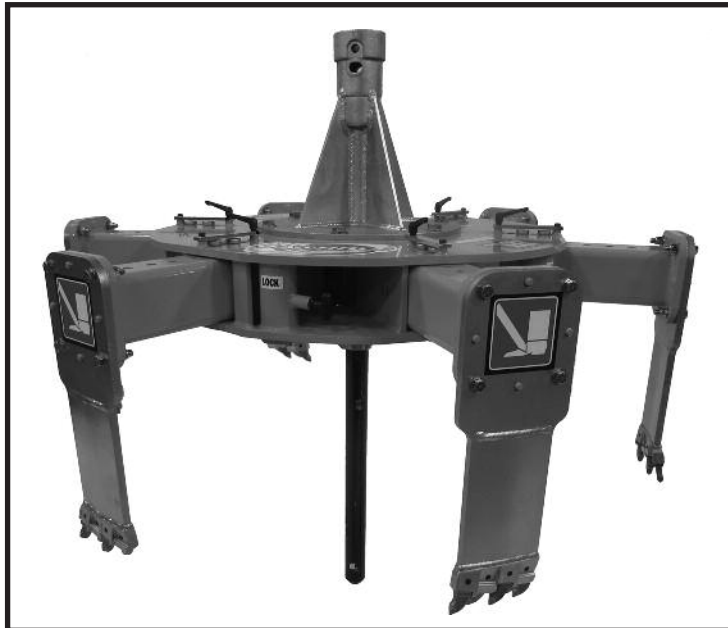




Manhole Cutter Model MM-SUPER DUTY

Hydraulic Drive Unit OPERATOR'S MANUAL

Serial Number _____



WARNING! Avoid injury or death. Read and understand this entire manual before installing, operating or servicing this equipment.

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Congratulations on the purchase of your MM-SUPER DUTY DRIVE UNIT

You have invested in a quality piece of equipment backed by people with years of experience. But only by proper installation, operation, and maintenance can you expect to receive the dependable performance and long life for which the cutter was designed.

This operator's manual contains information regarding the installation, operation, safe use, and maintenance of your MM-SUPER DUTY Drive Unit. ***Please be sure that all operators study this manual carefully and keep it on file for future reference.***

After reading this manual, if you have any questions about your MM-SUPER DUTY Drive Unit, please contact Mr. Manhole immediately as follows:

Phone: 419.741.9075
Fax: 419.692.1600
Web: www.mrmanhole.com
E-Mail: sales@mrmanhole.com

We strive to provide superior products and the highest level of customer service. If you have any suggestions on how we can improve for the future, we would appreciate hearing from you.

Thank you for putting your trust in Mr. Manhole

Mr. Manhole Drive Units

Proudly Manufactured in the U.S.A. by:

PREMIER Hydraulic Augers, Inc.

2707 Lofty Drive

Fort Wayne, IN 46808

**MR. MANHOLE MM-SUPER DUTY DRIVE UNIT
WARRANTY REGISTRATION**

Date of Purchase: _____

Model #: _____ Serial #: _____

Owner Information:

Owner's Name _____ Phone _____

Company Name _____

Address _____

City _____ State _____

Zip Code _____ Country _____

Dealer Information:

Dealer Salesman _____ Phone _____

Dealer Name _____

Address _____

City _____ State _____

Zip Code _____ Country _____

Installation & Application Information:

This MM-SUPER DUTY Drive Unit will be mounted on: _____

This Mr. Manhole MM-SUPER DUTY Drive Unit has been accepted in good condition and I have been instructed by the dealer and/or read and understand the entire Operator's Manual for proper installation, proper and safe operation, preventative maintenance and service, warranty and all other information covered in the Operator's Manual. I also understand that all operators must read and understand the entire Operator's Manual.

Owners Signature _____

This page must be returned within 10 days of purchase to validate warranty.

Return To: Mr. Manhole
125 S. Canal St.
Delphos, OH 45833

MR. MANHOLE MM-SUPER DUTY DRIVE UNIT WARRANTY POLICY

Serial #: _____

Mr. Manhole warrants its products to be free from defects in material or workmanship for a warranty period as stated below:

MM-SUPER DUTY DRIVE UNIT:	1 YEAR WARRANTY
PLANETARY OUTPUT SHAFT:	6 MONTH LIMITED WARRANTY

The warranty period begins on the date of purchase, by the original purchaser.

Warranty Performance

To make a claim under this warranty, contact the dealer where the unit was purchased, who will then obtain written return authorization from Mr. Manhole. All warranty returns must be accompanied by a Mr. Manhole Return Authorization.

Remedy

During the applicable warranty period Mr. Manhole, at its option will repair or replace, free of charge, any product determined by it to be defective. Such repair or replacement shall take place at a location designated by Mr. Manhole.

Exclusions From Warranty Coverage

1. This warranty automatically is void if any attempt is made to make field repairs to hydraulic motors or planetary gear reductions. To qualify for warranty performance the complete unit must be available for Mr. Manhole's inspection in its original "failed" condition.
2. There is no warranty against failures caused by or related to alterations or modifications made without the express written consent of Mr. Manhole.
3. Under no circumstances shall Mr. Manhole be responsible for the cost of labor for field replacement or repair, nor for damage caused by accident, misapplication, abuse, misuse, operator error, or environmental elements.
4. This warranty does not apply to parts subject to normal wear, such as teeth, nor to damage caused by failure to perform recommended maintenance or to replace worn parts.
5. Under no circumstances shall Mr. Manhole be obligated for the cost of any repair or replacement by anyone other than Mr. Manhole, without its express written consent.

Limitations And Exclusions

This warranty is in lieu of all other warranties written or oral, express or implied, statutory or otherwise arising by operation of law, including any warranty of merchantability or fitness for purpose.

The liability of Mr. Manhole arising out of the supplying of any product covered by this warranty contract, negligence or otherwise shall not in any case exceed the cost of parts or labor required to rebuild or replace such defective product, together with the transportation costs attributable thereto. Upon the expiration of the applicable warranty period herein specified, all such liability shall terminate.

This warranty constitutes the entire warranty of Mr. Manhole, and no oral representations, warranties or guarantees by any agent of Mr. Manhole, or the seller shall be binding on Mr. Manhole, and no part of this warranty may be modified or extended except upon the express written consent of Mr. Manhole.

Improvements

Mr. Manhole continually strives to improve our products. Mr. Manhole reserves the right to make changes or additions to any product without incurring any obligation whatsoever to make such changes or additions to products previously sold.

SAFETY INFORMATION

THE USE OF THIS EQUIPMENT IS SUBJECT TO CERTAIN HAZARDS WHICH CANNOT BE PROTECTED AGAINST MECHANICAL MEANS OR PRODUCT DESIGN. ALL OPERATORS OF THIS EQUIPMENT MUST READ AND UNDERSTAND THIS ENTIRE MANUAL, PAYING PARTICULAR ATTENTION TO SAFETY AND OPERATING INSTRUCTIONS, PRIOR TO USING THE MR. MANHOLE DRIVE UNIT. IF THERE IS SOMETHING IN THIS MANUAL YOU DO NOT UNDERSTAND, ASK YOUR SUPERVISOR TO EXPLAIN IT TO YOU. FAILURE TO OBSERVE THESE SAFETY PRECAUTIONS CAN RESULT IN DEATH OR SERIOUS INJURY OR SERIOUS EQUIPMENT DAMAGE.



