FARMALL 31, FARMALL 35
REPAIR MANUAL
COMPLETE CONTENTS

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The following pages are the collation of the contents pages from each section and chapter of the Farmall 31, Farmall 35 Repair manual. Complete Repair part # 84132127.

The sections used through out all Case IH product Repair manuals may not be used for each product. Each Repair manual will be made up of one or several books. Each book will be labeled as to which sections are in the overall Repair manual and which sections are in each book.

The sections listed above are the sections utilized for the Farmall 31, Farmall 35 Tractors.

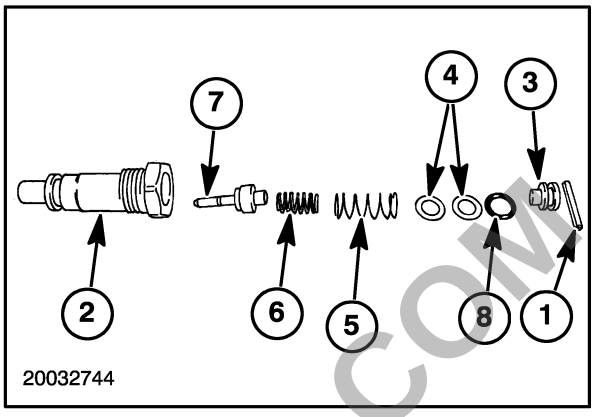
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NEUTRAL VALVE



80

Disassembly

1. The neutral valves can be disassembled if needed. Drive roll pin, 1, from valve body, 2, remove end cap, 3, shims, 4, outer spring, 5, inner spring, 6, and valve poppet, 7. O ring, 8, can be replaced on end cap if needed.

Inspection

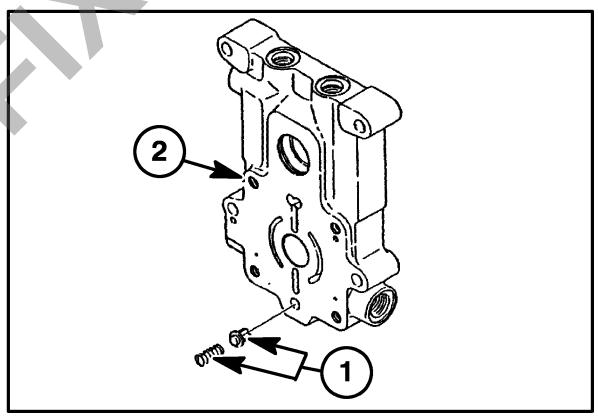
2. Check valve body for damage to the poppet seat or for contamination. Insert poppet into valve body and check for binding during poppet travel in valve bore.

Assembly

3. To reassemble, insert poppet, 7, inner spring, 6, outer spring, 5, shims, 4, end cap, 3, with O ring, 8. While pushing end cap into valve body, 2, drive roll pin, 1, into valve body.

CHARGE PUMP RELIEF VALVE

The charge pump relief valve, 1, functions to maintain approximately 5.2 – 6.6 bar (75 – 95 psi) of pressure in the oil supply system to the piston pump at all times. Excess oil not required by the piston pump is returned to the sump via the charge pump relief valve.



81

Disassembly

Remove the spring and valve, 1, from the hydrostatic motor side of the port block, 2.

Inspection

1. Inspect the valve seat for excess wear or scoring. Check the valve in the bore for a sticking or binding condition.
2. Inspect the valve spring for wear or damage.

NOTE: *If damage is observed, replace the valve and spring as a kit assembly.*

Assembly

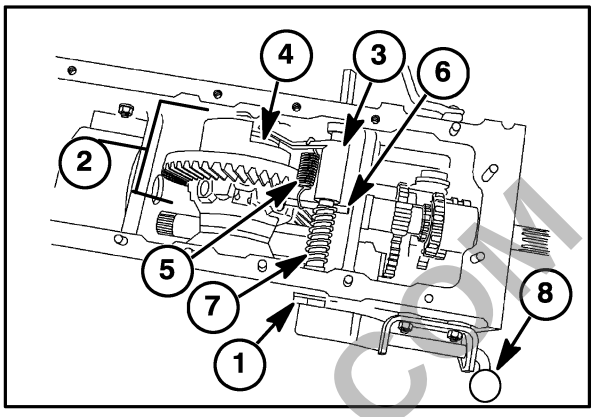
Install the valve and spring, 1, in the motor side of the port block, 2.

NOTE: *Use petroleum jelly to retain spring to motor housing during assembly. Do not use grease.*

