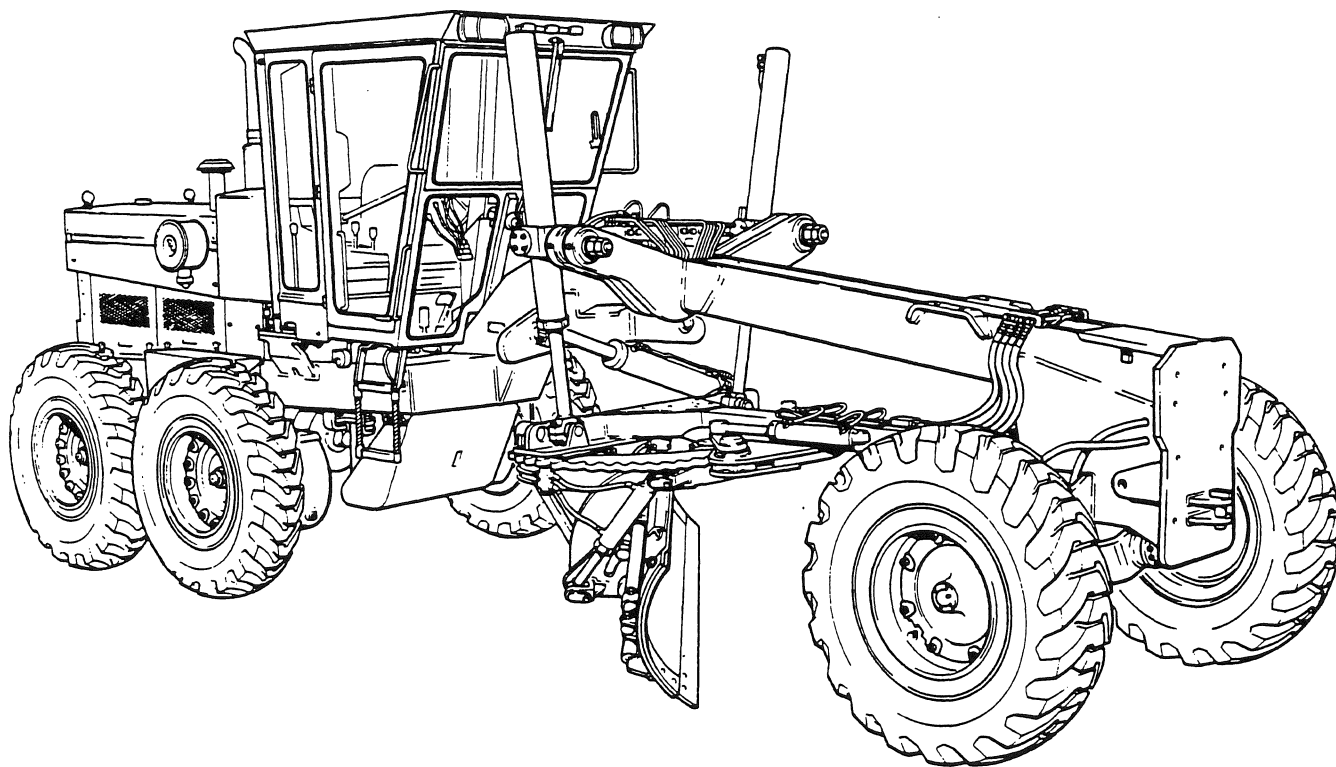


## SECTION 8

# 8400 TRANSMISSION



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8400 TRANSMISSION

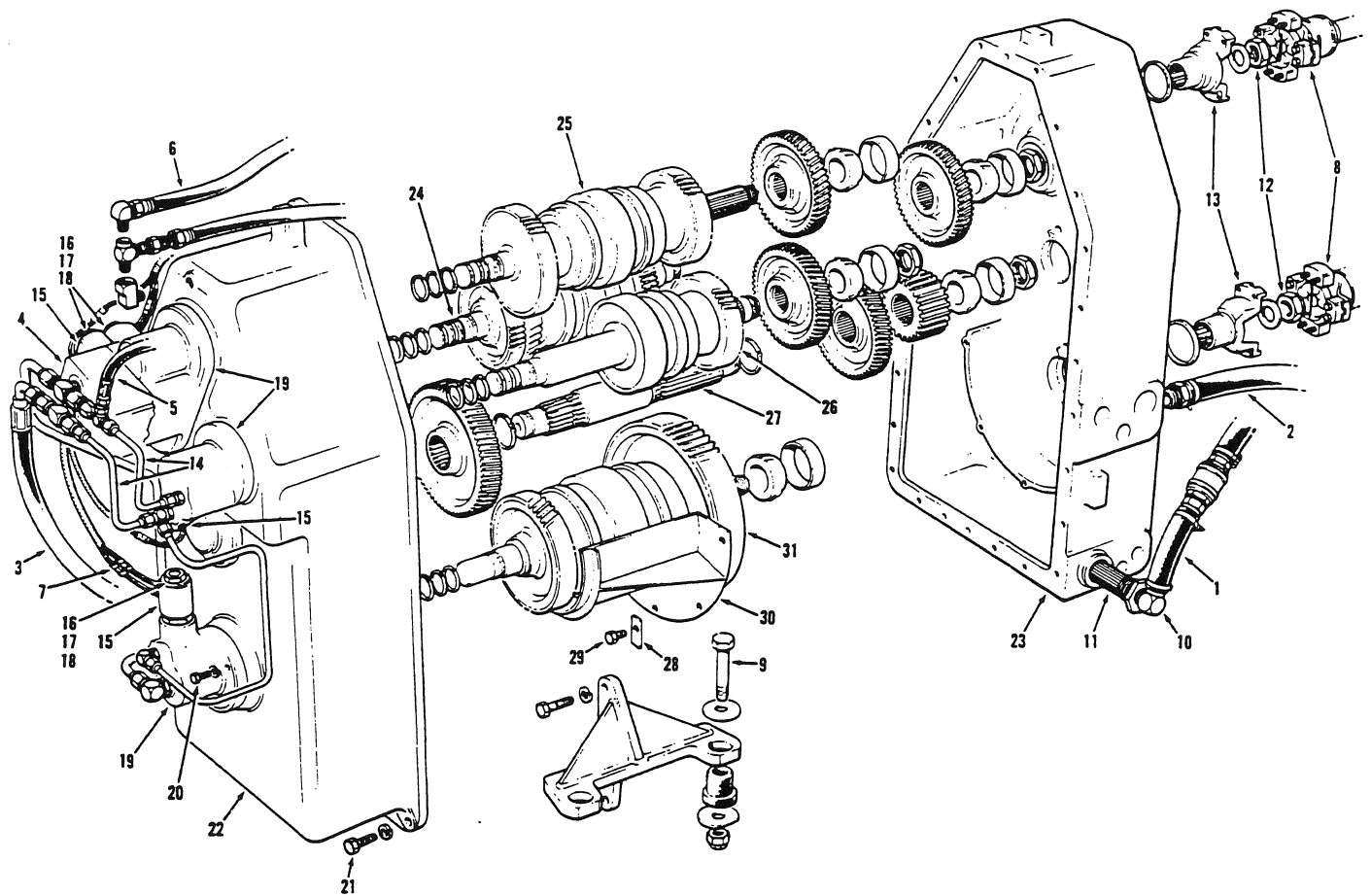


Fig. 1

- |                          |                       |                               |
|--------------------------|-----------------------|-------------------------------|
| 1. Suction hose          | 12. Nut               | 23. Rear case half            |
| 2. Clutch drain hose     | 13. Driveshaft yoke   | 24. Intermediate clutch pack  |
| 3. Trans. supply hose    | 14. Hydraulic tube    | 25. Input clutch pack         |
| 4. Regulator valve       | 15. Solenoid          | 26. Reverse clutch half-pack  |
| 5. Clutch supply hose    | 16. Nut               | 27. Second intermediate shaft |
| 6. Breather hose         | 17. Spacer            | 28. Locking plates            |
| 7. Trans. wiring harness | 18. Valve cartridge   | 29. Capscrews                 |
| 8. Drive shafts          | 19. Control valve cap | 30. Oil baffle                |
| 9. Trans. mount bolts    | 20. Capscrews         | 31. Output clutch pack        |
| 10. Suction fitting      | 21. Capscrews         |                               |
| 11. Suction strainer     | 22. Front case half   |                               |

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**General**

Before starting any service procedure, make sure the work area is clean and safe. A clean work area will reduce the chance of foreign matter entering the hydraulic system.

Make sure proper tools are available and in good working order. You will require a safe lifting device; blocks or proper stands; a transmission jack; shop tools and some special tools listed separately.



**ALWAYS PUT THE GRADER IN THE SERVICE POSITION BEFORE ATTEMPTING ANY OVERHAUL, MAINTENANCE OR INSPECTION PROCEDURE.**

**THE SERVICE POSITION IS AS FOLLOWS:- PARK THE GRADER ON A LEVEL SURFACE AND FULLY LOWER THE MOLDBOARD AND ALL ATTACHMENTS. IF IT IS NECESSARY TO ADJUST OR SERVICE THE MOLDBOARD OR ATTACHMENTS IN A RAISED POSITION, SUPPORT THEM WITH ADEQUATE STANDS OR BLOCKS. APPLY THE PARKING BRAKE. TURN THE IGNITION SWITCH TO THE "OFF" POSITION AND REMOVE THE KEY. OPERATE ALL HYDRAULIC CONTROLS TO ENSURE THAT NO ACCUMULATED PRESSURE REMAINS IN THE HYDRAULIC SYSTEM. INSTALL CHOCKS AT THE FRONT AND REAR WHEELS. TURN THE ISOLATION SWITCH TO THE "OFF" POSITION. THE ISOLATION SWITCH IS INSTALLED BEHIND THE LEFT FRONT ENGINE COVER. ON ARTICULATED MACHINES, INSTALL THE BLOCKING PINS ON BOTH SIDES OF THE HINGE. ALLOW THE ENGINE AND HYDRAULIC SYSTEM TO COOL BEFORE WORKING IN THESE AREAS. THE GRADER IS READY FOR SERVICING.**

**NOTE**

**Weights, measures and tolerances are in Metric (SI), Imperial and U.S. quantities. International standards specify the comma to represent the decimal point in all Metric measurements.**

**Description**

The model 8400 is an electronically controlled, full-powershift transmission. You can select eight forward gear ratios and four reverse gear ratios.

Solenoid cartridge valves mounted in the control valve caps regulate the flow of oil to the clutch packs. The controller, mounted in the cab, actuates the solenoid valves.

The transmission hydraulic system is separate from all other grader hydraulic systems. The transmission sump is the system oil reservoir.

The system is equipped with its own pump, cooler and filter. Bypass valves protect the system from possible blockages in the cooler or filter.

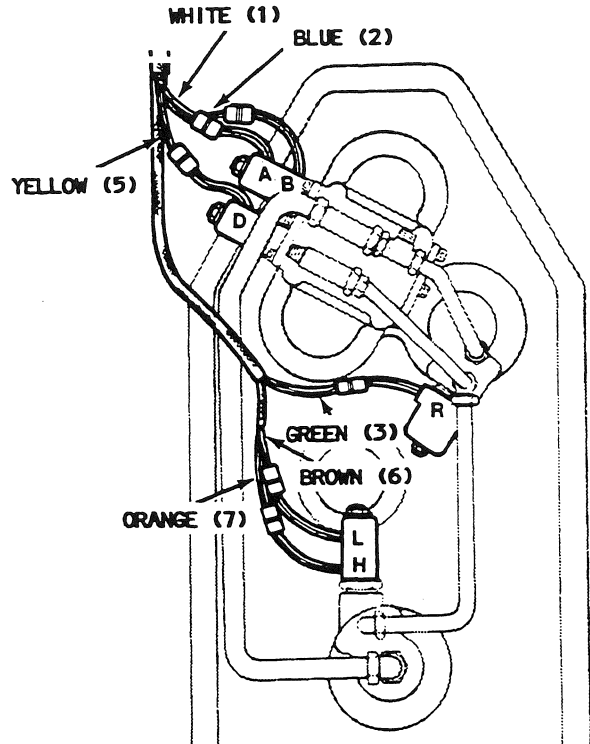
The transmission mounted regulator valve maintains a steady pressure of 1138-1275 kPa; 11,6-13,0 kg/cm<sup>2</sup> (165-185 psi) to operate the clutch packs. Any excess oil flows to the lubrication pressure valve, which regulates lubricating oil pressure to a maximum of 172 kPa; 1,75 kg/cm<sup>2</sup> (25 psi). If lubrication pressure falls below the minimum of 17,2 kPa; 0,2 kg/cm<sup>2</sup> (2.5 psi), a sensor activates the warning light on the operator's console.



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**Speed/Solenoids/Clutch Packs**

Speed	Solenoids energized	Clutch Packs engaged
1	1, 6	ACL
2	2, 6	BCL
3	1, 5, 6	ADL
4	2, 5, 6	BDL
5	1, 7	ACH
6	2, 7	BCH
7	1, 5, 7	ADH
8	2, 5, 7	BDH
Neutral	None	C
-1	3, 6	RCL
-2	3, 5, 6	RDL
-3	3, 7	RCH
-4	3, 5, 7	RDH



**Transmission Error Codes**

The 8400 controller is constantly running a self-diagnostic program which detects electrical failures in the transmission system. Should a failure occur, the shift console display immediately alerts the operator by showing E for half a second, followed by a two-digit numeric code for half a second. The controller disables both shift levers and places the transmission in neutral. The display will alternate between E and the code until the operator returns the mode control lever to the neutral position.

The Error Code Table lists the error codes and their definitions. Refer to the illustration for solenoid identification. Note that solenoid pairs 1/2 (A/B) and 6/7 (L/H) are each contained in one cartridge. A back-up alarm short circuit display alternates between the number of the current gear and a blank. No code appears in the event of an open back-up alarm circuit.

Code	Malfunction
1.0	Electric power is below 9.5 Vdc
2.0	Open circuit, solenoid 2 (B)
2.1	Open circuit, solenoid 3 (R)
2.3	Open circuit, solenoid 6 (L)
2.4	Open circuit, solenoid 7 (H)
2.5	Open circuit, solenoid 5 (D)
2.6	Open circuit, solenoid 1 (A)
2.7	No power to solenoid circuits
3.0	Short circuit, solenoid 2 (B)
3.1	Short circuit, solenoid 3 (R)
3.3	Short circuit, solenoid 6 (L)
3.4	Short circuit, solenoid 7 (H)
3.5	Short circuit, solenoid 5 (D)
3.6	Short circuit, solenoid 1 (A)
4.0	Forward/Neutral input error
4.1	Reverse/Neutral input error
4.2	Neutral restart error

**Error Code Table**

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**Special Tools**

Description	Part Number
Bearing shim tool	29858
Deep-reach socket wrench	29859

**Torque Guide**

Application	Torque Value		
	lbf.ft/lbf.in.	N.m	kgf.m
Yoke locknut	150 - 200	203 - 271	21 - 28
Bearing retaining locknuts	200 - 250	271 - 339	28 - 35
Oil level check sight glass	5	6,8	0,7
Reverse control valve cartridge	30 - 40	41 - 54	4,1 - 5,5
Locknut for above	30 - 40 lbf.in.	3,4 - 4,5	0,34 - 0,46
AB, LH and D valve cartridges	30 - 40	41 - 54	4,1 - 5,5
Locknuts for above	65 - 75 lbf.in.	7,3 - 8,5	0,75 - 0,86
Control valve capscrews	30 -35	40 -47	4 - 5
Transmission case capscrews	80 - 100	108 - 135	11 - 14
Upper driveshaft - U-joint capscrews	55	74	7,6
Lower driveshaft - U-joint capscrews	80	109	11

**Wear Limits - Clutch Friction Discs**

Plate diameter	5-1/4 in. 133,3 mm	6-5/8 in. 168,3 mm
Minimum plate thickness	0.049 in. 1,245 mm	0.088 in. 2,235 mm

**NOTE:** *Cross cut grooves in the friction material must be visible on both sides.*

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## 8400 TRANSMISSION

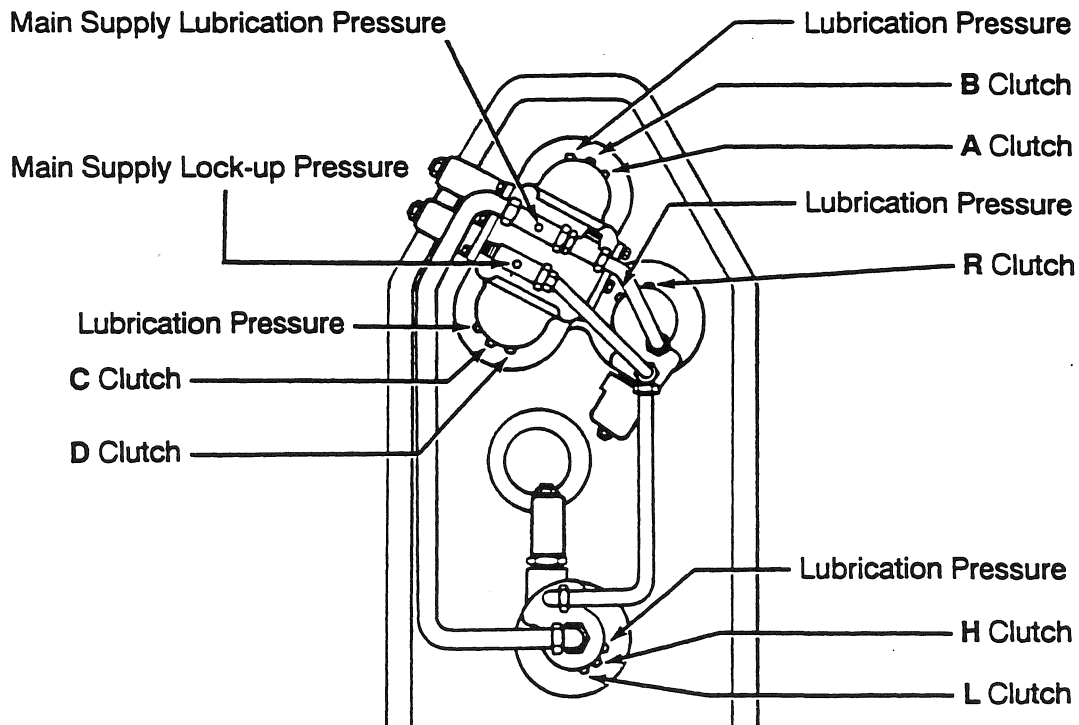
### Pressure Readings

Description	psi	kPa	kg/cm <sup>2</sup>
<b>Graders S/N 16224, 16245 to 20241, 20243, 20244, 20246 to 20249, 20251, 20252, 20254, 20255, 20257 to 20259, 20261 to 20264. U.S. 2021-2 to 2658-2 (fiber composite friction disc facing material)</b>			
Clutch pack lock-up pressure	165 - 185	1138 - 1275	12 - 13
<b>Graders S/N 20242, 20245, 20250, 20253, 20256, 20260, 20265 and up (bronze alloy friction disc facing material)</b>			
Clutch pack lock-up pressure	215 - 235	1482 - 1620	15,0 - 16,5
<b>All graders</b>			
Maximum lock-up pressure difference between clutches	10	69	0,7
Minimum lubrication pressure at minimum engine speed	2.5	17	0,2
Minimum lubrication pressure at maximum engine speed	10	69	0,7

### Flow Rates

Description	U.S. gpm	L/min
<b>All graders</b>		
Minimum transmission pump flow at minimum engine speed	9	34,0
Minimum transmission pump flow at maximum engine speed	30	113,5

### Test Port Locations



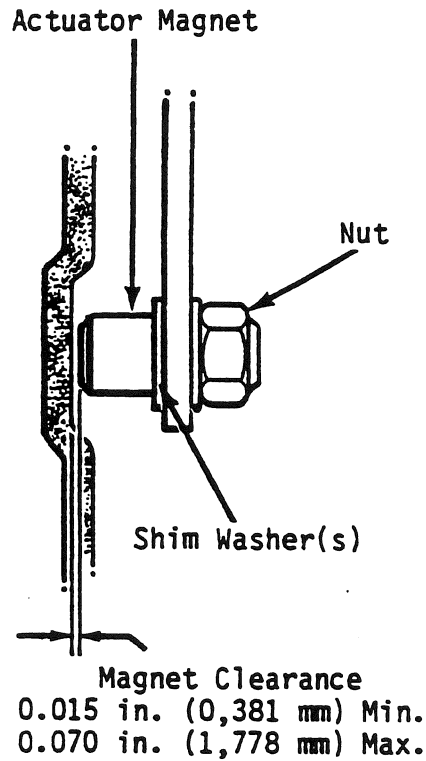
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**Solenoid Coil Approximate Resistance Values**

Clutch Pack	Solenoid Coil	Part Number	Resistance Value (High [+] & Low [-] Tolerances)
Rev.	3	37107	8.31 (+8.56, -8.06) ohms ( $\Omega$ )
AB and LH	1/2 and 6/7	37105	6.12 (+6.30, -5.94) ohms ( $\Omega$ )
CD	5	37106	5.03 (+5.18, -4.88) ohms ( $\Omega$ )

Resistance should be measured at a temperature of 20°C (68°F).

**Transmission Controller Actuator Magnet Clearance Measurement**



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**SHIM SELECTION CHART** (To be used only with Control Valve Caps with Counterbores)  
(Effective Grader Serial Nos. 18179, 18211 and up. U.S. 2659-2 and up)

**Average Measurement**

**Shim Part Number and Dimensions**

Average Measurement		Shim Part Number and Dimensions				
mm	in.	Output Shaft	Second Intermediate Shaft	First Intermediate Shaft	Input Shaft	Reverse Shaft
18,57	.731			37799 4,44 mm .175 in.		
18,54	.730					
18,52	.729					
18,49	.728					
18,46	.727					
18,44	.726					
18,41	.725					
18,39	.724			37764 4,57 mm .180 in.		
18,36	.723					
18,34	.722					
18,31	.721					
18,29	.720				37765 4,70 mm .185 in.	
18,26	.719	37798 4,70 mm .185 in.		37765 4,70 mm .185 in.		37765 4,70 mm .185 in.
18,24	.718		37765 4,70 mm .185 in.			
18,21	.717					
18,19	.716					
18,16	.715					
18,14	.714	37776 4,83 mm .190 in.		37766 4,83 mm .190 in.	37766 4,83 mm .190 in.	37766 4,83 mm .190 in.
18,11	.713		37766 4,83 mm .190 in.			
18,08	.712					
18,06	.711					
18,03	.710					
18,01	.709	37777 4,95 mm .195 in.		37767 4,95 mm .195 in.	37767 4,95 mm .195 in.	37767 4,95 mm .195 in.
17,98	.708		37767 4,95 mm .195 in.			
17,96	.707					
17,93	.706					
17,91	.705				37768 5,08 mm .200 in.	
17,88	.704	37778 5,08 mm .200 in.		37768 5,08 mm .200 in.		37768 5,08 mm .200 in.
17,86	.703		37768 5,08 mm .200 in.			
17,83	.702					
17,80	.701					
17,78	.700					
17,75	.699	37779 5,20 mm .205 in.		37769 5,20 mm .205 in.	37769 5,20 mm .205 in.	37769 5,20 mm .205 in.
17,73	.698		37769 5,20 mm .205 in.			
17,70	.697					
17,68	.696					
17,65	.695					
17,63	.694	37780 5,33 mm .210 in.		37770 5,33 mm .210 in.	37770 5,33 mm .210 in.	37770 5,33 mm .210 in.
17,60	.693		37770 5,33 mm .210 in.			
17,58	.692					
17,55	.691					
17,53	.690					
17,50	.689	37781 5,46 mm .215 in.		37771 5,46 mm .215 in.	37771 5,46 mm .215 in.	37771 5,46 mm .215 in.
17,47	.688		37771 5,46 mm .215 in.			
17,45	.687					
17,42	.686					
17,40	.685					
17,37	.684	37782 5,59 mm .220 in.		37772 5,59 mm .220 in.	37772 5,59 mm .220 in.	37772 5,59 mm .220 in.
17,35	.683		37772 5,59 mm .220 in.			
17,32	.682					
17,30	.681					
17,27	.680					
17,25	.679	37783 5,71 mm .225 in.		37773 5,71 mm .225 in.	37773 5,71 mm .225 in.	37773 5,71 mm .225 in.
17,22	.678		37773 5,71 mm .225 in.			
17,19	.677					
17,17	.676					
17,14	.675					
17,11	.674	37784 5,84 mm .230 in.		37774 5,84 mm .230 in.	37774 5,84 mm .230 in.	37774 5,84 mm .230 in.
17,09	.673		37774 5,84 mm .230 in.			
17,07	.672					
17,04	.671					
17,02	.670					
16,99	.669	37796 5,60 mm .235 in.		37794 5,60 mm .235 in.	37794 5,60 mm .235 in.	37794 5,60 mm .235 in.
16,97	.668		37794 5,60 mm .235 in.			
16,94	.667					
16,92	.666					
16,89	.665					
16,86	.664					
16,84	.663					
16,81	.662					
16,79	.661					
16,76	.660		37795 6,10 mm .240 in.	37795 6,10 mm .240 in.	37795 6,10 mm .240 in.	37795 6,10 mm .240 in.

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Cleaning and Inspection

Cleaning - General



**WARNING**

ALKALI CLEANING SOLVENTS AND VAPORS ARE EXTREMELY HARMFUL AND CAN CAUSE SERIOUS INJURY TO EYES, LUNGS AND SKIN. ALWAYS WEAR PROTECTIVE CLOTHING, GOGGLES AND RESPIRATOR. USE UT-MOST CARE WHEN HANDLING CHEMICALS.

**CAUTION**

YOU ARE RECOMMENDED TO WEAR COTTON GLOVES WHEN HANDLING BEARINGS. THIS PREVENTS SKIN ACIDS AND PERSPIRATION CONTAMINATING THE RACES AND ROLLING ELEMENTS.

Immerse small parts, gears and machined components into a mild alkali cleaning solvent. Agitate the parts to remove all foreign matter.

Parts should remain in the solvent long enough to be thoroughly cleaned and heated. This will help evaporate the solvent and rinse water. Thoroughly rinse parts to remove all traces of cleaning solvent.

Cleaning - Bearings

After rinsing, immediately dry the parts using moisture-free compressed air. Lint-free, uncontaminated wiping rags can be used. Ensure all oil passages are unblocked.

Immerse bearings in cleaning solvent. Rinse the cleaned bearings and dry with moisture-free compressed air while rotating them slowly by hand. DO NOT spin bearings when drying. Lubricate all bearings with system oil; wrap in clean, lint-free cloth or paper and store in a cool, dry place.

Inspection - General

A careful and thorough inspection of all parts is extremely important. Replace all parts showing indications of wear or damage.

Inspection - Bearings

Carefully inspect all rollers, cages and cups for wear, nicks or chipping. When replacing bearings, **ALWAYS** install new mating cups and cones. After inspection, lubricate all bearings with system oil; wrap in clean, lint-free cloth or paper and store in a cool, dry place.

**Cleaning and Inspection (Continued)****Inspection - Oil Seals, O Rings and Snap Rings**

Replace all oil seals, O rings and snap rings. Lubricant loss through a worn seal can cause expensive parts of the assembly to fail. Handle sealing components carefully, particularly when being installed. Cutting, scratching or curling of the seal lip seriously reduces efficiency.

Apply a thin coating of 'Permatex No. 2', or equivalent, onto the outer diameter of the oil seal carrier. This ensures an oil-tight fit in the bore. Lubricate all oil seal lips and O rings before installation.

**Inspection - Gears and Shafts**

If crack detection equipment is available, use the process to check parts. Examine teeth of all gears for wear, pitting, chipping, nicks, cracks and scores. If gear teeth show spots where the case hardening has worn through or cracked, replace the gear.

Small nicks can be removed using a suitable grinding stone. Inspect shafts for signs of bent or twisted splines and replace any deformed axles.

Check the flatness of all clutch pack reaction plates using a surface table and feeler gauges. Discard all warped plates.

---\*\*\*---

**Troubleshooting**

This troubleshooting program details procedures which will help you diagnose and repair most electrical and hydraulic malfunctions.

In most cases, the last procedure that may be required is a transmission overhaul.

Make sure proper tools are available and in good working order. You will require a multimeter, pressure gauges, a flowmeter rated to at least 40 U.S. gpm (151 L/min) and normal shop tools.

Testing electrical and hydraulic systems first will normally prevent the need for a costly, time-consuming mechanical overhaul.

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Troubleshooting (Continued)

**Fig. 2 ELECTRICAL SYSTEM**

Most electronic controller problems can be caused by a poor ground connection. **ALWAYS** check for a poor ground connection first. It could be between the cab and controller; between the cab and frame; across the articulation hinge; at the isolation switch or at the battery. On later model graders, the ground wire is in the wiring harness.

**Fig. 3**

When you start the engine or turn the ignition key to the **RUN** position, the controller display shows a series of codes known as the **start sequence** (refer to the 700 Series Operator's Manual). If no start sequence display appears, look for a tripped circuit breaker. Reset the circuit breaker. If all circuit breakers are normal, remove the screws retaining the console. Remove the console to expose the controller.

**Fig. 4**

With the ignition key in the **ON** position, look directly behind and to the left of the controller display. If you see an energized **green** light, the controller is working correctly. If you see an energized **red** light, the controller has malfunctioned and may have to be replaced. If no light is energized, power to the controller is below 9 volts. Check the power supply and ground connections to the controller.

**Fig. 5**

If the green light is energized but the display is blank, remove the controller and test for power at the microswitch terminal labeled **common**. There should be power if the ignition switch is in the **ON** position. If there is no power, check the continuous-duty solenoid under the console.

**Fig. 6**

If there is no power at the **common** terminal, make sure the mode lever is in **Neutral** and check the microswitch terminal labeled **normally open** for power.

**Fig. 7**

Move the mode lever to **Forward**; then **Reverse**. There should be power at the microswitch labeled **normally closed** for both modes. If there is no power, replace the microswitch.



