# 100K Synchronous Thinner

JOHN DEERE

## TECHNICAL MANUAL

100K Synchronous
Thinner

TM1074 (01Aug72) English

**TM1074 (01Aug72)**

LITHO IN U.S.A. (REVISED)
**ENGLISH**

# 100K SYNCHRONOUS THINNER

## TECHNICAL MANUAL

**TM-1074 (Aug-72)**

## CONTENTS



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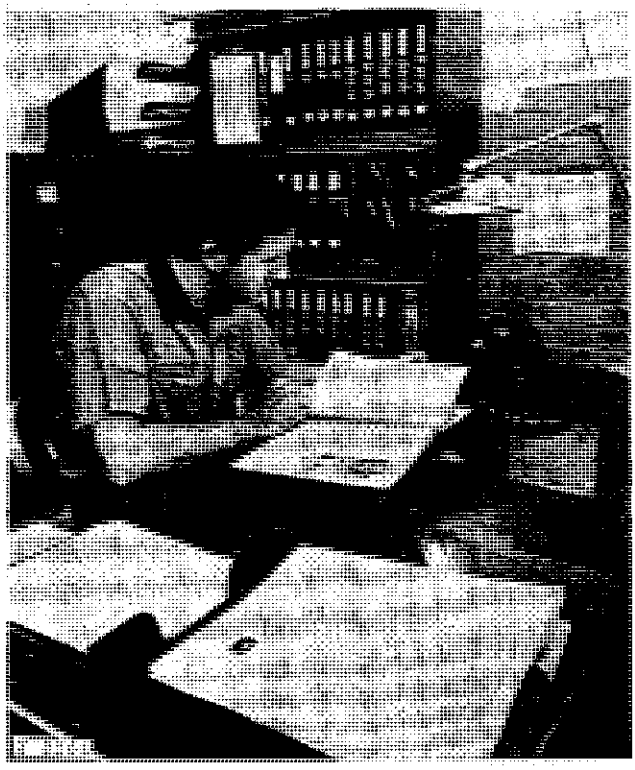
# INTRODUCTION



*Use FOS Manuals for Reference*

*Use Technical Manuals for Actual Service*

This technical manual is part of a twin concept of service:

- **FOS Manuals—for reference**
- **Technical Manuals—for actual service**

The two kinds of manuals work as a team to give you both the general background and technical details of shop service.

*Fundamentals of Service (FOS) Manuals* cover *basic* theory of operation, *fundamentals* of trouble shooting, *general* maintenance, and *basic* types of failures and their causes. FOS Manuals are for training new men and for reference by experienced men.

*Technical Manuals are concise* service guides for a *specific* machine. Technical Manuals are on-the-job guides containing only the vital information needed by a journeyman mechanic.


When a serviceman should refer to a FOS Manual for more information, a FOS symbol like the one at the left is used in the TM to identify the reference.

Some features of this technical manual:

- *Table of contents at front of manual*
- *Exploded views showing parts relationship*
- *Photos showing service techniques*
- *Specifications grouped for easy reference*

This technical manual was planned and written for you—a journeyman mechanic. Keep it in a permanent binder in the shop where it is handy. Refer to it whenever in doubt about correct service procedures or specifications.

Using the technical manual as a guide will reduce error and costly delay. It will also assure you the best in finished service work.

⚠ This safety alert symbol identifies important safety messages in this manual. When you see this symbol, be alert to the possibility of personal injury and carefully read the message that follows.

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# Section 10
# GENERAL

## CONTENTS OF THIS SECTION



# Group 5
# DESCRIPTION

John Deere 100K Synchronous Thinners are available in seven different models to thin various crops planted under various conditions. The operating principle of all models is the same. The distinctions concern the type of row units and the number of rows or seedlines each is designed to thin.

Row units are of two types, single-row units and double-row units. The single-row unit thinners are for crops, such as cotton, sugarbeets, etc., planted one seedline per bed. The single-row unit actuators are spaced from 22 to 40 inches apart. The double-row units are for crops, such as lettuce, broccoli, cabbage, etc., planted two seedlines per bed. The double-row unit actuators are spaced from 12 to 15 inches apart.

## How It Works

The thinner approaches the plant. The operation begins when the plastic shield on the probe touches the outer edge of the leaf. The shield folds the leaves forward until the probe is over the center of the plant. This is to prevent the leaves from contacting the electronic probe, which would activate the knife too soon.

As the unit continues to move along the row, and the shield folds the leaves forward, the electronic probe touches the plant near the plant's center. Contacting the plant completes an electric circuit, and generates a signal to a solenoid valve. The solenoid moves the spool in the valve directing hydraulic oil to activate a piston in the actuator which, in turn, moves the knife across the row.

When activated by the signal from the probe, the knife swings across the row at an extremely high speed (From the time the probe touches the plant until the knife completes its swing, time lapse is only 28/1,000 second). This speed assures that the knife will pass close enough to the plant sensed to leave single plants and provides enough force to cut out excess plants, for a distance equal to the length of the knife.

At the end of the swing across the row in one direction, the knife and knife arm are stopped hydraulically. When the shield and probe contact the next plant, causing a break in the electrical signal, the return spring moves the valve spool directing hydraulic oil to the other piston. This moves the knife back across the plant line, again clearing out excess plants. As the process is repeated down the row, a stand of young plants properly spaced for maximum growth is left to mature.