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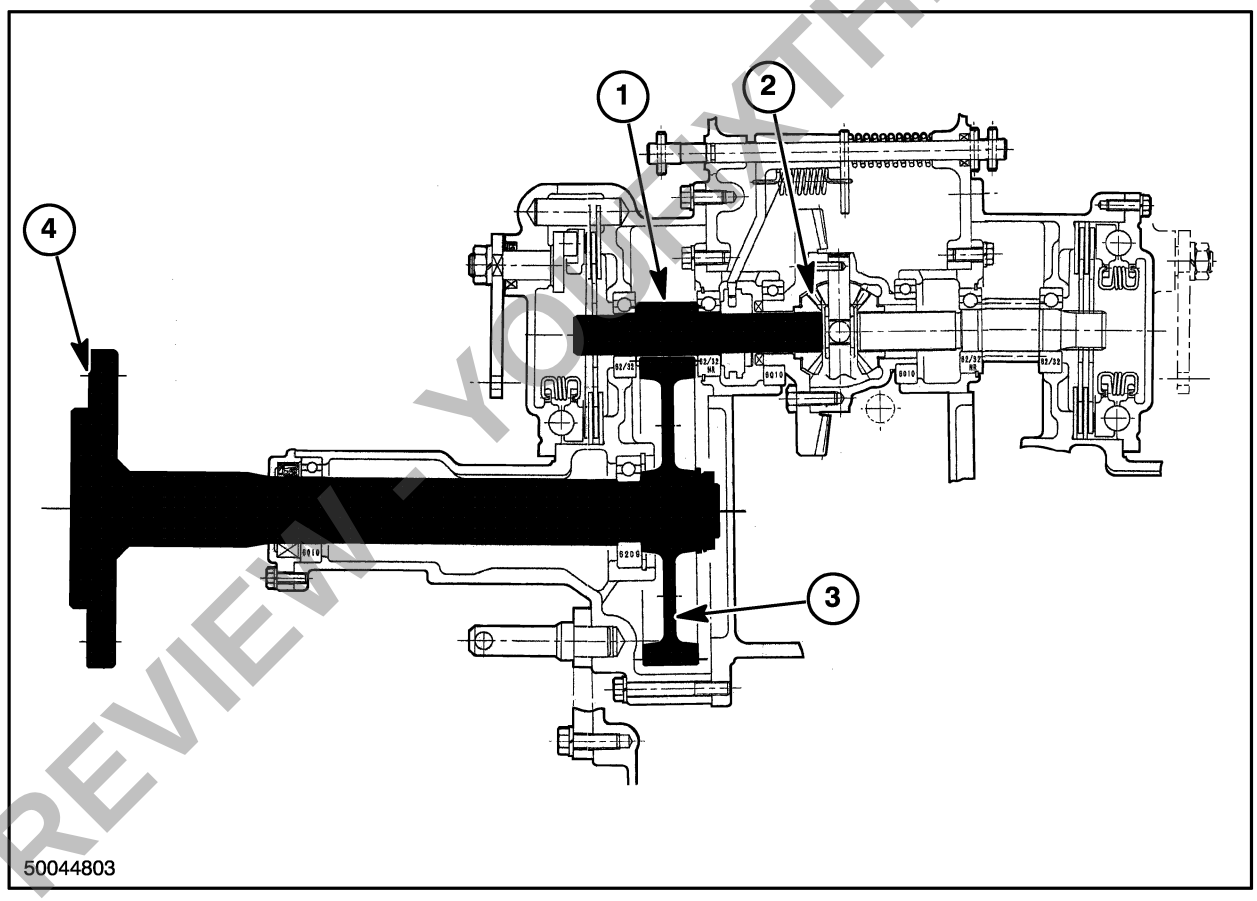
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5. Slide differential lock shaft, 1, into differential assembly, 2, while installing fork, 3, into clutch, 4, spring, 5, roll pin, 6, and return spring, 7. Install oil seal and O ring into housing then secure shaft with spring pins on outside of housing to differential lock pedals, 8.



25

DESCRIPTION OF OPERATION - REAR AXLE



26

The final drive pinion gear/shaft assemblies (11T), 1, are splined to the side gears, 2, and are meshed with the final reduction drive gear (65T), 3. As the final drive pinions rotate with the differential assembly, power is delivered to the final drive gears and rear axles, 4.

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SPECIFICATIONS

HYDROSTATIC TRANSMISSION

Type	HVFD23F-R32-P-LT
Theoretical Displacement of Pump	0 – 0.023 L/rev. (0 – 1.41 cu. in./rev.)
Theoretical Displacement of Motor	0.023 L/rev. (1.41 cu. in./rev.)
Theoretical Displacement of Charge Pump	0.005 L/rev. (0.30 cu. in./rev.)
Maximum Input Speed	2900 rpm
High Pressure Relief Valve	310 (± 3.5) bar (4495 ± 50 psi)
Output Speed	2510 rpm @ 147 bar (2133 psi)
Output Torque	79 N·m (59 ft-lbs) @ 310 (± 3.5) bar (4495 ± 50 psi)
Charge Pump Relief Valve	4.2 – 5.6 bar (61 – 81 psi) @ 2800 rpm
Swash Plate Tilt Angle (Pump)	0 – 18˚
Swash Plate Tilt Angle (Motor)	0 – 18˚

BOLT TORQUES

Hydrostatic Transmission Cover Screws	2 – 2.5 N·m (1.4 – 1.9 ft-lbs)
Charge Pump Housing Bolts	16 – 19 N·m (12 – 14 ft-lbs)
Hydrostatic Transmission Port Block Retaining Bolts	31 – 38 N·m (23 – 28 ft-lbs)
Hydrostatic Transmission Buckle Up Bolts	55 N·m (40 ft-lbs)

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SECTION 31 - POWER TAKE-OFF SYSTEMS

BOOK 2 - 84132129

Chapter 1 - Power Take-Off Systems (Continued)

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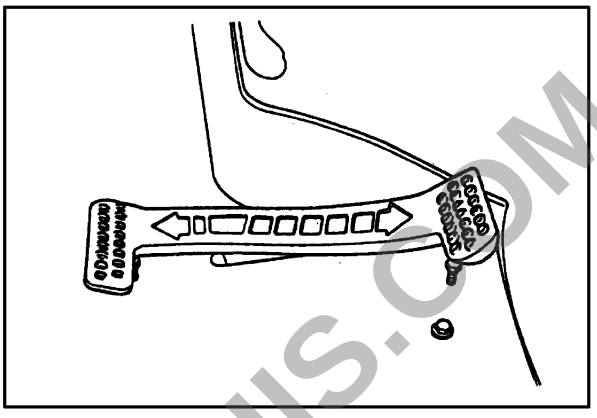
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DESCRIPTION OF OPERATION - HYDROSTATIC TRANSMISSION

HYDROSTATIC TRANSMISSION

The hydrostatic transmission consists of a variable displacement piston type hydraulic pump and a fixed displacement piston type motor assembly located in the engine clutch housing. The variable displacement pump is driven by the input shaft connected to the engine flywheel clutch. The pump supplies hydraulic power to the fixed displacement motor, which drives the three range transmission gearbox.



3

The hydrostatic unit, operated by a foot control pedal, can be advanced in forward, stopped, or reverse. The foot pedal automatically returns to neutral (stopped) position when it is released. The speed is controlled by varying the amount of movement of the pedal from the neutral position. When a constant forward speed is desired on level terrain, setting the speed control (cruise) switch to the "SET" position will hold the foot pedal in the fixed position and permit the operator to remove his foot from the pedal. When the speed control (cruise) switch is "RELEASED" the foot pedal automatically returns to neutral and the tractor stops.

