# GENERAL ELECTRICAL

## INTRODUCTION

This section describes the electrical system of the TR89 and TR99 combines. The electrical system has been broken down into sub systems and circuits according to functions performed or monitored. The Table of Contents lists the sub systems and circuits. Each sub system and circuit listed contains a description of the electrical circuit, a schematic of the circuit, and diagnostic test procedures based on the symptom(s) that a system may demonstrate.

Read all the introductory information before starting any test procedure. Next, look through the test procedures and locate the correct symptom. Use that test procedure to locate and correct the problem. Follow the steps as instructed. Do not skip steps unless instructed to do so in the test procedures.

Prepare the machine for the test by following the pretest instructions. Perform the test and observe the results. Perform the indicated corrective action. Continue through the test procedure until the problem is corrected, then return the system to an operational condition (replace shields, etc.).

## DEFINITION OF TERMS

ALTERNATING CURRENT (A.C.) - A flow of electrons which reverses its direction of flow at regular intervals in a conductor.

AMMETER - Measures the flow of electrical current in amperes. Ammeters are connected in series with the circuit to be tested.

AMPERE - A unit of measure for the flow of current in a circuit. The ampere is used to measure electricity such as “gallons per minute” is used to measure liquid flow.

CIRCUIT - A continuous, unbroken path along a conductor through which electrical current can flow from a source, through various units, and back to the source.

CIRCUIT BREAKER - A device to protect an electrical circuit from overloads.

COLD RATING - The cranking load capacity of a battery at low temperatures.

CONTINUITY - Unbroken path along a conductor through which electrical current can flow.

CURRENT - Movement of electricity along a conductor. Current is measured in amperes.

DIODE - An electrical device that will allow current to pass through itself in one direction only.

DIRECT CURRENT (D.C.) - A flow of electrons moving in the same direction along a conductor from a point of high potential to one of lower potential.

OHM - The standard unit for measuring resistance to flow of an electrical current.

OHMMETER - An instrument for measuring the resistance in ohms of an electrical circuit.

OPEN CIRCUIT - An open circuit occurs when a circuit is broken interrupting the flow of current through the circuit.

RELAY - An electrical switch which opens and closes a circuit automatically when activated.

RESISTANCE - The opposing force offered by a circuit. Resistance is measured in ohms.

SHORT CIRCUIT - A part of a circuit comes in contact with part of the same circuit or unintentionally touches a metallic object.

SOLENOID - A circular coil used for producing a magnetic field.

VOLT - A unit of electrical pressure which caused current to flow in a circuit.

VOLTAGE - The force which is generated to cause current to flow in an electrical circuit. Voltage is measured in volts.

VOLTMETER - An instrument for measuring the force in volts of electrical current. Voltmeters are connected in parallel to the points where voltage is to be measured.

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| STEP | PRETEST INSTRUCTIONS | TEST | RESULT | PROBABLE CAUSE AND CORRECTION |
|---|---|---|---|---|
| 20. | Key on. | Check for battery voltage at the “I” terminal of the key switch. | Battery voltage. | Open circuit or poor connection in O/R wire between key switch and A/C relay. Repair. |
| | | | No or low voltage. | Go to next step. |
| 21. | Key on. | Check for battery voltage at the B terminal of the key switch. | Battery voltage. | Defective key switch. Replace. |
| | | | No or low voltage. | Refer to “Engine will not Crank” section. |
| 22. | Key off. | Check for continuity between the B wire connection of the A/C relay base and a good ground. | Continuity. | Go to step #23. |
| | | | No continuity or high resistance. | Open circuit or poor connection in B wire. Repair. |
| 23. | Key on. | Check for battery voltage at the O/DK BL wire connection of the A/C relay base. | No or low voltage. | Defective relay. Replace. |
| | | | Battery voltage. | Repeat step #1. |
| 24. | Key off. Do not operate the A/C system for 15 minutes before performing this test. This will allow the system pressures to equalize.<br><br>**NOTE: A/C pressure gauges should be used to check system pressures. System low pressure must be below 365 PSI before performing this test.** | Check for continuity between the T/O wire of the A/C clutch relay base and a good ground. | Continuity. | Go to step #28. |
| | | | No continuity or high resistance. | Go to next step. |
| 25. | Key off. Disconnect the T/O wire from the high-pressure switch and the T/O wire to the combine frame. | Check for continuity between the T/O wire of the A/C clutch relay base and a good ground. | No continuity or high resistance. | Open circuit in T/O wire between the relay and high pressure switch or poor connection at connector B. Repair. |
| | | | Continuity | Go to next step. |



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## ENGINE CRANKS BUT WILL NOT RUN

| STEP | PRETEST INSTRUCTIONS | TEST | RESULT | PROBABLE CAUSE AND CORRECTION |
|---|---|---|---|---|
| 1. | Disconnect the electrical connector at the fuel solenoid. | Turn key to the start position and check for battery voltage at the W/B wire terminal of the connector on the wire harness that attaches to the fuel solenoid. | Battery voltage. | Go to next step. |
| | | | No or low voltage. | Poor connection or break in the W/B wire between the fuel solenoid and the start relay. |
| 2. | Key off. Same as #1. | Check for continuity between the B wire connector on the fuel solenoid wire harness and the combine frame. | Continuity. | Go to next step. |
| | | | High resistance or no continuity. | Poor connection or a break in the B wire. Repair. |
| 3. | Disconnect the fuel solenoid from the fuel pump lever. Apply 12 volts to the terminal of the solenoid where the W/B wire attaches. | Ground the terminal where the B wire attaches to the fuel solenoid. The solenoid should activate. | Solenoid activates. | Check fuel pump lever for binding and proper linkage adjustment. Repair. Repeat steps #1 and #2 if pump lever is not binding. |
| | | | Solenoid does not activate. | Solenoid defective. Replace. |

## ENGINE STARTS BUT WILL NOT CONTINUE TO RUN WHEN THE KEY SWITCH IS RETURNED TO THE RUN POSITION

| STEP | PRETEST INSTRUCTIONS | TEST | RESULT | PROBABLE CAUSE AND CORRECTION |
|---|---|---|---|---|
| 1. | Key off. | Check to be sure the 10-amp engine circuit breaker (located on the instrument console) has not tripped. | Circuit breaker tripped. | Go to next step. |
| | | | Circuit breaker not tripped. | Go to step #7. |
| 2. | Reset circuit breaker. | Crank engine and observe circuit breaker. | Circuit breaker tripped. | Go to next step. |
| | | | Engine starts and runs. | End of test. |

