

T1™

Service and Repair Manual

BLN-0101
June 2019

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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 T1™ hydrostatic transaxle.

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 T1 hydrostatic transaxle 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 (888) 406-1810 or at EETC@EETC.org. 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.

DESCRIPTION AND OPERATION

INTRODUCTION

The purpose of this manual is to provide information useful in servicing the Hydro-Gear® T1™ Dual-Axle Transaxle. This manual includes general descriptions, hydraulic schematics, technical specifications, servicing and troubleshooting procedures.

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

GENERAL DESCRIPTION

The T1™ is a self contained unit designed for the transfer and control of power. It provides an infinitely variable speed range between zero and maximum in both forward and reverse modes of operation.

This transaxle uses a variable displacement pump with a maximum displacement of 6cc per revolution, and motor with a fixed displacement of 10cc per revolution. The variable displacement pump features a cradle mounted swash-plate 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 check valves in the center section are used to control the makeup flow of the fluid to the low pressure side of the loop.

A hydraulic bypass is provided to allow the vehicle to be moved without starting the engine. The bypass lifts the motor block off the center section 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) .

HYDRAULIC SCHEMATIC

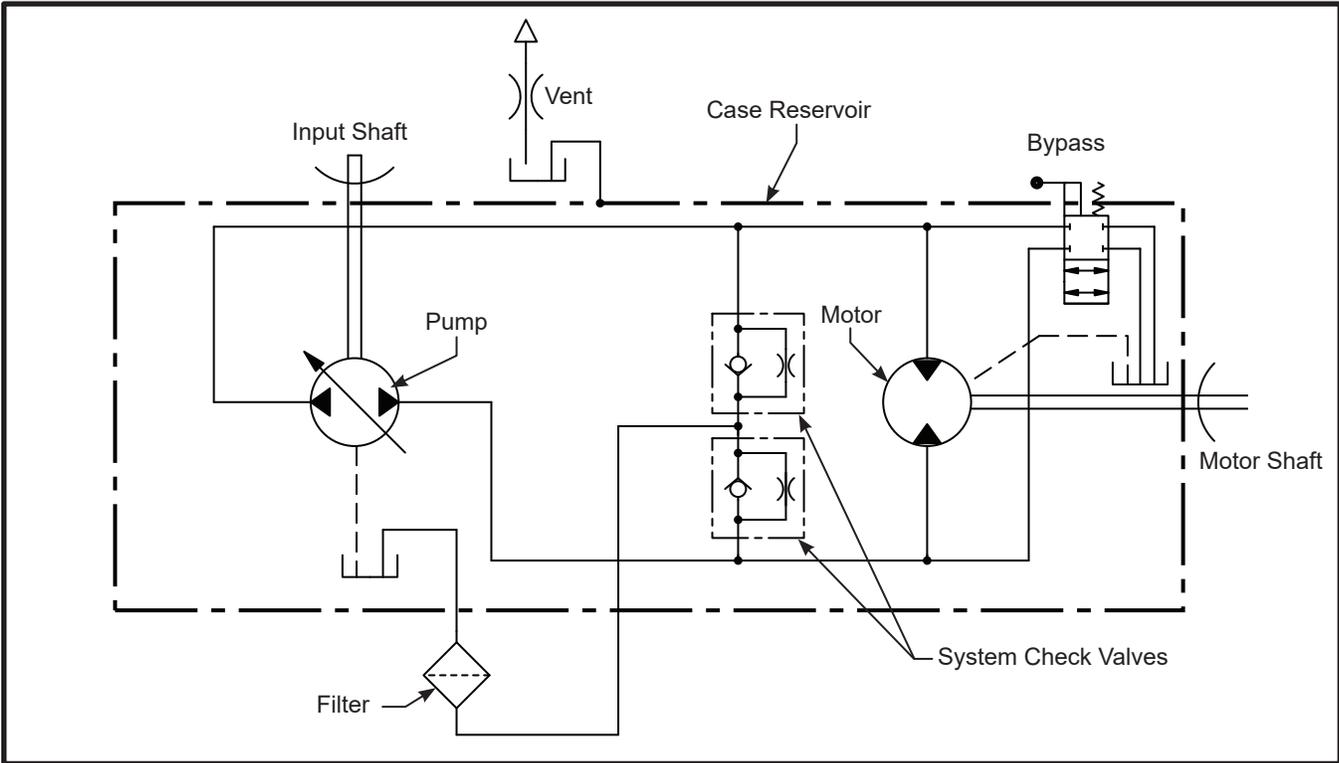


Figure 1, Hydraulic Schematic , T1™

EXTERNAL FEATURES T1™

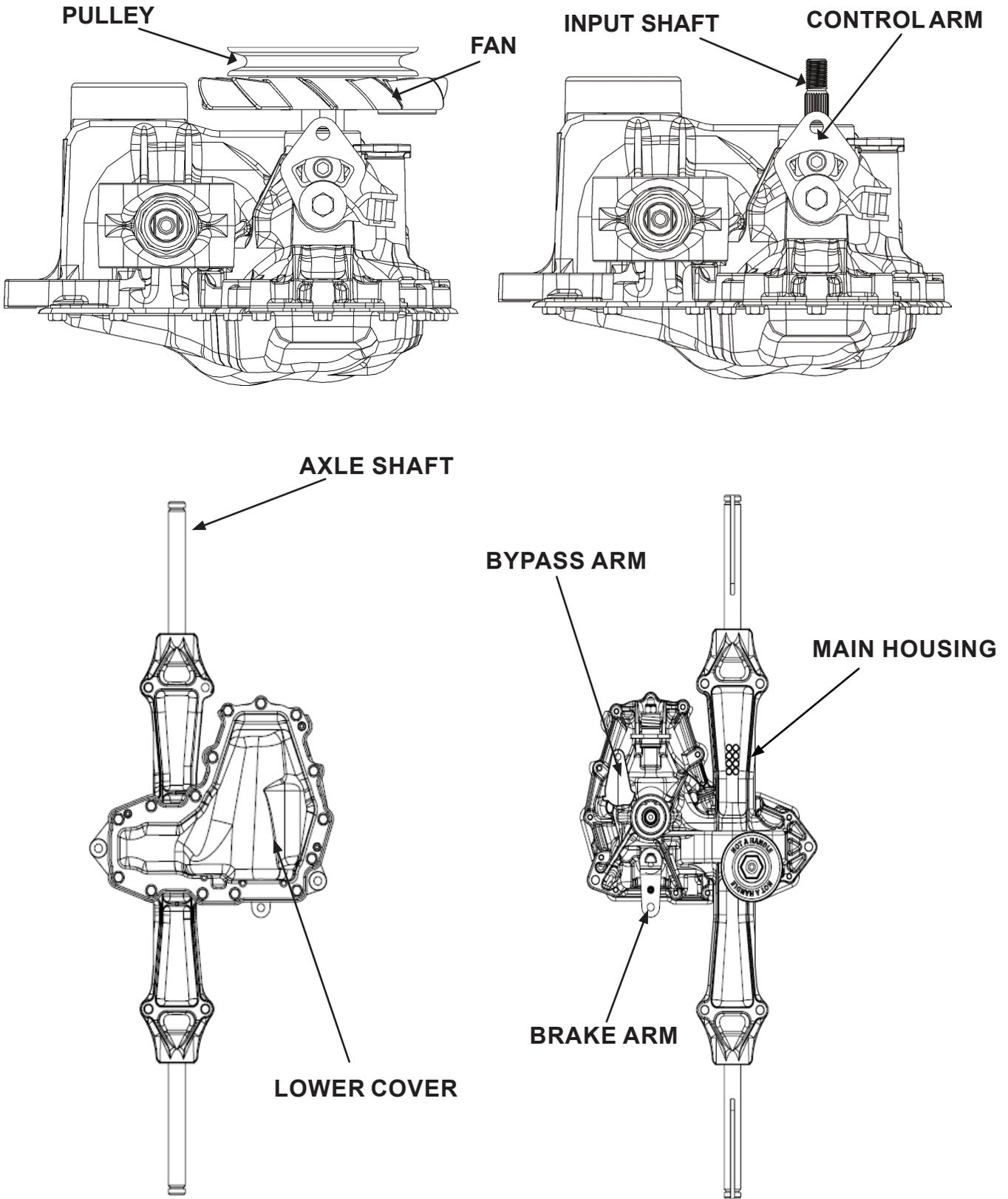


Figure 2, External Features

TECHNICAL SPECIFICATIONS

T1™	
Overall Transaxle Reductions	25.328:1
Pump Displacement	0.36in ³ /rev [6cc/rev]
Motor Displacement	0.62in ³ /rev [10.2cc/rev]
Input Speeds	
Maximum Hi-Idle (No Load)	3000 rpm
Minimum (Loaded)	1800 rpm
Output Torque	
Continuous	85 lb-ft [115 Nm]
Intermittent	160 lb-ft [217 Nm]
Axle Shaft Diameter	0.75 in [19.05 mm]
Axle Shaft Type	Keyed
Parking Brake Type	Internal Wet Disc
Weight of Unit	21 lbs [9.5 kg]

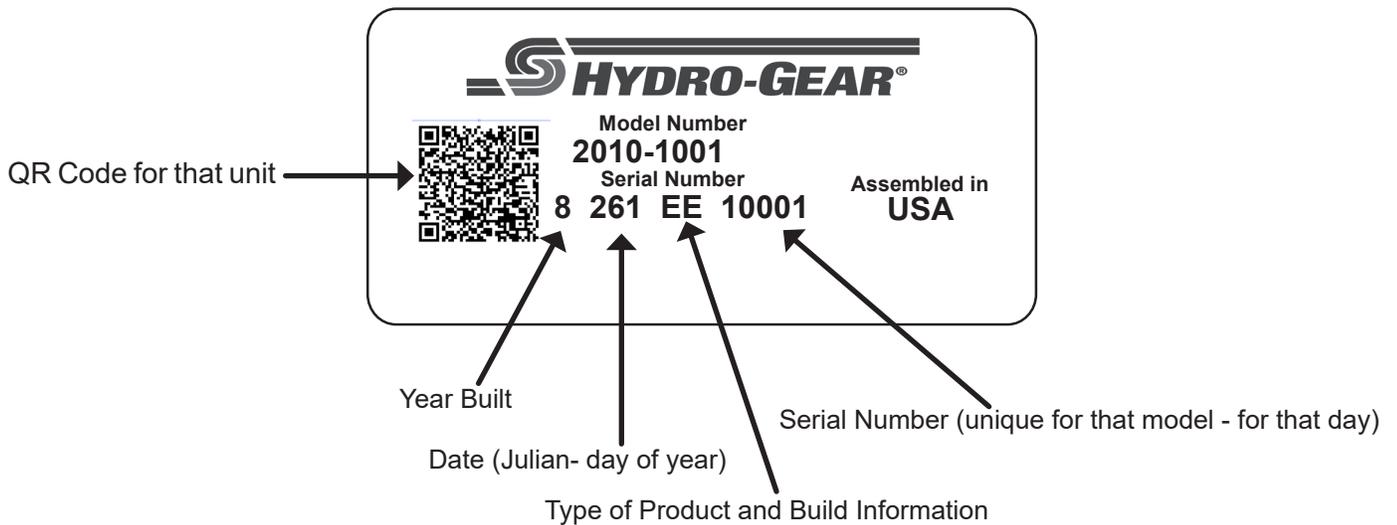


Figure 3, Product Label

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 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 hydraulic transaxle, 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 transaxle. 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 according to local, state, and federal regulations.”

