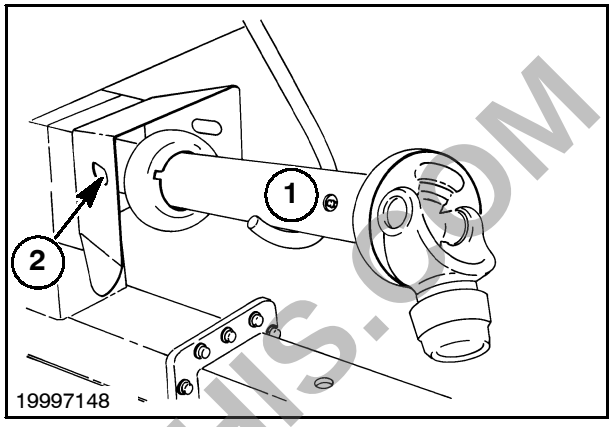
**Op. 31 201**

## TRACTOR PTO REPAIR

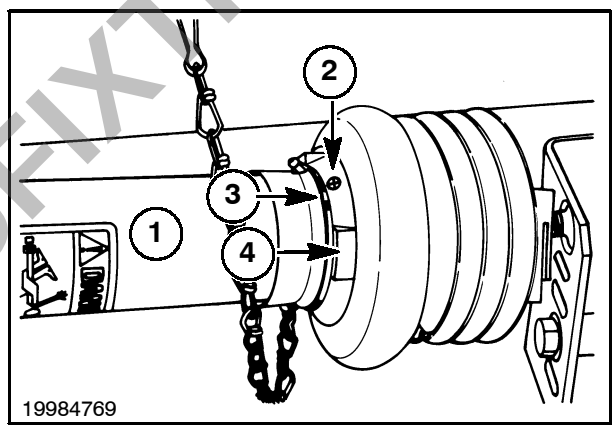
### Removal

1. The front PTO section, 1, can be removed by just sliding it off.
2. To remove the rear section, take off the shield, 2, over the rear U-joint.



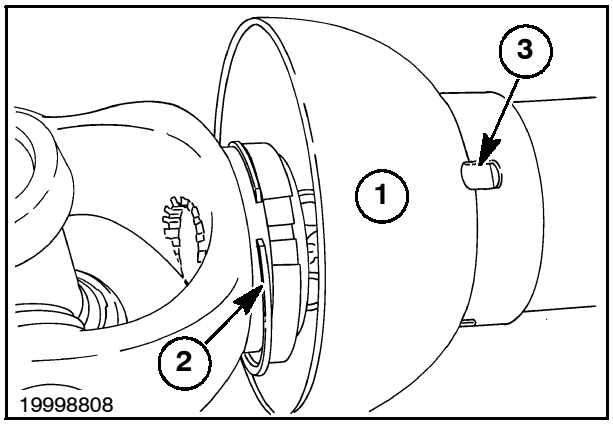

4

3. On a Walterscheid PTO, remove the plastic shield, 1. The shield on the front and rear PTO sections are removed the same way. Take out the screw, 2. Rotate the shields until the tabs, 3, align with the notches, 4. Slide the shield off.




5

4. On an FP230 harvester remove the steel shield, 1, from the PTO. Pry the end of the retaining ring, 2. Use a screwdriver through one of the holes, 3, in the shield.

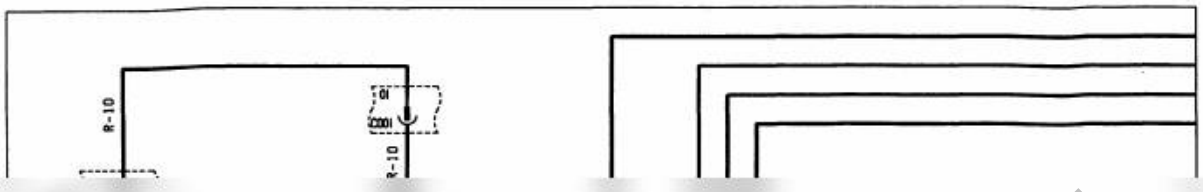



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# MINIMUM HARDWARE TIGHTENING TORQUES

## IN FOOT POUNDS (NEWTON-METERS) FOR NORMAL ASSEMBLY APPLICATIONS

### METRIC HARDWARE AND LOCKNUTS

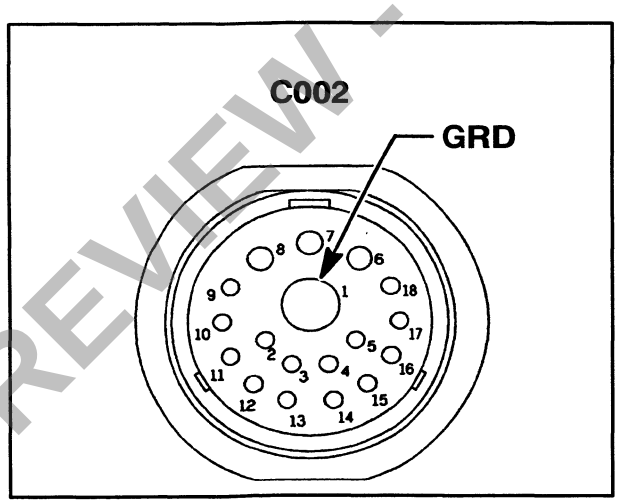
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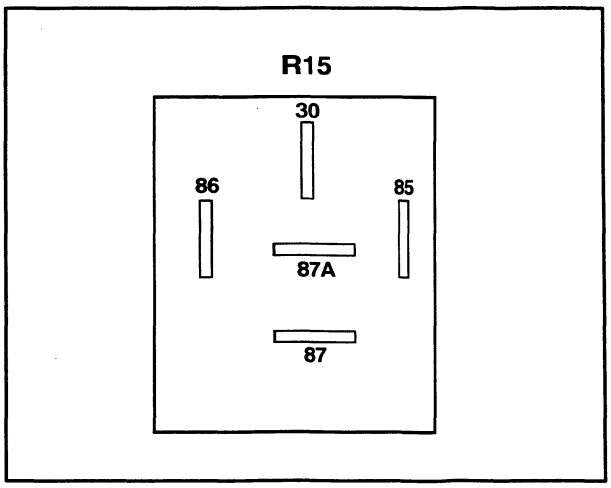
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**Problem: No power**

| | Step | Test | Result | Correction |
|---|---|---|---|---|
| 1 | Disconnect power source from tractor | Voltage, across tractor terminals | 12 volts<br>0 volts | Proceed to next step<br>Locate problem on tractor |
| 2 | Connect power source<br>Open control box | Voltage, on-off switch, red wire, to black grd wire | 0 volts<br>12 volts | Replace 10 amp fuse<br>Proceed to next step |
| 3 | Turn power switch, S01, on | Voltage, on-off switch, orange wire, to black grd wire | 0 volts<br>12 volts | Replace switch<br>Proceed to next step |
| 4 | Remove relay on harness, R15 | Conductivity, 85 to grd on harvester | Conductivity<br>No conductivity | Proceed to next step<br>Check ground wires |
| 5 | | Voltage, 30 to 85 | 12 volts<br>0 volts | Proceed to next step<br>Check red wire to relay |
| 6 | | Voltage, 86 to 85, power on | 12 volts<br>0 volts | Proceed to next step<br>Check diode, D05 and orange wire to diode |
| 7 | | Voltage, 87A to 85, power off | 12 volts<br>0 volts | Proceed to next step<br>Replace relay |
| 8 | Disconnect tractor to harvester connector, C002. Install relay | Voltage, socket 6, 7 & 8 to 1, power on | 12 volts<br><br>0 volts | Check connector and orange wires in harness<br>Proceed to next step |
| 9 | Remove relay R15 | Conductivity, 87 to pin holes 6, 7 and 8 on C002 connector | Conductivity<br>No conductivity | Replace relay R15<br>Check orange wire from R15 to C002 |