All bystanders should be kept a minimum of 10 feet away from working area of the drive unit.



Always wear an OSHA approved hard hat and safety eye protection when operating or servicing this equipment. Do not wear loose fitting clothing, flopping cuffs, dangling neckties and scarves, or rings and wrist watches that can catch moving parts.



An operator must not use drugs or alcohol, which can alter his alertness or coordination. An operator taking prescription or over the counter drugs should seek medical advice on whether or not he can safely operate equipment.



Always locate underground electrical wires, telephone cables, and gas, water, and sewer lines before digging. Maintain safe clearance and avoid contact with any underground or overhead utility lines or electrically charged conductors.



Never alter or remove any safety decals or safety shields. Check this manual for location of these items and replace immediately if damaged or illegible.



Never adjust a relief valve for pressure higher than recommended by vehicle manufacturer.



Whenever changing or installing this or other attachments, make sure all connections are securely fastened.



Travel only with the drive unit in a safe transport position to prevent uncontrolled movement. Drive slowly over rough ground and on slopes. Tether drive unit with a chain, if necessary, to prevent uncontrolled swinging of drive unit when moving from hole to hole. Remove drive unit from vehicle when transporting to and from job site.



Before exiting the vehicle, lower the unit to the ground, turn off vehicle engine and lock vehicle breaks.

(continued)

SAFETY INFORMATION



Never check a pressurized system for leaks with your bare hand. Oil escaping from pin-hole leaks under pressure can penetrate skin and could cause serious infection. Hold a piece of cardboard up next to suspected leaks and wear a face shield or safety eye protection. If any fluid is injected into the skin, it must be removed immediately by a doctor familiar with this type of injury.



Before disconnecting hydraulic lines or fittings be sure to relieve all pressure by cycling all hydraulic controls after shutdown. Remember hydraulic systems are under pressure whenever the engine is running and may hold pressure after shutdown. Before applying pressure to the system make sure all connections are tight and that there is no damage to lines, fittings, and hoses.



Flow and pressure gauges, fitting, and hoses must have a continuous operating pressure rating of at least 25% higher than highest pressures of the system.



Avoid steep hillside operation, which could cause the vehicle to overturn. Consult your vehicle operator's and safety manuals for the maximum incline allowable.

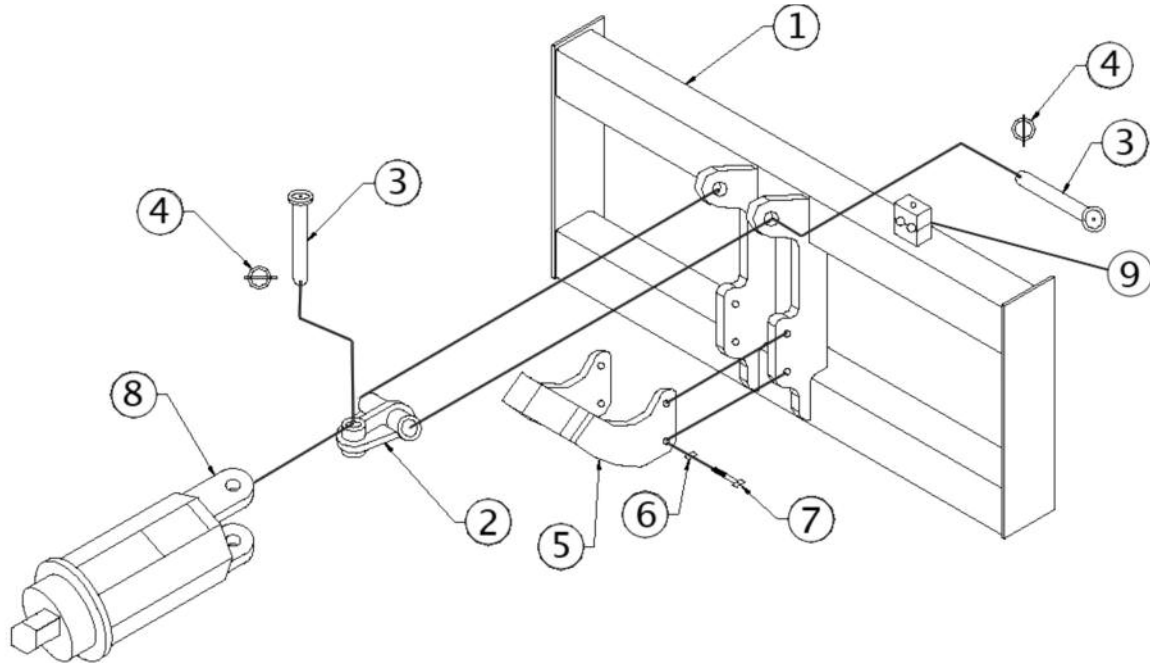


Never perform any work on drive unit unless you are authorized and qualified to do so. Always read the operator service manual before any repair is made. After completing maintenance or repair, check for correct functioning of the drive unit. If not functioning properly always tag "DO NOT OPERATE" until all problems are corrected.



This manual covers the safe use, installation, operation, and service instructions for the drive unit only. Always read the operating and safety manuals prepared for your vehicle and any other attachments before using them.

