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## FOREWORD

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® RT-310 right angle hydrostatic transmission.

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

Internal repair procedures require that the RT-310 right angle hydrostatic transmission 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 the EETC (Equipment and Engine Training Council) at (262) 367-6700 or their Hydro-Gear Central Service 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.

# DESCRIPTION AND OPERATION

## INTRODUCTION

The purpose of this manual is to provide information useful in servicing the Hydro-Gear® RT-310 right angle hydrostatic transmission. This manual includes general descriptions, hydraulic schematics, technical specifications, servicing and troubleshooting procedures.

The transmission 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 transmission will need to be thoroughly cleaned before beginning most procedures. Do not wash the transmission while it is hot. **Do not use a pressure washer to clean the unit.**

## GENERAL DESCRIPTION

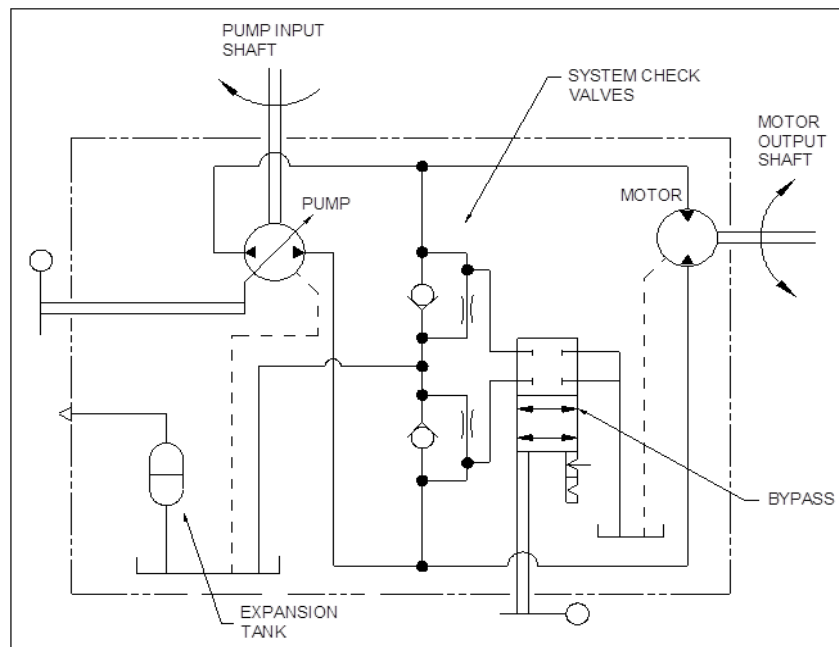
The RT-310 is a self contained unit designed for the transfer and control of power. It provides an infinitely variable speed range between zero and maximum in both forward and reverse modes of operation.

This transmission uses a variable displacement pump with a maximum displacement of 3cc 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 check valves in the center section are used to control the make-up flow of the fluid to the low pressure side of the loop.

A hydraulic bypass is provided to allow the vehicle to be moved without starting the engine. The bypass lifts the check valves off their seat allowing oil to freely flow. This permits moving the vehicle for a short distance at a maximum of 2 m.p.h. (3.2 Km/h).





# EXTERNAL FEATURES RT-310

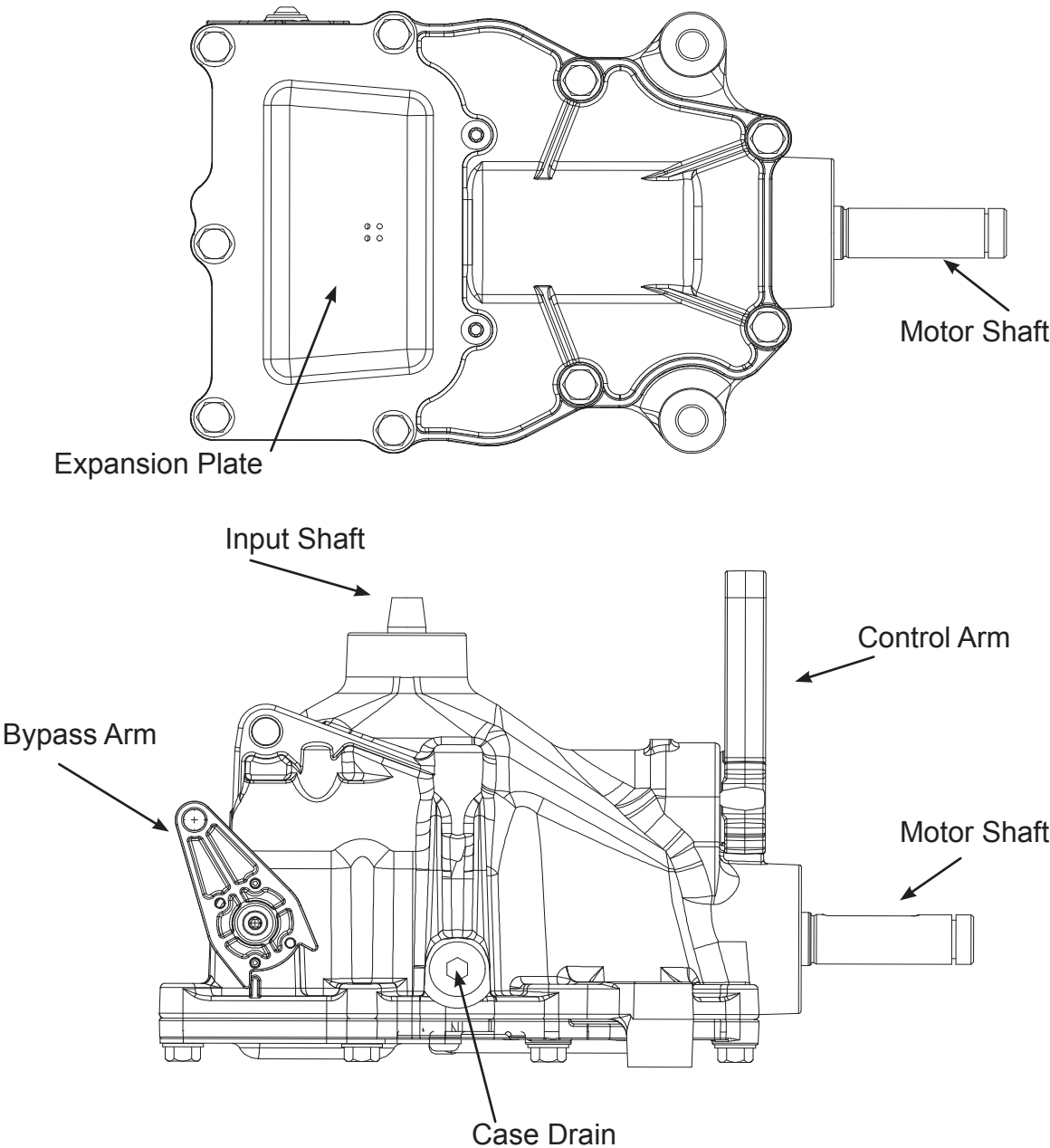


Figure 1, External Features

# TECHNICAL SPECIFICATIONS

## TECHNICAL SPECIFICATIONS

<b>Overall Transmission Reduction</b>	3:4:1
<b>Input Speeds</b>	
Maximum Hi-Idle (No Load).....rpm	3000
Minimum (Loaded).....rpm	500
<b>Output Torque</b>	
Continuous.....lb-ft[Nm]	5.8 [7.8]
Intermittent.....lb-ft[Nm]	10.0 [13.6]
<b>Pump Displacement</b> .....in <sup>3</sup> /rev [cc/rev]	.18 [3.0]
<b>Motor Displacement</b> .....in <sup>3</sup> /rev [cc/rev]	.62 [10.2]
<b>Output Shaft Diameter</b> .....in [mm]	.625 [15.8]
<b>Output Shaft End Type</b>	Keyed
<b>Weight of Unit</b> .....lb [kg]	9 [4]

