

**310-0510/-0610/-0710**  
**Integrated Hydrostatic Transaxle**  
**Service and Repair Manual**

BLN-51260  
July, 2011

# Table of Contents

<b>Section</b>	<b>Page</b>
<b>Foreword</b> .....	<b>1</b>
<b>Section 1 Description and Operation</b> .....	<b>2</b>
Introduction .....	2
General Description.....	2
Hydraulic Schematic.....	3
External Features 310-0510 .....	4
Model Recognition .....	5
Technical Specifications .....	6
Product Identification.....	6
<b>Section 2 Safety</b> .....	<b>7</b>
Personal Safety.....	7
Tool Safety.....	7
Work Area Safety .....	7
Servicing Safety .....	7
<b>Section 3 Troubleshooting</b> .....	<b>8</b>
<b>Section 4 Service and Maintenance</b> .....	<b>9</b>
External Maintenance.....	9
Service and Maintenance Procedures .....	9
Fluids.....	9
Fluid Change.....	10
Purging Procedures.....	11
Return to Neutral Setting.....	12
Brake Maintenance .....	13
Friction Pack Adjustment.....	13
<b>Section 5 Repair</b> .....	<b>14</b>
How To Use This Section .....	14
General Instructions .....	14
Transaxle Removal .....	14
Limited Disassembly .....	14
Tools and Torques .....	15
Brake Assembly and Bypass Arm.....	16
Control Arm and Friction Pack.....	17
Seal Kit Replacement .....	18
Side Housing.....	19
Axle Shaft, Differential and Reduction Gears .....	20
Motor Shaft and Bypass Rod.....	21
Input Shaft .....	22
Hydraulic Components .....	23-26
Transaxle Installation .....	27
Assembly After a Complete Teardown.....	27
<b>Sealant Application</b> .....	<b>28</b>
<b>310-0610 &amp; 310-0710 IHT</b> .....	<b>29</b>
Description.....	29
Features.....	29
Transaxle Removal .....	29
<b>Parts List</b> .....	<b>30-35</b>
<b>Glossary of Terms</b> .....	<b>36-37</b>

Headquartered in Sullivan, Illinois, Hydro-Gear® is a world leader in the design, manufacture, and service of quality hydrostatic transaxles for the lawn and garden industry. The mission of our company is to be recognized by our customers and the industry as a world-class supplier and the quality leader in everything we do.

This Service and Repair Manual is designed to provide information useful in servicing and troubleshooting the Hydro-Gear 310-0510 Integrated Hydrostatic Transaxle (IHT). Troubleshooting for the 310-0510 is further illustrated in video BLN-51368 (NTSC).

Also included is a glossary of terms that are frequently used throughout the industry and in Hydro-Gear service publications. Understanding terminology is very important!

It is necessary, and good shop practice, that your service area be equipped with the proper tools and the mechanics be supplied with the latest information available. All repair procedures illustrated in this guide are suggested, but preferred methods of repair.

Repair procedures require that the transaxle unit be removed from the vehicle.

This is not a certification, test or study guide for a certification test. If a technician is interested in certification they should contact an agent representing OPEESA (Outdoor Power Equipment and Engine Service Association) at (860) 767-1770 or their Hydro-Gear Distributor. Many distributors will be hosting certification testing. These study guides will cover most of the products and manufacturers in our industry.

For more information about Hydro-Gear or our products, please contact your Central Service Distributor, or call our Customer Service Department at (217) 728-2581.

# SECTION 1. DESCRIPTION AND OPERATION

## INTRODUCTION

The purpose of this manual is to provide information useful in servicing the Hydro-Gear® Integrated Hydrostatic Transaxle (IHT). This manual includes the IHT's general description, hydraulic schematic, technical specifications, servicing and troubleshooting procedures.

The transaxle normally will not require servicing during the life of the vehicle in which it is installed. Should other servicing be required, the exterior of the transaxle will need to be thoroughly cleaned before beginning most procedures. Do not wash the transaxle while it is hot. Do not use a pressure washer to clean the unit.

## GENERAL DESCRIPTION

The 310-0510 is a self contained unit designed for the transfer and control of power. It provides an infinitely variable speed range between zero and maximum in both forward and reverse modes of operation.


This transaxle uses a variable displacement pump with a maximum displacement of 10cc per revolution, and motor with a fixed displacement of 10cc per revolution. The variable displacement pump features a trunnion mounted swashplate with a direct-proportional displacement control. Reversing the direction of the swashplate reverses the flow of oil from the

pump and thus reverses the direction of the motor output rotation. The pump and motor are of the axial piston design and utilize spherical nosed pistons which are held against a thrust race by internal compression springs.

The 310-0510 has a self contained fluid supply and an internal filter. The fluid is forced through the filter by a positive "head" on the fluid in the housing/expansion tank with an assist by the negative pressure created in the pump pistons as they operate.

The check valves in the center section are used to control the makeup flow of the fluid to the low pressure side of the loop.

A check ball lifting bypass is utilized in the 310-0510 to permit moving the vehicle for a short distance at a maximum of 2 m.p.h. (3.2 Km/h) without starting the engine.

 **WARNING**

**Actuating the bypass will result in the loss of hydrostatic braking capacity. The machine must be stationary on a level surface and in neutral when actuating the bypass.**

The 310-0510 utilizes an in-line floating disc brake controlled by a "cam" style actuating arm.

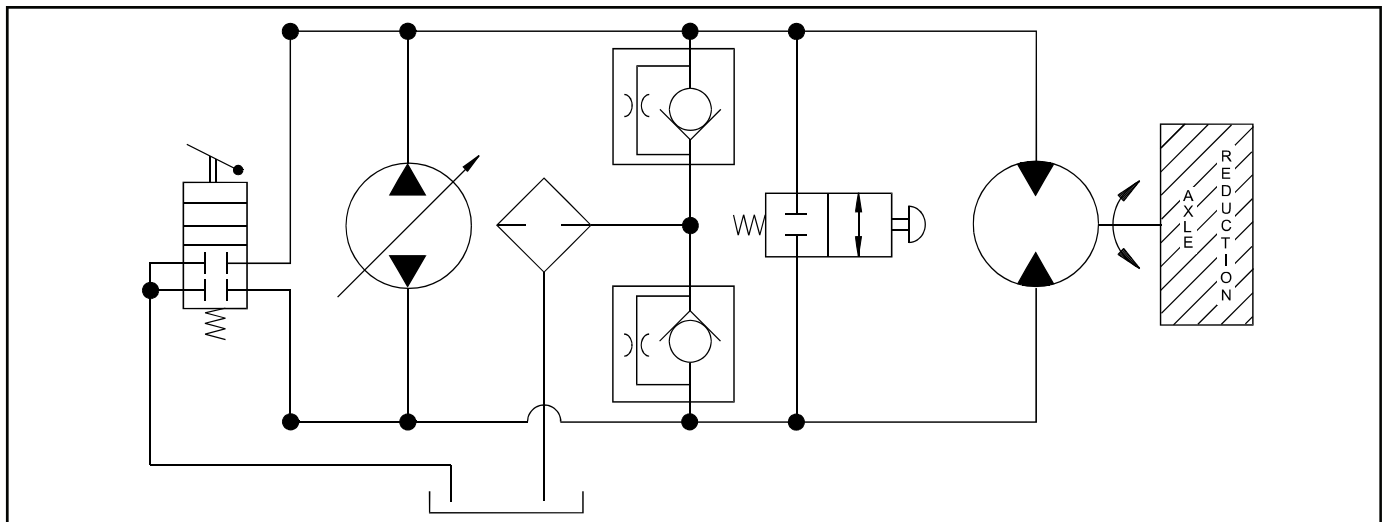
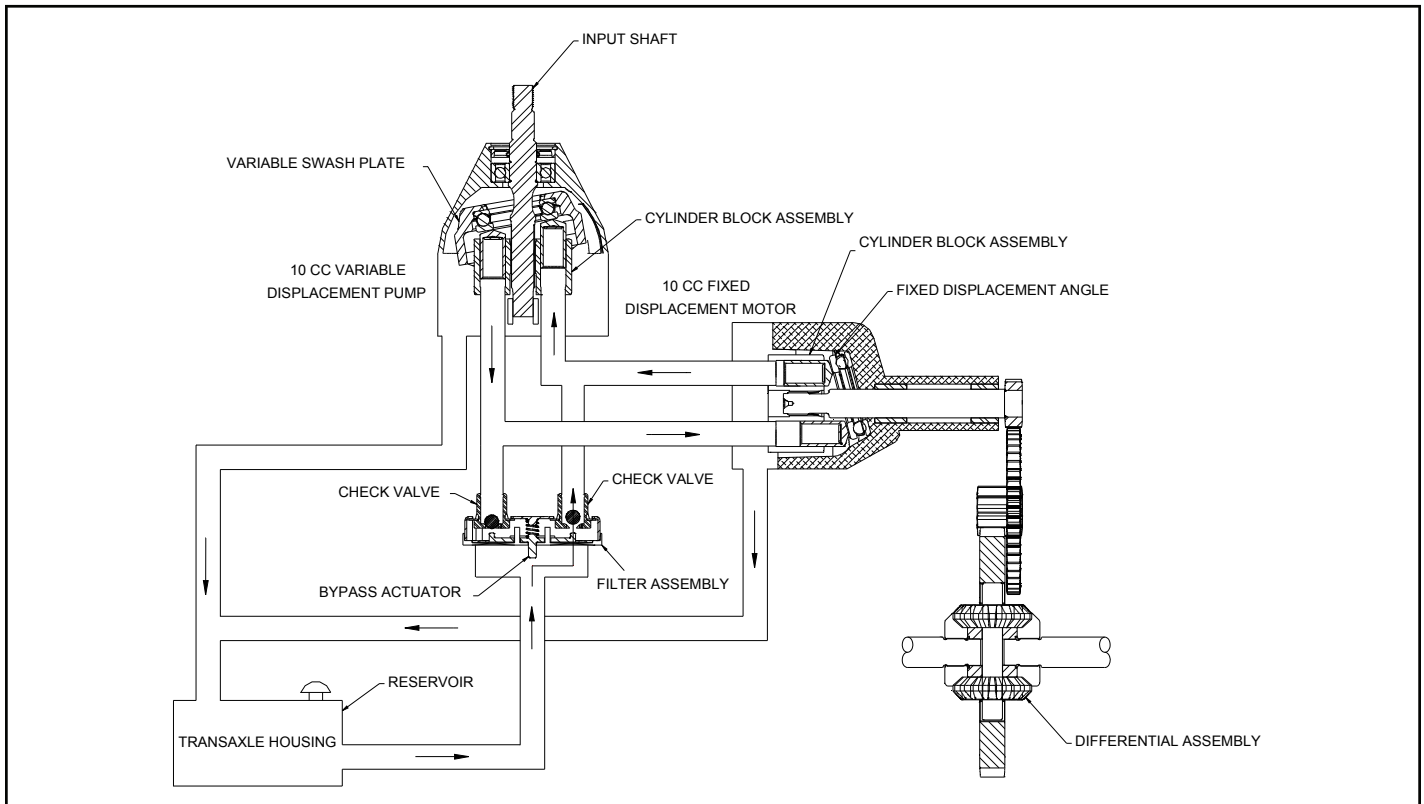


Figure 1. 310-0510 Hydraulic Schematic





**Figure 2. 310-0510 Hydraulic Flow Illustration**

## HYDRAULIC SCHEMATIC

Figure 2 provides an illustration of the hydraulic oil circuit. The oil supply for the hydraulic system of the 310-0510 IHT is also utilized for lubricating the components of the final drive assembly.

The input shaft and pump cylinder block are turned in one direction only by the engine/drive belt/pulley combination. Output of the oil flow is controlled by the direction and amount that the variable swashplate is angled. As the pump pistons compress they force the oil to flow through one of two passageways (forward or reverse) in the center section to the motor cylinder block and motor shaft. Since the motor has a fixed displacement angle it is forced to turn with the flow of oil. As the angle of the pump swashplate is increased the amount of oil being pumped will increase and cause a higher speed output of the motor. Reversing the angle of the swashplate will reverse the direction of oil flow.

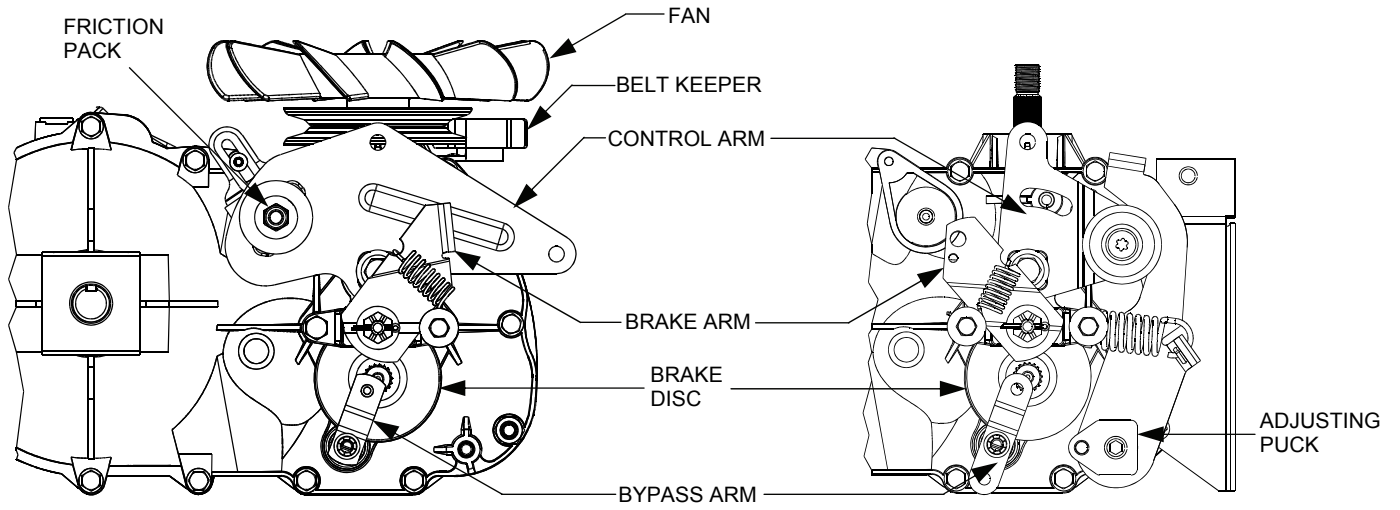
During the operation of the transaxle, fluid is “lost” from the hydraulic loop through leak paths

designed into the product for lubrication purposes (around pistons, under the rotating cylinder blocks, etc.). This “lost” fluid returns to the transaxle housing, then is pulled back into one of the check valves depending upon the direction of vehicle operation. All of this oil must pass through an internal filter.

The motor cylinder block mounts onto a splined motor shaft which drives the gear train.