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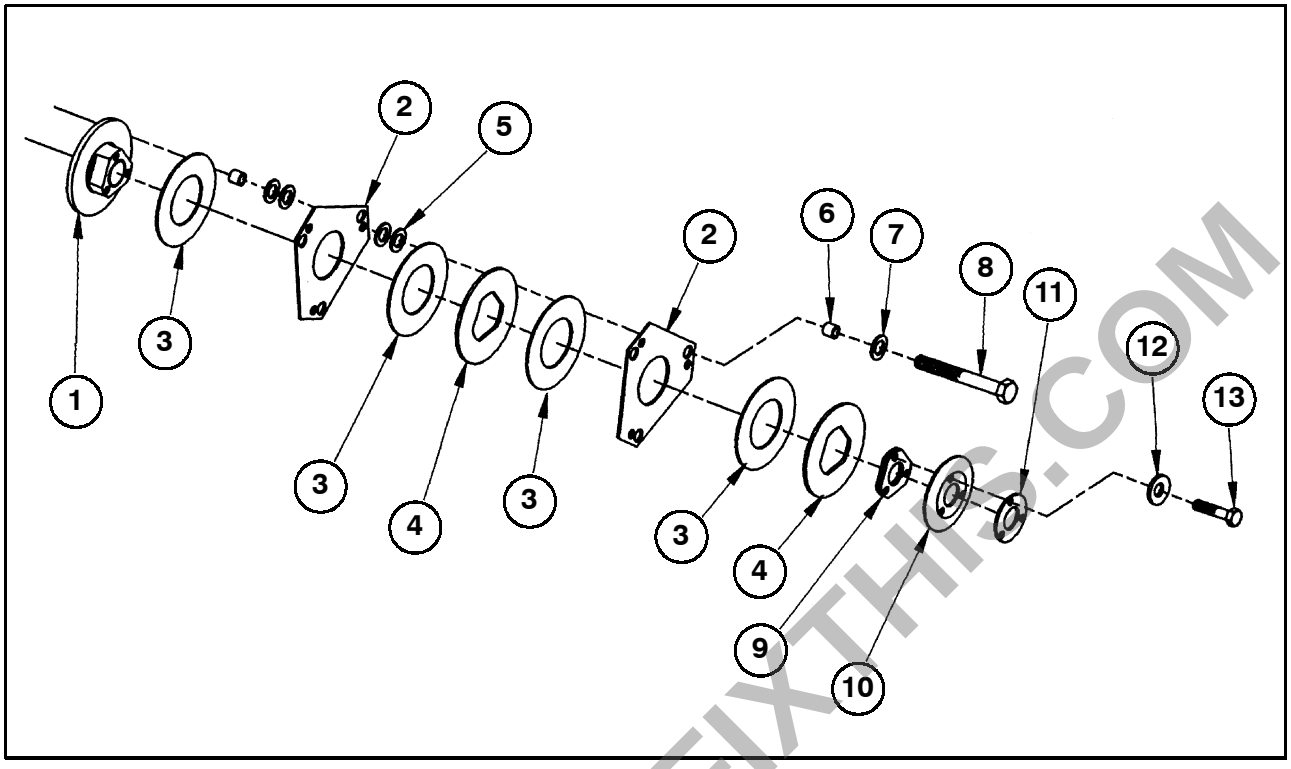



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**PARTS LIST – FP230 BLOWER CLUTCH**

| | |
|---|---|
| 1 | HUB |
| 2 | PLATE |
| 3 | BRAKE DISC |
| 4 | CLUTCH PLATE |
| 5 | SHIMS |
| 6 | SPACER |
| 7 | WASHER |
| 8 | BOLT - 1/2 x 4-1/2 |
| 9 | SHIMS |
| 10 | SPRING WASHER |
| 11 | RETAINER |
| 12 | LOCK WASHER |
| 13 | BOLT – 3/8 x 2-1/4 |

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# SECTION 00 - GENERAL INFORMATION

**BOOK 1 - 86900643**

## Chapter 1 - General Information

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# SECTION 31 - IMPLEMENT DRIVELINES

**BOOK 1 - 86900643**

## Chapter 1 - Driveline

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# SECTION 31 - IMPLEMENT DRIVELINES

**BOOK 1 - 86900643**

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# SECTION 31 - IMPLEMENT DRIVELINES

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## Chapter 5 - Drives

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| 31 260 | Top Feedroll U-joint and Clutch Repair | 18 |
| 31 260 | Top Feedroll U-joint and Shearbolt Hub Repair | 24 |
| 31 250 | Attachment Drive PTO Repair | 28 |


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# HARVESTER SETTINGS AND TOOLS

## SPECIAL TORQUES

| Description | Torque |
|---|---|
| Wheel Bolt (all tires) | 120 N·m (90 ft.-lb.) |
| Blower Slip Clutch | 746 to 881 N·m (550 to 650 ft.-lb.) |
| Blower Slip Clutch, center bolt | 174 N·m (128 ft.-lb.) |
| Cutterhead Slip Clutch | 2350 N·m (1733 ft.-lb.), with an allowance of +10% to –5% = 2233 to 2585 N·m (1646 to 1906 ft.-lb.) |
| Upper Feedroll Jaw Clutch | 881 to 949 N·m (650 to 700 ft.-lb.) |
| Electric Clutch | 2210 N·m (1630 ft.-lb.) |
| Lower Feed Roll Hub Bolt (metal detector) | 15-22 N·m (20-30 ft.-lb.) |
| Cutterhead Bearing Rolling | 13-20 N·m (10-15 ft.-lb.) |
| Knife Bolt | 237-271 N·m (175-200 ft.-lb.) |
| Knife Holder Bolt | 230 N·m (170 ft.-lb.) |
| Shear Bar Bolt | 89 N·m (66 ft.-lb.) |
| Hold-Down Clamp Bolt | 89 N·m (66 ft.-lb.) |
| PTO Bolts | 224 N·m (165 ft.-lb.) |
| Sharpening Slip Clutch | 100 – 120 N·m (74 – 88 ft.-lb.) |
| **Bevel gearbox** | |
| Output Shaft - rolling | 0.9 to 1.6 N·m (8 to 14 in.-lb.) |
| Input Shaft - additional rolling | 1.7 to 2.8 N·m (15 to 25 in.-lb.) |
| Input & Output Shaft - combined rolling | 3.7 to 4.4 N·m (33 to 39 in.-lb.) |

## ADJUSTMENTS

| | |
|---|---|
| Tire pressure (all tires) | 200 kPa (30 psi) |
| Gear backlash | 0.15 to 0.38 mm (0.006 to 0.015″) @ 63.5 mm (2.5″) on input shaft |
| Bevel gearbox shims | Bearing code + Housing code + 4 = shim thickness in thousands of an inch. |
| Paddle End Clearance | 0.76 to1.0 mm (0.030 to 0.040″) |
| Processor Roll Gap | Minimum 2.4 mm (3/32″) |

## SPECIAL TOOLS

Burnishing Resistor . . . . . 859959

Resistor Adapter . . . . . 86605901

Attachment Shaft Hub . . . . . 86521513

Portable Diagnostic Tool (with case, cable and cartridge) . . . . . FNH7ESPH95

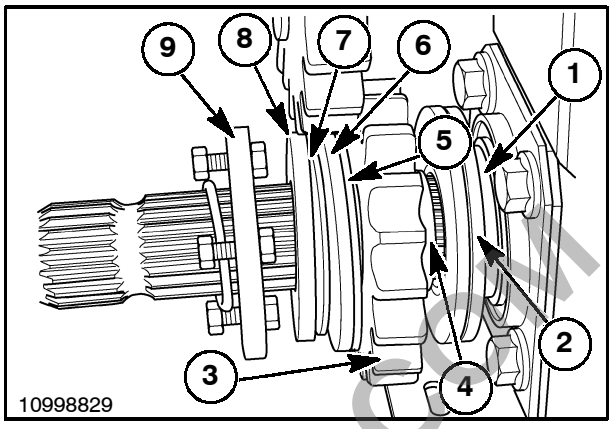
Portable Diagnostic Cartridge and Adapter (cable only) . . . . . FNH8ESPH95

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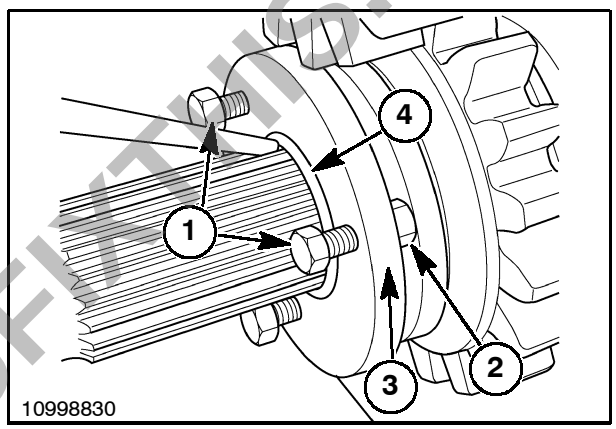
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8. Install a clutch plate, 1, a clutch disc, 2, the gear, 3, with a bushing, 4, inside the gear, a clutch disc, 5, a clutch plate, 6, the spring washer, 7, with the concave facing in, a large washer, 8, and clamping plate, 9.



