



SST Transaxle Service and Repair Manual

**BLN-0034
July 2010**

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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® SST transaxle.

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.

Repair procedures require that the SST 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 (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® SST series. This manual includes the SST series general description, 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 SST series is a self contained unit designed for the transfer and control of power. It provides an infinitely variable speed range between zero and maximum in both forward and reverse modes of operation.

The SST transaxle uses a variable displacement pump with a maximum displacement of 6cc per revolution, and motor with a fixed displacement of 6cc 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 SST series has a self contained fluid supply. 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.

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 SST 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.

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

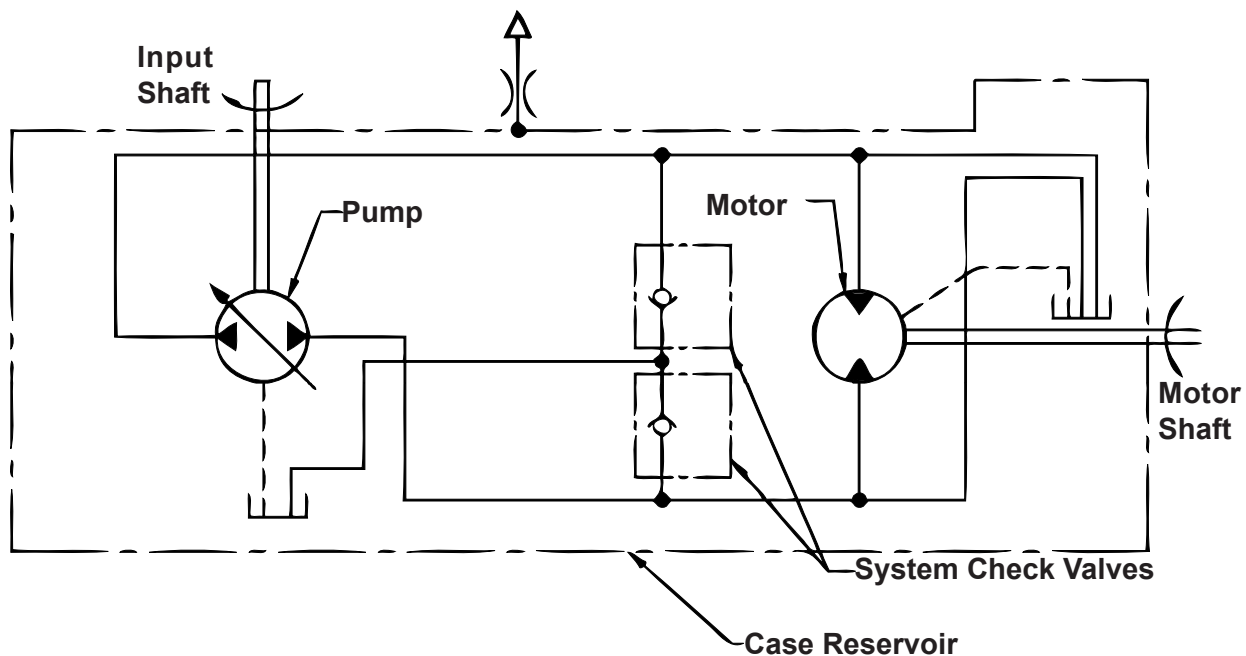
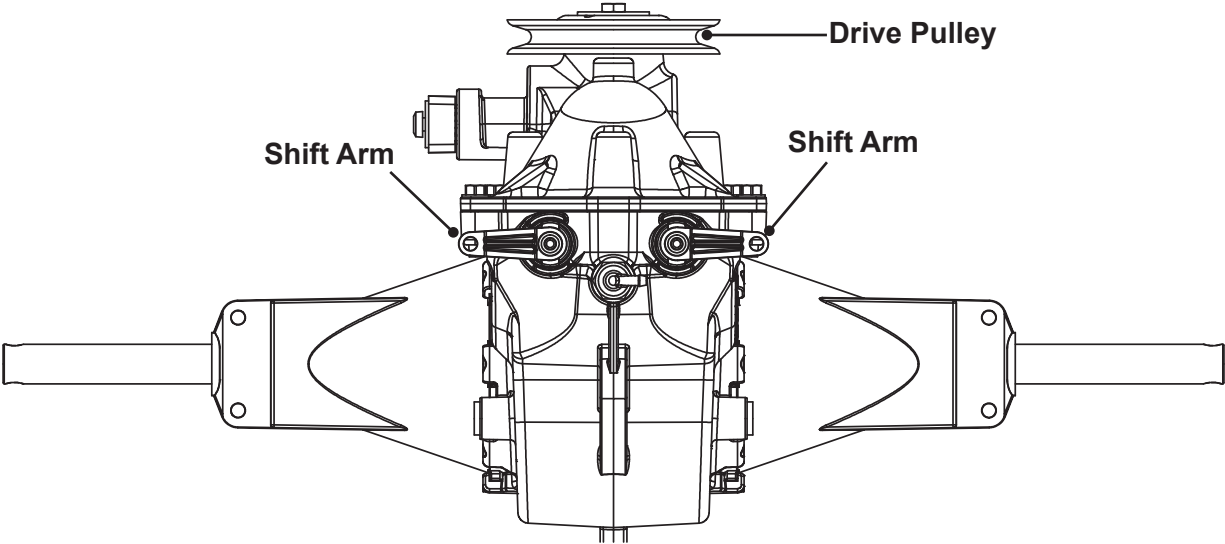
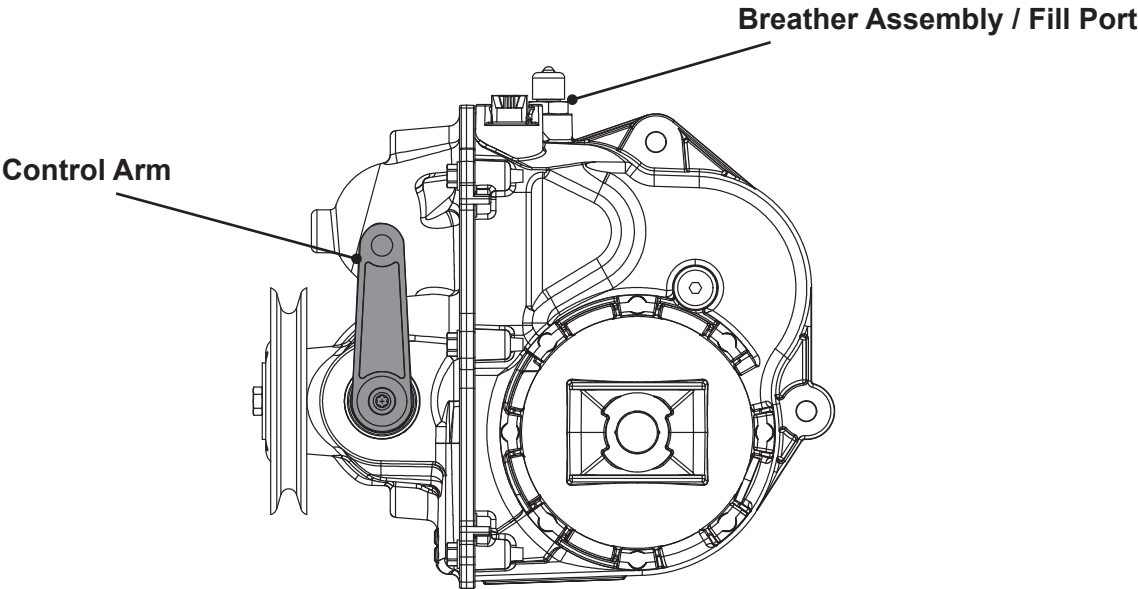