NOTE: *The operator can depress the pedal further from the set position to travel at a faster speed momentarily. The pedal will not return to the set position (and speed) when released. The pedal (cruise) control can be set in reverse.*

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MINIMUM HARDWARE TIGHTENING TORQUES

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

INCH NON-FLANGED HARDWARE AND LOCKNUTS

NOMINAL SIZE	SAE GRADE 2		SAE GRADE 5		SAE GRADE 8		LOCKNUTS		NOMINAL SIZE
	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	GR.B w/GR5 BOLT	GR.C w/GR8 BOLT	
1/4	6.2 (55)*	8.1 (72)*	9.7 (86)*	13 (112)*	14 (121)*	18 (157)*	8.5 (75)*	12.2 (109)*	1/4
5/16	13 (115)*	17 (149)*	20 (178)*	26 (229)*	28 (250)*	37 (324)*	17.5 (155)*	25 (220)*	5/16
3/8	23 (17)	30 (22)	35 (26)	46 (34)	50 (37)	65 (48)	31 (23)	44 (33)	3/8
7/16	37 (27)	47 (35)	57 (42)	73 (54)	80 (59)	104 (77)	50 (37)	71 (53)	7/16
1/2	57 (42)	73 (54)	87 (64)	113 (83)	123 (91)	159 (117)	76 (56)	108 (80)	1/2
9/16	81 (60)	104 (77)	125 (92)	163 (120)	176 (130)	229 (169)	111 (82)	156 (115)	9/16
5/8	112 (83)	145 (107)	174 (128)	224 (165)	244 (180)	316 (233)	153 (113)	215 (159)	5/8
3/4	198 (146)	256 (189)	306 (226)	397 (293)	432 (319)	560 (413)	271 (200)	383 (282)	3/4
7/8	193 (142)	248 (183)	495 (365)	641 (473)	698 (515)	904 (667)	437 (323)	617 (455)	7/8
1	289 (213)	373 (275)	742 (547)	960 (708)	1048 (773)	1356 (1000)	654 (483)	924 (681)	1

NOTE: Torque values shown with * are inch pounds.

IDENTIFICATION
CAP SCREWS AND CARRIAGE BOLTS



SAE GRADE 2 | SAE GRADE 5 | SAE GRADE 8

REGULAR NUTS | SAE GRADE 5 HEX NUTS | SAE GRADE 8 HEX NUTS

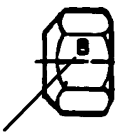
LOCKNUTS



GRADE IDENTIFICATION
GRADE A NO NOTCHES
GRADE B ONE CIRCUMFERENTIAL NOTCH
GRADE C TWO CIRCUMFERENTIAL NOTCHES



GRADE IDENTIFICATION
GRADE A NO MARKS
GRADE B THREE MARKS
GRADE C SIX MARKS
MARKS NEED NOT BE LOCATED AT CORNERS



GRADE A NO MARK
GRADE B LETTER B
GRADE C LETTER C
GRADE IDENTIFICATION

86529681 REV F 5.2

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SECTION 41 – STEERING SYSTEMS

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Chapter 1 – Power Steering

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SECTION 90 - PLATFORM

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SECTION 27 – DIFFERENTIAL, REAR AXLE

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Chapter 1 – Differential, Rear Axle

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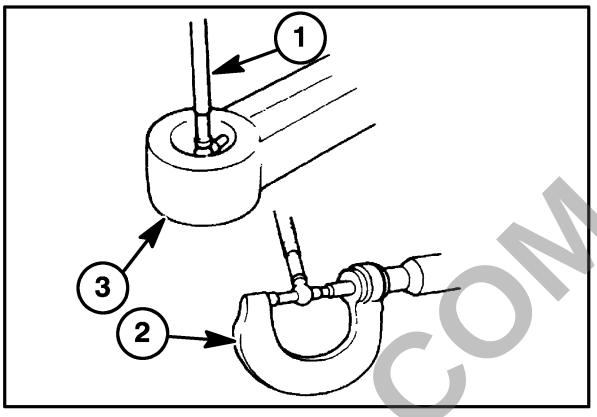
	Model Farmall 31—Hydrostatic/Gear	Model Farmall 35—Hydrostatic
CAST IRON WEIGHTS		
Front End:		
R-4 & Turf Tires with FWD	(2) weights @ 26 kg (57 lbs) each Optional (2) weights @ 45 kg (100 lbs) each	(2) weights @ 26 kg (57 lbs) each Optional (2) weights @ 45 kg (100 lbs) each
Ag. Tires with FWD	(2) weights @ 26 kg (57 lbs) each	(2) weights @ 26 kg (57 lbs) each
Rear Wheel:		
R-4 Tires	(4) weights (2) per wheel @ 34 kg (75 lbs) each	(4) weights (2) per wheel @ 34 kg (75 lbs) each
Turf Tires	---	---
Ag. Tires	(4) weights (2) per wheel @ 48 kg (105 lbs) each	(4) weights (2) per wheel @ 48 kg (105 lbs) each
DRAWBARS		
Swinging/Extendible	Standard	Standard

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3. Using a telescoping gauge and a micrometer, measure the inside diameter of the connecting rod wrist pin bushing.
4. Replace bushings measuring more than the following:

Model	Max. Inside Diameter
Farmall 35	28.0 mm (1.1024 in)



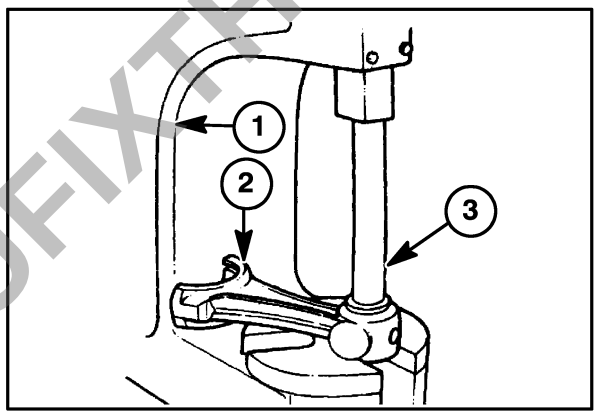
56

1. Hole Gauge
2. Micrometer
3. Connecting Rod

5. Remove and install the connecting rod wrist pin bushings using a suitable driver and press a new bushing into the rod bore.
6. Ream and hone the bushing to the following finish size.