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

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 T1™ 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 transaxle.
4. Inspect the bypass mechanism on the transaxle and the vehicle linkage to insure that both actuate and release fully.

SERVICE 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.

20W50 engine oil has been approved for the T1 and is recommended for normal operating procedures.

“All fluids should be handled and disposed of according to local, state, and federal regulations.”

FLUID VOLUME AND LEVEL

The T1™ is factory filled with 1140 ml (38.55 fluid ounces).

When filling the unit with oil make sure the T1™ is level with the bypass in the open or neutral position. Fill the unit at the fill port (fill port should be facing up). Once the unit is full of oil to the indicated level wait one minute for the oil to settle, add more if necessary.

After adding oil to the T1™, always follow the purging procedure located on page 9.

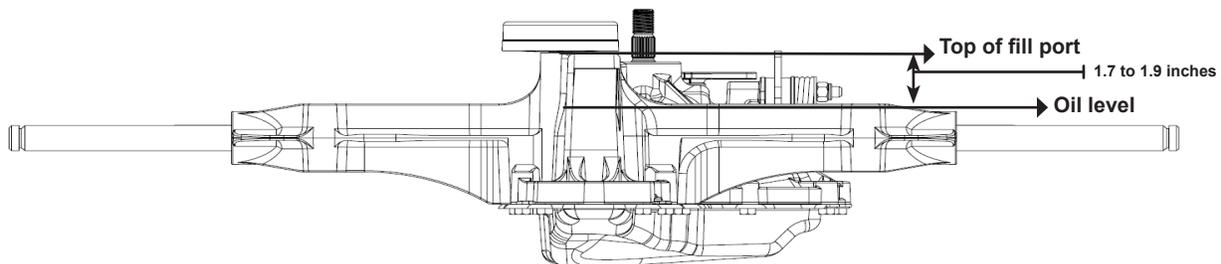


FIGURE 4, FLUID LEVEL

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 transaxle 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 transaxle 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 32 for part names and descriptions. A complete exploded view and item list of the transaxle 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. **It is best to not allow direct spray from a pressure washer to clean the transaxle.**

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 or at your Hydro-Gear Central Service Distributor.

Note: “Any and all components removed and replaced during service are recyclable.”

TOOLS

REQUIRED TOOLS	
Miscellaneous	Sockets
T40 Torx	3/4" Deep Socket
Torque Wrench	1/2" Deep Socket
Plastic Putty Knife	3/8" Deep Socket
Flat Blade Screw Driver	

TORQUES

REQUIRED TORQUE VALUES			
Item	Description	Torque	Operation
17	Seat, Check 5/8-18	390-420 in-lbs (44.06-46.45 Nm)	Check Plugs
18	Seat, Check 5/8-18	390-420 in-lbs (44.06-46.45 Nm)	Check Plugs
22	Screw, Hex Washer 1/4-20X.75	55-70 in-lbs (6.21-7.9Nm)	Filter Screw
30	Screw, Hex Flange 5/16-18X1.5	230-290 in-lbs (25.09-32.76 Nm)	Center Section Screws
44	Screw, Hex Washer 1/4-20X.75	105-155 in-lbs (11.86-17.51 Nm)	Housing Screws
82	Screw, Hex Cap, 5/16-24X1.875	230-310 in-lbs (25.98-35.02 Nm)	RTN Screw
57	Nut 1/2-20 Hex Jam W	540-660 in-lbs (61.00-74.56 Nm)	Fan & Pulley Hex Nut
66	Fitting, Vent	15-35 in-lbs (1.69-3.95 Nm)	Breather
100	Screw, Set 5/16-24 x1.75	135-155 in-lbs (15.25-17.51 Nm)	RTN Screw
107	Hex Lock Nut 5/16-24 UNF	75-120 in-lbs (8.47-13.55 Nm)	Stop Stud Nut
108	TWHCS 5/16-24X1.00	230-310 in-lbs (25.98-35.02 Nm)	TWHTCS RTN

REMOVAL

NOTE: *It is necessary to remove the T1™ 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 T1.

The following procedures are presented in the order recommended for a complete tear down of the T1.

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 28.

FAN AND PULLEY ASSEMBLY

Refer to Figure 5

Disassembly

FAN AND PULLEY KIT (62)

1. Remove the hex nut (57).
2. Remove the washer, pulley and fan.
3. Remove the fan hub.

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. Install the fan hub, fan and pulley.
3. Install the washer and nut.
4. When tightening the hex nut (57), refer to the table on page 11 for the required torque values.
5. The fan hub will need to be replaced if it is removed from the input shaft.

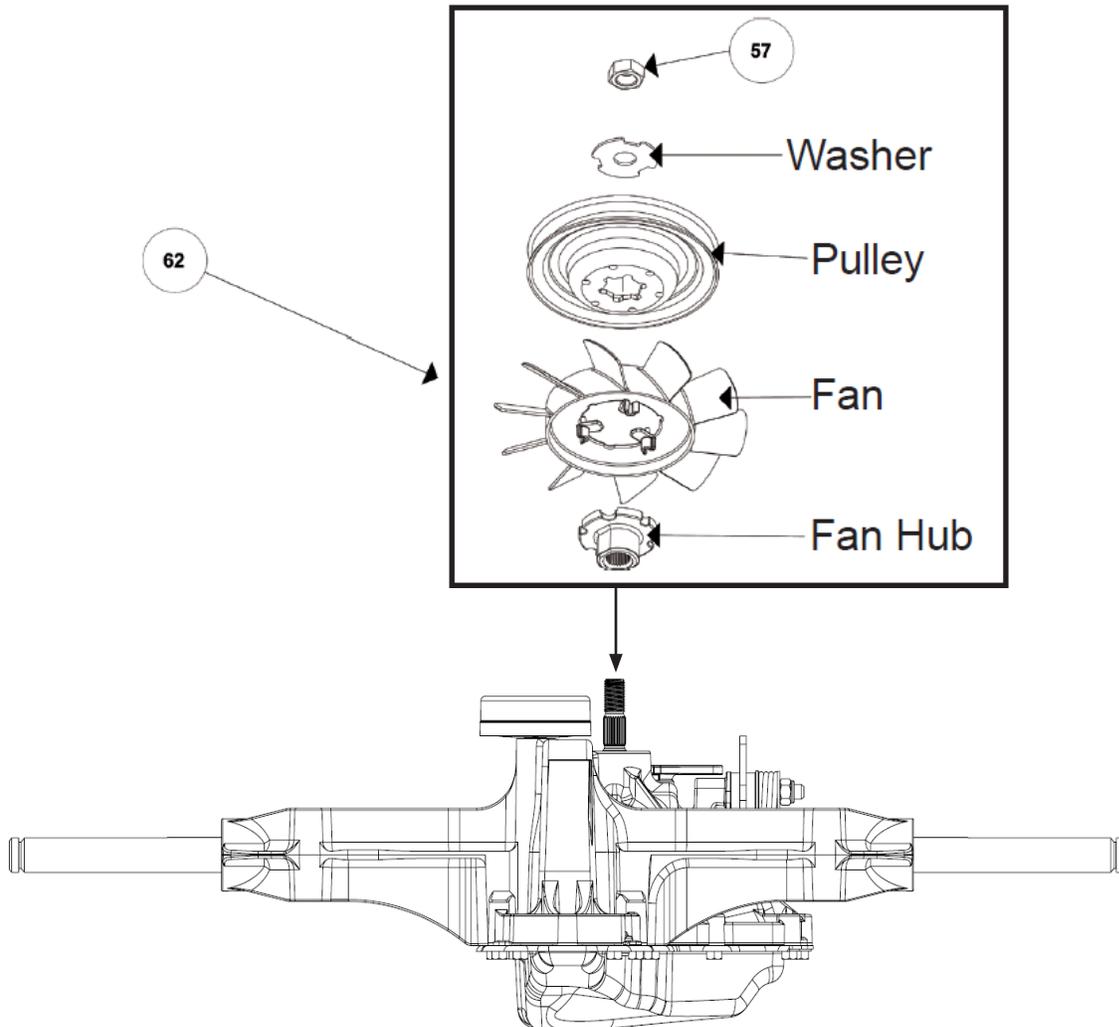


Figure 5, Fan & Pulley

INPUT SHAFT ASSEMBLY

Refer to Figure 6

Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the retaining ring (50).
3. Remove the seal (49) and washer (48).
4. Remove the input shaft (15).

Inspection

1. Inspect all items for wear and or damage.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install the input shaft (15).
3. Install the seal (49) and washer (48).
4. Install the retaining ring (50).

NOTE: The seal will need to be replaced with a new seal from the seal kit during assembly.

