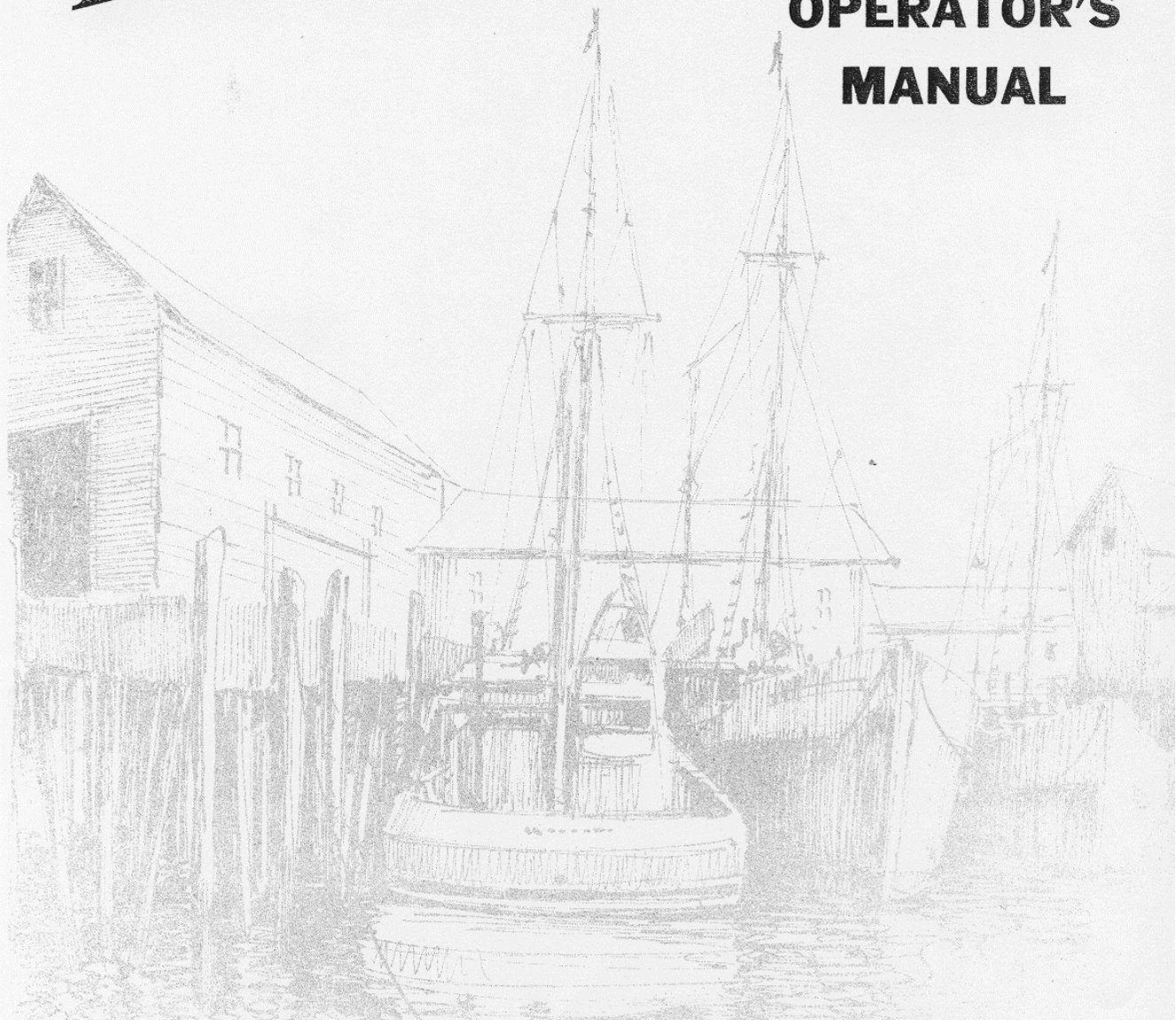


Paragon[®]

OPERATOR'S MANUAL



HYDRAULIC TRANSMISSIONS

Models P 200, P 300, P 400

PARAGON GEAR WORKS INC., TAUNTON, MASS., U.S.A.