SKID STEER LOADER INSTALLATION INSTRUCTIONS

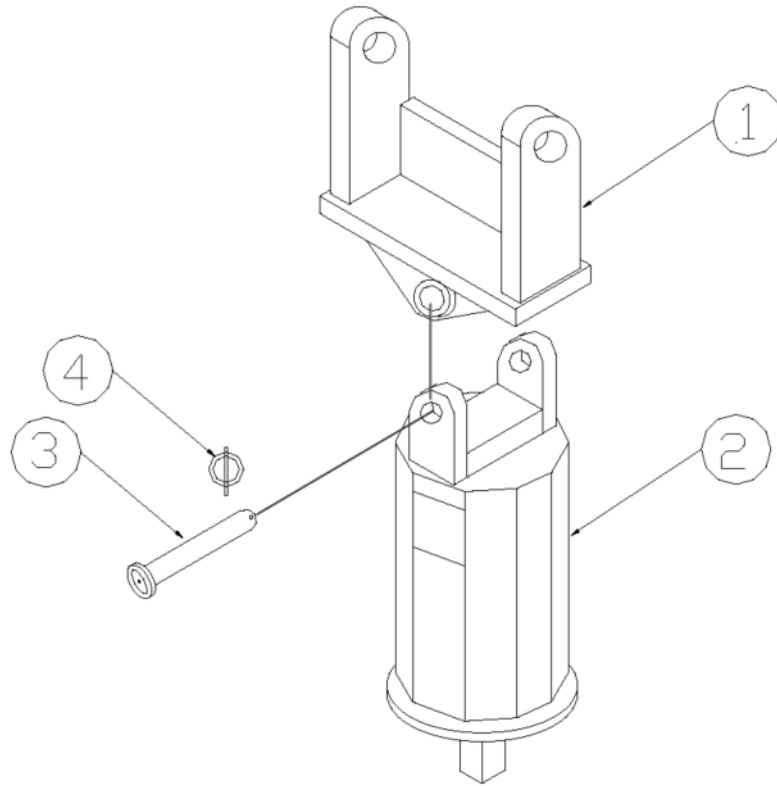


QUICK ATTACH MOUNTING BRACKET

<u>Ref.#</u>	<u>Part #</u>	<u>Description</u>
1	95020	Mount Weldment
2	91002	Knuckle Weldment
3	91001	Pin Weldment
4	40052	Snap Ring (Qty. 2)
5	91003	Carrier Weldment
6	40005	1/2"-13 Nut
7	40006	1/2"-13 HHCS 2-1/4" Long
8	N/A	Drive Unit
9	KIT	Hose Holder with Spring

- 1. READ AND UNDERSTAND ALL SAFETY INFORMATION BEFORE ATTEMPTING INSTALLATION.**
- Remove bucket or other attachment from vehicle quick attach mechanism.
- Assemble carrier weldment (5) to quick attach mounting bracket (1) with supplied 1/2" -13 HHCS 2" Long (7) and 1/2"-13 (6) hex nut.
- Attach quick attach mounting bracket (1) to vehicle quick attach mechanism as per the vehicle manufacturer's recommendations.
- Attach knuckle weldment (2) to the quick attach mounting bracket (1) with pin (3). Secure pin (3) with supplied snap rings (4).
- Attach and secure drive unit (8) to knuckle weldment (2) with pin (3). Secure pin (3) with supplied snap rings (4).
- Refer to the "Hydraulic System Hook-up" (page 11) in this manual for hydraulic connection instructions and recommendations.

BACKHOE & EXCAVATOR INSTALLATION INSTRUCTIONS



Ref.#	Part #	Description
1	(Varies by Host Machine)	Backhoe Mounting Bracket
2	MM-SUPER DUTY	Drive Unit
3	91001	Pin Weldment
4	40052	Snap Ring (Qty. 2)

1. **READ AND UNDERSTAND ALL SAFETY INFORMATION BEFORE ATTEMPTING INSTALLATION.**
2. Remove bucket from dipper arm and curl cylinder pin connections. The dipper arm pin will be used to attach backhoe mounting to backhoe dipper arm. Curl cylinder pin will not be required for drive unit installation.
3. Attach backhoe mounting bracket (1) to the dipper arm using the dipper pin removed from bucket in step #2. Secure bucket pin as per vehicle manufacturer's recommendation.
4. Attach drive unit (2) to backhoe mounting bracket (1) with pin weldment (3) and snap rings (4) supplied with drive unit.
5. Refer to the "Hydraulic System Hook-up" section in this manual for hydraulic connection instructions and recommendations.

HYDRAULIC SYSTEM HOOK-UP INSTRUCTIONS

1. Once the installation instructions are complete you are now ready to make the hydraulic connections necessary to operate your drive unit. **Read and understand safety information prior to making hydraulic connections.**
2. Your equipment dealer is in the best position to advise you as to where the best place on your machine is to make the hydraulic connections to power your drive unit. Some of the most common places to “tap” into the hydraulic system on various types of machines are as follows:

Skid Steer LoadersAuxiliary Hydraulic Outlets.

Backhoes & ExcavatorsAuxiliary Hydraulic Outlets or Bucket Curl Cylinder Outlet.

Wheel LoadersAuxiliary Hydraulic Outlets or Bucket Dump Cylinder Circuit.

3. Determine the length of hydraulic hoses required to plumb drive unit into the place on your machine where you will be “tapping” in to the hydraulics. Be sure the two hydraulic hoses are long enough to perform at the full range of the drive unit’s operating capacity.
4. Drive Unit Model MM-SUPER DUTY requires two 3/4” I.D. hoses with #12 JIC female fittings on one end of each to connect hoses to drive unit fittings.
5. Once all hydraulic connections have been made and checked for leaks and proper hose lengths, you are now ready to operate your drive unit. **Read and understand operating instructions and safety information prior to operating your drive unit.**



WARNING! Hoses and Fittings must have a Continuous Operating Pressure Rating of at least 25% Higher than the Highest Pressures of the System that you are “tapping” into.

OPERATING INSTRUCTIONS

1. After all installation instructions have been completed, safety information read and understood and the rest of this operator's manual has been reviewed, your Hydraulic Drive Unit is now ready to use.
2. With the cutter raised off the ground and the vehicle engine set at a low RPM, activate the drive unit control valve to determine position control valve lever must be in to turn cutter in a forward (clockwise) rotation. This is the "cutting" position.
3. Before beginning to cut, experiment with drive unit speed to determine a suitable cutter RPM. To increase cutter RPM, increase vehicle engine RPM. To decrease cutter RPM, decrease vehicle engine RPM.
4. Return drive unit control valve to neutral position to stop the cutter.
5. Activate the drive control valve so cutter is turning in a forward (clockwise) rotation. Use only enough down pressure to assure positive penetration of cutter into the ground. Ease up on down pressure if cutter rotation slows down drastically or stalls. Excessive down pressure will cause the cutter to stall frequently.
6. Once the required hole depth is reached, allow the cutter to turn a few seconds at this depth to clean the hole.
7. Return the drive unit control valve to the neutral position to stop the rotation of the cutter. Raise the cutter out of the hole, move away from the hole.
8. In some soil conditions or when excessive down pressure is applied, cutter may "screw" itself into the ground and become stuck causing drive unit to stall. If this happens, reverse the drive unit rotation (counter Clockwise) by moving the control valve lever to the reverse position, then slowly raise the cutter. Once the cutter is unstuck, return control valve lever to the forward position and continue cutting.
9. If the cutter becomes lodged under rocks, roots, or other large obstructions, do not attempt to raise cutter out of the ground. See step 8 for proper procedure to relieve the cutter.
10. Avoid excessive side loading to the drive unit which can cause drive unit or cutter damage.
11. Keep cutter in good condition. Check frequently and always keep spare teeth on hand so they can be replaced as wear is detected to avoid damage to the cutter.