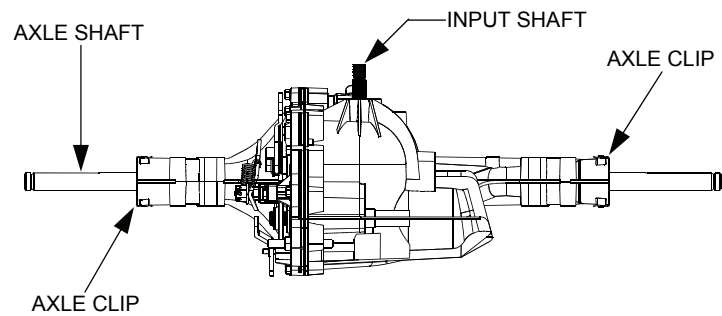
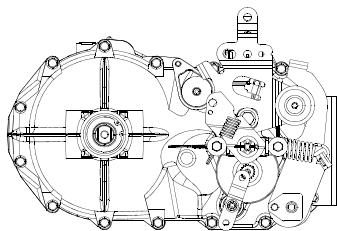
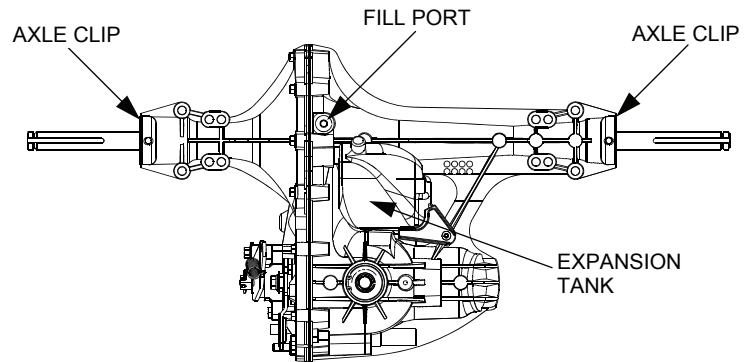
The bypass feature in the 310-0510 has a mechanical lever which lifts the check valve balls off their seat. This allows oil flow from the cylinder blocks to be discharged.

# EXTERNAL FEATURES 310-0510

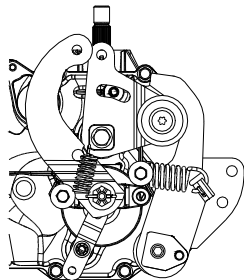
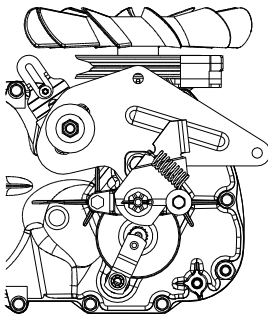
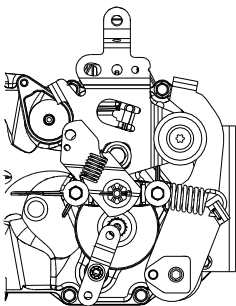
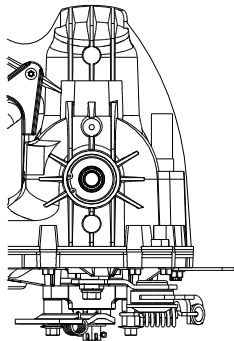
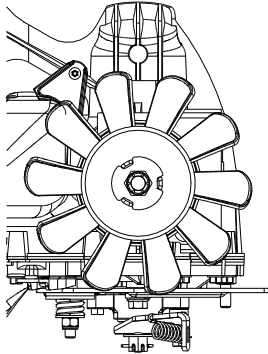
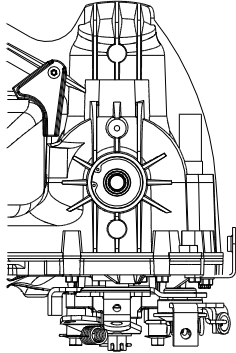


**Friction Pack Option**

**Return to Neutral Option**



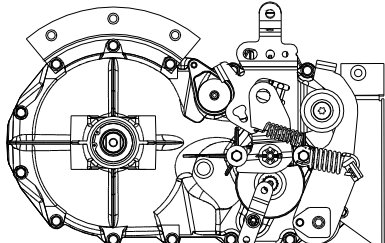
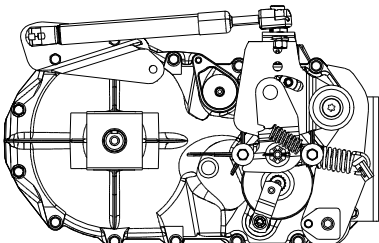
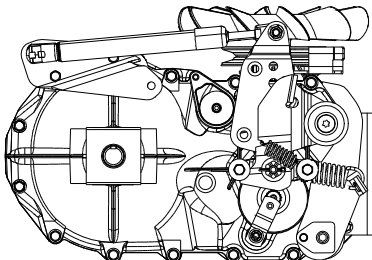
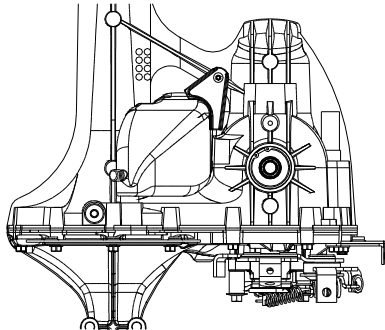
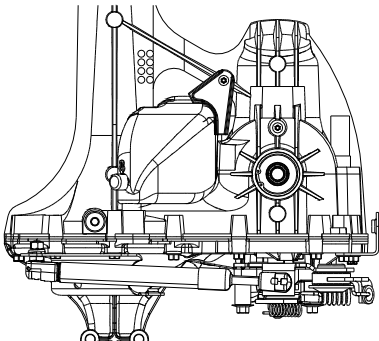
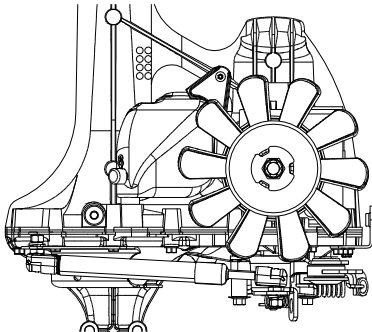
# MODEL RECOGNITION



618-0319

166768

104-1760



173839

036932

618-0389A

# TECHNICAL SPECIFICATIONS

Technical specifications for the 310-0510 IHT are listed in Table 1.

Table 1. 310-0510 Technical Specifications

<b>Overall Transaxle Reduction</b> 22.15:1	<b>Axle Shaft Options</b> Type: Keyed / Double "D" Diameter: 0.75 inch; 19.05 mm
<b>Input Speeds</b> Maximum: 3000 RPM Minimum: 1800 RPM	<b>Brake Type</b> Disc
<b>Maximum Tire Diameter</b> 20 inch; 508 mm	<b>Weight of Unit</b> 30 lb; 14 kg

# PRODUCT IDENTIFICATION

The model and configuration of the 310-0510 IHT can be determined from the label shown in Figure 3.

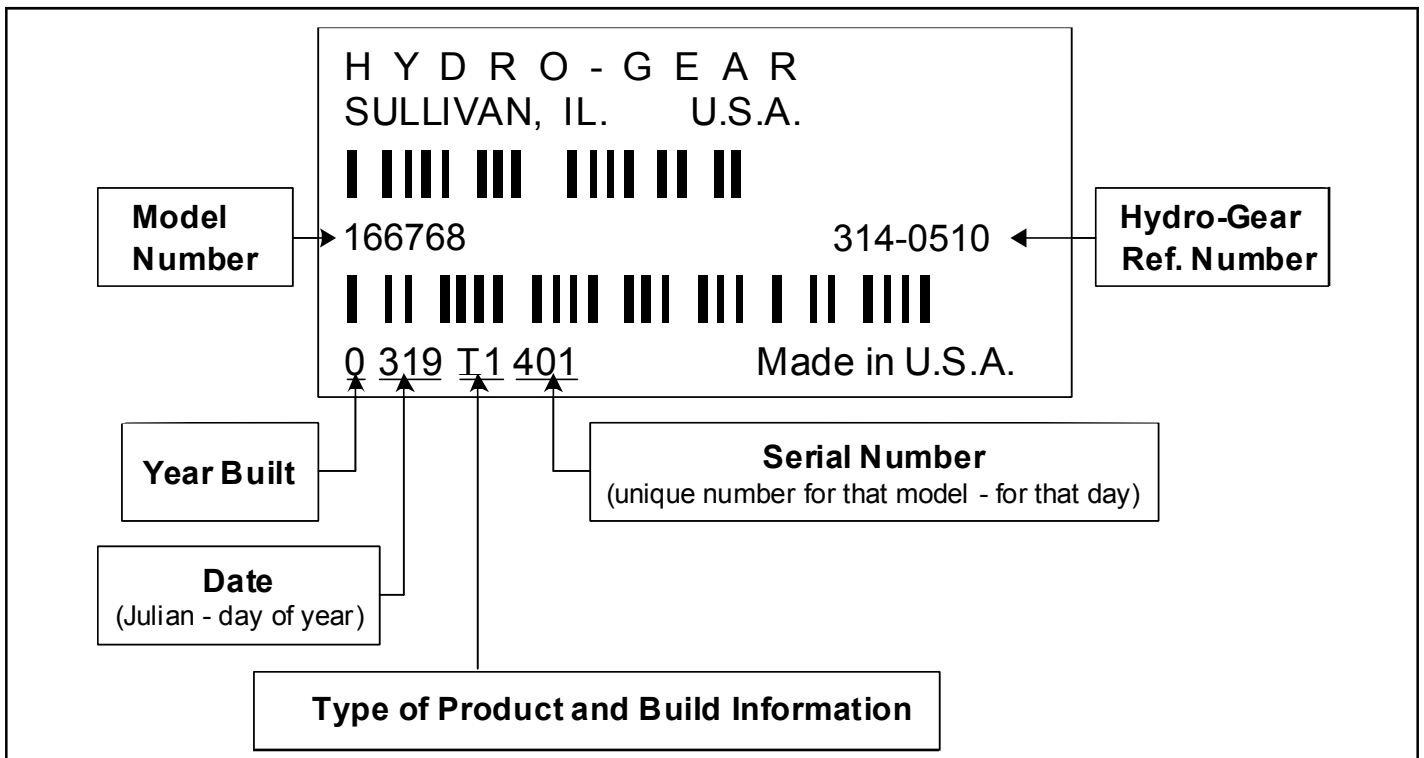


Figure 3. 310-0510 Configuration Label

## SECTION 2. SAFETY

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This symbol points out important safety instructions which, if not followed, could endanger the personal safety and/or property of yourself and others. Read and follow all instructions in this manual before attempting maintenance on your transaxle. When you see this symbol - **HEED ITS WARNING.**



### **WARNING**

#### **POTENTIAL FOR SERIOUS INJURY**

**Inattention to proper safety, operation, or maintenance procedures could result in personal injury, or damage to the equipment. Before servicing or repairing the 310-0510 IHT, fully read and understand the safety precautions described in this section.**

### **PERSONAL SAFETY**

Certain safety precautions must be observed while servicing or repairing the 310-0510 IHT. This section addresses some of these precautions but must not be considered an all-inclusive source on safety information. This section is to be used in conjunction with all other safety material which may apply, such as:

- 1) Other manuals pertaining to this machine,
- 2) Local and shop safety rules and codes,
- 3) Governmental safety laws and regulations.

Be sure that you know and understand the equipment and the hazards associated with it. Do not place speed above safety.

Notify your supervisor whenever you feel there is any hazard involving the equipment or the performance of your job.

Never allow untrained or unauthorized personnel to service or repair the equipment.

Wear appropriate clothing. Loose or hanging clothing or jewelry can be hazardous. Use the appropriate safety equipment, such as eye and hearing protection, and safety-toe and slip-proof shoes.

Never use compressed air to clean debris from yourself or your clothing.

### **TOOL SAFETY**

Use the proper tools and equipment for the task.

Inspect each tool before use and replace any tool that may be damaged or defective.

### **WORK AREA SAFETY**

Keep the work area neat and orderly. Be sure it is well lit, that extra tools are put away, trash and refuse are in the proper containers, and dirt or debris have been removed from the working areas of the machine.

The floor should be clean and dry, and all extension cords or similar trip hazards should be removed.

### **SERVICING SAFETY**

Certain procedures may require the vehicle to be disabled in order to prevent possible injury to the servicing technician and/or bystanders.

The loss of hydrostatic drive line power may result in the loss of hydrostatic braking capability. Proper brake maintenance is very important should this condition develop.

Some cleaning solvents are flammable. Use only approved cleaning materials. Do not use explosive or flammable liquids to clean the equipment.

To avoid possible fire do not use cleaning solvents in an area where a source of ignition may be present.

Discard used cleaning material in the appropriate containers.

## SECTION 3. TROUBLESHOOTING



### WARNING

**Do not attempt any servicing or adjustments with the engine running. Use extreme caution while inspecting the drive belt assembly, and all vehicle linkage!**

**Follow all safety procedures outlined in the vehicle owner's manual!**

In many cases problems with the 310-0510 are not related to a defective transaxle, but are caused by slipping drive belts, partially engaged bypass valves, and loose or damaged control linkages. Be sure to perform all operational checks and adjustments outlined in Section 4, Service and Maintenance before assuming the unit is malfunctioning. Table 2 below provides a troubleshooting check list to help determine the cause of operational problems.

**Table 2. 310-0510 Troubleshooting Checklist**

Possible Cause	Corrective Action
<b>UNIT OPERATES IN ONE DIRECTION ONLY</b>	
Control linkage bent or out of adjustment Drive belt slipping or pulley damaged	Repair or replace linkage, Page 9 Repair or replace drive belt or pulley, Page 9
<b>VEHICLE DOES NOT DRIVE/TRACK STRAIGHT</b>	
Vehicle tires improperly inflated Control linkage bent, loose or out of adjustment Bypass partially engaged	Refer to vehicle manufacturer suggested pressure Repair, adjust or replace vehicle linkage Adjust bypass linkage
<b>UNIT IS NOISY</b>	
Oil level low or contaminated oil Excessive loading Brake setting incorrect Loose parts Bypass assembly sticking Air trapped in hydraulic system	Fill to proper level or change oil, Page 10 Reduce vehicle loading, Page 9 Adjust brake to proper setting, Page 13 Repair or replace loose parts Repair or replace valve or linkage Purge hydraulic system, Page 11
<b>UNIT HAS NO/LOW POWER</b>	
Engine speed low Control linkage bent or out of adjustment Brake setting incorrect Drive belt slipping or pulley damaged Oil level low or contaminated oil Excessive loading Bypass assembly sticking Air trapped in hydraulic system	Adjust to correct setting Repair or replace linkage, Page 9 Adjust brake to proper setting, Page 13 Repair or replace drive belt or pulley, Page 9 Fill to proper level or change oil, Page 10 Reduce vehicle loading, Page 9 Repair or replace valve or linkage Purge hydraulic system, Page 11
<b>UNIT OPERATING HOT</b>	
Debris buildup around transaxle Brake setting incorrect Cooling fan damaged Oil level low or contaminated oil Excessive loading Air trapped in hydraulic system	Clean off debris, Page 9 Adjust brake to proper setting, Page 13 Repair or replace cooling fan Fill to proper level or change oil, Page 10 Reduce vehicle loading, Page 9 Purge hydraulic system, Page 11
<b>TRANSAXLE LEAKS OIL</b>	
Damaged seals, housing, or gaskets Air trapped in hydraulic system	Replace damaged component Purge hydraulic system, Page 11

## SECTION 4. SERVICE AND MAINTENANCE

**NOTE: Any servicing dealer attempting a warranty repair must have prior approval before conducting maintenance of a Hydro-Gear® product unless the servicing dealer is a current Authorized Hydro-Gear Service Center.**

### EXTERNAL MAINTENANCE

Regular external maintenance of the 310-0510 IHT should include the following:

1. **Check the vehicle operator's manual for the recommended load ratings. Insure the current application does not exceed load rating.**
2. Check oil level in accordance with Figure 4 Page 10.
3. Inspect the vehicle drive belt, idler pulley(s), and idler spring(s). Insure that no belt slippage can occur. Slippage can cause low input speed to the transmission.
4. Inspect the transmission cooling fan for broken or distorted blades and remove any obstructions (grass clippings, leaves, dirt, etc.).
5. Inspect the axle parking brake and vehicle linkage to insure proper actuation and adjustment of the parking brake.
6. Inspect the vehicle control linkage to the directional control arm on transaxle. Also, insure the control arm is securely fastened to the trunnion arm of the transaxle.
7. Inspect the bypass mechanism on the transaxle and vehicle linkage to insure it actuates and releases fully.