OPERATOR'S MANUAL

FOR

PARAGON

MODELS P200 - P300 - P400

HYDRAULIC TRANSMISSIONS

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I. SPECIFICATIONS

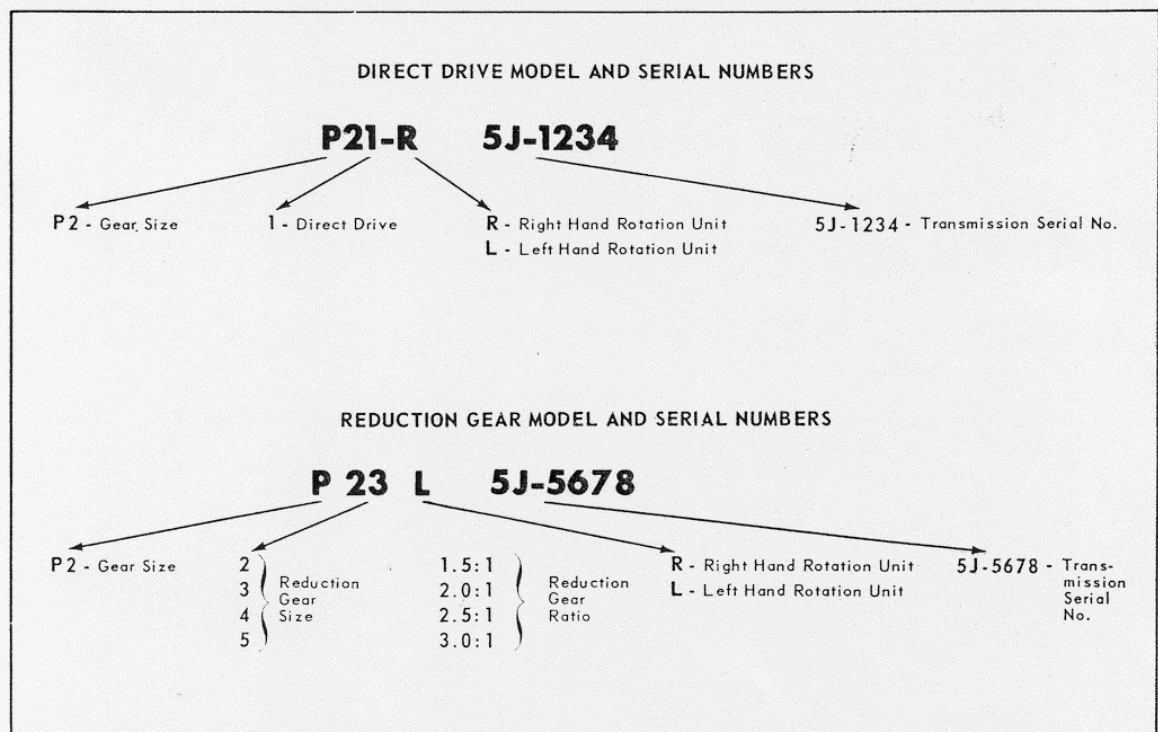
A. Description Chart

MODEL			REDUCTION RATIO	DIRECTION OF ROTATION
P200	P300	P400		
P21R	P31R	P41R	DIRECT	RIGHT
P21L	P31L	P41L	DIRECT	LEFT
P22R	P32R	P42R	1. 5:1	RIGHT
P22L	P32L	P42L	1. 5:1	LEFT
P23R	P33R	P43R	2. 0:1	RIGHT
P23L	P33L	P43L	2. 0:1	LEFT
P24R	P34R	P44R	2. 5:1	RIGHT
P24L	P34L	P44L	2. 5:1	LEFT
P25R	P35R	P45R	3. 0:1	RIGHT
P25L	P35L	P45L	3. 0:1	LEFT

B. Model and Serial Numbers

Each reverse gear has a model number and a serial number. These numbers are on the name plate, located on the housing of the transmission.