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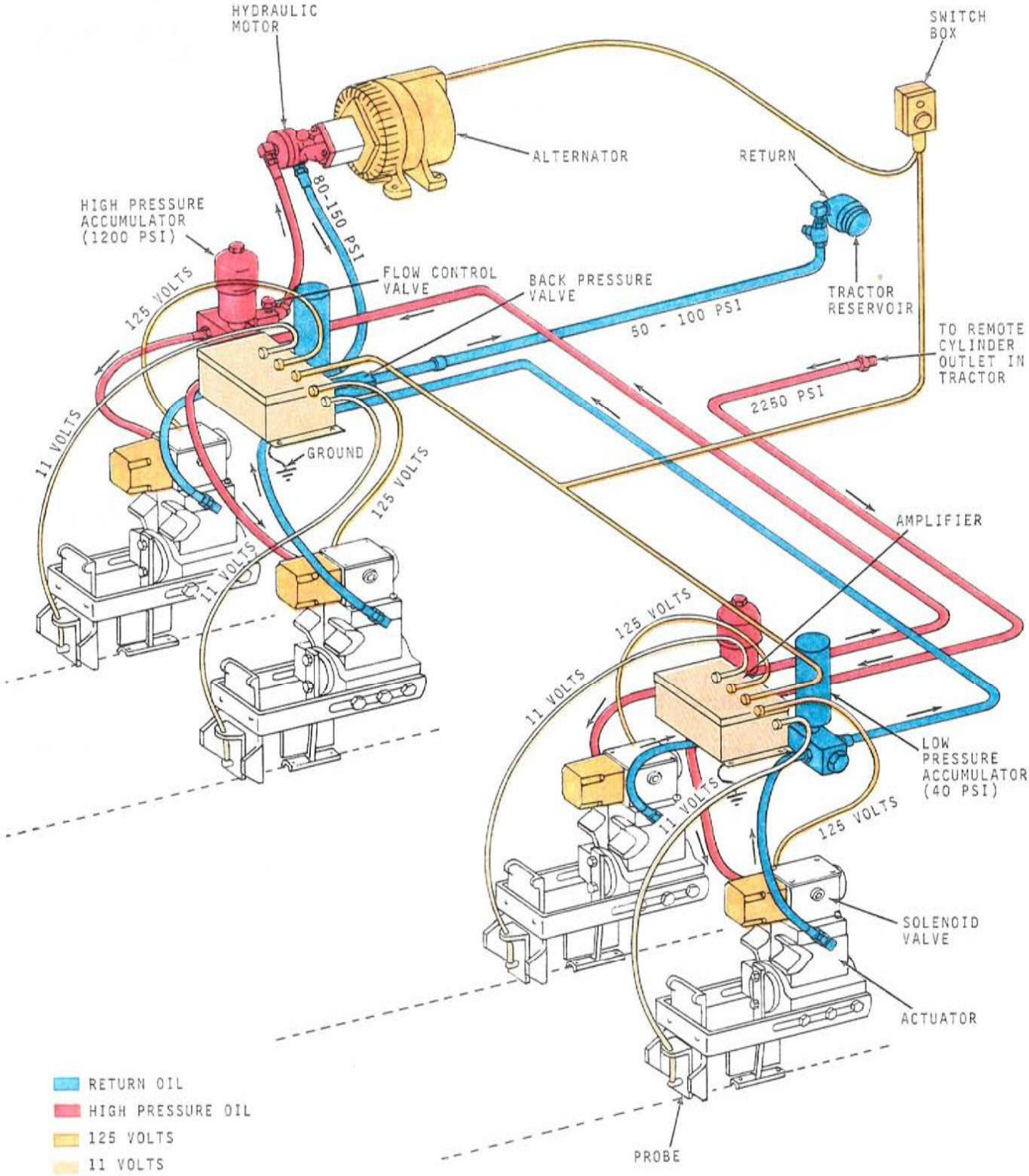


N24034

*Fig. 1 - Thinner Hydraulic and Electrical Schematic*

## ADVANCE PLANNING

Advance planning and field work is required for efficient operation of the thinner. Follow these recommended steps:

1. Field surface should be firm and as smooth as possible. This is necessary for accurate gauging and maintaining uniform height of the electrical probe. An irregular surface could cause the gauge wheels to (1) raise the probe above the plants, resulting in no thinning or (2) permit the probe to touch the soil and activate the knife, taking out a plant that should be saved.

2. The plant line should be free of clods as a clod can complete the electrical circuit and activate the knife. In this case the clod would be saved and the plant in front would be removed. Cultivating before thinning is normally not recommended. If it is necessary to cultivate and if clods appear in the plant line, roll the field a day or two before thinning.

*NOTE: Be sure plants will tolerate rolling before doing so.*

3. Planting and spacing the crop is important. For efficient thinning, the plants should be spaced at least 2 inches apart. If the plants are too close, the thinner will consider two plants as one and save both plants.

4. For the most accurate work, the plants should be from 1 to 4 inches high. Smaller plants can be thinned if the ground surface is smooth and free of clods so the electrical probe can be adjusted close to the ground without touching the soil as the thinner moves across the field. When the plants are too high, it is possible for the machine to malfunction because of trash or cutout plants accumulating and contacting the electrical probe. The tall crop attachment will minimize this problem.