Pin to Bushing Clearance

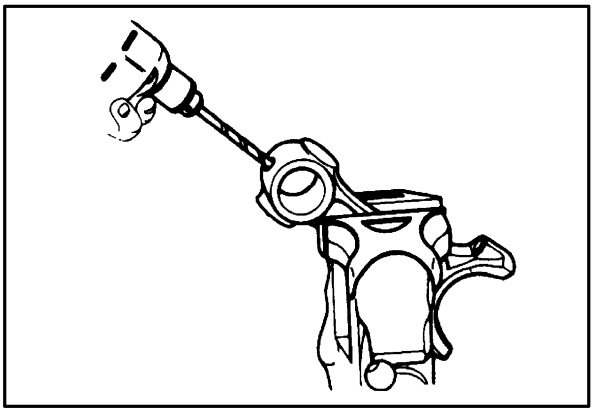
Std.	Max.
0.010 – 0.025 mm (0.00039 in – 0.00098 in)	0.08 mm (0.0031 in)



57

1. Press
2. Connecting Rod
3. Bushing Driver

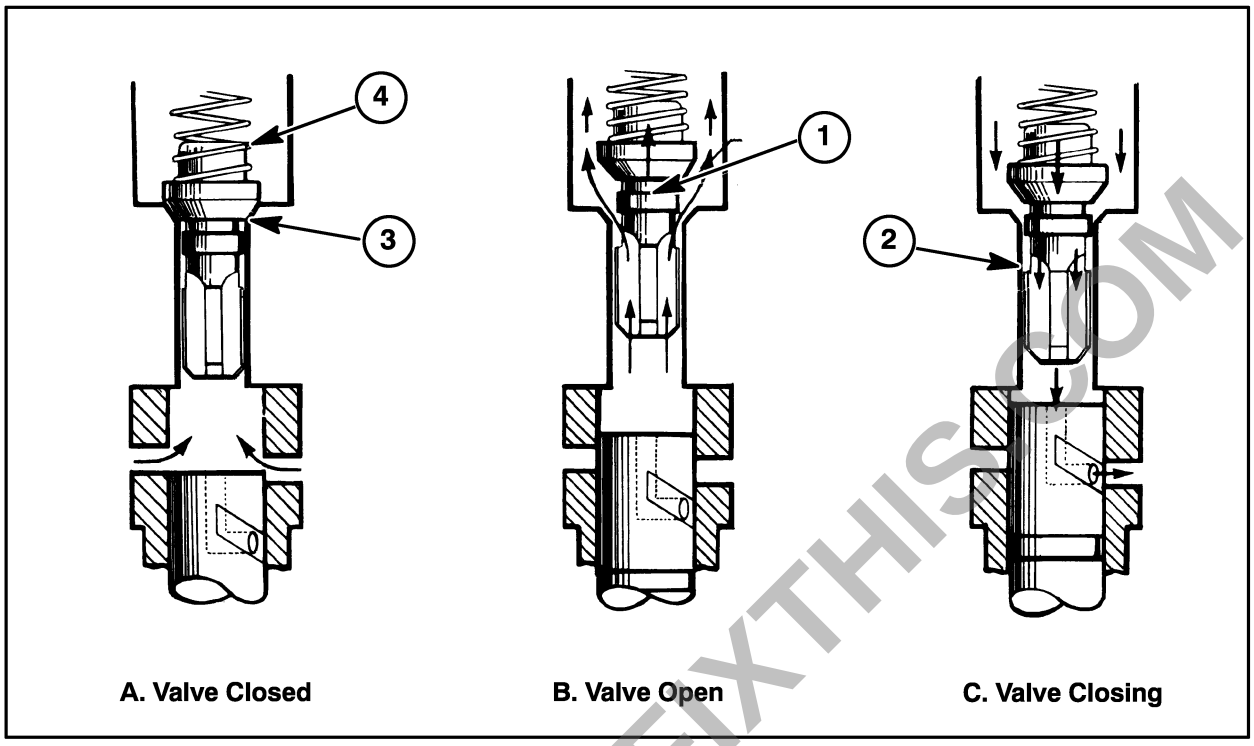
7. When installing a new piston pin bushing, use the hole in the rod and drill a lube hole in the new bushing.



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14

1. Piston
2. Valve Guide
3. Conical Seat
4. Spring

The delivery valve operates as follows:

Position A: The pump plunger is at the bottom of the stroke and the inlet ports are uncovered, so the barrel and delivery guides are filled with fuel. As the fuel is at low pressure, the delivery valve is retained on the seat by spring pressure.

Position B: The plunger has risen and closed both inlet ports, pressurized the fuel and the injection process begins. The pressurized fuel overcomes the spring tension, lifting the delivery valve off its seat until the piston is clear of the guide, permitting fuel to pass to the injector.

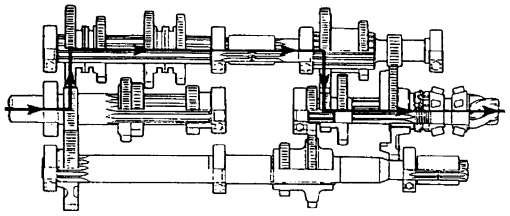
Position C: The helical groove has uncovered the inlet port and released the fuel pressure. The delivery valve spring, aided by the high pressure still existing in the pipeline, forces the delivery valve to close rapidly.

During closing, the piston portion of the valve returning into the guide increases the volume of the injector line by the volume of this part of the valve.

This sudden increase in the volume of the injector line causes a rapid collapse of pressure and allows the injector needle valve to “snap” shut.

