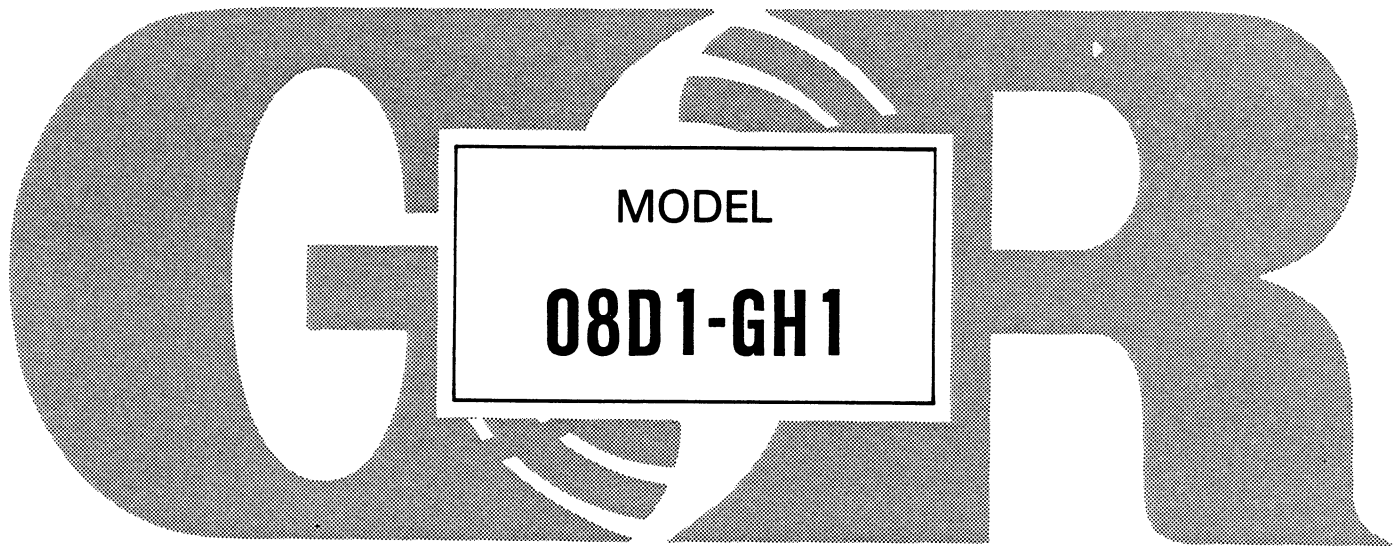




**INSTALLATION, OPERATION, PARTS LIST,
AND MAINTENANCE MANUAL**



THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA

Printed in U.S.A.

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INTRODUCTION

This Installation, Operation, and Maintenance Manual is designed to help you achieve the best performance and longest life from your Gorman-Rupp pump.

This pump is an O Series, enclosed impeller, self-priming centrifugal model with straight-in suction without a suction check valve. The pump is designed for vehicular mounting in petroleum service, and has an integral split-shaft gearbox engineered for midship installation.

If there are any questions regarding the pump or its application which are not covered in this manual or in other literature accompanying this unit, please contact your Gorman-Rupp distributor, or write:

The Gorman-Rupp Company	or	Gorman-Rupp of Canada Limited
P.O. Box 1217		70 Burwell Road
Mansfield, Ohio 44901		St. Thomas, Ontario N5P 3R7

For information or technical assistance on the truck chassis, contact the truck chassis manufacturer's local dealer or representative.

The following are used to alert maintenance personnel to procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel:

NOTE

Instructions to aid in installation, operation, and maintenance or which clarify a procedure.

CAUTION

Instructions which must be followed to avoid causing damage to the product or other equipment incidental to the installation. These instructions describe the requirements and the possible damage which could result from failure to follow the procedures.

WARNING

```

////////////////////////////////////
//
// These instructions must be followed to avoid causing in- //
// jury or death to personnel, and describe the procedure //
// required and the injury which could result from failure //
// to follow the procedure. //
// //
////////////////////////////////////

```


WARNINGS

WARNINGS - SECTION A

THESE WARNINGS APPLY TO O SERIES SPLIT-SHAFT REFUELER PUMPS. GORMAN-RUPP HAS NO CONTROL OVER OR PARTICULAR KNOWLEDGE OF THE TRUCK CHASSIS WHICH WILL BE USED. REFER TO THE MANUAL ACCOMPANYING THE TRUCK CHASSIS BEFORE ATTEMPTING TO BEGIN OPERATION.

WARNING

Before attempting to open or service the pump:
1. Familiarize yourself with this manual.
2. Turn off the vehicle ignition to ensure that the pump will remain inoperative.
3. Allow the pump to cool if overheated.
4. Vent the pump slowly and cautiously.
5. Close the suction and discharge valves.
6. Check the temperature before opening any covers, plates, or plugs.
7. Drain the pump.

WARNING

Before operating or servicing the pump, be certain proper safety practices are followed. Provide adequate ventilation, prohibit smoking, wear static-resistant clothing and shoes. Clean up all fuel spills immediately after occurrence.

WARNING

Do not operate the pump against a closed discharge valve for long periods of time. This could bring the liquid to a boil, build pressure, and cause the pump to rupture or explode.

WARNING

Overheating may produce dangerous fumes. Use extreme caution when venting the pump, or when removing covers, plates, plugs, or fittings.

WARNINGS

WARNING

```

////////////////////////////////////
//
// After the vehicle is positioned for pump maintenance, //
// block the wheels and set the emergency brake before at- //
// tempting to disconnect the drive shaft or remove the //
// pump. Be sure the pump is properly reinstalled and se- //
// cure before operation. //
// //
////////////////////////////////////

```

WARNING

```

////////////////////////////////////
//
// Never tamper with the governor to gain more power. The //
// governor establishes safe operating limits that should //
// not be exceeded. Limit input speed and operating range //
// as indicated on the performance curve. //
// //
////////////////////////////////////

```

WARNING

```

////////////////////////////////////
//
// Decals and tags vital to pump operation were shipped //
// loose with the pump. Affix these decals in a prominent //
// place visible to the pump operator. //
// //
////////////////////////////////////

```

CAUTION

Never run the pump dry of pumping medium. There must be a supply of liquid to the pump at all times to prevent destruction of the shaft seal faces.

CAUTION

This pump has been shipped dry of gearbox lubrication. The gearbox must be lubricated before the pump is operated (see LUBRICATION in Section E.).

INSTALLATION - SECTION B

Since pump installations are seldom identical, this section offers only general recommendations and practices required to inspect, position, and arrange the pump and piping.

WARNING

Warning text enclosed in a box with slashes: // DO NOT test or operate this pump and integral gearbox before reading the installation and operation instructions in this manual.

Model 08D1-GH1 is a self-priming centrifugal pump with an integral gearbox assembly. The entire unit is designed for midship mounting between the frame members of a petroleum handling vehicle. The gearbox replaces a part of the main drive shaft connecting the transmission to the rear axle.

This design permits full utilization of engine power to selectively operate the pump or the rear driving wheels on the vehicle. Both can not be operated at the same time.

PREINSTALLATION INSPECTION

The pump assembly was inspected and tested before shipment from the factory. Before installation, inspect the pump for damage which may have occurred during shipment. Check as follows:

- a. Inspect the pump assembly for cracks, dents, damaged threads, and other obvious damage.
b. Check for and tighten loose bolts, nuts, capscrews, and other attaching hardware. Since gaskets tend to shrink after drying, check for and tighten loose nuts and capscrews securing mating surfaces.
c. Carefully read all tags, decals, and markings on the pump assembly, and perform all duties indicated. Note the direction of rotation indicated on the pump. Check that the pump shaft rotates in the required direction.

CAUTION

Only operate the pump input shaft in a clockwise direction while facing the shaft. Otherwise, the impeller could become loosened from the shaft and seriously damage the pump.

- d. The gearbox assembly was shipped dry of lubricant. Refer to LUBRICATION in the MAINTENANCE AND REPAIR section of this manual and perform duties as instructed.

PUMP INSTALLATION

Pump Specifications

See Table 1 and 1A for the typical pump specifications and gearbox data.

Table 1. Pump Specifications

Pump Type	Self-priming, centrifugal with enclosed impeller
Suction	8-inch "victaulic" fitting
Discharge	6-inch petroleum flange
Nominal Capacity	See Performance Curve - Page E-1
Impeller Shaft Seal	Mechanical self-lubricated
Gearbox (Air Shift)	
Air Pressure Required At Shift Cylinder	70-140 PSI thru 1/4" line
Gear Ratio	2.56:1 speed increase
Input Shaft Rotation	Clockwise (facing gearbox)
Maximum Input Speed	See performance curve page E-1
Input & Output Shaft	heavy duty 2 1/4 inch - 10 spline
Input & Output Flange	1700 Series "Dana" flanges
Lubrication	5 U.S. pints (12.36 l) SAE No. 90 gear lube with 4 fl. oz. (0.12 l) Dow Corning 'Molykote® M Gear Guard'
Approx. Net Weight	330 pounds (150 kg)

Table 1A. Through Torque Capacity Based On Shaft And Spline Size

Type Of Engine	Diesel		Gasoline	
	Auto	Manual	Auto	Manual
Transmission				
Torque ft - lbs (max)	6400	6000	8000	7400

Pump And Mounting Dimensions

A 40-inch cross member is provided for mounting the output end of the gearbox, and a trunnion mount is provided for the input end. This design provides a flexible three point suspension. The trunnion mount prevents chassis frame twist from being transmitted through the gearbox.

See Figure 1 on page B-3 and Figure 2 Page E-4 for the physical dimensions of the pump and mounting devices.