MODEL AND SERIAL NUMBER CHART



II. INTRODUCTION

The Models P200, P300 and P400 hydraulic transmissions have been designed for smooth operation and dependability in marine use. The transmission is self-contained, having an oil pressure system and oil supply completely separated from engine lubricating oil systems.

Transmission oil under pressure is used to engage a forward or reverse drive. The forward

drive is through a multiple disc clutch arrangement, while the reverse drive utilizes a reverse clamp band and planetary gear train. The transmission oil is circulated and cooled through a separate external oil cooler core, which is in turn cooled by the engine water. Paragon transmissions are furnished with either direct drive or reduction gears. Gear reduction ratios and corresponding model identification numbers are listed in Section I, under "SPECIFICATIONS".

III. INSTALLATION

A. The installation instructions below are for use when the original transmission has been removed for servicing and must be re-installed, or when the transmission unit is to be adapted as non-original equipment to a marine engine.

B. It is important that the engine and transmission rotations are matched. The direction of rotation of an engine is defined in this manual as the direction of rotation of the engine crankshaft as viewed from the output end of the transmission. A clockwise rotation of the engine is a right hand rotation and a counterclockwise rotation of the engine is a left hand rotation.

A letter "R" or "L" appearing on the transmission serial number plate illustrated in Section I, "SPECIFICATIONS", indicates whether the transmission is for use with a right or left hand rotating engine.

C. The hydraulic transmission is attached to the engine in the following manner:

1. Insert two 3-1/2" studs in opposite transmission mounting holes in the engine adapter plate.
2. Place the transmission against the studs so that the studs go through two of the matching holes in the transmission housing flange.
3. Slide the transmission along the studs toward the engine so that the spline on the shaft at the front of the transmission enters the matching splined hole in the engine vibration dampener.

4. Install and tighten four bolts with lockwashers through the transmission housing flange into the engine adapter plate. Remove the 3-1/2" studs. Install and tighten the two remaining bolts with lockwashers through the transmission housing flange.

D. The transmission and propeller shaft coupling must be carefully aligned before the propeller shaft is connected to the transmission, in order to avoid vibration and consequent damage to the transmission, engine, and boat hull during operation. To align the coupling, move the propeller shaft, with attached coupling flange, toward the transmission so that the faces of the propeller shaft coupling flange and transmission shaft coupling flange are in contact. The coupling flange faces should be in contact throughout their entire circumference. The total runout or gap between the faces should not exceed .002" at any point. If the runout exceeds .002", reposition the engine and attached transmission by loosening the engine support bolts and adding or removing shims to raise or lower either end of the engine. If necessary, move the engine sideways to adjust the runout or to align the coupling flange faces laterally. Tighten the engine support bolts and recheck the alignment of the coupling before bolting the coupling flanges together. Connect the coupling flanges with bolts, lockwashers, and nuts.

E. Connect the oil cooler lines to the transmission.

F. Connect the shift control cable from the cockpit control station to the transmission control valve lever, shown in Figure on page 5. Place the transmission control valve lever in the neutral position and

adjust the shaft control cable length until the cockpit control station hand lever is in the neutral position. Move the cockpit control hand lever to forward and reverse positions several times while observing the transmission control valve lever motion. The transmission control valve lever should move fully into forward or reverse position when the hand lever is moved into forward

or reverse position, and should return exactly to the neutral position when the hand lever is in the neutral position.

- G. Remove the oil dipstick, shown in Figure on page 5, and fill the transmission with Type A transmission fluid to the mark on the dipstick. Replace the dipstick in the transmission housing.

