

# HGM-H™ Series Motor Service and Repair Manual

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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® HGM-H™ series motor.

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 HGM-H series motor 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® HGM-H series motor. This manual includes the HGM-H series motor general description, hydraulic schematic, technical specifications, servicing and troubleshooting procedures.

Should servicing be required, the exterior of the motor 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 HGM-H series hydraulic motors are fixed displacement axial piston motors. The motor is designed to convert hydraulic power into rotational power at the axle shaft. It operates at an infinitely variable speed range between zero and maximum axle speed determined by motor displacement and maximum pump flow in both forward and reverse modes of operation.

The HGM-H series motor is available with a fixed displacement of 15 cu. in. or 18 cu. in. (245 to 294 cc) maximum per revolution. The cylinder block pistons in the HGM H series motors are set at a fixed displacement by a swash angle that is integral to the motor housing. Therefore, the motor is always at maximum displacement. As pressurized fluid from the pump pushes against the cylinder block pistons, they are forced to rotate with the thrust bearing. As the pistons rotate with the thrust bearing, they create torque and rotary motion that is transmitted to the axle shaft. Torque continues to develop as long as the piston is being pushed out of the cylinder block. When the piston reaches the end of the

movement out of the cylinder block, it gets pushed back into the cylinder and fluid inside the piston is discharged through the low pressure port of the motor. Pistons develop torque only through half of the cylinder block rotation cycle. Therefore, multiple pistons are used to provide a constant and continuous torque to the motor shaft. Reversing the direction of the incoming pressurized fluid into the motor reverses the direction of the motor output rotation.

A hydraulic bypass is utilized in a hydraulic system 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 bypass will be located on the hydraulic pump.

The HGM-H series motor utilizes a friction type brake controlled by a cam attached to an external actuating arm.



# EXTERNAL FEATURES HGM-H SERIES MOTORS

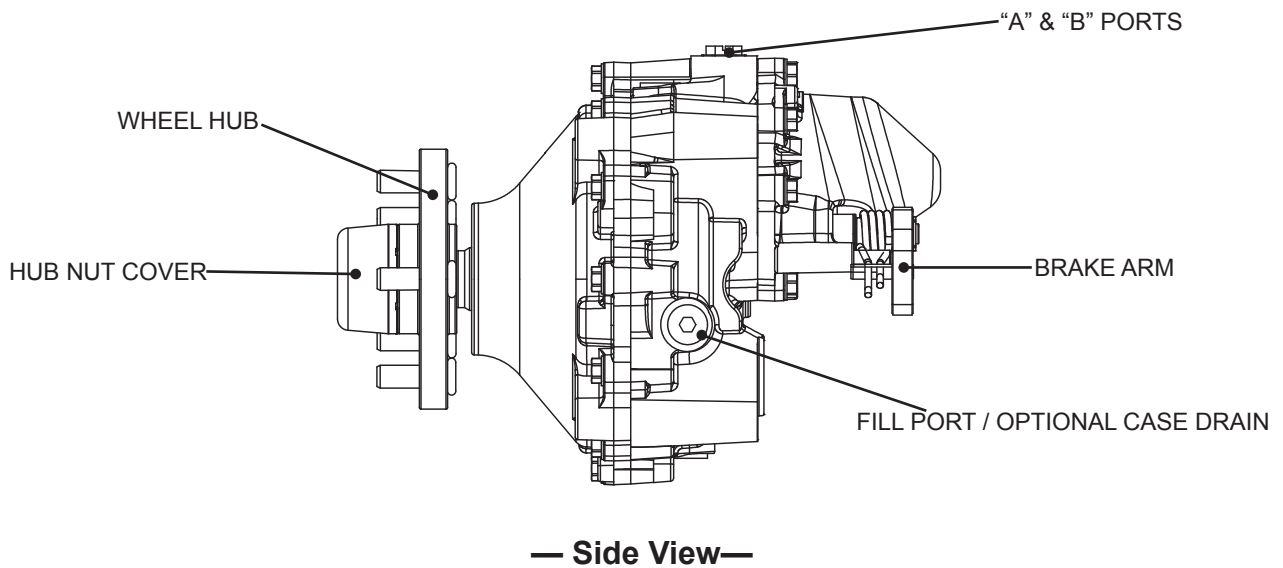
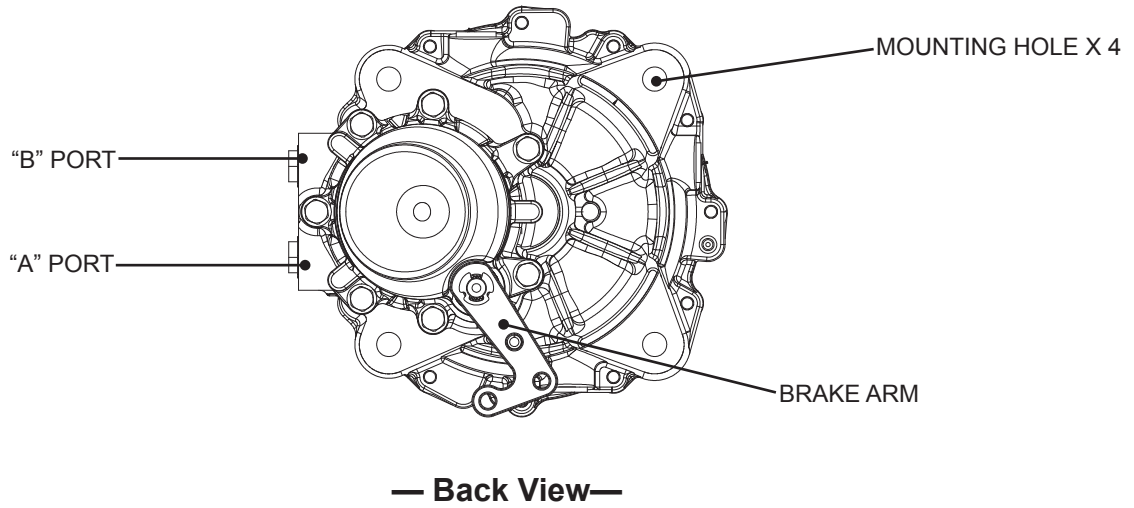
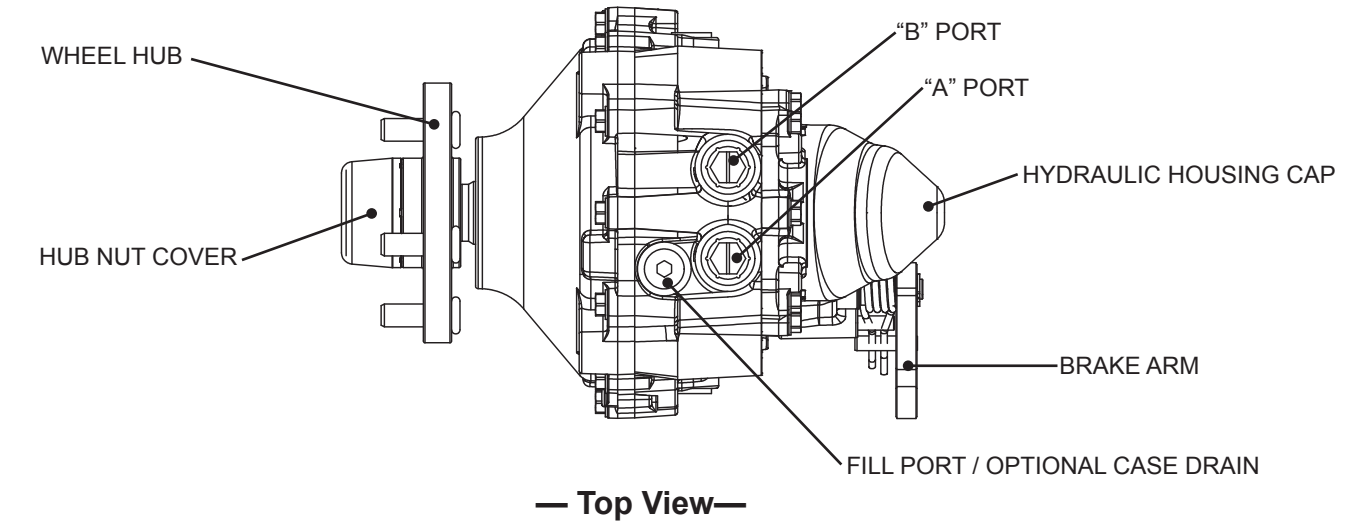


