

# **310-3000**

## **Integrated Hydrostatic Transaxle**

### **Service and Repair Manual**

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# Table of Contents

<b>Section</b>	<b>Page</b>
<b>Foreword</b> .....	<b>i</b>
<b>Description and Operation</b> .....	<b>ii</b>
<b>Introduction</b> .....	<b>1</b>
General Description.....	1
Introduction.....	1
Hydraulic Schematic.....	2
Technical Specifications.....	3
Product Identification.....	3
<b>Safety</b> .....	<b>4</b>
Personal Safety.....	4
Tool Safety.....	4
Work Area Safety.....	4
Servicing Safety.....	4
<b>Troubleshooting</b> .....	<b>5</b>
<b>Service and Maintenance</b> .....	<b>6</b>
External Maintenance.....	6
Service and Maintenance Procedures.....	6
Fluids.....	7
Brake Maintenance.....	8
Return to Neutral Setting Hand Control.....	9
Return to Neutral Setting Foot Control.....	10
Purging Procedures.....	11
<b>Repair</b> .....	<b>12</b>
General Instructions.....	12
Required Tools.....	12
Torque Specifications.....	12
Transaxle Removal.....	12
Limited Disassembly.....	12
How to Use This Manual.....	13
Brake Assembly.....	14,15
Bypass Assembly.....	16
Control Arm Assembly.....	17,18
Torque Bracket Assembly.....	19
Fan and Pulley Assembly.....	20
Input Shaft Assembly.....	21
Charge Pump Assembly.....	22
Lower Housing/Filter/Manifold Assembly.....	23
Planetary Differential Assembly.....	24,25
Motor/Center Section/Pump Assembly.....	26,27,28
Directional Control Assembly.....	29
Transaxle Installation.....	30
Assembly After a Complete Tear-down.....	30
<b>Parts List</b> .....	<b>31,32</b>
<b>Glossary of Terms</b> .....	<b>33,34</b>

## FOREWORD

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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 the 310-3000 Hydro-Gear Integrated Hydrostatic Transaxle (IHT).

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 proper tools and the mechanics to 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.

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

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 the ESA (Engine Service Association) (610) 363-3844 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, visit [www.hydro-gear.com](http://www.hydro-gear.com) or call our Technical Service Department at (217) 728-2581.

## SECTION 1. DESCRIPTION AND OPERATION

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### INTRODUCTION

The purpose of this manual is to provide useful information for servicing the Hydro-Gear® 310-3000 Integrated Hydrostatic Transaxles (IHT). This manual includes transaxle general description, hydraulic schematic, technical specifications, product identification, safety, troubleshooting, maintenance, and repair 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 transaxle will need to be thoroughly cleaned before beginning most procedures.

Please refer to the instructions titled "How to Use This Manual" in the Repair Section for an explanation of the layout of the disassembly, inspection, and reassembly portions of this manual.

### GENERAL DESCRIPTION

The 310-3000 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.

The transaxle uses a variable displacement pump with a maximum displacement of 10 cc per revolution, and motor with a fixed displacement of 21cc per revolution. The variable displacement pump features a cradle swashplate with a direct-proportional displacement control. Reversing the direction of the swash-

plate 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 310-3000 has a self contained fluid supply and an internal filter. The fluid is drawn through the internal reservoir and feeds the fixed displacement gerotor charge pump. Excess fluid in the charge circuit is discharged over the charge relief valve and dumps back to case. Charge check valves in the center section are used to control the makeup flow of the fluid to the low pressure side of the loop.

The transaxle is filled and tested at the factory and should not require fluid or filter changes unless the fluid becomes contaminated.

A cam style, block lifting bypass is utilized in the 310-3000 to permit moving the vehicle for a short distance at a maximum speed of 2 m.p.h. (3.2 km/hr) 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 310-3000 utilizes an in-line floating disc brake controlled by a "cam" style actuating arm.

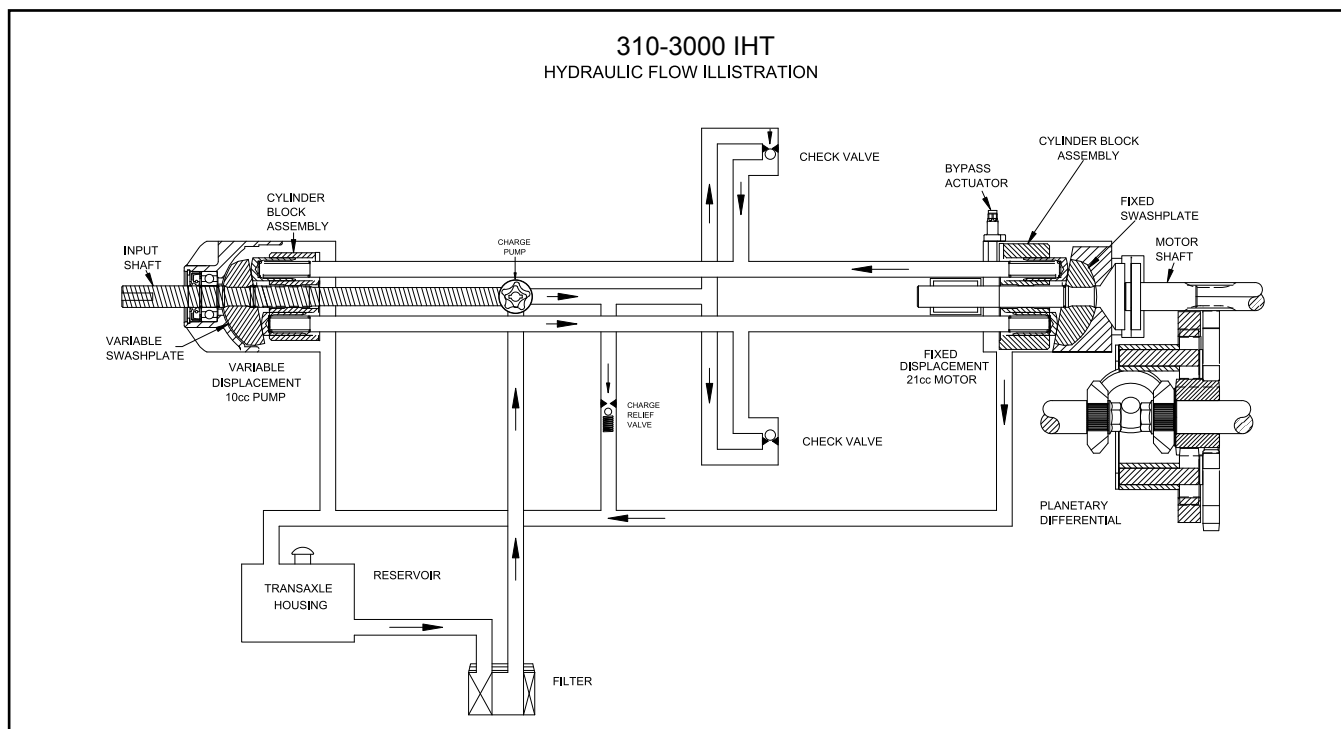


Figure 1. 310-3000 Hydraulic Flow Illustration

## HYDRAULIC SCHEMATIC

Figure 1 provides an illustration of the hydraulic oil circuit. The oil supply for the hydraulic system of the 310-3000 IHT is also utilized for the lubrication of the planetary differential drive gears.

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 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 (or valve body) 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 swashplate is increased the amount of oil being pumped will increase and cause a higher RPM output of the motor. Reversing the angle of the pump 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 transmission housing and must be made up in the loop. A charge pump is included on the 310-3000 IHT to supply this makeup flow. The make up flow is controlled (or directed) by the check valves. Each check valve will either be held opened or closed (depending upon the direction of vehicle operation) by the system operating pressure (closed) or by charge pressure (open) from the charge pump.

The charge pump maintains a continuous flow of oil as long as the input shaft is turning. All of the oil being pulled into the charge pump first must pass through an internal filter. Any oil not needed by the transmission for make up flow is

discharged through the charge relief valve. The charge relief valve maintains the charge pressure at no more than 40 PSI.

The motor cylinder block mounts onto the splined motor shaft which drives the planetary differential gear/differential assembly.

The bypass feature in the 310-3000 IHT has a mechanical lever which lifts the motor block off of the center section running surface, allowing any oil flowing from the pump block to be discharged into the housing without turning the motor.

## TECHNICAL SPECIFICATIONS

Technical specifications for the 310-3000 IHT are given in Table 1.

## PRODUCT IDENTIFICATION

The model and configuration of the 310-3000 IHT can be determined from the label shown in Figure 2.

