

ASSEMBLY, OPERATION AND PARTS

MANUAL

JOHN DEERE - LINDEMAN

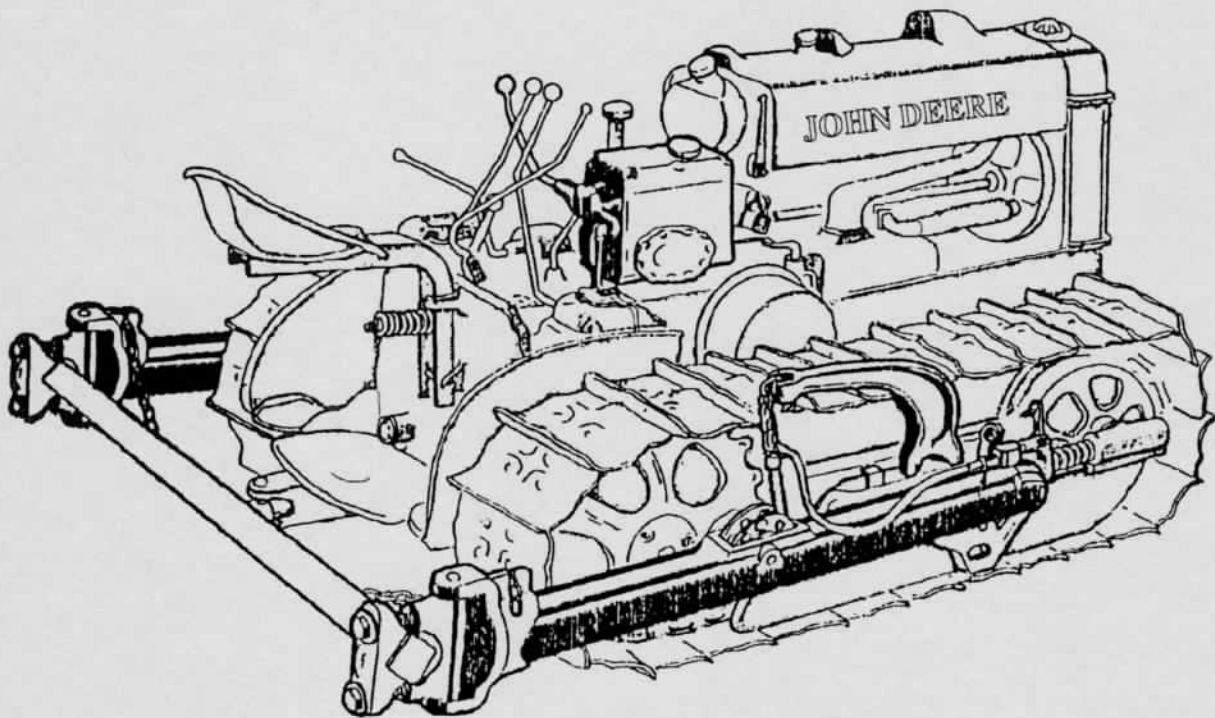
HYDRAULIC TOOL BAR

MODEL E-1100

for the

John Deere -Lindeman Crawler Tractor

Model "BO"



Designed and Manufactured
by

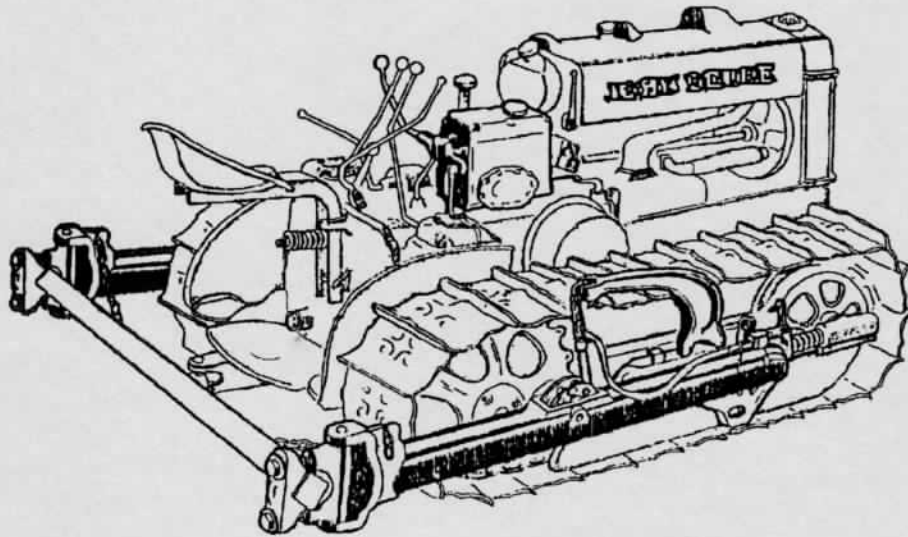
**JOHN DEERE - LINDEMAN
COMPANY
YAKIMA, WASHINGTON**

This parts and service manual has been compiled from previous manuals for the "BO" Lindeman Crawler Hydraulic System, in memory of the late Jesse G. Lindeman. It is our hope that you will find it useful in the restoration of this classic tractor and it's accessories. If there are any corrections or additions please let us know. Thank you.

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SECTION 1

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ASSEMBLY PROCEDURE

for

JOHN DEERE - LINDEMAN HYDRAULIC TOOL-BAR

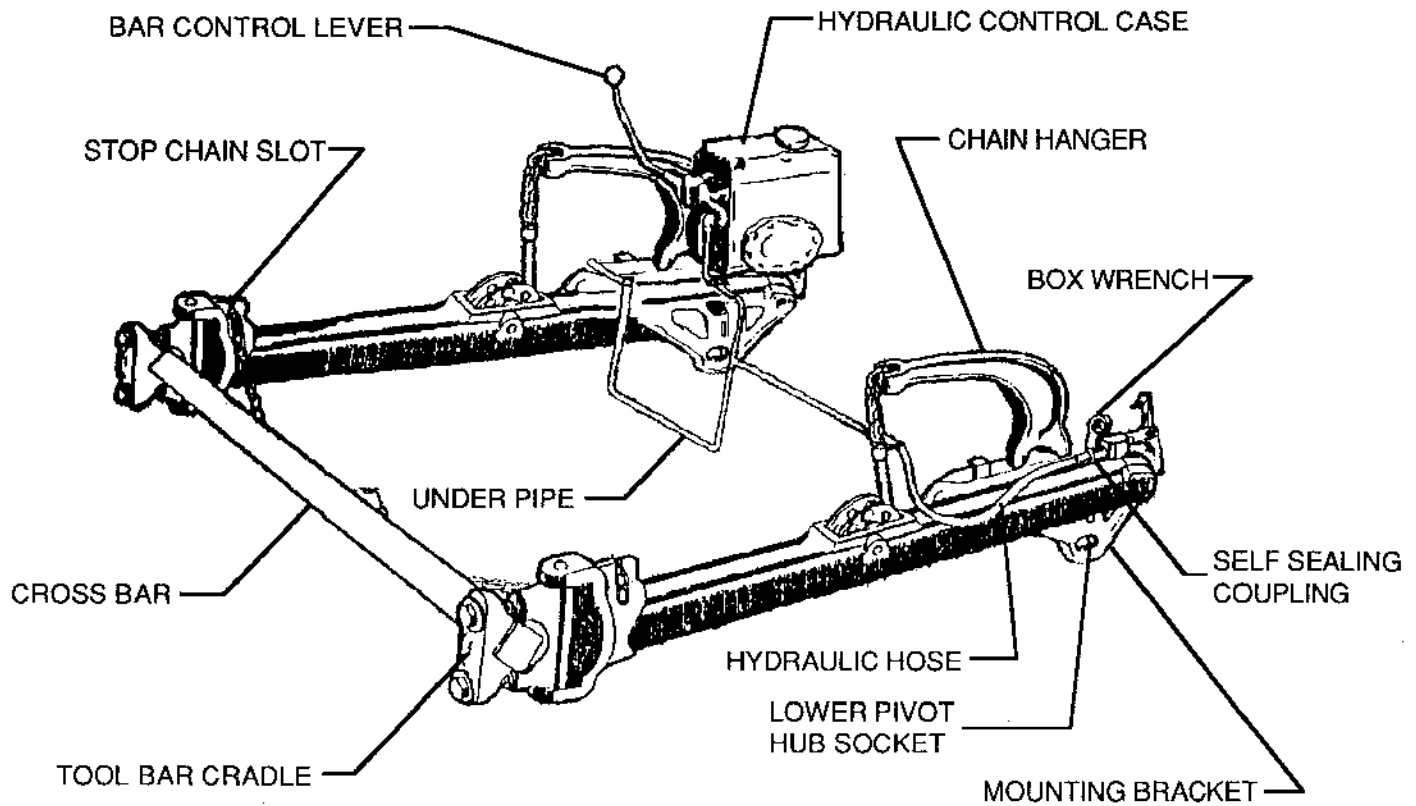


FIG. 1 TOOL - BAR UNITS INSTALLED

I. HYDRAULIC CONTROL SYSTEM

IT IS IMPORTANT --

That grease, dirt and other foreign material do not foul oil lines, gears or other parts momentarily exposed while the Hydraulic System is being mounted.

IT IS SUGGESTED --

FIRST - The area affected by Hydraulic System installation should be thoroughly cleaned before assembly.

SECOND - Oil line openings or exposed moving parts should be plugged or covered while elements of the Hydraulic System are fitted.

1. If a work pit is not available, run rear of tractor up on blocks or planks to working clearance under the rear of the machine.

2. Remove the tractor drawbar to allow Under-pipe Assembly to fit directly under transmission. This is done by taking out the two carriage bolts that hold the drawbar pivot plate to the track frame bar.
3. Remove the gear case cover (TE-769) at the top right hand side of the transmission.
4. Place Control Case Gasket (E-237Y) in position over this opening in transmission.
5. Install Hydraulic Control Case (AE-1201Y) on gasket and firmly tighten tractor transmission case, using the four 7/16" x 1-1/4" cap screws and washers.
6. From under the tractor, push the right end of the under-pipe assembly--the end with the special tee fitting--up through the opening in the bottom of the right hand steering clutch case.
7. Guide the left end into position between the rear cross member and the final drive housing on the left side of the tractor. This will place the upright portion of the under-pipe on the outside of the tractor fly wheel housing.
8. Slip the under-pipe holding bracket over the end of the under-pipe, putting the end of the pipe through the larger hole in the bracket.
9. Take out the lower two (2) cap screws in the forward edge of the final drive housing.
10. Attach the under-pipe holding bracket to the final drive housing with the cap screws.
11. Using white lead or sealer on the connections, insert the 3/8" under-pipe nipples into the elbow and side outlet of the "tee" in the under-pipe.
12. Couple Cylinder Oil Line Hoses to end of nipples.
13. Remove the bolt from the rear end of track frame dust guard cover, (right side). Place Hold-Down Clamps over hose and secure in place with bolt, 3/8" x 4-1/2" and trunnion.
14. Remove forward left hand cap screw from clutch case cover.
15. Connect the copper Pressure Tube Assembly to the top outlet of the "tee" on the under-pipe and the outlet fitting on the rear of the Control Case.
16. Replace forward left hand cap screw in clutch case cover.
17. Replace drawbar to original position.
18. Slip casting of Control Lever Assembly over assembly mounting seat on rear of Hydraulic Control Case, with lever pointing towards center of tractor.
19. Secure control lever assembly by inserting Control Lever Pin through lever casting and mounting seat from the top down.
20. Fasten control lever assembly to Control Stem protruding through rear, right had side of Control Case, with connecting Link.
21. Insert Oil Gauge Dip-Stick Assembly into position in top of the Hydraulic Control Case directly ahead of the oil-filler neck cap.