### SERVICE AND MAINTENANCE PROCEDURES

All the service and maintenance procedures presented on the following pages can be performed while the 310-0510 is mounted on the vehicle. Any repair procedures as

mentioned in the repair section of this manual must be performed after the unit has been removed from the vehicle.

### FLUIDS

The fluids used in Hydro-Gear products have been carefully selected, and only equivalent, or better products should be substituted.

Typically, an engine oil with a minimum rating of 9 cSt (55 SUS) at 230°F (110° C) and an API classification of SL is recommended. A 20W-50 engine oil has been selected for use by the factory and is recommended for normal operating temperatures.

### FLUID VOLUME AND LEVEL

Fluid volume information is provided in Table 3.

Certain situations may require additional fluid to be added or even replaced. Refer to Page 4 and Figure 4 for the proper fill port location.

Fill the 310-0510 to the top of the oil fill port.

Recheck the fluid level once the unit has been operated for approximately 1 minute.

Purging may be required. Refer to the purging procedures on page 11.



# FLUID CHANGE

## FLUID CHANGE PROCEDURE

This transaxle is factory filled, sealed and does not require oil maintenance. However, in the event of oil contamination or degradation, oil addition or change may alleviate certain performance problems.

1. Remove the transaxle from the vehicle.
2. Clean the expansion tank and oil fill port areas of any debris.
3. Remove the oil fill port fitting.
4. Position the transaxle so the oil will drain completely out of the housing.
5. After all the oil is drained from the transaxle, remove the expansion tank by removing the self tapping bolt (10-32 x 1/2) that holds the tank support bracket.
6. Remove the tank and drain the oil from the tank. DO NOT remove the vent cap from the tank. DO NOT remove the tank hose or o-ring unless a replacement is needed.
7. Install the tank by first inserting the hose into the opening in the expansion tank. Push the tank opening over the o-ring to ensure a proper

seal.

8. Install the tank support bracket and self tapping bolt making sure not to cross thread the bolt. Torque the bolt to the lower value of the torque specification listed in Table 5.
9. Fill the transaxle at the oil fill port according to Figure 4.
10. Install the oil fill port fitting.

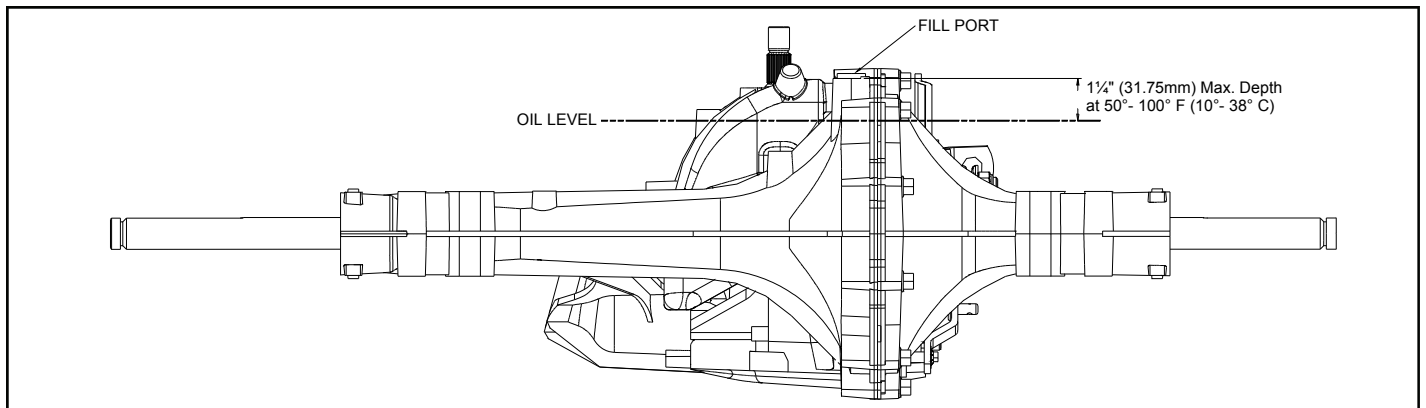
## EXPANSION TANK FUNCTION

*The expansion tank allows the 310-0510 to operate free of air entrainment and provides maximum lubrication to the mechanical and hydraulic components in the transaxle.*

*As the 310-0510 transaxle is operated, oil in the transaxle housing heats up which causes the oil to expand. The oil flows through an internal hose to the bottom of the vented expansion tank. As the oil cools, the oil in the transaxle housing contracts, causing the oil level to go down in the housing. This creates a negative pressure in the housing causing the oil to be drawn back into the case. This keeps the transaxle housing full of oil at specified operating temperatures.*

**Table 3. Fluid Volumes for the 310-0510 IHT**

Fluid Description	Volume
20W-50 engine oil	79 fl. oz. (2336 ml.)



**Figure 4. 310-0510 Fluid Level and Fill Port**



## PURGING PROCEDURES

Due to the effects air has on efficiency in hydrostatic drive applications, it is critical that it be purged from the system.

These purge procedures should be implemented any time a hydrostatic system has been opened to facilitate maintenance or any additional oil has been added to the system.

Air creates inefficiency because its compression and expansion rate is higher than that of the oil approved for use in hydrostatic drive systems.

The resulting symptoms in hydrostatic systems may be:

1. Noisy operation.
2. Lack of power or drive after short term operation.
3. High operation temperature and excessive expansion of oil.

Before starting, make sure the transaxle/transmission is at the proper oil level. If it is not, fill to the specifications outlined on page 10, Figure 4.

The following procedures should be performed with the vehicle drive wheels off the ground, then repeated under normal operating conditions.

1. With the bypass valve open and the engine running, slowly move the directional control in both forward and reverse directions (5 to 6 times), as air is purged from the unit, the oil level will drop.
2. With the bypass valve closed and the engine running, slowly move the directional control in both forward and reverse directions (5 to 6 times). Check the oil level, and add oil as required after stopping engine.
3. It may be necessary to repeat Steps 1 and 2 until all the air is completely purged from the system. When the transaxle moves forward and reverse at normal speed purging is complete.

## RETURN TO NEUTRAL SETTING (FOOT CONTROL)



### WARNING

#### POTENTIAL FOR SERIOUS INJURY

Certain procedures require the vehicle engine to be operated and the vehicle to be raised off the ground. To prevent possible injury to the servicing technician and/or bystanders, insure the vehicle is properly secured.



### WARNING

Do not attempt any adjustments with the engine running. Use extreme caution while inspecting all vehicle linkage!

Follow all safety procedures outlined in the vehicle owner's manual.

The return to neutral mechanism on the transmission is designed to set the directional control into a neutral position when the operator removes their foot from the foot control. Follow the procedures below to properly adjust the return to neutral mechanism on the transaxle:

1. Confirm the transaxle is in the operating mode (bypass disengaged). Raise the vehicle's drive tires off the ground to allow free rotation.

**NOTE:** It may be necessary to remove the drive tire from the axle hub to access the linkage control and the transaxle return arm.

2. Remove the Original Equipment Manufacturer's (OEM's) control linkage at the control arm. Refer to Figure 5.
3. Start the engine and increase the throttle to full engine speed.

4. Check for axle rotation. If the axles do not rotate, go to Step 5. If the axles rotate, go to Step 6.
5. Stop the vehicle's engine. Reattach and adjust the OEM linkage according to the OEM manual. Recheck according to Step 3 and 4. Stop the vehicle engine. Refer to Figure 5.
6. Note the axle directional movement. Stop the vehicle engine. Loosen the adjusting puck screw until the puck can be rotated. Rotate the adjusting puck the opposite direction of the wheel rotation in 5 degree increments. Tighten the adjusting puck screw. Refer to Table 5. Required Torque Values, Page 15. Recheck according to steps 3 and 4. Stop the vehicle engine. Reattach and adjust the OEM linkage according to the OEM manual. Recheck according to steps 3 and 4. Refer to Figure 5.

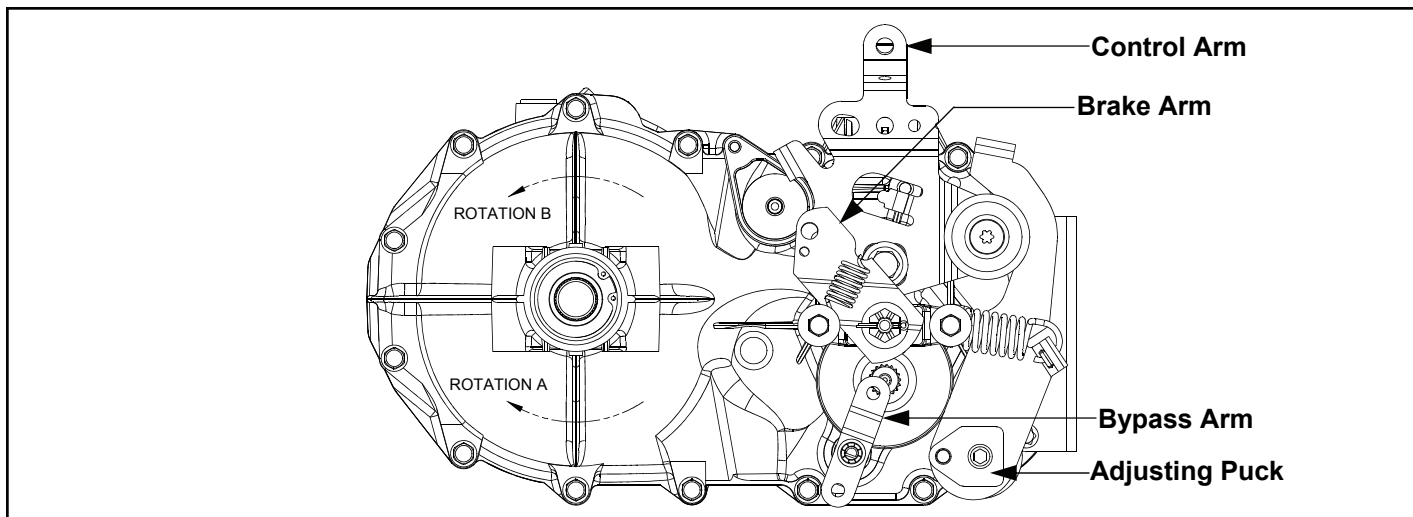


Figure 5. Return to Neutral, Foot Control

# BRAKE MAINTENANCE

## BRAKE SETTING

1. Remove the brake arm bias spring, and then the cotter pin securing the brake castle nut.
2. Insert a 0.015" feeler gage between the brake disc and top brake puck, and then set the brake by finger tightening or loosening the castle nut.
3. Install a new cotter pin to secure the castle nut, and then install the brake arm bias spring.

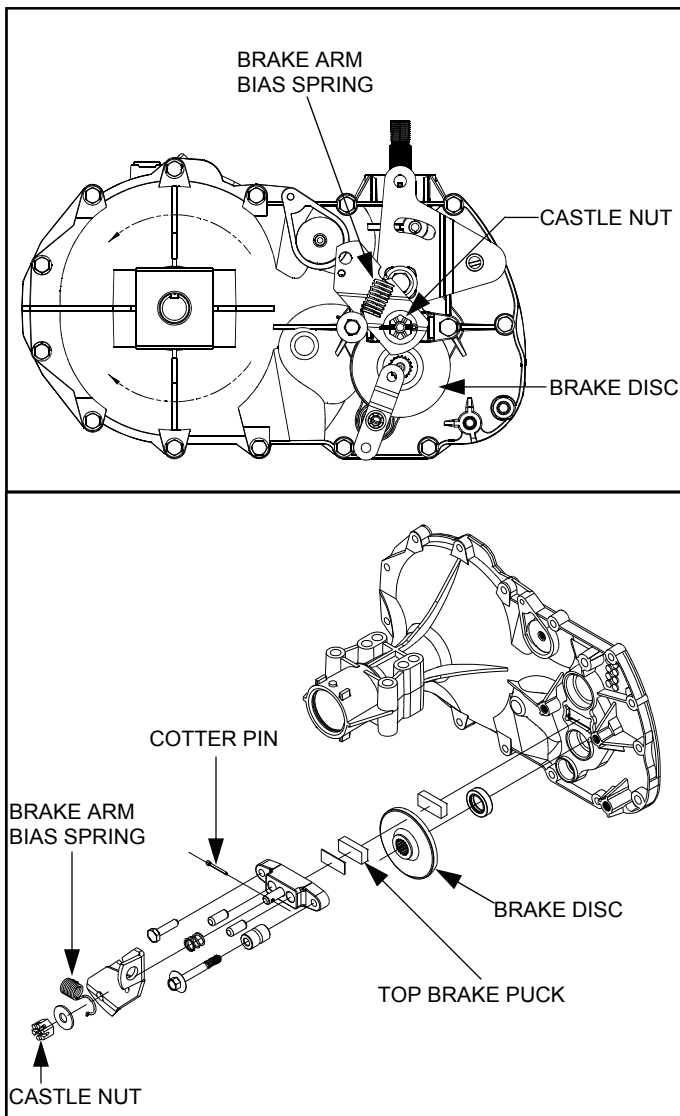


Figure 6. Brake Components

## BRAKE CHECKING

When checking the brake puck/rotor gap, the gap should be 0.010-0.030 inches (0.254-0.762 mm).

## FRICITION PACK ADJUSTMENT

The friction pack dampens or holds the operator control lever in its desired position.

Adjustment for the amount of drag or holding force can be made by turning the friction pack nut in or out.

Adjustments should be made in no more than 1/4 turn increments.

Over-tightening will result in difficulty or inability of the operator to move the control lever.

**Note:** The factory setting for the friction pack is tightening of the friction pack nut to 100 in-lbs (11 Nm) torque. The friction pack nut is then backed off per the vehicle manufacturer's specifications.

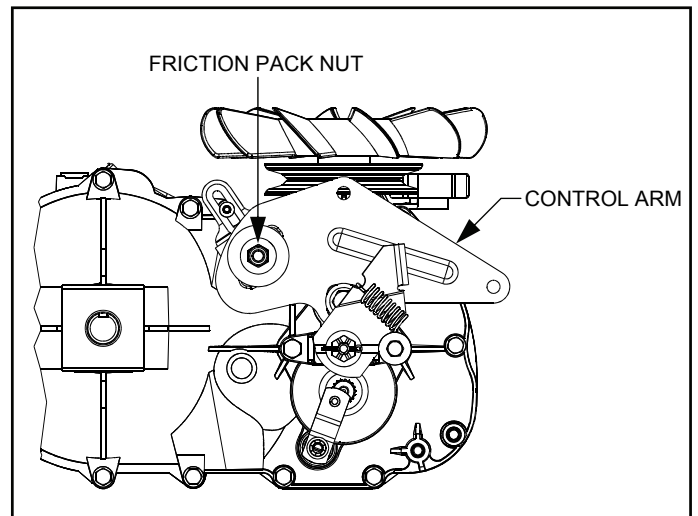


Figure 7. Friction Pack

## SECTION 5. REPAIR

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### HOW TO USE THIS SECTION

Each subassembly illustrated in this section is illustrated by an exploded view showing the parts involved. **The item reference numbers in each illustration are for assembly instructions only.** See pages 31 and 33 for part names and descriptions. A complete exploded view and item list of the transaxle is provided at the end of this section.

