
PRECAUTIONARY STATEMENTS

PERSONAL SAFETY

Throughout this manual and on machine decals, you will find precautionary statements (“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.



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.

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

MACHINE SAFETY

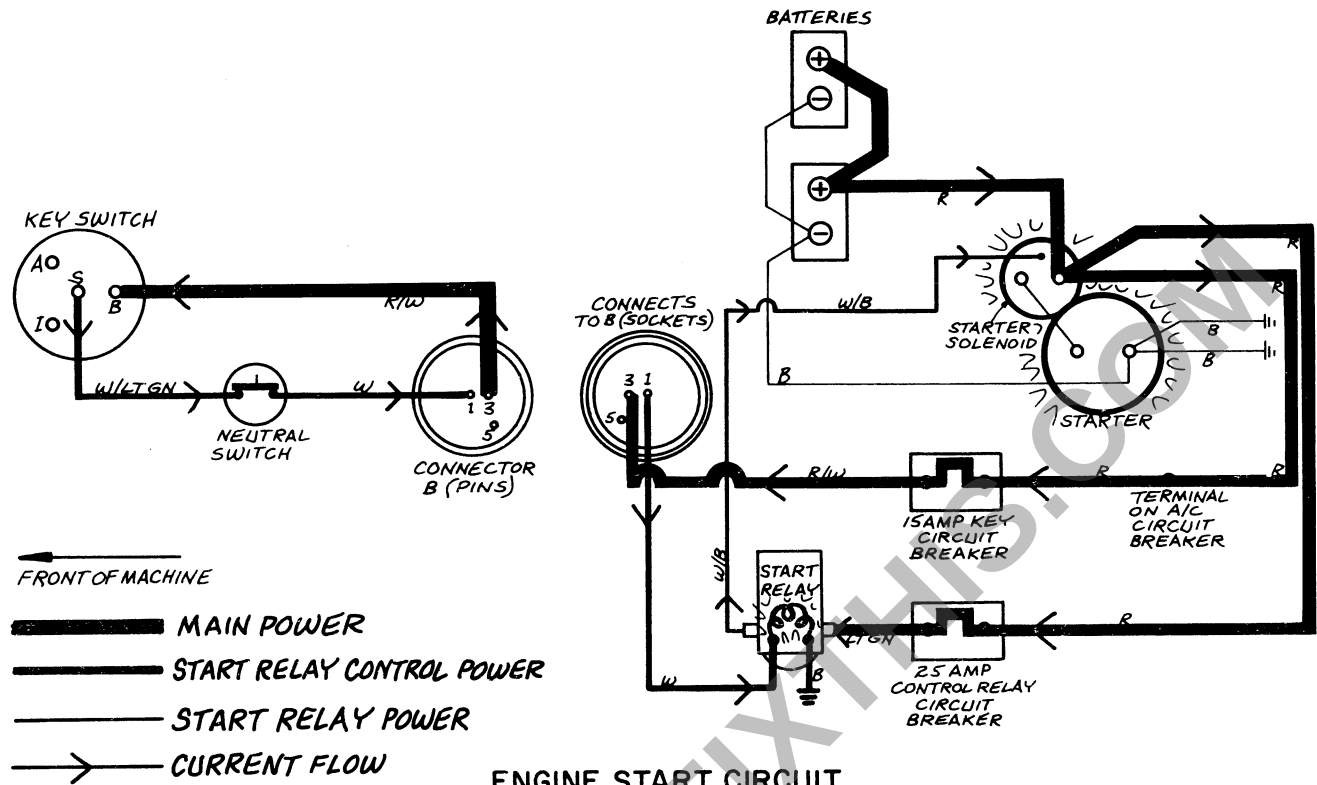
Additional precautionary statements (“ATTENTION” and “IMPORTANT”) are followed by specific instructions. These statements are intended for machine safety.

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.

AN INDIVIDUAL LIGHT DOES NOT WORK

STEP	PRETEST INSTRUCTIONS	TEST	RESULT	PROBABLE CAUSE AND CORRECTION
1.	Turn light switch on to supply voltage to light.	Check for battery voltage at the light connector.	No or low voltage.	Open circuit or poor connection in power wire.
			Battery voltage.	Go to next step.
2.	Switch off.	Check for continuity between ground wire at the light and the combine.	No continuity.	Open circuit or poor connection in ground wire. Repair.
			Continuity.	Go to next step.
3.	Switch off.	Check for continuity through the bulb.	No continuity.	Bulb defective. Replace.
			Continuity.	Repeat steps #1 and #2.



ENGINE START CIRCUIT

TR 86 BELOW S/N 527531

START CIRCUIT ACTIVATED

FIGURE 1E-3

Start Circuit

Figure 1E-3

When the ignition switch is turned to the start position, power passes through the switch to the S terminal. Power travels through the W/LTGN wire to the neutral safety switch. With the hydrostatic lever in neutral, the switch is closed so power can pass through the neutral switch. The W wire carries power from the neutral switch through connector B to the start relay.

When power reaches the start relay, the relay is energized and closes.

When the relay closes, power from the LTGN wire passes through the relay and out the W/B wire to the starter solenoid and energizes it.

When energized, the starter solenoid engages the starter drive with the flywheel. Power is passed to the starter motor which causes the starter motor to turn and cranks the engine.

TROUBLESHOOTING

Before attempting to troubleshoot a problem review the information under the “General Troubleshooting” heading in this section along with the material in the “General Electrical” section of this book.

Operate the machine and observe the problem. Match the problem to one of the headings on the following charts. Follow the systematic step-by-step instructions in the chart to locate and correct the problem. Follow all the instructions carefully.

STEP	PRETEST INSTRUCTIONS	TEST	RESULT	PROBABLE CAUSE AND CORRECTION
13.	Engine running.	Check for battery voltage at the O/PU wire connection of the master solenoid relay base.	<p>No or low voltage.</p> <p>Battery voltage.</p>	<p>Defective relay. Replace.</p> <p>If the reel will not lower and the unloading auger swing and feeder reverser systems do not work, refer to that section for test procedures.</p> <p>If only one or two systems do not work, refer to those specific sections for test procedures.</p>