Figure 1: Hydraulic Schematic

EXTERNAL FEATURES SST SERIES



— Top View—



— Side View—

TECHNICAL SPECIFICATIONS

SST TECHNICAL SPECIFICATIONS

Overall Reduction Ratio	30.43:1
Input Speed	
Maximum	2600 rpm
Minimum	1800 rpm
Output Torque	
Peak	130 lb-ft (176 N-m)
Continuous	62 lb-ft (84 N-m)
Weight on Tires (per unit)	
Maximum with 12" tires	290 lb (131.5 kg)
Maximum with 14" tires	290 lb (131.5 kg)
Maximum with 16" tires	290 lb (131.5 kg)
Weight of Unit	21.4 lb (9.7) kg

PRODUCT IDENTIFICATION

The model and configuration of the SST can be determined from the label shown below.

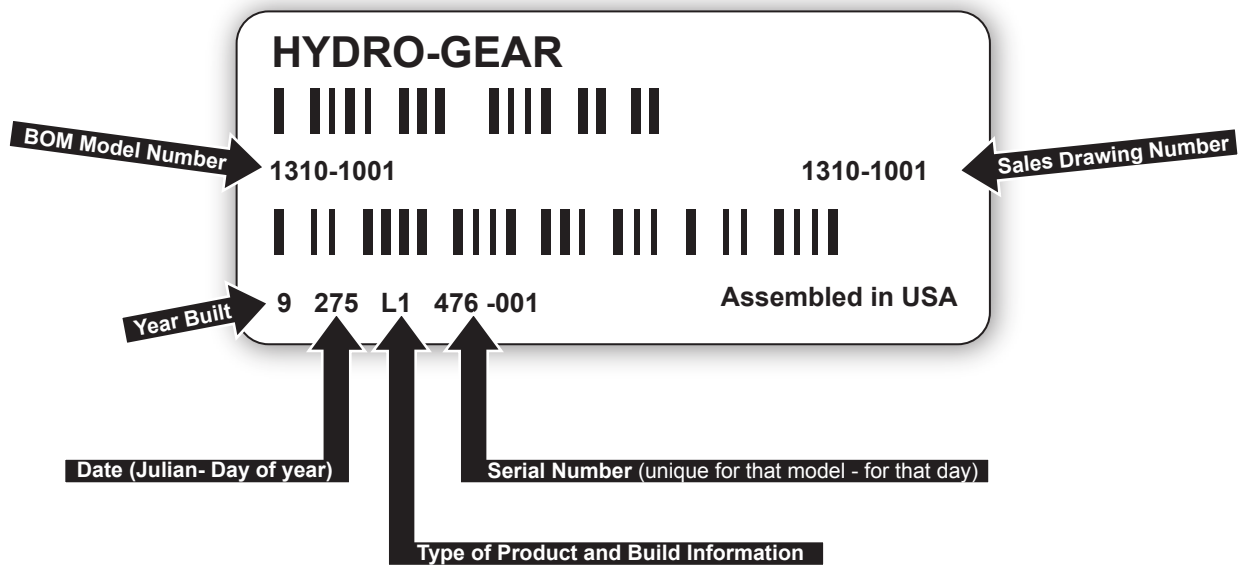


Figure 2: Product Configuration

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 SST 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 SST. 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 SST Drive™ are not related to a defective transaxle, but are caused by slipping drive belts, partially engaged bypass arms, 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 8
Drive belt slipping or pulley damaged	Repair or replace drive belt or pulley, Page 8
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 8
Unit Is Noisy	
Oil level low or contaminated oil	Fill to proper level or change oil, Page 8 & 10
Excessive loading	Reduce vehicle loading, Page 8
Loose parts	Repair or replace loose parts
Air trapped in hydraulic system	Purge hydraulic system, Page 10
Unit Has No/Low Power	
Engine speed low	Adjust to correct setting
Control linkage bent or out of adjustment	Repair or replace linkage, Page 8
Drive belt slipping or pulley damaged	Repair or replace drive belt or pulley, Page 8
Oil level low or contaminated oil	Fill to proper level or change oil, Page 8 & 10
Excessive loading	Reduce vehicle loading, Page 8
Air trapped in hydraulic system	Purge hydraulic system, Page 10
Unit Is Operating Hot	
Debris buildup around transaxle	Clean off debris, Page 8
Oil level low or contaminated oil	Fill to proper level or change oil, Page 8 & 10
Excessive loading	Reduce vehicle loading, Page 8
Air trapped in hydraulic system	Purge hydraulic system, Page 10
Transaxle Leaks Oil	
Damaged seals, housing, or gaskets	Replace damaged components
Air trapped in hydraulic system	Purge hydraulic system, Page 10

SERVICE AND MAINTENANCE

EXTERNAL MAINTENANCE

Regular external maintenance of the SST Drive 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 2 Page 9.
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 drive pulley for any obstructions (grass clippings, leaves, dirt, etc.).
5. 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.
6. 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 SST 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 5W-30 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 to 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 9, Figure 3 and page 4 for the proper fill port location.

Fill the SST to the specification in the chart below and instructions on page 9.

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

Purging may be required. Refer to the purging procedure on page 10.

Fluid Description	
5W-30 engine oil	
SST	
Component	Volume
Transaxle	1805 ml (61.04 fl. oz.)

FLUID CHANGE PROCEDURE

Refer to Figure 3

This transaxle is designed in such a manner that the factory oil fill should last the life of the unit and is not required to be changed. However, should circumstances require the oil to be changed, follow the procedure below.

The following procedure requires that the transaxle be removed from the vehicle to change the oil as this unit is not equipped with a drain plug feature

1. Remove the breather fitting from the fill port and drain the oil.
2. Fill the transaxle with new 5W-30 motor oil through the fill port.
3. Install the breather fitting. When tightening the oil fill plug, refer to the table on page 12 for the required torque values.
4. Purge the unit. Refer to the purging procedure on page 10.