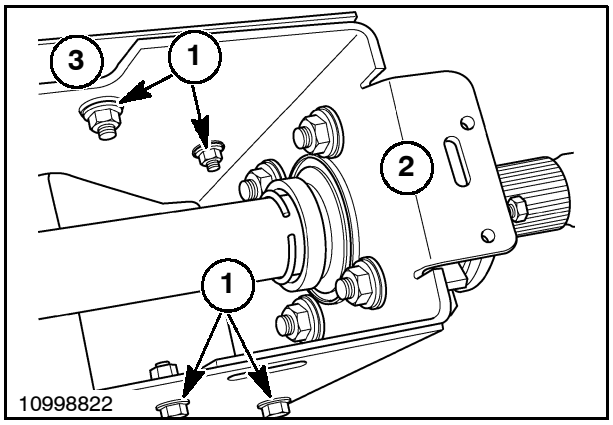

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9. Start the three clamping bolts, 1, into the nuts, 2. The nuts must be against the plate, 3, and the bolts not protruding beyond the nuts.
10. Install the retaining ring, 4.




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11. If a new shaft is installed, loosen the bolts, 1, between one of the bearing mounts, 2, and the shield, 3.



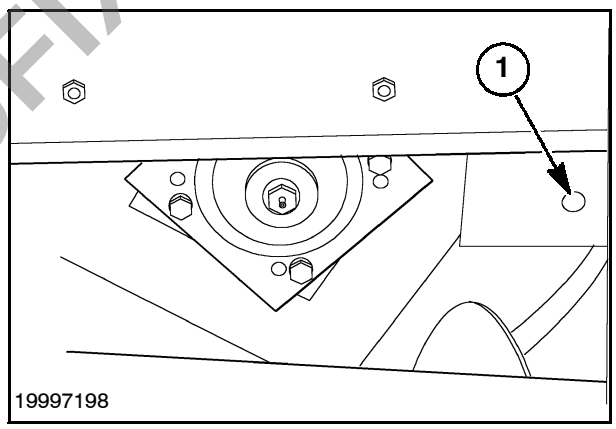

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10. Seat the hub, 1, (Figure 43 for a FP230 or Figure 44 for a FP240) on the blower shaft with anti-seize in the spline. Use a short piece of large diameter tubing to drive the hub in the tapered spline of the shaft.
11. Install the blower clutch. The inner assembly can be bolted to the blower. If the inner assembly was not kept together, assemble the parts, 2 through 8, as shown. The outer spacer, 6, goes through the large holes in the outer plate, 2. The bolt, 8, goes through the small holes in the inner plate, 2. The shims, 5, are used to locate the blower in the center of the housing. If the original location of the shims is not known, start with two on each side of the inner plate, 2. Each bolt gets a flanged nut and lock washer on the other side of the blower.
12. Add the last clutch disc, 3, and pressure plate, 4. Assemble the shims, 9, the spring washer, 10 and the retainer, 11, with the three bolts, 13, and lock washers, 12. Install the assembly on the end of the shaft.
13. Install a 3/4″ shaft through the blower housing at 1, to keep the fan from rotating so the hardware can be tightened.



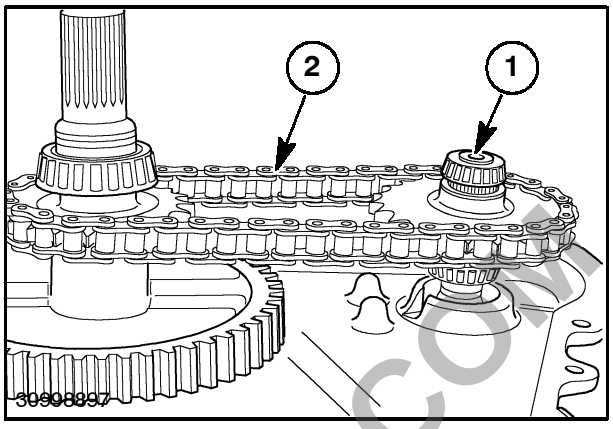

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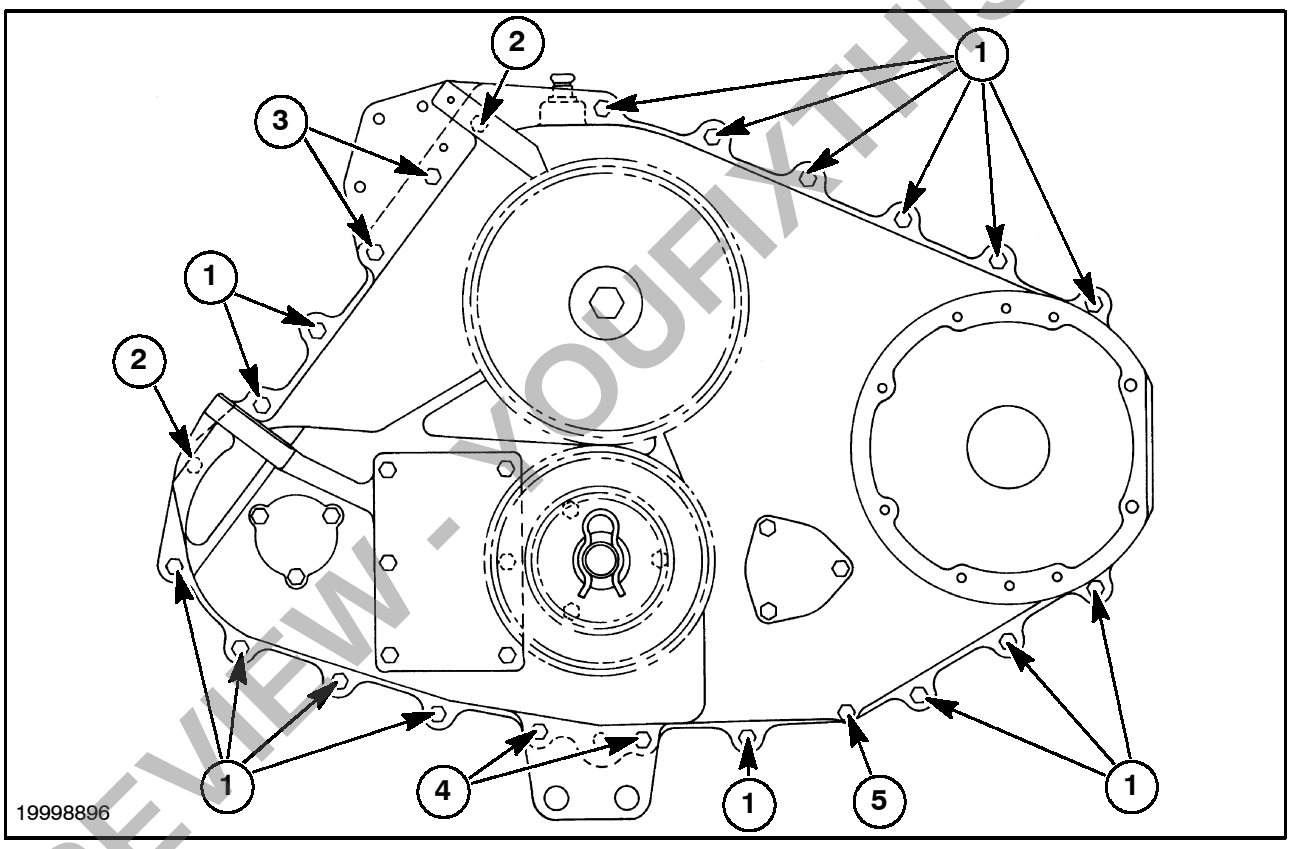
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11. Install the attachment drive shaft, 1, and drive chain, 2.
12. Apply Loctite 515 gasket eliminator to the flange of the right gearbox housing.
13. Place the left half of the gearbox housing in position.