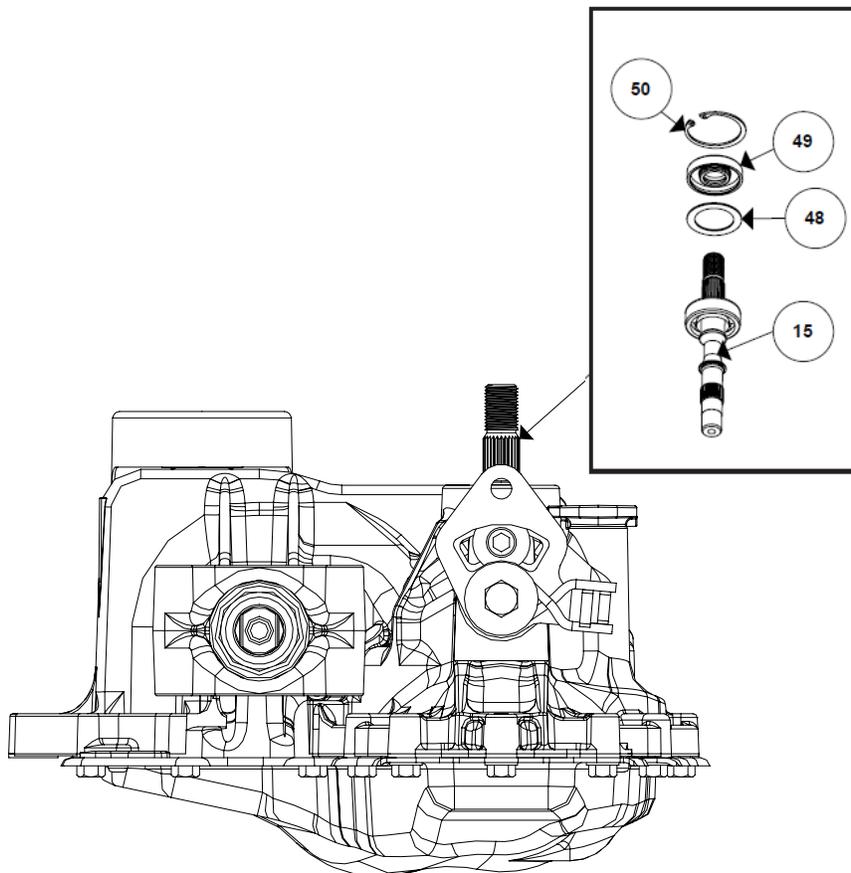


Figure 6, Input Shaft

RETURN TO NEUTRAL (RTN) ASSEMBLY

Refer to Figure 7

Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the screw (82), washer (81), and spacer (80).
3. Remove the spring (79) and RTN arm (78).
4. Remove the screw (77), washer (58), and neutral arm (75).

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install the neutral arm (75), washer (58), and the screw (77).
3. Install the RTN arm (78) and the spring (79).
4. Install the spacer (80), washer (81), and screw (82).

Inspection

1. Inspect all items for wear and or damage.

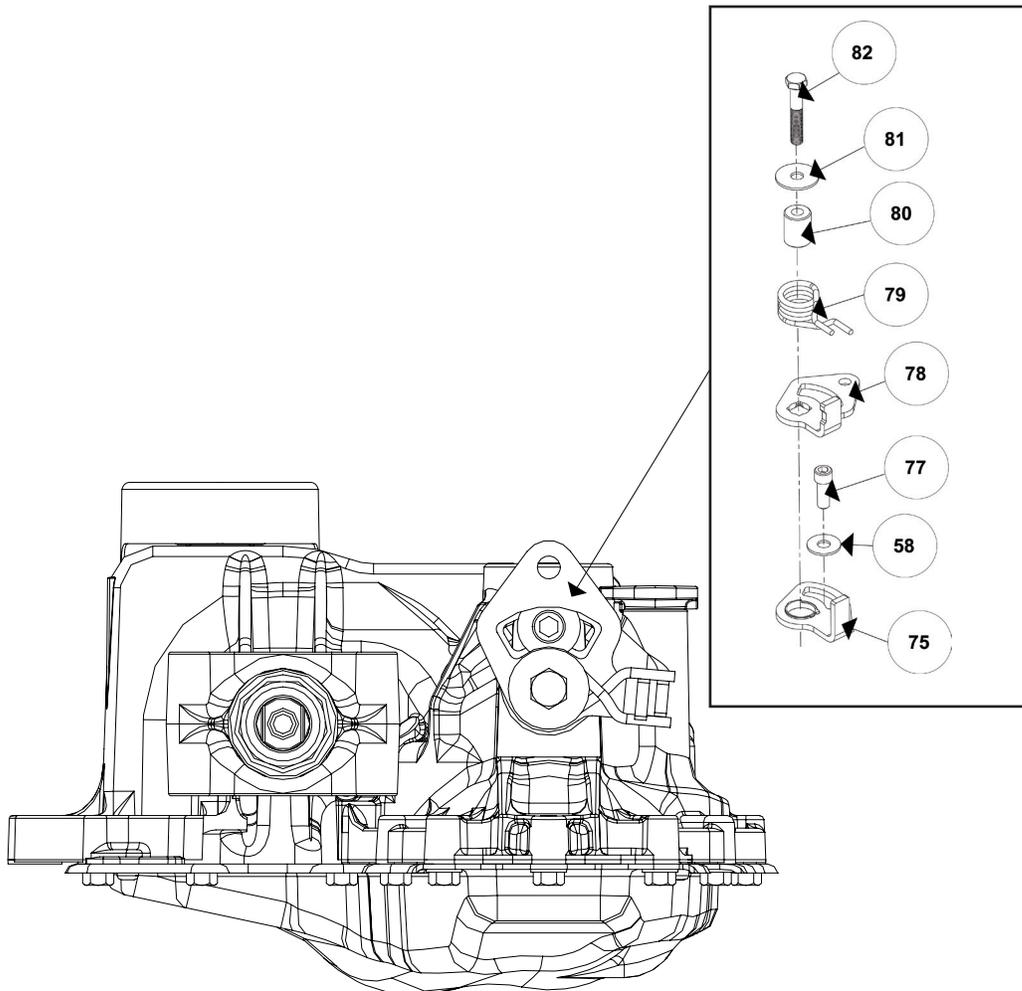


Figure 7, Return To Neutral

CONTROL ARM ASSEMBLY

Refer to Figure 8

Disassembly

1. Remove all items previously discussed in the recommended order.
2. Mark the orientation of the control arm (102) before removal.
3. Remove the hex nut (107), washer (106) and compression spring (105).
4. Remove the flanged spacer (104) and plastic washer (101).
5. Remove screw (108) and control arm (102).
6. Remove the plastic washer (101) and set screw (100).

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 the set screw (100) and plastic washer (101).
3. Install control arm (102) to marked orientation and screw (108).
4. Install the plastic washer (101) and flanged spacer (104).
5. Install the compression spring (105), washer (106) and hex nut (107).

NOTE: When tightening screw (108) and the hex nut (107), refer to the table on page 11 for the required torque values.

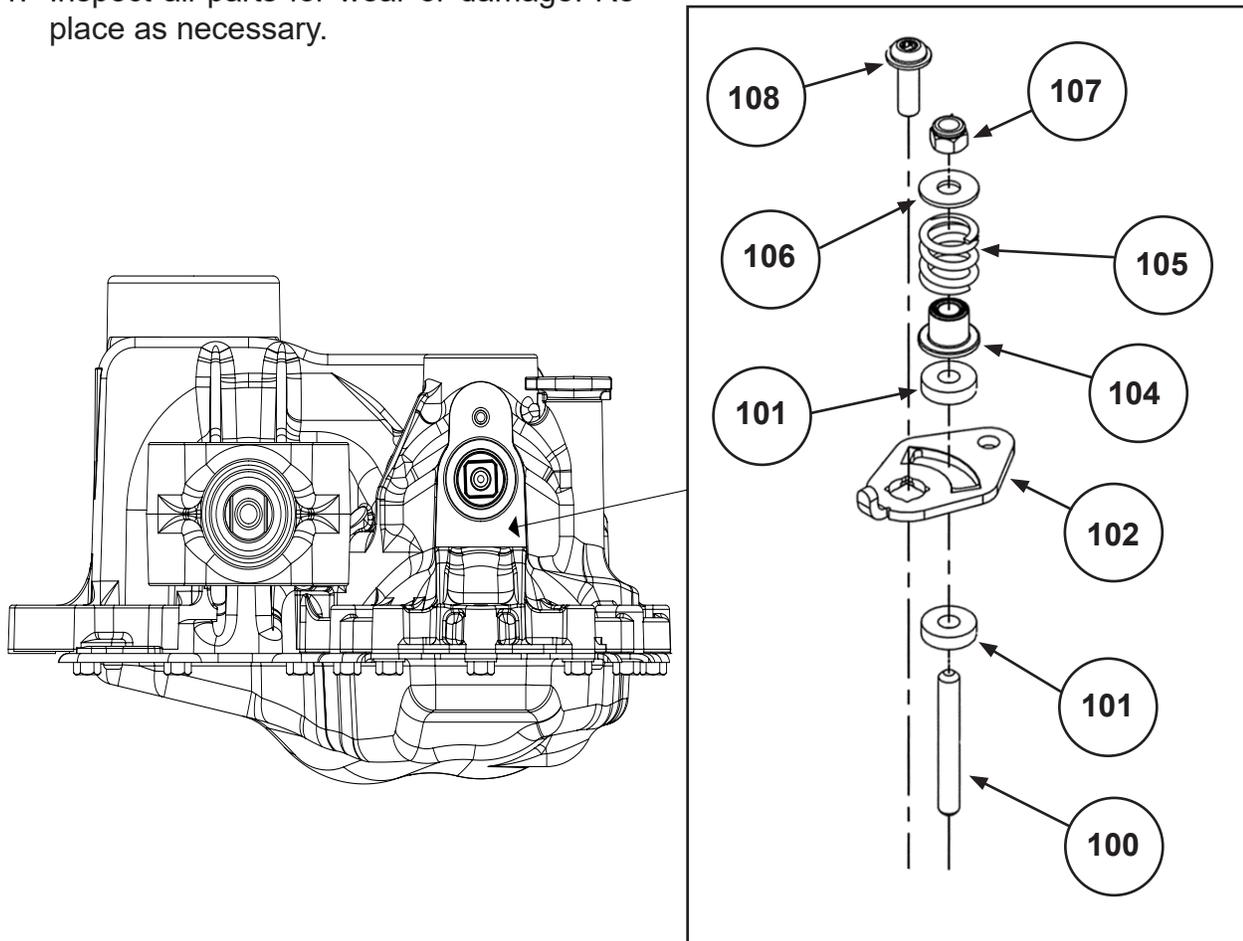


Figure 8, Control Arm Assembly

LOWER COVER ASSEMBLY

Refer to Figure 9

Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the housing screws (44).
3. Remove the lower cover (42).