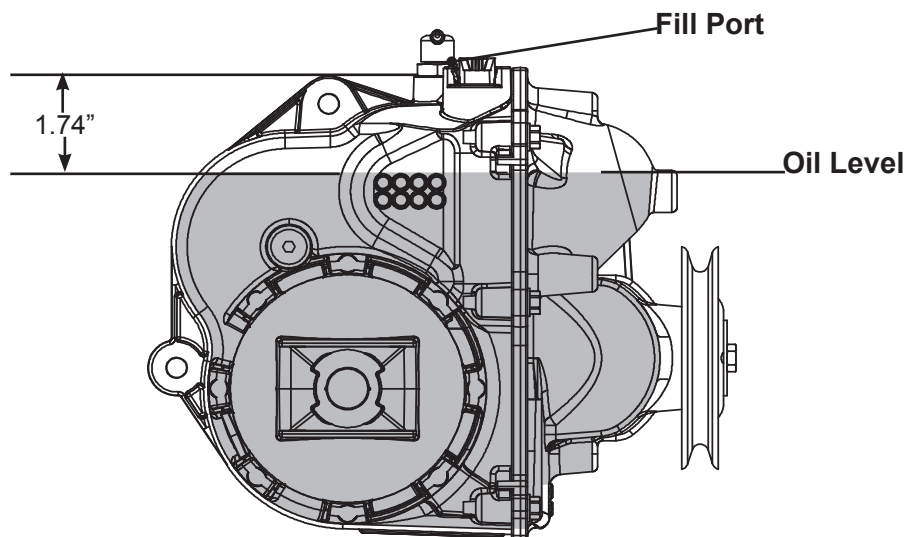


Figure 3: Oil Level

PURGING PROCEDURE

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 8 and 9.

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

1. With the shift levers engaged and the engine running, slowly move the directional control in both forward and reverse directions (20 to 30 times), as air is purged from the unit, the oil level will drop.
2. Check the oil level and add oil as needed according to specifications.
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.

SEAL REPLACEMENT INSTRUCTIONS

HOW TO USE THIS MANUAL

Every seal is replaceable in the SST. The following procedures should be used, if necessary, to replace defective seals. Complete tear down of this unit is not recommended as internal parts are not available.

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.

TRANSAXLE REMOVAL

It is necessary to remove the SST transaxle from the vehicle before performing the seal replacement procedures presented in this section.

NOTE: *Before starting any disassembly, make certain that your work area is neat and clean. Clean the external parts of the transaxle.*

LIMITED DISASSEMBLY

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

TOOLS

REQUIRED TOOLS	
Miscellaneous	Sockets
Screw Driver	3/8 deep socket
3/8" Drive Ratchet	7/16 deep socket
Rubber Mallet	
Needle Nose Pliers	
AN-08 (3/4 Allen)	
T-30 Torx	
11/16 Open Ended Wrench	

TORQUES

REQUIRED TORQUE VALUES			
Item	Description	Torque	Operation
68	Screw, Hex Washer	105-155 in-lbs [11.9-17.5 Nm]	Side Housing Screw
64	Screw, Pan Head	60-80 in-lbs [6.8-9.0 Nm]	Control Arm
22	Bolt, Patch Lock	135-185 in-lbs [15.3-20.9 Nm]	Pulley Assembly
	Breather Fitting	180-240 in-lbs [20.3-27.1 Nm]	Oil Change

AXLE SEALS

Refer to Figure 4

Disassembly

1. Remove axle horn clip (75) attaching axle horn to main housing and discard clip.
2. Remove axle horn (44).
3. Remove axle seal (43) and discard.