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# REEL FORE/AFT CIRCUIT

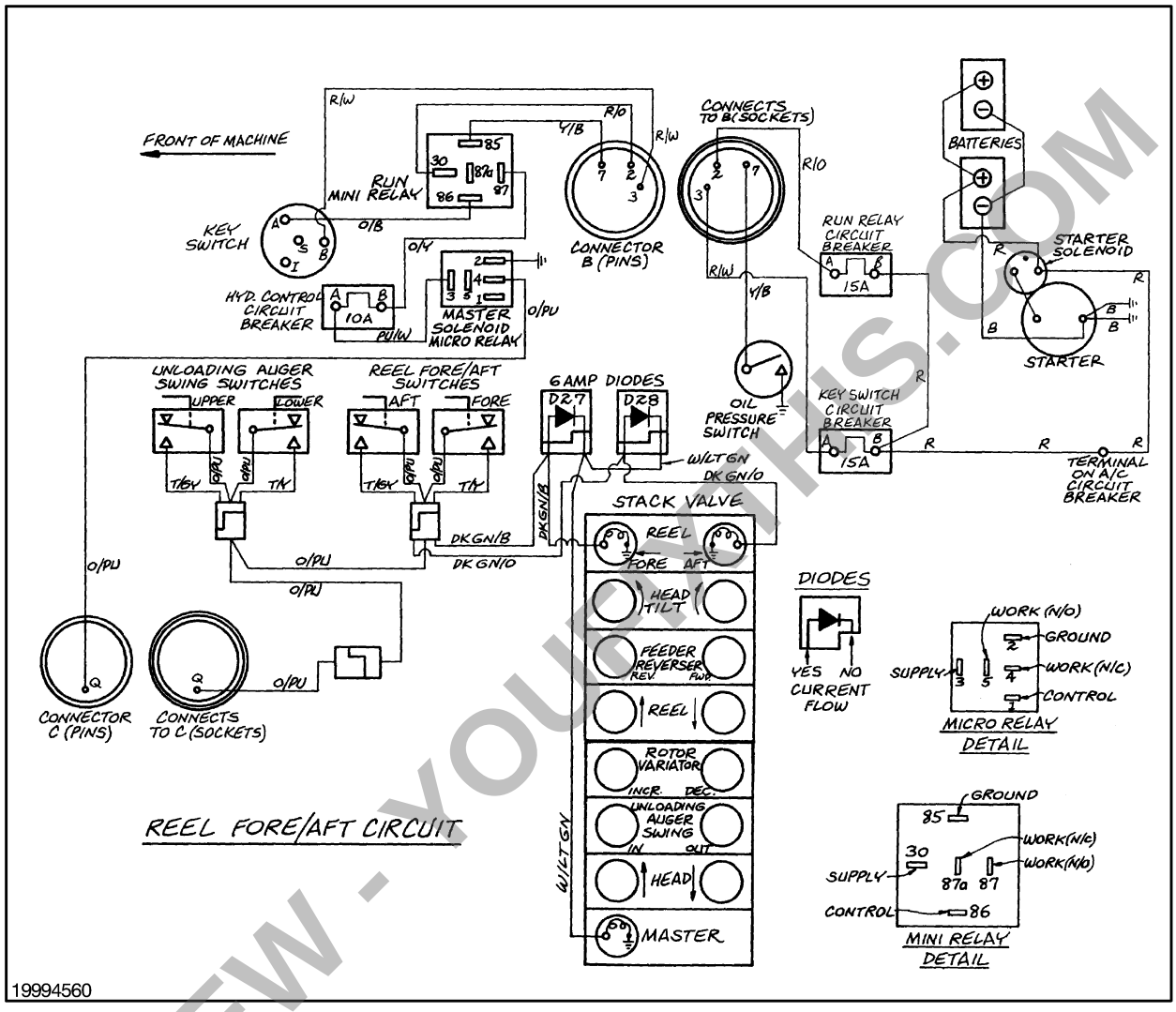



**Figure 1-77**

The reel fore-aft circuit is shown in Figure 1-77.

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| STEP | PRETEST INSTRUCTIONS | TEST | RESULT | PROBABLE CAUSE AND CORRECTION |
|---|---|---|---|---|
| 3. | Same as #2. D6 diode removed. | Check for battery voltage at the B wire connection of the D6 diode connector. | No or low voltage. | Open circuit or poor connection in B wire. |
| | | | Battery voltage. | Go to next step. |
| 4. | Key off. D6 diode removed. | Test D6 diode. | Diode does not meet test criteria. | Defective diode. Replace. |
| | | | Diode meets test criteria. | Go to next step. |
| 5. | Engine running. D6 diode in place. D7 diode removed. Head tilt switch pushed upward. | Check for battery voltage at the PU/LT GN wire connection of the D7 diode connector. | No or low voltage. | Open circuit or poor connection in PU/LT GN wire between D6 and D7 diode connectors. Repair. |
| | | | Battery voltage. | Go to next step. |
| 6. | Engine running. D6 and D7 diodes installed. Head tilt switch pushed up. | Check for battery voltage at the master solenoid coil. | No or low voltage. | Poor connection in PU/LT GN wire at base of D7 diode connector. |
| | | | Battery voltage. | Repeat step #1 if system does not work. |
| 7. | Engine running. Head tilt switch pushed up. | Check for battery voltage at the W/B wire connection of connector T.<br><br>**NOTE: If the head tilt clockwise indicator light lights, go to next step.** | No or low voltage. | Open circuit or poor connection in W/B wire between D6 diode connector and connector T. Repair. |
| | | | Battery voltage. | Go to next step. |
| 8. | Same as #7. | Check for battery voltage at the head tilt clockwise solenoid coil. | No or low voltage. | Open circuit or poor connection in W/B wire between the solenoid and connector T. Repair. |
| | | | Battery voltage. | Repeat step #1 if system does not work. |
| 9. | Key off. Remove D7 diode. | Test D7 diode. | Diode does not meet test criteria. | Defective diode. Replace. |
| | | | Diode meets test criteria. | W/Y wire shorted to PU/LT GN wire. Repair. |



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# HEAD WILL NOT TILT COUNTERCLOCKWISE WHEN THE AUTOMATIC COUNTERCLOCKWISE LOWER SWITCH IS ACTIVATED

| STEP | PRETEST INSTRUCTIONS | TEST | RESULT | PROBABLE CAUSE AND CORRECTION |
|---|---|---|---|---|
| 1. | Engine running. Automatic head height control actuated. Head tilt circuit prepared for testing as described in "Troubleshooting General Information" section. Rotate cam so counterclockwise lower switch is closed. | Check for battery voltage at the W/Y wire connection at connector L. | No voltage.<br><br>Battery voltage. | Go to step #4.<br><br>Go to next step. |
| 2. | Same as #1. Disconnect two-prong connector on the left side that attaches the microswitch box to the head wire harness. | Check for battery voltage at the W/B wire of the head wire harness. | No voltage.<br><br>Battery voltage. | Go to step #4.<br><br>Go to next step. |
| 3. | Key off. Remove D16 diode. | Test D16 diode. | Diode does not meet test criteria.<br><br>Diode meets test criteria. | Defective diode. Replace.<br><br>W/B and W/Y wires shorted in head wire harness. Repair.<br><br>**NOTE: If system still does not work, proceed to step #4.** |
| 4. | Engine running. Automatic head height control actuated. Head tilt circuits ready for testing as described in "Troubleshooting General Information" section. All switches in neutral position. | Check for battery voltage at the following wires of the counterclockwise lower microswitch:<br><br>PU/Y wire (normally open terminal)<br><br>LT BL/Y wire (common terminal) | No voltage at the PU/Y wire.<br><br>Battery voltage at the following wires:<br><br>PU/Y only<br><br>LT BL/Y only or PU/Y and LT BL/Y | Open circuit or poor connection in PU/Y wire between connector L and switch. Repair.<br><br>Go to step #5.<br><br>Go to step #10. |

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## 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 instructions carefully.

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## INDIVIDUAL GAUGE CIRCUITS DO NOT FUNCTION PROPERLY

(Oil Pressure Gauge, Coolant Temperature Gauge, or Fuel Gauge)

| STEP | PRETEST INSTRUCTIONS | TEST | RESULT | PROBABLE CAUSE AND CORRECTION |
|---|---|---|---|---|
| 1. | Key on. | Remove wire from sensor and contact to a good ground. Gauge should go to the top of the range. | Correct reading. | Defective sensor. Replace and retest. |
| | | | Incorrect reading. | Go to next step. |
| 2. | Key off. Remove instrument bar. | With wire at sensor connected to a good ground, check continuity at problem circuit wire at instrument bar connector with the ground lead on a good ground (cab frame). | No continuity. | Open circuit or poor connection in problem circuit wire between sender and instrument bar connector. Repair and retest. |
| | | | Continuity. | Go to next step. |
| 3. | Key off. | Remove the circuit board and unplug the gauge from the board. Perform gauge checks as shown in Figure 1-229. | Incorrect resistance reading. | Defective gauge. Replace and retest. |
| | | | Correct resistance reading | Defective instrument bar circuit board. Replace and retest. |

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# HYDRAULIC SYSTEM TROUBLESHOOTING

## INTRODUCTION

This section covers troubleshooting of the hydraulic portion of the electrohydraulic and steering systems.

This section is divided into two portions. The first portion is a valve chart that references problems that may occur with each valve. The second portion deals with specific problems that may affect one or more circuits.

## GENERAL TROUBLESHOOTING INFORMATION

If a problem occurs, perform the necessary tests to determine if the problem is electrical or hydraulic. The electrical portion of the electrohydraulic system is covered in Section 1 of this manual.

After determining that there is a hydraulic problem, review the introduction and operation sections of this manual. These sections explain the operation of the hydraulic components.

Before attempting to troubleshoot a circuit, familiarize yourself with the valve schematics, hydraulic flow, and operation of the hydraulic components in that circuit.

After you are familiar with the operation of the hydraulic circuit, operate the combine and observe the symptom(s) of the problem. Match the symptom(s) you observe to the main headings listed in the “Troubleshooting” chart for that circuit in this section. When you find the heading that describes the symptom(s) you observed, follow the step by step instructions until the problem is corrected.



**CAUTION: BEFORE WORKING ON THE HYDRAULIC SYSTEM, ALWAYS PLACE THE HEAD ON THE GROUND OR ON THE CYLINDER SAFETY STOP, THE UNLOADING AUGER IN THE HOME POSITION OR HAVE THE SAFETY PIN INSTALLED, AND THE REEL IN THE LOWERED POSITION OR ON THE CYLINDER SAFETY STOP.**

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4. Check the shuttle spool control orifice, 1, for dirt contamination.