Table 1. Technical Specifications

### Overall Transaxle Reduction

30.15:1

### Input Speeds

Maximum: 3600 RPM

Minimum: 1800 RPM

### Maximum Tire Diameter

23 inch; 584 mm

### Axle Shaft Options

Type: Keyed

Diameter: 1 inch; 25.4 mm

Type: Flanged

Diameter: Hub

### Brake Type

Disc

### Weight of Unit

58 lb; 26 kg

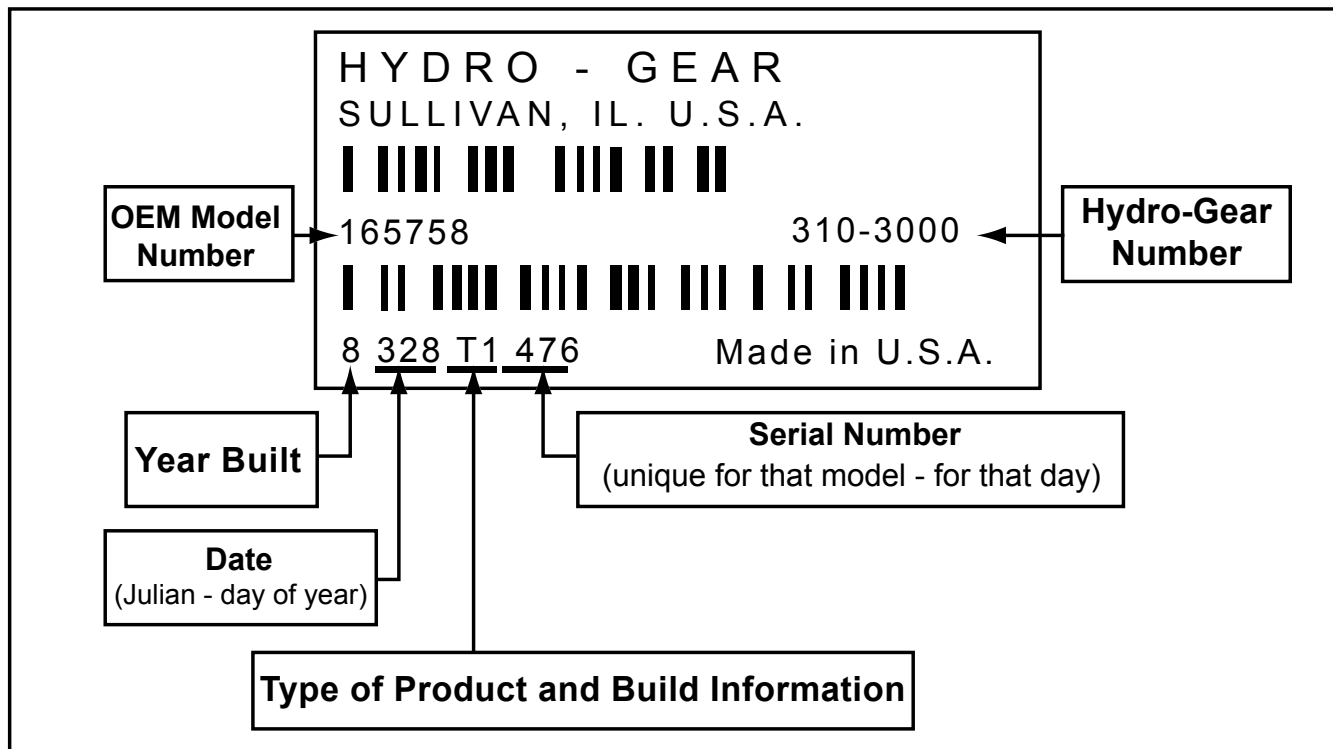


Figure 2. 310-3000 Configuration Label

## SECTION 2. SAFETY



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 310-3000 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 310-3000 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:

Other manuals pertaining to this machine

Local and shop safety rules and codes

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 310-3000IHT are not related to a defective transmission or axle, 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 before assuming the unit is malfunctioning. Table 2 below provides a troubleshooting check list to help determine the cause of operational problems.

**Table 2. Troubleshooting Checklist**

Possible Cause	Corrective Action	Refer To:
<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 Repair or replace drive belt or pulley	Control Linkage Repair, Page 17 Pulley Repair, Page 20
<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 Reduce vehicle loading Adjust brake to proper setting Repair or replace loose parts Repair or replace valve or linkage Purge hydraulic system	Fluid Maintenance, Page 7 Vehicle Specifications Brake Adjustment, Page 8 Appropriate Repair Procedure Bypass Repair, Page 16 Purging Procedure, Page 11
<b>UNIT HAS NO/ LOW POWER</b>		
Engine RPM 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 Adjust brake to proper setting Repair or replace drive belt or pulley Fill to proper level or change oil Reduce vehicle loading Repair or replace valve or linkage Purge hydraulic system	Vehicle Specifications Control Linkage Repair, Page 17 Brake Adjustment, Page 8 Pulley Repair, Page 20 Fluid Maintenance, Page 7 Vehicle Specifications Bypass Repair, Page 16 Purging Procedure, 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 Adjust brake to proper setting Repair or replace cooling fan Fill to proper level or change oil Reduce vehicle loading Purge hydraulic system	Brake Adjustment, Page 8 Cooling Fan Repair, Page 20 Fluid Maintenance, Page 7 Vehicle Specifications Purging Procedure, Page 11
<b>TRANSAXLE LEAKS OIL</b>		
Damaged seals, housing, or gaskets Air trapped in hydraulic system	Replace damaged component Purge hydraulic system	Appropriate Repair Procedure Purging Procedure, Page 11



## SECTION 4. SERVICE AND MAINTENANCE

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**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

Reference Table 4., Page 13 for tools required in the maintenance of the 310-3000 IHT.

Regular external maintenance of the 310-3000 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 See Figure 3, Page 7.
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 RPM to the transaxle
4. Inspect the transaxle 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 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 310-3000 is mounted on the vehicle. Any servicing beyond those given must be performed after the unit has been removed from the vehicle. Additional procedures are provided in Section 5. Repair Procedures.

## 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 9cSt (55 SUS) at 230° F (110° C) and an API classification of SJ/CD is recommended. A 20W-50 engine oil has been selected for use by the factory and is recommended for normal operating temperatures.

## FLUID VOLUME

Fluid volume information is provided in Table 3.

## FLUID LEVEL

Certain situations may require additional fluid to be added or even replaced. Refer to Figure 3 for the proper fill port and fluid level port locations. Fill the unit until fluid flows out of the fluid level port. Recheck the fluid level once the unit has been operated for approximately 1 minute. Purging may be required. Refer to the purging procedures, Page 11.

## FLUID CHANGE

This transaxle is factory filled and does not require a regular oil change. In the event of oil contamination or degradation an oil change may improve performance.

Using the transaxle removal procedure from Section 5, Page 12, remove the transaxle and drain the oil from the top fluid fill port. Fill unit per Table 3, reinstall the transaxle and perform the purging procedures, Page 11.

In the event a fluid change and filter inspection is required, refer to Page 23, Disassembly/Assembly instructions.

### Caution

#### Do not overfill.

**If you overfill the transaxle while the unit is "cold", it may overflow as it reaches normal operating temperatures. The oil level should not be above the manufacturer's suggestions outlined in this manual. This will allow the space needed for the oil to expand as it warms up.**

Table 3. Fluid Volumes for the 310-3000 IHT

Fluid Description	Volume
20W-50 engine oil	0.95 gal. (121.6 oz) (3.59 liters)

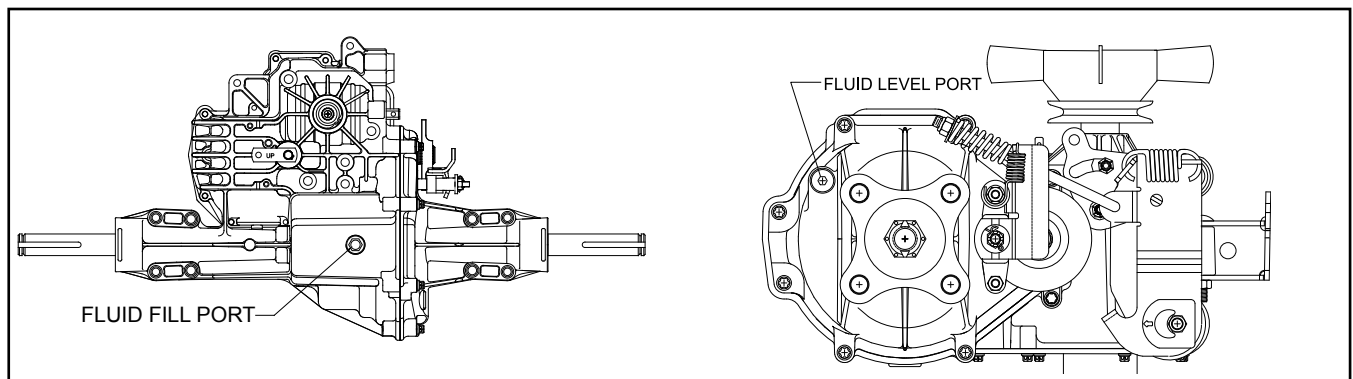


Figure 3. 310-3000 Fluid Fill and Level Ports

## 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" (.381 mm) feeler gage between the brake disc and top brake puck, and then set the brake by tightening or loosening the castle nut.
3. Adjust brake gap to 0.015" (.381 mm) clearance.
4. Install the cotter pin to secure the castle nut, and then install the brake arm bias spring.

### RETURN TO NEUTRAL SETTING (OPTIONAL FEATURE)

The return to neutral mechanism on the transmission is designed to set the directional control into a neutral position. An optional feature, it is available in two versions. One version provides hand control, and the other, foot control. Setting procedures are provided on pages 9 and 10.



#### **WARNING**

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

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

## RETURN TO NEUTRAL SETTING HAND CONTROL



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

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

The return to neutral mechanism on the transmission is designed to set the directional control into a neutral position when the vehicle parking brake is engaged. 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 trans-axle control arm.**

2. Remove the Original Equipment Manufacturer's (OEM's) control linkage at the control arm. Refer to Figure 4.
3. Remove the cotter pin and washer securing the brake pull rod to the return actuating arm. Remove the brake pull rod from the return actuating arm. Refer to Figure 4.



### **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!

4. Apply the vehicle brake, start the engine and increase the throttle to full engine rpm.
5. Check for axle rotation. If the axles do not rotate, go to Step 6. If the axles rotate, go to Step 7.
6. Stop the vehicle engine. Adjust the OEM linkage according to the OEM manual. Recheck according to step 4 and 5. Stop the vehicle engine. Replace the brake pull rod onto the return actuating arm. Install the washer and a new cotter pin securing the brake pull rod to the actuating arm. Refer to Figure 4.
7. Note the axle directional movement. Stop the vehicle's engine. Loosen the adjusting puck screw until the puck can be rotated. Rotate the adjusting puck the opposite direction of the wheel rotation on the control linkage side in 5 degree increments. Tighten the adjusting puck screw. Refer to Table 5. Required Torque Values, Page 13. Recheck according to step 4 and 5. Stop the vehicle engine. Adjust the OEM linkage according to the OEM manual. Recheck according to Step 4 and 5. Stop the vehicle engine. Replace the brake pull rod onto the return actuating arm. Install the washer and a new cotter pin securing the brake pull rod to the actuating arm. Refer to Figure 4.

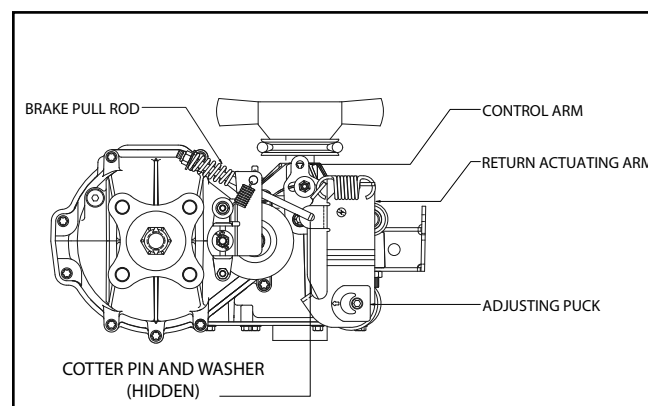


Figure 4. Return to Neutral, Hand Control

## 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 of the ground. To prevent possible injury to the servicing technician and/or bystanders, insure the vehicle is properly secured.

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 control arm.