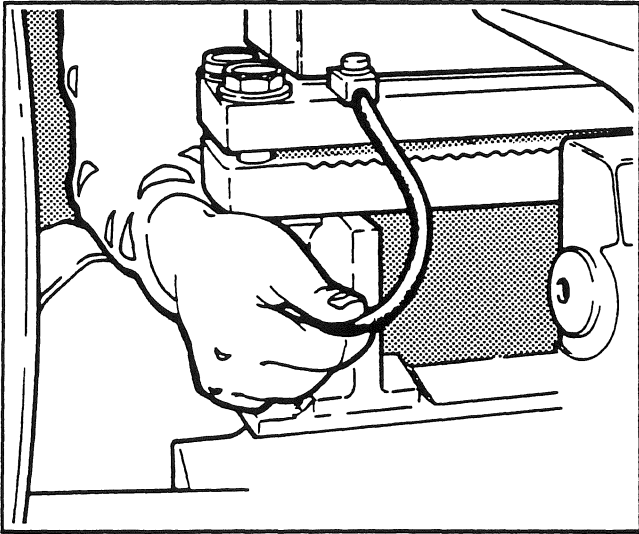


Fig. 2

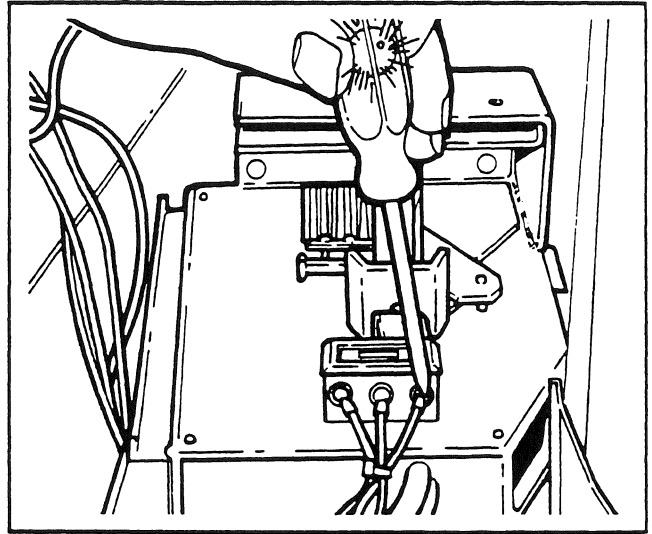


Fig. 5

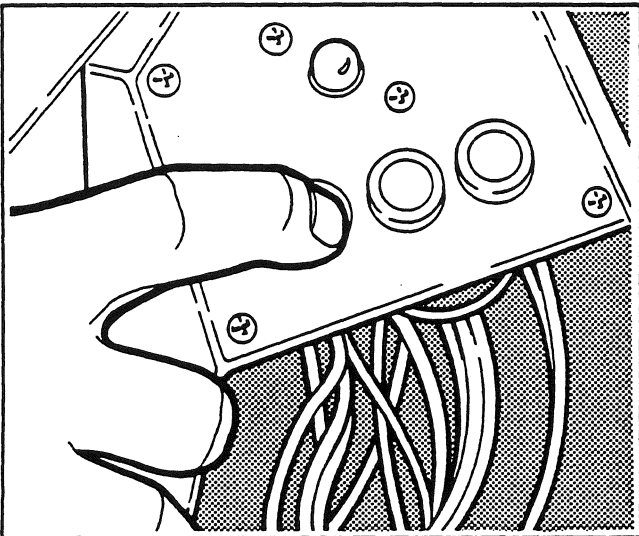


Fig. 3

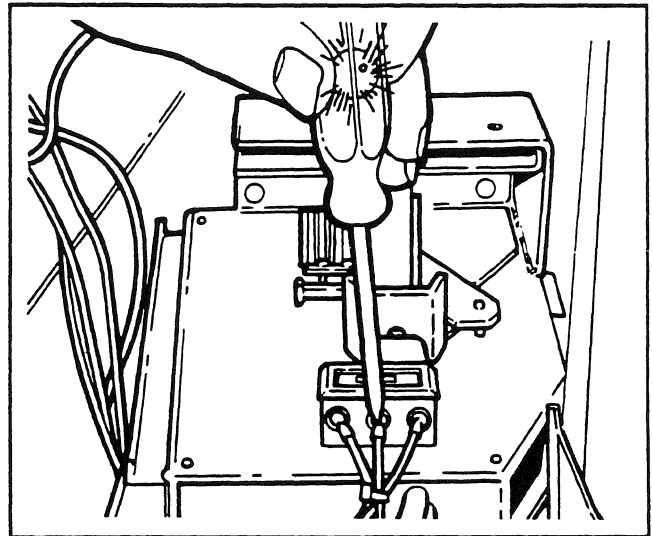


Fig. 6

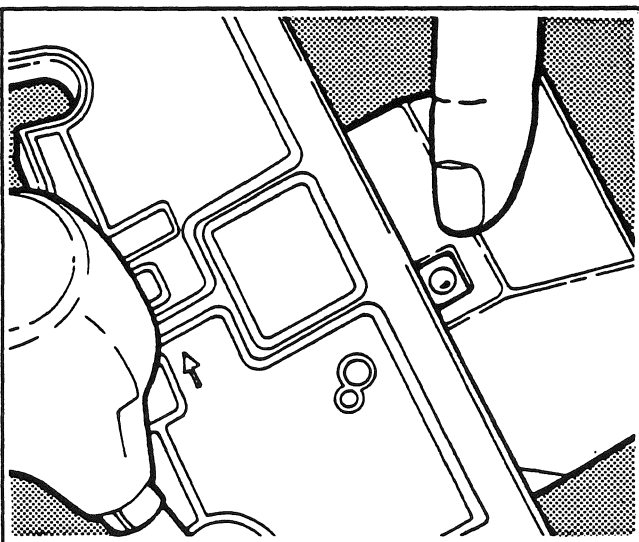


Fig. 4

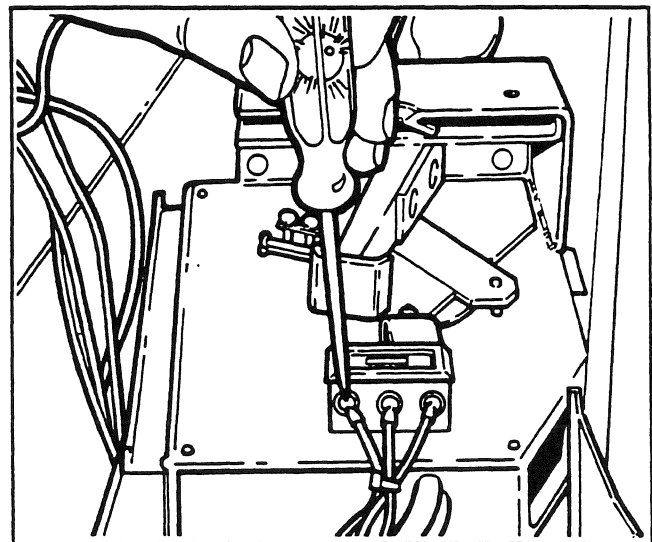


Fig. 7

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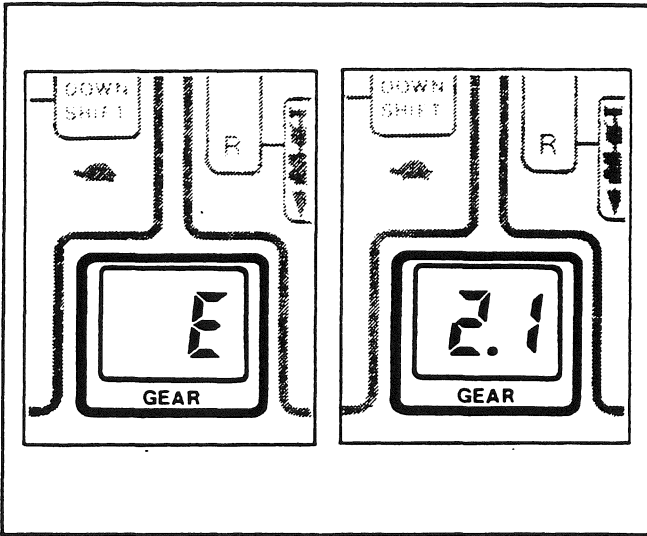


Fig. 8

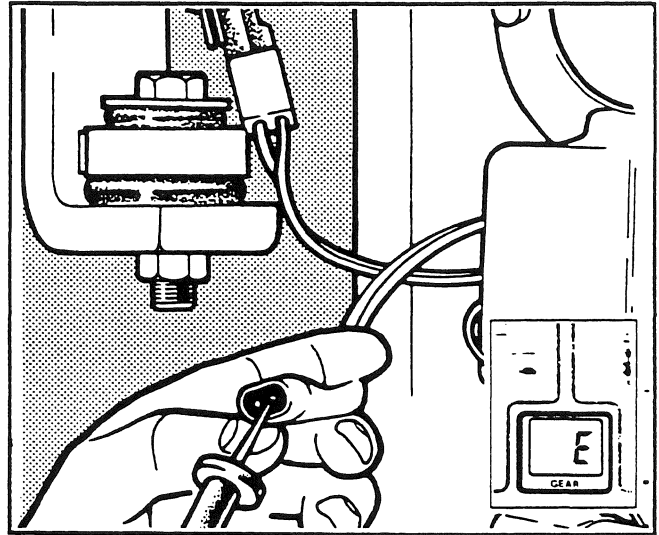


Fig. 11

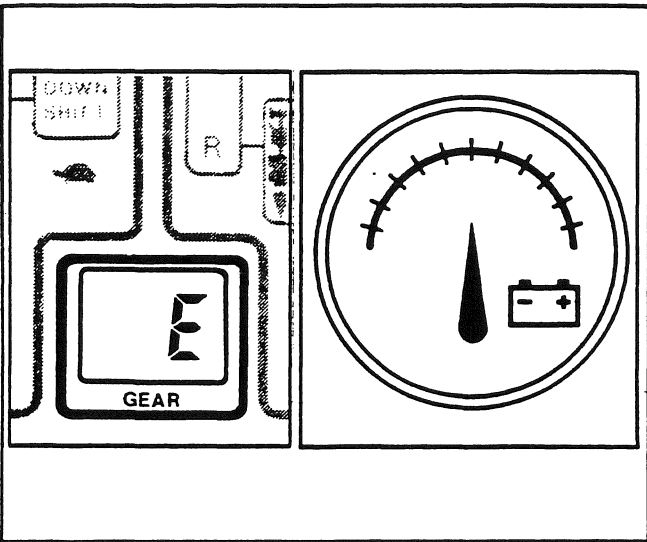


Fig. 9

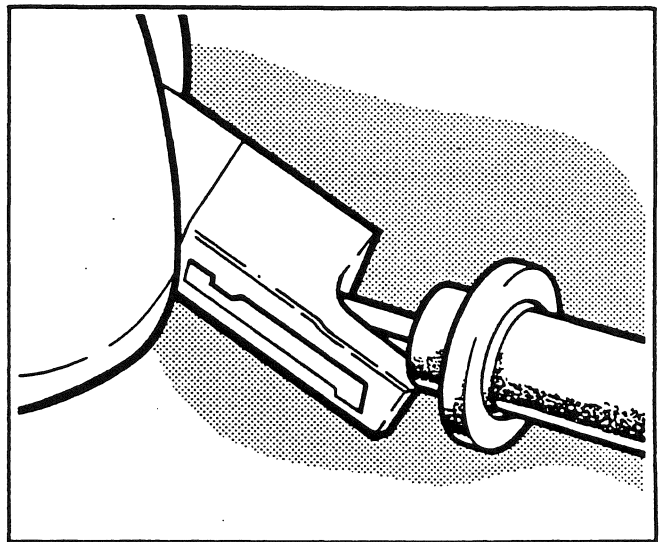


Fig. 12

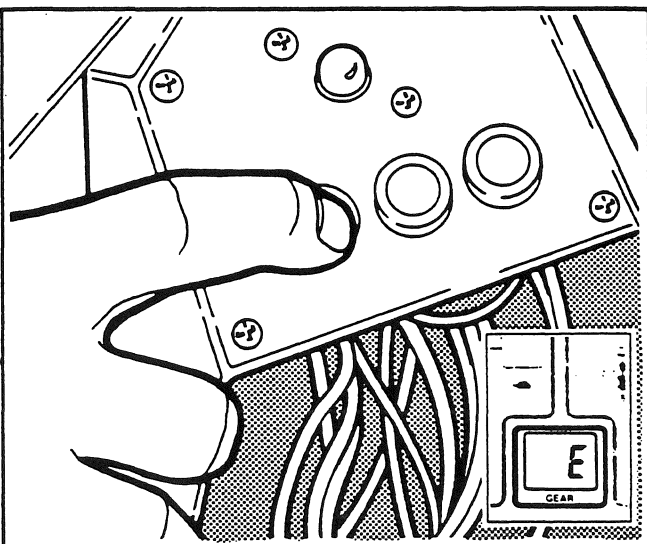


Fig. 10  
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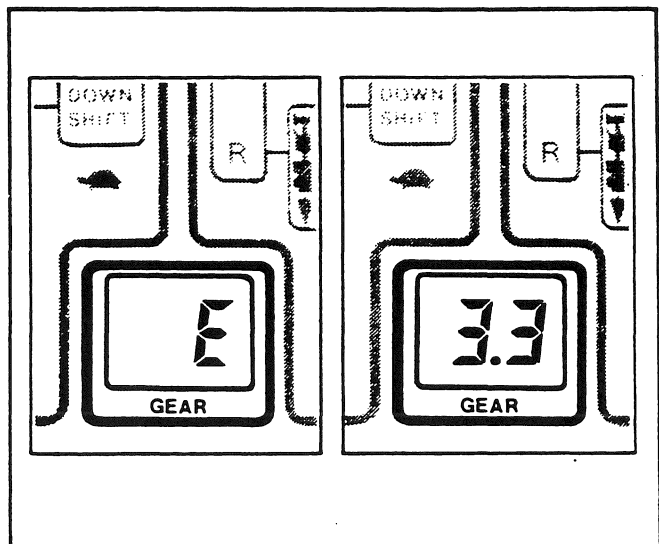


Fig. 13

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Troubleshooting (Continued)

**Fig. 8**

The transmission controller is self-diagnostic and continuously monitors the transmission electrical system. The display indicates an error by alternately flashing E and a two digit code. You will find the error codes listed on Page 2 of this Shop Manual Section. Whenever an error code is displayed, the transmission automatically shift to and remains in **Neutral**. To reset the controller, move the mode lever to **Neutral**.

**Fig. 9**

For example, if the power supply to the controller is between 8.5 and 10 volts d.c., the error code E 1.0 flashes. This indicates either a low state of charge in the batteries if the engine is shut down, or a faulty charging system if the engine is running. Should the power supply drop below 8.5 volts d.c., the display remains blank.

**Fig. 10**

Error code E 2.7 indicates an open circuit in the power supply to all six solenoids. Check the 15 amp circuit breaker first. If the circuit breaker has not tripped, check for power at the continuous duty solenoid; the circuit breaker and at the single connector between the transmission and main power supply harness.

**Fig. 11**

Error codes from 2.0 to 2.6 indicate an open circuit in one of the transmission solenoids. For example, error code E 2.3 is an open circuit in solenoid number six. Look for a broken wire or short to ground. You should also check the resistance of the solenoid against the values listed on Page 5 of this Shop Manual Section. If the resistance is high, replace the solenoid. If the resistance is normal, re-connect the solenoid to the transmission harness.

**Fig. 12**

Disconnect the single pin connector at the controller and check the resistance from there to the appropriate pin on the transmission harness. If the resistance is once again high, the transmission harness is faulty and should be replaced. The controller will not allow the transmission to operate with an open circuit.

**Fig. 13**

Short circuits are failures where electrical current by-passes the solenoids, and are indicated by error codes 3.0 to 3.6. For example, error code E 3.3 is a short circuit in solenoid number six. The transmission will function provided you do not select a gear that requires activation of the short circuited solenoid.

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Troubleshooting (Continued)

**Fig. 14**

To troubleshoot a 3 series error code, disconnect the 2-pin connector at the suspect solenoid and check the resistance. If the value is below specification, replace the coil. If the resistance is normal, re-connect the solenoid. Disconnect the single connector and the controller multi-pin connector. Check the resistance between the single connector and the appropriate pin. The value should be slightly higher than that of the solenoid coil. If the resistance is far less, you must replace the transmission harness.

**Fig. 15**

Error codes 4.0 and 4.1 indicate **Forward/Neutral** and **Reverse/Neutral** controller input errors. When you shift from either **Forward** or **Reverse** to **Neutral**, two steps must take place:- a) the magnet on the mode lever must move away from a proximity switch; b) the microswitch must be depressed. If these two steps do not occur, the display shows one of the 4 error codes.

**Fig. 16**

Check for a missing or misaligned magnet. Refer to Page 5 for the correct clearance. If any adjustment is needed, add or remove washers. You can also move the magnet laterally in the slot. The same condition may also apply if the pulser lever is ignoring shift commands. Check that the magnets are present and properly adjusted.

**Fig. 17**

**DO NOT** connect any accessories, such as radios, to the transmission electrical circuit; including the continuous duty solenoid. The accessory solenoid is available to power these types of equipment.

**Fig. 18**

The controller electronic components are sealed in a box. Rubber boots are available for the levers to protect the microswitch from dust.

**Fig. 19**

Recent production units have a gasket between the controller box and the face plate to keep the digital display clean. This gasket, Champion part number 37377, is available for installation on older units.

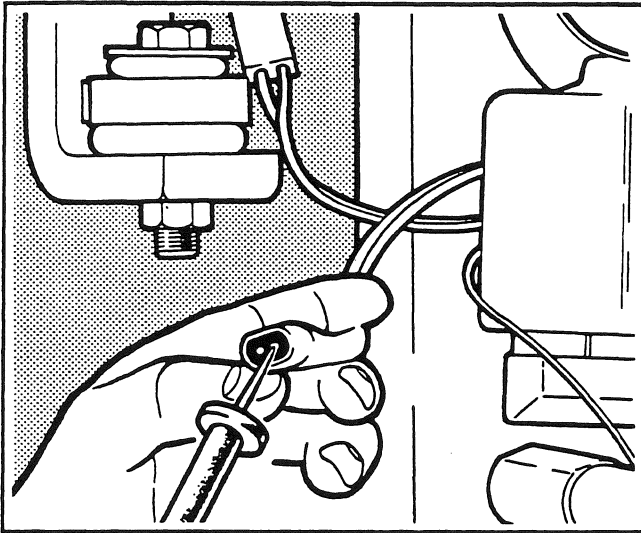


Fig. 14

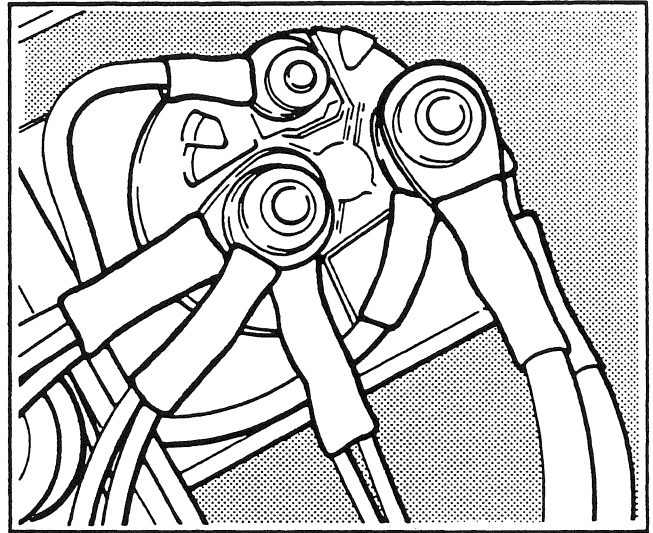


Fig. 17

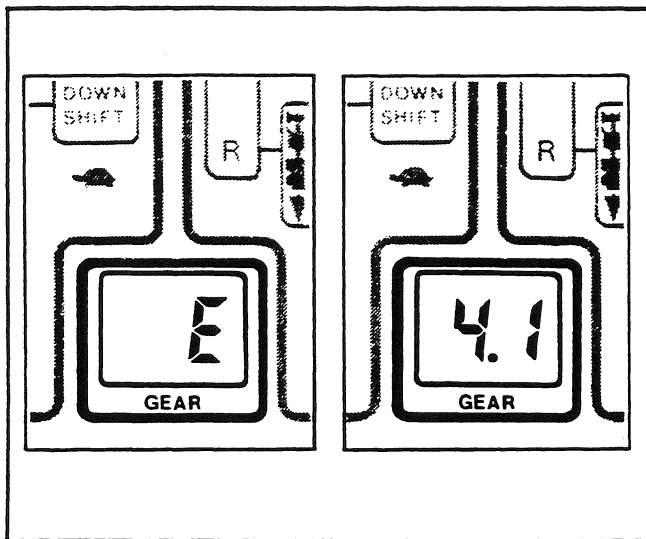


Fig. 15

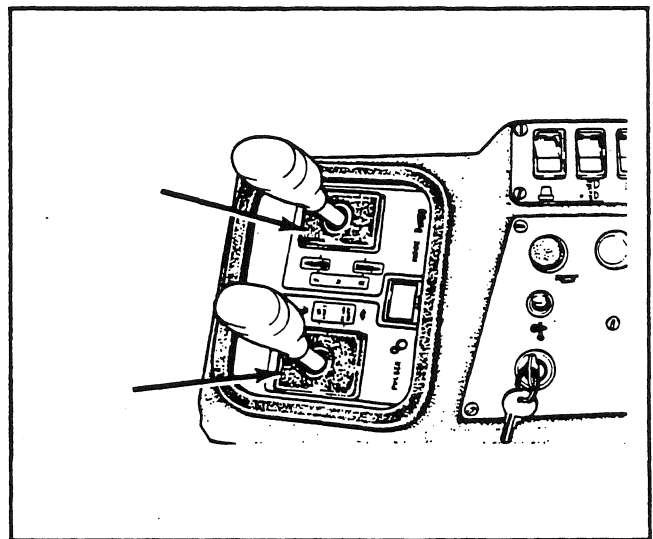


Fig. 18

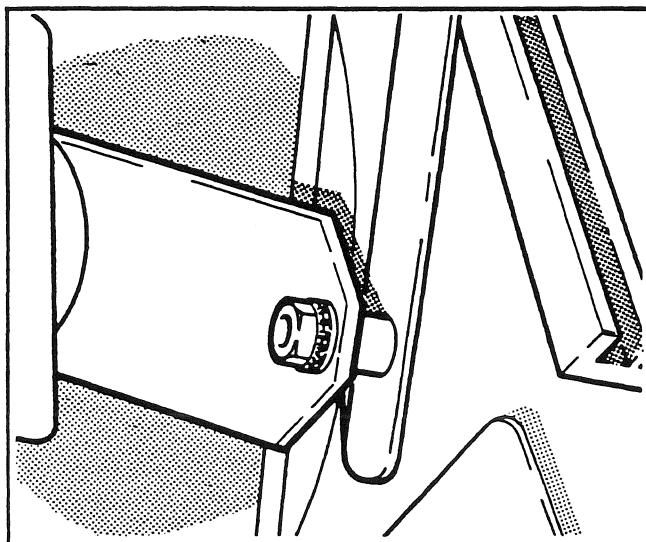


Fig. 16

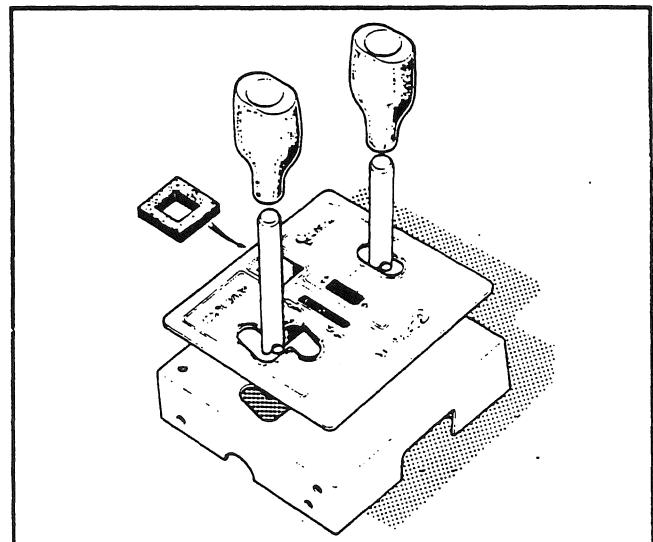


Fig. 19

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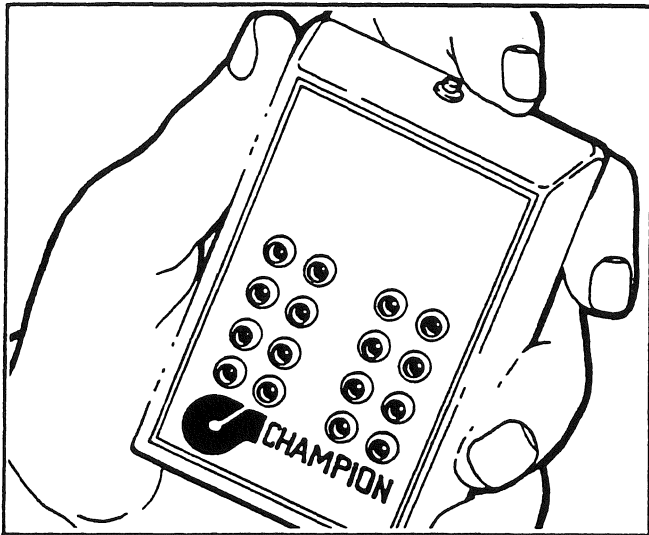


Fig. 20

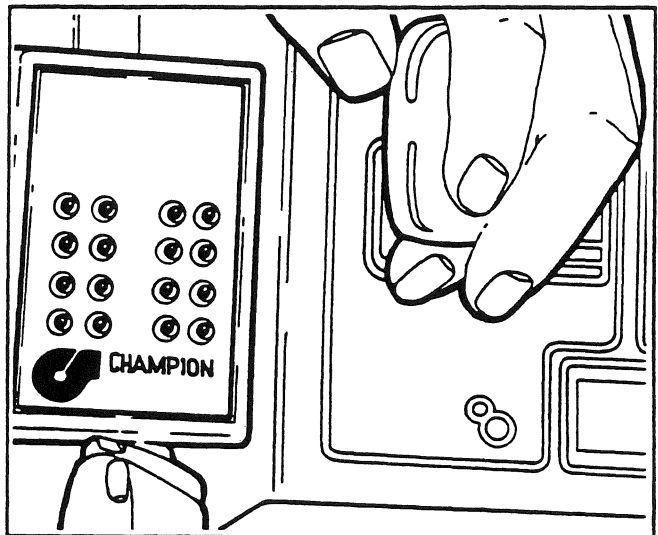


Fig. 23

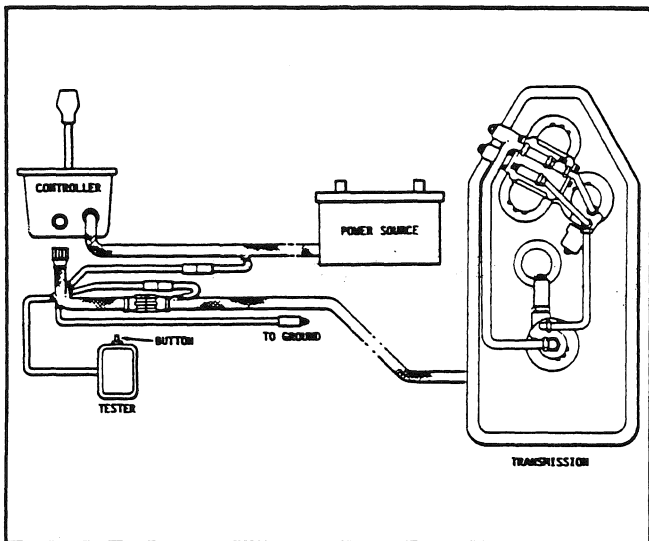


Fig. 21

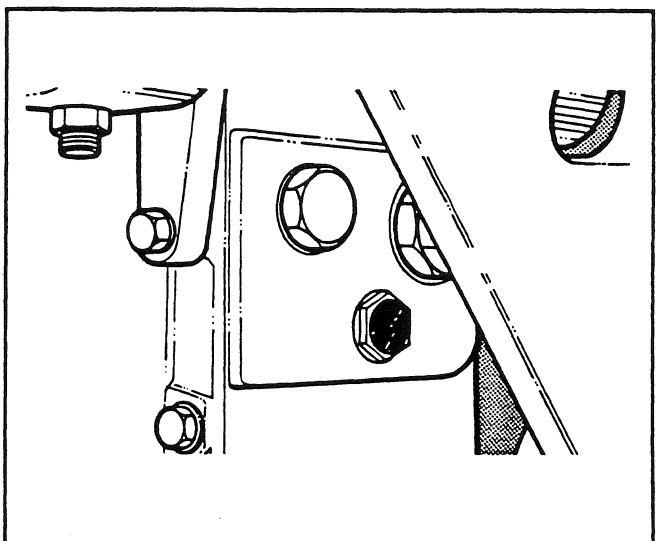


Fig. 24

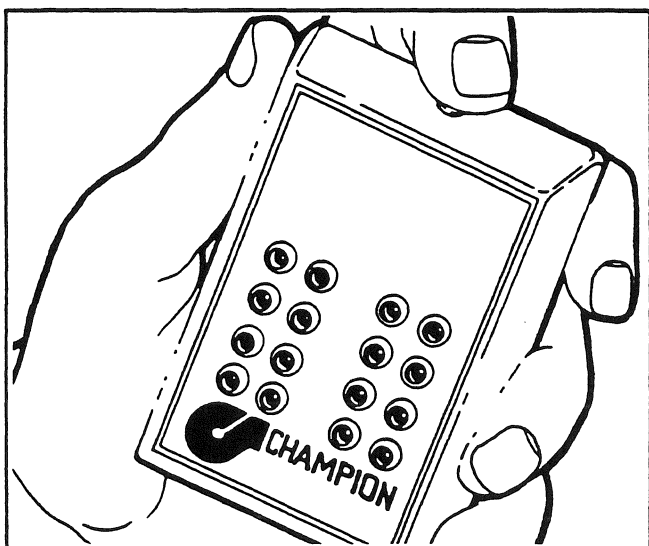


Fig. 22

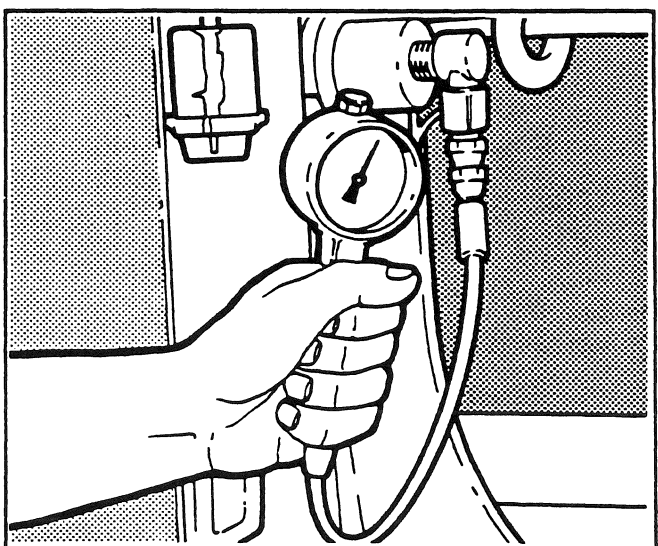


Fig. 25

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Troubleshooting (Continued)

**Fig. 20**

The preceding electrical troubleshooting procedures should resolve most model 8400 transmission electrical faults. If you are still experiencing a transmission malfunction, there may be a hydraulic or mechanical problem. Additional to these diagnostic procedures, Champion has introduced a handheld tester that simplifies electrical troubleshooting. Using this tester, you can quickly check for open or short circuits and verify shift sequences.