MAINTENANCE INSTRUCTIONS

1. **CLEAN HYDRAULIC OIL IS ESSENTIAL!** 80% of all hydraulic component failures are caused by contamination of the hydraulic oil. Always keep all dirt and other contaminants from entering hydraulic system during disconnect and connect operations. Always use dust caps and plugs on all quick disconnects when not in use. Tightly cap all hydraulic openings to hold oil in and keep dirt and other contaminants from entering hydraulic systems.
2. **CHECK ALL HYDRAULIC OIL DAILY FOR CONTAMINATION.** If contamination is present, determine the source of the problem.
3. **INSPECT ALL HYDRAULIC HOSE ASSEMBLIES DAILY** for cracked and brittle covers caused by excessive heat. Reduced viscosity of hydraulic oil occurs at higher operating temperatures and causes a breakdown of fluid additives such as wear inhibitors. Excessive heat will cause higher internal leakage in drive unit motor to become brittle and crack. Replacement of hoses before failure will prevent loss of hydraulic oil, time consuming “bleeding” of system, hydraulic oil contamination, and component damage caused by cavitations. It will also reduce the chance of personal injury caused by hydraulic fluid.
4. **CHECK CUTTER DAILY** for loose, worn or broken cutting teeth. Worn teeth can drastically affect cutter penetration and greatly reduce cutter life expectancy. Always keep spare teeth on hand. Some digging conditions may require checking teeth at more frequent intervals.
5. **CHECK DRIVE UNIT AND ALL ACCESSORIES DAILY** for loose, bent, cracked, or worn, bolts and fasteners. Always use grade 5 or better replacement bolts. Always use lock washers with standard hex nuts or self locking nuts.
6. **CHECK ALL CONNECTING PINS DAILY** for bends, cracks, breaks, or wear. Replace if any of these conditions exist.
7. **CHECK DRIVE UNIT OUTPUT SHAFT DAILY** for bends, cracks, breaks, or wear. Replace if any of these conditions exist.
8. **CHANGE PLANETARY GEAR REDUCTION OIL AFTER FIRST 50 HOURS OF OPERATION, THEN EVERY 1000 HOURS OR IN ONE YEAR, WHICHEVER COMES FIRST.** Use mild extreme pressure lubricant API-GL-5 number 80 or 90 for filling planetary gear reduction under normal temperature ranges between 0 degrees and 120 degrees. Approximate oil capacity for MM-SUPER DUTY is **two quarts**. ***Check oil level daily to assure proper lubrication is maintained.***
9. When storing Drive Unit for any length of time be sure Drive Unit motor and hoses are full of clean oil. Also, be sure that Planetary Gear Reduction is full to the recommended capacity for each model as outlined in number 8 above.
10. Drive Unit Output Shaft, inside of Cutter Collar, and all Connecting Pins should be coated liberally with grease as required to prevent rust and reduce wear.
11. Check Planetary Gear oil as follows. Lie Drive Unit horizontal with ground place bottom drain plug straight up. Remove plug, tilt drive unit at 2:00 or 10:00. Fill until oil leaks out from hole at one of these positions.

TROUBLESHOOTING

Problem	Possible Cause	Solution
Slow Speed	Low flow	Check Flow Meter. If low, investigate the cause.
	Line restrictions	Clear lines.
	Fittings or connections too small	Replace with proper sizes.
	Oil filter dirty	Replace.
	Hydraulic pump worn or damaged	See Dealer for repair.
Insufficient Cutting Power	Worn Teeth	Replace.
	Low System Pressure	Check Pressure Gauge. If low, investigate cause.
	Relief Valve damaged or setting wrong	Adjust or replace as required.
	Excessive Load	Reduce load to within machine specifications.
Reverse Direction	Hoses Reversed	Re-install hoses correctly.
Excessive Oil Heating	Line Restrictions	Clear lines.
	Fluid Dirty	Replace hydraulic fluid & filter.
	Insufficient amount of hydraulic fluid	Fill reservoir to proper level. Increase reservoir storage capacity.
Oil Leaks	Hoses loose or damaged	Tighten or replace.
	Fittings loose or damaged	Tighten or replace.
	Hydraulic motor seals worn or damaged	See dealer for repair.

For further assistance, please contact Mr. Manhole as follows:

Phone: 419.741.9075
Fax: 419.692.1600

MR. MANHOLE MM-SUPER DUTY DRIVE UNIT SPECIFICATIONS

MM-SUPER DUTY

Min. Hydraulic GPM20 gpm

Max. Hydraulic GPM45 gpm

Max. Hydraulic PSI4500 psi

No Case Drain Line Required

2" Hex or 2-1/2" Hex Output Shaft

<u>GPM - RPM</u>	<u>PSI - TORQUE</u>
20..... 53	2500 2861
25..... 67	3000 3433
30..... 80	3500 4005
35..... 94	4000 4578

Output speed and torque specifications are based on theoretical values and are provided for comparative purposes only. Mr. Manhole is continually striving to improve its products. Therefore, we reserve the right to make changes to our products or specifications at any time without notice or obligation.

HYDRAULIC MOTOR - MM-SUPER DUTY

SERVICE PROCEDURES

DISASSEMBLY

Cleanliness is extremely important when repairing a hydraulic motor. Work in a clean area. Before disconnecting the lines, clean port area of motor thoroughly. Use a wire brush to remove foreign material and debris from exterior joints of motor. Check shaft and keyway, use 600 grit paper/cloth to remove all nicks, burrs, and sharp edges that might damage the shaft seals when installing retainer on shaft and bearing assembly. Before starting disassembly procedures, drain oil from inside of motor.

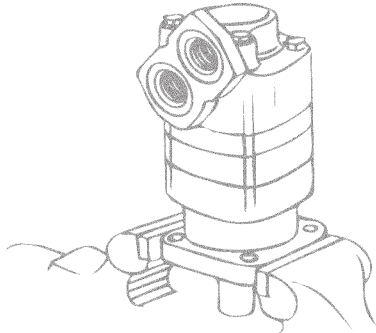


Figure 1

1 Place motor in a vise with output shaft down. Clamp across edge of bearing housing not on housing (see Figure 1). Excessive clamping pressure on housing will cause distortion. When clamping, use some protective device on vise, such as special soft jaws, pieces of hard rubber or board.

Although not all drawings show the motor in a vise, we recommend that you keep the motor in the vise during disassembly. Follow the clamping procedures explained throughout the manual.

2 Remove 4 bolts (or nuts for earlier models) from motor. Remove studs (earlier models) as shown in step 16.

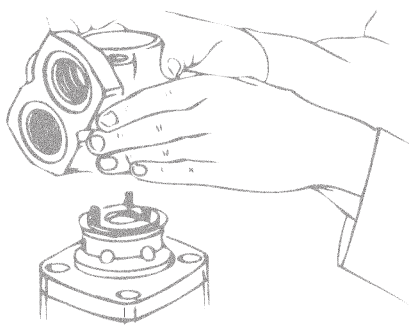


Figure 2

3 Lift valve housing straight up. If done carefully, the springs and balance ring subassembly will remain on valve for easy removal.

