



ZT-5400 Powertrain®

Service and Repair Manual

BLN-0014
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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® ZT-5400 Powertrain®

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 transaxle unit be removed from the vehicle.

This is not a certification, test or study guide for a certification test. If a technician is interested in certification, they should contact an agent representing 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® ZT-5400 Powertrain® Hydrostatic Transaxle. This manual includes the ZT-5400 Powertrain's general description, hydraulic schematic, technical specifications, servicing and troubleshooting procedures.

Should servicing be required, the exterior of the transaxle will need to be thoroughly cleaned before beginning most procedures. Do not wash the transaxle while it is hot. **Do not use a pressure washer to clean the unit.**

GENERAL DESCRIPTION

The ZT-5400 Powertrain 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 16.4cc per revolution, and the motor has two distinct displacement of 28.1cc and 15.0cc 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 ZT-5400 Powertrain has a self contained fluid supply and an internal filter. The fluid is forced through the filter by a positive "head" on the fluid in the housing/expansion tank with an assist by the negative pressure created in the pump pistons as they operate.

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

A hydraulic bypass is utilized in the ZT-5400 Powertrain to permit moving the vehicle for a short distance at a maximum of 2 m.p.h. (3.2 Km/h) without starting the engine.

The ZT-5400 Powertrain utilizes an internal in-line floating disc brake controlled by a "cam" style actuating arm.

DESCRIPTION AND OPERATION (CONTINUED)

HYDRAULIC SCHEMATIC

Figure 1 is a schematic of the hydraulic oil circuit. The oil supply for the hydraulic system of the ZT-5400 Powertrain® is also utilized for lubricating the components of the final drive assembly.

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

increase and cause a higher speed output of the motor. Reversing the angle of the swashplate will reverse the direction of oil flow.

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

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

The bypass feature in the ZT-5400 Powertrain has a mechanical lever which lifts the check valves off their seat. This allows oil to flow freely between system passages in the filtered, oil filled charge galley.

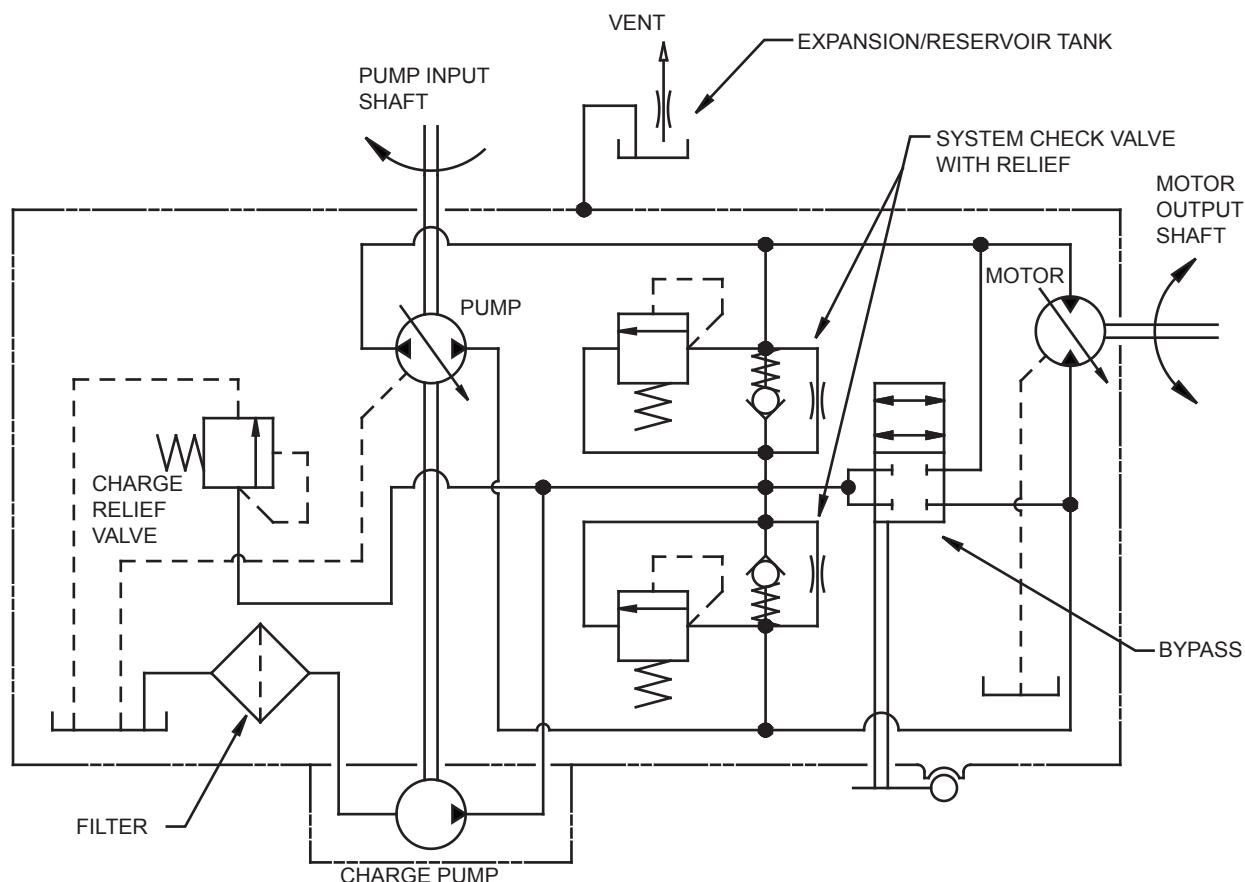
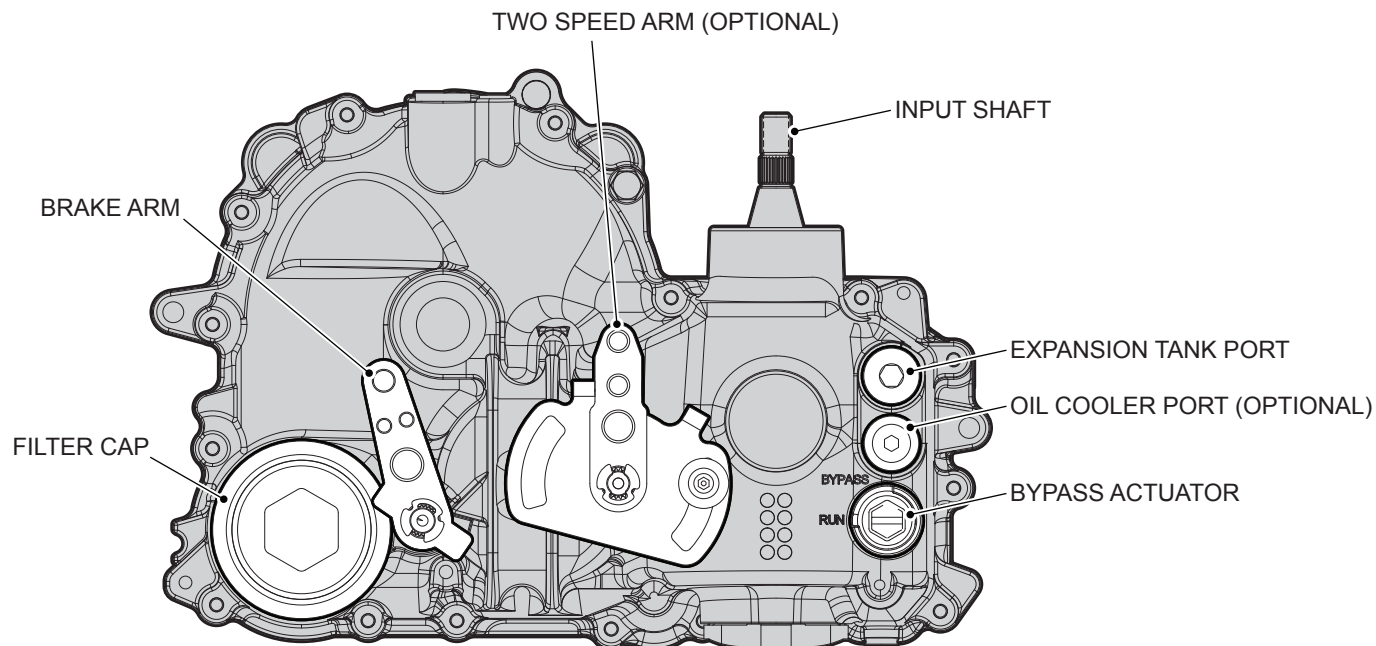
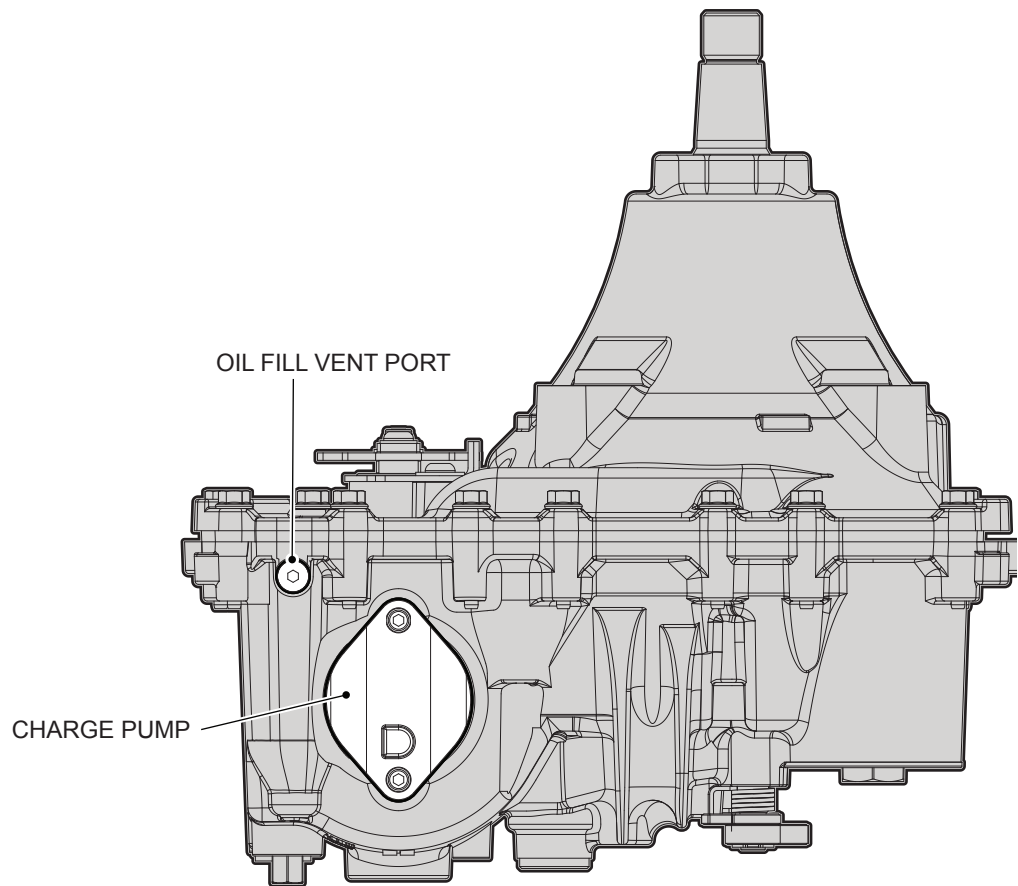