**NOTE:** APPLIES ONLY TO S/N 16245 TO 20719.

**Fig. 21**

To install the tester, disconnect the transmission harness from the controller; then connect the test harness to the transmission harness. Disconnect the power supply connector and connect the tester supply between the two wires. Connect the tester ground clip to the main harness ground stud. With the mode lever in **Neutral**, turn the ignition key to the **ON** position. After the start sequence, move the mode lever to **Forward**. The controller displays **E 2.7**.

**Fig. 22**

Press the button on the tester: seven red light-emitting diodes (LEDs) should energize. Disregard the two upper right LEDs. Any red LED that does not energize indicates an open circuit in that solenoid. When you release the button, check for an energized green LED. An energized green LED indicates a short to ground. Turn the ignition key to the **OFF** position and rectify any indicated open or short circuits.

**Fig. 23**

Now connect the tester harness to the transmission controller. With the ignition switch in the **ON** position and the mode lever in **Forward**, cycle the pulser lever through the gears and check the energized green LED patterns for the correct sequences. Repeat this procedure to check the **Reverse** gears. Disregard the lower right red LED if your grader is not equipped with a back-up alarm or lights. Any abnormal sequences may be due to a faulty controller.

**Fig. 24 HYDRAULIC SYSTEM**

An important point to remember is that hydraulic oil flow rates and pressure settings **should be checked first**. This will eliminate unnecessary transmission removal and overhaul. Before starting any hydraulic troubleshooting, place the grader in the **Service Position** (refer to Page 1 of this Shop Manual Section). Before making any oil flow or pressure checks, make sure you can see transmission oil half-way up the level check sight glass, with the engine running at idle and at operating temperature.

**Fig. 25**

If the low lubrication pressure warning light is energized or the transmission is not operating normally, check the lock-up oil pressure reading at the transmission filter outlet. Record the pressures at idle and rated engine speed. Compare the results with the chart on Page 4 of this Shop Manual Section.

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Troubleshooting (Continued)

**Fig. 26**

If the recorded pressure is lower than the specification on the chart, remove the transmission filter element and check for contamination. Drain the transmission oil; then check the transmission sump strainer for contamination. Refill the transmission with the correct type of oil. With the engine running at idle and at operating temperature, make sure you can see transmission oil half-way up the level check sight glass. Check all supply lines for damage or suction leaks.

**Fig. 27**

On graders equipped with a lock/unlock differential final drive where oil flow is at or above the recommended minimum and pressure remains low, isolate and plug the line that supplies the differential lock hydraulic circuit. Again, check the clutch pressure. If the pressure rises, there is excessive leakage in the differential lock hydraulic circuit.

**Fig. 28**

Remove and inspect the differential lock valve and cylinder assembly. A malfunctioning assembly may also be the cause of low lubrication oil pressure.

**Fig. 29**

If the low pressure problem is not corrected by these methods, check the transmission pump oil flow. Install a 40 U.S. gpm (151 L/min) in-line type flowmeter between the transmission oil cooler and filter (with the engine running at idle and at operating temperature, make sure you can see transmission oil half-way up the level check sight glass. Replenish as necessary). Record the oil flow at idle and rated engine speed. If the flow is below the specifications shown on Page 4 of this Shop Manual Section, repair or replace the transmission pump. Look for excessive wear; cavitation; erosion; contamination; scoring or defective seals.

**Fig. 30**

If the flow rate is normal and the pressure reading is low, remove and inspect the lock-up pressure regulator valve spring. If the spring is not collapsed or broken, adding a shim between the spring and the spool may raise the transmission pressure to specification.

**Fig. 31**

If the flow rate and pressure reading are normal, but the low lubrication oil warning light is energized or the transmission is not working normally, follow the procedures given in the **Hydraulic Test Sheet** detailed at the end of the Shop Manual Section and record the results. It may not be necessary to complete the entire chart. Transmission lock-up and lubrication pressures, and the differences for each clutch pack, are specified on Page 4 of this Shop Manual Section.



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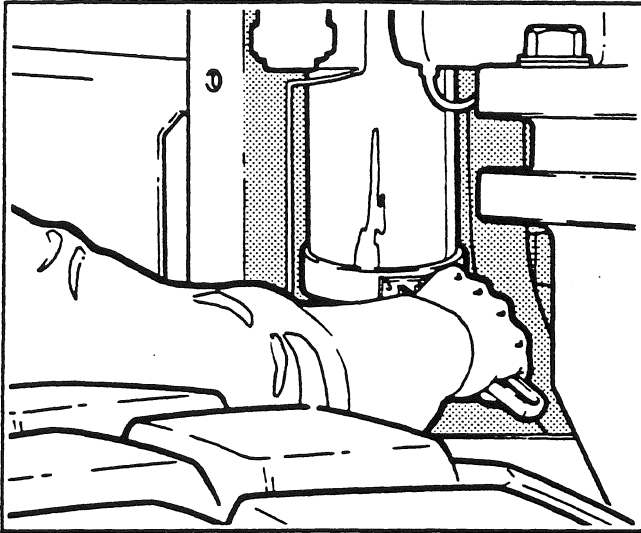


Fig. 26

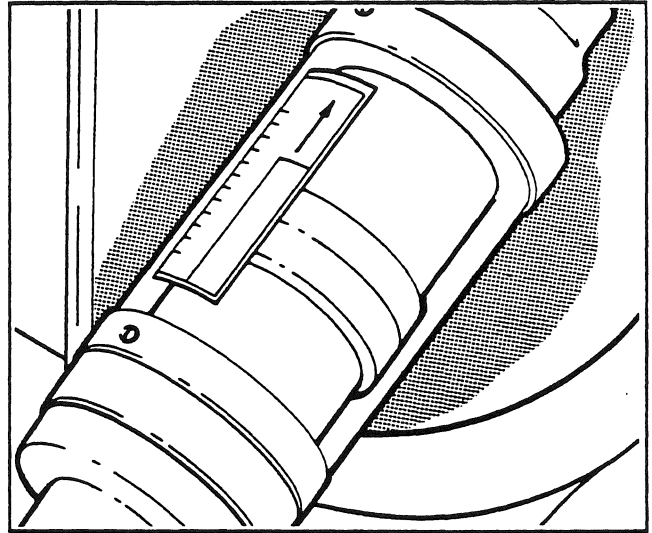


Fig. 29

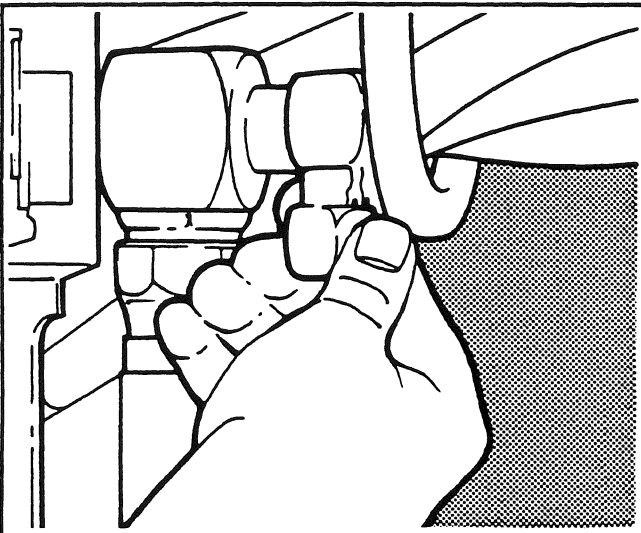


Fig. 27

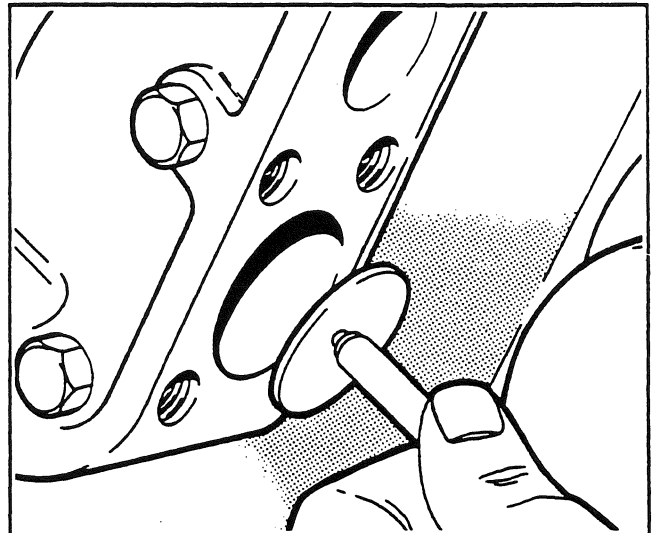


Fig. 30

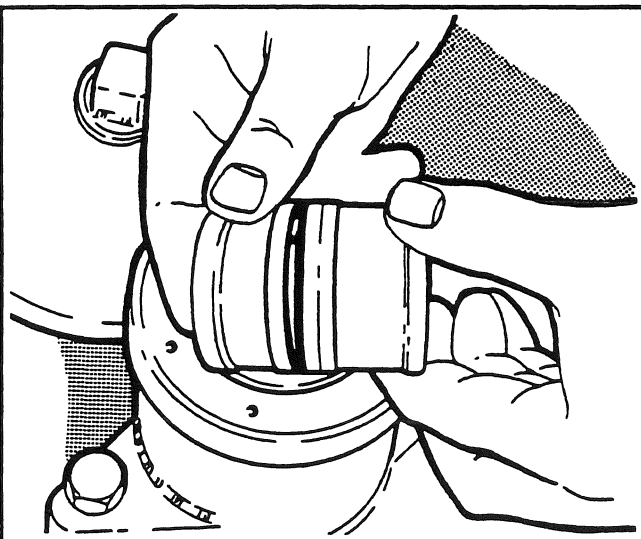


Fig. 28

700 SERIES SHOP MANUAL  
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HYDRAULIC TEST SHEET  
(Reproduce this form as required)

Customer \_\_\_\_\_ Model \_\_\_\_\_ Hours \_\_\_\_\_ Date \_\_\_\_\_  
Grader s/n \_\_\_\_\_ Trans. s/n \_\_\_\_\_ Tested by \_\_\_\_\_

**"How to Use this Chart"**

1. Lower attachments and moldboard, block all wheels, apply the parking brake.
2. Transmission oil must be at operating temperature.
3. Install gauges in the test ports as shown in the diagram on page 4.

**WARNING**  
Ensure that the gauge hoses are long enough to reach beyond the grader wheels.  
DO NOT work under the grader or near the wheels when the engine is running!

GEAR	CLUTCH						LUBE	
	A	B	C	D	H	L		R
1								
2								
3								
4								
5								

min. engine sod.  
max. engine sod.

Fig. 31

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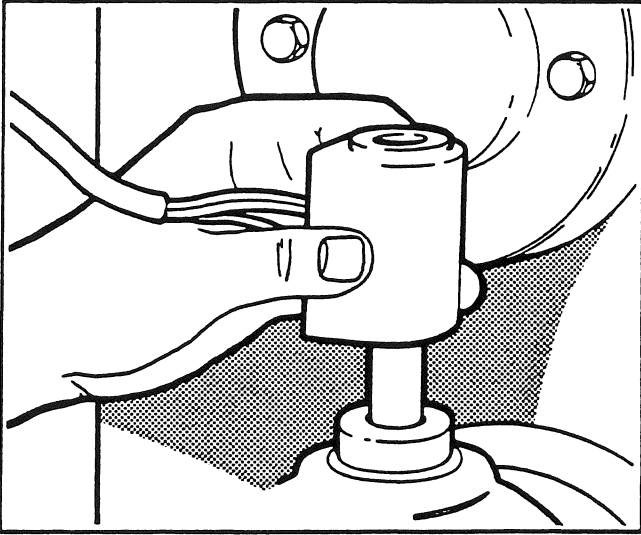


Fig. 32

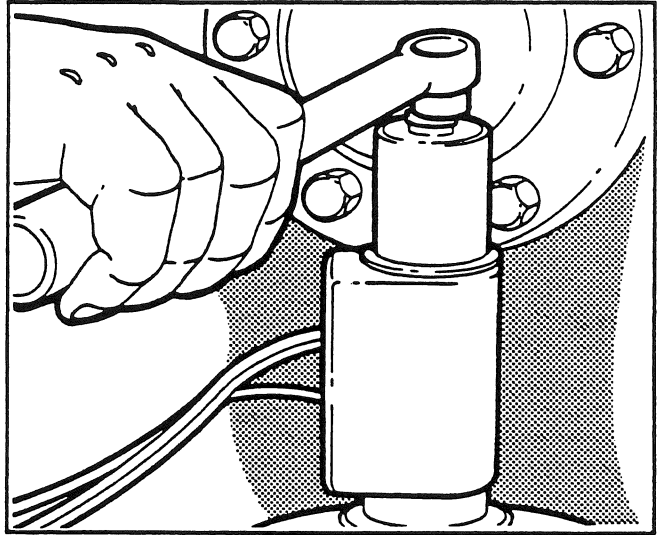


Fig. 35

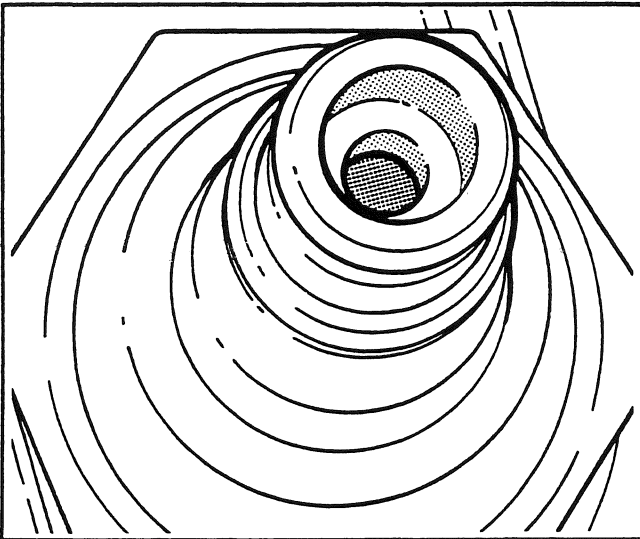


Fig. 33

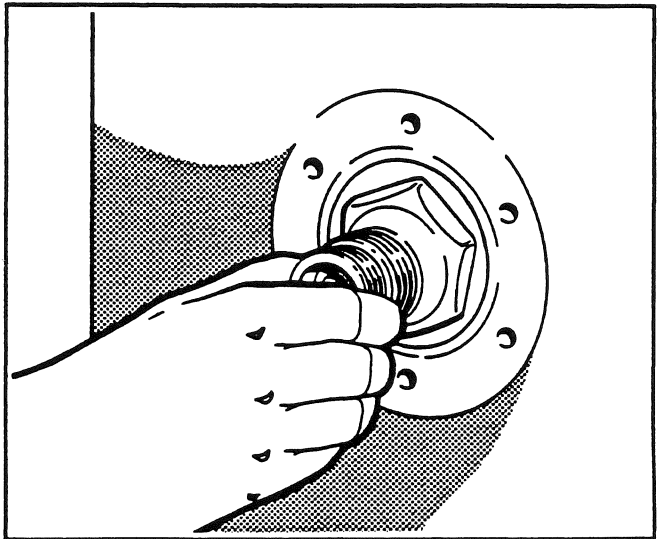


Fig. 36

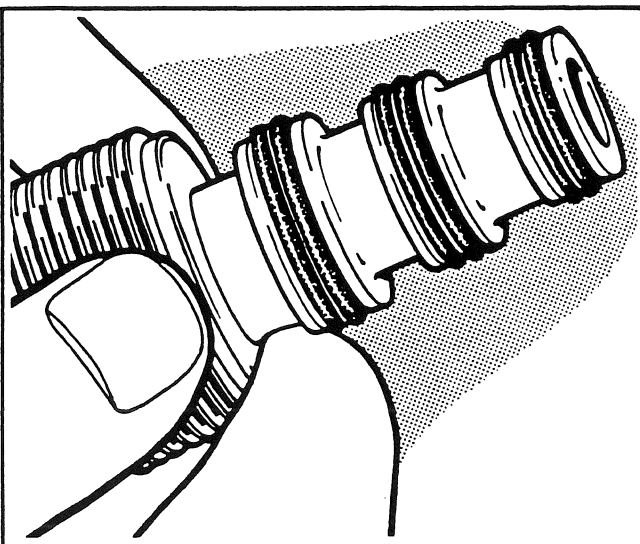


Fig. 34

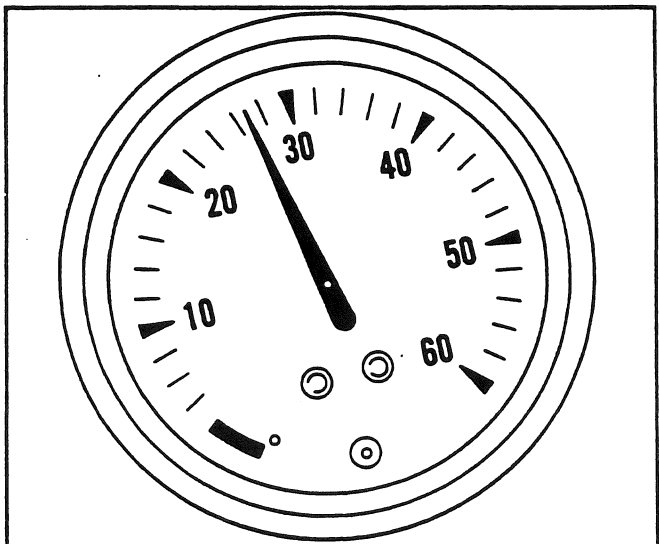


Fig. 37

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**Troubleshooting (Continued)**

**Fig. 32**

If lock-up oil pressure is low in a selected clutch pack, check the mechanical operation of the appropriate solenoid valve spool. Remove the coil and cartridge from the valve bore. Inspect the coil and cartridge.

**Fig. 33**

With the engine shut-down, but the ignition key in the **ON** position, engage a gear that uses that valve cartridge. The valve spool should move freely.

**Fig. 34**

Also, check the screens around the valve for contamination. Check the O rings for damage.

**Fig. 35**

Install the valve cartridge and tighten the hexagon to the specified torque. If the valve fails to operate, the control valve cap bore is probably distorted. Replace the control valve cap. Tighten the nut retaining the coil to the specified torque.

**Fig. 36**

If lock-up oil pressure remains low at one clutch only, remove the control valve cap from that clutch. Inspect the seal rings for cracks, chips or nicks. Inspect the internal bore of the control valve cap. The seal ring grooves should be evenly worn around the inside diameter.

**Fig. 37**

If the low lubrication oil pressure warning light is energized, remove the sender unit and install a pressure gauge rated at 0-414 kPa; 0-4,2 kg/cm<sup>2</sup> (0-60 psi). Record the pressure at idle and rated engine speed. Compare the results with the specifications shown on Page 4 of this Shop Manual Section. If the flow rate is normal and pressure reading is low, adding a shim between the spring and the spool may raise the lubrication pressure to specification.

If the transmission still malfunctions with the normal flow rates and pressure readings, or lock-up flow to individual clutches is excessively high, a mechanical problem may exist within the transmission. Refer to the following pages for disassembly and assembly instructions of the model 8400 transmission and clutch packs.

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Transmission - Removal

Fig. 38



**WARNING**

IT IS EXTREMELY IMPORTANT TO SUPPORT THE GRADER UNDER THE TANDEM CASES WITH PROPER BLOCKS OR STANDS.

Depending on the model of grader, you may need to raise the machine high enough so that the transmission sitting on the jack will clear the underside of the frame.

Fig. 39

If your grader is equipped with a transmission guard, remove it. Remove the drain plug on the lower left hand side of the transmission and drain the oil into a suitable container.

Fig. 40

Remove the suction hose (1) from the transmission.

Fig. 41

Remove the clutch drain hose (2) from the transmission.

Fig. 42

Remove the transmission supply hose (3) from the regulator valve (4). Remember to plug the open valve ports and hose fittings to prevent contamination.

Fig. 43

Remove the clutch supply hose (5).

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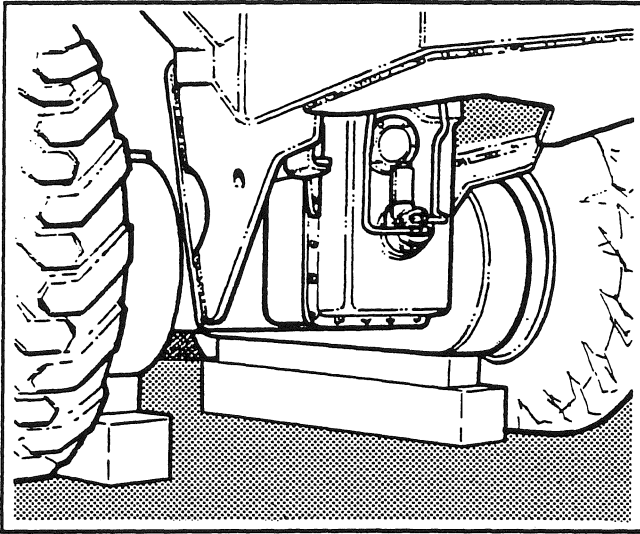


Fig. 38

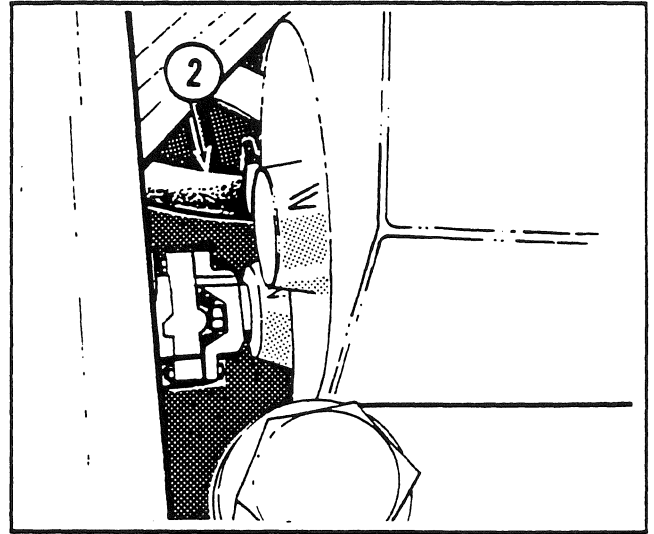


Fig. 41

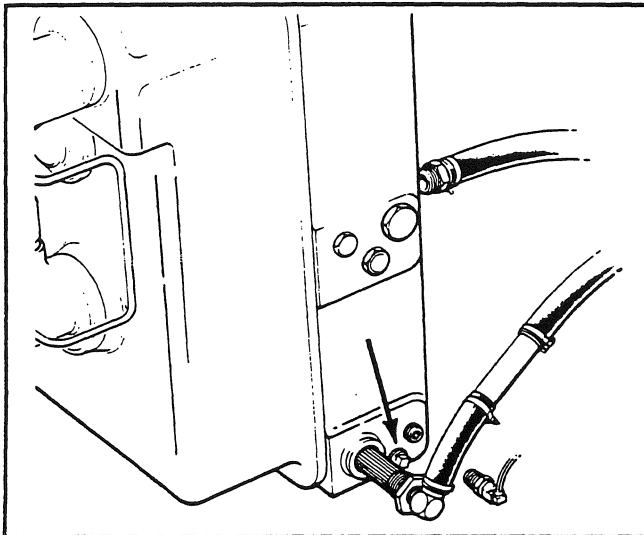


Fig. 39

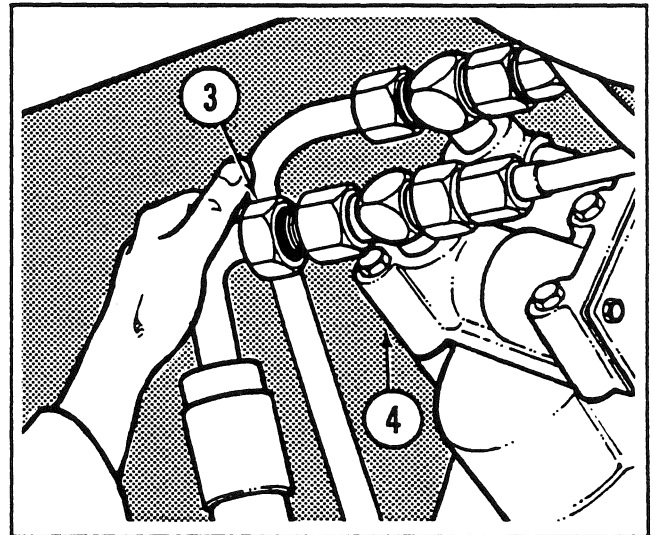


Fig. 42

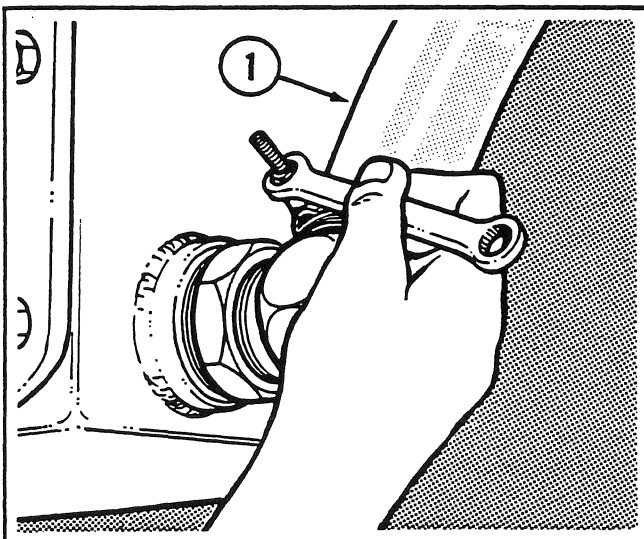


Fig. 40

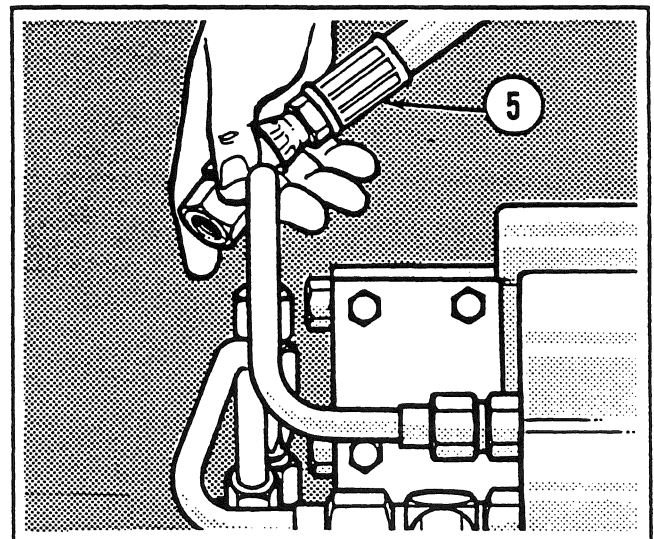


Fig. 43

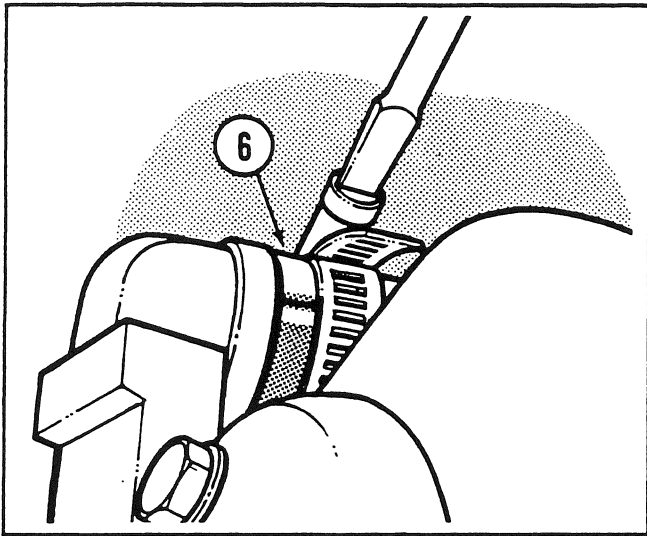


Fig. 44

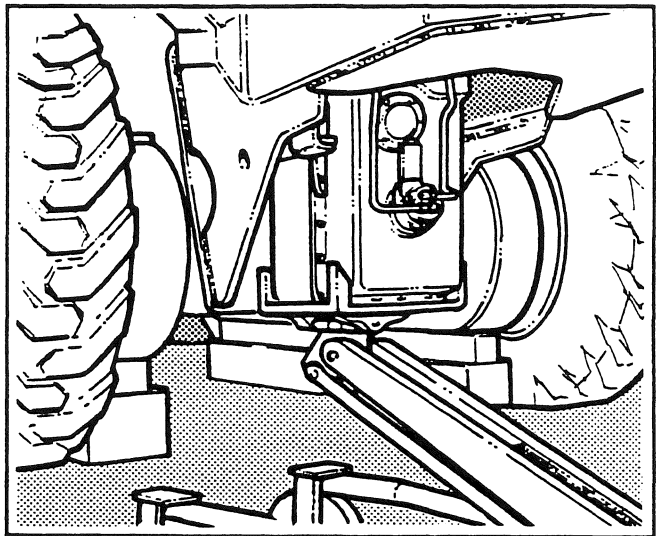


Fig. 47

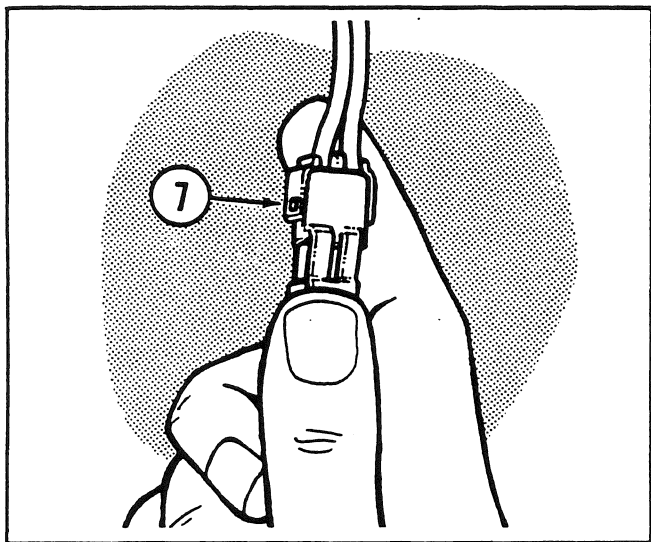


Fig. 45

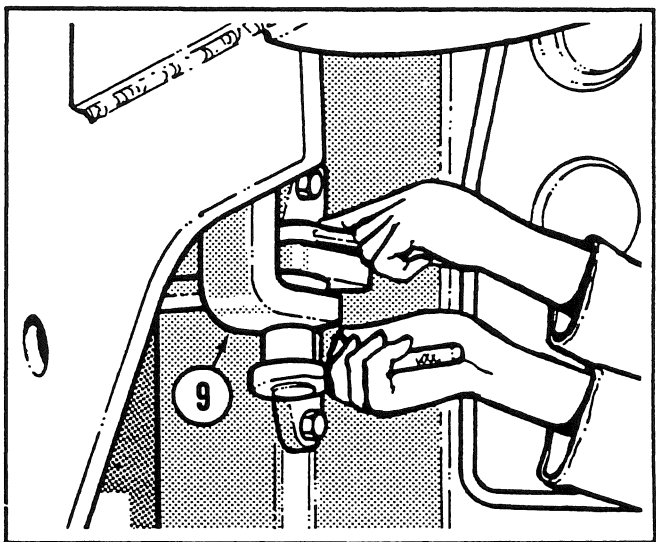


Fig. 48

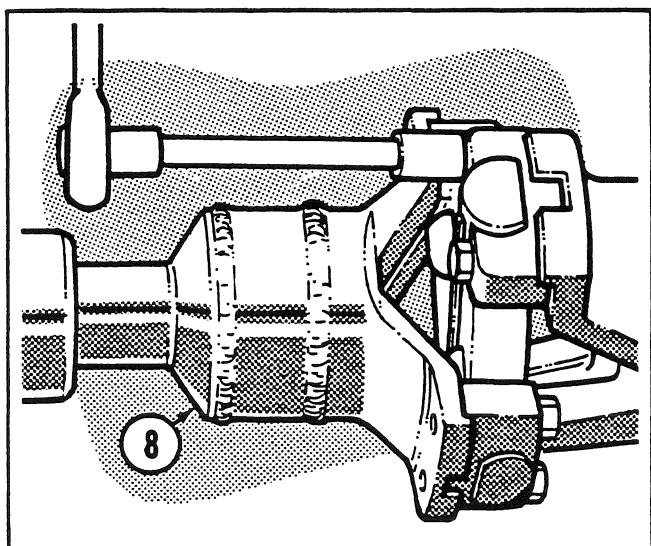


Fig. 46

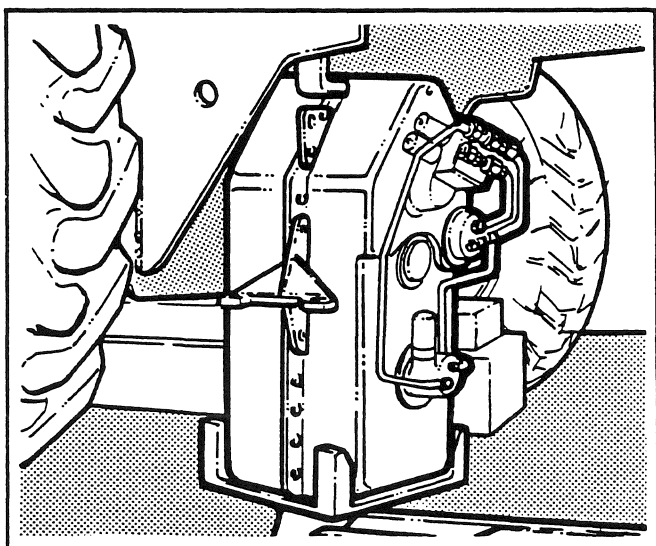


Fig. 49

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**Transmission - Removal** (Continued)

**Fig. 44**

Remove the breather hose (6).