IV. OPERATION

Principle of Operation

The transmission forward and reverse drives are operated by transmission oil under pressure. An internal gear type oil pump delivers the transmission oil, under pressure, to the external oil cooler. The transmission oil is returned, still under pressure, to the oil distribution tube and relief valve. The relief valve maintains the oil pressure by remaining closed until the oil pressure reaches 60 PSI. When the control lever is shifted to the forward position, oil under pressure is delivered to the multiple disc clutch piston, which moves to clamp the clutch discs and planetary reverse gear case together. The discs and case then revolve as a solid coupling in the direction of engine rotation. The reverse drive is engaged by shifting the control lever to the reverse position, so that oil under pressure is delivered to the reverse piston. The reverse piston moves to clamp the reverse band around the planetary gear case, preventing the planetary gear case from moving but allowing the planetary gears to revolve to drive the output or propeller shaft in a direction opposite to the rotation of the engine. With the control lever in the neutral position, pressurized oil is prevented from entering the clutch piston or reverse band piston and the propeller shaft remains stationary.

Starting Procedure

1. Always start the engine with the transmission in NEUTRAL to avoid moving the boat suddenly forward or back.
2. When the engine is first started, allow it to idle for a few moments. Stop the engine and check the transmission oil level. Add oil if necessary to bring the oil level up to the mark on the transmission dipstick.

NOTE

ON SUBSEQUENT START-UPS, THE TRANSMISSION OIL LEVEL MAY BE CHECKED BEFORE RUNNING THE ENGINE, WHEN ENGINE OIL IS CHECKED.

3. Start the engine again, with the transmission in NEUTRAL, and allow the engine to warm up to operating temperature.
4. Shift the transmission into FORWARD or REVERSE as desired. If the engine should stall when the transmission is shifted to FORWARD or REVERSE, place the transmission in NEUTRAL before restarting the engine.

It is recommended that shifting be done at speeds below 1000 RPM, and preferably in the 800 RPM, or idle engine range, to prolong the life of the engine, transmission, and boat. EMERGENCY shifts may be at higher engine speeds, but this is not a recommended practice.

V. MAINTENANCE

A. Lubrication

The Models P200, P300 and P400 transmissions are self-contained units, independent of the engine lubricating systems. The units are lubricated by pressure and by splash from its own oil. The type of oil recommended is "Transmission Fluid, Type A", commonly used for automatic transmissions in automobiles.

The quantity of oil depends upon the angle of installation, as well as the reduction model. The level must be maintained at the mark on the dipstick and should be checked periodically to ensure satisfactory operation.

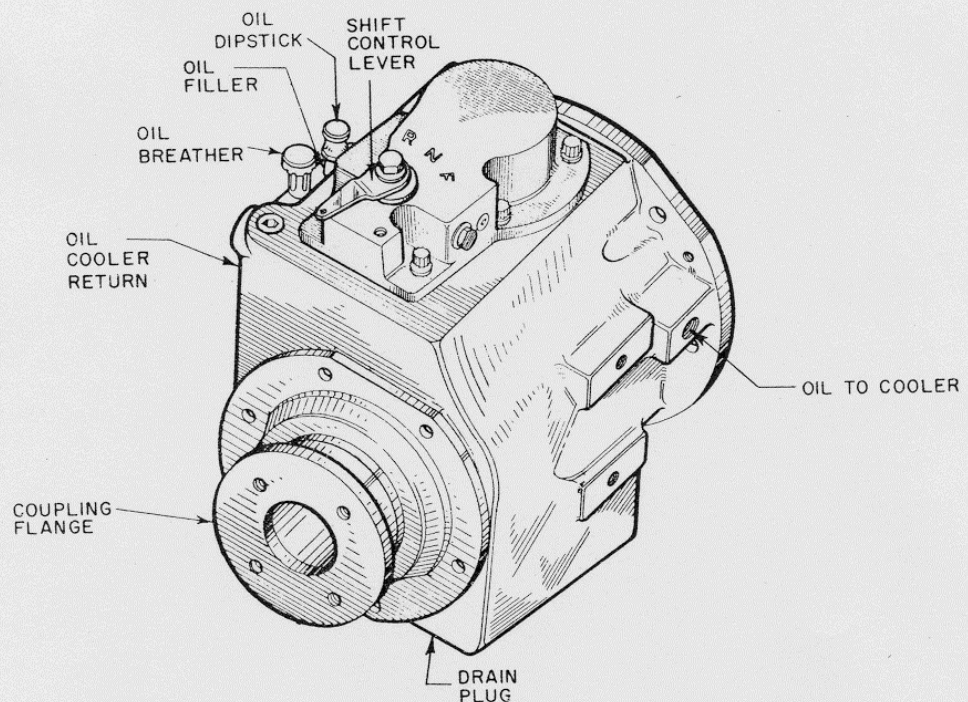
When filling for the first time or refilling after an oil change, check the level after running for a few minutes to make certain that the oil cooler and the various passages