Assembly

1. Install new axle seal (43) from seal kit.
2. Install axle horn (44) and axle horn clip (75).

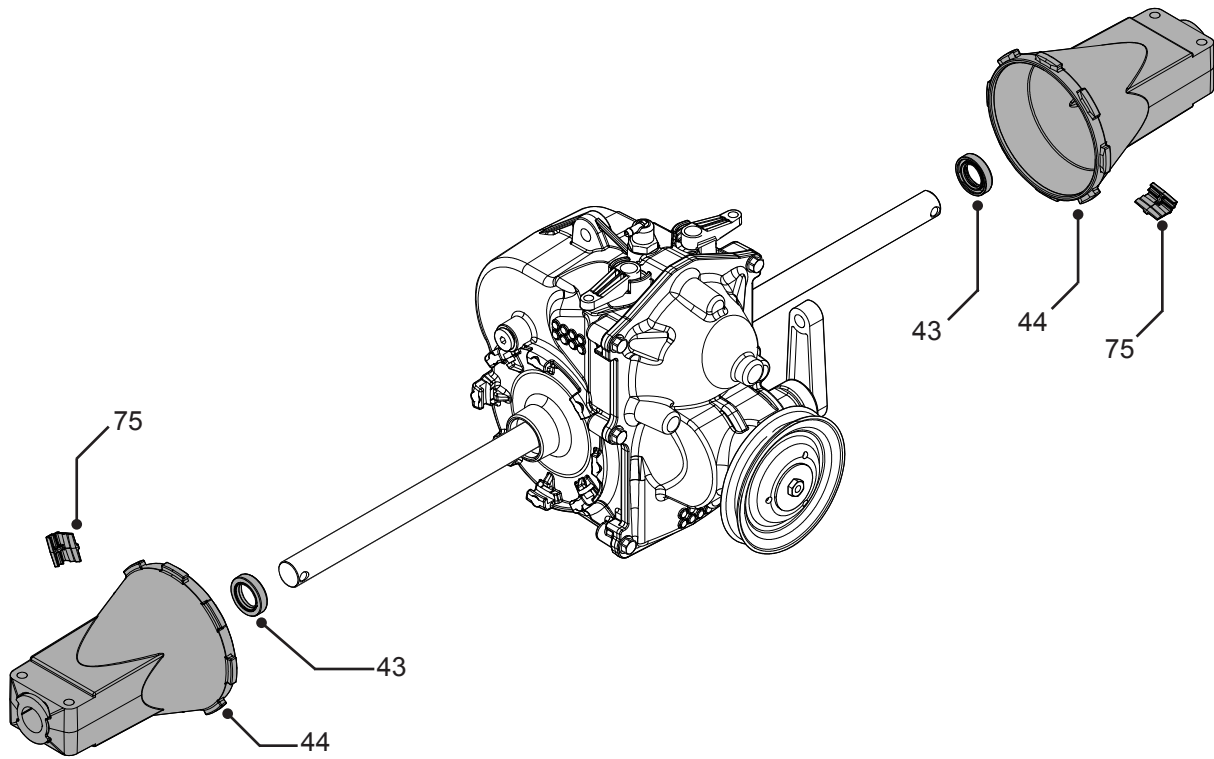


Figure 4: Axle Seal Replacement

SHIFT SHAFT SEALS

Refer to Figure 5

Disassembly

1. Remove shift shaft (47) and discard.
2. Remove seals (46) and discard.

Assembly

1. Install new shift shaft seal (46) from seal kit.
2. Install shift shaft (47)

NOTE: Shift shafts will snap into main housing.

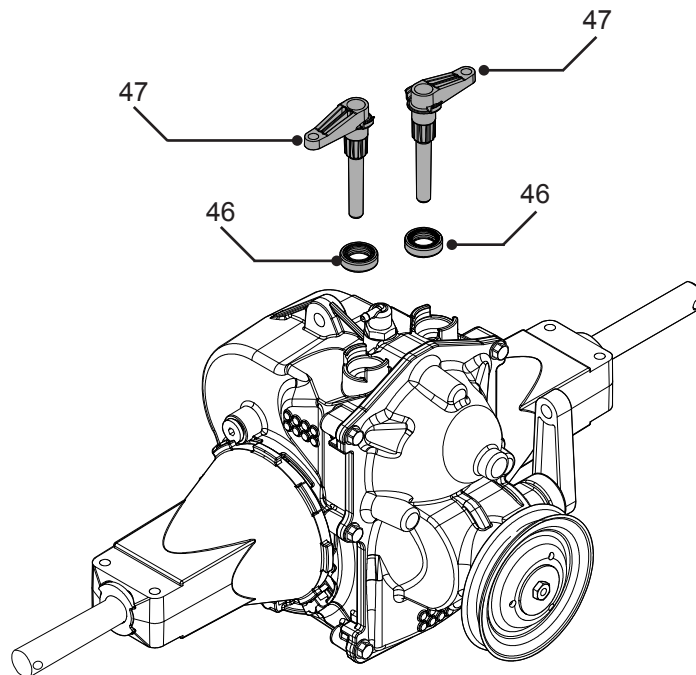


Figure 5: Shift Shaft Replacement

INPUT SEAL

Refer to Figure 6

Disassembly

1. Remove bolt (18) and discard.
2. Remove washer (17), pulley (16) and hub (15) from input shaft.
3. Remove input shaft seal (14) and discard.

Assembly

1. Install new input shaft seal (14) from seal kit.
2. Install hub (15), pulley (16) and washer (17) onto input shaft.
3. Install new bolt (18) from seal kit.

NOTE: As a general rule, use the low end of the torque specification on fasteners when reassembling the unit. (Refer to page 12 for torque specification)