HEAD CONTROL CIRCUIT

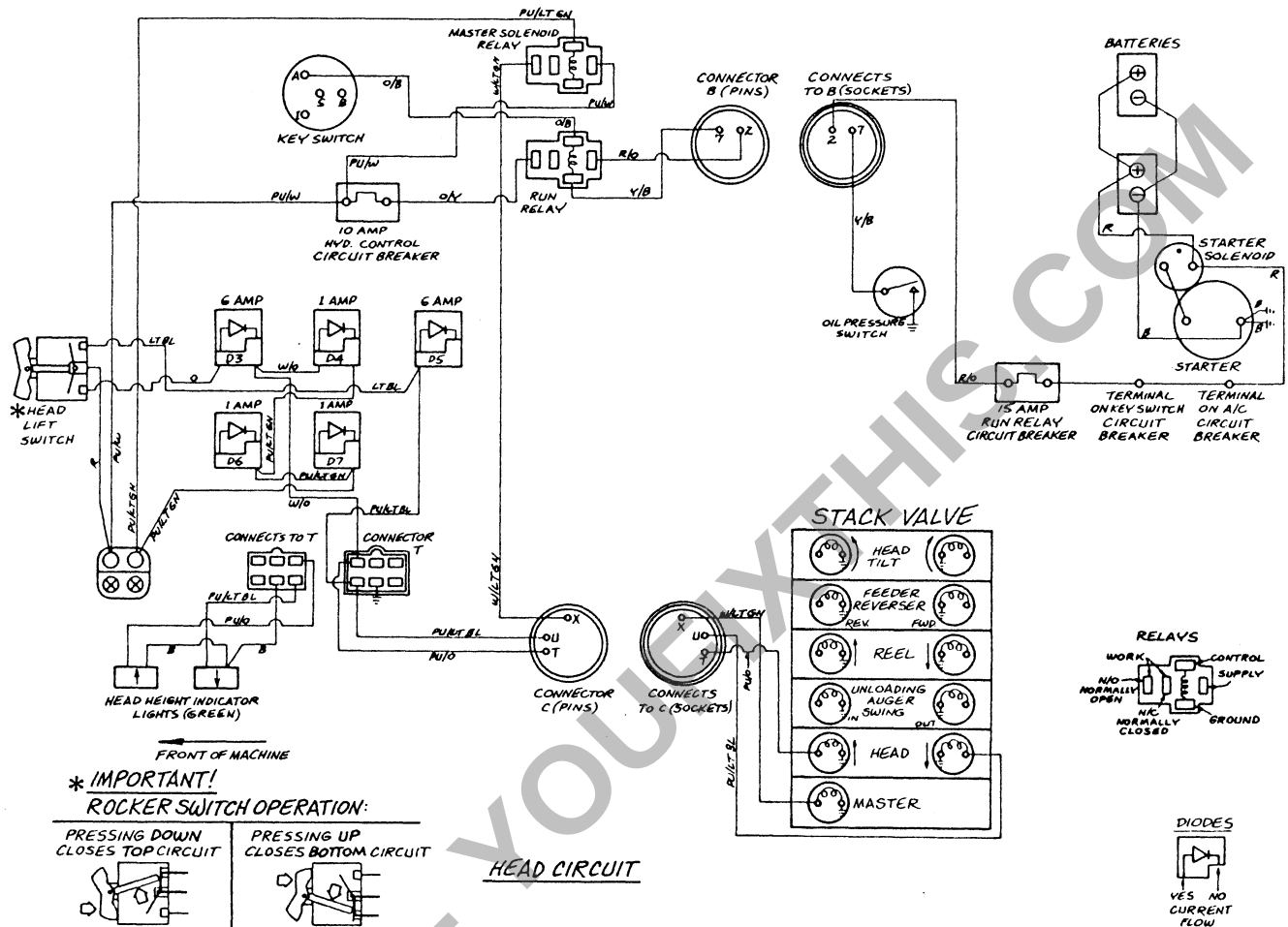


Figure 1G-45

The head circuit is shown in Figure 1G-45.

AUTOMATIC HEAD TILT WILL NOT TILT COUNTERCLOCKWISE

STEP	PRETEST INSTRUCTIONS	TEST	RESULT	PROBABLE CAUSE AND CORRECTION
1.	Engine running and automatic head height control actuated. Head tilt (lateral float) linkage bars disconnected from the lateral float control box arms. Cams positioned so all microswitches are in the neutral position. Head raised and support latch installed. Connectors, K, disconnected.	Check for battery voltage at the PU/Y wire connection (normally open terminal) of the following lateral float switches: Counterclockwise Raise Counterclockwise Lower	Battery voltage at both connectors. No voltage at one or both switches.	Problem is in the individual circuit. Refer to individual circuits test procedures. Open circuit or poor connection in PU/Y wire between connector L and the switch(es). Repair.

SOLENOID COILS

Introduction

Four different styles of coils are used to activate the various solenoids used on the combine.

One style coil is used on the electrohydraulic stack valve solenoids. This style coil is an intermittent duty coil and is energized only when a stack valve function is activated. This coil has an internal spark suppression diode to prolong the life of the momentary switches. These coils are identified by a dot of red and yellow paint.

All the coils used on the stack valve are the same and can be interchanged.

A second style coil is used on the reel speed control valve. This coil is a continual duty coil and is energized when the reel speed is activated.

A third style coil is used on the powered rear axle control valve. This is a continual duty coil and is energized when the powered rear axle is engaged.

A fourth style of coil is used on the unloading auger drive, head drive, and return shutoff valve solenoids. This style is a continual duty coil. The return shutoff coil is energized when the ignition is on. The unloading auger drive coil is energized when the unloading auger drive is activated. The head drive coil is energized when the head drive is activated.

Operation

Power enters the coil through the stud and passes through the coil windings and grounds through the metal ring at the end of the coil. When the coil is energized, an electromagnetic field is created around the solenoid. The electromagnetic field causes the armature inside the solenoid to move. The armature moves a poppet which controls oil flow through the electrohydraulic valve.

ENGINE START (CRANKING) CIRCUIT

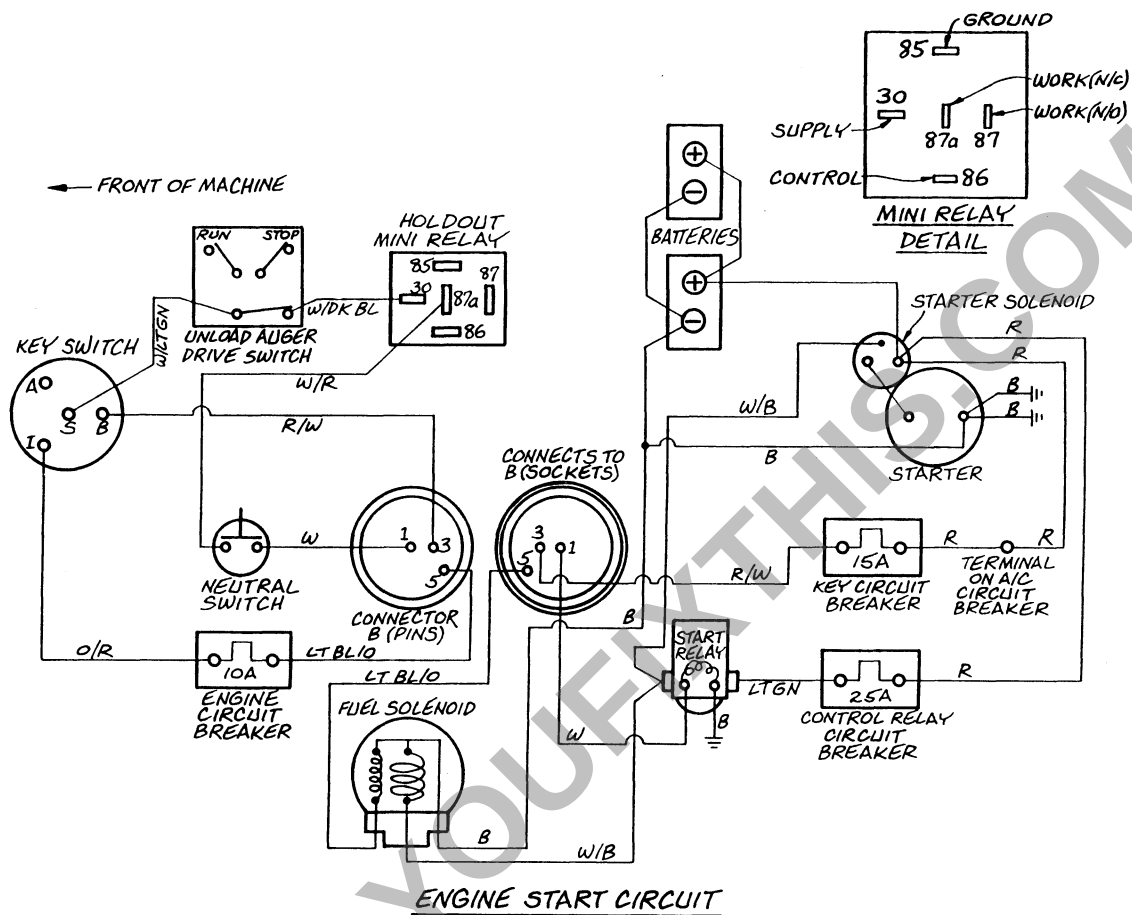


Figure 1E-1

The engine start circuit is shown in Figure 1E-1.