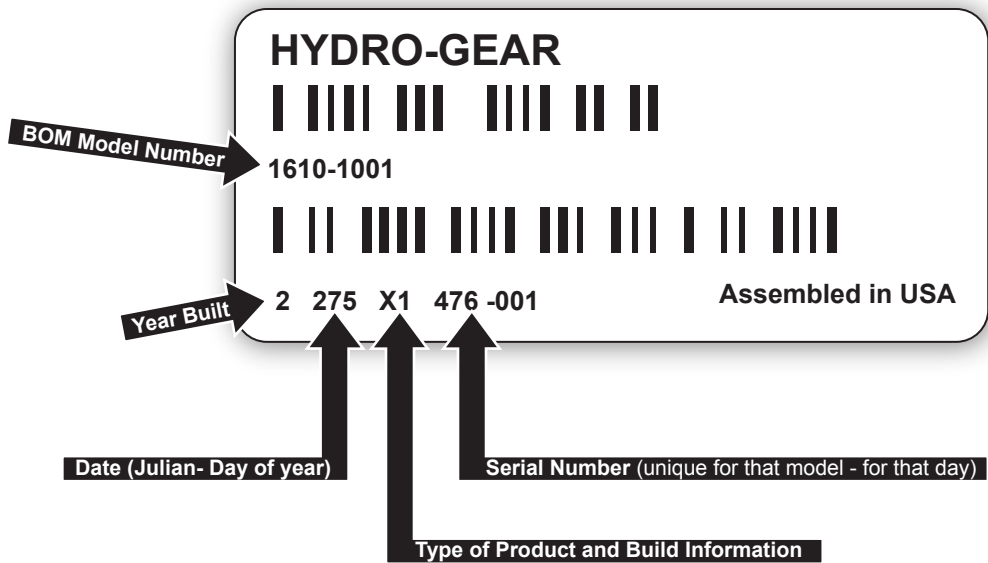


Figure 2, Product Label

# 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 hydraulic motor. 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 hydraulic motor, fully read and understand the safety precautions described in this section.**

## PERSONAL SAFETY

Certain safety precautions must be observed while servicing or repairing the hydraulic motor. 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.

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.

# 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 a hydraulic system are not related to a defective hydraulic unit, 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 Service and Maintenance, before assuming the hydraulic system is malfunctioning. The table below provides a troubleshooting checklist to help determine the cause of operational problems.

### TROUBLESHOOTING CHECKLIST

Possible Cause	Corrective Action
<b>Unit Operates In One Direction Only</b>	
Control linkage bent or out of adjustment	Repair or replace linkage on vehicle pump assembly, Page 8
Drive belt slipping or pulley damaged	Repair or replace belt/pulley on vehicle pump assembly, Page 8
<b>Vehicle Does Not Drive/Track Straight</b>	
Vehicle tires improperly inflated	Refer to vehicle manufacturer suggested tire pressure
Control linkage bent or out of adjustment	Repair or replace linkage on vehicle pump assembly, Page 8
Drive belt slipping or pulley damaged	Repair or replace belt/pulley on vehicle pump assembly, Page 8
Brake Partially Engaged	Disengage Brake, Replace damaged brake components, Page 14
<b>Unit Is Noisy</b>	
Oil level low or contaminated oil	Fill to proper level or change oil, Page 8
Excessive loading	Reduce vehicle loading, Page 8
Loose parts	Repair or replace loose parts
Air trapped in hydraulic system	Purge hydraulic system, Page 9
Brake Partially Engaged	Disengage Brake, Replace damaged brake components, Page 14
<b>Unit Has No/Low Power</b>	
Engine speed low	Adjust to correct setting
Control linkage bent or out of adjustment	Repair or replace linkage on vehicle pump assembly, Page 8
Drive belt slipping or pulley damaged	Repair or replace belt/pulley on vehicle pump assembly, Page 8
Oil level low or contaminated oil	Fill reservoir to proper level or change oil, Page 8
Excessive loading	Reduce vehicle loading, Page 8
Air trapped in hydraulic system	Purge hydraulic system, Page 9
Brake Partially Engaged	Disengage Brake, Replace damaged brake components, Page 14
<b>Unit Is Operating Hot</b>	
Debris buildup around transaxle	Clean off debris, Page 8
Oil level low or contaminated oil	Fill to proper level or change oil, Page 8
Excessive loading	Reduce vehicle loading, Page 8
Air trapped in hydraulic system	Purge hydraulic system, Page 9
Brake Partially Engaged	Disengage Brake, Replace broken, missing or frozen return spring
<b>Transaxle Leaks Oil</b>	
Damaged seals, housing, or gaskets	Replace damaged components
Air trapped in hydraulic system	Purge hydraulic system, Page 9



## 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 RT-310 should include the following:

1. **Check the vehicle operator's manual for the recommended load ratings. Insure that the current application does not exceed load rating.**
2. 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.
3. Inspect the vehicle control linkage to the directional control arm on the transmission. Also insure that the control arm is securely fastened to the trunnion arm of the transmission.
4. Inspect the bypass mechanism on the transmission and the vehicle linkage to insure that both actuate and release fully.

### SERVICE AND MAINTENANCE PROCEDURES

Some of the service procedures presented on the following pages can be performed while the transmission 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. The unit should be thoroughly cleaned before any service procedures are performed.

### 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 9.0 cSt (55 SUS) at 230° F (110° C) and an API classification of SL is recommended. SAE 0W-40 has been approved for the RT-310 in all season applications where operation needs to occur in both winter and summer seasons. SAE 20W50 has been approved for non-winter applications where operation does not occur in ambient temperatures below 40° F. Biodegradable oils are **not approved** for this unit as they degrade too quickly while in service.

### FLUID VOLUME AND LEVEL

The RT-310 is factory filled with 540 mL (18.26 fluid ounces).

Upon reassembly, prior to oil fill, apply a strip of Scotch® tape or similar to the holes on the expansion plate. The tape is applied to the outside and will be removed once assembly is complete. Press the tape firmly to achieve a good seal around the holes.

Assemble the expansion plate cover to the side cover, securing the bladder.

If desired, the unit can be pressure checked for leaks with a maximum of 5 psi applied to the oil fill port.

Install oil fill plug. The transmission should now be completely sealed.

Follow purging procedure listed on the next page.

***Remove the tape from the expansion plate.***

**CAUTION:** The bladder may lose functionality if serviced improperly. If any seal is leaking and requires service, the bladder must also be reset using the above procedure. The procedure traps a volume of air in the bladder during assembly. When vacuum or pressure is applied or when the weight of the oil is pressing on the bladder, the trapped air keeps the bladder properly sized. Once the transmission case is sealed, the tape can be removed.

# SERVICE AND MAINTENANCE

## PURGING PROCEDURES

Due to the effects air has on efficiency in hydrostatic drive applications, it is critical that it is 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 transmission is at the proper oil level.

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 or 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 the engine.
3. It may be necessary to repeat Steps 1 and 2 until all the air is completely purged from the system. When the transmission moves forward and reverse at normal speed purging is complete.