Figure 1, External Features



# TECHNICAL SPECIFICATIONS

HGM-H™ PISTON MOTOR TECHNICAL SPECIFICATIONS		
<b>Geometric Displacement</b>	15 in <sup>3</sup> /rev (245.81 cc/rev)	18 in <sup>3</sup> /rev (294.97 cc/rev)
<b>Maximum Speed</b>		
Continuous	210 rpm	185 rpm
Intermittent	250 rpm	210 rpm
<b>Maximum Torque</b>		
Peak	6600 in-lbf (75 N-m)	7900 in-lbf (89 N-m)
Continuous	2700 in-lbf (30 N-m)	3200 in-lbf (36 N-m)
Intermittent	4900 in-lbf (75 N-m)	5900 in-lbf (64 N-m)
<b>Maximum Oil Flow</b>		
Continuous	9.4 hp (7 KW)	
Intermittent	20.5 hp (15.4 kW)	
<b>Axle Shaft Diameter</b>	1.375 in (34.925 mm)	
<b>Axle Shaft End Options</b>	4 Bolt Flange 5 Bolt Flange	
<b>Parking Brake Type</b>	Internal Wet Disc	
<b>Max. weight applied to shaft/housing</b>		
Wheel Load Force - Radial	840 lbf (381 kg)	
<b>Weight of Unit</b>	38.2 lb (17.3 kg)	

## PRODUCT IDENTIFICATION

The model and configuration of the HGM-H can be determined from the label found on the transaxle.

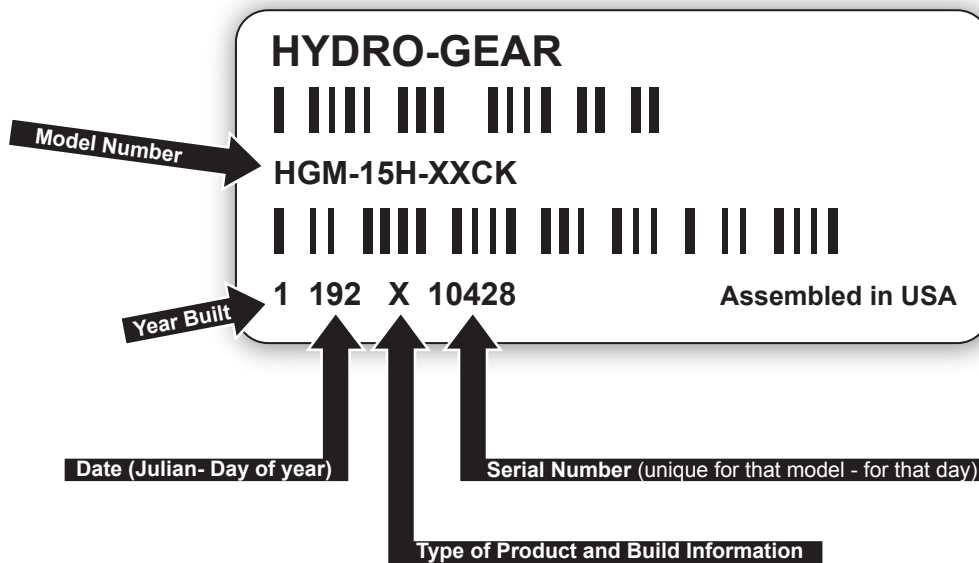


Figure 2, Product Label

# SAFETY



This symbol points out important safety instructions which, if not followed, could endanger the personal safety and/or property of yourself and others. Read and follow all instructions in this manual before attempting maintenance on your hydraulic motor. When you see this symbol - **HEED ITS WARNING.**



## WARNING

### POTENTIAL FOR SERIOUS INJURY

**Inattention to proper safety, operation, or maintenance procedures could result in personal injury, or damage to the equipment. Before servicing or repairing the hydraulic motor, fully read and understand the safety precautions described in this section.**

## PERSONAL SAFETY

Certain safety precautions must be observed while servicing or repairing the hydraulic motor. This section addresses some of these precautions but must not be considered an all-inclusive source on safety information. This section is to be used in conjunction with all other safety material which may apply, such as:

1. Other manuals pertaining to this machine,
2. Local and shop safety rules and codes,
3. Governmental safety laws and regulations.

Be sure that you know and understand the equipment and the hazards associated with it. Do not place speed above safety.

Notify your supervisor whenever you feel there is any hazard involving the equipment or the performance of your job.

Never allow untrained or unauthorized personnel to service or repair the equipment.

Wear appropriate clothing. Loose or hanging clothing or jewelry can be hazardous. Use the appropriate safety equipment, such as eye and hearing protection, and safety-toe and slip-proof shoes.

Never use compressed air to clean debris from yourself or your clothing.

## TOOL SAFETY

Use the proper tools and equipment for the task.

Inspect each tool before use and replace any tool that may be damaged or defective.

## WORK AREA SAFETY

Keep the work area neat and orderly. Be sure it is well lit, that extra tools are put away, trash and refuse are in the proper containers, and dirt or debris have been removed from the working areas of the machine.

The floor should be clean and dry, and all extension cords or similar trip hazards should be removed.

## SERVICING SAFETY

Certain procedures may require the vehicle to be disabled in order to prevent possible injury to the servicing technician and/or bystanders.

The loss of hydrostatic drive line power may result in the loss of hydrostatic braking capability.

