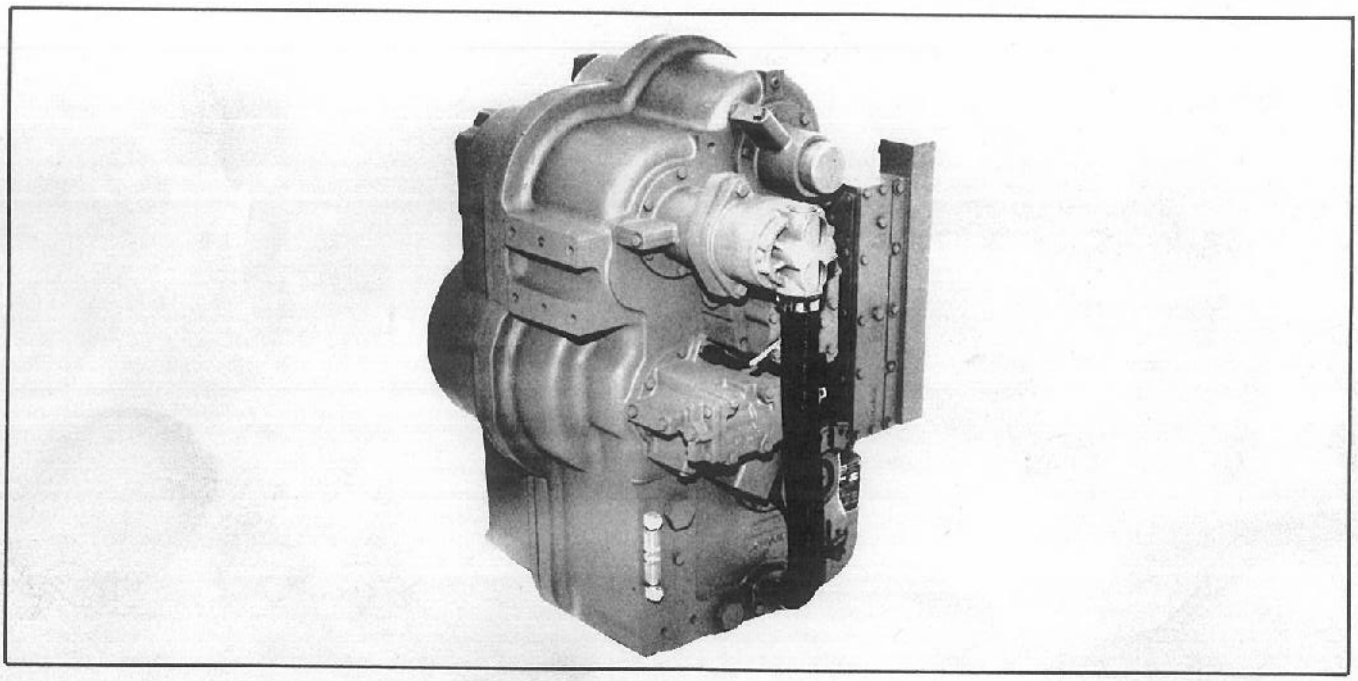
T.M.

STEIGER®

POWERPULSE TRANSMISSION

SERVICE MANUAL



IMMEDIATE ACTION LETTER REFERENCE:

No/Date

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SERVICE BULLETIN REFERENCE:

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SERVICE NEWS REFERENCE:

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37-119 (7-83)

Contents

Description

The PowerPulse Controlled Transmission is a hydraulically actuated and computer controlled powershift transmission. This transmission is manufactured for Steiger Tractor, Inc. by Twin Disc Incorporated. The transmission is fully warranted and supported by Steiger Tractor, Inc. therefore, all inquiries or service related problems must be referred to the Steiger Service Department at the factory office located in Fargo, North Dakota.

The transmission uses a simple countershaft design and all gears are in constant mesh. All transmission gears are hardened and ground, spur type. The gears are lubricated by a constant spray of oil from the bearings and clutches.

A total of eight hydraulically operated clutch packs, installed on four shafts, are applied in various combinations to provide twelve speeds forward and two speeds in reverse. This transmission is unique because no torque converter is required for its operation. This is possible because of a modulated master clutch incorporated into the transmission. The master wet clutch is the rear 9-inch clutch.

All internal components of the transmission are encased in a cast, two piece housing. The housing split line is sealed with Loctite #49 plastic to prevent oil leakage. The bottom of the transmission housing serves as the reservoir for oil used in the transmission. The transmission also serves as the common sump for the PTO wet clutch and dropcase when this option is used.

An oil baffle shrouds the lower portion of clutches and gears on the output shaft to prevent foaming oil in the sump. This prevents air or foamed oil from being drawn through the suction screen at the bottom of the sump, and into the pump, which could cause overheating.

All shafts are located and supported by single row tapered roller bearings. The "rear" bearing cups are shimmed between the cup and bearing retainer to adjust bearing clearance.

A gear type constant displacement pump is mounted on a pad on the rear side of the transmission. The pump is driven through a pump adaptor at the rear of the input driven shaft to supply oil flow and pressure for clutch application and lubrication of the transmission. The pump draws oil through the suction screen in the sump and directs it through the filter, then to the heat exchanger on to the transmission regulator valve.

Main Regulator Valve

A cascading-type system is used in this transmission wherein the demands for pressure and flow for all transmission functions are supplied in sequence from the single pump. The main regulator valve controls and maintains the necessary pressures for each function. As the demand for pressure and flow are met for one area of the system, oil is cascaded to meet the demand of the next area. Pressure regulating valves for controlling both main and lube oil pressures are contained within the regulator valve assembly.

The main pressure regulating valve maintains main pressure 225 ± 5 psi by opening and cascading excess pressure on to the lube regulator valve. As the main pressure is building up to 225 psi, oil passes through an orifice to the lube regulator valve. The lube regulator valve maintans lube oil pressure regulation.

Master Clutch Lube Control Valve:

The master clutch lube control valve is actuated mechanically by a cable arrangement from the clutch pedal. The purpose of the master clutch lube control valve is to provide additional lube oil to the master clutch during periods of modulation to dissipate the heat generated by clutch slippage. When the master clutch is being modulated, the control valve removes main pressure that was assisting the valve spring to hold the master clutch control valve closed. The master clutch lube control valve now assumes control of the lube system pressure by opening against preset spring tension and cascading all excess oil flow across the master clutch plates to cool them. When the master clutch is fully engaged, oil pressure to assist the valve spring is restored and the master clutch lube control valve is closed causing control of lube system pressure to revert back to the lube regulator valve within the main regulator valve assembly.

Clutches

Internally splined, hardened steel plates and externally splined sintered friction plates are used in all clutch packs. The reverse clutch plates are of the "polygon" design. The clutches are of the "S" dump valve configuration with dual area pistons. The clutches are hydraulically activated, spring released and oil cooled.

Transmission Power Flow

Power Flow

Neutral

Torque from the engine is transmitted through a flywheel mounted, spring loaded torsional damper, through a driveline to the transmission input yoke on the front of the upper 7-inch clutch shaft (input shaft), causing the clutch shaft to rotate in engine direction. A driver transfer gear, splined to the rear of this shaft, is in mesh with a transfer driven gear splined to the rear of the second (lower) 7-inch input driven shaft. Therefore, whenever the engine is running, the top 7-inch driven shaft will be turning engine direction, the lower 7-inch driven shaft will be turning opposite engine direction. If the transmission in in "neutral", the power flow stops at this point. In order to have output torque, one of the four 7-inch clutches, one of the two 9-inch clutches, and one of the two 8-inch clutches must be engaged simultaneously.

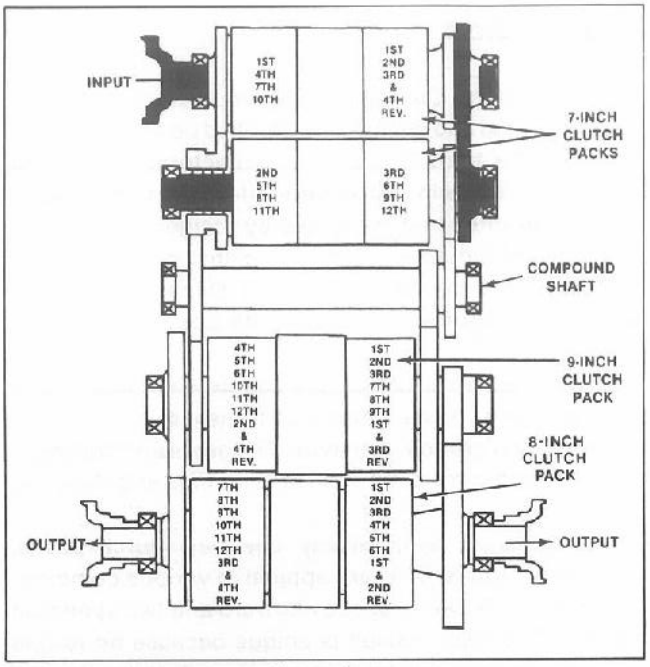


Figure 1: Power Flow - Neutral

First Speed Forward

The front 7-inch clutch on the input shaft is engaged causing its gear and drive ring to rotate engine direction. The gear and drive ring is meshed with the gear and drive ring on the front of the lower 7-inch clutch causing it to rotate anti-engine direction. This gear and drive ring is meshed with a spline connected driven gear on the front of the compound shaft. This causes the compound shaft and spline-connected drive gear on the rear of the shaft to rotate engine direction. This gear meshes with the gear and drive ring on the rear of the 9-inch clutch shaft driving it anti-engine direction. The rear 9-inch (master) clutch is engaged causing the 9-inch clutch shaft and spline connected driven gear on the rear side to rotate. This gear is in mesh with the gear and drive ring on the rear 8-inch clutch. The rear 8-inch clutch is engaged causing the outputs shaft to rotate engine direction.

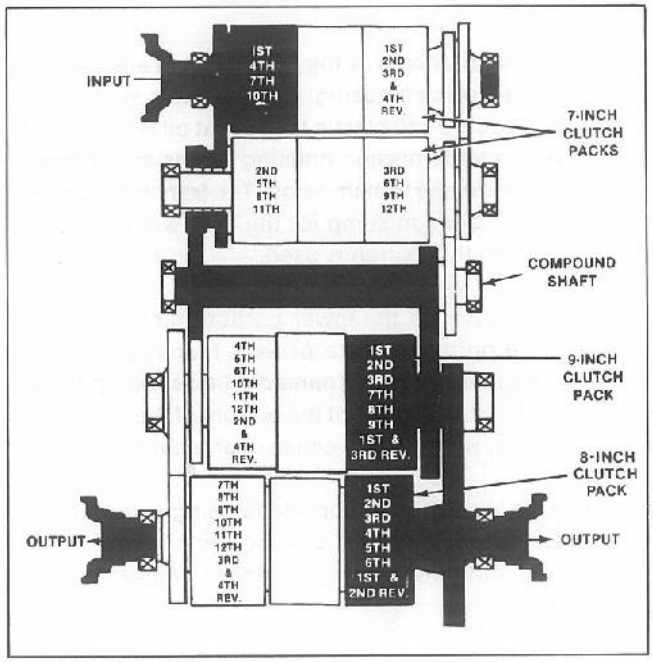


Figure 2: Power Flow - First Speed Forward Range

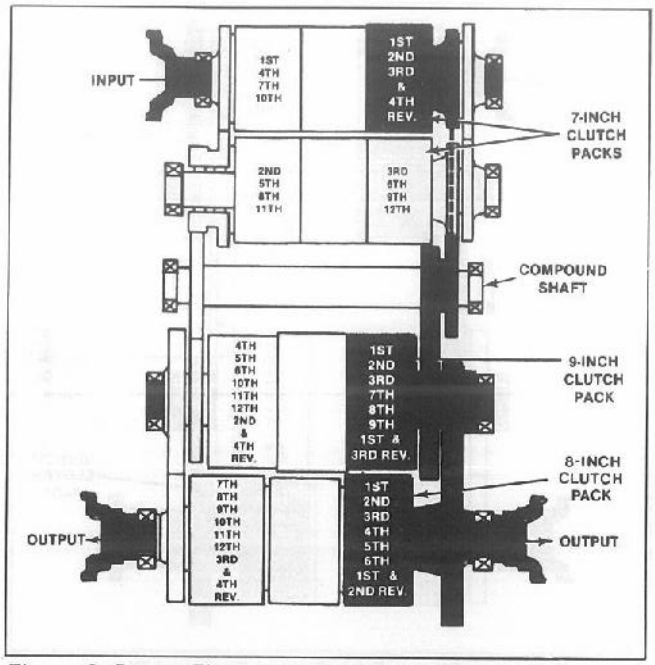


Figure 3: Power Flow - First Speed Reverse Range

First Speed Reverse

In the first speed reverse range, the rear 7-inch clutch on the upper input shaft is engaged, causing its gear and drive ring to rotate engine direction. This gear and drive ring is meshed with the driven gear on the rear of the compound shaft, driving it anti-engine direction. The gear on the rear of the compound shaft is meshed with the gear and drive ring on the rear of the 9-inch (master) clutch shaft, driving the gear and drive ring engine direction. The rear 9-inch (master) clutch is engaged causing the 9-inch clutch shaft and spline connected driver gear to rotate. The drive gear is meshed with the drive gear on the rear of the output shaft. The rear 8-inch clutch on the output shaft is engaged driving the output shaft anti-engine direction.

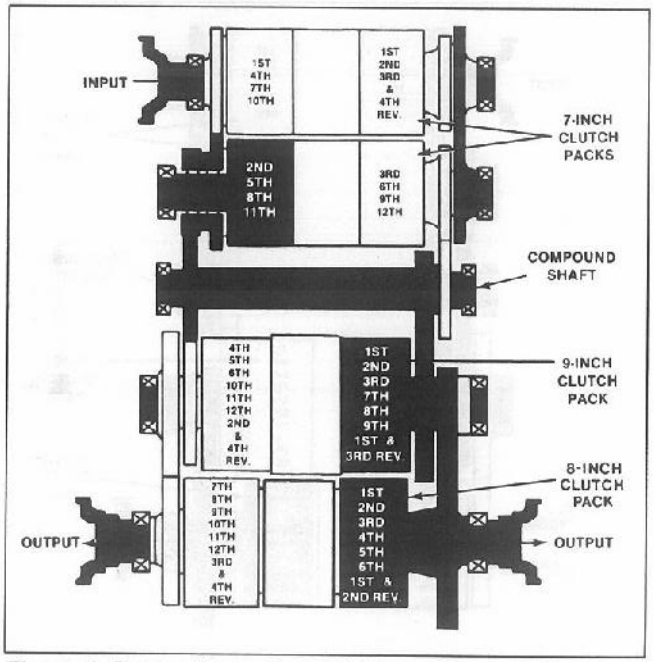


Figure 4: Power Flow - Second Speed Forward Range

Second Speed Forward

All other ranges are similar and can be traced through on the following sequence of power flow diagrams. Keep in mind the rear 9-inch (master) clutch is modulateable in the "first forward" and "first reverse" ranges only.

Transmission Power Flow

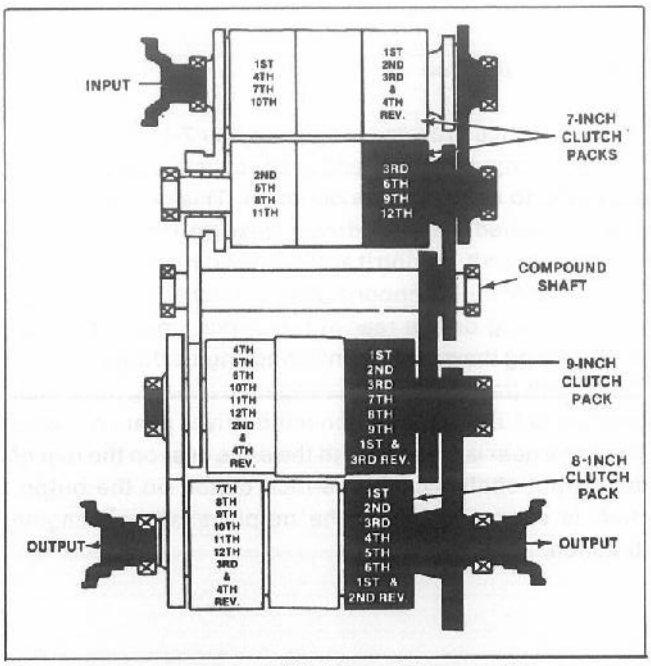


Figure 5: Power Flow - Third Speed Forward Range

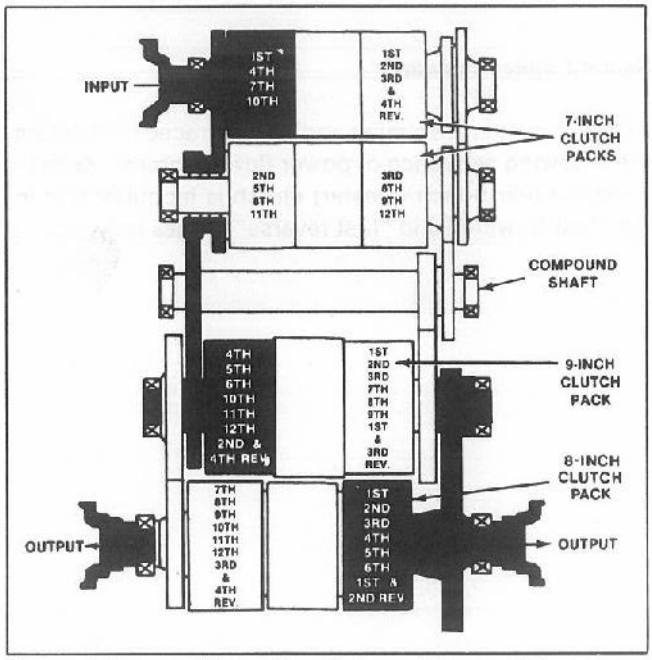


Figure 6: Power Flow - Fourth Speed Forward Range

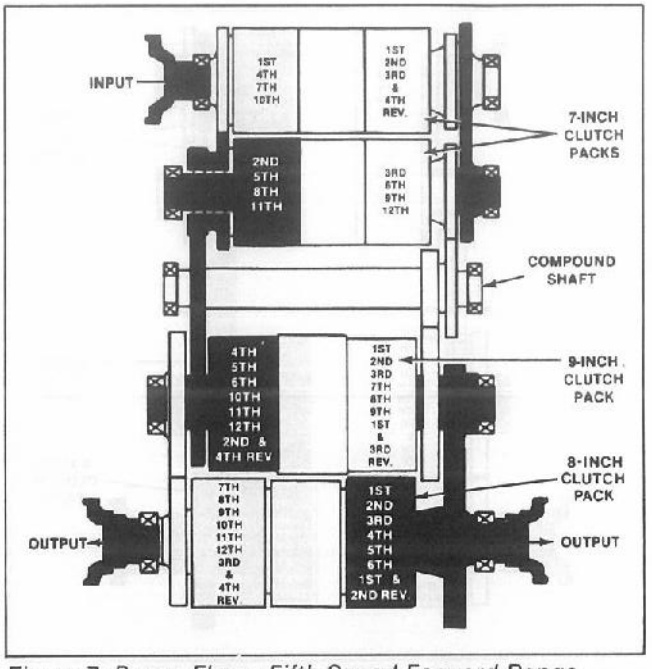


Figure 7: Power Flow - Fifth Speed Forward Range

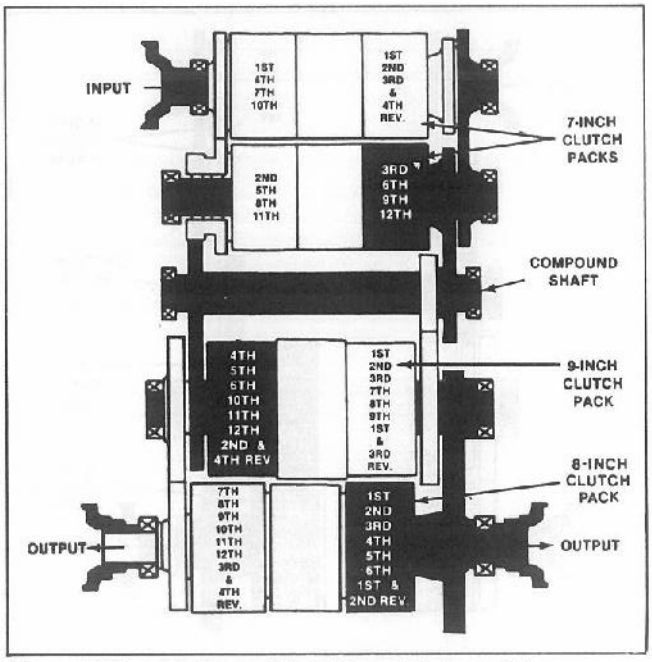


Figure 8: Power Flow - Sixth Speed Forward Range

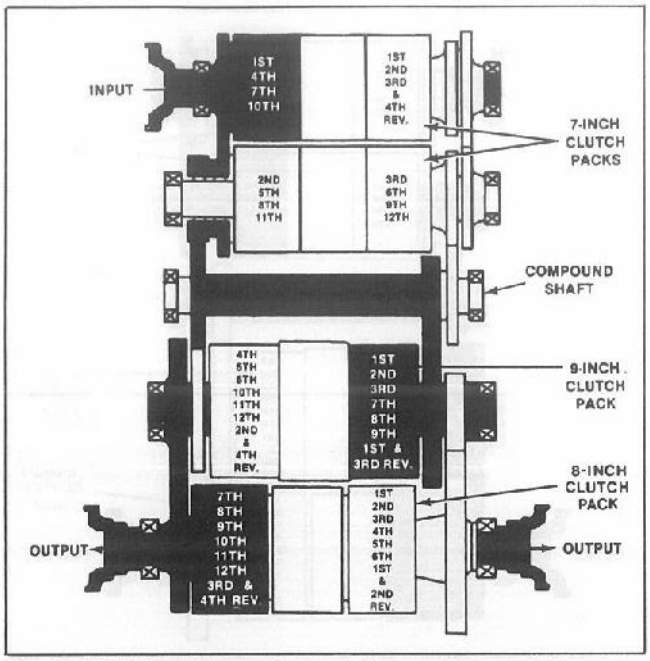


Figure 9: Power Flow - Seventh Speed Forward Range

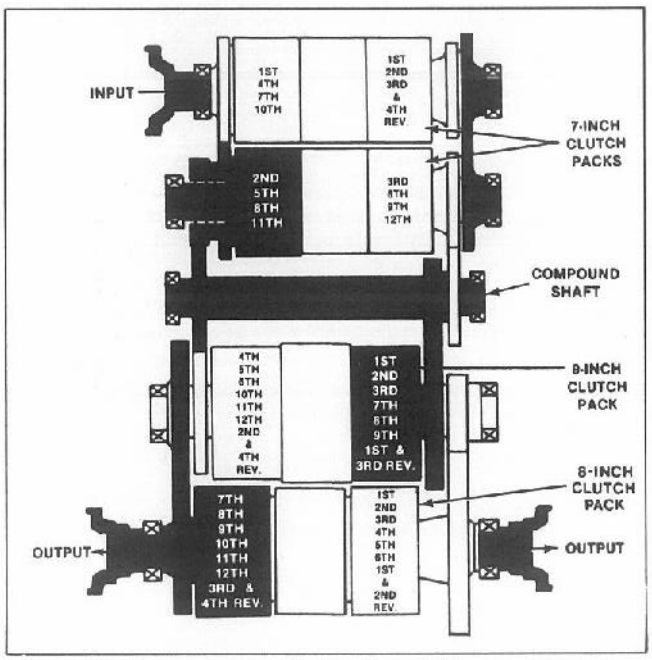


Figure 10: Power Flow - Eighth Speed Forward Range

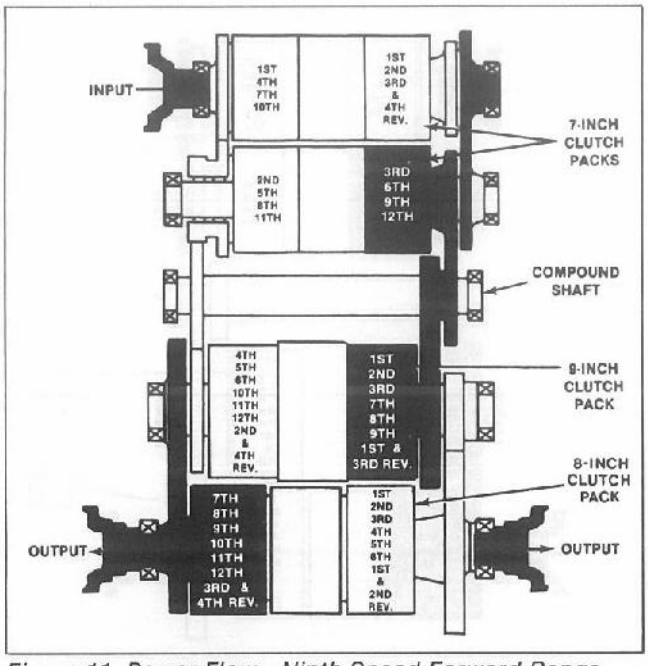


Figure 11: Power Flow - Ninth Speed Forward Range

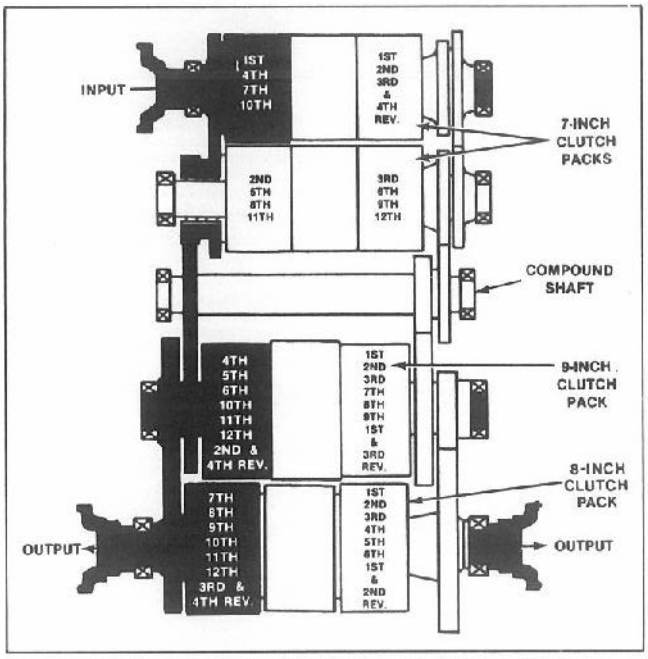


Figure 12: Power Flow - Tenth Speed Forward Range

Transmission Power Flow

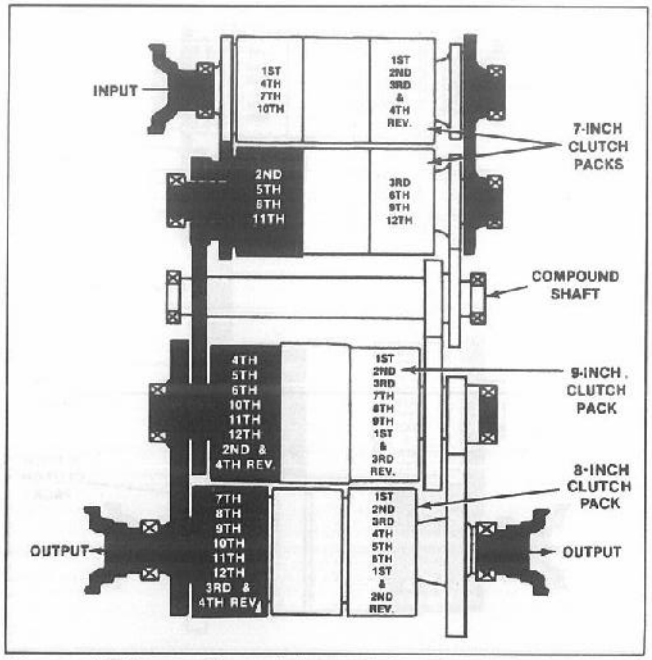


Figure 13: Power Flow - Eleventh Speed Forward Range

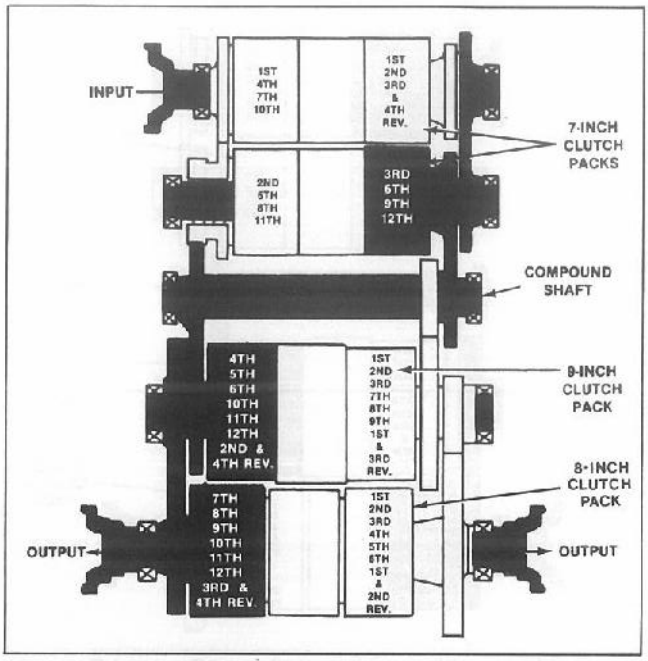


Figure 14: Power Flow - Twelfth Speed Forward Range

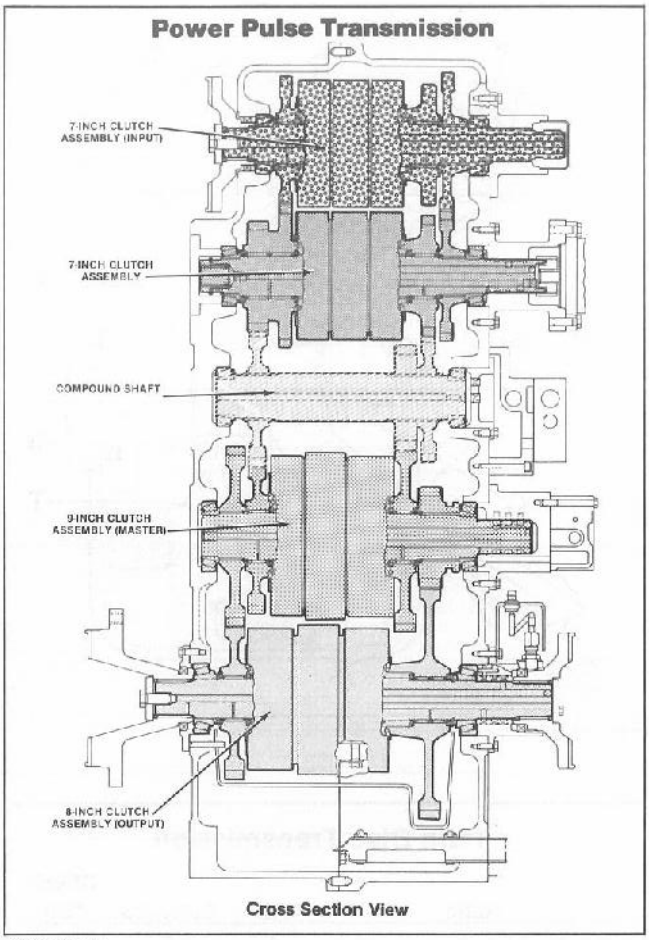


Figure 1:

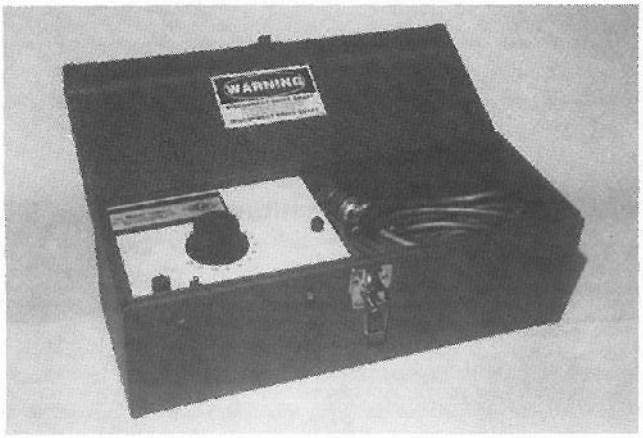


Figure 2:

Hydraulic System Pressure Checks

The PowerPulse Control Transmission is basically a hydraulically actuated and computer controlled power-shift transmission, in which malfunction of hydraulic, electrical or mechanical componants may cause a malfunction of the overall system. It must be remembered that a specific problem may be caused by malfunction of a number of individual system componants or combinations thereof.