**Fig. 47**

Use the jack to support the transmission.

**Fig. 45**

Disconnect the transmission wiring harness (7). Identify the connectors to prevent confusion during assembly.

**Fig. 48**

Remove the transmission mount bolts (9).

**Fig. 46**

Disconnect the upper and lower drive shafts (8).

**Fig. 49**

Use the jack to lift the transmission off the mounts; then pull it forward slightly until it is clear of the mounts. Lower the transmission from the grader. Stand the transmission upright on blocks.

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**Transmission - Disassembly**

**Fig. 50**

Remove the suction fitting (10) and suction strainer (11). Remove and discard the O ring.

**Fig. 53**

Remove the hydraulic tubes (14).

**Fig. 51**

Remove the nuts (12), washers and driveshaft yokes (13) from the rear of the transmission.

**Fig. 54**

Carefully remove the nuts (16) spacers (17) and solenoids (15).

**Fig. 52**

Rest the transmission on its back (driveshaft yoke side), using blocks to support the assembly.

**Fig. 55**

Remove the valve cartridges (18) from the control valve caps (19).



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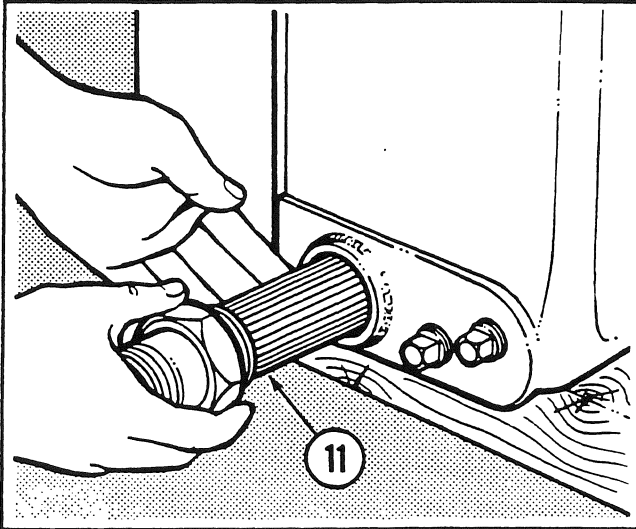


Fig. 50

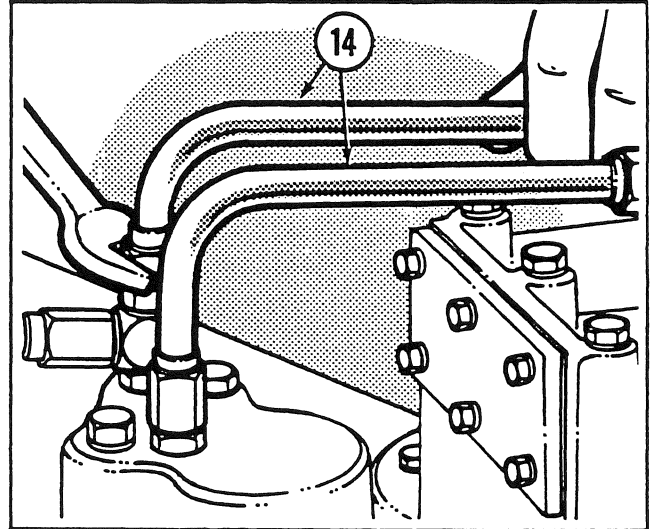


Fig. 53

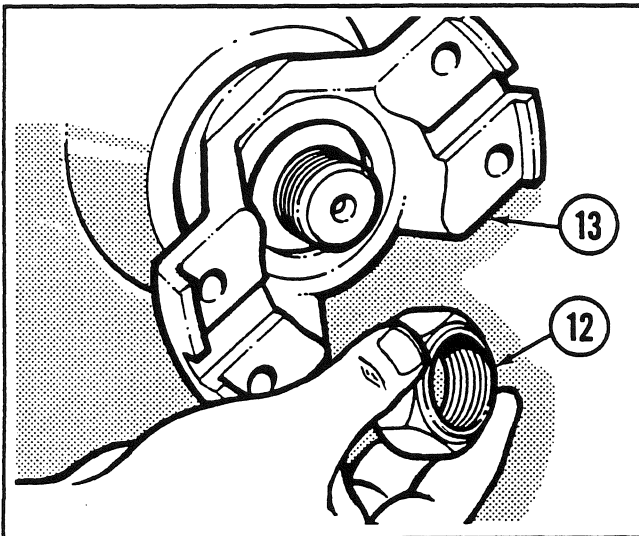


Fig. 51

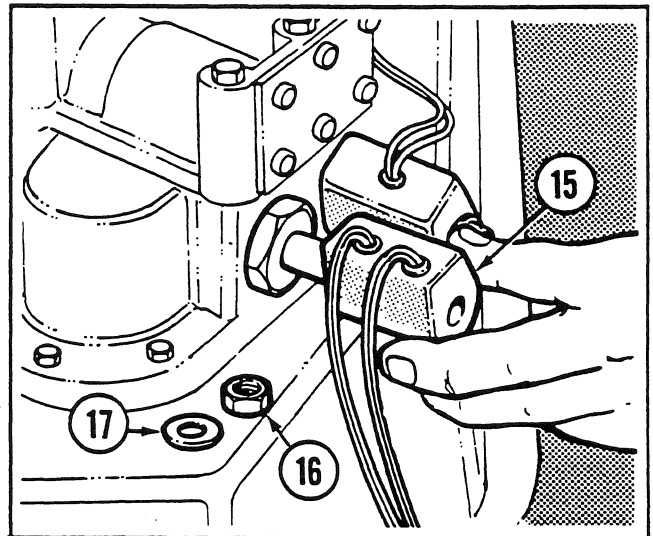


Fig. 54

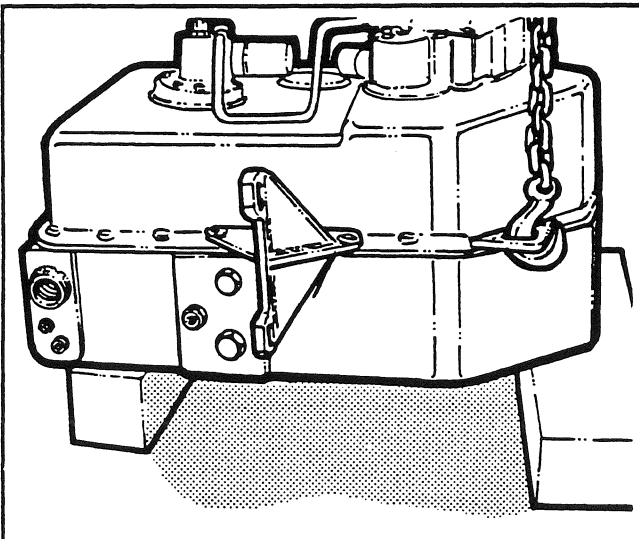


Fig. 52

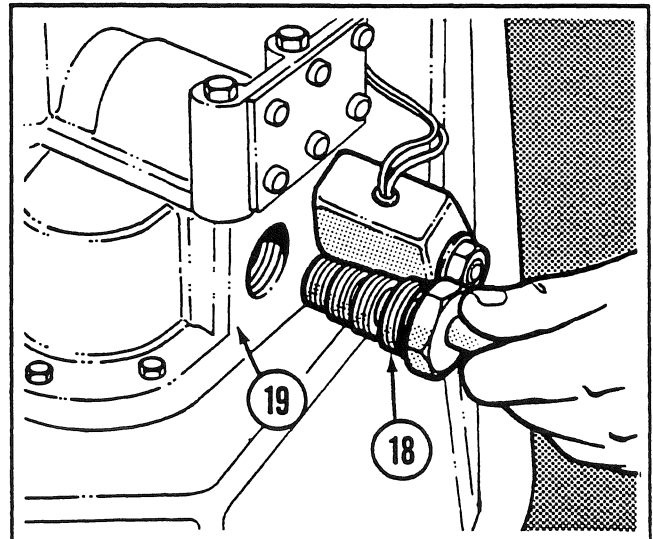


Fig. 55

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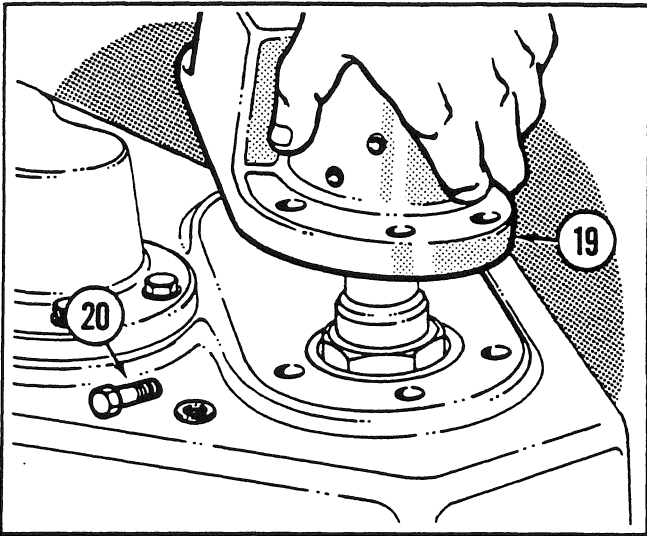


Fig. 56

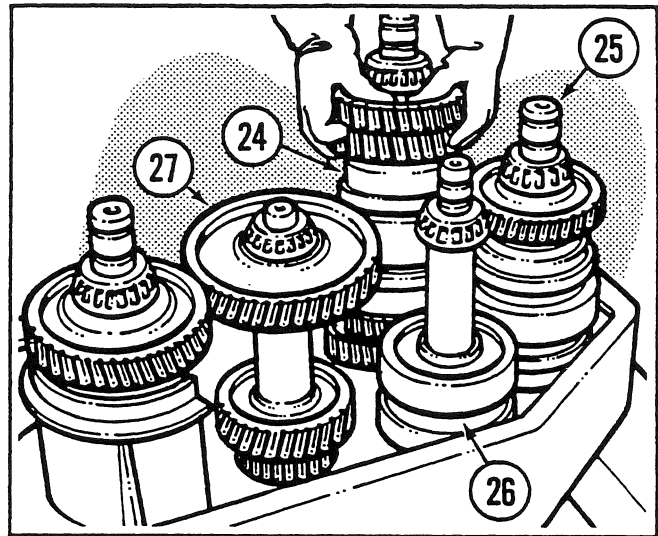


Fig. 59

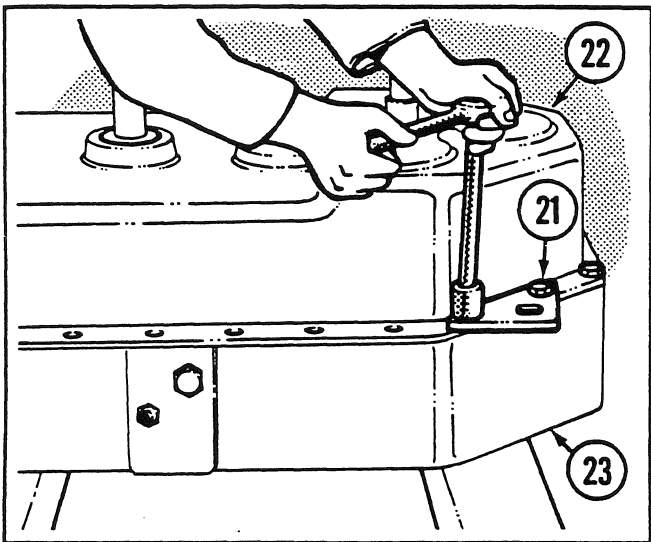


Fig. 57

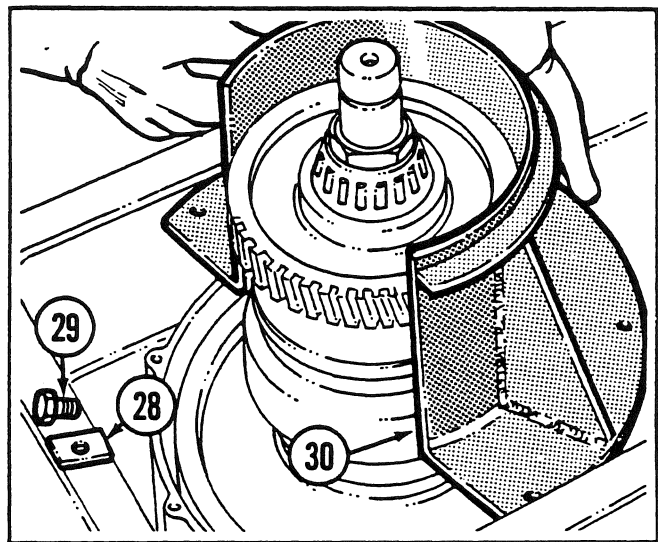


Fig. 60

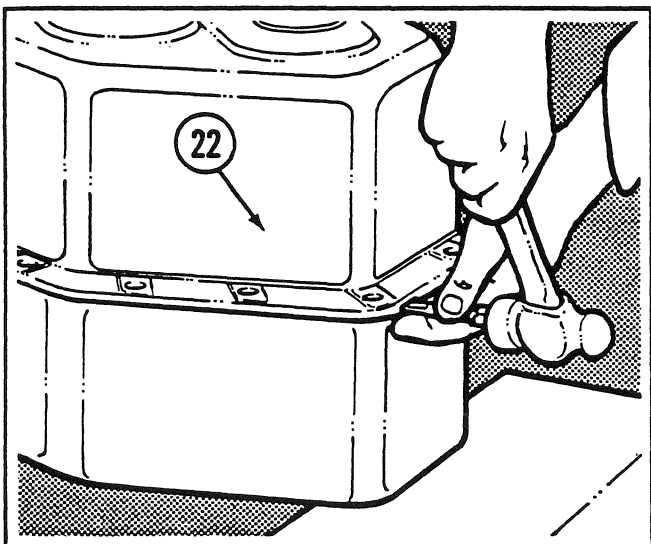


Fig. 58

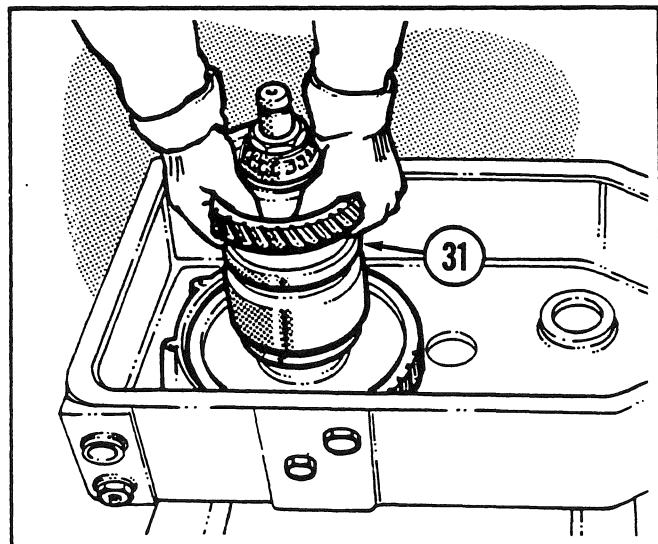


Fig. 61

Transmission - Disassembly (Continued)

**Fig. 56**

Remove the capscrews (20) from the control valve caps (19). Use a soft faced hammer to break the seal between the valve caps and the case. Remove the control valve caps.

**Fig. 57**

Remove the capscrews (21) fastening the transmission case halves (22 and 23) together.

**Fig. 58**

Install lifting eyes in the front case half (22) and use the lifting device to support the weight of the transmission. Insert a flat chisel into one of the slots located at either end of the case. Strike the chisel sharply with a large hammer to break the seal between the case halves. **DO NOT** attempt to use a pry-bar. Remove the front case half.

**Fig. 59**

Remove the clutch packs in the following order: the intermediate clutch pack (24); the input clutch pack (25); the reverse clutch half-pack (26) and, finally, the second intermediate shaft (27).

**Fig. 60**

Bend back the locking plates (28) securing the capscrews (29) for the oil baffle (30). Remove the capscrews and baffle. Discard the locking plates.

**Fig. 61**

Remove the output clutch pack (31) from the rear case half.

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**Clutch Pack - Disassembly**

Disassembly procedures are essentially similar for all clutch packs in the 8400 transmission. Differences between clutch packs are detailed where they affect the procedure.

**Fig. 62**

Remove the hook-type seal rings (32) from the end of the clutch pack shaft (33).

**Fig. 65**

The intermediate clutch pack (24) is not equipped with thrust bearings. For all other clutch packs, remove the outer thrust washers and bearings (37).

**NOTE**

The thrust bearings may have different thicknesses. Take care not to mix these parts.

**Fig. 63**

Remove the locknut (34) with the special tool listed in the front of this Shop Manual Section.

**Fig. 66**

Remove the gear and drum assembly (38).

**Fig. 64**

Use a puller to remove the bearing cones (35) and any outer gears (36).

**Fig. 67**

For all clutch packs except the intermediate clutch pack, remove the needle roller bearings (39) and spacer (40). Examine the bearings for excessive wear or damage.

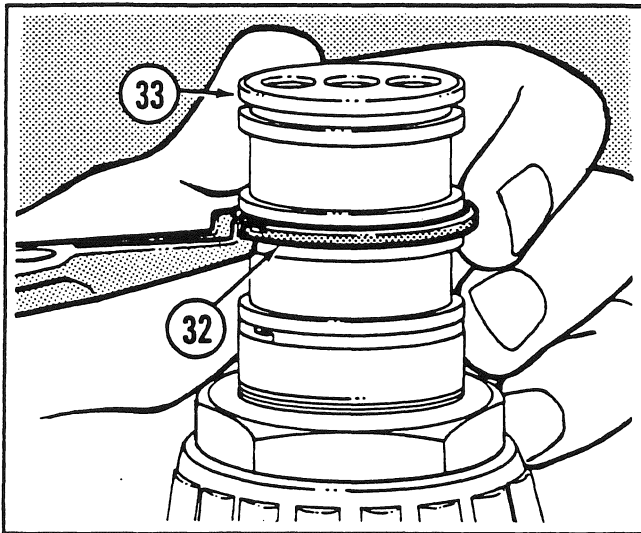


Fig. 62

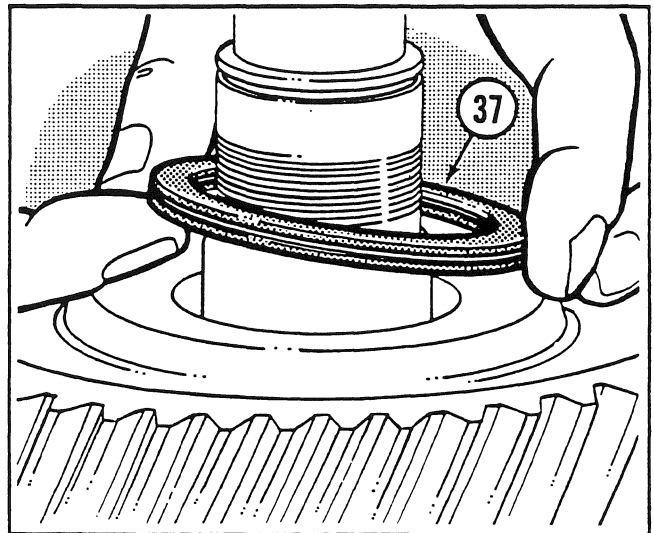


Fig. 65

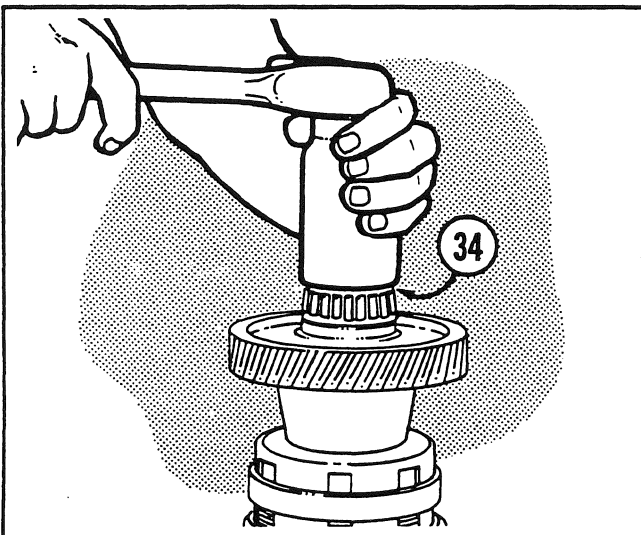


Fig. 63

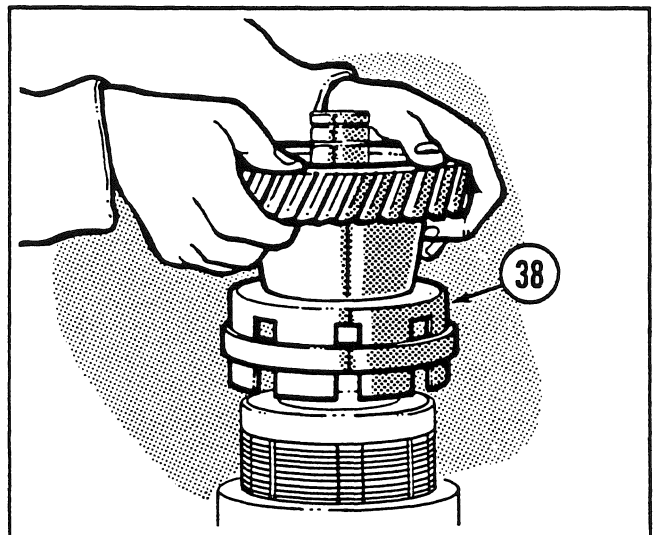


Fig. 66

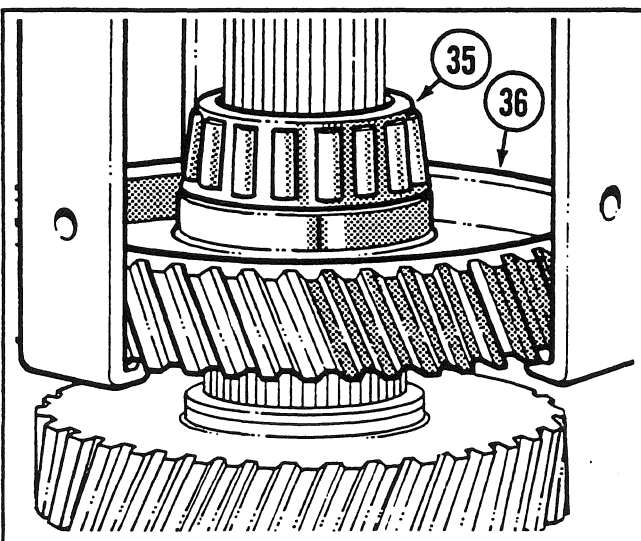


Fig. 64

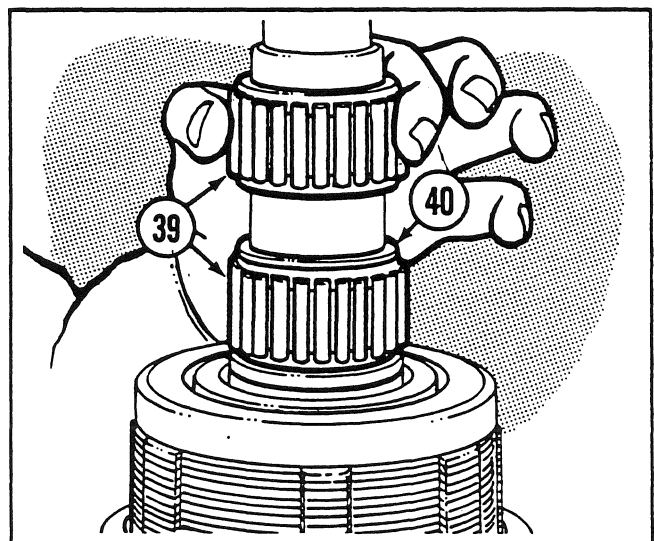


Fig. 67

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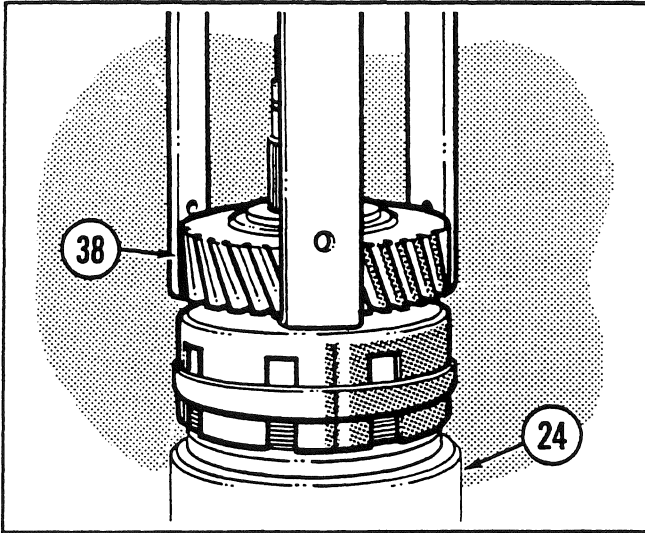