Many of the parts and subassemblies of this transaxle can be removed and serviced independently of other components. Where some components and assemblies must be removed before a given assembly can be serviced, that information is given at the beginning of the disassembly instructions.

### GENERAL INSTRUCTIONS

Cleanliness is a primary means of assuring satisfactory life on repaired units. Thoroughly clean all exposed surfaces prior to any type of maintenance. Cleaning of all parts by using a solvent wash and air drying is usually adequate. As with any precision equipment, all parts must be kept free of foreign material and chemicals.

Protect all exposed sealing surfaces and open cavities from damage and foreign material. The external surfaces should be cleaned before beginning any repairs.

Upon removal, it is recommended that all seals, O-rings, and gaskets be replaced. During installation lightly lubricate all seals, O-rings, gaskets with a clean petroleum jelly prior to assembly. Also protect the inner diameter of seals by covering the shaft with a cellophane (plastic wrap, etc.) material.

Parts requiring replacement must be replaced from the appropriate kits identified in the Items Listing, found at the end of this manual. Use only original Hydro-Gear® replacement parts found listed in BLN-51427 (CD).

**IMPORTANT:** When internal repair is performed on the 310-0510 IHT, the filter assembly must be replaced.

### TRANSAXLE REMOVAL

It is necessary to remove the 310-0510 from the vehicle before performing the repair procedures presented in this section.

### LIMITED DISASSEMBLY

The following procedures are presented in the order in which they must be performed to completely disassemble the unit. Do not disassemble the unit any farther than is necessary to accomplish the required repairs. Each disassembly procedure is followed by a corresponding assembly procedure.

Reassembly is accomplished by performing the "Assembly" portions of the procedures. If the unit has been completely disassembled, a summary of the assembly procedures, in the order in which they should occur, is given on page 27.

# TOOLS AND TORQUES

**Table 4. Required Tools**

Miscellaneous	Sockets
310-0510 Service & Repair Manual	1/2"- 3/8" Adapter
Flat Blade Screw Driver (2)	1/2" Deep
Torque Wrench	7/16" Deep
Air Impact Wrench	9/16" Deep
Rubber Mallet	3/4" Deep
Breaker Bar	7/8"
Side Cutters/Snips	10 mm
<b>Pliers</b>	T-25 Torx Head
Needle Nose	
Large External Snap Ring	

**Table 5. Required Torque Values**

Operation	U.S. Torque	Metric Torque	Item	Description
Side Housing Screws	105-155 lb-in	12-17 Nm	7	Screw 1/4-20 x 1.25
Housing Stud	230-310 lb-in	26-35 Nm	8	Stud 5/16-24 Hex
Control Arm Screw	230-310 lb-in	26-35 Nm	16	Screw 5/16-24 x 0.75
Check Plugs	280-400 lb-in	32-45 Nm	23/75	Check Plug Assembly
Center Section Bolts	450-550 lb-in	50-62 Nm	44	Screw 3/8-24 x 2.5
Brake Yoke Bolt	80-120 lb-in	9-14 Nm	63	HFHCS 1/4-20 x 2
Brake Yoke Bolt	80-120 lb-in	9-14 Nm	64	Bolt 1/4-20 x 1
Friction Pack Mounting Stud	50-120 lb-in	6-14 Nm	76	Stud 5/16-24
Friction Pack Nut	85-120 lb-in	10-14 Nm	80	Lock Nut 5/16-24
Expansion Tank Hose Fitting	96-120 lb-in	11-14 Nm	84	Fitting 5/16 SAE 5/32 Tube
Belt Keeper Screw	40-70 lb-in	5-8 Nm	88	Screw, Self-Tapping 10-32 x .5
Bracket Support Bolt	42-65 lb-in	5-7 Nm	88	Bolt 10-32 x 0.5
Friction Pack Wedge Screw	30-70 in-lb	3.4-8 Nm	88	Screw, Self Tapping 10-32 x .5
Puck Inner Wedge Bolt	42-65 lb-in	5-7 Nm	88	Bolt 10-32 x 0.5
Adjusting Puck Screw	250-320 lb-in	28-36 Nm	95	Socket Hd CS 5/16-24 x 1.50
RTN Screw	180-240 lb-in	20-27 Nm	97	Screw, Countersunk 5/16-18 x 1
Bracket Screw	230-310 lb-in	26-35 Nm	110	Screw, Torx Hd 5/16-18 x 1.50
Fan/Pulley-Input Shaft Nut	540-660 lb-in	61-74 Nm	121	Nut, Patch Lock
Fan/Pulley Screws	65-90 lb-in	8-10 Nm	122	Screw, Hex Flange 1/4-20 x .75
Fan/Pulley Nuts	35-50 lb-in	4-6 Nm	124	Nut, Hex 1/4-20
Cruise Damper Bracket Nuts	160-210 lb-in	18-24 Nm	132	Nut, Hex 5/16-18
Axle Hub Nut (310-0710)	240-260 lb-ft	271-298 Nm	152	Nut, Pin-Lock 3/4-16
Axle Hub Nut (310-0710)	180-200 lb-ft	244-271 Nm	152	Nut, Hex Lock 3/4-16

# BRAKE ASSEMBLY AND BYPASS ARM

Refer to Figure 8.

## DISASSEMBLY

1. Remove the brake arm bias spring (66). *Note the orientation of the spring for proper reassembly.*
2. Remove the cotter pin (70), castle nut (69), washer (73), brake arm (68), spring (71) and actuating pins (62). *Note the orientation of the brake arm for proper reassembly.* Discard the cotter pin (70).
3. Remove the two brake yoke screws (63/64) and spacer (65) from the side housing assembly (2). *Note the orientation of the spacer(s) (65) on the brake yoke assembly to ensure proper reassembly.* Remove the brake yoke assembly (58), puck plate (61) and puck (60).
4. Remove the bypass arm retaining ring (50) and bypass arm (49). Discard the retaining ring.
5. Remove the brake rotor (59) and puck (60). *Note: The hub on the rotor faces away from the transaxle.*

## INSPECTION

1. Inspect the brake arm bias spring (66), castle nut (69), washer (73), brake arm (68), actuating pins (62), spring (71), brake yoke screws (63/64), brake yoke (58), pucks (60), puck plate (61), bypass arm (49), spacer (65) and brake rotor (59) for wear or damage.

## ASSEMBLY

1. Install the brake puck (60) and brake rotor (59).
2. Install the bypass arm (49) onto the bypass rod. Secure the bypass arm with a new retaining ring (50).
3. Install the brake puck (60), puck plate (61), brake yoke assembly (58), spacer(s) (65) and brake yoke screws (63/64).
4. Insert the brake actuating pins (62) into the brake yoke (58). Install the spring (71).
5. Assemble the brake arm (68), washer (73) and castle nut (69). Adjust the brake gap. Refer to page 13. Install the brake arm bias spring (66).

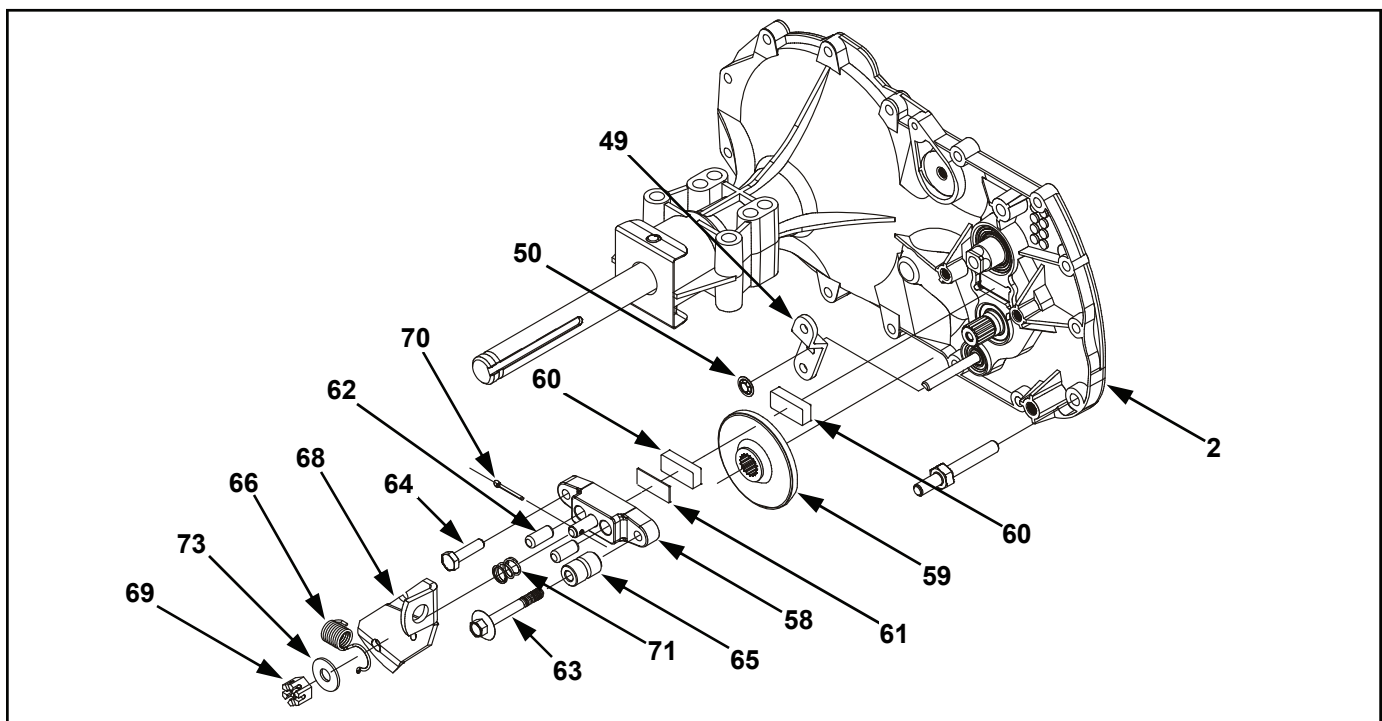


Figure 8. Brake Assembly and Bypass Arm



# CONTROL ARM AND FRICTION PACK

Refer to Figure 9.

## DISASSEMBLY

1. Remove the brake assembly. See page 16.
2. Loosen and remove the friction pack lock nut (80), flat washer (73), spring (78), spacer (79), washer clip (82) and puck (77). Discard the lock nut (80).
3. Remove the hex head screw (16) from the directional control.
4. Remove the flat washer (73) and control arm (18).
5. Remove the inner wedge puck (90).
6. Removal of the friction pack wedge (81) should not be necessary. *Note: If it is removed, mark the orientation of the wedge for ease in reassembly.*
7. If necessary, remove and replace the friction pack stud (76).

## INSPECTION

1. Inspect the friction pack assembly components for wear or damage.
2. Inspect the control arm for wear or damage.

3. Inspect the inner wedge puck (90).
4. Inspect the friction pack stud (76) for wear or damage.

## ASSEMBLY

1. Install the friction pack stud (76), if removed. Torque according to specifications in Table 5.
2. If previously removed, install the friction pack wedge (81) and self tapping bolt (88). Refer to Table 5 for bolt torque specifications. Use the marks made during disassembly to reposition the wedge properly.
3. Install the inner wedge puck (90).
4. Install the control arm (18).
5. Install the flat washer (73) and control arm screw (16). *Note: Remember to apply thread adhesive to the screw threads before installation.* Refer to Table 5 for screw torque specifications.
6. Install the puck (77), washer clip (82), spacer (79), spring (78), flat washer (73) and a new lock nut (80). Adjust the friction pack according to instructions on page 13.
7. Install the brake assembly. See page 16.

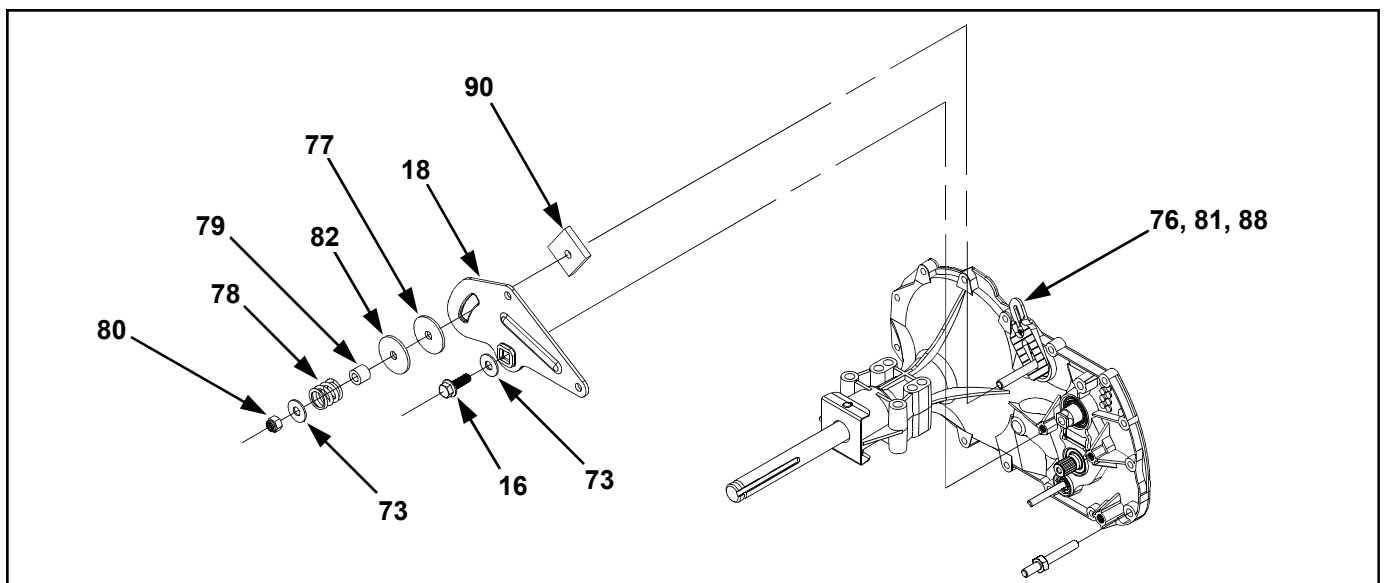


Figure 9. Control Arm & Friction Pack

# SEAL KIT REPLACEMENT

Before disassembly, wipe the unit free of any debris to avoid contamination.

Refer to Figure 10.