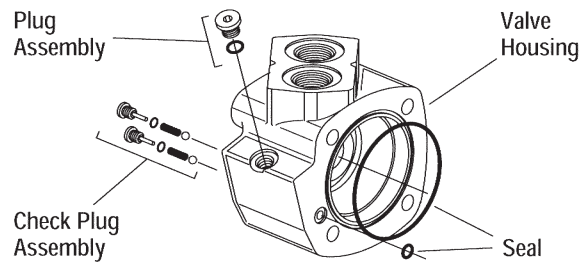


Figure 3

4 Carefully remove the following from the valve housing:

- 1 seal, 92,3 mm [3.63 inch] I.D.
- 1 seal, 7,6 mm [.30 inch] I.D.
- 2 check valve plug assemblies (plug, seal, spring, ball) 1 plug (case drain) with seal.

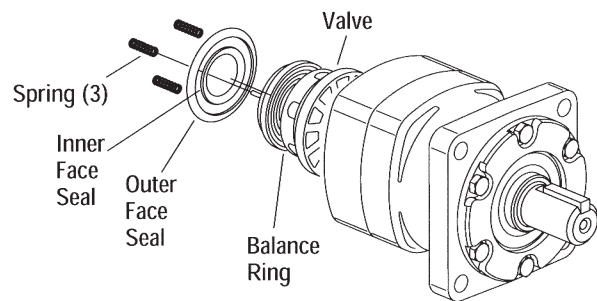


Figure 4

5 Remove 3 balance ring springs.

6 Remove balance ring subassembly.

7 Remove inner and outer face seals from the balance ring.

8 Lift off valve.

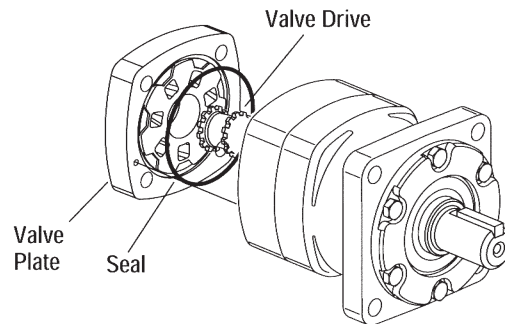


Figure 5

9 Remove valve plate.

10 Remove 95,0 mm [3.74 inch] I.D. seal from valve plate (see Figure 5).

11 Remove valve drive (see Figure 5).

HYDRAULIC MOTOR - MM-SUPER DUTY SERVICE PROCEDURES

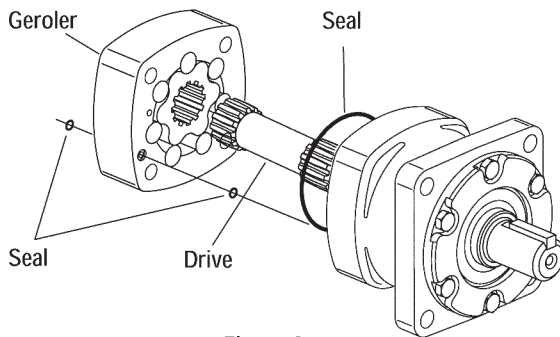


Figure 6

12 Remove Geroler. Retain rollers in outer Geroler ring if they are loose.

13 Remove 2 seals (6,1mm [.24 inch]) from Geroler, 1 seal on each side of Geroler.

14 Remove drive.

15 Remove 95,0 mm [3.74 inch] I.D. seal from bearing housing.

16 Use a stud remover or vise grips to remove studs (earlier models only). Then clamp bearing housing in vise as shown in Figure 7. Loosen 6 bolts. Then remove bolts and retainer. You may have to pry retainer free but do not damage housing or retainer.

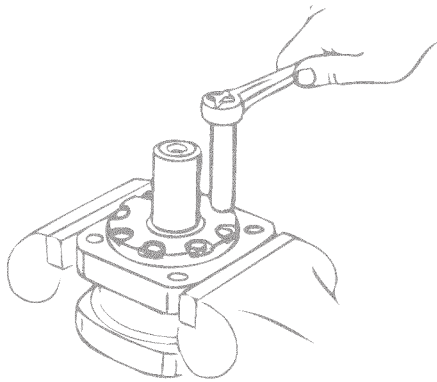


Figure 7

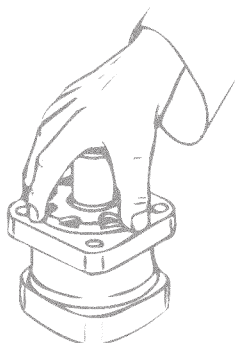


Figure 8

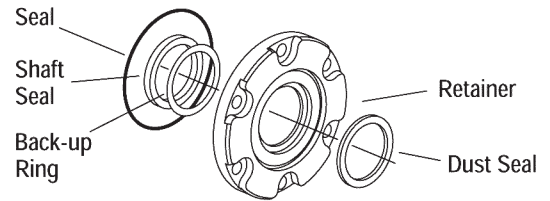


Figure 9

17 Remove 92,3 mm [3.64 inch] I.D. seal, shaft seal and back-up ring (if supplied) from retainer. Use a small screwdriver to remove dust seal. Do not damage bore of retainer.

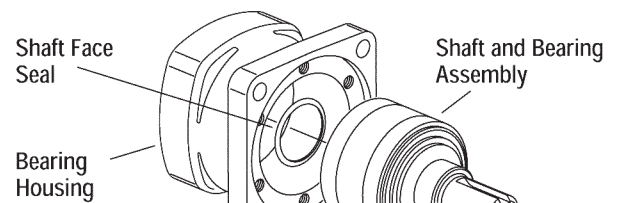


Figure 10

18 Remove shaft and bearing assembly. You may need a press to remove shaft and bearing assembly (see Figure 10).

19 Remove shaft face seal from bore of bearing housing (see Figure 10). Do not damage bore of bearing housing.

Note: Individual parts of the shaft and bearing assembly are not so separately and must be replaced as a unit.

HYDRAULIC MOTOR - MM-SUPER DUTY

SERVICE PROCEDURES

REASSEMBLY

Check all mating surfaces. Replace any parts that have scratches or burrs that could cause leakage. Clean all metal parts in clean solvent. Blow dry with air. Do not wipe with cloth or paper towel because lint or other matter could get into the hydraulic system and cause damage. Do not use a coarse grit papers/cloth or try to file or grind motor parts. Check around the keyway and chamfered area of the shaft for burrs, nicks, or sharp edges that can damage the seals when reassembling the retainer.

Note: Lubricate all seals (prior to installation) with petroleum jelly such as Vaseline®. Use new seals when reassembling the motor. Refer to parts list (6-127 6000 Series -005 and 6-159 6000 Series -006) for replacement parts and proper kit number.