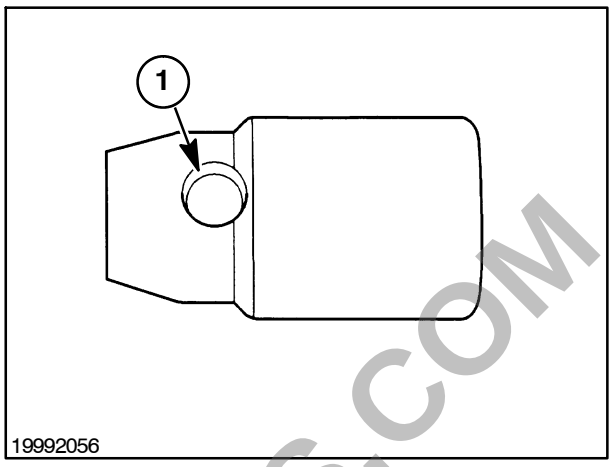



**Figure 2-62**

## Assembly

1. Install shuttle spool seat, 1, using seat installation tool (FNH10707 and FNH10708), 2.

   *IMPORTANT: Be sure the shuttle spool seat is installed with the taper toward tool, 2. Also be sure the seat is not cocked in the valve body when driving the seat in place. Failure to install the seat properly could result in damage to the valve body, seat, or both, as well as improper valve operation.*

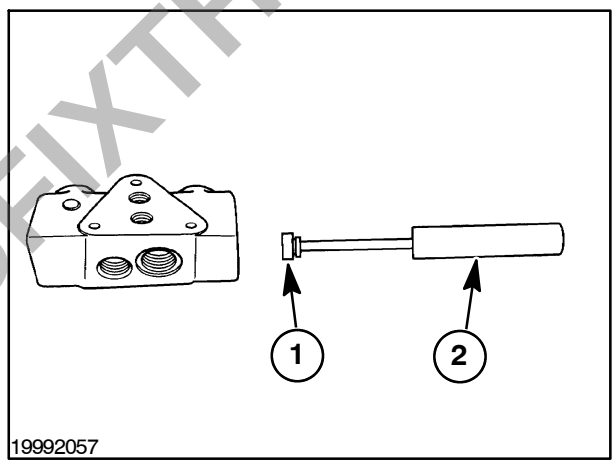



**Figure 2-63**

2. Install O ring, 5, in the valve body.
3. Install shuttle spool, 1, into the valve body. Secure with spring, 2, and plug, 3.

   *IMPORTANT: Be sure the shuttle spool is installed with taper, 4, toward seat, 5. Failure to install the shuttle spool in this manner could result in excessive hydraulic component damage.*

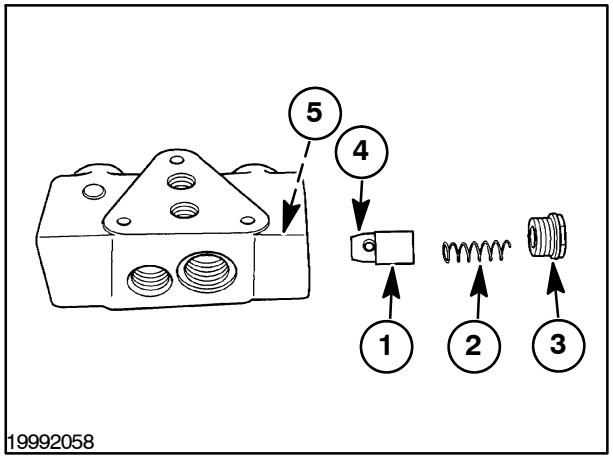



**Figure 2-64**

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### Motor (Gerotor) End

1. Clamp unit in vise, meter end up. Clamp lightly on edges of mounting area. Use protective material on vise jaws. Do not overtighten jaws.

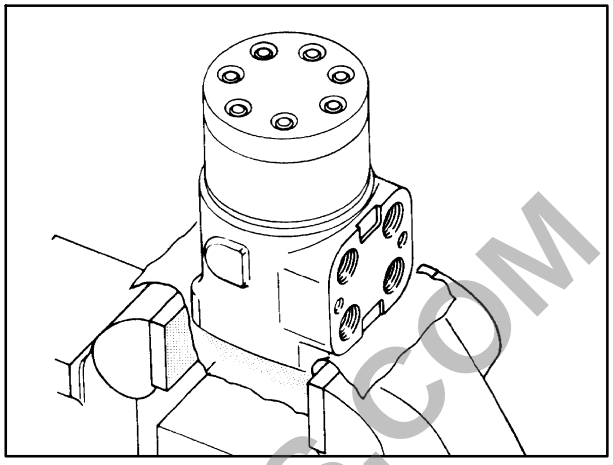


Figure 2-180

2. Remove 5/16″ cap screws, 1.
3. Remove end cap, 2.
4. Remove seal from end cap, 3.

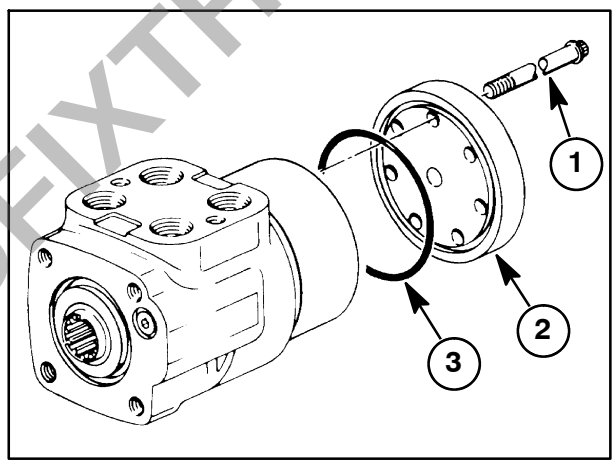



Figure 2-181

5. Remove meter (Gerotor), 1. Be careful not to drop star, 2.
6. Remove seal from meter, 3.
7. Remove drive spacer, 4.

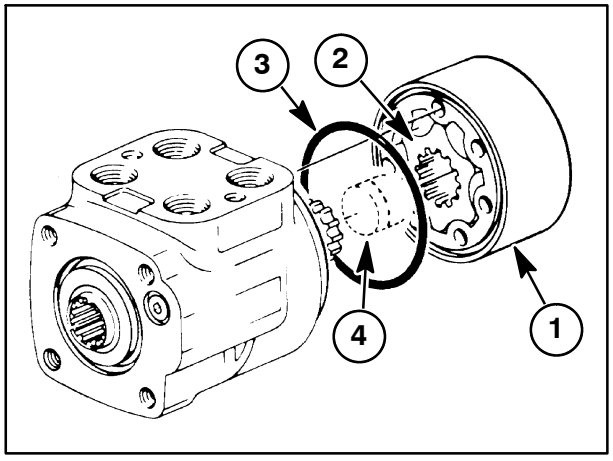



Figure 2-182

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# SERIES 90 HYDROSTATIC SYSTEM - MINOR REPAIRS

**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 690 bar (10,000 psi) pressure gauges in the high pressure gauge ports, 1 and 2.
3. Start the combine and operate at normal speeds.

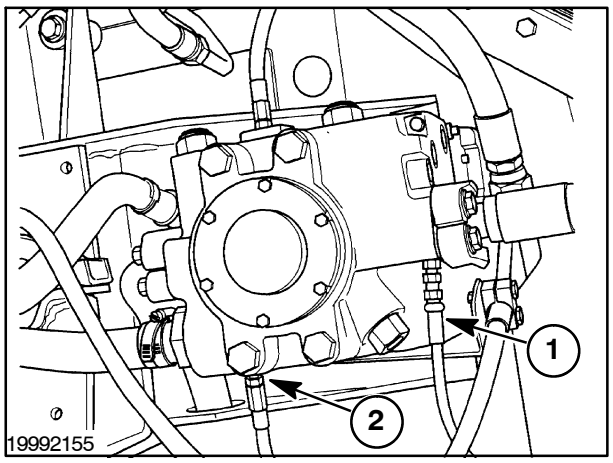



**Figure 2-255**

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# UNLOAD AUGER SWING CYLINDER

## INTRODUCTION

The unload auger swing cylinder used on the TR89 and TR99 combines is part #847681. Use seal kit part #86578583 when repairing this cylinder.