Some cleaning solvents are flammable. Use only approved cleaning materials: Do not use explosive or flammable liquids to clean the equipment.

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

Discard used cleaning material in the appropriate containers.

# TROUBLESHOOTING



## WARNING

**Do not attempt any servicing or adjustments with the engine running. Use extreme caution while inspecting the drive belt assembly and all vehicle linkage!**

**Follow all safety procedures outlined in the vehicle owner's manual.**

In many cases, problems with a hydraulic system are not related to a defective hydraulic unit, but are caused by slipping drive belts, partially engaged bypass valves, and loose or damaged control linkages. Be sure to perform all operational checks and adjustments outlined in Service and Maintenance, before assuming the hydraulic system is malfunctioning. The table below provides a troubleshooting checklist to help determine the cause of operational problems.

### TROUBLESHOOTING CHECKLIST

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

## SERVICE AND MAINTENANCE

### EXTERNAL MAINTENANCE

Regular external maintenance of the hydraulic motor 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. Check reservoir oil level in accordance with the vehicle manufacturers recommendations.
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 pump resulting in low flow to the hydraulic motor.
4. Inspect the vehicle control linkage to the directional control arm on the vehicles pump assembly.
5. Inspect the hydraulic motors and pumps for debris. Keeping the units debris free is important in the overall performance of the unit.
6. Inspect all external plumbing for possible leaks or loose fittings. An air leak may be difficult to detect on the "suction side" or inlet line to the pump. Refer to Purging Procedure on page 9.

### SERVICE AND MAINTENANCE PROCEDURES

Some of the service procedures presented on the following pages can be performed while the transaxle 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.

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

all parts must be kept free of foreign material and chemicals.

Protect all exposed sealing surfaces and open cavities from damage and foreign material. The external surfaces should be cleaned before beginning any repairs. **Do not use a pressure washer to clean the transaxle.**

### 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. Refer to the vehicle manufacturer for recommended oil.

### FLUID VOLUME AND LEVEL

Certain situations may require additional fluid to be added or even replaced. **In addition to filling the hydraulic system with fluid, an additional 34 fl. oz. (1000mL) will need to be added to the case via the highest fill point of the HGM-H unit. Reference page 4 for the proper fill location.** Refer to the vehicle manufacturer's recommendations for the proper fill location and level of the complete hydraulic system. After maintenance or oil change, follow purging procedures on page 9 and check the fluid level once the unit has been purged and operated for 1 minute.

### FLUID CHANGE

In the event of oil contamination or degradation, oil addition or change may alleviate certain performance problems. Refer to the vehicle manufacturer's recommended oil change frequency. Refer to purging procedures on page 9 after changing fluids.

### FILTERS

An inlet filter is required to insure that only clean fluid enter the system. Refer to the vehicle manufacturer for approved filter replacement.

# SERVICE AND MAINTENANCE

## PURGING PROCEDURE

The HGM-H motor can not be purged of air as a stand alone component. The hydraulic system as a whole will need to be purged after any addition of oil to the system or a complete oil change. This will most likely involve the use of the hydraulic pumps bypass feature. If this is not available, see the manufacturers recommendation for air purging.

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

These purge procedures must be preformed anytime a hydrostatic system has been opened for maintenance or repair, or if any additional oil has been added to the system.

Air creates inefficiency because it has compression and expansion rates that are higher than that of oil.

Air trapped in the oil may cause the following symptoms:

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 reservoir is at the proper oil level. If it is not, fill to the vehicle manufacturer's specifications.

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



### WARNING

#### POTENTIAL FOR SERIOUS INJURY

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

1. With the vehicles pump assembly bypass valve open and the engine running, slowly move the directional control in both forward and reverse directions (10 to 20 times). As air is purged from the unit, the oil level in the reservoir may drop.
2. With the bypass valve closed and the engine running, slowly move the directional control in both forward and reverse directions (10 to 20 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 hydraulic system moves forward and reverse at normal speed and the reservoir oil remains at a constant level, purging is complete.

# TEAR DOWN AND REASSEMBLY

## HOW TO USE THIS MANUAL

Each subassembly illustrated in this manual is illustrated with an exploded view showing the parts involved. The **item reference numbers in each illustration are for assembly instructions only**. See page 25 for part names and descriptions. A complete exploded view and item list of the 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. **Do not use 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](http://www.hydro-gear.com) or at your Hydro-Gear Central Service Distributor.

## TOOLS

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

## TORQUES

REQUIRED TORQUE VALUES			
Item	Description	Torque	Operation
4	Screw, Housing	280-340 in-lbs (31.6-38.4 Nm)	All Housing Screws
10	Nut, Axle, Castlrelated	275-350 ft-lbs (372.9-474.5 Nm)	Hub
56	Nut, Brake	600-800 in-lbs (67.8-90.4 Nm)	Brake Shaft
80	Plug 9/16-16 (Metal)	110-170 in-lbs (12.4-19.2 Nm)	Oil Input Port

## MOTOR REMOVAL

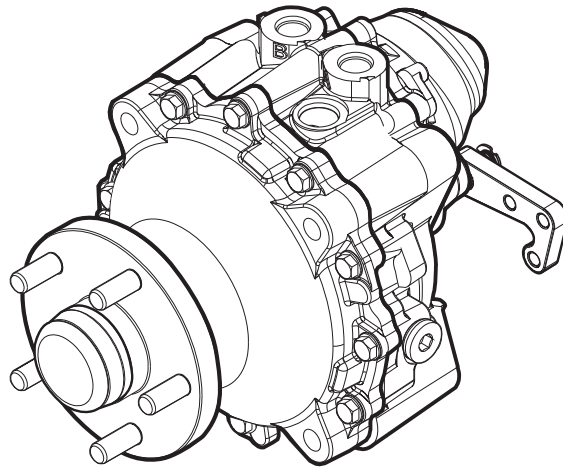
**NOTE:** *It is necessary to remove the HGM-H Motor from the vehicle before performing the repair procedures presented in this section.*

*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 23.*



**Figure 3, HGM-H Wheel Motor**



# AXLE HUB ASSEMBLY

Refer to Figure 4

1. Remove the axle cap and discard (9).
2. Remove the cotter pin and discard (18).
3. Remove the castle nut (10).
4. Remove the taper hub assembly (11) and discard.