5. There should not be any weeds in the plant line as a weed will activate the knife the same as the plants to be saved.

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# Group 10
# SPECIFICATIONS

## TRACTOR REQUIREMENTS

Tractor must be equipped with the following:

Closed-center hydraulic system (minimum of 2,000 psi and maximum of 2,300 psi).

Constant pressure in return line (minimum of 50 psi and a maximum of 100 psi).

Dual remote cylinder outlets (one raises and lowers the front-mounted thinner, the other controls flow of hydraulic fluid which operates thinner row units).

## ACTUATOR

Oil capacity without dipstick—5 fluid ounces
Oil capacity with dipstick—9 fluid ounces
Type of oil—JDM 303 Special purpose oil—only
Type—Two piston
Solenoid voltage—110 volts
Stroke time—.028 seconds

## ACCUMULATORS

For each two rows there is a high and low pressure accumulator.

High pressure accumulator nitrogen precharge—1200 psi.

Low pressure accumulator nitrogen precharge—40 psi.

## OPERATING SPEEDS

Down-the-row-approximately 1-1/2 to 3 miles per hour.

Transport—10 miles per hour.

## ALTERNATOR

Output—125 volts, 1,800 watts, 60 cycle.

## STANDARD TORQUE CHART

**RECOMMENDED TORQUE IN FOOT-POUNDS**
**COARSE AND FINE THREADS**

| Bolt Diameter | Plain Head | Three Radial Dashes | Six Radial Dashes |
|---|---|---|---|
| 1/4 | Not used | 10 | 14 |
| 5/16 | Not used | 20 | 30 |
| 3/8 | Not used | 35 | 50 |
| 7/16 | 35 | 55 | 80 |
| 1/2 | 55 | 85 | 120 |
| 9/16 | 75 | 130 | 175 |
| 5/8 | 105 | 170 | 240 |
| 3/4 | 185 | 300 | 425 |
| 7/8 | 160 | 445 | 685 |
| 1 | 250 | 670 | 1030 |

## SERIAL NUMBERS

The thinner serial and model numbers are on a plate located on the alternator shield.

The amplifier serial number is on a plate located on the side of each amplifier.

*(Specifications and design subject to change without notice).*

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# Group 15
# LUBRICATION

## GENERAL INFORMATION

Carefully written and illustrated lubrication instructions are included in the operator's manual furnished with your customer's machine. Remind him to follow these instructions.

For your convenience, the following chart shows capacities and types of lubricants for the thinner components and systems. Specifications for lubricants follow the chart.

| | Capacity | Type of Lubricant | Interval of Service |
|---|---|---|---|
| Grease fittings | . . . . . | John Deere Muliti-purpose lubricant or equivalent SAE multi-purpose grease | See Operator's Manual |
| Actuator Crankcase (Add through breather elbow) | 5 ounces without dipstick<br>9 ounces with dipstick | J.D. Type 303 Special Purpose Oil or its equivalent | Every 10 Hours—Check (by removing frame clamp bolt in center of casting, either side) |

## HYDRAULIC OIL

Use only John Deere Type 303 Special-Purpose Oil or its equivalent in the thinner actuator crankcase. Other types of oil will contaminate the hydraulic oil in the tractor system and will not give satisfactory service. Other oil may result in eventual damage.

**IMPORTANT: MAKE sure tractor uses John Deere type 303 Special-Purpose Oil or its equivalent.**

## GREASES

John Deere Multi-purpose lubricant or equivalent SAE multipurpose-type grease is recommended for all grease fittings. Application of grease as instructed in the lubrication chart will provide proper lubrication and will prevent contamination of bearings.

## STORING LUBRICANTS

This thinner can operate efficiently only if clean lubricants are used. Use clean containers to handle all lubricants. Store them in an area protected from dust, moisture, and other contaminants.

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# Group 20
# DIAGNOSING MALFUNCTIONS

DOUBLES
- Adjustments - See Your Operator's Manual
  - Probe and shield assembly set too high.
  - Probe too high in relation to shield.
  - Probe set too far behind knife.
  - Probe plate dirty.
  - Ground speed too fast in relation to knife length and amplifier delay distance adjustment.
- Advance Planning - See Page 10-5-3.
  - Ground too uneven to allow uniform contact of plant.
- Hydraulic System Malfunction - See Section 30
  - Accumulators precharge too low.
  - Hydraulic volume too low.
- Electrical System Malfunction - See Section 40
  - Voltage too low.

SKIPS (EXTRA PLANT TAKEN OUT BY KNIFE)
- Adjustments - See Your Operator's Manual.
  - Probe too low in relation to shield.
  - Probe too high.
  - Probe too close to knife.
  - Plants too large.
  - Knife cutting too deep
- Advance Planning - See Page 10-5-3.
  - Clods or trash in plant row.
- Electrical System Malfunction - See Section 40
  - Probe shorted to shield.
  - Probe wire too close to solenoid coil housing.

KNIFE OSCILLATES CONTINUOUSLY AND UNIFORMLY
- Electrical System Malfunction - See Section 40
  - Plant or dirt shorting from probe to frame or ground.
  - Probe wire insulation cut allowing shorting from center wire to shielding.
  - Probe wire socket shorting.
  - Moisture in amplifier box.
  - Ground wire from amplifier to support broken.