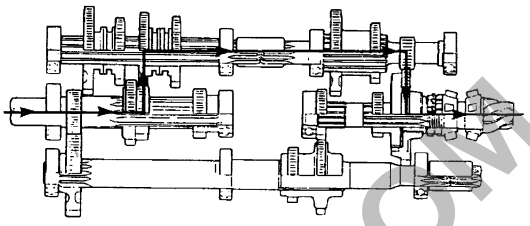
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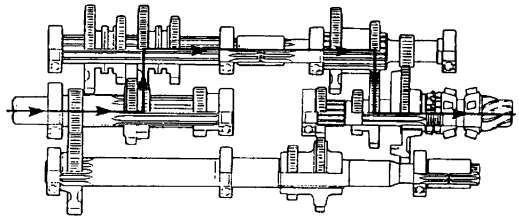
Power Flow – 1st Gear – High Range

10



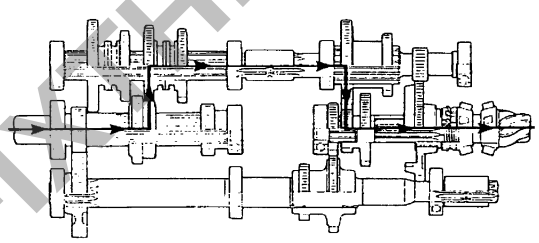
Power Flow – 2nd Gear – Low Range

11



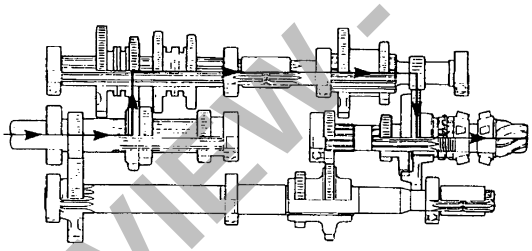
Power Flow – 2nd Gear – Mid-Range

12



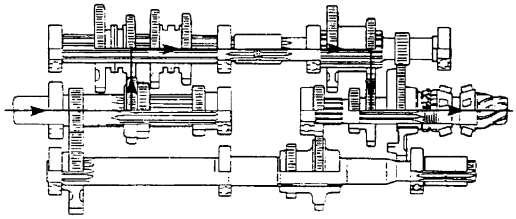
Power Flow – 2nd Gear - High Range

13



Power Flow – 3rd Gear – Low Range

14



Power Flow – 3rd Gear – Mid-Range

15

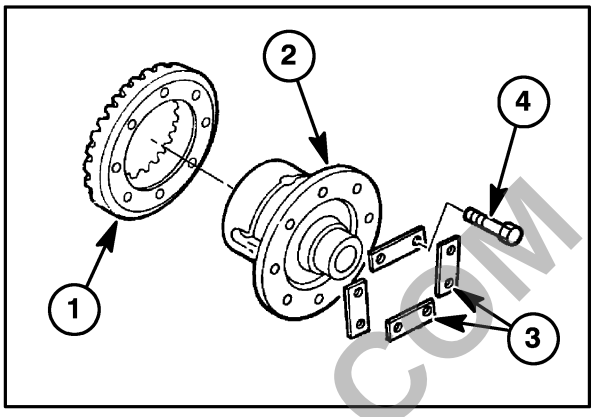
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DIFFERENTIAL GEAR

Assembly

1. Install the differential ring gear, 1, to the case, 2, and align the mounting bolt holes.
2. Install new locking plates, 3, and attaching bolts, 4, and torque to 49 – 62.8 N·m (36.2 – 46.2 ft-lbs).



15

AXLE AND DIFFERENTIAL

Assembly

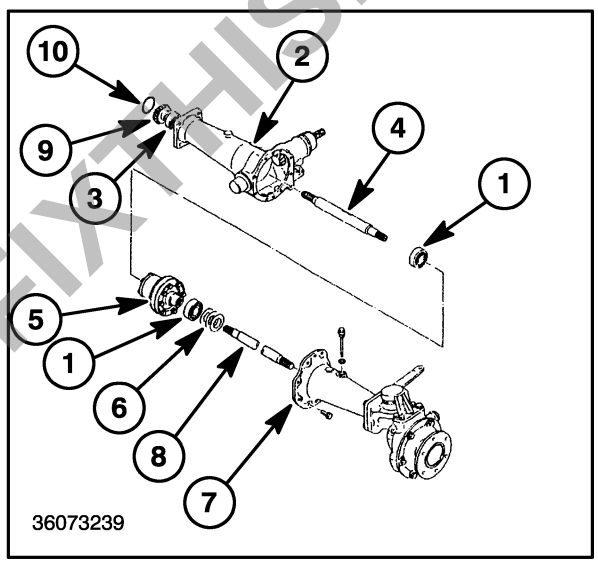
1. Install the carrier bearing, 1, in the differential axle housing, 2.
2. Install the axle shaft outer bearing, 3, onto the axle shaft, 4.
3. Position the differential assembly, 5, in the housing inserting the differential outer cover end inside the bearing, 1, previously positioned in the axle housing, 2.
4. Install the shim pack, 6, and carrier bearing, 1, in the differential axle housing, 7.

NOTE: *Shim sizes are: 0.1 mm (0.004 in), 0.2 mm (0.008 in), and 0.5 mm (0.020 in).*

5. Apply liquid gasket to the left axle housing mating surface and align the right and left axle housings together.
6. Install the axle retaining bolts and tighten to the specified torque. See "Bolt Torque Specifications," discussed later in this Section.

NOTE: *The differential carrier bearing pre-load and ring gear backlash must be checked and adjusted if differential case bearings, axle shaft inner bearings, or axle shaft have been replaced.*

7. Install both axle shafts, 8, and 4, into the axle housings, 7, and, 2.
8. Install the pinion gear, 9, and O ring, 10.



16

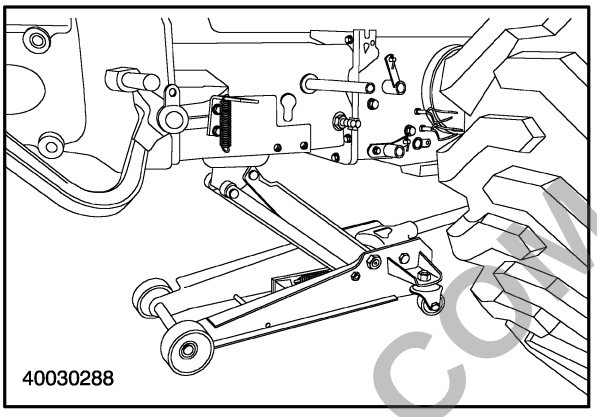
1. Differential Carrier Bearings
2. Axle Housing – R.H.
3. Outer Bearing
4. R.H. Axle Shaft
5. Differential Assembly
6. Shim Pack
7. Axle Housing – Left
8. L.H. Axle Shaft
9. Drive Pinion Gear
10. O-ring