II. TOOL-BAR ASSEMBLY

A. Mounting Brackets

1. Install mounting brackets (right side, AE-2110Y, left side, AE-2111Y), on the right and left hand side of track frame to the ends of the cross members extending through the track frame, using 7/8" x 2" cap screws and 7/8" cut washers.

B. Cable Hangers

1. Before mounting cable hangers, it must be determined whether a front or rear position of the Tool-Bar is desired.
2. The chain socket in the cable hanger must point forward for a front mounting and to the rear for a rear mounting with the off-set in the hanger away from the tractor.
3. For a front mounting, hanger assembly (AE-1113Y) is used on the right hand side and hanger assembly (AE-1112Y) on the left. For a rear mounting, the hangers are reversed, putting hanger AE-1112Y on the right side and hanger AE-1113Y on the left.
4. Insert the toe of the hanger into the tunnel on top of the mounting bracket, pointing the chain socket in the desired direction, and put the heel of the hanger in the vertical hole in the mounting bracket.

C. Side Arms (Figure 2)

1. For a front mounting, Side Arm Assembly (AE-1103Y) is on the right side of the tractor and (AE-1102Y) is on the left.

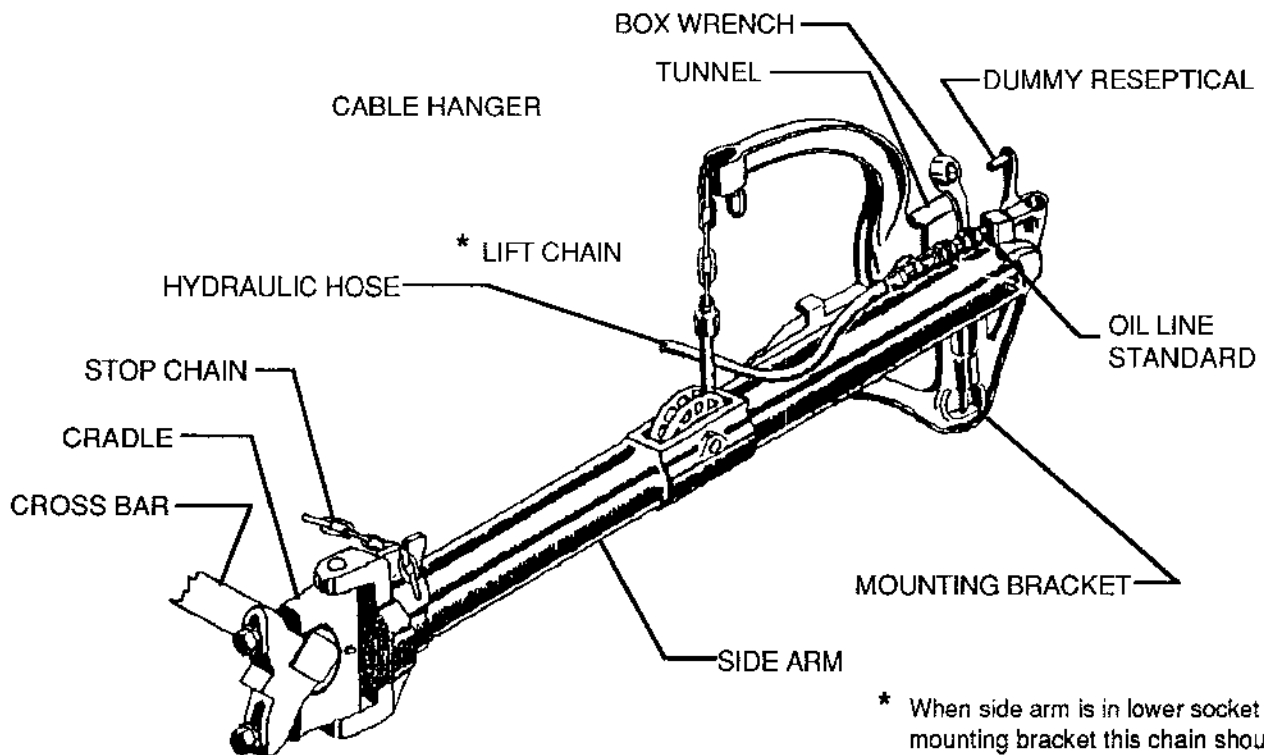


FIG. 2 SIDE ARM INSTALLED

For a rear mounting, Side Arm Assembly (AE-1102Y) is on the right side of the tractor and (AE-1103Y) is on the left.

- NOTE:
- a. The cylinder oil line fitting standard (which is the adapted "tee" fitting on the tractor end of the side arms) should be upright in either a front or rear mounting.
 - b. The cylinder oil line standard on the side arm is constructed so that the cylinder oil line fitting may be placed on either side of the standard merely by reversing the oil line plug and cylinder oil line fitting.
 - c. The cylinder oil line fitting should be in line with the cylinder oil line hose.
 - d. Do not twist the standard when changing from front or rear mounting -- switch the positions of the oil plug and oil line fitting.

2. Put the pivot hub of the side arm into the pivot socket in the mounting bracket.

-- NOTE --

There is an upper and lower pivot socket in the mounting brackets (AE-2110Y and AE-2111Y). They are for positioning the pivot hub of the Tool-Bar side arms correctly for handling loads which must be pulled from different positions on the tractor. For example, in the use of a disc harrow, chisel, subsoiler or similar tools that may need assistance in penetrating or staying down in the soil, the lower pivot socket may be used. It is recommended, however, that the top pivot socket be used for all Tool-Bar work in front of tractor.

3. Secure the side arms in the mounting brackets by using the handles of box wrenches (E-315Y and E-316Y) as locking pins.

D. Cable Hook - Up to Cable Hangers

1. When the Tool-Bar side arms are inserted in the upper pivot socket in the mounting bracket, the cable hook-up chain should be dropped downward through the chain hole in the end of the hanger arm. When the desired link is slipped into the link notch in the chain hole, the free end of the chain will hang below the chain hole in the hanger arm.
2. If the Tool-Bar side arms are inserted in the lower pivot socket in the mounting bracket, the cable hook-up chain should be pushed upward through the chain hole in the hanger arm. When the desired link is slipped into the link notch in the chain hole, the free end will hang over the end of the hanger arm.

E. Cross Bar

1. Insert the four 7/8" x 4" cap screws with 7/8" cut washers into the slotted holes in the cross bar cradles which are on each end of the cross bar.
2. Place the cross bar in position in the cradles on the ends of the side arms, then tighten the cap screws.
3. Proper leveling of Tool-Bar may be accomplished by adjustment of the cap screws in the cross bar cradles.

EXAMPLE: Loosening the top cradle screw and tightening the lower screw will raise the cross bar on that end. The reverse procedure will lower that end of the bar.

NOTE: It is important the cross bar cradle screws be kept very tight to keep the bar in correct alignment. Periodically, tightness of these screws should be checked to prevent the cross bar from working out of alignment.

F. Tool-Bar Stop Chains

(Tool-Bar in Rear Position)

1. If the Tool-Bar is in a rear position, insert the stop chain casting in the tractor drawbar clevis, with the neck of the casting downward, and secure with the drawbar clevis pin.
2. Hook the ends of the stop chains in the link notches on the top of the tool end of the side bar so that the Tool-Bar assembly may have maximum lateral play without striking the track pads of the tractor.

(Tool-Bar in Front Position)

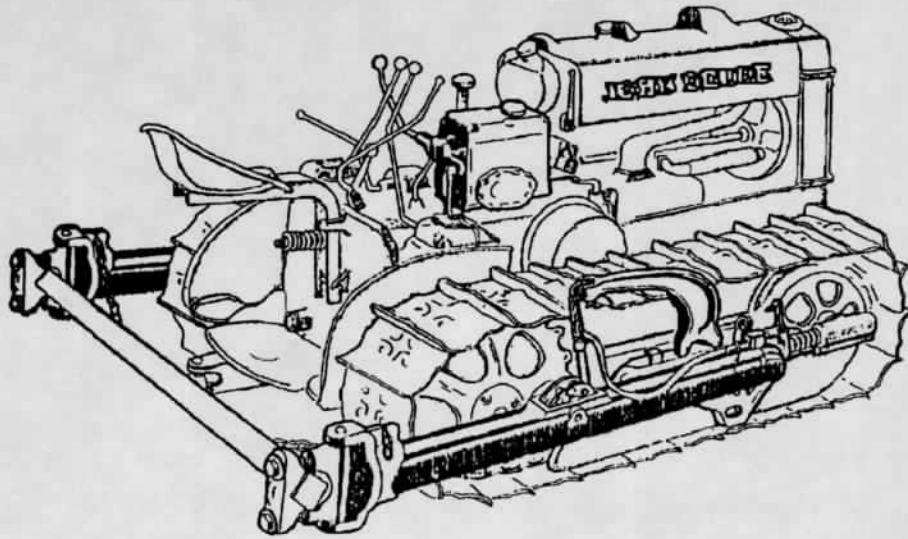
3. When the Tool-Bar is in the front position, the stop chain casting is pinned with clevis pin (E-147Y), into the vertical clevis underneath the front end of the tractor frame, with the neck of the casting towards the rear. Secure the special clevis pin with a 5/16" x 3-1/2" machine bolt.

G. Gauge Wheel

1. The gauge wheel assembly is normally used only when the Tool-Bar is in the rear position with the side arms mounted in upper pivot socket in the mounting bracket.
2. Clamp the gauge wheel bracket at any desired spot along the length of the cross bar. The gauge wheel and gauge wheel lead bar are positioned to the rear of the cross bar. The gauge wheel adjustment control handle is between the cross bar and the rear of the tractor.

SECTION 2

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OPERATING PROCEDURE

for

JOHN DEERE - LINDEMAN HYDRAULIC TOOL - BAR

I. HYDRAULIC CONTROL SYSTEM

A. On Installation

.....
..... **IMPORTANT**
..... **Use only NEW oil.**
..... **Use oil of correct WEIGHT; or Viscosity**
..... **Use the PROPER AMOUNT**
..... **Change oil with CLIMATIC SEASONS**
..... **Freezing weather S.A.E. 10.**
..... **Warm weather S.A.E. 30**
..... **Hot weather S.A.E. 40.**
.....

1. Push Hydraulic Control lever forward and place tool-bar in lowered position. (Refer to "Operation of Tool-Bar" section below).
2. Remove "dip-stick" oil gauge from Hydraulic Control Case.
3. Fill Hydraulic Control Case with 1 gallon of oil of the proper weight or viscosity.
4. Replace "dip-stick" in Hydraulic Control Case. When any oil shows on the dip-stick, it is the proper operating level.

B. Checking oil

1. Release tool-bar to lowest position to force oil from side arm cylinders into Hydraulic Control Case.
2. Remove dip-stick oil gauge to allow air to escape from the Hydraulic Control Case.
3. Measure oil with dip-stick oil gauge. When oil shows on dip-stick, the proper operating level is indicated.