ERRATIC THINNING
- Adjustments - See Your Operator's Manual
  - Probe and/or actuator not aligned with row.
  - Probe dirty.
  - Gauge wheels too far from plant row.
  - Probe too high.
- Hydraulic System Malfunction - See Section 30
  - Hydraulic oil volume too low.
- Electrical System Malfunction - See Section 40
  - Voltage too low.
  - Ground wire from amplifier to support broken.
  - Machine not grounding because of insufficient metal to ground contact.
  - Broken electrical wire or loose connections.

KNIFE MAKES TWO STROKES FOR EACH PLANT
- Electrical System Malfunction - See Section 40
  - Probe cable passing too close to solenoid.

KNIFE OF ONE ROW CHATTERS
- Actuator and Solenoid Valve Malfunction - See Section 20.
  - Wire from amplifier to solenoid coil broken.
  - Solenoid defective.
  - Hydraulic system malfunction. See Section 30.
  - Voltage too low.

TWO KNIVES ACTUATE AS A RESULT OF ONE PROBE CONTACTING PLANT
- Electrical System Malfunction - See Section 40
  - Loose power supply wire.
  - Broken supply wire.
  - Loose or broken amplifier to solenoid wire on unit not contacted.
  - Fuse not tight in socket.

THREE OR MORE UNITS OPERATE WHEN ONE PROBE IS CONTACTED
- Electrical System Malfunction - See Section 40
  - Electrical power source is being interrupted.
  - Alternator voltage output in excess of 150 volts.

NO ELECTRICAL POWER
- Hydraulic System Malfunction - See Section 30
  - Hydraulic motor defective.
  - Flow control valve defective.
- Electrical System Malfunction - See Section 40
  - Electrical switch defective.
  - Alternator defective.

KNIFE WORKS SLUGGISHLY
- Actuator - See Section 20
  - Actuator defective.
  - Valve defective.
  - Oil level too low.

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# Section 20
# ACTUATOR AND SOLENOID VALVE

## CONTENTS OF THIS SECTION



# Group 5
# ACTUATOR

## GENERAL INFORMATION

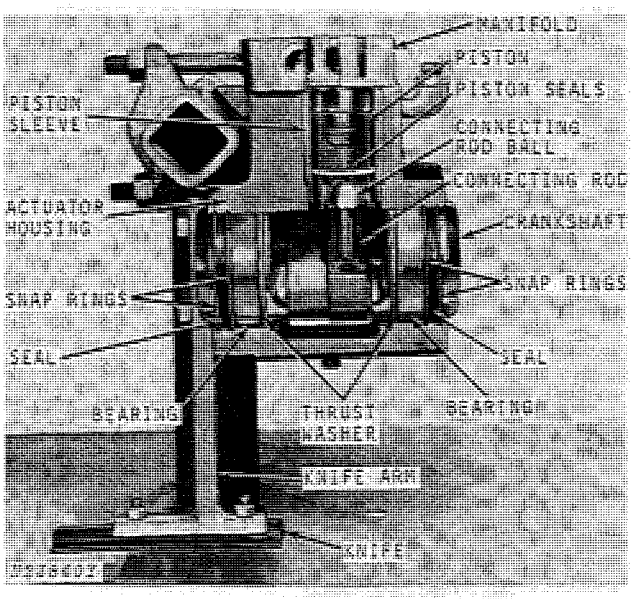


*Fig. 1 - Actuator, Manifold and Solenoid Valve*

The actuator is a unique, simple and sturdy hydraulic motor and consists of the following components.

1. Actuator housing
2. Two pistons with connecting rods and connecting rod balls.
3. Crankshaft
4. Two bearings, thrust washers, seals and four snap rings.

The actuator action is started by a signal from the probe circuit when a plant is touched. This signal controls 125 volts of power to the solenoid valve. The valve directs hydraulic oil to activate a piston which, in turn, moves the knife through the row. When the probe touches the next plant the signal is interrupted and the valve spool is shifted by a spring. This directs the hydraulic oil to the other piston and moves the knife back across the row, completing the cycle.

## DIAGNOSING MALFUNCTIONS

EXCESSIVE OIL LEAKAGE OUT OF BREATHER IN SPURTS OR A CONTINUOUS FLOW WHEN OPERATING
- Piston ring defective
- Breather defective
- Oil level too high in actuator crankcase

OIL LEAKING FROM AROUND CRANKSHAFT
- Crankshaft seal defective

OIL LEAKING AROUND BOTTOM OF VALVE
- Manifold defective - Check for cracks with spot-check
- Valve defective
- Valve-to-manifold O-rings defective

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## DIAGNOSING MALFUNCTIONS—Continued

ACTUATOR DOES NOT FUNCTION OR IS SLUGGISH
- Scored or broken pistons
- Scored or broken connecting rods
- Broken or wedged ball
- Crankshaft bearings defective
- Valve spool sticking
- Valve return spring broken
- Hydraulic system pressure and flow too low
- Back pressure valve defective
- Faulty quick coupler on return hose defective

KNIFE ARM WEARING ON ACTUATOR HOUSING
- Thrust washer defective or left out
- Snap rings defective or left out