A decision to remove the transmission should never be made until it is definitely determined that correction of the problem requires such removal. To do otherwise, may result in unnecessary downtime, excessive costs, etc, with no assurance that the problem has been corrected.

The pressure checks and adjustments outlined in this manual are important when diagnosing many of the malfunctions which may occur in the transmission.

Prior to making pressure checks, ensure that the transmission fluid level is correct and that the transmission oil temperature is at least 150°F.

WARNING: Due to the nature of the transmission and control system, a complete test of the hydraulic and the electrical solenoid control system will require disconnecting the drivelines at the transmission front and rear output yokes.

Use the electrical control test box, P/N 59-199, to isolate the transmission from the on-board computer control system when making transmission pressure tests. This will allow remotely controlling the transmission during the testing procedure.

Troubleshooting

All points for controlling transmission main pressure are coded "D", and will require 0-300 psi gauges. All points for checking lube pressure are coded "C", and will require 0-100 psi gauges. Pressure check points for individual clutch apply checks are pressurized only when the corresponding clutch is selected. These check ports are coded alphabetically, S, T, U, V, W, X, Y and Z.

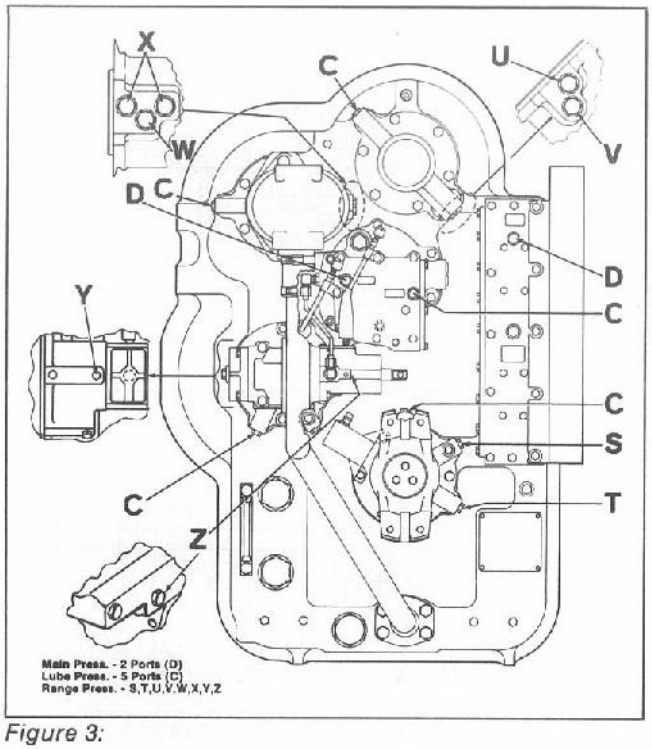


Figure 3:

Clutch apply check ports at the oil supply covers correspond to the respective solenoid(s) that are energized for each selected range.

Twin Disc Transmission

Ratio	Pin	Solenoid	Check Port
1, 4, 7, 10	A	Z	U
REV 1 & 2	B	Y	V
2, 5, 8, 11	C	X	W
3, 6, 9, 12	D	W	X
1, 2, 3, 7, 8, 9, REV 1	I	V	Y
4, 5, 6, 10, 11, 12, REV 2	J	T	Z
1, 2, 3, 4, 5, 6, REV 1 & 2	E	S	S
7, 8, 9, 10, 11, 12	F	Q	T
Power 12V DC	H		

Combinations

	Pins	Solenoids	Clutch Check Ports
1	AEI	ZSV	USY
2	CEI	XSV	WSY
3	DEI	WSV	XSY
4	AEJ	ZST	USZ
5	CEJ	XST	WSZ
6	DEJ	WST	XSZ
7	AFI	ZQV	UTY
8	CFI	XQV	WTY
9	DFI	WQV	XTY
10	AFJ	ZQT	UTZ
11	CFJ	XQT	UTZ
11	CFJ	XQT	WTZ
12	DFJ	WQT	XTZ
R1	BEI	YSV	VSY
R2	BEJ	YST	VSZ

Figure 4:

Pressure/Flow Checks @715 RPM
Master Clutch Fully Engaged

Operating Pressures:	
a) Main Pressure @ Regulator	185-220 psi
b) Clutch Apply Pressures @ End Caps	185 psi min (mandatory)
c) Lube Pressure @ Regulator	4-10 psi
d) Master Clutch Lube Pressure	0-3 psi
e) Oil Supply Cover Lube Pressures (trans in neutral)	3-10 psi

Figure 5:

All pressure checks must be made with the master clutch fully engaged. For the correct pressure, test values at 715 rpm, refer to Figure 5.

Pressure/Flow Checks @2150 RPM

Operating Pressures:	
a) Main Pressure @ Regulator	205-230 psi
b) Clutch Apply Pressure @ End Caps	within 12 psi of Regulator
c) Lube Pressure @ Regulator	35-40 psi
d) Master Clutch Lube Pressure	0-5 psi
e) Oil Supply Cover Lube Pressures:	
Input Shaft	15-25 psi
Input Driven Shaft (lower 7 inch)	30-45 psi
9-inch Shaft	25-35 psi
Output Shaft	30-45 psi

Figure 6:

For the correct pressure, test values at 2100 rpm, refer to Fig. 6.

Master Clutch Control

Check engaging and disengaging in first range @ 2150 rpm with gauge installed at test port "C" on master clutch collector. Within the first .100 in. (2.54 mm) of stem travel, clutch lube pressure should increase to 15-25 psi and lube pressure at the regulator valve should drop to 15-25 psi. In the full out (disengaged) position, master clutch apply pressure should be less than 20 psi. As the master clutch is engaging and disengaging, the apply pressure should be proportional to stem travel.

Figure 7:

Use the special test manifold gauge bar set (P/N 58-195) to allow connecting to all test ports at once when making hydraulic pressure tests. This should be used in conjunction with the special electrical test control box 58-199.

Troubleshooting Guide

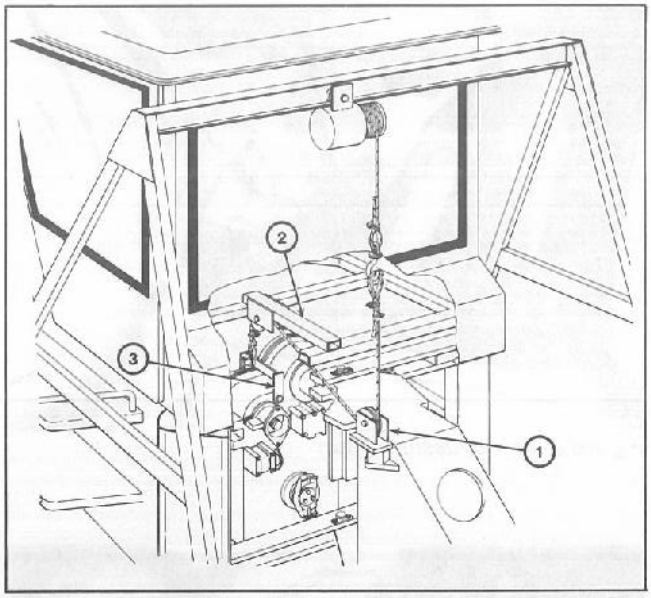
Symptom	Cause	Remedy
1. No main Pressure.	1-1. Low sump oil level.	1-1. Fill sump to proper level.
	1-2. Blocked sump filter screen.	1-2. Remove sump filter and clean.
	1-3. Obstruction in suction line to pump inlet.	1-3. Remove suction line and clean obstruction. Replace line if kinked or damaged.
	1-4. Loose suction line at pump or sump.	1-4. Tighten suction line fittings.
	1-5. Pump shaft sheared.	1-5. Replace pump.
2. Low main pressure (transmission in neutral).	2-1. Low transmission sump level.	2-1. See Remedy 1-1.
	2-2. Partially clogged sump filter screen.	2-2. See Remedy 1-2.
	2-3. Foamed oil.	2-3. a. Eliminate air leak in pump suction line. b. Oil level too high. Drain to proper level. c. Wrong type oil. Drain and refill with recommended oil. See Section 4.
	2-4. Main pressure regulating valve stuck open or broken valve spring.	2-4. Remove, clean and inspect main regulator valve parts. Replace damaged, corroded or broken parts.
	2-5. Worn hydraulic pump.	2-5. Replace pump.
3. High main pressure.	3-1. Main pressure regulator valve sticking.	3-1. Disassemble, clean and inspect main regulator valve. Replace worn or damaged parts.
4. High lub pressure.	4-1. Lube pressure regulating valve stuck.	4-1. Disassemble lube pressure regulating valve. Clean and inspect, replace damaged or worn parts.
5. Low lube pressure.	5-1. Lube pressure regulating valve stuck or broken regulator valve spring.	5-1. Disassemble lube pressure valve parts. Clean and inspect. Replace damaged or worn parts.
	5-2. Leaking seal ring at rear end of forward or reverse clutch shafts.	5-2. Remove oil supply covers over forward and reverse clutch shafts. Inspect seal rings for freedom and damage. Replace worn or damaged seal rings or oil supply covers. NOTE: damaged seal ring grooves on clutch shafts will require replacement of clutch shaft assembly.
	5-3. Hydraulic pump worn.	5-3. Replace pump.

Troubleshooting Guide

Symptom	Cause	Remedy
6. Slow or erratic clutch.	6-1. Low main pressure. (See 2-1 through 2-5).	6-1. See 2-1 through 2-5.
	6-2. Internal oil leakage.	6-2. Remove transmission and overhaul.
	6-3. Electronic control system malfunction.	6-3. See testing instructions, (vehicle manual) for electronic control system trouble shooting procedures.
	6-4. Solenoid valves sticking.	6-4. Remove range selector valve.
7. High transmission oil temperature (overheating).	7-1. Low oil level in transmission.	7-1. See Remedy 1-1.
	7-2. Foamed oil.	7-2. See Remedy 2-3.
	7-3. Low hydraulic pump volume.	7-3. Repair or replace the pump.
	7-4. Faulty heat exchanger and/or lines.	7-4. Check heat exchanger for clogged tubes. Check lines for loose lining which may cause restriction in lines.
	7-5. Slipping clutch.	7-5. Check clutch apply pressure. Remove oil supply cover from rear of forward and/or reverse clutch shafts. Inspect for defective seal rings or oil supply covers. Damaged seal ring grooves on clutch shafts or defective clutch parts will require removal and overhaul of transmission.
	7-6. Bearing failure.	7-6. Remove transmission and overhaul.
	7-7. High oil level.	7-7. Drain oil to proper level.
8. Lost of power	8-1. Engine trouble.	8-1. Determine and correct engine problem. See engine manual.
	8-2. Dragging brakes.	8-2. Check brake system for proper operation.
	8-3. Foamed oil.	8-3. See Remedy 2-3.
	8-4. Slipping range clutch.	8-4. Overhaul transmission.
9. Excessive noise at flywheel.	9-1. Driving ring loose.	9-1. Check for loose or missing capscrews holding drive ring to flywheel. Check drive ring for damage. Replace drive ring or reinstall properly as required.
10. Severe vibrations.	10-1. Driveline or U-joint problem.	10-1. Replace defective parts.
11. Vehicle moves in neutral and in one range, transmission locks up when shifted to other ranges.	11-1. Defective clutch.	11-1. Overhaul transmission.

Troubleshooting Guide

Symptom	Cause	Remedy
12. Transmission locks up when shifted into one or more ranges, operates normally in other ranges.	12-1. Defective wiring to range selector valve.	12-1. Check all wiring for shorts. Replace as necessary.
	12-2. Defective electronic shift selector.	12-2. See electronic shaft selector test procedure in the vehicle manual.
	12-3. Piston housing and retaining snap rings are loose on shaft allowing two clutches on same shaft to engage.	12-3. Overhaul transmission.
13. Low clutch apply pressure at check point on clutch oil supply covers. See Figure 12-16.	13-1. Low main pressure.	13-1. See Remedy 2-1.
	13-2. Damaged or worn seal rings at rear of clutch shaft.	13-2. See Remedy 7-3.
	13-3. Internal oil leakage.	13-3. Remove transmission and overhaul. Check all rolled in tubes in housing for cracks and security.
14. Vehicle will not move in certain ranges; moves in other ranges.	14-1. Defective wiring to solenoid.	14-1. Replace solenoid.
15. Low master clutch apply pressure.	15-1. Weak or broken springs in master clutch control valve.	15-1. Add shims to the compression spring in the master clutch control valve. Pressure will increase approximately 8-10 psi per shim. Replace broken parts.
	15-2. Sealing ring worn or broken on rear of master clutch shaft.	15-2. Replace sealing ring.
	15-3. Master clutch control valve actuating linkage damaged, binding or out of adjustment.	15-3. Check all linkage between master clutch foot pedal and master clutch control valve for damage and evidence of binding. Replace damaged or worn parts. Adjust linkage as necessary to achieve necessary travel.
16. Master clutch will not fully engage.	16-1. Low main pressure.	16-1. See Remedies 2-1 to 2-5.
	16-2. Low master clutch apply pressure.	16-2. See Remedies 15-1 to 15-3.



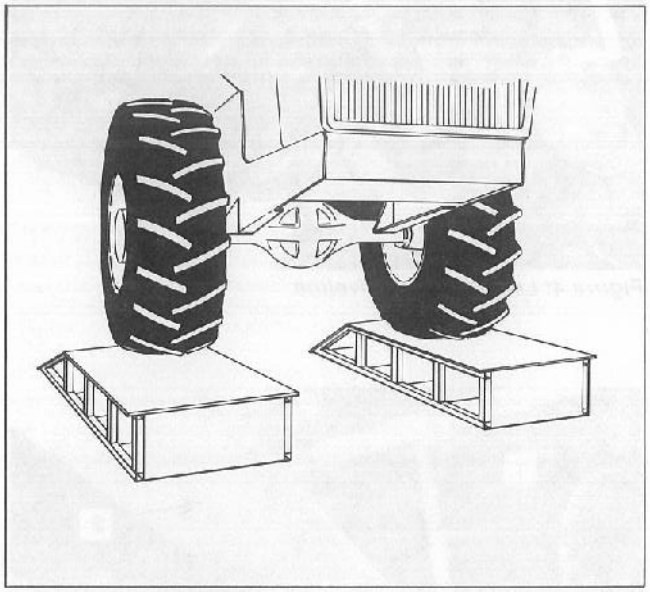


Figure 1: Tractor on Stand

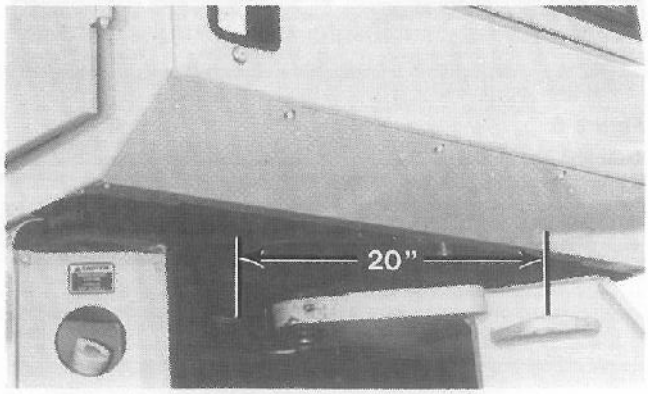


Figure 2: 20" Between Frame Lock Hole Centers

Removal Procedure

Tools Required

Description	P/N
Transmission Lifting Fixture Group	58-198
Axle Support Stands or Ramps	
Overhead or A-Frame Hoist	
Oil Catch Pans	
Hand Tools	
Coffer Hoist	58-075

Preparation Information

Prior to removing the transmission certain procedures must be followed in order to assure removal of the transmission with the least time and effort.

The tractor should be placed in a work area that has a good sollid floor and access to an overhead or A-frame type hoist capable of supporting 2000 lb (908 Kg).

1. Drive the tractor front wheels up on ramps or place suitable stands under the front axle so that the front wheels are raised a **minimum** of 6 inches to obtain the clearance necessary for the transmission to be removed from under the tractor.

2. Steer the tractor to the right so that there is approximately 20 inches hole center to hole center at the frame articulation lockbar brackets. This is necessary so that the cable and pulley arrangement (P/N 58-198) used for lifting will center over the transmission lift point. This will also provide better work access for the technician through the center on the left side.

3. After the tractor has been positioned correctly remove the transmission drain plug and drain the oil into a container capable of holding approximately 13 gal. (49L).

CAUTION: Remove the master switch key to prevent accidental startup.

After the oil is drained, replace the plug and tighten to 90 ft lb (122 N.m).

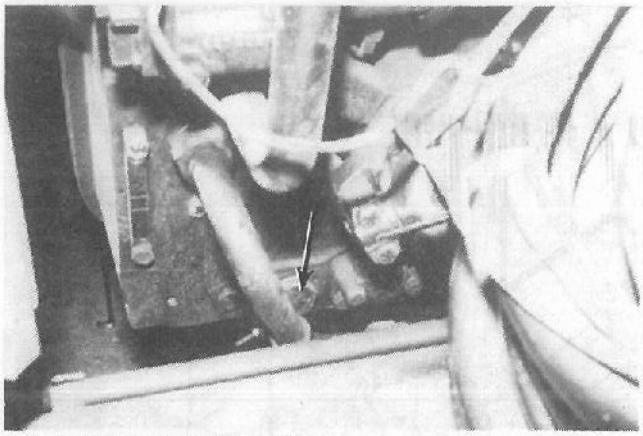


Figure 3: Transmission Drain

4. Remove the lower front driveline assembly.

CAUTION: Drivelines are heavy and must be kept under the technicians control. Use lifting devices if necessary.

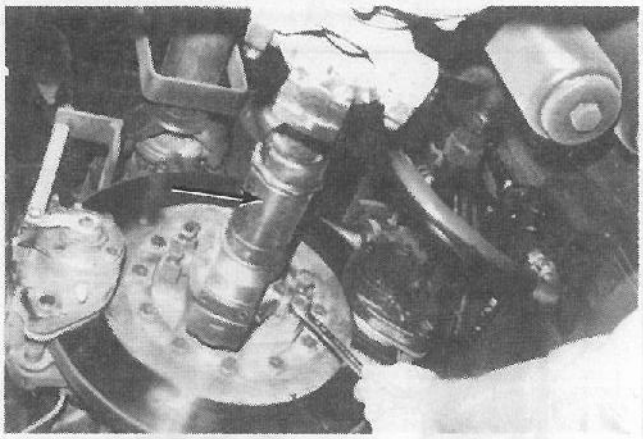


Figure 4: Lower Front Driveline

5. Remove the upper driveline guard and driveline assembly.

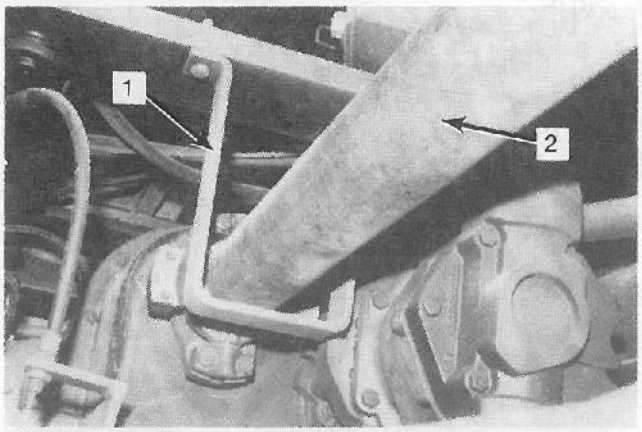


Figure 5:
1-Guard
2-Upper Driveline

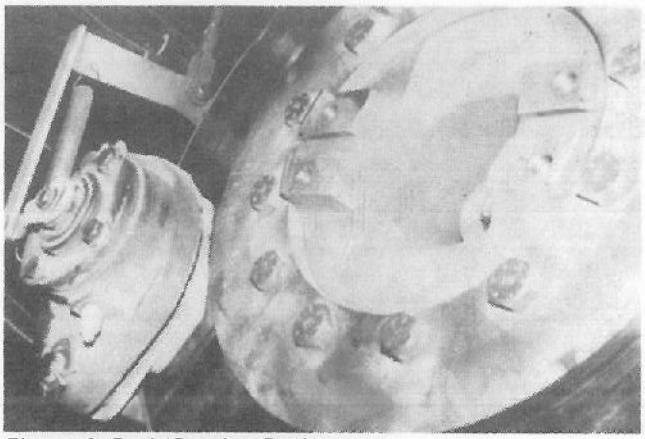


Figure 6: Park/Service Brake

1-Park Brake Cable
2-Pin
3-Fluidline
4-Retaining Bolts

6. On the left side combination Park/Service brake caliper, remove the park brake cable pin. Disconnect the caliper fluid line. Remove the four (4) retaining bolts from the rear side of the caliper assembly, remove caliper.

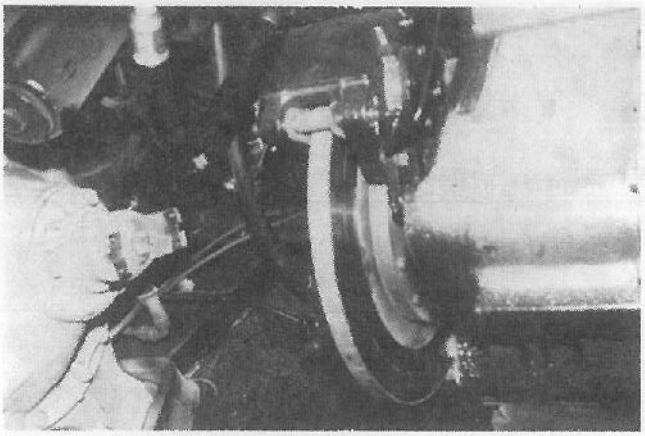


Figure 7: Right Side Service Brake

7. Remove the fluid line from the right side service brake caliper. Remove the four (4) retaining bolts and remove the caliper assembly.

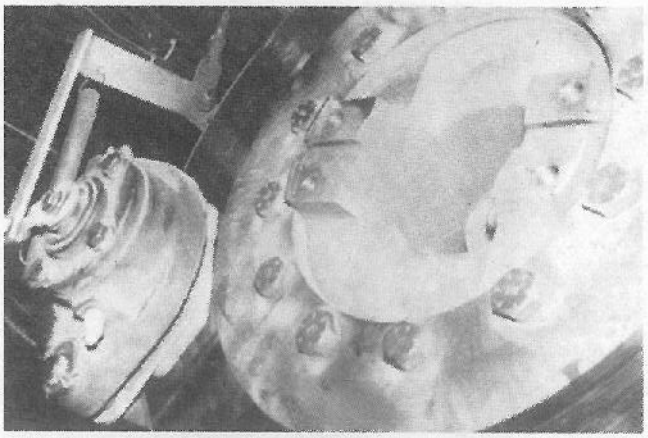


Figure 8: Brake Disc Capscrews

8. Remove the twelve (12) retaining capscrews at the brake disc mounting flange. Remove brake disc.

NOTE: *If the hydraulic system charge pump and piston pump is dismounted from the transmission as one complete assembly and supported in the frame by a cable or chain arrangement there will be no need to drain the hydraulic reservoir or disconnect lines.*

9. Loosen and remove the charge pump to transmission mount capscrews. Slide the charge pmp and piston pump assembly rearward to disengage the pump drive.

CAUTION: The assembly is heavy and must be supported during removal from the transmission.

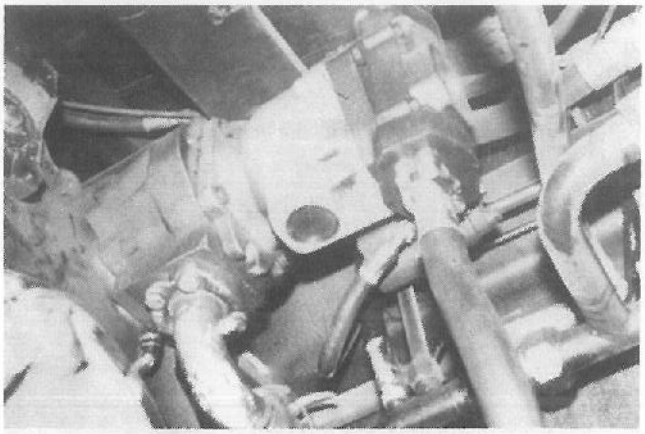


Figure 9: Hydraulic System Charge and Piston Pump
1-Charge Pump Mount Capscrews

10. At the rear of the transmission disconnect the transmission lube pump discharge line. Remove the suction lower split flange retainer at the transmission. Remove the two (2) lube pump mounting bolts and remove the lube pump and rubber suction line as one assembly.

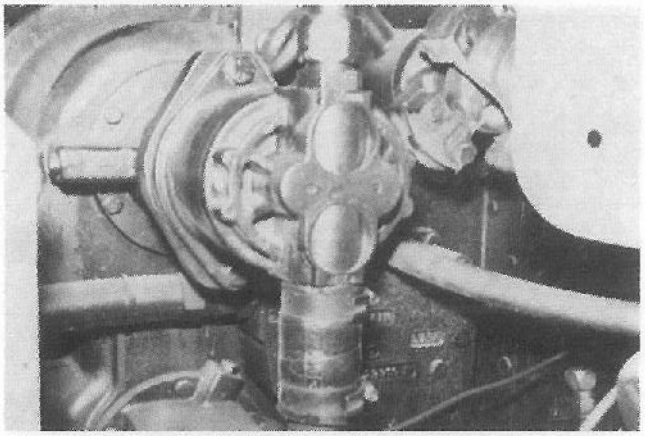


Figure 10: Transmission Lube Pump

11. Tape the opening of the lube pump transmission mounting.

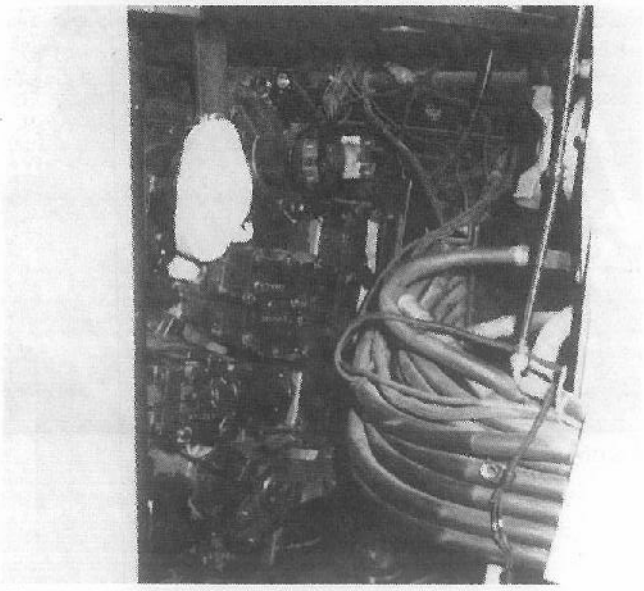


Figure 11: Taped Opening

Figure 12: PTO Oil Return Line

12. If the tractor is PTO equipped, disconnect the PTO system oil return line from the transmission.

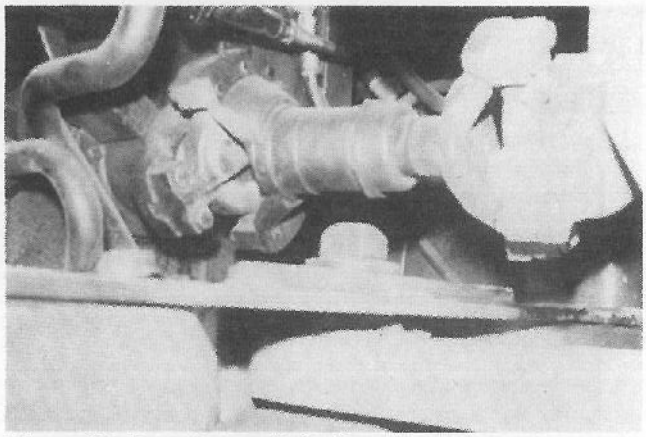


Figure 13: Rear Output Driveline

13. Disconnect the rear output driveline at the transmission end.

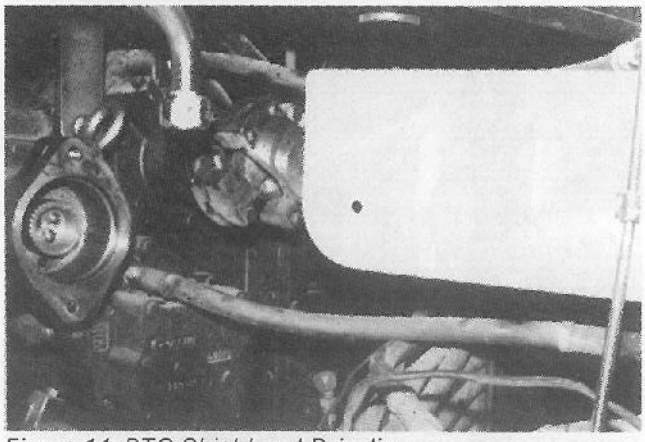


Figure 14: PTO Shield and Driveline

14. If tractor is PTO equipped, remove safety shield and disconnect the PTO driveline at the transmission.

15. Remove the master clutch control cable. First loosen and back off the cable housing lock nut. Remove the two (2) 5/16 inch hex head capscrews from the cable housing. Turn the threaded housing back onto the cable until the cable core connector is visible. Remove the connector pin to disconnect the cable from the master clutch control valve stem.