are full. If necessary, refill to the mark on the dipstick to ensure proper operation of the transmission. The transmission oil level should be checked each time the engine oil level is checked, before running the engine.

The oil in the transmission should be changed every 100 hours, or each season under normal conditions. However, the number of hours that can be run between oil changes varies with the operating conditions. Drain plugs are located at the bottom of the reverse gear housing and the reduction gear housing.

B. Adjustments

No adjustment is necessary for the FORWARD drive multiple disc clutches, and the reverse band is self adjusting to compensate for lining wear, so that no external reverse band adjustment is necessary.



PARAGON TRANSMISSION

C. Trouble Shooting Chart

PROBLEM	POSSIBLE CAUSES AND METHODS OF CORRECTION
GEAR INOPERATIVE Drive Shaft does not operate with selector valve in forward or reverse.	1. Low Oil Pressure. a. Low oil supply. Add oil, refer to lubrication. b. Faulty oil gauge. Replace gauge. Oil gauge slow to register, air or obstruction in oil gauge line. Clean and bleed oil gauge line. c. Plugged oil lines or passages. Clean lines or passages. d. Oil pressure relief valve scored and sticking. Remove relief valve. Clean valve and valve bore in control valve housing with crocus cloth to free valve, or replace. e. Defective pistons and oil distributor seal rings. Replace seal rings. f. Defective oil pump. Check for wear, and replace if necessary. 2. High Oil Temperature a. Low oil supply. Add oil, refer to lubrication. b. Low water level in cooling system. Add water, and check for leaks. c. Plugged raw water inlet screen. Clean screen. d. Collapsed or disintegrated water inlet hose. Replace hose. e. Air leak in cooling water suction line. Replace suction line. f. Raw water pump impeller worn or damaged. Replace impeller. g. Clogged or dirty oil cooler element. Remove and clean 3. Reverse Band not engaging Planetary Gear Cage. a. Reverse band lining worn out. Replace lining. b. Defective reverse piston "O" ring. Replace "O" ring. 4. Failure of Planetary Assembly. Remove gear case assembly, and check for defective or damaged parts. Replace defective or damaged parts. 5. Failure of Reduction Gear. Remove reduction gear assembly and check for defective or damaged parts. Replace defective or damaged parts.

PROBLEM	POSSIBLE CAUSES AND METHODS OF CORRECTION	
GEAR DRAGGING Drive Shaft rotates either forward or reverse with Selector Valve in neutral position.	1. Defective forward Clutch Plates. 2. Defective forward Clutch Piston Release Spring. 3. Binding in Planetary Assembly.	Forward clutch plates warped and sticking. Remove clutch plates and replace. Forward clutch piston release spring broken or weak. Replace spring. a. Bearings and gears worn excessively in gear case. Replace necessary parts. b. Input shaft bearings worn excessively, causing misalignment of input shaft. Replace necessary parts.
GEAR SLIPPING OR SLOW TO ENGAGE With Selector Valve in forward or reverse position.	1. Low Oil Pressure. 2. Worn forward Clutch Plates. 3. Reverse Band not engaging Gear Case.	See "Gear Inoperative," (1). Remove forward clutch plates and check for wear excessively, replace clutch plates. See "Gear Inoperative", (3).
INTERNAL AND EXTERNAL LEAKS	1. Water in Lubricating Oil. 2. Excessive Oil in Engine Crankcase or Flywheel Housing. 3. Oil on Exterior of Marine Gear. 4. Loss of Oil from Transmission.	a. Hole in oil cooler element permitting water to seep into oil compartment. Replace oil cooler element. b. Oil cooler gaskets. Check gaskets and replace. Defective front end plate oil seal. Replace oil seal. a. Oil seeping from breather. Check for too high oil level. b. Defective rear end oil seal. Replace oil seal. a. Check for defective gaskets and seal.