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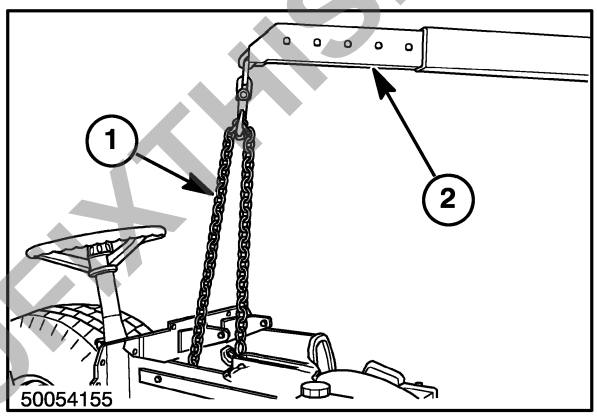
ATTACHING THE TRACTOR AT ENGINE AND CLUTCH HOUSING

1. Place a suitable floor jack under the transmission from the rear of the tractor. Raise the jack just enough to support the transmission.
2. Remove jackstands.



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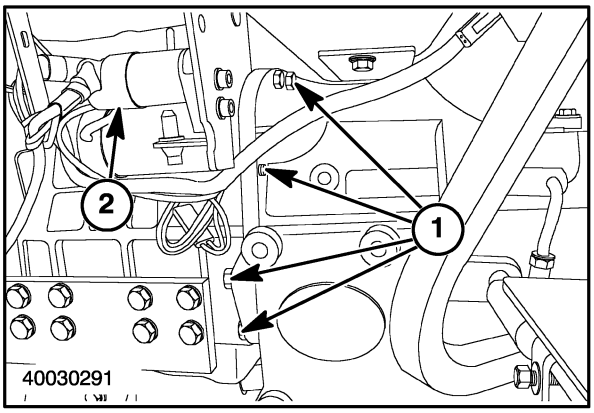
3. Attach a chain sling, 1, to the engine lifting eyes located at the left rear and right front of the engine.
4. Attach a secure lifting device, 2, to the chain sling to support the front of the tractor.
5. Remove jackstands.



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NOTE: *During installation, coat the transmission and clutch housing mating surfaces with Loctite ™ Gasket Eliminator 518. Use caution to prevent excess sealer from entering the inside of the housing and contaminating the hydraulic fluid supply.*

6. Roll the floor jack towards the engine. Carefully align and attach the clutch housing/transmission to the engine while rotating the transmission gears to allow the transmission input shaft to mesh with the coupler on the engine crankshaft.
7. Install the external buckle up bolts and nuts, 1, to secure the clutch housing to the engine. Tighten buckle up bolts and nuts to 79 N·m (58 ft-lbs).
8. Install the starter, 2, onto the engine.
9. Install the air cleaner assembly onto the top of the engine.



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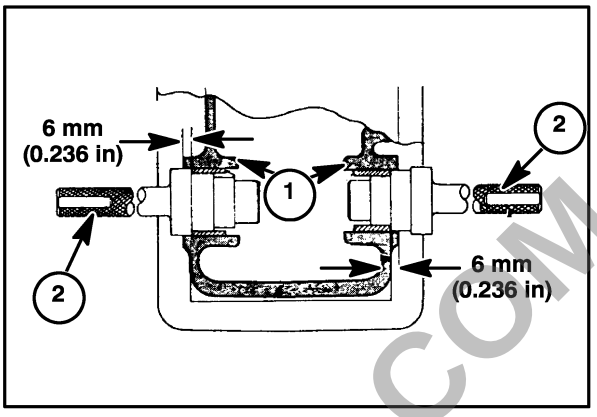
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Inspection

1. Check the piston and cylinder for excessive wear or damage. Replace if necessary.
2. Check the cross shaft bushings, 1, for excessive wear or damage. Replace the bushings if necessary using a suitable driver, 2.

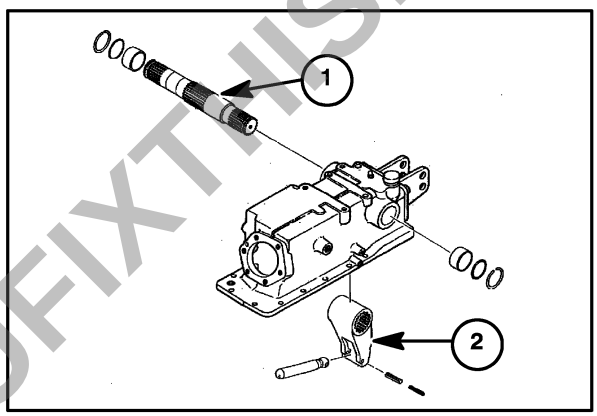
NOTE: *Be sure to install the bushings to the correct depth as shown.*



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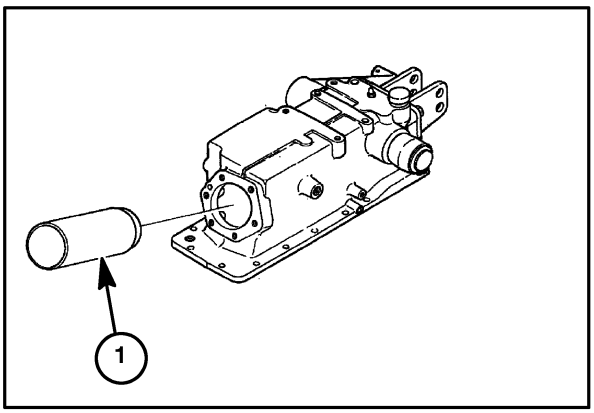
Assembly

1. Clean all parts in a suitable solvent and air dry.
2. Apply clean hydraulic fluid to all parts, including O-rings and seals, during assembly.
3. Install the cross shaft, 1, in the cover while aligning the ram arm, 2, to the scribe marks made during disassembly.



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4. Install the cylinder liner, 1, in the lift cover housing. Be sure to position the piston rod inside the liner during installation.