Figure 1, Hydraulic Schematic With Charge Pump

EXTERNAL FEATURES ZT-5400 POWERTRAIN®

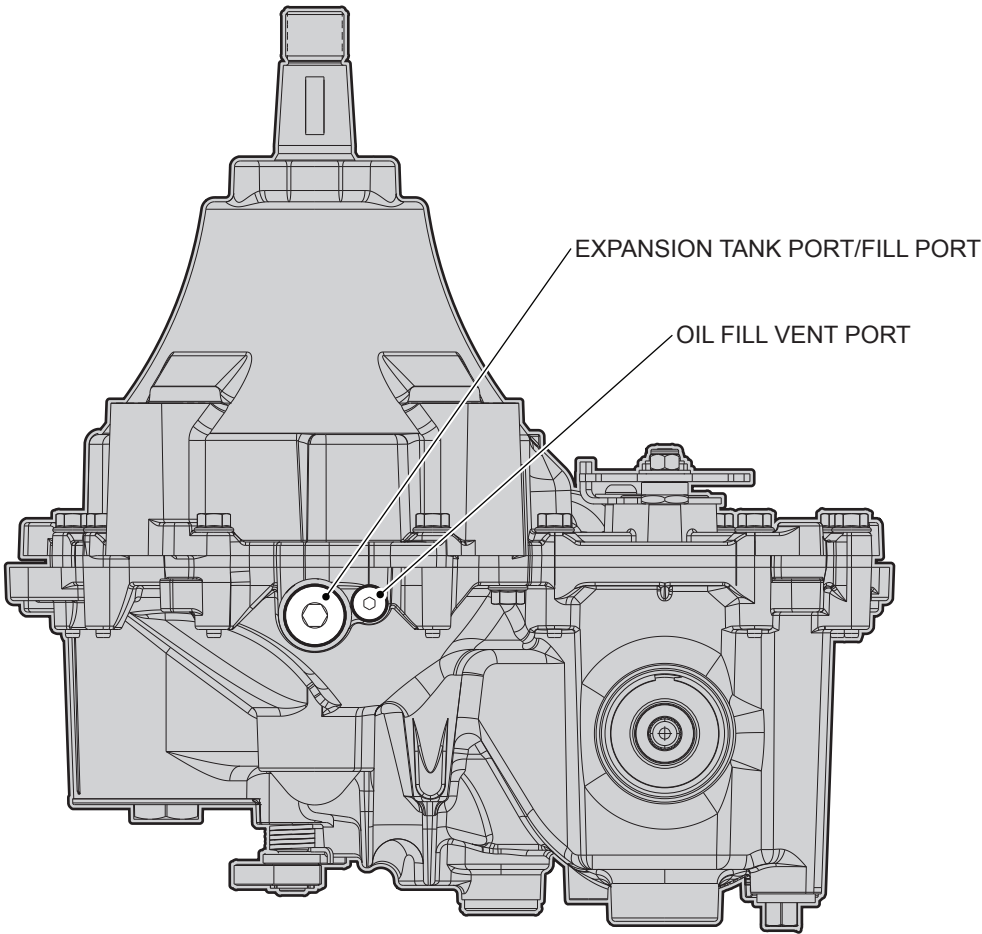


— Inboard View—

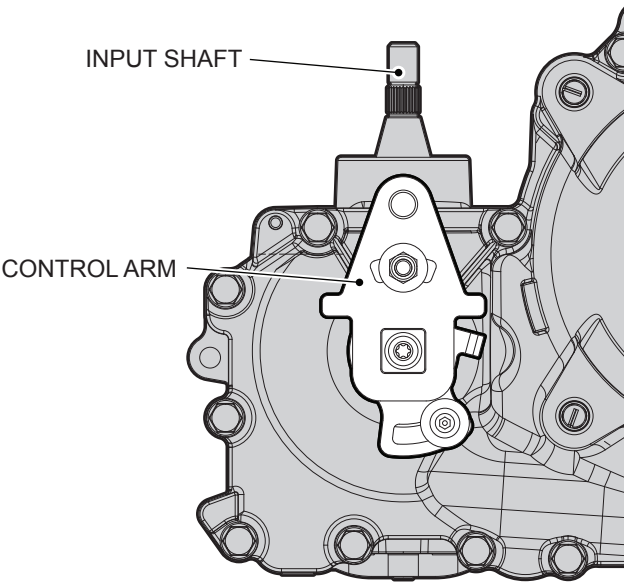


— Bottom View—

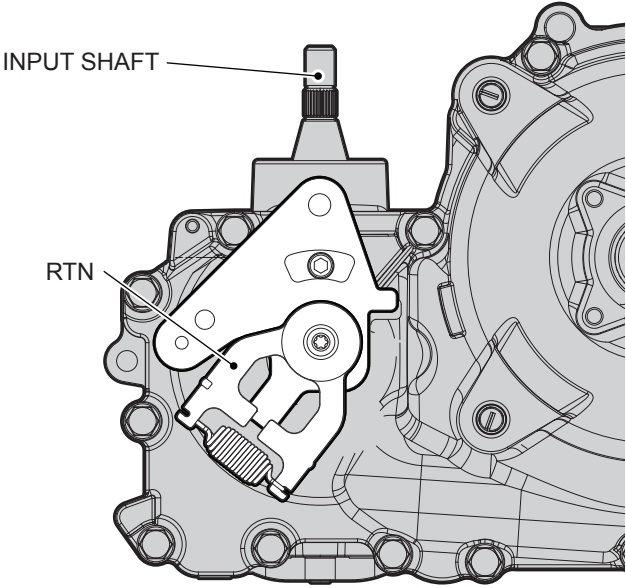
EXTERNAL FEATURES ZT-5400 POWERTRAIN®



— Top View—



Control Arm



Return to Neutral

— Outboard View—

TECHNICAL SPECIFICATIONS

ZT-5400 POWERTRAIN® TECHNICAL SPECIFICATIONS		
ZT-5400 Powertrain Reduction Package	0401	0402
Overall Transaxle Reduction		
	Normal Speed	18.6:1
(Optional) 2 Speed	12.9:1	16.0:1
Input Speed		
Maximum	3600 rpm	
Minimum	1800 rpm	
Output Torque		
Intermittent	525 lb-ft (711 N-m)	650 lb-ft (880 N-m)
Continuous	260 lb-ft (352 N-m)	325 lb-ft (440 N-m)
Weight on Tires (per unit)		
Maximum with 23" tires	800 lb (362.8 kg)	
Maximum with 24" tires	800 lb (362.8 kg)	
Maximum with 26" tires	700 lb (317 kg)	
Axle Shaft End Options		
	4 Bolt Flange	
	5 Bolt Flange	
Parking Brake Type		
	Internal Disc	
Weight of Unit		
	57 lb (25.85) kg	

PRODUCT IDENTIFICATION

The model and configuration of the ZT-5400 Powertrain can be determined from the label shown below.

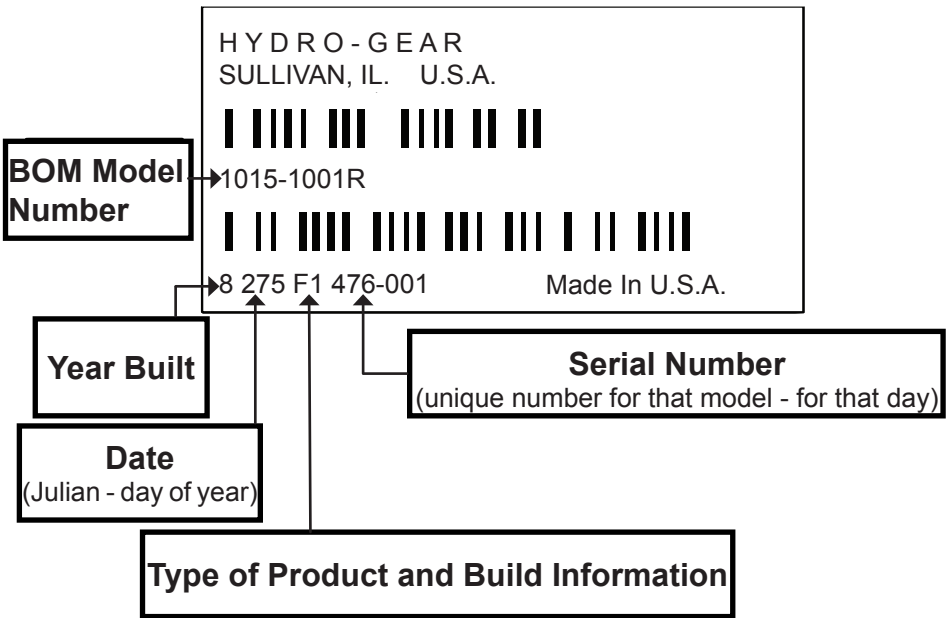


Figure 2, Configuration Label

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 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 ZT-5400 Powertrain™ 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 ZT-5400 Powertrain. 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 the ZT-5400 Powertrain® are not related to a defective transaxle, but are caused by slipping drive belts, partially engaged bypass valves, and loose or damaged control linkages. Be sure to perform all operational checks and adjustments outlined in Service and Maintenance, before assuming the transaxle 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, Page 9
Drive belt slipping or pulley damaged	Repair or replace drive belt or pulley, Page 9
Vehicle Does Not Drive/Track Straight	
Vehicle tires improperly inflated	Refer to vehicle manufacturer suggested pressure
Control linkage bent or out of adjustment	Repair or replace linkage, Pages 9 and 12
Bypass assembly sticking	Repair or replace bypass, Page 23
Brake Partially Engage	Disengage Brake, Replace Broken or Missing Brake Return Spring
Unit Is Noisy	
Oil level low or contaminated oil	Fill to proper level or change oil, Page 10
Excessive loading	Reduce vehicle loading, Page 9
Loose parts	Repair or replace loose parts
Bypass assembly sticking	Repair or replace linkage, Page 9
Air trapped in hydraulic system	Purge hydraulic system, Page 11
Brake Partially Engage	Disengage Brake, Replace Broken or Missing Brake Return Spring
Unit Has No/Low Power	
Engine speed low	Adjust to correct setting
Control linkage bent or out of adjustment	Repair or replace linkage, Page 9
Drive belt slipping or pulley damaged	Repair or replace drive belt or pulley, Page 9
Oil level low or contaminated oil	Fill to proper level or change oil, Page 10
Excessive loading	Reduce vehicle loading, Page 9
Bypass assembly sticking	Repair or replace linkage, Page 9
Air trapped in hydraulic system	Purge hydraulic system, Page 11
Brake Partially Engage	Disengage Brake, Replace Broken or Missing Brake Return Spring
Unit Is Operating Hot	
Debris buildup around transaxle	Clean off debris, Page 9
Cooling fan damaged	Repair or replace cooling fan, Pages 17
Oil level low or contaminated oil	Fill to proper level or change oil, Page 10
Excessive loading	Reduce vehicle loading, Page 9
Air trapped in hydraulic system	Purge hydraulic system, Page 11
Brake Partially Engage	Disengage Brake, Replace Broken or Missing Brake Return Spring
Transaxle Leaks Oil	
Damaged seals, housing, or gaskets	Replace damaged components
Air trapped in hydraulic system	Purge hydraulic system, Page 11

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 ZT-5400 Powertrain® should include the following:

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

SERVICE AND MAINTENANCE PROCEDURES

All the service and maintenance procedures presented on the following pages can be performed while the ZT-5400 Powertrain is mounted on the vehicle. Any repair procedures as mentioned in the tear down and assembly section of this manual must be performed after the unit has been removed from the vehicle.

FLUIDS

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

Typically, an engine oil with a minimum rating of 9.0 cSt (55 SUS) at 230°F (110° C) and an API classification of SL is recommended. A 20W-50 engine oil has been selected for use by the factory and is recommended for normal operating temperatures. Biodegradable oils are not approved for this unit as they degrade too quickly while in service.

FLUID VOLUME AND LEVEL

Fluid volume information is provided in the Table below.

Certain situations may require additional fluid to be added or even replaced. Refer to Page 10, Figure 3 and page 5 for the proper fill port location.

Fill the ZT-5400 Powertrain to the top of the oil fill port.

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

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

FLUID CHANGE PROCEDURE

This transaxle is designed with a serviceable filter. To ensure constant fluid quality levels and longer life, an initial oil and filter change at 100 hours is recommended. Subsequent changes are recommended at 400 hour intervals minimum, or yearly, whichever comes first.

The following procedure can be performed with the transaxle installed in the vehicle, and the vehicle on level ground. Apply the bypass valve and lock the vehicle parking brake.

1. Place an oil drain pan (12" or more in diameter and 8 qt. capacity is optimal) beneath the oil filter. Remove the oil filter cover from the transaxle to drain the oil. Remove the O-ring from the cover and discard the O-ring.
2. After the oil has drained from the transaxle, remove the oil filter from the transaxle housing.
3. Install a new filter and a new O-ring onto the filter cover and install the filter cover. See Figure 3a. See page 15 for torque specifications.
4. Remove the top oil fill vent port plug (see page 5) and fill the transaxle with new 20W50 motor oil through the expansion tank port/fill port until oil reaches the oil fill vent port.
5. Install the top oil fill vent port plug and continue filling the system with oil until the fill line is reached in the expansion tank.
6. Drain old oil filter of all free flowing oil prior to disposal. Place used oil in appropriate containers and deliver to an approved recycling collection facility.
7. Proceed to the purge procedure.

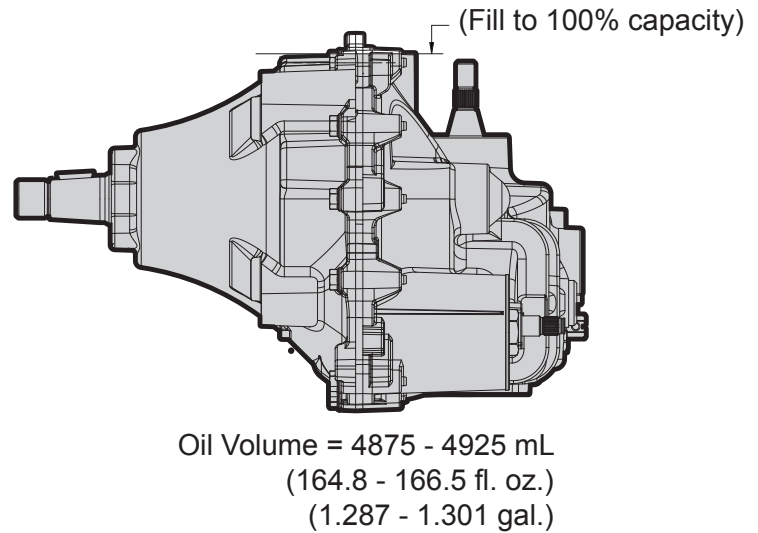


Figure 3, Oil Volume

Note: The oil volume figure shown does not include what is in the expansion tank hose or the expansion tank. That will have to be determined by the machine manufacturer/end user due to varying hose sizes/lengths and expansion tank sizes.

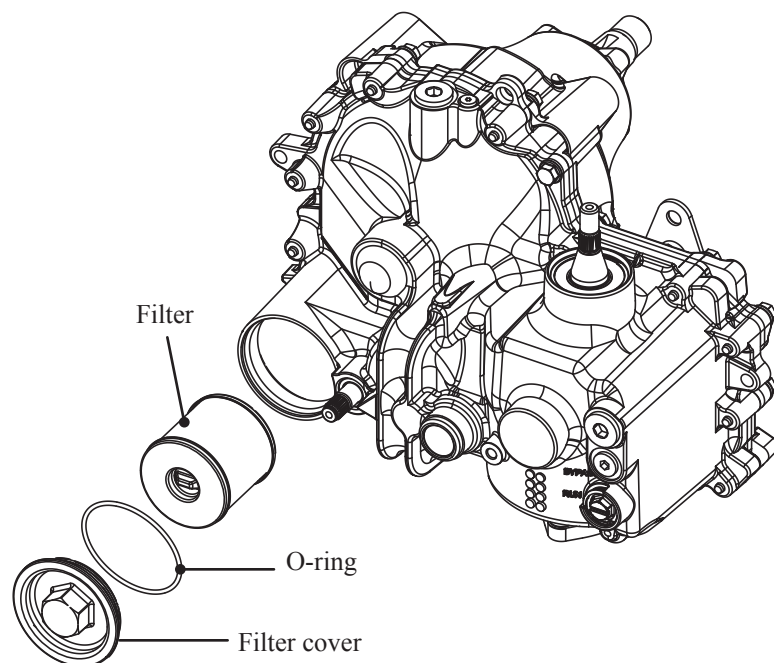


Figure 3a, Filter Components

PURGING PROCEDURES

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

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

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

The resulting symptoms in hydrostatic systems may be:

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

Before starting, make sure the transaxle/transmission is at the proper oil level. If it is not, fill to the specifications outlined on page 9.