HEAD RAISE/LOWER CONTROL CIRCUIT

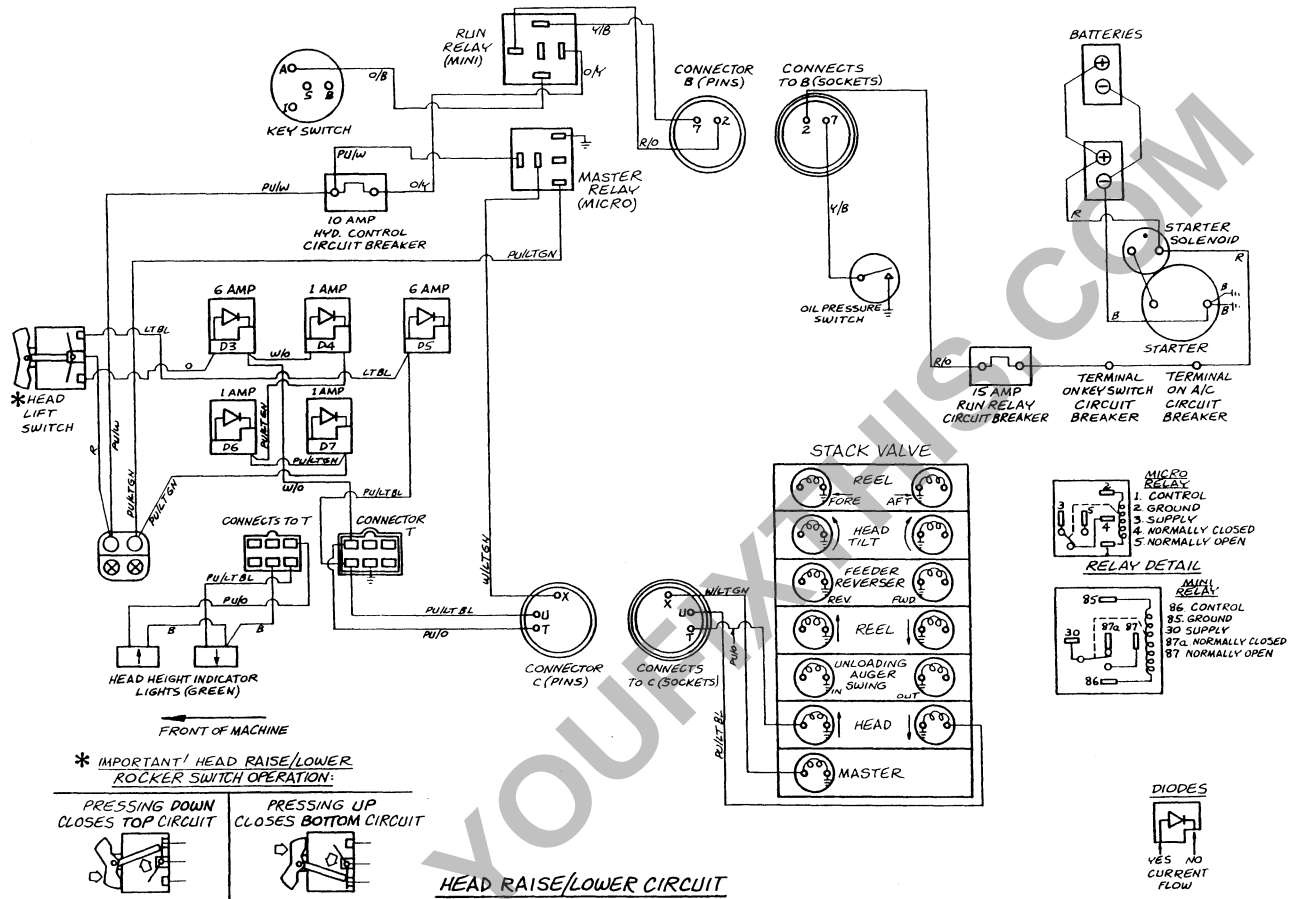


Figure 1G-18

The head circuit is shown in Figure 1G-18.

STEP	PRETEST INSTRUCTIONS	TEST	RESULT	PROBABLE CAUSE AND CORRECTION
8.	Same as #5. Remove D16 diode.	Check for battery voltage at the male connector of the D16 diode connector.	No or low voltage.	Open circuit or poor connection in W/B wire between clockwise raise switch and D16 diode connector. Repair.
			Battery voltage.	Go to next step.
9.	Same as #8.	Test D16 diode.	Diode does not meet test criteria.	Defective diode. Replace.
			Diode meets test criteria.	Open circuit in W/B wire between diode base and connector L. Repair. NOTE: If system fails to work, repeat step #1.
10.	Key off. Disconnect the two and three prong connector at the right side of the head. Both switches in neutral position.	Check for continuity between the PU/Y and the following wires at the two and three prong connectors that attach to the switches: W/Y LTBL/Y	Continuity at either or both wires.	Short in wires between connectors and switch or defective switch. Test and repair or replace.
			No continuity.	Go to next step.
11.	Same as #5. Only the three prong connector disconnected at right side of head.	Check for battery voltage at the LTBL wire at the three prong connector of the head wire harness.	Battery voltage.	LTBL wire shorted to PU/Y wire or clockwise raise switch is closed. Check switch or repair short.
			No or low voltage.	Repeat step #1.

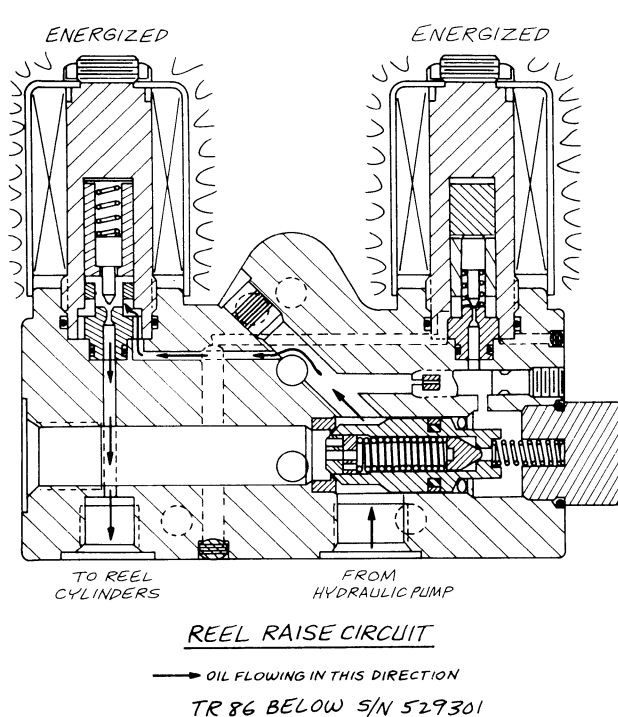
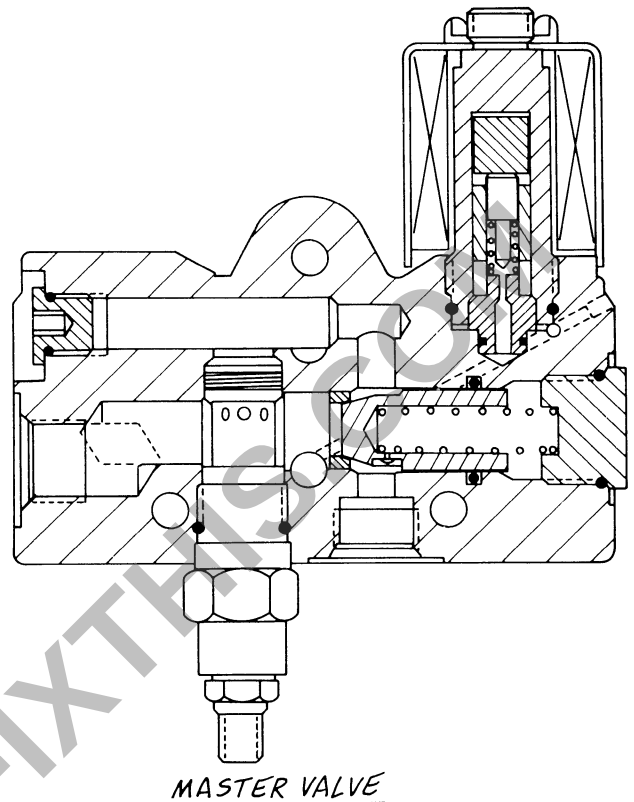


Figure 2A-8

REEL RAISE CIRCUIT (TR86 below serial number 529301)

Figure 2A-8

The reel is raised by energizing both the reel and the master solenoids. Oil flow from the pump passes through the open poppet and to the reel cylinders. The pressure oil forces the cylinders to extend and raises the reel.