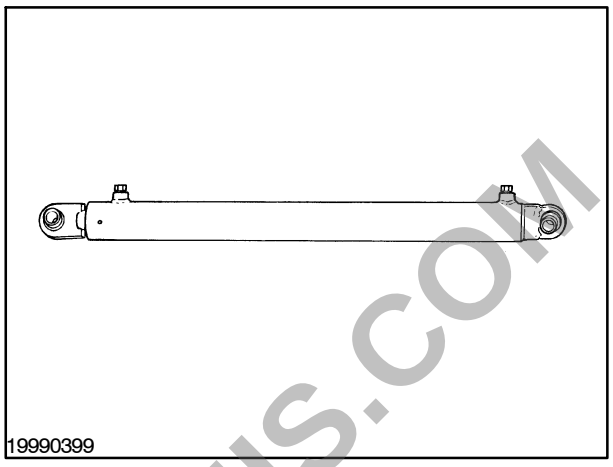



**Figure 2-355**

## Removal

1. Retract the unload auger into the storage position before removing the cylinder.

**WARNING: IF FOR ANY REASON THE CYLINDER MUST BE WORKED ON WITH THE AUGER IN OPERATING POSITION, BE SURE TO INSERT PIN, 1.**

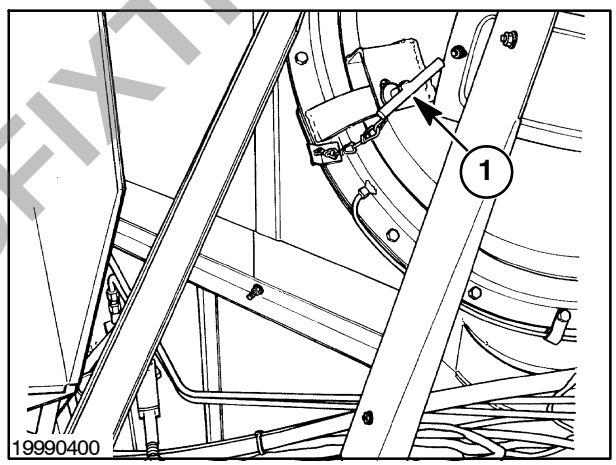



**Figure 2-356**

2. Loosen the hydraulic hose fittings, 1, allowing any hydraulic oil pressure to bleed off before completely disconnecting the hoses from the cylinder. Cap the ends of the hoses to prevent dirt from entering.
3. Remove the cotter pins and clevis pins, 2, which hold the cylinder in the mounting brackets.
4. Clean the cylinder in suitable solvent before disassembly.

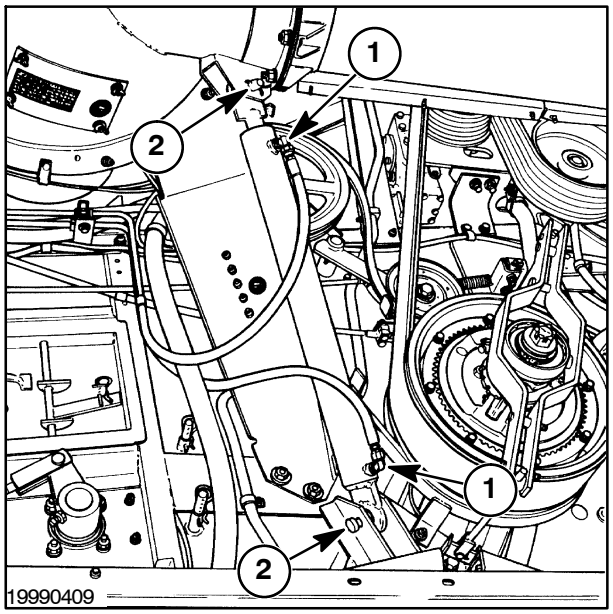



**Figure 2-357**



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4. If adjustment is required to obtain the proper setting, depress pin, 1, and rotate adjusting nut, 2. Turning the nut clockwise will increase pressure and counterclockwise will reduce pressure.
5. After clutch is adjusted properly, install 1/2″ cap screw. Disengage the clutch (key on).
6. When the clutch is disengaged, there should be 22 mm (7/8″) between the ear on the throw-out bearing and the adjusting nut as shown at 3.

   **NOTE: Spray the pin liberally with penetrating fluid, and carefully push the pin in to ensure it does not stick in the hole.**

   *ATTENTION: Do not operate the combine if the pin is stuck in the hole, or clutch failure will occur.*
7. To obtain the 22 mm (7/8″) dimension adjust the outer limit switch, 1. Loosen the set screws to move the switch. Retighten the set screws to a maximum of 0.565 N·m (5 in. lbs).

   *IMPORTANT: Do not over torque set screws, or limit switch failure will occur.*

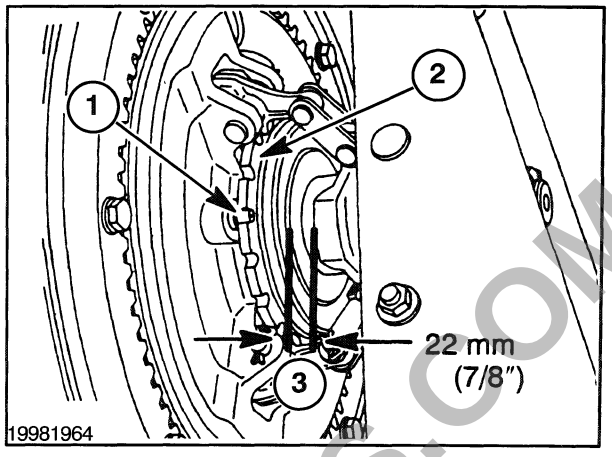



Figure 3-31

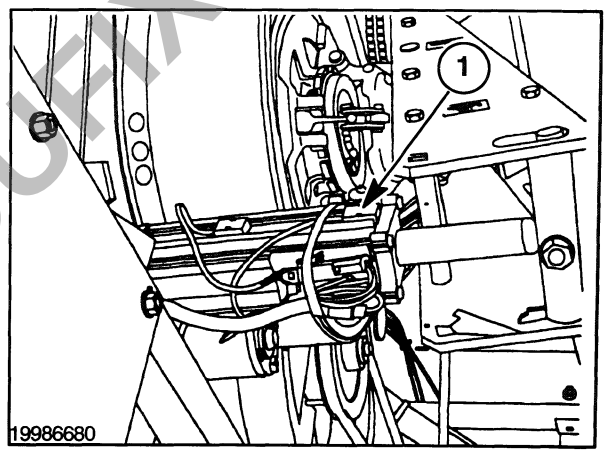



Figure 3-32

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### Removing the Differential Half Shafts

Removal of the differential half shafts (D or E, Figure 3-144):

1. Remove snap ring, 1, on the brake housing.
2. Slide out half shaft, 2.
3. Remove the brake housings by removing the three locknuts, 3, at the top.

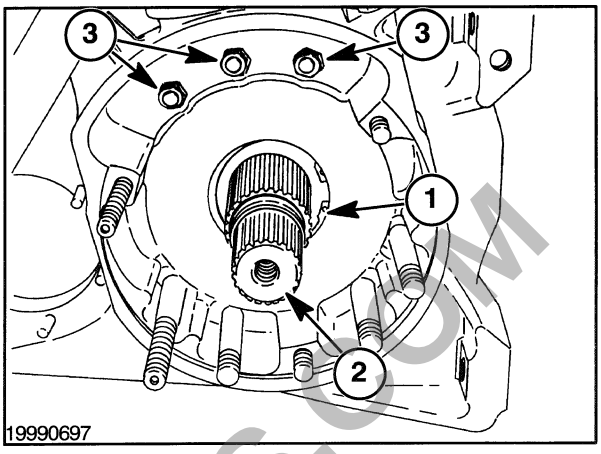



**Figure 3-148**

4. Pry the brake housing, 1, off, being careful of gasket, 2, between the transmission housing and the brake housing.
5. Repeat the process on the other side.