# TEAR DOWN AND REASSEMBLY

## HOW TO USE THIS MANUAL

Each subassembly illustrated in this manual is illustrated with an exploded view showing the parts involved. The **item reference numbers in each illustration are for assembly instructions only**. See page 25 for part names and descriptions. A complete exploded view and item list of the transmission is provided at the end of the repair section.

## 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. **Do not use a pressure washer to clean the transmission.**

Upon removal, it is recommended that all seals, O-rings, and gaskets be replaced. During installation lightly lubricate all seals, O-rings and gaskets with a clean petroleum jelly prior to assembly. Also protect the inner diameter of seals during installation by covering the shaft with a cellophane or plastic wrap material. Be sure all remnants of this covering are removed after servicing.

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 at [www.hydro-gear.com](http://www.hydro-gear.com) or at your Hydro-Gear Central Service Distributor.

## TOOLS

REQUIRED TOOLS	
Miscellaneous	Sockets
Three Jaw Puller	3/8" Deep
Flat Blade Screw Driver (2)	1/2" Deep
Torque Wrench	1/4" Allen
Air Impact Wrench	T-25 Torx Head
Rubber or Neoprene Mallet	T-20 Torx Head
Breaker Bar	
Needle Nose Pliers	
Large External Snap Ring Pliers	
Small Internal Snap Ring Pliers	

## TORQUES

REQUIRED TORQUE VALUES			
Item	Description	Torque	Operation
67	Bolt 1/4-20	135-185 in-lbs (Nm)	Fan/Pully
34	Screw, hex washer 1/4-20	105-155 in-lbs (Nm)	Control Arm
7	Plug	110-150 in-lbs (Nm)	Case Drain
56	Screw, M4 X 16	12-20 in-lbs (Nm)	Bypass arm
23	Screw, HFHCS 5/16-18	230-290 in-lbs (Nm)	Center Section Bolts
21	Check plug	280-400 in-lbs (Nm)	Check Plug in Center Section
22	Check plug	280-400 in-lbs (Nm)	Check Plug in Center Section
6	Bolt, self tapping 10-32	25-50 in-lbs (Nm)	Expansion Plate
5	Screw, hex flange 1/4-20	85-115 in-lbs (Nm)	Housing Screw

# REMOVAL

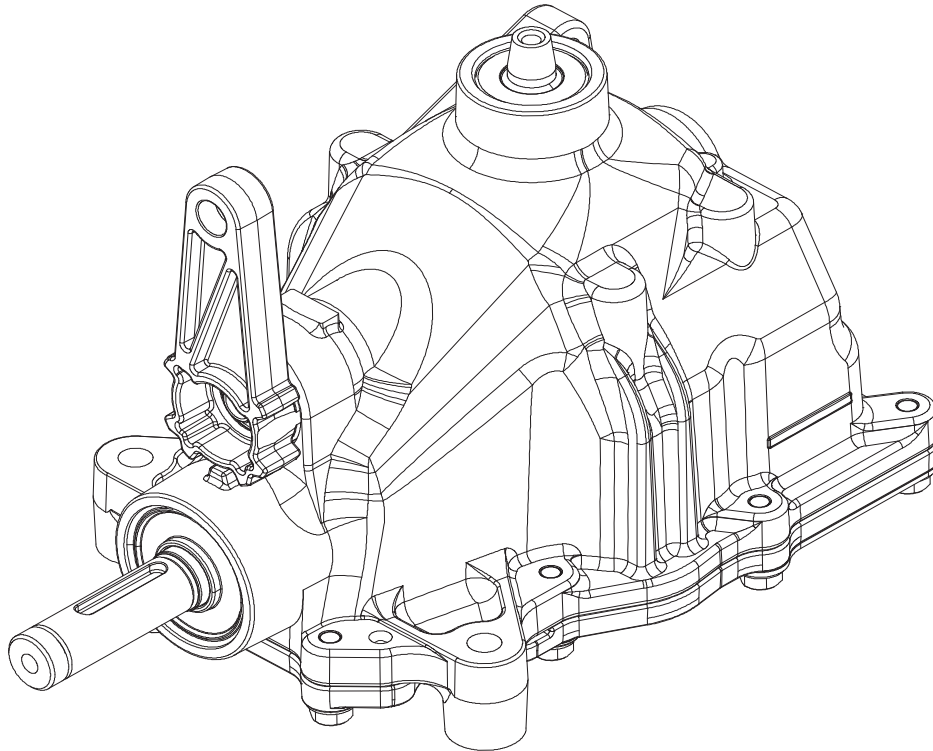
**NOTE:** *It is necessary to remove the RT-310 from the vehicle before performing the repair procedures presented in this section.*

*Before starting any disassembly, make certain that your work area is neat and clean. Clean the external parts of the RT-310.*

*The following procedures are presented in the order recommended for a complete tear down of the RT-310.*

*Do not disassemble the unit any farther than necessary to accomplish the required repairs.*

*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 23.*



**Figure 3, RT-310**

# FAN AND PULLEY ASSEMBLY

Refer to Figure 4

1. Remove the bolt (67).
2. Remove the washer (66).
3. Remove the pulley and fan (65 & 64).
4. Remove the pulley hub (62).
5. Remove the seal (61).

## Inspection

1. Check all components for excessive wear or damage. Replace if necessary.

## Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. The seal (61) will need to be replaced with a new seal from the seal kit.
3. When tightening the bolt (67), refer to the table on page 11 for the required torque values.

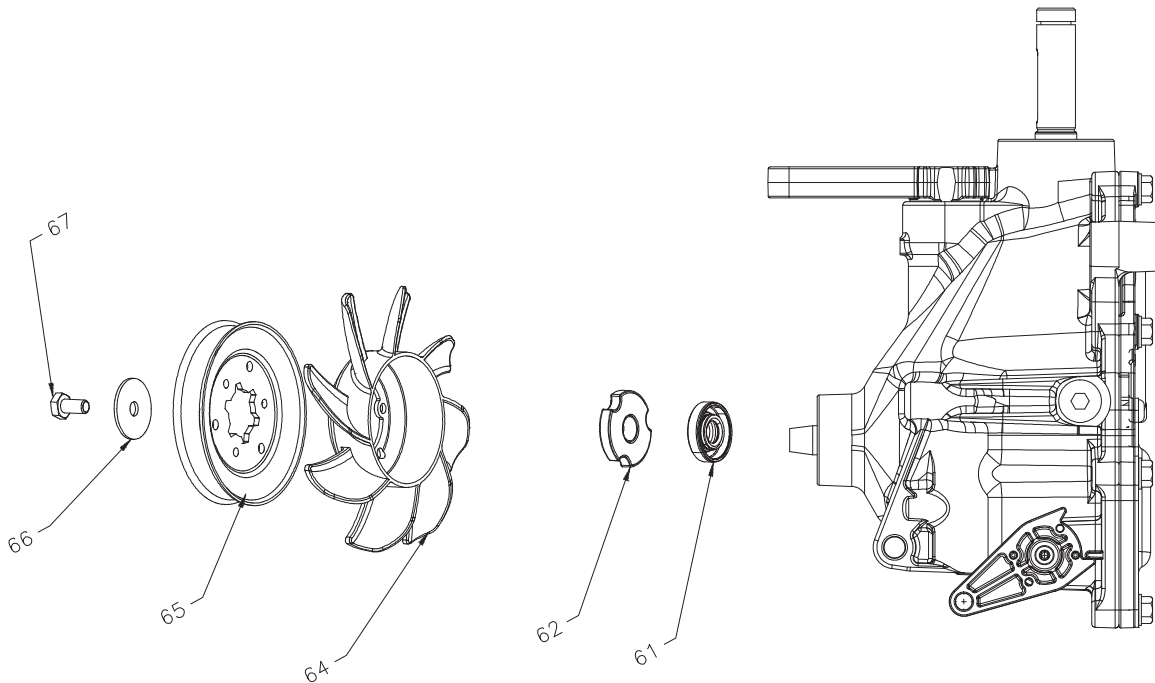


Figure 4, Fan & Pulley Assembly

# CONTROL ARM ASSEMBLY

Refer to Figure 5

## Disassembly

1. Remove all items previously discussed in the recommended order.
2. Mark the orientation of the control arm (33) before removal.
3. Remove the screw (34).
4. Remove the control arm (33).
5. Remove the seal (32).