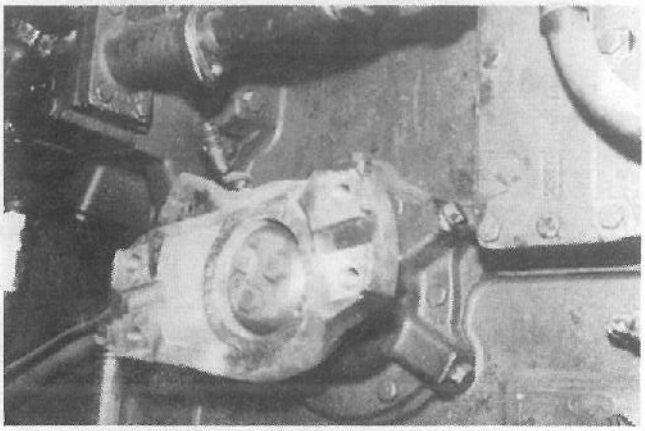


Figure 15: Master Clutch
1-Housing Locknuts 2-Retaining Capscrews

16. Loosen and remove the transmission solenoid bank wire harness connector.

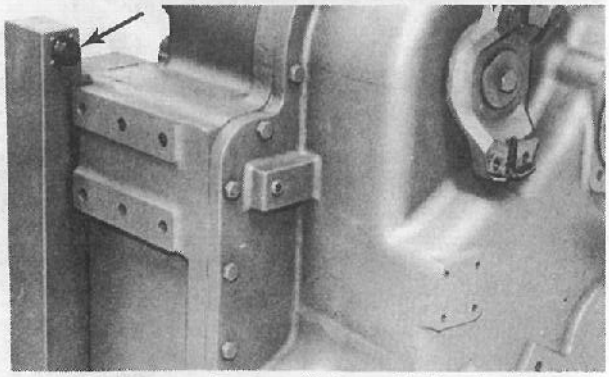


Figure 16: Transmission Solenoid Bank Harness Connector

17. Remove transmission temperature gauge thermal coupler and pressure gauge line.

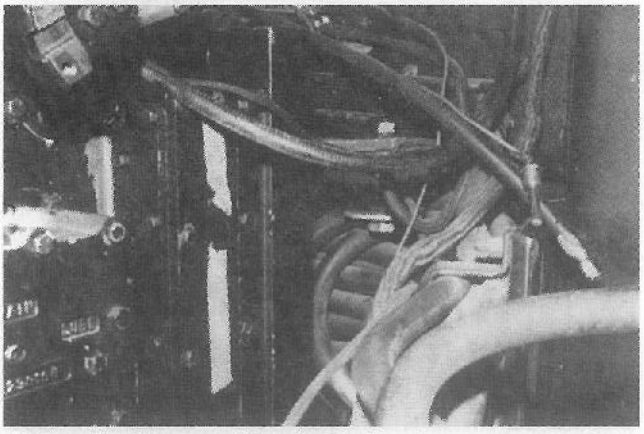


Figure 17.: Pressure Line Temp Sender

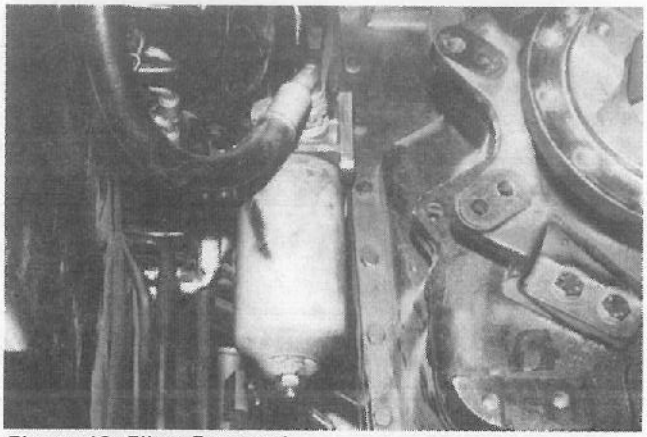


Figure 18: Filter Removal

18. Remove the transmission filter assembly at the transmission mount bracket. The filter assembly may be secured against the side frame to prevent interference.

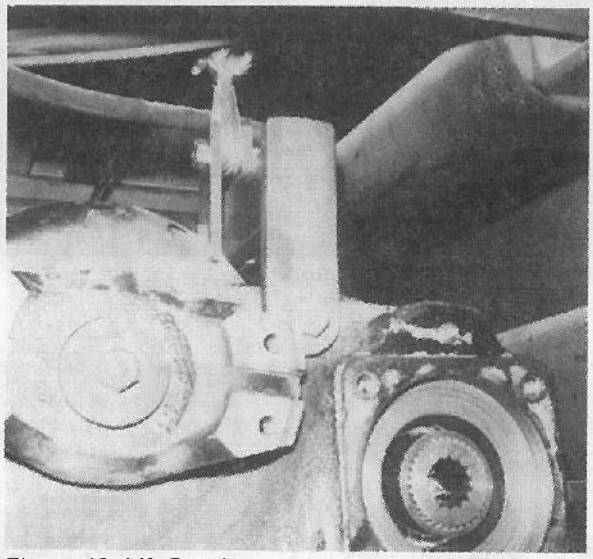


Figure 19: Lift Bracket

19. Secure the transmission lift bracket to the transmission using two (2) 5/8 x 1-3/4 UNC capscrews threaded into the holes provided at the top front and rear of the transmission.

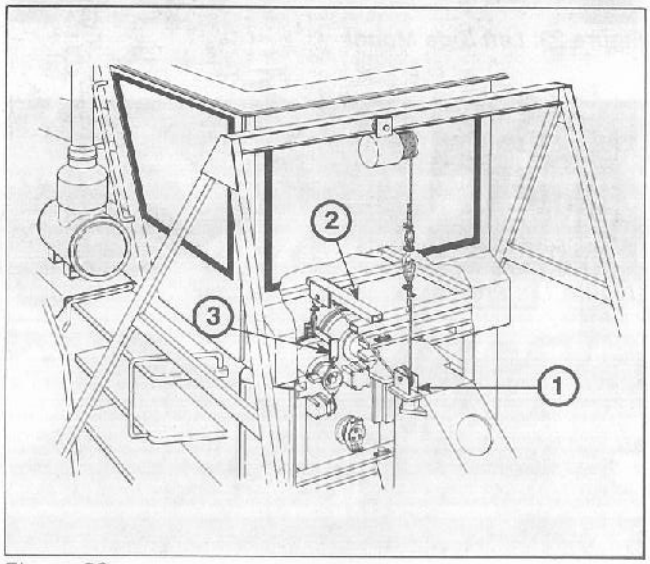


Figure 20:

20. Install the transmission lift bar and pulley arrangement under the cab floor positioned on top of the 2 x 3 inch cab support beams and directly above the transmission lift point. Attach cable clevis to the transmission lift bar.

21. Install the second lift pulley and bracket to the center hinge frame lockbar bracket. Attach cable end to overhead hoist. Apply enough tension on the hoist to support the transmission.

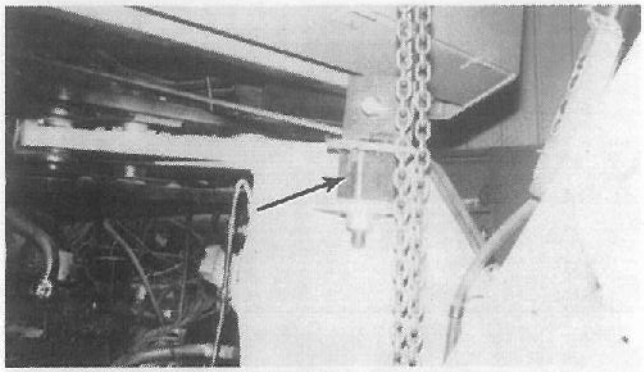


Figure 21: Lift Pulley Mounting

22. Remove the complete right side transmission mount assembly. This will allow room for the transmission solenoid bank when lowering the transmission.

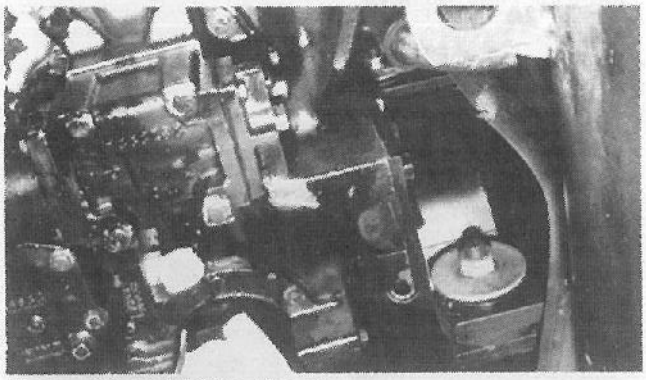


Figure 22: Right Side Mount

23. Remove the six (6) left side mount capscrews.

NOTE: *The left side mount bracket does not require complete removal.*

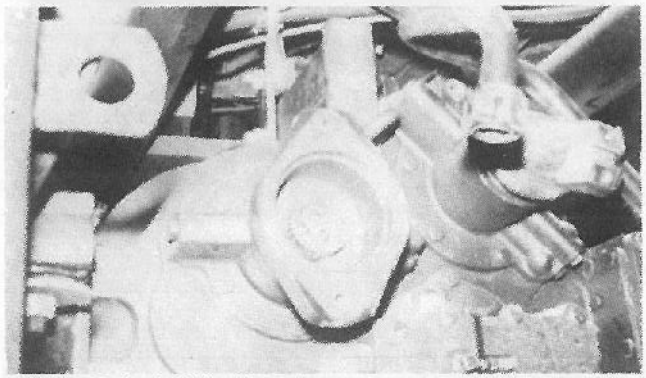


Figure 23: Left Side Mount

24. Attach coffer hoist to the front frame of the tractor. Attach other end of hoist to the transmission output flange. As the transmission is being lowered use the coffer hoist to tilt the transmission.

IMPORTANT: *The transmission **must** lay on the left side to prevent damage to the shift solenoid bank or flange yokes when the transmission is removed from under the tractor.*

Cap all disconnected lines and openings to prevent contamination. Clean the transmission exterior prior to teardown.

IMPORTANT: *Before reinstallation or startup, the transmission filter must be changed. If a major failure has occured all lines and the oil cooler must be cleaned. The first filter change should occur after the first eight (8) hours of operation.*

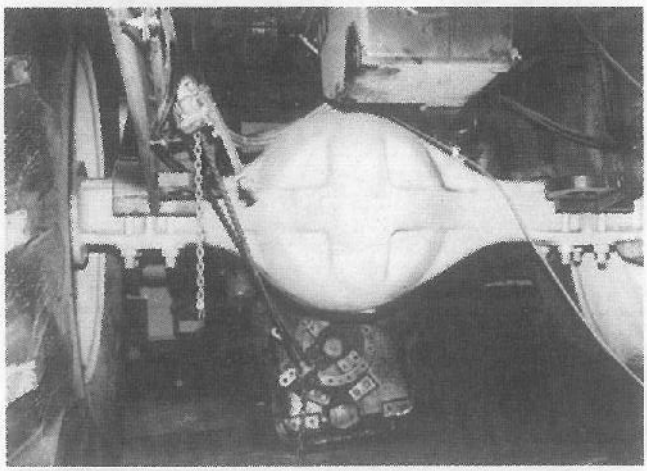


Figure 24:

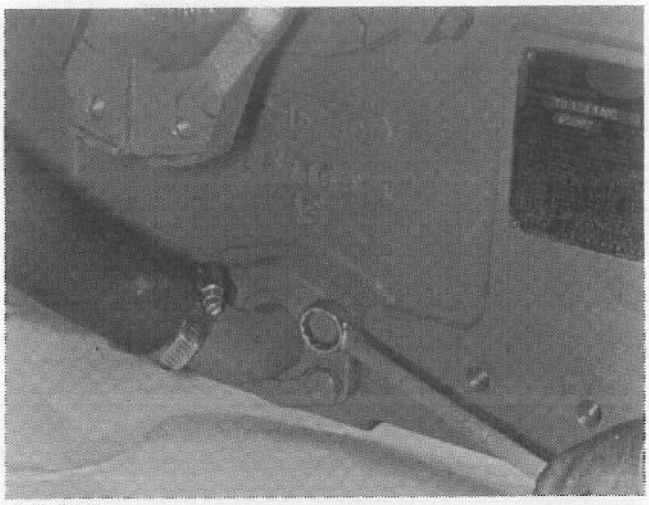


Figure 1:

Transmission

Disassembly

NOTE: *Throughout this manual the input (engine) side is referred to as the front and the output side the rear.*

1. Support the transmission in the upright position. Remove the suction tube split flange retainer bolts and remove suction tube. It is not necessary to remove the tube at the pump unless pump inspection or repair is planned.

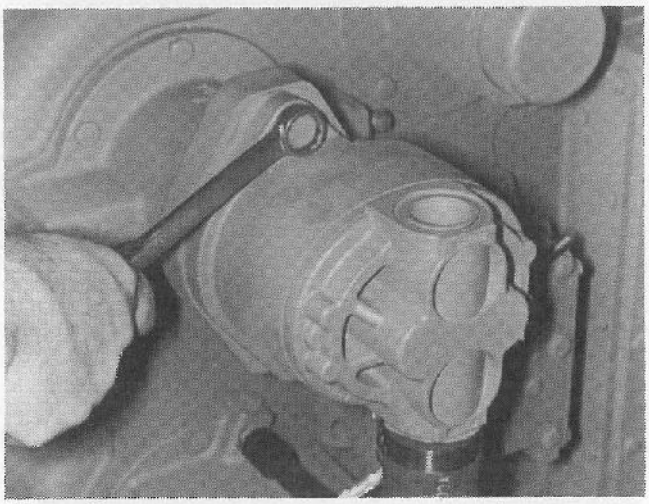


Figure 2:

2. Remove the two pump retaining capscrews and remove the pump and gasket.

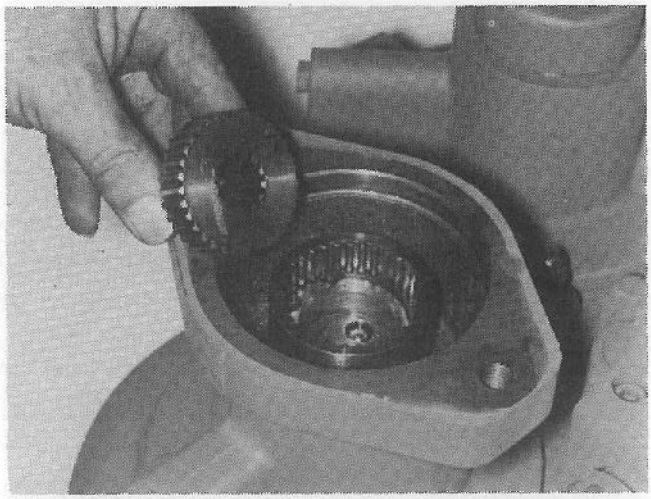


Figure 3:

3. Remove the pump adaptor and coupling.

NOTE: *The snap rings in the bore of the pump coupling and pump adaptor need not be removed unless they are damaged.*

4. Loosen and remove the capscrew on the input yoke.

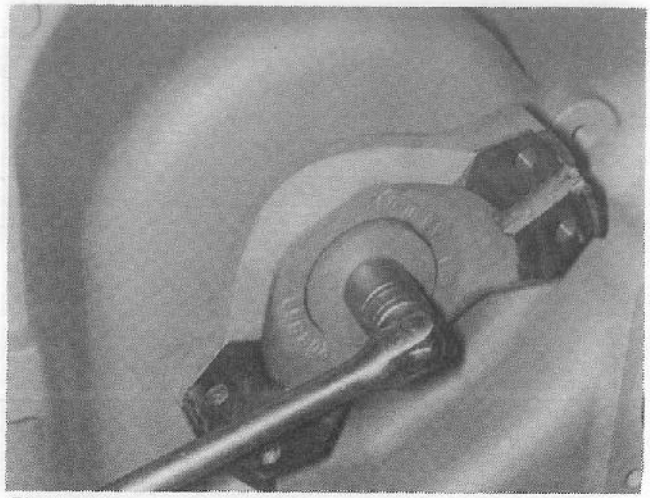


Figure 4:

5. Remove the retainer washer, O-ring and shims from the input shaft.

IMPORTANT: *Shaft to yoke end clearance is controlled. Care should be taken not to damage the shims. It is suggested the yoke shims be tied to each respective yoke as they are removed. A wire shipping tag will work very well for this purpose.*

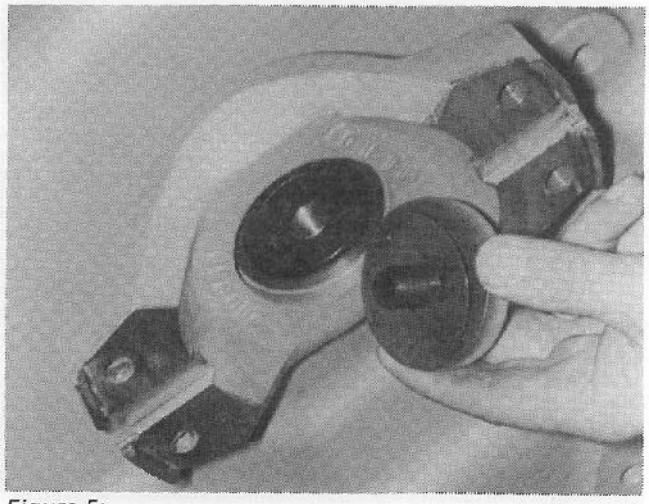


Figure 5:

6. Loosen and remove the yoke retaining capscrews, washer, O-ring and shims from the front and rear output shaft.

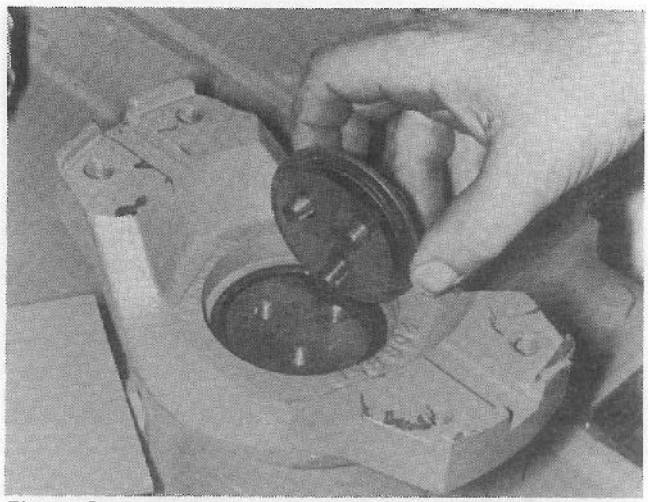


Figure 6:

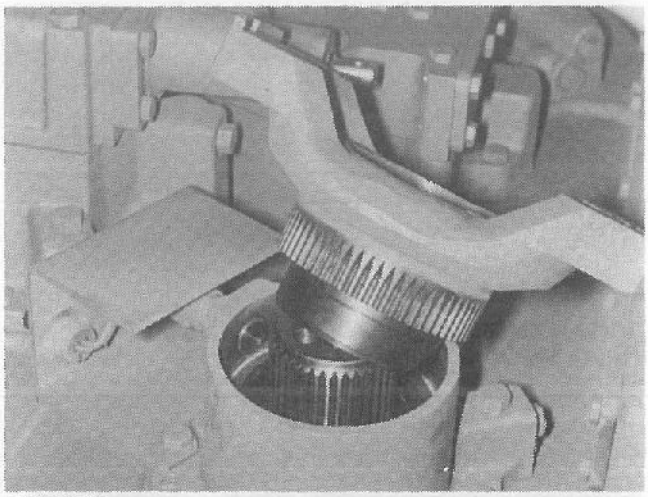


Figure 7:

7. The rear output drive yoke removed.

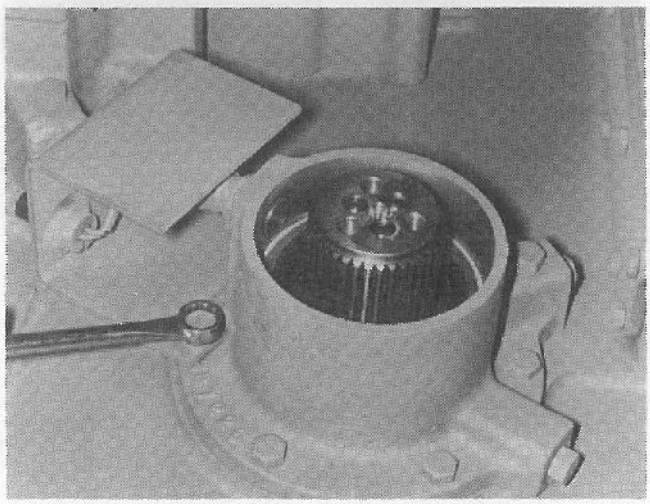


Figure 8:

8. Lay the transmission on the input (front) side supported by blocks. Remove the magnetic pickup guard and magnetic pickup.

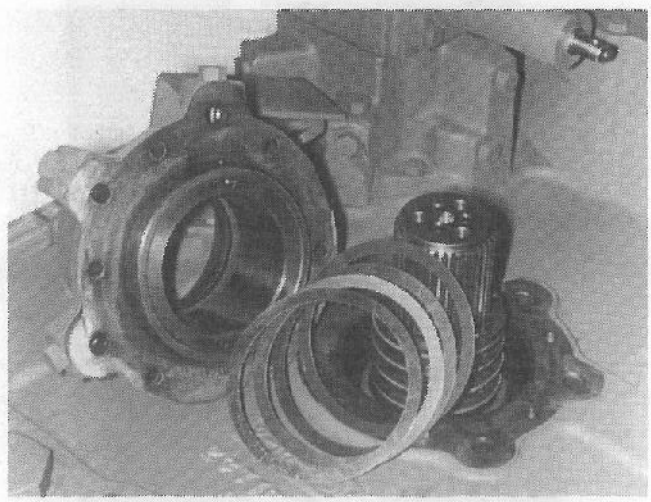


Figure 9:

9. Remove the rear output shaft bearing retainer, gasket and shims.

IMPORTANT: *Bearing clearance is controlled on all shafts. Shims will be found at the rear side shaft bearing retainers. It is suggested that each shim pack be wire tied to each respective shaft bearing retainer as they are removed.*

10. Loosen and remove the range selector valve capscrews.

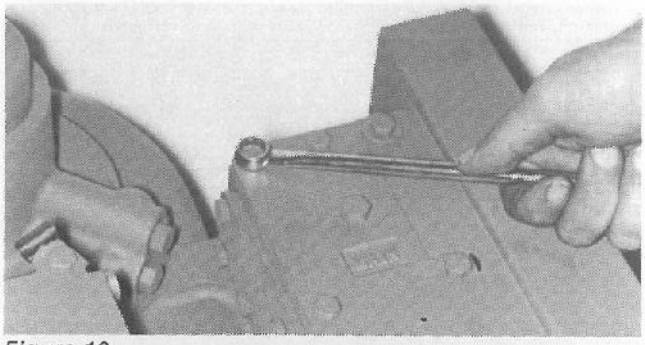


Figure 10:

11. When the range selector valve capscrews are loosened or removed the range solenoid junction box cover will be free.

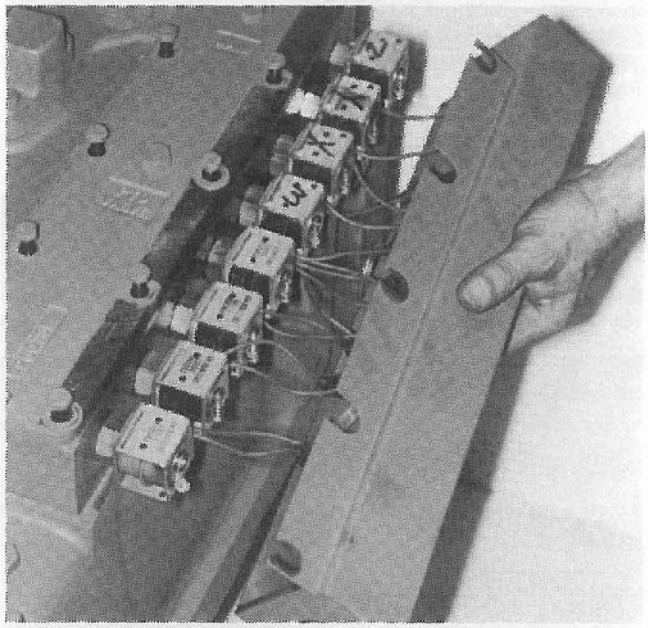


Figure 11:

12. Remove the range selector valve and gasket.

CAUTION: The range selector valve assembly is heavy and must be under the control of the technician.

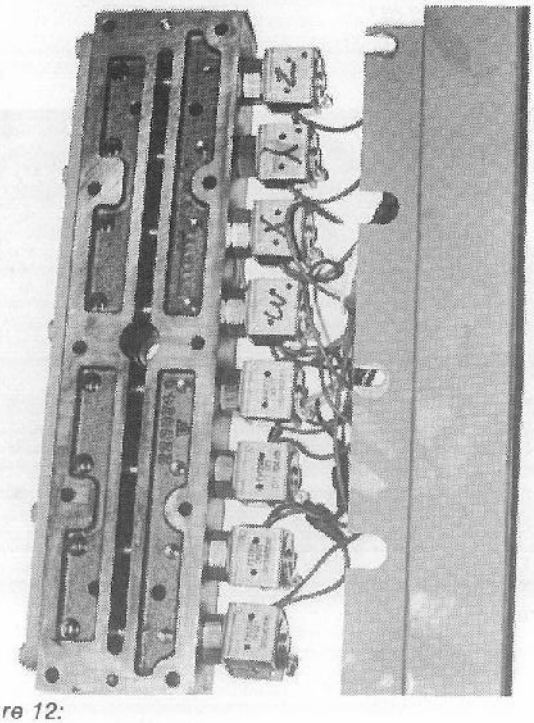


Figure 12:

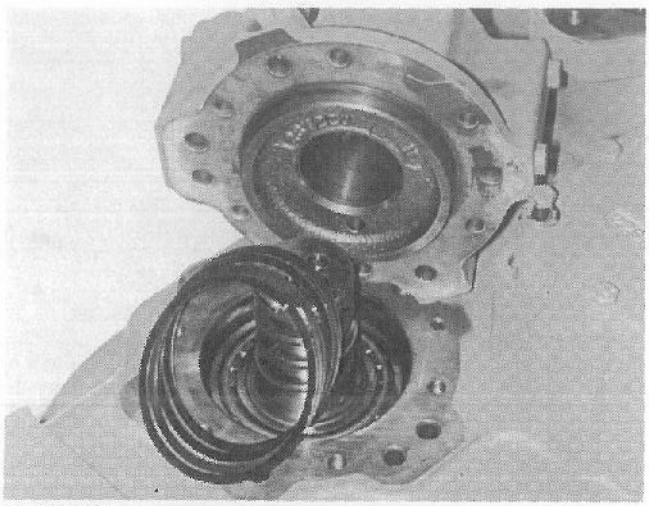


Figure 13:

13. Loosen and remove the master clutch control valve capscrews. Remove the master clutch collector, gasket and shims. Wire tie the shims to the collector body.

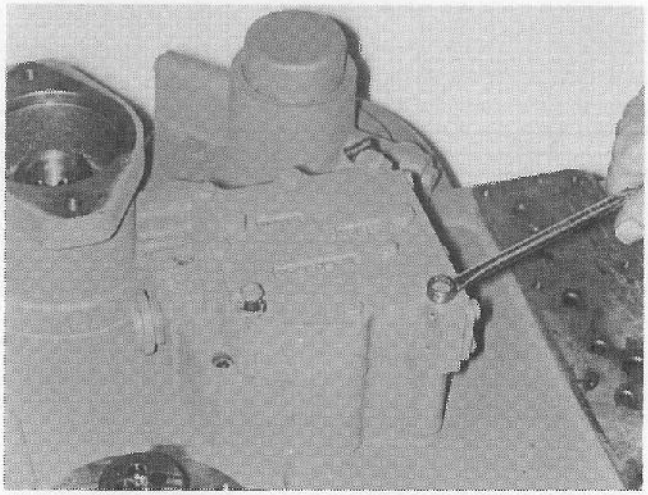


Figure 14:

14. Loosen and remove the main regulator valve capscrews. Remove main regulator valve and gasket.

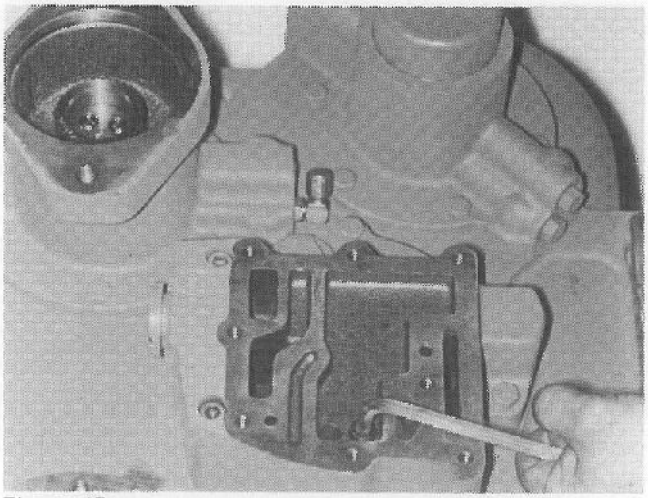


Figure 15:

15. Remove the main regulator valve ditch plate. The capscrews in the ditch plate will have some hex head style capscrews.