C. Changing Oil

1. Lower tool-bar.
2. Remove dip-stick oil gauge from Hydraulic Control Case.

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3. Drain oil by removing plug from lower, left hand, front corner of Hydraulic Control Case. Use bent tin or other type of drain so that old oil or flushing fluid can flow to a container without splattering on machine.
4. Flush Hydraulic Control Case with kerosene or gasoline.
5. Replace plug and fill with 1 gallon of oil of the correct weight or viscosity.
6. Measure oil with dip-stick oil gauge to be sure that the Hydraulic Control Case is filled to proper operating level.

- NOTE:
- a. It is not necessary to bleed lines when changing oil.
 - b. Waste in the filler neck should be washed with gasoline or replaced when it becomes dirty.

D. Engaging or Disengaging Hydraulic Control System

1. To engage the Hydraulic Control System push Engaging Knob, on the left of the Hydraulic Control Case, into the Control Case as far as it will go, with tractor clutch disengaged.
2. To disengage pull the engaging knob away from the Hydraulic Control Case, with tractor clutch disengaged.

II. OPERATION OF TOOL-BAR

A. Raising and Lowering of Tool-Bar

1. The Control Lever on the rear of the Hydraulic Control Case has three positions - -

First ----- central or neutral position

Second ---- back or raising position

Third ----- forward or lowering position

2. Engage Hydraulic Control System.
3. To raise the tool-bar to maximum height the control lever should be pulled back by the operator to the raising position and then released. When the bar has reached its maximum height, the control lever will automatically return to its neutral position.
4. To lower the tool-bar to the maximum depth, the operator should push the control lever to the forward or lowering position. The lever should remain in the forward or lowering position while the tool-bar is in working operation or until it is desired to raise the bar, then it must be moved to the raising position by the operator.
5. To raise or lower the bar to any position between the maximums, the lever should be operated manually and returned to the neutral by the operator when the desired height or depth is reached.
6. If cross bar raises unevenly, loosen cross bar cradle bolts, put cross bar in proper alignment, and tighten cradle bolts securely.

7. Before actual work operations are started, and after a few practice raising and lowerings of the tool-bar have been done, check the oil with the tool-bar in a lowered position. This is to be sure the proper operating oil level is in the Hydraulic Control System.

III. CONTROLLING WORKING DEPTH OF TOOLS

1. To increase the maximum height of the bar from the ground, the chain between the lift cable and the link slot in the cable hanger should be shortened.
2. To allow the tool-bar to work lower to the ground the chain between the lift cable and the lift link slot in the hanger should be lengthened.
3. The working movement of the bar can be controlled by changing the pivot hub of the side arm to the upper or lower pivot socket in the mounting bracket.
4. The working depth of the tool-bar can also be controlled by raising or lowering the gauge wheel by means of its adjustment lever.
5. The angle at which tools enter the ground may be regulated by loosening the cap screws in the tool-bar cradles; rotating the tool-bar to the front or back to secure the desired angle; then retightening the screws.

IV. DETACHING TOOL-BAR FROM TRACTOR

1. Lower tool-bar.
2. Remove box wrenches whose handles hold side arms to mounting brackets.
3. Detach stop chain from tractor clevis and from ends of side arms.
4. Pull the side arms out of pivot sockets on mounting brackets.
5. Stand on side arms to force oil out of cylinders in side arms.
6. Unhook lift chains from cable hangers.
7. Disconnect hydraulic hose couplings from side arms and fasten to dummy hose fittings on mounting brackets.
8. Disengage Hydraulic Control System by pulling out control knob on left side of Hydraulic Control Case.
9. Replace box wrenches in mounting bracket.

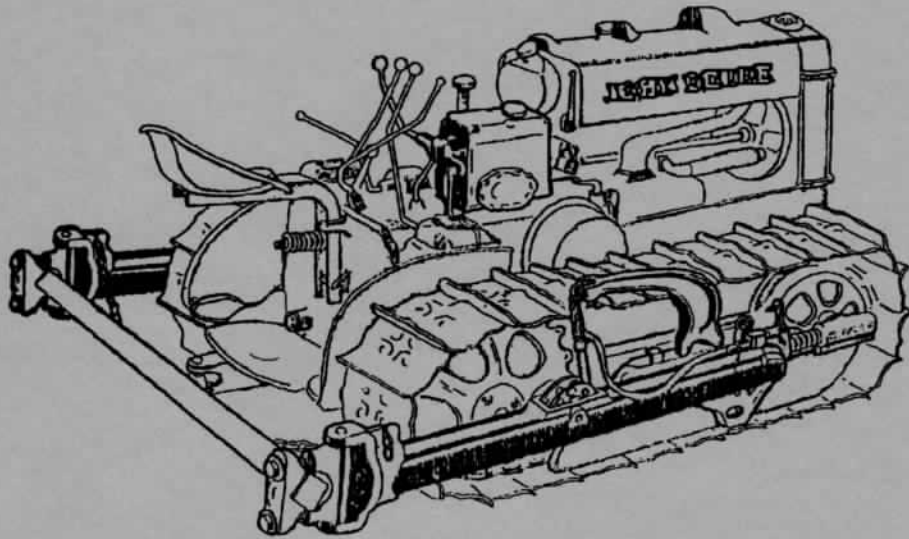
V. ATTACHING TOOL-BAR TO TRACTOR

1. To attach tool-bar to tractor in either front or rear position, drive the tractor in between the side arms so that the pivot sockets on the mounting brackets are in line with the pivot hubs at the ends of the side arms.
2. Hook lifting cable chains to cable hangers.
3. Engage Hydraulic Control System by pushing in control knob on left side of Hydraulic Control Case.

4. Lift the bar sufficiently to allow insertion of pivot hubs and side arms into desired pivot socket on mounting bracket.
5. Lock pivot hubs to mounting bracket with the handles of the box wrenches that serve as locking pins.
6. Lower tool-bar to a block of wood to relieve tension on lifting cables and reset lifting cable chains so that tool-bar will have proper working movement.
7. Insert stop chain casting in clevis on tractor, (drawbar clevis if tool-bar is in rear position or vertical clevis if tool-bar is in front position) and hook stop chains to side arms to prevent side arms from striking track pads because of lateral motion.

SECTION 3

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MAINTENANCE
of
JOHN DEERE - LINDEMAN HYDRAULIC TOOL-BAR

The simplicity of design, efficiency of engineering, and the rigid insistence on quality materials which governs the production of your John Deere - Lindeman Hydraulic Tool-Bar, assures you of a long period of efficient operation.

YOU ARE CAUTIONED, HOWEVER,

that to maintain this high operating efficiency, the few simple maintenance steps outlined in this manual must be carefully followed.

If, because of abnormal usage or accident, or if for any other reason your Hydraulic Tool-Bar does not seem to be operating properly, and the suggestions contained herein do not provide for its proper adjustment, consult your authorized JOHN DEERE - LINDEMAN CRAWLER TRACTOR DEALER. He has the trained personnel, the equipment, and the materials needed for complete repair and adjustment of your Hydraulic Tool-Bar.

I. HYDRAULIC CONTROL SYSTEM

A. Care of Hydraulic System

1. Keep Hydraulic Control Case filled to the proper level with the correct oil.
2. Check oil Daily.
3. Change oil with climatic changes.
(See Operation Section Page 6)

B. Principle of Operation (See Figures 3 and 4)

The directed flow of the oil in the Hydraulic Control System is the working force which makes the Hydraulic Tool-Bar operate. Directed oil flow is controlled through the operation of the control stem in the Control Case. The relation of cams on the control stem to the check valve poppet stem and the by-pass valve poppet stem determines whether the oil pressure created by the pump is directed into the cylinders in the side arms to raise the Tool-Bar, or whether the oil pressure is idle and oil merely flows back into the sump.

1. Oil Flow with Control System in Neutral

In neutral, the check valve is closed, the pressure control valve is closed and the oil flows from the pump through the by-pass valve back to the sump.

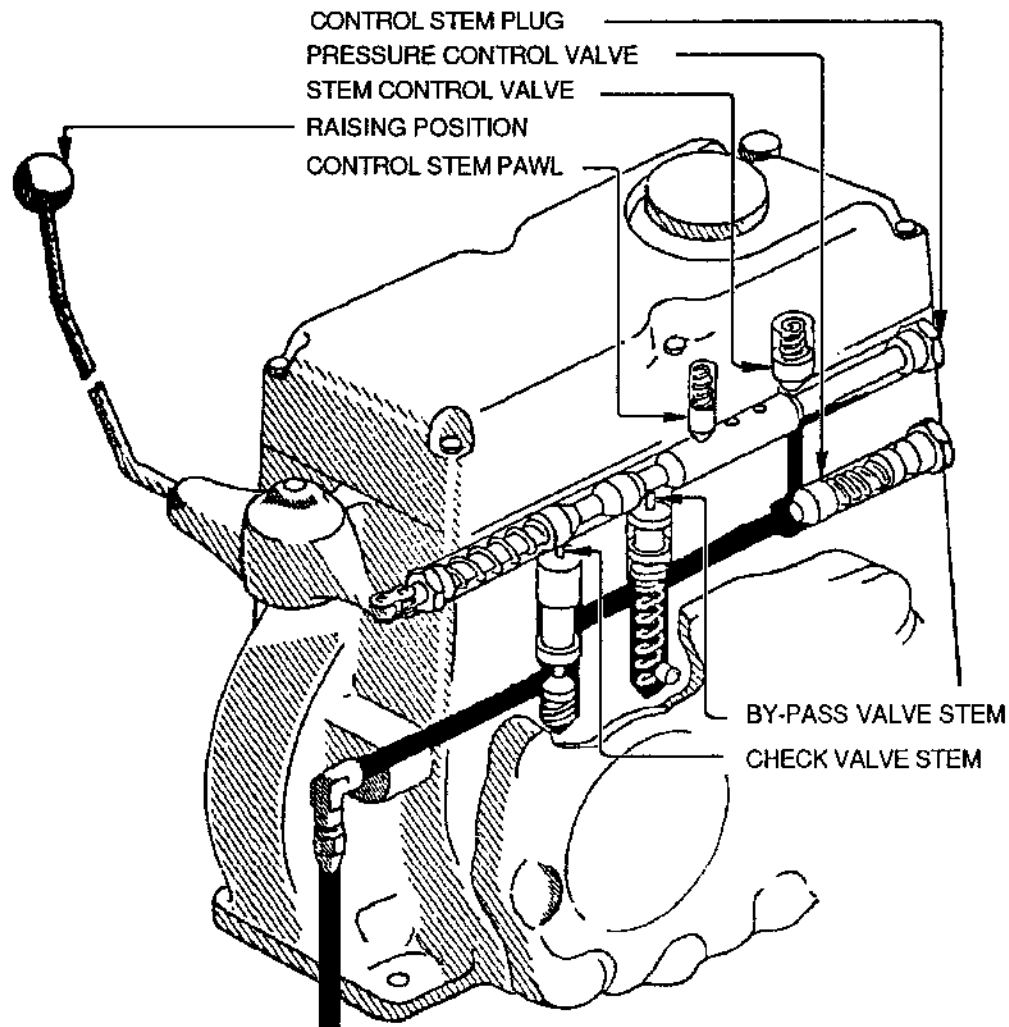


FIG. 3 OIL FLOW DURING TOOL BAR RAISING OPERATION

2. Oil Flow During Tool-Bar Raising Operation

During the Tool-Bar raising operation, the by-pass valve is closed, the pressure control valve is closed, the check valve is open and the oil flows from the pump to the cylinders in the side arms. When the Tool-Bar has reached its maximum height and no more oil can flow into the cylinders, the oil pressure is exerted against the pressure control valve. This valve opens when the pressure reaches the point for which the valve is adjusted. The oil then flows to the chamber between the forward cam and the control stem and the control stem plug. The oil pressure against this forward cam forces the control stem back into neutral position. Any excess oil pressure is automatically released by the stem control valve and the oil flows back to the sump. When the raising operation is stopped before the Tool-Bar reaches its maximum height, and the control stem is put into neutral position manually, the pressure control valve and control stem valve are not disturbed.