**NOTE:** O-ring (31) is located inside the control arm (33)

## Inspection

1. Inspect all parts for wear or damage. Replace as necessary.

## Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install new seal (32) from seal kit.
3. When tightening the screw (34), refer to the table on page 11 for the required torque values.

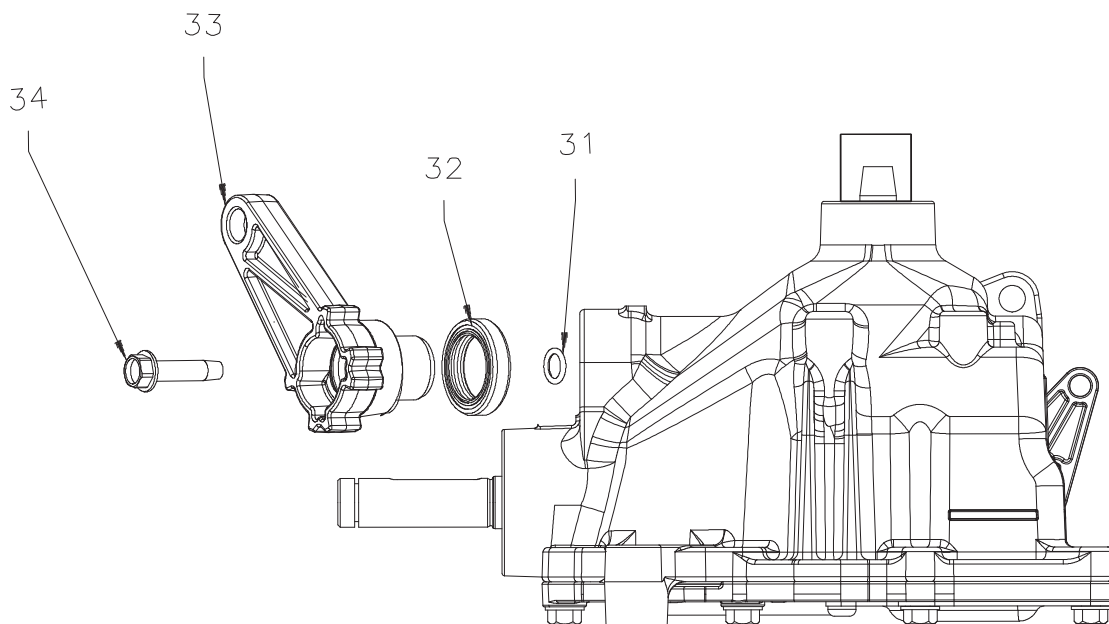


Figure 5, Control Arm Assembly

# SIDE HOUSING

Refer to Figure 6

## Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the two screws on the expansion plate (6) and the nine screws on the side housing (5).
3. Remove the expansion plate (3).
4. Remove the bladder (4).
5. Remove the side housing (2) by gently prying the housings apart using a screw driver.

## Inspection

1. Inspect the bladder for holes, tears or damage. Replace if necessary.

## Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Apply a bead of sealant around the perimeter of the middle housing face.

**NOTE:** Remove all old sealant from the main housing (1) and the side housing (2) before applying new sealant.

3. Align the side housing (2) with the main housing (1). Use care not to smear the sealant bead.
4. Install the nine housing screws (5).
5. Install the bladder (4). Note the tab on the bladder only allows for it to be installed in one direction.
6. Upon reassembly, prior to oil fill, apply a strip of Scotch® tape or similar to the holes on the expansion plate. The tape is applied to the outside and will be removed once assembly is complete. Press the tape firmly to achieve a good seal around the holes.
7. Install the expansion plate (3) and two screw (6).

**NOTE:** When tightening the screws, refer to the table on page 11 for the required torque values.

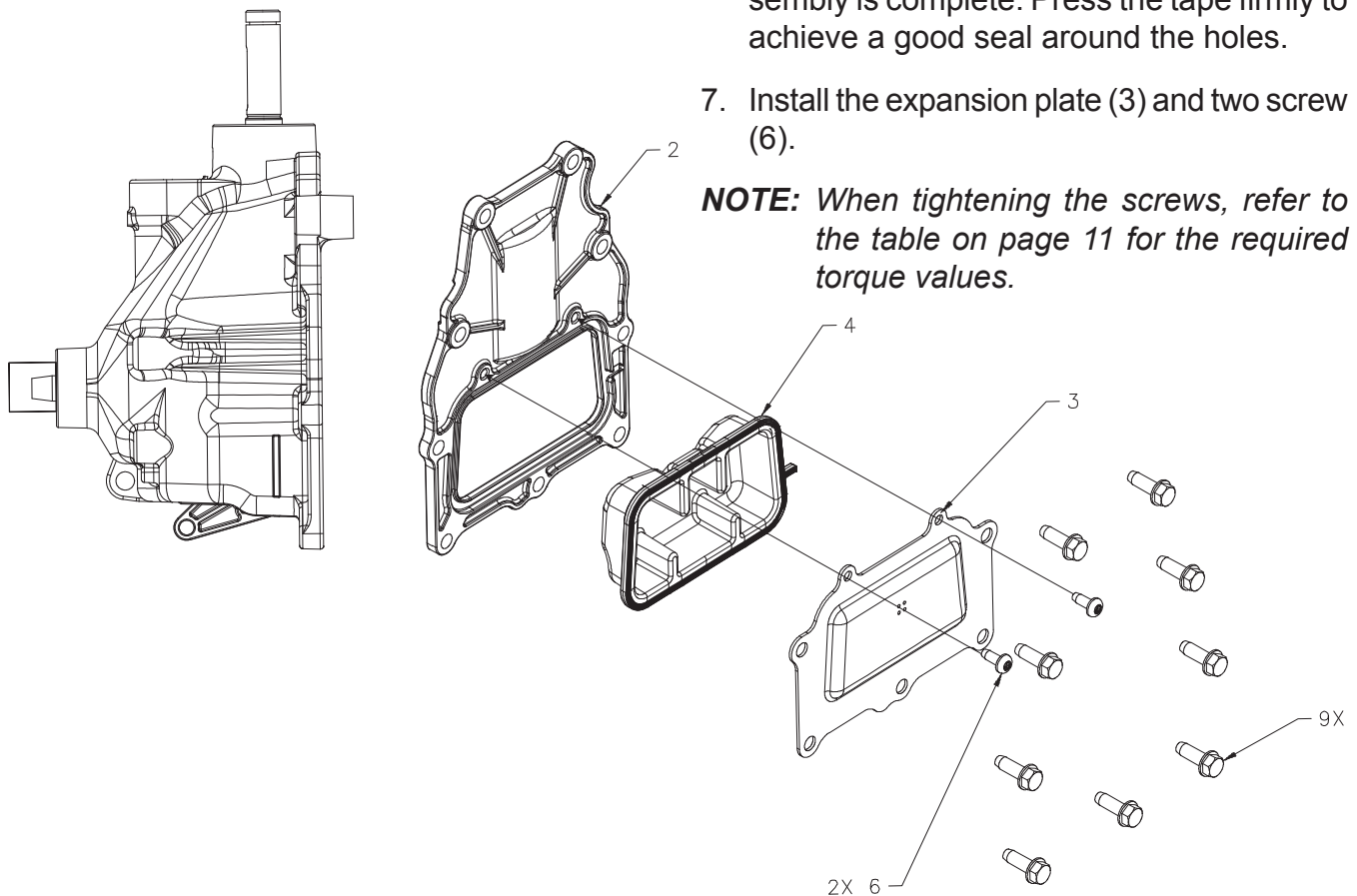


Figure 6, Side Housing



# MOTOR SHAFT

Refer to Figures 7 and 8

## Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the seal guard (49).
3. Remove the retaining ring (48).
4. Remove the seal (47) and washer (46).
5. Remove the motor shaft assembly (43).