Inspection

1. Inspect the parts for wear or damage.

Assembly

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

IMPORTANT: Before scraping the old sealant from the main housing, place a protective cover over the internal parts of the transaxle; avoiding any debris from entering the housing.

NOTE: Remove all old sealant from the main housing (1) and the lower cover (42) before applying new sealant. Refer to page 29 for the sealant path diagram.

2. Apply a bead of sealant around the perimeter of the main housing face.
3. Align the lower cover (42) with the main housing (1). Use care not to smear the sealant bead.
4. Install the fifteen housing screws (44).

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

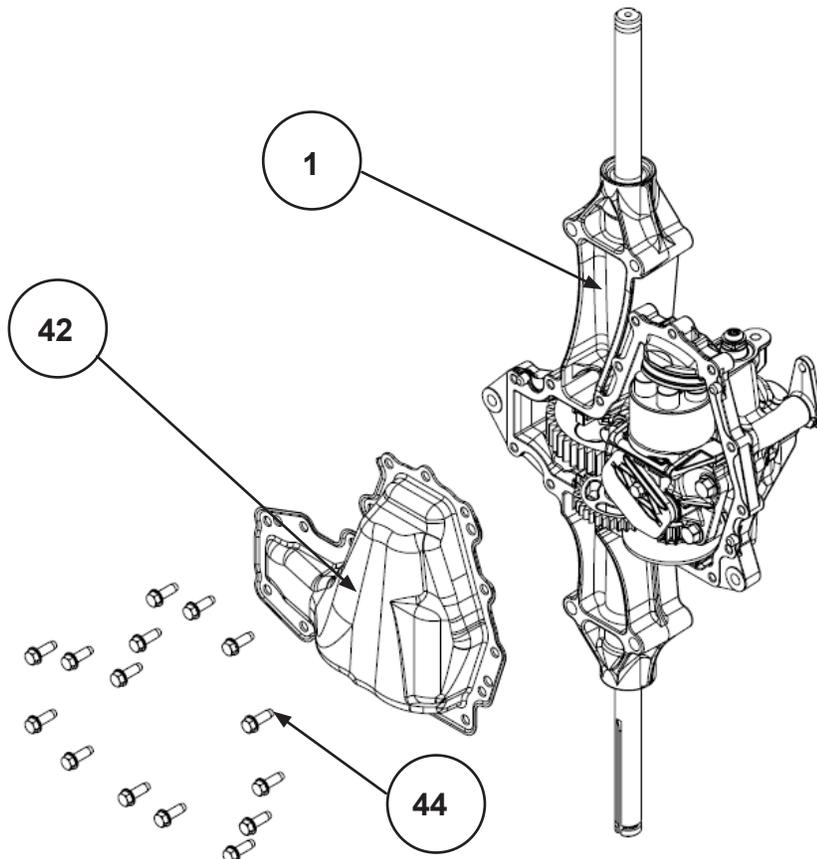


Figure 9, Lower Cover

REDUCTION GEAR SET AND BRAKE DISC ASSEMBLY

Refer to Figure 10

Disassembly

1. Remove all items previously discussed in the recommended order.
2. Step 1: Remove the brake puck (32) and brake disc (31).
3. Step 2: Remove the reduction gear (38), sun gear (39), and jack shaft pin (40).
4. Step 3: Remove the gear spacers (37) and the c-clips (36) from the bottom of the axle shafts (34 and 67).
5. Remove the differential assembly.
6. Remove the bevel gears (92), bevel gears (91) and pins (90).

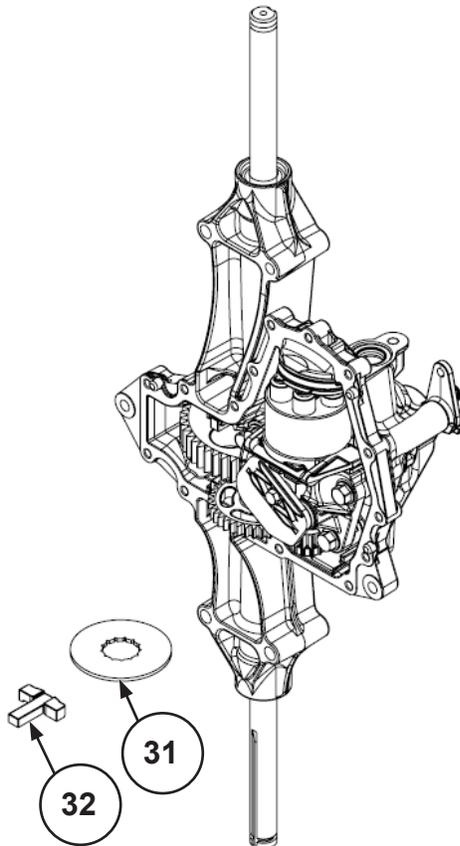
Inspection

1. Inspect all parts for wear or damage.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Assemble the differential. Install the pins (90), gears (91) and bevel gears (92).
3. Install the differential assembly.
4. Install the sun gear (39), reduction gear (38), and jack shaft pin (40).
5. Install the brake disc (31) and brake puck (32).

Step One



Step Two

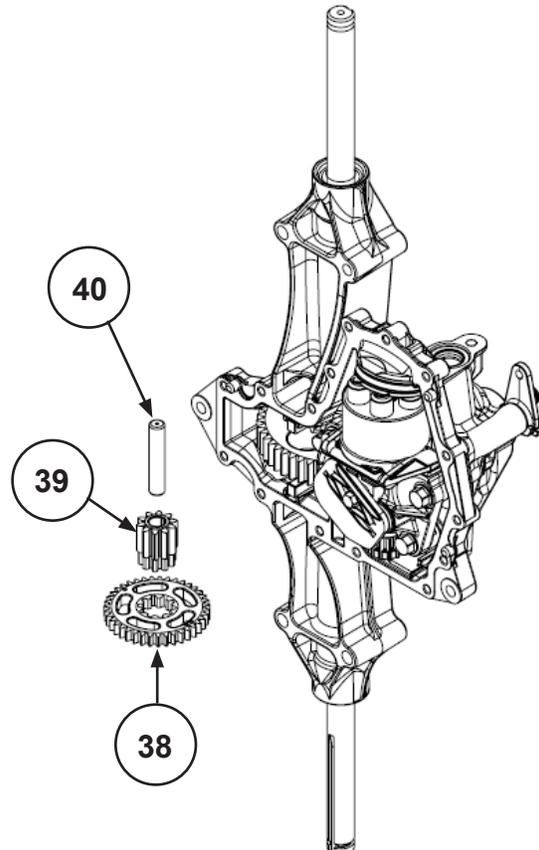


Figure 10, Reduction Gear Set and Brake Disc

REDUCTION GEAR SET AND BRAKE DISC ASSEMBLY CONT.

Step Three

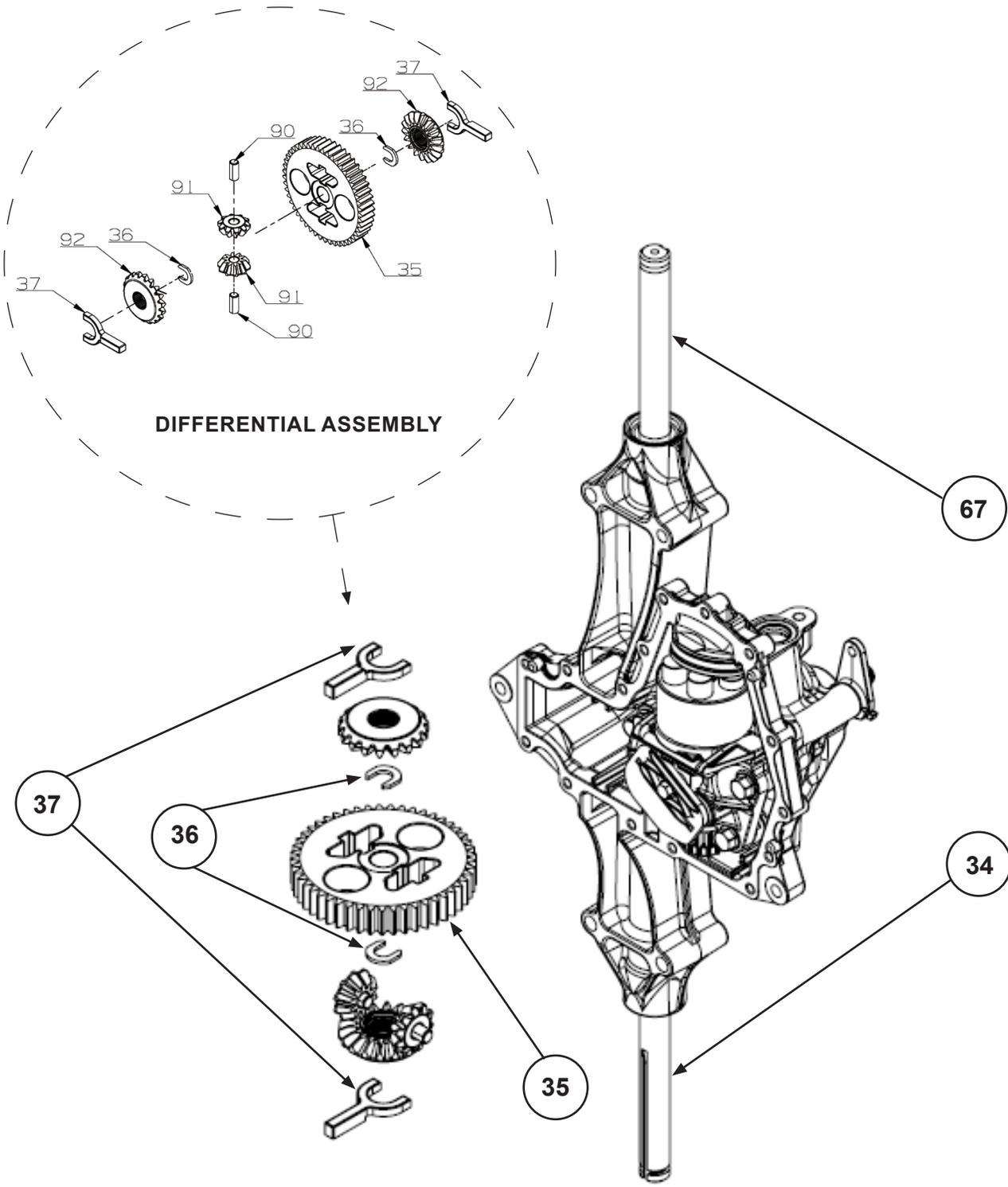


Figure 11, Differential Assembly

AXLE SHAFT ASSEMBLY

Refer to Figure 12

Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the seals (52), axle shafts (34 and 67) and outboard bushings (51).