## Axle Seal

1. Remove the axle clips (93) from the axle horns (for units with keyed axle shafts).
2. Remove the seal retaining rings (12).
3. Carefully pull the axle seals (34) out of the housing bore with a “hook” type tool. Care must be taken to avoid damage to the housing bore or to the shaft sealing areas.
4. Lubricate the new seal with petroleum jelly prior to installation.
5. Wrap the shaft keyway (splines) with cellophane to prevent damage to the seal lip during installation.
6. Slide the seal over the shaft and press it into the housing bore.
7. The seal should seat against the sleeve bearing.
8. Install the seal retaining rings (12).
9. Install the axle clips (93), if applicable.

## Input Seal

1. Remove the input pulley and fan from the

input shaft.

2. The seal (13) can be replaced by following steps 2-6 of the procedure used to replace the axle seals.

## Trunnion Seal

1. Remove the control arm and any attachments to the control arm. See page 17.
2. The seal (17) can be replaced by following steps 3-6 of the procedure used to replace the axle seals.

## Brake Seal

1. Remove the brake assembly and any attachments to the brake assembly. See page 16.
2. The seal (74) can be replaced by following steps 3-6 of the procedure used to replace the axle seals. Install a new retaining ring (74).

## Bypass Seal

1. Remove the bypass arm and any attachments to the bypass arm. See page 16.
2. The seal (51) can be replaced by following steps 3-6 of the procedure used to replace the axle seals.

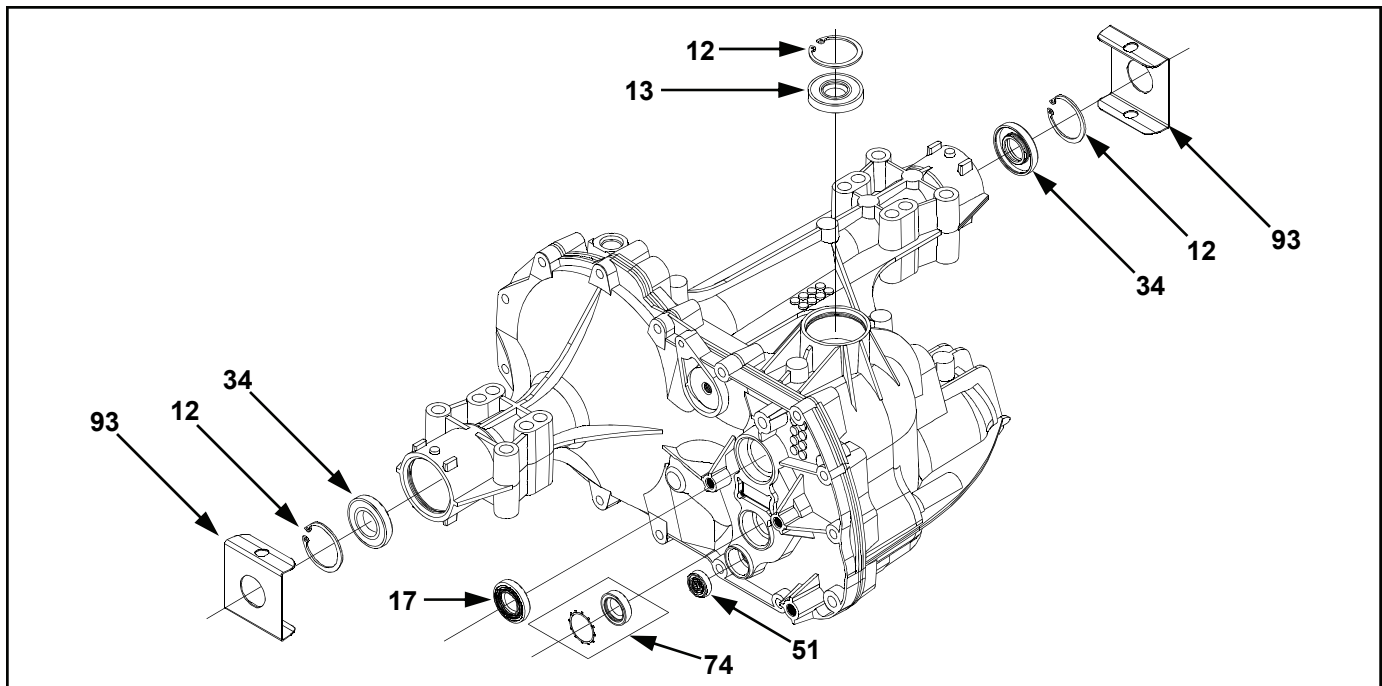


Figure 10. Seal Kit Replacement



# SIDE HOUSING

Refer to Figure 11.

## DISASSEMBLY

1. Remove the brake assembly and bypass arm. See page 16.
2. Remove the control arm and friction pack. See page 17.
3. Remove the oil from the transaxle. See page 10.
4. After all of the oil has been removed from the transaxle, remove the housing screws (7) and torque strap screw (8).
5. Pull away the side housing (2), leaving the axle assembly (35, Page 32) in the main housing (1). It may be necessary to use screwdrivers at the pry points to break loose the sealant (positions B-H and G-J, Fig. 11).
6. Remove all the seals in the side housing. See page 18.
7. Clean off **all** the old sealant on the side and main housings. Take care not to damage the sealing surfaces. A wire brush and solvent is effective.

## INSPECTION

1. Inspect the bearing areas in the side housing.

## ASSEMBLY

1. Apply a bead of sealant around the perimeter of the side housing face. See sealant pattern on page 28.
2. Install the axle and sleeve bearing (31). *Note the orientation of the locating tab on the sleeve bearing. It is essential for this to align with the side housing bore.*
3. Install the locating pins (83), if not already installed.
4. Install the side housing (2) while aligning the bypass rod into its side housing bore. Use care not to smear the sealant bead.
5. Install the torque strap screw (8). Tighten the screw according to the specifications in Table 5.
6. Install the side housing screws (7). Refer to the screw tightening pattern in figure 11 and torque specs in Table 5.
7. Install the remaining seals. Refer to page 18. Remember to use a seal protector during installation.
8. Fill the transaxle with new oil. See page 10.
9. Install the control arm and friction pack. See page 17.
10. Install the bypass arm and brake assembly. See page 16.

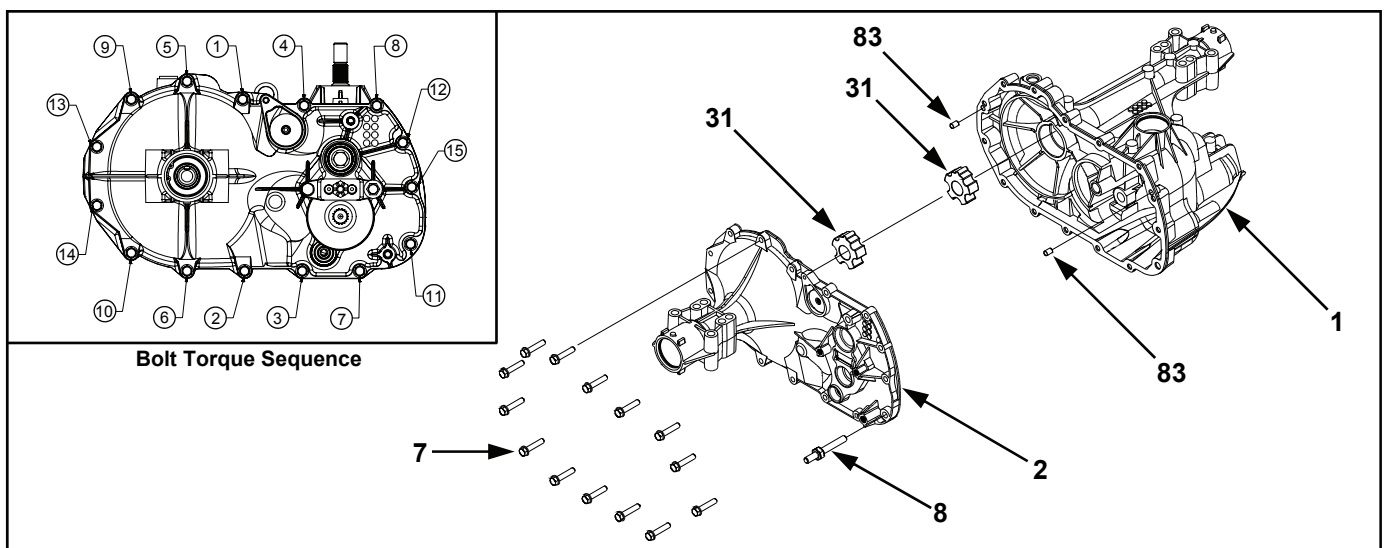


Figure 11. Side Housing Assembly

# AXLE SHAFT, DIFFERENTIAL & REDUCTION GEARS

Refer to Figure 12.

## DISASSEMBLY

1. Remove the brake assembly and bypass arm. See page 16.
2. Remove the control arm and friction pack. See page 17.
3. Remove the oil from the transaxle. See page 10.
4. Remove the side housing. See page 19.
5. Remove the axle assembly (36), sleeve bearing (31) and washer (33).
6. Remove the center block bearing (54) (earlier models), differential cross shaft(s) (39) and miter gears (38).
7. Remove the bull gear (30).
8. Remove the reduction gears (28 & 29), jack shaft pin (41) and washers (72).

## INSPECTION

1. Inspect the axle, sleeve bearing and washer for wear or damage. Replace as necessary.
2. Inspect the differential cross shaft, center block bearing and miter gears for wear or damage.

3. Inspect the bull gear for wear or damage.
4. Inspect the reduction gears, shaft and washers.
5. Inspect the housing bores.

## ASSEMBLY

1. Reassemble and install the reduction gears (28 & 29), jack shaft pin (41) and washers (72).
2. Install the bull gear (30).
3. Reassemble and install the center block bearing (54) (earlier units), differential cross shaft(s) (39) and miter gears (38).
4. Install the washer (33), sleeve bearing (31) and axle assembly (36).
5. Install the side housing. See page 19.
6. Install the outer sleeve bearing (32), axle seal (34) (see page 18) and retaining ring (12).
7. Install all remaining seals. See page 18.
8. Fill the unit with oil. See page 10.
9. Install the control arm and friction pack. See page 17.
10. Install the brake assembly and bypass arm. See page 16.

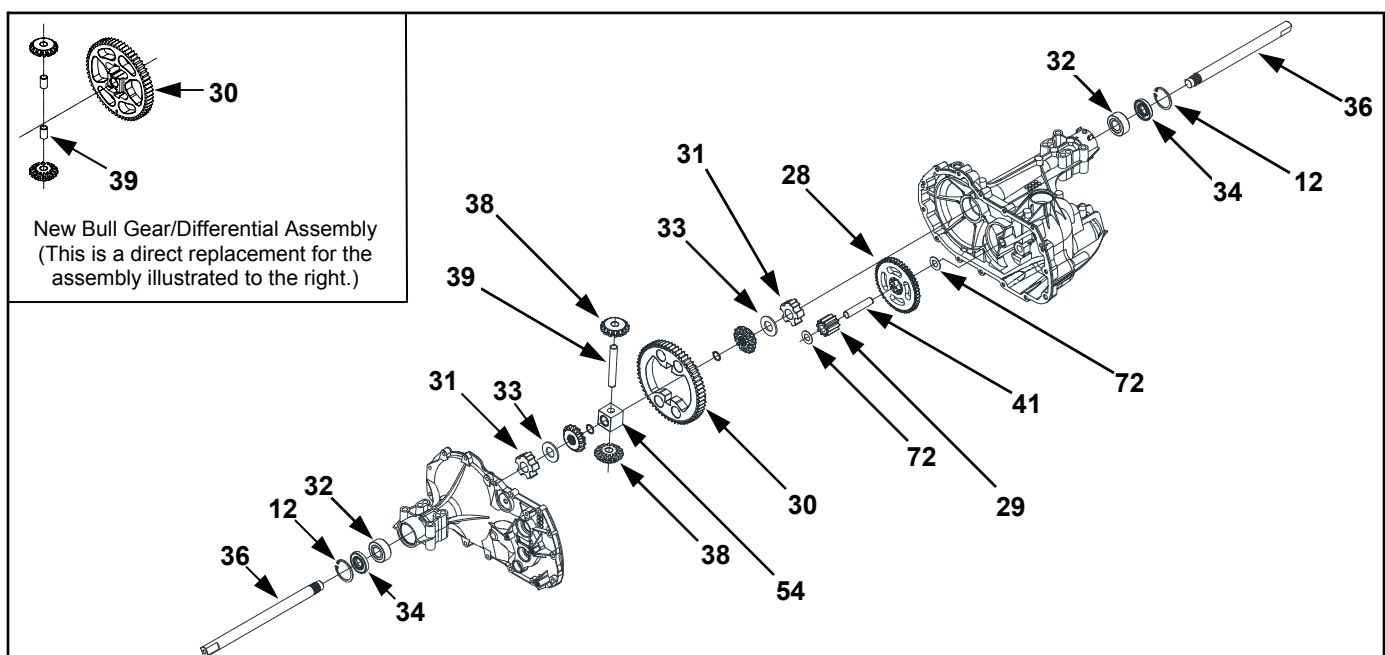


Figure 12. Axle Shaft, Differential & Reduction Gears (earlier bull gear shown)

## MOTOR SHAFT AND BYPASS ROD

Refer to Figure 13.

### DISASSEMBLY

1. Remove the brake assembly and bypass arm. See page 16.
2. Remove the control arm and friction pack. See page 17.
3. Drain the oil from the transaxle. See page 10.
4. Remove the side housing. See page 19.
5. Remove the axle shaft, differential and reduction gears. See page 20.
6. Remove the flat washer (52), motor shaft (24) and pinnion gear (27), and the flat washer (108).
7. Remove the bypass rod (48). Clean the magnet (42) of any foreign material.

### INSPECTION

1. Inspect the motor shaft (24), pinnion gear (27) and flat washers (52 & 108) for wear or damage.

2. Inspect the bypass rod (48) for wear or damage.

### ASSEMBLY

1. Insert the bypass rod's (48) short end into the housing while aligning the rod's flat with the bypass actuator. Confirm proper bypass function.
2. Insert the motor shaft (24) with the pinnion gear (27) and flat washers (52 & 108) into the center section (3).
3. Install the axle shaft, differential and reduction gears. Refer to page 20.
4. Install the side housing. Refer to page 19.
5. Install new seals. Refer to page 18.
6. Fill the transaxle with oil. See page 10.
7. Install the control arm and friction pack. See page 17.
8. Install the brake assembly and bypass arm. See page 16.