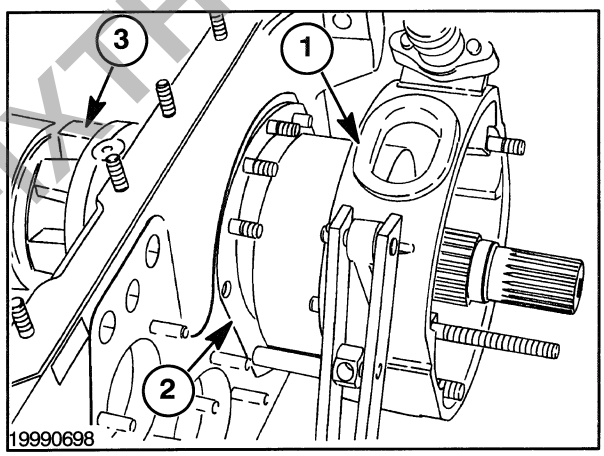



**Figure 3-149**

6. Remove the differential, 3, Figure 3-149, through the top of the transmission.

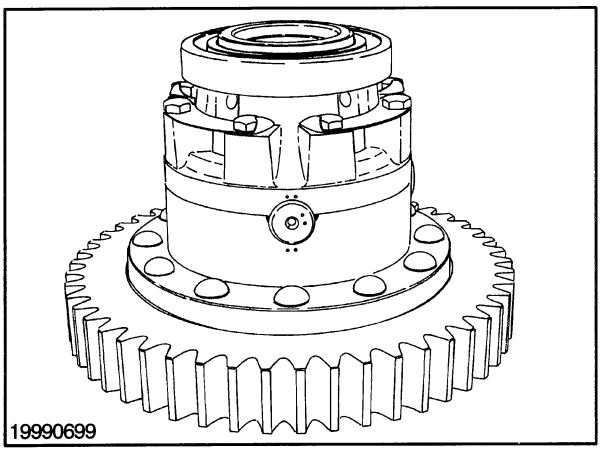



**Figure 3-150**

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6. Remove the cover sub-assembly, 1, from the hub.

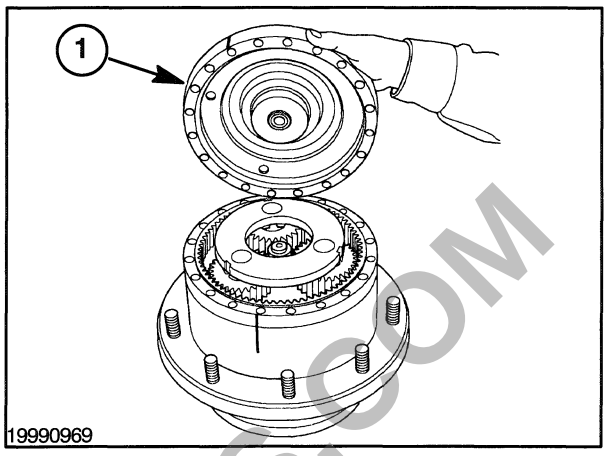



**Figure 3-241**

7. Remove the spacer, 1, from the input shaft.

   **NOTE: The gear ratio of the torque hub will determine the size and position of the input gear, 3, Figure 3-243, and the spacer, 1. Note this relationship during disassembly.**

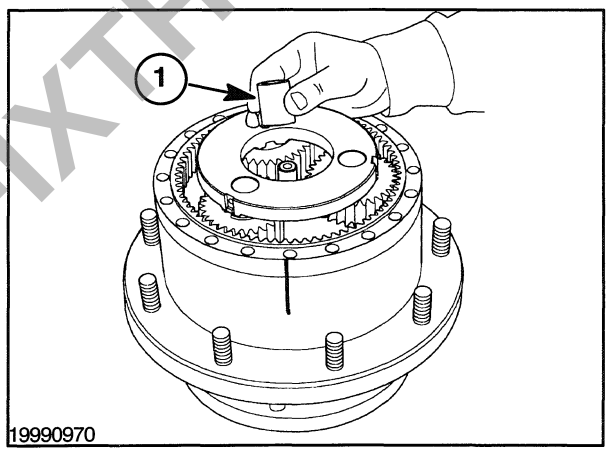



**Figure 3-242**

8. Remove the ring gear, 1, and carrier sub-assembly, 2.

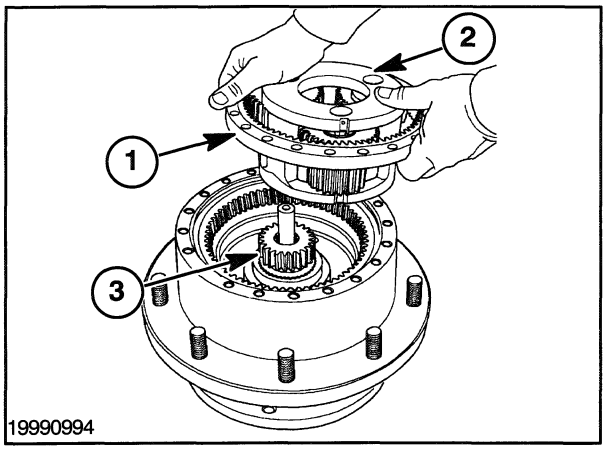



**Figure 3-243**

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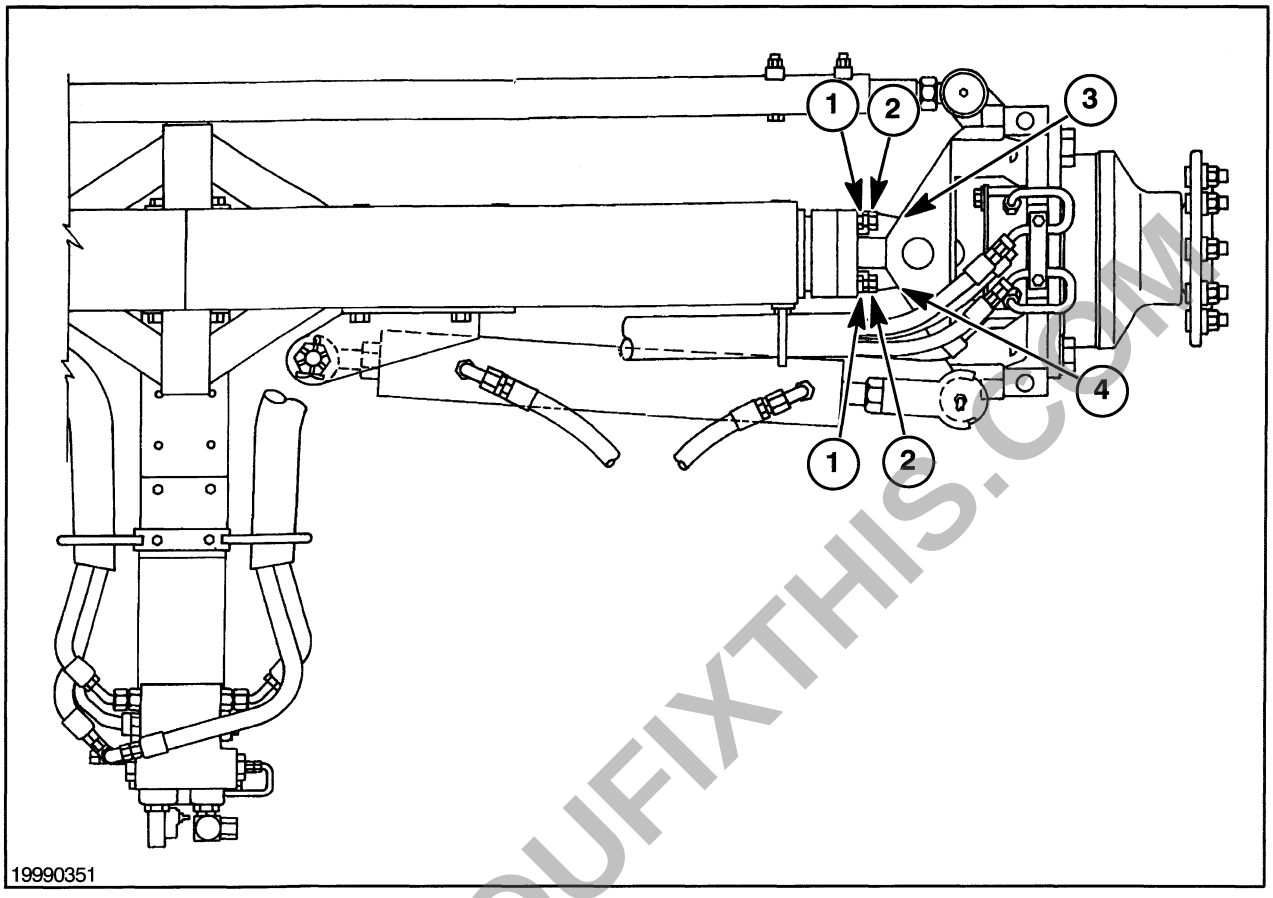



Figure 3-340

### Steering Stops

1. Park the combine on level ground in a clear area with the wheels pointing straight ahead.
2. Loosen the jam nuts, 1, and completely screw in all four stop bolts, 2.
3. Start and drive the combine slowly forward and turn the steering wheel one full turn to the right.
4. Stop the combine and adjust the left rear and right front stop bolts to touch the edge of the wheel motor mounting frame, 3 (left rear shown).
5. Tighten the jam nuts to 150 N·m (110 ft lbs).
6. Start and drive the combine slowly forward and turn the steering wheel to straight ahead then two full turns to the left.
7. Stop the combine and adjust the right rear and left front stop bolts to touch the edge of the wheel motor mounting frame, 4 (left front shown).
8. Tighten the jam nuts to 150 N·m (110 ft lbs).
9. Check for adequate tire clearance with narrow tread center settings and extreme axle oscillation with the wheels turned fully in both directions.
10. Make any necessary adjustments and return the wheels to a straight ahead position.