Inspection

1. Inspect the axle shafts (34 and 67) for wear or damage. Inspect the splines on the shaft for possible damage. Replace if necessary.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install the outboard bushings (51), axle shafts (34 and 67) and seals (51).

NOTE: The seal will need to be replaced with a new seal from the seal kit during assembly.

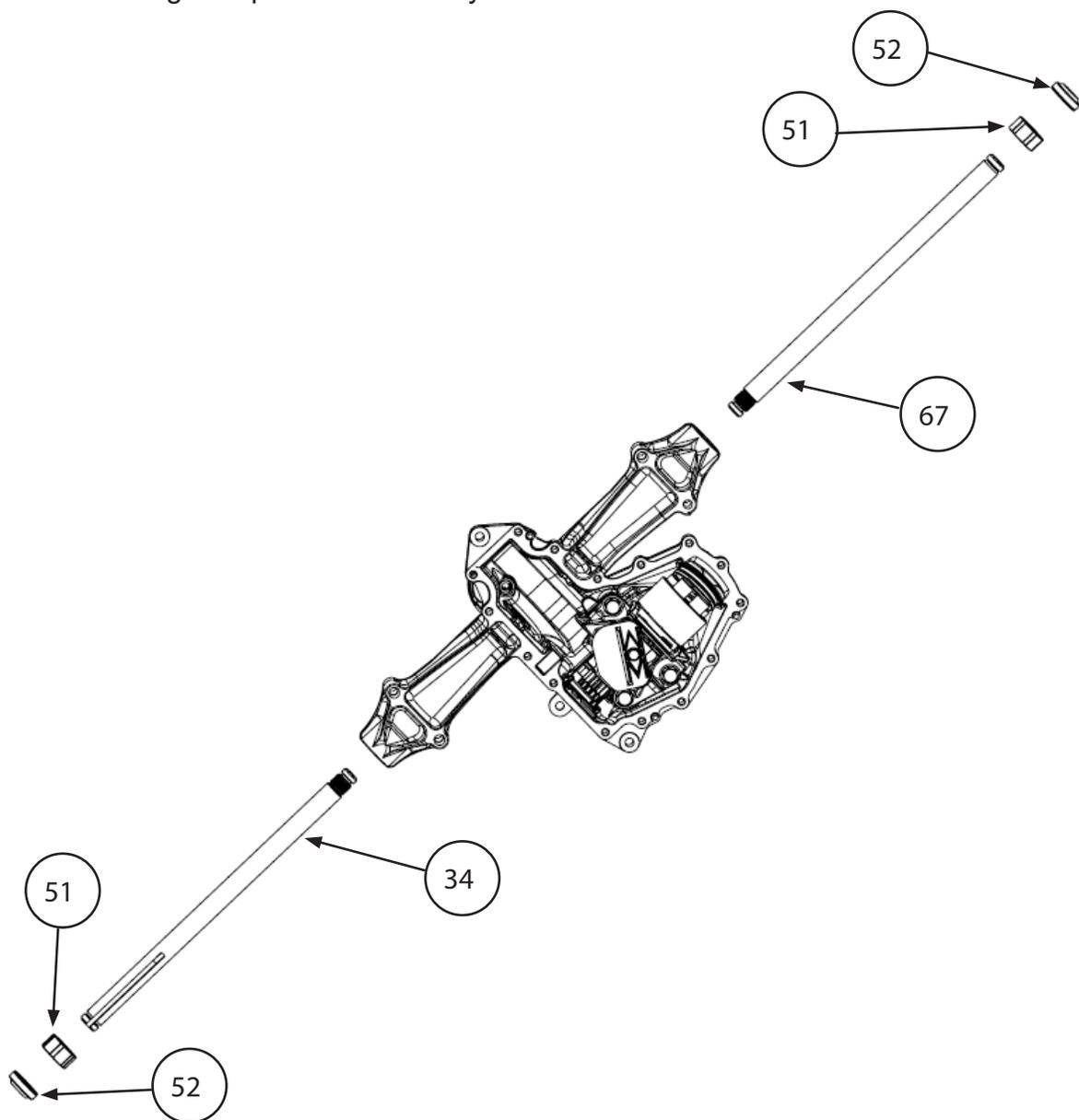


Figure 12, Axle Shaft

THRUST BEARING ASSEMBLY

Refer to Figure 13

Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the thrust bearing (9) using a plastic putty knife.

Inspection

1. Inspect all components for wear or damage.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install the thrust bearing (9).

NOTE: The thick race must face towards the pistons.

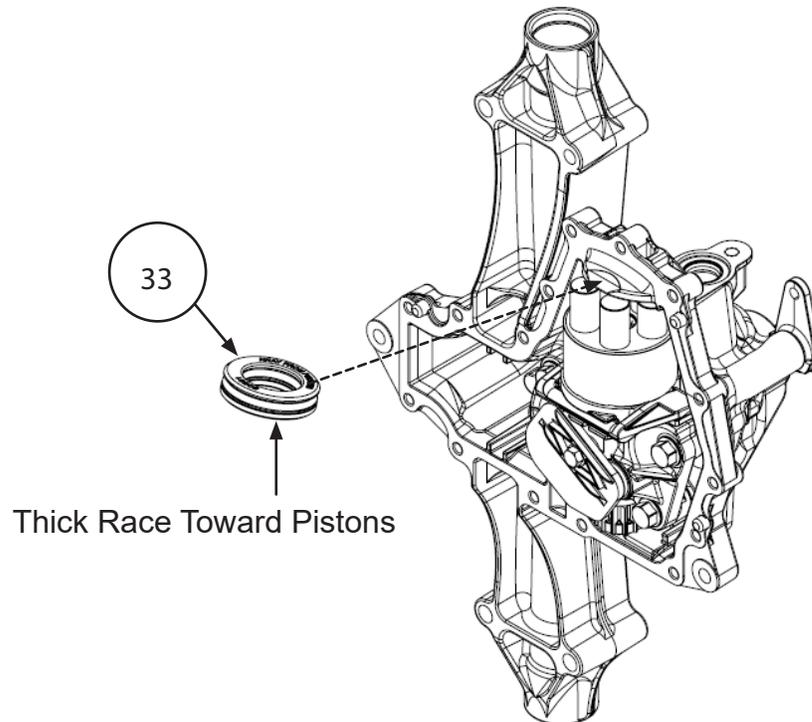


Figure 13, Thrust Bearing

MOTOR BLOCK AND CENTER SECTION ASSEMBLY

Refer to Figure 14

Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the filter screw (22) and filter assembly (20 and 21).
3. Remove the check seat assemblies (17 and 18) and both check ball assemblies (16).
4. Remove the center section screws (30).
5. Remove the center section assembly (15).
6. Remove the motor shaft (23) from the center section (15).
7. Remove the motor block assembly (29).
8. Remove the pistons, springs, and piston seats from the cylinder block.
9. Remove the bypass actuator (28) from the center section assembly (15).
10. Remove the brake puck (27).
2. Inspect the running surface of the cylinder block (29) and piston ends for damage. The running surface may show evidence of minor abrasion. This will be normal wear. If grooved, scratched, or smeared, replace with a new cylinder block assembly.
3. Inspect the threaded check seat assemblies (17 and 18) and the ports of the center section (15) for debris or damage.
4. Inspect all bearing, bushing and wear areas in the main housing (1).