2. Remove the Original Equipment Manufacturer's (OEM's) control linkage at the control arm. Refer to Figure 5.



### 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!

3. Start the engine and increase the throttle to full engine rpm.
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. 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 on the control linkage side in 5 degree increments. Tighten the adjusting puck screw. Refer to Table 5. Required Torque Values, Page 13. Recheck according to Step 3 and 4. Stop the vehicle engine. Adjust the OEM linkage according to the OEM manual. Recheck according to Step 3 and 4. Refer to Figure 5.

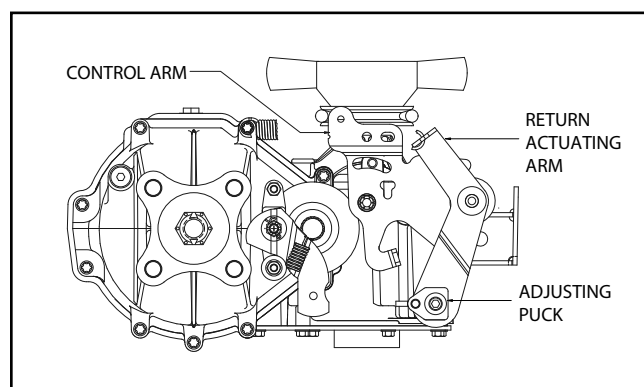


Figure 5. Return to Neutral, Foot Control

## 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 normally 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", in the latter case, oil may overflow.

Before starting, make sure the transaxle/ transmission is at the proper oil level. If it is not, fill to the manufacturers suggestions outlined in the vehicle owners manual.

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 and bubbles may appear in the oil. After stopping the engine, add oil, as necessary. Fill to the level outlined in Figure 3, Page 7.
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, purging is complete.

### CAUTION

#### DO NOT OVERFILL.

**If you overfill the transaxle while the unit is "cold", it may overflow as it reaches normal operating temperatures. The oil level should not be above the level shown in figure 3, Page 7. This will allow the space needed for the oil to expand as it warms up.**



## SECTION 5. REPAIR

**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.**

### 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.).

Parts requiring replacement must be replaced from the appropriate kits identified in the Items Listing, found at the end of this manual.

### REQUIRED TOOLS

A list of tools required for the repair of the 310-3000 IHT is provided in Table 4, Page 13.

### TORQUE SPECIFICATIONS

Torque specifications for fasteners used on the 310-3000 IHT are provided in Table 5.

### TRANSAXLE REMOVAL

It is necessary to remove the 310-3000 from the vehicle before performing the repair procedures presented in this section. Use the following procedure to prepare the unit for removal from the vehicle.

1. With the vehicle wheels on the ground, loosen the nut (119, Figure 19) Page 31, retaining the hub (118, Figure 19) on the control side of the transaxle only. Use an air impact wrench and a 1-1/8" socket to loosen the hub.
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.

#### CAUTION

**USE CARE IN REMOVING THE HUB TO PREVENT CRACKING.**

### 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, and the disassembly process can be halted after any given procedure.

Assembly 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 30.



## HOW TO USE THIS MANUAL

Many of the parts and subassemblies of this transaxle can be removed and serviced independently of other components. The disassembly, inspection, and assembly portions of this manual are therefore laid out in subsections. Each assembly is treated as a unit, and the disassembly, inspection, and assembly procedures follow one another.

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.

Subassemblies removed to reach another component or feature need not be fully disassembled. They may be reassembled intact following the necessary repairs.

Each assembly is provided with an exploded view showing the parts involved. At the end of the manual, after the reassembly summary, a complete exploded views and items lists are provided.

**Table 4. Required Tools**

<p><b>Miscellaneous</b>                  310-3000 Service &amp; Repair Manual                  Loctite                  Flat Blade Screw Driver                  Torque Wrench                  Air Impact Wrench  <b>Pliers</b>                  Needle Nose                  External Snap Ring                  Internal Snap Ring</p>	<p><b>Allen Wrenches</b>                  5 mm, 6 mm, 1/4 inch  <b>Sockets</b>                  3/8" Drive: 7/16", 1/2", 13/16"                  1/2" Drive: 9/16", 15/16", 1-1/8"                  #8 Internal Torx Drive                  #10 Internal Torx Drive  <b>Socket Drivers</b>                  3/8", 1/2"  <b>Combination Wrenches</b>                  7/16", 1/2", 9/16", 13/16", 15/16", 1-1/8"</p>
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**Table 5. Required Torque Values**

Operation	Torque	Item	Description
Center Section Screws (Item #4)	525-700 lb-in (59-79 Nm)	44	Screw
Lower Housing Screws (Item # 50)	135-185 lb-in (15-21 Nm)	50	Screw
Charge Pump Cover Screws (Item # 29)	87-108 lb-in (9-12 Nm)	29	M6 x 1-22
Axle Shaft Jam Nut (Item # 73)	660-800 lb-in (75-90 Nm)	73	5/16-18
Right Hand Housing Screws (Item # 80)	230-290 lb-in (26-33 Nm)	80	5/16-18
Axle Hub Nut (Item # 119)	200-295 lb-ft (271-400 Nm)	119	3/4-16
Pulley Nut (Item # 115)	360-520 lb-in (41-59 Nm)	115	Jam Nut
Fan Screws (Item # 107)	35-50 lb-in (4-6 Nm)	107	Screw
Bypass Screw (Item # 138)	42-62 lb-in (5-7 Nm)	138	10-32 x 1/2
Torque Bracket Nut (Item # 142)	160-210 lb-in (18-24 Nm)	142	5/16-18
Control Arm Stud (Item # 36)	50-120 lb-in (6-14 Nm)	36	5/16-24
Trunnion Shaft Nut (Item # 95)	180-240 lb-in (20-27 Nm)	95	5/16-24
Control Bearing Screw (Item # 92)	190-240 lb-in (22-27 Nm)	92	Screw
Control Arm Nut (Item # 95)	85-120 lb-in (10-14 Nm)	95	5/16-24
Adjusting Puck Screw (Item # 88)	250-320 lb-in (28-36 Nm)	88	5/16-24 x 1-3/4
Brake Nuts (Item # 127)	80-120 lb-in (9-14 Nm)	127	1/4-20

## BRAKE ASSEMBLY

Refer to Figures 6 and 7.

### DISASSEMBLY

The following procedure is for model 324-3000. Reference microfiche for other models.

1. Remove lock nut (95), washer (77), brake spring (134), and washer (77) from brake pull rod (152).
2. Remove cotter pin (129), and washer (77) from brake pull rod (152).
3. Remove brake pull rod (152) and set aside.
4. Remove the cotter pin (129), castle nut (128), and washer (77).
5. Remove brake arm (124), and brake arm bias spring (141).
6. Remove brake anti-drag compression spring (151), and two brake pins (125).
7. Remove upper nut (127), lock washer (126), washer (139), and spacer (130) which secure brake yoke assembly (122).
8. Remove lower nut (127), and lock washer (126) securing brake yoke assembly (122).
9. Remove brake yoke assembly (122), puck plate (131), and outer brake puck (120).
10. Remove brake disc (85), and inner brake puck (120).