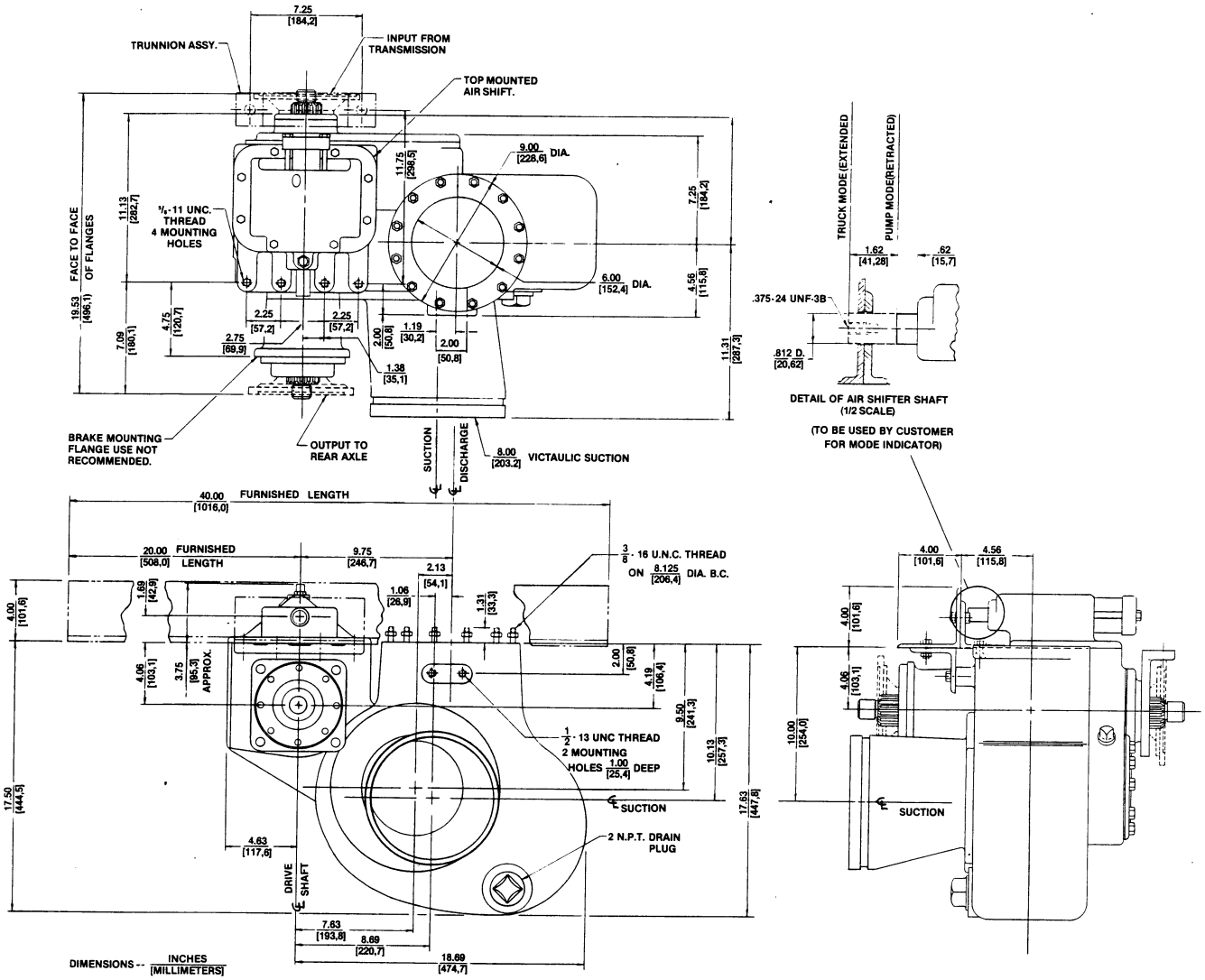


Figure 1. Dimensions Of Pump Model 08D1-GH1

VEHICLE REQUIREMENTS

NOTE

The following instructions apply equally to new installations, rebuilds, or retrofits.

WARNING

```

////////////////////////////////////
//
// After installation, do not attempt to test run or oper- //
// ate the pump and integral gearbox before reading OPERA- //
// TION in Section B. The gearbox was shipped dry of //
// lubricant; lubricate the gearbox as instructed in LUBRI- //
// CATION in Section E before attempting to operate the //
// pump. //
// //
////////////////////////////////////

```

Tank Preparation

It is **essential** that any tank scale, dirt, or other foreign material be removed from the tank and piping prior to pump installation. Failure to do so could result in clogging or damage to the pump.

Vehicle Configuration

If the pump is to be used in tractor-trailer or straight-truck plus trailer service, either a liquid fifth wheel or jumper hoses are required. **Be sure** the drive line of the tractor-trailer is long enough to allow installation of the gearbox at the proper angle, and that jumper hoses are long enough to allow a full turning radius.

Brake Installation

When shifting from vehicle drive to pump mode, or vice versa, drive shaft rotation must be limited to 15 RPM or less to prevent raking of gears. Vehicles with automatic transmissions should be equipped with a brake on the transmission output shaft to stop shaft rotation during shifting of gear box.

Air Cylinder Pressure

For proper operation of the gearbox, air shift device requires vehicle air pressure of 70 to 140 psi. See **Gear Shift Connections** for further information.

POSITIONING PUMP

Lifting

Use lifting equipment with a capacity of at least **2000 pounds**. This pump weighs approximately **330 pounds**, not including the weight of accessories and cross members. Customer installed equipment such as suction and discharge hoses **must** be removed before attempting to lift.

CAUTION

Due to the confined mounting location, specialized equipment such as a transmission jack with custom brackets should be used to lift and position the pump and gearbox.

Mounting Location

The following factors must be considered when selecting a mounting location for the pump.

- a. Mounting brackets
- b. Universal joint angles
- c. Shift linkage
- d. Piping
- e. Ground clearance
- f. Accessibility of pump and gearbox for service.

Any damage to the pump or gearbox resulting from improper mounting and installation is **not** covered by the Gorman-Rupp warranty.

MOUNTING BRACKETS

The rear cross member shipped with the pump can be cut to size to fit the side rails of the vehicle chassis. Use the hardware provided with the pump to rigidly secure the pump and gearbox mounting brackets to the rear cross member (see Figure 2 on page B-6).

When mounted on the pump, the rear cross member **must not** extend over the pump discharge port or in any way impede removal of the pump casing. Proper mounting is critical to access and pump serviceability.

NOTE

On special applications, the pump and gearbox assembly may be rotated 90° to facilitate installation. When rotated, the pump is **not** self-priming and requires relocation of drain plugs and vents. (Order installation kit 48123-003). Contact the factory or your Gorman-Rupp distributor for more information.

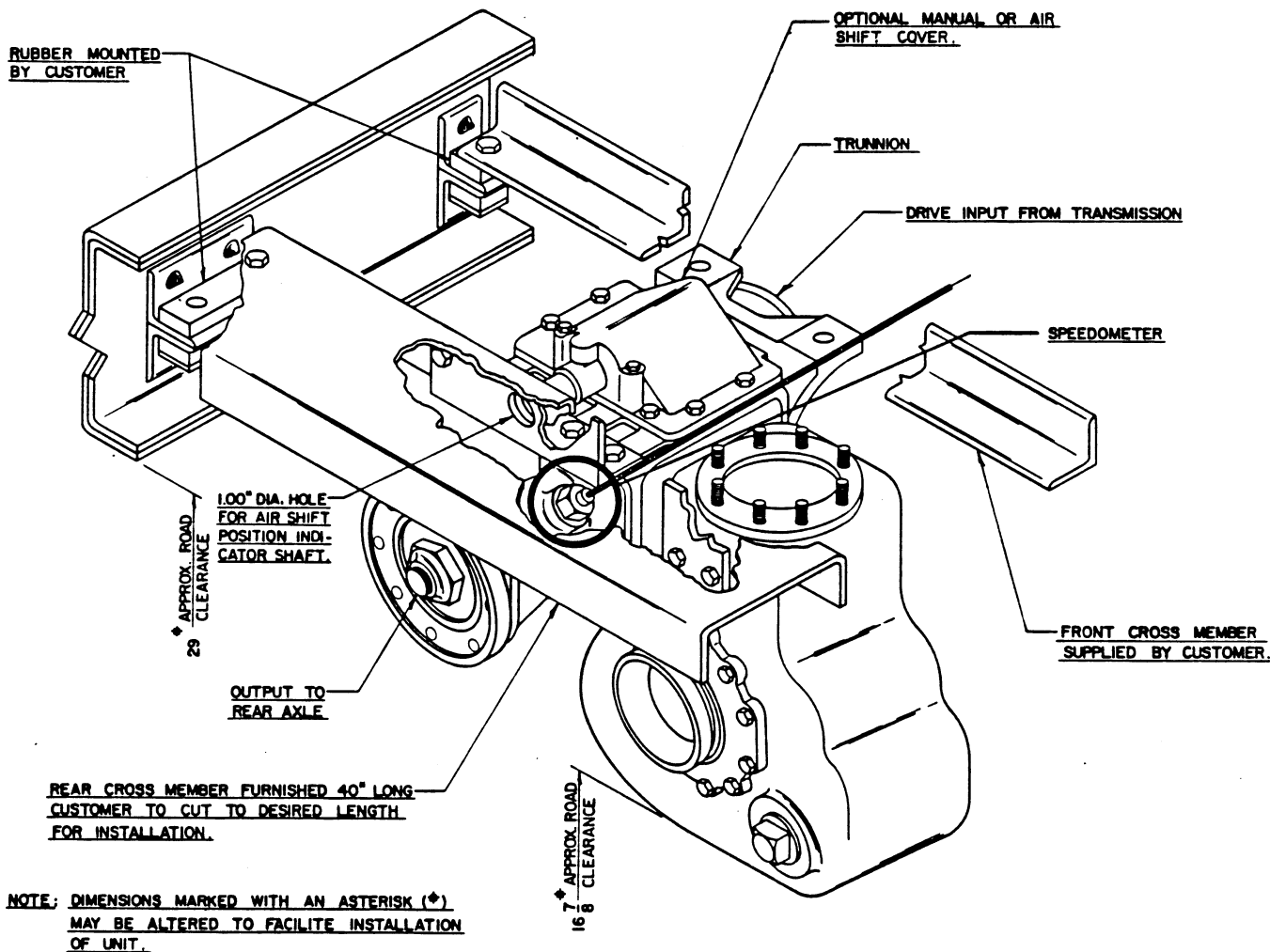


Figure 2. Typical Pump Mounting On Vehicle Chassis

The drive input end of the gearbox is fitted with a trunnion which prevents chassis frame twist from being transmitted through the gearbox. Mount the trunnion to the front cross member (not supplied with pump) to support the drive input end of the pump. When mounting the trunnion, make certain that it will not interfere with the input drive flange. The trunnion mounting foot **must** be directed toward the input flange.

Position the cross members and mounted pump on the side rails of the chassis. The cross members **must** be mounted with rubber or other vibration-dampening material when secured to the side rails.

Do not secure the cross members to the side rails before establishing the exact location and position of the air shift rod and shift indicator connections. Be careful not to put the pump in a bind from front to rear during mounting. Improper alignment could result in bearing or gear failure or gearbox breakage. (See Drive Shaft Alignment).