Inspection

1. Inspect the center section assembly running surfaces (15).

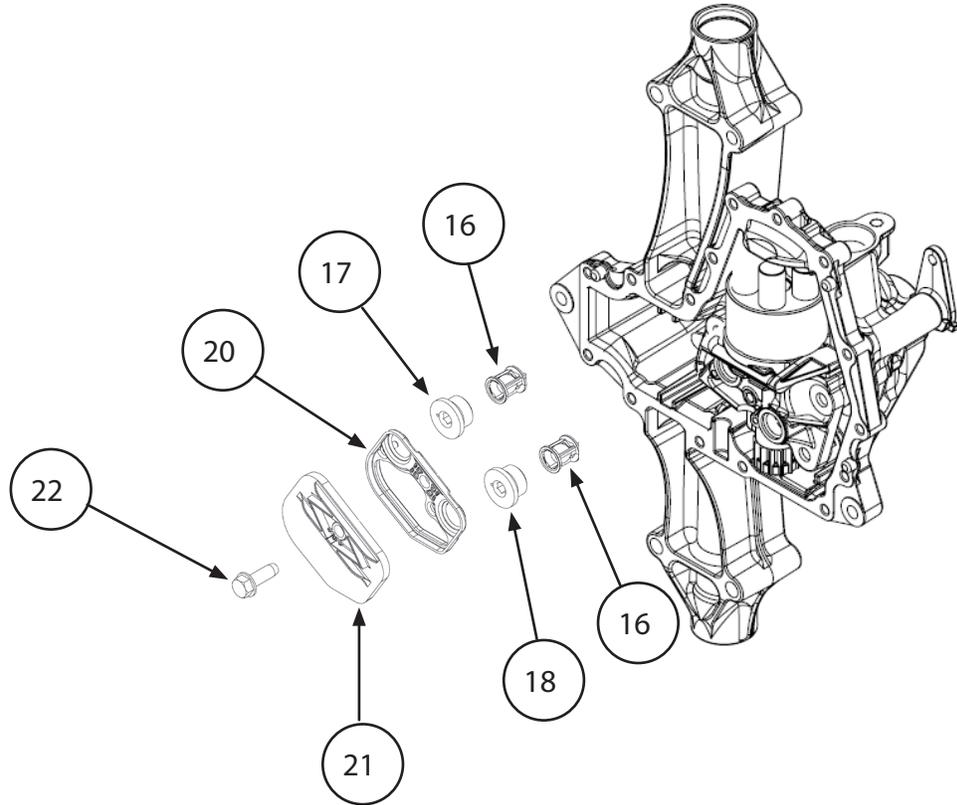
NOTE: These “running” surfaces should be smooth in appearance without scratches, scoring, nicks or abrasions. Drag a fingernail across the surface to detect uneven wear or scratches which may not be visible.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install the brake puck (27) into the main housing (1).
3. When installing the check seat assemblies (17 and 18) refer to the table on page 11 for the required torque values.
4. Apply a light coating of oil to all running surfaces to prevent scoring during reassembly.
5. Install the motor shaft (23) into the center section (15).
6. Install the actuator (28) and the motor block assembly (29).
7. Install the center section assembly (15).
8. Install the center sections screws (30), filter assembly (20 and 21) and filter screw (22).

MOTOR BLOCK AND CENTER SECTION ASSEMBLY CONT.

STEP ONE



STEP TWO

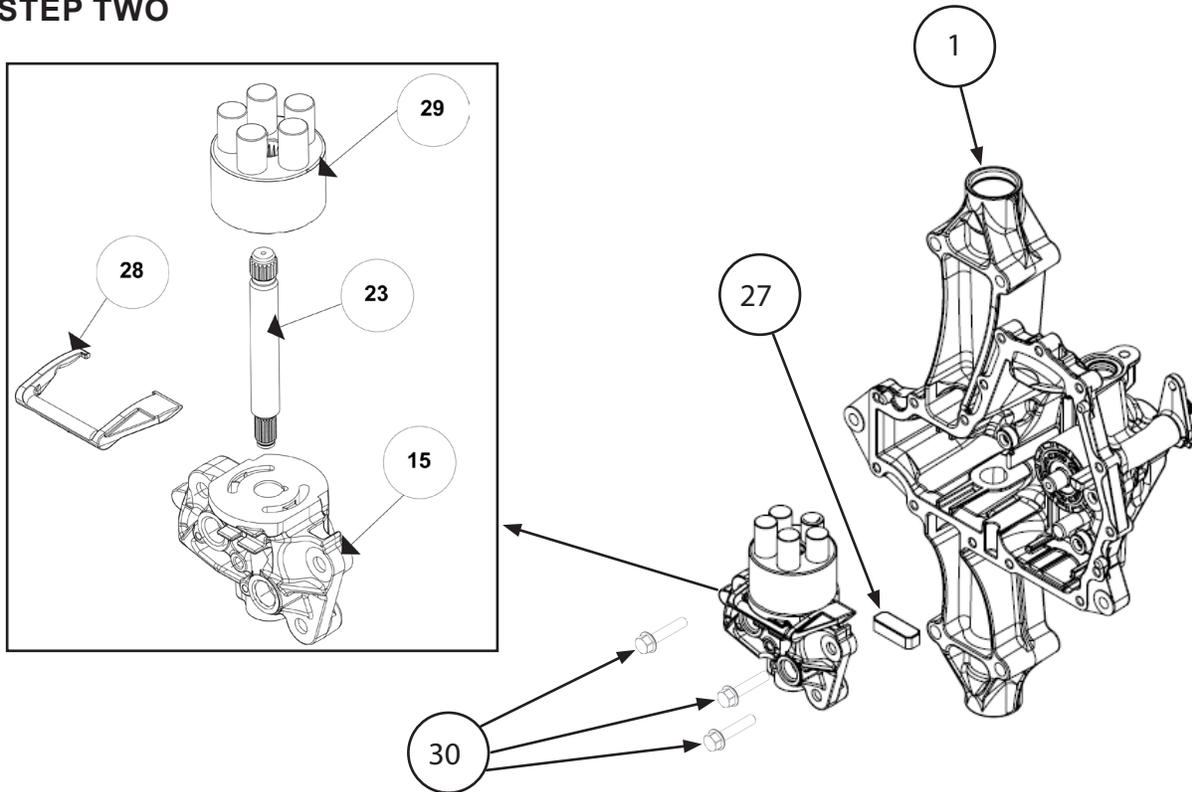


Figure 14, Motor Block and Center Section

BRAKE ASSEMBLY

Refer to Figure 15

Disassembly

1. Remove all items previously discussed in the recommended order.
2. Remove the brake arm assembly (7).
3. Remove the spring (12).

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install the spring (12).
3. Install the brake arm assembly (7).

Inspection

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

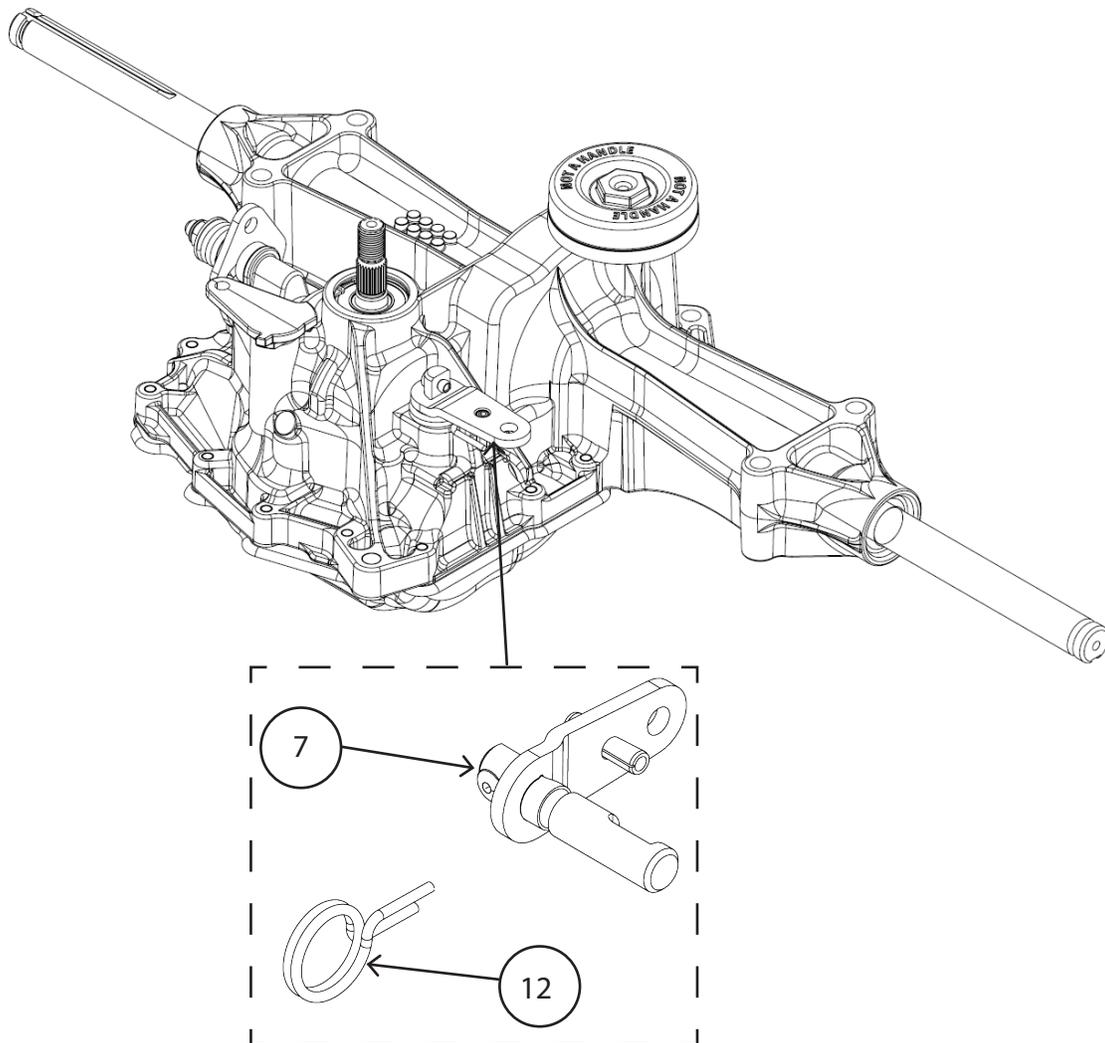


Figure 15, Brake Assembly

PUMP BLOCK ASSEMBLY

Refer to Figure 16

Disassembly

1. Remove the pump block assembly (26) from housing (1).
2. Remove the pistons, springs and piston seats from the motor block.

Inspection

1. Inspect the running surface of the cylinder block and piston ends for damage. The running surface may show evidence of minor abrasion. This will be normal wear. If grooved, scratched, or smeared, replace with a new cylinder block assembly.

Note: Residual oil may cause the piston seats to remain stuck inside of the pistons.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install the piston seats, pistons and springs into the cylinder block (26).
3. Install the cylinder block assembly (26). Make sure the pistons are facing towards the swash plate assembly (6).