3. Oil Flow During Tool-Bar Lowering Operation

When the Tool-Bar is lowered, the pressure control valve is closed, the by-pass valve is open, the check valve is open, and the oil flows from the cylinders in the side arms, and from the pump back to the sump.

The operating forces exerted on the control stem is the force of the operator through the Hydraulic Control Lever and the pressure of the oil against the forward cam when the control stem is automatically returned to neutral from the raising position.

The retarding forces are the control stem check spring and the control stem pawl.

The control stem pawl indicates the raising, lowering or neutral position of the control stem, and tends to hold the stem in any of these respective positions until it is desired to shift the position of the control stem.

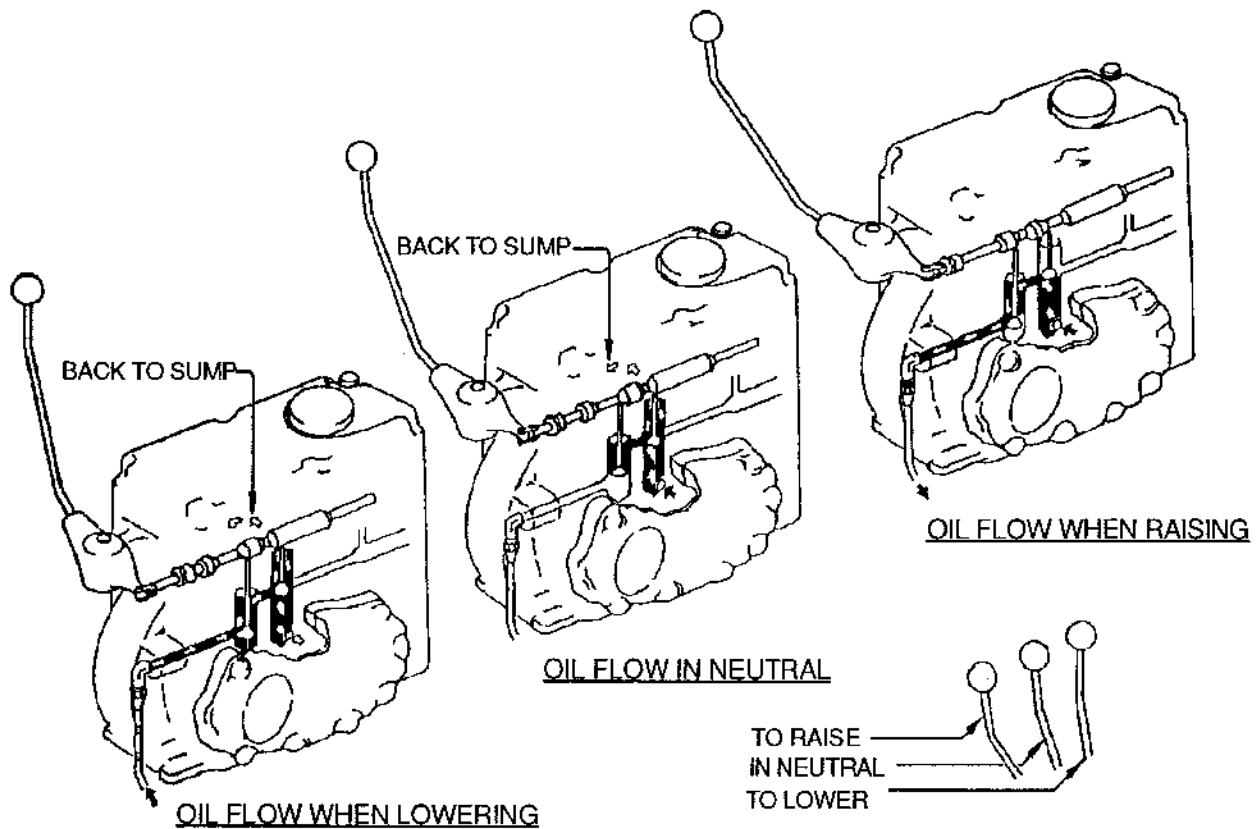


FIG. 4 DIRECTED OIL FLOW IN CONTROL CASE

II. DISMANTLING, ASSEMBLING & ADJUSTING THE HYDRAULIC CONTROL SYSTEM

(See Figure 5)

A. Control Stem Check Spring

1. Unscrew the control stem oil seal nut from the Hydraulic Control Case.
2. Remove the control stem link.
3. Push the control stem lever forward until the allen screw on the back side of the control stem lever pivot is exposed.
4. Loosen the allen screw and punch out the control lever pin.

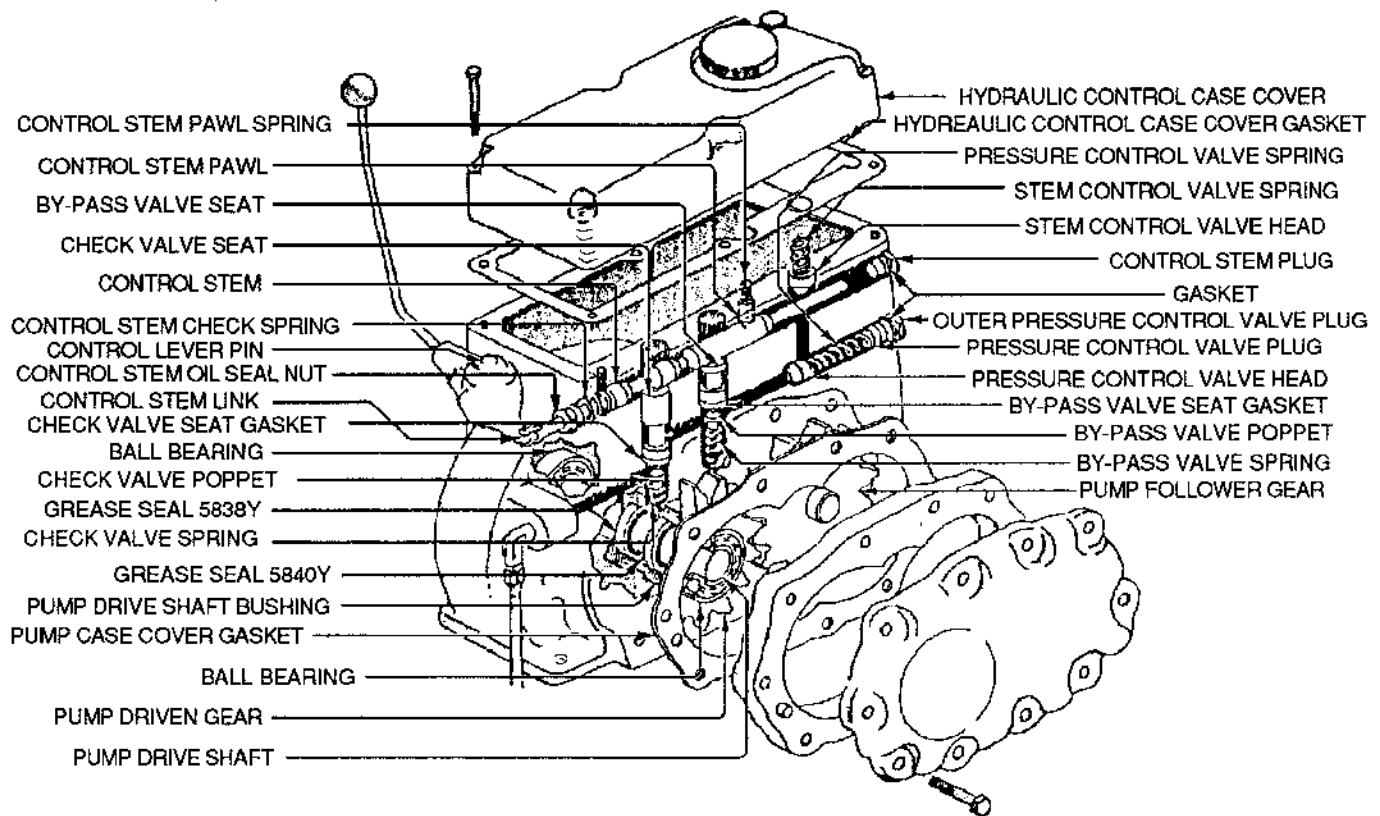


FIG. 5 HYDRAULIC CONTROL SYSTEM ADJUSTMENTS

- - CAUTION - -

On reassembling, it is most important that the allen screw is very tight and the nut is properly seated. If the nut is loose, it may interfere with the action of the control stem lever when an attempt is made to put it in the forward position.

- - Note - -

On those models where the control lever pin is not secured by the allen screw, punch the pin out by punching from the bottom upwards.

5. Draw the control stem out of the control case until the spring is exposed.
 6. Slip off the control stem seal nut and the control stem check spring.
 7. When reassembling the control stem, care must be used when replacing the control stem oil seal nut so that the seal will not be damaged by the end of the control stem. A guide of .003 shim stock should be formed over which the seal nut can be pushed. The shim is then withdrawn when the seal is over the machined portion of the control stem.
 8. Be sure, when the control stem is inserted into the control case, that the pawl notches are up.
- B. Control Stem Plug
1. The function of the control stem plug is merely to lend accessibility to the control stem channel. This plug must be kept tight at all times to avoid oil leakage between the control case, the gasket and the plug.
- C. Control Stem Pawl (Old Style, Fig. 6)
1. The control stem pawl and pawl spring are retained by the Hydraulic Control Case Cover, hence for making any adjustment to the pawl, the Control Case Cover must be removed.
 2. Lift out the pawl spring.
 3. For access to the pawl, remove the control stem from the case.
 4. Remove control stem plug, insert a screwdriver until it touches the tip of the pawl, then flip the pawl out.
 5. The control stem must be replaced before the pawl may be placed back in position.
- D. Control Stem Pawl (New Style, Fig. 6)
- A new style pawl and pawl spring are now being installed in the Hydraulic Control System of the John Deere - Lindeman Hydraulic Tool-Bar.
1. The new pawl is longer, giving greater side bearing surface, and is more accessible for adjustment or replacement. It extends above the top edge of the Hydraulic Control Case and into the Control Case Cover. The top of the pawl is drilled and the pawl spring is seated down into the pawl rather than on top of it. This holds the spring in place when the Control Case Cover is removed. To remove the new pawl and pawl spring, merely take off the Control Case Cover and pick them out with the fingers.