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14. Fasten the gearbox halves together as shown.



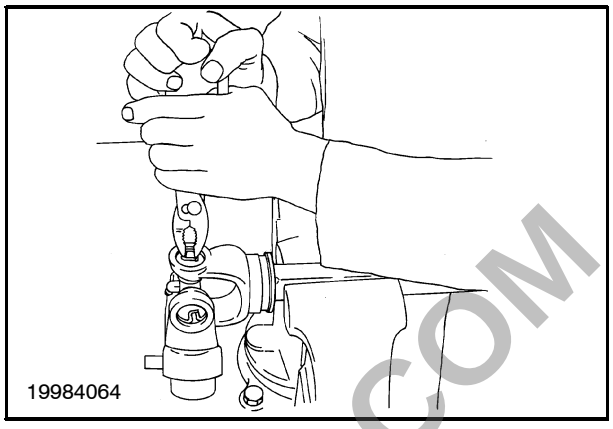

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**1.** 3/8″ x 1-1/4″ cap screw, lock washer and nut
**2.** 3/8″ x 1″ cap screw and lock washer
**3.** 3/8″ x 1-1/2″ cap screw, lock washer and nut
**4.** 3/8″ x 1-3/4″ cap screw, lock washer and nut
**5.** 3/8″ x 1-1/4″ cap screw and lock washer

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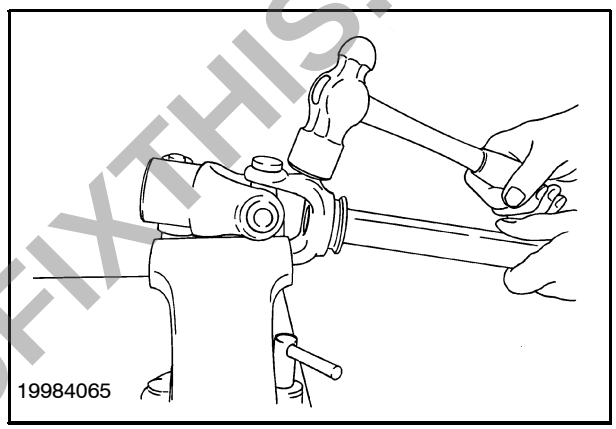

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**Repair**
Remove the four retaining rings on the cross to be repaired.




7

Set the U-joint across the open jaws of a vise and drive the bearing cap out of the yoke.




8

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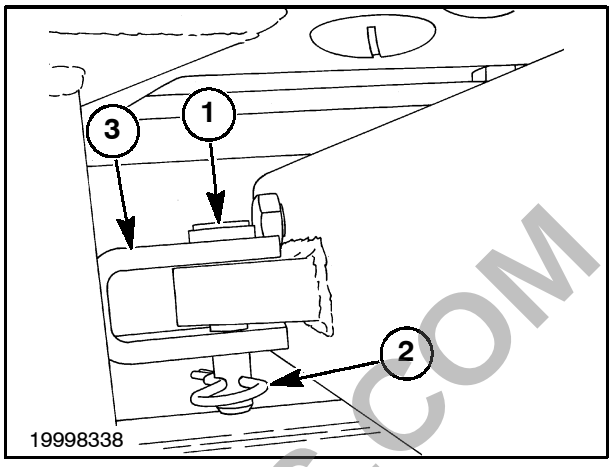
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**Op. 35 528**

## TONGUE SWING CYLINDER REPAIR

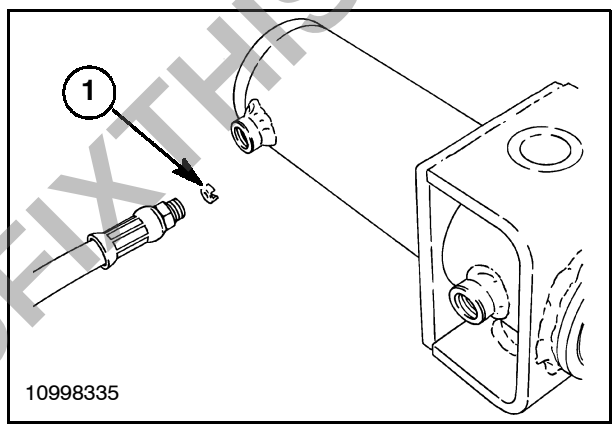
### Removal

1. Move the hydraulic cylinder, 3, to align the pin, 1, with the hole in the top of the frame. Remove the hydraulic pressure from the cylinder.
2. Remove the hairpin cotter, 2, and pull out the pin.



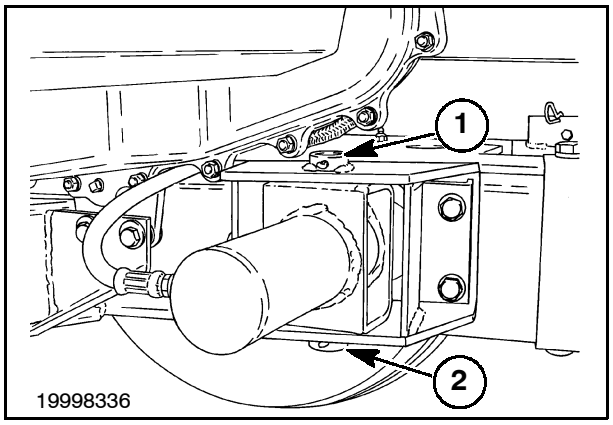

7

3. Take the hydraulic hoses loose from the cylinder. There is an orifice, 1, in each line. Be careful not to lose the orifice. Make note of the direction in which the orifice is installed; slotted side in toward the cylinder.




8

4. Take out the cotter pins, 1 and 2. Add penetrating oil to the pivot pins. Pry out the pins from the inside. The cylinder is now free to be removed.