VI. PARTS

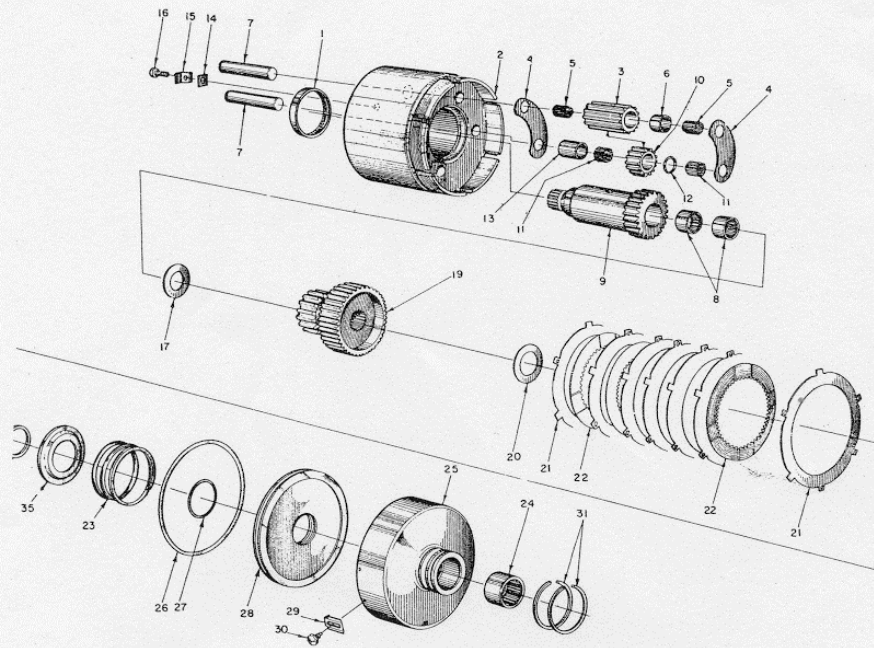
Each part illustrated in the exploded views has a key number and an arrow pointing from the key number to the part. Refer to the key number in the parts list to determine the part number and name.

ALWAYS GIVE THE PART NUMBER, PART NAME, TRANSMISSION MODEL NUMBER, AND TRANSMISSION SERIAL NUMBER WHEN ORDERING PARTS.