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

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

RETURN TO NEUTRAL SETTING



WARNING

POTENTIAL FOR SERIOUS INJURY

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

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

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

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

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

3. Start the engine and increase the throttle to full engine speed.
4. Check for axle rotation. If the axles do not rotate, go to Step 5. If the axles rotate, go to Step 6.
5. Stop the vehicle's engine. Reattach and adjust the OEM linkage according to the OEM manual. Recheck according to Step 3 and 4. Start the vehicle engine.
6. Note the axle directional movement. Stop the vehicle engine. Loosen the lock down screw (61) until the control arm (54) can be rotated. Rotate the control arm in the opposite direction of the wheel rotation 5 degrees. Tighten the lock down screw. Recheck according to steps 3 and 4. Refer to Figure 4.

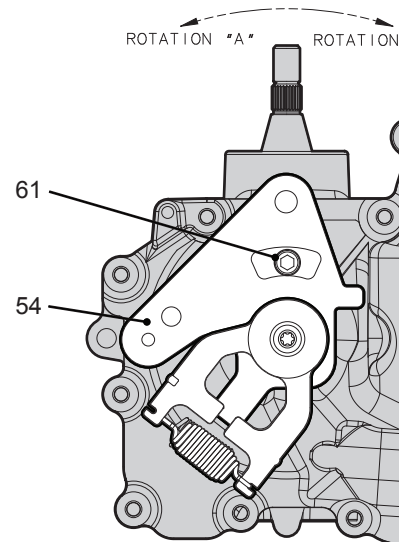


Figure 4, Return to Neutral

2-SPEED OPTION SETTING



WARNING

POTENTIAL FOR SERIOUS INJURY

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

The 2-speed option mechanism on the transaxle is designed to increase the axle speed when the 2-speed control arm (168) is moved from its vertical position. Follow the procedure below to properly set the 2-speed option on the transaxle:

Note: THIS PROCEDURE SHOULD ONLY HAVE TO BE DONE IF THE LOCK DOWN ARM (165) NEEDS REPLACED OR A NEW SIDE HOUSING HAS TO BE INSTALLED. IT IS NOT NECESSARY TO EVER REMOVE THE LOCK DOWN ARM (165) FOR ANY OTHER REASON DURING THE DISASSEMBLY OF THIS UNIT.

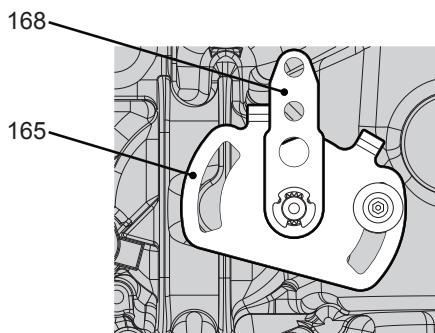


Figure 5, 2-Speed Control Arm

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.*

2. Remove the Original Equipment Manufacturer's (OEM's) control linkage at the 2-speed control arm (168). Position the 2-speed control arm (168) so it is in the normal speed (vertical) position. Refer to Figure 5.
3. Start the engine and increase the throttle to full engine speed.
4. Stroke the transaxle control arm (54) until 183 rpm axle speed is obtained. Refer to Figure 6.
5. Rotate the 2-speed control arm (168) and lock down arm (165) together until the axle speed reaches 265 rpm. Lock down the 2-speed lock down arm (165) with the 2-speed control arm (168) against the stop.
6. Stop the engine and reconnect any OEM linkage.

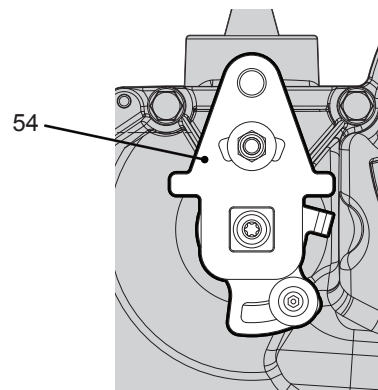


Figure 6, Transaxle Control Arm

TEAR DOWN AND REASSEMBLY

HOW TO USE THIS MANUAL

Each subassembly illustrated in this section is illustrated by an exploded view showing the parts involved. **The item reference numbers in each illustration are for assembly instructions only.** See page 37 for part names and descriptions. A complete exploded view and item list of the transaxle is provided on pages 38 and 39.

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

GENERAL INSTRUCTIONS

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

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

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

Anytime the tapered axle hub is removed it should be replaced by a new axle hub, insuring that the integrity of the taper lock is not lost.

Parts requiring replacement must be replaced from the appropriate kits identified in the Items Listing, found on page 39. Use only original Hydro-Gear® replacement parts found listed in the authorized dealer section of the Hydro-Gear web site (www.hydro-gear.com).

IMPORTANT: When internal repair is performed on the ZT-5400 Powertrain®, the filter assembly must be replaced.

TRANSAXLE REMOVAL

It is necessary to remove the ZT-5400 Powertrain from the vehicle before performing the repair procedures presented in this section.

LIMITED DISASSEMBLY

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

Reassembly is accomplished by performing the "Assembly" portions of the procedures. If the unit has been completely disassembled, a summary of the assembly procedures, in the order in which they should occur, is given on page 33.

TOOLS

REQUIRED TOOLS	
Miscellaneous	Sockets
2 Screw Drivers	33 mm socket
3/8" Drive Ratchet	1/2" socket
Rubber Mallet	3/4" socket
Large External Retaining Ring Pliers	9/16" socket
Large Internal Retaining Ring Pliers	7/8" socket
Small External Retaining Ring Pliers	13/16" socket
Small Internal Retaining Ring Pliers	15/16" socket
AN-04 (1/8 Allen)	1 1/8" socket
AN-06 (3/16 Allen)	1 7/16" socket
AN-08 (1/4 Allen)	
AN-10 (5/16 Allen)	
AN-12 (3/8 Allen)	
T-25 Torx	
T-40 Torx	
3 Jaw Puller	

TORQUES As a general rule, use the low end of the torque spec on fasteners when reassembling the unit.

REQUIRED TORQUE VALUES			
Item	Description	Torque	Operation
6	HFHCS	230-290 in-lbs [25.9-32.7 Nm]	Housing screw
21	Bolt, Hex Flange	450-550 in-lbs [50.8-62.1 Nm]	Center Section
22	Bolt, Hex Flange	450-550 in-lbs [50.8-62.1 Nm]	Center Section
26	Seat Check Nut	280-400 in-lbs [31.6-45.2 Nm]	Center Section
30	Check Spring Retainer	200-250 in-lbs [22.59-28.24 Nm]	Center Section
36	Plug	200-265 in-lbs [22.59-29.95 Nm]	Center Section
40	Bolt, Self Tapping	20-30 in-lbs [2.25-3.38 Nm]	Center Section Magnet
52	Stud	50-120 in-lbs [5.7-13.5 Nm]	RTN
56	TWHCS	230-310 in-lbs [25.9-30.0 Nm]	RTN
57	Nut	85-120 in-lbs [9.6-13.5 Nm]	RTN
61	SHCS	175-200 in-lbs [19.7-22.5 Nm]	RTN
67	Screw	175-200 in-lbs [19.7-22.5 Nm]	RTN
113	Castle Nut*	275-350 ft-lbs* [372.9-474.5 Nm]	Hub
126	Nut	660-800 in-lbs [74.5-90.3 Nm]	Brake Shaft
145	Screw	80-120 in-lbs [9.0-13.5 Nm]	Gerotor Cover
152	Plug, Oil Filter Cover	480-580 in-lbs [54.23-65.53 Nm]	Oil Filter
167	Screw	175-200 in-lbs [19.7-22.5 Nm]	Two Speed
170	Plug Metal	200-280 in-lbs [22.5-31.6 Nm]	Expansion Tank/Fill Port
171/173	Plug	32-42 in-lbs [3.6-4.7 Nm]	Oil Fill Vent Port
172	Plug, Metal	200-280 in-lbs [22.5-31.6 Nm]	Expansion Tank Port
174	Plug Metal	110-150 in-lbs [12.4-16.9 Nm]	External Cooler Port Plug
183	Nut, HEX, 1/2-20 W/ PATCH	540-660 in-lbs [61.6- 74.6Nm]	Fan/Pully

* If a 275 ft-lbs torque wrench is not available please use the alternative torque procedure outlined on page 36.

TRANSAXLE REMOVAL

NOTE: It is necessary to remove the ZT-5400 Powertrain® 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 transaxle.

The following procedures are presented in the order recommended for a

complete tear down of the transaxle.

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 33.

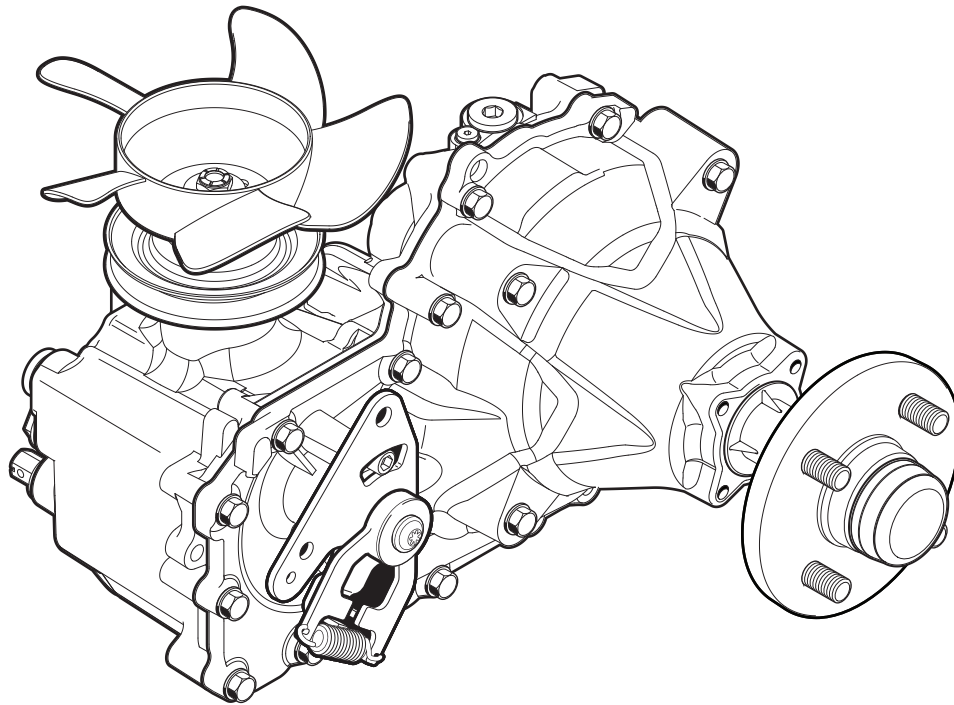


Figure 7, ZT-5400 Powertrain Transaxle

FAN AND PULLEY

Refer to Figure 8

1. Remove the locknut (183) and the washer (182).
2. Remove the fan (181) and the washer (184).
3. Remove the pulley assembly (180).

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. When tightening the lock nut (183), refer to the table on page 15 for the required torque values.

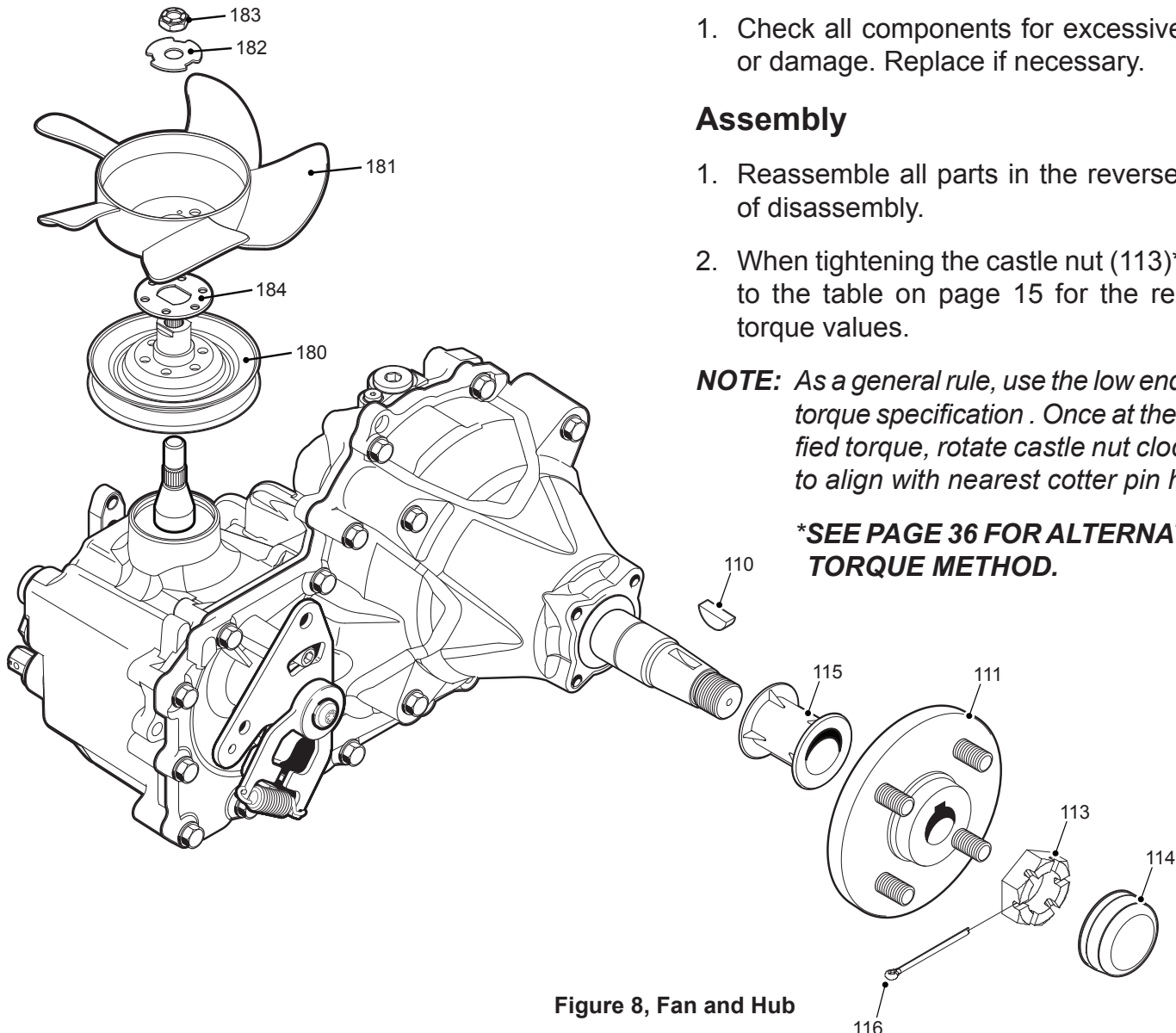


Figure 8, Fan and Hub

AXLE HUB ASSEMBLY

Refer to Figure 8

1. Remove the axle cap and discard (114).
2. Remove the cotter pin and discard (116).
3. Remove the castle nut (113).
4. Remove the taper hub assembly (111) and discard.