MASTER VALVE

TR86 ABOVE S/N 529300,
TR87, TR88

Figure 2A-9

MASTER VALVE (TR86 above serial number 529300, TR87, TR88)

Figure 2A-9

The master valve is the bottom valve of the valve stack. The valve houses the relief valve cartridge and the master solenoid. The master solenoid is normally open.

When the master solenoid is not energized, pump flow is allowed to return to the tank. When the master solenoid is energized, there will be pump flow available to the stack valve assembly.

5. Remove cap, A. Under cap, A, will be spring, B, and washer, C, which is on the end of the spool.



Figure 2B-111

6. Remove cap, A. Under cap, A, will be spring, B, and washer, C, which is on the end of the spool.
7. Remove shuttle spool, D, by sliding it to the left or right and removing it from the valve body. Note which way the spool was removed.

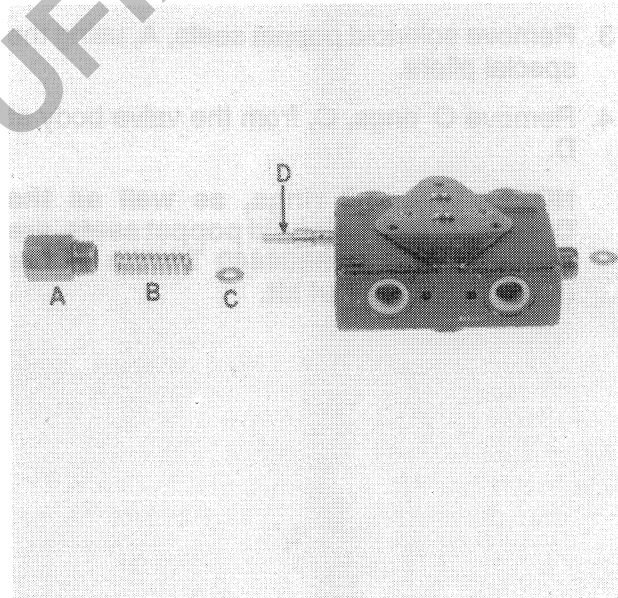


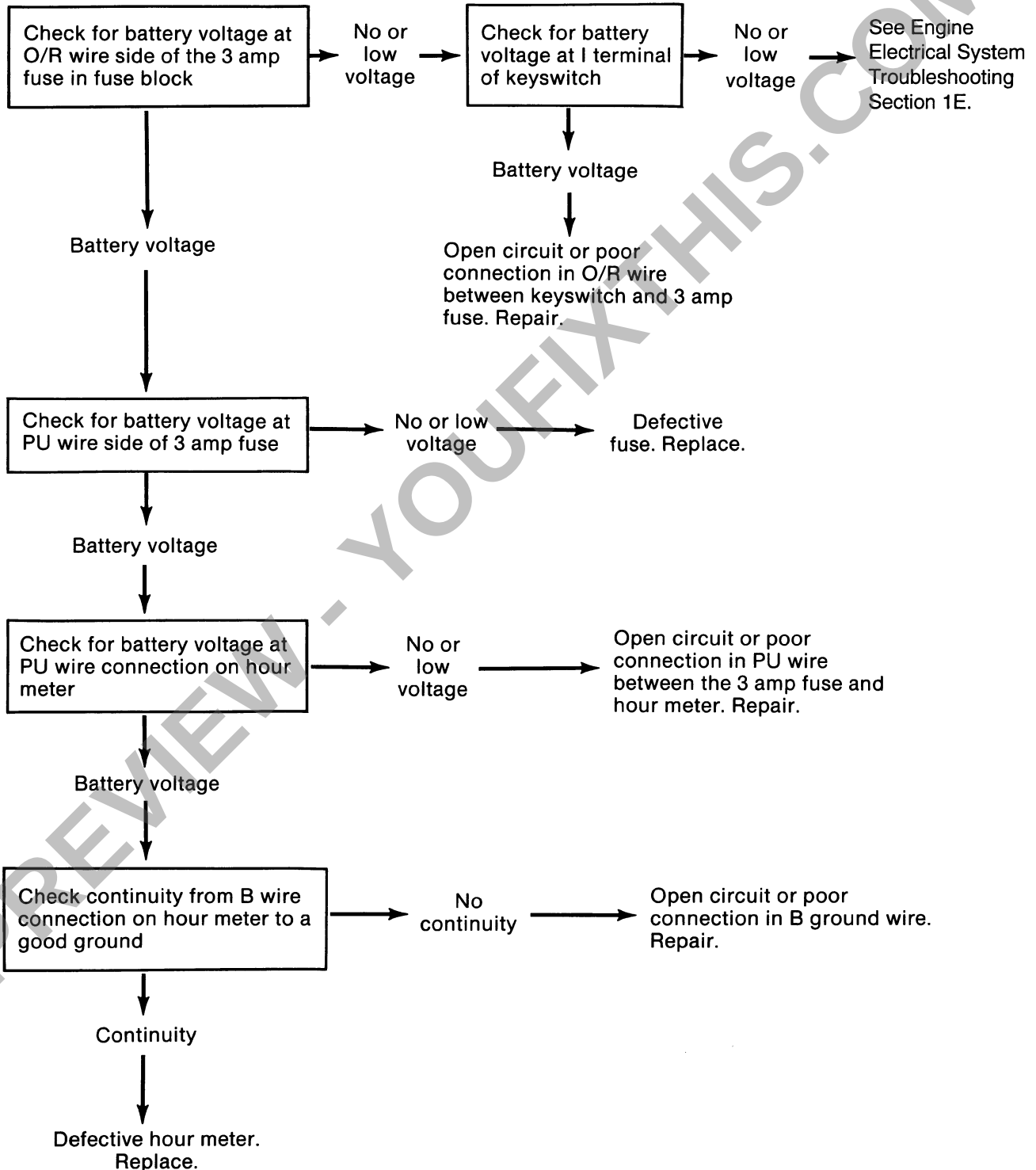
Figure 2B-112

THE UNLOADING AUGER SWINGS IN WHEN THE HEAD RAISE, REEL RAISE, FEEDER REVERSER, OR HEAD TILT CIRCUITS ARE ACTIVATED.

STEP	PRETEST INSTRUCTIONS	TEST	RESULT	PROBABLE CAUSE AND CORRECTION
1.	Engine off. Head on the ground or on the cylinder safety stop, the unloading auger in the home position or safety pin installed, and the shuttle spool removed.	Check the shuttle spool for binding, broken springs, or bent washers.	<p>The spool is binding or the components are damaged.</p> <p>The components are in good condition.</p>	<p>Replace damaged components.</p> <p>Go to next step.</p>
2.	Engine off. Head on the ground or the cylinder safety stop, the unloading auger in the home position or safety pin installed, and the unloading auger swing in solenoid removed.	Check the solenoid components for damage.	<p>The components are damaged.</p> <p>The components are in good condition.</p>	<p>Replace damaged components.</p> <p>Go to next step.</p>
3.	Same as #2	Check the solenoid poppet seat and o-ring for damage.	<p>The seat or o-ring is damaged.</p> <p>The seat and o-ring are in good condition.</p>	<p>Replace damaged components.</p> <p>Refer to the Electro-hydraulic electrical section 1G for electrical checks.</p>