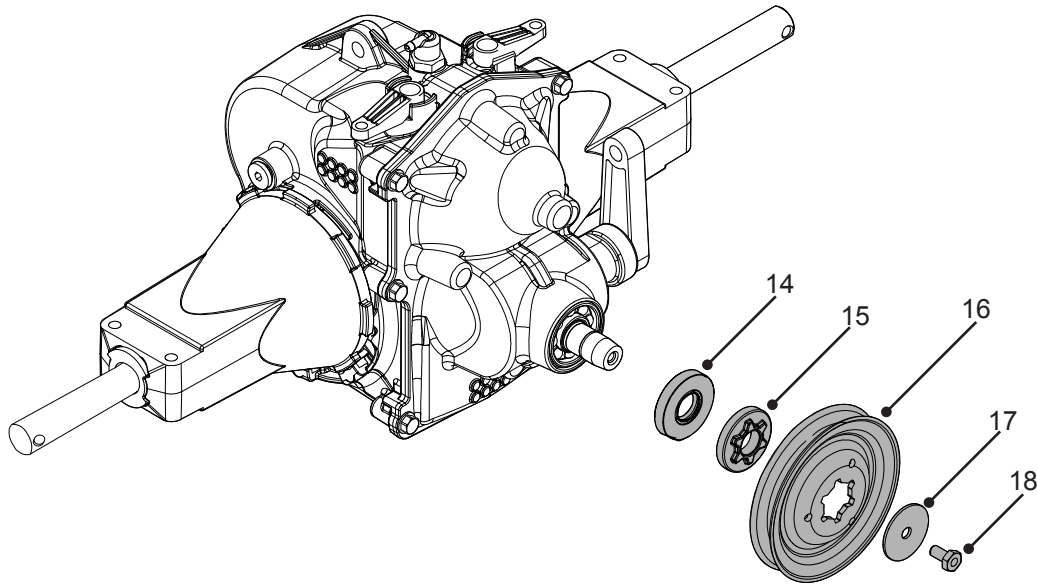


Figure 6: Input Seal Replacement

CONTROL ARM SEALS

Refer to Figure 7

Disassembly

1. Remove screw (64) and discard.
2. Remove washer (63) and control arm (62).
3. Remove trunnion seal (61) and discard.

Assembly

1. Install new trunnion seal (61) from seal kit.
2. Install control arm (62) and washer (63).
3. Install new bolt (64) from seal kit.

NOTE: As a general rule, use the low end of the torque specification on fasteners when reassembling the unit. (Refer to page 12 for torque specification)

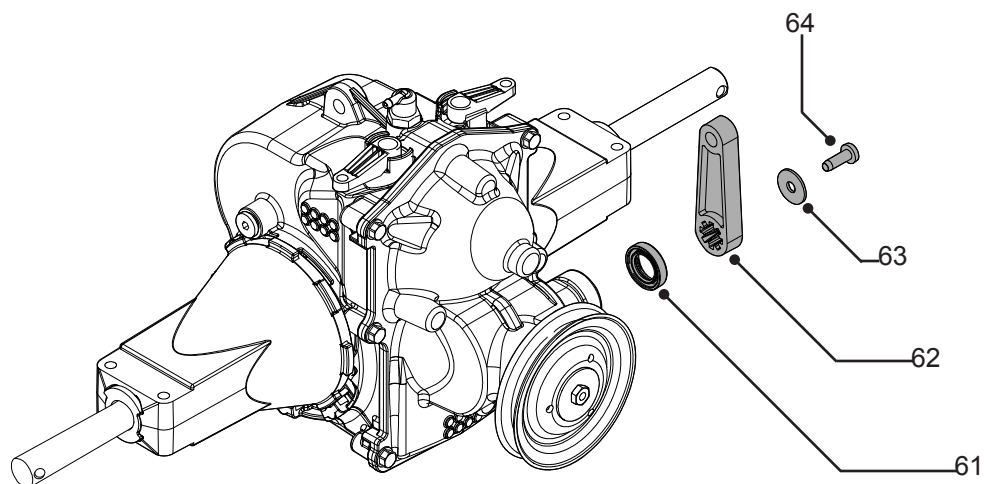


Figure 7: Control Arm Seal Replacement

MAIN GASKET

Refer to Figure 8

Disassembly

1. Remove both shift shafts (47) and discard.
2. Remove housing screws (68) and separate side housing (2) from main housing (1).
3. Remove gasket (6) and discard.

Assembly

1. Install new gasket (6) from seal kit.
2. Align side housing (2) with main housing (1).
3. Install housing screws (68).
4. Install new shift shafts (47) from seal kit.

NOTE: As a general rule, use the low end of the torque specification on fasteners when reassembling the unit. (Refer to page 12 for torque specification)