Fig. 68

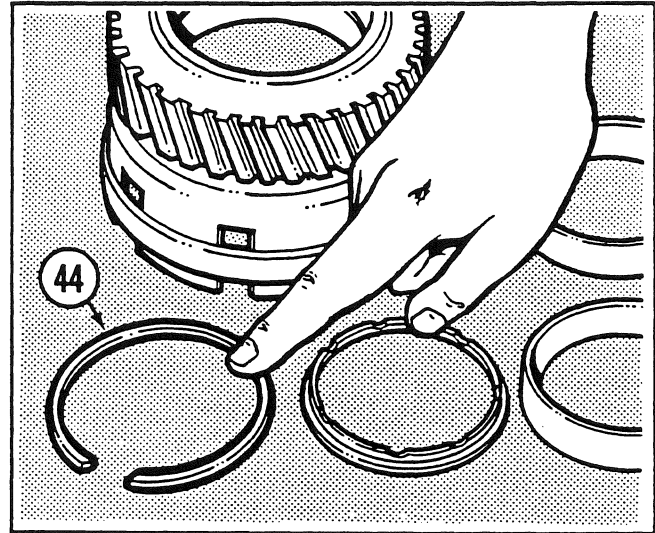


Fig. 71

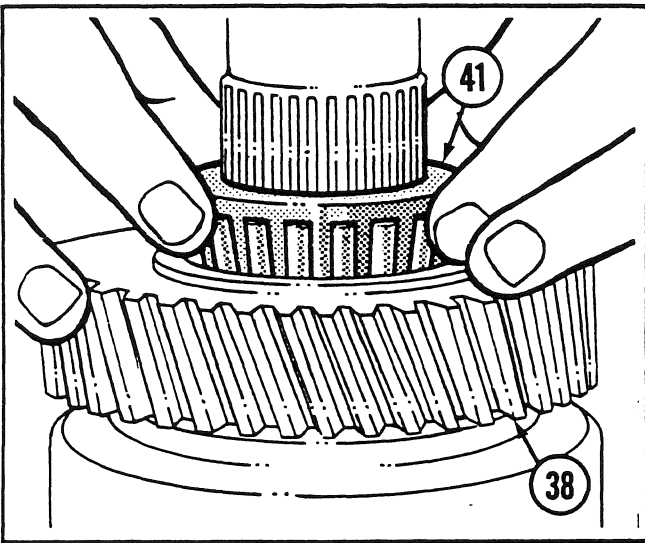


Fig. 69

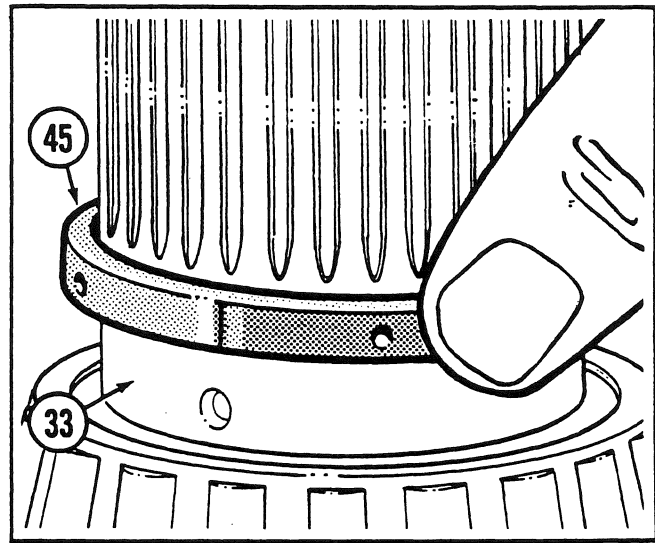


Fig. 72

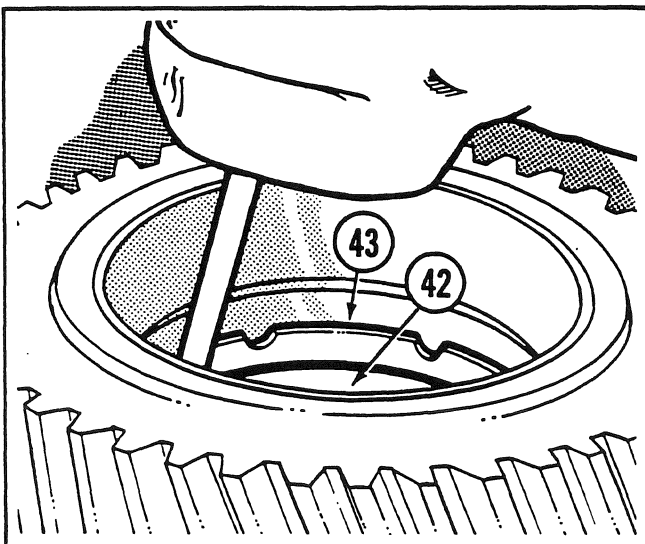


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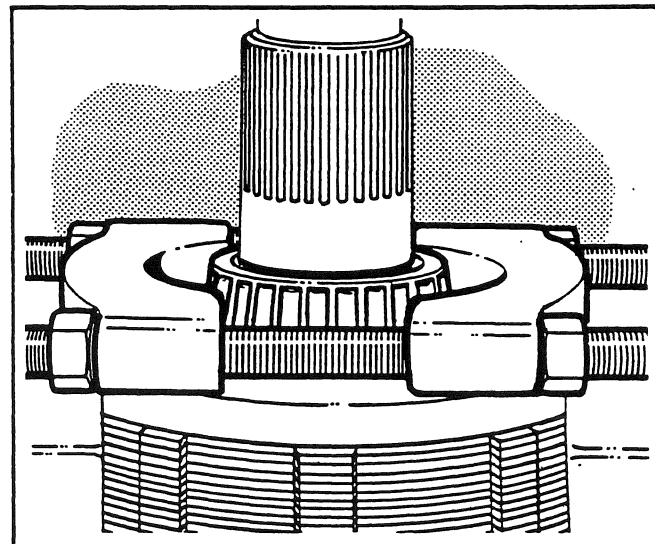


Fig. 73

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**Clutch Pack - Disassembly (Continued)**

**Fig. 68**

If you are working on the intermediate clutch pack (24), use a puller to remove the gear and drum assembly (38).

**Fig. 69**

You may need to remove the outer bearing cone (41) before you can fully remove the gear and drum assembly (38).

**Fig. 70**

Use a soft metal drift to force one bearing cup (42) out of the gear and hub assembly. Remove the cup spacer (43).

**Fig. 71**

Remove and discard the snap ring (44) and force the other bearing cup (42) out of the gear.

**Fig. 72**

Remove the bearing cone spacer (45) from the shaft (33).

**Fig. 73**

Use a suitable bearing separation device to remove the remaining bearing cone from the shaft. Examine the bearings for excessive wear or damage.

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Clutch Pack - Disassembly (Continued)

**Fig. 74**

Remove the inner thrust bearing and washers (46) from all clutch packs except the intermediate clutch pack.

**Fig. 75**

Remove the spacer.

**Fig. 76**

The spacer (47) for the output clutch pack is different.

**Fig. 77**

Remove and discard the retainer snap ring (48) from all clutch packs except the output clutch pack.

**Fig. 78**

If you are working on the output clutch pack (31), remove the retainer cap-screws (49).

**Fig. 79**

Remove the retainer half-rings (50) from the hub assembly. It may be necessary to depress the hub assembly against return spring pressure to remove the half-rings.



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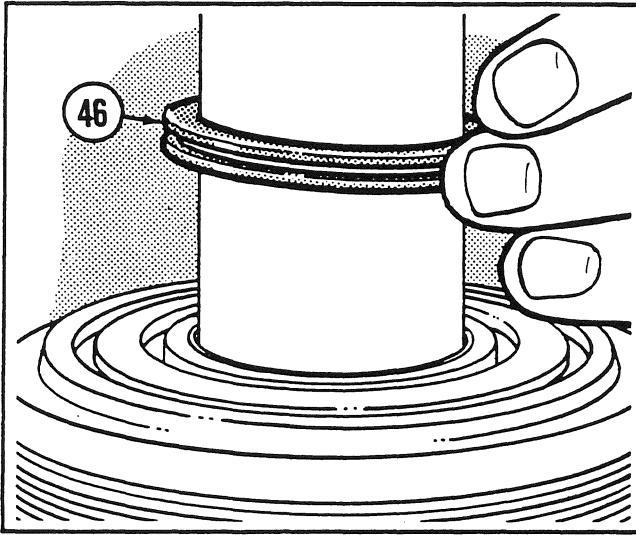


Fig. 74

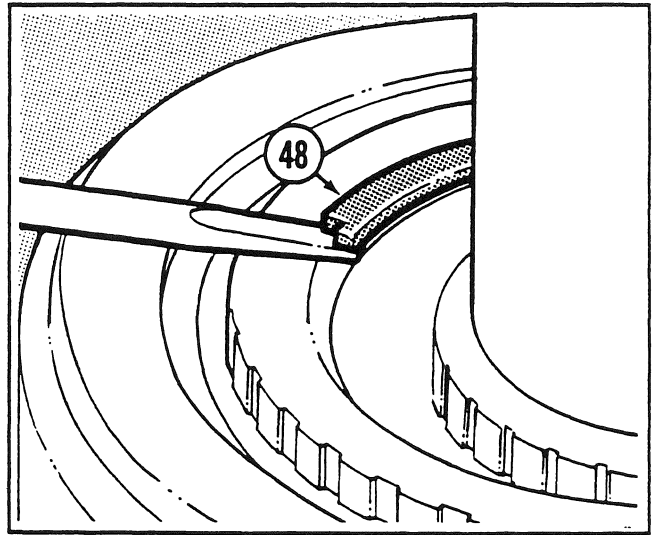


Fig. 77

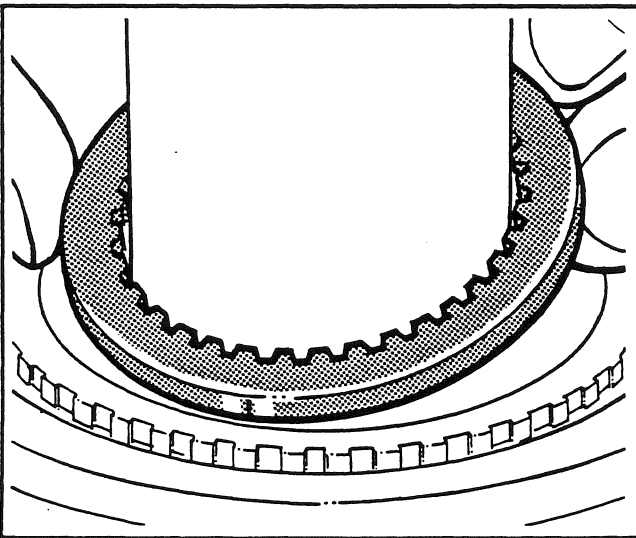


Fig. 75

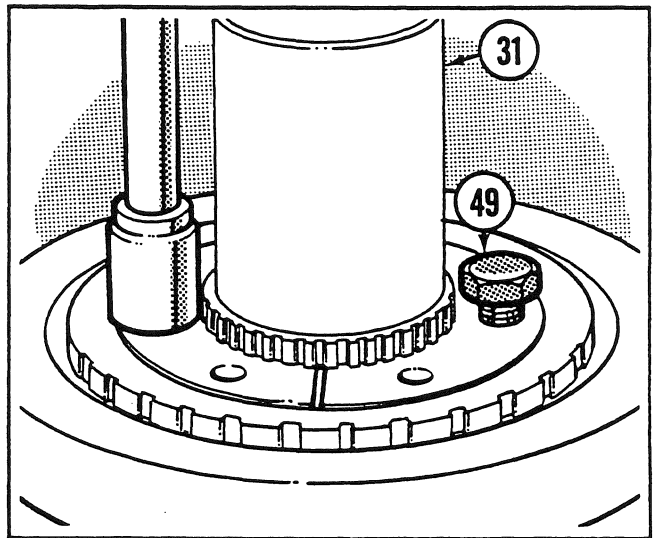


Fig. 78

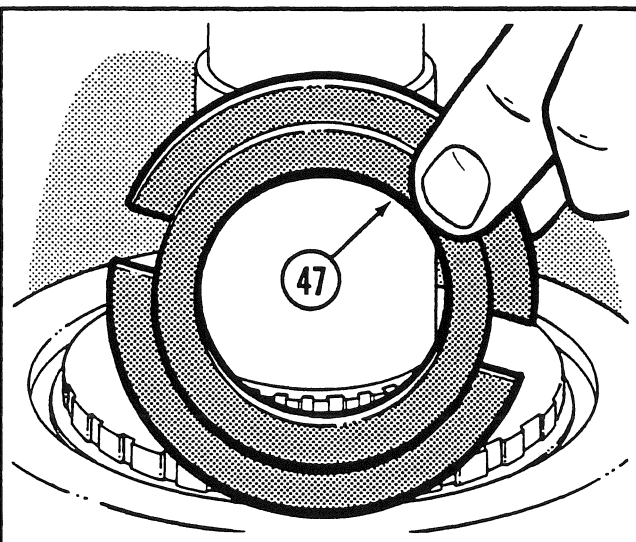


Fig. 76

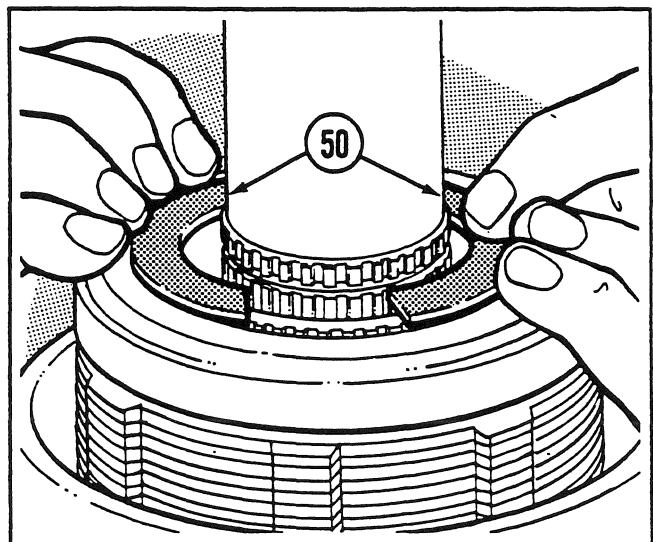


Fig. 79

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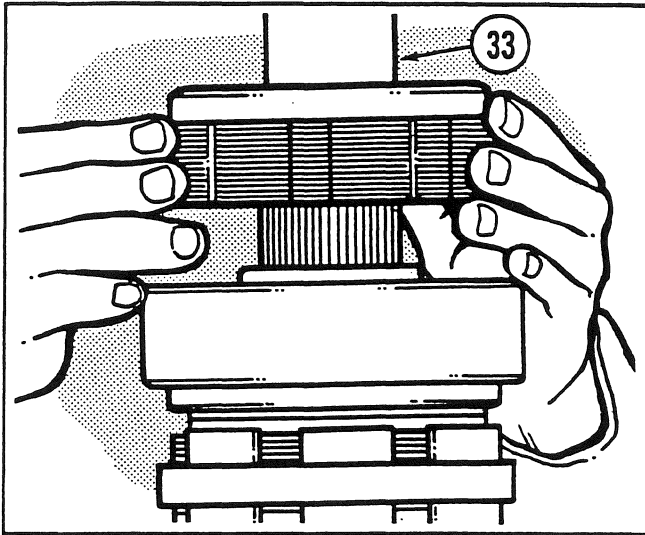


Fig. 80

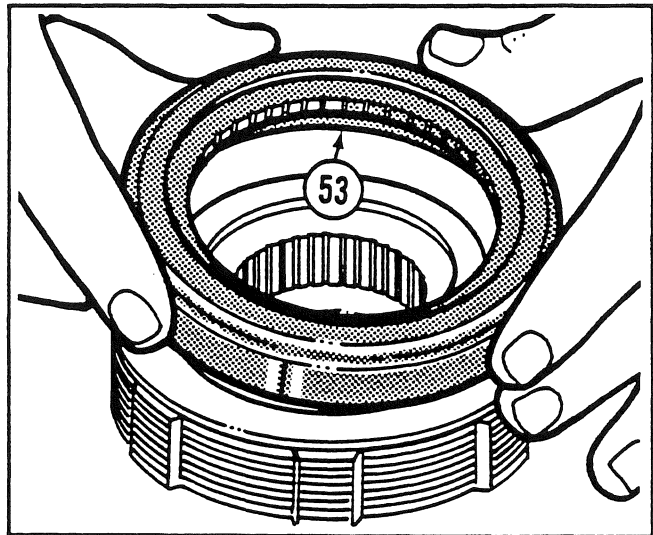


Fig. 83

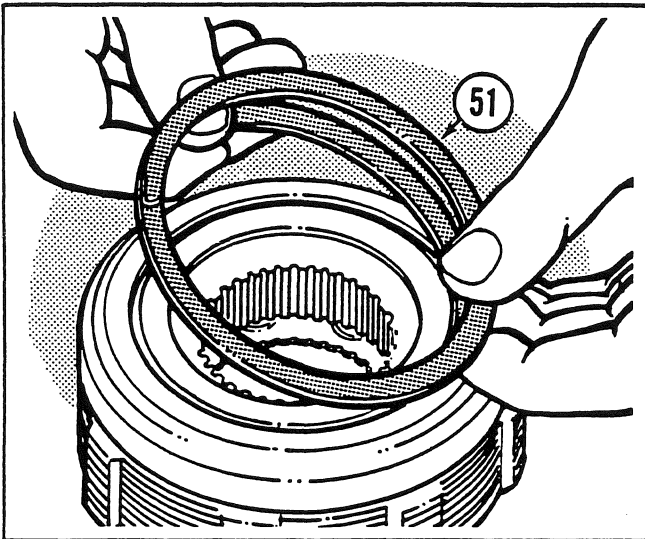


Fig. 81

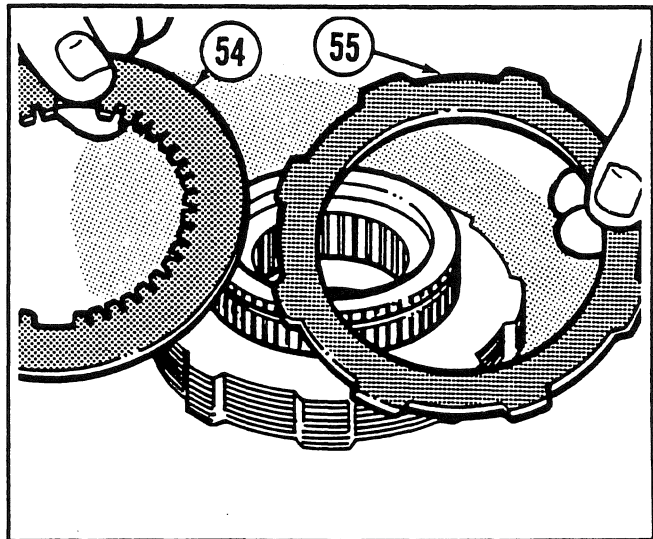


Fig. 84

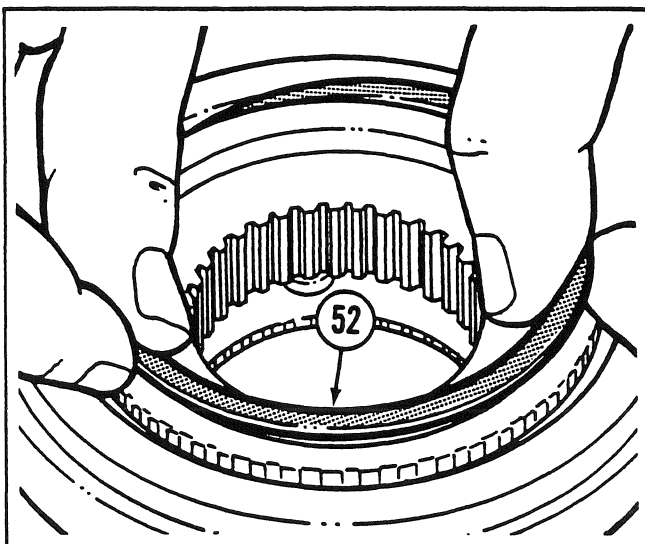


Fig. 82

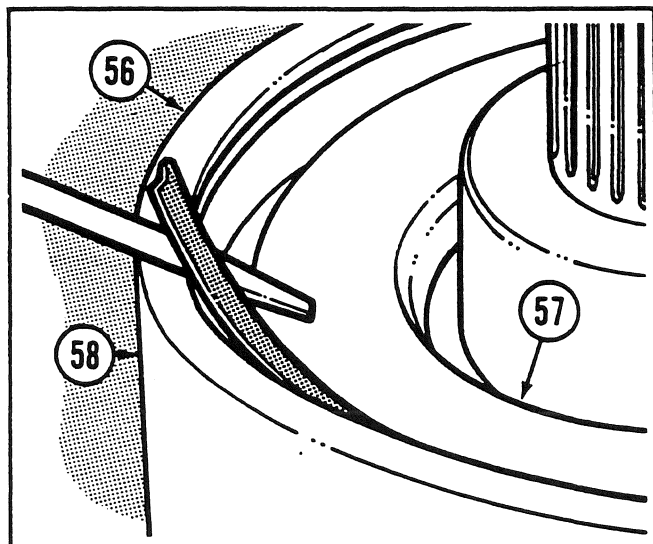


Fig. 85

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Clutch Pack - Disassembly (Continued)

**Fig. 80**

Lift the hub assembly off the shaft (33).

**Fig. 81**

Remove and discard the spiral lock ring (51).

**Fig. 82**

Remove and discard the snap ring (52).

**Fig. 83**

Remove the backing plate (53). Identify all backing plates to prevent confusion. **The backing plates are not interchangeable!**

**Fig. 84**

Remove the friction discs (54) and reaction plates (55) from the hub assembly and separate them. Discard the friction discs if they are less than the minimum thicknesses shown on Page 3 of this Shop Manual Section; or if the oil grooves are not visible on both sides. If you reuse the same friction discs and reaction plates, assemble the parts in the same order as disassembly.

**Fig. 85**

Before proceeding further, you will have to repeat the procedures described in **Fig. 62** through **Fig. 84** to disassemble the opposite side of the clutch pack (all except the reverse clutch half-pack). When you have removed the opposite hub assembly, you can begin disassembly of the piston housing (56) and force piston (57). Remove and discard the snap ring (58).

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Clutch Pack - Disassembly (Continued)

**Fig. 86**

Use a soft-faced mallet to push the piston housing (56) off the force piston (57).

**Fig. 89**

Remove and discard all hook-type seal rings (61).

**Fig. 87**

Remove the force piston (57) and piston housing (56) from the shaft (33). Remove and discard the seal ring.

**Fig. 90**

Remove the accelerator piston (60).

**Fig. 88**

Remove and discard the snap ring (59) from the accelerator piston (60).

**Fig. 91**

Remove the disc valve (63) and reinforcing disc (64).

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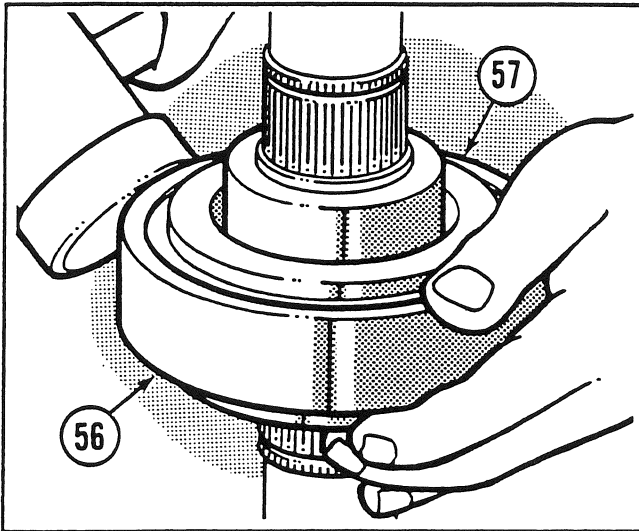