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7. Support cylinder block assembly, 1, on two blocks of wood with distributor mating surface, 2, facing up. Tap out each roll pin, 3, using a punch and hammer.

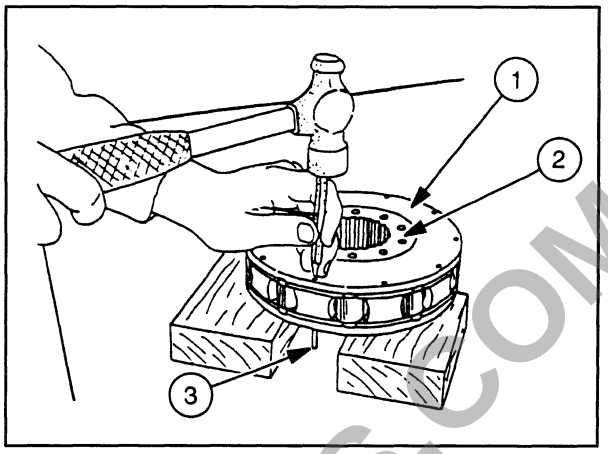



Figure 3-434

8. Remove piston/roller retainers, 1.

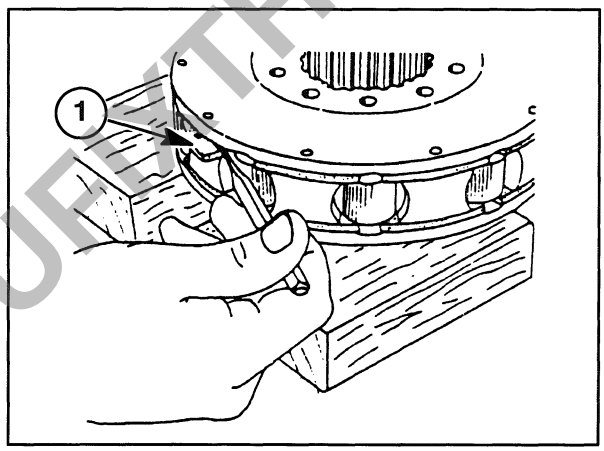



Figure 3-435

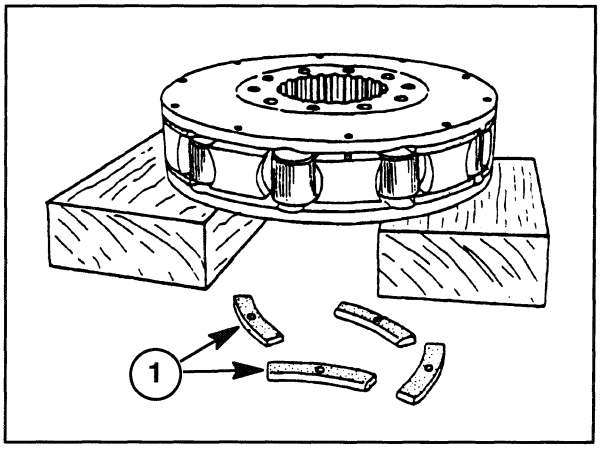



Figure 3-436



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## EVAPORATOR

The evaporator, 1, is in the air conditioning unit. The evaporator consists of a number of turns of continuous coils mounted in a series of thin cooling fins to provide maximum heat transfer in a minimal amount of space.

Low-temperature refrigerant in the evaporator absorbs heat from the hotter air in the operator's compartment, thereby cooling the air.

## BLOWER FAN

The blower fan, 2, is next to the evaporator. The fan draws warm air from outside the cab and forces it across the evaporator. The fan then blows the cooled air through the air conditioner outlets and into the cab. A three-speed switch controls the blower motor.

Although the fastest blower speed moves the most air through the system, a slower speed gives the air more time to exchange heat for cold as it passes through the cooling fins and coils of the evaporator. Therefore, the lowest fan speed produces the coldest air, although in less volume than at high fan speed.

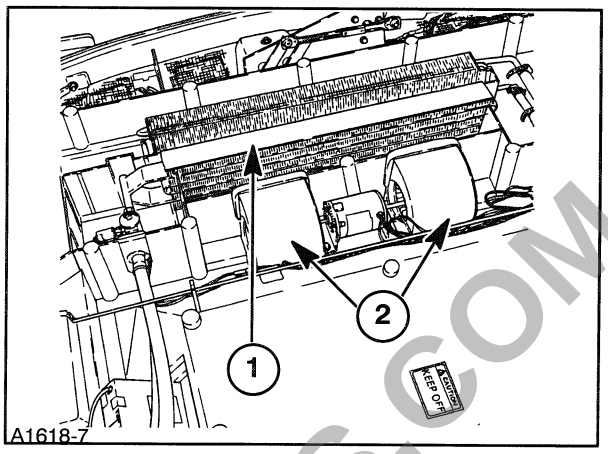



Figure 3-541

## SWITCHES AND CONTROLS

### Air Conditioner Temperature (Thermostatic) Control Switch

The thermostatic switch is a bellows-type switch, with a capillary tube filled with refrigerant. The capillary tube is inside the evaporator core and senses the temperature of the core. Because the temperature of the refrigerant in the tube directly affects the pressure in the capillary tube, it sends a pressure signal to the thermostatic switch. This pressure signal, along with the operatoR adjusted thermostat switch, acts to turn the compressor clutch on or off.

When the evaporator core cools down sufficiently, a pressure signal from the capillary tube acts to trip the thermostatic switch and shuts the power off to the compressor clutch. For a period of time, the compressor remains idle and the refrigerant flow stops. When this occurs, the evaporator core warms up and causes the capillary tube to detect this new (higher) temperature. Again the pressure signal sent to the thermostatic switch by the capillary tube trips the switch to activate the compressor clutch. This cycling of the compressor clutch will continue throughout the operation of the air conditioning system.



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5. Remove the reverser motor from the reverser gearbox by removing the four cap screws, 1. Slide the hydraulic motor out of the gearbox and place it in the railing post at the front of the access ladder.

   **NOTE: Do not disconnect the reverser hydraulic hoses or the hydraulic reservoir will drain.**

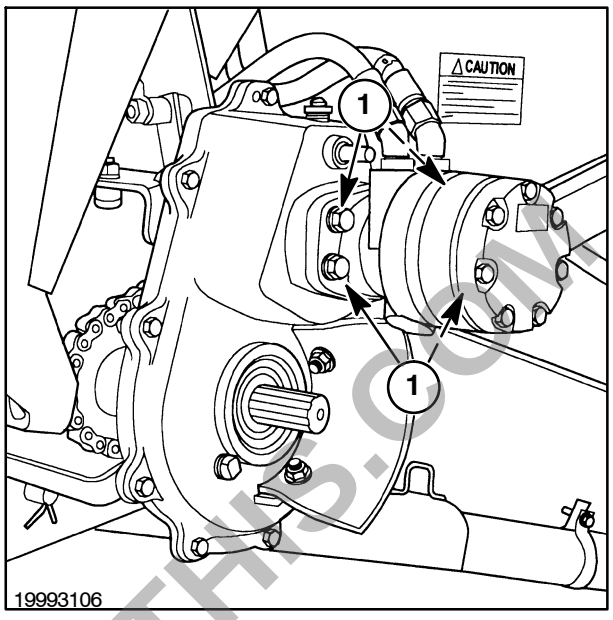



**Figure 4-6**

6. If the feeder is equipped with the optional Terrain Tracer™, disconnect the hydraulic hoses for the lateral float cylinders, 1, and lay the hoses on top of the feeder.