16. After removal of the regulator valve ditch plate, remove the compound shaft bearing retainer and hims.

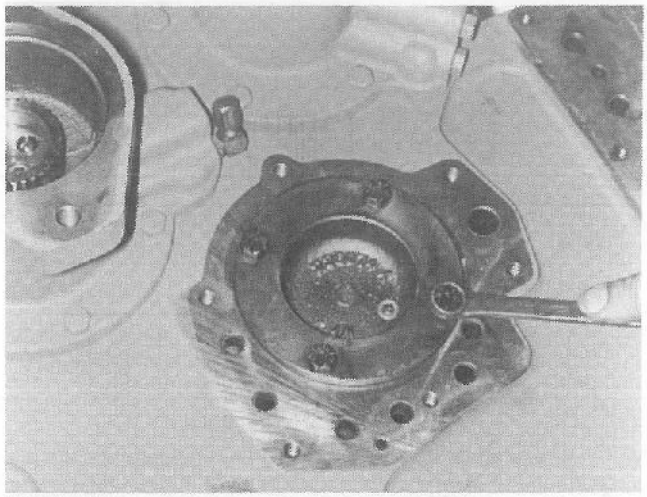


Figure 16:

17. Shown here is the compound shaft bearing retainer and shims. Again, wire tie the shims to the retainer.

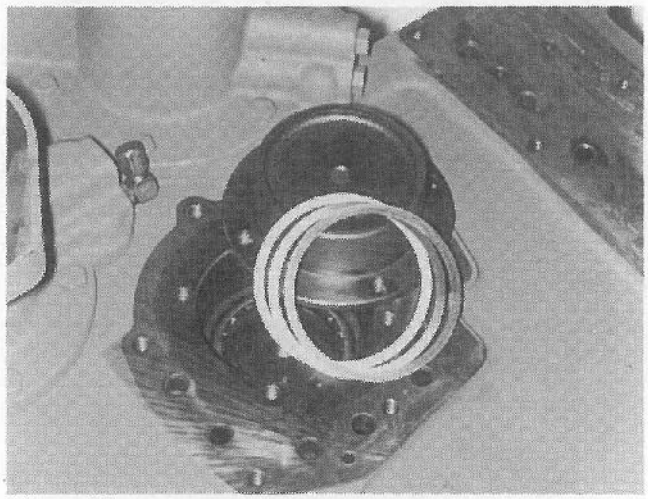


Figure 17:

18. Remove the oil supply cover from the rear of the input (upper) 7 inch clutch shaft.

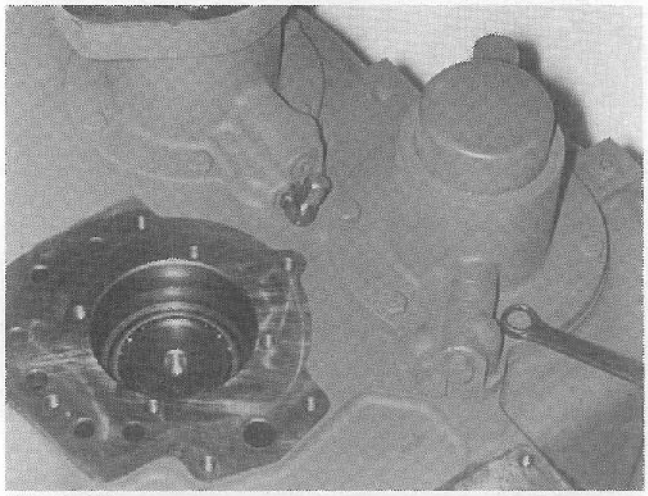


Figure 18:

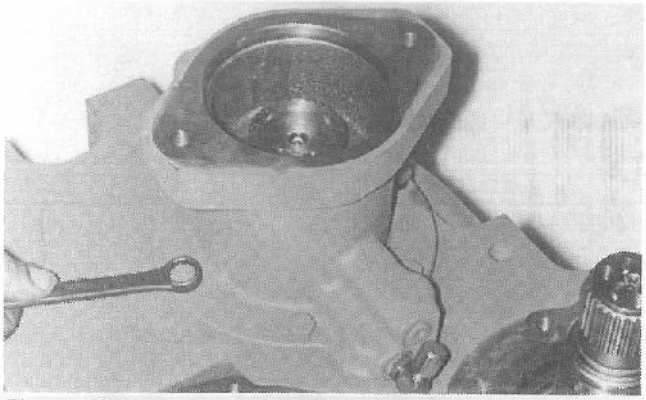


Figure 19:

19. Remove the oil supply cover, gasket and shims from the second (lower) 7 inch clutch shaft. Wire tie the shims to the cover.

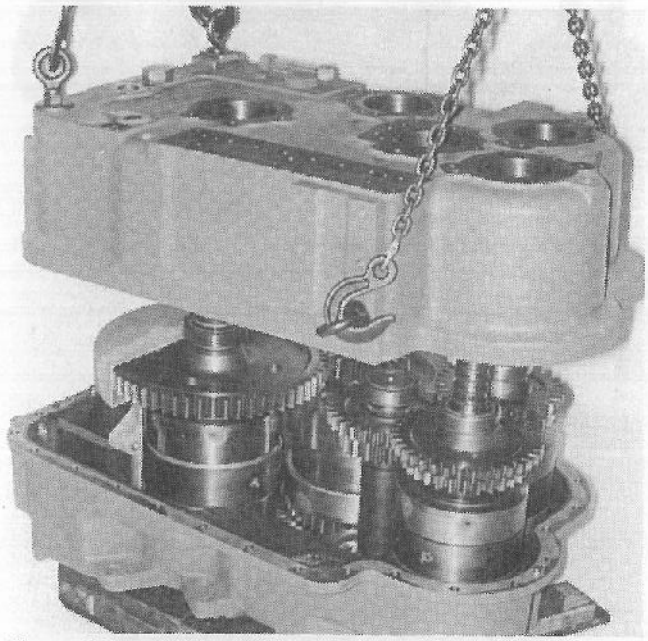


Figure 20:

20. Remove the thirty (30) capscrews securing the rear housing to the front housing. Use three of the capscrews in the threaded pusher holes provided to separate the case halves, screw the pusher bolts in alternately and evenly to prevent damage.

    Install lifting eyebolts and hoist the rear housing off the front housing.

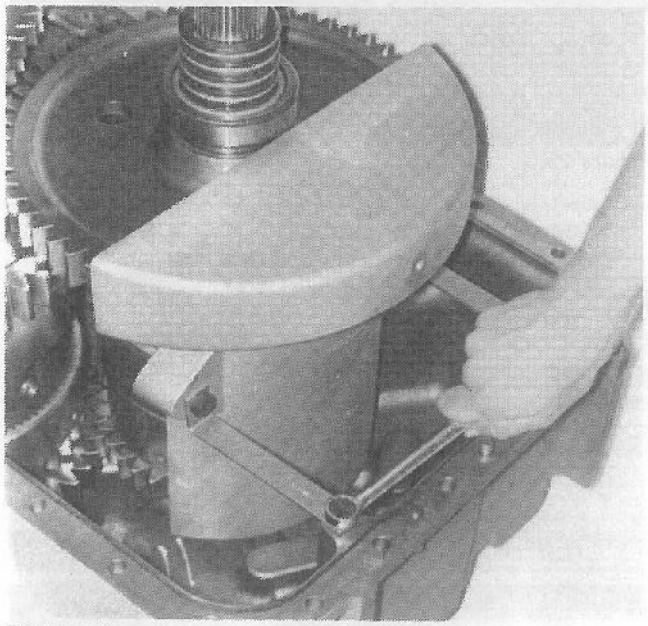


Figure 21:

21. Loosen and remove the two capscrews securing the oil baffle to the front housing. Remove the oil baffle.

22. Using special lifting bail (5390) remove the lower 7 inch clutch pack assembly.

    Install shaft adaptor (5385) to upper 7 inch shaft and remove 7 inch clutch pack assembly.

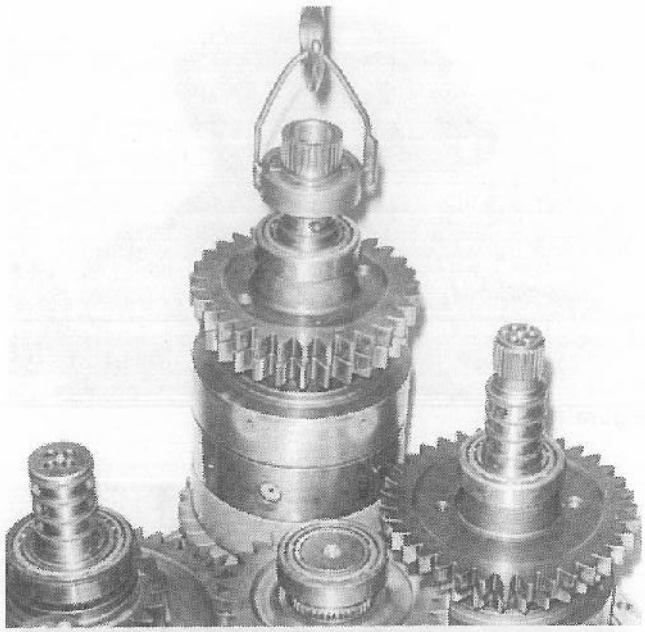


Figure 22:

23. Install lifting eyebolt into threaded hole in the end of the 8-inch clutch shaft. Remove the 8 inch clutch pack assembly.

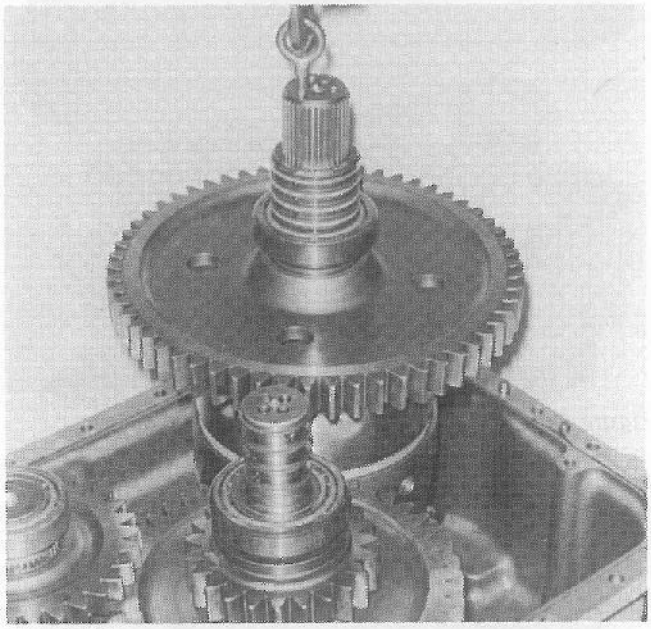


Figure 23:

24. Install special lifting bail (5390) on the 9 inch clutch shaft. Remove the 9-inch clutch pack assembly and compound shaft group.

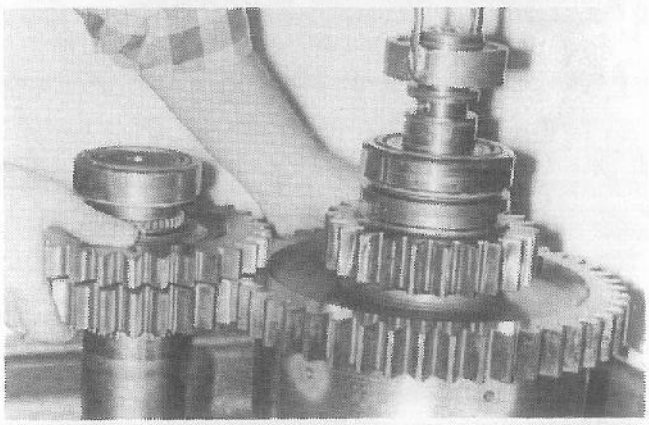


Figure 24:

Cleaning

General

NOTE: *Replace all oil seals, gaskets, O-rings, lock plates, piston rings, seal rings, snap rings, etc., as a part of any maintenance or overhaul procedure. Shims which could be damaged or destroyed in disassembly should also be replaced.*

1. Using Stoddard® solvent, or equivalent or steam cleaning, clean all parts. Parts cleaned with solvent or steam cleaned must be dried and oiled immediately.

2. Examine all parts carefully for grit, dirt and abrasives and reclean them if necessary.

3. Clean all oil passages by working a piece of wire back and forth through the passages and then flushing them with cleaning solvent.

4. Use clean solvent to flush oil pumps, valves, etc.

5. Flush all hoses, tubing, coolers, etc., particularly if the unit is being disassembled due to an internal failure.

Cleaning Bearings

Do not remove grease in which new bearings are packed. Thoroughly wash bearings that have been in service, in clean solvent. Soak bearing in solvent if they are particularly dirty or filled with hardened grease.

CAUTION: Never dry bearing with compressed air. Do not spin bearings while they are not lubricated. Oil bearings with SAE 10 engine oil immediately after cleaning. Be sure bearings are oiled before inspection.

Preventing Entrance of Dirt Into Bearings

Dirt and grit in bearings are often responsible for bearing failure; consequently, it is important to keep bearings clean. Do not remove grease from new bearings. Keep the wrapper on new bearings until they are to be installed. Do not expose clean bearings if they are not to be assembled at once. Wrap them with a clean lint free cloth or paper to keep out dust.

Previously Sealed Joints

1. For previously sealed joints, scrape surfaces to remove old gasket material. Gel-type paint removers containing methylene chloride can be used to wipe off cured sealant.

2. Clean surfaces with 1, 1, 1-trichloroethane to remove oil and grease residue.

3. Test for clean surfaces by applying a few drops of cool water to the surfaces. Parts are sufficiently clean if water covers the surface of the part in a film. If the water puddles or forms beads, use fresh solvent and reclean.

Inspection

Housings, Cast Parts and Machined Surfaces

NOTE: *Units with matched housings require replacement of both halves. These must be kept in matched halves.*

1. Replace cast parts or housings that are cracked.

2. Inspect bores for wear, grooves, scratches and dirt. Remove burrs and scratches with crocus cloth or soft stone. Replace parts that are deeply grooved or scratched.

3. Inspect oil passages for obstructions. If an obstruction is found, remove it with compressed air or by working a wire back and forth through the passage and flushing it with solvent.

4. Inspect machined surfaces for burrs, scratches, nicks and foreign matter. If such defects cannot be removed with crocus cloth or a soft stone, replace the part.

5. Inspect threaded openings for damaged threads. Chase damaged threads with a tap of the correct size.

6. Inspect studs for damaged threads and looseness. Replace defective studs.

7. Inspect dowel pins for wear or damage. Replace defective dowels. This applies where matched set of parts is not involved.

8. Inspect dowel pin holes for wear due to movement between mating parts. If a dowel pin hole is worn, rebore and sleeve the hole when possible. Otherwise, replace the parts. This applies where matched set of parts is not involved.

Cleaning And Inspection

Valve Seats

Inspect valve seats for burrs, nicks and scratches. If these defects cannot be removed with a crocus cloth, replace the part. Check to see that the valve is seating properly after reworking the valve seat.

Bearings

1. Inspect bearings for roughness of rotation. Replace the bearing if the rotation is rough.

2. Inspect bearings for corrosion, scored, scratched, cracked, pitted or chipped races, and for indication of excessive wear of balls or rollers. If one of these defects is found, replace the bearing.

3. Inspect bearing bores and shafts for grooved, burred, or galled conditions that would indicate that the bearing has been turning in its housing or on its shaft. If the damage cannot be repaired with a crocus cloth, replace the part.

Bushings and Sleeves

Inspect bushings for size and out-of-roundness, scores, burrs, sharp edges, and evidence of overheating. Remove scores with a crocus cloth. If the bushing is out-of-round, deeply scored, or excessively worn, replace it.

Thrust Washers and Spacers

Inspect thrust washers for distortion, scores, burrs and wear. Rework or replace any defective thrust washers or spacers.

Gears

1. Inspect gears for scuffed, nicked, burred or broken teeth. If the defect cannot be removed with a soft stone, replace the gear.

2. Inspect gear teeth for wear that may have destroyed the original tooth shape. If this condition is found, replace the gear.

3. Inspect thrust faces of gears for scores, scratches and burrs. If these defects cannot be removed with a soft stone, replace the gear.

Splined Parts

Inspect splined parts for stripped, twisted, chipped or burred splines. Remove burrs with a soft stone. Replace the part if other defects are found.

Clutch Plates

1. Inspect the clutch driving plates for cracked or glazed surfaces, or for cracked, worn or broken teeth. Check for excessive wear. Replace damaged or worn driving plates.

2. Inspect the clutch steel plates for discoloration and warpage. Replace damaged steel plates.

Snap Ring

Replace damaged or distorted snap rings.

Springs

Inspect springs for broken or distorted coils. Replace the spring if either of these defects are found.

Flexible Hoses

Inspect all flexible hoses for cracks and sponginess. Replace damaged hoses.

IMPORTANT REBUILD INFORMATION: *If there has been a massive system failure, and the transmission must be removed for inspection and rebuild, the oil cooler and all system hoses must also be removed for cleaning and flushing.*

Some oil coolers are difficult or impossible to clean by flushing due to their construction. This type of cooler must be replaced.

IMPORTANT: *On initial start-up of a rebuilt transmission system, change the filter element(s) after the first 30 minutes of operation, and then again after the first 8 hours of operation. This should be followed by a third filter element change after 50 hours of operation to ensure a clean system. From then on, change the filter element at the specified 250 hour interval.*

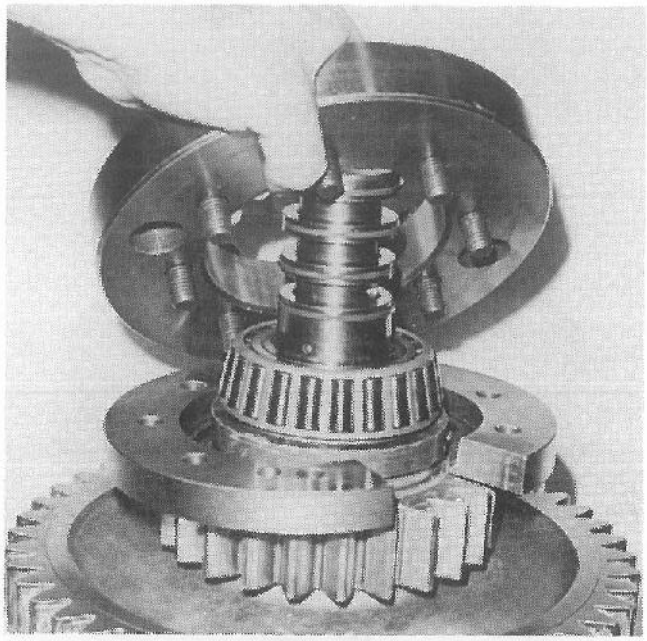


Figure 1:

9-Inch Clutch Shaft Disassembly

1. Remove the four teflon sealing rings from the rear of the clutch shaft.

   Install special puller tool plates, (5389) into the groove on the driver gear and install the special tool top plate (5387)onto the bottom plates. Secure puller plates together with bolts provided.

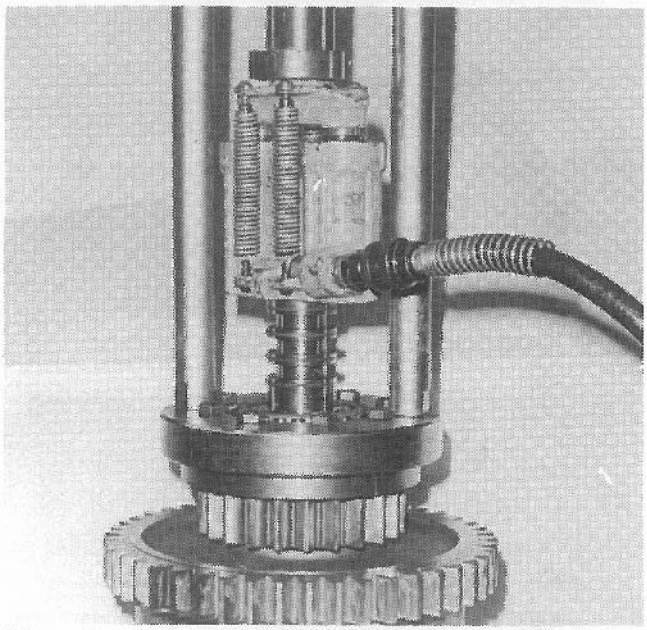


Figure 2:

2. Use a portable hydraulic press with the puller legs threaded into the tool assembly to remove the driver gear and roller bearing.

3. Remove the external snap ring from its groove in the shaft.

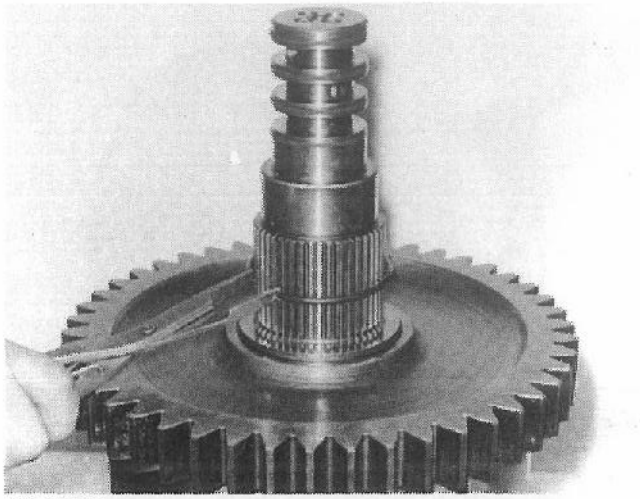


Figure 3:

4. Remove the two steel thrust washers and needle thrust bearing.

NOTE: *The steel thrust washers have different OD's, one thrust washer fits into the gear bore.*

Remove the gear and drive ring assembly.

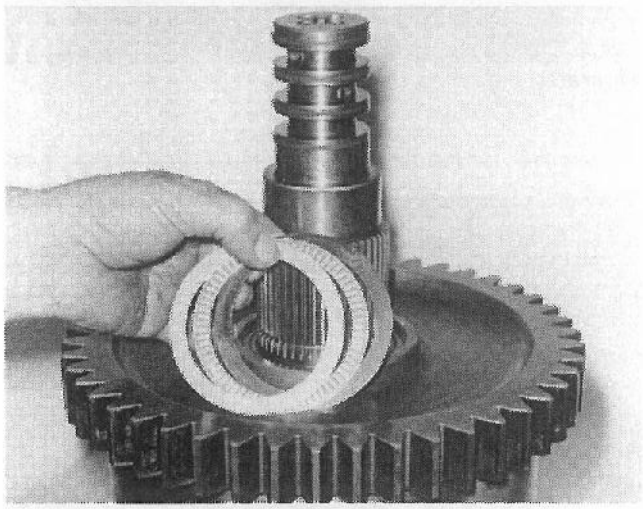


Figure 4:

5. Remove the roller bearing, two steel thrust washers, and needle thrust bearing from the shaft.

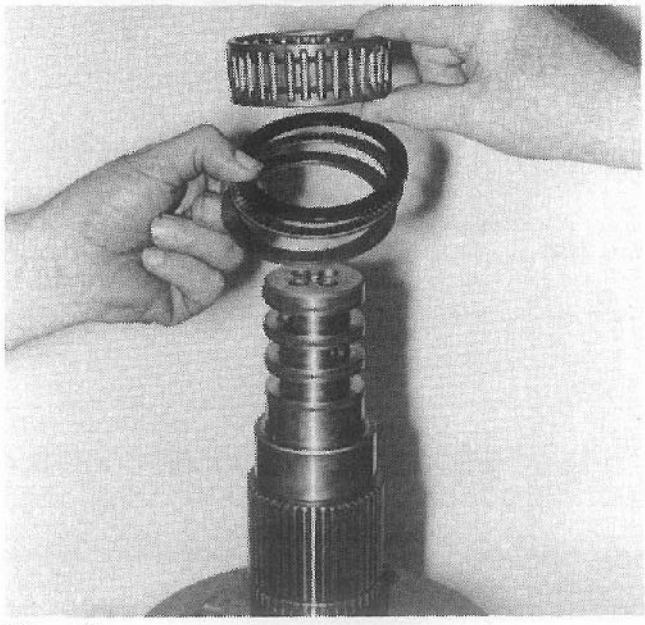


Figure 5:

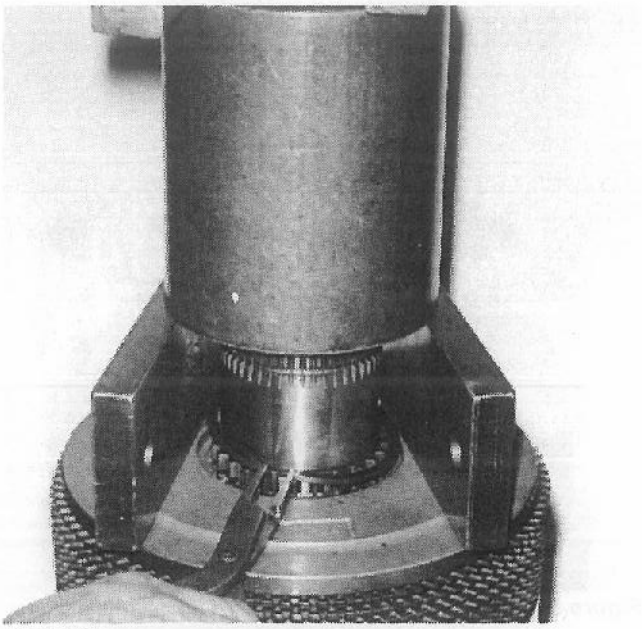


Figure 6:

6. Place the shaft assembly in a press and remove the shaft to clutch hub external snap ring.

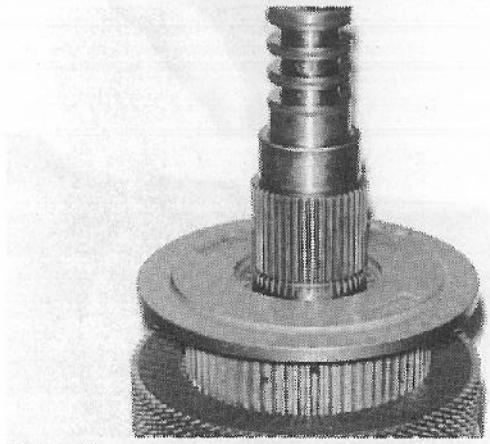


Figure 7:

7. Remove the clutch hub.

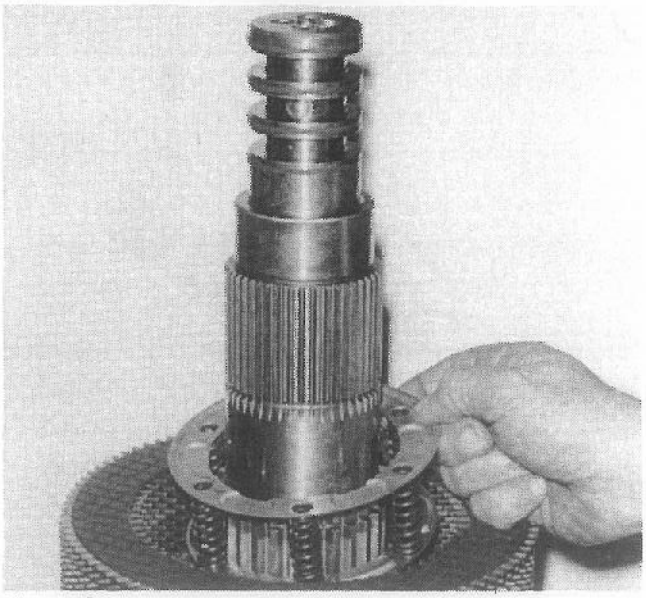


Figure 8:

8. Remove the piston return spring retainer assembly and the rear clutch plates.

9. To remove the clutch piston, apply a short burst of regulated air pressure to the rear clutch dump valve.

   Remove the sealing ring from the OD of the rear clutch piston, and piston rings.

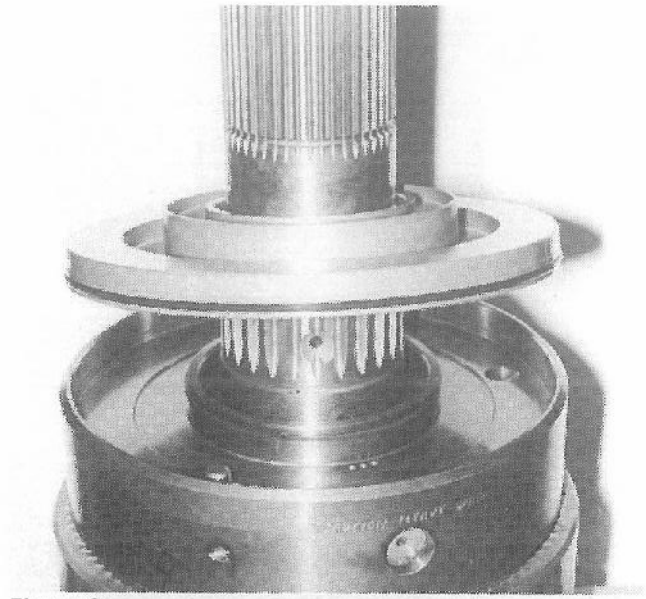


Figure 9:

10. To remove the dump valve assembly, depress and hold the dump valve sleeve to remove spring pressure from the snap ring. Remove the small snap ring from the dump valve. Slowly release pressure from the dump valve sleeve.

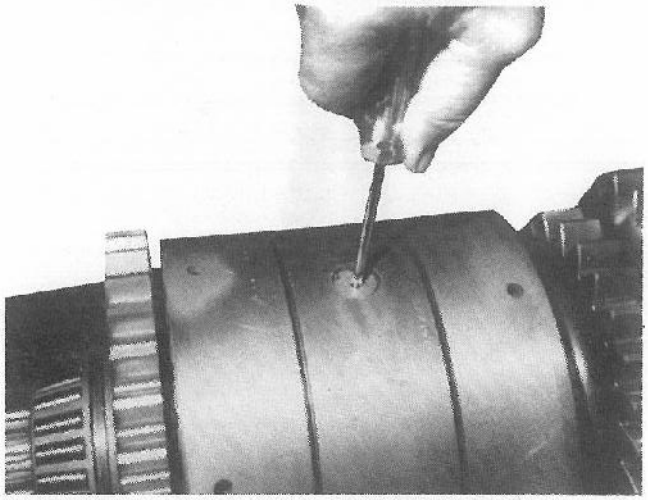


Figure 10:

11. Remove the dump valve sleeve, stem, shims, compression spring and feedback dump valve.

IMPORTANT: *The dump valve crack pressure is factory preset.* **Do not** loose or mix shims for the dump valves. The dump valve setting is critical to the overall operation of the transmission.