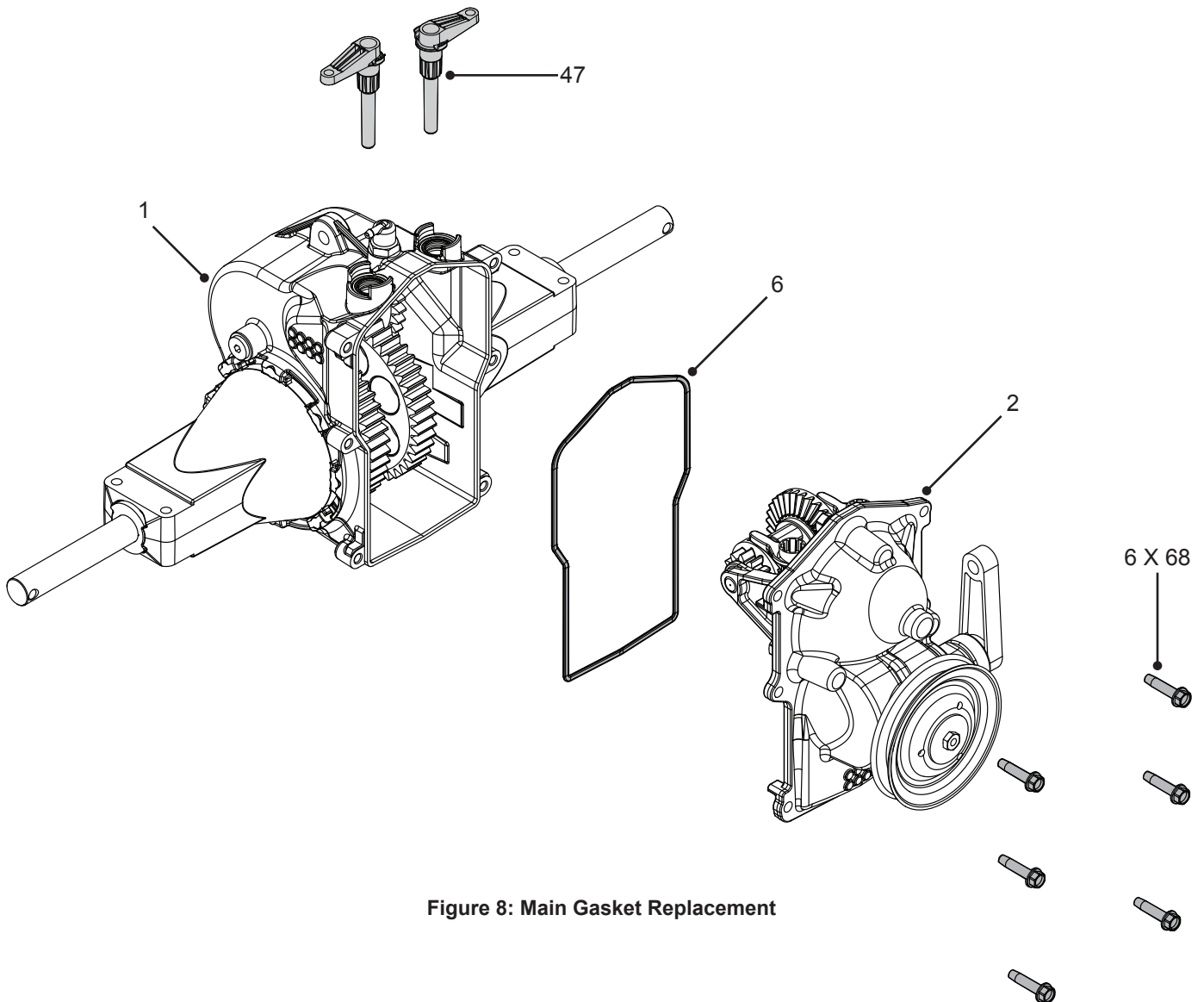


Figure 8: Main Gasket Replacement

SIDE HOUSING – SCREW TIGHTENING SEQUENCE

Refer to Figure 9

Starting with the number “1” screw location, tighten sequentially through to “6.”

Torque each screw to 105 – 155 in-lbs (11.9 – 17.5 Nm).