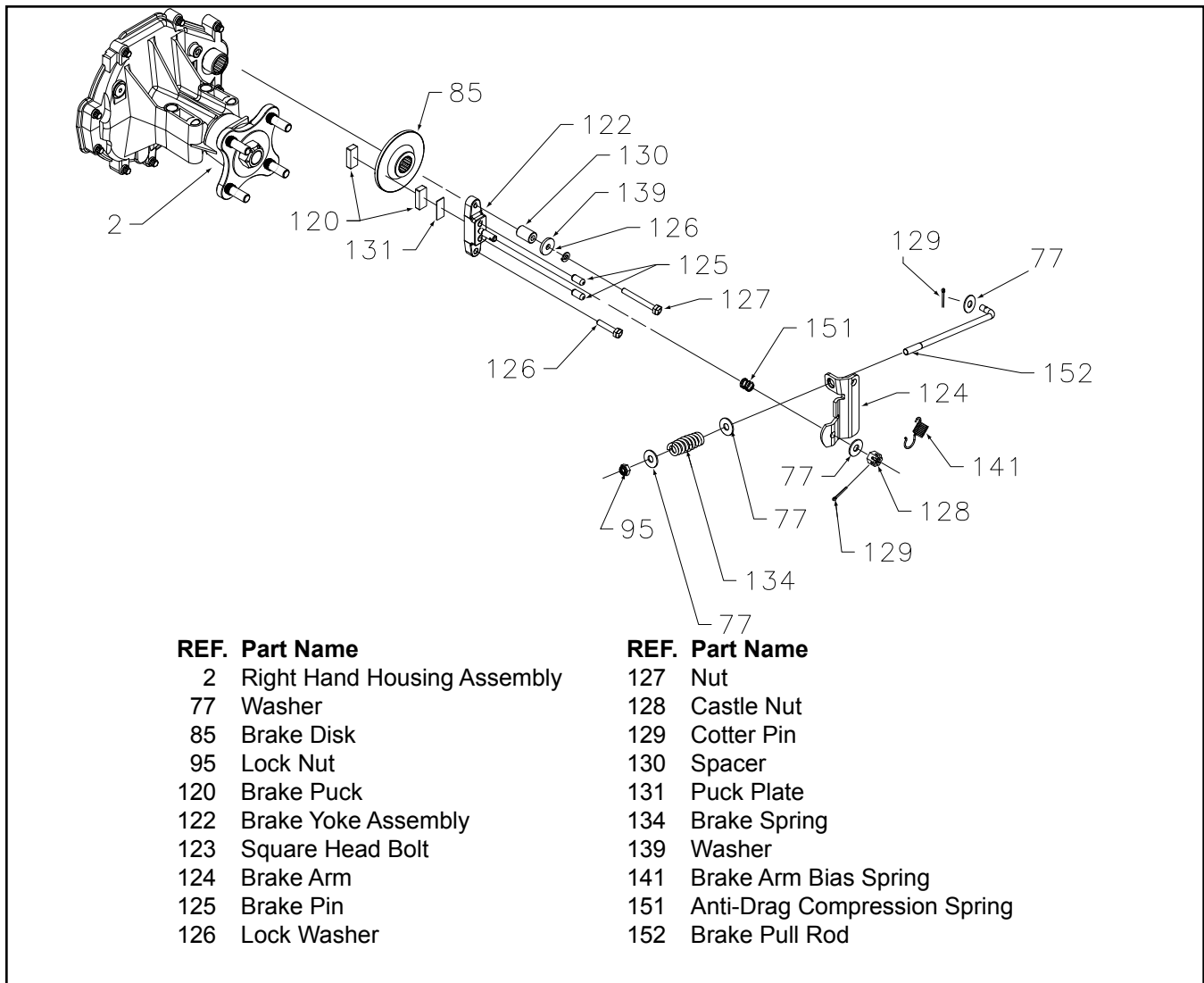


Figure 6. Brake Assembly

## INSPECTION

1. Inspect the brake pucks (120) for excessive wear.
2. Replace with new if necessary.

## ASSEMBLY

1. Install inner brake puck (120), and brake disc (85).
2. Assemble the brake yoke assembly, by installing puck plate (131), outer brake puck (120) into brake yoke (122).
3. Install the brake yoke assembly onto two mounting studs on housing assembly (2). Use of a feeler gage (0.015") (.381 mm) may be helpful in retaining the brake yoke assembly at this step.
4. Install at upper bolt spacer (130), washer (139), lock washer (126), and nut (127).
5. Install at lower bolt lock washer (126), and nut (127) to secure the brake yoke assembly.
6. Install brake anti-drag compression spring (151), and two brake pins (125).
7. Install brake arm (124) onto brake yoke assembly.
8. Install washer (77), and castle nut (128).
9. Insert a (0.015") (.381 mm) feeler gage between brake disc (85) and top brake puck (120). Adjust the brake by turning castle nut (128) until it is snug but not tight against the feeler gage. (The brake gap must be adjusted to a (0.015") (.381 mm) clearance.
10. Install cotter pin (129) to secure castle nut (128).
11. Install brake arm bias spring (141) to brake arm (124) and top brake arm bolt.
12. Install brake pull rod (152) into brake arm (124) and actuating arm (35).
13. Secure brake rod (152) to actuating arm (35) by installing washer (77) and cotter pin (129).
14. Secure brake pull rod (152) to brake arm by installing washer (77), brake spring (134), washer (77), and lock nut (95). Set to the dimension shown in Figure 7.

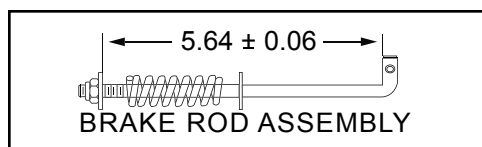


Figure 7. Brake Pull Rod Assembly Adjustment

## BYPASS ASSEMBLY

Refer to Figure 8.

### DISASSEMBLY

1. Remove self tapping screw (138), and extension spring (136).
2. Remove snap ring (42), and bypass arm (41).
3. Remove bypass lip seal (40).

### INSPECTION

1. Inspect spring pin (137) for damage.

### ASSEMBLY

1. If necessary, install new spring pin (137).
2. Install bypass lip seal (40).
3. Install bypass arm (41), and snap ring (42).
4. Install self tapping screw (138), and extension spring (136).

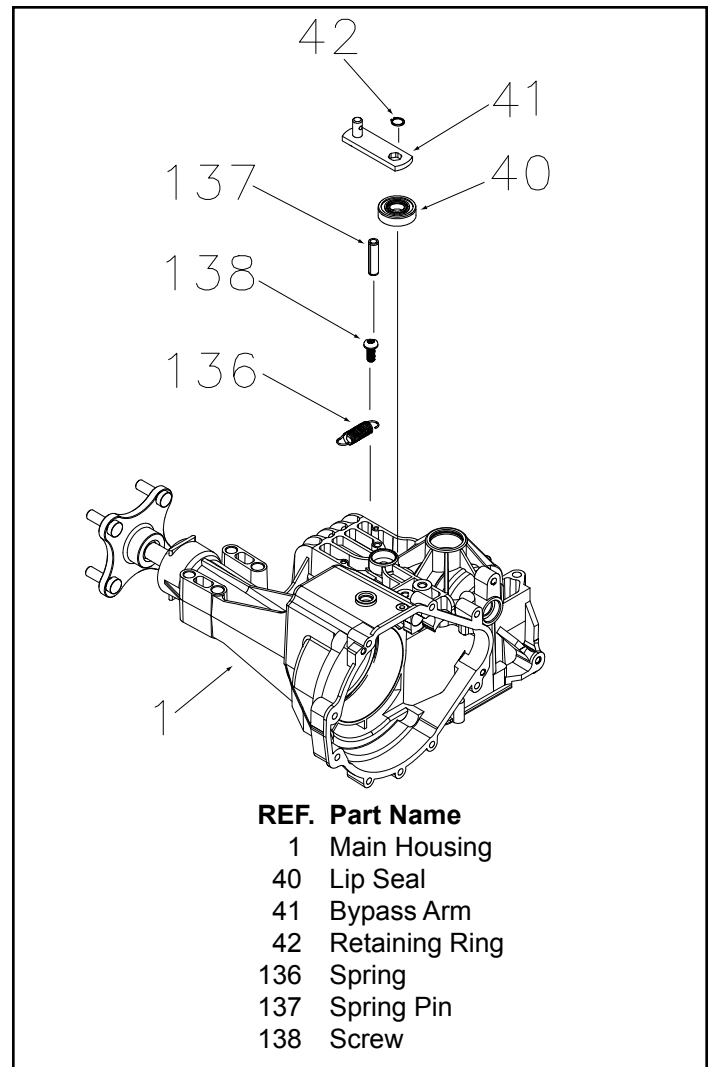


Figure 8. Bypass Assembly

## CONTROL ARM ASSEMBLY

Refer to Figure 9, Page 18

### DISASSEMBLY

#### NEUTRAL ASSEMBLY

**NOTE: The brake pull rod (152), washer (77), and cotter pin (129) must be removed before disassembling the Neutral Assembly (refer to Brake Assembly).**

1. Remove bolt (88) and adjusting puck (48).
2. Remove neutral spring (46), actuating arm (35), return arm (34), and washer (87).

#### CONTROL ARM ASSEMBLY

1. Remove upper lock nut (95), washer (77), spring (93), spacer (94), washer (77), and friction puck (37).
2. Remove lower lock nut (95), and trunnion spacer (106), from the trunnion arm (31).
3. Remove control arm (26).
4. Remove friction puck (37), and stud (36), if necessary.

### INSPECTION

1. Inspect bearing (89), and replace if necessary. Remove bearing by removing countersink screw (92), and washer (90).

2. Inspect trunnion arm lip seal (33), and replace if necessary.

### ASSEMBLY

#### CONTROL ARM ASSEMBLY

1. Install trunnion arm lip seal (33), into main housing (1).
2. Install stud (36), per Table 5, Page 16 and friction puck (37).
3. Install control arm (26), onto trunnion arm (31), and stud (36), with washer (77) and nut (95) per Table 5, Page 13.

**NOTE: If bearing (89) must be replaced, install bearing (89), washer (90), and countersink screw (92).**

4. Install friction puck (37), washer (77), spring (93), spacer (94), washer (77), and lock nut (95). Tighten locknut to 120 in. lbs. (14 Nm), then back off (1) full turn.

#### NEUTRAL ASSEMBLY

1. Install washer (87), return arm (34), actuating arm (35), and neutral spring (46).
2. Install adjusting puck (48), and bolt (88).
3. Reference Pages 9, 10 for proper neutral adjustment procedures.

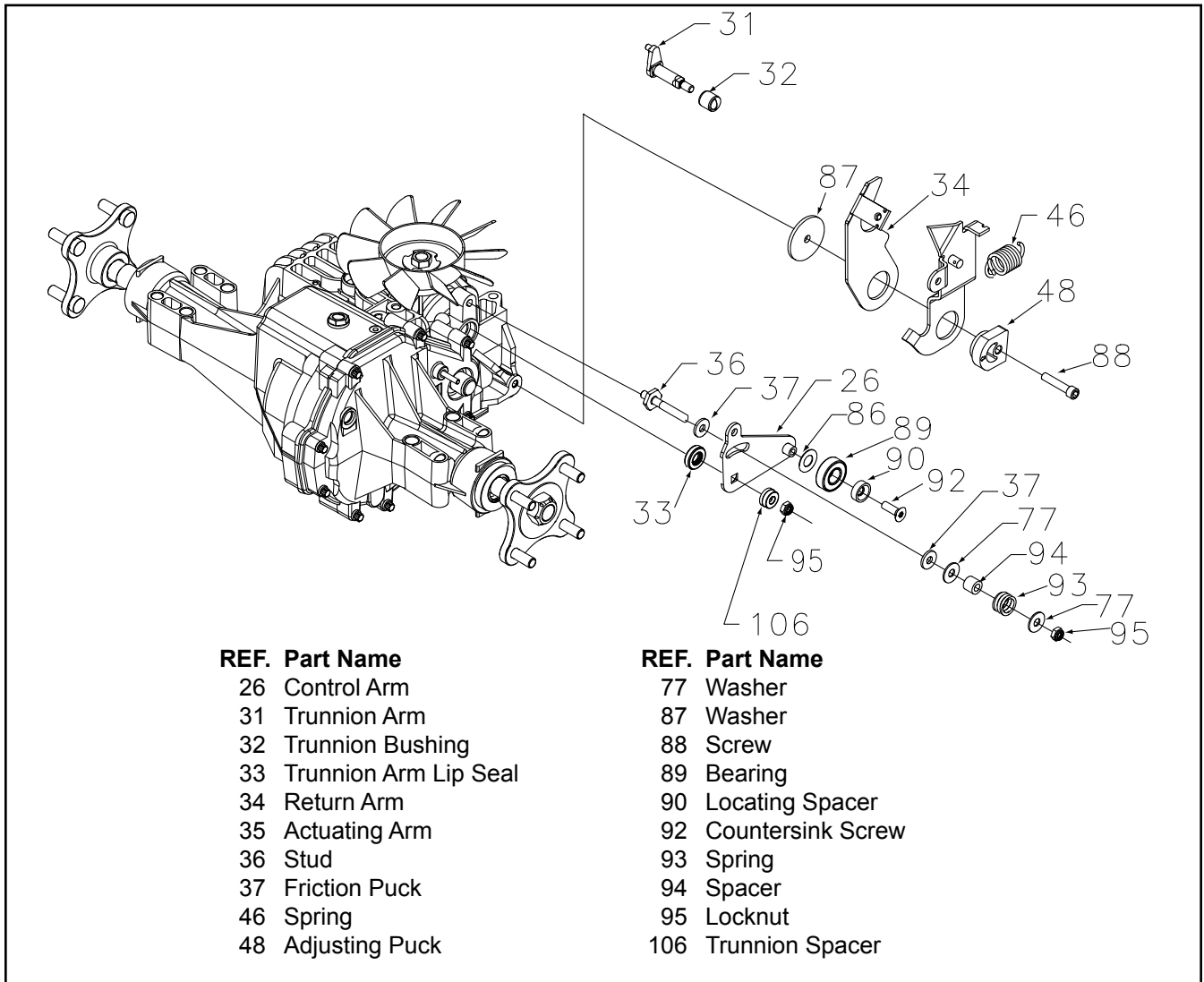


Figure 9 Control Arm Assembly

## TORQUE BRACKET ASSEMBLY

Refer to Figure 10.

