rubber mallet to separate the two pumps. The pumps are coupled with coupler, A, Figure 4-3, which will remain on one of the splined shafts. The O-ring, B, Figure 4-3, fits over flange, C, and should be replaced on reassembly.

5. To separate the valve plate from the pump housing, remove the four bolts, A, Figure 4-5, and tap the valve plate, B, with a plastic or rubber mallet to separate it from pump housing, C.

NOTE: The pump housing has two alignment dowel pins, D, Figure 4-5.

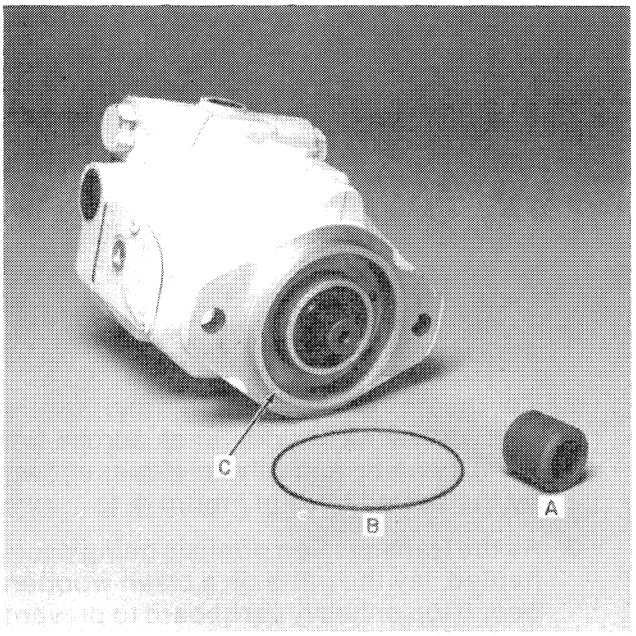


FIGURE 4-3

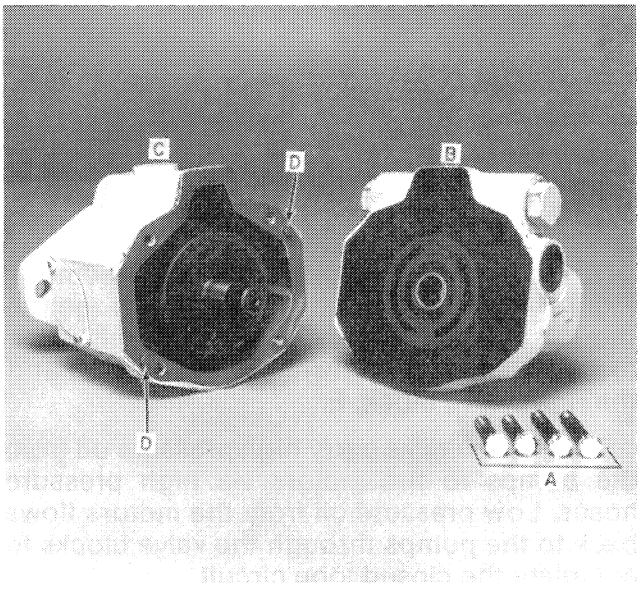


FIGURE 4-5

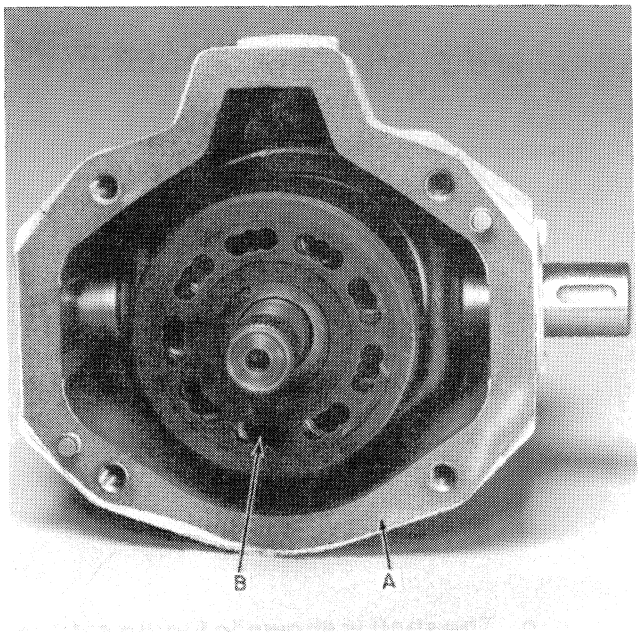


FIGURE 4-6

6. Hold the rotating piston block, B, Figure 4-6, in one hand and tilt the open end of the housing down. Turn the rotating piston block and pull it out as a complete unit without scratching or burring the parts.

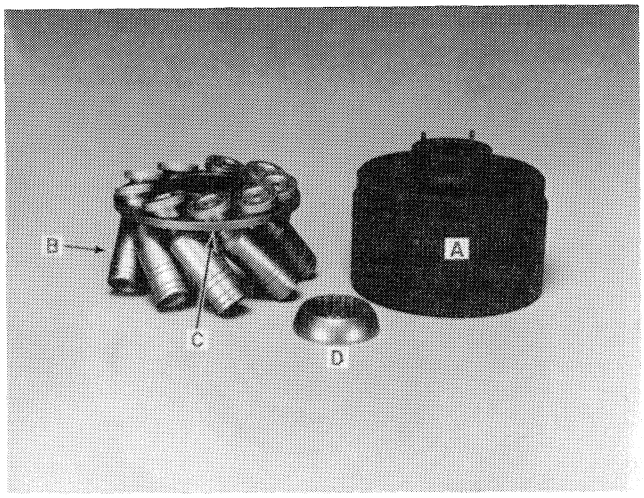


FIGURE 4-7

7. The rotating group parts are shown in Figure 4-7. Lift these parts out of the pump rotating block and carefully lay them on cardboard to avoid damage.