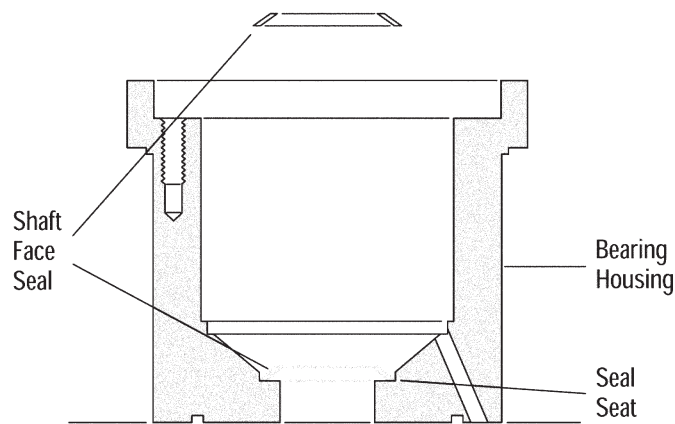


Figure 11

20 Place bearing housing on smooth flat surface with largest open end of housing up.

Apply petroleum jelly to shaft face seal. Install seal in seal seat. Seat seal properly in groove (see Figure 11 and 14). A damaged or improperly installed shaft face seal could cause internal lubrication loss and subsequent parts wear.

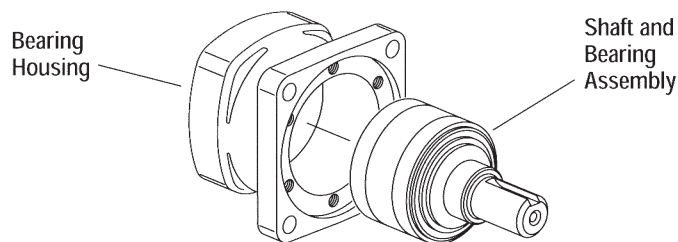


Figure 12

21 Install shaft and bearing assembly in bearing housing (see Figure 12). Do not damage seal in bore of housing. You may need a press to install shaft and bearing assembly.

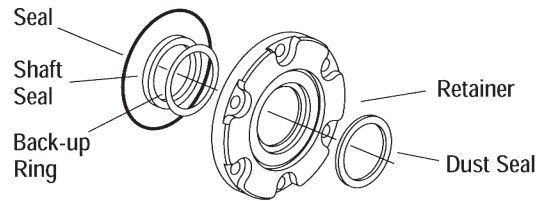


Figure 13

22 Use a small press, if available, to install dust seal in retainer. Metal side of dust seal must face toward retainer as shown in Figure 14. If a press isn't available, use a plastic or rubber hammer to tap dust seal in place.

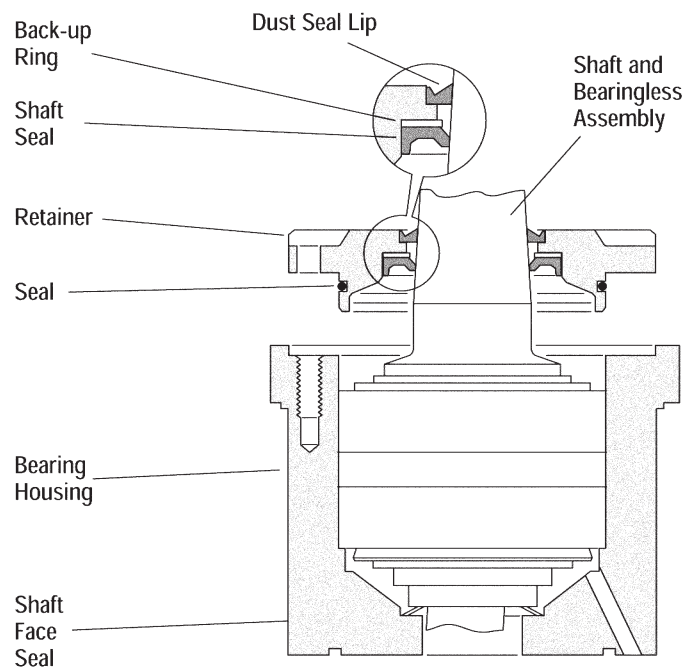


Figure 14

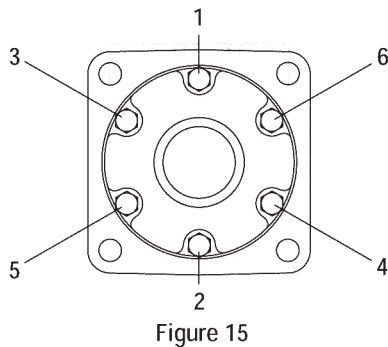
23 Install 92,3 [3.64] I.D. seal, back-up ring and shaft seal in retainer. Flat or smooth side of shaft seal must face toward retainer as shown in Figure 14. Apply petroleum jelly to inside diameter of shaft seal (after installing seal).

24 Before installing retainer, place a protective sleeve of bullet (see note below) over shaft. Grease inside diameter of dust and shaft seals. To prevent damage to seals, install retainer over shaft with a twisting motion. Do not cut or distort shaft seal. Damage to shaft seal will cause external leakage.

Note: Bullet 600464 for 1-1/2 inch diameter shafts available—by special order through our service department.

HYDRAULIC MOTOR - MM-SUPER DUTY

SERVICE PROCEDURES



25 Lubricate threads of 6 bolts with a film of light oil. Install and finger tighten all 6 bolts. Torque bolts to 6 Nm [50 lb-in] in sequence (see Figure 15). Then final torque to 34 Nm [300 lb-in], in sequence.

Note: Full torque 34 Nm [300 lb-in] on one bolt at a time can damage bolt or retainer.

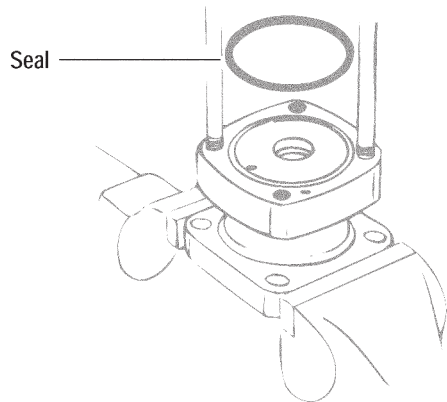


Figure 16

27 Reposition motor in vise with output shaft down. Clamp across edges of retainer as shown in Figure 16.

28 Pour a small amount of light oil inside the output shaft.

29 Install 2 studs (earlier models), diagonally opposed, in bolt holes of bearing housing (see Figure 16). If you replace studs with bolts, use 2 studs for alignment purposes when stacking parts.

30 Apply a light film of petroleum jelly on 95,0 mm [3.74 inch] I.D. seal. Install seal in bearing housing (see Figure 16).

31 Install drive in output shaft (insert longer splined end of drive first), (see parts drawing on page 3).

32 Apply petroleum jelly on 2 seals, 6,1 mm [.24 inch] I.D. Install seals (1 on each side of Geroler) in case drain grooves of Geroler.

Note: Installation at this point involves 3 steps in timing the motor. Timing determines the direction of rotation of the output shaft.