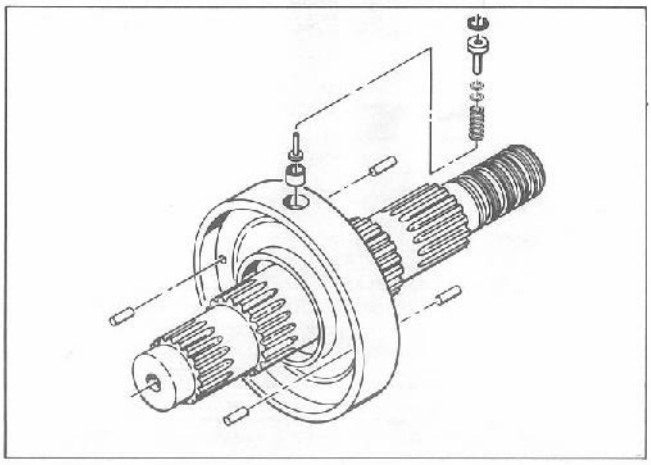


Figure 11:

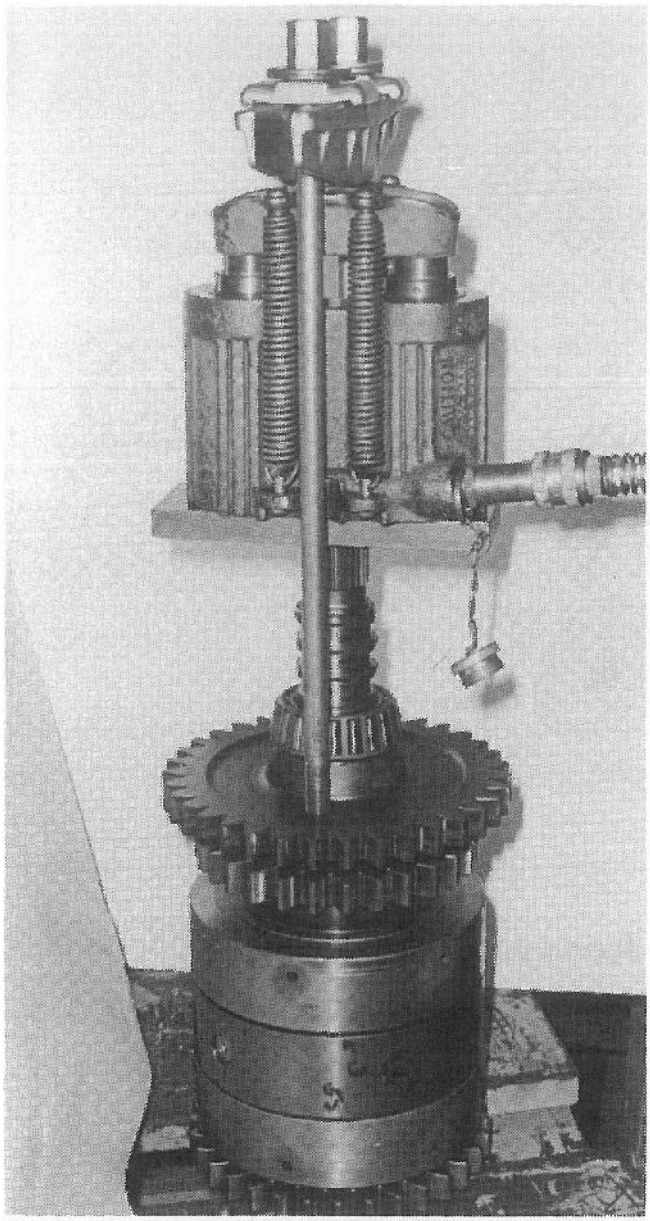


Figure 12:

12. Turn the remainder of the shaft assembly over so the front end is up. Use a portable hydraulic press with legs threaded into the holes provided in the driver gear, to remove the driver gear and bearing.

13. Repeat steps 3 through 11 to disassemble the front clutch assembly.

    Refer to the cleaning and inspection section of this manual after the disassembly is completed.

IMPORTANT: ***Do not*** *attempt to remove the piston housing from the clutch shaft. The shaft and piston housing are serviced as an assembly.*

NOTE: *The disassembly and assembly procedures of all clutch shafts in this transmission are basically the same. Adhere to the following before assembling any clutch shafts.*

a) Heat all tapered roller bearings and pressed on gears in a 275°F oven for no more than 30 minutes prior to assembly on the shafts.

b) Submerge all friction plates in the correct oil for a minimum of one hour prior to assembly.

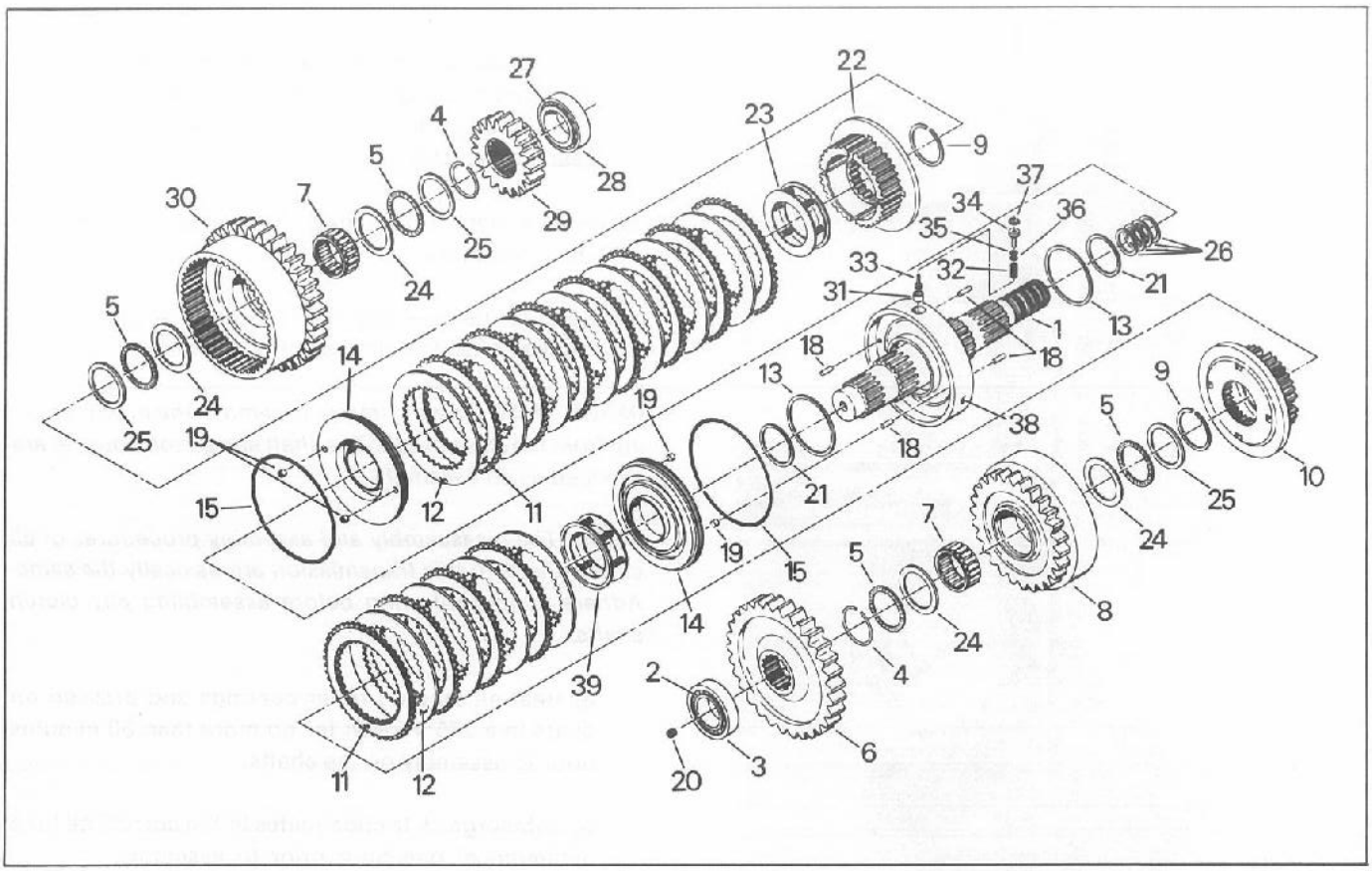


Figure 13:

9" Clutch Pack Assembly

Ref.	Description	Qty.
1-39	9" Clutch Pack Assy	1
1	Clutch Shaft Assy (incl Ref. 16-18, 20 & 38)	1
2	Bearing Cone	1
3	Bearing Cup	1
4	Snap Ring	2
5	Thrust Bearing	4
6	Driver Gear	1
7	Roller Bearing	2
8	Gear & Ring Assy	1
9	Snap Ring	2
10	Clutch Hub	1
11	Faced Plate	12
12	Steel Plate (Flat)	12
13	Piston Ring (see Note)	2
14	Clutch Piston Assy (incl Ref. 19)	2
15	Sealing Ring (see Note)	2
16	Dowel Pin (not shown) (see Ref. 1)	1
17	Snap Ring (not shown) (see Ref. 1)	2
18	Dowel Pin (see Ref. 1)	4
19	Piston Sleeve	4
20	Orificed Plug (see Ref. 1)	1
21	Piston Ring	2
22	Clutch Hub	1
23	Spring Retainer Assy	1
24	Thrust Washer	4
25	Thrust Washer	3
26	Sealing Ring (see Note)	4
27	Bearing Cone	1
28	Bearing Cup	1
29	Driver Gear	1
30	Gear & Ring Assy	1
31-36	Dump Valve Kit	2
31	Feedback Valve	2
32	Dump Valve Spring	2
33	Dump Valve Stem	2
34	Dump Valve Sleeve	2
35	Shim	AR
36	Shim	AR
37	Snap Ring	2
38	Piston Housing Assy (see Ref. 1)	1
39	Spring Retainer Assy	1

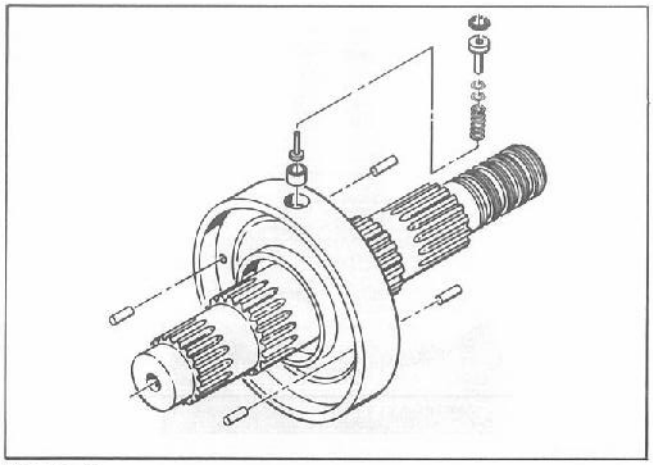


Figure 1:

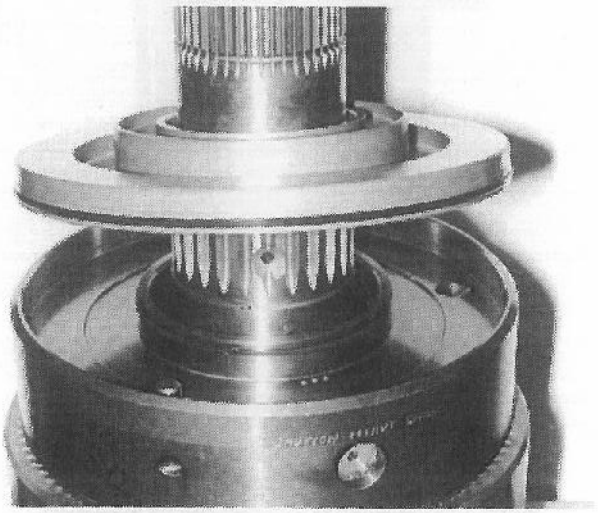


Figure 2:

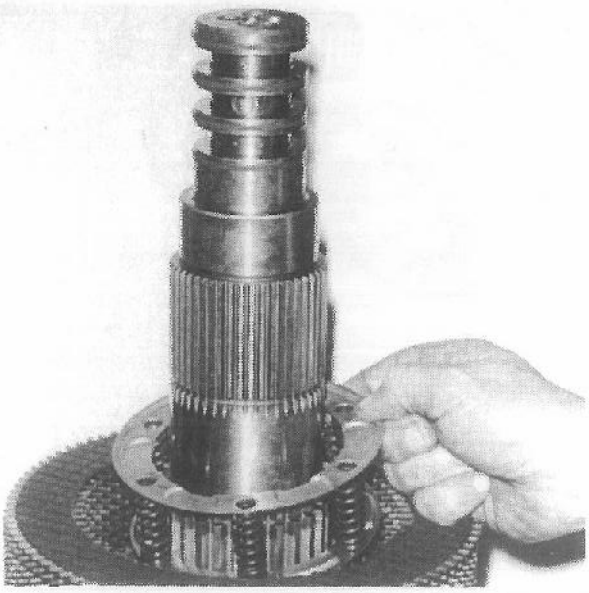


Figure 3:

9-Inch Clutch Shaft Assembly

1. Dump Valve: The crack pressure required to open the dump valve is critical to the function of the clutch. This pressure must be 164-176 psi and is adjusted by adding or removing shims. This pressure is factory adjusted, so if the exact same parts are reinstalled the pressure will be correct. If parts need replacing, a new pre-tested kit must be installed.

NOTE: *During the assembly procedure reference will be made to the 9 inch clutch exploded view (Figure 13).*

2. Install the dump valve assembly as follows;

   a) Install the feedback valve (31) open end up into the housing.

   b) INstall the dump valve stem (33) into the open end.

   c) Install the spring (32), shims (35) and dump valve sleeve (34), compress the spring to expose the snap ring and install snap ring (37) sharp side up.

3. Lubricate and install the sealing ring (15) onto the OD of the clutch piston. Install piston rings (13) and (21). With the output end of the clutch shaft up, install the clutch piston.

4. Install the clutch plates onto the clutch hub, beginning with a faced plate, and alternating with a steel plate. There are eight (8) of each. Use two clamps 180° apart to hold the plate onto the hub.

5. Install the piston return spring retainer (23).

6. Align the teeth on the steel clutch plates and install the clutch hub.

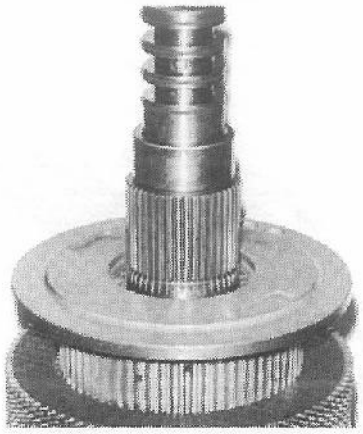


Figure 4:

7. Use large clamps or plate the shaft assembly in a press to compress the piston return springs, install the external snap ring (9) into the groove provided in the shaft.

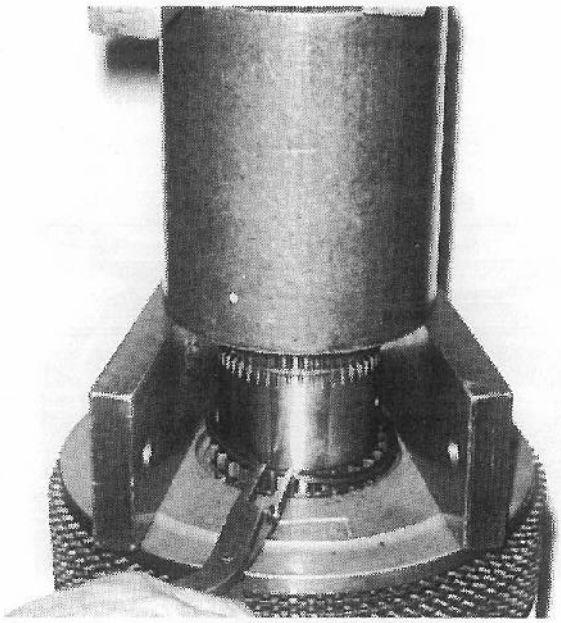


Figure 5:

8. Install the steel thrust washer (25) that pilots on the clutch shaft, install the needle thrust bearing (5), and the steel thrust washer (24) that pilots in the bore of the gear and drive ring.

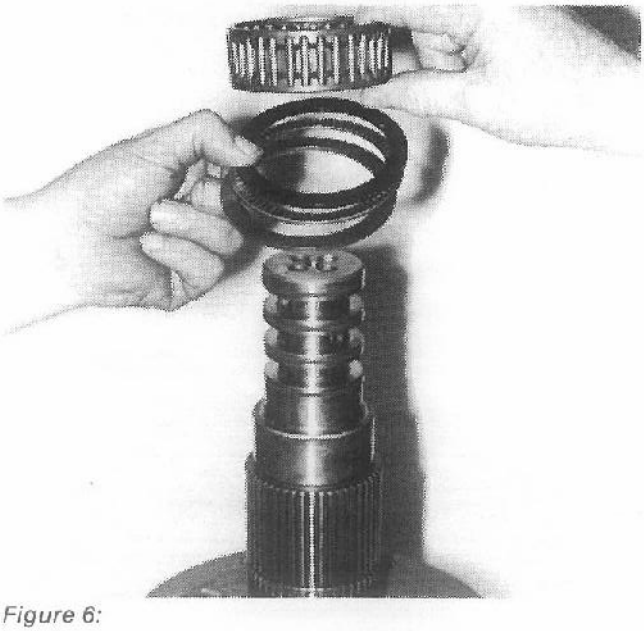


Figure 6:

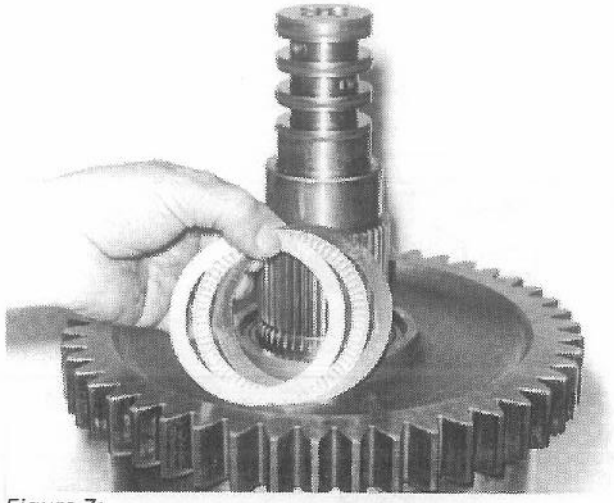


Figure 7:

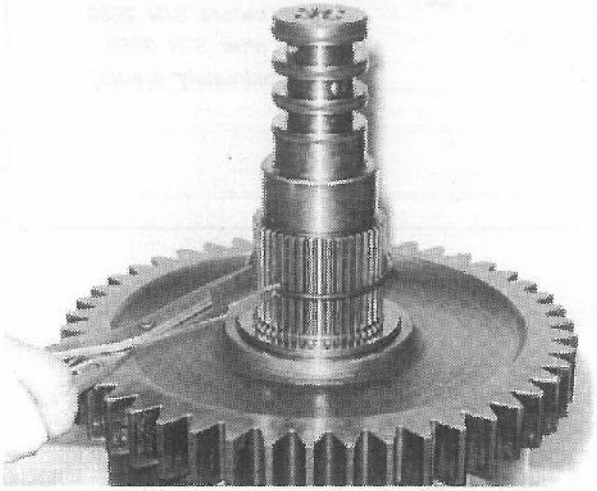


Figure 8:

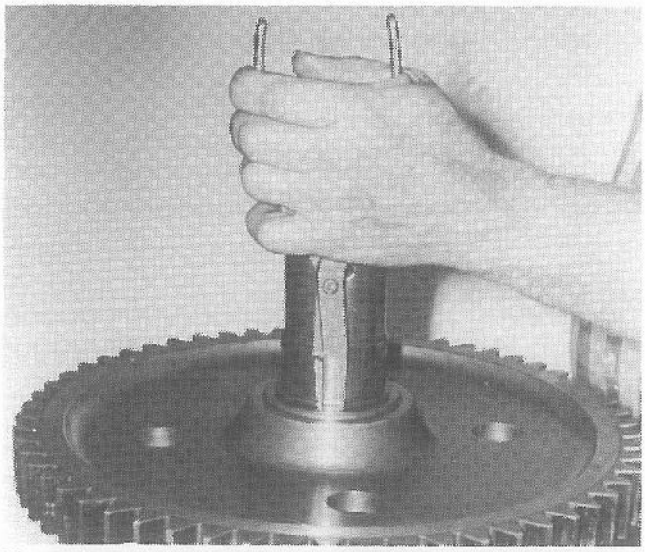


Figure 9:

9. Align the teeth on the faced clutch plates and install the gear and drive ring (3).

IMPORTANT: *Be sure the steel thrust washer (24) is in place in the bore of the gear and drive ring.*

Install the roller bearing (7) into the bore of the drive ring.

10. Install the steel thrust washer, needle thrust bearing and steel thrust washer onto the gear and drive ring.

NOTE: *The dark colored steel thrust washer must be in the gear and drive ring assembly bore.*

11. Install the snap ring (4) into the groove on the clutch shaft.

Heat the driver gear (29) in a 275°F oven for 30 minutes and install it onto the clutch shaft. Allow the driver gear to cool and then seat it against the snap ring by applying twenty tons of force by a hydraulic press.

12. Heat the roller bearing cone (27) in a 275°F oven for no more than 30 minutes and install it onto the rear end of the clutch shaft. After cooling, seat the bearing against the driver gear (29) by applying five tons of pressure to the bearing inner race.

NOTE: *Do not install the teflon sealing rings (26) until the clutch shaft assembly is in the housing and the oil supply covers are ready to be installed.*

13. Turn the assembly over so that the input end of the clutch shaft is up and repeat steps 3 through 11 to install the front clutch.

NOTE: *The front clutch contains only one steel thrust washer (24) which is to the rear of the gear and drive ring.*

14. After completing steps 3 through 11, install external snap ring.

Heat the driver gear (6) in a 275°F oven for no more than thirty minutes and install it onto the shaft.

Allow the driver gear to cool and then seat it against the snap ring by appling ten tons of pressure with a hydraulic press.

15. Heat the roller bearing in the same manner and install it on the shaft. After cooling, seat the bearing by applying five tons of pressure to the bearing inner race.

This completes assembly of the 9 Inch Clutch Shaft.

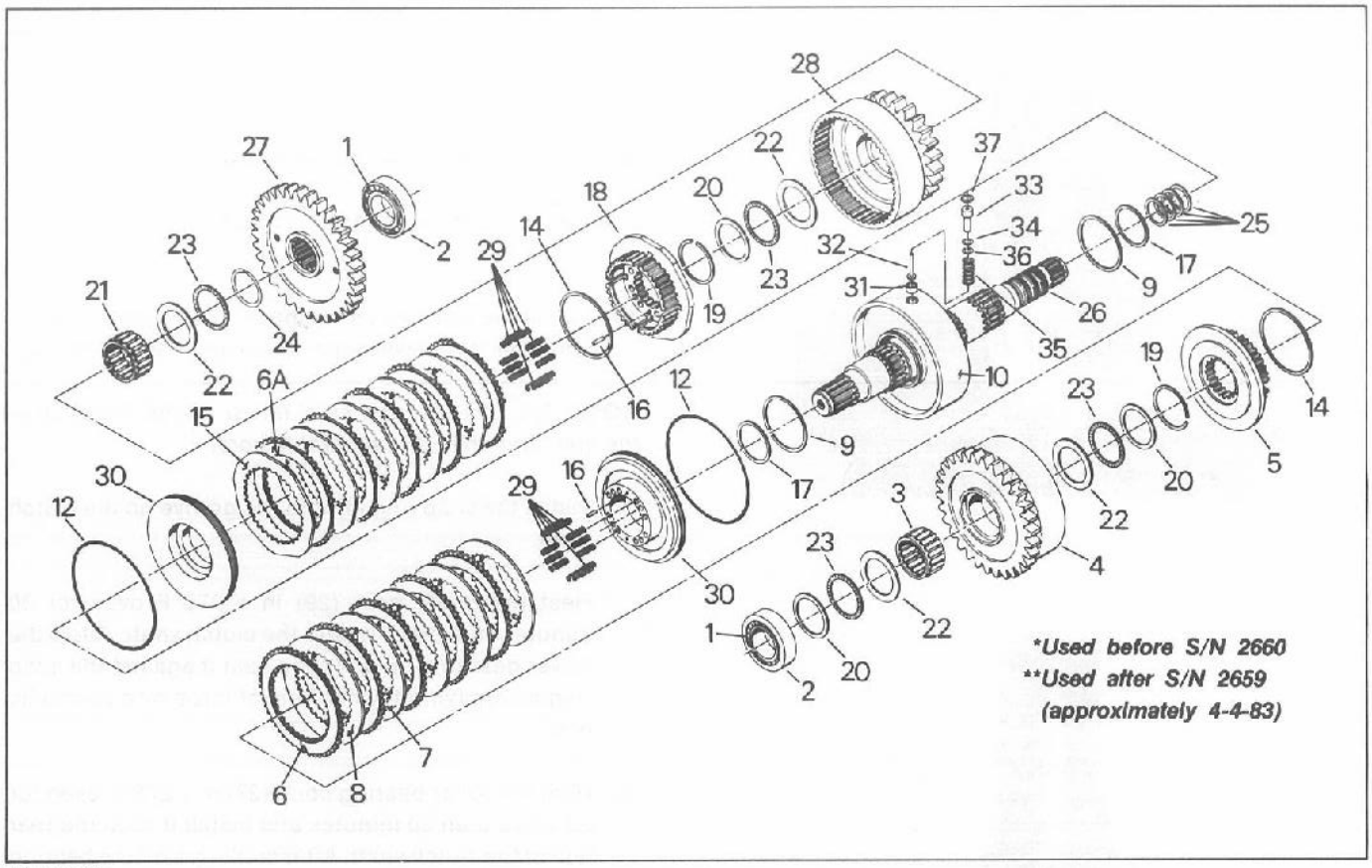


Figure 1:

Upper 7" Clutch Pack Assembly
(Input Shaft)

Ref.	Description	Qty.	Ref.	Description	Qty.
1-38	7" Clutch Pack Assy (Input)	1	19	Snap Ring	2
1	Bearing Cone	2	20	Thrust Washer	3
2	Bearing Cup	2	21	Roller Bearing	1
3	Roller Bearing	1	22	Thrust Washer	4
4	Gear & Drive Assy	1	23	Thrust Bearing	4
5	Clutch Hub	1	24	Snap Ring	1
6	Faced Plate **(B)*** (qty 5 on early models)	10	25	Sealing Ring (see Note)	4
6A	Faced Plate **(B)**** (see Note)	5	26	Clutch Shaft Assy (incl Ref. 10, 11, 13 & 38)	1
7	Steel Plate (Coned)	2	27	Input Driver Gear	1
8	Steel Plate (Flat)	3	28	Gear & Drive Assy	1
9	Piston Ring (see Note)	2	29	Return Spring	24
10	Piston Housing Assy (see Ref. 26)	1	30	Clutch Piston	2
			31-36	Dump Valve Kit	2
11	Dowel Pin (not shown) (see Ref. 26)	1	31	Feedback Valve	2
			32	Dump Valve Stem	2
12	Sealing Ring (see Note)	2	33	Dump Valve Sleeve	2
13	Snap Ring (not shown) (see Ref. 26)	2	34	Shim	AR
			35	Dump Valve Spring	2
14	Piston Ring (see Note)	2	36	Shim	AR
15	Steel Plate (Flat)	5	37	Snap Ring	2
16	Roll Pin	4	38	Dump Valve Seat (not shown) (see Ref. 26)	2
17	Piston Ring (see Note)	2			
18	Clutch Hub	1			

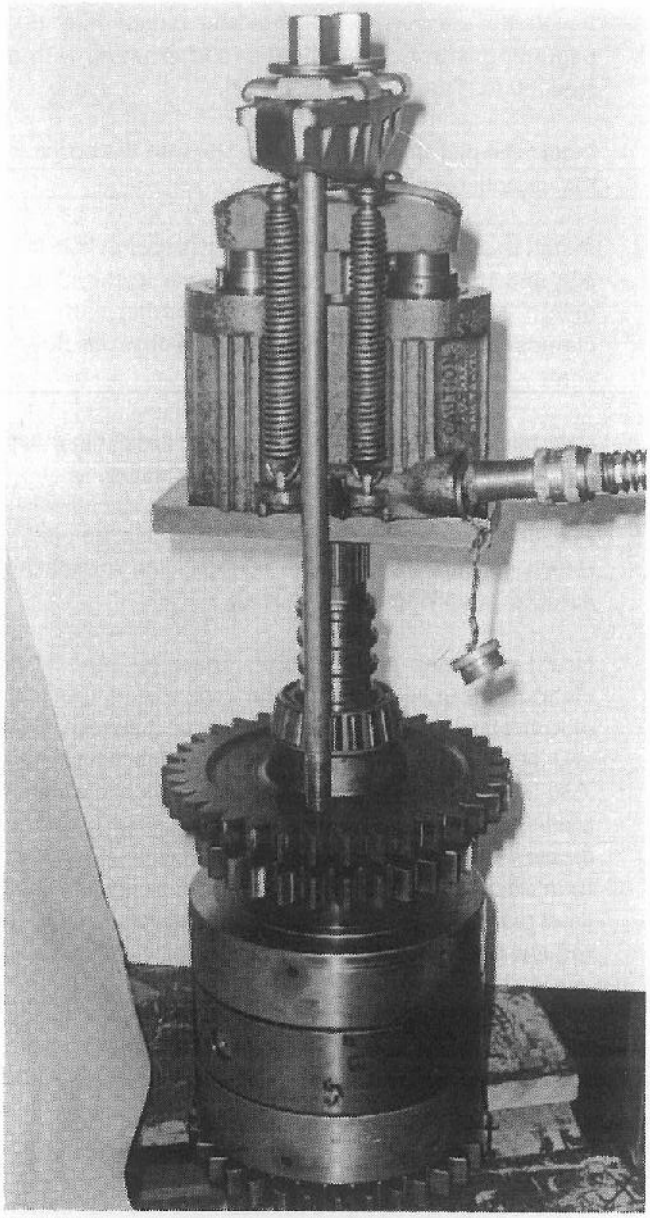


Figure 2:

Upper 7 Inch Clutch Disassembly

1. Remove the four teflon sealing rings from the rear of the clutch shaft. Use a portable hydraulic press with legs threaded into the two puller holes in the input driver gear to remove the driver gear and roller bearing.

   Remove the external snap ring from the shaft.

2. Remove the two steel thrust washers (24 & 22) and needle thrust bearing (23).

   Remove the gear and drive ring assembly (28).

3. Remove the roller bearing (21), steel thrust washer (22), needle thrust bearing (23), and second thrust washer (20).

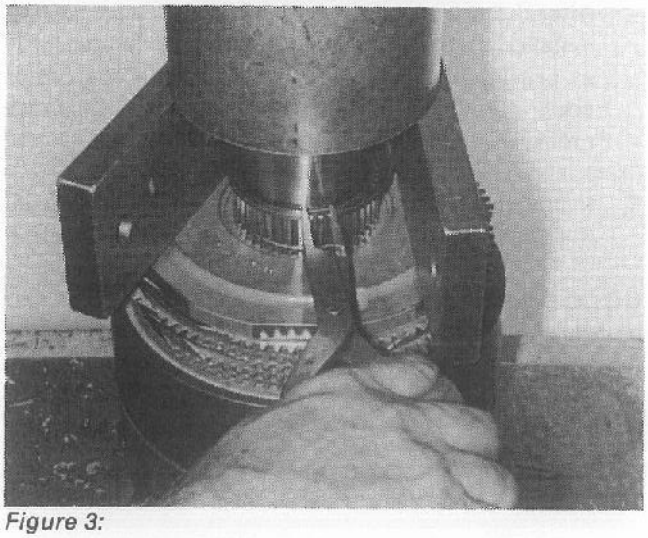


Figure 3:

4. Place the shaft assembly in a press and remove the shaft to clutch hub external snap ring.

5. Remove the clutch hub (18) and individual piston return springs (29).

6. Remove the clutch plates. Apply a short burst of regulated air pressure to the rear dump valve to remove the clutch piston.