   Piston block (A)

   Piston and shoe assembly (B)

   Shoe plate (C)

   Spherical washer (D)

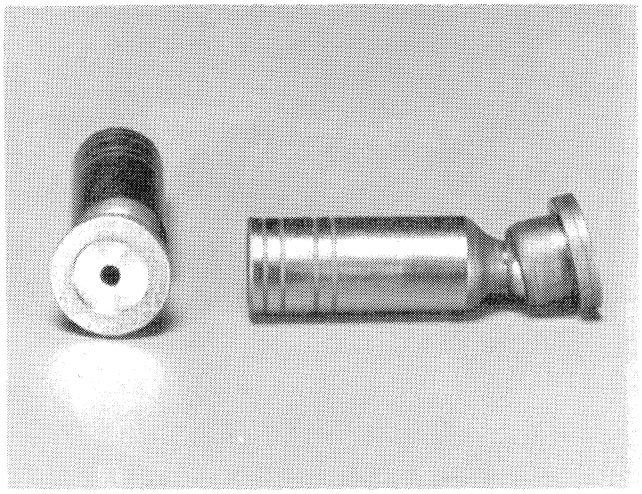


FIGURE 4-8

8. The pump shaft is shown at A, Figure 4-9. To remove the pump shaft:

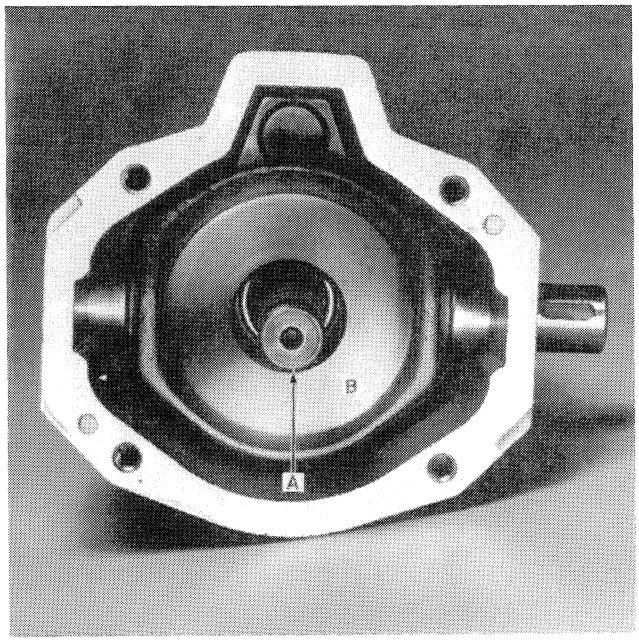


FIGURE 4-9

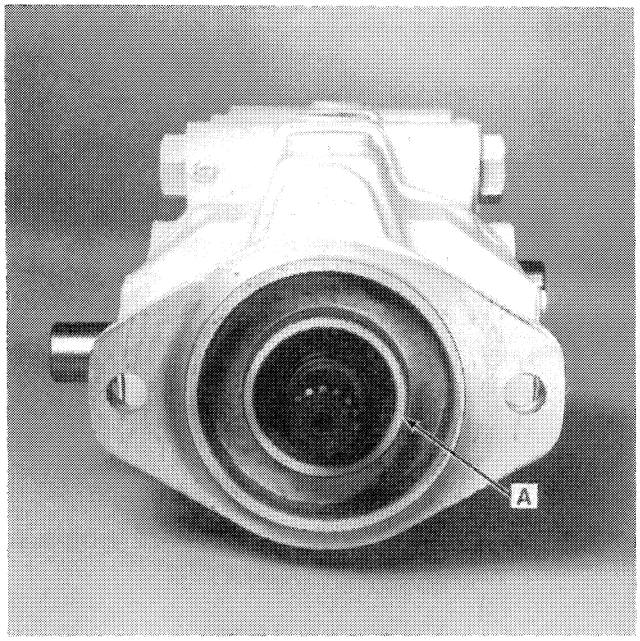


FIGURE 4-10

a. Remove the large snap ring, A, Figure 4-10.

b. Use an arbor press to remove the shaft, oil seal, and thrust bearing from the housing. The shaft is pressed out toward the snap ring.

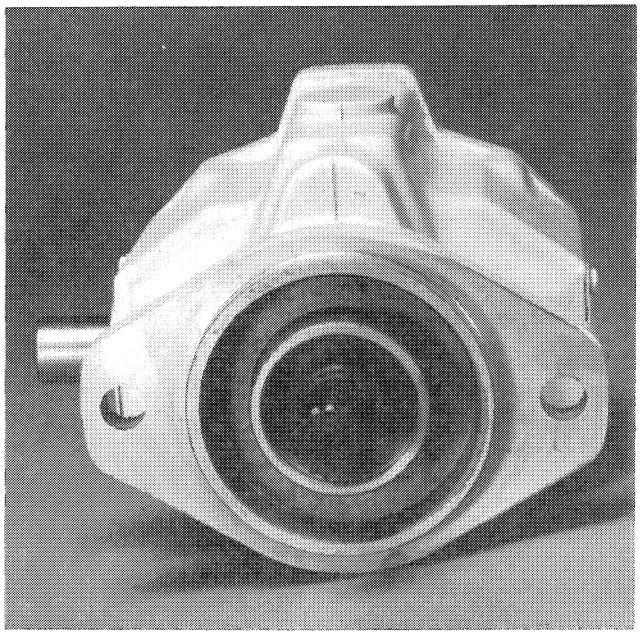


FIGURE 4-11

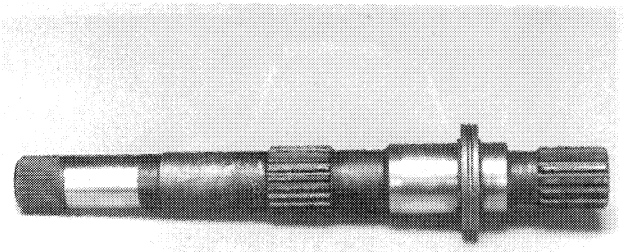


FIGURE 4-12

c. The shaft is shown in Figure 4-12 as a complete assembly after removal. Figure 4-13 shows the pump housing after shaft removal.