HOUR METER DOES NOT FUNCTION PROPERLY**Flip Up Instrument Bar**

Key on



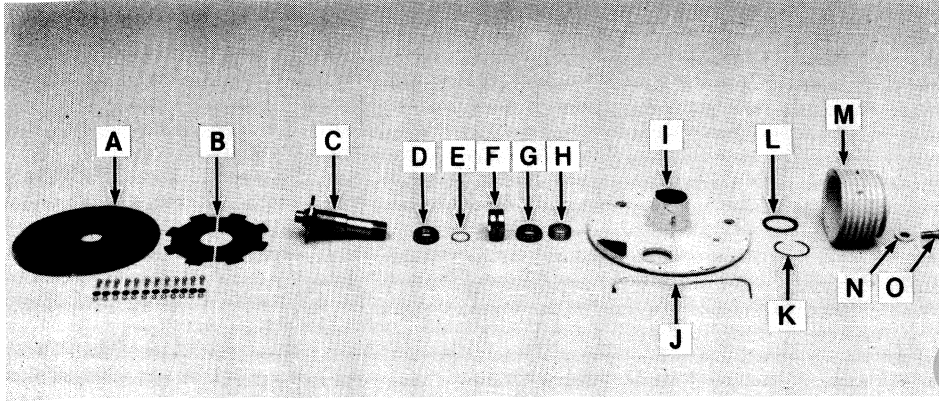


FIGURE 5B-11

Bell Housing Parts

A	Flex plate	F	Bearing cup	K	Snap ring
B	Sensor disc	G	Bearing cone	L	Seal
C	PTO shaft	H	Spacer	M	Sheave
D	Bearing cone	I	Bell housing	N	Washer
E	Spacer	J	Grease line	O	Cap screw

Inspecting the Bell Housing

1. Check the PTO shaft pilot dimension. The pilot should be 1.374" to 1.375" (34.925 to 34.900 mm) as shown in Figure 5B-12. If the PTO shaft pilot does not meet the specifications, it should be replaced.

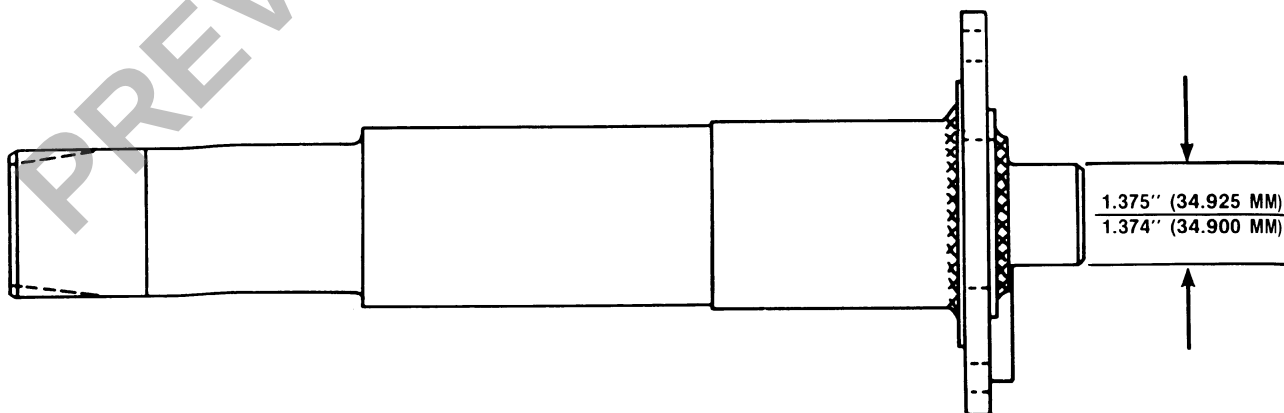


FIGURE 5B-12

10. Press the pinion gear, A, off the pinion shaft.

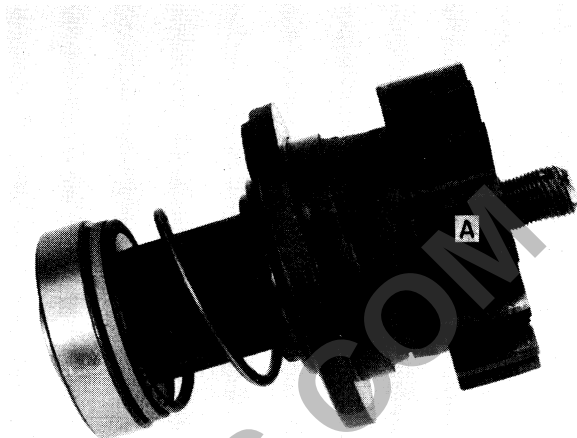


Figure 6-140

7102-7

11. Press the clutch, A, off and it will bring the tapered bearing with it.

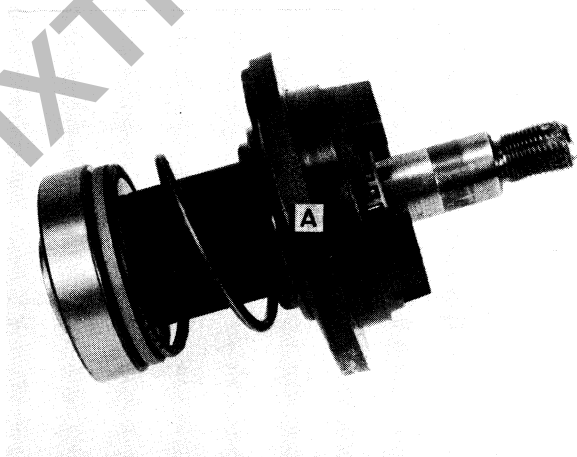


Figure 6-141

7102-8

12. Remove snap ring, A, and remove the bearing, B, and washers, C.

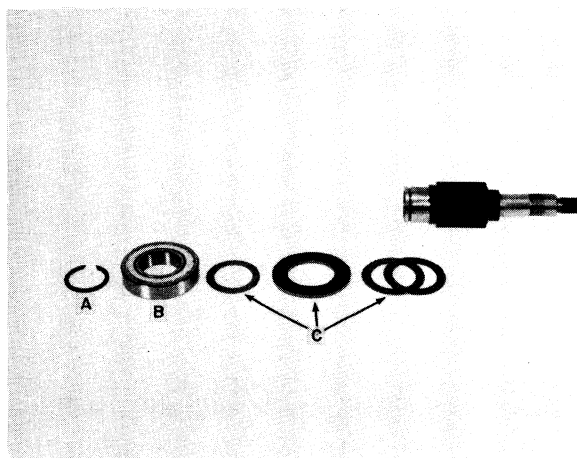


Figure 6-142

7104-5

INTRODUCTION

The Models TR86, TR87, and TR88 combines are equipped with two separate rotors; each rotor is 17" in diameter and 88" long. These rotors perform the functions of feeding, threshing, and separation. The rotors are powered by two rotor gearboxes. Power comes from the engine to the separator clutch which, when engaged, transmits power through the main shaft, through the rotor drive to the rotor gearboxes. Power is then transmitted from the gearboxes to the rotors through a coupler chain.

Two styles of rotors are used on the combines:

Style I rotors are used on the Model TR86 below serial number 529738.



Figure 8-1

7166-6

Style II rotors are used on all TR86, TR87, and TR88 combines above serial number 529739.