Timing parts include:

1. Geroler
2. Valve drive
3. Valve Plate
4. Valve

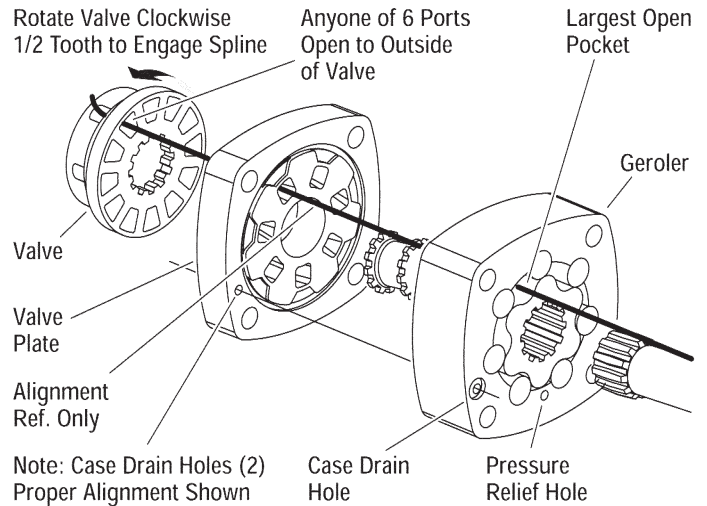


Figure 17 Timing Alignment

Timing Step No. 1 — Locate largest open pocket in Geroler. Then mark location of pocket on outside edge of Geroler (see Figure 17).

33 Align case drain hole and pressure relief hole in Geroler with case drain hole and pressure relief hole in bearing housing. Install Geroler on bearing housing (see Figure 17). Retain rollers in outer Geroler ring if they are loose.

34 Install valve drive in Geroler.

35 Apply a light film of petroleum jelly on 95,0 mm [3.74 inch] I.D. seal. Install seal in valve plate.

36 Align case drain hole in valve plate with case drain hole in Geroler. Install valve plate (seal side toward Geroler) on Geroler as shown in Figure 17.

Timing Step No. 2 — Locate slot opening in valve plate which is in line with largest open pocket of Geroler (see Figure 17).

37 Use the following procedure for installing the valve on the valve plate.

Timing Step No. 3 — Locate any one of the side openings of the valve that goes through to the face of the valve. Line up this side opening in the valve with open slot of valve plate that is in line with largest open pocket of Geroler. Rotate valve clockwise (1/2 spline tooth) to engage valve with the valve drive spline, alignment reference shown in Figure 17 (above). This procedure provides standard timing when pressurized as shown in Figure 18 (below) .

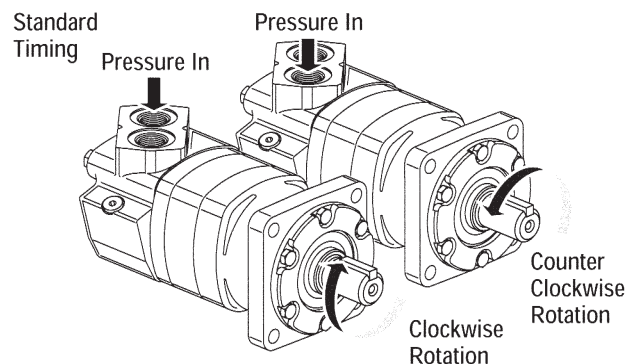


Figure 18

HYDRAULIC MOTOR - MM-SUPER DUTY SERVICE PROCEDURES

38 Apply clean grease on 3 balance ring assembly springs. Install springs in 3 holes located inside bore face of valve housing (see Fig. 19).

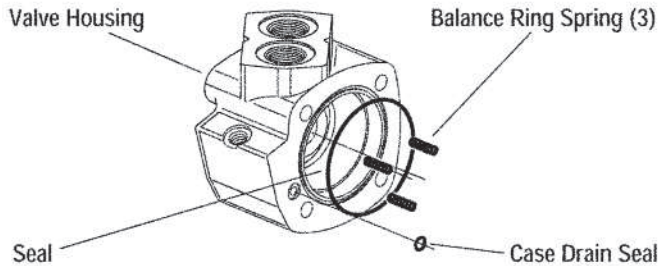


Figure 19

39 Apply a light film of petroleum jelly on 7,6 mm [.30 inch] I.D. seal. Install seal in case drain groove of valve housing.

40 Apply a light film of petroleum jelly on 92,3 mm [3.63 inch] I.D. seal. Install seal in outside seal groove of valve housing.

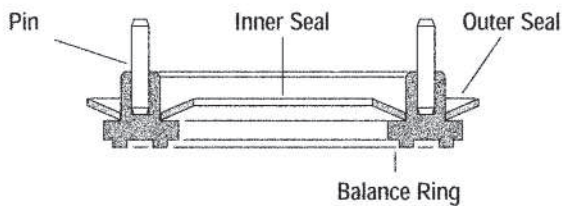


Figure 20

41 Apply petroleum jelly on inner and outer face seals. Install seals on balance ring as shown in Figure 20.

Important: Install face seals in the positions shown in Figure 20 or the motor will not operate properly. Do not force or bend these face seals. Any damage to these seals will affect the operation of the motor.

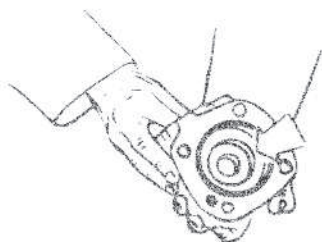


Figure 21

42 Align balance ring assembly pins with 2 holes in valve housing (see Figure 21). Install balancing ring subassembly in valve housing.

43 Insert your finger through port of housing. Apply pressure to side of balance ring assembly. Hold ring in position until valve housing is in place (see Figure 21). Align case drain hole in housing with case drain hole in valve plate. Install valve housing against valve plate (see Figure 22).

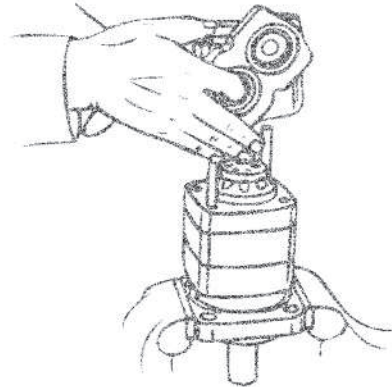


Figure 22

Note: After installing valve housing on valve plate, check between body parts of motor for unseated seals.

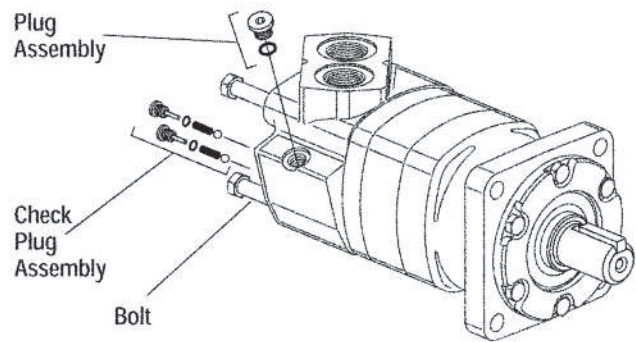


Figure 23

44 Install and finger tighten 2 bolts (or studs for earlier models) opposite alignment studs. Remove alignment studs and install remaining bolts (or studs and 4 nuts for earlier models). Torque bolts (or nuts) to 98 Nm [864 lb-in/ 72 lb-ft], in sequence (see Figure 24).