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

5. Remove the axle shaft key (17).

## 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 (10)\*, refer to the table on page 11 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 22 FOR ALTERNATE TORQUE METHOD.**

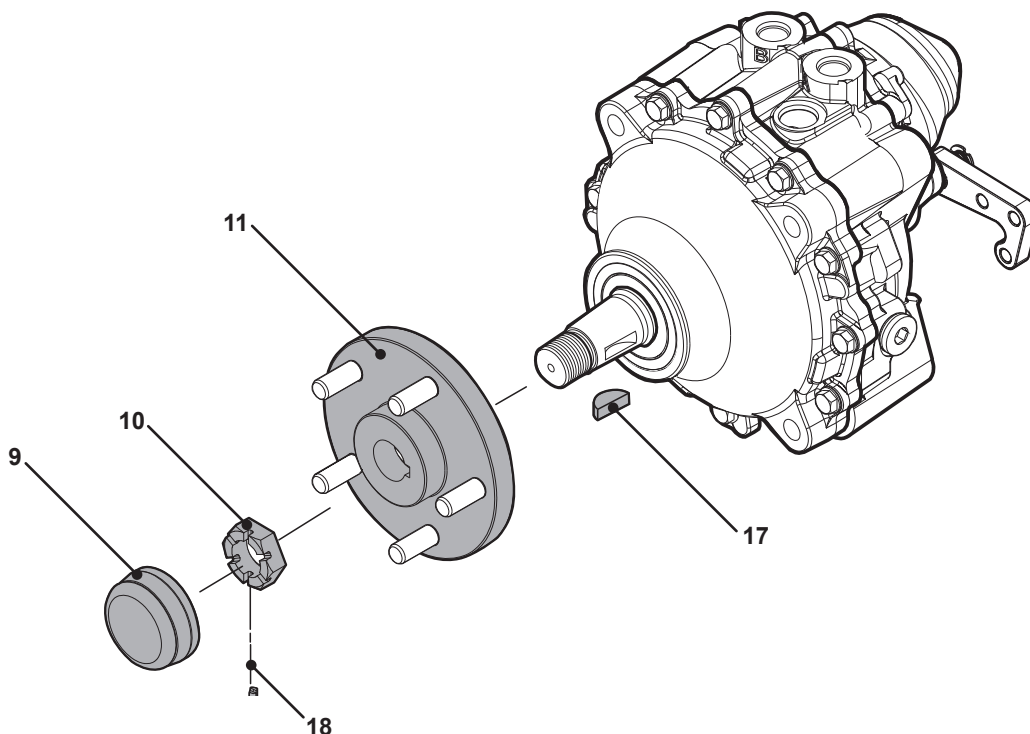


Figure 4, Hub Assembly

# BRAKE ARM ASSEMBLY

Refer to Figure 5

## Disassembly

1. Remove all items previously discussed in their recommended order.
2. Mark the orientation of the brake arm (59) before removal.
3. Remove the retaining ring (60).
4. Remove the brake handle (59), spring (82) and spring pin (83).
5. Remove the spring spacer (81) and brake spacer (57).
5. Remove the dowel pin (84) and the seal (58). Discard the seal.

**NOTE:** Only remove the seal (58) and dowel pin (84) 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 (58) from seal kit.

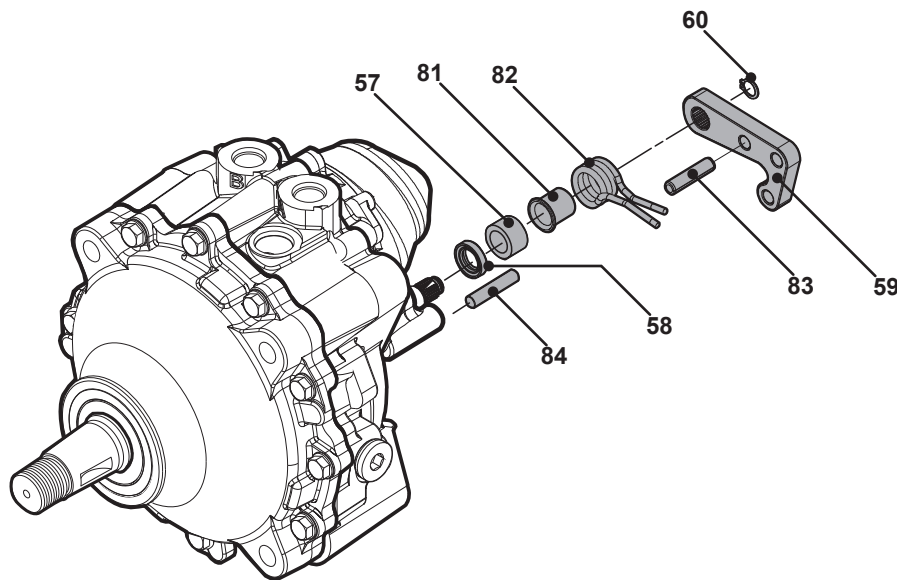


Figure 5, Brake Arm Assembly

# SIDE HOUSING

Refer to Figure 6

## Disassembly

1. Remove all external items previously discussed in their recommended order.
2. Remove the seal (13) and discard.
3. Remove the twelve housing screws (4), then separate axle housing (1) from middle housing (2).

## 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 middle housing face. See “Sealant Application Diagram” on page 21.

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

3. Align the side housing (2) with the main housing (1). Use care not to smear the sealant bead.
4. Install the twelve housing screws (6). Refer to the screw tightening pattern on page 21.
5. When tightening the fasteners, refer to the table on page 11 for the required torque values.
6. Install a new axle seal (13) from the seal kit.

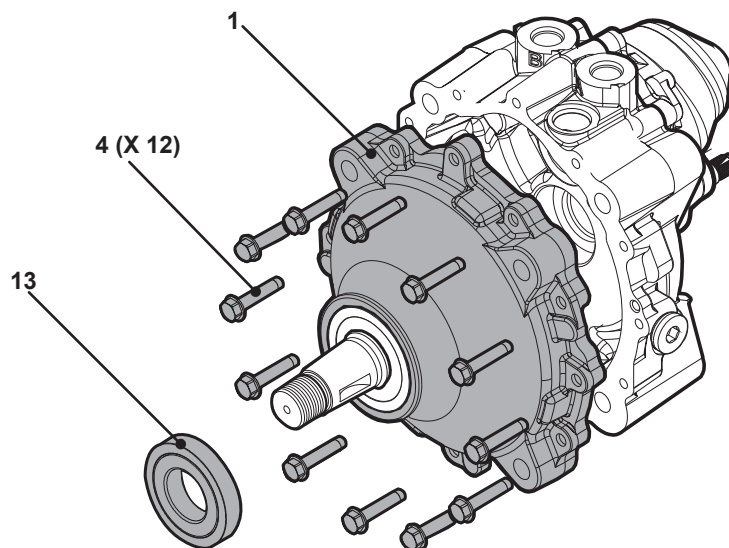


Figure 6, Side Housing

# AXLE SHAFT AND PLANETARY GEAR SET

Refer to Figures 7 and 8

## 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 bearing (14) and washer (15).
3. Remove the ring gear (21).
4. Remove the axle shaft (16) and planetary assembly from the middle housing (2).
5. Remove the axle retaining ring (26), axle shaft spacer (25), axle gear (24), planet gears (22), sun gear (23) and the carrier (20).