DRIVE FLANGE INSTALLATION

New Installation

The pump is shipped with two "Dana" 1700 series drive flanges (see Figure 3) installed on the heavy duty 2 1/4 inch - 10 spline split shaft. The drive flanges will accommodate Spicer, or equivalent universal joints.

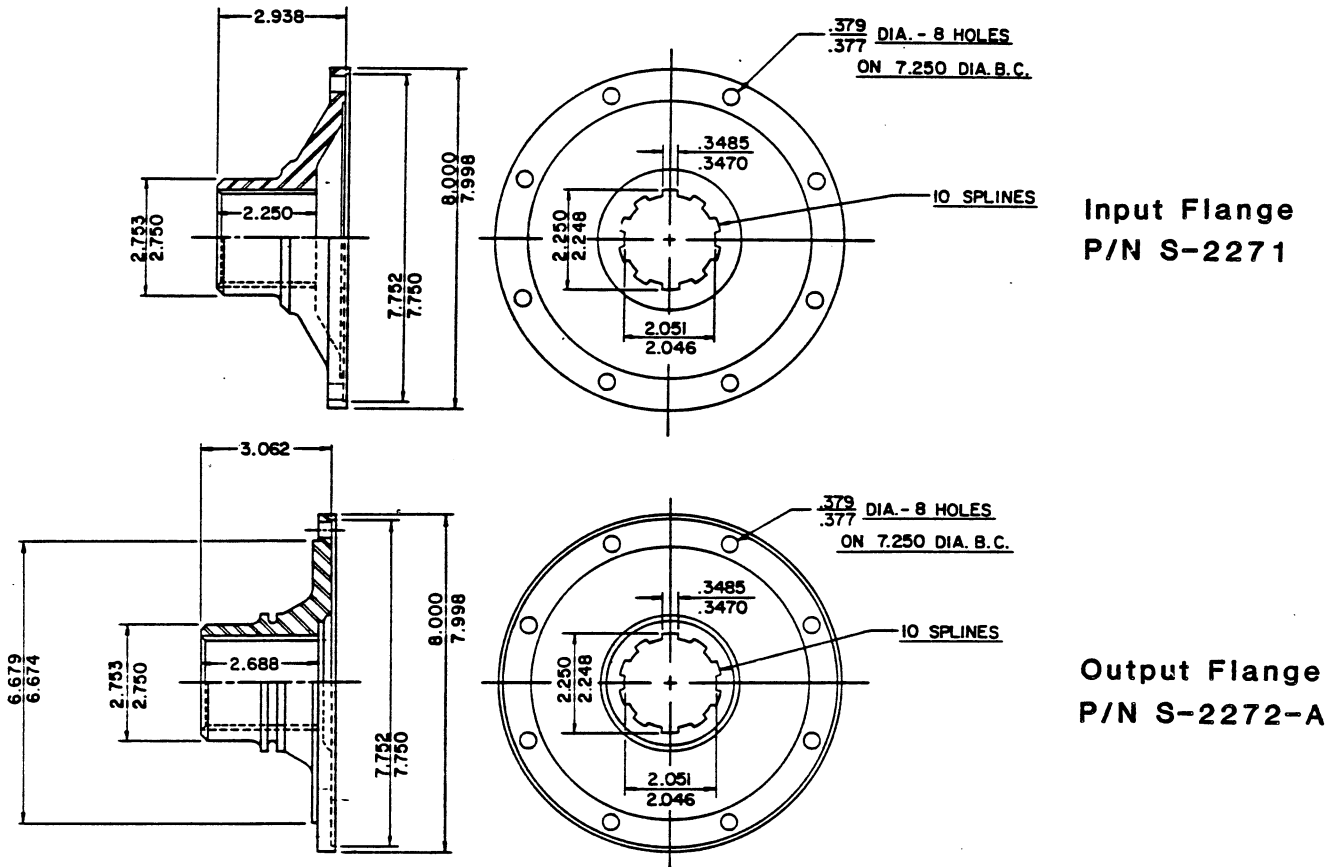


Figure 3. Drive Flange Dimensions

The shaft splines are designed to produce a tight interference fit with the drive flange splines. This fit is intentional to eliminate fretting corrosion.

NOTE

For detailed instructions on removing and installing the drive flanges, see the specific areas in Section E.

DRIVE SHAFT AND LINKAGE CONNECTIONS

Drive Shaft Alignment

To promote maximum universal joint and bearing life, the universal joint angles must be kept to a minimum. A joint angle of 1 degree is **required** for proper needle bearing circulation, but excessive angles cause accelerated wear and require lower maximum operating speed. (see Table 2).

JOINT ANGLE	MAXIMUM SPEED
5 degrees	5000 RPM
6 degrees, 30 minutes	4000 RPM
8 degrees	3000 RPM

Table 2. Joint Angle/Maximum RPM

Align the gearbox with the transmission and the rear axle to obtain the optimum universal joint angles. See Figure 4 on page B-9 for recommended alignment.

CAUTION

Be certain the rear axle position when vehicle is empty or fully loaded will not cause excessive universal joint angles or cause drive shaft slip joints to bottom out.

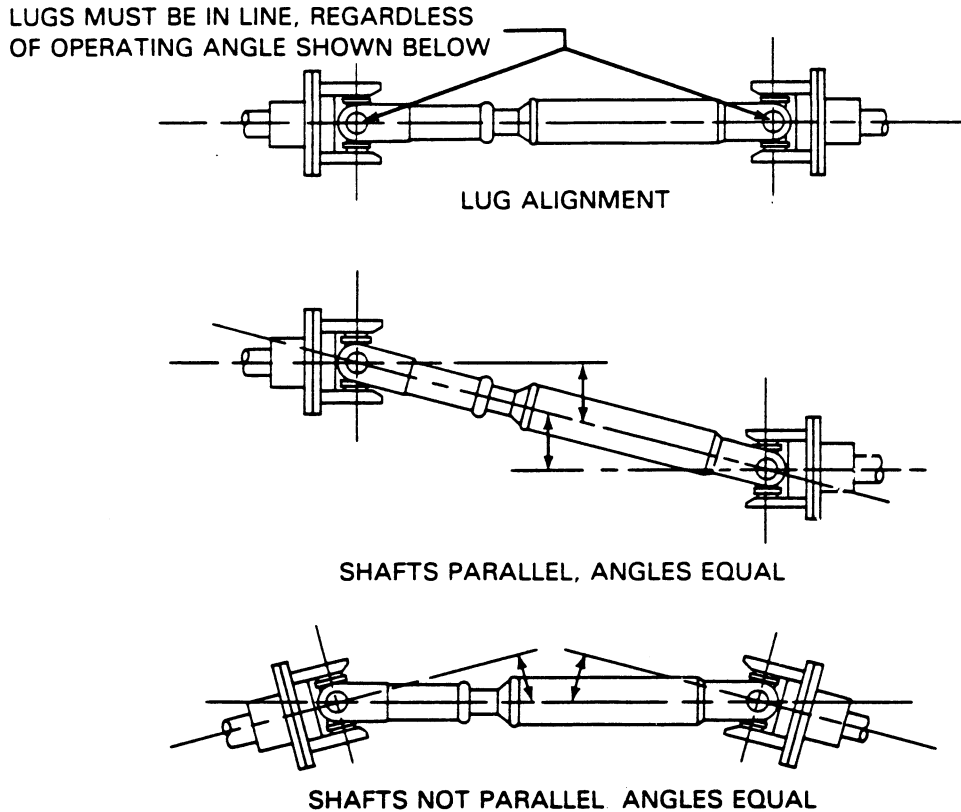


Figure 4. Drive Shaft Alignment

Make sure the horizontal and vertical joint angles are equal. Limit the angles to 1 to 3 degrees using a short coupled joint, and less than 8 degrees with a double joint assembly.

NOTE

Install a short coupled slip joint on the input side and a double joint with slip on the output side of the gearbox to attain the prescribed angles and eliminate tensile stress on the shaft.

The input and output shafts should be completely subassembled and checked for straightness and balance before installation. Also check the universal joint yokes for proper alignment.

Speedometer Connection

The gearbox is fitted with a speedometer adaptor for vehicles equipped with speedometer drive. It is designed to measure truck speed and mileage only. The

adaptor has a 3/16-inch SAE drive, and operates at a 4.66:1 decrease ratio (see Figure 5 on page B-10).

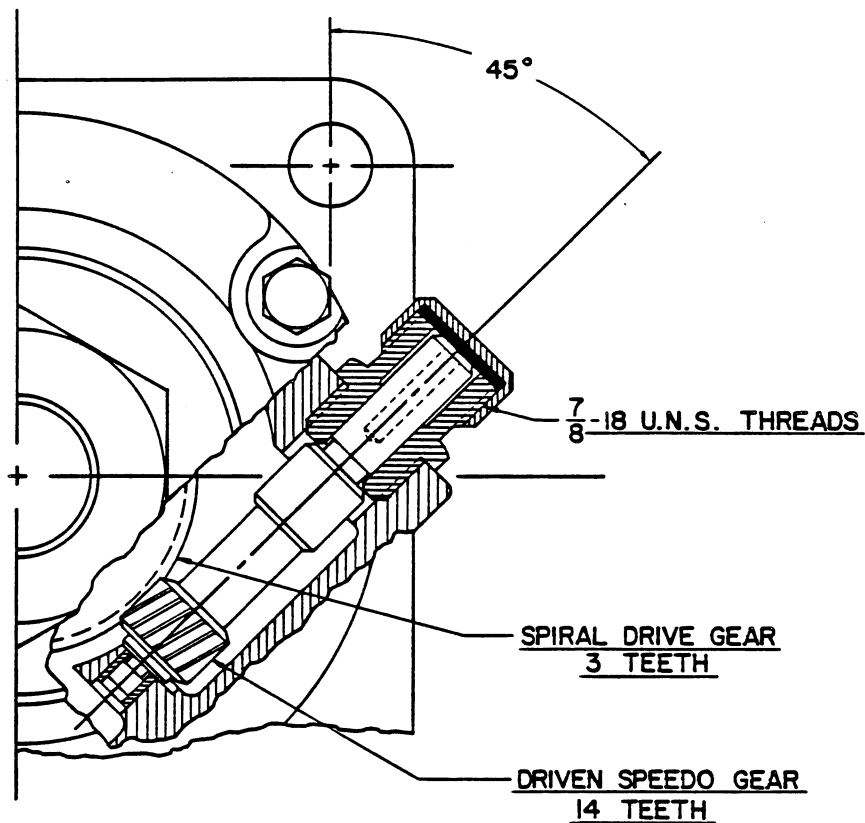


Figure 5. Speedometer Drive Detail

Gear Shift Connections

After the pump is mounted to the chassis, hook up the air shift rod to the proper control stations.