## Inspection

1. Inspect all items for wear and or damage.

## Assembly

1. Reassemble all parts in the reverse order of disassembly. The seal (47) will need to be replaced with a new seal from the seal kit.

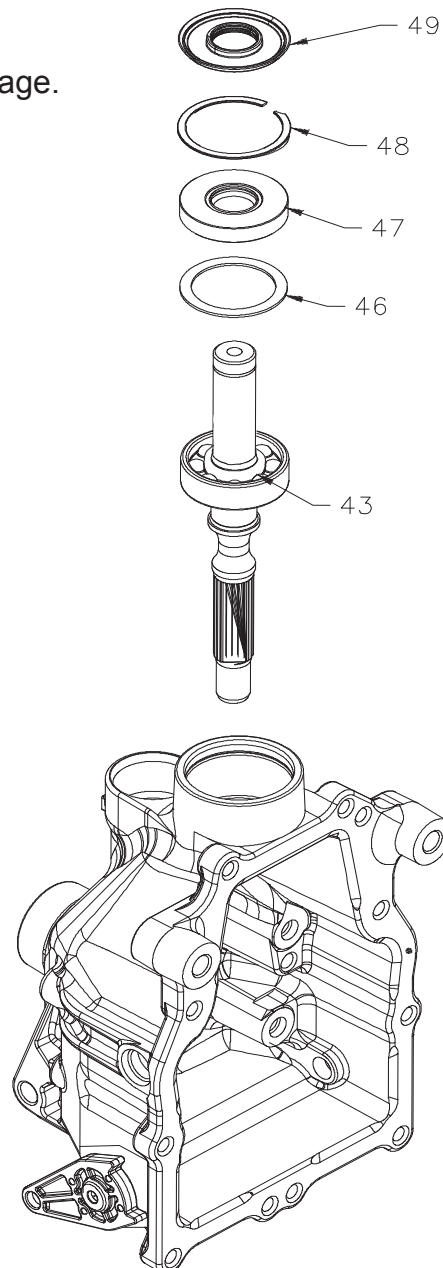


Figure 8, Motor Shaft

# BEARING AND MOTOR BLOCK ASSEMBLY

Refer to Figure 9

## Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the motor block assembly (24) and thrust bearing (28). Slide a plastic putty knife between thrust bearing and housing. Compress the pistons to side the block assembly out.

## Inspection

1. 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 (27), piston springs (25) and thrust washers (26) for excessive wear or damage.

**NOTE:** Thrust washers may be held in place in the piston by residual oil.

## Assembly

1. Reassemble the pistons, springs and washers into the cylinder block and set aside.
2. Reassemble the thrust bearing into the housing (28).
3. Coat the pump running surface with clean motor oil.
4. Using a plastic putty knife compress the pistons of the motor block as it is reassembled.

**NOTE:** Care must be taken to prevent the scaring or scratching of the center section sealing face during this step.

5. Reassemble all parts in the reverse order of disassembly.

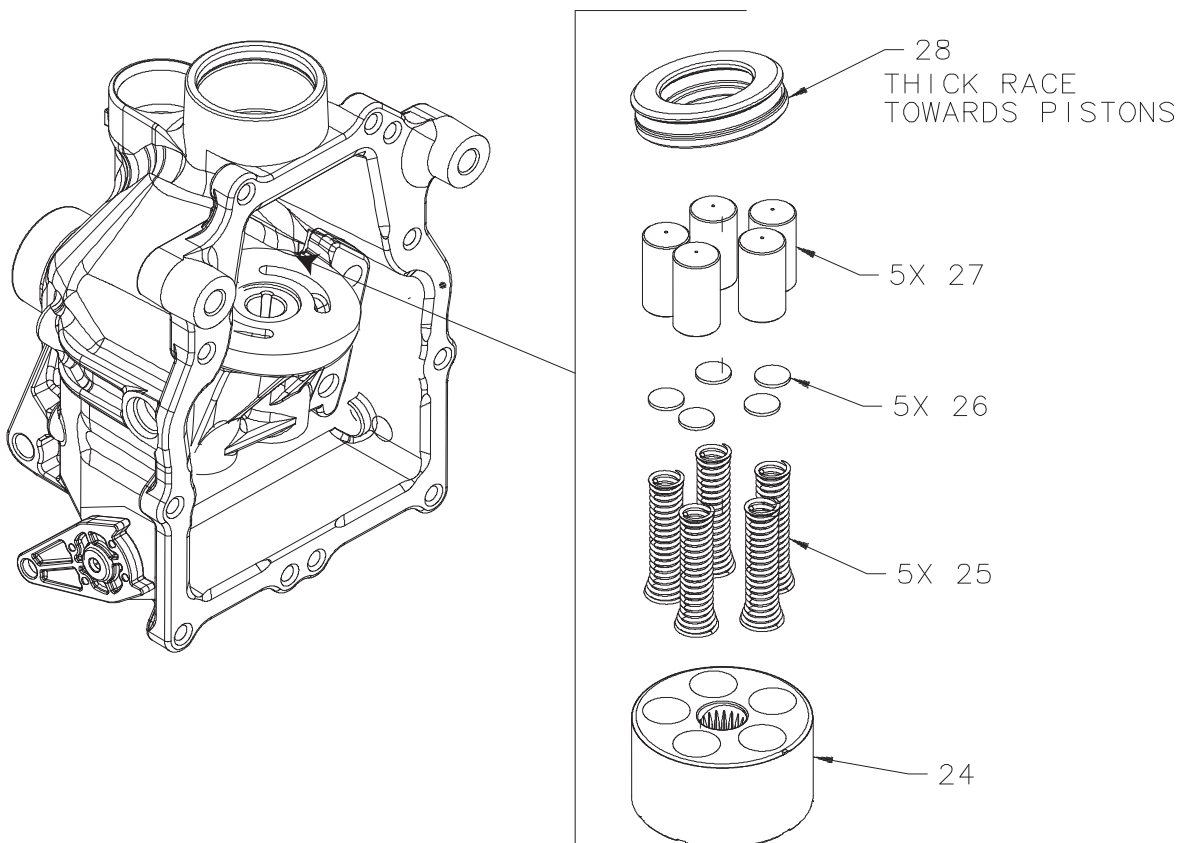


Figure 9, Motor Block Cap and Bearing

# CENTER SECTION

Refer to Figure 10

## Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the center section mounting screws (23). NOTE: The center section is under pump block piston spring pressure. These screws are factory installed to 700 lb-in (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.