**NOTE:** The sun gear (23) and axle gear (24) are pressed as one piece in some models. (Figure 8a)

## 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.

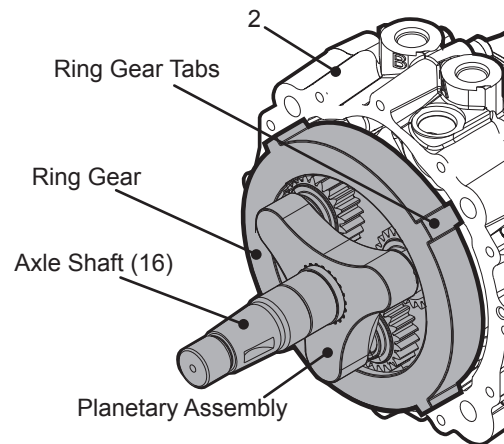


Figure 7, Planetary Gear Set

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

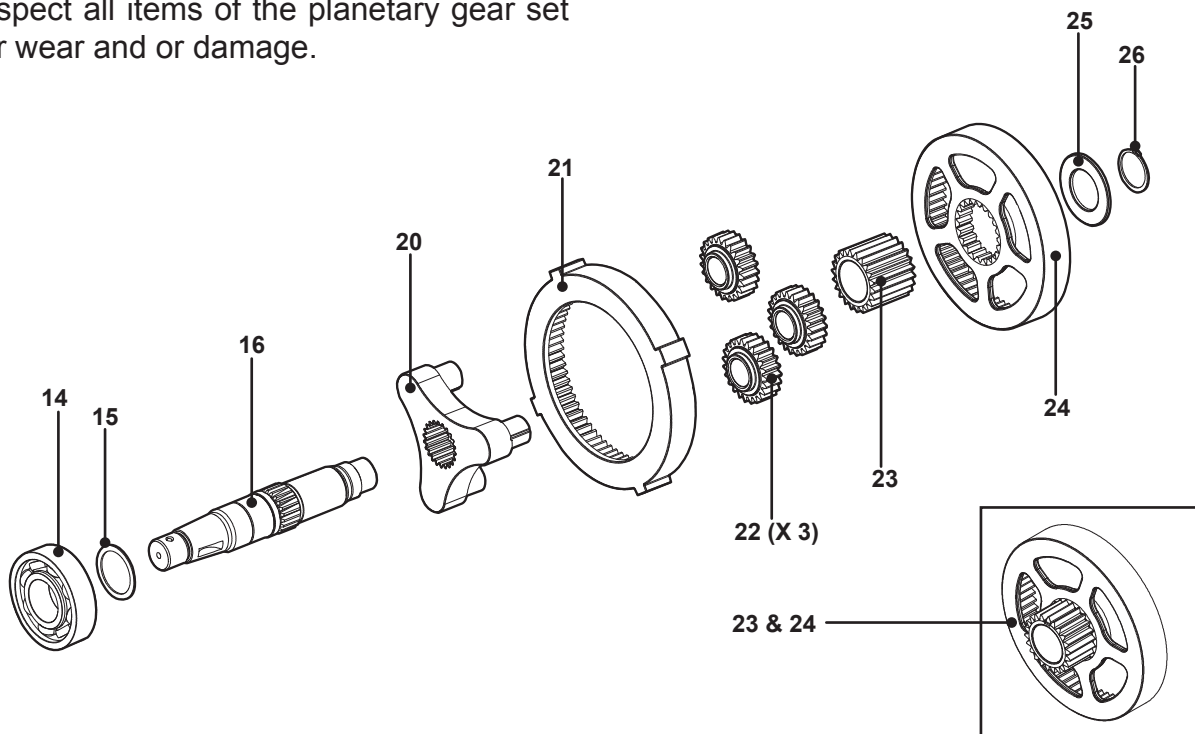


Figure 8a

Figure 8, Planetary Gear Set

# BEARING AND MOTOR BLOCK CAP

Refer to Figure 9

## Disassembly

1. Remove all external items previously discussed in their recommended order.
2. Remove the seven housing cap screws (4) and the housing cap (3).
3. Remove the o-ring (6) and discard.
4. Remove the thrust bearing (45), retaining ring (47) and washer (46). Discard the retaining ring (47)

## Inspection

1. Inspect the races of the thrust bearing (80) for wear or damage.

## Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Install new o-ring (6) and retaining ring (47) from seal kit.
3. Place the thrust bearing assembly (45) so the thick race contacts the motor block pistons.
4. Install the seven housing screws (6). Refer to the screw tightening pattern on page 21.
5. When tightening the fasteners, refer to the table on page 11 for the required torque values.

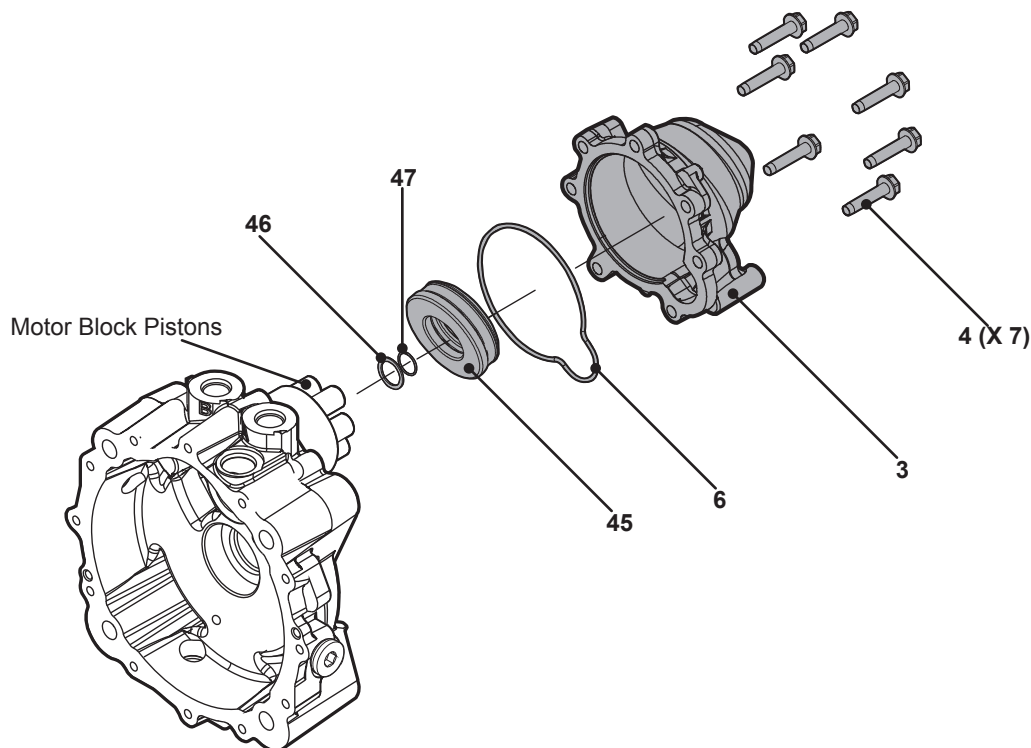


Figure 9, Motor Block Cap and Bearing

# MOTOR BLOCK

Refer to Figure 10

## Disassembly

1. Remove all external items previously discussed in their recommended order.
2. Remove the motor block assembly (40) from the middle housing (2).
3. Disassemble the motor block assembly and inspect all parts.

## Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. Apply a light coating of oil to all running surfaces to prevent scoring during reassembly.

## Inspection

1. Inspect the pistons (43), piston seats (42), springs (41) and the motor cylinder block (40) of the motor block assembly for scratches and or wear. Replace the motor block assembly if necessary.

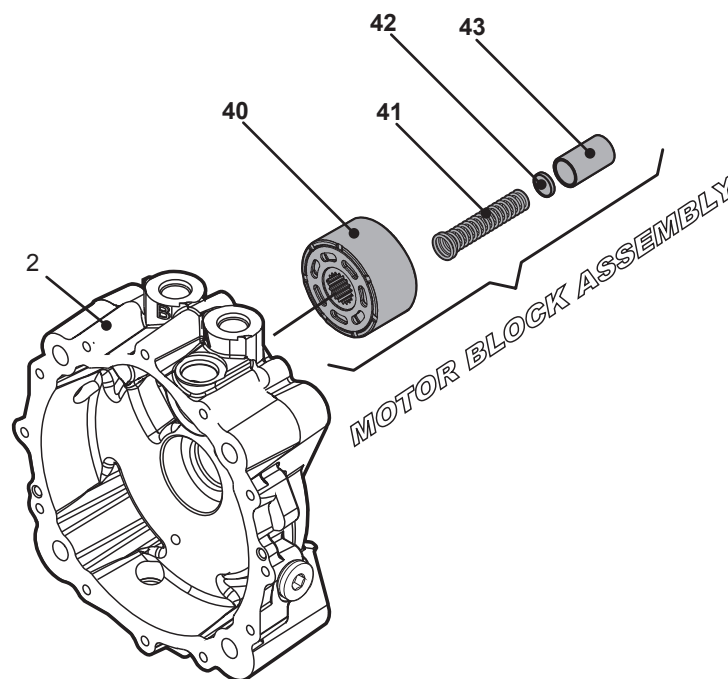


Figure 10, Motor Block

# MOTOR SHAFT AND AXLE BEARING

Refer to Figure 11

## Disassembly

1. Remove all external items previously discussed in their recommended order.
2. Remove the motor shaft (34), retaining ring (30) and gear (31) out of the middle housing (2).
3. Remove the brake rotor (32) and the washer (33).
4. Remove the inboard axle bearing (27).

## Inspection

1. Inspect for scratches and or damage to the brake rotor (32).
3. Inspect the gear (31) and motor shaft (34) for wear or damage.

## Assembly

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

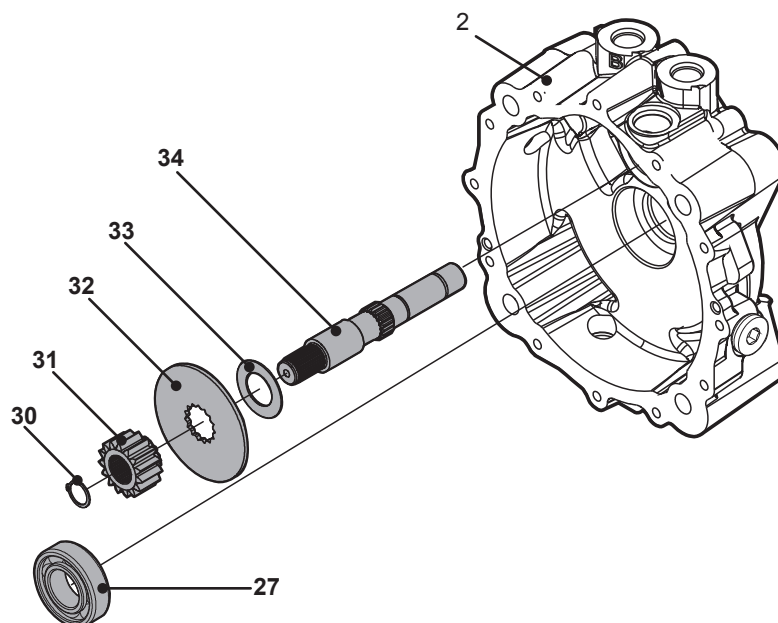


Figure 11, Motor Shaft and Brake Disc

# BRAKE SHAFT AND CAM

Refer to Figure 12

## 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. Remove the brake shaft nut (56) and washer (55).
3. Remove the brake shaft (50), the splined cam (51), the puck cam (52) and brake puck (54).
4. Remove the magnet screw (7) magnet (8) and dowel pin (53).

**NOTE:** *Only remove the dowel pin (53) and magnet components (7, 8) if damage is present.*

## Inspection

1. Inspect the puck (54) for excessive wear.
2. Inspect all components for wear or damage.

## Assembly

1. Reassemble all parts in the reverse order of disassembly.
2. When tightening the nut (56), refer to the table on page 11 for the required torque values.