- The new and old style pawls and pawl springs are interchangeable as long as both spring and pawl are changed together. The new pawl will not function with the old style spring or the new spring will not operate with the old pawl.

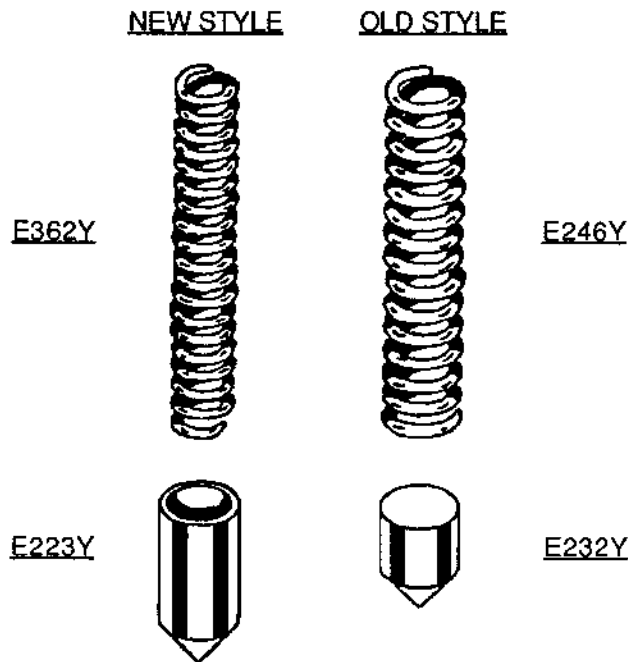


FIG. 6 CONTROL STEM PAWL

E. Stem Control Valve

- Since the Stem Control Valve is retained by the Control Case Cover, the cover must be removed to gain access to the valve.
- Lift the stem control spring from the valve head.
- The control valve head is free on its seat for adjustment or replacement.

F. Pressure Control Valve

- Remove the outer pressure control valve plug.
- Inside the outer plug will be seen the pressure control valve plug.
- Remove this plug.

- - CAUTION - -

The tension on the pressure control valve spring exerted by the pressure control valve plug has been carefully regulated by an instrument at the factory. No attempt should be made in the field to adjust it. If this spring is not functioning properly, it should be replaced with a new one. Hence, it is important that the exact number of turns required to remove the plug be recorded so that the same number of turns can be made when the plug is replaced.

4. In most cases, there will be enough oil pressure against the pressure valve head to push out the head and spring. If necessary, disconnect the oil line hose from a side arm. Put the Control Lever in a raising position, and blow air under pressure into the control case through the oil line. The force of air will blow the spring and valve head free from the Control Case.

G. By - Pass Valve

1. To gain access to the by-pass valve, take off the control case cover and remove the control stem.
2. Using valve Tool No. E-398Y, screw out the by-pass valve seat.
3. The valve poppet can then be lifted out with the fingers.
4. With a bent wire, the gasket and spring can be removed.
5. On reassembling, first put the gasket in position on the gasket seat in the valve cavity. Whenever a gasket is removed, it should be replaced with a new one.
6. Drop the valve spring into the valve cavity.
7. Rub a little gun grease on the poppet and stick the stem of the poppet into its channel in the valve seat. The grease will keep the poppet in place while the valve seat is being screwed into position.
8. Using the valve Tool No. E-398Y, screw the valve head down into the valve cavity until the top of the head is even with the bottom of the control stem channel. This allows 3/32" of the poppet stem to extend above the valve seat to contact the cam on the control stem, but does not allow the valve seat to interfere with the action of the control stem.

H. Check Valve

1. Same as By-Pass Valve above.

III. HYDRAULIC OIL PUMP (FIG. 7)

The following outline is for the complete disassembly of the Hydraulic Control System Oil Pump and should be followed for replacement of any of its parts to the extent necessary to reach the part in question.

Drain the Hydraulic Control Case. Save the oil if it is in good condition for subsequent replacement.

Remove the control case from the tractor.

A. Gear Engaging Shaft Assembly

1. Take out the gear engaging shaft pawl plug and with a bent wire, lift out the engaging shaft pawl spring.
2. Unscrew the gear engaging shaft from the gear engaging yoke. The yoke will then be free to be taken out through the bottom of the pump drive gear housing.

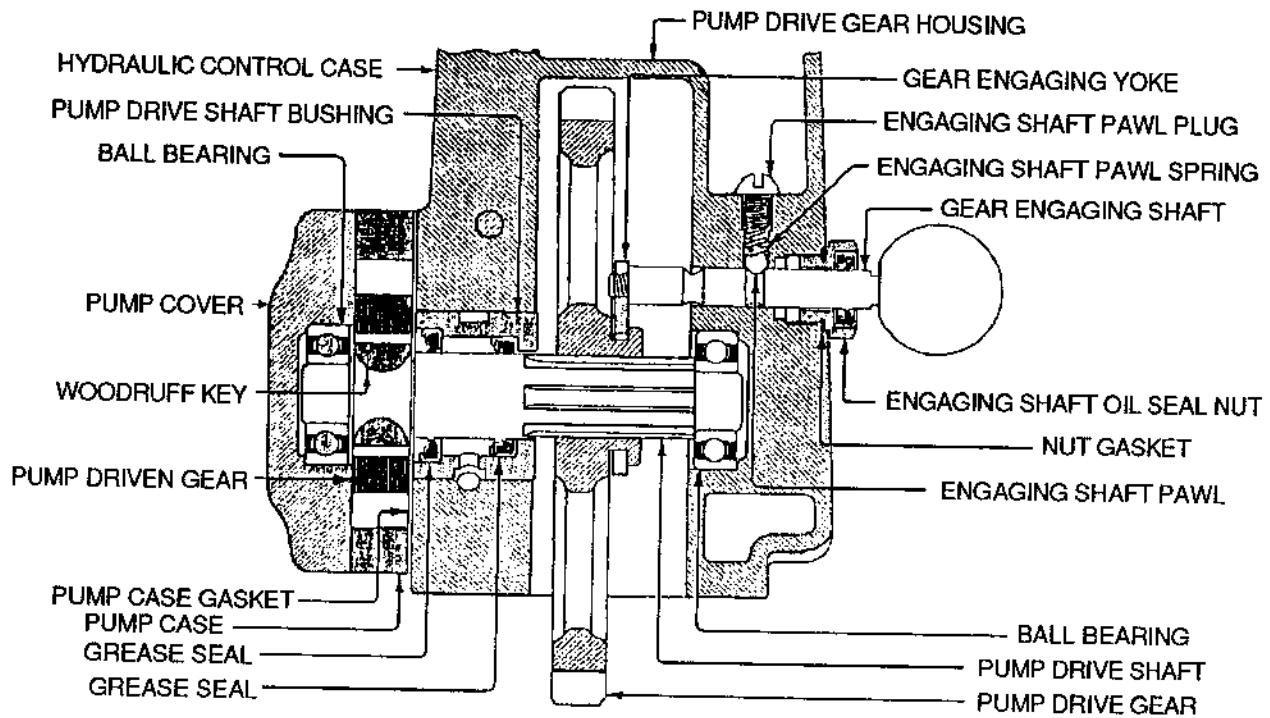


FIG. 7 PUMP CONTROL ASSEMBLY

3. Loosen the engaging shaft oil seal nut. Do not remove the oil seal nut from the engaging shaft unless it is necessary. Damage to the seal may occur on replacing unless it is protected from the notches or grooves in the shaft. A guide may be formed out of a .003 shim stock over which the seal nut can be slipped into position on the machined portion of the shaft. The shim stock is then pulled out.
 4. Pull out the gear engaging shaft and the gear engaging shaft pawl is free to be removed.
- B. Pump Drive Shaft Assembly
1. Remove pump case cover and pump case.
 2. The pump follower gear, which is directly forward of the pump driven gear, can be lifted out.
 3. The pump follower gear with its bushing can be driven from the pump follower gear shaft.
 4. The pump driven gear, which is keyed to the pump drive shaft by woodruff keys, may be pulled from the shaft with a gear puller.
 5. To remove the pump drive shaft, it is necessary to use a puller.

6. For replacement of the pump drive gear, the drive shaft should not be taken out entirely, but only far enough to allow removing clearance for the drive gear.
7. To replace drive shaft bearing in the housing or the drive shaft oil seals, it is necessary to completely withdraw the drive shaft.
8. When replacing drive shaft bearings in the pump cap, use driving Tool No. E-391Y. When the bearing is being reseated in the driving gear housing, use driving Tool No. E-395Y.
9. To assure proper functioning of new drive shaft oil seals, they should be snugly tapped into position with driving Tool No. E-392Y for seal No. 5480Y, and driving Tool No. E-393Y for seal No. 5838 Y (See Fig. 5).
10. After replacing seals, care must be used to protect them from the splines of the pump drive shaft when reseating the drive shaft. A guide for the shaft can be made from .003 shim stock. When the splines are past the seals, the shim stock can be pulled out. Use driving Tool No. E-395Y to firmly seat the shaft on the drive shaft bearing in the housing.
11. Before replacing the pump driven gear, seat the woodruff keys in the pump drive shaft.

- - NOTE - -

It is important that these keys are not longer than 3/4". If it is necessary to use to use a longer key, grind off the tips of the keys to 3/4".

Drive on the driven gear with driving Tool No. 391Y. The force used to seat the driven gear may tend to pull the drive shaft from the drive gear housing. The drive shaft should be tapped back until the shoulder of the driven gear seat on the drive shaft is flush with the side of the driven gear.

12. Gaskets are not used between the Hydraulic Control Case and the pump case, or between the pump case and the pump cover to prevent oil leakage.

Since the clearance between the gears and the side walls of the pump determine the amount of oil pressure developed, i.e., the less clearance (without actually rubbing) the more pressure, very thin gaskets may be used to prevent the developing of too much pressure. Although it may be desirable to remove a gasket after extensive wear to increase the pressure, it is generally recommended to use no gaskets other than the same number installed at the factory.

- - CAUTION - -

After working on the Hydraulic Control Case and before operation, **CHECK THE OIL LEVEL** and add, if necessary, enough to reach the proper working level.

IV. SIDE ARMS & CROSS - BAR

- A. REPLACING WORN OR BROKEN LIFT CABLES (See Fig. 8)
 1. Disconnect the oil line hose and take off the oil line standard.
 2. Remove box wrench locking side arm in bracket.