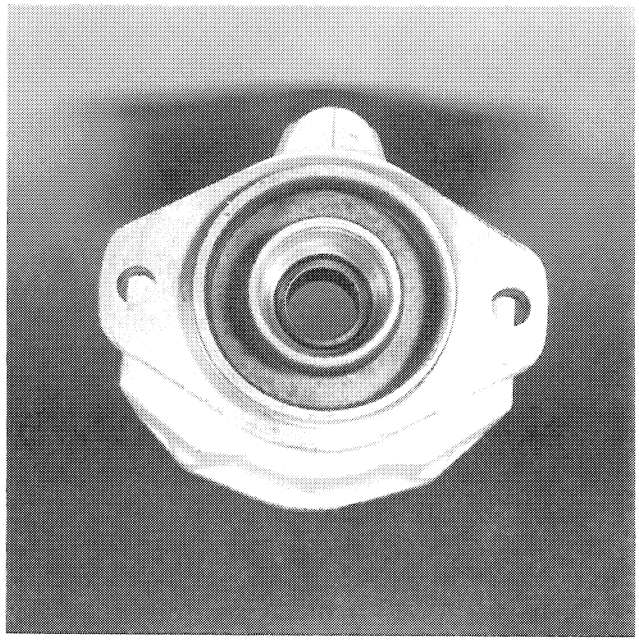


FIGURE 4-13

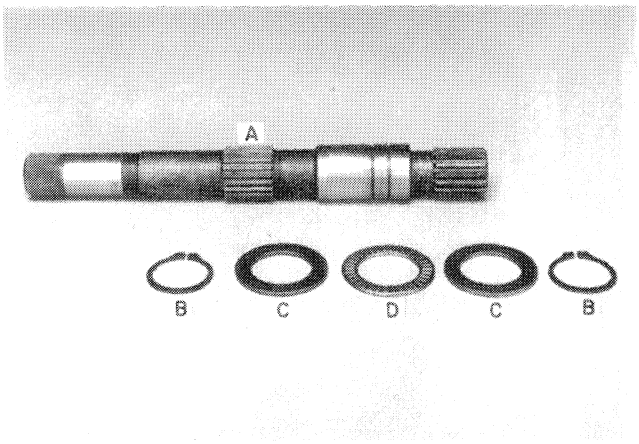


FIGURE 4-14

d. The shaft and related parts are shown in Figure 4-14.

Shaft (A)

Snap rings (B)

Thrust washers (C)

Needle thrust bearing (D)

9. To remove cam plate, B, Figure 4-9:

a. Remove the torx head screws, A, and cover plate, B, Figure 4-15.

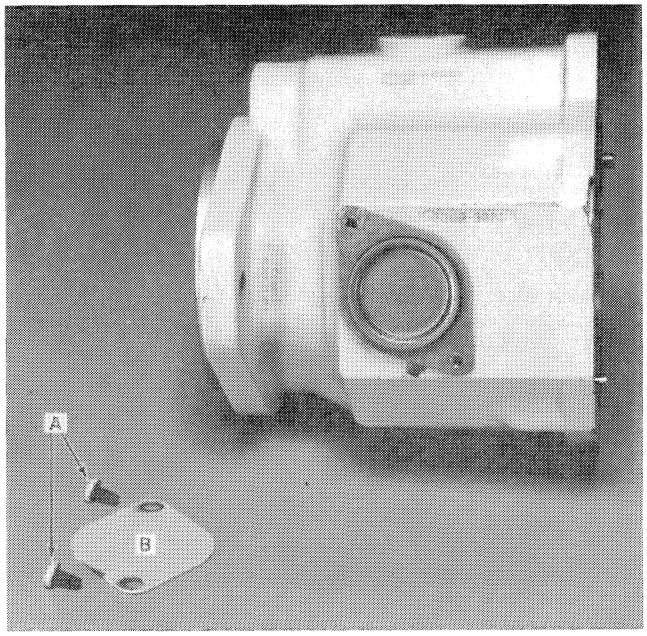


FIGURE 4-15

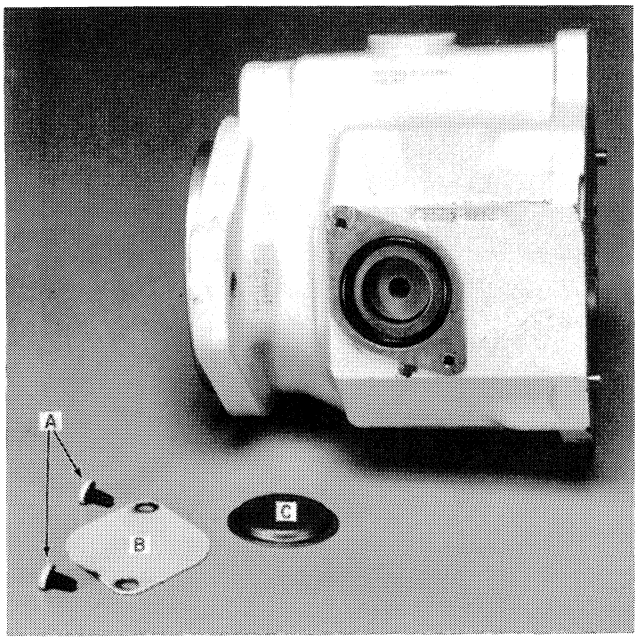


FIGURE 4-16

b. Remove O-ring cover, C, Figure 4-16, O-ring, D, Figure 4-17, and washer, E, Figure 4-18.