   Remove the piston sealing rings.

7. To remove the dump valve assembly, depress and hold the dump valve sleeve to remove spring pressure from internal snap ring. Remove the small snap ring and slowly release pressure from the dump valve sleeve.

   Remove the dump valve sleeve (33), stem (32) shims (34) compression spring (35) and feedback dump valve (31).

8. Turn the remainder of the clutch shaft assembly so that the front end of the clutch shaft is up.

9. Thread puller legs into the puller holes in the gear and drive ring (4) and use a portable hydraulic press to remove the gear and drive ring.

   The two steel thrust washers (20 & 22), needle thrust bearing (23) and roller bearing (3) are removed with the gear and drive ring.

   Repeat steps 2 through 6 above to disassemble the front 7 inch clutch.

IMPORTANT: *Do not attempt to remove the piston housing from the clutch shaft. The shaft and piston housing are serviced as an assembly.*

Upper 7 Inch Clutch Assembly

1. Install the dump valve assembly as follows:

   a) Install the feedback valve (31) open end up into the housing.

   b) Install the dump valve stem (32) into the valve open end.

   c) Install the spring (35), shims (34) and dump valve sleeve (33), compress the spring to install snap ring into the groove.

2. Lubricate and install the sealing ring (12) onto the OD of the clutch piston. Lubricate and install the piston rings. With the output end of the clutch shaft up, install the clutch piston.

3. Install the clutch plates onto the clutch hub (5), beginning with a faced plate and alternating with a steel plate. There are five of each.

   Install the piston return springs (29) into the bores in the clutch hub (5).

4. Install the clutch piston (16) onto the clutch hub (5), aligning the springs with the pockets in the clutch piston. Hold the plates and hub together with two clamps 180° apart and install the parts onto the clutch shaft.

   Use the flat of a screw driver or similar flat bar to press the clutch piston into the piston housing.

5. Place the assembly in a press to compress the piston return springs, remove the clamps, and install the external snap ring onto the shaft.

   Use two feeler gauges 180° apart to check the clearance between the clutch piston and the rear clutch plate. This clearance must be between .050 and .080 in. (1.3-2.0 mm). If the clearance is less than .050 inch (1.3 mm) substitute one or more flat steel plates for an equal number of coned steel plates to increase the clearance. If the clearance is greater than .080 in. (2.0 mm) substitute one or more coned steel plates for an equal number of flat steel plates to reduce the clearance.

6. Heat the bearing (1) in an oven to 250-275°F for no more than thirty minutes and install the bearing onto the front end of the clutch shft. After cooling, apply five tons hydraulic pressure to the bearing inner race to seat it.

7. Repeat steps 2 through 6 to assemble the rear clutch on the shaft assembly.

   After the rear clutch is assembled and the snap ring installed on the shaft, heat the input driver gear (27) as previously described, and install the gear. After cooling, seat the gear with ten tons of hydraulic press pressure.

8. Install the heated roller bearing (1), after cooling, seat the bearing with five tons of hydraulic press pressure.

NOTE: ***Do not*** *install the four teflon seal rings on the rear of the shaft until the clutch shaft is installed in the housing.*

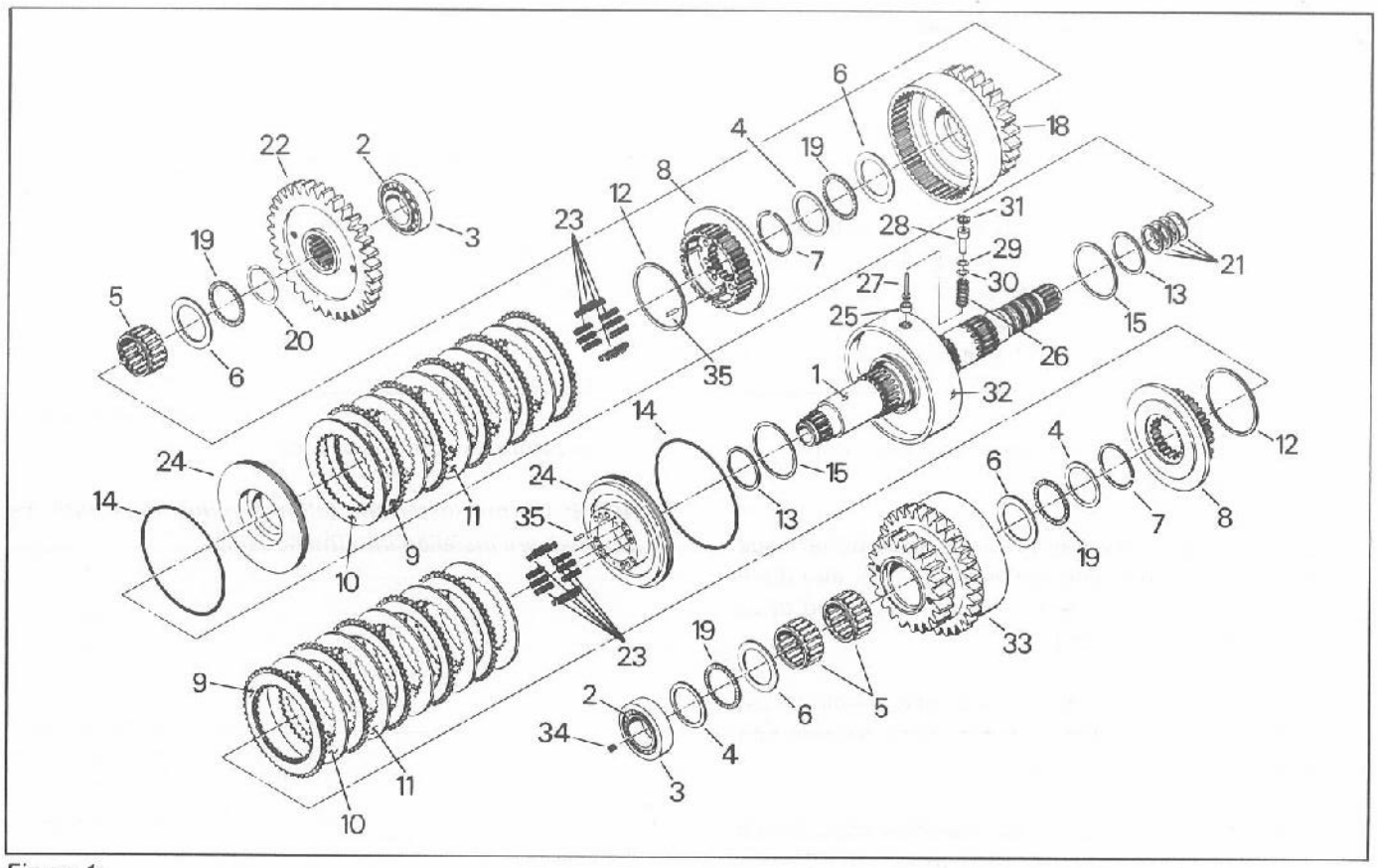


Figure 1:

Lower 7" Clutch Pack Assembly

Ref.	Description	Qty.	Ref.	Description	Qty.
1-35	7" Clutch Pack Assy	1	18	Gear & Ring Assy	1
1	Clutch Shaft Assy (incl Ref. 16, 17, 32 & 34)	1	19	Thrust Bearing	4
			20	Snap Ring	1
2	Bearing Cone	2	21	Sealing Ring	4
3	Bearing Cup	2	22	Input Gear	1
4	Thrust Washer	3	23	Return Spring	24
5	Roller Bearing	3	24	Clutch Piston	2
6	Thrust Washer	4	25-30	Dump Valve Kit	2
7	Snap Ring	2	25	Feedback Valve	2
8	Clutch Hub	2	26	Dump Valve Spring	2
9	Faced Plate	10	27	Dump Valve Stem	2
10	Steel Plate (Coned)	4	28	Dump Valve Sleeve	2
11	Steel Plate (Flat)	6	29	Shim	AR
12	Piston Ring	2	30	Shim	AR
13	Piston Ring	2	31	Snap Ring	2
14	Sealing Ring	2	32	Piston Housing Assy (see Ref. 1)	1
15	Piston Ring	2	33	Gear & Ring Assy	1
16	Dowel Pin (not shown) (see Ref. 1)	1	34	Orificed Plug (see Ref. 1)	2
			35	Roll Pin	4
17	Snap Ring (not shown) (see Ref. 1)	2			

Transmission Subassemblies

Lower 7 Inch Clutch Shaft Disassembly

1. Remove the four sealing rings (21) from the rear of the clutch shaft.

2. Install puller legs into the puller holes in the input driven gear (22), and use a portable hydraulic press to remove the gear and roller bearing.

3. Repeat steps 3 through 11 (disassembly of 9 Inch Clutch) to disassemble the rear, lower 7 Inch Clutch.

4. Turn the shaft assembly over so that the input end of the clutch shaft is up.

5. Use a portable hydraulic press with puller legs threaded into the puller holes in the gear and drive ring (33) to remove the front clutch gear and drive ring and roller bearing.

6. Two steel thrust washers (4 & 6) and needle thrust bearing (19) will also be removed with the gear and drive ring.

7. Repeat steps 2 through 11 (disassembly of the 9 Inch Clutch) to disassemble the lower, front 7 Inch Clutch.

Lower 7 Inch Clutch Shaft Assembly

1. Repeat steps 3 through 11 (9 Inch Clutch Assembly) to assemble the front, lower 7 Inch Clutch.

2. Install the two roller bearings (5) into the bore of the gear and drive ring (33).

3. In the following order, install the steel thrust washer (6), needle thrust bearing (19) and steel thrust washer (4).

4. Install heated roller bearing (2) onto the front of the shaft. After cooling, seat the bearing by applying five tons of pressure to the bearing inner race with a hydraulic press.

5. Turn the shaft assembly over so that the output end of the shaft is up.

6. Repeat steps 3 through 11 (9 Inch Clutch Assembly) to assemble the rear 7 Inch Lower Clutch.

7. Install steel thrust washer (6) and needle thrust bearing (19) and install shaft snap ring.

8. Heat the input driver gear (22) in a 275°F oven for no more than thirty minutes and install the gear. After cooling, seat the gear with ten tons of pressure with a hydraulic press.

9. Heat the roller bearing in the same manner and install. After cooling, seat the bearing with five tons pressure on the inner race.

NOTE: *Do not install the teflon sealing rings until the clutches are installed into the housing.*

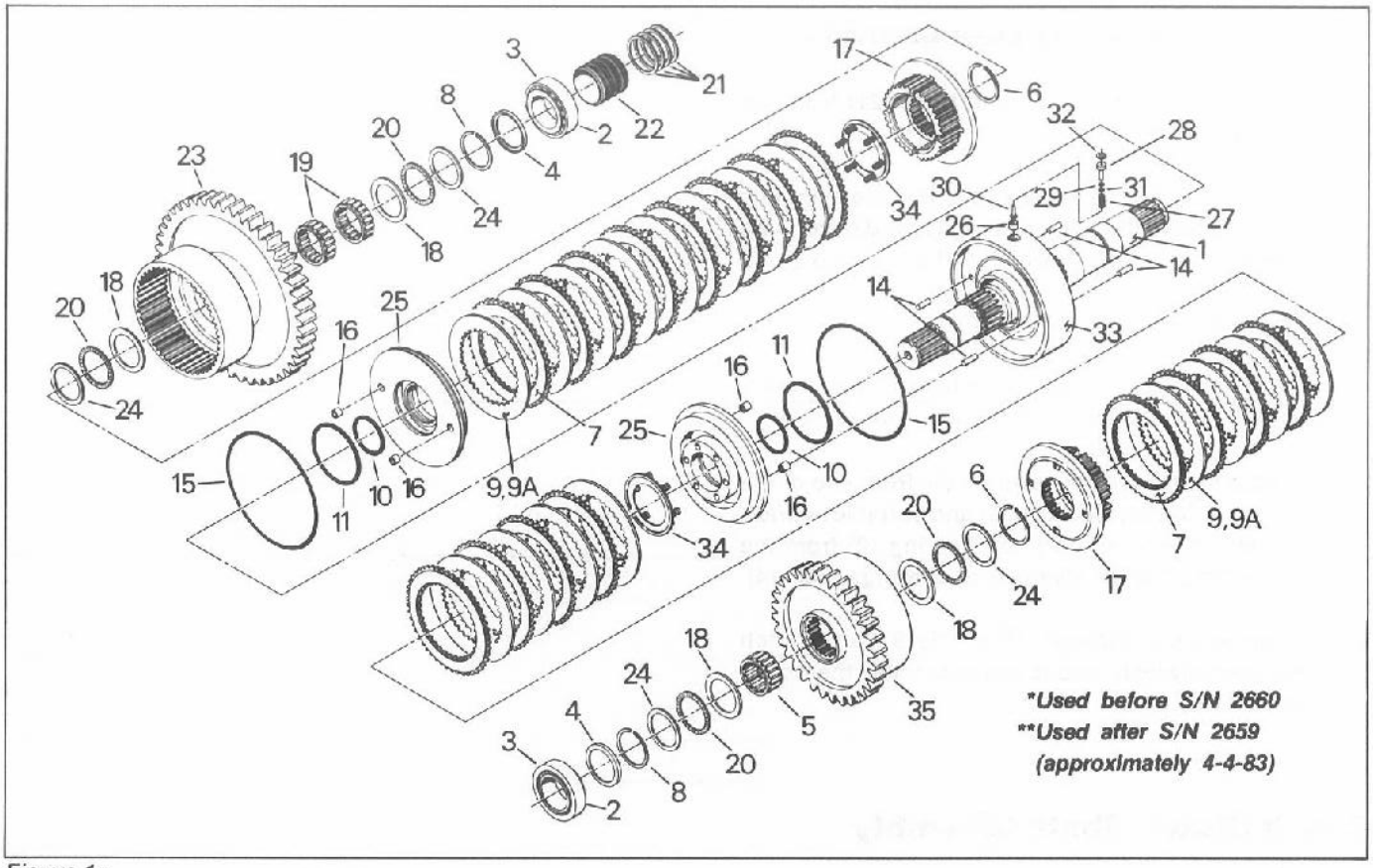


Figure 1:

8" Clutch Pack Assembly

Ref.	Description	Qty.	Ref.	Description	Qty.
1-35	8" Clutch Pack Assy (90-3002T91 - Code B)	1	16	Piston Sleeve	4
1	Clutch Shaft Assy (incl Ref. 12-14 & 33) (90-3264T91 - Code B)	1	17	Clutch Hub	2
2	Bearing Cup	2	18	Thrust Washer	4
3	Bearing Cone	2	19	Roller Bearing	2
4	Bearing Spacer	2	20	Thrust Bearing	4
5	Roller Bearing	1	21	Sealing Ring (see Note) (90-3210T1 - Code B)	4
6	Snap Ring	2	22	Piston Ring Carrier (90-3077T1 - Code B)	1
7	Faced Plate	16	23	Gear & Ring Assy	1
8	Snap Ring	2	24	Thrust Washer	4
9	Steel Plate (Flat) **(B)*** (qty 8 on early models)	16	25	Clutch Piston Assy (incl Ref. 16)	2
9A	Steel Plate (Coned) **(B)**** (see Note)	8	26-31	Dump Valve Kit	2
10	O-Ring (see Note)	2	26	Feedback Valve	2
11	O-Ring (see Note)	2	27	Dump Valve Spring	2
12	Snap Ring (not shown) (see Ref. 1)	2	28	Dump Valve Sleeve	2
13	Dowel Pin (not shown) (see Ref. 1)	1	29	Shim	AR
14	Dowel Pin (see Ref. 1)	4	30	Dump Valve Stem	2
15	Sealing Ring (see Note)	2	31	Shim	AR
			32	Snap Ring	2
			33	Piston Housing Assy (see Ref. 1)	1
			34	Spring Retainer Assy	2
			35	Gear & Ring Assy	1

Transmission Subassemblies

8 Inch Clutch Shaft Disassembly

1. Remove the four teflon sealing rings (21) from the piston ring carrier (22).

2. Use a guillotine-type puller and a portable hydraulic press to remove the roller bearing (3) and piston ring carrier (21) from the front end of the clutch shaft.

3. Remove the bearing spacer (4).

4. Repeat steps 3 through 11 (9 Inch Clutch Disassembly) to disassemble the rear 8 Inch Clutch.

5. Turn the shaft assembly over so the front end of the shaft is up. Use a bearing puller and portable hydraulic press to remove the roller bearing (2) from the front end of the shaft. Remove the bearing spacer (4).

6. Repeat steps 3 through 11 of the 9 Inch Clutch Dissassembly instructions to disassemble the front 8 Inch Clutch.

8 Inch Clutch Shaft Assembly

1. Repeat steps 3 through 11 of the 9 Inch Clutch Assembly instructions to assemble the front 8 Inch Clutch.

NOTE: *The 8 Inch Clutch pistons have two O-rings (10 & 11) in the ID and a lathe cut ring (15) on the OD instead of the sealing rings and piston rings of the 9 Inch Clutch.*

2. Use two feeler gauges 180° apart to check the clearance between the clutch piston and the rear clutch plate. This clearance must be between .050 and .080 inch. If the clearance is less than .050 inch (1.3 mm), substitute one or more flat steel plate for an equal number of coned steel plates to increase the clearance. If the clearance is greater than .080 inch (2.0 mm), substitute one or more coned steel plates for an equal number of flat steel plates to reduce the clearance.

3. Install the bearing spacer (4). Install heated roller bearing onto the front end of the shaft. After cooling seat the bearing with five tons of pressure with a hydraulic press.

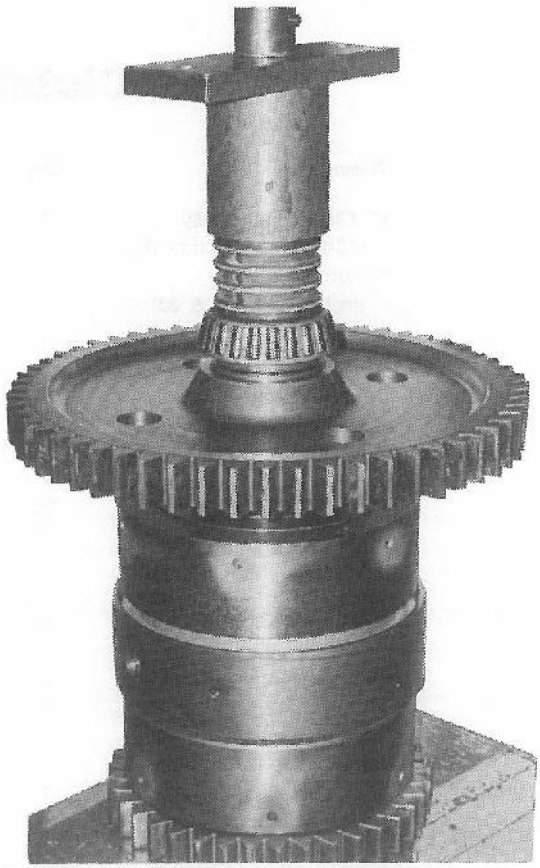


Figure 2:

4. Turn the shaft assembly over so that the rear end of the shaft is up.

   Repeat steps 3 through 11 of the 9 Inch Clutch Assembly instructions to assemble the rear 8 Inch Clutch.

5. Install bearing spacer (4). Install heated roller bearing (3) onto the rear of the shaft. After cooling, seat the bearing with five tons of hydraulic press pressure applied to the bearing inner race.

6. Heat the piston ring carrier (22) in a 275°F oven for 30 minutes and install it onto the rear end of the shaft.

NOTE: *Do not install teflon sealing rings (21) until the clutch shaft assembly is installed into the housing.*

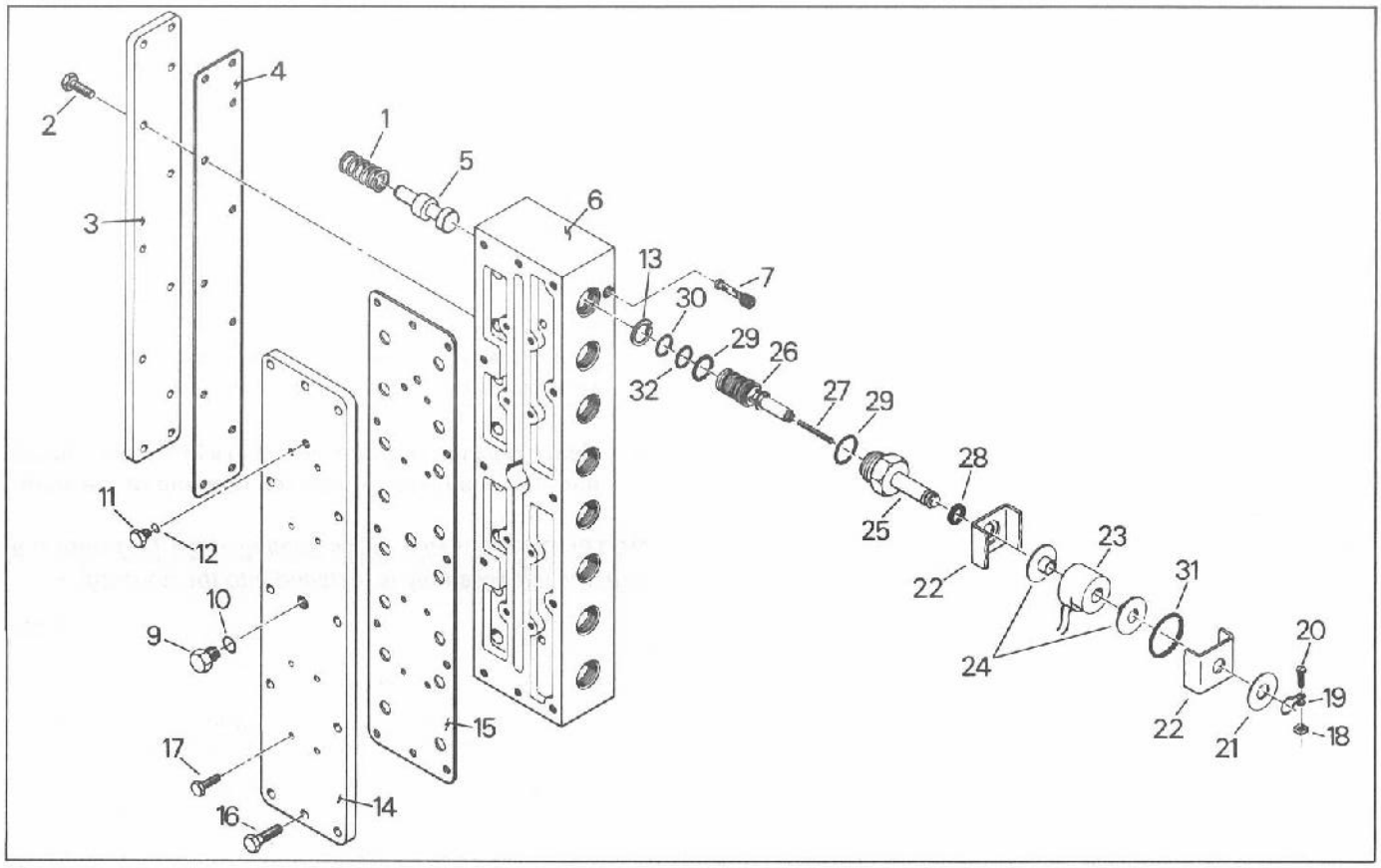


Figure 1:

Transmission Range Selector Valve Assembly

Ref.	Description	Qty.	Ref.	Description	Qty.
1-32	Trans Range Selector Valve Assy	1	17	Capscrew	8
			18-32	Solenoid Assy*	8
1	Spring	8		Solenoid Kit (see Note)	AR
2	Capscrew	11	18	Nut	1
3	Valve Cover	1	19	Retaining Clip	1
4	Cover Gasket (see Note)	1	20	Machine Screw	1
5	Selector Valve	8	21	Spacer	1
6	Valve Body	1	22	Yoke	1
7	Filter Screen	8	23	Coil	1
8	Solenoid & Wire Assy (not shown)	1	24	Sleeve	2
			25	Base	1
9	Plug	1	26	Core	1
10	O-Ring (see Note)	1	27	Core Spring	1
11	Plug	1	28	O-Ring	1
12	O-Ring (see Note)	1	29	O-Ring	2
13	Snap Ring	8	30	O-Ring	1
14	Valve Cover	1	31	O-Ring	1
15	Cover Gasket (see Note)	1	32	O-Ring	1
16	Capscrew	2			

Range Selector Valve Disassembly

1. Remove the valve body side cover capscrews (2), cover (3) and gasket (4).

NOTE: *The cover is spring loaded, back out all screws an equal amount alternately and evenly until the cover is released.*

2. Remove the eight compression springs (1) and eight range selector poppet valves (5).

IMPORTANT: *Do not mix poppet valves and bores. Each valve should be replaced in the port they were removed from.*

3. To move the solenoid assemblies proceed as follows:

   a) Loosen the retaining clip screw (20), remove clip (19) and spacer washer (21).

   b) Remove the coil assembly from the base.

   c) Loosen and unscrew the base (25) from the valve body. Remove the O-rings from the base.

   d) Remove the O-ring from the top of the core.

   e) Remove the spring (27) from within the core (26).

IMPORTANT: *The spring has a closed coil on the top end. When reassembling the closed coil end must be up.*

4. Thread a No. 4-40 screw into a hole in the top of the core (26) and use a pliers to pull the core out of the valve body (See Fig. 2).

IMPORTANT: *Do not pull on the core stem. To do so can destroy the core.*

   Remove the core O-rings.

NOTE: *The internal snap rings (13) need not be removed unless the valve body is to be replaced.*

5. Remove the solenoid filter screen (7).

   Remove all solenoids and screens in the described manner.

6. Remove the range selector valve top cover capscrews. Remove the cover (14) and gasket (15).

   This completes the valve disassembly. Clean and inspect the complete valve assembly prior to reassembly.

Range Selector Valve Assembly

1. Install the solenoid filter screens (7).

2. If removed, install the internal snap rings (13).

3. Lubricate and install the O-rings onto the core. Install the core into the valve body.

IMPORTANT: *Install the spring into the core stem, closed coil end up.*

4. Lubricate and install the O-ring on top of the core.

5. Lubricate and install the O-ring above the threaded area of the solenoid base. Thread the base into the valve body and tighten.

6. Lubricate and install the O-ring over the stem on the base and install the coil over the stem.

7. Install the coil spacer, install the retainer clip into the stem groove provided, and the retaining screw and nut.

   Repeat the above for each solenoid.

8. Install the eight range selector valves (5) and compression springs (4).

9. Install the valve body side cover gasket (4) and side cover (3). Tighten the eleven capscrews to 15 ± 2 ft lb (20 ± 3 N.m).

10. Install the valve body top gasket and cover. Install capscrews tighten two capscrews (16) to 15 ± 2 lb ft (20 ± 3 N.m) and eight capscrews (17) to 7 ± 1 lb ft (9 ± 1 N.m).

Transmission Subassemblies

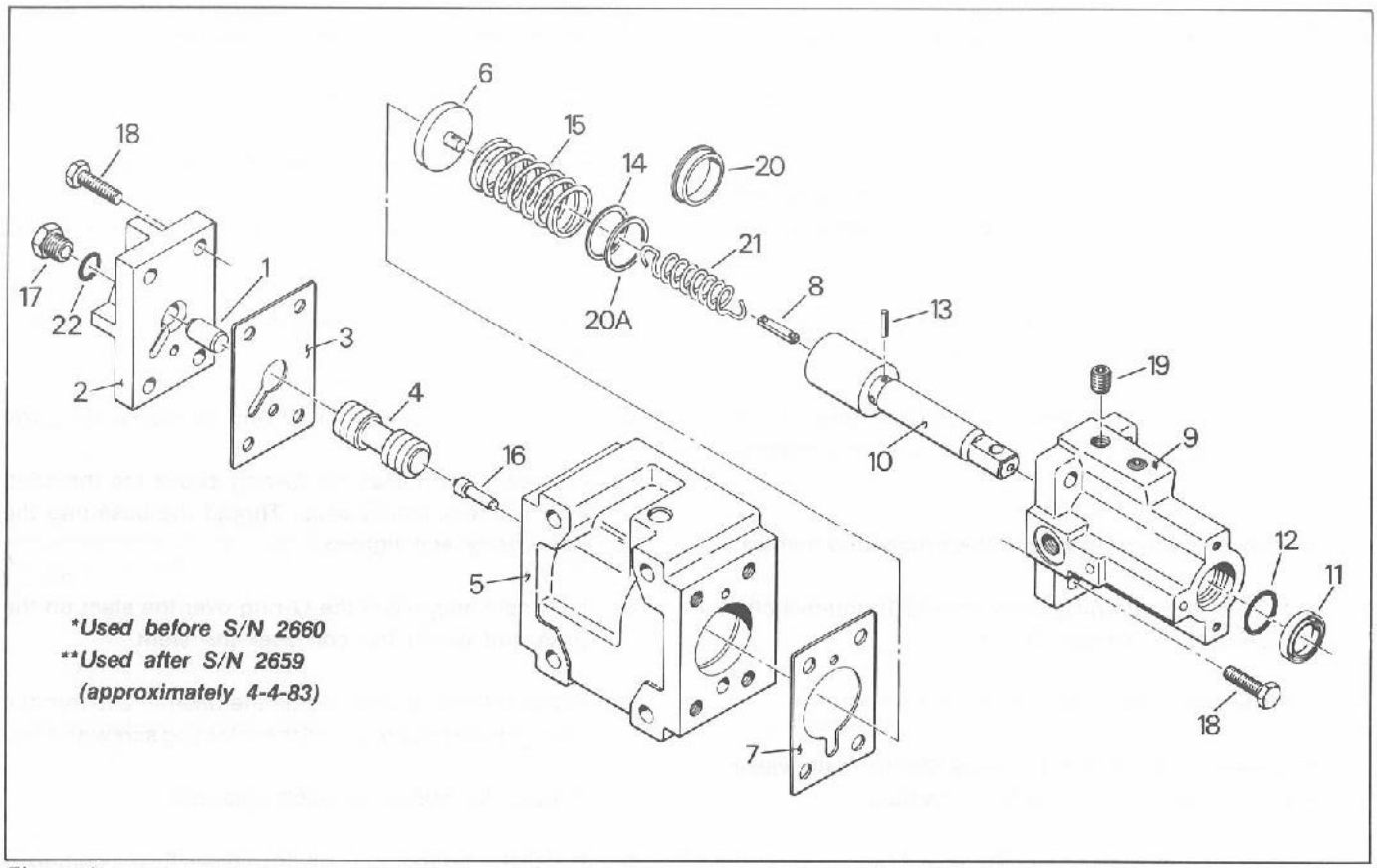


Figure 1:

Transmission Control Valve Assembly

Ref.	Description	Qty.	Ref.	Description	Qty.
1-22	Trans Control Valve Assy **(B)***	1	10	Control Stem*	1
	Trans Control Valve Assy **(B)****			Control Stem**	
1	Reducing Spool*	1	11	Seal (see Note)	1
	Reducing Spool**		12	O-Ring (see Note)	1
2	Valve Cover*	1	13	Roll Pin	1
	Valve Cover**		14	Washer (see Note)	AR
3	Valve Cover Gasket	1	15	Spring	1
	(see Note)		16	Pin	1
4	Modulator Spool	1	17	Plug	1
5	Modulator Body	1	18	Capscrew	8
6	Spring Seat	1	19	Pipe Plug	2
7	Cover Gasket (see Note)	1	20	Valve Spacer*	1
8	Link*	1	20A	Valve Spacer**	
	Link**		21	Spring*	1
9	Control Stem Cover*	1		Spring**	
	Control Stem Cover**		22	O-Ring (see Note)	1

Master Clutch Control Valve Disassembly

1. Remove the capscrews (18) and remove the control valve stem cover (9) and gasket (7).

2. Remove the control stem (10) and attaching parts by pressing the control stem into the stem cover. Remove roll pin (13) and remove the control stem from the extension spring (21) and link (8).