## REMOVAL

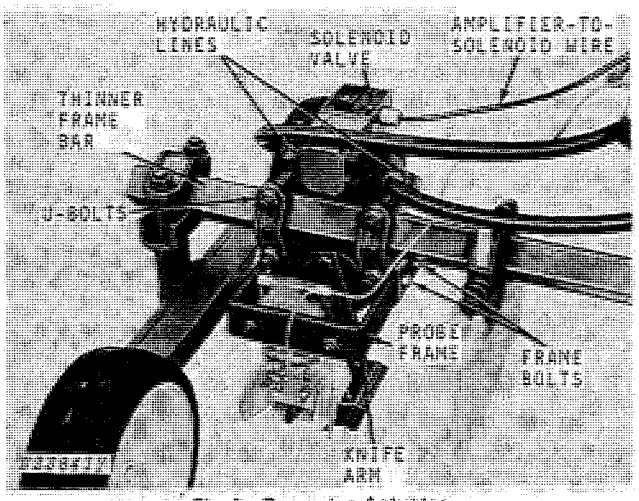


*Fig. 2 - Removing Actuator*

**CAUTION: Escaping hydraulic oil under pressure can cause personal injury; therefore, be sure all connections are tight and that lines and hoses are not damaged. Before disconnecting lines in the thinner hydraulic system, be sure to relieve all hydraulic pressure. See page 30-15-3.**

Bleed pressure from hydraulic system at the pressure line break-away coupler.

Disconnect the pressure and return hydraulic hoses from the actuator manifold. **IMPORTANT: Plug hoses and connectors to keep dirt out of system.**

Disconnect probe wire from probe.

Remove the probe frame with probe and probe wire from actuator housing. There are four bolts holding frame to housing. Replace bolt in center hole on each side of actuator to prevent oil loss from crankcase.

Disconnect the amplifier-to-solenoid wire from the amplifier.

Remove the actuator from the thinner frame bar by removing the two U-bolts.

Remove knife arm and knife.

## INSTALLATION

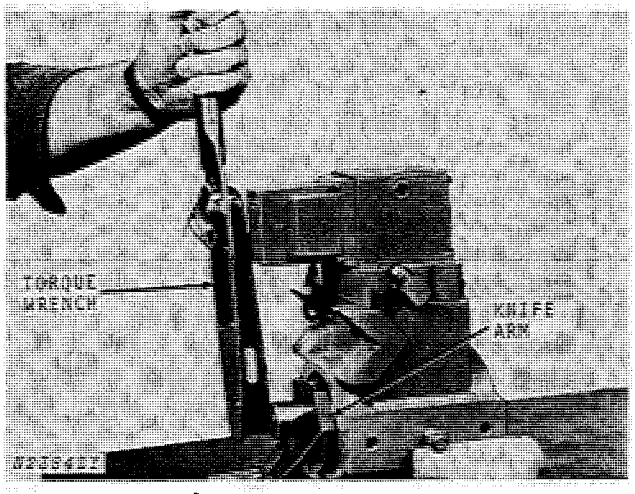


*Fig. 3 - Installing and Tightening Knife Arm*

Bolt the knife arm and knife to the actuator crankshaft with two lug bolts and tighten to 100-120 ft-lbs torque.

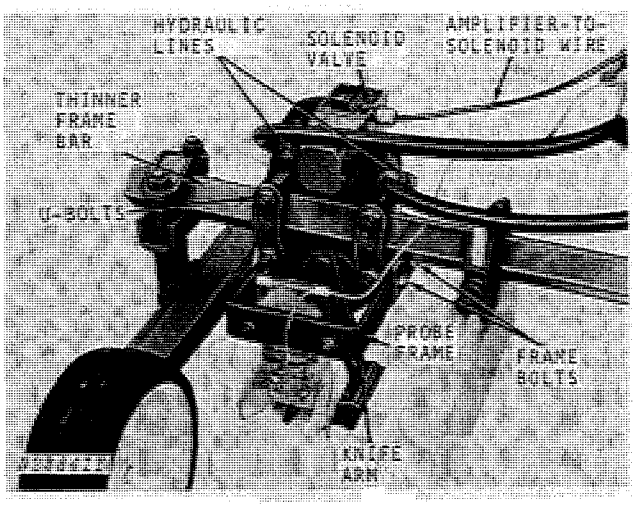


*Fig. 4 - Installing Actuator*

Mount the actuator to the thinner frame bar with U-bolts and blocks. Do not tighten bolts at this time.

Bolt the probe frame with probe and probe wire to actuator housing and tighten bolts.

Connect the pressure and return hydraulic hoses to the manifold. The pressure and return ports are identified on top of the manifold.

Connect the amplifier-to-solenoid wire to the amplifier.

Position the actuator on thinner frame bar to the desired row spacing and tighten U-bolts.

Connect probe wire.

## DISASSEMBLY

Disassemble the actuator in the following steps to repair damaged parts or to replace leaky O-rings or seals:

Clean all dirt and oil from the actuator.

Position knife arm in bottom dead center position and remove arm and knife.