NOTE: A new hub will have to be ordered to replace the discarded hub.

5. Remove the axle cover (115).
6. Remove the axle shaft key (110).

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. When tightening the castle nut (113)*, refer to the table on page 15 for the required torque values.

NOTE: As a general rule, use the low end of the torque specification. Once at the specified torque, rotate castle nut clockwise to align with nearest cotter pin hole.

***SEE PAGE 36 FOR ALTERNATE TORQUE METHOD.**

RETURN TO NEUTRAL ASSEMBLY OPTION

Refer to Figure 9

Disassembly

1. Remove all items previously discussed in their recommended order.
2. Remove the spring (64).
3. Remove the Torx head screw (56) and discard. Remove the washer (63).
4. Remove the scissor arm (62). Remove the Allen head screw (61), the bushing (60) and the RTN control arm (54).
5. Remove the neutral arm (59) and the spacer (58).

NOTE: Only remove the seal (51) and the RTN control arm stroke limiter (65) if damaged or worn. Mark the orientation of the stroke limiter before removal.

Inspection

1. Inspect all parts for excessive wear or damage. Replace if necessary.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. When tightening the fasteners, refer to the table on page 15 for the required torque values.
3. Install new Torx head screw (56) and lip seal (51) from seal kit.

NOTE: As a general rule, use the low end of the torque specification on fasteners when reassembling the unit.

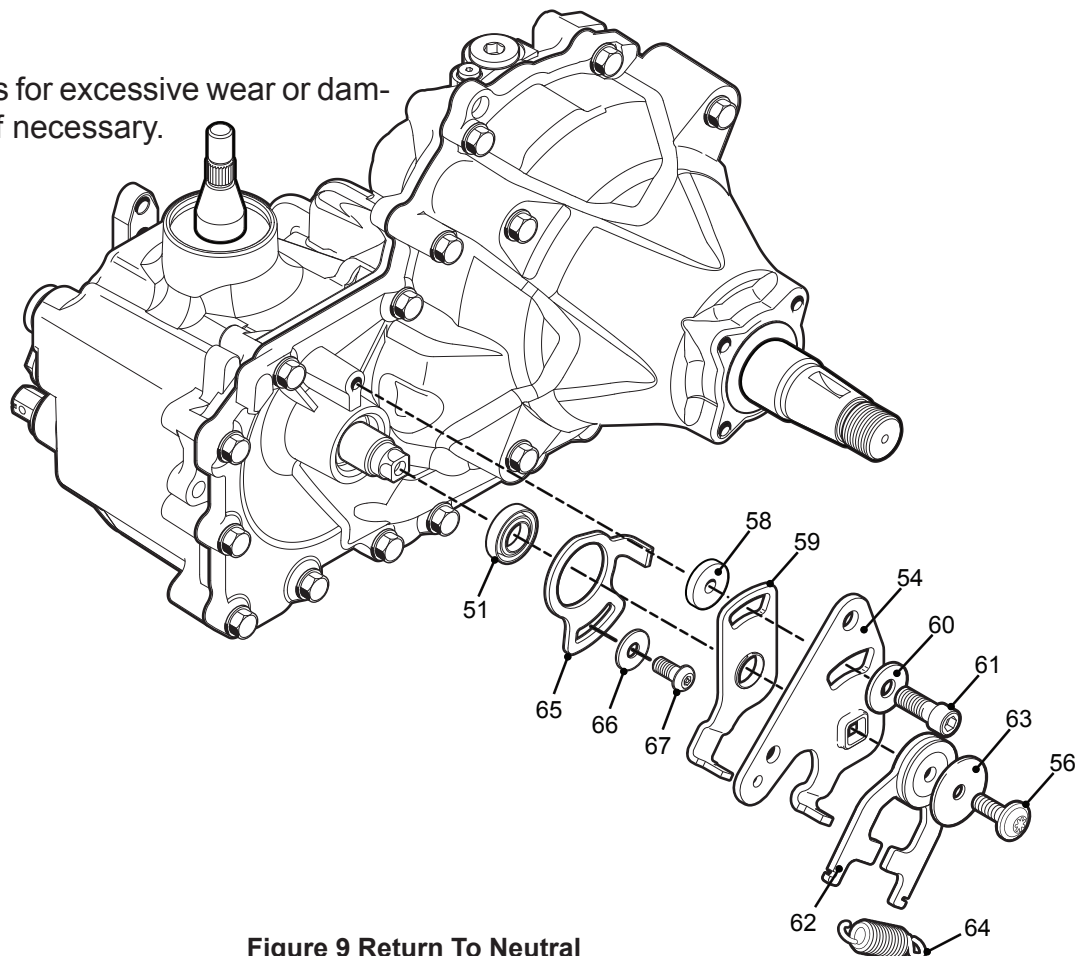


Figure 9 Return To Neutral

CONTROL ARM ASSEMBLY

Refer to Figure 10

Disassembly

1. Remove all items previously discussed in their recommended order.
2. Remove the Torx head screw (56) and discard.
3. Remove the nut (57) and the washer (55).
4. Remove the control arm (54).
5. Remove the plastic washer (53) and the stud (52).
6. Remove the stop plate (65).

NOTE: Only remove the lip seal (51) and stop plate (65) if damaged or worn, or if doing a complete disassembly. Mark the orientation of the stop plate before removal.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. When tightening the fasteners, refer to the table on page 15 for the required torque values.
3. Install new Torx head screw (56) and lip seal (51) from seal kit.

NOTE: As a general rule, use the low end of the torque specification on fasteners when reassembling the unit.

Inspection

1. Inspect all parts for excessive wear or damage. Replace if necessary.

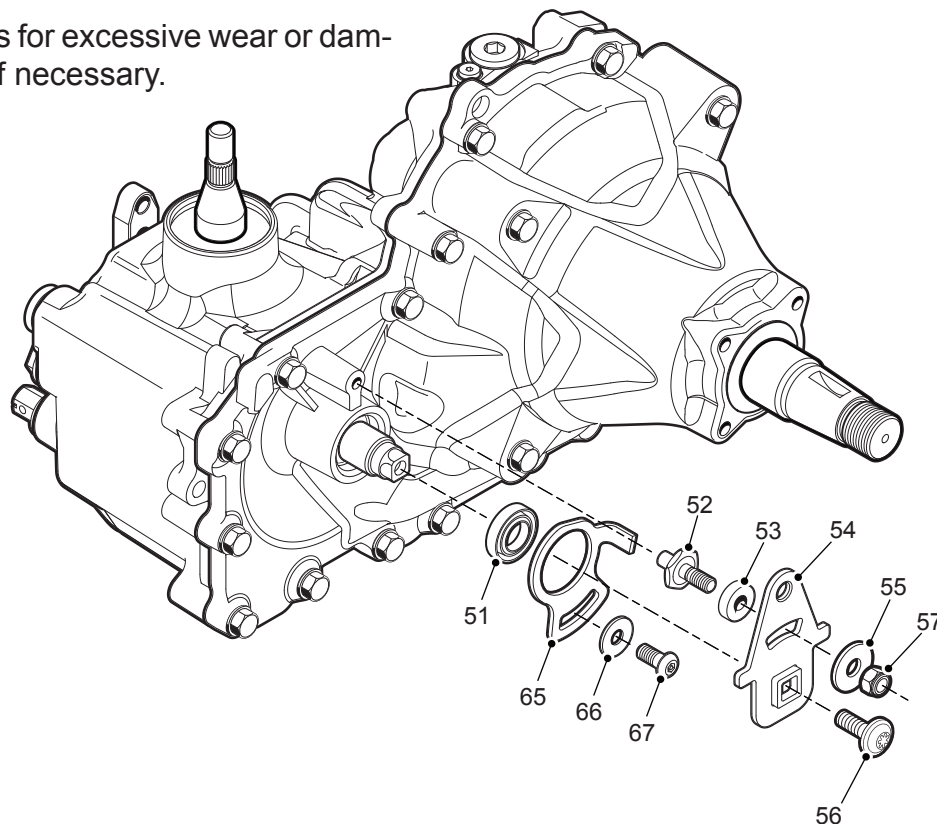


Figure 10, Control Arm

FILTER AND FILTER COVER

Refer to Figure 11

Disassembly

1. Remove the filter cover (152).
2. Remove the O-ring (151) from the cover (152) and discard.
3. Remove the filter (150) and discard.

Inspection

1. Inspect all parts for wear or damage. Replace as necessary.
2. Check for old filter grommet stuck on the filter tube. Remove if present.

Assembly

1. Install the new filter (150).
2. Install the new O-ring (151) onto the cover (152).
3. Install the filter cover (152). Refer to torque chart on page 15.

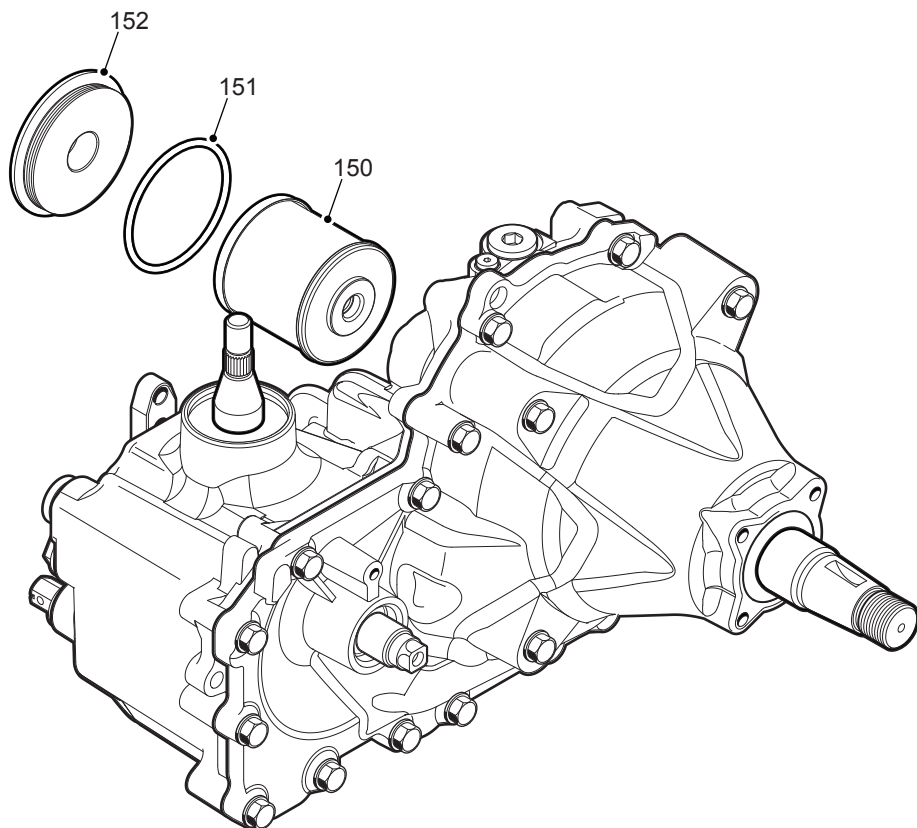


Figure 11, Filter and Filter Cover

BRAKE ASSEMBLY

Refer to Figure 12

Disassembly

1. Remove all items previously discussed in their recommended order.
2. Mark the orientation of the brake arm (130) before removal.
3. Remove the retaining ring (131) and discard.
4. Remove the brake handle (130) and the bushing (128).
5. Remove the seal (127) and discard.

NOTE: Only remove the seal (127) if damaged or worn, or if doing a complete disassembly.

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 (127) from seal kit.

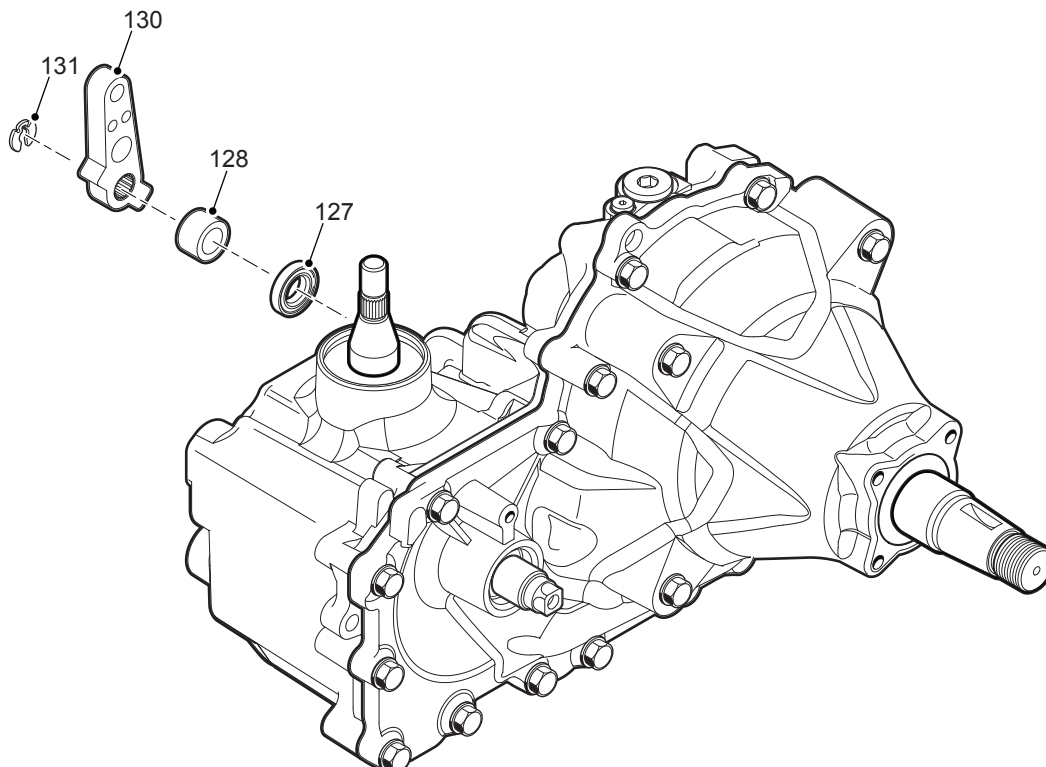


Figure 12, Brake Assembly

2-SPEED ARM (OPTIONAL)

Refer to Figure 13

Disassembly

1. Remove all external items previously discussed in their recommended order.
2. Remove the external retaining ring (169) and discard. Remove the 2-speed arm (168).