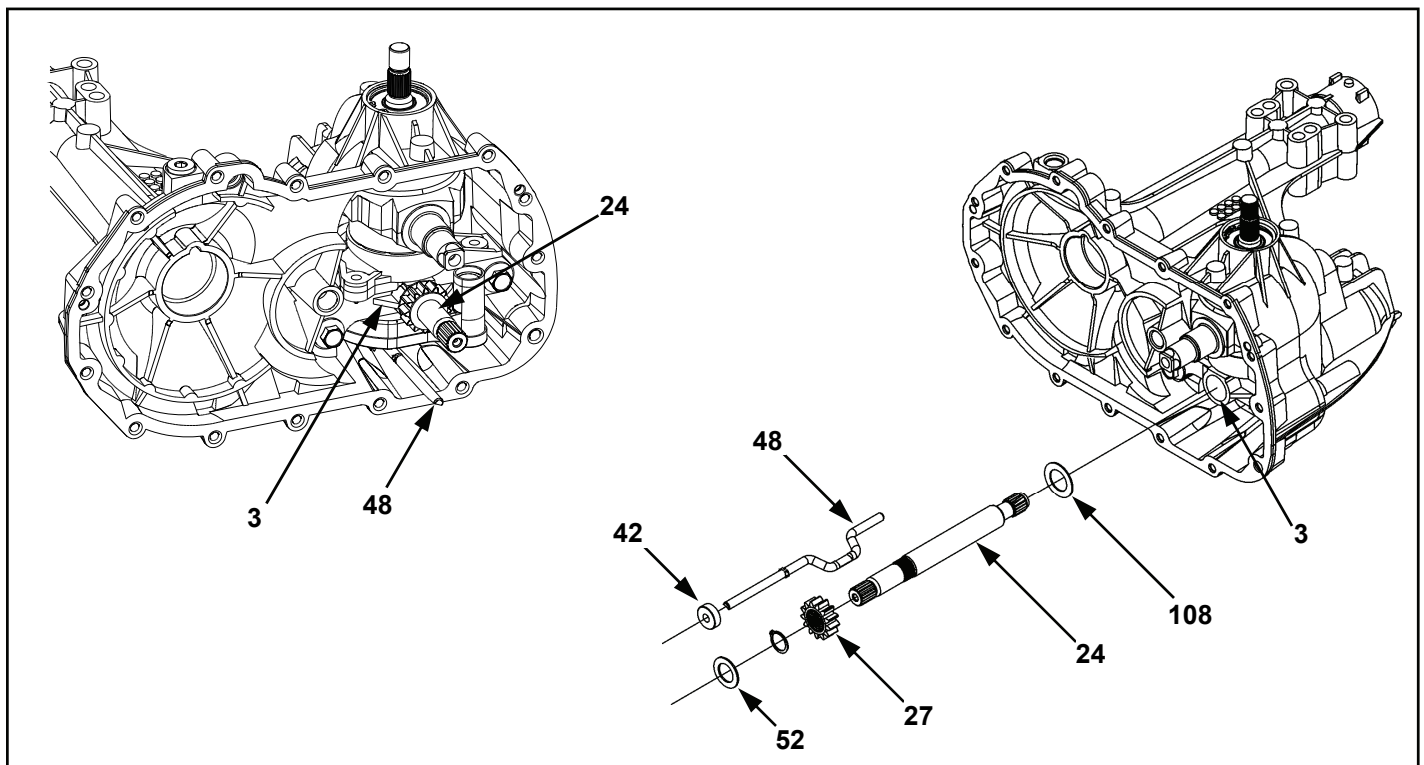


Figure 13. Motor Shaft & Bypass Rod Assemblies

## INPUT SHAFT

Refer to Figure 14.

### DISASSEMBLY

1. Remove the brake assembly and bypass arm. See page 16.
2. Remove the control arm and friction pack. See page 17.
3. Drain the oil from the transaxle. See page 10.
4. Remove the side housing. See page 19.
5. Remove the seals in the side housing. See page 18.
6. Remove the axle shaft, differential and reduction gears. Refer to page 20.
7. Remove the motor shaft and bypass rod. See page 21.
8. Remove the retaining ring (12) and shaft seal (13). Discard the seal.
9. Remove the washer (11), input shaft assembly (9,10 and 14), block thrust washer (56) and block spring (55).

### INSPECTION

1. Inspect the input shaft components for wear or damage.

### ASSEMBLY

1. Install the block thrust washer (56) and spring (55) onto the input shaft (9).
2. Ensure that the pump block is aligned concentrically with the center section running face.
3. Insert the input shaft (9), with bearing (14) and retaining ring (10), into the pump block assembly. *NOTE: Do not force the shaft and bearing as damage may occur. If alignment is correct the shaft assembly will fit into place.*
4. Install the washer (11), seal (13) and retaining ring (12).
5. Install the motor shaft & bypass rod. See page 21.
6. Install the axle, differential & reduction gears. Refer to page 20.
7. Install the side housing. Refer to page 19.
8. Install new seals in the side housing. See page 18.
9. Fill the transaxle with oil. See page 10.
10. Install the control arm and friction pack. See page 17.
11. Install the brake assembly and bypass arm. See page 16.

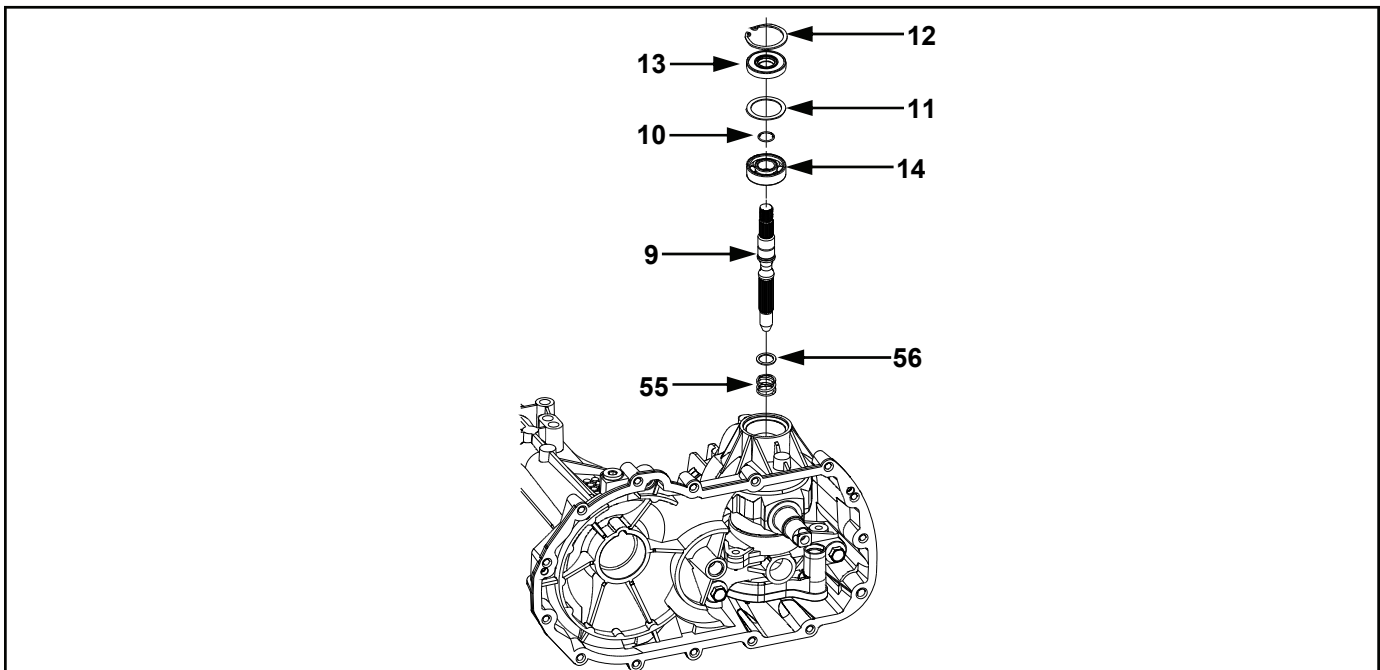


Figure 14. Input Shaft Assembly

## HYDRAULIC COMPONENTS

Refer to Figures 15-24.

### DISASSEMBLY

#### (Pump Block)

1. Remove the brake assembly and bypass arm. See page 16.
2. Remove the control arm and friction pack. See page 17.
3. Drain the oil from the transaxle. See page 10.
4. Remove the side housing. See page 19.
5. Remove the seals in the side housing. See page 18.
6. Remove the axle shaft, differential and reduction gears. Refer to page 20.
7. Remove the motor shaft and bypass rod. See page 21.
8. Remove the input shaft. See page 22.
9. **(See Fig. 15)** Remove the swashplate (4) and pump cylinder block (5) as one assembly. NOTE: *Removal will be aided by applying a small amount of pressure on the trunnion mounted swashplate towards the center section. Also note that the control arm (18, Page 32) may be loosely assembled at this point to assist in swashplate removal. While gently removing the swashplate and block assembly, keep the block face flush with the center section to minimize damage to the running surface.*
10. **(See Fig. 16)** Disassemble the pump cylinder block (5) from the swashplate (4).
11. **(See Fig. 17)** Check each piston for proper operation by pressing the pistons in and releasing them in the block bore. Disassemble the pump cylinder block. Check for piston/block wear in the cylinder bore. Inspect the pistons (1), piston springs (2) and piston seats (3) for excessive wear or damage. NOTE: Piston seats may be held in place in the piston by residual oil.

12. Reassemble the pistons, springs and seats into the cylinder block and set aside.
13. **(See Fig. 18)** Remove the thrust bearing assembly (19) from the swashplate (4).

#### (Center Section/Filter)

14. **(See Fig. 19)** Remove the center section mounting screws (44). NOTE: The center section is under motor block piston spring pressure. These screws are factory installed to 700 in. lbs. (80 Nm) and use an anaerobic thread adhesive. A breaker bar will be required at this step. Clean the internal threads of the mounting holes with compressed air.
15. Remove the center section and filter assembly (124, Fig. 20).
16. **(See Fig. 21)** Remove the filter (45) from the filter base (46) by snipping the four posts with side cutters or applicable tool. NOTE: This filter cannot be reused.
17. Remove and inspect the deflector (107), bypass actuator (47) and bypass spring (43).
18. Note the location of both check plugs (23 & 75) before removal for correct placement during reassembly. Remove and inspect the check plug assemblies (23) for debris or damage.
19. Remove the filter base (46) and discard it. NOTE: The filter base is included in the filter kit to be installed during reassembly of the unit.

#### (Motor Block)

20. **(See Fig. 22)** Remove the motor cylinder block assembly (5) from the housing (1).
21. Disassemble the motor cylinder block assembly (5). Check each piston for proper operation by pressing the pistons in and releasing them in the block bore. Disassemble the motor cylinder block. Check for piston/block wear in the cylinder bore. Inspect the pistons, piston springs and piston



# HYDRAULIC COMPONENTS

seats for excessive wear or damage.  
NOTE: Piston seats may be held in place in the piston by residual oil.

22. Reassemble the pistons, springs and seats into the cylinder block and set aside.
23. Remove the thrust bearing assembly (19) from the housing (1). Inspect the thrust bearing and thrust bearing cavity in the housing.

## INSPECTION

1. Inspect the pump cylinder block running surface for wear or damage.
2. Inspect the swashplate and thrust bearing assemblies for wear or damage.
3. Inspect the center section block running surfaces. NOTE: These “sealing” surfaces should be smooth in appearance without scratches, scoring, nicks or abrasions. Drag a fingernail across the surface to detect uneven wear or scratches which may not be visible.
4. Inspect the threaded check plug ports of the center section for debris or damage.
5. Inspect the motor cylinder block running surface for damage and wear.
6. Inspect all bearing, bushing and wear areas in the housing.

## ASSEMBLY

### (Motor Block)

1. **(See Fig. 22)** Turn the housing (1) so the axle horn is pointing down. This will assist in the installation of the thrust bearing assembly (19) keeping it in the bearing cavity during installation of the center section assembly.
2. Insert the thrust bearing (19) in the housing (1). NOTE: Place the thin race of the bearing towards the housing bearing cavity. The thick race must face the pistons.

### (Center Section)

3. **(See Fig. 21)** Install the new filter base (46) onto the center section (3).
4. Install the check plugs (23 & 75), in their correct location, into the center section (3). Tighten the check plugs according to Table 5.
5. Install the bypass spring (43) into the filter base (46).
6. Install the deflector (107) into the underside of the filter (45).
7. Install the bypass actuator (47) into the underside of the deflector (107).
8. Hold the stem of the bypass actuator (47) from the top of the filter (45) to retain the deflector (107) and bypass actuator (47) in place when snapping the filter (45) onto the filter base (46). NOTE: Filter installation is best accomplished by using the spacer (65, Page 32) as an assembly tool over each of the (4) snaps while lightly tapping with a rubber mallet. Excessive force will result in damage to the plastic filter components.
9. **(See Figures 13 & 23)** Install the motor shaft (24), pinion gear (27) and flat washers (52 & 108) into the center section (3).
10. Assemble the motor block assembly (5) onto the motor shaft (24).
11. **(See Fig. 23)** Install the motor shaft, center section and motor block assembly so that the block pistons contact the thrust bearing race. NOTE: Hold in place and insure all pistons are still positioned correctly in the cylinder bore by confirming spring bias against the center section.
12. **(See Fig. 19)** After applying thread adhesive, insert the center section mounting screws (44) while holding downward pressure on the center section assembly (3, Fig. 23).

# HYDRAULIC COMPONENTS

13. Tighten the center section mounting screws (44) to the proper torque. Refer to Table 5.

## (Swashplate/Pump Block)

14. (See Fig. 18) Install the pump thrust bearing (19) in the trunnion machined swashplate (4). NOTE: Place the thin race of the bearing towards the swashplate. The thick race must face the pistons.
15. (See Fig. 16) Place the pump block assembly (5), pistons down, on top of the thrust bearing in the swashplate (4).
16. Coat the pump running surface with clean motor oil.
17. *Care must be taken to prevent the scaring or scratching of the center section sealing face during this step.* Insert the short shaft side of the swashplate/pump block assembly (Fig. 24) into the housing while simultaneously compressing the pistons in the block. NOTE: To assist in the installation of these components, insert the assembly until  $\frac{3}{4}$  of the pump block is covered by the center section. Then slightly angle the trunnion shaft end away while pressing the short swashplate shaft into its pocket.
18. Install the input shaft. See page 22.
19. Install the bypass rod. See page 21.
20. Install the axle shaft, differential and reduction gears. Refer to page 20.
21. Install the side housing. See page 19.
22. Install the seals in the side housing. See page 18.
23. Fill the transaxle with new oil. See page 10.
24. Install the control arm and friction pack. See page 17.
25. Install the brake assembly and bypass arm. See page 16.