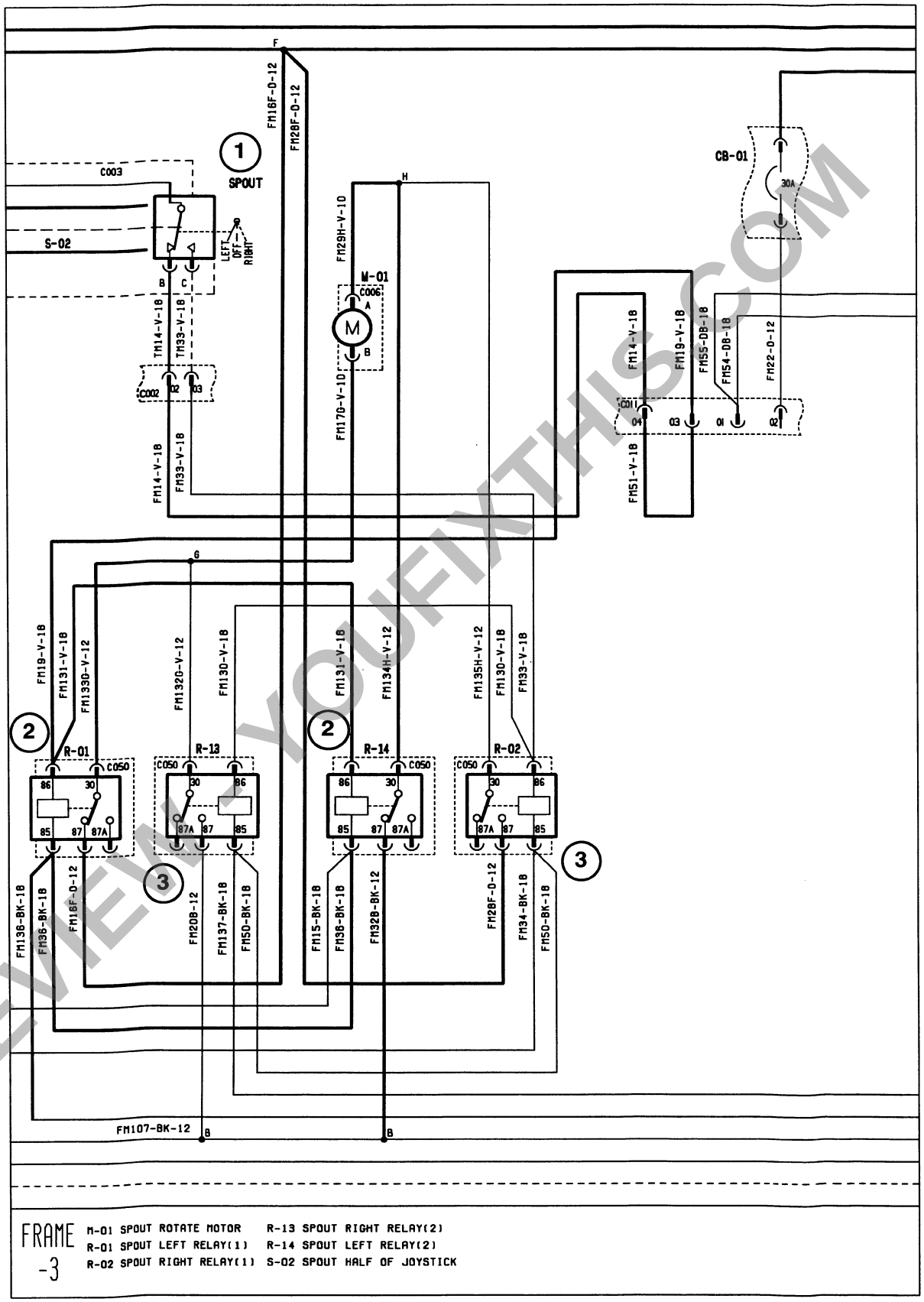



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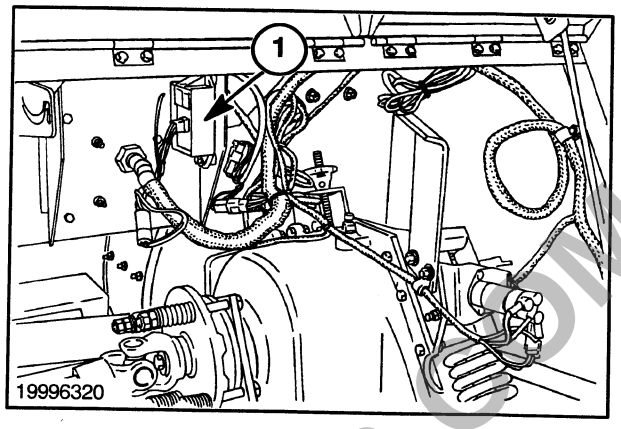

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**Light Circuit (Frame 6)**

A light module, 1, changes some of the signals from the tractor lights. This causes the lights on the harvester to operate according to the ASAE standards for towed agricultural equipment.




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**Figure 22**

The light circuit operates the tail, turn, brake and hazard lights, 1, from the tractor. A connector is provided to operate the harvester lights in conjunction with the tractor lights. The tongue harness contains a plug, 2, for connecting to a current model New Holland tractor. Power is routed along the tongue harness to the light module, 3, located on the front side of the main electrical panel.

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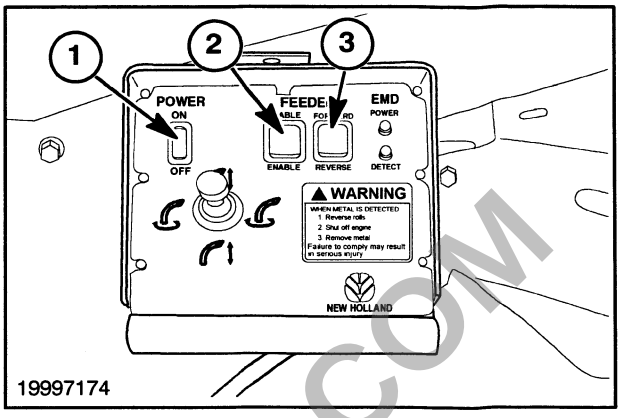
**Op. 55 618**

## POWER, ENABLE AND FEED ROLL SWITCHES

The POWER switch, 1, is a single-pole, single-throw switch. It allows current to pass to the joystick switch, enable switch, metal detector (if equipped) and latch relay (R08). The power relay is also energized directly from the power switch.

The ENABLE switch, 2, is a momentary single-pole, double-throw switch which sends power to the feed roll direction switch. It must be depressed when operating the feed rolls in reverse. It must be pressed and released when operating the feed rolls in forward.

The feed roll DIRECTION switch, 3, is a double-pole, double-throw switch which controls the direction of the feed rolls by activating the appropriate clutch on the reversing gearbox. It is a momentary contact in the reverse direction and latches in the forward direction.




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To test the POWER switch:

1. Open the control box.
2. Pull off the wires on the switch.
3. Measure the resistance across the spades with the switch on and off.
4. If there is not a high ohms reading with the switch off and a low reading with the switch on, replace the switch.
5. The red wire goes on the horizontal spade.

To test the ENABLE switch:

1. Open the control box.
2. Remove the top and center wires from the enable switch.
3. Measure the resistance with the bottom enable switch on and off. A low reading with the switch open and a high reading with the switch closed indicate that that half of the switch works properly.
4. Put the top wire back on the spade; remove the bottom wire.
5. Measure the ohms the same as the other half of the switch.
6. If any of the readings are not as expected replace the switch.

To test the DIRECTIONAL switch:

1. Open the control box.
2. On the directional switch, remove the short orange wire from the enable switch and the violet wire.
3. Measure the resistance with the switch in reverse position. There should be a low resistance reading. There should be a high reading with the switch in neutral.
4. Replace the wires.
5. Remove the other orange wire and the red wire.
6. Measure the resistance with the forward switch on and off. The switch should have a high resistance when the switch is open and a low resistance when it is closed.
7. If the switch does not pass this test, replace it.



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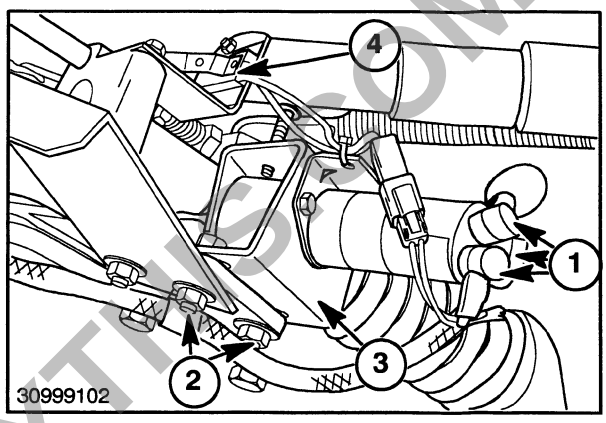
**Op. 55 800**

## STOP SPRINGS REPLACEMENT

Two springs are used to absorb the rotational energy of the feed rolls and reversing gearbox when metal is detected and the stop pawl drops onto the ratchet wheel. The stop pawl attaches to a slide which is supported by the two springs.

### Removal

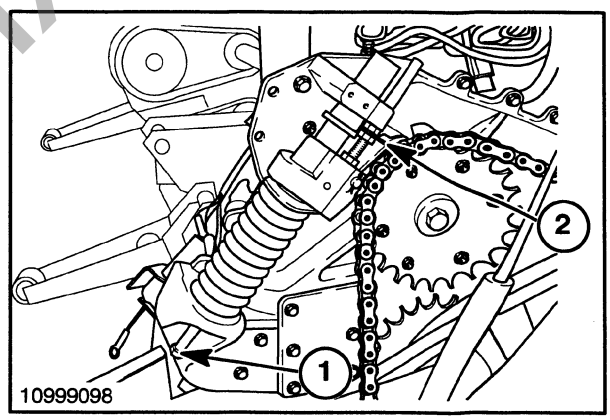
1. Pull wire boots, 1, back and disconnect three wires from solenoid terminals.
2. Remove bolts, washers and nuts, 2, securing solenoid mounting bracket, 3, to the gearbox. Bracket and solenoid will hang from cable as an assembly.
3. Remove the pawl switch, 4.