Running Surface

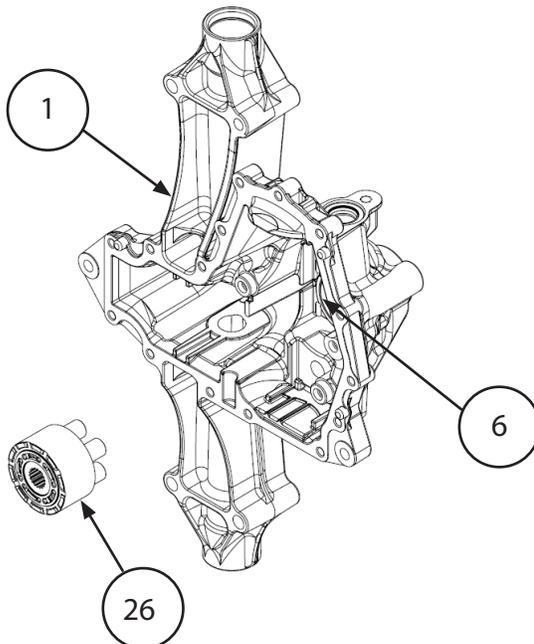
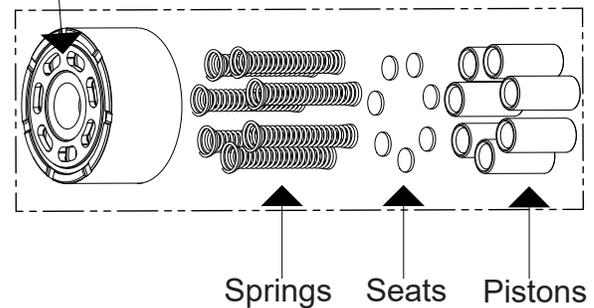


Figure 16, Pump Block

SWASHPLATE AND TRUNNION ARM ASSEMBLY

Refer to Figure 17

Disassembly

1. Remove the swashplate assembly.
2. Remove the thrust bearing (14) from the swash plate (6).
3. Remove the cradle bearings (5) from the swashplate, if damaged.
4. Remove the trunnion arm (13), if damaged.

Inspection

1. Inspect all components for wear or damage.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install the trunnion arm (13) if removed.
3. Install the cradle bearings (5) onto the swashplate (6).
4. Install the thrust bearing (14) into the swashplate (6).
5. Install the swashplate assembly.

NOTE: When reassembling the thrust bearing (14), the thick race must face toward the pistons.

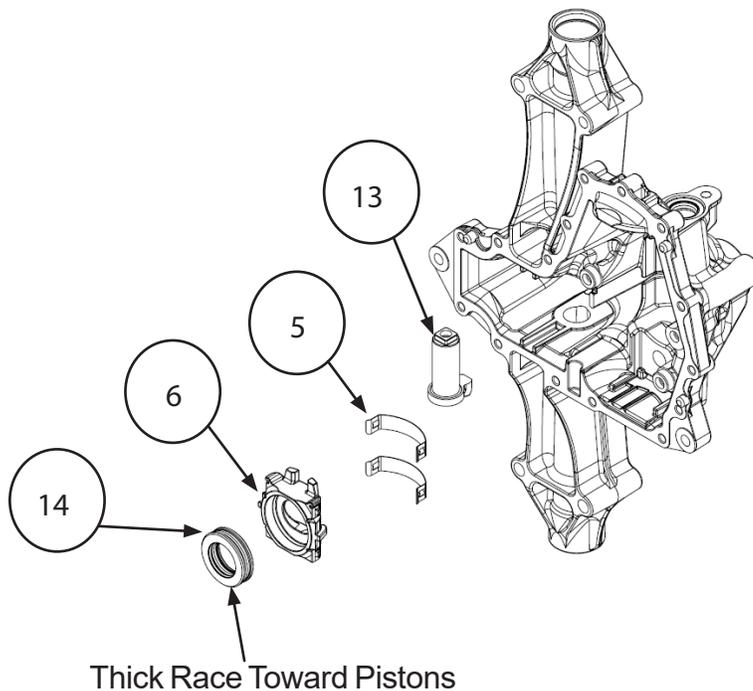


Figure 17, Swashplate and Trunnion Arm

BYPASS ASSEMBLY

Refer to Figure 18

Disassembly

1. Remove the bypass rod assembly (4).

NOTE: Only remove the bypass rod (4) if damaged.

Inspection

1. Inspect all components for wear or damage.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install the bypass rod assembly (4).

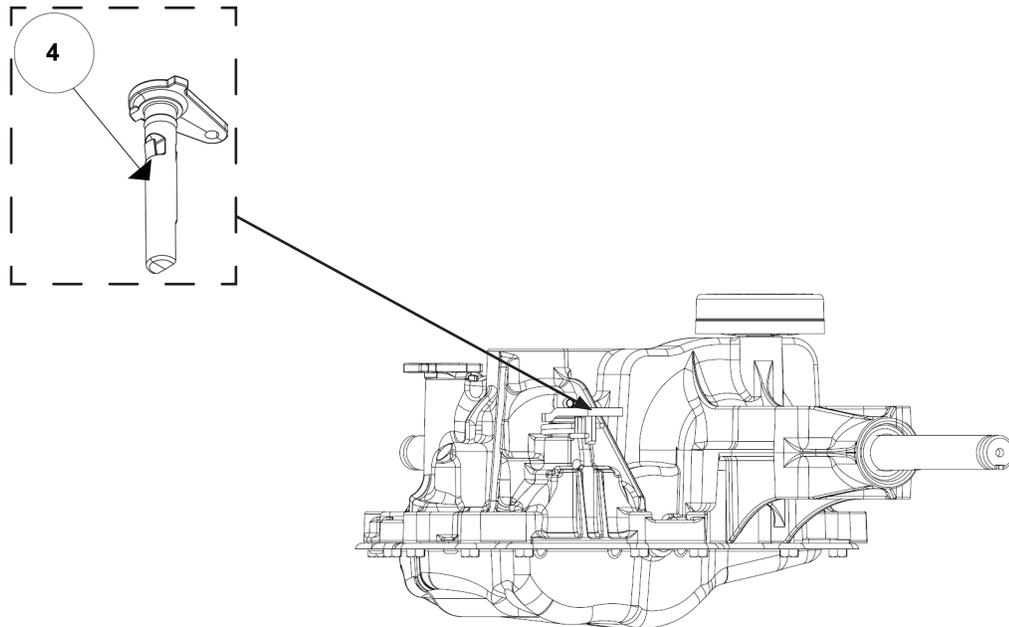


Figure 18, Bypass

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.

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 31.

1. Install the trunnion arm (13) if removed.
2. Install the cradle bearings (5) onto the swashplate (6). Install the thrust bearing (14).
3. Install swashplate assembly.
4. Install the pump block assembly (26).
5. Install the brake torsion spring (12) and brake assembly (7).
6. Install the motor shaft (23) and 14T Gear (24) into the center section.
7. Install the center section assembly (15), bypass actuator (28), and motor block assembly (29) into the main housing (1).
8. Install the center section screws (30), filter screw (22), and filter assembly (20 and 21).
9. Install the thrust bearing (33) while using a plastic putty knife. The thick race must face toward the pistons.
10. Install the brake disc (31) and brake puck (32).
11. Install the axle shafts (34 and 67), differential assembly, C clips (38), and gear spacers (37).
12. Install the sun gear (39), reduction gear (38), and jack shaft pin (40).
13. Before installing the lower cover (42), remove all old sealant. Apply a bead of sealant around the perimeter of the middle housing face. Align the lower cover with the main housing. Use care not to smear the sealant bead.
14. Install the fifteen housing screws (44). Refer to the screw tightening sequence on page 30.
15. Install the outboard axle bushings (51) and seals (52).
16. Install the input shaft assembly (15), washer (48), new seal (49), and retaining ring (50).
17. Install the trunnion seal (52).
18. Install the neutral arm (75), washer (58), and the screw (77).
19. Install the RTN arm (75), spring (79), spacer (80), washer (81), and screw (82).
20. Install the fan and pulley assembly (62).
21. Add oil and purge the unit. See pages 8 and 9 for more information.

Important Pages:

Page 8.....	Fluid Volume and Level
Page 9.....	Purging Procedures
Page 11.....	Required Torque Values
Page 13-27.....	Tear down and Assembly
Page 31.....	Exploded View
Page 32.....	Parts List

SEALANT APPLICATION DIAGRAM

Refer to Figure 19

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

A small consistent bead (approx. 1/16 - 1/8 inch) of the sealant around the housing face will be sufficient. Use sparingly.

The illustration below indicates the correct sealant path.

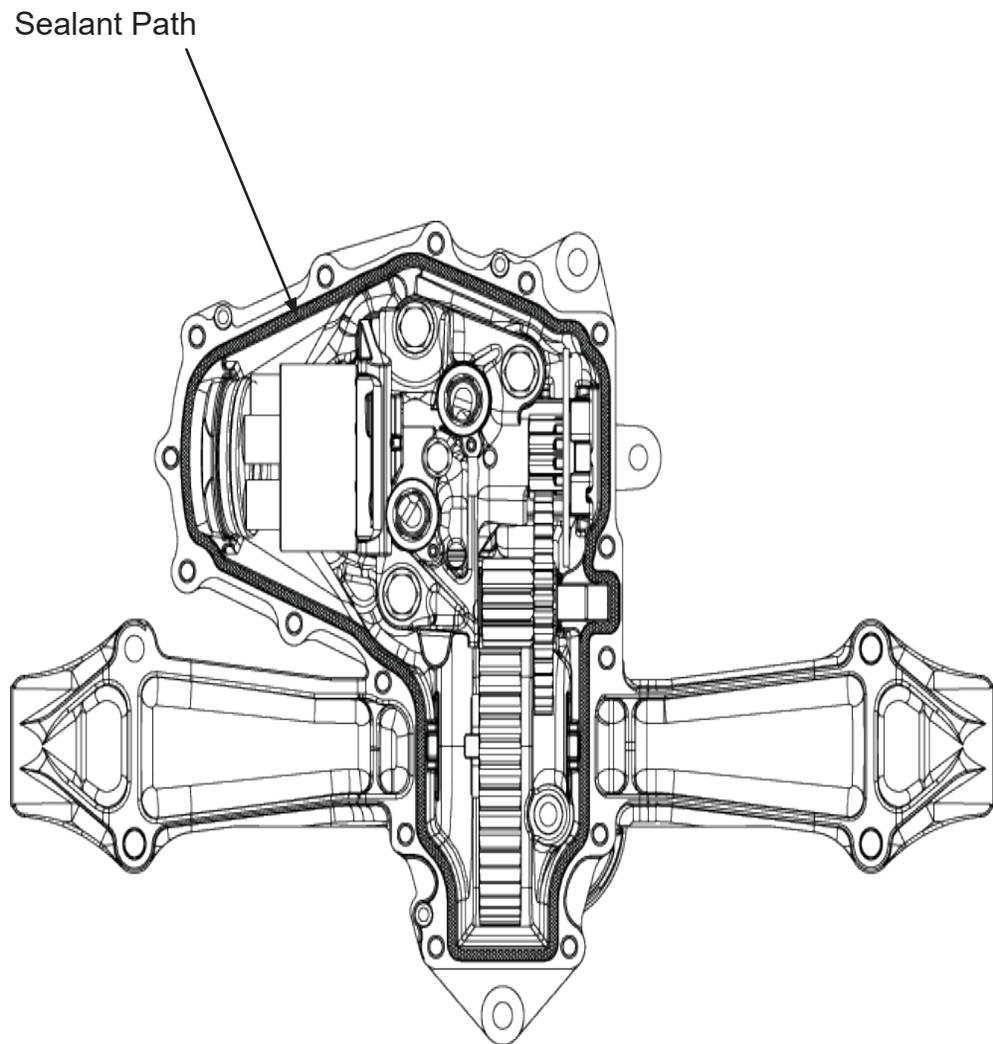


Figure 19, Sealant Application Diagram

LOWER COVER - SCREW TIGHTENING SEQUENCE

Refer to Figure 20

Starting with the number “1” screw location, tighten sequentially through to “15”.