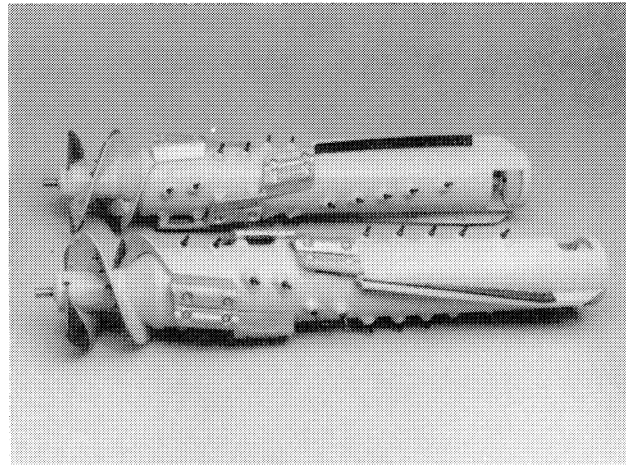


Figure 8-2

9213-8

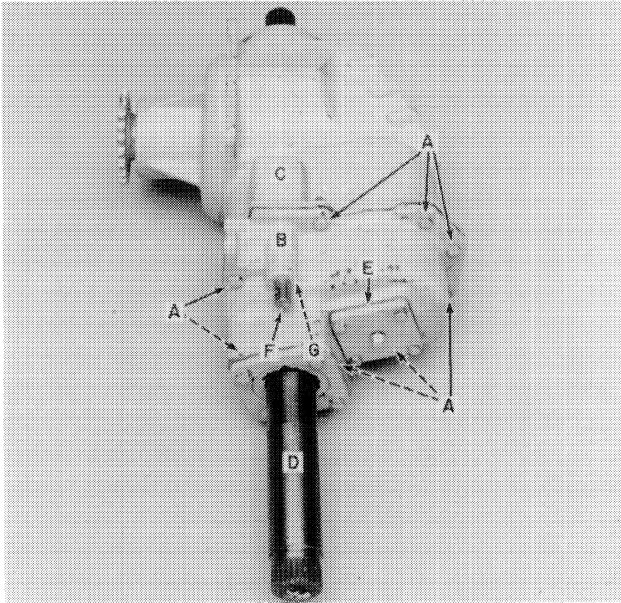


FIGURE 9B-30

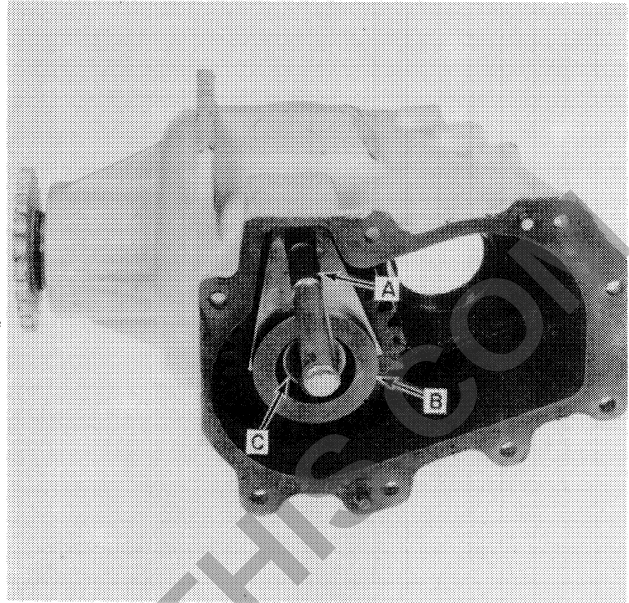


FIGURE 9B-31

5. Remove the eight cap screws, lock washers and nuts, A, Figure 9B-30.
6. Pry gearbox housing, B, Figure 9B-30, away from housing, C. Exercise caution when removing housing, B, as shafts, D and E, will come along with the housing.

NOTE: An O ring in housing, G, may cause some resistance in removing the housing. Be careful not to use extreme force and damage shifter fork, F.

7. If shaft, D, Figure 9B-30, has not come along with housing, B, remove it at this time.
8. Remove shifter fork, A, Figure 9B-31, and spur gear, B, by sliding it off of shaft, C.
9. Remove snap ring, A, Figure 9B-32. Behind this snap ring will be a series of metal shims. Remove the shims, B.

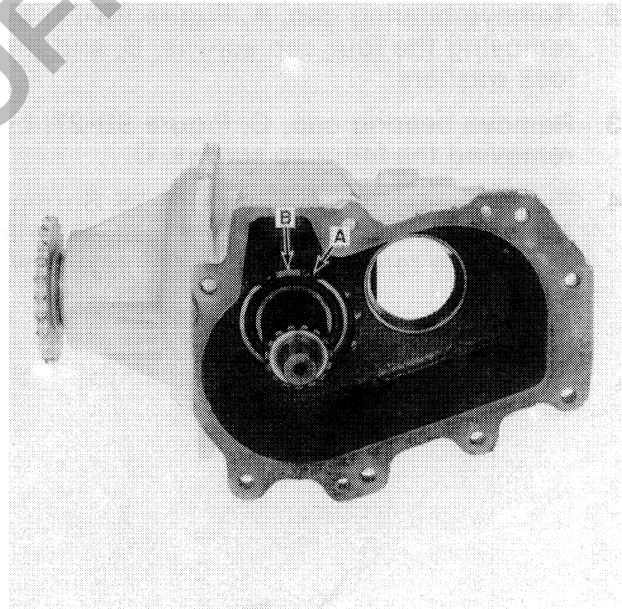


FIGURE 9B-32

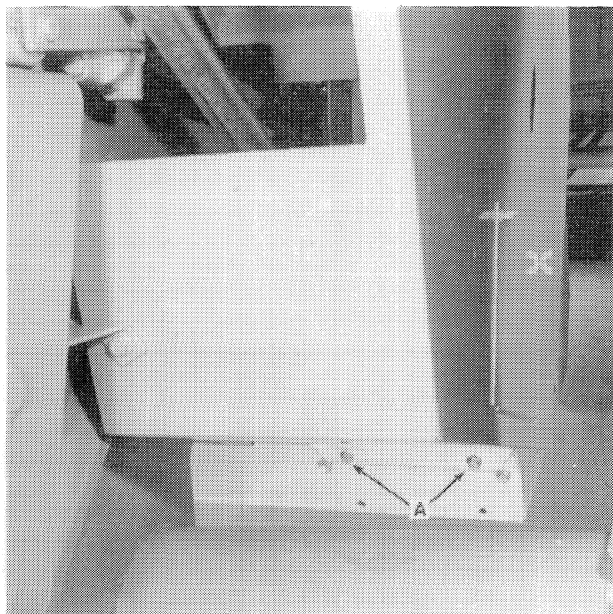


FIGURE 13-21

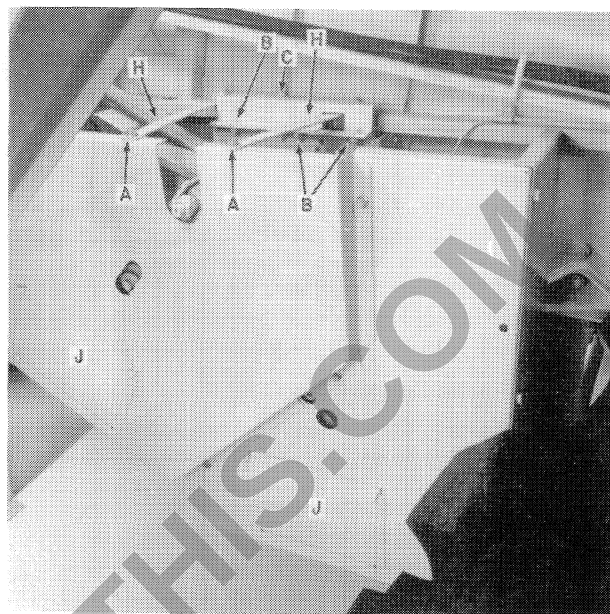


FIGURE 13-23

6. Install two 5/16" x 1/2" flange bolts at A, Figure 13-21.
7. Install bracket, G, Figure 13-22, using one 5/16" x 1/2" flange bolt and nut at B.
8. Install braces, H, Figure 13-23, using the existing hardware at the combine frame and two 5/16" x 3/4" flange bolts and nuts at A. Install shield, C, using three 5/16" x 3/4" flange nuts and bolts at B.
9. Install the access doors, J, Figure 13-23, using wing screws.
10. On the left side of the machine, begin by attaching shield, K, Figure 13-24, with one 1/4" x 1" cap screw and flange nut at A.