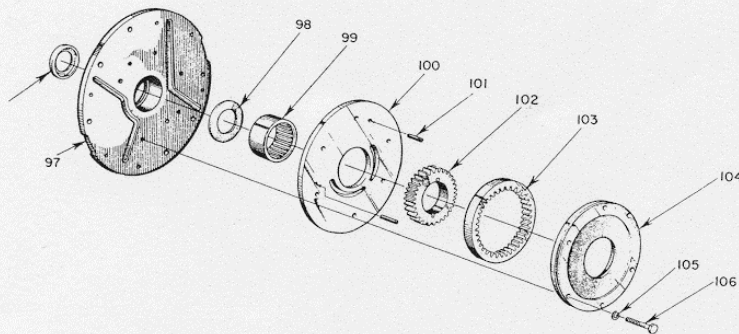
PARTS LIST

Key No.	Description	Key No.	Description
1	Gear Case - Needle Bearing	67	Hold Down Spring
2	Gear Case	68	Socket Head Pipe Plug
3	Long Pinion	69	Pipe Plug
4	Pinion Thrust Pad	70	Control Lever Pin
5	Roller Bearing	71	Capscrew
6	Long Pinion Bearing Spacer	72	Lockwasher
7	Pinion Shaft	73	Plain Washer
8	Engine Gear - Roller Bearing	74	Control Lever
9	Engine Gear	75	Control Lever Bushing
10	Short Pinion	76	Control Lever Pawl
11	Roller Bearing	77	Control Valve "O" Ring
12	Short Pinion Bearing Spacer	78	Control Valve
13	Short Pinion Spacer	79	Control Valve Retaining Ring
14	Pinion Shaft Locking Tab	80	Cover
15	Case Clip	81	Reverse Piston "O" Ring
16	Capscrew	82	Reverse Piston and Shaft Assembly
17	Engine Gear Thrust Washer	83	Piston Back Up Plate
18	Direct Drive Tailshaft	84	Reverse Piston Shaft Pin
19	Propeller Gear	85	Retaining Ring
20	Propeller Gear Thrust Washer	86	Reverse Band Roll Pin
21	Steel Clutch Plate	87	Reverse Band Lever
22	Bronze Clutch Plate	88	Reverse Band Roll
23	Screw Collar Spring	89	Piston Back-Up Plate "O" Ring
24	Screw Collar - Needle Bearing	90	Relief Valve Plug
25	Screw Collar	91	Relief Valve Spring
26	Forward Piston "O" Ring - Outer	92	Relief Valve Retaining Ring
27	Forward Piston "O" Ring - Inner	93	Relief Valve "O" Ring
28	Forward Piston	94	Relief Valve Pin
29	Clip - Screw Collar	95	Relief Valve Housing
30	Lockscrew	96	Front Plate Oil Seal
31	Oil Distributor Seal Rings	97	Front Plate
32	Tailshaft Thrust Washer	98	Front Plate Thrust Washer
33	Tailshaft Seal Washer	99	Roller Bearing
34	Woodruff Key	100	Pump Port Plate
35	Spring Retainer	101	Pump Housing Pin
36	Retaining Ring	102	Inner Pump Gear
37	Cover Gasket	103	Outer Pump Gear
38	Distributor Tube	104	Pump Housing
39	Tailshaft Needle Thrust Race	105	Lockwasher
40	Tailshaft Needle Thrust Bearing	106	Capscrew
41	Retaining Ring	107	Dipstick
42	Ball Bearing	108	Flat Head Socket Capscrew
43	Reduction Pinion Tailshaft	109	Breather
44	Reduction Adapter Plate	110	Pump Key
45	Adapter Plate Seal	111	Reverse Band
46	Capscrew	112	Pipe Plug
47	Gasket	113	Brass Washer
48	Crescent	114	Brake Band Support Screw
49	Plain Steel Washer	115	External Socket Head Cap Screw
50	Lockwasher	116	Detent Seal Washer
51	Capscrew	117	Detent Ball
52	Locknut	118	Capscrew
53	Lockwasher	119	Detent Spring
54	Capscrew	120	Lockwasher
55	Lockwasher	121	Capscrew
56	Ball Bearing	122	Reduction Gear Housing
57	Direct Drive Plate	123	Pipe Plug
58	Oil Seal	124	Oil Seal
59	Gear Half Coupling	125	Gear Half Coupling
60	Rear Gasket	126	Lockwasher
61	Housing	127	Locknut
62	Dipstick Tube	128	Internal Gear
63	Front Gasket	129	Bearing Assembly
64	Reverse Band Housing Pin	130	Retaining Ring
65	Baffle	131	"O" Ring
66	Flat Head Socket Capscrew	132	Suction Tube
		133	Washer