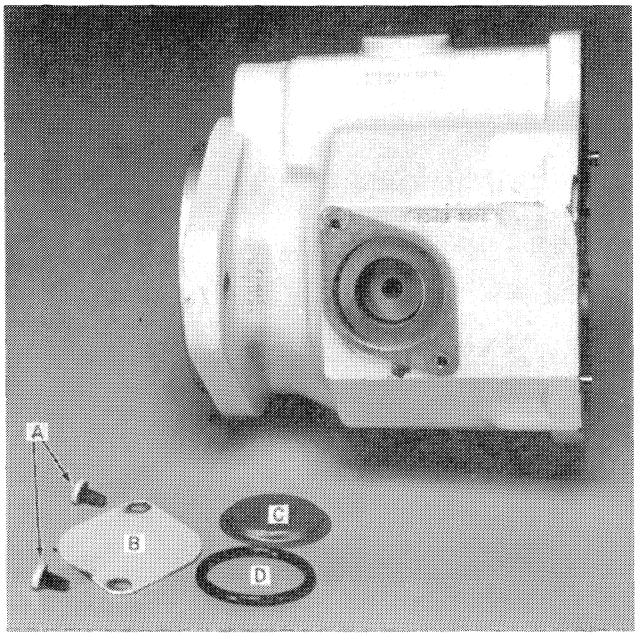


FIGURE 4-17

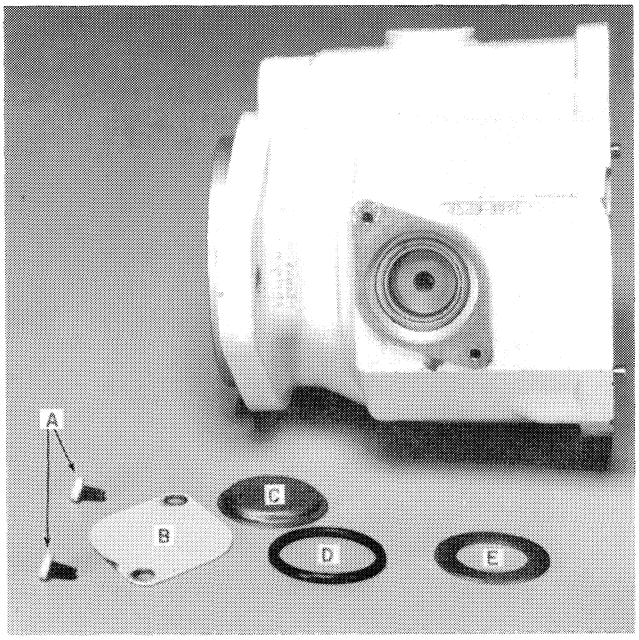


FIGURE 4-18

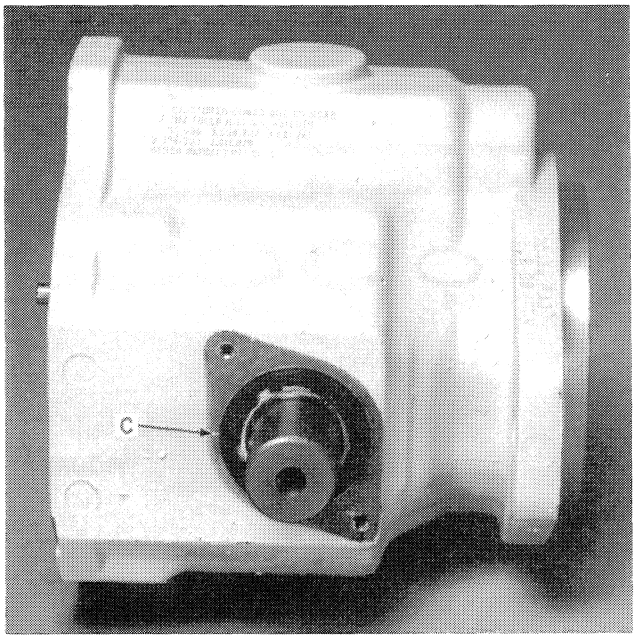


FIGURE 4-20

c. Remove the torx head screws, A, and cover plate, B, from the pintle shaft side, Figure 4-19.

d. Remove seal, C, Figure 4-20, and washer, D, Figure 4-21.