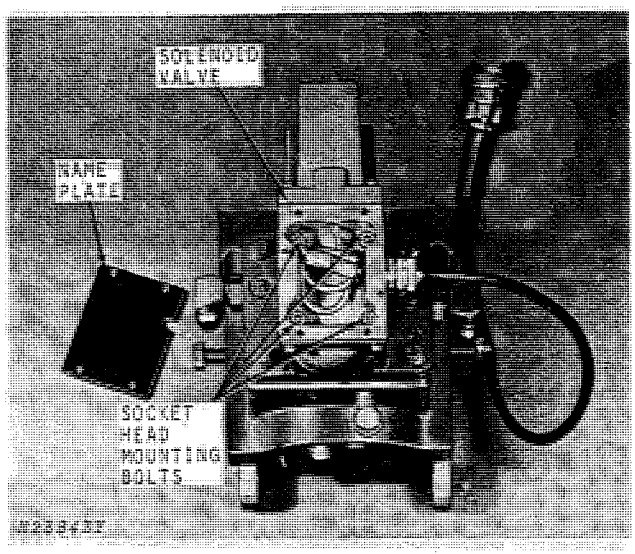


*Fig. 5 - Removing Solenoid Valve*

Remove name plate and gasket from top of valve.

Remove the four 1/4 x 2-3/4-inch socket head cap screws that hold the valve to the actuator manifold.

**IMPORTANT: Do not lose the lock washers on these bolts.**

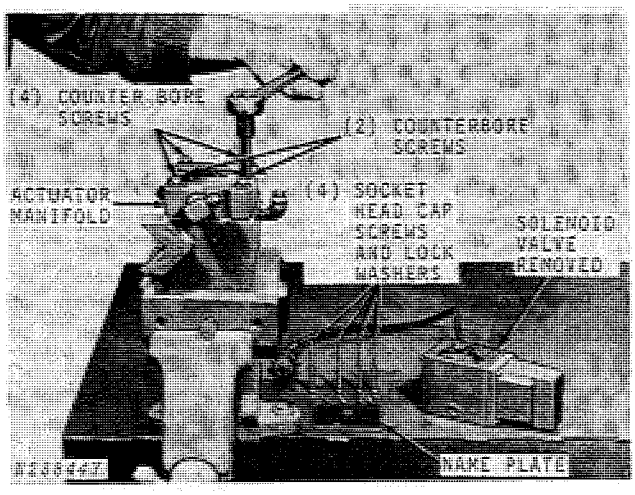


*Fig. 6 - Removing Actuator Manifold*

Remove the two 3/8 x 1-1/2-inch counterbore screws in the middle of the manifold.

Remove the four 3/8 x 2-inch counterbore screws on the outside of the manifold.

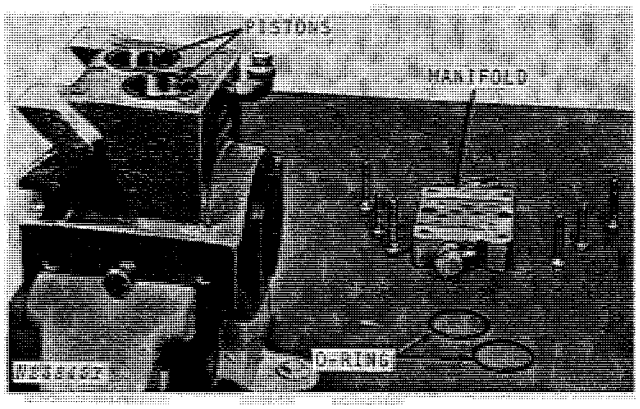


*Fig. 7 - Removing Pistons and Manifold*

After manifold is removed, remove the two O-rings and discard.

Remove the pistons. The groove in the hole in the center of the pistons is provided as a gripping point for pulling the piston out. Remove piston backup and guide ring, and discard.

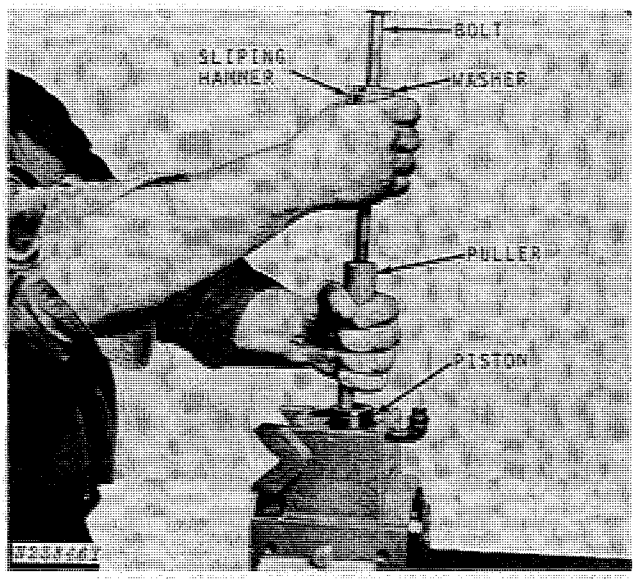


*Fig. 8 - Removing Piston with Piston Puller*

If piston is broken or cannot be removed by hand, it may be necessary to remove piston with piston puller. See Fig. 41 and 42 page 20-5-14, for making a piston puller.

Position puller in groove in the hole in the center of the piston. Hold puller in position and slide hammer against washer and bolt to remove piston.