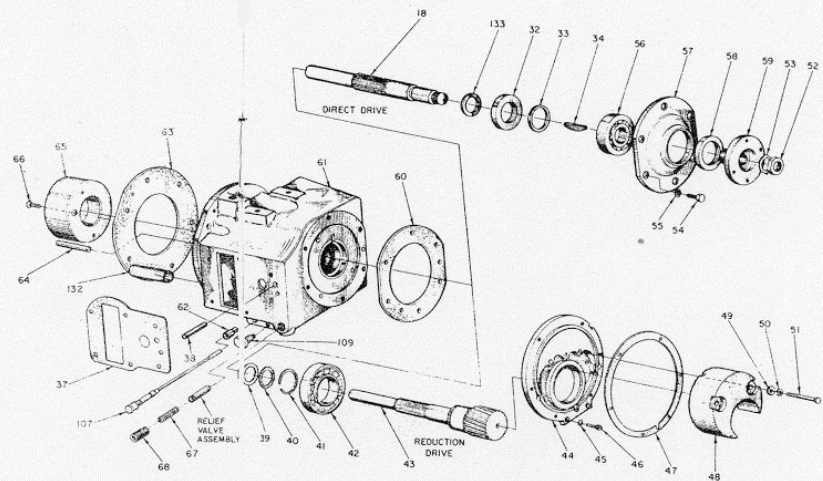
GEAR CASE ASSEMBLY



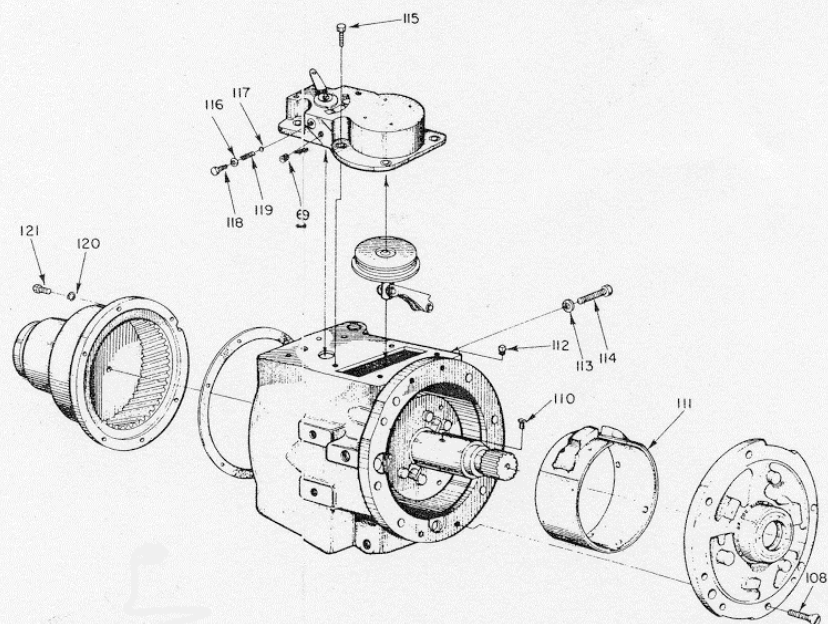
FRONT END PLATE AND PUMP ASSEMBLY



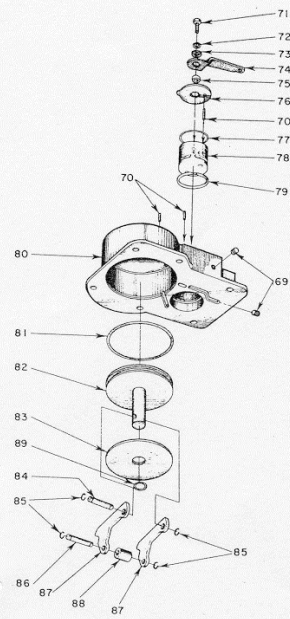
REVERSE GEAR HOUSING ASSEMBLY



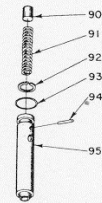
COMPLETE ASSEMBLY



COVER ASSEMBLY



RELIEF VALVE ASSEMBLY



REDUCTION GEAR ASSEMBLY