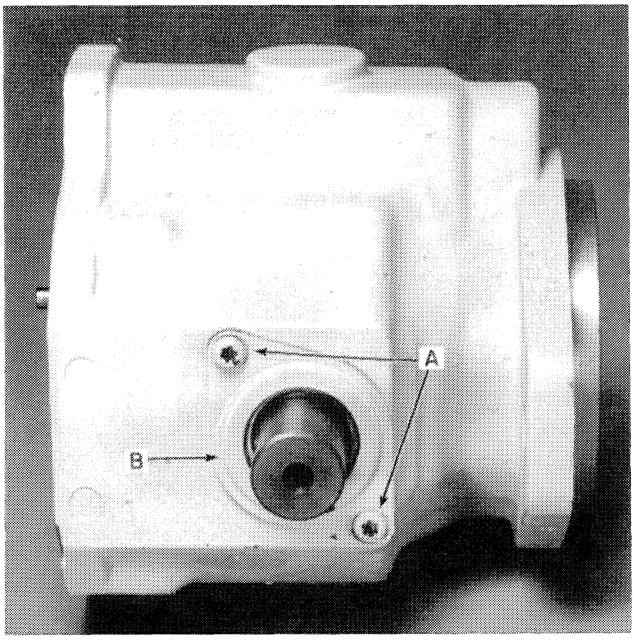


FIGURE 4-19

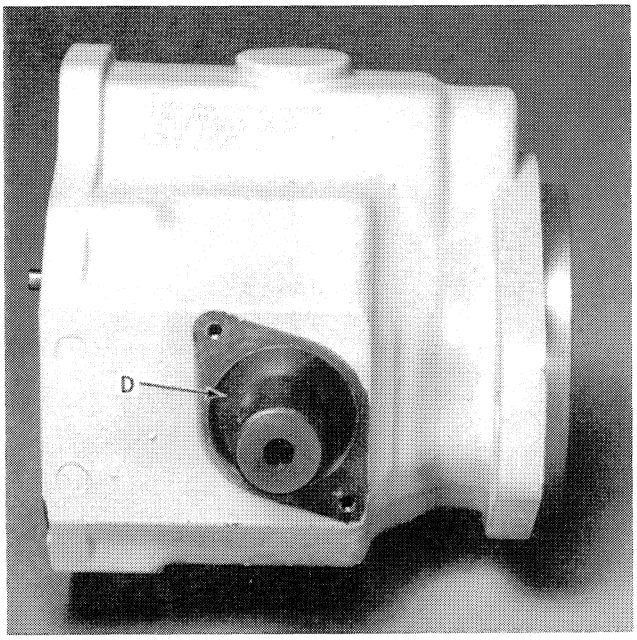


FIGURE 4-21

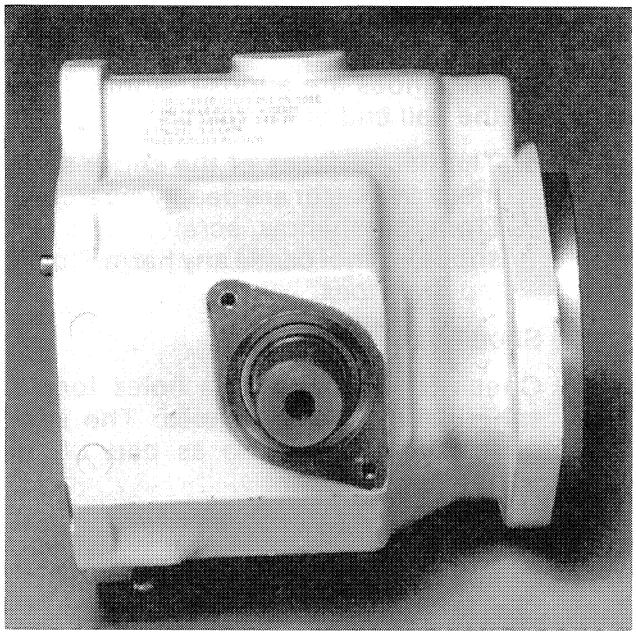


FIGURE 4-22

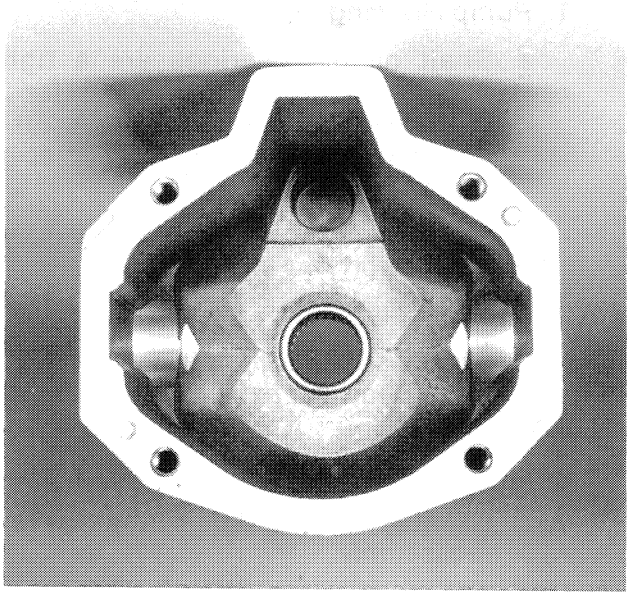


FIGURE 4-24

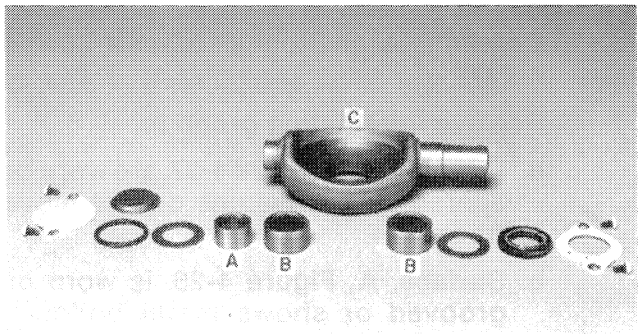


FIGURE 4-23

e. Remove bearing race, A, and bearings, B, Figure 4-23. These can be easily removed by sliding cam plate, C, back and forth until the bearings can be grasped.

f. Remove cam plate, C, Figure 4-23, by cocking the cam plate and sliding the short side of the cam plate out of the pump housing first. Figure 4-23 shows all the parts used on the cam plate.

NOTE: A bearing race is not used on the pintle shaft side of the cam plate. Figure 4-24 shows the pump housing with all parts removed.

10. The valve block relief valves have been removed in Figure 4-25. These are non-adjustable and should be replaced if not operating properly.

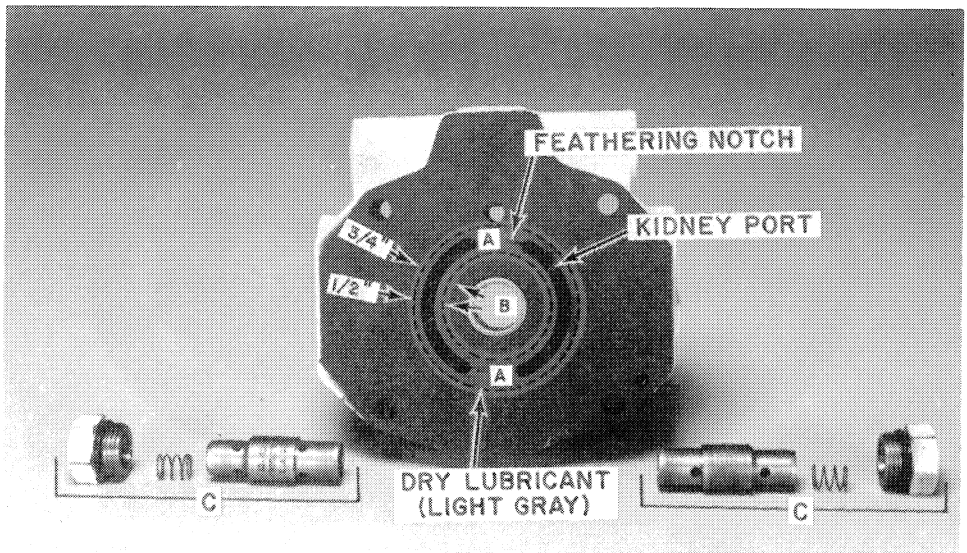


FIGURE 4-25

B. INSPECTION OF PARTS

1. Pump Housing

   a. Shaft needle bearings are a tight press-fit in housing. Inspect for a loose bearing in the housings. Also check for loose or missing needles in the bearing housing.

   b. All oil seals should be changed upon reassembly.