## DISASSEMBLY—Continued

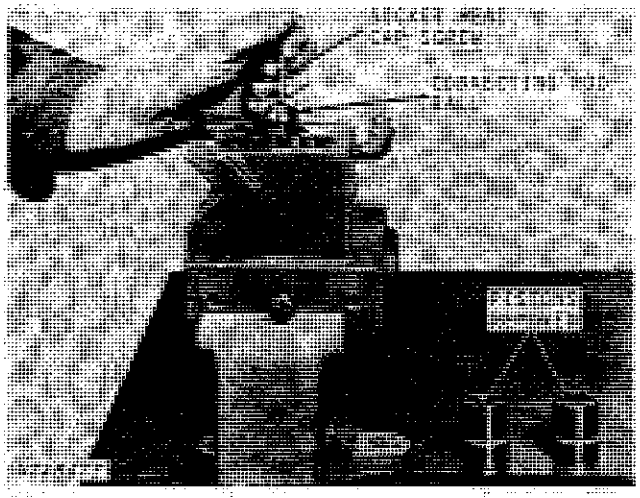

*Fig. 9 - Removing Connecting Rod Ball*

Use one 1/4 x 2-3/4-inch socket head cap screw used in the valve to remove the connecting rod balls.

**IMPORTANT: Remove lock washer from screw to prevent dropping it in the crankcase. Screw the cap screw into the ball and remove through the piston hole.**

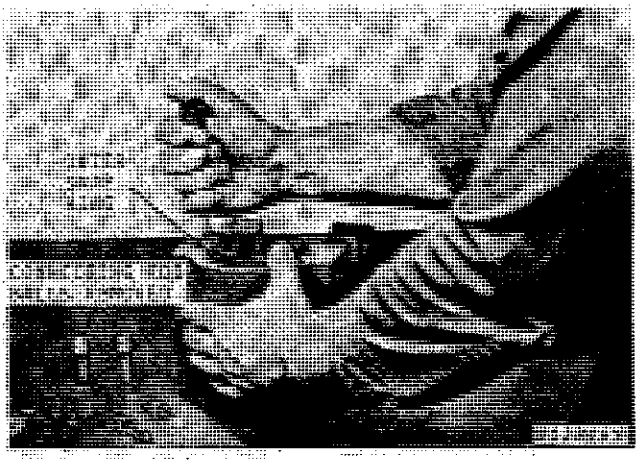

*Fig. 10 - Removing Outer Snap Ring*

Remove breather, oil level check plug assembly, and bolt.

Remove the outer snap ring from both sides.

**IMPORTANT: Do not pull up on snap ring when removing as this will cause distortion of snap ring.**

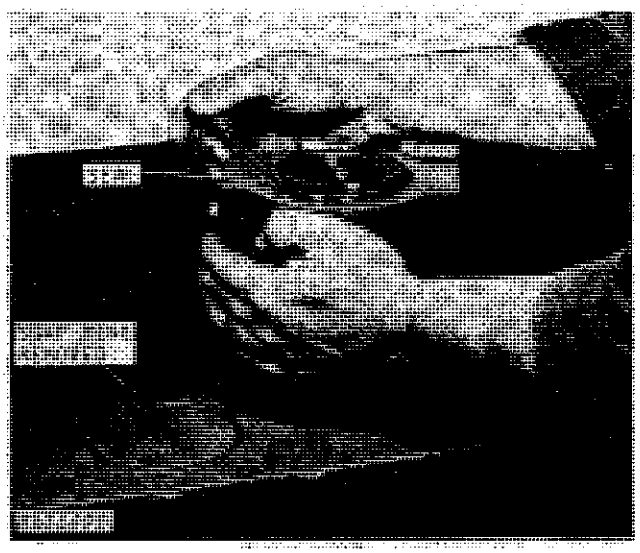

*Fig. 11 - Removing Seal*

Remove seal from both sides of crankshaft. Do not save these seals. Replace both seals when reassembling actuator. An actuator seal kit is available which includes all actuator seals and O-rings.

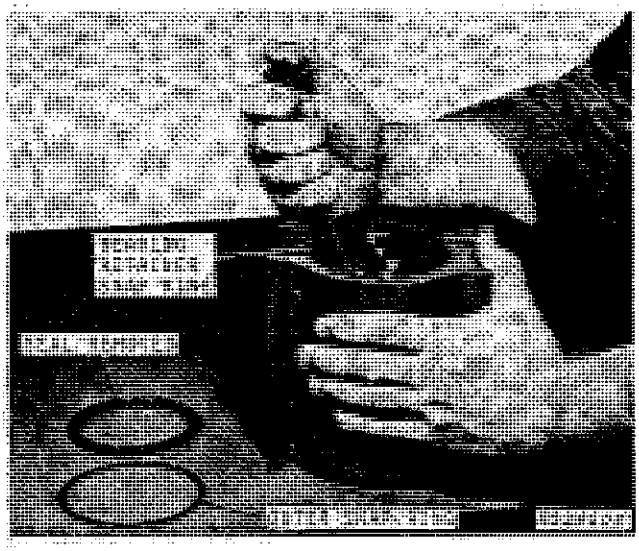

*Fig. 12 - Removing Bearing Retainer Snap Ring*

Remove the bearing retainer snap ring from both sides of the actuator crankshaft.