## Inspection

1. Inspect the center section block running surfaces (20).

**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.

2. Inspect the threaded check plug (21 & 22) ports of the center section for debris or damage.

3. Inspect all bearing, bushing and wear areas in the housing.

## Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Apply a light coating of oil to all running surfaces to prevent scoring during reassembly.
3. In order to reassemble the center section use the alignment pins that are included in the seal kit.
4. When tightening the screw (34), refer to the table on page 11 for the required torque values.

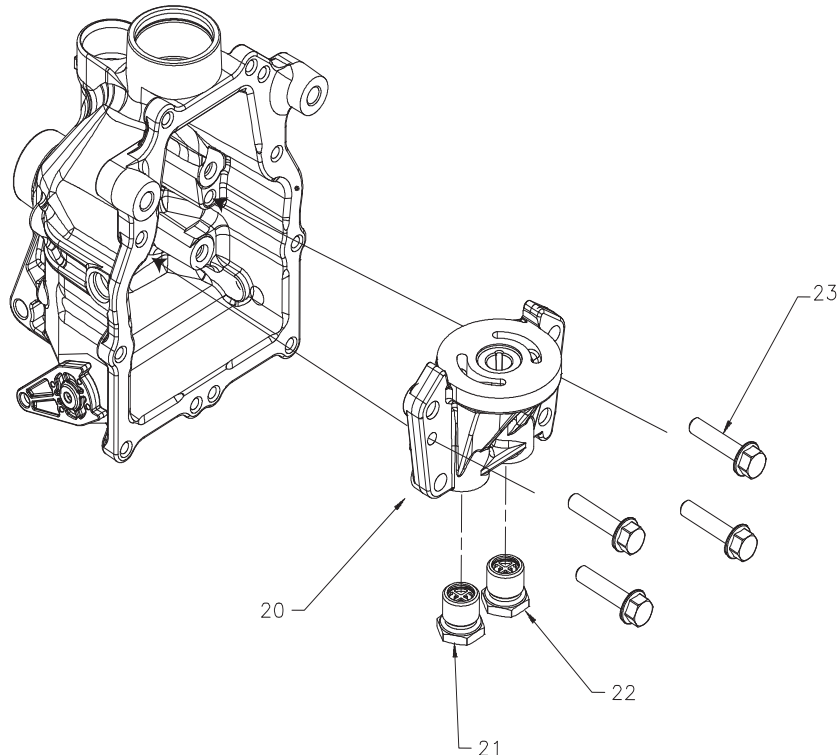


Figure 10, Center Section

# PUMP BLOCK

Refer to Figure 11

## Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the pump block assembly (18).

## Inspection

1. 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, piston springs and thrust washers for excessive wear or damage.

**NOTE:** Thrust washers may be held in place in the piston by residual oil.

## Assembly

1. Reassemble the pistons, springs and washers into the cylinder block and set aside.
2. Coat the pump running surface with clean motor oil.

**NOTE:** Care must be taken to prevent the scaring or scratching of the center section sealing face during this step.

3. Reassemble all parts in the reverse order of disassembly.

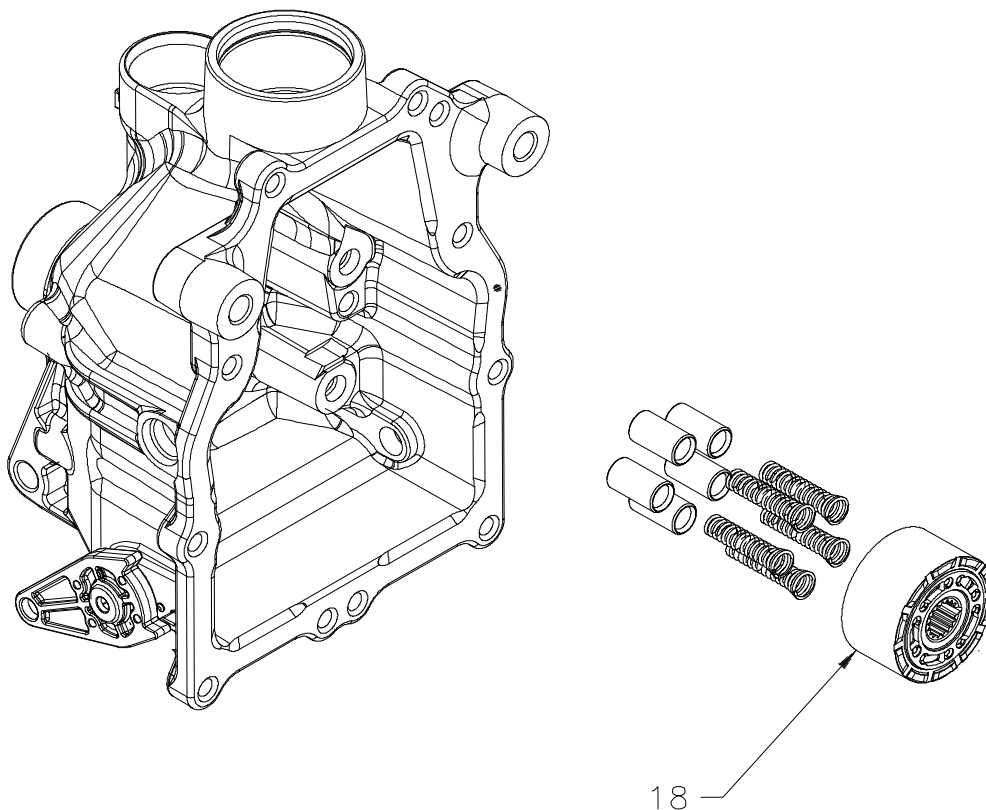


Figure 11, pump block

# SWASH PLATE AND THRUST BEARING

Refer to Figure 12

## Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the swash plate (13) and thrust bearing (15).
3. Remove the cradle bearings (12).