### DISASSEMBLY

1. Remove lock nut (142), and bolt (143), from torque bracket (102).
2. Remove torque bracket (102), from main housing (1).

### ASSEMBLY

1. Install torque bracket (102), onto main housing (1).
2. Install lock nut (142), and bolt (143), to secure torque bracket (102) to main housing (1). Reference Table 5, Page 13 for torque values.

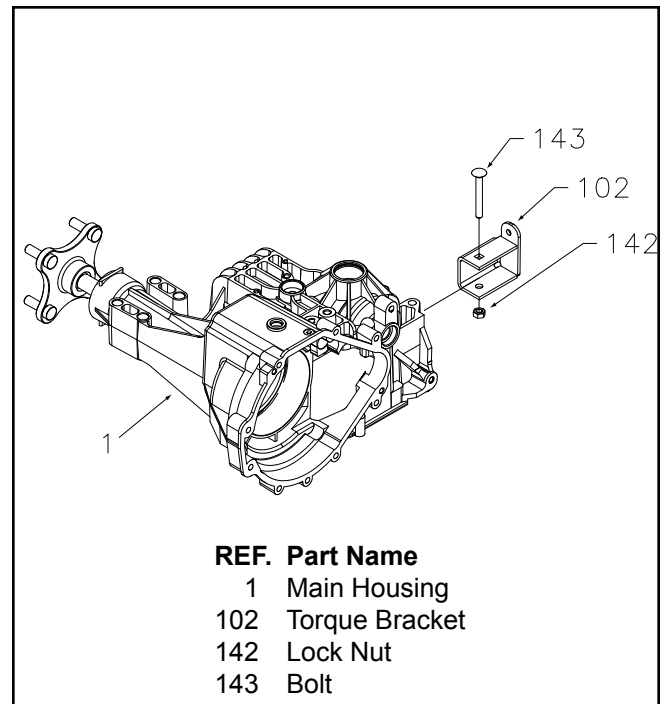


Figure 10. Torque Bracket Assembly



## FAN AND PULLEY ASSEMBLY

Refer to Figure 11.

### DISASSEMBLY

1. Remove jam nut (115) from input shaft (12).
2. Remove fan/pulley assembly (104), (103), (107).

### INSPECTION

1. Inspect fan (104) for broken and/or damaged blades. If necessary to replace fan (104), remove screws (107), and fan (104), from pulley (103).

### ASSEMBLY

1. Install fan/pulley assembly (104), (103), (107) onto input shaft (12).
2. Secure fan/pulley assembly (104), (103), (107) onto shaft (12) by installing jam nut (115), per table 5, Page 13.

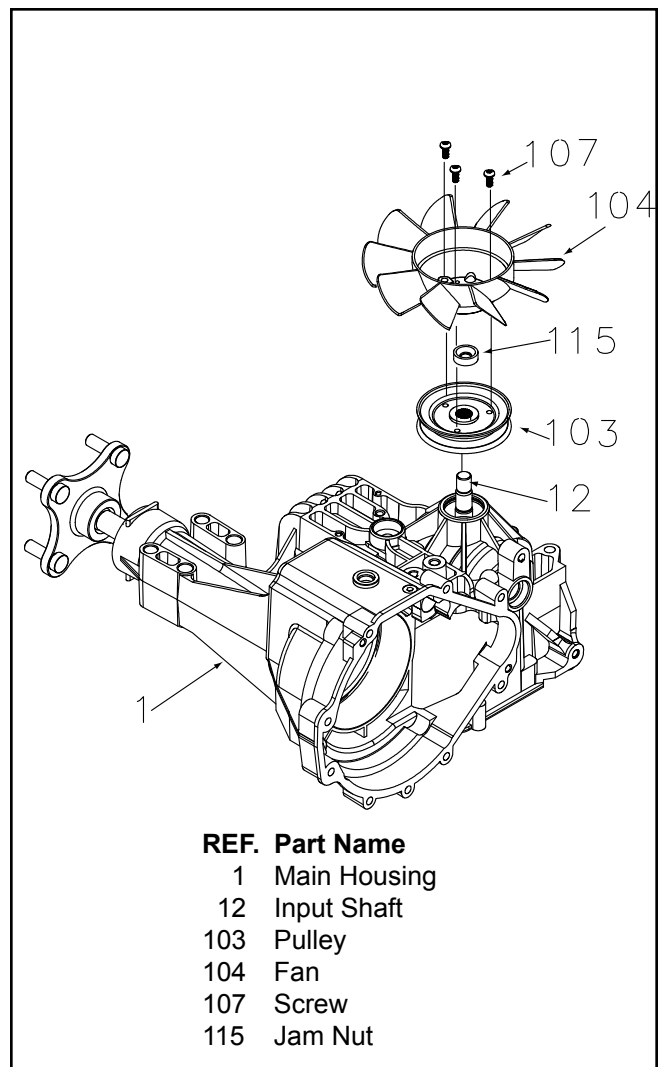


Figure 11. Fan and Pulley Assembly

## INPUT SHAFT ASSEMBLY

Refer to Figure 12.

### DISASSEMBLY

1. Drain the oil from the transaxle.
2. Remove snap ring (7), input shaft lip seal (5), and spacer (4).
3. Remove input shaft assembly (12), (8), (6).
4. Remove washer (13) from cavity.

### INSPECTION

1. Inspect bearing (8) for damage and, if necessary replace bearing, remove wire retaining ring (6) and bearing (8) from input shaft (12).

### ASSEMBLY

1. Carefully install washer (13) onto top of spring in cavity.
2. Press bearing (8) onto input shaft (12) and secure by installing wire retaining ring (6).
3. Install input shaft assembly (12), spacer (4), and lip seal (5) into input bearing bore of main housing (1).
4. Secure input shaft assembly (12) by installing retaining ring (7).

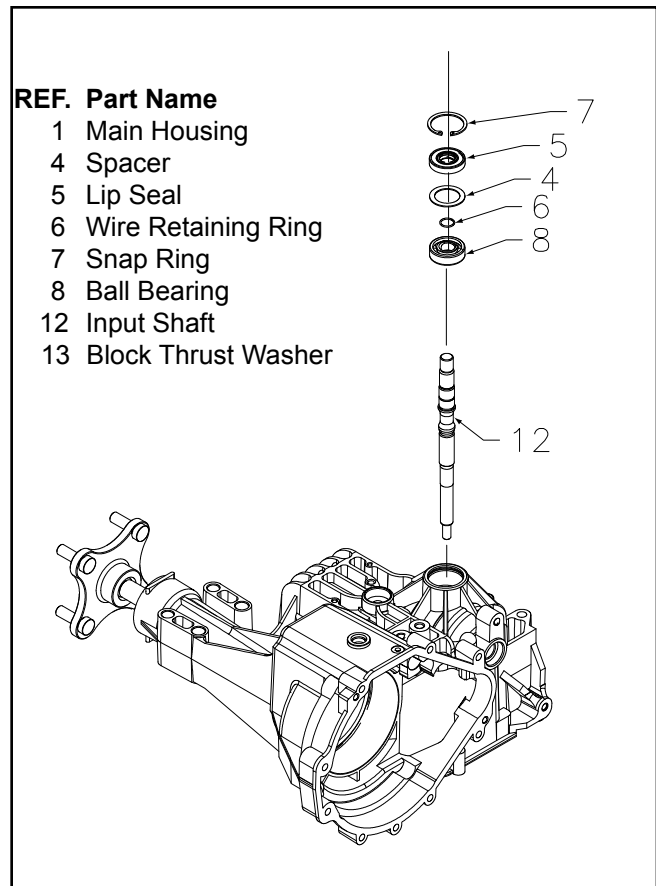


Figure 12. Input Shaft Assembly

## CHARGE PUMP ASSEMBLY

Refer to Figure 13.

### DISASSEMBLY

**Note:** Before disassembling, note the orientation of the charge pump cover (54). Scribe or mark the charge pump cover (54) for correct orientation during assembly.

1. Remove two screws (29) from the charge pump cover (54), and remove charge pump cover (54).
2. Remove o-ring (53) and gerotor assembly (52).

### INSPECTION

1. Inspect gerotor assembly (52), cavity of charge pump cover (54), plate on which cover is mounted for damage or excessive wear.

### ASSEMBLY

1. Install gerotor assembly (52) onto input shaft (12) (not shown).
2. Install new O-ring (53) into charge pump cover (54).
3. Install charge pump cover (54), making sure it is properly oriented.
4. Secure charge pump cover (54) by installing two screws (29), per Table 5, Page 13.

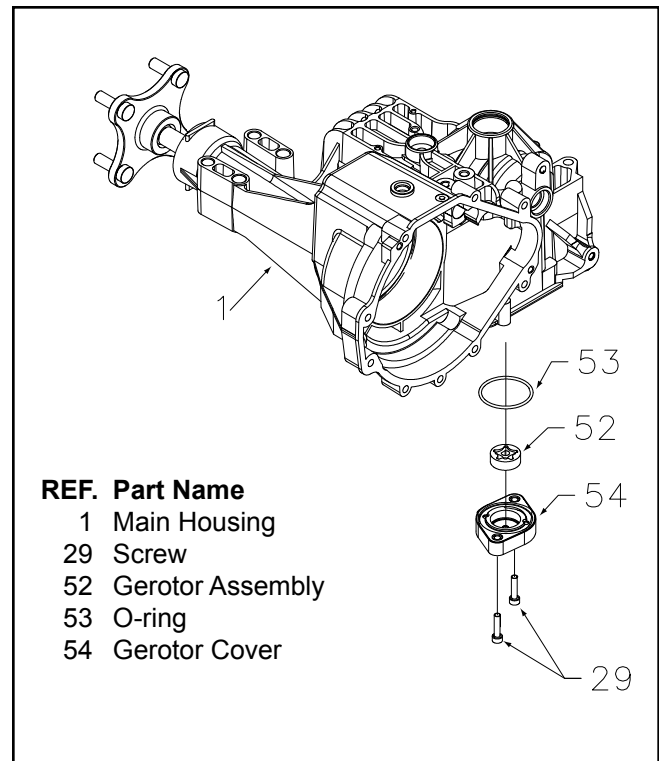


Figure 13. Charge Pump Assembly

## LOWER HOUSING/FILTER/ MANIFOLD ASSEMBLY

Refer to Figure 14.