2. Pump Shafts

   a. Check areas contacting the needle roller bearings for wear and a rough bearing.

   b. Check for a bent or worn shaft.

   c. All oil seals should be changed upon reassembly.

3. Cam Plates

   a. Shoes of the pump pistons rotate at high speed against the cam plate surface. This surface must be smooth with no metal flaked away and no scoring. Circular scratches centered on this machined surface are due to contamination. If scratches can be felt with your thumbnail, replace the cam plate.

   b. Inspect the bearing surfaces for wear.

4. Piston and Shoe Assemblies (Figure 4-8)

   Replace the rotating groups if:

   a. The pistons have side play in the piston block.

   b. The edges of the shoes are worn from contact with the cam plate.

   c. The shoes are a loose, sloppy fit on the ball end of the piston.

   d. The flat surfaces of the shoes show metal flaking or are deeply scratched. Light or shallow scratches in the shoes will not cause any harm. Do not lap the shoes.

5. Shoe Plate

   Check for cracks at the holes for the spherical washer or shoes. The shoe plate is only available as part of the rotating group.

6. Spherical Washer

   Check for wear on the top surface where the shoe plate fits. The spherical washer is only available as part of the rotating group.

7. Rotating Piston Block (Figures 4-26 and 4-27)

   Replace the rotating group if:

   a. Cylinders, C, Figure 4-27, are worn or scored so the pistons do not move freely.

   b. Surface, A, Figure 4-26, is worn or grooved or shows metal buildup. Nicks must not extend from the cylinders to the edge of the raised area, A, Figure 4-26.

   c. Cylinder ports may be milled, B, or drilled, C, Figure 4-26 (two types of blocks).

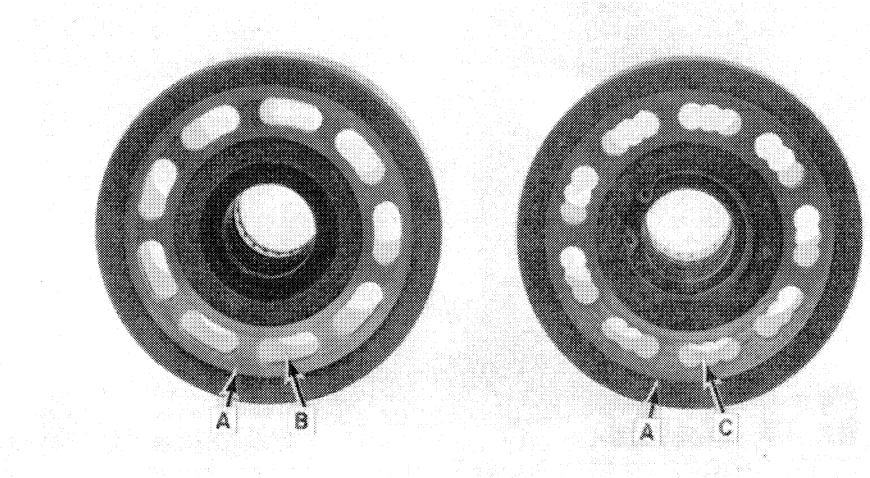


FIGURE 4-26

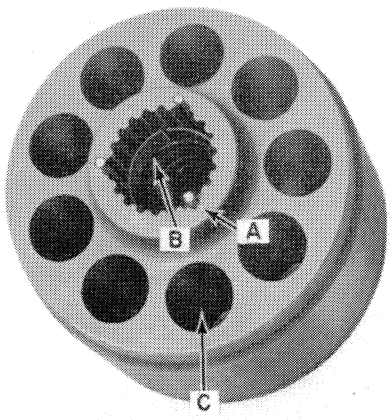


FIGURE 4-27

d. The three block loading pins, A, Figure 4-27, are spring loaded. They are held in place by the pin keeper (split bushing), B.

   Check loading pin action by placing the pin side of the piston block on a flat steel surface. Press on the opposite end (top) of the block with both hands to compress the large spring. Release the pressure, and the spring should force out the three pins. All the pins should extend out of the block the same distance and must be straight.

8. Valve Plates

   ATTENTION: The outer layer of the heat-treated sides of the valve plate is less than 0.001" thick (0.025 mm) and dull black. Do not try to smooth or polish the side of the valve plate by lapping.

   After heat-treating, a ¾" (20 mm) wide band of dry-film lubricant is applied to both sides of the valve plate, Figure 4-25.

   THIS LUBRICANT:

   a. Is a light gray color.

   b. Is centered across the two kidney ports.

   c. Is usually 0.0005"-0.001" (0.01-0.03 mm) thick, but may be thicker.

   d. Can be scraped off with your thumbnail (but should be used as is).

   e. Will be smoothed or polished off down to the black surface by the ½" (13 mm) wide raised land of the rotating cylinder block. Polishing will be complete within 200 hours' use so two valve plates with the same amount of use may not look the same.

   f. Usually will be completely polished off (along with the black outer layer) between the two PISTON kidney ports, Figure 4-25.

   Check the sides of the valve plate for wear, grooves, or metal buildup in the ½" (13 mm) wide area contacted by the rotating piston block, A, Figure 4-25. This area should not feel rough or grooved when scraped crossways with your thumbnail. Sometimes the unpolished edge of the dry-film lubricant can be felt, but the valve plate is not worn and can be used.