3. Remove the shims (20) and spring (15). Unhook the spring seat (6) from the extension spring (21).

4. Remove the capscrews (6) from the valve body cover (2) and remove the cover, gasket (3) and reducing spool (1).

5. Remove the modulator valve spool (4) and pin (16).

6. Remove stem cover O-ring (12) and seal (11).

   This completes master clutch control valve disassembly.

   Clean and inspect all parts prior to reassembly.

Master Clutch Control Valve Assembly

1. Lubricate and install stem cover O-ring (12) and seal (11).

2. Install orifice plug (17) and O-ring (22).

3. Install modulator spool pin (16) flanged end last.

4. Install modulator valve spool (4).

5. Install gasket (3) reducing spool (1) and valve body cover (2). Secure with four hex head capscrews (18). Tighten the capscrews to 15 ± 2 lb ft (20 ± 3 N.m).

6. Hook extension spring (21) into spring seat (6). Install spring (15) over the extension spring.

7. Install shims (20) over the extension spring. Hook link (8) onto the extension spring.

8. Install the control stem (10) over the link (8) aligning the hole in the stem and link to install the roll pin (13).

9. Install the control stem cover (9) over the control stem and attached parts.

10. Install gasket (7) and control stem cover (9) while guiding the spring seat (6) and spring (15) into place.

11. Secure the control stem cover (19) with four hex head capscrews (18). Tighten the capscrews to 15 ± 2 lb ft (20 ± 3 N.m).

    This completes the master clutch control valve reassembly.

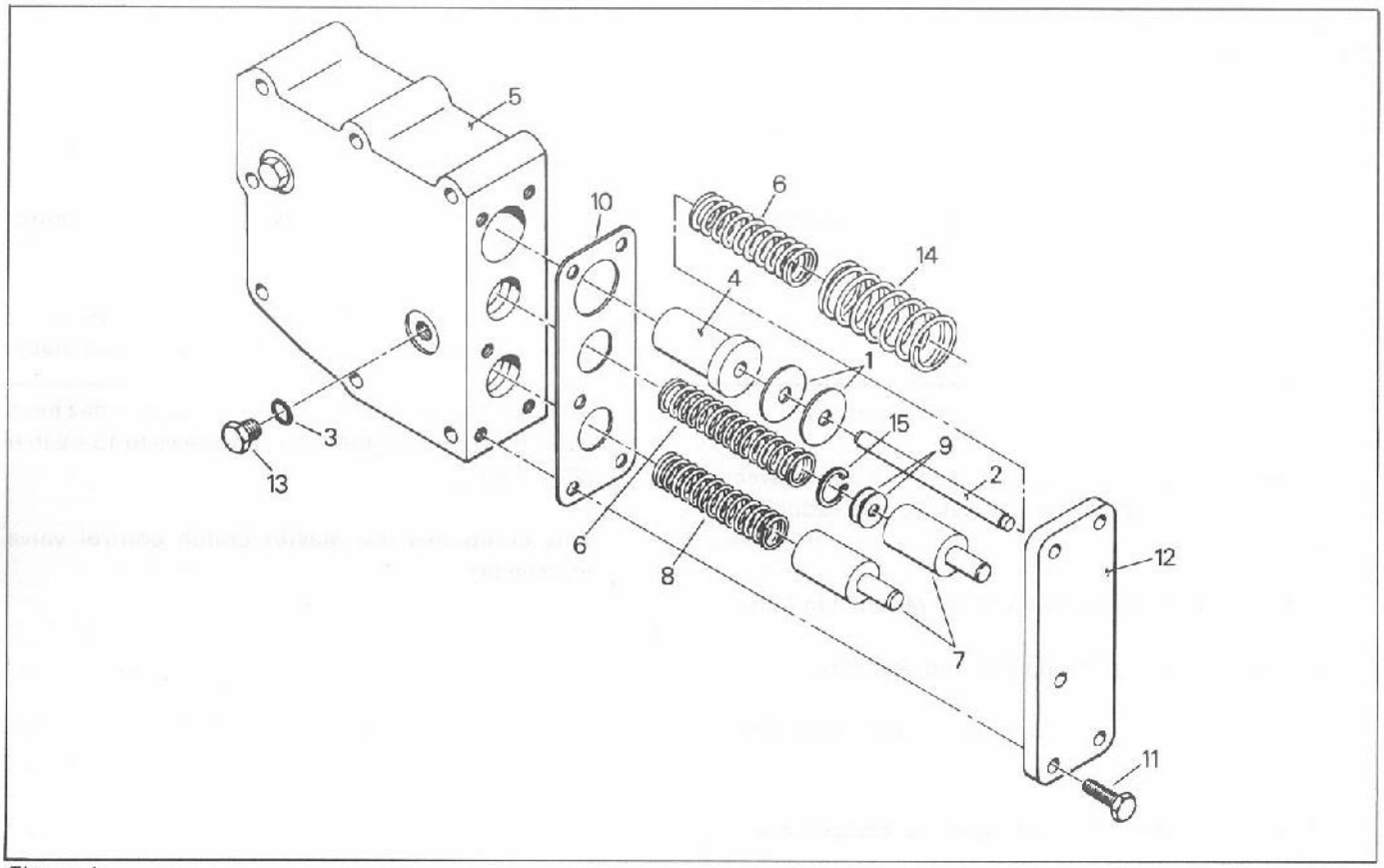


Figure 1:

Transmission Regulator Valve Assembly

Ref.	Description	Qty.	Ref.	Description	Qty.
1-15	Trans Regulator Valve Assy	1	8	Spring	1
1	Shim	AR	9	Shim	AR
2	Press. Rod	1	10	Cover Gasket	1
3	O-Ring (see Note)	2	11	Capscrew	5
4	Regulator Valve	1	12	Valve Body Cover	1
5	Regulator Valve Body	1	13	Plug	2
6	Spring	2	14	Spring	1
7	Lube Valve	2	15	Snap Ring	1

Pressure Regulator Valve Disassembly

1. Remove the five capscrews (11) and remove the valve body cover (12) and gasket (10).

NOTE: *The cover will be under spring pressure.*

2. Remove the lube regulator valves (7), master clutch lube valve spring (8), lube regulator valve spring (6) and shims (9).

3. Remove the main regulator valve inner spring (6) and outer spring (14).

4. Remove the pressure regulator rod (2) and shims (1).

5. Remove pressure reulator valve spool (4). Remove plug (13) and O-ring (3).

This completes the pressure regulator valve disassembly. Clean and inspect for damage as required.

Pressure Regulator Valve Assembly

1. Install the main pressure regulator valve spool (4) into the valve body, small orifice end in first.

2. Install shims (1) and rod (2). Install main regulator valve inner spring (6) and outer spring (14).

3. Install the master clutch lube regulator valve spring (6) into the center hole, shim (9), and regulator valve (7). Install the lube regulator valve spring (8) and regulator valve (7) into the remaining bore.

4. Install the valve body cover gasket (10) and cover (12). Tighten the capscrews 15 + 2 lb ft (20 + 3 N.m).

5. Install O-ring (3) on the plug (13), install and tighten plug.

This completes the main regulator valve assembly.

Transmission Assembly

Front Housing Disassembly

1. Remove the upper input shaft oil seal.

2. Use a hook-type bearing puller to remove the upper bearing outer race from the case.

3. Remove the six hex-head capscrews securing the lower front output shaft bearing retainer. Remove the retainer gasket and oil seal.

4. Use a hook-type bearing puller to remove the remaining roller bearing outer races from the case.

NOTE: *Do not remove the oil baffle roll pin unless it is damaged.*

Clean and inspect the front housing for damage prior to reassembly.

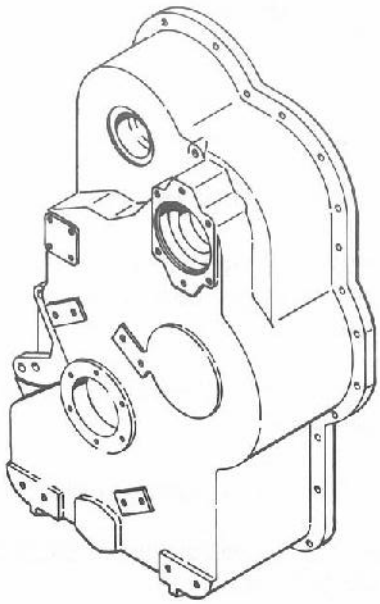


Figure 1:

Front Housing Assembly

1. Install all shaft assembly roller bearing outer races into their respective locations in the front housing case.

2. Install the upper input shaft oil seal with the lip toward the oil being retained.

3. Install the front lower output shaft bearing retainer gasket and bearing retainer. Secure the retainer with six hex-head capscrews. Tighten the capscrews to 27 ± 2 ft lb (36 ± 3 N.m).

4. Press in the lower output shaft oil seal. Seat the seal to the proper depth.

Transmission Assembly

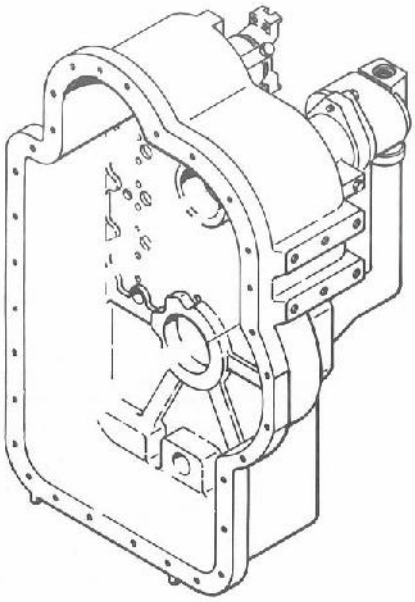


Figure 1:

Rear Housing Disassembly

1. Remove all shaft assembly roller bearing races from their locations in the rear case.

2. Remove the two hose clamps retaining the suction screen and remove the suction screen.

IMPORTANT: *Do not remove the rolled-in oil tubes unless they are damaged. Installation of new tubes requires the use of a special tube rolling tool. See tube rolling information.*

3. Thoroughly clean and inspect the rear case and tubing for damage prior to reassembly.

Rear Housing Assembly

1. Press in all shaft assembly roller bearing outer races that were removed.

2. Install new or cleaned suction screen and secure with two hose clamps.

Tube Rolling

General Information

Rolled-in-place tubes are used in the PowerPulse Control Transmission housing. The designer uses this method of tube termination due to its low cost and reliability. A properly rolled tube end is mechanically strong and oil tight. It is necessary to repair or replace rolled-in tubes occasionally. The following information will explain the principles involved in tube rolling. This information has been prepared from information furnished by the supplier of tube rolling equipment.

Airetool Division
Dresser Industries
302 South Center Street
Springfield, OH 45501

Please note that Steiger Tractor does not manufacture, or offer for sale, tube rolling equipment. It is suggested, that if tube rolling equipment is required, you contact Airtool directly.

Terms Used By The Tube Rolling Tool Manufacturer

Wall thickness of the tube is expressed in gauge units by the tool manufacturer. The gauge is Birmingham or Stubs Iron Wire or Sheet Gauge.

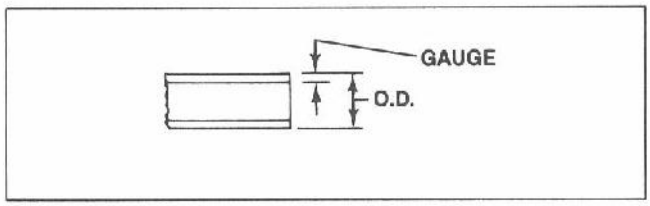


Figure 1:

The term sheet is used by the tool manufacturer to describe the housing (structural member) into which the tube is rolled.

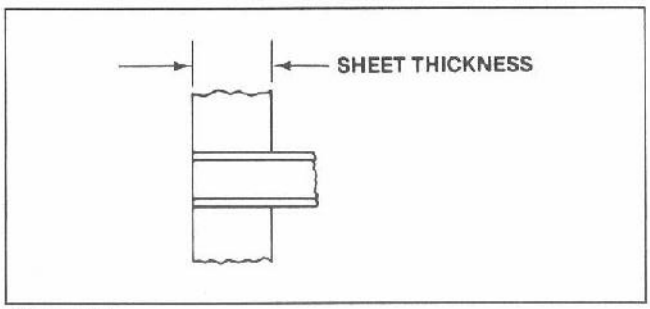


Figure 2:

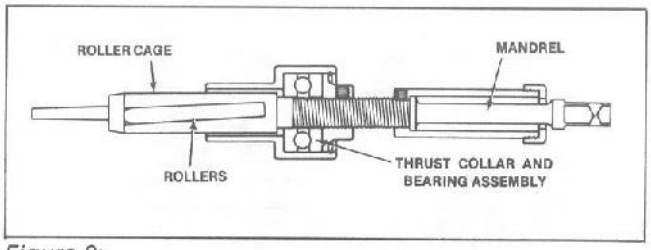


Figure 3:

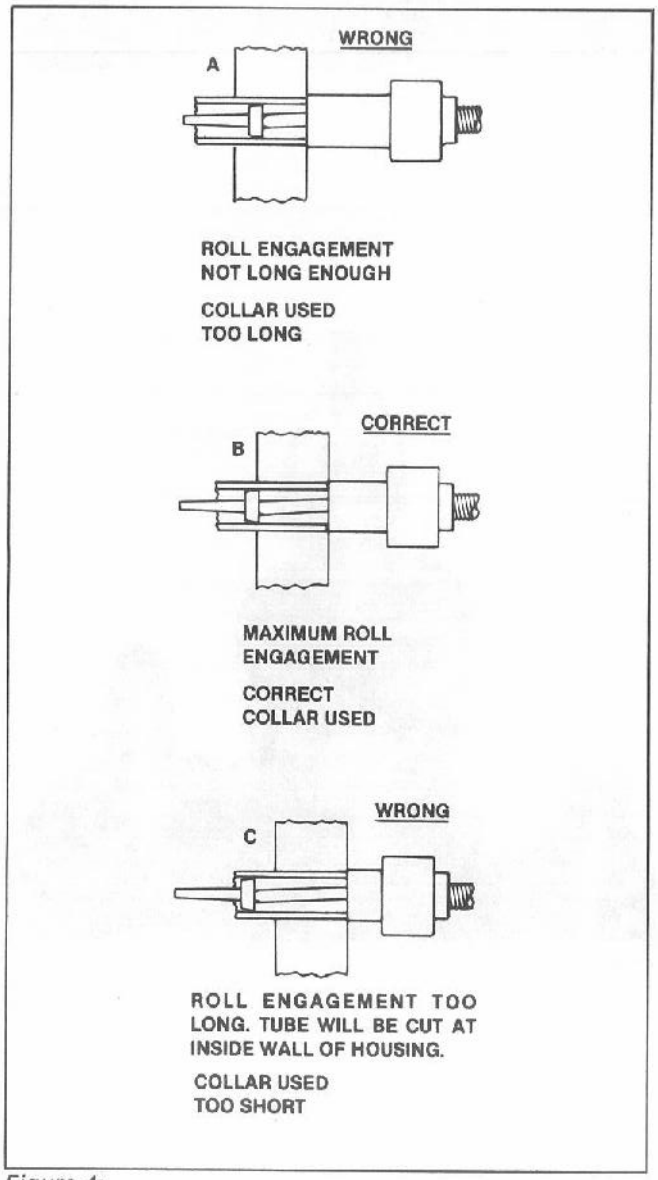


Figure 4:

Description Of The Tube Rolling Tool

Mandrel - This is the long tapered part which is turned clockwise to roll-in a tube.

Thrust Collar and Bearing Assembly - This part bears against the housing (structural member) during rolling. Please note, that different lengths of collars are used to control the depth of rolling. It is important that the correct depth collar is used (see Fig. 4).

Rollers - These are the parts that contact the I.D. of the tube being rolled. Please note that the rollers are skewed in relation to the mandrel axis. This provides an automatic feed of the mandrel during the rolling operation. These rollers are also tapered so that when in contact with the tapered mandrel they are parallel to the tube axis. This provides for uniform rolling pressure across the entire length of the roller which is in contact with the tube. Also, note that the leading end of the roller is gradually radiused and relieved to avoid a sharp offset inside the tube which could cause tube breakage.

Roller Cage - This part guides the rollers in operation and holds them in position when the tool is not being used.

Use of the correct thrust collar is important (see Fig. 4).

It is necessary to control the rolling operation in order to avoid under or over tube expansion. Under expansion produces a joint where the tube O.D. is not in full contact with the housing (structural member). Over expansion products a shearing of the bond between tube O.D. and housing I.D. due to excessive tube elongation. Both, under and over expansion are to be avoided. Either condition results in reduced holding strength of the rolled joint. The control method used by Twin Disc is the tool torque method. This method is based on the fact that under equal conditions the same amount of tool torque will produce the same amount of expansion in a tube of identical size, gauge and material. In the service letters describing specific tube locations, the rolling torque is given.

Transmission Assembly

Assembly Of Internal Sub Assemblies

1. Place the front housing assembly rear side up on a working surface.

2. Install the 9-inch clutch assembly and compound shaft group.

3. Install the oil baffle over the 8-inch clutch assembly and install the clutch and oil baffle assembly into the case, align the hole in the front of the oil baffle with the roll pin in the front housing.

   Secure the rear of the oil baffle to the front housing with the two oil baffle straps, two washers and capscrews. Tighten the four capscrews to 90 ± 7 ft lb (122 ± 9 N.m).

NOTE: *Oiled torque values will be given for all capscrews; therefore, capscrews should be oiled before installing.*

4. Install the upper and lower 7-inch clutch shaft assemblies into their respective locations.

IMPORTANT: *The front and rear housing split line is sealed with anaerobic plastic gasket. These split line sealing surfaces must be absolutely clean prior to joining the case halves.*

5. To clean the split line, scrape the surfaces to remove the old plastic gasket material. Gel type paint removers containing methylene chloride can be used to wipe off curred sealant. Clean the surfaces with 1,1,1-trichlorethane to remove oil and grease residue.

   Prior to joining the front and rear case, use Locquic "T" or equivalent primer on both mating surfaces. Allow primer to dry. This usually take three to four minutes. Keep the surfaces clean and free from oil and grease from this point on.

   Apply a 1/16 inch continuous bead of Loctite No. 49 to one surface on the side of the bolt holes toward the fluid being retained. Be sure that any narrow overlap areas are covered. The bead of Loctite should loop the fluid passages.

6. After cleaning the case half surfaces, and applying Loctite, install the rear half of the housing over the front half, aligning the two dowel pin holes.

   Install the 30 capscrews that secure the rear housing to the front housing. Tighten the capscrews to 65 + 5 ft lb (88 ± 7 N.m).

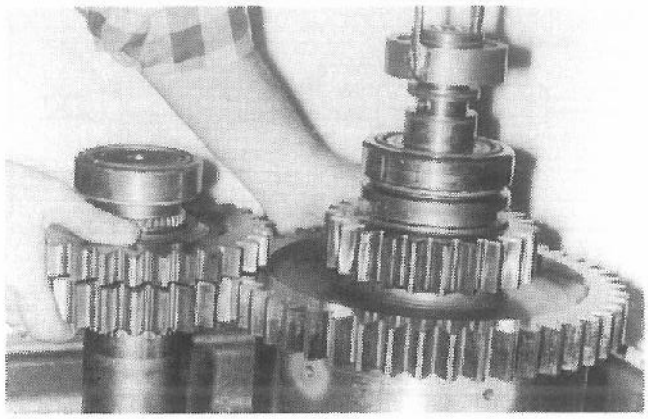


Figure 1:

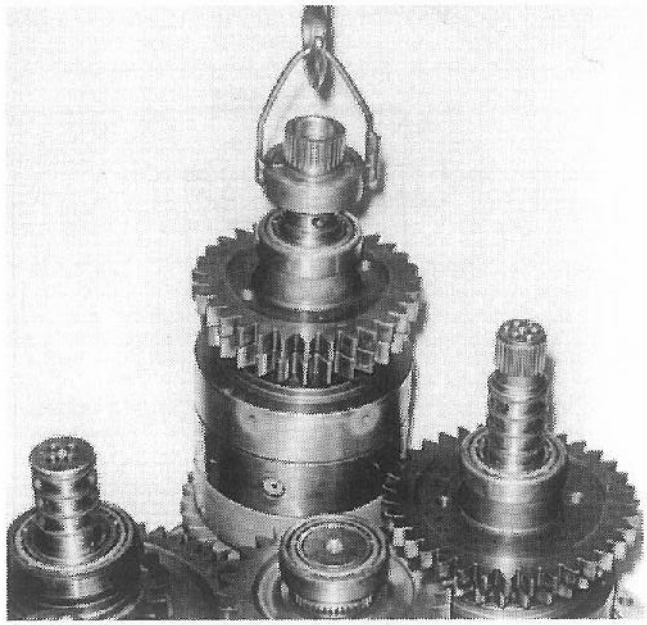


Figure 2:

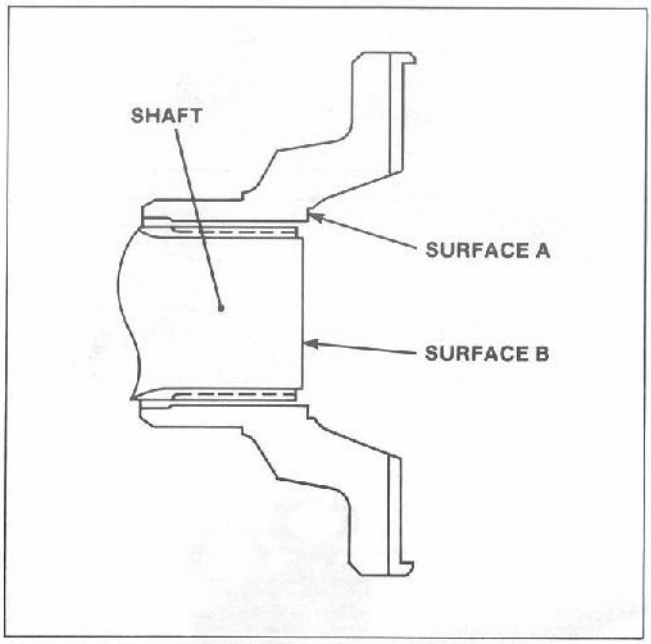


Figure 3:

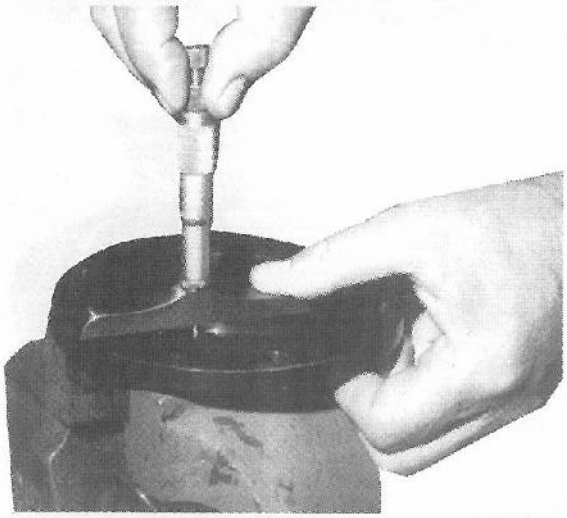


Figure 4:

7. Stand the unit in an upright position and install the input yoke.

   To seat the input yoke, install the retainer washer and capscrew **without** the O-ring or shims. Tighten the capscrew 130 ± 10 ft lb (176 ± 14 N.m).

8. Remove the capscrew and retainer washer.

   Measure the distance (gap) between the surface "A" on the yoke where the retainer washer seats and the end of the clutch shaft "B".

   Establish a shim pack to provide .004 inch gap between surface "A" and surface "B".

   Install the selected shim pack and O-ring, retainer washer and capscrew. Torque the capscrew to 130 ± 10 ft lb (176 ± 14 N.m).

9. Install the front output yoke. To seat the yoke, install the retainer washer and capscrew without the O-ring and shims. Torque the capscrew to 130 ± 10 ft lb (176 ± 14 N.m).

   Remove the capscrew and retainer washer.

   Repeat the same procedure used on the upper input yoke to establish .004 inch gap between the yoke retainer, washer seat and shaft end prior to installing the O-ring, shim pack, retainer washer and capscrew.

10. Turn the unit over so that the rearside is up. Measure and record the pilot length of the special bearing adjustment fixture No. 5371.

11. Measure and record the pilot length of the upper (input) 7-inch clutch oil supply cover.

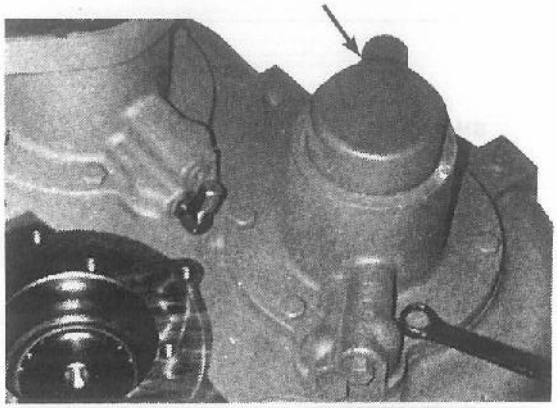


Figure 5:

12. Install the upper 7-inch clutch oil supply cover gasket over the shaft, and install the special bearing adjustment fixture with six hex-head capscrews. Torque the capscrews to 27 ± 2 ft lb (37 ± 3 N.m).
13. Check the end play of the shaft as follows:

    a) Apply a 200 lb downward (forward) pressure to the end of the clutch shaft and rotate it back and forth several times to seat the front bearing and outer race.

    b) With pressure still applied, install a dial indicator so that the base is on a machined surface and the indicator finger is on the bearing outer race.

    c) Zero the dial indicator and mark the spot with a felt ink marker where the dial indicator finger is resting.

    d) Use a hoist and fish scale to apply 275 lb upward (rearward) pressure. Use shaft adaptor No. 5385.

    e) Being careful not to bump the dial indicator, rotate the shaft each direction several times. Stop with the dial indicator finger on the mark previously made. The indicator reading will be the shaft end play.

    f) Add or remove shims to adjust the shaft end play to .006 to .008 inch (0.15 - 0.20 mm).

    g) Repeat steps a through f after the shims have been installed and the capscrews are torqued to be sure end play is within .006 - .008 inch (0.15 - 0.20 mm). Remove the bearing adjustment fixture.

    h) Adjust the shim pack to compensate for any difference between the pilot length of the bearing adjustment fixture and the oil supply cover recorded previously.

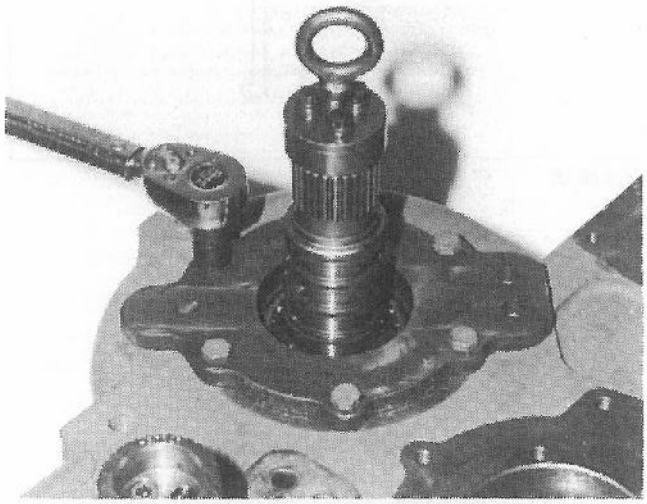


Figure 6:

Figure 7:

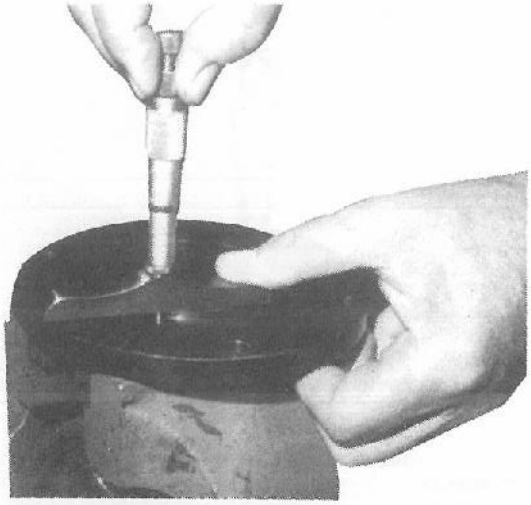


Figure 8:

14. Install the four teflon sealing rings into the grooves in the end of the clutch shaft with the gasket and shims as determined above in place, install the oil supply cover. Secure the cover with six hex-head capscrews. Torque the capscrews 27 ± 2 ft lb (37 ± 3 N.m).

15. Using the same bearing adjustment fixture (No. 5371) as used on the upper 7-inch shaft, measure and record the pilot length of the bearing adjusting fixture.

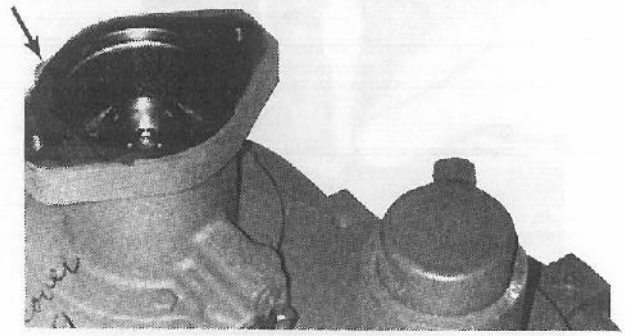


Figure 9:

16. Measure and record the pilot length of the lower 7-inch clutch shaft oil supply cover.

17. Install the gasket over the lower 7-inch clutch shaft, install the bearing adjustment fixture tool No. 5371. Secure with six hex-head capscrews. Torque the capscrews to 27 ± 2 ft lb (37 ± 3 N.m).