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4. Remove bolt, lock washer and washer from the bottom of the pin. Insert a 5/8" bolt of at least 155 mm (6") into the bottom of the pin at 1.
5. Tap on the head of the bolt, driving the pin out the top of the gearbox support. Once the pin is loose, remove the bolt from the bottom of the pin. The springs, slide assembly, pin and washer can then be removed.

***NOTE:*** *The pawl switch actuation tab, 2, may require adjusting to clear the gearbox support.*




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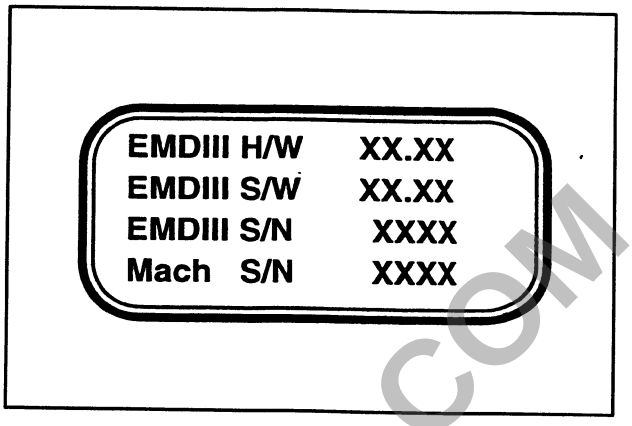
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## MAIN MENU OPTIONS

### 1 - SYSTEM ID

To select the System ID option:

1. Press the "1" key on the keypad. The System ID display screen shows the electronic hardware, software, and ECU serial number information. It also displays the serial number of the original base unit. The first line is the component level and the second is the software level. The third line is the sensor serial number. By comparing the last line, the machine serial number, with the serial number on the base unit, you can determine whether the sensor has been replaced.
2. Press the MODE key to return to the Main Menu.

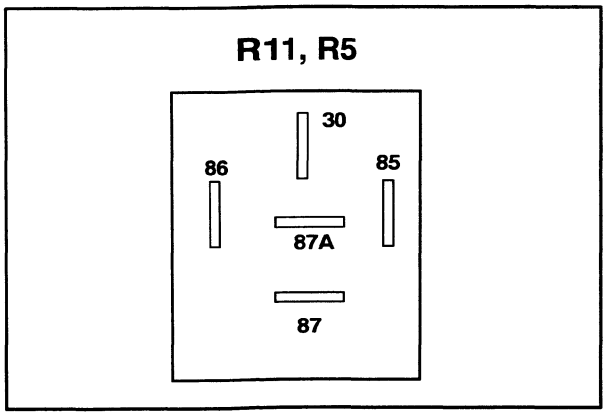



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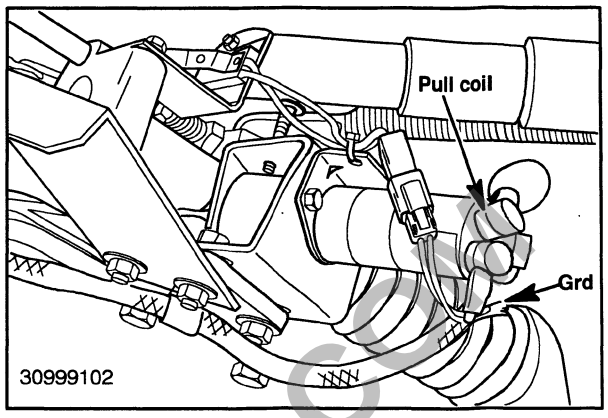
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**Op 55 000**

## OVERVIEW

The following **Quick Checks** can be used to determine if the electrical system on an FP230-240 non-metal detector system will operate properly. The Quick Checks will isolate where in the electrical system a problem is located when a test is failed.

In order for the electrical system to operate properly it must pass all of the following checks.

1. Control Box Connector Check
2. Relay, Diode, Circuit Breaker and Arc Suppression Module Check
3. Wire Harness Check
4. Power Out Check
5. 12 Volts Constant Check
6. Grounds Check
7. Diode-Relay Receptacle Wiring Check

The control Box for both non-metal detector and metal detector units are identical and test the same. The rest of the non-metal detector electrical system is similar but has fewer relays, diodes, circuit breakers and fuses.

To correct a specific electrical problem the **Troubleshooting Charts** can be used. The charts are a step by step procedure to locate the source of an electrical malfunction such as:

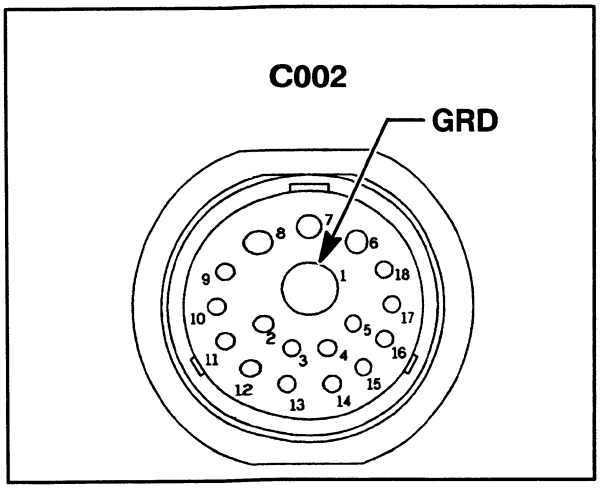
1. No power
2. Spout does not turn right
3. Spout does not turn left
4. Spout does not turn
5. Deflector does not go down
6. Deflector does not go up
7. Deflector does not move
8. No forward clutch
9. No reverse clutch
10. All the trailing lights are out
11. Amber light is out
12. Red taillight is out
13. Red flashing light is out
14. Red brake light is out

The **Wiring Diagrams and Connector Pin Locations** for non-metal detector units are in the back of this chapter. For an explanation of the diagrams and how the circuits work, refer to chapter 1.