Fig. 86

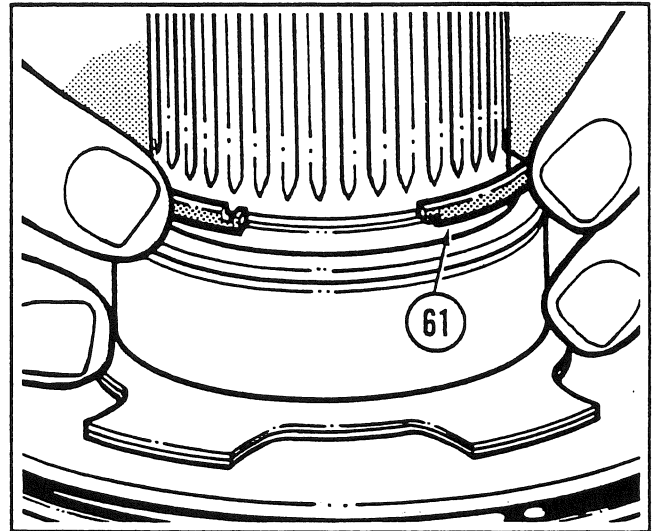


Fig. 89

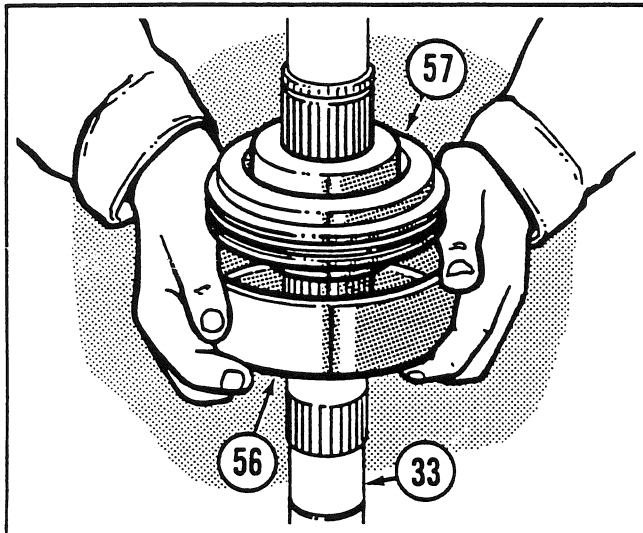


Fig. 87

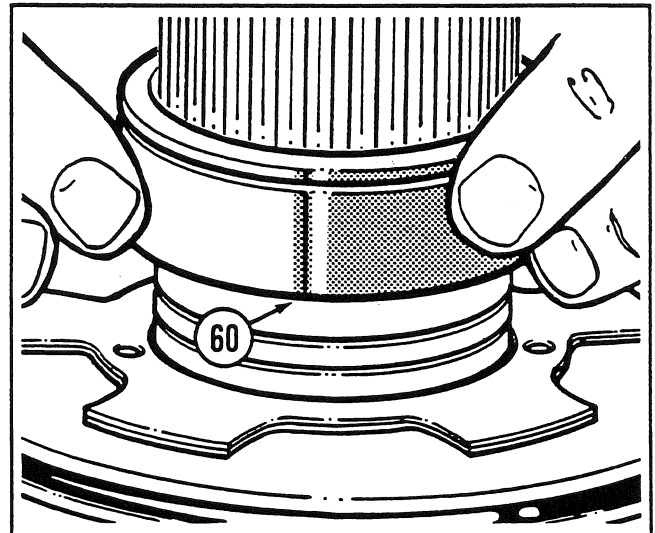


Fig. 90

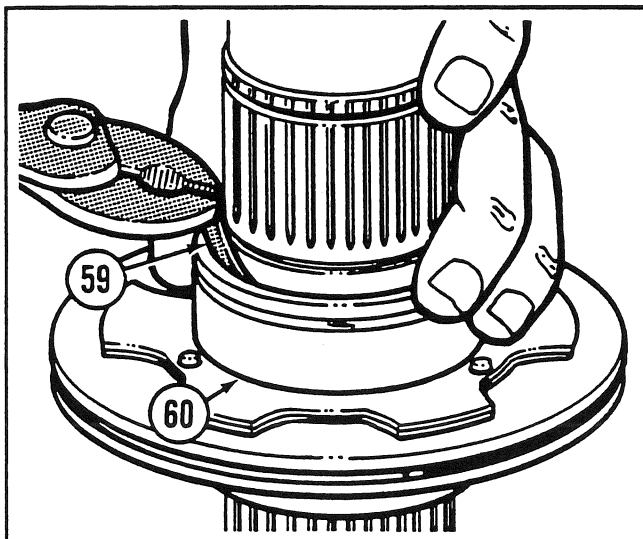


Fig. 88

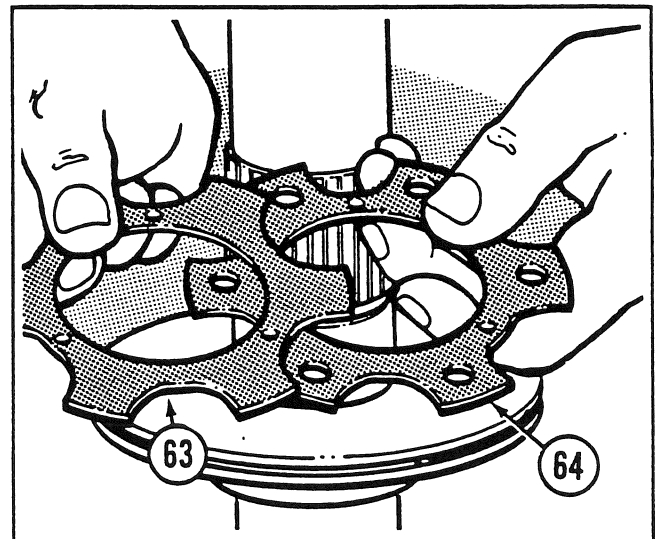


Fig. 91

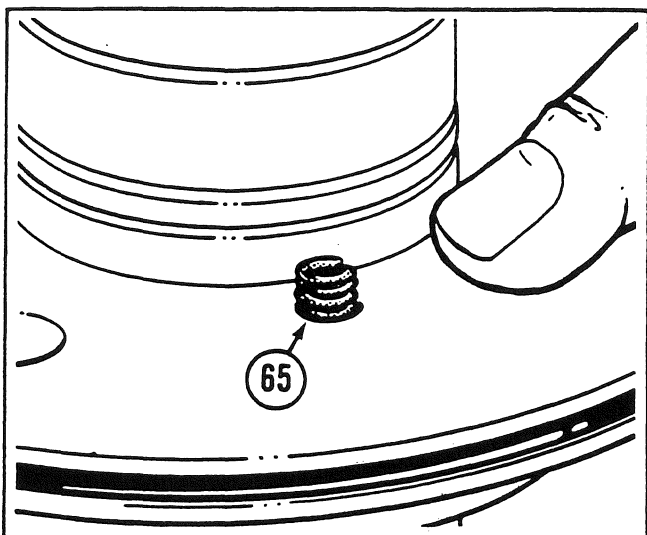


Fig. 92

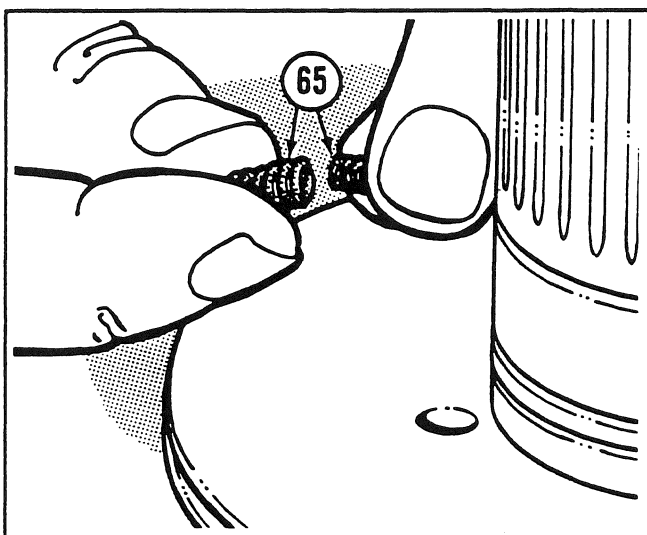


Fig. 95

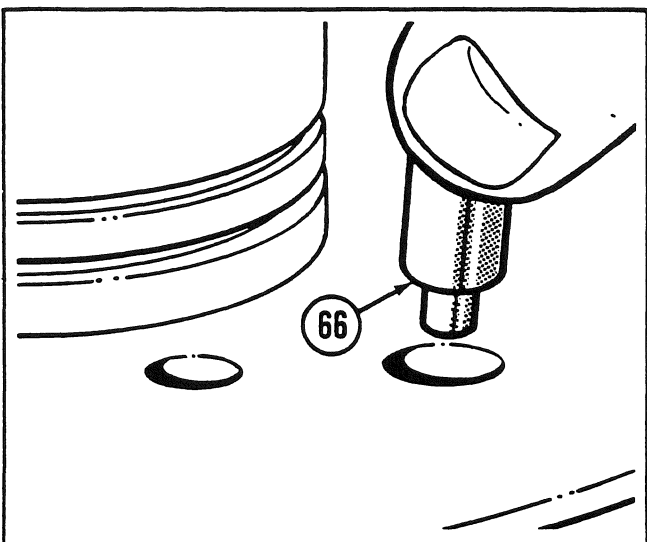


Fig. 93

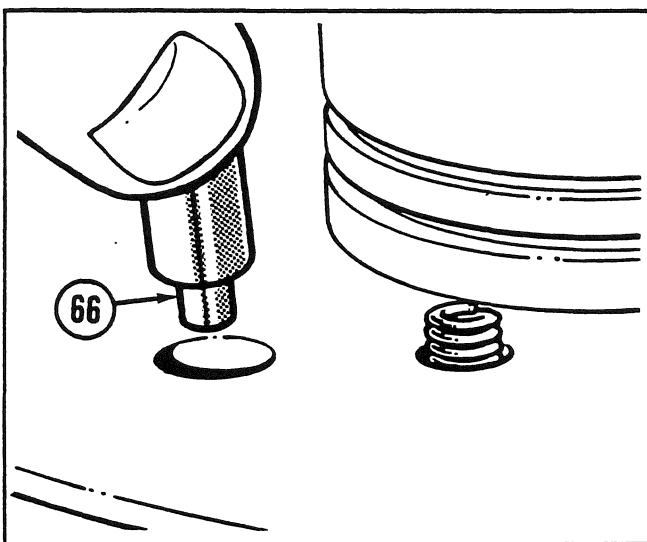


Fig. 96

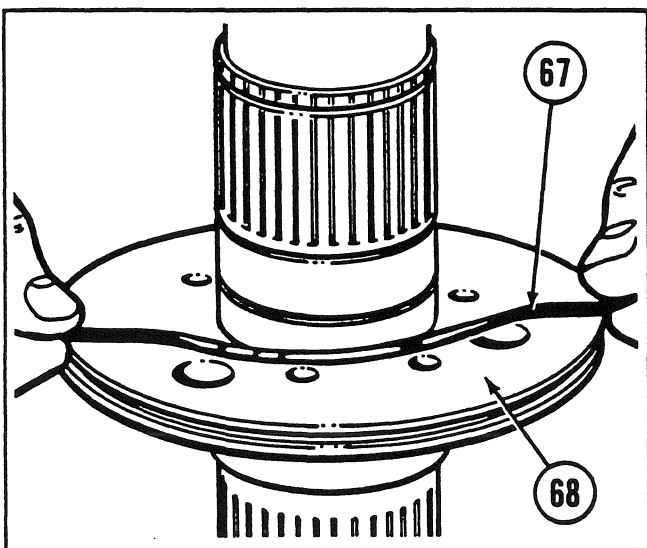


Fig. 94

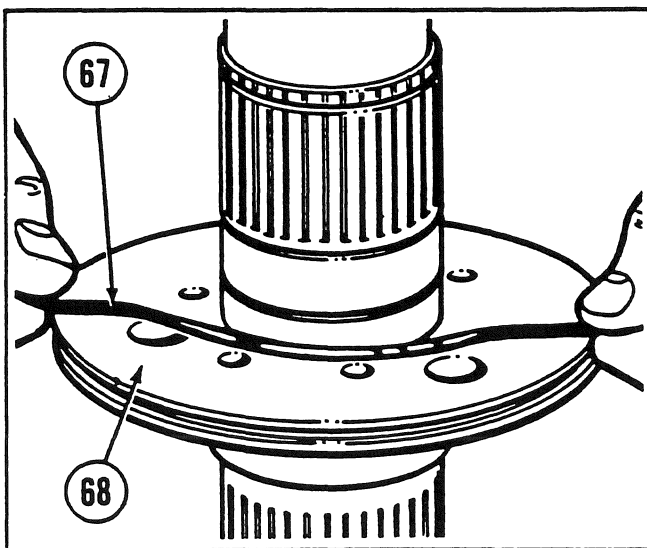


Fig. 97

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**Clutch Pack - Disassembly** (Continued)

**Fig. 92**

Remove the inner and outer springs (65).

**Fig. 93**

Remove the three dowel pins (66) from the separator plate of all clutch packs except the reverse clutch half-pack. The reverse clutch half-pack has fixed dowel pins.

**Fig. 94**

Remove and discard the O ring (67) from the separator plate (68). **DO NOT** attempt to remove the separator plate from the shaft.

**Clutch Pack - Assembly**

**Fig. 95**

Install the inner and outer springs (65).

**Fig. 96**

Install the dowel pins (66) in the separator plate of all clutch packs except the reverse clutch half-pack.

**Fig. 97**

Lubricate and install a new O ring (67) into the separator plate (68) groove. Coat the O ring with a thick layer of petroleum jelly.

Following disassembly of the transmission and clutch packs, refer to **Cleaning and Inspection** detailed on pages 7 and 8 of this Shop Manual Section. Thoroughly clean and inspect all parts before assembling the transmission and clutch packs.

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**Clutch Pack - Assembly (Continued)**

**Fig. 98**

Install the reinforcing disc (64), followed by the disc valve (63). Align the holes in the discs with the dowel pins (66).

**Fig. 99**

Install new hook-type seal rings (61) on the shaft.

**Fig. 100**

Install a new hook-type seal ring on the accelerator piston (60) and install the piston on the shaft (33).

**Fig. 101**

Install a new snap ring (59) retaining the accelerator piston (60).

**Fig. 102**

Lubricate and install a new seal ring (69) on the force piston (57) - or in the case of the reverse clutch half-pack, the piston return housing.

**Fig. 103**

Fill the entire snap ring groove of the piston housing (56) with soft copper wire or petroleum jelly. This will prevent the groove from cutting the separator plate O ring.



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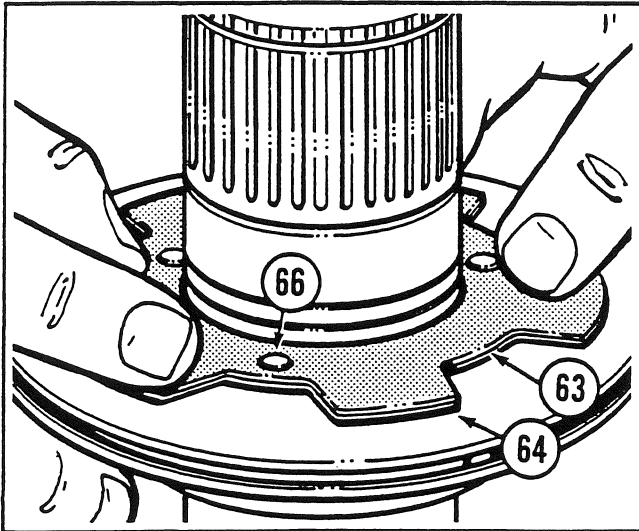


Fig. 98

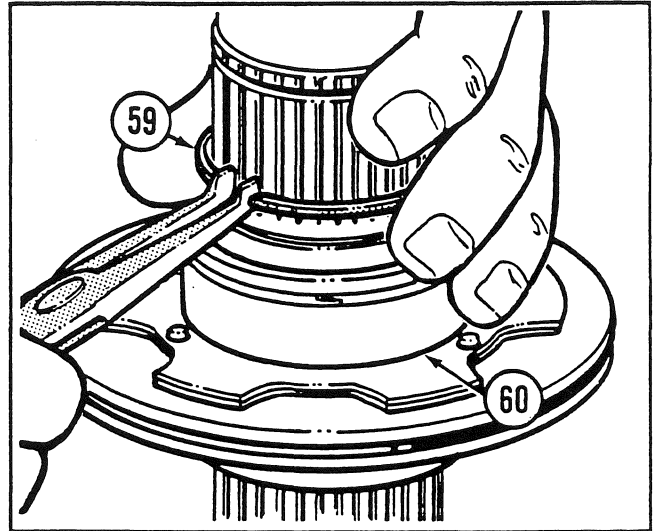


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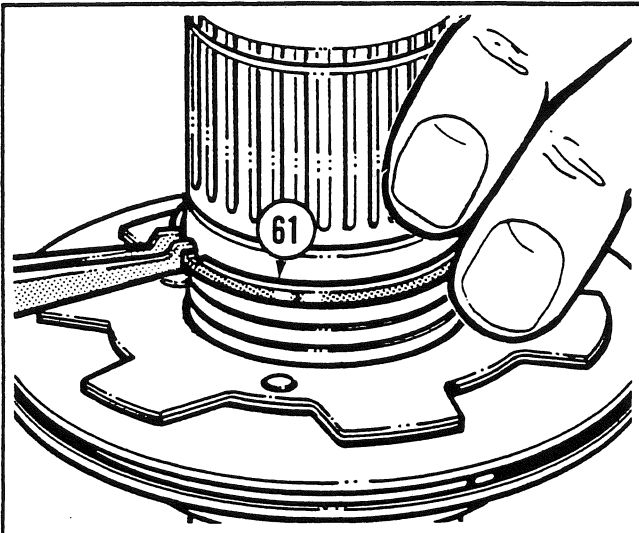


Fig. 99

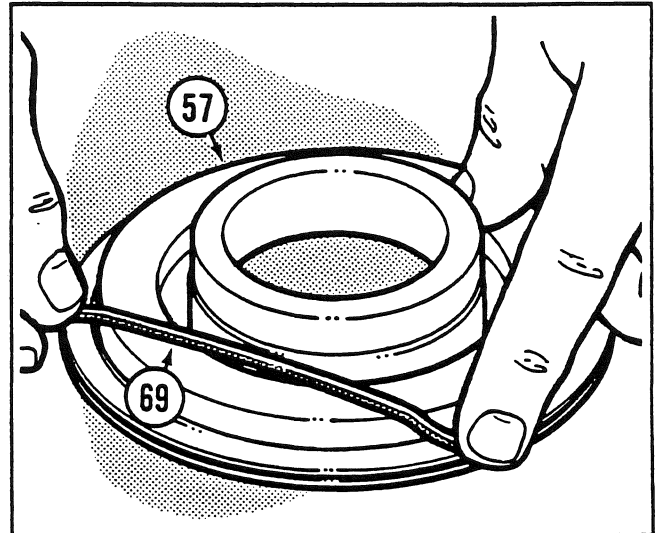


Fig. 102

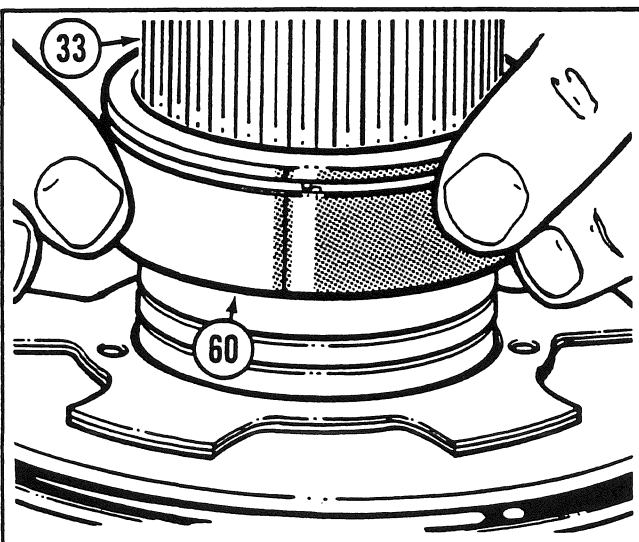


Fig. 100

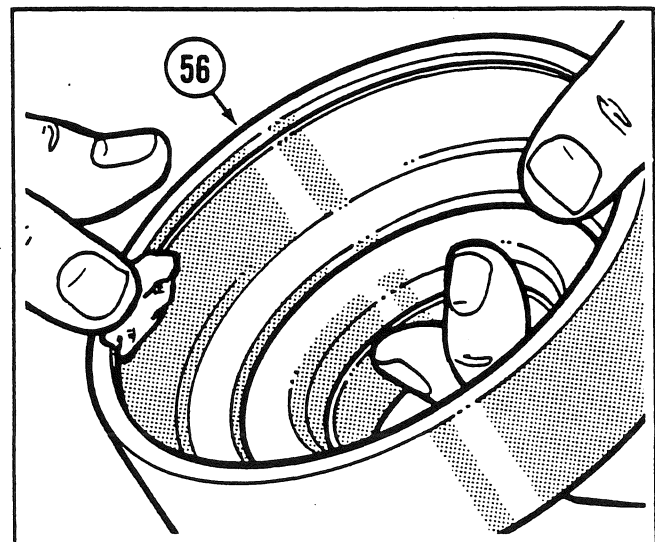


Fig. 103

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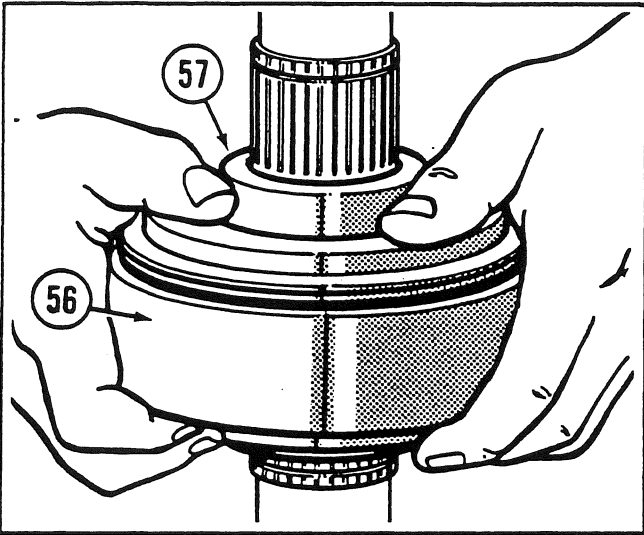


Fig. 104

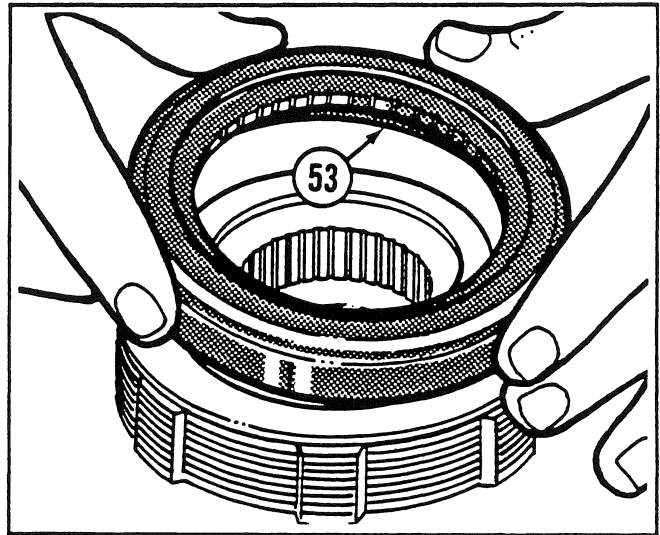


Fig. 107

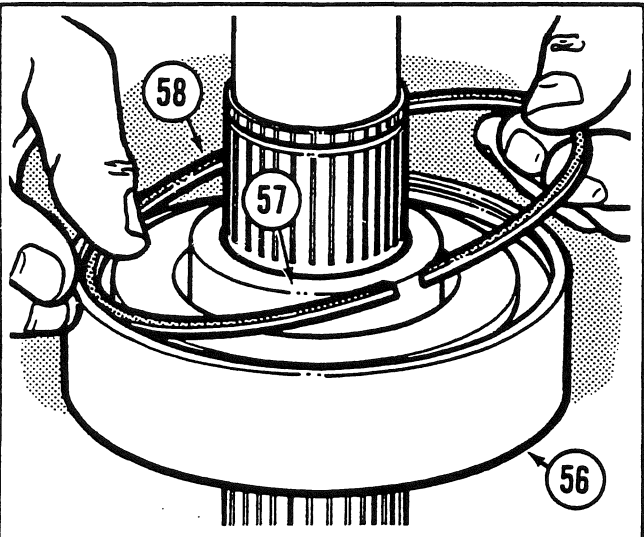


Fig. 105

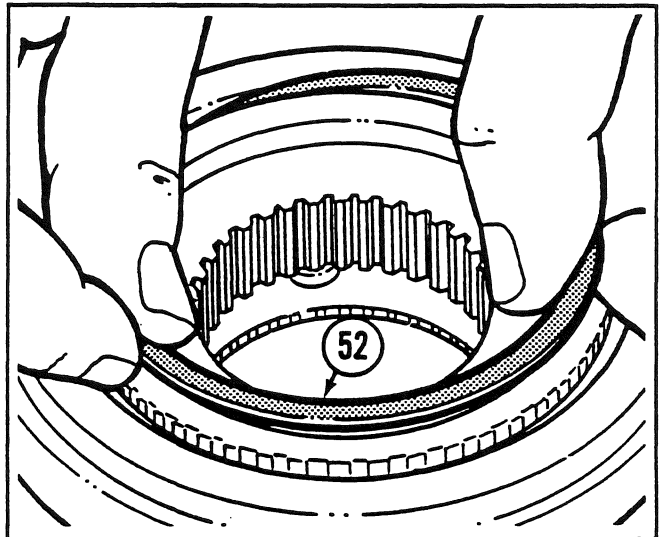


Fig. 108

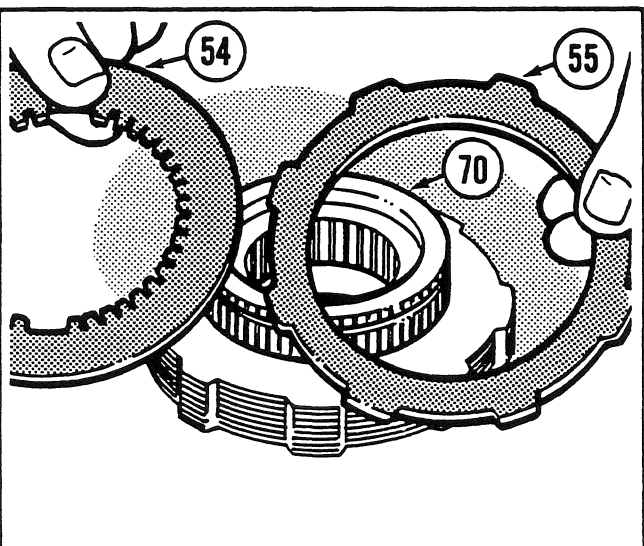


Fig. 106

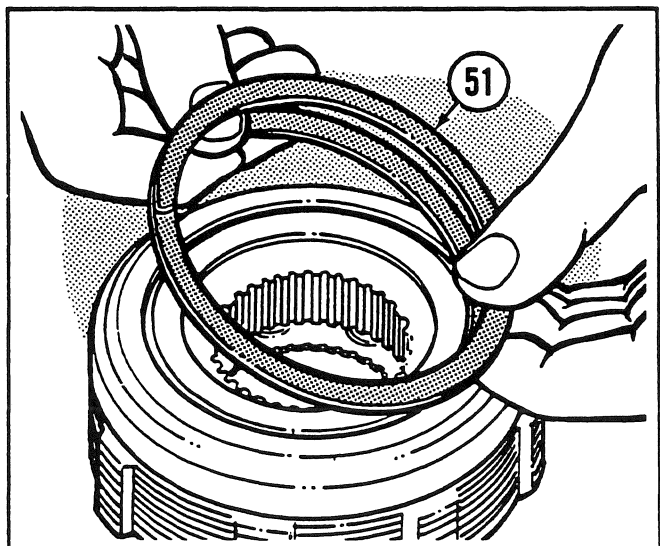


Fig. 109

**Clutch Pack - Assembly (Continued)**

**Fig. 104**

Install the piston housing (56) and force piston (57) on the shaft. Ease the lip of the housing past the separator plate O ring. **DO NOT FORCE** the housing past the hook-type seal rings on the shaft or accelerator piston. Allow the chamfers on the housing to compress the seal rings.

**Fig. 105**

Once the force piston (57) clears the snap ring groove in the piston housing (56), you can remove any copper wire you may have installed in the snap ring groove. Install a new snap ring (58). If you are working on a reverse clutch half-pack, install a new snap ring in the shaft to secure the piston return housing.

**Fig. 106**

Lubricate internal-spline friction discs and external-tang reaction plates in system oil. Install a friction disc (54) on the hub assembly (70), followed by a reaction plate. Install internal-spline and external-tang discs alternately. The last or top disc should have internal splines. Refer to the 700 Series Parts Manual for the exact number of discs and plates for each clutch pack assembly.

**Fig. 107**

Install the backing plate (53) on the hub assembly. Take care not to confuse the backing plates from different clutch packs. **The backing plates are not interchangeable!**

**Fig. 108**

Install a new internal snap ring (52).

**Fig. 109**

Install a new external spiral lock ring (51).

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**Clutch Pack - Assembly (Continued)**

**Fig. 110**

Install the hub and disc assembly on the shaft (33).

**Fig. 113**

If you are working on an output clutch pack (31), install the retainer ring halves (50). Install the retainer cap-screws (49) and secure to finger tightness.

**Fig. 111**

Install the retainer ring halves (50).

**Fig. 114**

Install the spacer on all clutch packs. If you are working on an output clutch pack, you may have to align the heads of the retainer capscrews with the slots in the spacer (47).

**Fig. 112**

On all clutch packs except the output clutch pack, secure the retainer ring halves with a new snap ring (48).

**Fig. 115**

For all clutch packs except the intermediate clutch pack, install the inner thrust bearing and washers (46). Refer to the 700 Series Parts Manual to select the exact thrust bearing size you need.