NOTE: Only remove the 2-speed lock-down arm (165) if damaged. Mark the orientation before removal.

3. Remove the screw (167) and the washer (166).
4. Remove the 2-speed lock-down arm (165).
5. Remove the seal (164) and discard.

NOTE: Only remove the seal (164) if damaged or worn, or if doing a complete disassembly.

Inspection

1. Inspect the 2-speed actuating handle (168) and the 2-speed lock-down arm (165) for excessive wear or damage. Replace if necessary.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install the new seal (164) from seal kit.
3. Install the 2-speed lock-down arm (165), washer (166) and screw (167). Refer to the table on page 15 for the required torque values.
4. Install the 2-speed actuating arm (168), screw (167).
5. Install the new external retaining ring (169).

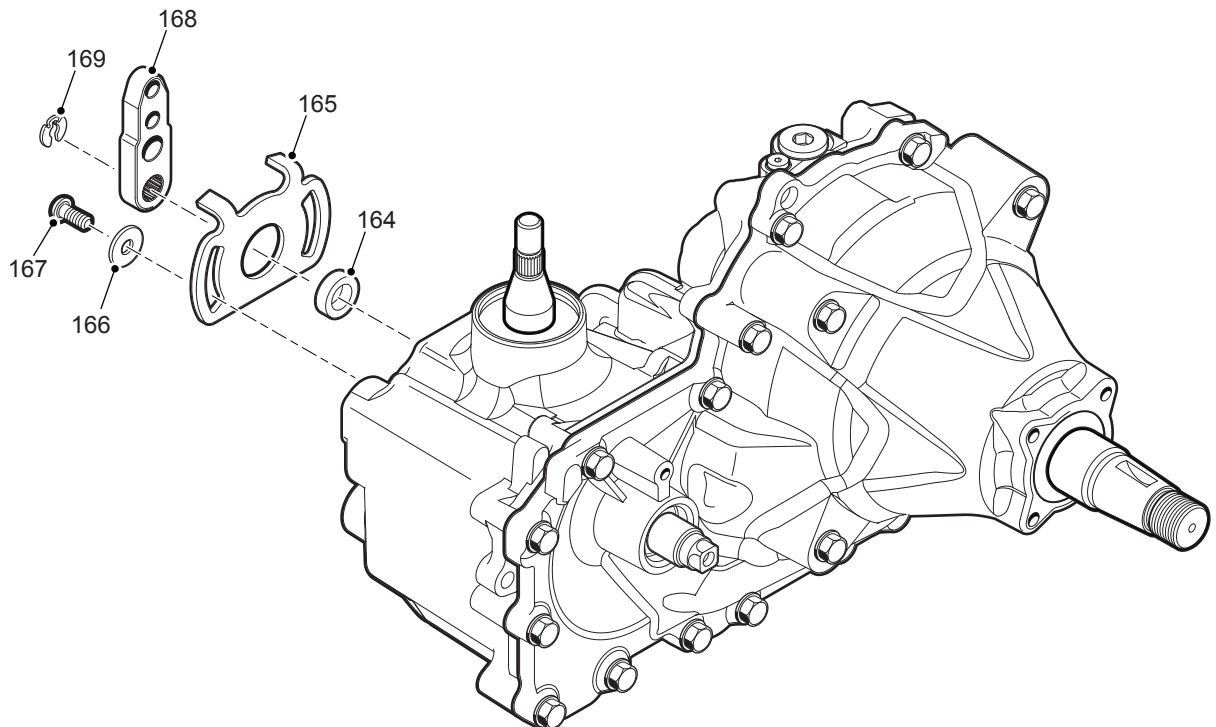


Figure 13, 2- Speed Arm

BYPASS ACTUATOR

Refer to Figure 14

Disassembly

1. Remove all external items previously discussed in their recommended order.
2. Remove the retaining ring (45), wave spring (44) and discard; then, remove the bypass actuator rod (43).
3. Remove the O-rings (42) from the bypass rod (43) and discard.
4. Remove the lip seal (41) and discard.

NOTE: Only remove the seal (41) if damaged or worn, or if doing a complete disassembly.

Inspection

1. Inspect the actuator bypass rod (43) for wear or damage. Replace if necessary.

NOTE: Take care to insure that the actuator bypass rod is free of burrs that may cut the rubber lip seal.

2. Inspect the housing bore.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install a *new* lip seal (41).
3. Install two new O-rings onto the actuator bypass rod.
4. Install the bypass actuator rod (43).
5. Install the new wave spring (44) and the new retaining ring (45).

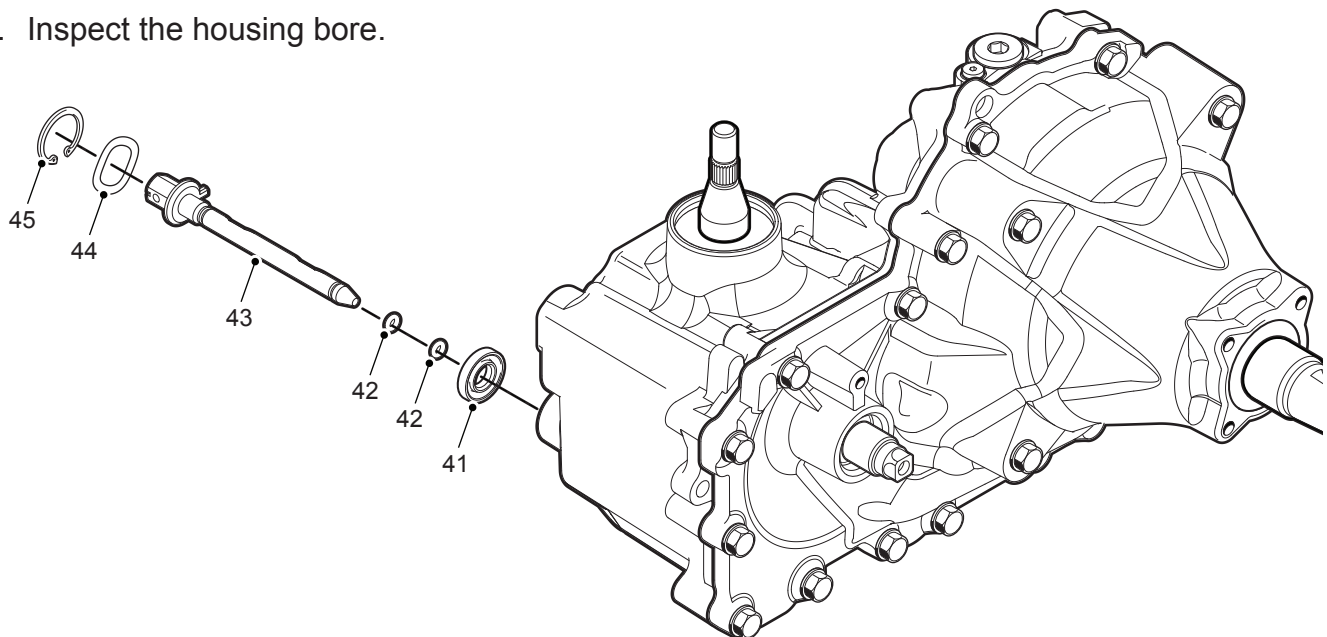


Figure 14, Bypass Actuator

SIDE HOUSING

Refer to Figure 15

Disassembly

1. Remove all external items previously discussed in their recommended order.
2. Remove the retaining ring (107), the seal (106) and discard.
3. Remove the screws (6), then separate side housing (2) from main housing (1).

Inspection

1. Inspect the bearing and bushing areas in the side cover for excessive wear 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 main housing face. See "Sealant Application Diagram" on page 34.
3. Align the side housing (2) with the main housing (1). Use care not to smear the sealant bead.
4. Install the seventeen housing screws (6). Refer to the screw tightening pattern on page 35.
5. When tightening the fasteners, refer to the table on page 15 for the required torque values.

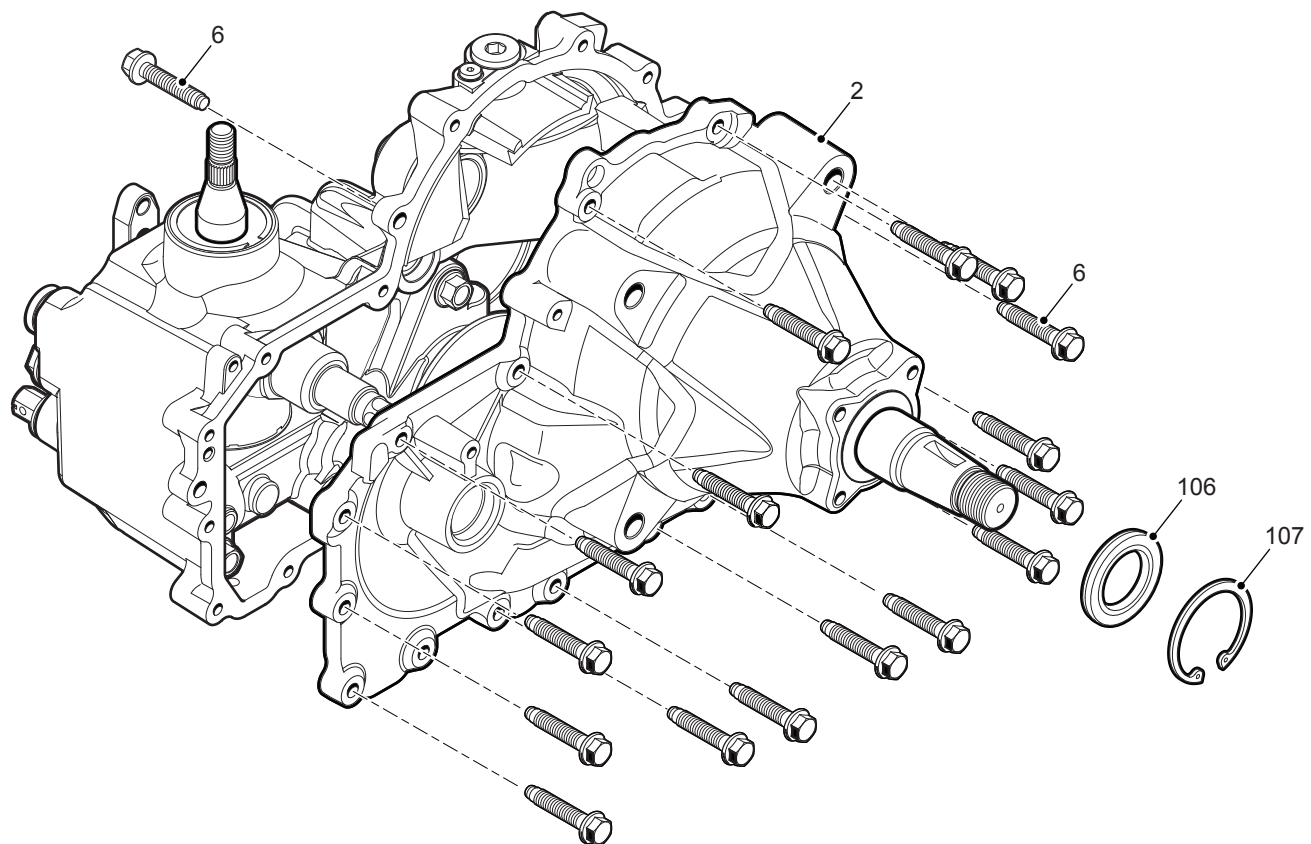


Figure 15, Side Housing

AXLE SHAFT AND PLANETARY GEAR SET

Refer to Figure 16, 17

Disassembly

1. Remove all external items previously discussed in their recommended order.

NOTE: Note the location of the ring gear tabs.

2. Remove the axle shaft (103) and the planetary assembly.
3. Remove the axle bearing (105) and washer (104).
4. Remove the axle shaft thrust ball (100) from the main house (1).
5. Remove the axle retaining ring (101), axle shaft spacer (102), axle gear (94), ring gear (95), planet gears (96), sun gear (97) and the carrier (98).

Inspection

1. Inspect all items of the planetary gear set for wear and or damage.

Assembly

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

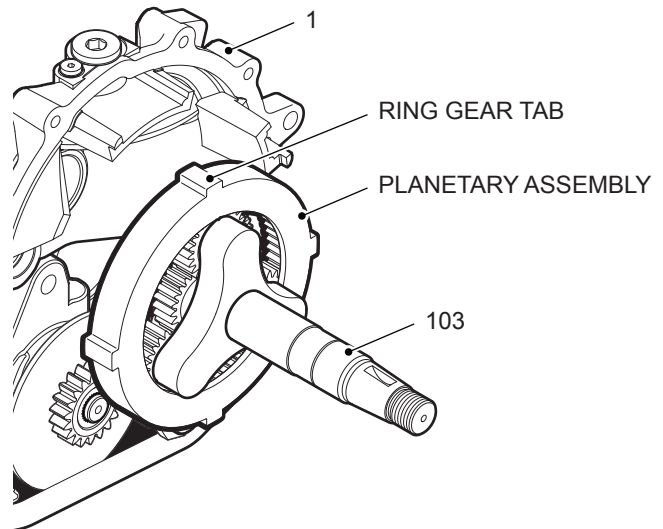


Figure 17, Planetary Gear Set

NOTE: When installing the ring gear assembly — line up the ring gear tabs with the housing tabs.