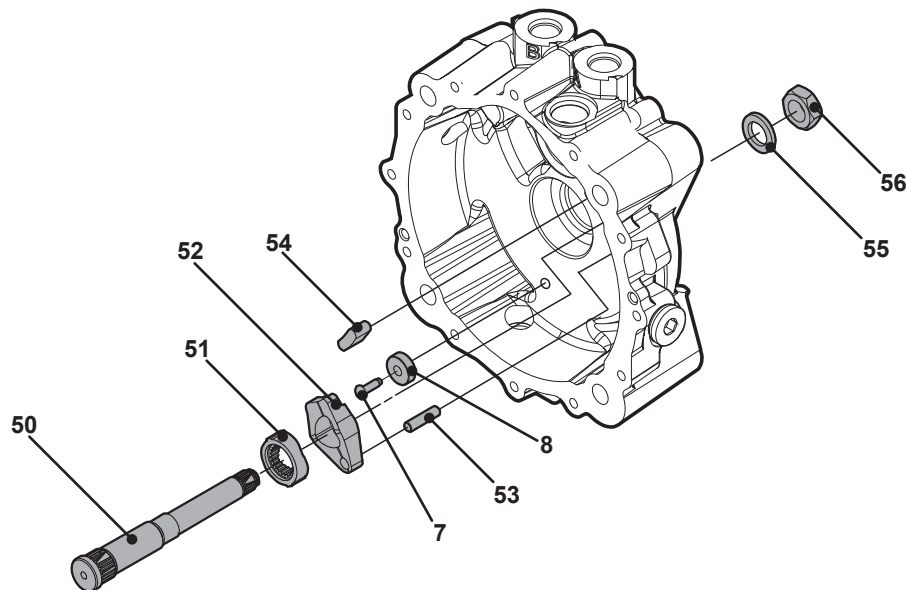


Figure 12, Brake Shaft Assembly



# SCREW TIGHTENING SEQUENCE

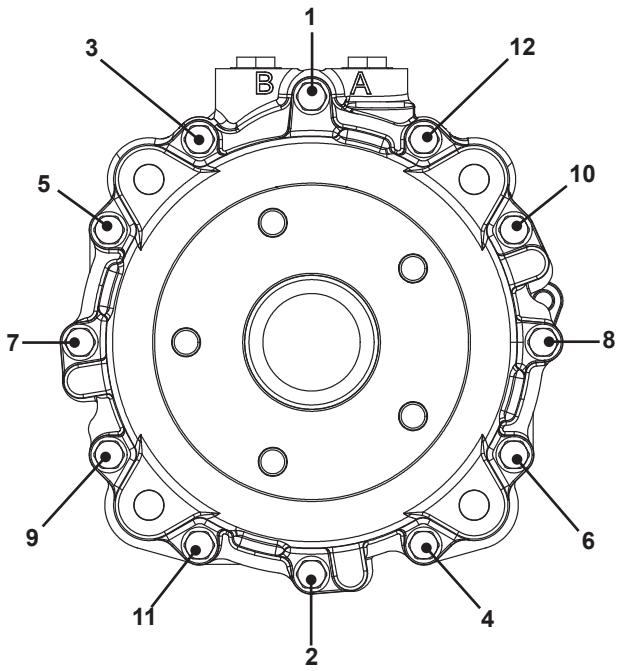


Figure 13, Side Housing Bolt Sequence

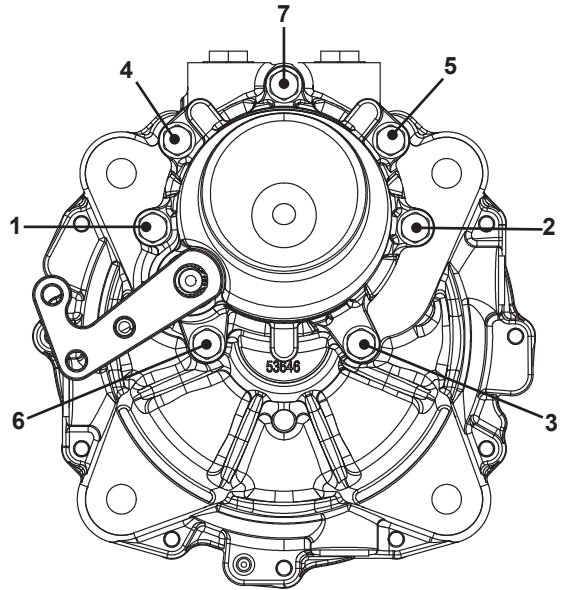


Figure 14, Motor Housing Cap Bolt Sequence

# SEALANT PATH

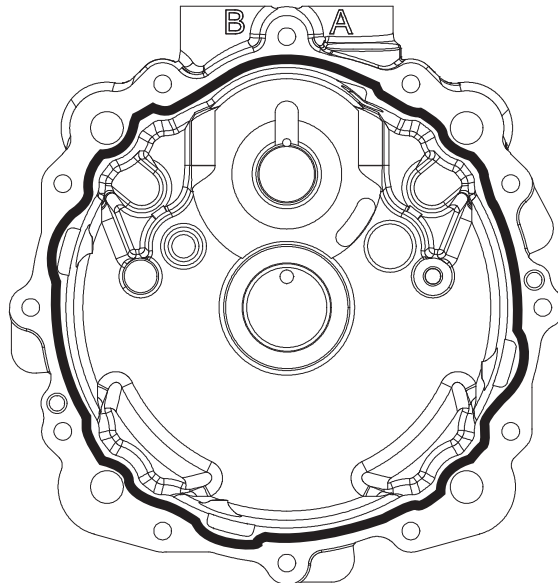


Figure 15, Sealant Path

# CASTLE NUT (10) 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 16. (Point A)
6. Measure 2 nut flats or 120° per Figure 16 and mark hub. (Point B)
7. Turn nut clockwise until mark "A" lines up with mark "B". (Figure 17)
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.