**NOTE: Charge Pump assembly must be removed before the following steps can be performed.**

### DISASSEMBLY

1. Remove the eleven housing screws (50) and lower cover (51), and remove sealant.
2. Remove screw O-rings (157).
3. Remove spring (145) and ball (146).
4. Remove filter (55) and charge manifold (56).
5. Remove O-ring (144).

### INSPECTION

1. Inspect filter (55) and manifold (56), replace if necessary.
2. Inspect O-ring (144) and screw O-rings (157).

### ASSEMBLY

1. Install O-ring (144) onto center section assembly (3), refer to Figure 134
2. Install filter (55) and charge manifold (56).
3. Install spring (145) and ball (146).
4. Install screw O-rings (157).
5. Dry fit lower cover (51) on housing, using screws (29) to align cover and manifold (56).
6. Remove screws (29) and cover (51). Apply sealant (79) to lip of main housing (1).
7. Reinstall cover (51) and screws (29), reference Table 5, Page 13.
8. Secure lower cover (51) to main housing (1) by installing the eleven housing screws (50), reference Table 5, Page 13.

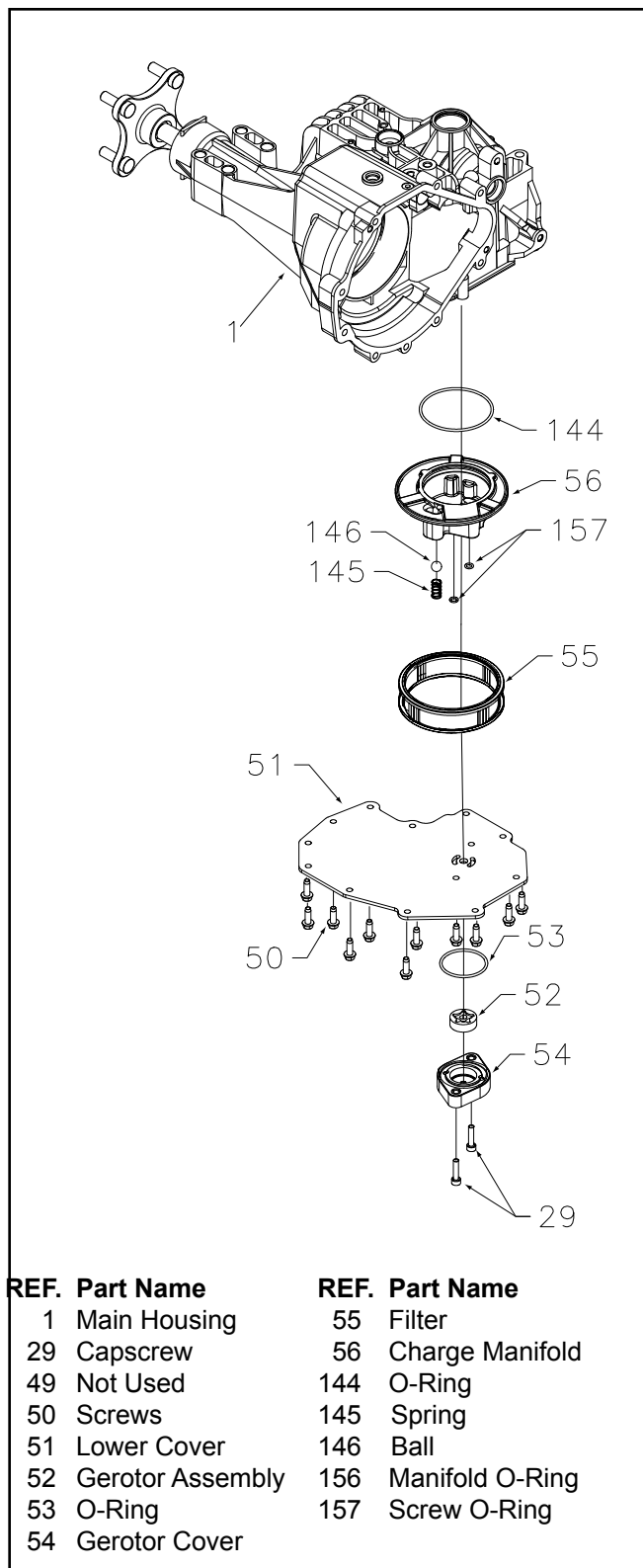


Figure 14. Lower Housing/Filter/Manifold Assembly

## PLANETARY DIFFERENTIAL ASSEMBLY

Refer to Figure 15, next page.

**NOTE: Brake Assembly, and optional Return to Neutral have to be removed before the following steps can be performed.**

### DISASSEMBLY

1. Remove the axle hub assembly (118) on control side by removing nuts (119), and hub assemblies (118).
2. Remove the eight torx head screws (80) that secure the R.H. housing assembly (2).
3. Remove R.H. housing assembly (2), while holding axle shaft (76) in place.
4. Remove the two housing pins (117).
5. Remove washer (71) from axle shaft (76).
6. Remove spur gear (60), and thrust plate (62).
7. Remove 21T sun gear (61), and sleeve bearing (96).
8. Remove the planetary gears (59).
9. Remove washer (70), and axle shaft (76).
10. Remove the four carrier pins (58) from planetary carrier (64).
11. Remove 51T ring gear (63) from main housing (1).
12. Remove the two miter gears (66), and differential shaft (67).
13. Remove planetary carrier (64) and differential thrust plate (68).
14. If necessary, remove the second axle shaft assembly (76) from main housing (1).
15. Remove the seal from the shaft, if necessary.

### INSPECTION

1. Inspect all gears for excessive wear or damage and replace if necessary.

2. Remove all sealant from both housings and inspect seal lands for damage when cleaning.
3. If miter gear (65) needs replaced, remove jam nut (73) from axle shaft (76).

### ASSEMBLY

1. If necessary, install L.H. Axle shaft assembly (76) into main housing (1). If necessary, reassemble axle shaft assembly (76) by installing washer (70), miter gear (65), and jam nut (73) onto axle shaft (76).
2. Install differential thrust plate (68) into main housing (1).
3. Install planetary carrier (64) into main housing (1).
4. Reassemble the two miter gears (66) onto differential shaft (67), and install assembly into planetary carrier (64).
5. Install 51T ring gear (63) into main housing (1).
6. Install the four carrier pins (58) into planetary carrier (64).
7. If necessary, reassemble axle shaft assembly (76) by installing washer (70), miter gear (65), and jam nut (73) onto axle shaft (76).
8. Install R.H. Axle shaft assembly (76) partway into assembled differential components.

**NOTE: It will be necessary to support the RH axle shaft in the partially installed position while steps 9 through 16 are completed.**

9. Assemble sleeve bearing (96) and sun gear (61), sliding them onto R.H. axle shaft. The smaller diameter on the sun gear OD should be "IN".
10. Install the four 15T planetary gears (59) on pins (80). Make sure the planetary gears are properly aligned with the sun gear. Mate the bevel gear on the end of the R.H. axle shaft with the bevel gears in the differential assembly. Continue to support the R.H. axle shaft.



## MOTOR/CENTER SECTION/ PUMP ASSEMBLY

Refer to Figures 16 and 17, (next pages).

**NOTE: Brake Assembly, Input Assembly, Charge Pump Assembly, and Lower Housing/Filter/Manifold Assembly have to be removed before the following steps can be performed.**

### DISASSEMBLY

1. Remove washer (82), snap ring (83), washer (82), 16T pinion gear (28), spacer (27), and shaft (28).
2. Remove motor thrust bearing retainer (57).
3. Remove motor thrust bearing (25), and 21cc motor cylinder block assembly (21).
4. Remove each piston (23), spring (18), and piston seat (22) from the 21cc motor cylinder block assembly.
5. Remove bypass plate (38) from center section assembly (3).
6. Remove the three screws (44) from center section assembly (3).
7. Lift center section assembly (3) out of main housing (1).
8. Remove the two center section assembly pins (43).
9. Remove bypass actuator (39) from the center section (3).
10. Remove 10cc pump cylinder block assembly (15).
11. Remove each piston (17), spring (18), piston seat (16) from the 10cc pump cylinder block assembly (21).
12. Remove block spring (14), and block thrust washer (13) from shaft (12, Figure 10)

### INSPECTION

1. Inspect running surface of thrust bearing

(25) for excessive wear (grooving or smearing).

2. Inspect each piston (23), spring (18), and piston seat (22) in the motor cylinder block assembly.
3. Inspect seal lands of the 21cc motor cylinder block assembly (21) for excessive wear (grooving or smearing).
4. Inspect the two running surfaces of center section assembly (3) for excessive wear (grooving or smearing). Abnormal wear patterns will usually be visible. Any wear detectable when a fingernail is dragged across the surface is cause for rejection.
5. Inspect each piston (17), spring (18), piston seat (16).
6. Inspect seal lands of 10cc pump cylinder block assembly (15) for excessive wear (grooving or smearing).

### ASSEMBLY

1. Install pump cylinder block thrust washer (13) and spring (14) onto input shaft assembly (12).
2. Install piston washers (18), springs (17), and pistons (18) in cylinder block (15).
3. Install pump cylinder block assembly (15). Be sure spring tension is even around the entire block.
4. Install the two center section assembly pins (43).
5. Install center section assembly (3) into main housing (1). Make sure center section seats fully on its mating surface.
6. Secure center assembly section (3) by installing three screws (44) reference Table 5, Page 13. Apply a few drops of loctite on screws when installing.
7. Install bypass plate (38) into center section assembly (3).



**NOTE: To hold bypass plate (38) in position, apply a small drop of grease to its slot before installing.**

8. Install spacer (27), 16T pinion gear (28), washer (82), snap ring (83), and washer (82) onto motor shaft (24).
9. Insert the motor shaft assembly far enough to seat the motor cylinder block (21).
10. Install piston washers (18), springs (17), and pistons (16) in cylinder block (21).
11. If not already available, make an assembly tool from 28 ga. sheet metal as shown in Figure 16. The assembly tool must be free of burrs and rough edges.
12. Using the assembly tool to compress pistons (22), install cylinder block assembly (21). Be careful not to dislodge bypass plate (38) when installing the cylinder block assembly.

13. Again using the assembly tool to compress pistons (22), slide thrust bearing (25), behind the tool, into its cavity in front of the cylinder block (21) and assembled pistons.

**NOTE: The thick race of thrust bearing (25) must face the pistons.**

14. While holding the cylinder block assembly (21) and the thrust bearing (25) in place, withdraw the assembly tool from between the thrust bearing and the pistons.
15. Install motor thrust bearing retainer (57)
16. Reassemble the planetary differential assembly and install removed components as directed in their respective assembly procedures.