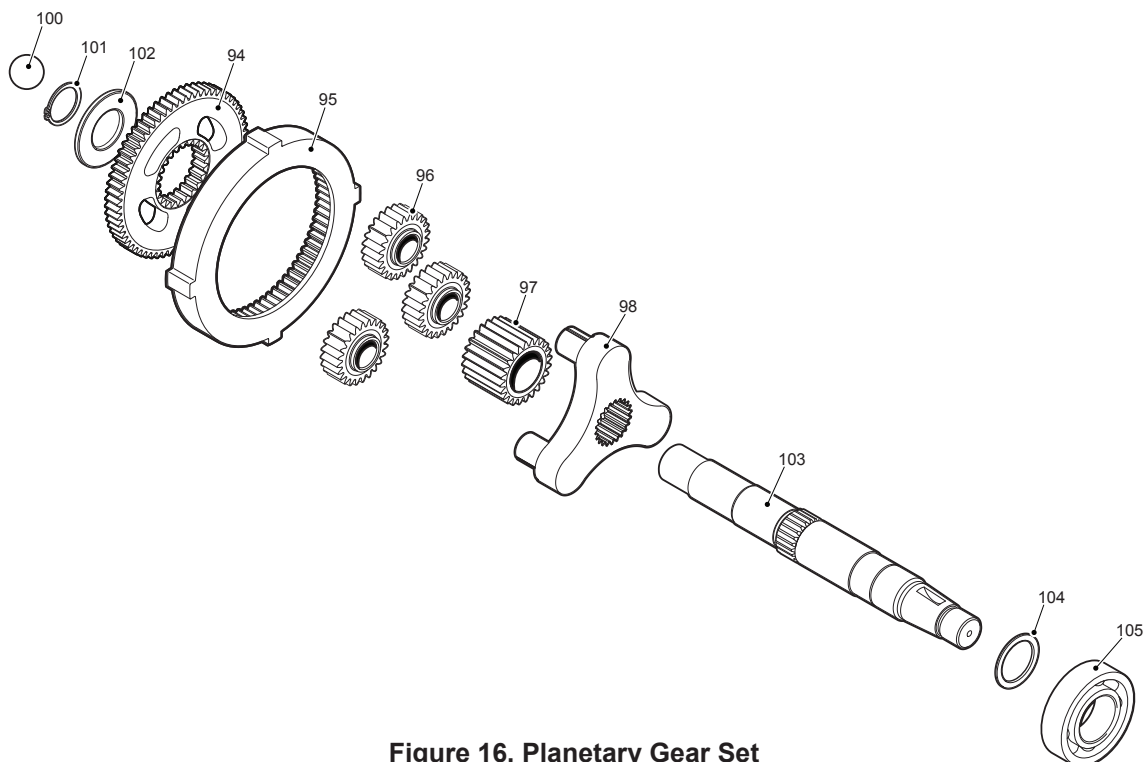


Figure 16, Planetary Gear Set

CHARGE PUMP AND OIL TUBE

Refer to Figure 18

Disassembly

1. Remove all external items previously discussed in their recommended order.
2. Pry out the oil tube (38).
3. Mark the orientation of the charge pump cover (144).
4. Remove the charge cover screws (145), the cover (144) and the gerotor (142), then remove and discard the O-ring (143).
5. Remove the gerotor and the charge tubes (141).
6. Remove and discard the O-ring (146)

Inspection

1. Inspect items of the charge cover assembly for wear and or damage. Replace if necessary.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. When installing the charge pump cover (144) line up the mark on the cover with the mark on the housing — refer to Disassembly step 3.
3. When tightening the fasteners, refer to the table on page 15 for the required torque values.
4. Place a small dab of sealant on each end of the oil tube (38) just before the bend. The sealant should contact the inside of the side housing when it is installed.

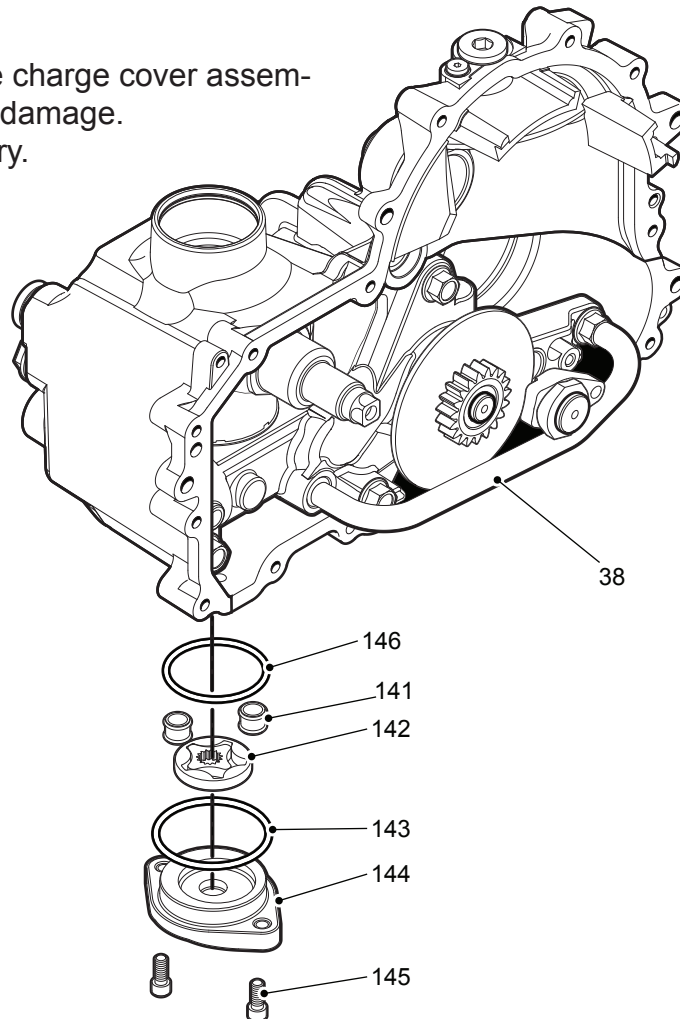


Figure 18, Charge Pump

INPUT SHAFT

Refer to Figure 19

Disassembly

1. Remove all external items previously discussed in their recommended order.
2. Remove the retaining ring (75) and discard.
3. Remove the lip seal (74) and discard.
4. Remove the washer (73).
5. Remove the pump shaft (70) with pressed on bearing (71).

NOTE: Remove the bearing from pump shaft only if worn or damaged.

5. Remove the wire ring retainer (72) and discard. Remove the bearing (71) from the pump shaft (70).

Inspection

1. Inspect the bearing and input shaft 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 input shaft assembly into the main housing.
3. Install the washer (73).
4. Install the new lip seal (74) and new retaining ring (75).

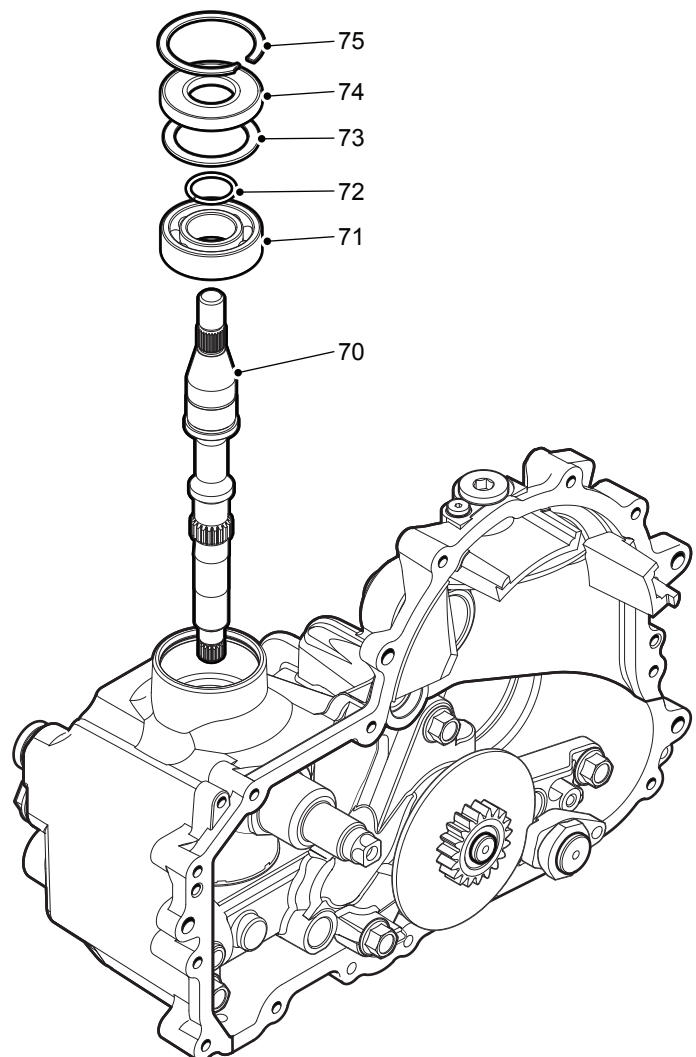


Figure 19, Input Shaft

SWASHPLATE

Refer to Figure 20, 21

Disassembly

1. Remove all external items previously discussed in their recommended order.
2. Remove the trunnion arm (50), swashplate, the thrust bearing (85) and the pump block assembly.

Inspection

1. Inspect the races of the thrust bearing (85) for wear or damage.
2. Inspect the pistons (86) and washers (82) of the pump block assembly for scratches and or wear. Replace the pump block assembly if necessary.
3. Inspect for scratches on the machined surfaces of the swashplate (50).

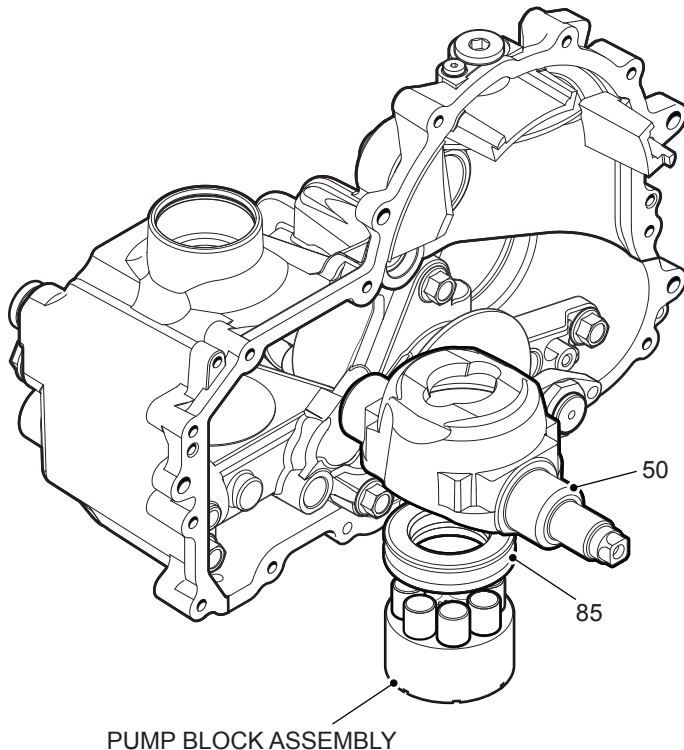


Figure 20, Swashplate

4. Inspect the pump cylinder block (88).

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Apply a light coating of oil to all running surfaces.
3. Reassemble the items of the pump block assembly. **Place the thrust bearing assembly (85) so the thick race contacts the pump block pistons.**
4. Realign the swashplate and pump block assembly with the center section.

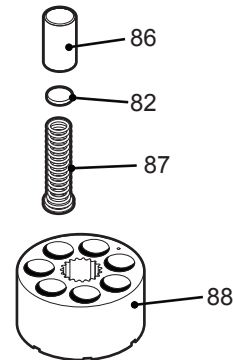


Figure 21, Pump Block Assembly

CENTER SECTION

Refer to Figure 22

Disassembly

1. Remove all external items previously discussed in their recommended order.
2. Remove the grommet (37) from the center section assembly.
3. Remove the center section bolts (21) and (22).
4. Remove the center section assembly and motor block assembly. Slide the motor block assembly off of the motor shaft.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Apply a light coating of oil to all running surfaces.
3. When tightening the fasteners, refer to the table on page 15 for the required torque values.

Inspection

1. Inspect for surface wear damage (scratches or scoring) on the machined surfaces of the center section (20).

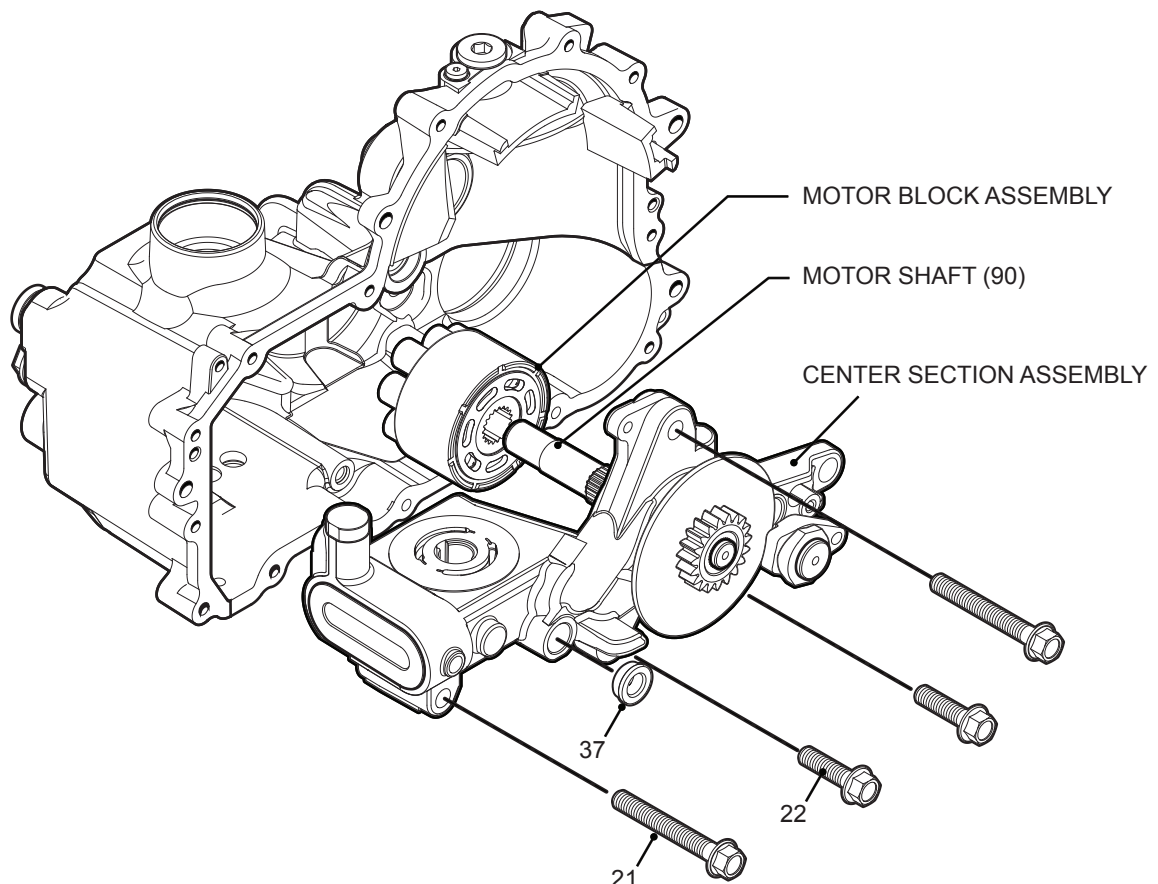


Figure 22, Center Section

BRAKE ASSEMBLY AND MOTOR SHAFT

Refer to Figure 23

Disassembly

1. Remove all external items previously discussed in their recommended order.

NOTE: *If the brake is working properly and the brake components are not damaged, there is no need to remove the brake assembly.*

2. Pull the motor shaft (90), retaining ring (192) and gear (93) out of the center section (20).
3. Remove the brake rotor (123) and the washer (91).
4. Remove the brake shaft nut (126) and washer (125).
5. Remove the brake shaft (120), the splined cam (121), the puck cam (122) and brake puck (124).