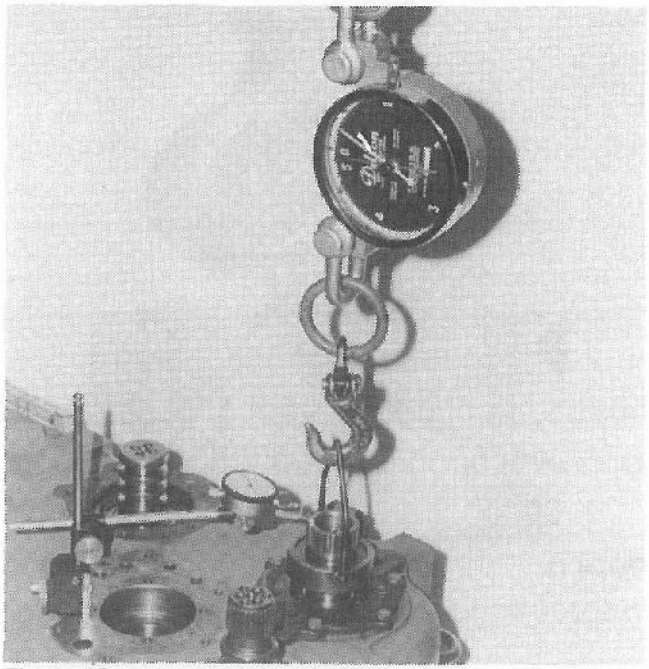


Figure 10:

18. Repeat the procedure outlined previously in steps 13 a through h for the upper 7-inch clutch shaft.

    Use the lifting bail No. 5390 shown to lift the shaft.

19. Remove the bearing adjustment fixture No. 5371 and adjust the shim pack to compensate for any difference in the pilot length between the fixture and oil supply cover.

20. Install the four teflon step seals into the grooves in the clutch shaft. With the gasket and shims as determined above in place, install the oil supply cover. Secure with six hex-head capscrews. Torque capscrews to 27 ± 2 ft lb (37 ± 3 N.m).

21. Measure and record the pilot length of the compound shaft bearing adjustment fixture tool No. 5369.

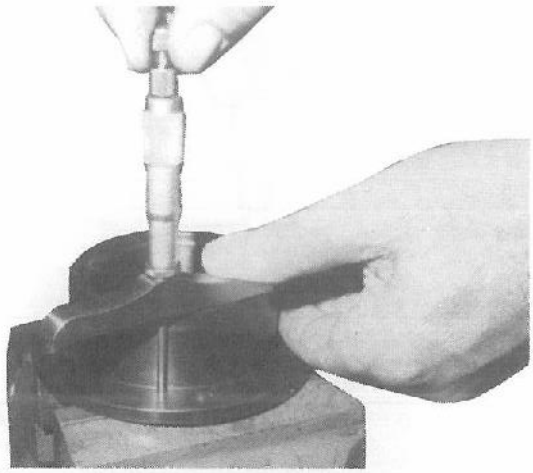


Figure 11:

22. Measure and record the pilot length of the compound shaft bearing retainer. Calculate the difference between the fixture and the bearing retainer.

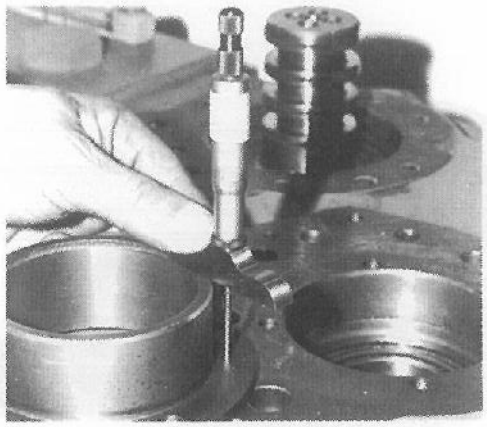


Figure 12:

23. Install the bearing adjustment fixture No. 5369 over the compound shaft and secure with four hex-head capscrews. Torque the capscrews to 38 ± 3 ft lb (52 ± 4 N.m).

    Repeat steps 13 a through 13 h described earlier on the upper 7-inch clutch. Use eyebolt to lift the compound shaft.

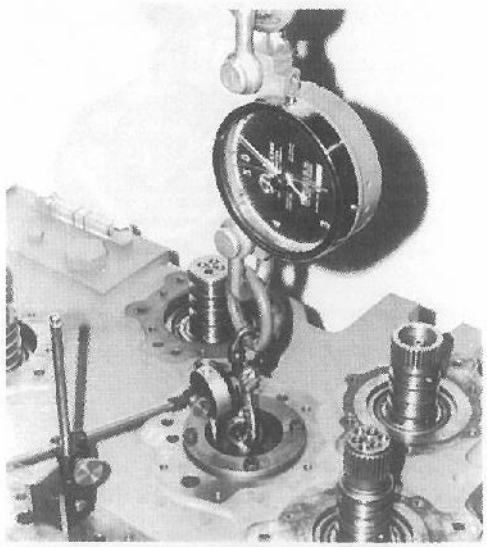


Figure 13:

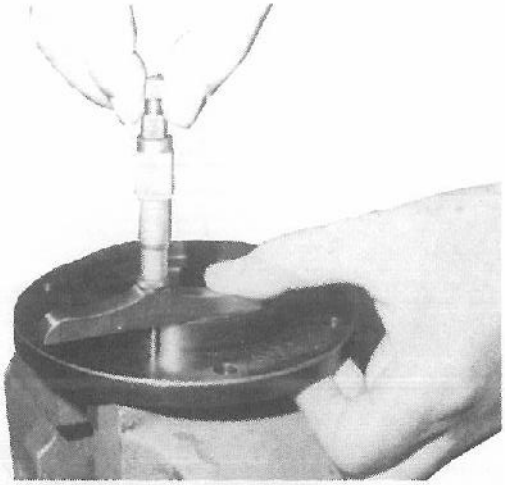


Figure 14:

24. With the correct shim pack as determined above in place, install the compound shaft bearing retainer. Secure with four hex-head capscrews. Torque the capscrews 38 ± 3 ft lb (52 ± 4 N.m).

25. Measure and record the pilot length of special bearing adjustment fixture No. 5372 for the 9-inch clutch shaft.

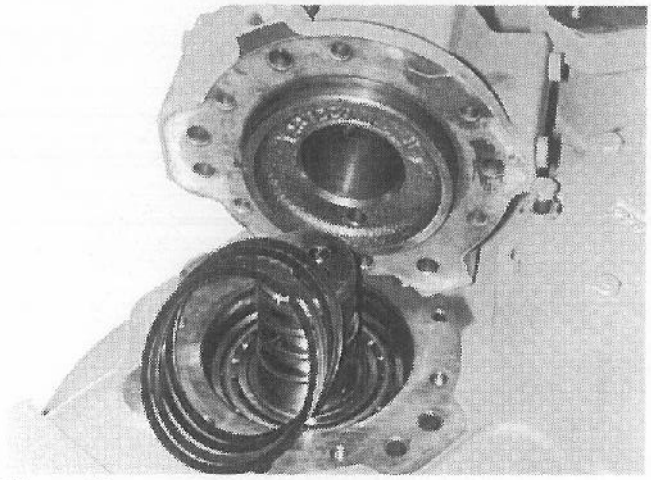


Figure 15:

26. Measure and record the pilot length of the master clutch collector. Calculate the difference in length between the two measurements.

27. Install the collector gasket and bearing adjustment fixture tool No. 5372 over the 9-inch (master) clutch shaft. Secure with six hex-head capscrews torque the capscrews to 27 ± 2 ft lb (37 ± 3 N.m).

    Repeat steps 13a through 13h as described earlier for the upper 7-inch clutch to determine the correct bearing clearance.

28. Remove the bearing adjustment fixture and adjust the shim pack to compensate for the difference between the pilot length of the bearing fixture and the master clutch collector.

    Install the four teflon step sealing rings into the grooves in the shaft. With shim pack and gasket as previously determined above in place, install the master clutch collector. Secure the collector with six capscrews. Torque the capscrews to 27 ± 2 ft lb (37 ± 3 N.m).

29. Measure and record the pilot length of special bearing adjustment fixture No. 5370.

30. Measure and record the pilot length of the 8-inch clutch bearing retainer.

31. Install the bearing retainer gasket and special bearing adjustment fixture No. 5370 over the 8-inch clutch shaft (output). Secure the fixture with six hex-head capscrews. Torque the capscrews to 27 ± 2 ft lb (37 ± 3 N.m).

32. Repeat steps 13a through 13h described earlier for the upper 7-inch clutch to determine the correct bearing clearance.

33. Remove the special bearing adjustment fixture.

    Adjust the shim pack to compensate for the difference between the pilot lengths of the special bearing adjustment fixture and the bearing retainer.

34. Install the four teflon step sealing rings into the grooves on the end of the output shaft.

35. Install the oil seal into the bore of the bearing retainer with the lip toward the oil being retained.

36. With the retainer gasket and shim pack as determined previously in place, install the bearing retainer. Secure with capscrews. Torque the capscrews to 27 ± 2 ft lb (37 ± 3 N.m).

37. Install the output yoke onto the rear of the 8-inch clutch shaft.

38. To seat the output yoke, install the retainer washer without the O-ring or shims. Secure the washer with three hex-head capscrews. Torque the capscrews 27 ± 2 ft lb (37 ± 3 N.m).

39. Remove the output yoke retainer capscrews and retainer washer. Measure the distance from the surface on the yoke where the retainer washer seats to the end of the clutch shaft.

    Determine a shim pack that will provide .004 - .010 inch gap (clearance).

40. Install the output yoke O-ring, shim pack, retainer washer and capscrews. Torque the capscrews to 27 ± 2 ft lbs (37 ± 3 N.m).

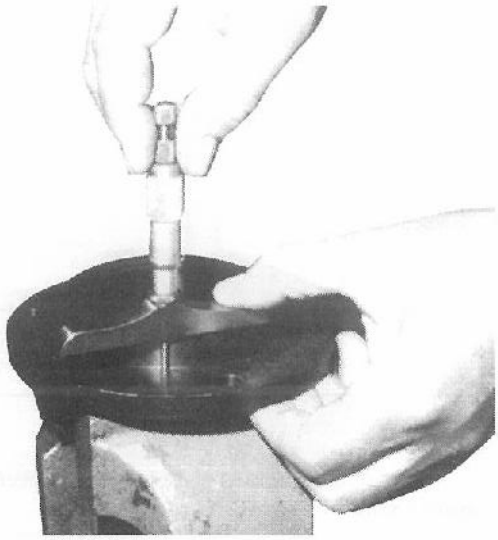


Figure 16:

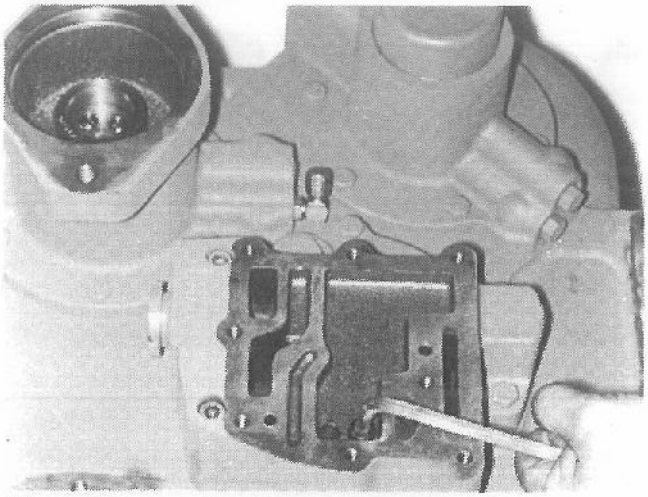


Figure 17:

41. Line up a gear tooth of the output yoke with the center lines of the hole that the magnetic pickup threads into. Screw the magnetic speed pickup in until it just contacts the yoke gear tooth. Back the pickup out 1/2 turn and hold in this position while tightening the lock nut.

42. Install the regulator valve ditch plate gasket and ditch plate. Secure with three socket-head capscrews. Torque the capscrews 38 ± 3 ft lb (52 ± 4 N.m).

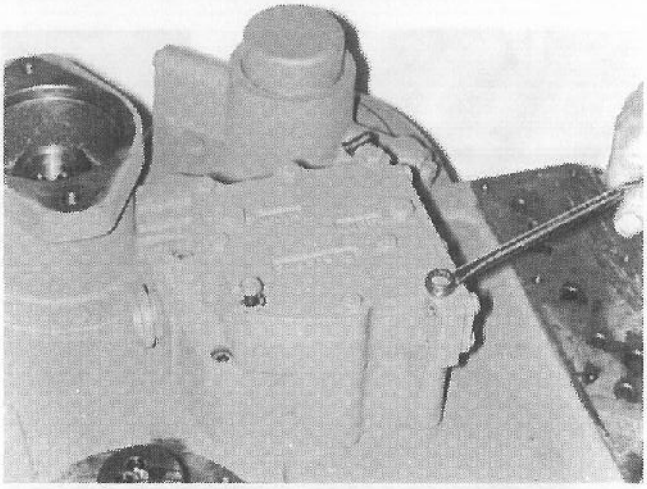


Figure 18:

43. Install the regulator valve body gasket and valve body. Secure with eight capscrews. Torque the capscrews to 27 ± 2 ft lb (37 ± 3 N.m).

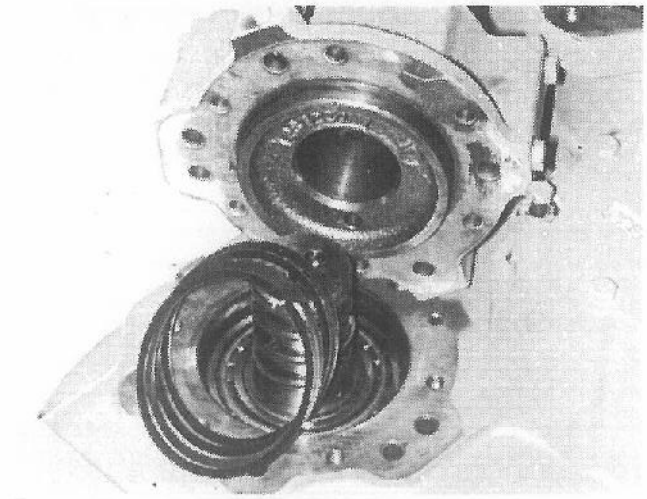


Figure 19:

44. Install the master clutch control valve body gasket and control valve assembly. Secure with four hex-head capscrews. Torque the capscrews to 27 ± 2 ft lb (37 ± 3 N.m).

45. Install the range selector valve body gasket and range selector valve assembly. Install solenoid junction box. Secure the valve body and junction box with ten hex-head capscrews and three washers. The three washers go on each end and in the middle of the junction box. Torque all capscrews to 22 ± 2 ft lb (30 ± 3 N.m).

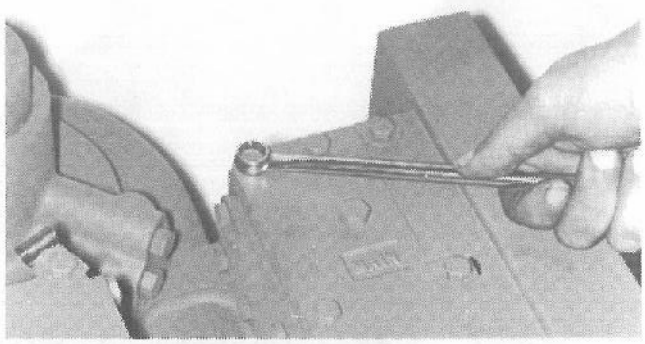


Figure 20:

46. Install the hydraulic pump coupling and pump adaptor.

47. Install the pump gasket and pump assembly. Secure the pump with two capscrews. Torque the capscrews 65 ± 5 ft lb (88 ± 7 N.m).

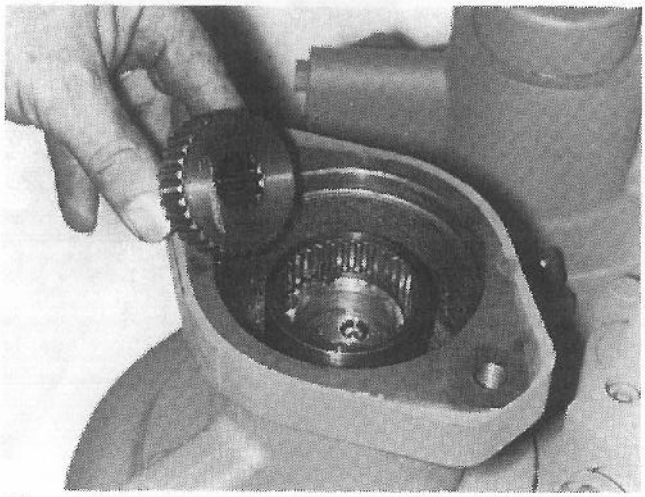


Figure 21:

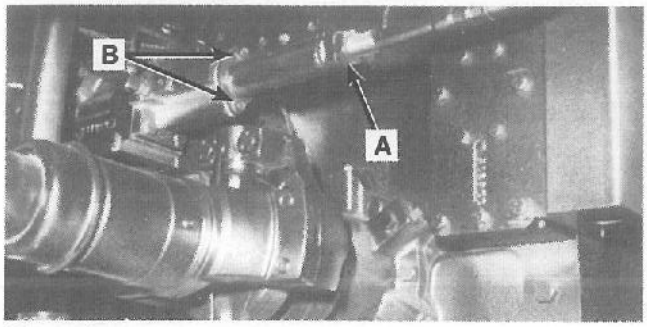


Figure 1:

Master Clutch Adjustment

To obtain correct master clutch feathering on the Panther 1000 series tractors requires that the cable arrangement between the clutch pedal and the transmission master clutch control valve be accurately adjusted. Master clutch cable adjustment is performed with the engine shut down and the park brake applied and will also require an assistant in the cab to "hand" operate and "feel" the clutch pedal travel. Use the following procedure for master clutch adjustment.

1. At the master clutch control valve located at the rear of the transmission, loosen and back off the cable housing lock nut "A". Loosen, do not remove the two cable housing retaining capscrews "B" (Fig. 1).

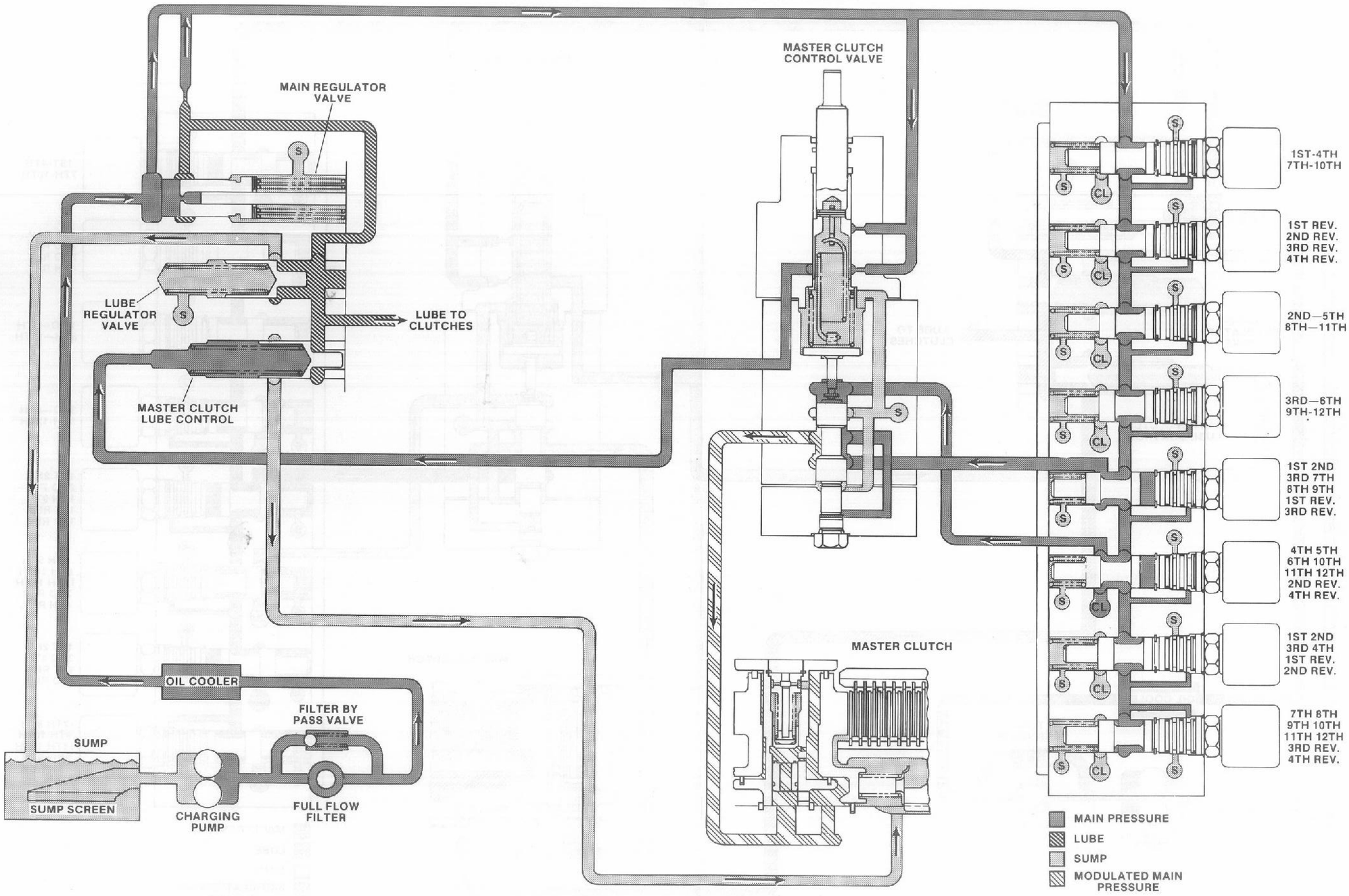
2. With an assistant in the cab pushing the pedal down, loosen the cable housing at transmission end until assistant feels the clutch pedal contact bottom of travel rubber stop.

3. Tighten cable housing until assistant feels clutch pedal come "off" of bottom of travel rubber stop.

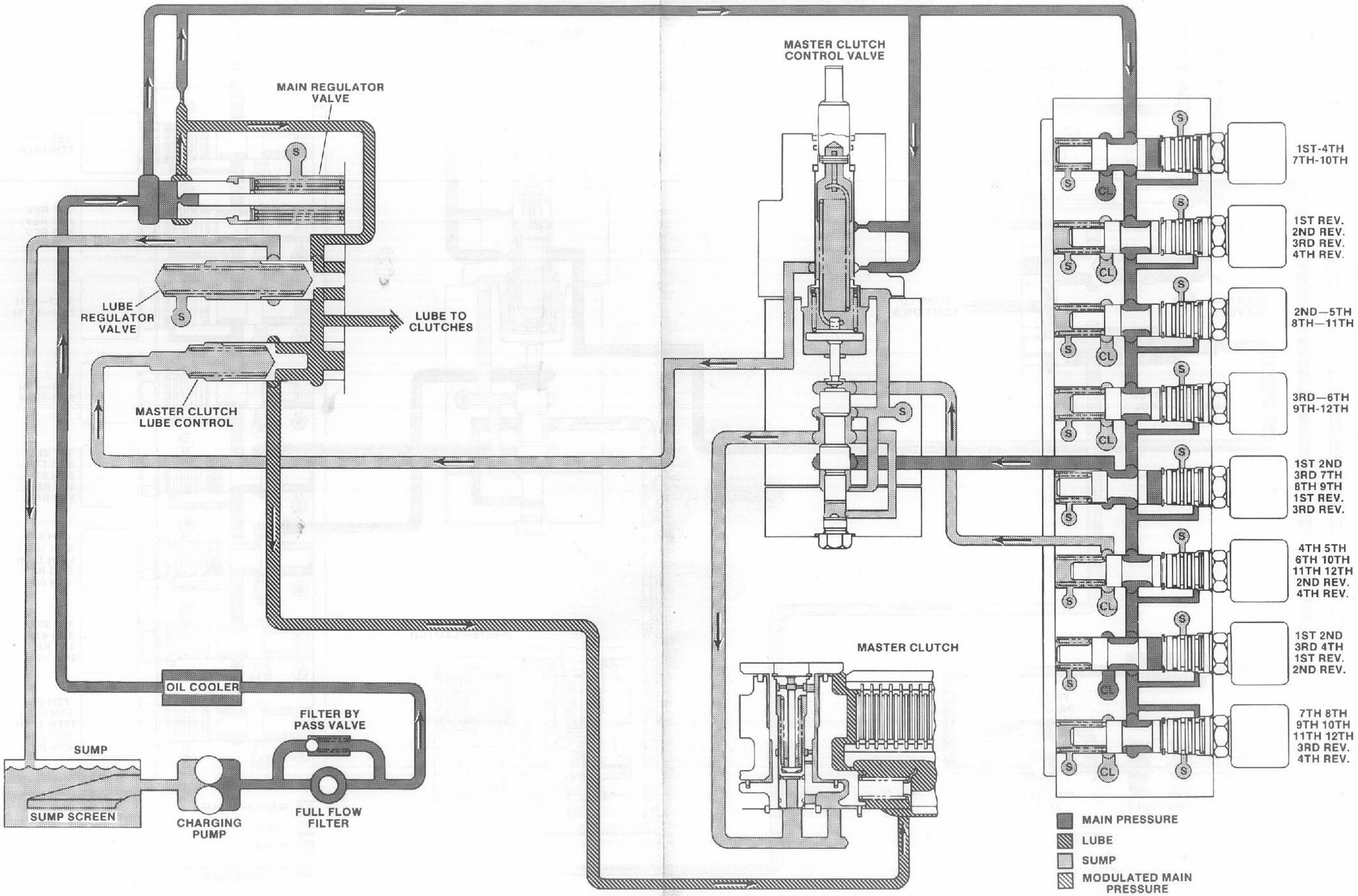
4. Loosen the cable housing again, slowly, until assistant **just** feels pedal make contact with the bottom of travel rubber stop.

5. Continue to **loosen** cable housing one additional full turn from point of contact with bottom of travel rubber stop. Install cable housing retaining capscrews and lock housing in place.

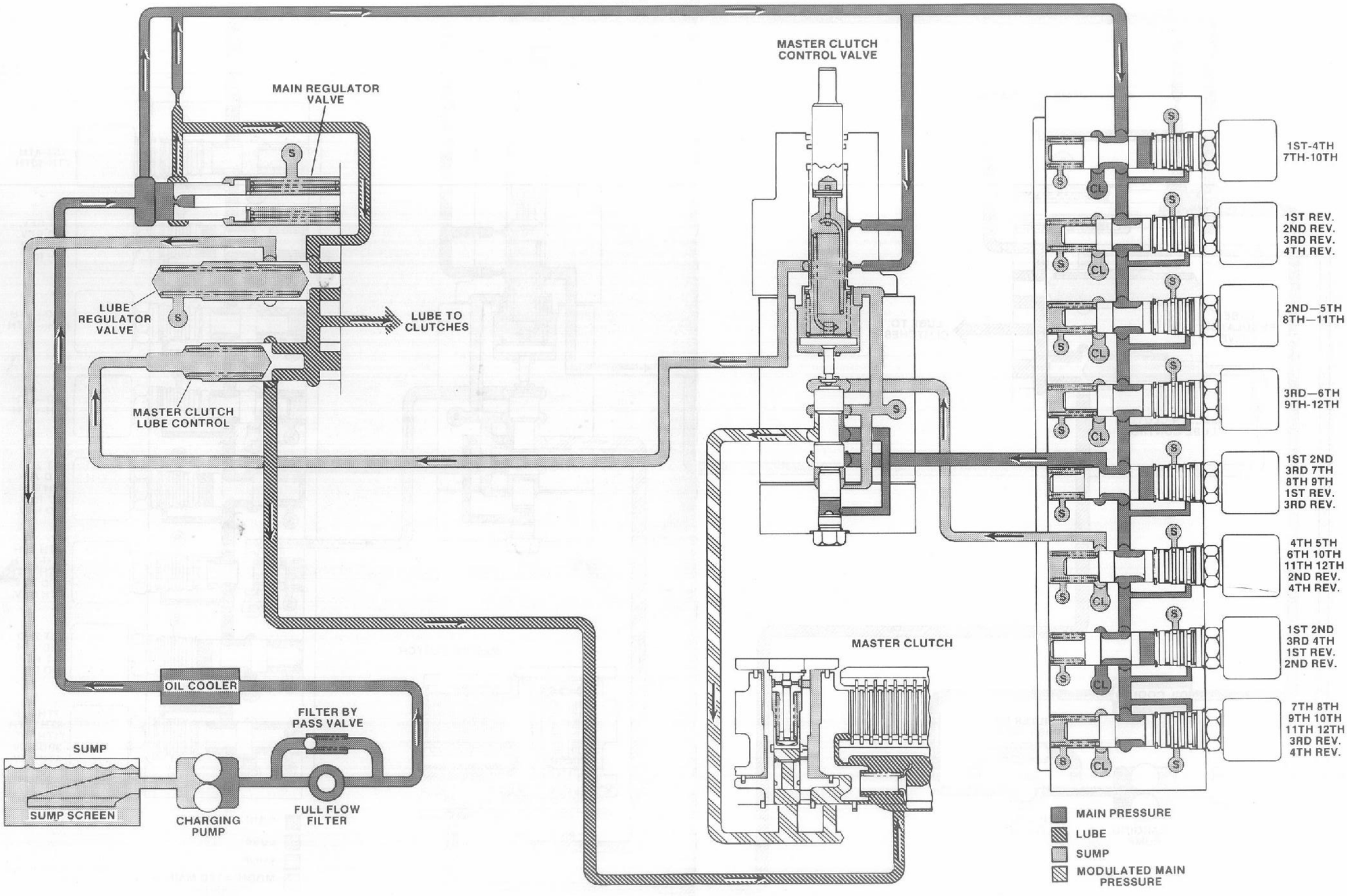
Hydraulic Schematic-Selector Neutral, Master Clutch Foot Pedal Released, Engine Operating, Hydraulic Pressure Normal



Hydraulic Schematic-Selector 1st Range Forward, Master Clutch Foot Pedal Depressed



Hydraulic Schematic-Selector 1st Range Forward, Master Clutch Being Modulated



Hydraulic Schematic-Selector 1st Range Reverse
Master Clutch Being Modulated