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

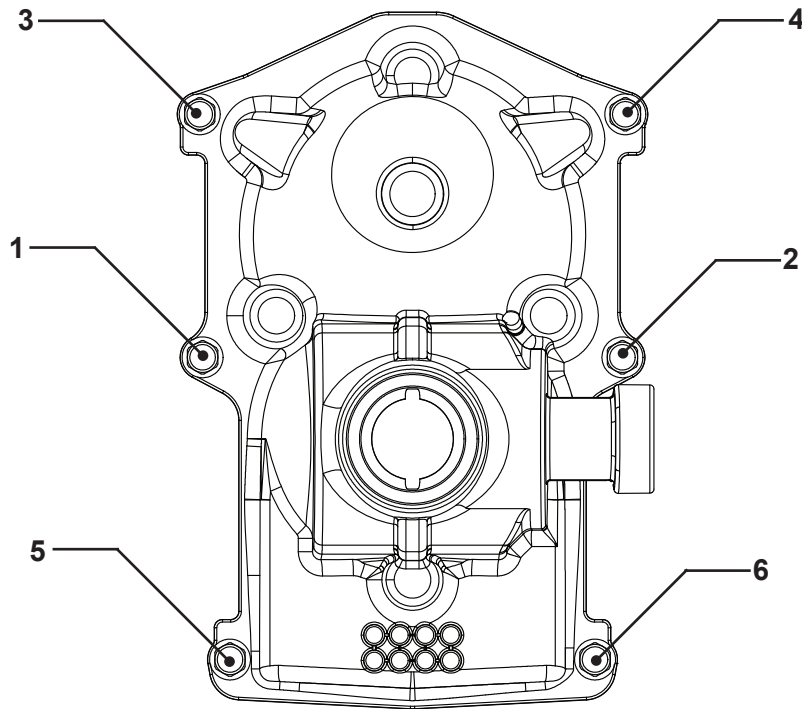
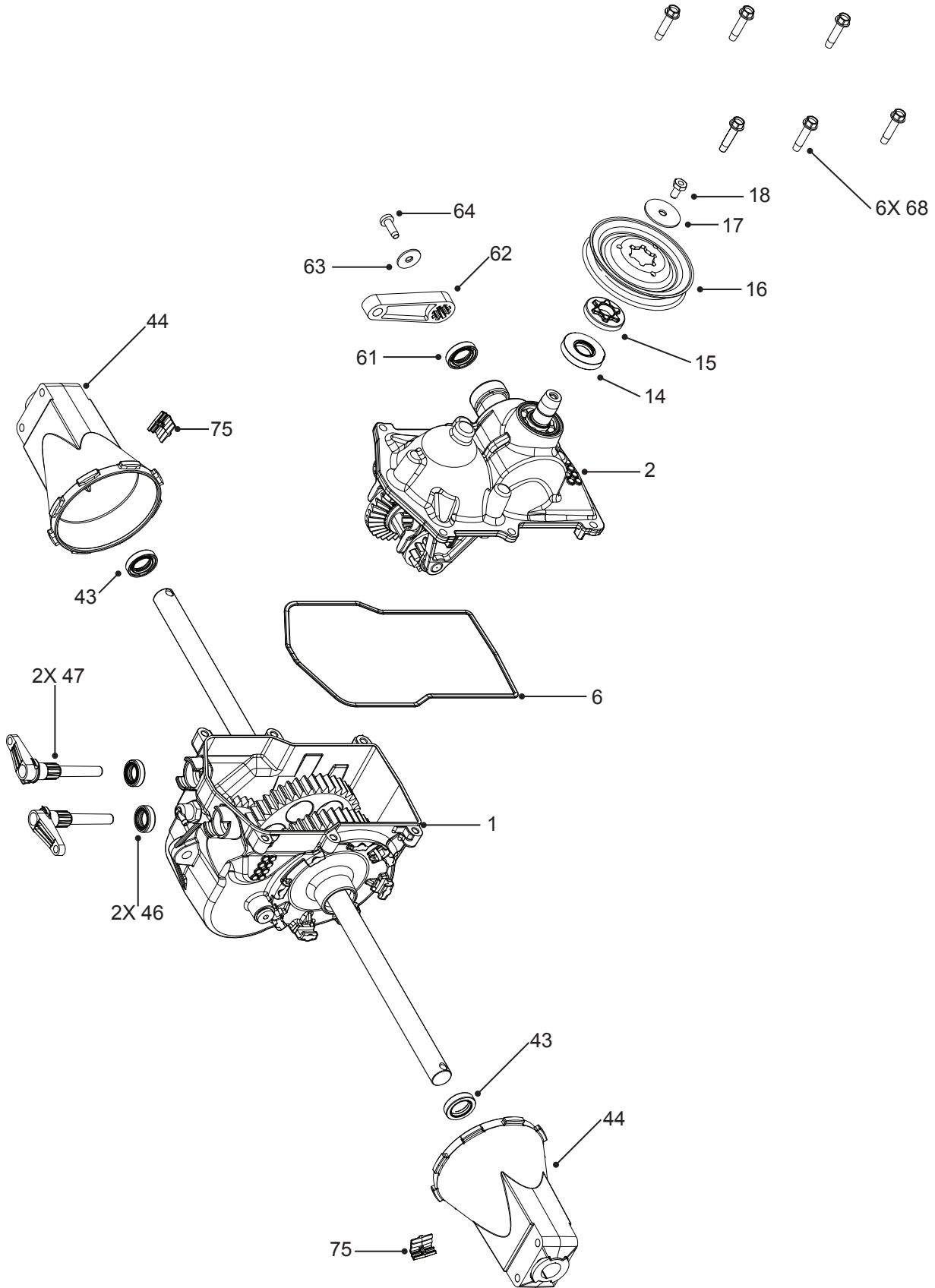


Figure 9: Torque Sequence



SST TRANSAXLE PARTS LIST

1	Housing, Main
2	Housing, Cover
6	Gasket, Flange
14	Seal, Lip 17 X 40 X 7
15	Hub, Pulley
16	Disc, Pulley
17	Washer, .24 X 1.65 X .06
18	Bolt, Patch
43	Seal, Lip .75 X 1.125 X .250
44	Horn, Axle
46	Seal, Lip 15 X 24 X 7
47	Shaft, Shift
61	Seal, Lip .75 X 1.125 X .250
62	Arm, Control
63	Washer, Flat
64	Screw, Pan Head
68	Screw, Hex Washer
75	Clip, Retaining

NOTES



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