Inspection

1. Inspect for scratches and or damage to the brake rotor (123).
2. Inspect the puck (124) for excessive wear.
3. Inspect the gear (93) for wear or damage.

Assembly

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

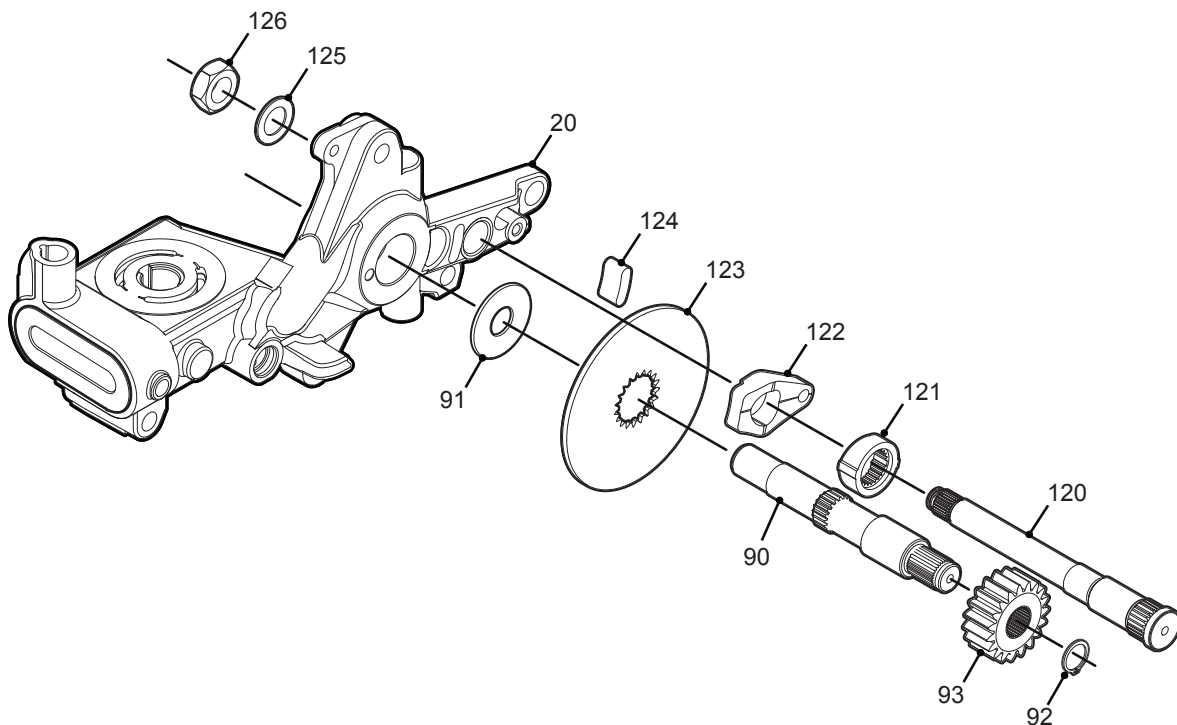


Figure 23, Brake Assembly and Motor Shaft

MOTOR CYLINDER BLOCK, OPTIONAL 2-SPEED SHAFT & SWASHPLATE

Refer to Figure 24

Disassembly

1. Remove all external items previously discussed in their recommended order.
2. Disassemble the motor block assembly and inspect all parts.
3. Remove the thrust bearing (80) and swashplate (160) from the main housing.

Two Speed Model(Optional)

4. Remove the cam (161) and the 2-speed shaft (162).

Inspection

1. Inspect the races of the thrust bearing (80) for wear or damage.
2. Inspect the pistons (81), washers (82) and the motor cylinder block (84) of the motor block assembly for scratches and or wear. Replace the motor block assembly if necessary.

Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Apply a light coating of oil to all running surfaces.
3. Reassemble the items of the motor block assembly. **Place the thrust bearing assembly (80) so the thick race contacts the motor block pistons.**

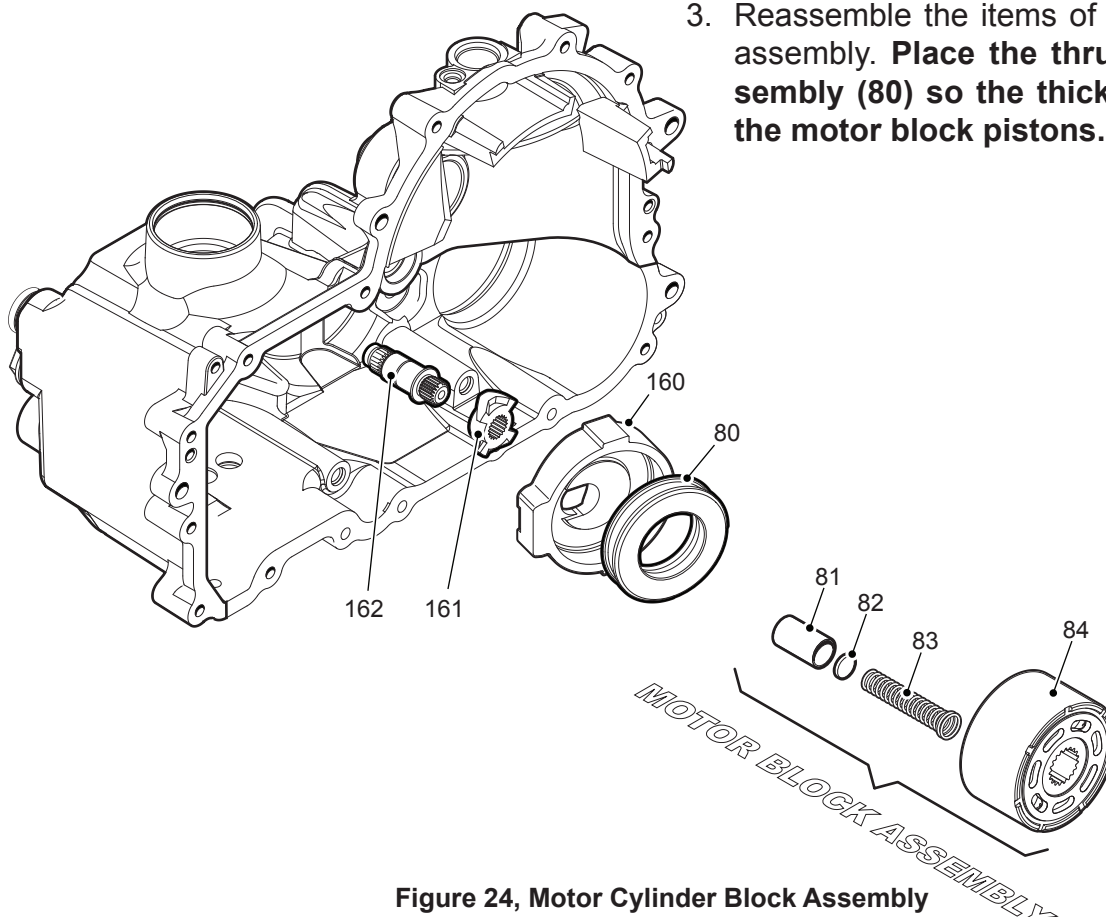


Figure 24, Motor Cylinder Block Assembly

CENTER SECTION AND MAGNET

Refer to Figure 25

Disassembly

1. Remove all items previously discussed, in their recommended order.
2. Pry off the charge galley cap (25).

NOTE: Mark orientation of the shock valves before removing.

3. Remove the shock valve seats (26).
4. Remove the shock valves (28/29), the springs (32) and the check spring retainers (30).
5. Remove the charge pressure relief plug (36), the spring (35) and the ball (34).

Inspection

1. Inspect the all items of the charge galley assembly for wear or damage. Replace if necessary.
2. Clean off the magnet (39).

Assembly

1. Assemble items in reverse order of disassembly.
2. When tightening components refer to the table on page 15 for the required torque values.

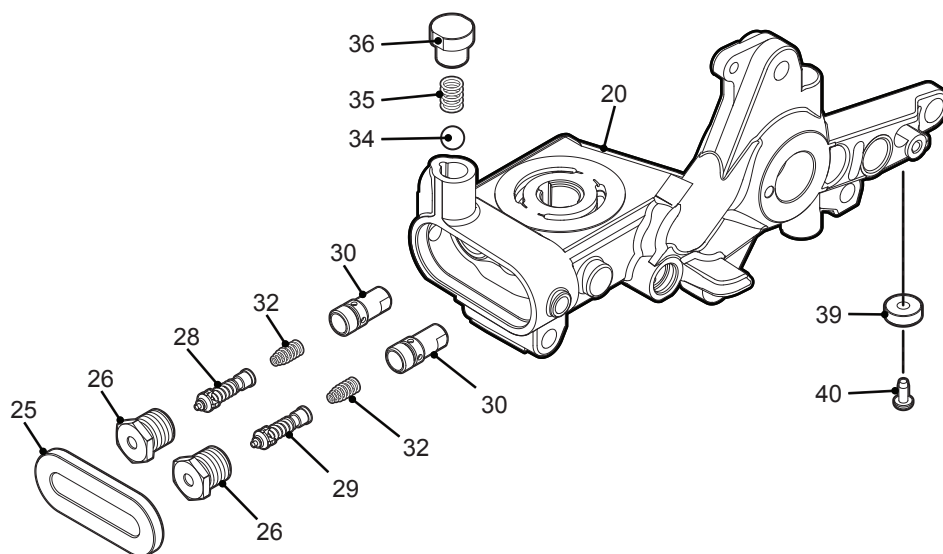


Figure 25, Charge Galley Assembly and Magnet

ASSEMBLY AFTER A COMPLETE TEARDOWN

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

The part reference numbers provided in each assembly procedure are keyed to the individual exploded views, and are also keyed to the complete unit exploded view on page 36.

1. Assemble the center section assembly (shock valves, bypass cover, charge relief ball & spring and plug, motor shaft & brake rotor) then set aside.
2. Install the 2-speed shaft and cam into the main housing, if so equipped.
3. Install the motor thrust bearing and swashplate into the main housing.
4. Install the motor block assembly onto the motor shaft.
5. Install the center section assembly into the main housing.
6. Install the four center section screws. Tighten the screw below the brake assembly first, tighten completely, then tighten the remaining screws.
7. Install the oil tube.
8. Install the filter and cover.
9. Install the pump block assembly, thrust bearing and trunnion swashplate into the main housing.
10. Install the input shaft, bearing, seal & retaining ring into the main housing.
11. Install the charge pump assembly (seal, push O-ring tubes, gerotor, O-ring and cover) onto the main housing.
12. Install any removed plugs/fittings into the main housing located above the bypass bore.

13. Install the bypass rod, wave washer and retaining ring.
14. Install the three planet gears (96) onto the carrier (98) and then onto the axle shaft (103). Install the sun gear (97) onto the axle shaft (103). Install the gear (94), thrust spacer (102) and retaining ring (101) onto the axle shaft and set assembly aside. Install the thrust ball (100) into the main housing. Place the axle assembly into the main housing. Install the ring gear (95) onto the axle shaft so that the teeth mesh with the planet gears.

Note: *Make sure that two of the tabs on the outer diameter of the ring gear (95) locate between the tabs cast into the main housing.*

Install the washer (104) and bearing (105) onto the axle.

15. Place a small dab of sealant on each end of the oil tube just before the bend. The sealant should contact the inside of the side housing when it is installed. Place a small bead of sealant on the side housing. Mate the side housing with the main housing and install the housing screws.
16. Install the two speed actuating handle (168) and the external retaining ring (169), if so equipped.
17. Install the bushing (128) and brake arm (130) onto the brake shaft. Install the retaining ring (131) onto the brake shaft.
18. Control arm assembly installation: Install the spacer (53) onto the short stud (52). Install the control arm (54) onto the trunnion shaft. Secure the control arm to the trunnion shaft with Torx Head capscrew (56). Install the washer (55) and nut (57).

— OR —

RTN assembly installation: Install the spacer (58), neutral arm (59), washer (60) and

ASSEMBLY AFTER A COMPLETE TEARDOWN (CONTINUED)

socket head capscrew (61). Place the control arm (54) on the trunnion shaft. Install the RTN assembly (62), washer (63) onto the trunnion shaft and secure with Torx head capscrew (56). Install the spring (64) on the RTN assembly.

19. Install the axle seal (106) and retaining ring (107) into the side cover (2). Place the axle shaft key (110) into the keyway on the axle. Slide the hub (111) onto the axle and secure with the castle nut (113).

20. Perform the purge procedures listed on page 11.

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.