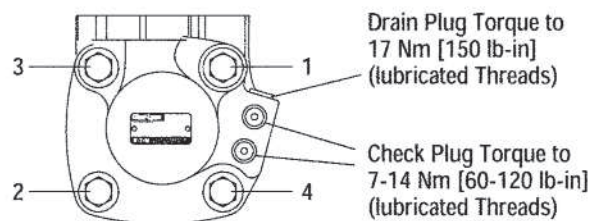
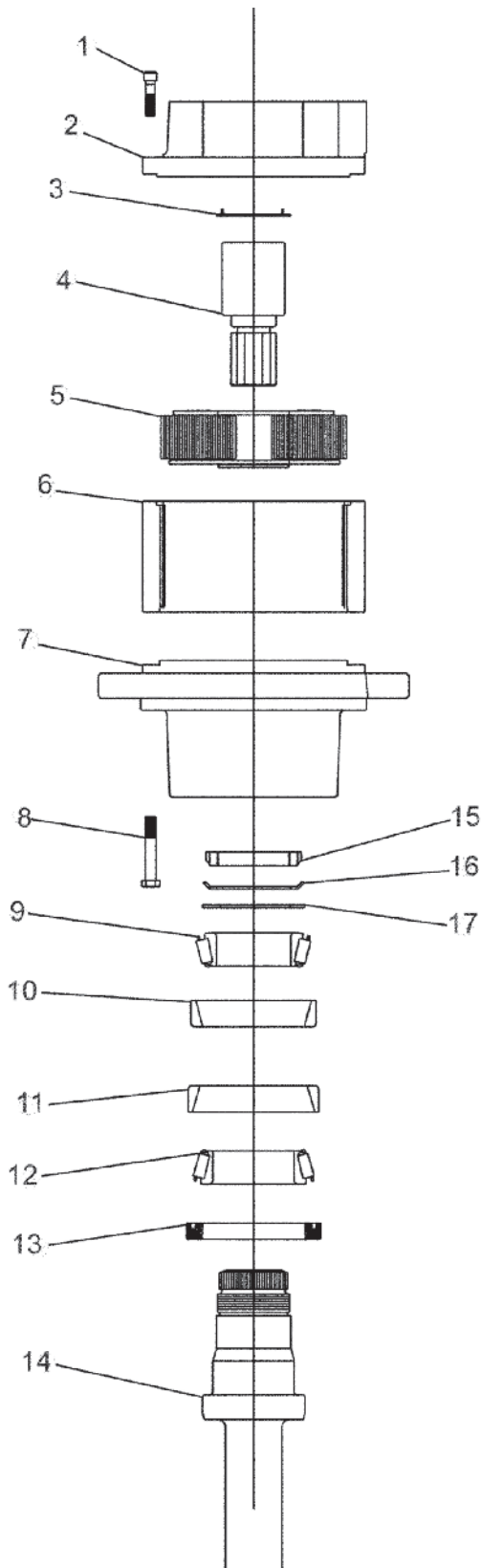


Figure 24

45 Install 2 check plug assemblies (ball, spring, plug with seal). Also install case drain plug with seal, parts shown in Figure 23 and plug torque shown in Figure 24.

PLANETARY - MM-SUPER DUTY EXPLODED VIEW AND PARTS LIST



<u>Ref.#</u>	<u>Part #</u>	<u>Description</u>	<u>Qty.</u>
1	69600	Planetary Cover Bolt	8
2	69601	Cover Plate	1
3	69407	Thrust Washer	1
4	69602	Sun Gear	1
5	69603	Carrier Assembly	1
6	69604	Ring Gear	1
7	69605	Hub	1
8	69606	Ring Gear Bolt	8
9	69054	Inner Bearing Cone	1
10	69055	Inner Bearing Cup	1
11	69052	Outer Bearing Cup	1
12	69053	Outer Bearing Cone	1
13	69018	Oil Seal	1
14	69051	2" HEX Output Shaft	1
14	69608	2-1/2" HEX Output Shaft	1
15	69417	Shaft Lock Nut	1
16	69408	Lock Washer	1
17	69412	Inner Thrust Washer	6

PLANETARY - MM-SUPER DUTY SERVICE PROCEDURES

GENERAL INSTRUCTIONS:

To facilitate the repair of these units and before any work is done, we suggest that you first read all of the steps used in disassembly and assembly of unit.

It is important to air blast all parts and wipe them with clean, lint less cloth before assembly.

It is a good idea to check all replacement parts closely before installing to ensure that no damage occurred during shipment.

CAUTION - If parts are stubborn during assembly, do not force them and never employ an iron hammer.

Never hammer bearing cones or cups. Use only an arbor press or other suitable tool.

DISASSEMBLY:

1. Index mark all sections with a punch. Be sure to align all these marks when reassembling.
2. Remove bolts from cover. Lift cover from assembly. Thrust Washer usually remains with cover.
3. Lift Sun Gear from Carrier Assembly. Remove Carrier Assembly.
4. Remove 6 hex bolts and washers from hub. Pull Ring Gear from remaining assembly. It may be necessary to strike Ring Gear with a rubber mallet to loosen from hub.
5. **WARNING!** *Eye protection should be worn during retaining ring removal.* Remove Lock Nut from Output Shaft. Pull Output Shaft from Hub.
6. Remove Oil Seal and Bearing Cones from hub. Inspect Bearing Cups in hub and remove only if replacement is required.

ASSEMBLY:

1. Press new bearing cups into each side of hub. It is recommended that the bearing cups and Cones be replaced in sets.
2. Assemble bearing cone into cup at seal end of Hub.
3. Lubricate lips of oil seal and lower hub onto output shaft. Keep hub centered to prevent damage to oil seal.
4. **WARNING!** *Eye protection should be worn during retaining ring installation.* Assemble bearing cone over output shaft and into bearing cup. Install Thrust Washer, Lock Washer and Output Shaft Lock Nut above the Bearing. Bearings should have from .000 to .006 inches endplay when properly tightened.
5. Apply a bead of silicone sealant to face of hub that mates with Ring Gear.
6. Assemble Ring Gear to hub being careful to align all bolt holes.
7. Install six hex bolts and washers. Torque bolts to 52-60 ft/lbs.
8. Place carrier assembly into ring gear aligning the gear teeth. Carrier splines mesh with splines on output shaft. Place Sun Gear into Carrier Assembly. Sun Gear should turn freely by hand.
9. Apply a bead of silicone to cover face of Ring Gear.
10. Secure Thrust Washer with tangs engaged in cover. **Note:** Thrust Washer can be secured to cover with a small amount of grease or silicone sealant. Assemble cover to Ring Gear.
11. Install eight bolts and torque to 20-25 ft/lbs.
12. Position unit with output shaft pointing down and fill with oil (approximately 2 quarts).