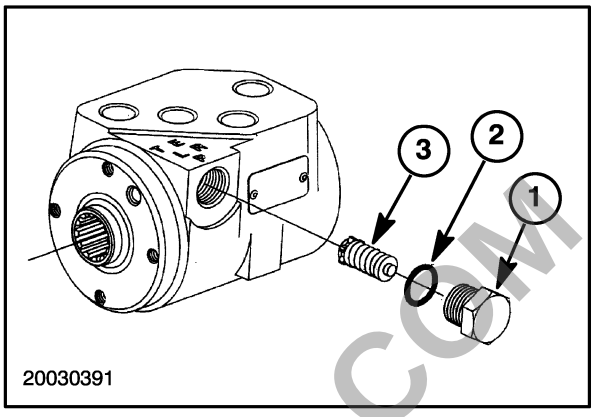


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23. Remove the plug, 1, O-ring, 2, and check/relief valve, 3, from the side of the control motor housing.



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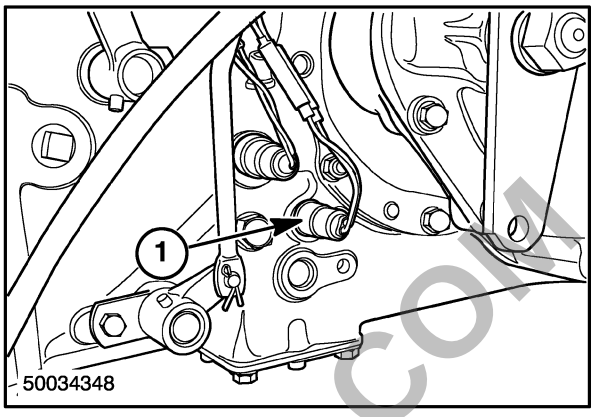
Inspection

1. Thoroughly clean all parts in a suitable solution and allow to air dry. Use compressed air to dry parts. NEVER wipe parts dry with paper towels or cloth as lint in a hydraulic system will cause damage.
2. Discard all old seals and O-rings. Always use new seals and O-rings when reassembling steering control motors.
3. Lubricate all new seals and O-rings with petroleum jelly prior to installation.
4. Lubricate all machined surfaces and bearings with clean hydraulic oil prior to assembly.
5. Inspect the spool and sleeve for evidence of sticking, scuff marks and any other damage. Replace as required.
6. Inspect the pin to make sure it is not bent or cracked.
7. Inspect the internal splines on the spool for wear or damage.
8. Inspect the inside machined surfaces of the housing for wear or damage.
9. Inspect the gerotor parts for wear or damage.
10. Inspect the drive shaft for wear or damage.
11. Inspect the thrust bearing and bearing races for wear or damage.
12. Inspect the centering springs for distortion. Centering springs that are distorted or have lost tension should be replaced.

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REAR PTO SAFETY SWITCH



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Description

The rear PTO safety switch, 1, is a push-button switch mounted to the left rear side of the transmission case. The switch is normally open and is actuated internally by the PTO shift rail. The switch terminals are protected from contamination by a rubber boot.

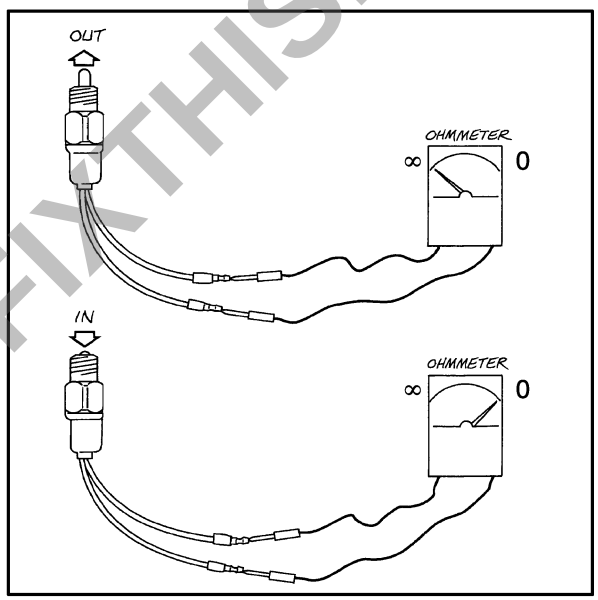
NOTE: *Remove the left rear tire assembly for easier access to the range, rear, and mid-PTO safety switches. Be sure to provide adequate support to the rear axle during repairs.*

Testing

Use an ohmmeter to test the rear PTO safety switch.

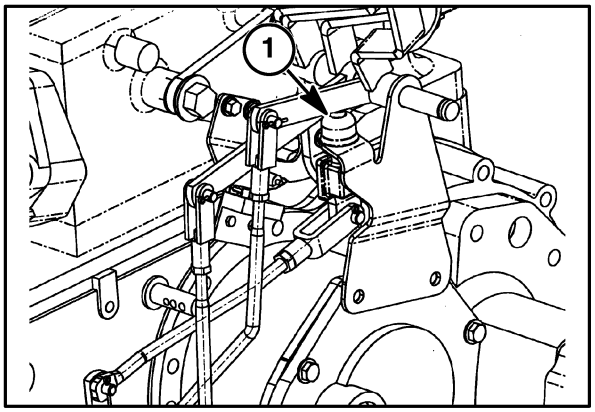
- With the button in the “OUT” position, there will be no continuity across the terminal leads.
- With the button in the “IN” position, there will be continuity across the terminal leads.

If test results are not as outlined above, replace the rear PTO safety switch.



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MID PTO SAFETY SWITCH



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Description

The mid PTO safety switch, 1, is a double pole, single throw-style switch located on the control lever pivot bracket. The switch, consisting of a rubber booted push-button actuator and four rubber coated terminals, monitors the position of the mid PTO linkage and is activated by the mid PTO lever.