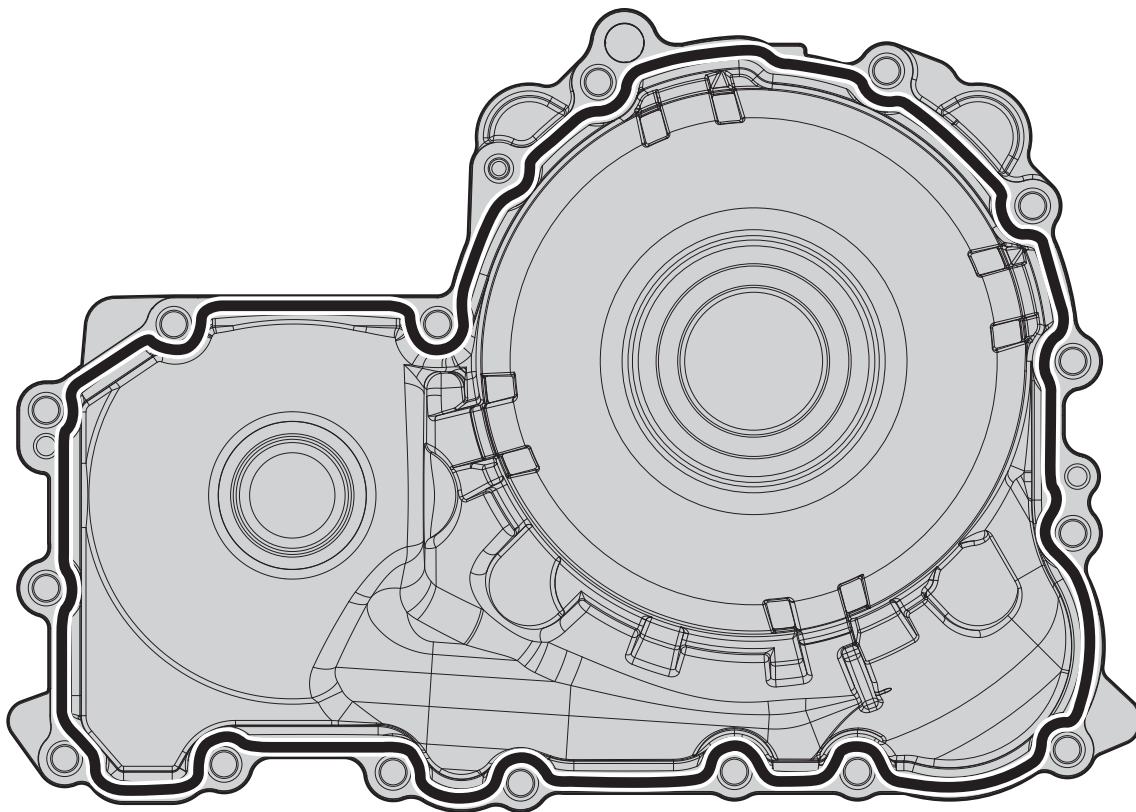


Figure 26, Sealant Application Diagram

SIDE HOUSING – SCREW TIGHTENING SEQUENCE

Starting with the number “1” screw location, tighten sequentially through to “17.”

Torque each screw to 230 – 290 lb-in (25.9 – 32.7 Nm).

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

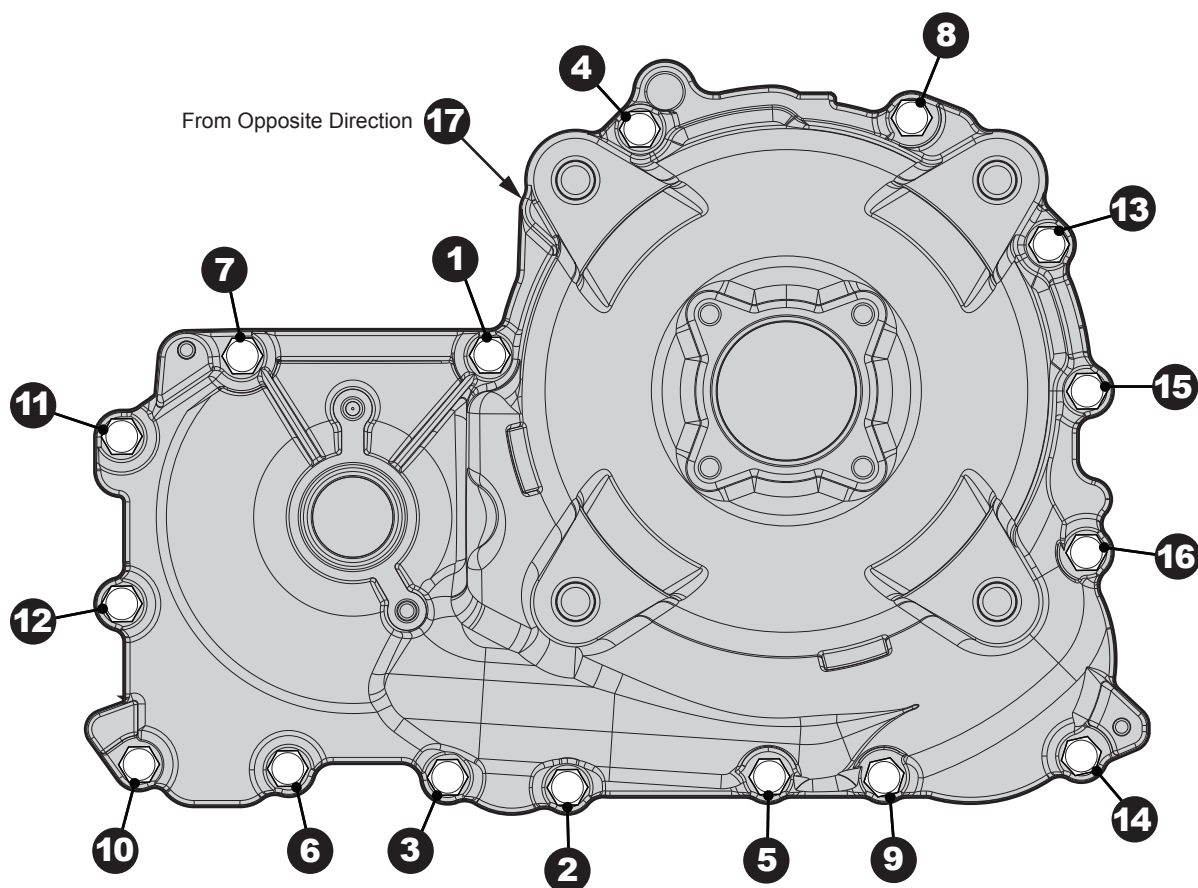


Figure 27, Screw tightening sequence

CASTLE NUT (113) ALTERNATE TORQUE METHOD

NOTE: The ideal method for installing a new hub and nut is utilizing a torque wrench capable of 275 ft-lbs. If a 275 ft-lbs torque wrench is not available please use the alternative procedure outlined in this document. All parts need to be clean and free of lubrication.

Tools:

1. Air Compressor and Air Impact Wrench or Electric Impact Wrench (REMOVAL ONLY)
2. 1 7/16" Socket
3. Socket Extension
4. Torque Wrench (Must be capable of achieving 50 ft-lbs)
5. Paint Pen or visible marker.
6. Flash Light

Procedure:

1. Engage machine parking brake.
2. Remove nut cover.
3. Remove existing nut.
4. Install new nut to 50 ft-lbs
5. Mark a point on the new nut and hub per Figure 28. (Point A)
6. Measure 2 nut flats or 120° per Figure 28 and mark hub. (Point B)
7. Turn nut clockwise until mark "A" lines up with mark "B". (Figure 29)
8. Continue turning nut clockwise until the slot lines up with the cross hold of the axle shaft.
9. Install cotter pin.
10. Reinstall nut cover.

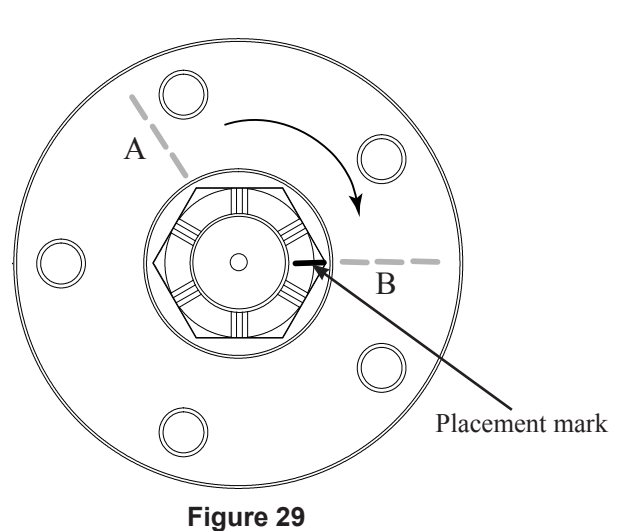
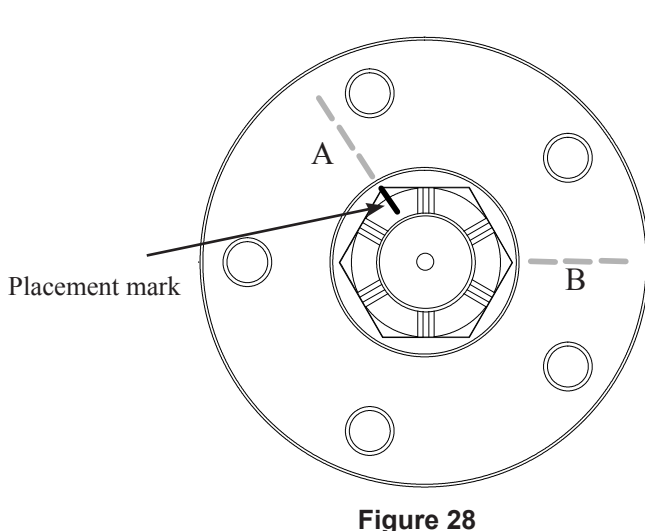


Figure 28 / Figure 29, Alternate Torque Method

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ZT-5400 POWERTRAIN® TRANSAXLE PARTS LIST

1	Housing, Main	103	Shaft, Axle 1.25 Taper
2	Housing, Side	104	Washer, 1.40 X 1.75 X .05
5	Dowel Pin	105	Bearing, Ball 35 X 80 X 21 (6307)
6	Screw, HWHST 5/16-18 X 1.5	106	Seal, Lip 1.375 X 2.062 X 0.250
11	Bearing, Needle 1.125 X 1.375 X 1.000	107	Ring, Retaining Internal
20	Center Section	110	Key, Shaft, Axle
21	Bolt, Center Section, Long	111	Hub, Taper 1.25, 4 Bolt
22	Bolt, Center Section	112	Stud 1/2-20x1.5 (Rib Neck)
25	Check Plug/w Assembly	113	Castle Nut, Hex 1-20 Slotted
28	Shock Valve	114	Axle Cap
34	Ball, .375 Plastic	115	Axle Tube
35	Spring, Compression .375 X .75	116	Pin, Cotter 9/64
36	LSHCS, 5/8-11X.50 UNC-2A	120	Shaft, Brake
37	Grommet, Center Section	121	Cam, Splined
38	Tube, Oil	122	Cam, Puck
40	Screw	123	Rotor, Brake
41	Seal, Lip 12 X 24 X 5 TC	124	Puck, Brake
43	Actuator, Bypass	125	Washer, .63 X 1.0 X .04
44	Ring, Wave	126	Nut, Hex
45	Retaining Ring	127	Seal, .56 X .88 X .19
50	Swashplate, Trunnion 16CC	128	Bushing
51	Seal, Lip, 22 X 32 X 7	130	Handle, Actuating
52	Stud, Short 5/16-24	131	Ring, Retaining
53	Washer, Plastic	140	Seal, .50 X .69 X .09 Vc
54	Control Arm	141	Tube, Push O-ring
55	Washer .34X.88X.06	142	Gerotor, Splined, 3.7cc/Rev
56	TWHCS 5/16-24 X 1.00 (PATCH)	143	O-ring, -139
57	Nut, Hex Lock 5/16-24 UNF	144	Cover, Charge Pump
58	Spacer .320 X 1.005 X .179	145	Screw, 1/4-20 X .625
59	Arm, Neutral	146	O-ring
60	Washer	150	Filter and O-ring
61	SHCS 5/16-24 X .875 (PATCH)	152	Filter Plug and O-ring
62	Return To Neutral Assembly	160	Plate, Single Speed
63	Washer, .343 X 1.500 X .062	161	Cam, 2 Speed
64	Spring, Extnsn	162	Shaft, 2-Speed, Bevel
65	Plate, Stop	163	Ring, Retaining External .59
66	Washer, .34 X .88 X .06	164	Seal, Plug
67	Screw, 5/16-18 X .75 Anti-Tamper	165	Arm, Lock-Down, 2-Speed,
70	Shaft, Input	166	Washer, .34 X .88 X .06
73	Spacer	167	Screw, 5/16-18 X .75 Anti-Tamper
74	Seal, Lip 25 X 52 X 7 TC	168	Handle, Actuating
75	Ring, Retaining, Internal	169	Ring, Retaining External .375
80	Bearing, Thrust Ball 42 X 68 X 16	170	Plug, 7/8-14, Plastic
84	Block, Cylinder 21CC	170	Fitting, 7/8-14 Sae, .625 Beaded
85	Bearing, Thrust 35 X 70 X 22	171	Plug, 5/16-24, Metal
88	Block, Cylinder 16cc	172	Plug, 7/8-14, Metal
90	Shaft, Motor	172	Fitting, 7/8-14 Sae, .625 Beaded
91	Washer, .89 X 1.50 X .04	173	Plug, 5/16-24, Metal
92	Ring, Retaining	174	Plug, 9/16-18, Metal
93	Gear, 19T or Gear, 16T	174	Plug, 9/16-18, Plastic
94	Gear, 65T or Gear, 68T	175	Tube, Push
95	Gear, Ring, 68T	180	Assembly, Hub/Pulley
96	Gear, Planet, 23T	181	Fan, 9.0 (5 Blade, Cw)
97	Gear, Sun, 22T	182	Washer, Od Slotted, 53 X 1.63 X .06
98	Carrier	183	Nut, Hex, 1/2-20 W/ Patch
100	Ball, Thrust, .75	184	Washer
101	Ring, Retaining, 1.25	300	Kit, RTN
102	Spacer, Thrust, Axle		

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.

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