WARNING

```

////////////////////////////////////
// Decals and tags vital to pump operation were shipped //
// loose with the pump. Affix these decals in a prominent //
// place visible to the pump operator. //
// //
////////////////////////////////////

```

Proper operation of the gearbox air shift requires an air cylinder with air pressure of 70 to 140 psi. Use air lines of one-quarter inch. The air line connection at the end cap of the air cylinder is for vehicle operation, and the air line connection at the top of the air shifter cover is for pump operation. Seal all hose fittings with Permatex or equivalent compound.

When actuated, the shifter rod travels through a hole in the rear cross member. A customer supplied shift indicator (mechanical, electrical, or air operated device) should be installed in this area to indicate shifter mode to the pump operator. A tapped hole is provided in the shaft for convenience.

See Figure 6 for approximate shaft travel and hole size.

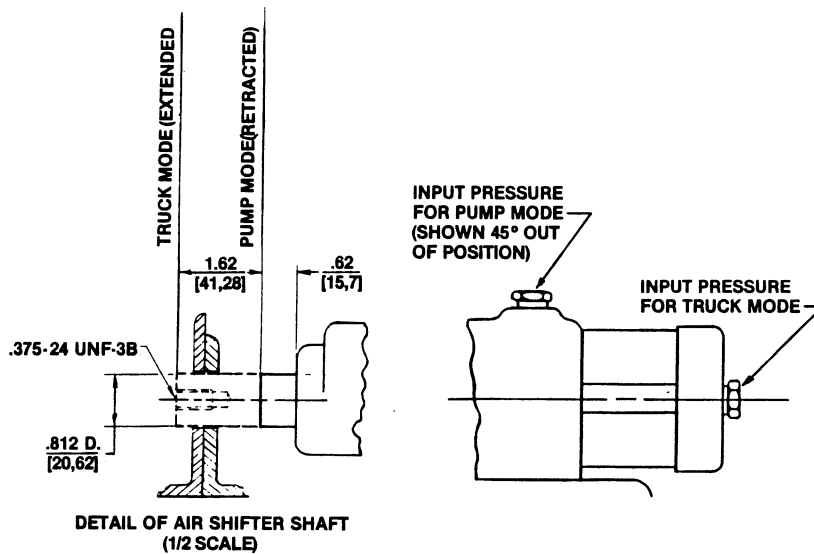


Figure 6. Detail Of Air Shifter Shaft

SUCTION AND DISCHARGE PIPING

Typical System Installation

Most petroleum handling vehicles perform both fueling and defueling functions. This requires a system utilizing flow-directing (FDF) valves, eductors, related piping, and safety accessories. Some of the accessories are available from Gorman-Rupp as optional equipment.

See Figure 7 on page B-12 and Figure 8 on page B-12 illustrating typical piping systems used on refueling vehicles.

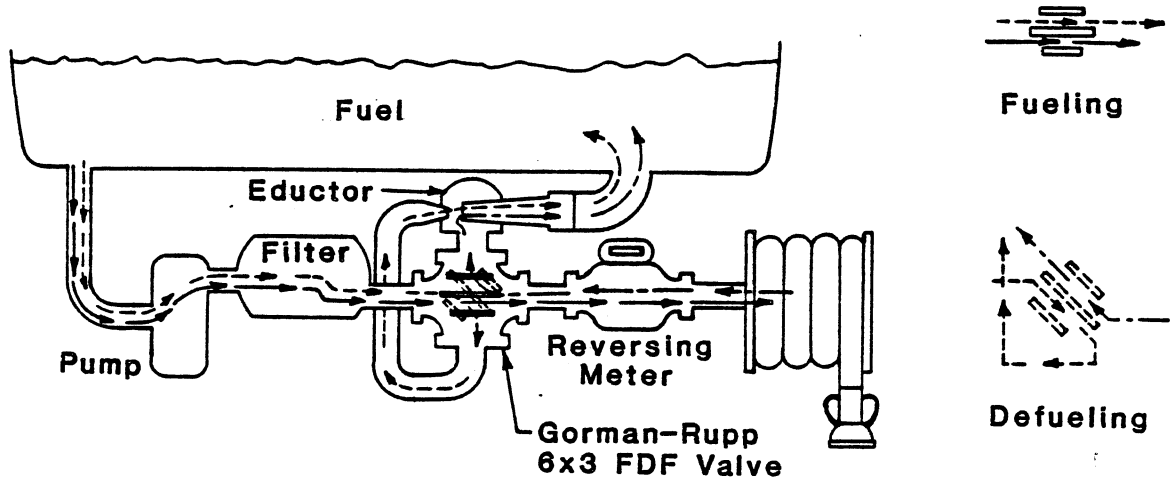
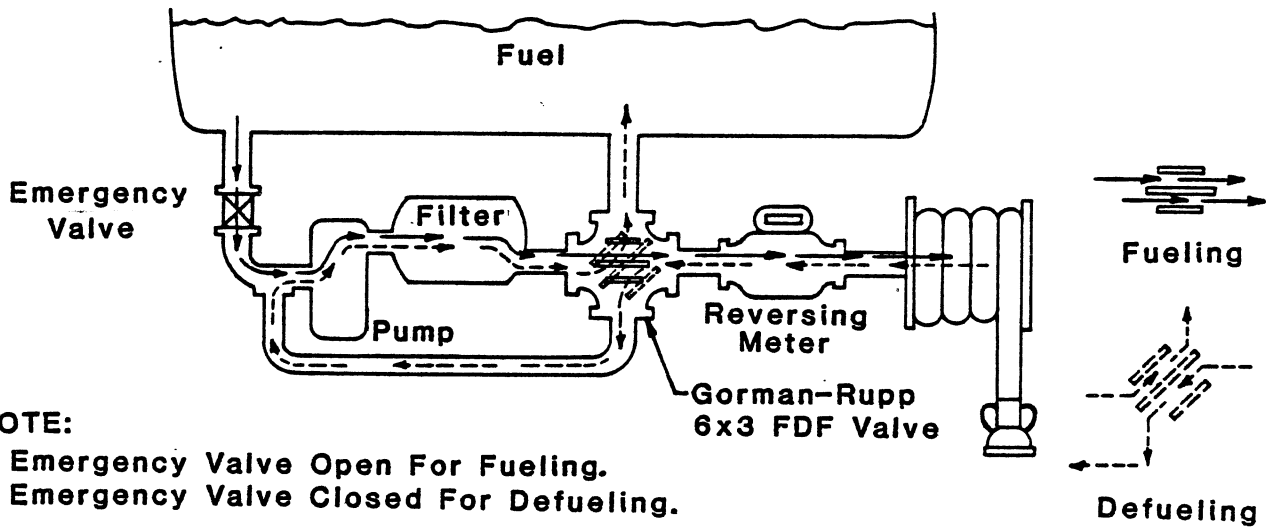


Figure 7. Typical Installation Using Eductor For Defueling And Fueling



NOTE:
 Emergency Valve Open For Fueling.
 Emergency Valve Closed For Defueling.

Figure 8. Typical Installation Using Pump For Defueling And Fueling

Piping

All piping material must be compatible with the liquid being pumped. If hose is used in suction lines, it must be the rigid-wall, reinforced type to prevent collapse under suction.

Run the 8-inch suction piping directly from the tank sump to the pump inlet. The suction lines should be as short and straight as possible to minimize friction loss.

NOTE

This pump is fitted with an offset "victaulic" type suction fitting as standard equipment.

The pump discharge is a 6-inch petroleum flange. The discharge should be mounted vertically just below the top of the chassis frame. It can easily be piped to the filter inlet, discharge manifold, valves, etc..

To avoid wracking, flexible connections such as "victaulic" or bellows **must** be installed at pump suction and discharge.

Do not tighten connecting flanges unless they are properly aligned. Never pull a pipe into place by tightening the flange bolts.

VALVES

Gorman-Rupp manufactures several sizes of flow-directing (FDF) valves for use in fueling-defueling operations. The valves are designed to reverse flow of the fuel with only a turn of the valve handle.

CAUTION

The FDF valve is designed for directing flow only. DO NOT use as a positive sealing valve.

See Figure 9 on page B-14 and Figure 10 on page B-14 illustrating the installation dimensions and theory of operation for a typical FDF Valve. Consult the factory for further assistance or other sizes.