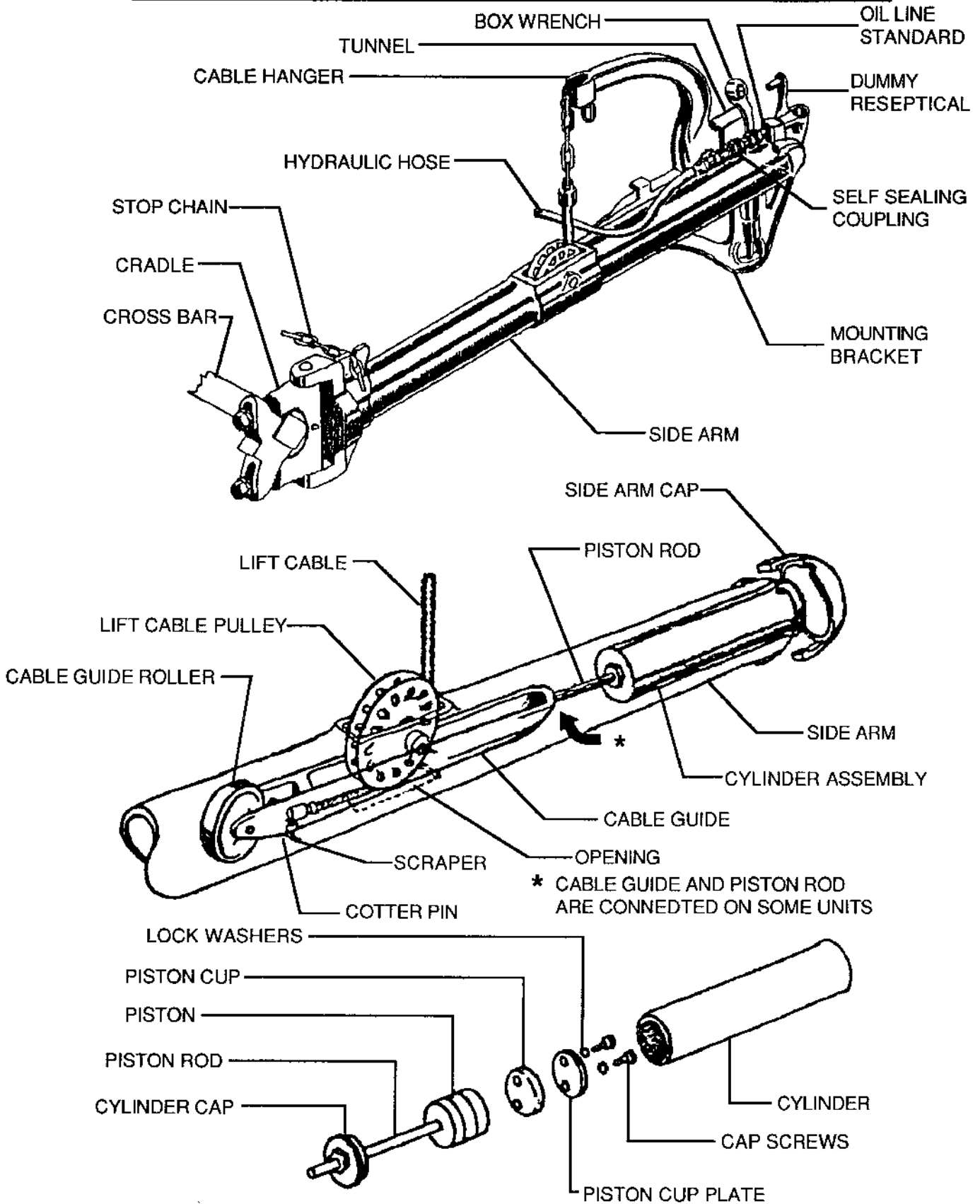


FIG. 8 SIDE ARM

3. Pull the side arm from the mounting bracket.
4. Remove the side arm cap.
5. Pull the cylinder assembly out of the side arm (The piston rod is not fastened to the cable).
6. Remove cable pulley by removing one of the two snap rings holding its axle and force the axle out.
7. The roller assembly and the worn or broken cable is then drawn from the side arm.
8. Remove the cotter key, that holds the cable in its anchor seat and serves as a pin for the scraper. The old cable may now be slipped from its anchor.
9. Insert new cable and reassemble.

B. Replacing Piston Cup Leather (Fig. 8)

1. Follow steps No. 1 to 5 as listed above in paragraph II, "Replacing Lift Cables."
2. Unscrew the cylinder cap from the cylinder and slide it back on piston rod.
3. Pull the piston from the cylinder.
4. Take out the two cap screws and lock washers from the piston cup plate on the end of the piston.
5. Take off the piston cup plate and piston cup leather.
6. Place the new piston cup leather in position and secure snugly by replacing the piston cup plate and two cap screws and lock washers.
7. Reassemble the side arm.

C. Removing Dirt from Side Arm

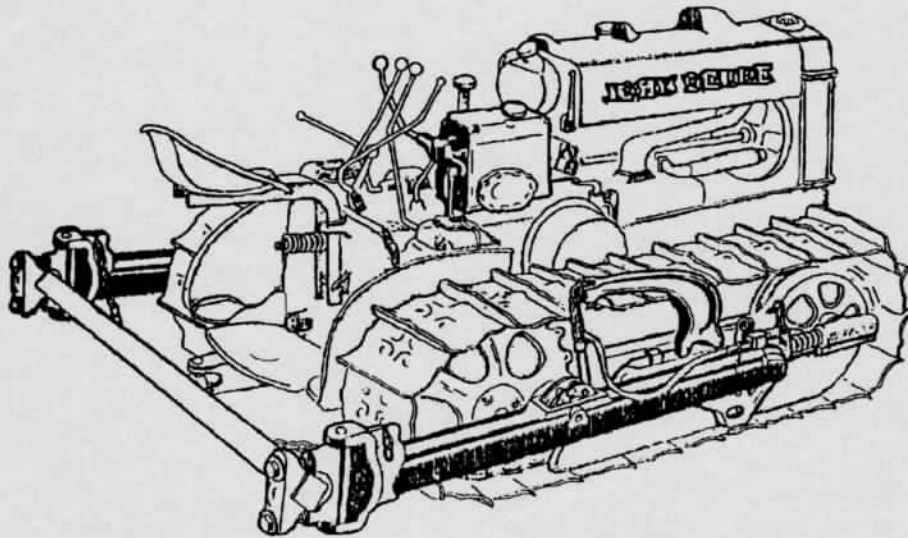
1. Dirt and foreign matter that will undoubtedly fall into the side arm should cause little or no trouble for the back and forth sliding of the Cable Guide with its scraper will keep the bar clean. However, the bar should be washed out from time to time by flushing it with water.

V. LUBRICATION

1. The only part of the Tool-Bar that needs lubrication by the operator is the Cross - Bar cradle. The "zerk" fitting on the cradle should be filled with gun grease every 500 hours of operation.

SECTION 4

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- - TROUBLE SHOOTING CHART - -

Trouble 1 - Tool-Bar will not Raise Properly

<u>Possible Causes</u>	<u>Remedies</u>
1. Hydraulic System not Engaged	- Engaged Hydraulic System
2. The load may be too heavy	- Lighten the load or place load closer to center of cross-bar, as the Tool-Bar is designed to lift 2500 lbs. at the center of the Cross-Bar.
3. Not enough oil in Hydraulic Control Case	- Lower the Tool-Bar and fill control case until oil shows to bevel on dip-stick gauge.
4. Oil may be too light or too heavy	- Change to correct weight of oil as indicated in Operation Section of this manual.
5. Dirt or gravel in side arm	- Put nozzle of water hose at the top of pulley cable housing and wash dirt and grease out through the bottom of cable pulley housing. Raise and lower Tool-Bar during the washing process to allow all foreign material to escape.
6. Damaged Piston Cup	- Replace Piston Cup. Refer to Part IV - B of Maintenance Section.
7. By - Pass valve leaking	- Clean poppet and valve seat and grind valve.
8. Relief valve leaking or not holding required pressure	- If spring is weakened or broken, replace with new spring. Clean and grind valve or replace with new valve.
9. Damaged piston assembly	- Install new piston assembly.
10. Too much space between pump gears and pump cover or between gears and side of control case.	- Replace worn parts if gears or pump cover is scored; or take out gasket between pump cover or between pump case and Hydraulic Control Case.
11. Loose cradle bolts (Bars raise unevenly)	- Tighten the 4 Tool-Bar cradle bolts. These bolts must be tight at all times to prevent uneven raising.

Trouble 2 - Tool -Bar will not stay in Raised Position.

<u>Possible Causes</u>	<u>Remedies</u>
1. Damaged Piston Cup	- Change to correct oil.
2. Check valve leaking	- Clean and grind valve or replace damaged part of valve.

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Trouble 3 - Oil in Control Case Over Heats

<u>Possible Causes</u>	<u>Remedies</u>
1. Oil is to light	- Change to correct oil.
2. Overloading Tool-Bar	- Move load closer to center of Tool-Bar or tighten load.
3. Scored faces on pump gears, pump cover or control case	- Refer to Paragraph 10 of Trouble 1.
4. Control lever not returning to neutral when Tool-Bar is raised to maximum height	- Refer to Trouble 7.

Trouble 4 - Oil Leaks at Cylinder

<u>Possible Causes</u>	<u>Remedies</u>
1. Damaged Piston Cup	- Replace Piston Cup
2. Oil fittings leak	- a: If hose fitting is damaged, replace with new hose. b: If oil line standard leaks, take out and clean and replace, using white lead or sealer on threads. c: If oil line standard is damaged, replace with new part.

Trouble 5 - Oil Leaking from Hose when Attached to Dummy Plug on Mounting Bracket

<u>Possible Causes</u>	<u>Remedies</u>
1. Damaged connection	- Replace with new oil hose assembly.

Trouble 6 - Oil leaks into Crank Case

<u>Possible Causes</u>	<u>Remedies</u>
1. Damaged seal on pump drive shaft	- Replace seals.

Trouble 7 - Control Lever Does not Return to Neutral

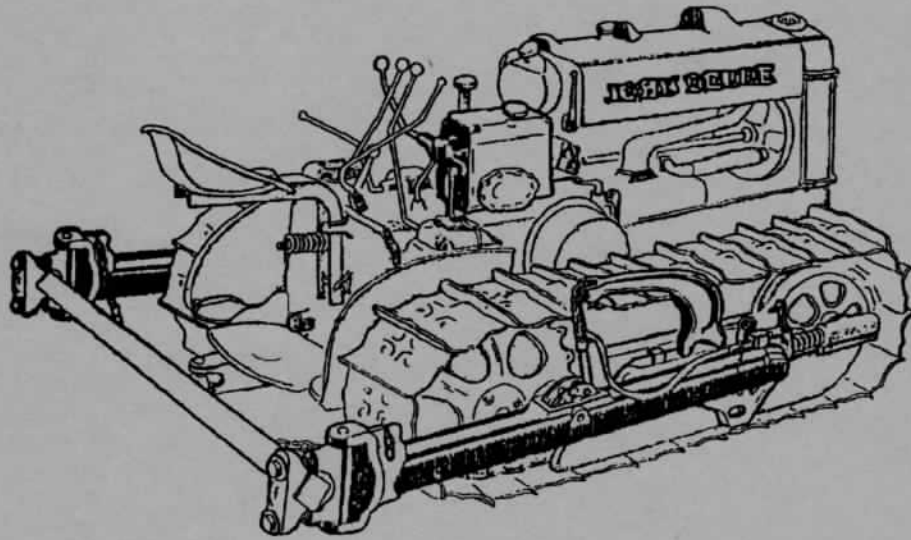
<u>Possible Causes</u>	<u>Remedies</u>
1. Not enough oil in Hydraulic Control Case	- Fill to correct operating level.
2. Stem control valve spring is weakened or broken	- Replace spring.
3. Control stem sticks in channel	- Clean stem and channel.

- 4. Control stem pawl sticks
 - Clean pawl or replace with new part if necessary.