## Inspection

1. Inspect all components for wear or damage.

## Assembly

1. Reassemble all parts in the reverse order of disassembly.

**NOTE:** When reassembling the thrust bearing (15) the thick race needs to be towards the pistons.

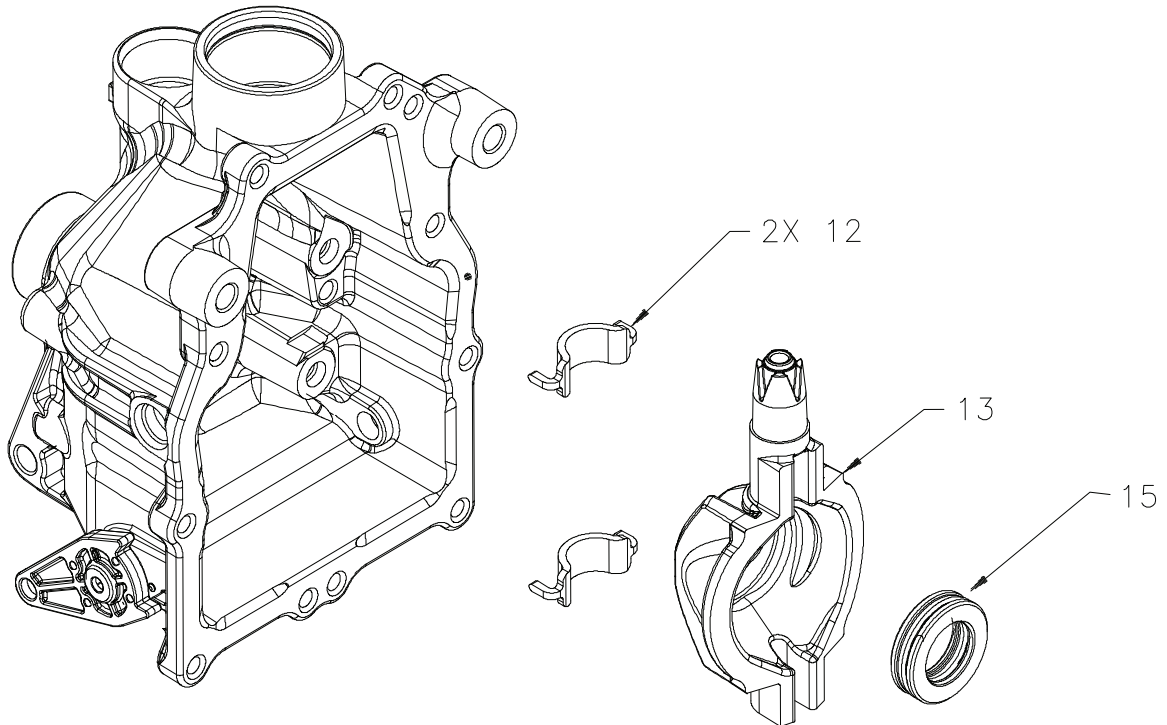


Figure 12, Brake Shaft Assembly

# INPUT SHAFT

Refer to Figure 13

## Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the input shaft (14).

## Inspection

1. Inspect all components for wear or damage.

## Assembly

1. Reassemble all parts in the reverse order of disassembly.

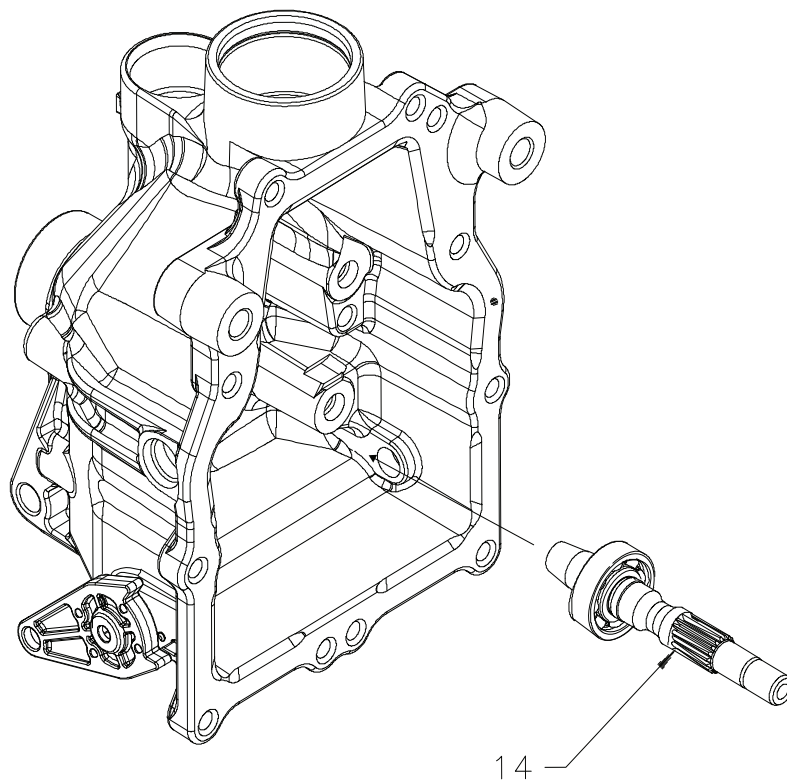


Figure 13, Brake Shaft Assembly

# BYPASS ASSEMBLY

Refer to Figure 14

## Disassembly

**NOTE:** Only remove the bypass assembly if necessary.

1. Remove all external items previously discussed in their recommended order.
2. Mark orientation of bypass arm (55). Remove screw (56) and bypass arm (55).
3. Remove retaining ring (54).
4. Remove seal (53).
5. Remove wave washer (52).
6. Remove bypass actuator (51).

## Inspection

1. Inspect all components for wear or damage.

## Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install a new seal (53) and bypass actuator (51) provided in seal kit.

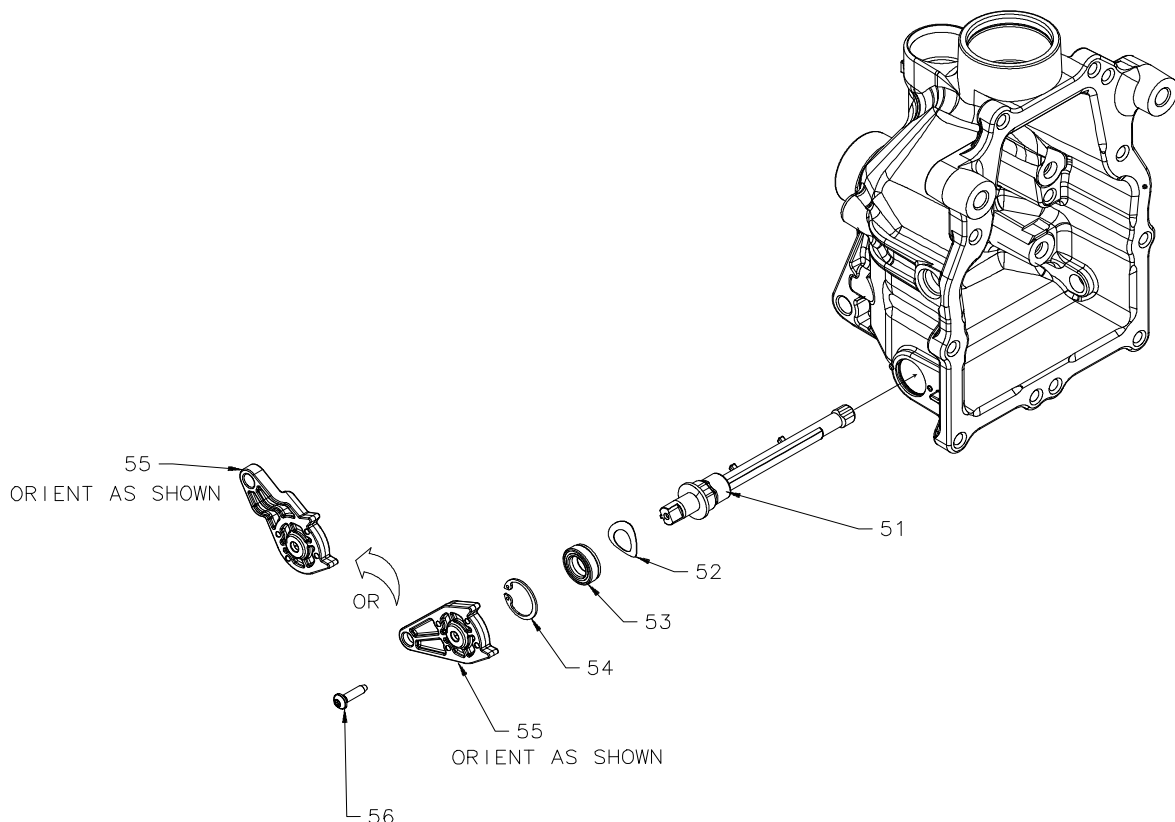


Figure 14, Bypass

## 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. 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 24.

1. Install input shaft (14), cradle bearings (12), swash plate (13), thrust bearing (15) and pump block (18). See pages 19-21.