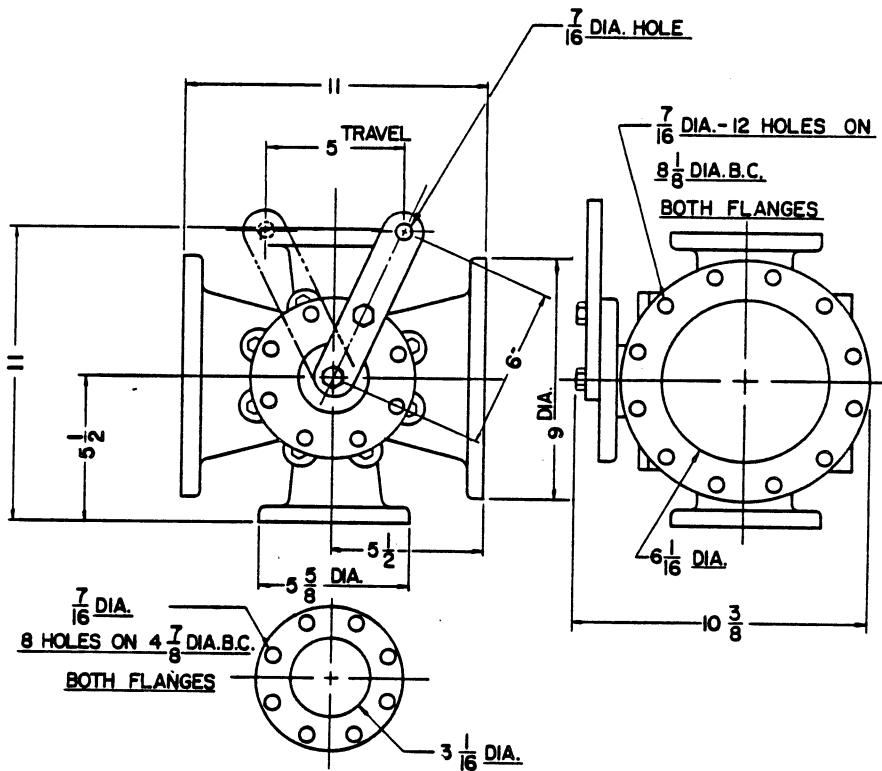
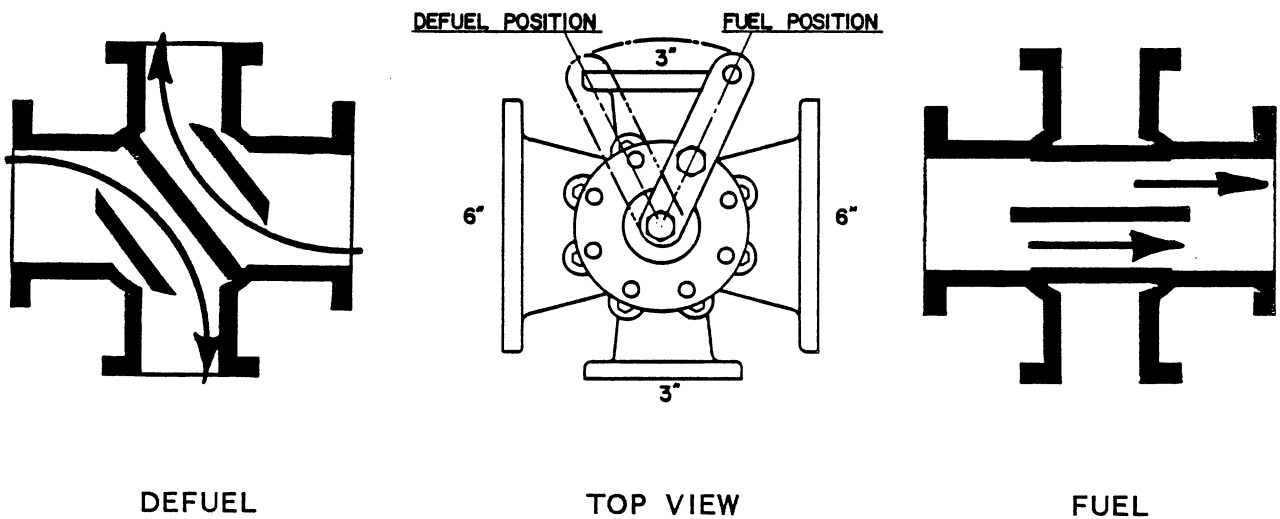


Figure 9. Valve Installation Dimensions

When the center web of the valve is aligned with the 6-inch ports (fueling position) the flow passes straight through. When the handle is turned to the defueling position, the web blocks the straight flow and opens two paths of flow through the 6-inch and 3-inch ports.



DEFUEL

TOP VIEW

FUEL

Figure 10. Theory of Valve Operation

Eductors

An eductor is used in conjunction with an FDF valve to increase defueling rates and efficiency. An eductor can be used to collapse the service hose and provide hose defueling service.

Contact the Gorman-Rupp Company or an authorized distributor for specifications and performance data.

OPERATION - SECTION C

CAUTION

WHETHER NEW INSTALLATION OR REBUILD OF FUELER, THE FOLLOWING REQUIREMENTS APPLY:

1. It is essential that tank scale dirt and any other foreign elements be removed from tank and piping prior to pump installation.
2. Lubrication has been removed from gearbox prior to shipment from manufacturer. Lubrication must be added before any operation.
3. Pump must not run dry of product at any time.

WARNING

```

////////////////////////////////////
//
// Never tamper with the governor to gain more power. The
// governor establishes safe operating limits that should
// not be exceeded. Limit input speed and operating range
// as indicated on the performance curve.
//
////////////////////////////////////

```

PRIMING

Make sure that the piping connections are tight, and that the pump is securely mounted. Check that the pump is properly lubricated (see LUBRICATION in MAINTENANCE AND REPAIR).

This pump is self-priming, but the pump should never be operated unless there is liquid in the pump casing.

CAUTION

Never operate a self-priming pump unless there is liquid in the pump casing. The pump will not prime when dry. Operation of a dry pump will result in rapid heat build-up and destruction of shaft seal faces.

Add liquid to the casing when:

1. The pump is being put into service for the first time.
2. The pump has not been used for a considerable length of time.

-
-
3. The liquid in the casing has evaporated.

When installed in a flooded suction application, simply open the system valves and permit the incoming liquid to evacuate the air. After the pump and piping system have completely filled, evacuate any remaining air pockets in the pump or suction line by loosening pipe plug or opening bleeder valves.

Once the casing has been filled, the pump will prime and reprime as necessary.

GROUNDING

To eliminate electrostatic build-up by the liquid being pumped, the chassis on which the pump is mounted must be grounded by attaching the ground wire assembly to a ground rod. Install the ground rod in accordance with the National Electrical Codes and all local codes. Be sure the clamp or fastener has made a tight electrical connection with the rod.

CAUTION

Inspect and test the ground wire assembly for conductivity. Replace broken or frayed wire before re-suming operation.

STARTING

Consult the operations manual furnished with the truck chassis.

Rotation

The pump input shaft **must** rotate clockwise while facing the shaft. If the pump is operated in the wrong direction, the impeller could become loosened from the shaft and seriously damage the pump.

CAUTION

Only operate the pump input shaft in a clockwise direction while facing the shaft. Otherwise, the impeller could become loosened from the shaft and seriously damage the pump.

Drive

The entire pump and gearbox assembly is mounted midship between the chassis frame members. The gearbox split shaft replaces a part of the chassis drive shaft connecting the transmission to the rear axle.

Consult the manual furnished with the truck chassis before attempting to start the unit.

OPERATION

WARNING

```

////////////////////////////////////
//
// Do not operate the pump against a closed discharge valve //
// for long periods of time. This could bring the liquid //
// to a boil, build pressure, and cause the pump to rupture //
// or explode. //
// //
////////////////////////////////////

```

The split drive shaft design of the pump gearbox provides for selective operation of either the pump or the vehicle; both cannot be operated at the same time.

Operating Controls

Since Gorman-Rupp has no control over the actual installation, it is the obligation of the tank builder or the installer to devise controls to **safely** operate the pump from inside the cab, or from a remote control panel. All instructions and operational procedures for the pump and system **must** be provided to the pump operator.

WARNING

```

////////////////////////////////////
//
// Decals and tags vital to pump operation were shipped //
// loose with the pump. Affix these decals in a prominent //
// place visible to the pump operator. //
// //
////////////////////////////////////

```

On air shift models, it is strongly recommended that shift mode indicator be visible to the operator.

Shifting Sequence

In shifting to vehicle operation, the air shift rod linkage is activated to engage the output shaft and provide direct drive (1:1 ratio) through the gearbox

OPERATION

to the rear axle of the vehicle.

In shifting to pump operation, activate the air shifter to disengage the gearbox drive output shaft, and to engage the drive input shaft to the gear train which operates the pump. **Never** shift from "drive" to "pump" unless the vehicle is completely stopped.

The pump air cylinder must maintain air pressure of 70 to 140 psi for air shift operation.

At the time of shifting from pump to vehicle operation or vice versa, the power input shaft should be rotating **no more than** 15 RPM. If the vehicle is equipped with a brake on the transmission output shaft, engage the brake before shifting.

CAUTION

When this pump is operated by a diesel engine drive, low idle speed should be increased approximately 200 RPM, or to a speed ensuring even, vibration-free operation of the drive shaft, to prevent excessive wear of components.

Liquid Temperature And Overheating

The **maximum** liquid temperature for this pump is 160° F (71.1° C). Do not apply it at a higher operating temperature.

Overheating can occur if the valves in the suction or discharge lines are closed. Operating against closed valves could bring the liquid to a boil, build pressure, and cause the pump to rupture or explode. If overheating occurs, stop the pump and allow it to cool before servicing it. Refill the casing with cool liquid.

WARNING

Overheating may produce dangerous fumes. Use extreme caution when venting the pump, or when removing covers, plates, plugs, or fittings.

STOPPING

Never halt the flow of liquid suddenly. If the liquid being pumped is stopped abruptly, damaging shock waves can be transmitted to the pump and piping system. Close all connecting valves slowly.

After stopping the pump, secure all pump and system controls to ensure that the pump will remain inoperative.

OPERATING CHECKS

Leakage

No leakage should be visible at pump mating surfaces, or at pump connections or fittings. Keep all line connections and fittings tight to maintain maximum pump efficiency.

Strainer Check

If a strainer is installed in the pump suction line, check it regularly, and clean as necessary. The strainer should also be checked if pump flow rate begins to drop.

GEARBOX TEMPERATURE CHECK

The gearbox runs higher than ambient temperatures because of heat generated by friction. Temperatures of approximately 200°F (93.3°C) are considered normal, and can operate intermittently at 250°F (121.1°C).

Checking gearbox temperatures by hand is inaccurate. Place a contact-type thermometer against the housing and record this temperature for future reference.

A sudden increase in gearbox temperature is a warning that the bearings are at the point of failing. Make certain that the bearing lubricant is of the proper viscosity and at the correct level (see **LUBRICATION** in Section E). Bearing overheating can also be caused by shaft misalignment and/or excessive vibration.

When pumps are first started, the bearings may seem to run at temperatures above normal. Continued operation should bring the temperatures down to normal levels within 20 minutes or less.