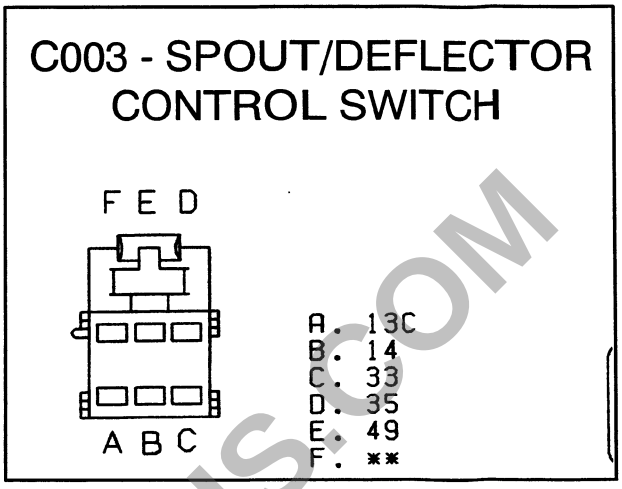
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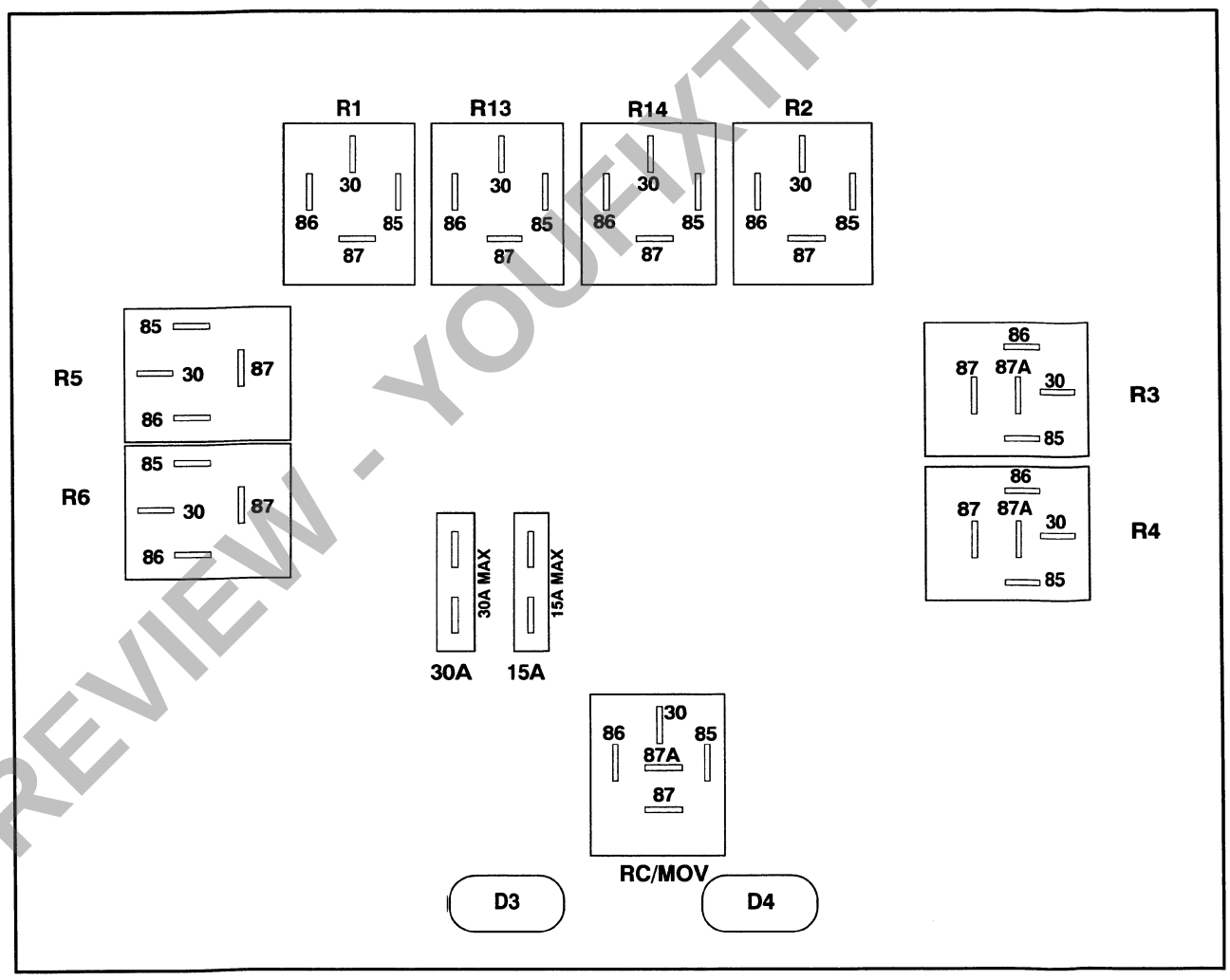
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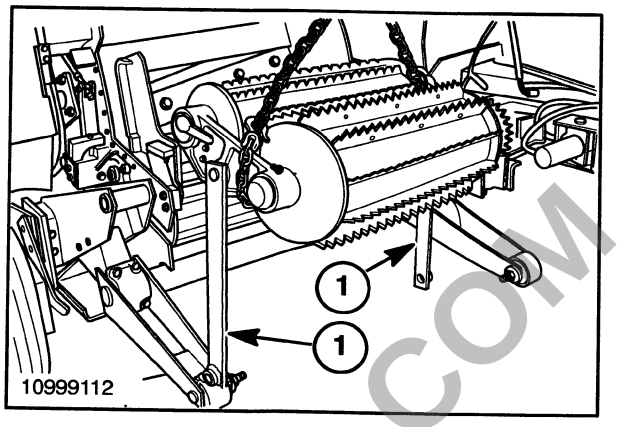
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**Installation**

**⚠ WARNING ⚠**

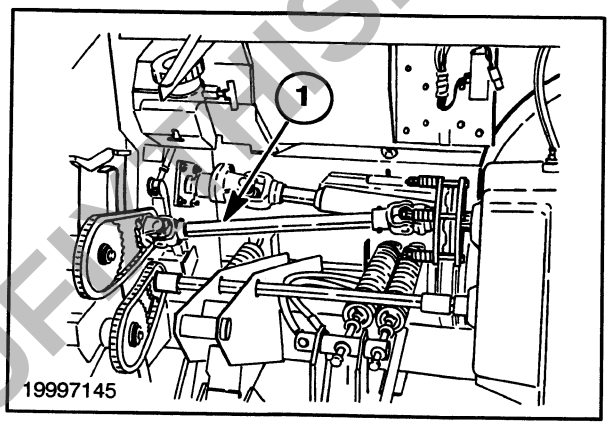
**Upper feed roll assembly weighs approximately 59 kg (130 lb.).**

1. Using a hoist, position the feed roll assembly over harvester throat. Lower assembly into feed roll side sheets and allow to rest on side sheet stops.
2. Attach hold-down links, 1, to lift arms. Secure with cotter pins.




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3. Install drive shaft, 1, in rear feed roll U-joint. Secure with latch pin.
4. Tighten feed roll tension spring and secure with hairpin cotter.



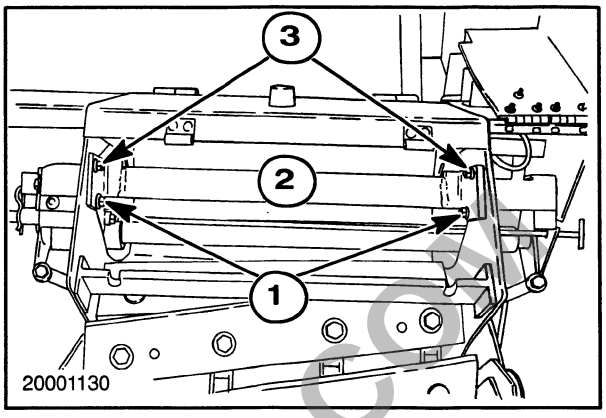

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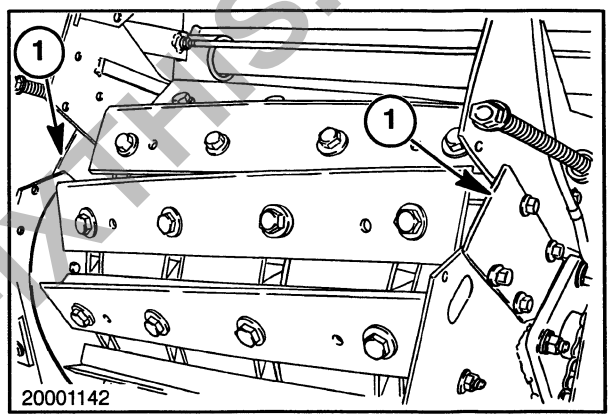
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9. Remove lower bolts, washers and nuts, 1, securing sharpener rail, 2, and loosen the upper bolts, 3. Pivot the sharpener rail and lower the knife sharpener. Do not allow sharpener to fall and damage the stone. Remove the upper bolts, washers and nuts and remove sharpener rail.




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10. Remove filler plates, 1, from each side sheet. Crop processor-equipped units have one plate on each side. Non-crop processor-units have two plates on each side.




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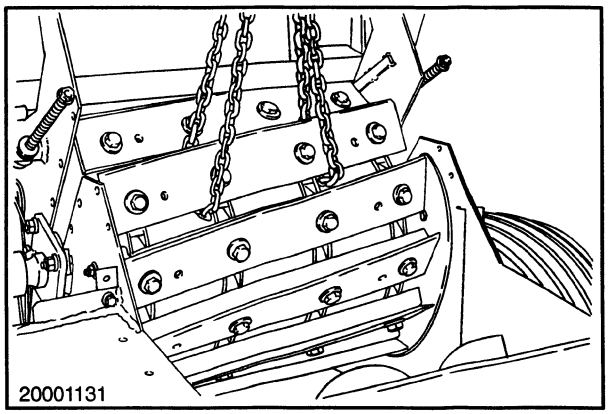
11. Wrap a chain securely around a cutterhead knife and support with a suitable lifting device.