   Check the needle bearings for wear, B, Figure 4-25. These bearings are pressed into the valve plate, with bearing numbers to the outside.

   Two directional relief valves are located in each transmission, C, Figure 4-25. These relief valves limit the maximum system pressure to 3000 psi.

   Relief valve pressure is factory set and should not be readjusted.

   Clean the outside of the transmission before removing the valves. A small amount of oil will be lost when replacing the valves. Add oil to the reservoir as needed.

C. REASSEMBLY

After reading the following notes, reverse the disassembly procedures previously outlined.

1. Use a suitable solvent to thoroughly clean all parts. Lay the parts on a clean cardboard and air dry.

2. Use a clean universal tractor fluid (meeting J20A specifications) to lubricate all moving parts as they are reassembled. Fill the transmission cases with oil through the case drain hole after completing assembly of the component.

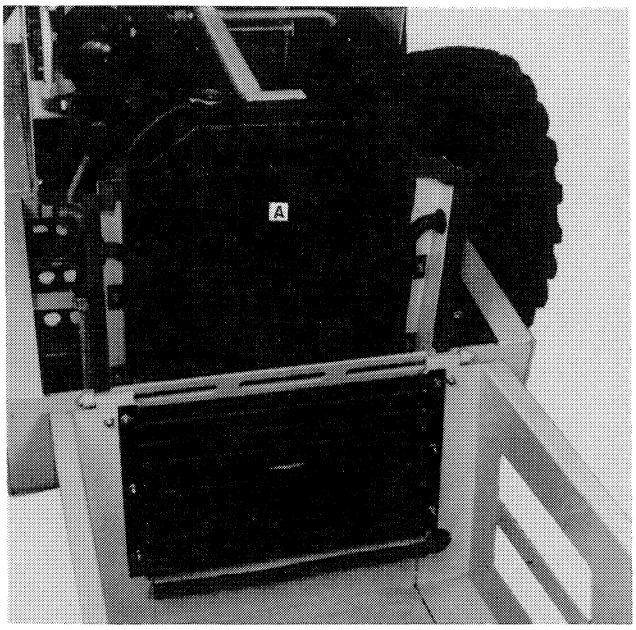
3. Install the new gaskets, O-rings, seals, and snap rings included with the repair kit.
4. Torque the pump housings to valve plate bolts, A, Figure 4-5, to 27-31 ft. lbs. (37-42 N·m).
5. Torque the hydrostatic pump coupler bolts, A, Figure 4-2, to 55-60 ft. lbs. (74-81 N·m).
6. Needle bearings are installed with the lettered side of the bearings outward. The pintle shaft bearing inner race(s) is installed with the chamfered end inward.
7. Before installing the pump hydrostatic units, fill both pumps with oil through the case drain hole.

D. SYSTEM CLEANING PROCEDURE AFTER TRANSMISSION OVERHAUL

The hydraulic/hydrostatic system must be cleaned if the transmissions show wear on the pistons and shoes, rotating piston blocks, valve plate or cam plate.

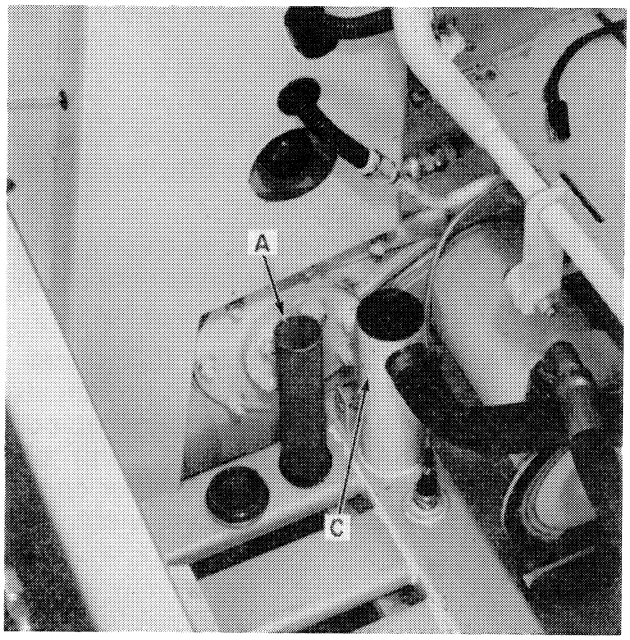
ATTENTION: Do not use the gear pump and charge pump to flush the system with solvent while the hydrostatic transmissions are connected into the system. The solvent will not provide enough lubrication to protect moving parts inside the transmissions or gear pump.

1. Drain all remaining oil from the hydraulic system.

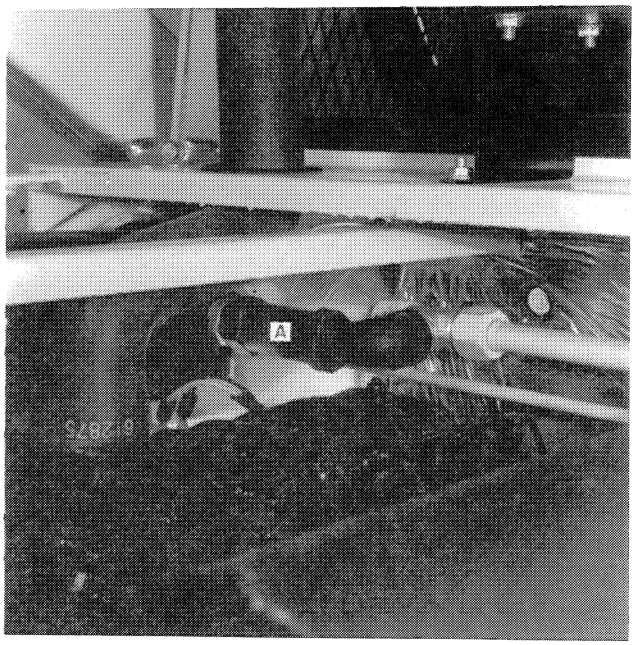


SHIELDS REMOVED FOR CLARITY. **FIGURE 4-29**

2. Remove the covers from the chain cases. Clean the chain cases thoroughly, especially at the bottom corners.
3. Remove suction screen, A, from tower, C, Figure 4-28. Thoroughly clean the screen in solvent.
4. Thoroughly flush the oil cooler, A, Figure 4-29, with solvent.
5. Clean and flush all the hydraulic lines.
6. Remove the charge check valve assembly, A, Figures 4-30 and 4-31.