TROUBLESHOOTING - SECTION D

WARNING

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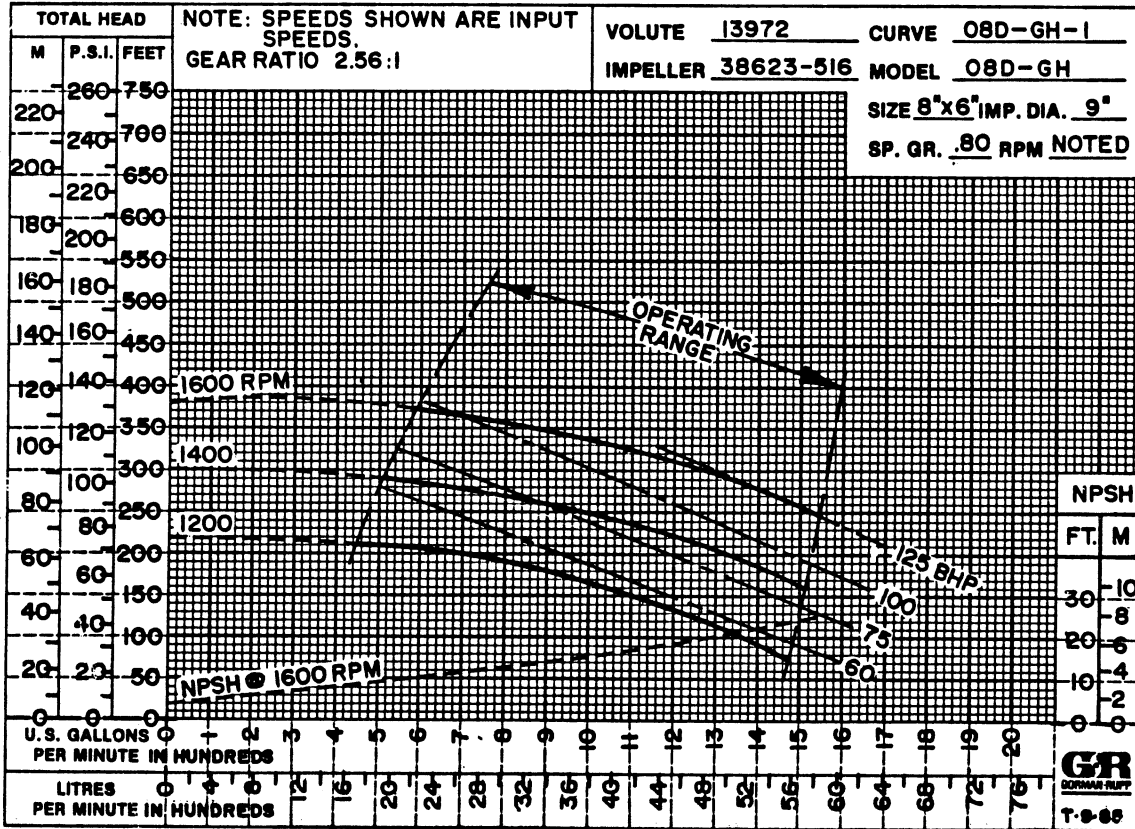
////////////////////////////////////
//
// Before attempting to open or service the pump:
//
// 1. Familiarize yourself with this manual.
// 2. Turn off the vehicle ignition to ensure that the
// pump will remain inoperative.
// 3. Allow the pump to cool if overheated.
// 4. Vent the pump slowly and cautiously.
// 5. Close the suction and discharge valves.
// 6. Check the temperature before opening any covers,
// plates, or plugs.
// 7. Drain the pump.
//
////////////////////////////////////
    