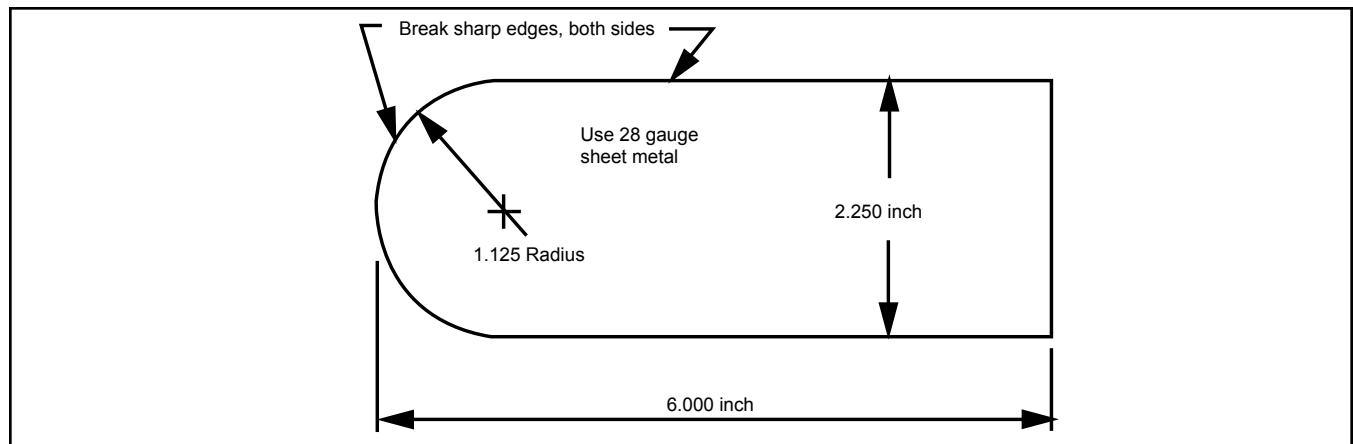
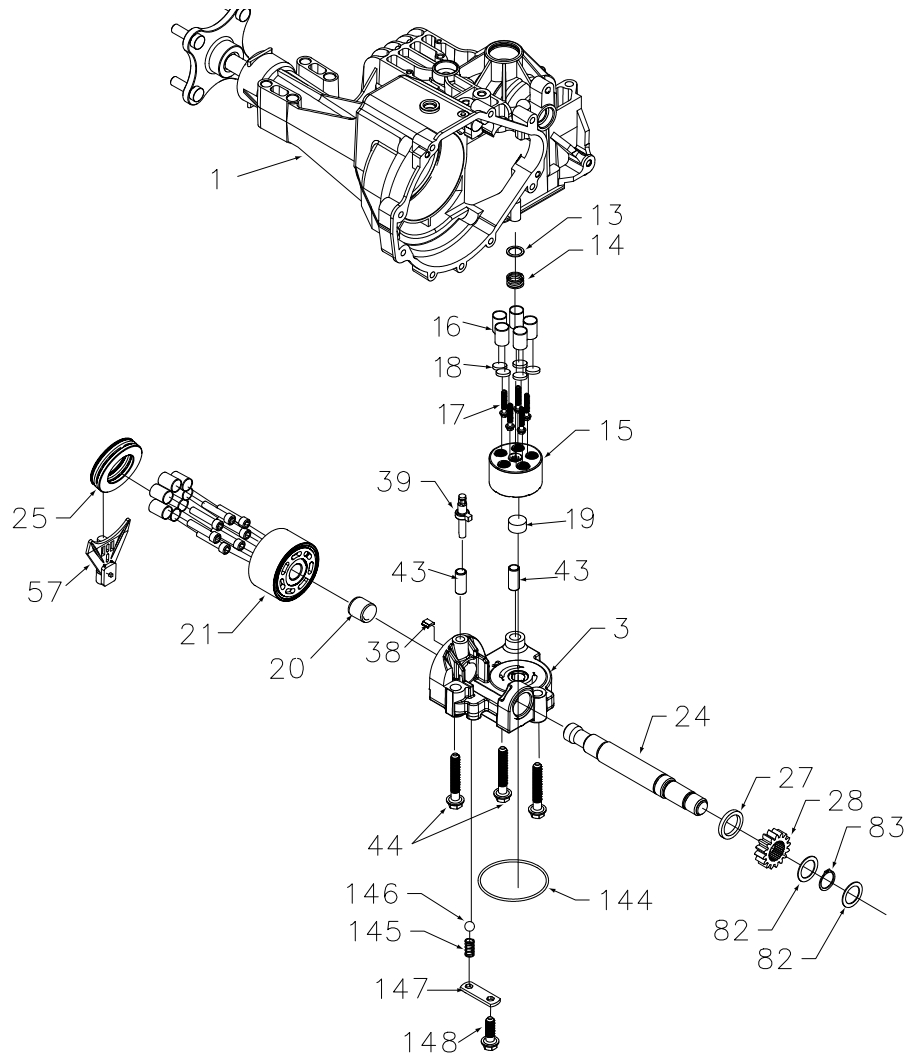


Figure 16. Motor Cylinder Block Assembly Tool



REF. Part Name	REF. Part Name	REF. Part Name
1 Main Housing	20 Bushing	38 Bypass Plate
3 Center Section Assembly	21 21cc Cylinder Block	43 Pin
13 Block Insert Washer	22 Pistons	44 Screws
14 Block Spring	23 Springs	53 O-Ring
15 10cc Cylinder Block	24 Motor Shaft	57 Bearing Retainer
16 Pistons	25 Thrust Bearing	82 Washer
17 Springs	27 Spacer	83 Retaining Ring
18 Piston Washers	28 16t Pinnion Gear	144 O-ring
19 Block Spring		

Figure 17. Motor/Center Section/Pump Assembly

## DIRECTIONAL CONTROL ASSEMBLY

Refer to Figure 18.

**NOTE: The Motor/Center Section/Pump Assembly must be disassembled before this procedure can be completed.**

### DISASSEMBLY

1. Remove swashplate assembly (10). Disassemble swashplate assembly by removing thrust bearing (11) from swashplate (10). The thick race of thrust bearing must face pistons.
2. Remove slot guide (30).

### INSPECTION

1. Visually inspect (in place) the two cradle bearings (9), which are staked in upper housing. Do not remove the Cradle Bearings (9) from housing (1).

### ASSEMBLY

1. Install slot guide (30).
2. Assemble swashplate assembly (10) by installing thrust bearing (11) into swashplate (10).

**Note: Assemble thrust bearing with thick race facing pistons.**

3. Install swashplate assembly (10) into main housing (1). The swashplate (10) will couple with slot guide (30).

**NOTE: When installing swashplate assembly (10), use flat head screwdriver to hold slot guide (30) in place.**

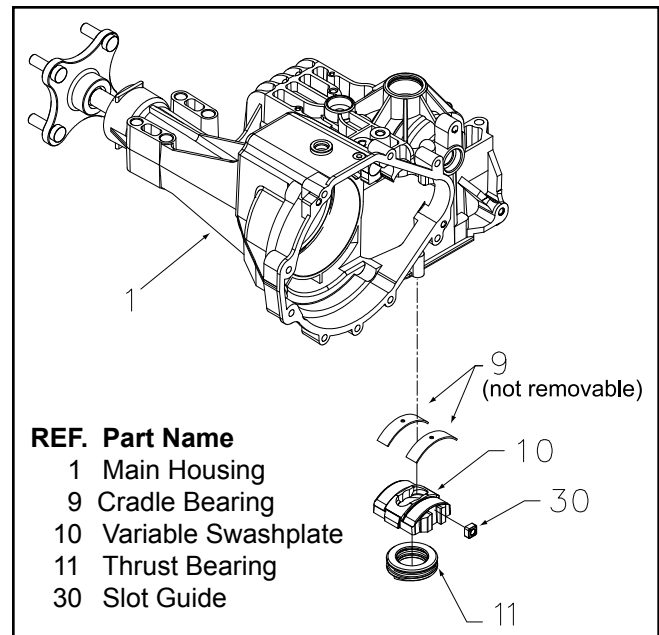


Figure 18. Directional Control Assembly

## TRANSAXLE INSTALLATION

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

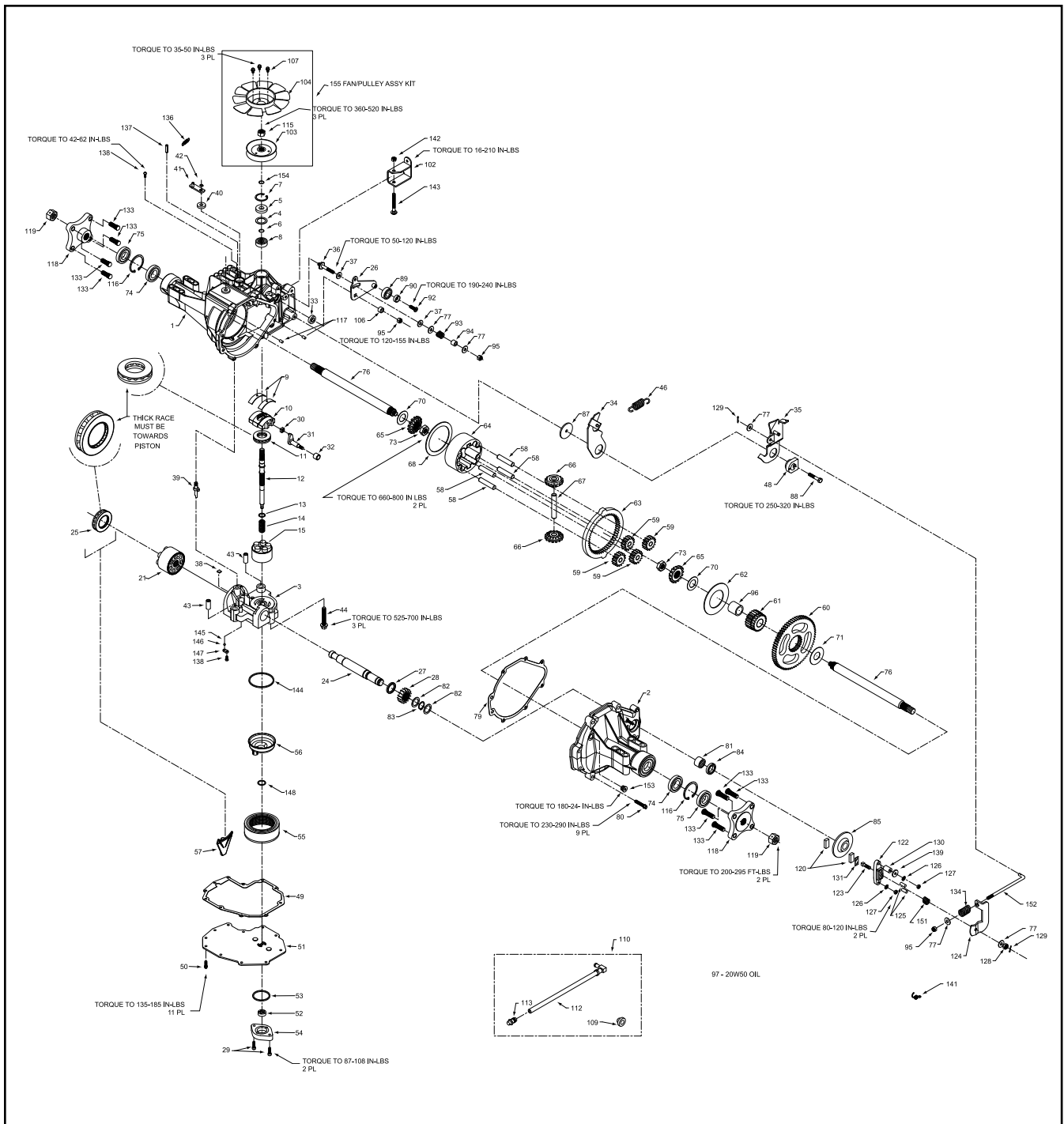
1. Install and secure the transaxle on the vehicle according to instructions in the vehicle owner's manual.
2. Install the hub assembly (118, Figure 13) on the shaft. Install hex nut (119, Figure 13).
3. With the vehicle raised, install the wheel on the hub, and retain with the wheel lug nuts.
4. Lower the vehicle wheels to the ground, and torque the nut retaining the hub to 290 to 295 lb.-ft., using an air impact wrench.
5. Tighten the wheel lug nuts.