NOTE: *Remove the left rear tire assembly for easier access to the range, rear, and mid-PTO safety switches. Be sure to provide adequate support to the rear axle during repairs.*

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SAFETY START CIRCUIT (OPERATOR NOT PRESENT)

NOTE: *The starting circuit is shown with:*

- Operator **NOT** in the seat
- Park Brake "ON"
- Transmission range lever in "NEUTRAL" position
- PTO lever in the "OFF" position

1. Current starts at the battery, and flows through the positive (+) battery cable to the engine starter motor.
2. From the starter motor, current flows through the 40-amp fuse to a wire splice. The wire splice sends current into two directions:
    - To the "B" and "D" terminals of the ignition switch
    - To terminal 30 of the glow plug power relay
    - To terminal 87 of the starter relay
3. When the ignition switch is placed in the "START" position current is transferred across the following ignition switch terminals:
    - "B" to "C" terminals
    - "D" to "A" terminals

Terminal "A" of ignition switch

1. Current flows from the "A" terminal of the ignition switch to 86 terminal of the neutral start relay.

Terminal "C" of ignition switch

1. Current flows from the "C" terminal of the ignition switch to the fuse panel bussbar, from the bussbar current travels through the following fuses:
    - Fuse #1 – 7.5 amp
    - Fuse #2 – 10 amp
    - Fuse #5 – 15 amp
2. Current also flows from terminal "C" to:
    - Terminal 85 of glow plug power relay
    - Terminal 4 of the glow plug timer relay

Fuse Functions

1. The #1, 7.5-amp fuse, sends current two directions:
    - Main PTO Safety Start Switch
    - Terminal #2 of the instrument panel
2. The #2, 10-amp fuse, sends current to:
    - Terminals #1 and #5 of the fuel shutoff relay
3. The #5, 15-amp fuse, sends current three directions:
    - Range neutral safety switch
    - Mid PTO safety switch
    - Operator seat safety switch (two different terminals)

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Park Brake Alarm

The park brake alarm will sound when the following terminals of the alarm are as follows:

- Terminal “1” has current supplied
- Terminal “2” does have a ground source supplied
- Terminal “3” does **NOT** have current supplied
- Terminal “5” has a ground source supplied
- Terminal “6” does have current supplied
- Terminal “7” does have current supplied

TROUBLESHOOTING ALARM CIRCUIT (Key “ON”, Rear PTO “ON”, Operator Not Present and Park Brake “ON”)		
CONDITION	**POSSIBLE CAUSE**	**REMEDY**
Alarm will not sound	Blown main 40-amp fuse	Replace 40-amp main fuse
	Blown #6, 20-amp fuse	Replace 20-amp fuse
	Blown #5, 15-amp fuse	Replace 15-amp fuse
	Park brake switch failed in open mode	Replace park brake switch
	Open circuit in harness to park brake alarm	Inspect wiring harness and repair as necessary
	Defective park brake alarm	Replace park brake alarm
	Operator seat safety switch failed in closed mode	Replace seat switch
Alarm will not shut off	Park brake failed in open mode	Replace park brake switch
	Defective park brake alarm	Replace park brake alarm
	Short circuit in harness to park brake alarm	Inspect wiring harness and repair as necessary

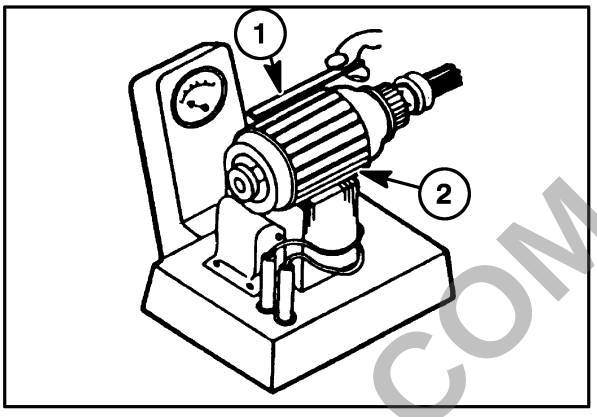
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Electrical Testing

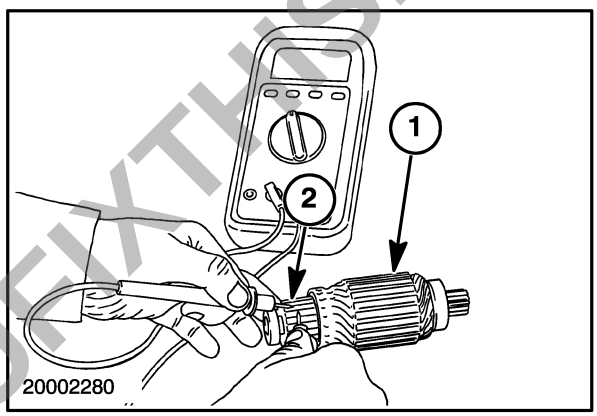
Armature

1. Use a growler, 1, to inspect the armature coil, 2, for short circuits. Replace if the armature is shorted.



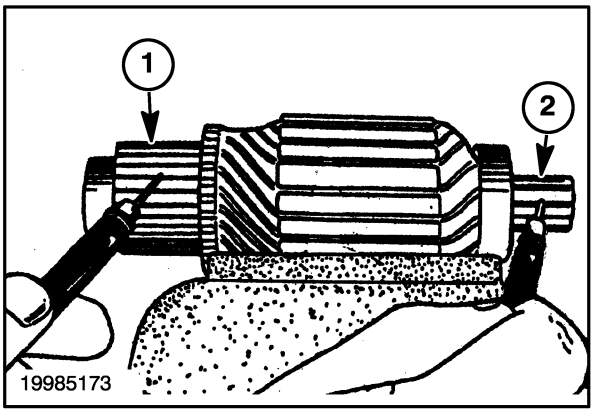
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2. Use an ohmmeter to test for continuity in the armature coil, 1.
3. Touch one ohmmeter test probe to a commutator contact, 2. Touch the ohmmeter test probe to an adjacent commutator contact.
4. Observe the ohmmeter. Repeat the test on each adjacent commutator contact. Little or no resistance indicates that there is continuity and the armature coil is good. High resistance indicates that the armature is defective and needs replaced.



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5. If the armature is tested OK, touch one ohmmeter test probe to a commutator contact, 1. Touch the other test probe to the armature shaft, 2.
6. Observe the ohmmeter. A high resistance reading indicates the armature is good. Little or no resistance indicates that the armature is defective and needs replaced.



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