   **NOTE: The stack valve assembly with the optional reel fore-aft valve is shown. If the reel fore-aft system is not installed, the Terrain Tracer™ quick connectors will connect to the top stack valve.**

7. Disconnect any remaining hydraulic hoses.
8. Disconnect the electrical wiring harnesses.

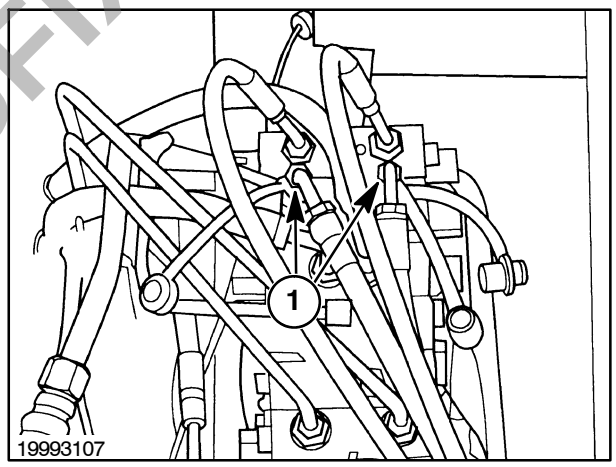



**Figure 4-7**

9. Lower the optional jack stand, 1, into position and insert pins. Lower the feeder to the ground. If a forklift will be used, disregard this step.

**CAUTION: THE FEEDER IS HEAVY. BE SURE THE FEEDER IS PROPERLY SUPPORTED AND RESTRAINED BEFORE REMOVING IT FROM THE BASE UNIT.**

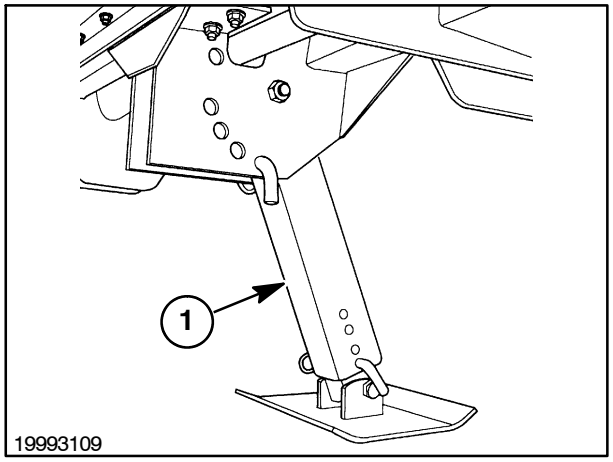



**Figure 4-8**

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## LABOR GUIDE

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

| Job | Labor-Hours |
|---|---|
| Header jackshaft belts, remove and install | 0.5 |
| Main drive belt, remove and install | 1.0 |
| Upper shaft idler, remove and install | 2.0 |
| Intermediate idler sheave, remove and install (fixed) | 2.0 |
| Intermediate idler sheave, remove and install (variable) | 2.5 |
| Variable speed motor, remove and install | 0.5 |
| Feeder ratchet clutch, remove and install | 0.5 |
| Upper shaft, remove and install | 6.0 |
| Stone roll, remove and install | 3.0 |
| Front drum, remove and install | 3.0 |
| Feeder floor, remove and install | 2.0 |
| Cradle, remove and reinstall | 1.5 |
| Feeder face plate, remove and reinstall | 1.5 |
| Reverser gearbox, remove and repair, replace and adjust | 2.5 |
| Reverser motor, remove, repair and replace | 2.0 |

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### Inspecting the Left Rotor Gearbox

1. Inspect bearings, gears, and shafts for wear and damage.
2. The bearing cones must fit tightly on the shaft.
3. The splines inside the gears should fit snugly on the splines of the shafts.

### Assembling the Left Rotor Gearbox

**NOTE: Grease the lips of all seals and coat all bearings with 80W-90 oil before installation.**

1. Install the spherical bushing, 2, in the output shaft and washer, 1, with the stepped (large diameter), side in. Grease the bushing.

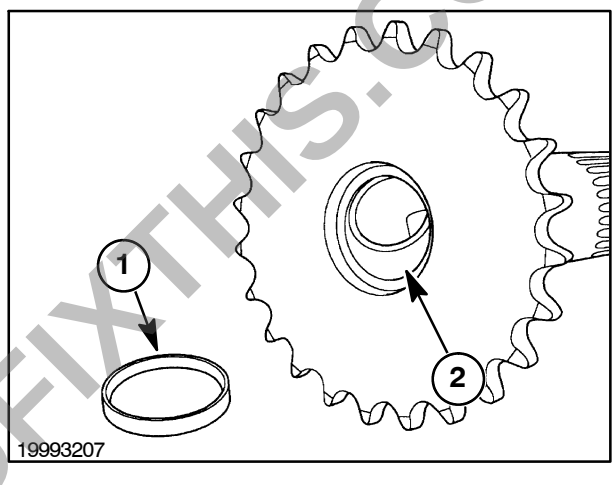



**Figure 4-248**

2. Press bearing cup, 3, into the housing.
3. Place seal, 2, on the output shaft. The seal must be installed with the lip pointing to the inside.
4. Press bearing cone, 1, on the output shaft as shown.

   *IMPORTANT: The bearing cups and cones must be kept as matched pairs.*

   Slide the output shaft assembly into the housing.

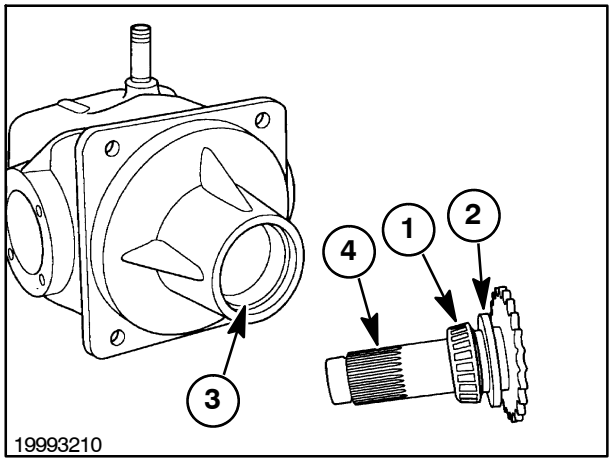



**Figure 4-249**

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3. **All units** - Use the ratchet handle (TR89), or the switch (TR99), in the cab to raise the concaves until the #5 rub bar, on universal or corn and soybean concaves or #7 on small grain and round bar concaves **lightly** contacts a swing gauge or the concaves are fully raised.
4. Level the concave front to rear using the following method:
   a. Place the swing gauge over rub bar #5, on universal or corn and soybean concaves or #7 on small grain and round bar concaves as shown.
   b. Lengthen or shorten the secondary link by loosening jam nut, 2, Figures 4-363 and 4-364, and turning turnbuckle, 3, as needed to make the concaves parallel to the rotors.

      Rotate turnbuckle, 3, Figures 4-363 and 4-364, a maximum of two turns before checking the opposite side.

      **NOTE: The amount of clearance between the swing gauge and the concave is not important as long as the clearance is the same at the front and the rear of each concave.**
   c. Lock jam nut, 2, Figures 4-363 and 4-364, on the secondary link.
5. Swing the swing gauges to the #1 rub bar as shown. Center the concaves using the following method:

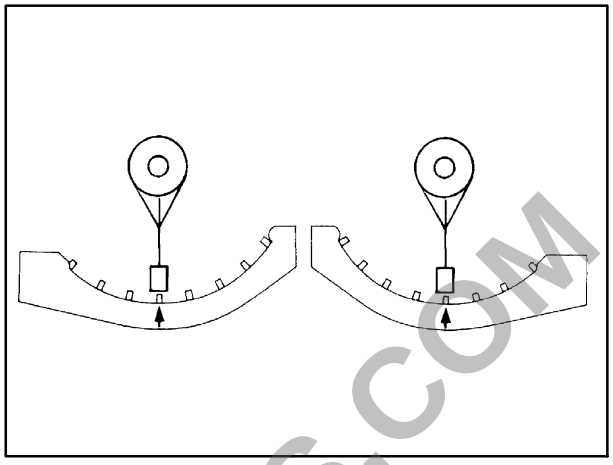


**Figure 4-365**

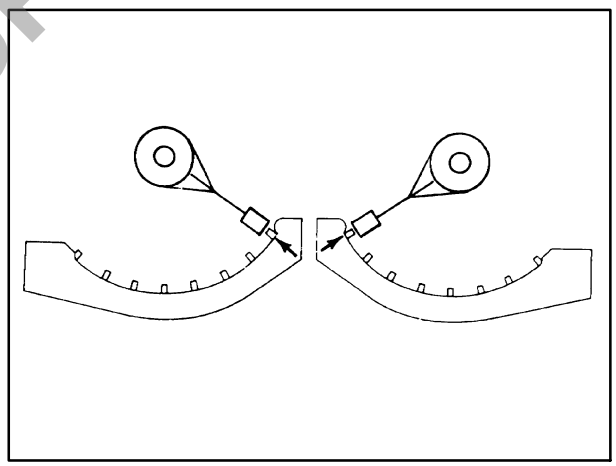


**Figure 4-366**

   a. Loosen the center divider clamp bolts, 1.