**⚠ CAUTION ⚠**

**The FP230 cutterhead with knives installed weighs 181 kg (400 lb). The FP240 cutterhead with knives installed weighs 200 kg (440 lb).**

**⚠ WARNING ⚠**

**Do not use straps which can be cut by the knives.**




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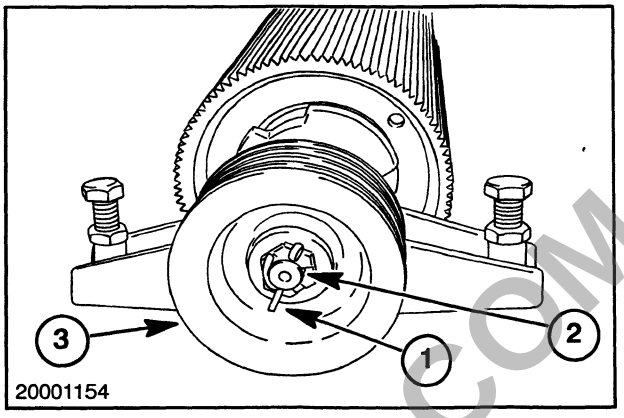
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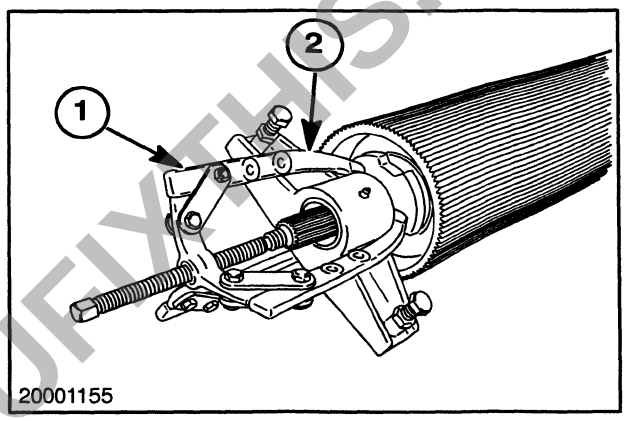
**Disassembly**

1. Remove cotter pin, 1, and castle nut, 2. Remove washer and sheave, 3, from the right end of the shaft.



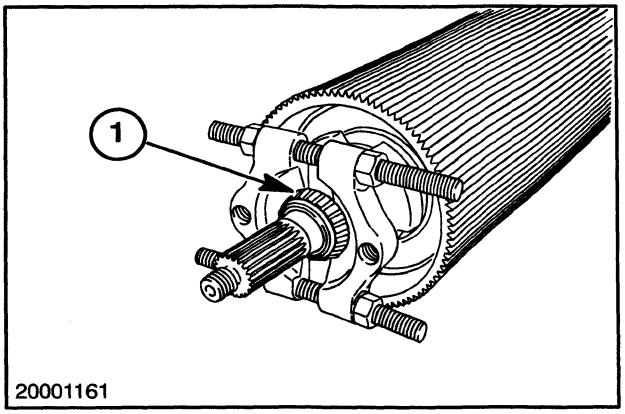

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2. Using a gear puller, 1, remove bearing housing, 2, from shaft. This will pull the outer bearing and seal from the shaft.




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3. Remove the inner bearing and seal, 1, from the shaft using a bearing puller.




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**Inspection**

1. Replace any plates that are scored or pitted.
2. The clutch discs must be replaced if they are scored, glazed or burned.
3. Check the spring washers for any cracking. Replace if required.

**Assembly**

1. Install the hub, 4, on the shaft with anti-seize. Use an aluminum punch against the hub and rap the hub several times to seat the tapered spline.
2. Install a clutch disc, 6, followed by a triangular or square plate, 5.
3. Add a clutch disc, 6, a round plate, 7, another clutch disc, 6, and another triangular or square plate, 5.
4. Take one of the 1/2 x 4 1/2 bolts, 16. Place a washer, 22, and a spacer, 8, on the bolt.
5. Put the bolt and spacer through one of the large holes in the outside plate, 5. Add the same number of washers, 22, which were removed, on the bolt. Push the bolt through one of the small holes in the inner plate, 5. Install the rest of the washers, 22. If the number of washers that were on each side of the plate is not known, start with two.
6. Add a spacer, 8. Push the bolt through the fan and add a lockwasher and flanged nut on the back side of the fan.
7. Install the remaining bolts using the same procedure and tighten them.

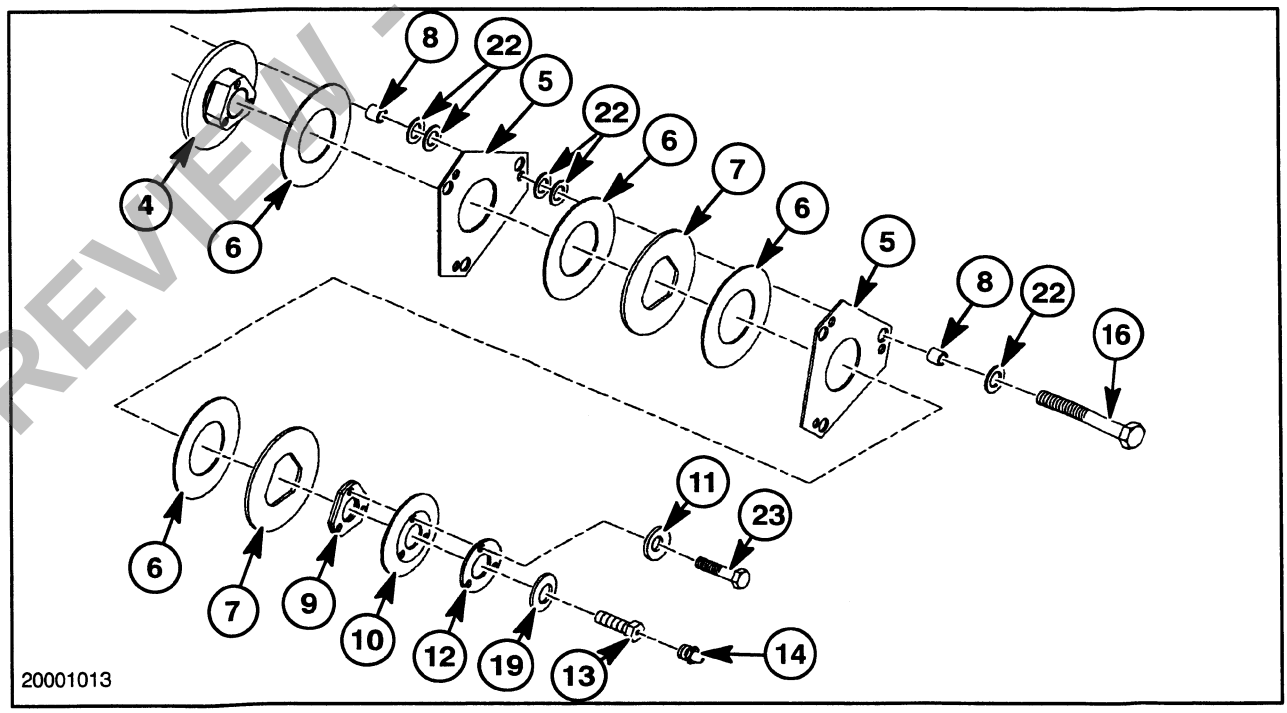
***NOTE:*** *It is critical that the bolt and spacer go through the large hole in the outer plate. This will allow the outer plate to free float on the spacer. The outer plate must free float to allow the belleville washer to apply pressure to the clutch and maintain the clutch setting as the clutch discs wear. If the small hole in the outer plate is used and the plate is trapped between the spacer and bolt head, the position of the plate will be fixed. The belleville washer will not be able to apply clamp load to the clutch and the clutch will not maintain its torque setting.*

*The bolt spacers and washers need to be sandwiched around the small hole in the inner plate. This fixes the position of the clutch. The number of washers on each side of the plate will determine the location of the blower paddles in the blower housing. If the spacers pilot through the large holes in the inner plate, the fan will be free to float in the blower housing and damage to the blower may result.*

8. Continue to install a clutch disc, 6, a round plate, 7, and the shims, 9.

***NOTE:*** *The number of shims, 9, determines the slip torque of the clutch. The number of shims may have to be changed after the slip torque is checked.*

9. Install the spring washer, 10, with the concave side against the shims. Add the retainer, 12. Install the three bolts, 23, and lockwashers, 11. Install the special bolt, 13.




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