2. Install check plugs (21 and 22) into center section assembly (20). See torques on page 11.

3. Install the center section (20) using two 1/4 inch diameter dowel pins (included in the center section kit). Remove these pins after the four bolts (23) are installed. See page 18 for a diagram and page 11 for torque specifications.

4. Install a new bypass actuator (51) that is included in the seal kit, wave washer (52), new seal (53), retaining ring (54), bypass arm (55) and screw (56). See page 22 for diagram and page 11 for torque specifications.

5. Install motor block assembly (24) and thrust bearing (28). Reassembly the thrust bearing into the housing. Make sure the thick race of the thrust bearing is against the pistons. Coat running surfaces with oil. Use a plastic putty knife to compress the pistons of the motor block as it is reassembled. See page 17.

6. Install motor shaft (43), washer (46), new seal (47), retaining ring (48) and new seal guard (49). See page 16.

7. a) Before installing the side housing remove all old sealant. Apply a bead of sealant around the perimeter of the middle housing face. Align the side housing (2) with the main housing (1) use care not to smear the sealant bead.

b) Install the bladder (4)

c) Upon reassembly, prior to oil fill, apply a strip of Scotch® tape or similar to the holes on the expansion plate. The tape is applied to the outside and will be removed once assembly is complete. Press the tape firmly to achieve a good seal around the holes. See page 8 for more information on removing tape.

d) Assemble the expansion plate cover (3) to the side cover, securing the bladder.

e) Install the housing screws (5) and expansion plate screws (2). These screws are self-tapping and will need to be pre-started by hand to avoid cross threading. See page 15 for diagram and page 11 for torque specifications.

8. Install new seal (32), control arm (33) and screw (34). See page 14 for diagram and page 11 for torque specifications.

9. Install new seal (61), pulley hub (62), fan and pulley (65 & 64), washer (66) and bolt (67).

### **Important Pages:**

Page 8.....Fluid Volume and Level

Page 9.....Purging Procedures

Page 11.....Required Torque Values

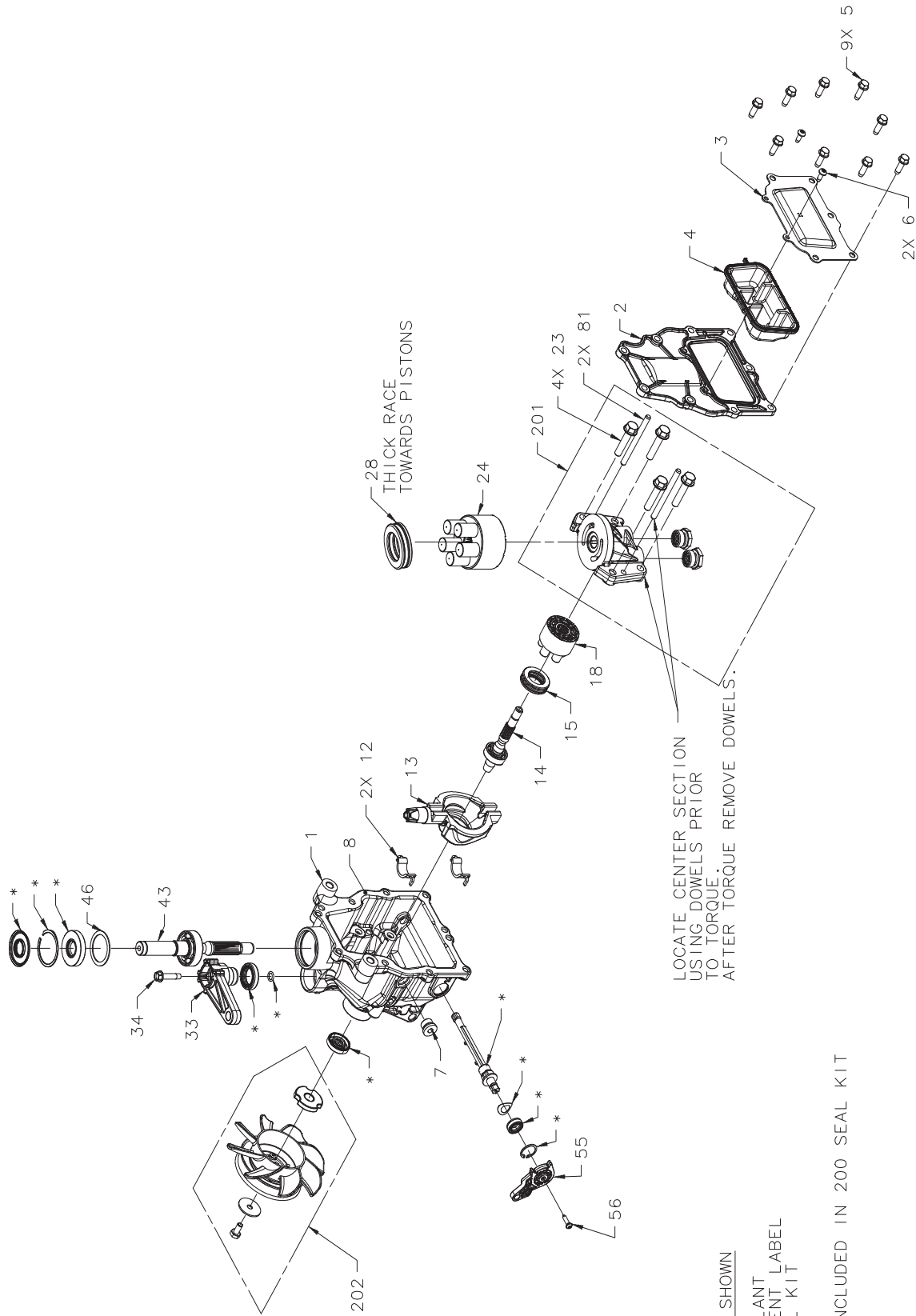
Page 13-22.....Tear down and Assembly

Page 24.....Exploded View

Page 25.....Parts List



# RT-310 EXPLODED VIEW



LOCATE CENTER SECTION  
USING DOWELS PRIOR  
TO TORQUE.  
AFTER TORQUE REMOVE DOWELS.

ITEMS NOT SHOWN

- 8 - SEALANT
- 72 - PATENT LABEL
- 200 - SEAL KIT

\* PARTS INCLUDED IN 200 SEAL KIT



## RT-310 PARTS LIST

1	HOUSING, MAIN, SHOT
2	COVER
3	PLATE, EXPANSION
4	BLADDER
5	SCREW, HEX FLANGE
6	BOLT, SELF TAPPING
7	PLUG, 9/16-18 STRAIGHT THREAD SOCKET HEAD
12	BEARING, CRADLE
13	SWASH PLATE
14	KIT, INPUT SHAFT
15	BEARING
18	KIT, 3cc BLOCK
23	SCREW, HFHCS
24	KIT, 10cc BLOCK
28	BEARING, THRUST
33	ARM, CONTROL
34	SCREW, HEX WASHER
43	KIT, MOTOR SHAFT
46	WASHER, FLAT
55	ARM, BYPASS
56	SCREW, M4 X 16, WUPLAST
81	PIN, STRAIGHT HEADLESS
200	KIT, SEAL
201	KIT, CENTER SECTION
202	KIT, FAN/PULLEY

## 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).

**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 mechanically generated mixture of air bubbles having a tendency to separate from the liquid phase.

**Gerotor:** A formed rotor set operating about an eccentric that provides a fixed displacement for pumps or motors.

**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 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 transfer of power.

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

**Integrated Zero-Turn Transaxle:** 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 efficiency losses.

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

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

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

# NOTES

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