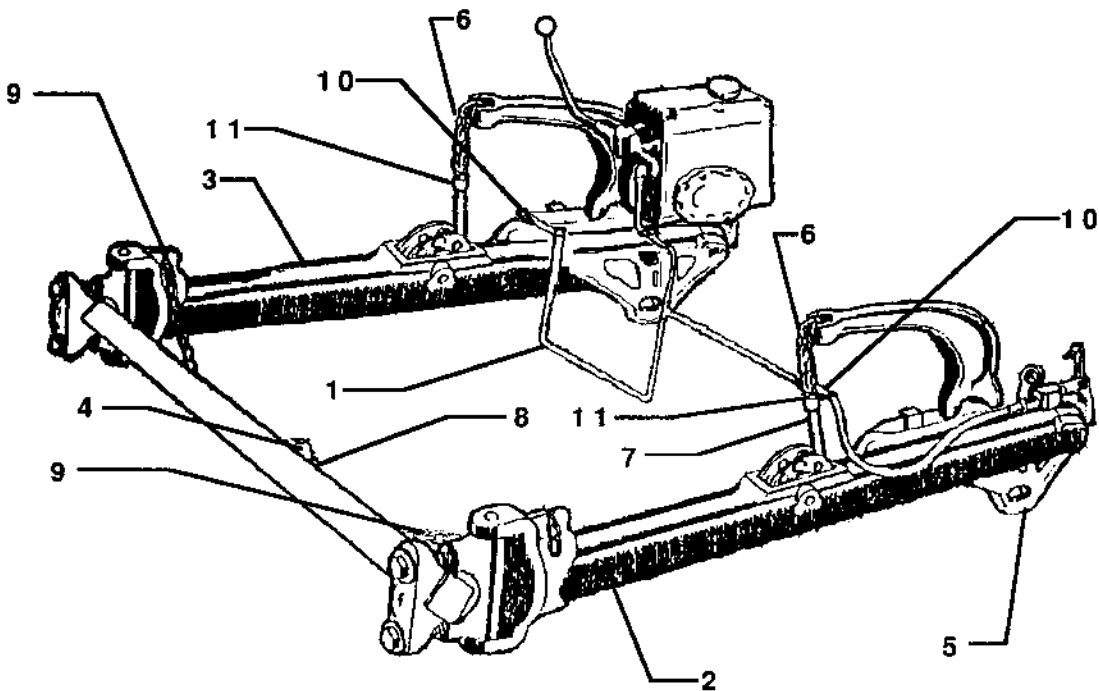
- 5. Pressure control valve sticks
 - Clean and grind pressure control valve.

SECTION 5

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TOOL - BAR ASSEMBLY

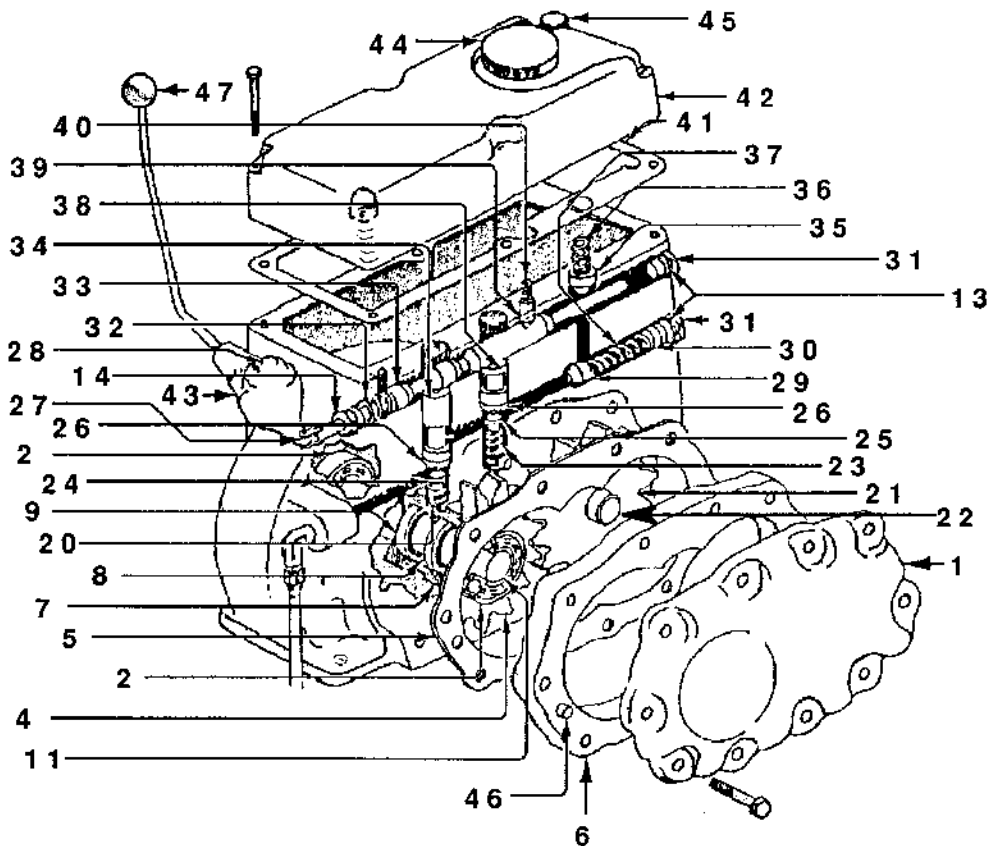
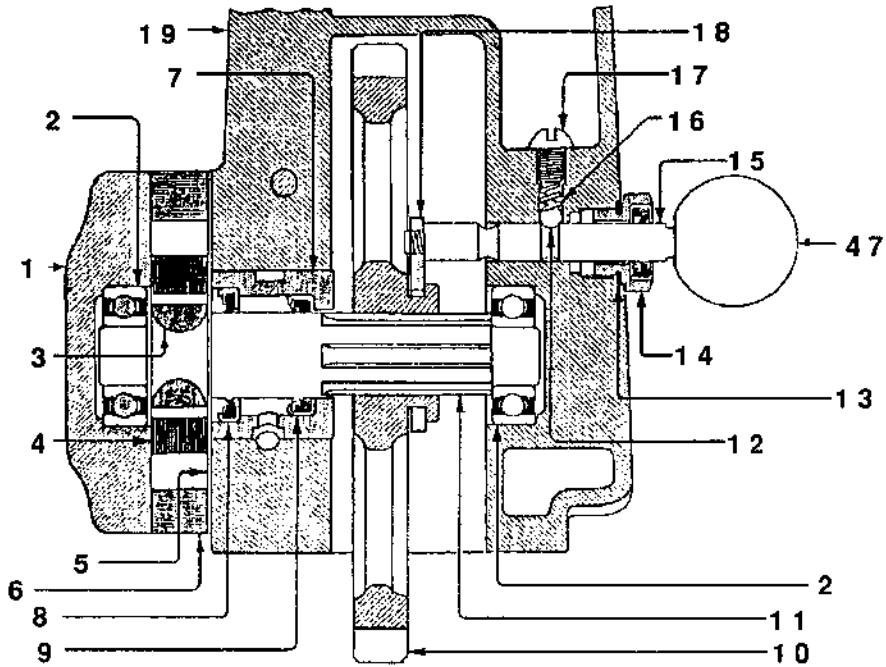


Key	Part No.	Serial No.	Description
1	AE 2153Y	(-)	Underpipe Assembly
	AE 2357Y	(-)	Underpipe Assembly (For tractors with starter)
2	AE 2102Y	(-)	Side Arm Assembly R.H.
3	AE 2103Y	(-)	Side Arm Assembly L.H.
4	E 155Y	(-)	Casting, Stop Chain
5	AE 2110Y	(-)	Mounting Bracket Assembly, R.H.
	AE 2111Y	(-)	Mounting Bracket Assembly, L.H.
6	AE 2126Y	(-)	Lift Chain Assembly
7	AE 2145Y	(-)	Lift Cable Assembly
8	9050Y	(-)	Cold Shut, 3/8"
9	E 154Y	(-)	Chain, Stop
10	E 128Y	(-)	Clamp, Oil Hose Hold Down
11	E 175Y	(-)	Lock, Cable Hanger

PARTS LISTED BELOW ARE NOT SHOWN

E	331Y	(-)	Extension Arm, Side Arm (For Angle Dozer)
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HYDRAULIC CONTROL SYSTEM