**IMPORTANT: Do not pull up on snap ring when removing, this will cause distortion of snap ring.**

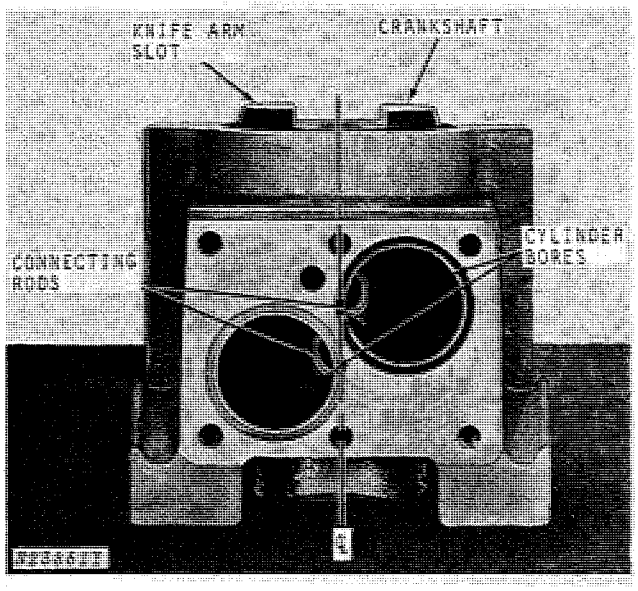


*Fig. 13 - Lining Up Crankshaft and Connecting Rods in Casting*

Locate the crankshaft with the knife arm slot parallel to cylinder bores.

Position the connecting rods so they are in line with the crankshaft as shown in Fig. 13.

**IMPORTANT: Failure to position connecting rods may result in damage to cylinder block, crankshaft, and connecting rods.**

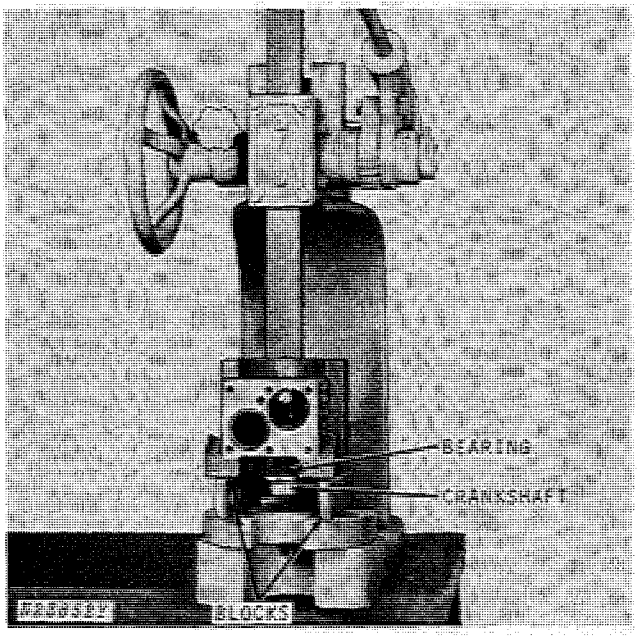


*Fig. 14 - Removing Crankshaft and One Bearing*

Position cylinder block in press with crankshaft vertical under arbor and on two blocks. See Fig. 14.

Press crankshaft out. Do not drop parts.

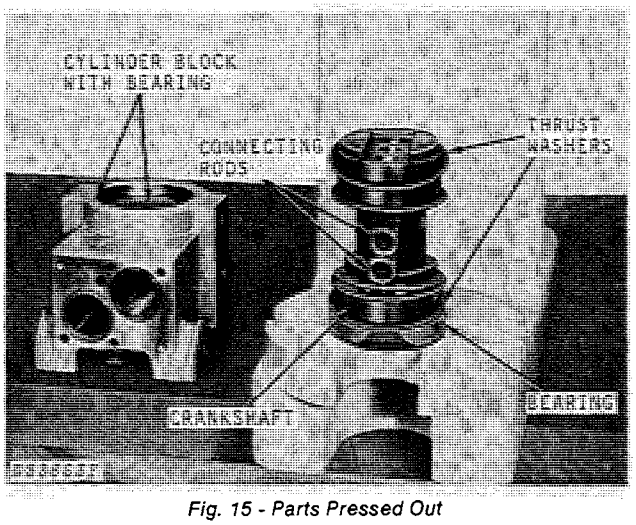


*Fig. 15 - Parts Pressed Out*

The lower bearing, crankshaft, connecting rods, and thrust washers will be removed with crankshaft.

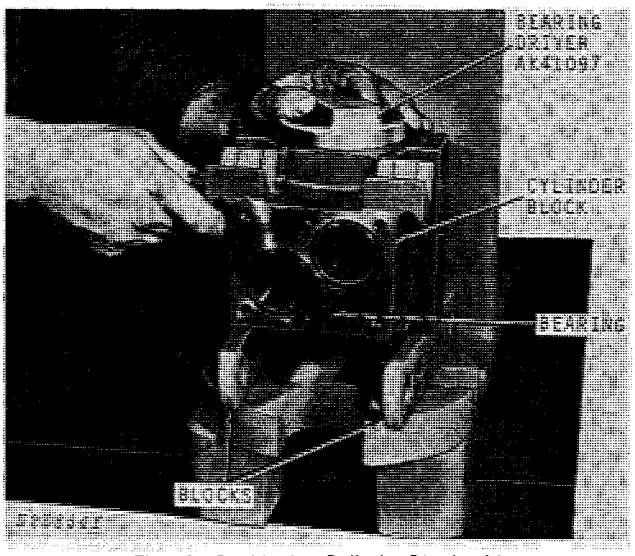


*Fig. 16 - Positioning Cylinder Block with Bearing in Press*

Position cylinder block in press on blocks and position bearing driver AK41097 through crankshaft opening.

Press out bearing.

Press off bearing from crankshaft.