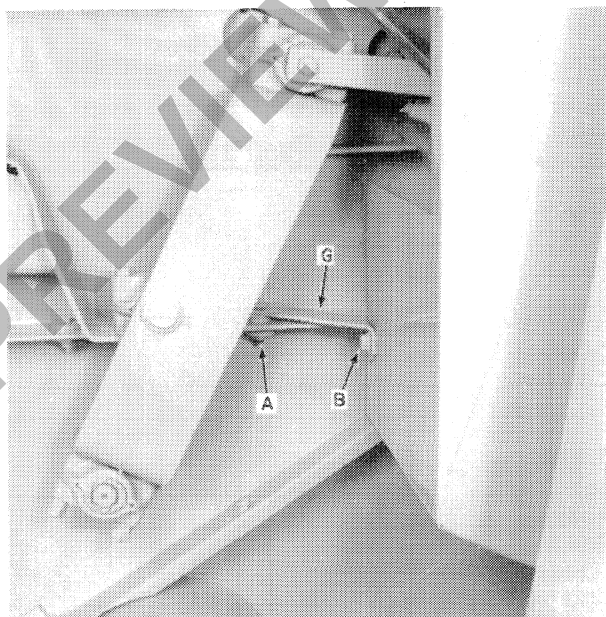
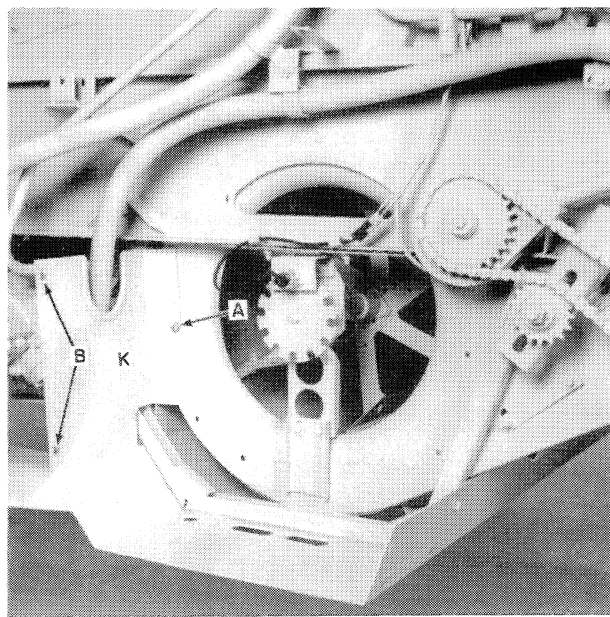


FIGURE 13-22



SHIELDS SHOWN REMOVED FOR CLARITY. FIGURE 13-24

SECTION 17

UNLOADING SYSTEM

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TROUBLESHOOTING CHARGE PUMP SERIES 23

SYMPTOM	CAUSE	SOLUTION
NOISY CHARGE PUMP	<ul style="list-style-type: none"> a. Oil supply low. b. Oil too heavy. c. Oil filter plugged. d. Suction line plugged. 	<ul style="list-style-type: none"> a. Fill reservoir. b. Change to proper viscosity. c. Clean filters. d. Clean line.
OIL HEATING	<ul style="list-style-type: none"> a. Oil supply low. b. Contaminated oil. c. Setting or relief valve too high or too low. d. Oil in system too light. 	<ul style="list-style-type: none"> a. Fill reservoir. b. Drain reservoir and refill with clean oil c. Set to correct pressure. d. Drain reservoir and refill with proper viscosity oil.
SHAFT SEAL LEAKAGE	<ul style="list-style-type: none"> a. Worn shaft seal. b. Broken diaphragm seal or back-up gasket. c. Bearings out of position. d. Excessive internal wear. 	<ul style="list-style-type: none"> a. Replace shaft seal. b. c. d.-If replacing the shaft seal does not stop leakage, the pump should be disassembled and check for items b, c, d.
FOAMING OIL	<ul style="list-style-type: none"> a. Low oil level. b. Air leaking into suction line. c. Wrong kind of oil. 	<ul style="list-style-type: none"> a. Fill reservoir. b. Tighten fittings. c. Drain and fill reservoir with correct oil.

SECTION 19G

SERIES 90 HYDROSTATIC SYSTEM

TR86 Above Serial Number 530055, TR87, TR88

MINOR REPAIRS

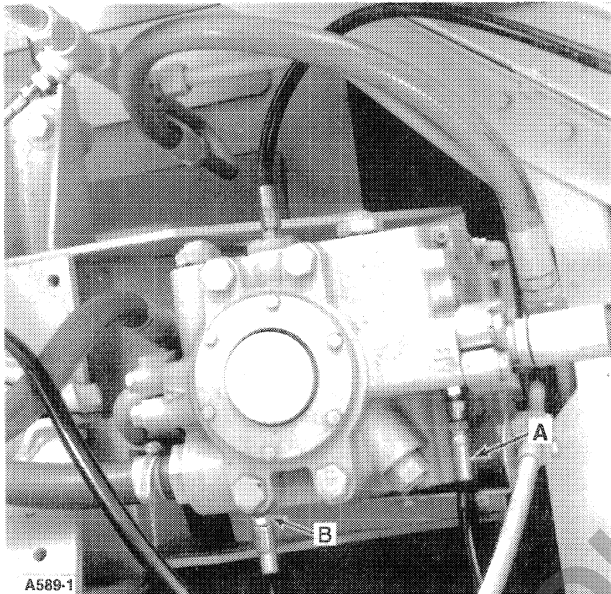


FIGURE 19G-1

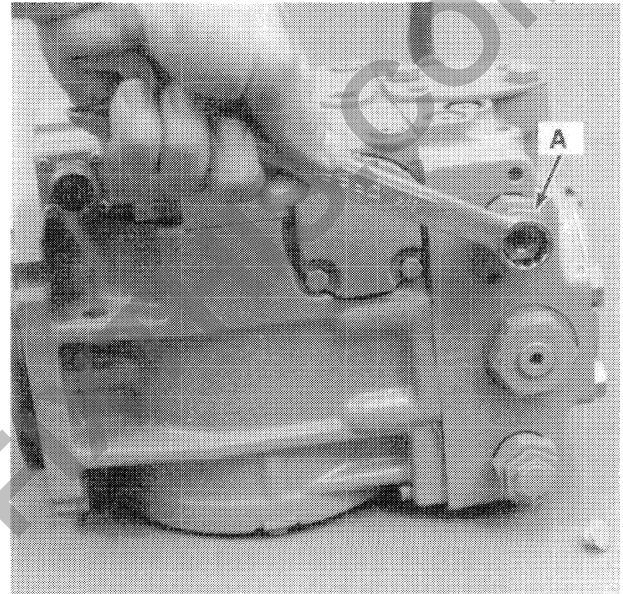


FIGURE 19G-2

NOTE: These repairs and adjustments can be made without removing the hydrostat.



WARNING: THE MACHINE MUST BE OPERATING TO CHECK SYSTEM PRESSURES. MAKE CERTAIN THAT EVERYONE IS CLEAR OF THE MACHINE AND ALL GAUGES ARE SECURED.

CAUTION: RAISE THE COMBINE DRIVE WHEELS OFF THE GROUND TO PREVENT THE COMBINE FROM TRAVELING UNCONTROLLED WHEN MAKING ADJUSTMENTS. BE SURE TO USE SUITABLE BLOCKING OR JACK STANDS TO SUPPORT THE WEIGHT OF THE COMBINE.

CAUTION: IF EQUIPPED WITH POWERED REAR AXLE MAKE CERTAIN THE SWITCH IS OFF.

MULTI-FUNCTION VALVE ADJUSTMENT

1. In order to set the pressure on the limiter or relief valves, the motor output shaft must be locked so it does not rotate. This may be accomplished by locking the brakes.



WARNING: TAKE NECESSARY PRECAUTIONS THAT THE MOTOR SHAFT REMAINS LOCKED DURING THE ADJUSTING PROCEDURE.

2. Install two 10,000 psi (690 bar) pressure gauges in the high pressure gauge ports, A and B, Figure 19G-1.
3. Start the combine and operate at normal speeds.