SHIELDS REMOVED FOR CLARITY. **FIGURE 4-28**



SHIELDS REMOVED FOR CLARITY. **FIGURE 4-30**

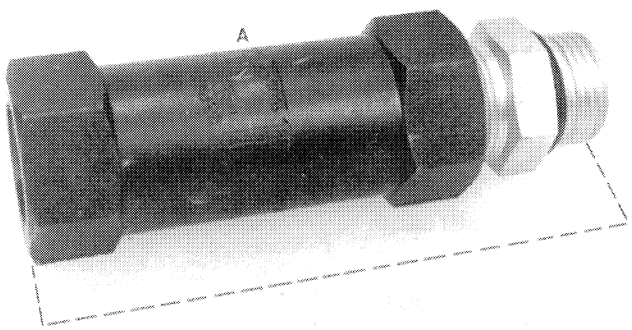


FIGURE 4-31

To disassemble this valve, follow these steps:

a. Measure the total length of the valve, including the fitting, indicated by the dotted lines on Figure 4-31.

b. Clamp housing, A, in a vise and unscrew fitting, G, Figure 4-32.

c. Carefully remove and count the number of washers, F, Figure 4-32.

d. Remove snap ring, E, and count and remove washers, D, spring, C, and poppet, B, from housing, A, Figure 4-32.

e. Flush and clean all components.

f. Measure the free length of spring, C, Figure 4-32. The length should be 1.540" (39.12 mm). If it is not, the complete valve should be changed.

g. Install poppet, B, spring, C, two washers, D, and snap ring, E, Figure 4-32.

NOTE: You may find housing, A, Figure 4-32, stamped with a number 110, 120 or 130. If the free length of the spring measured 1.540" (39.12 mm), all of these valves require two washers at D, Figure 4-32.

h. Install the same number of washers, F, as removed and tighten fitting, G, to the same dimensional length as it was before disassembly.

NOTE: To check if the valve is assembled correctly, insert a screwdriver through the fitting. The washers, F, should have a slight resistance when moving them side to side. If the washers are loose, the fitting should be tightened a small amount at a time until a slight resistance is felt. After the machine has been completely reassembled, the charge pressure reading should be checked. This is crucial to the life of the hydrostats. The pressure should be a minimum of 150 psi (1,034 kPa) and a maximum of 190 psi (1,310 kPa).

7. Drain the oil from the hydraulic cylinders and hoses.

8. It is not necessary to disassemble the hydraulic control valve.

9. If not already disassembled, remove and disassemble the hydraulic gear pump and check for wear. Clean and reassemble the gear pump. (See Section 6 of this manual.)

10. Change the hydraulic filters. After 25 hours of operation, change the filters again to insure all contamination has been filtered out. (It is not necessary to change the oil at the 25-hour level.)

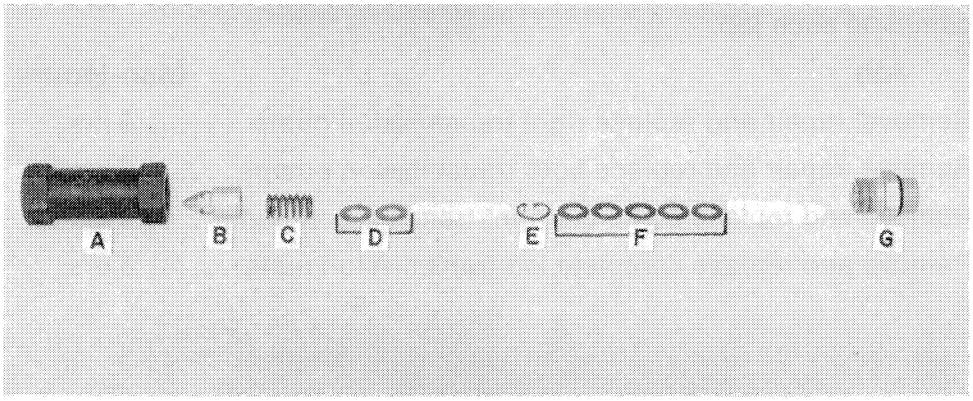


FIGURE 4-32

11. If there was severe internal wear in only one transmission, remove and clean the opposite transmission and inspect it for wear.
12. Reinstall the hoses and other components that were removed to clean the system.
13. Install the suction screen and chain case covers.
14. Tighten all hardware, lines, and fittings.
15. Fill the unit with oil.
16. Crank the engine until the charge light goes out without starting the engine. Do not crank the engine for more than 30 seconds without allowing the starter to cool.
17. Run the unit at half throttle without stroking the hydrostat levers for 20-30 minutes.

    IMPORTANT: If the charge pressure light remains on for more than a few seconds while the engine is running or blinks on excessively during normal operation, cease operation. Failure to do so could cause catastrophic transmission failure. See the "Troubleshooting" section of this manual for possible causes.
18. Slowly stroke the transmission levers to forward and hold for 30 seconds. This will bleed the air from the transmissions and hydraulic lines.

LABOR GUIDE

The following labor amounts are listed as a guide only. Working conditions and experience will vary the time it actually takes to complete each job.

Job	Man-Hours
Remove, repair and replace right transmission pump	6 hrs.
Remove, repair and replace both transmission pumps	7 hrs.
Remove and replace complete right transmission pump	4 hrs.
Remove and replace complete left transmission pump	5 hrs.