Torque each screw to 105-155 in-lb (11.86-17.51 Nm).

NOTE: As a general rule, use the low end of the torque specification.

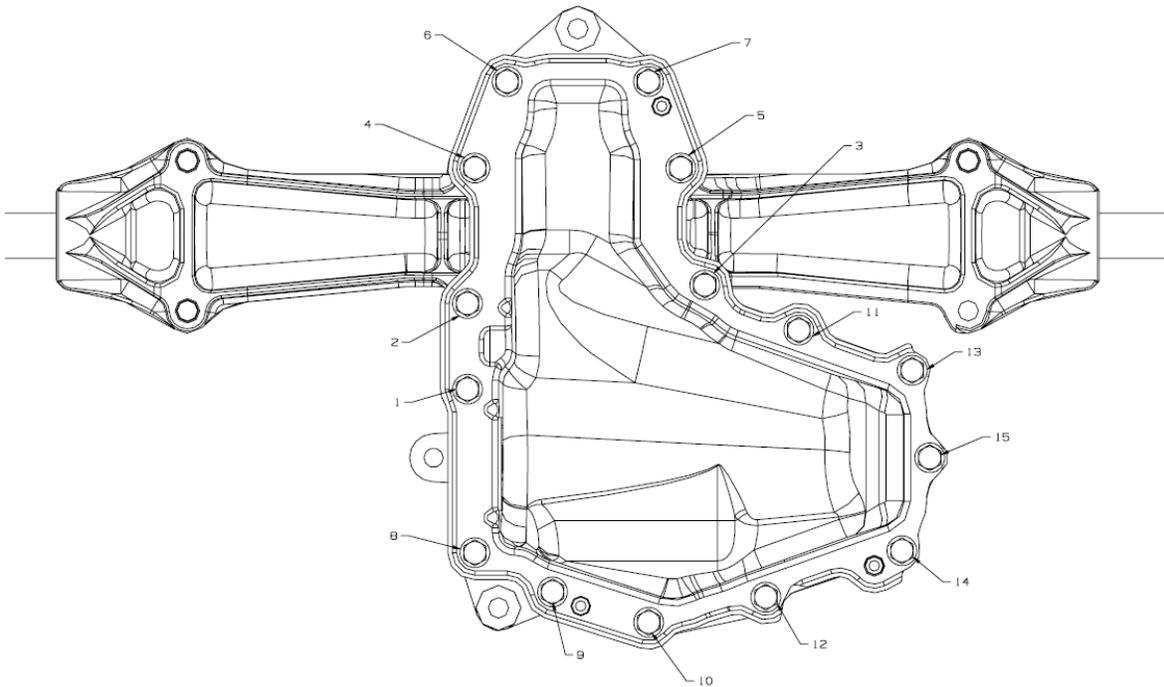
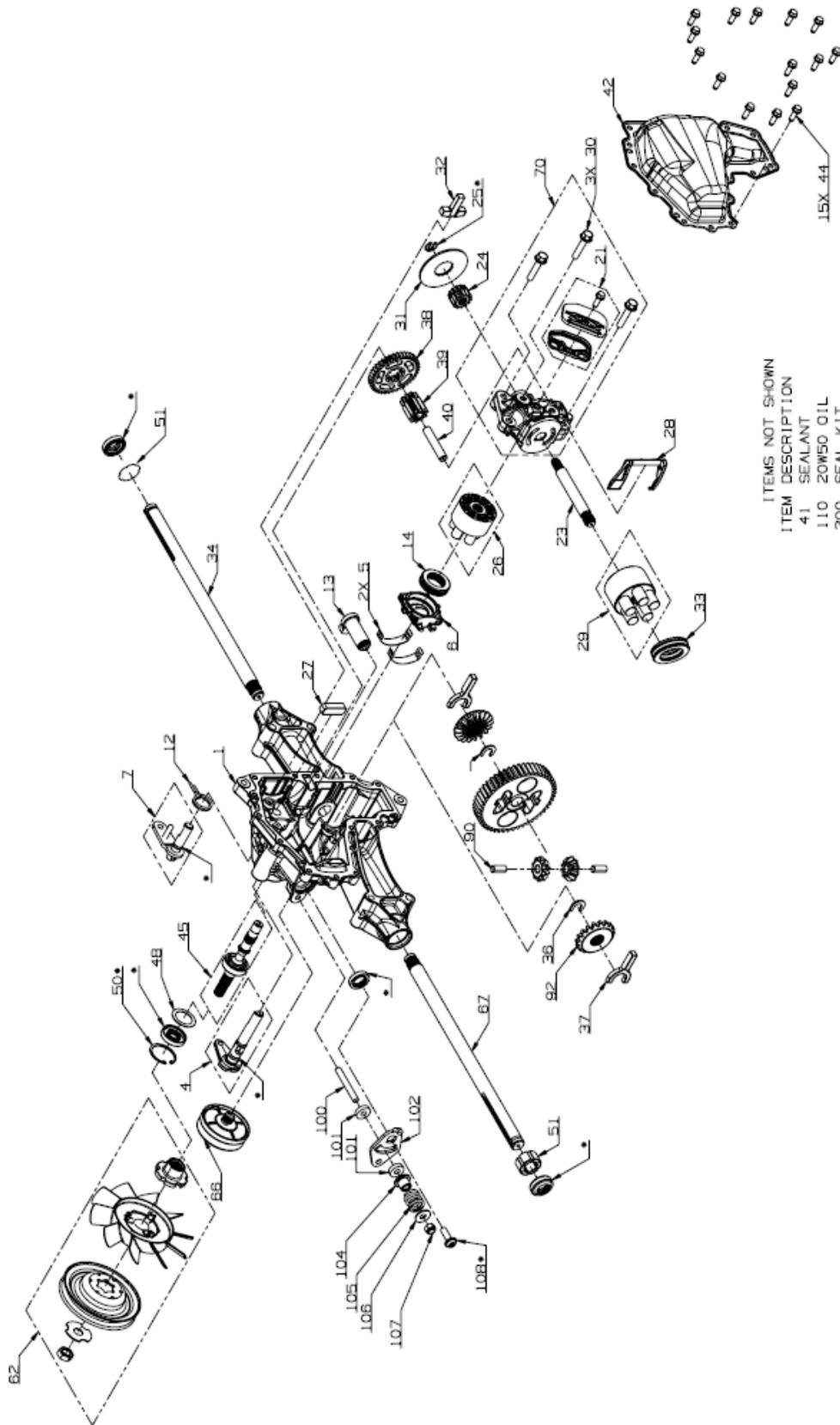


Figure 20, Lower Cover - Screw Tightening Sequence

T1™ EXPLODED VIEW



T1™ PARTS LIST

1	Housing, Main	44	Screw, Hex Washer 1/4 - 20 X .75
4	Kit, Bypass	45	Kit, Input Shaft
5	Bearing, Cradle	48	Washer, .98 X 1.37 X .04 Flat
6	Swashplate, 6cc	50	Ring, Retaining 1.37 Internal
7	Kit, Brake	51	Bushing, Axle Outboard
12	Spring, Brake Torsion	54	Screw, Set 5/16-24 X 1.75
13	Arm, Trunnion	55	Washer .31 X .88 X .06
14	Bearing, Thrust 26 x 42 x 11	56	Arm, Control, Zinc Plated
21	Kit, Filter	62	Kit, Fan/Pulley
23	Shaft, Motor	66	Breather Assembly
24	Gear, 13 T	67	Shaft, Axle .75 X 14.36 Keyed
25	Ring, Retaining External .375	70	Kit, Center Section
26	Kit, Cylinder Block 6cc	75	Arm, Neutral
27	Puck, Brake, Moving	77	Screw, SHCS 5/16-24 X .875
28	Actuator, Bypass	78	Arm, Control RTN
29	Kit, Block 10cc Cylinder	79	Spring, RTN Torsion
30	Screw, Hex Flange 5/16 - 18 X 1.5	80	Spacer, .32 X .70 X .92
31	Rotor, Brake	81	Washer, .34 X 1.13 X .06 Flat
32	Puck, Brake, Stationary	82	Screw, Hex Cap, 5/16 - 24 X 1.875
33	Bearing, Thrust 30 X 52 X 13	90	Pin, .375 X .850
34	Shaft, Axle .75 X 14.36	91	Gear, 10T Bevel
35	Gear, 49T	92	Gear, 18T Bevel
36	Clip, C	100	Screw, Set 5/16 - 24
37	Spacer, Gear	101	Washer, Plastic .32 X .80 X .21
38	Gear, 39T	102	Arm, Control, Zinc Plated
39	Gear, 10T	104	Spacer, Flanged
40	Pin, Jack Shaft	105	Spring Comp, .87 X .06
42	Cover, Lower, RH		

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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