## ASSEMBLY AFTER A COMPLETE TEAR-DOWN

If the unit has been torn down completely, the following summary identifies the assembly procedures necessary to completely assemble the unit, in the order they must be completed. 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, Figure 19.

1. Assemble the Directional Control Assembly (Page 29).
2. Assemble the Motor/Center Section/Pump Assembly (Page 26,27,28).
3. Assemble the Planetary Differential Assembly (Page 24,25).
4. Assemble the Lower Housing/Filter/Manifold Assembly (Page 23).
5. Assemble the Charge Pump Assembly (Page 22).
6. Assemble the Input Shaft Assembly (Page 21).
7. Assemble the Fan and Pulley Assembly (Page 20).
8. Assemble the Torque Bracket Assembly (Page 19).
9. Assemble the Control Arm Assembly (Page 17,18).
10. Assemble the Bypass Assembly (Page 16).
11. Assemble the Brake Assembly (Page 14,15).



## ITEMS LIST

Part numbers are not provided in this manual. See Service Schematic or Distributor for part numbers.

NO.	DESCRIPTION	NO.	DESCRIPTION
1	Main Housing Assembly	79	Gasket Material/Sealant
2	R.H. Housing Assembly	80	Torx Head Screw 5/16 - 18
3	Center Section Assembly	81	Needle Bearing
4	Spacer	82	Washer
5	Lip Seal	83	Retaining Ring
6	Wire Retaining Ring	84	Lip Seal
7	Retaining Ring	85	Brake Disc
8	Ball Bearing	87	Washer
9	Cradle Bearing	88	Screw 5/16 - 24 X 1-3/4
10	Variable Swashplate	89	Bearing
11	Thrust Bearing	90	Spacer, Locating
12	Input Shaft	91	O-Ring
13	Block Thrust Washer	92	Countersunk Screw
14	Block Spring	93	Spring Spacer
15	10cc Cylinder Block Assembly	94	Spacer
21	21cc Cylinder Block Assembly	95	Nut, Hex Lock 5/16 - 24
24	Output (Motor) Shaft	96	Sleeve Bearing
25	Thrust Bearing	97	20W50 Oil
26	Control Arm	102	Torque Bracket
27	Spacer	103	Pulley
28	16T Pinion Gear	104	Fan
29	Cap Screw M6 X 1-22	106	Spacer, Trunnion
30	Slot Guide	107	Screw
31	Trunnion Arm	109	Vent Bushing
32	Trunnion Bushing	110	Fitting Kit
33	Lip Seal	111	Cap-Vent Assembly
34	Return Arm	113	Hose/ Fitting Assembly
35	Actuating Arm	115	Jam Nut
36	Stud 5/16 - 24	116	Retaining Ring
37	Friction Puck	117	Std Hlds Pins
38	Bypass Plate	118	Hub Assembly 7/16 - 14
39	Bypass Actuator	119	Nut, Hex 3/4 - 16
40	Lip Seal	120	Puck, Brake
41	Bypass Arm	121	Rib Neck Bolt, 2"
42	Retaining Ring	122	Brake Yoke
43	Pin	123	Bolt, Square-Head
44	Screw	124	Arm, Brake
46	Neutral Spring	125	Pins, Brake
48	Adjusting Puck	126	Lock Washer, 1/4"
50	Screw , Self-Tapping	127	Nut, 1/4 - 20
51	Lower Cover	128	Nut, Castle
52	Gerotor Assembly	129	Cotter Pin
53	O-Ring	130	Spacer
54	Gerotor Cover	131	Puck Plate
55	Filter	132	Rib Neck Bolt, 3"
56	Charge Manifold	133	Wheel Stud 7/16-14
57	Retainer, Motor Bearing	134	Brake Spring
58	Pin, Carrier	136	Extension Spring
59	15T Planet Gear	137	Spring Pin
60	67T Spur Gear	138	Screw , Stap 10-32 X .5
61	21T Sun Gear	139	Washer
62	Planet Thrust Plate	141	Spring, Brake Arm Bias
63	51T Ring Gear	142	Hex Lock Nut 5/16 - 18
64	Planetary Carrier	143	Bolt 5/16 -15 X 2.5
65	Miter Gear, Differential (SPLINED)	144	O-Ring
66	Miter Gear, Differential	145	Spring, Relief
67	Shaft , Differential	146	Ball , 7/16
68	Differential Thrust Plate	151	Compression Spring Brake Anti-Drag
69	Flange Bearing	152	Brake Pull Rod
70	Washer	153	Plug, Straight Thread
71	Washer	154	Wire Retaining Ring
73	Hex Jam Nut, 5/8 - 18	155	Fan/ Pulley Assembly
74	Ball Bearing 6205-1	157	Screw O-Ring
75	Seal, 1" ID X 2.0472" X 0.375"	180	Manifold Kit
76	Shaft, Axle	202	Manifold O-Ring Kit
77	Washer	203	Seal Kit (310-3000)

## SECTION 6. GLOSSARY OF TERMS

---

**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"



**Hydrostatic Transaxle:** A multicomponent 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.

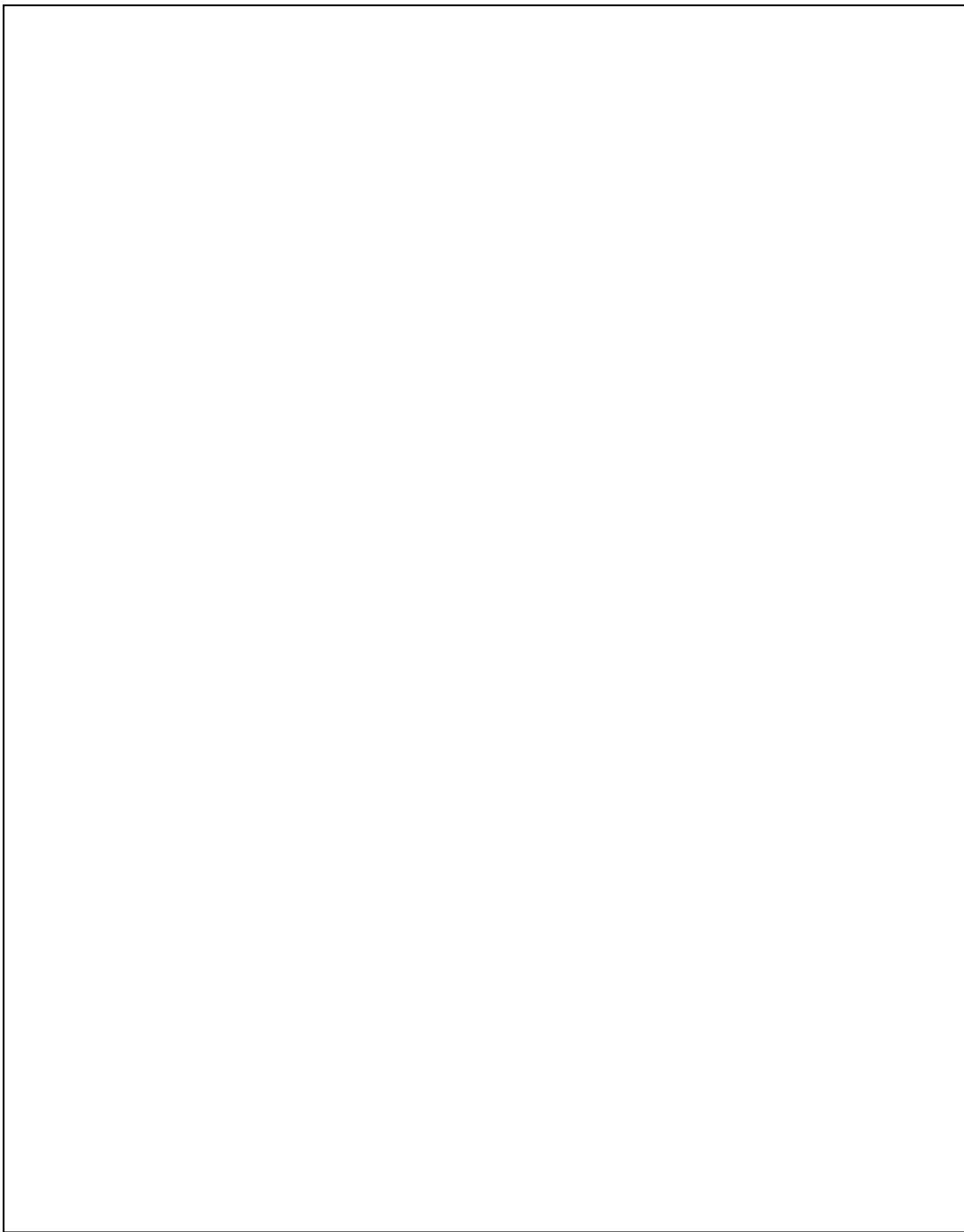
**Variable Displacement Pump:** A pump in which the displacement per cycle can be varied.

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

**NOTES**

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**NOTES**





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