      **NOTE: The concaves may need to be lowered with the ratchet handle (TR89) or switch (TR99) to move the swing gauges to the #1 rub bar.**
   b. Raise the concaves with the ratchet handle (TR89), or the switch (TR99) in the cab until one of the swing gauges **lightly** contacts the #1 rub bar, Figure 4-366.

      If round bar concaves are installed, the concaves may not be raised enough to contact the swing gauge. Raise the concaves fully, and use feeler gauges to check clearances.

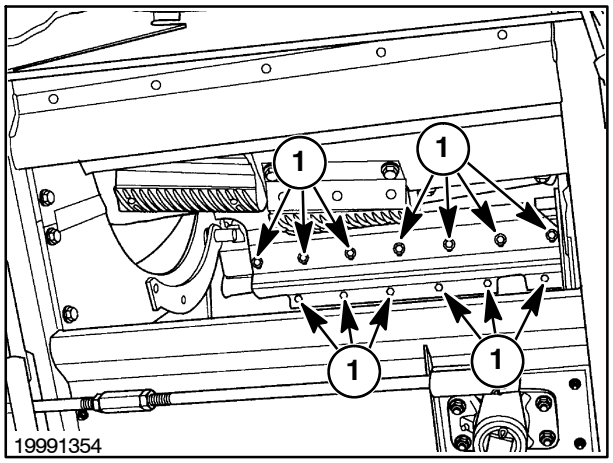



**Figure 4-367**



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## Assembly

1. The outside diameter of the fan must be 630 mm (24-13/16″) (see Figure 5-20).
2. Position the fan in the housing so the fan blades are parallel within 1.5 mm (1/16″) to the cut-off. The cut-off is where the blade passes the top area of the fan housing throat. Set the blade to clear the cut-off by 6.4 mm ± 1.5 mm (1/4″ ± 1/16″) (see Figure 5-20).
3. Position the fan so the end of the shaft is located 233 mm (9-5/32″) from the fan housing, as illustrated at right.

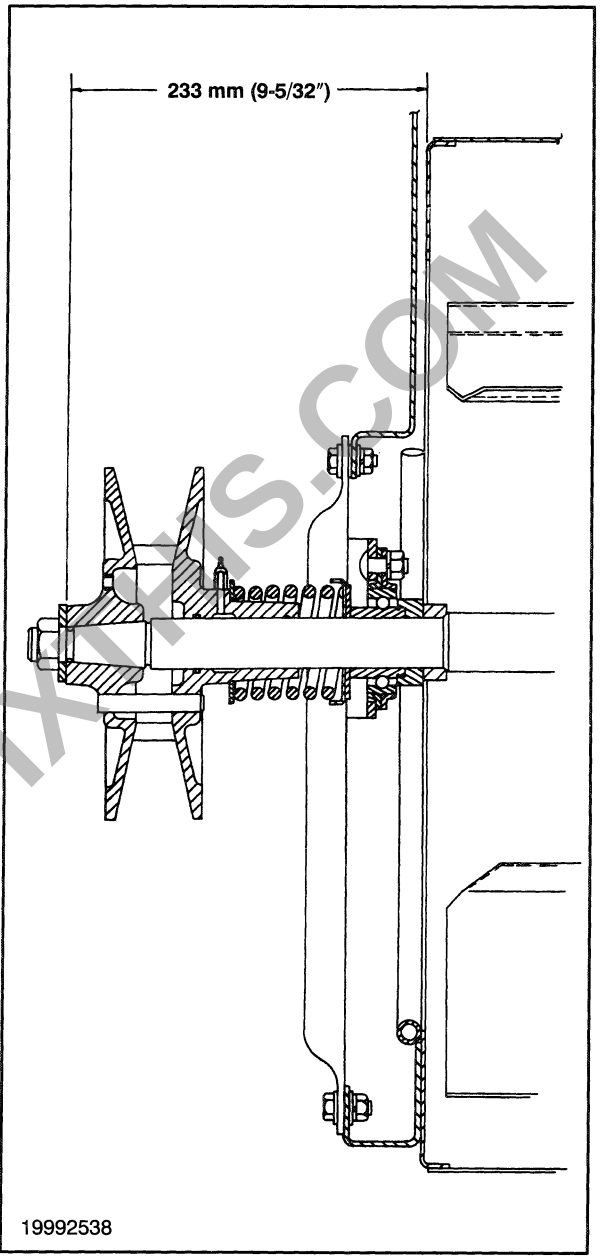



Figure 5-21

4. Assemble and adjust the wind boards so the arrow tabs at each end point to punch marks at 1, on the outside of the fan housing.

   When positioned this way, the wind boards should match the position dimensions of 70 mm ± 1.5 mm (2-3/4″ ± 1/16″). and 152.4 mm (6″), shown in Figure 5-20.

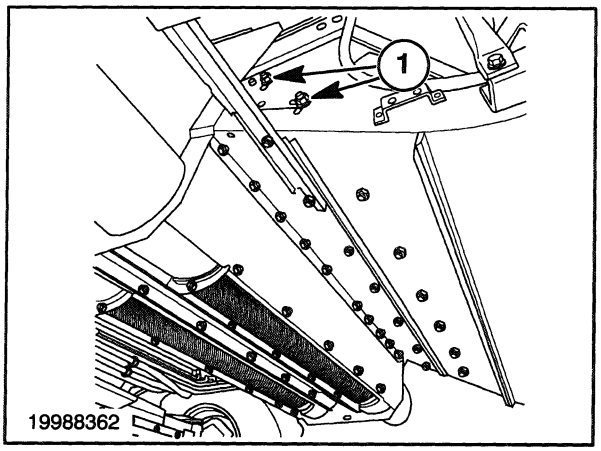



Figure 5-22



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3. Remove the two hex socket-head bolts, 1, (one on each side) securing the output shaft spacer.
4. Remove the cotter pin, 2, nut, 3, and washer, 4, securing the bevel gear, 5, on the output shaft.
5. Use a hammer and a soft (aluminum or brass) drift to drive out the output shaft with the bearings and seals, then remove the bevel gear.

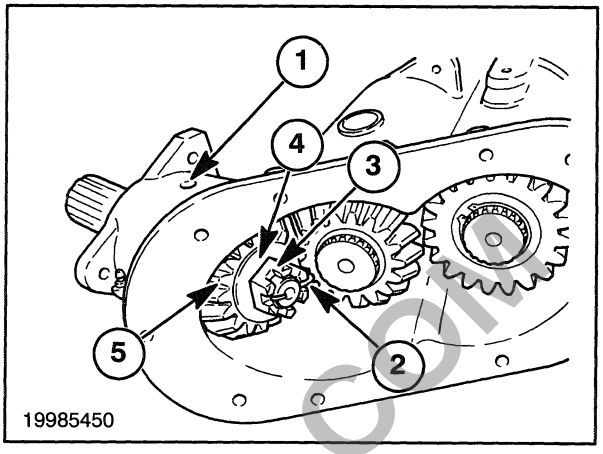



Figure 5-143

6. Use a hammer and a soft (aluminum or brass) drift to drive out the input shaft, 1, with spur gear and bearing cone.
7. Remove the input shaft seal, 2, then remove the bearing cone, 3. Be sure to keep the bearing cone with the input shaft.

**NOTE: When removing shafts and bearings, be sure to keep the bearing cones with the bearing cups. The cone and cup sets are matched and must not be mixed.**

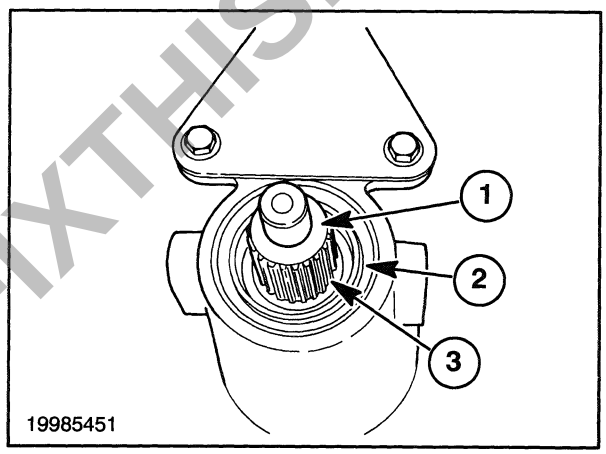



Figure 5-144

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