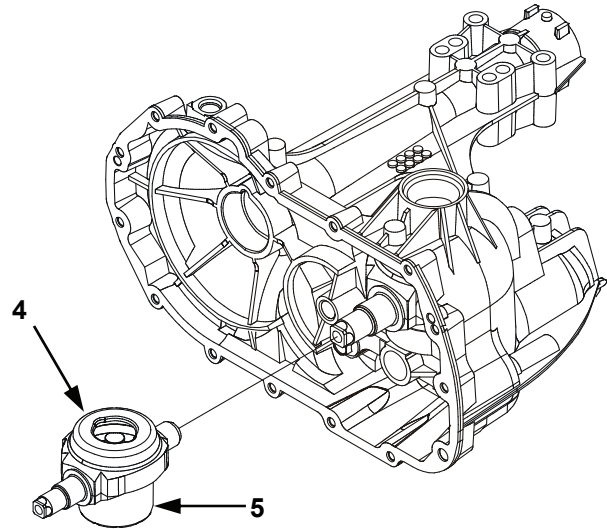


Figure 15

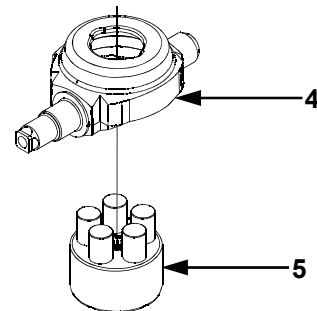


Figure 16

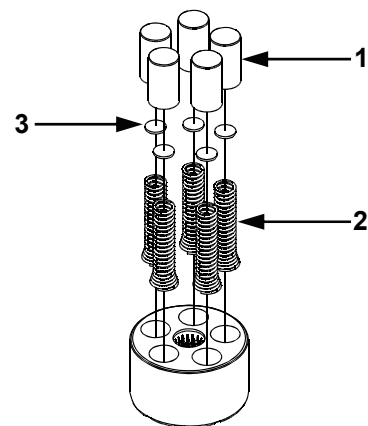


Figure 17

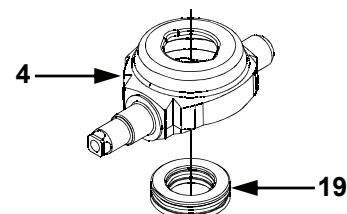


Figure 18

# HYDRAULIC COMPONENTS

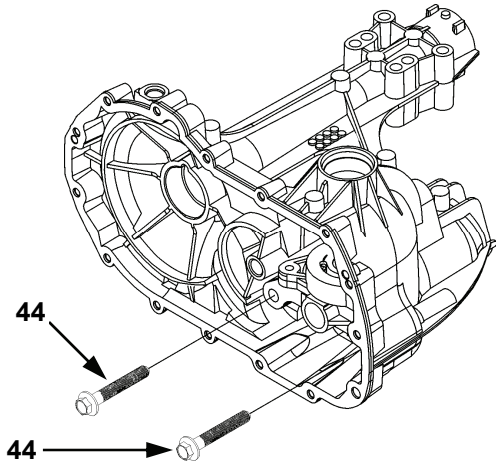


Figure 19

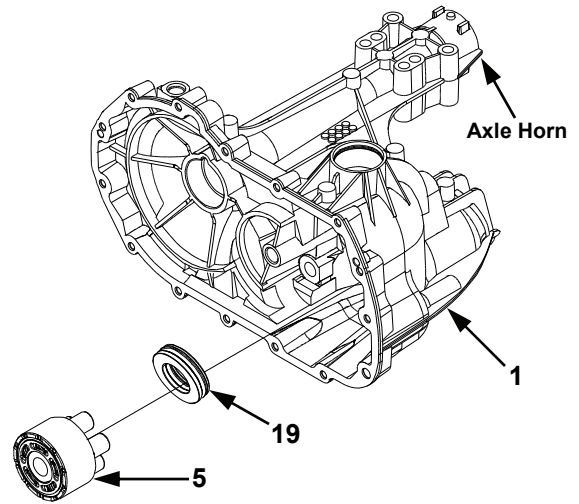


Figure 22

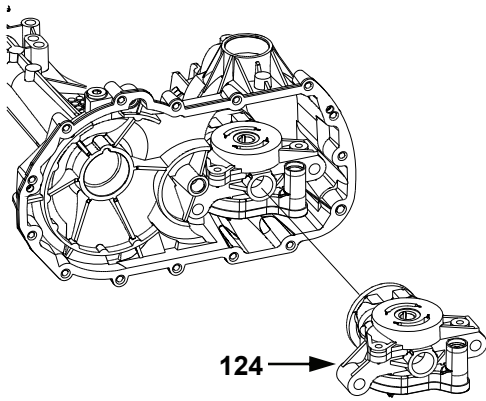


Figure 20

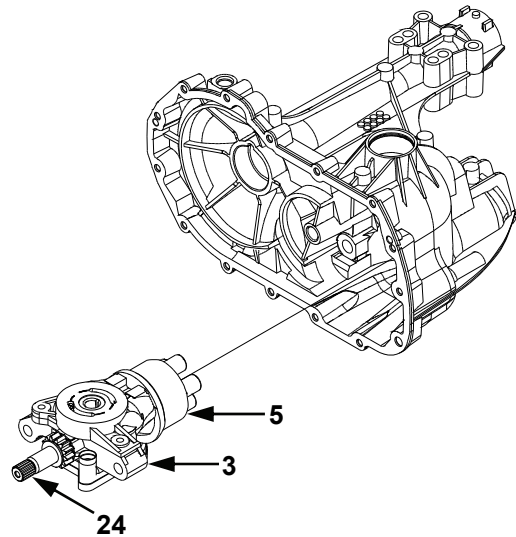


Figure 23

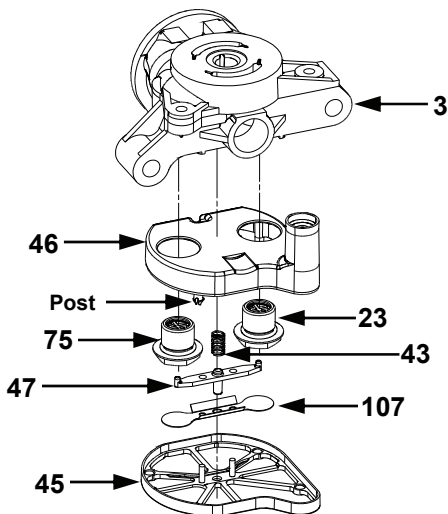


Figure 21

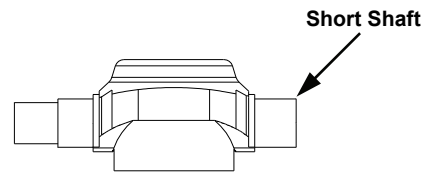


Figure 24. Swashplate/Pump Block Assembly



## TRANSAXLE INSTALLATION

Use the following procedure to complete the installation of the transaxle on the vehicle.

1. Install and secure the transaxle on the vehicle according to the instructions in the vehicle owner's manual.
2. With the vehicle raised, install the wheels on the axles, and snug the wheel hardware.
3. Lower the vehicle wheels to the ground and torque the wheel hardware per the vehicle owner's manual.

## ASSEMBLY AFTER A COMPLETE TEARDOWN

If the unit has been torn down completely, the following summary identifies the assembly procedures necessary to completely assemble the unit. Each assembly procedure is located by a page reference.

The part reference numbers provided in each assembly procedure are keyed to the individual exploded views, and are also keyed to the complete unit exploded view on page 32.

1. Install the hydraulic components. See pages 23-26.
2. Install the input shaft. See page 22.
3. Install the bypass rod. See page 21.
4. Install the axle shaft, differential and reduction gears. See page 20.
5. Install the side housing. See page 19.
6. Install new seals in the side housing. Refer to page 18.
7. Fill the transaxle with new oil. See page 10.
8. Install the control arm and friction pack. See page 17.
9. Install the brake assembly and bypass arm. See page 16.
10. Install the transaxle onto the vehicle.
11. Perform the purge procedures listed on page 11.
12. Perform the return to neutral procedure on page 12.

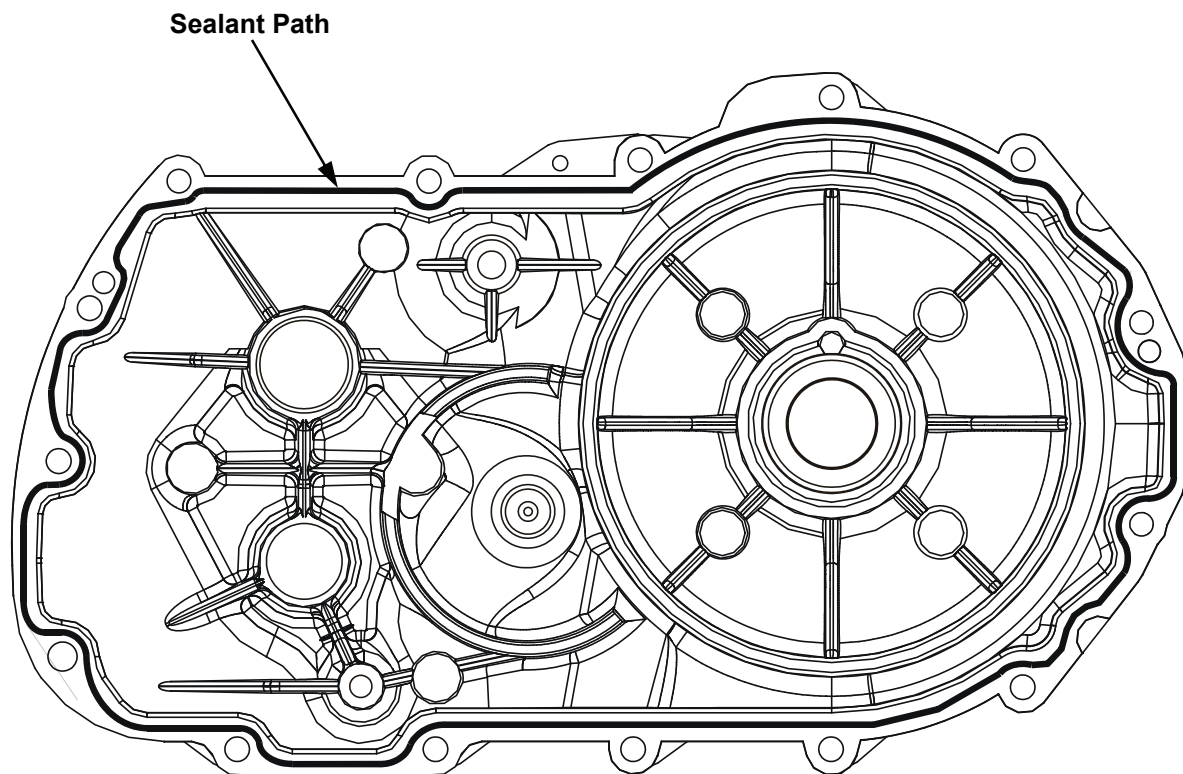
## SEALANT APPLICATION

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**NOTE:** Prior to applying the new sealant, the old sealant must be removed from all surfaces.

A small consistent bead of the sealant around the housing face will be sufficient. Use sparingly.

The illustration below indicates the correct areas.



# 310-0710 INTEGRATED HYDROSTATIC TRANSAXLE

## DESCRIPTION

The 310-0710 transaxle is an upgraded 310-0510 unit with different axle shafts, pump cylinder block assembly, center section and seal kit. The 310-0710 will have, as standard, black axle shafts. Flanged hubs will be an available option.

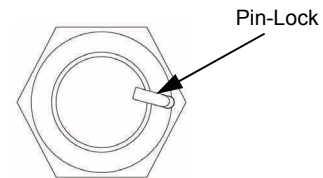
Except for flanged hub removal and assembly described below, repair techniques for this model are the same as described in the preceding sections of this manual. Table 6 illustrates key feature differences between the 310-0510 and the 310-0710.

## TRANSAXLE REMOVAL

It is necessary to remove the 310-0710 from the vehicle before performing the repair procedures presented in the repair section. Use the following procedure to prepare the unit for removal from the vehicle.

1. With the vehicle wheels on the ground, loosen the nuts retaining the hubs on the transaxle. Use an air impact wrench and socket to loosen the nuts.

**NOTE:** If unit is equipped with a Pin-Loc lock nut, a punch must be used to tap the pin-lock off of the axle shaft before removing the nut.



2. Lift the vehicle wheels from the ground and remove the nut completely.
3. Remove the wheel from the hub.
4. Using a wheel or gear puller, remove the hub from the shaft. Always inspect the hub for damage after removal.

## FEATURE COMPARISONS

Table 6. Transaxle Features

310-0510/-0610 Features	310-0710 Features
<ul style="list-style-type: none"> <li>• 5 piston 10cc pump</li> </ul>	<ul style="list-style-type: none"> <li>• 7 piston 10cc pump</li> </ul>
<ul style="list-style-type: none"> <li>• ¾" axle shafts</li> </ul>	<ul style="list-style-type: none"> <li>• 1" axle shafts</li> </ul>
<ul style="list-style-type: none"> <li>• Keyed and two flats axle end options</li> </ul>	<ul style="list-style-type: none"> <li>• Splined axle ends</li> </ul>
<ul style="list-style-type: none"> <li>• Seal Kit part no. 70463</li> </ul>	<ul style="list-style-type: none"> <li>• Seal Kit part no. 70722</li> </ul>
	<ul style="list-style-type: none"> <li>• Optional flanged hub</li> </ul>

Note that larger (1") axle shafts make it necessary to specify a seal kit and axle bushings different from the 310-0510 unit. The center section, pump cylinder block assembly, and associated kits also differ from those on the 310-0510. Refer to the appropriate model schematic for specific component part numbers.



## 310-0710 ITEMS LIST

No.	DESCRIPTION	No.	DESCRIPTION
1	Main Housing, Assembly, Black	71	Compression Spring Brake Anti-Drag
	Main Housing, Black	72	Washer, Flat .51 x 1.00 x .03
	Bushing .865 x .985 x .790	73	Washer, Flat .34 x .88 x .06
2	Side Housing, Assembly, Black	74	Oil Seal .625 X 1.0 X .25
	Side Housing, Black	75	Check Plug Assy, .027, Washer, "B" Port
	Bushing .865 x .985 x .790	94	Ball Bearing .62 I.D. x 1.38 x .44
	Bushing .624 x .719 x .562	95	Socket Head Cap Screw, 5/16-24 x 1-1/2
3	Center Section Assembly	96	Spacer Locating
	Center Section Machined	97	Screw, Countersunk 5/16-18 x 1.0
	Bushing .707 x .788 x .591	98	Arm, Return
4	Swashplate, Trunnion Machined	99	Puck, Adjusting
5	Block - Assembly	100	Washer, .32 x 1.60 x .24
	Block - Cylinder	101	Spring, Extension
	Piston	102	Spacer, .260 x .560 x .87
	Spring Compression	103	Bracket, Torque
	Thrust - Washer	107	Deflector
6	Sealant	108	Washer, Motor Shaft .71 x 1.16 x .04
7	Hex Flange Screw 1/4-20 x 1.25	109	Plug, 9/16-18 (Metal)
9	Shaft, Input	110	Torx Head Screw 5/16-18 x 1.5
10	Ring - Retaining	114	Spring Guide
11	Washer, Flat 1.23 x 1.57 x .04	117	Pin, Spring .304 x.75
12	Ring - Retaining	119	Fan, 7.0 in. (10 Blade)
13	Seal, Lip 17 x 40 x 7	120	Pulley, 3.86 in.
14	Ball Bearing 17MM x 40MM x 12MM	121	Nut, Hex Lock 1/2-20 w/nylon insert
16	Hex Flange Head Screw 5/16-24 x 0.94 w/patch	122	Washer, OD slotted .53 x 1.63 x .06
17	Lip Seal 18 X 32 X 7	124	Center Section-Filter-Bypass Assy
18	Arm, Control		Center Section Machined
19	Bearing, 30X52X13 Thrust		Base Filter
23	Check Plug Assembly, .027, Washer, "A" Port		Check Plug Assy.
24	Shaft, Motor		Spring, Bypass
27	Gear - Pinion, 13T		Actuator, Bypass
28	10T/48T Gear		Deflector
29	Gear, 10T Jackshaft		Filter
30	60T Bull Gear		Bushing, .707 X .788 X .591
31	Sleeve Bushing (Inboard)	125	Filter Assembly
32	Sleeve Bushing (Outboard) 1.002 x 1.571 x .625	126	Kit, Fan/Pulley
33	Washer, Flat .77 x 1.5 x .10	127	Kit, Seal & O-Ring
34	Lip Seal Axle Seal		Seal, Lip 17 x 40 x 7
35	Shaft, Black, Axle 1.00/.75 x 10.65 (Flange, R.H.)		Seal, Lip 18 x 32 x 7
36	Shaft, Black, Axle 1.00/.75 x 16.25 (Flange, R.H.)		Seal, Lip 1.00 X 1.577 X .250
37	Miter Gear, 12T (Splined)		Seal, Lip .250 X .750 X .250
38	Miter Gear 12T (0.5 ID)		Seal, Lip .625 X 1.0 X .25
39	Shaft		O-Ring .299 x .505 x .103
40	Ring, Spiral Retaining	135	Assembly, Block 7 Piston
41	Pin, Jackshaft		Block, Cylinder
42	Magnet, Ring		Piston
43	Spring, Bypass		Spring, Compression
44	Bolt, Hex Flange 3/8-24 x 2.5		Seat
45	Filter	152	Nut, Pin Lock 3/4-16
46	Base, Filter	153	Assembly, Hub
47	Actuator, Bypass		Hub, 4 Stud Metric (Painted)
48	Rod, Bypass Actuator		Stud, M12 x 1.5 (Rib Neck)
49	Arm, Bypass	164	Plug, 9/16-18 (Magnetic)
50	Retaining Ring .250 External	165	Fitting, 90° 9/16 SAE Beaded
51	Seal, Lip .250 x .750 x .250 TC	200	Kit, 60T Bull Gear Diff Pins
52	Flat Washer, .63 x 1.0 x .05		Gear, 60T
53	Retaining Ring		Pin, 0.5 OD
55	Spring, Block		Bulletin, Bull Gear
56	Washer, Thrust .59 x .79 x .04		
57	20W-50 Oil		
58	Brake Yoke Kit		
59	Disk, Brake		
60	Brake Puck		
61	Puck Plate		
62	Brake Actuating Pin		
63	Bolt, Hex Head 1/4-20 x 2 w/patch		
65	Spacer		
66	Spring, Brake Arm Bias		
68	Arm, Brake		
69	Nut, Castle 5/16-24		
70	Cotter Pin 3/32 X 3/4		