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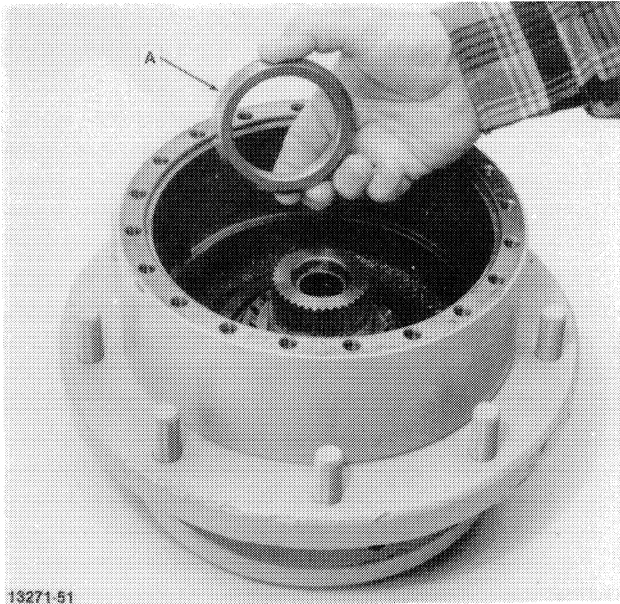


FIGURE 21B-67

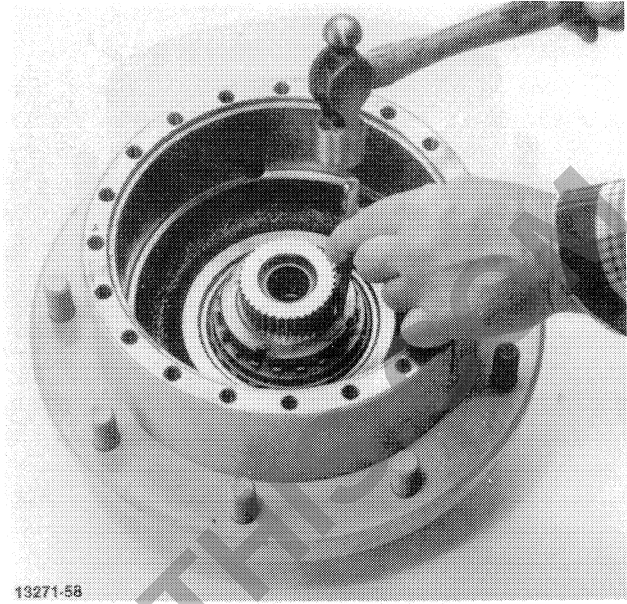


FIGURE 21B-69

9. Apply Loctite 277 to the second screw thread from the bottom of a new spanner nut, A, Figure 21B-67, and install it on the spindle hand tight.
10. Using a torque wrench, A, Figure 21B-68 and tool no. T-136699, Figure 21B-8, apply 50 ft.-lbs. of torque to the spanner nut. Rotate the hub in both clockwise and counterclockwise directions. Reset the torque to 50 ft.-lbs. Repeat this procedure several times.

NOTE: One tang on the lockwasher must line up with one of the four notches in the spanner nut. Apply additional torque to line up the tang and notch if required. DO NOT LOOSEN THE NUT.

11. Bend the aligned tang on the lockwasher with the notch into the spanner nut.
12. Stake the spanner nut in four equally spaced points at a distance of 1/8 inch from the inside edge as shown in Figure 21B-69.
13. At this point the hub/spindle sub-assembly is complete.

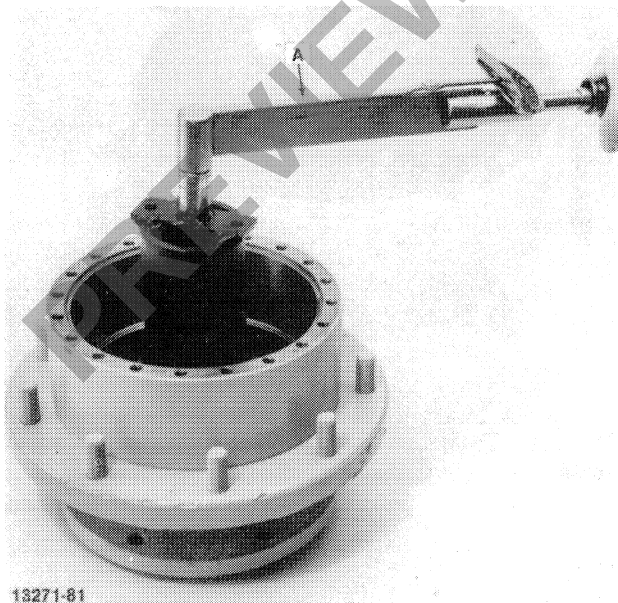


FIGURE 21B-68

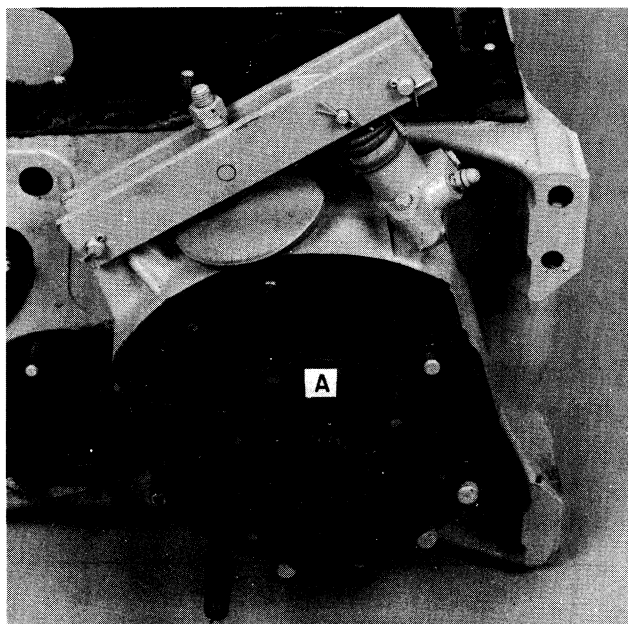


FIGURE 23-12

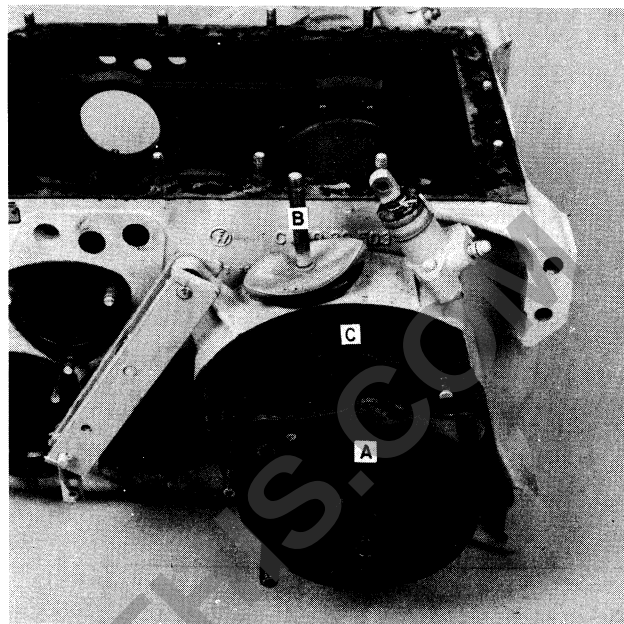


FIGURE 23-13

7. Remove the outer brake disc, A, Figure 23-12.
8. The brake actuating mechanism, A, Figure 23-13, can now be removed by disconnecting the actuating rod, B, and sliding the actuating assembly off the shaft.
9. Remove the inner brake disc, C, Figure 23-13.

For disassembly of the brake housing, refer to Section 20 "Transmission."

Refer to Figure 23-14 for layout of the disc brake parts.

PREVIEW ONLY

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