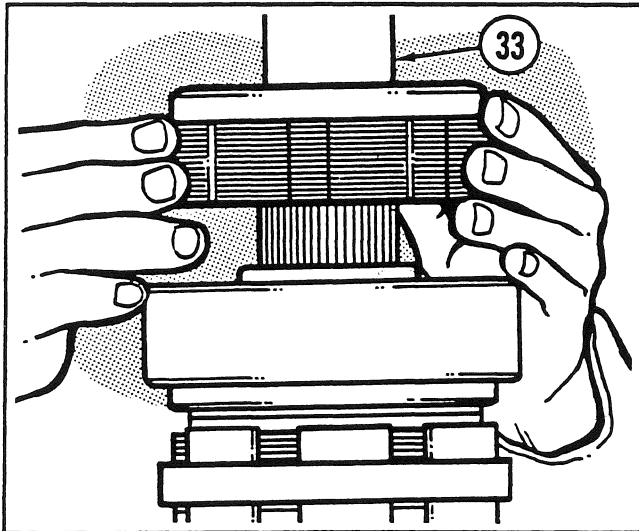


Fig. 110

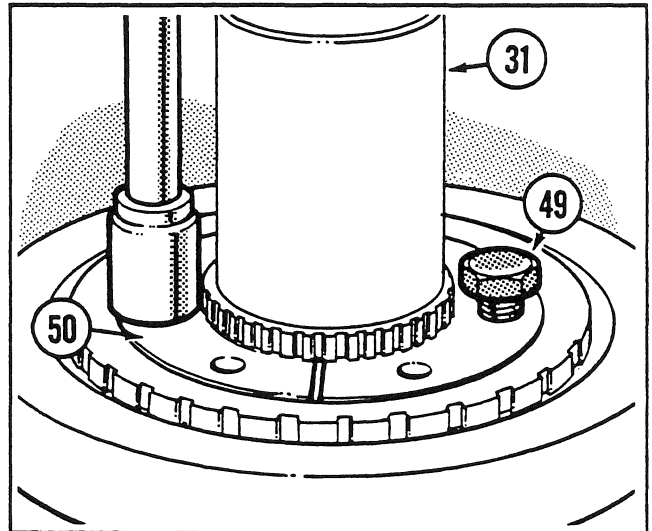


Fig. 113

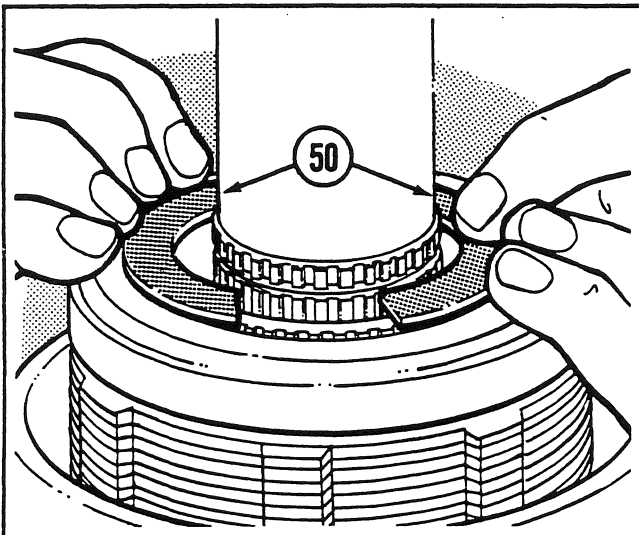


Fig. 111

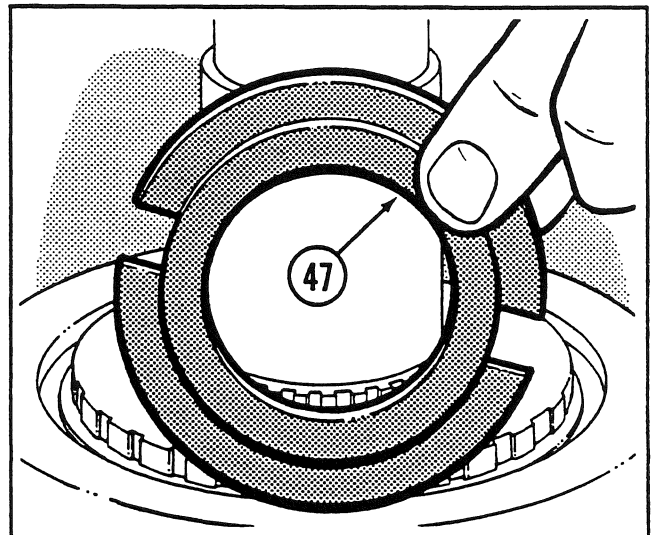


Fig. 114

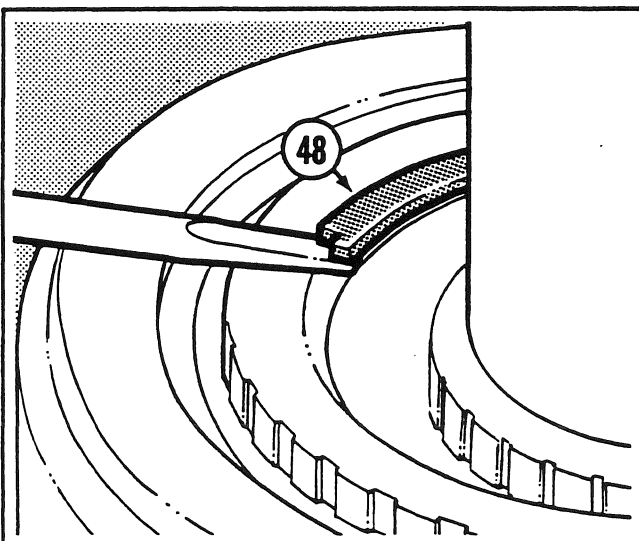


Fig. 112

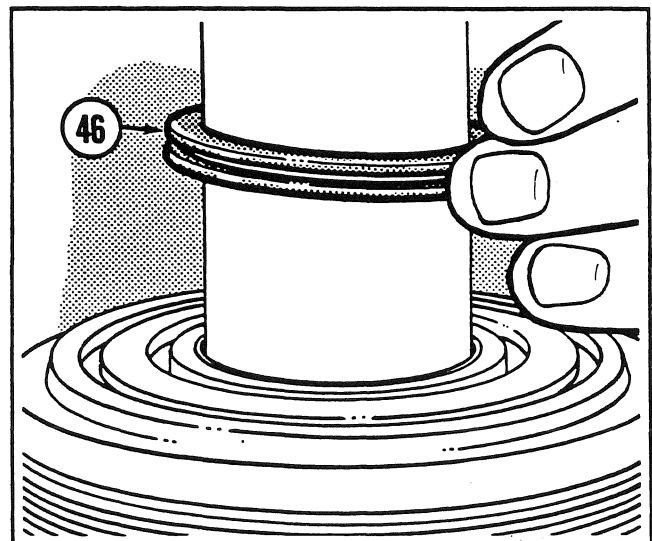


Fig. 115

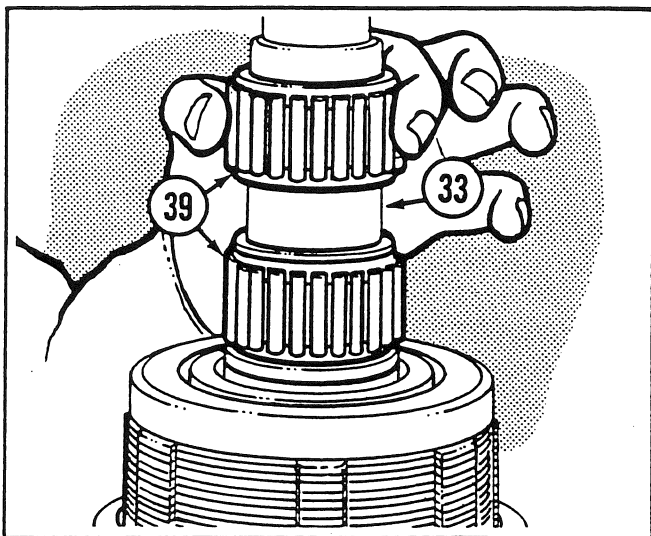


Fig. 116

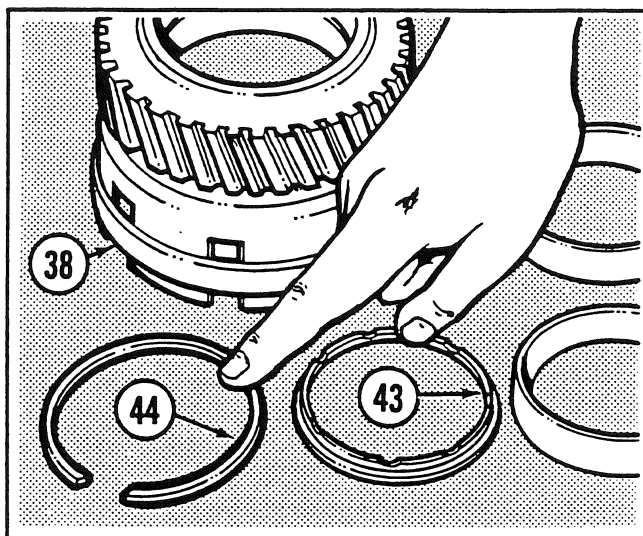


Fig. 119

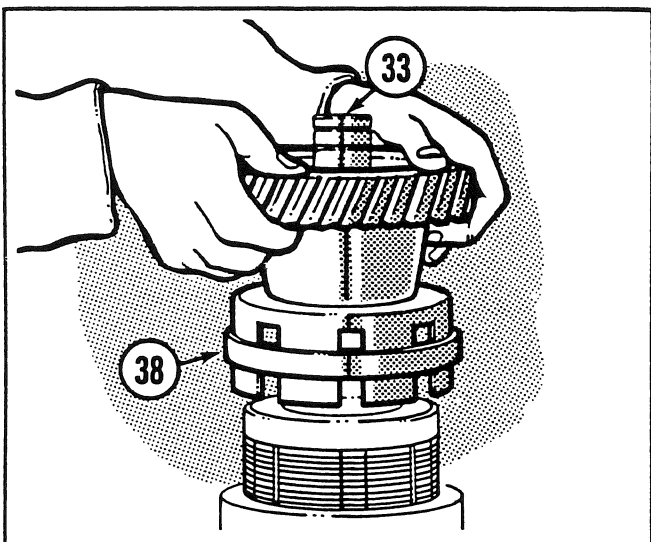


Fig. 117

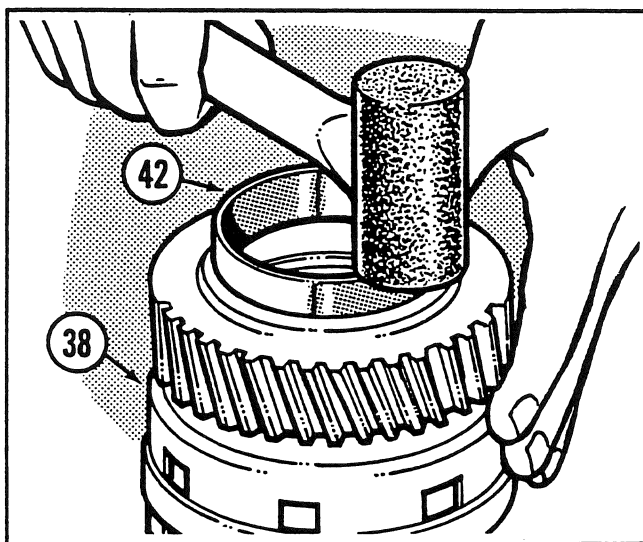


Fig. 120

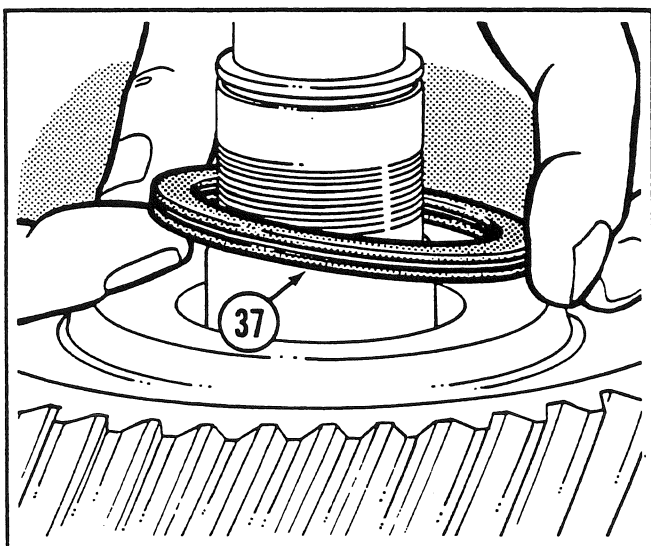


Fig. 118

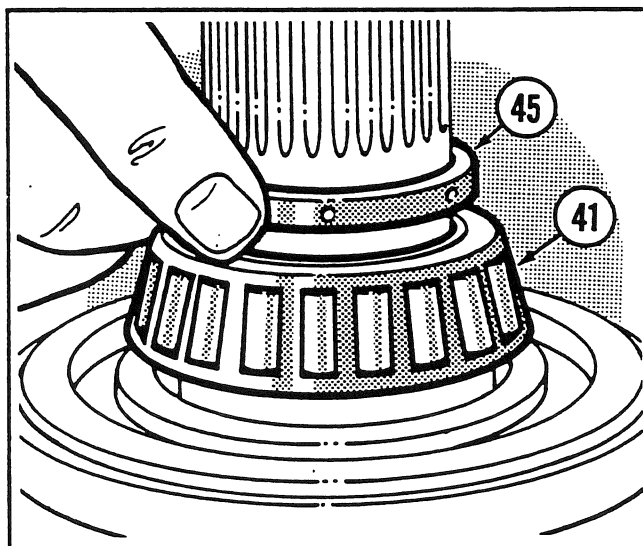


Fig. 121

Clutch Pack - Assembly (Continued)

**Fig. 116**

Install the needle roller bearings (39) on the shaft (33).

**Fig. 117**

Install the gear and drum assembly (38) on the shaft (33), taking care to engage the tangs of the reaction plates with the slots in the drum.

**Fig. 118**

Install the outer thrust bearing and washers (37). Refer to the 700 Series Parts Manual to select the exact thrust bearing size you need.

**Fig. 119**

If you are working on the intermediate clutch pack, install a new snap ring (44) and the cup spacer (43) in the gear and drum assembly (38). Make sure that the spacer is on the drum side of the snap ring.

**Fig. 120**

Use dry ice, a soft-faced hammer or soft metal drift to install the inner and outer bearing cups (42) in the gear and drum assembly (38).

**Fig. 121**

**CAUTION**

**WHEN INSTALLING A BEARING CONE, ALWAYS USE A SUITABLE SOFT METAL TUBULAR DRIFT HAVING THE SAME DIAMETER AS THE CONE INNER RACE.**

Lubricate the bearing cone (41). Use the hydraulic press and suitable drift to install the bearing cone. The bearing is easier to install when heated. Use only an oven or oil bath type heater and **DO NOT** exceed 121°C (250°F). Install the cone spacer (45) on the shaft.

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Clutch Pack - Assembly (Continued)

Fig. 122

Install the gear and drum assembly (38) for the intermediate clutch pack, taking care to align the tangs of the reaction plates with the slots in the drum.

Fig. 123

**CAUTION**

**WHEN INSTALLING A BEARING CONE, ALWAYS USE A SUITABLE SOFT METAL TUBULAR DRIFT HAVING THE SAME DIAMETER AS THE CONE INNER RACE.**

Lubricate the bearing cone (41). Use the hydraulic press and suitable drift to install the bearing cone. The bearing is easier to install when heated. Use only an oven or oil bath type heater and **DO NOT** exceed 121°C (250°F).

Fig. 124

Apply anti-seize lubricant ('Rocol' J 166, or equivalent) to the splines of the shaft (33). Install any splined gears (36). Use a press to install the gears firmly against the clutch pack assembly.

The clutch pack overhaul is now complete. For all clutch packs except the reverse clutch half-pack, repeat the procedures described in Fig. 106 through Fig. 124 to assemble the opposite side of the shaft assembly.

Fig. 125

**CAUTION**

**WHEN INSTALLING A BEARING CONE, ALWAYS USE A SUITABLE SOFT METAL TUBULAR DRIFT HAVING THE SAME DIAMETER AS THE CONE INNER RACE.**

Lubricate the shaft bearing cones. Use the hydraulic press and suitable drift to install the bearing cone. The bearing is easier to install when heated. Use only an oven or oil bath type heater and **DO NOT** exceed 121°C (250°F).

Fig. 126

Install the locknut (34) and tighten to the specified torque using the special tool listed in the front of this Shop Manual Section.

Fig. 127

Install the bearing cups (71) in the bearing bores.



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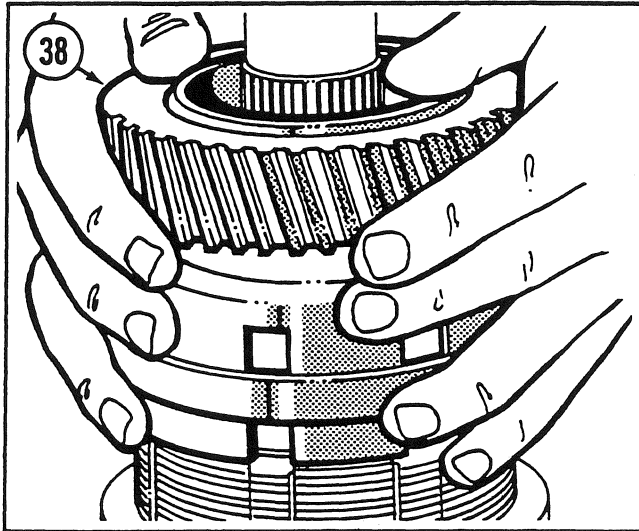


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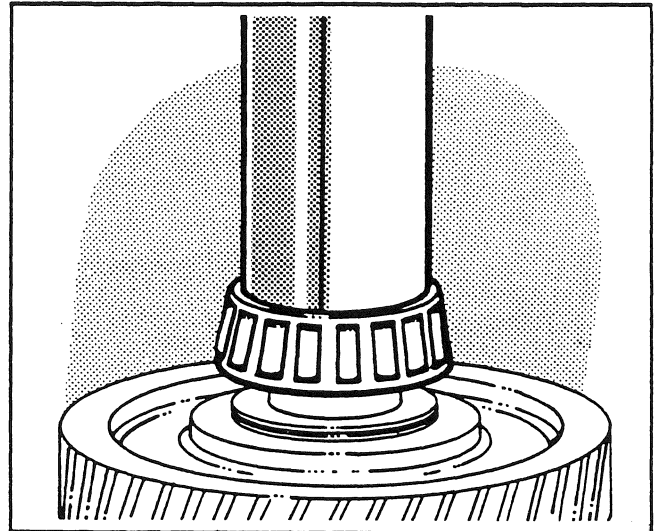


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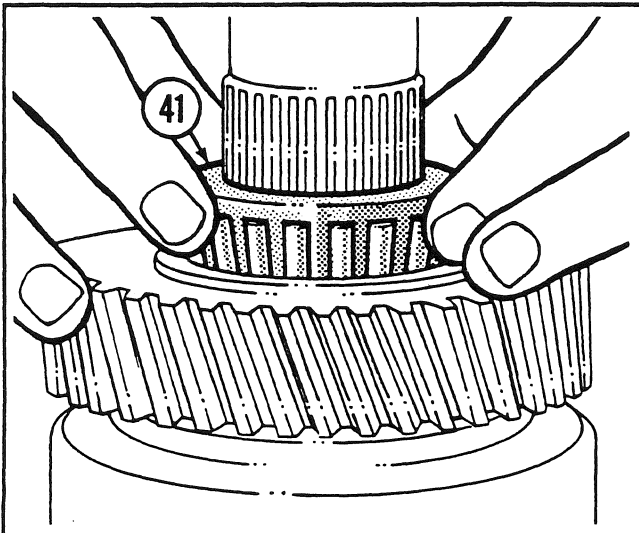


Fig. 123

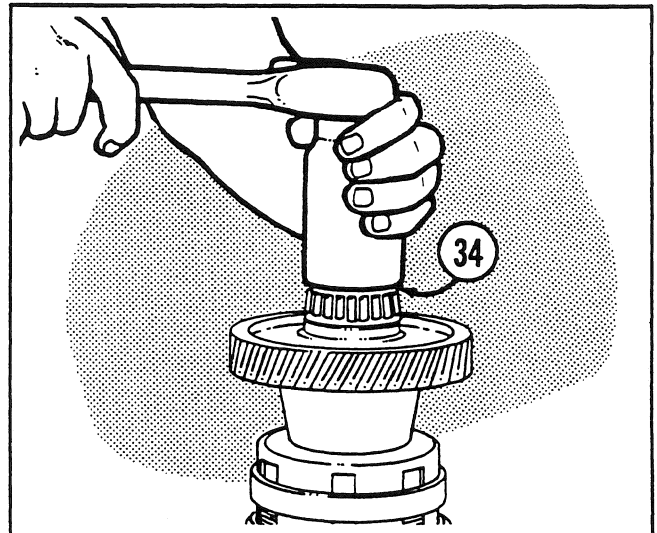


Fig. 126

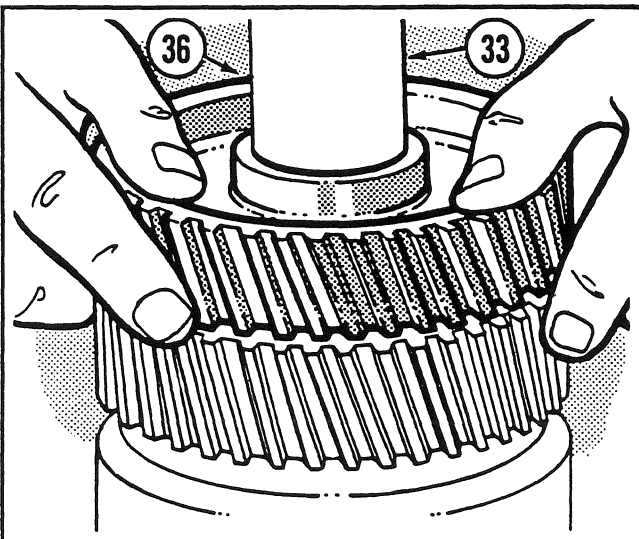


Fig. 124

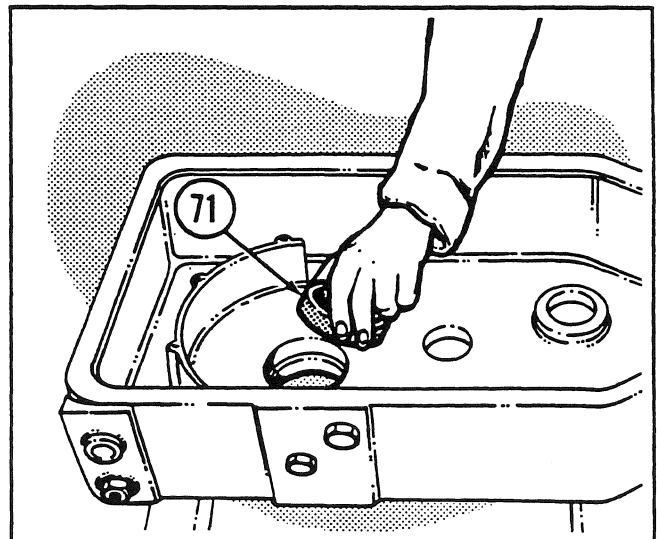


Fig. 127

700 SERIES SHOP MANUAL  
8400 TRANSMISSION

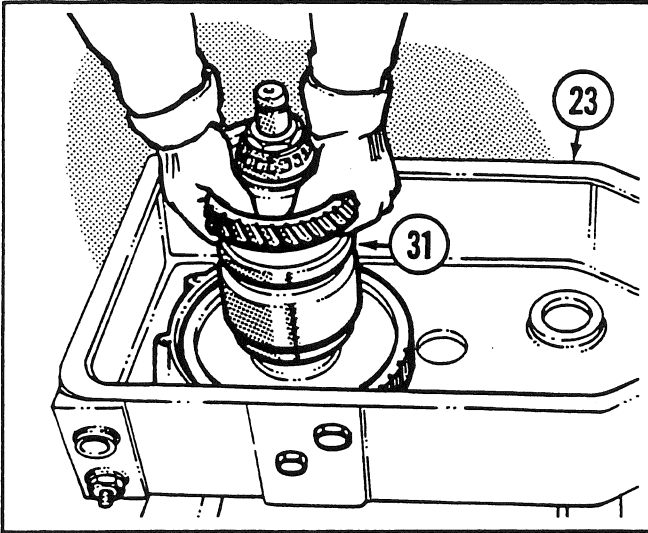


Fig. 128

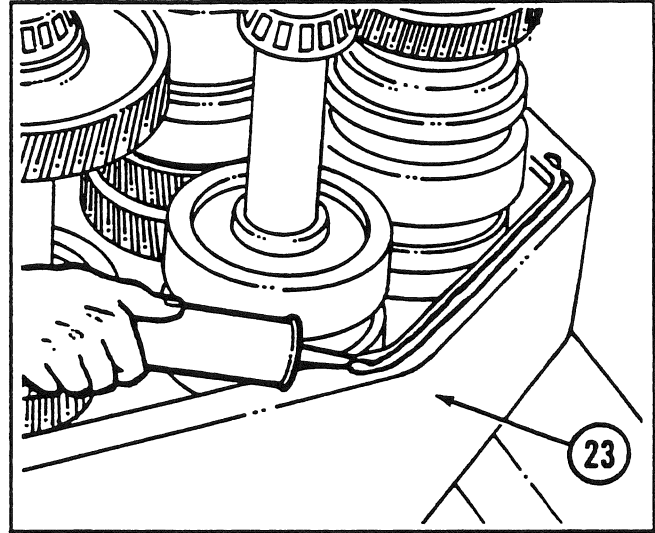


Fig. 131

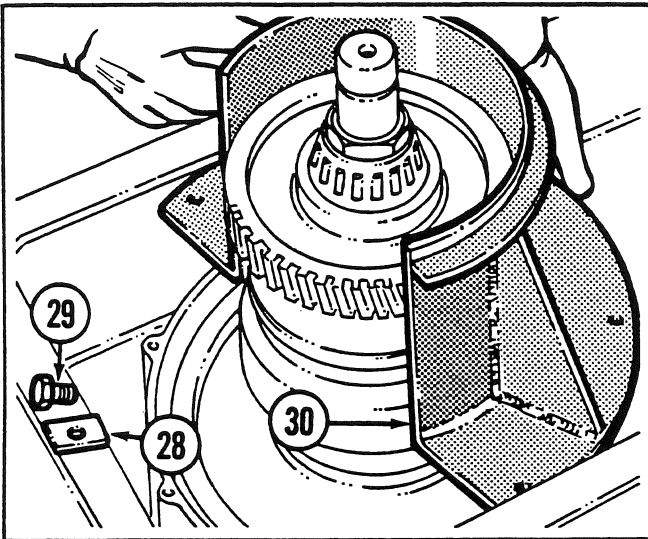


Fig. 129

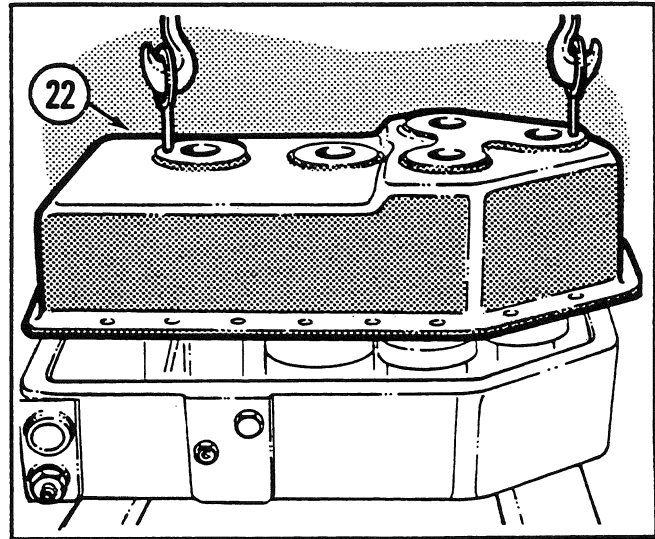


Fig. 132

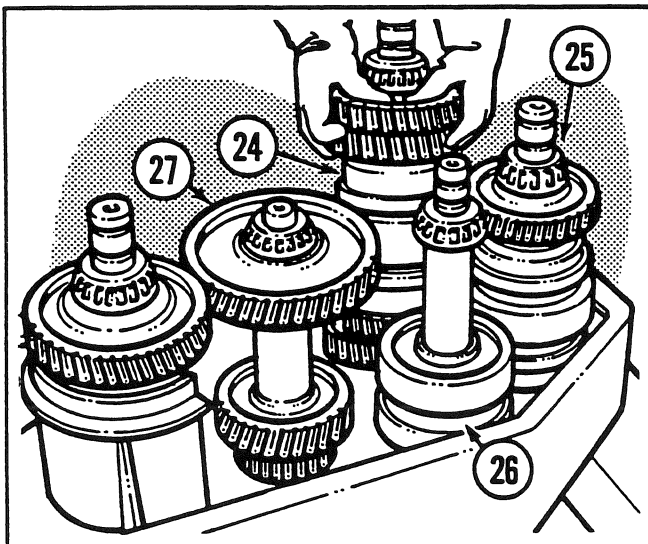


Fig. 130  
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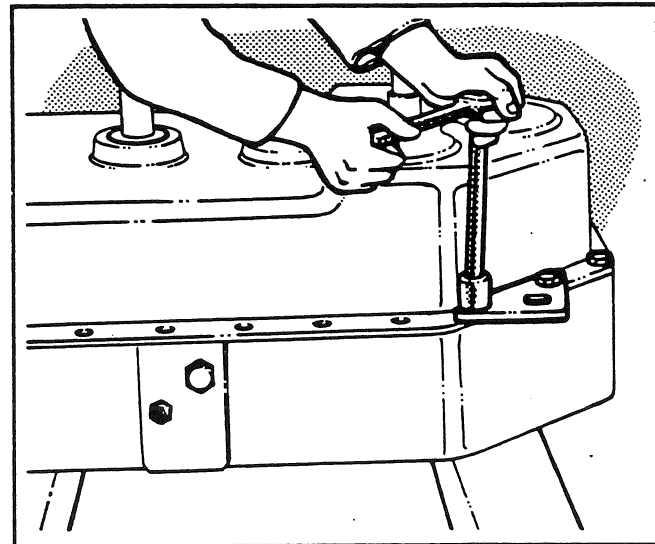


Fig. 133

700 SERIES SHOP MANUAL  
8400 TRANSMISSION

**Transmission - Assembly**

**Fig. 128**

Install the yoke end of the output clutch pack (31) in the rear case half (23).

**Fig. 129**

Install the oil baffle (30). Install the capscrews (29) and new locking plates (28). Tighten the capscrews. Bend the locking plates over the cap-screw heads and edge of the oil baffle.

**Fig. 130**

Install the clutch packs in the following order: the second intermediate shaft (27); the reverse clutch half-pack (26); the input clutch pack (25) and the intermediate clutch pack (24). The seal ring end of each shaft should be pointing up.

**Fig. 131**

Use 'Loctite Liquid Chisel', or equivalent, to clean the flange mating surfaces of both case halves, the mating surfaces of the control valve caps, second intermediate cap and regulator valve. Apply a bead of gasket eliminator, Champion part number 25303, 'Loctite' 515 or equivalent, to the flange mating surface of the rear case half (23).

**Fig. 132**

Carefully install the front case half (22).

**Fig. 133**

Install the capscrews, together with the transmission mounts and lifting eyes. Tighten the capscrews to the specified torque.

## 700 SERIES SHOP MANUAL

### 8400 TRANSMISSION

(To be used only with Control Valve Caps with Counterbores)

#### Transmission Assembly (Continued)

##### Fig. 134

The 8400 transmission uses shims in each shaft bearing bore to control proper end-float. The proper end-float is **0.002 in. to 0.006 in. (0,051 mm to 0,152 mm)**. You must determine the correct shim thickness for **each** shaft. Install the special tool, part number **29858**, and secure with two capscrews. Torque-tighten the capscrews evenly to 20 lbf.in. (2,3 N.m; 0,23 kgf.m).

##### Fig. 135

Use the special tool, part number **29859**, to rotate the shaft assembly in both directions. This ensures that the tapered roller bearing is fully seated.

##### Fig. 136

Torque-tighten the capscrews evenly to 40 lbf.in. (4,5 N.m; 0,46 kgf.m) and repeat the rotating step in **Fig. 135**. Torque-tighten the capscrews evenly to 60 lbf.in. (6,8 N.m; 0,69 kgf.m) and repeat the rotating step in **Fig. 135**. Check the final torque and repeat this procedure as necessary to reach the final torque value. **These torque values are critical to the final outcome of the procedure, so follow them exactly!**

##### Fig. 137

Use a depth micrometer and measure through each of the four small holes in the special shim tool to the surface of the transmission case. Calculate and record the average measurement.

##### Fig. 138

Measure the depth of the cap counter-bore in four places. Calculate and record the average measurement.

##### Fig. 139

Subtract **Fig. 138** average measurement from **Fig. 137** average measurement. Find this total in the **Average Measurement** column of the **SHIM SELECTION CHART** (refer to your grader serial number). Find the column for the shaft you are working on. Find the part number and thickness of the shim in that column opposite the **Average Measurement**. Use a micrometer to check the shim thickness. Compare with the chart before installation. Install the shim with the chamfered edge away from the bearing. Install the cap. If in doubt, repeat the shim selection procedure. **Remember**, improper end-float can cause bearing damage!

#### NOTE

**DO NOT** use the new caps with old (thinner) shims. Use only one shim for each bearing bore. **NEVER** use two thinner shims to equal the thickness of the required shim.