## 310-0610 ITEMS LIST

No.	DESCRIPTION	No.	DESCRIPTION
1	Main Housing, Assembly	65	Spacer .26 x .57 x .87
	Main Housing	66	Spring, Brake Arm Bias
	Bushing .865 x .985 x .790	68	Arm, Brake
	Pin, Headless Standard	69	Nut, Castle 5/16-24
2	Side Housing, Assembly	70	Cotter Pin 3/32 X 3/4
	Side Housing	71	Compression Spring Brake Anti-Drag
	Bushing .865 x .985 x .790	72	Washer, Flat .51 x 1.00 x .03
	Bushing .624 x .719 x .562	73	Washer, Flat .34 x .88 x .06
3	Center Section Assembly	74	Kit, Motor Shaft Seal .625 X 1.0 X .25
	Center Section Machined (5 piston)	75	Check Plug Assy, .027, Washer, "B" Port
	Bushing .707 x .788 x .591	76	Stud, 5/16-24 Friction Pack
4	Swashplate, Trunnion Machined	77	Puck .330 x 1.50 x .0975
5	Block - Assembly	78	Spring, Helical Compression
	Block - Cylinder	79	Spacer, .32 x .59 x .50
	Piston	80	Nut, Hex lock 5/16-24 w/nylon insert
	Spring Compression	81	Wedge, Friction Pack
	Thrust - Washer	82	Spacer, Friction Pack
6	Sealant	84	Fitting, 5/16 SAE 5/32 Tube
7	Screw, Hex Washer 1/4-20 x 1.25	85	Hose, Expansion Tank 7.56
8	Stud, 5/16-18 THD, 5/16-18 Strap	87	Cap, Barbed Vent
9	Shaft, Input	88	Bolt, Self Tapping
10	Ring - Retaining	90	Puck, Inner Wedge
11	Washer, Flat 1.23 x 1.57 x .04	93	Spring Clip, Housing Thrust (.75 In Axle)
12	Ring - Retaining	107	Deflector
13	Seal, Lip 17 x 40 x 7	108	Washer, Motor Shaft .71 x 1.16 x .04
14	Ball Bearing 17MM x 40MM x 12MM	109	Plug, 9/16-18 (Metal)
16	Bolt, Hex Flange 5/16-24 x 0.94 w/patch	111	O-Ring .299 x .505 x .103
17	Lip Seal 18 x 32 x 7	113	Bracket, Expansion Tank
18	Arm, Control	119	Kit, Fan, 7.0 in. (10 Blade)
19	Bearing, Thrust 30 x 52 x 13	120	Pulley, 3.86 in.
23	Shock Valve Assembly, .027, Washer, "A" Port	121	Nut, Hex Lock 1/2-20 w/nylon insert
24	Shaft, Motor	122	Washer, OD slotted .53 x 1.63 x .06
27	Gear - Pinion, 13T	123	Bracket, Belt Keeper, Angled
28	10T/48T Gear	124	Center Section-Filter-Bypass Assy
29	Gear, 10T Jackshaft		Center Section Machined
30	60T Bull Gear		Base Filter
31	Sleeve Bushing (Inboard)		Shock Valve Assy.
32	Sleeve Bushing .752 x 1.571 x .625		Check Plug Assy.
33	Washer, Flat .77 x 1.5 x .10		Spring, Bypass
34	Lip Seal .750 x 1.577 x .250		Actuator, Bypass
35	Shaft, Axle .75 x 11.39 (Key, R.H.)		Deflector
36	Shaft, Axle .75 x 16.99 (Key, L.H.)		Filter
37	Miter Gear, 12T (Splined)		Bushing, .707 X .788 X .591
38	Miter Gear 12T (0.5 ID)	125	Filter Assembly
39	Shaft	126	Kit, Fan/Pulley
40	Ring, Spiral Retaining	127	Kit, Seal & O-Ring
41	Pin, Jackshaft .50 x 2.43		Seal, Lip 17 x 40 x 7
42	Magnet, Ring		Seal, Lip 18 x 32 x 7
43	Spring, Bypass		Seal, Lip 1.00 X 1.577 X .250
44	Bolt, Hex Flange 3/8-24 x 2.5		Seal, Lip .250 X .750 X .250 TC
45	Filter		Seal, Lip .625 X 1.0 X .25
46	Base, Filter		O-Ring .299 x .505 x .103
47	Actuator, Bypass	128	Kit, Expansion Tank
48	Rod, Bypass Actuator	200	Kit, 60T Bull Gear Diff Pins
49	Arm, Bypass		Gear, 60T
50	Retaining Ring .250 External		Pin, 0.5 OD
51	Seal, Lip .250 x .750 x .250 TC		Bulletin, Bull Gear
52	Flat Washer, .63 x 1.0 x .05		
53	Retaining Ring		
55	Spring, Block		
56	Washer, Thrust .59 x .79 x .04		
57	20W-50 Oil		
58	Brake Yoke Kit		
	Yoke, Brake		
	Bolt, Sq. Hd. 5/16-24 Ribbed		
59	Disk, Brake		
60	Brake Puck		
61	Puck Plate		
62	Brake Actuating Pin		
63	Bolt, Hex Head 1/4-20 x 2 w/patch		
64	Bolt, Hex Head 1/4-20 x 1 w/patch		







## 310-0510 ITEMS LIST

No.	DESCRIPTION	No.	DESCRIPTION
1	Main Housing, Assembly	69	Nut, Castle 5/16-24
	Main Housing, Machined	70	Cotter Pin 3/32 x 3/4
	Bushing .865 x .985 x .790	71	Compression Spring, Brake, Anti-Drag
	Pin, Standard Headless	72	Washer, HT .51 x 1.0 x .03
2	Side Housing, Assembly	73	Flat - Washer .34 x .88 x .06
	Side Housing, Machined	74	Oil Seal .625 x 1.0 x .25
	Bushing .865 x .985 x .790	75	Check Plug Assembly, .027 Bleed, Washer ("B" port)
	Bushing .624 x .719 x .562	84	Fitting, 5/16 SAE 5/32 Tube
3	Center Section Assembly	85	Hose, Expansion Tank
	Center Section Machined (5 piston)	87	Cap - Vent
	Bushing .707 x .788 x .591	88	Bolt, Self Tapping 10-32 x 1/2
4	Swashplate, Trunnion Machined	94	Bearing, Ball .62 x 1.38 x .44
5	Block - Assembly	95	Screw, Socket Hd Cap 5/16-24 x 1.5
	Block - Cylinder	96	Spacer, Locating
	Pistons	97	Screw, Countersunk 5/16-18 1.0
	Springs, Compression	98	Arm, Return
	Thrust - Washer	99	Puck, Adjusting
6	Sealant (10.1 oz.)	100	Washer, Flat .32 x 1.60 x .24
7	Hex Flange Screw 1/4-20 x 1.25	101	Spring, Extension Double Loop
8	Stud, 5/16-24 Hex Double End	102	Spacer .26 x .56 x .87
9	Shaft, Input	103	Bracket, Torque
10	Ring - Retaining	107	Deflector
11	Washer, Flat 1.23 x 1.57 x .04	108	Washer, Flat .71 x 1.16 x .04
12	Ring - Retaining	109	Plug, 9/16-18 (Metal)
13	Seal, Lip 17 x 40 x 7	110	Screw, Torx Hd 5/16-18 x 1.5
14	Ball Bearing 17MM x 40MM x 12MM	111	O-Ring .299 x .505 x .103
16	Hex Flange Head Screw 5/16-24 x 0.94 w/patch	113	Bracket, Support Expansion Tank
17	Lip Seal 18 x 32 x 7	114	Spring Guide
18	Arm, Control	124	Center Section-Filter-Bypass Assy
19	Bearing, 30 x 52 x 13 Thrust		Center Section (5 piston)
23	Check Plug Assembly, .027 Bleed, Washer ("A" port)		Base Filter (w/poppet)
24	Shaft, Motor		Check Plug Assy. .027 Bleed, Washer
27	Gear - Pinion, 13T		Spring, Bypass .50 in
28	10T/48T Gear		Actuator, Bypass
29	Gear, 10T Jackshaft		Deflector
30	60T Bull Gear		Bottom, Filter
31	Sleeve Bushing (Inboard)		Bushing, .707 x .788 x .591
32	Sleeve Bushing .75 x 1.575 x .625	125	Filter Assembly
33	Washer, .77 x 1-1/2 x .10 THK		Bottom, Filter
34	Lip Seal Axle Seal		Spring, Bypass .50 in
35	Shaft, Axle .75 x 11.39 (DD, R.H.)		Actuator, Bypass
36	Shaft, Axle .75 x 17.99 (DD, L.H.)		Deflector
37	Miter Gear 12T (Splined)		Base, Filter w/poppet
38	Miter Gear 12T (0.5 ID)	127	Kit, Seal & O-Ring
39	Pin		Seal, Lip 17 x 40 x 7
40	Ring, Spiral Retaining		Seal, Lip 18 x 32 x 7
41	Pin, Jackshaft		Seal Lip .75 x 1.577 x .250
42	Magnet, Ring		Seal, Lip .250 x .750 x .250 TC
43	Spring, Bypass		Seal, Lip .625 x 1.0 x .25
44	Bolt, Hex Flange 3/8-24 x 2.5		O-Ring .299 x .505 x .103
45	Filter	128	Kit, Expansion Tank
46	Base, Filter		Tank, Expansion Assembly
47	Actuator, Bypass		Cap, Expansion
48	Rod, Bypass Actuator		Bolt, Self Tapping 10-32 x 1/2
49	Arm, Bypass		Bracket, Expansion Tank
50	Retaining Ring .250 External	200	Kit, 60T Bull Gear Diff Pins
51	Seal, Lip .250 x .750 x .250TC		Gear, 60T
52	Flat Washer, 5/8 x 1.0 x .05		Pin, 0.5 OD
53	Retaining Ring		
55	Spring - Helical Compression		
56	Washer, Thrust .59 x .79 x .04		
57	20W-50 Oil		
58	Brake Yoke		
59	Rotor, Brake		
60	Brake Puck		
61	Puck Plate		
62	Brake Actuating Pin		
63	Bolt, Hex Hd 1/4-20 x 2 w/patch		
65	Spacer		
66	Spring, Brake Arm Bias		
68	Arm, Brake		

## GLOSSARY OF TERMS

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**Axial Piston:** Type of design for hydraulic motors and pumps in which the pistons are arranged parallel with the spindle (input or output shaft).

**Bantam Duty:** A descriptive term relating to the product capacity (meaning: light duty).

**Bypass Valve:** A valve whose primary function is to open a path for the fluid to bypass the motor or pump. Also referred to occasionally as the freewheel valve or dump valve.

**Case Drain Line (Return Line):** A line returning fluid from the component housing to the reservoir.

**Cavitation:** A concentrated gaseous condition within the fluid causing the rapid implosion of a gaseous bubble.

**Center Section:** A device which acts as the valve body and manifold of the transmission.

**Charge Pump:** A device which supplies replenishing fluid to the fluid power system (closed loop).

**Charge Pressure:** The pressure at which replenishing fluid is forced into a fluid power system.

**Charge Relief Valve:** A pressure control valve whose primary function is to limit pressure in the charge circuit.

**Check Valve:** A valve whose primary function is to restrict flow in one direction.

**Closed Loop:** A sealed and uninterrupted circulating path for fluid flow from the pump to the motor and back.

**Decay Rate:** The ratio of pressure decay over time.

**End Cap:** See "Center Section"

**Entrained Air:** A mechanical mixture of air bubbles having a tendency to separate from the liquid phase.

**Gerotor:** A positive displacement pump frequently used as a charge pump.

**Hydraulic Motor:** A device which converts hydraulic fluid power into mechanical force and motion by transfer of flow under pressure.

**Hydraulic Pump:** A device which converts mechanical force and motion into hydraulic fluid power by producing flow.

**Hydrostatic Pump:** See "Hydraulic Pump"

## GLOSSARY OF TERMS

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**Hydrostatic Transaxle:** A multi-component assembly including a gear case and a hydrostatic transmission.

**Hydrostatic Transmission:** The combination of a hydraulic pump and motor in one housing to form a device for the control and transference of power.

**Inlet Line:** A supply line to the pump.

**Integrated Hydrostatic Transaxle (IHT):** The combination of a hydrostatic transmission and gear case in one housing to form a complete transaxle.

**Manifold:** A conductor which provides multiple connection ports.

**Neutral:** Typically described as a condition in which fluid flow and system pressure is below that which is required to turn the output shaft of the motor.

**Pressure Decay:** A falling pressure.

**Priming:** The filling of the charge circuit and closed loop of the fluid power system during start up, frequently achieved by pressurizing the fluid in the inlet line.

**Purging:** The act of replacing air with fluid in a fluid power system by forcing fluid into all of the components and allowing the air a path of escape.

**Rated Flow:** The maximum flow that the power supply system is capable of maintaining at a specific operating pressure.

**Scoring:** Scratches in the direction of motion of mechanical parts caused by abrasive contaminants.

**Swash Plate:** A mechanical device used to control the displacement of the pump pistons in a fluid power system.

**System Charge Check Valve:** A valve controlling the replenishing flow of fluid from a charge circuit to the closed loop in a fluid power system.

**System Pressure:** The pressure which overcomes the total resistance in a system, including all losses.

**Valve:** A device which controls fluid flow direction, pressure, or flow rate.

**Variable Displacement Pump:** A pump in which the displacement per cycle can be varied.

**Volumetric Displacement:** The volume for one revolution.



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