```

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	Not enough liquid in casing. Air leak in suction line. Leaking or worn seal or pump gasket. Strainer clogged.	Add liquid to casing. See PRIMING. Correct leak. Check pump vacuum. Replace leaking or worn seal or gasket. Check strainer and clean if necessary.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line. Strainer clogged. Impeller or other wearing parts worn or damaged. Pump speed too slow. Discharge throttling valve partially closed; check valve installed improperly. Discharge line clogged or restricted; hose kinked.	Correct leak. Check strainer and clean if necessary. Replace worn or damaged parts. Check that impeller is properly centered and rotates freely. Check driver speed. Check vehicle transmission for slippage. Open discharge valve fully; check piping installation. Check discharge lines; straighten hose.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP REQUIRES TOO MUCH POWER	<p>Universal joint drive misaligned.</p> <p>Pump speed too high.</p> <p>Discharge head too low.</p>	<p>Align drive.</p> <p>Check driver speed; check that the universal joint drive is properly installed.</p> <p>Adjust discharge valve.</p>
EXCESSIVE NOISE	<p>Cavitation in pump.</p> <p>Pumping entrained air.</p> <p>Pump or drive not securely mounted.</p> <p>Universal joint drive misaligned.</p> <p>Low or incorrect lubricant.</p>	<p>Reduce discharge pressure and/or pump speed.</p> <p>Locate and eliminate source of air bubble.</p> <p>Secure mounting hardware.</p> <p>Align drive.</p> <p>Check for proper type and level of lubricant.</p>
BEARINGS RUN TOO HOT	<p>Bearing temperature is high, but within limits.</p> <p>Low or incorrect lubricant.</p> <p>Suction and discharge lines not properly supported.</p> <p>Drive misaligned.</p>	<p>Check bearing temperature regularly to monitor any increase.</p> <p>Check for proper type and level of lubricant.</p> <p>Check piping installation for proper support.</p> <p>Align drive properly.</p>

MAINTENANCE AND REPAIR - SECTION E

MAINTENANCE AND REPAIR OF THE WEARING PARTS OF THE PUMP WILL MAINTAIN PEAK OPERATING PERFORMANCE.



*STANDARD PERFORMANCE FOR PUMP MODEL 08D1-GH1

*Based on 70°F clear water at sea level with minimum suction lift, corrected to 0.80 specific gravity. Since pump installations are seldom identical, your performance may be different due to such factors as viscosity, specific gravity, elevation, temperature, and impeller trim.

If your pump serial number is followed by an "N", your pump is NOT a standard production model. Contact the Gorman-Rupp Company to verify performance or part numbers.

CAUTION

Pump speed and operating condition points must be within the continuous performance range shown on the curve. Limit input speeds as specified.

SECTIONAL DRAWING

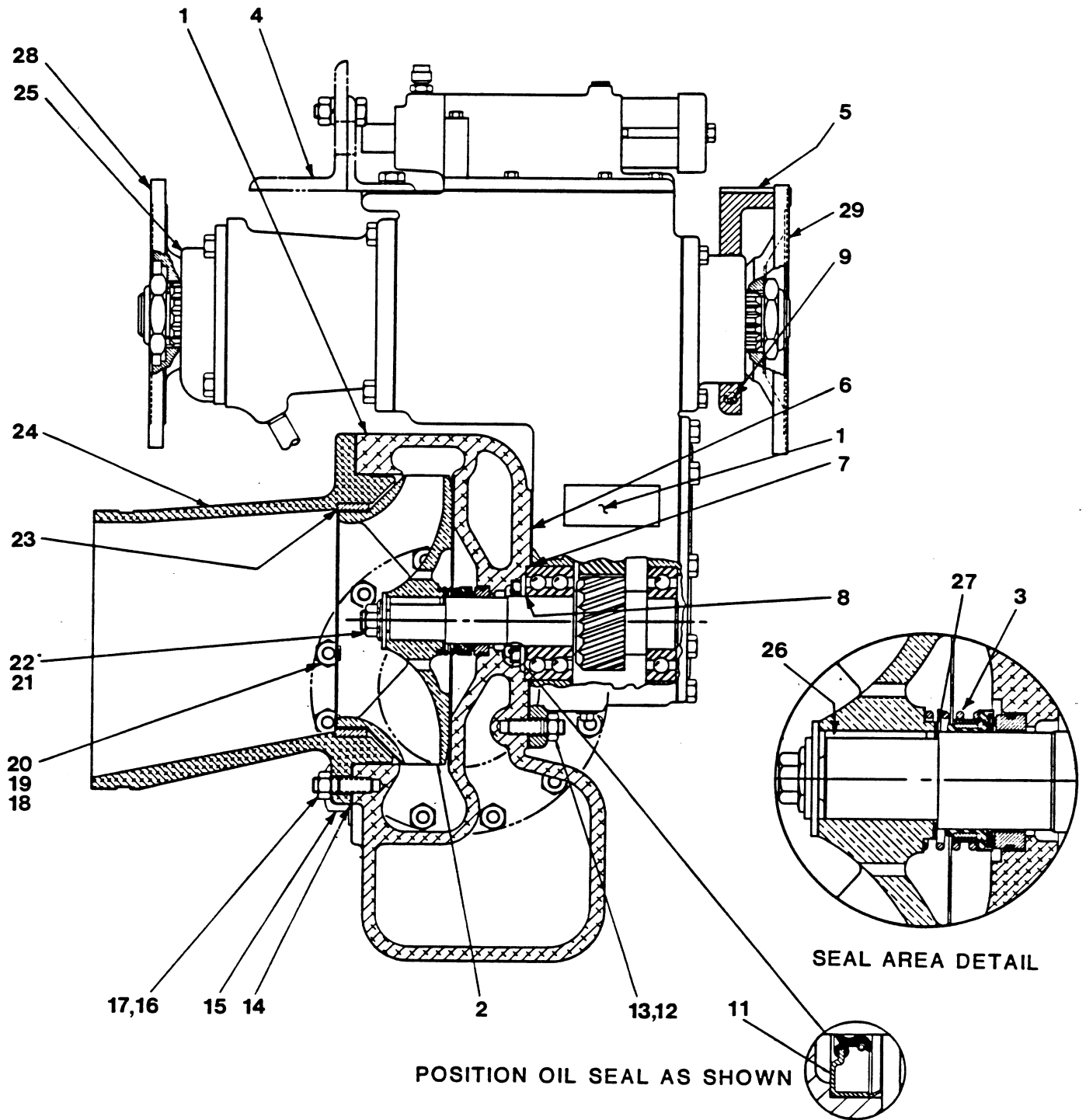


Figure 1. Pump Model 08D1-GH1

PARTS LIST
Pump Model 08D1-GH1
 (From S/N 860137 up)

If your pump serial number is followed by an "N", your pump is **NOT** a standard production model. Contact the Gorman-Rupp Company to verify part numbers.

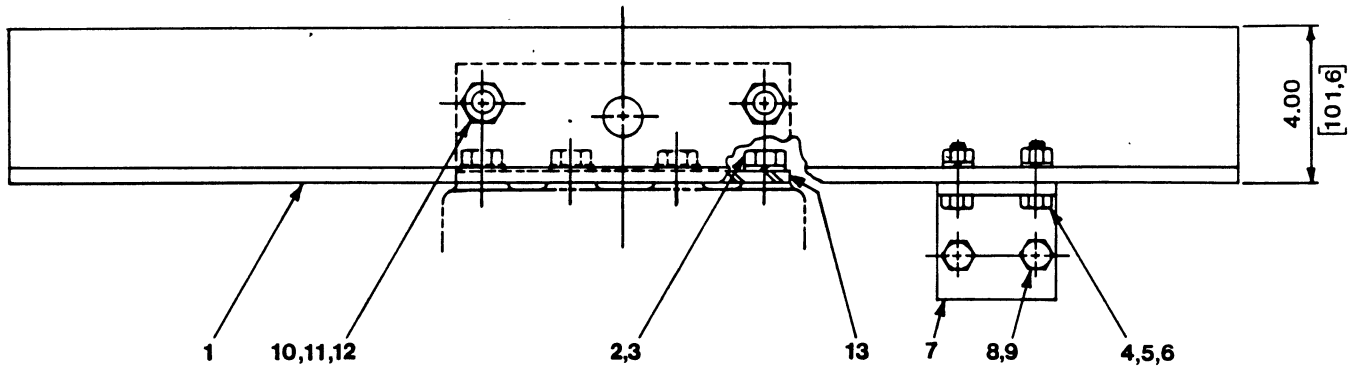
ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	PUMP CASING	13972	13040	1
2	* IMPELLER	38623-516	1304R	1
3	* SEAL ASSY	25271-903	-----	1
4	CROSS MEMBER (SEE FIGURE 2)	14078	-----	1
5	TRUNNION	8767-A	11000	1
6	* PUMP CASING GSKT	8377-G	18000	1
7	* PUMP CASING O-RING	S2085	-----	1
8	* BEARING SHIM SET	8543	15990	1
9	LUBE FITTING	S186	-----	1
10	NAME PLATE	38818-020	13990	1
	DRIVE SCREW	BM#04-03	15990	4
11	* OIL SEAL	S2007	-----	1
12	STUD	C0807	15991	6
13	HEX NUT	D08	15991	6
14	* SUCTION HEAD GSKT	13977	20000	1
15	CASING DRAIN PLUG	P32	11990	1
16	STUD	C0807	15991	8
17	HEX NUT	D08	15991	8
18	* DISCHARGE FLANGE GSKT	11037-G	20000	1
19	STUD	C0607	15991	12
20	HEX NUT	D06	15991	12
21	* IMPELLER WASHER	K10	15991	1
22	* IMPELLER LOCKNUT	S2202	-----	1
23	* SUCTION HEAD WEAR RING	13976-A	14000	1
24	SUCTION HEAD	13975-A	13040	1
25	GEARBOX ASSY (SEE FIG. 3 & 3A)	24571-025	-----	1
26	* IMPELLER KEY	N0406	15990	1
27	* IMPELLER SHIM SET	37-J	17090	1
28	OUTPUT COMPANION FLANGE	S2272-A	-----	1
29	INPUT COMPANION FLANGE	S2271	-----	1
NOT SHOWN:				
	GEAR LUBE DECAL	38816-086	-----	1
	LUBE INSTRUCTION TAG	38817-041	-----	1
OPTIONAL:				
	MECHANICS FLANGE KIT	48123-004	-----	1
	TRUNNION ASSY	8478	-----	1

*INDICATES PARTS RECOMMENDED FOR STOCK

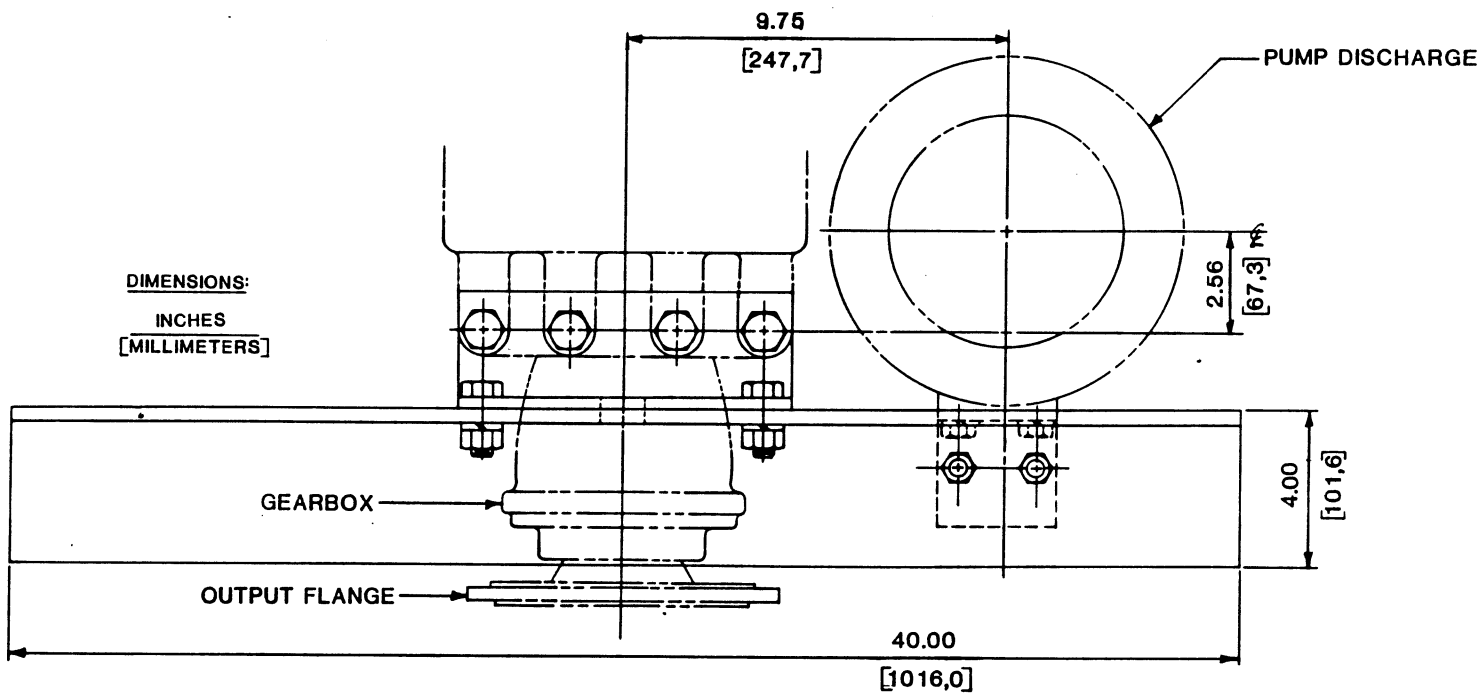
Above Serial Numbers Do Not Apply To Pumps Made In Canada.

CANADIAN SERIAL NO. AND UP

SECTIONAL DRAWING



AS VIEWED FROM OUTPUT SHAFT



AS VIEWED FROM TOP

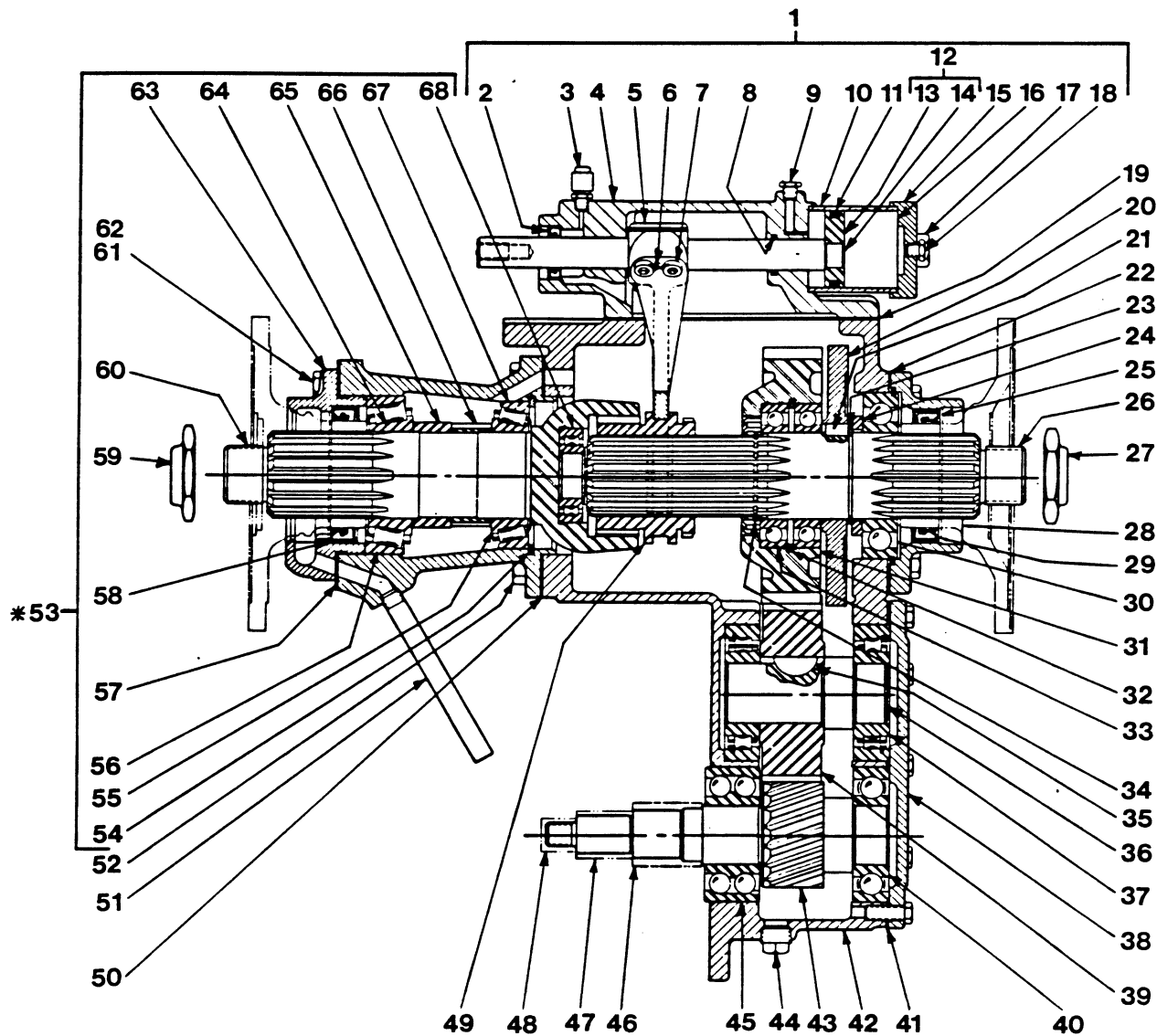
Figure 2. Rear Cross Member Assy 14078

PARTS LIST
Rear Cross Member Assy 14078

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	REAR CROSS MEMBER ASSY	14078	-----	1
2	-HEX HD CAPSCREW	B1004	15991	4
3	-LOCKWASHER	J10	15991	4
4	-HEX HD CAPSCREW	B0805	15991	2
5	-LOCKWASHER	J08	15991	2
6	-HEX NUT	D08	15991	2
7	-PUMP MOUNTING BRACKET	NOT AVAILABLE		1
8	-HEX HD CAPSCREW	B0804	15991	2
9	-HEX NUT	J08	15991	2
10	-HEX HD CAPSCREW	9016	15990	2
11	-LOCKWASHER	J10	15991	2
12	-HEX NUT	D10	15991	2
13	-GEARBOX MOUNTING BRACKET	NOT AVAILABLE		1

*INDICATES PARTS RECOMMENDED FOR STOCK

SECTIONAL DRAWING



*Note: See Figure 3A For Additional Components Of Tail Shaft Assembly

Figure 3. Gearbox Assy 24571-025

PARTS LIST
Gearbox Assy 24571-025

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
1	AIR SHIFT CVR ASSY	24571-230	-----	1	37	ROLLER BEARING	24571-081	-----	2
2	-OIL SEAL	24571-168	-----	1	38	BEARING COVER	24571-039	-----	1
3	-PRESS RELIEF FIT	S1530	-----	1	39	IDLER GEAR	24571-073	-----	1
4	-SHIFTER COVER	24571-231	-----	1	40	BALL BEARING	S1080	-----	1
5	-SHIFTER FORK	24571-235	-----	1	41	GASKET	24571-040	-----	1
6	-SAFETY WIRE	24571-165	-----	1	42	HOUSING	24571-030	-----	1
7	-SOCK HD CAPSCREW	24571-236	-----	2	43	IMPELLER SHAFT	13974	-----	1
8	-SHAFT O-RING	24571-214	-----	1	44	MAG DRAIN PLUG	PM08	-----	1
9	-PLASTIC SHIP PLUG	24571-174	-----	1	45	BALL BEARING	S1495	-----	1
10	-CYLINDER	24571-221	-----	1	46	>SHIPPING COVER	-----	-----	2
11	-PISTON O-RING	24571-215	-----	1	47	>SHIPPING COVER	-----	-----	1
12	-SHAFT/PISTON ASSY	24571-233	-----	1	48	>SHIPPING COVER	-----	-----	1
13	-PISTON	NOT AVAILABLE		1	49	SLIDING CLUTCH	24571-077	-----	1
14	-SHIFTER SHAFT	NOT AVAILABLE		1	50	GASKET	24571-110	-----	1
15	-CYLINDER CAP	24571-222	-----	1	51	DRAIN PIPE	24571-051	-----	1
16	-GASKET	24571-203	-----	2	52	HEX HD CAPSCREW	24571-111	-----	4
17	-HEX HD CAPSCREW	24571-223	-----	2	53	TAIL SHAFT ASSY	24571-102	-----	1
18	-PLASTIC SHIP PLUG	24571-174	-----	1	54	-RETAINING RING	24571-143	-----	1
19	SHIFTER COVER GSKT	24571-036	-----	1	55	-TAPERED BEARING	23765-426	-----	1
20	SLINGER/SPACER ASSY	24571-075	-----	1		CONE			
21	KEY	N0302 1/2	-----	1	56	-TAPERED BRG CUP	23775-028	-----	1
22	GASKET	24571-047	-----	1	57	-SHIMS	24571-117	-----	1
		24571-048	-----	1			24571-118	-----	1
23	RETAINING RING	24571-087	-----	1	58	-OIL SEAL	24571-092	-----	1
24	SPACER	24571-067	-----	1	59	-LOCKNUT	22568-137	-----	1
25	SHIPPING COVER	-----	-----	1	60	-OUTPUT SHAFT	24571-132	-----	1
26	INPUT SHAFT	24571-061	-----	1	61	-HEX HD CAPSCREW	24571-041	-----	4
27	LOCKNUT	22568-137	-----	1	62	-HY-COLLAR	24541-032	-----	4
28	INPUT BRG CAP	24571-046	-----	1		LOCKWASHER			
29	OIL SEAL	24571-092	-----	1	63	-BEARING CAP	24571-116	-----	1
30	BALL BEARING	23263-017	-----	1	64	-TAPERED BEARING	23765-425	-----	1
31	DRIVE GEAR	24571-072	-----	1		CONE			
32	RETAINING RING	24571-088	-----	1	65	-SPACER	24571-134	-----	1
33	BALL BEARING	23231-513	-----	2	66	-SPEEDO GEAR	24571-152	-----	1
34	RETAINING RING	24571-085	-----	1	67	-TAPERED BRG CUP	23775-331	-----	1
35	WOODRUFF KEY	AV1009	-----	1	68	-ROLLER BEARING	23528-002	-----	1
36	IDLER SHAFT	24571-062	-----	1					

>Items 46, 47, and 48 are provided on repair gearbox assemblies for shipping purposes only. These must be removed before installing the gearbox.

SECTIONAL DRAWING

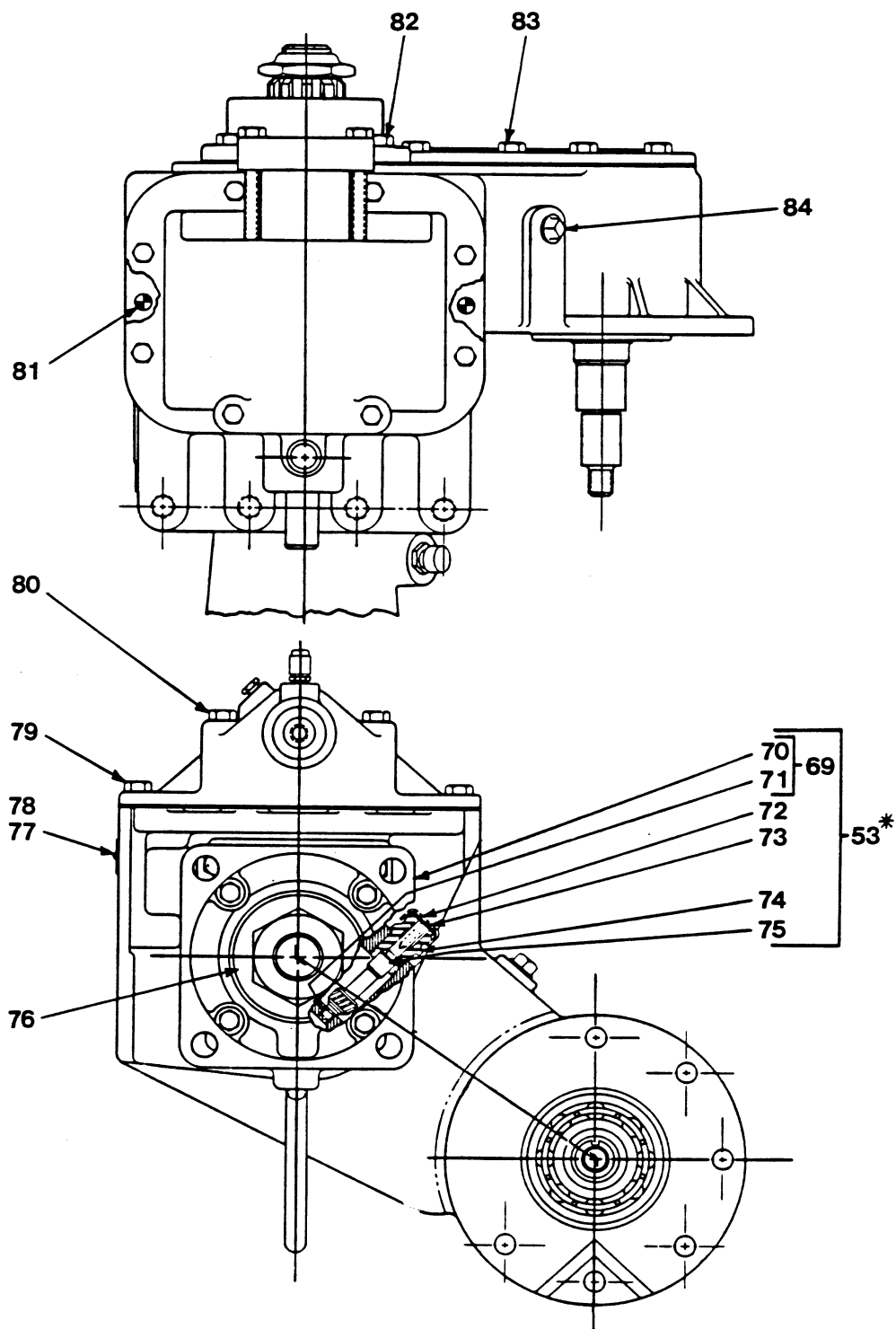


Figure 3A. Gearbox Assy 24571-025 (Continued)

PARTS LIST
Gearbox Assy 24571-025 (continued)

ITEM NO.	PART NAME	PART NUMBER	MATL CODE	QTY
69	-BRAKE BRACKET ASSY	24571-106	-----	1
70	-BRAKE BRACKET	24571-108	-----	1
71	-BUSHING	24571-109	-----	1
72	-DUST CAP	24571-155	-----	1
73	-GASKET	24571-156	-----	1
74	-SLEEVE NUT	24571-154	-----	1
75	-SPEEDO GEAR	24571-153	-----	1
76	SHIPPING COVER	-----	-----	1
77	NAME PLATE	-----	-----	1
78	DRIVE SCREW	-----	-----	2
79	HEX HD CAPSCREW	24571-049	-----	6
80	HEX HD CAPSCREW	24571-204	-----	2
81	DOWEL PIN	AA0704	-----	2
82	HEX HD CAPSCREW	24571-049	-----	4
83	HEX HD CAPSCREW	24571-041	-----	8
84	PIPE PLUG	P08	-----	1

*INDICATES PARTS RECOMMENDED FOR STOCK

PUMP, SEAL, AND GEARBOX DISASSEMBLY AND REASSEMBLY

Maintenance And Repair

WARNING