(To be used only with Control Valve Caps with Counterbores)

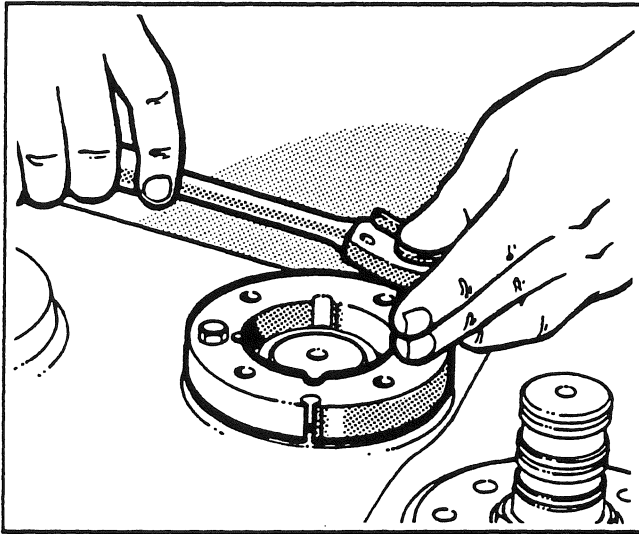


Fig. 134

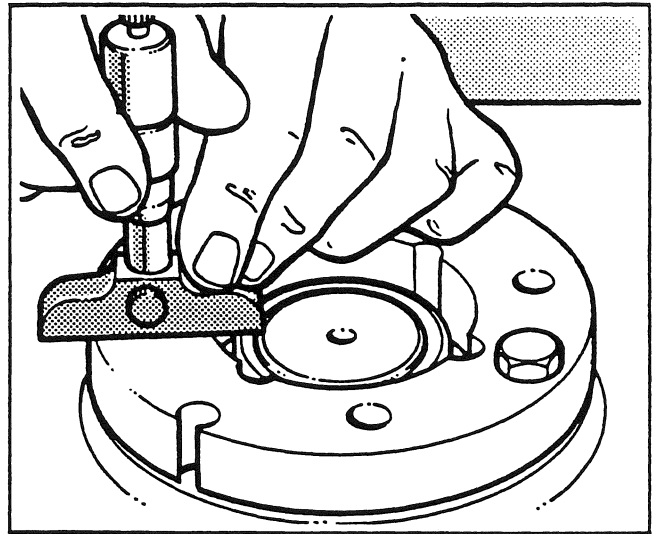


Fig. 137

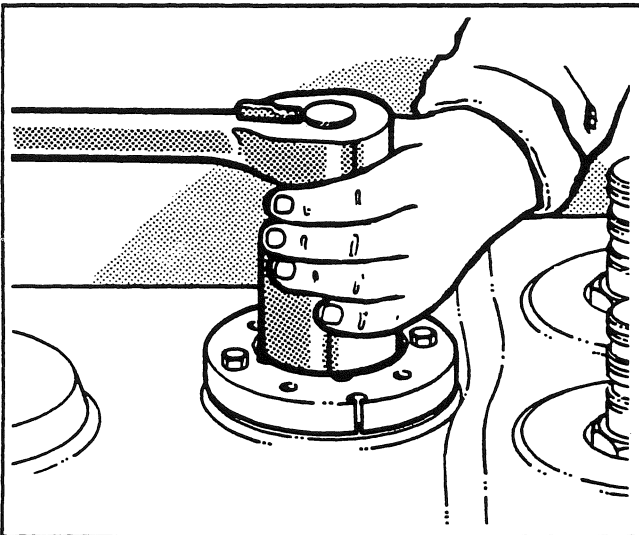


Fig. 135

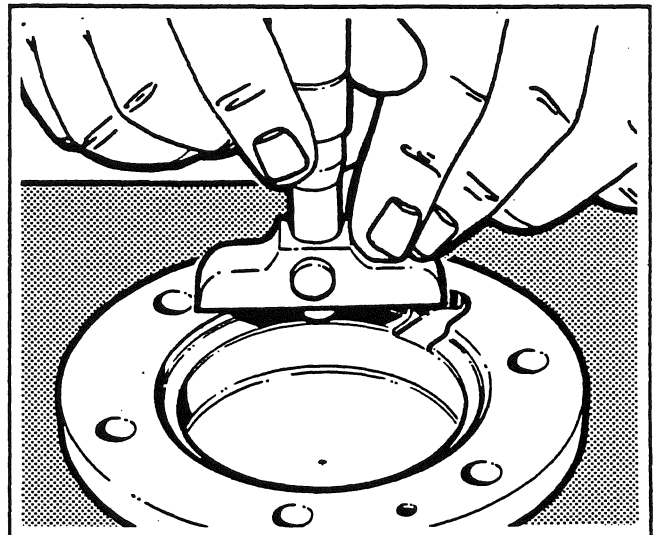


Fig. 138

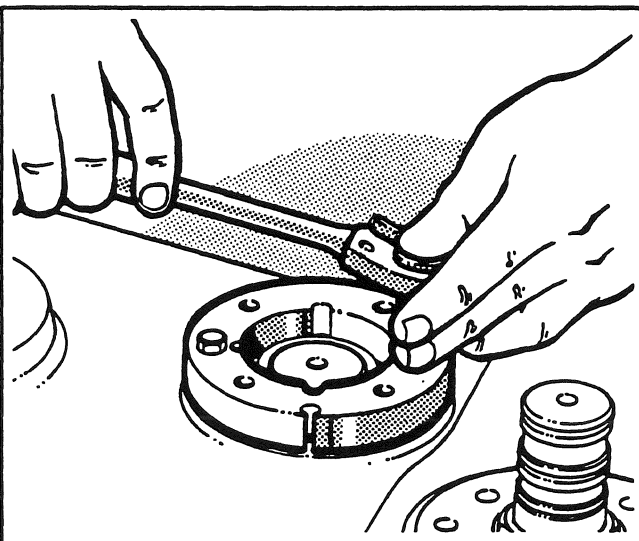


Fig. 136

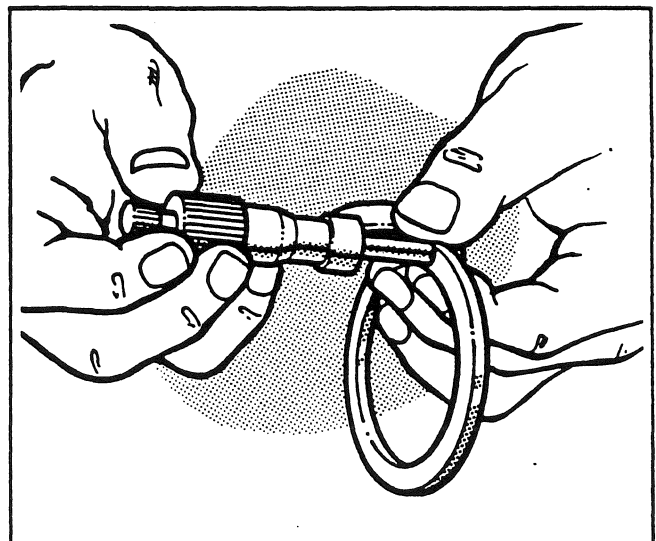


Fig. 139

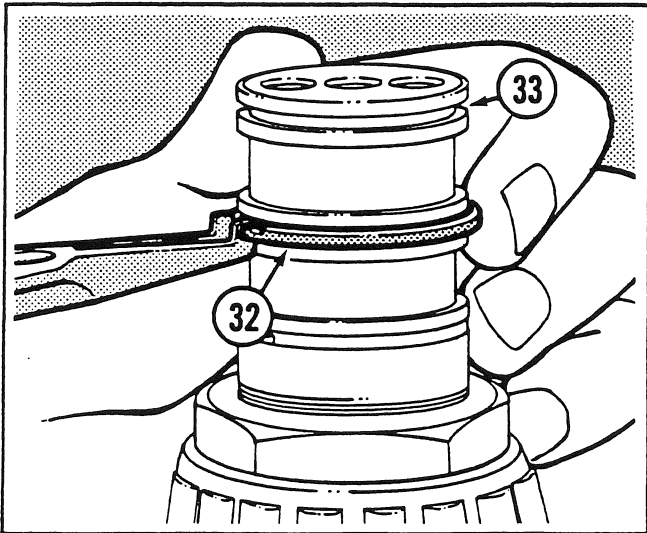


Fig. 140

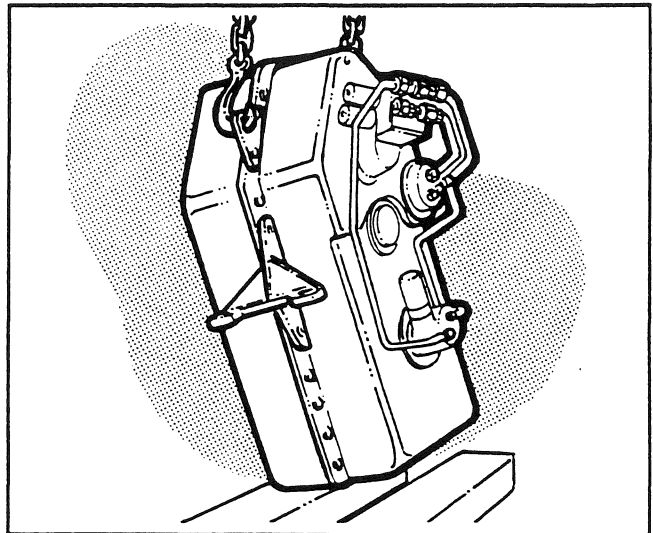


Fig. 143

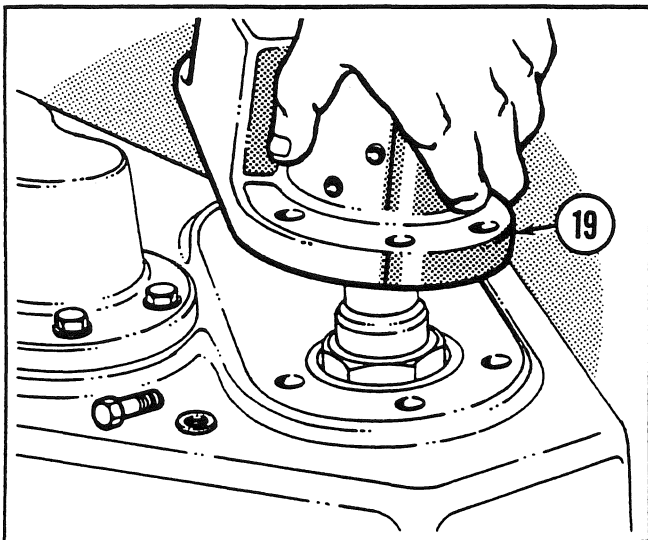


Fig. 141

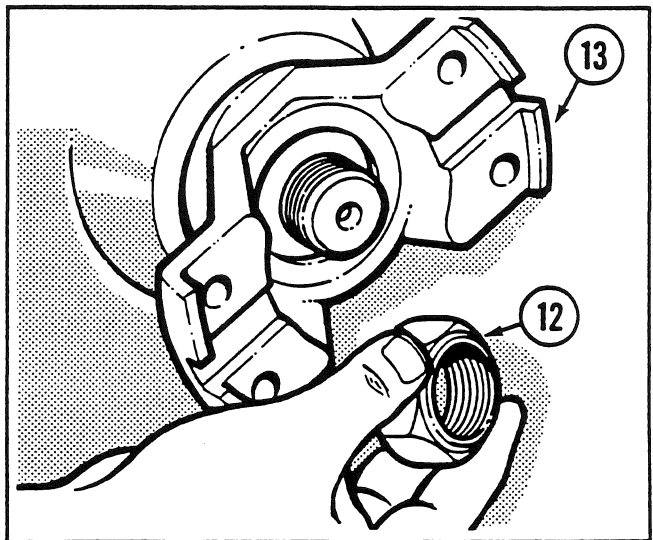


Fig. 144

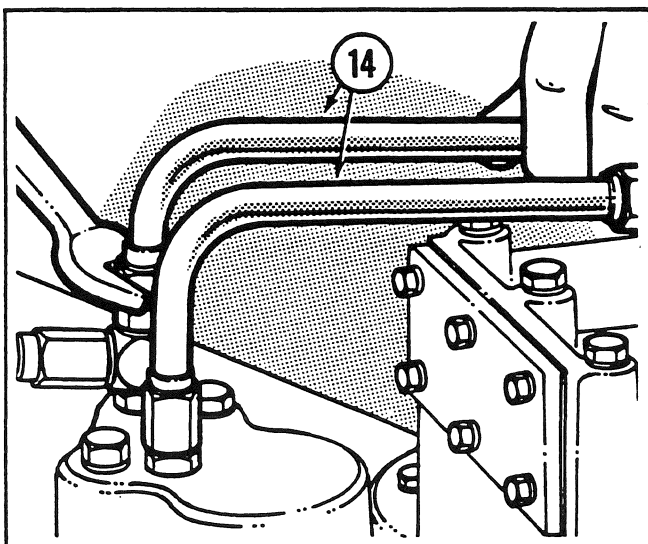


Fig. 142

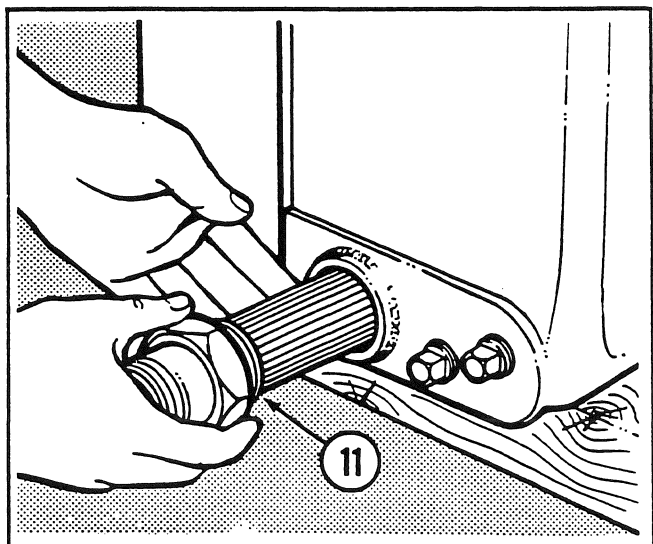


Fig. 145

700 SERIES SHOP MANUAL  
8400 TRANSMISSION

Transmission - Installation

**Fig. 140**

Install new hook-type seal rings (32) on the valve end of all shafts.

**Fig. 143**

Raise the transmission into an upright position.

**Fig. 141**

Apply a bead of gasket eliminator, Champion part number 25303, 'Loctite' 515 or equivalent, to the mating surfaces of the control valve caps, second intermediate cap (19) and regulator valve (4). Centralize the seal rings on the shafts and install the control valve caps. **Take care not to damage the seal rings!** Install the second intermediate cap. Tighten the capscrews evenly. Finally, tighten the capscrews to the specified torque. Install the solenoids, spacers and nuts. **Be sure to tighten to the specified torque to avoid damaging the components!**

**Fig. 144**

Apply a bead of gasket eliminator, Champion part number 25303, 'Loctite', 515 or equivalent, to the bearing face of both driveshaft yokes (13) and install them. Install the washers and locknuts (12). Tighten the locknuts to the specified torque.

**Fig. 142**

Install the hydraulic tubes (14).

**Fig. 145**

Lubricate and install a new suction strainer O ring. Press the suction strainer bypass valve and check for free return spring action. Clean and install the suction strainer (11) and fitting (10).

**700 SERIES SHOP MANUAL**  
**8400 TRANSMISSION**

**Transmission - Installation (Continued)**

**Fig. 146**

Place the model 8400 transmission on a jack and maneuver it under the grader. Raise the transmission carefully into position. Make sure that the mounts are properly aligned.

**Fig. 149**

Connect the breather hose (6).

**Fig. 147**

Install and tighten the transmission mount bolts (9).

**Fig. 150**

Connect the clutch supply hose (5).

**Fig. 148**

Connect the upper and lower drive shafts (8). Tighten the capscrews to the specified torque.

**Fig. 151**

Connect the transmission supply hose (3) to the regulator valve (4).



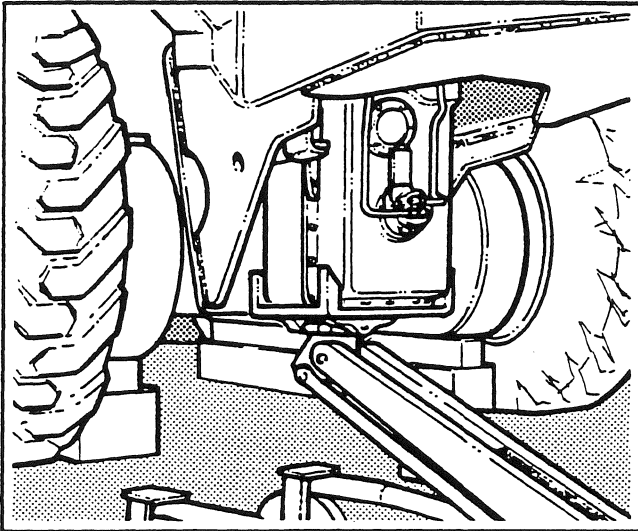


Fig. 146

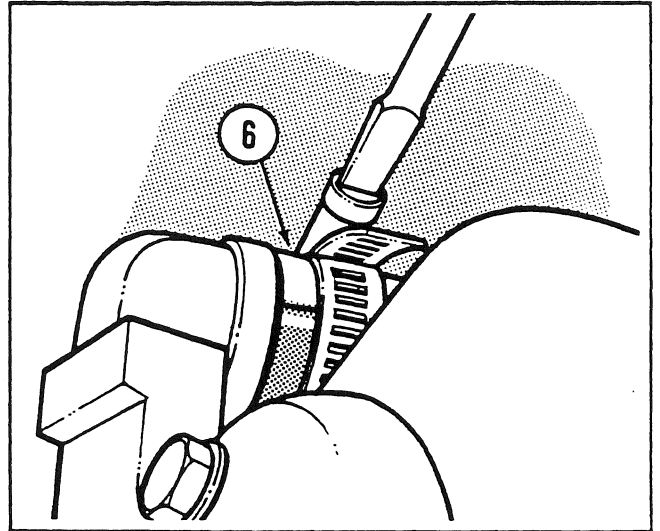


Fig. 149

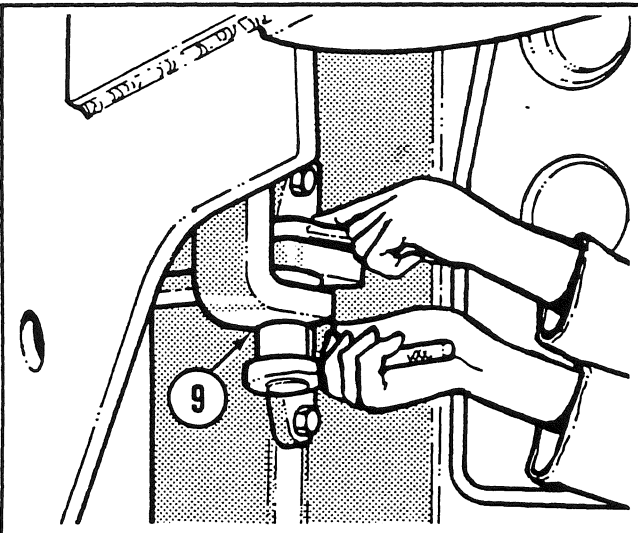


Fig. 147

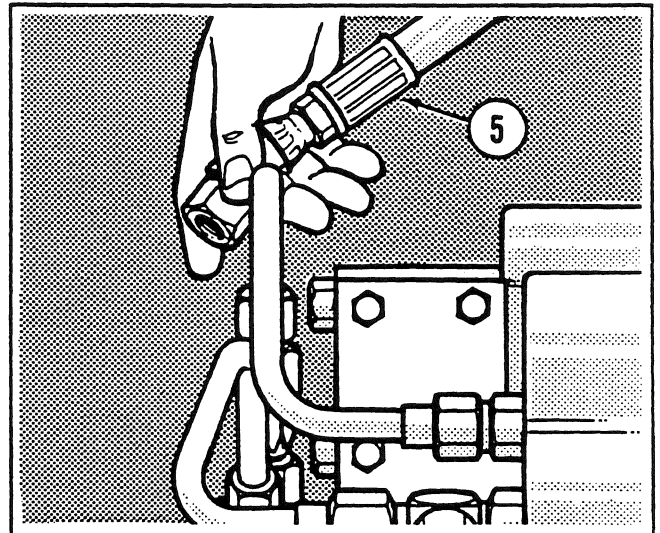


Fig. 150

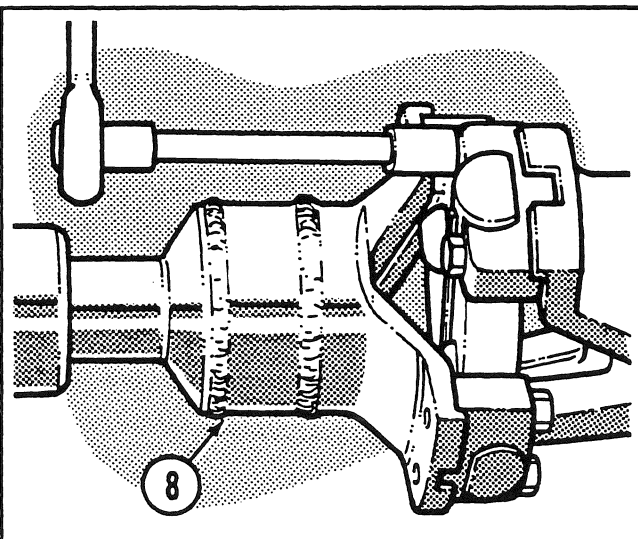


Fig. 148

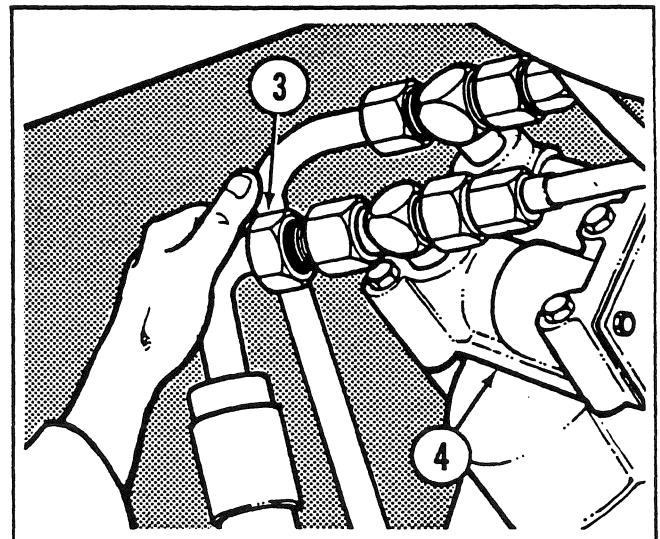


Fig. 151

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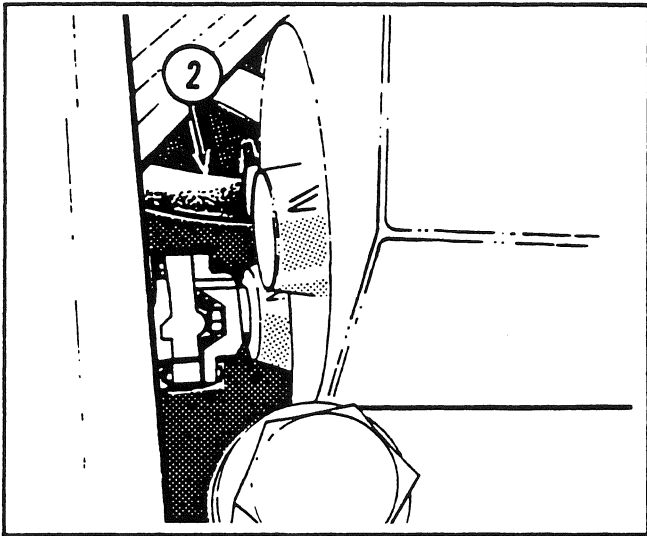


Fig. 152

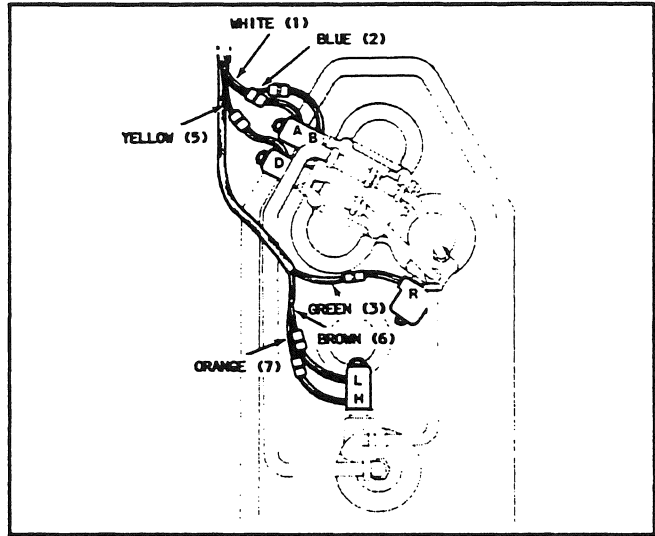


Fig. 155

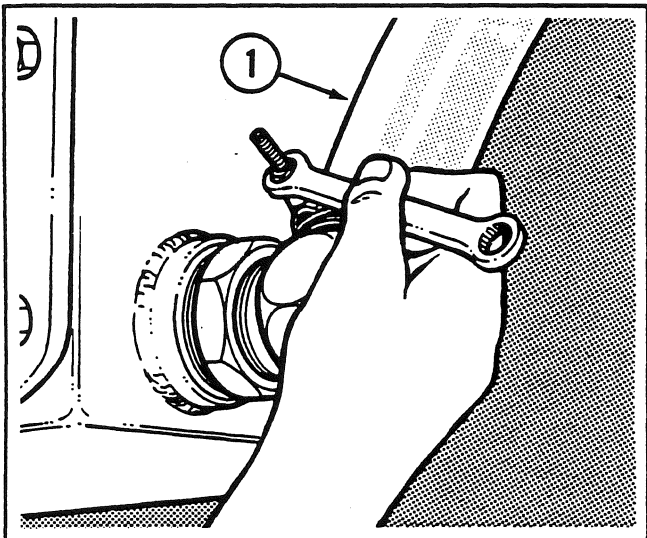


Fig. 153

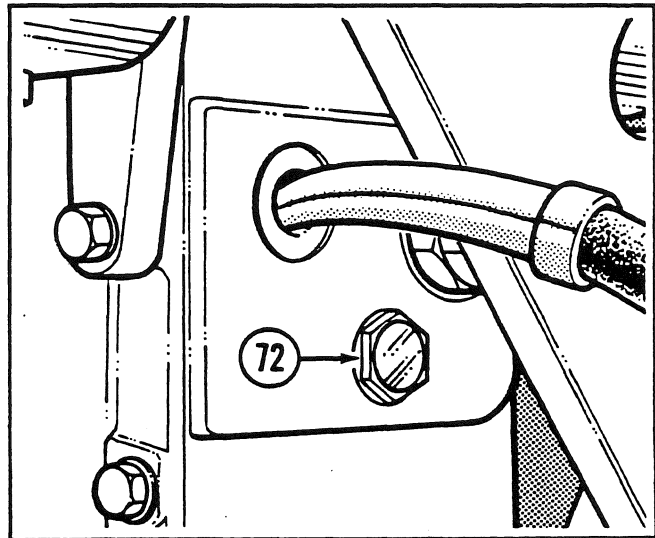


Fig. 156

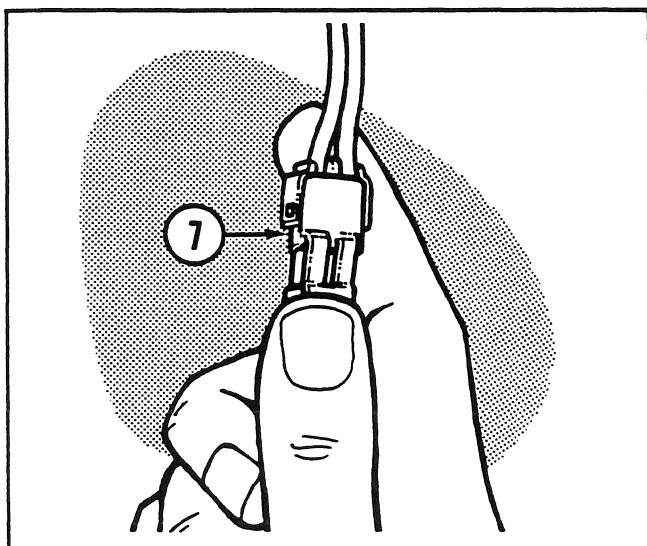


Fig. 154

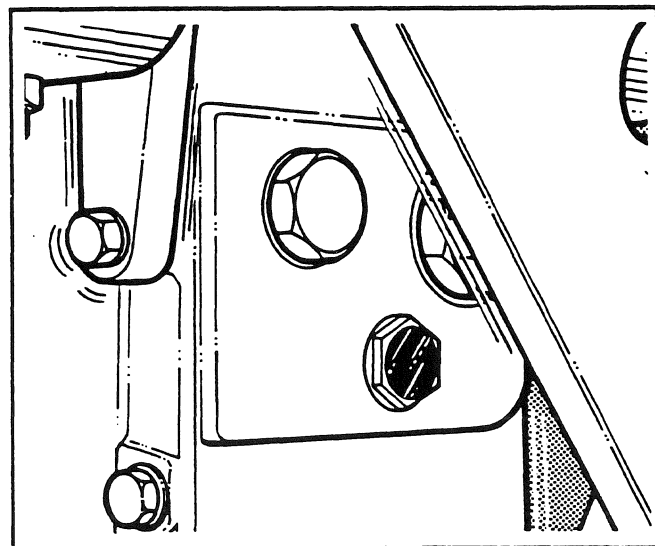


Fig. 157

700 SERIES SHOP MANUAL  
8400 TRANSMISSION

Transmission - Installation (Continued)

**Fig. 152**

Connect the clutch drain hose (2).

**Fig. 155**

Verify the positions of the wires by comparing them to the connection diagram on page 2 of this Shop Manual Section.

**Fig. 153**

Connect the suction hose (1).

**Fig. 156**

Install a new transmission filter element. Refill the transmission with the lubricant recommended in the Lubrication Specifications at the front of this Shop Manual.

**Fig. 154**

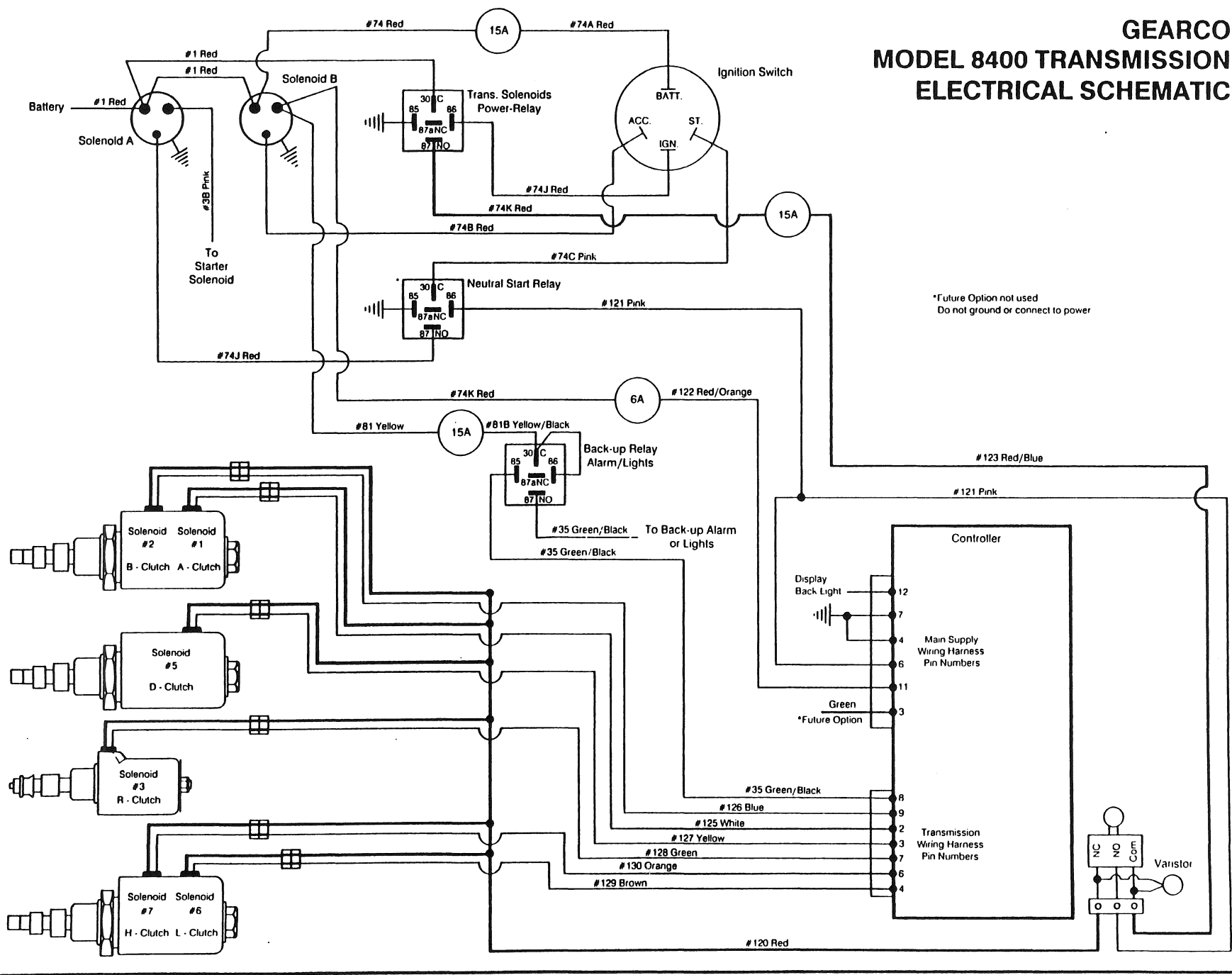
Connect the transmission wiring harness (7). The harness consists of six color-coded or number-coded wires. Use the colors or numbers to make sure the wires are properly connected.

**Fig. 157**

Park the grader on level ground. With the engine running at idle and at operating temperature, make sure you can see transmission oil half-way up the level check sight glass.

**Road test the grader to make sure that the transmission functions properly. Check all connections for leaks. When you are satisfied that everything is working properly, install the transmission guard.**

# GEARCO MODEL 8400 TRANSMISSION ELECTRICAL SCHEMATIC



\*Future Option not used  
Do not ground or connect to power