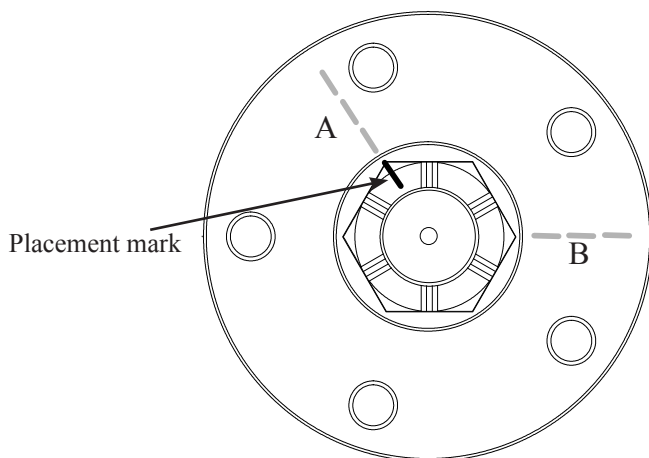


Figure 16

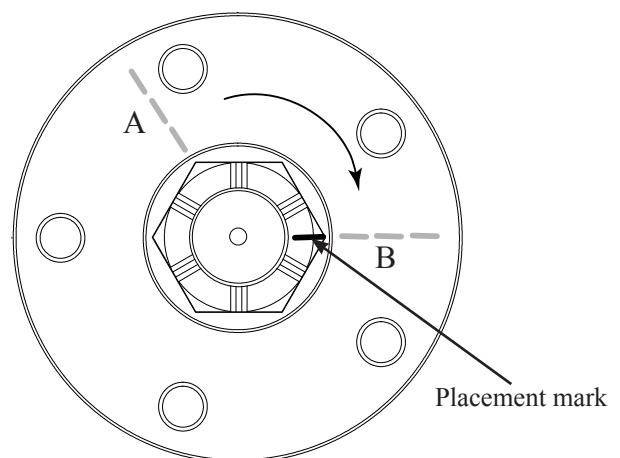


Figure 17

Figure 16 / Figure 17, Alternate Torque Method

## 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.

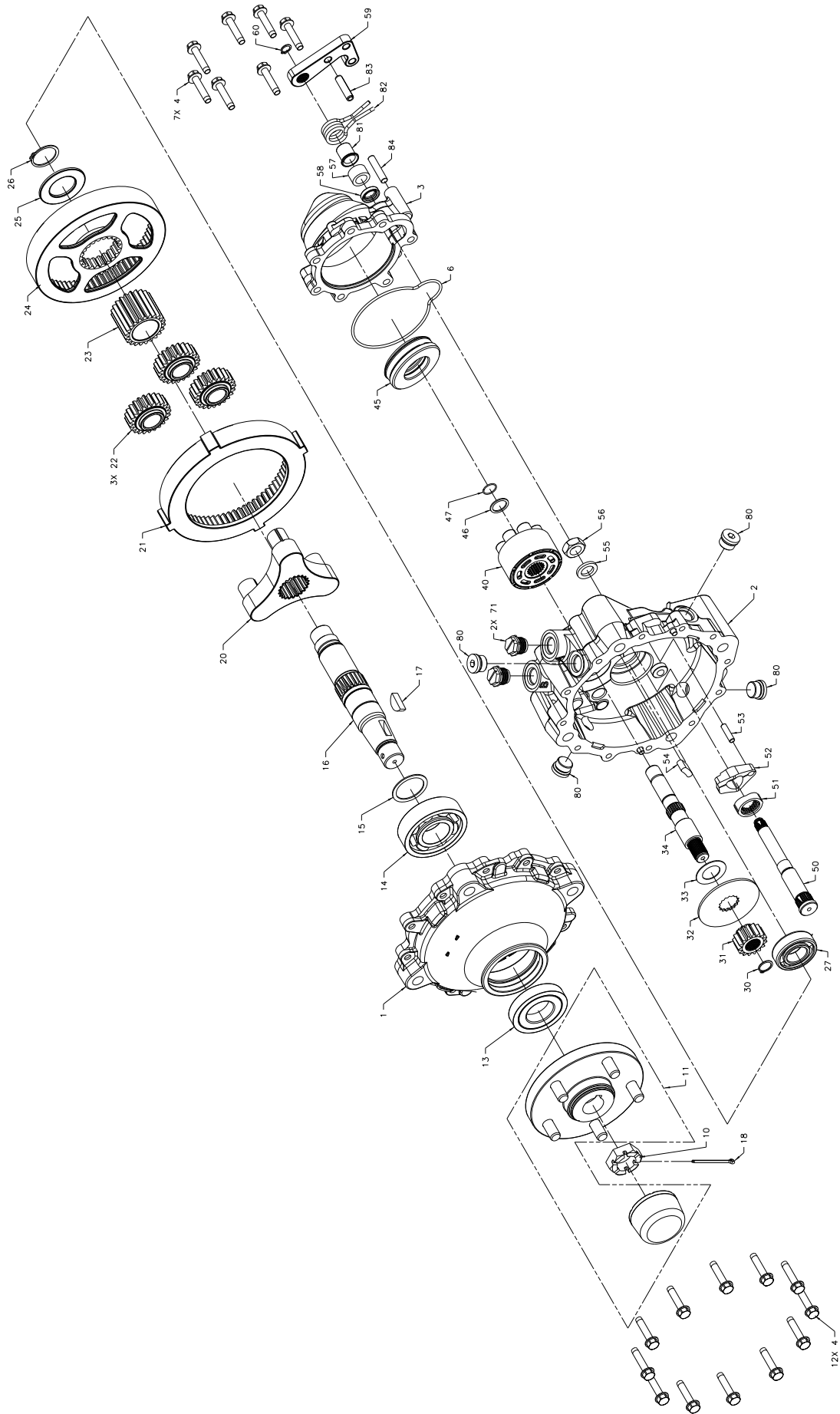
The part reference numbers provided in each assembly procedure are keyed to the individual exploded views, and are also keyed to the complete unit exploded view on page 24.

1. Install the brake shaft (50) and cam assembly (51, 52) to the middle housing (2). Page 20
2. Install the inboard axle bearing (27). Page 19
3. Install the motor shaft (34), washer (33), brake rotor (32), motor shaft gear (31), retaining ring (30). Page 19
4. Install the block assembly (40) onto the motor shaft (34). Page 18
5. Install the retaining ring (46) and washer (47) onto the motor shaft (34). Page 17
6. Install the thrust bearing (45), o-ring (6), housing cap (3) and housing cap screws (7). Page 17
7. Install the three planet gears (22) onto the carrier (20) and then onto the axle shaft (16). Install the sun gear (23) onto the axle shaft (16). Install the bull gear (24), thrust spacer (25) and retaining ring (26) onto the axle shaft and set assembly aside. Place the axle assembly into the main housing. Install the ring gear (21) onto the axle shaft so that the teeth mesh with the planet gears and install the washer (15) and axle bearing (14) onto the axle shaft (16). Page 16
8. Apply sealant material onto housing middle housing (2). Page 21
9. Install the axle housing (1), the 12 housing screws (4), and the axle seal (13). Page 15
10. Install brake dowel pin (84), brake seal (58), brake spacer (57), and spring spacer (81). Page 14
11. Install the brake arm spring (82), the spring pin (83), the brake arm (59), and the retaining ring (60). Page 14
12. Install the axle key (17), hub assembly (11), axle nut (10), cotter pin (18) and axle cap (9). Page 13
13. Install the unit into the machine and fill the case with 34 fl. oz. of fluid after filling the hydraulic system. Page 8

**Note:** *Make sure that two of the tabs on the outer diameter of the ring gear (21) locate between the tabs cast into the main housing.*

*- Some models will have the sun gear (23) and the bull gear (24) as one pressed gear.*

# HGM-H MOTOR EXPLODED VIEW



# HGM-H MOTOR PARTS LIST

1	Housing, Axle
2	Housing, Middle
3	Housing, Motor Block
4	Screw, Housing
6	O-ring, Motor Housing
9	Cap, Axle
10	Nut, Axle
11	Hub, Taper (1.25, 4 Bolt / 1.25, 5 Bolt)
13	Seal, Axle
14	Bearing, Axle, Outboard
15	Spacer, Axle
16	Axle
17	Key, Woodruff, Axle
18	Pin, Cotter 5/32 X 2
20	Carrier
21	Gear, Ring
22	Gear, Planet
23	Gear, Sun
24	Gear, Internal, 71T
25	Spacer, Axle, Gear
26	Retaining Ring
27	Bearing, Axle, Inboard
30	Retaining Ring, Motor Shaft
31	Gear, 19T
32	Rotor, Brake
33	Washer, Motor Shaft
34	Shaft, Motor
40	Motor Block Kit, 16cc Cylinder
45	Thrust Bearing
46	Washer
47	Retaining Ring, External
50	Shaft, Brake
51	Splined Cam, Brake
52	Cam Puck, Brake
53	Pin, Ground, Dowel
54	Brake Puck
55	Washer, Flat .63 X 1.0 X .125
56	Nut, Brake
57	Spacer, Brake
58	Seal, Brake
59	Handle, Brake Actuating
60	Retaining Ring, Brake Handle
71	Plug, 3/4 SAE, Plastic
80	Plug, 3/4-16, Metal
81	Spacer, Spring
82	Spring, Torsion
83	Pin, Spring 5/16 X 1.375
84	Pin, Hardened Ground Dowel 5/16 X 1.5

## 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



# NOTES







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