HYDRAULIC CONTROL SYSTEM -- Continued

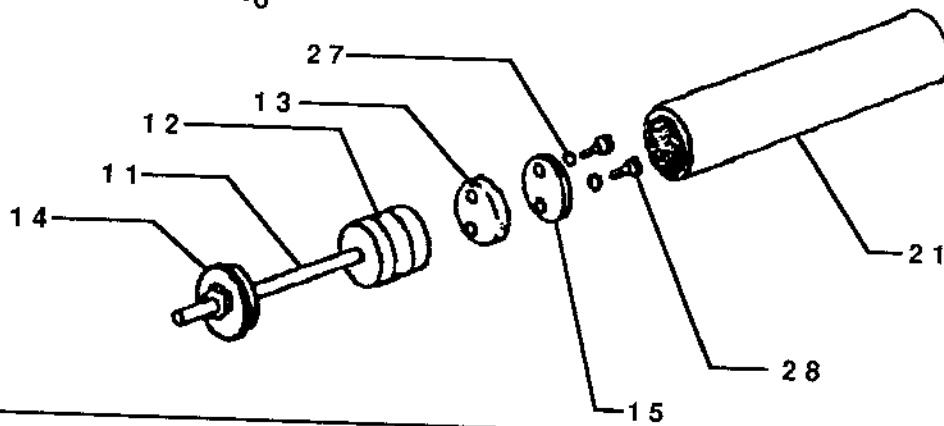
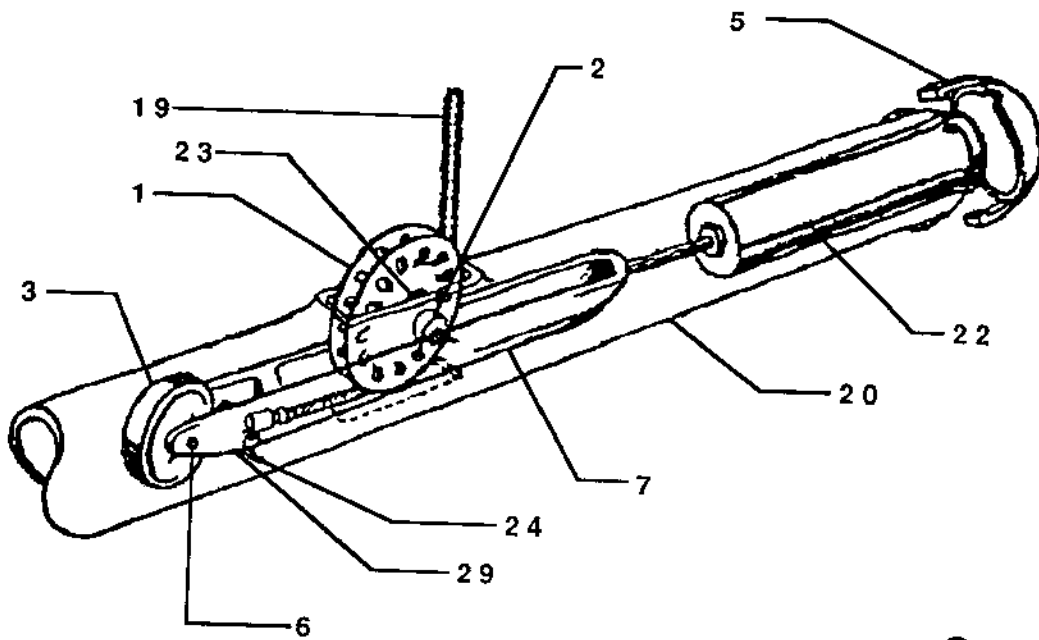
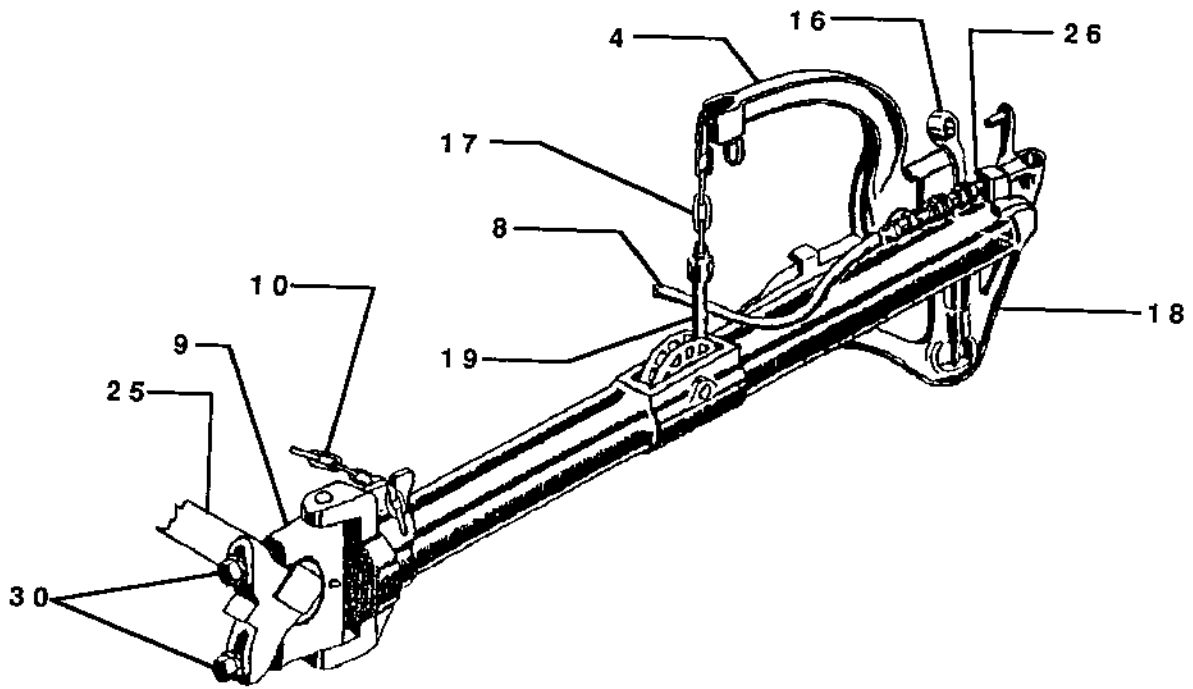
Key	Part No.	Serial No.	Description
1	E 240Y	(-)	Cover, Pump Case
2	JD 7677R	(-)	Bearing, Ball (ND 3204)
3	E 249Y	(-)	Key, Woodruff
4	E 213Y	(-)	Gear, Pump Driven
5	E 237Y	(-)	Gasket, Pump Case
6	E 210Y	(-)	Case, Pump
7	E 204Y	(-)	Bushing, Pump Drive Shaft Seal
8	5840Y	(-)	Seal, Grease
9	5838Y	(-)	Seal, Grease
10	E 202Y	(-)	Gear, Pump Drive
11	E 201Y*	(-)	Shaft, Pump Drive
12	9025Y	(-)	Ball, Steel 5/16"
13	E 236Y	(-)	Gasket, Nut
14	E 235Y	(-)	Nut, Control Stem Oil Seal and / or Engaging Shaft Oil Seal
15	E 221Y	(-)	Shaft, Gear Engaging
16	E 248Y	(-)	Spring, Engaging Shaft Pawl
17	E 222Y	(-)	Plug, Gear Engaging Shaft Pawl
18	E 220Y	(-)	Yoke, Gear Engaging
19	E 200Y	(-)	Case, Hydraulic Control
20	E 244Y	(-)	Spring, Check Valve
21	E 212Y	(-)	Gear, Pump Follower
22	E 214Y	(-)	Shaft, Follower Gear
23	E 243Y	(-)	Spring, By-Pass Valve
24	E 2229Y	(-)	Poppet, Check Valve
25	E 2228Y	(-)	Poppet, By-Pass Valve
26	E 239Y	(-)	Gasket, By-Pass Valve Seat and / or Check Valve Seat
27	E 333Y	(-)	Link, Control Stem
28	E 217Y	(-)	Pin, Control Lever
29	E 230Y	(-)	Head, Pressure Control Valve
30	E 233Y	(-)	Plug, Pressure Control Valve
31	E 234Y	(-)	Plug, Outer Pressure Control Valve and / or Control Stem
32	E 247Y	(-)	Spring, Control Stem Check
33	E 225Y	(-)	Stem, Control
34	E 227Y	(-)	Seat, Check Valve
35	E 231Y	(-)	Head, Stem Control Valve
36	E 245Y	(-)	Spring, Stem Control Valve
37	E 242Y	(-)	Spring, Pressure Control Valve
38	E 226Y	(-)	Seat, By-Pass Valve
39	E 223Y	(-)	Pawl, Control Stem
	E 232Y	(-)	Pawl, Control Stem (Old Style)
40	E 362Y	(-)	Spring, Control Stem
	E 246Y	(-)	Spring, Control Stem (Old Type)
41	E 238Y	(-)	Gasket, Hydraulic Control Case
42	E 208Y	(-)	Cover, Hydraulic Control Case
43	E 2209Y	(-)	Lever Assembly, Control
44	E 206Y	(-)	Cap, Oil Filler
45	E 1325Y	(-)	Dip Stick Assembly, Oil Gauge (E325Y & E326Y)
46	E 211Y	(-)	Pin, Pump Case Dowel
47	9001Y	(-)	Knob, Lever

PARTS LISTED BELOW ARE NOT SHOWN

E 203Y	(-)	Baffle, Filler Neck
E 207Y	(-)	Neck, Oil Filler
E 215Y	(-)	Screen, Oil Filler Neck
E 327Y	(-)	Decal, Control Lever Operation Instructions
E 328Y	(-)	Decal, Gear Engaging Instructions

* When ordering this shaft, order correct woodruff keys. Some early shafts used 1/4 x 7/8 (26H-82), latest ones used 1/4 x 3/4 (26H-78).

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FRAME AND CYLINDER



FRAME AND CYLINDER -- Continued

Key	Part No.	Serial No.	Description
1	E 107Y	(-)	Pulley, Lift Cable
2	E 108Y	(-)	Shaft, Lifting Cable Pulley (when 1 bearing type is used)
	E 363Y	(-)	Shaft, Lifting Cable Pulley (when 2 bearing type is used)
3	E 109Y	(-)	Roller, Cable Guide
4	E 112Y	(-)	Hanger, Cable, R.H.
	E 113Y	(-)	Hanger, Cable, L.H.
5	E 117Y	(-)	Cap, Side Arm Pivot Bracket, R.H.
	E 118Y	(-)	Cap, Side Arm Pivot Bracket, L.H.
6	E 121Y	(-)	Pin, Cable Guide Roller
7	E 122Y	(-)	Bar, Cable Guide
8	E 151Y	(-)	Hose, Oil line
9	E 102Y	(-)	Cradle, Side Arm Assembly
10	E 154Y	(-)	Chain, Stop
11	E 164Y	(-)	Rod, Piston
12	E 165Y	(-)	Piston
13	E 168Y	(-)	Leather, Piston Cup (H874R John Deere)
14	E 169Y	(-)	Cap, Cylinder (H877R John Deere)
15	E 173Y	(-)	Cap, Piston
16	E 315Y	(-)	Wrench, 7/8" Hex. Box
	E 316Y	(-)	Wrench, 1-1/8" Hex. Box
17	AE 2126Y	(-)	Lift Chain Assembly
18	AE 2110Y	(-)	Mounting Bracket Assembly, R.H.
	AE 2111Y	(-)	Mounting bracket Assembly, L.H.
19	AE 2145Y	(-)	Lift Cable Assembly (1/2" X 21-1/2" Flex Steel Wire Rope Swivel Release Ferrule)
20	AE 2102Y	(-)	Side Arm Assembly, R.H.
	AE 2103Y	(-)	Side Arm Assembly, L.H.
21	AE 2120Y	(-)	Cylinder
22	AE 1120Y	(-)	Cylinder Assembly, Complete
23	6851Y	(-)	Bearing, Cable Pulley (2 used per pulley)
	6853Y	(-)	Bearing, Cable Pulley (1 used per pulley)
24	E 364Y	(-)	Scraper, Cable Guide
25	AE 2160Y	(-)	Tool-Bar Assembly, 72"
	AE 2319Y	(-)	Tool-Bar Assembly, 78"
	AE 2320Y	(-)	Tool-Bar Assembly, 84"
	AE 2178Y	(-)	Tool-Bar Assembly, 96"
26	E 123Y	(-)	Standard, Oil Hose Line Fitting
27	12H10	(-)	Washer, Split Lock Med., 5/16"
28	19H112	(-)	Screw, Hex. Hd. Cap, 5/16" x 1" NC
29	11H119	(-)	Key, Cotter, Hammer Lock
30	19H885	(-)	Screw, Hex. Hd. Cap, 7/8" x 4", NF
	24H635	(-)	Washer, Cut. 7/8"

PARTS LISTED BELOW ARE NOT ILLUSTRATED

Key	Part No.	Serial No.	Description
E	130Y	(-)	Head, Gauge Wheel Adjustment
E	132Y	(-)	Handle, Gauge Wheel Adj. Head
E	134Y	(-)	Block, Gauge Wheel Adj. Head Bearing
E	135Y	(-)	Fork, Gauge Wheel
E	139Y	(-)	Pin, Gauge Wheel Adj. Screw
E	140Y	(-)	Clamp, Bottom, Gauge Wheel
E	141Y	(-)	Clamp, Top, Gauge Wheel, L.H.
E	142Y	(-)	Clamp, Top, Gauge Wheel, R.H.
E	147Y	(-)	Pin, Front Vertical Clevis
E	157Y	(-)	Cover, Dust, Lift Cable Housing (Not Used on Imp. Model AE-1100Y)
E	158Y	(-)	Cover, Lifting Cable Hanger
E	163Y	(-)	Screw, Cap, Mounting Bracket
E	176Y	(-)	Spring, Cable Hanger Cover
E	191Y	(-)	Rim, Pneumatic Gauge Wheel (Half)
E	196Y	(-)	Shaft, Pneumatic Gauge Wheel
E	317Y	(-)	Boot, Lift Cable Dust (Not Used on Imp. Model AE-1100Y)