```

////////////////////////////////////
//
// Before attempting to open or service the pump:
//
// 1. Familiarize yourself with this manual.
// 2. Turn off the vehicle ignition to ensure that the
//    pump will remain inoperative.
// 3. Allow the pump to cool if overheated.
// 4. Vent the pump slowly and cautiously.
// 5. Close the suction and discharge valves.
// 6. Check the temperature before opening any covers,
//    plates, or plugs.
// 7. Drain the pump.
//
////////////////////////////////////

```

WARNING

```

////////////////////////////////////
//
// After the vehicle is positioned for pump maintenance,
// block the wheels and set the emergency brake before at-
// tempting to disconnect the drive shaft or remove the
// pump. Be sure the pump is properly reinstalled and se-
// cure before operation.
//
////////////////////////////////////

```

The position of the pump unit below the tank and between the frame members of the vehicle chassis provides maximum accessibility to the impeller, wear ring, and seal assembly - the pump parts susceptible to greatest wear. These parts may be serviced with the pump in place on the truck chassis.

If it is necessary to service the gearbox, it is recommended that the entire pump unit be removed from the chassis.

This pump requires little service due to its minimum-maintenance design. However, if it becomes necessary to inspect or replace components, follow these instructions, which are keyed to the sectional views (see Figure 1, 2, 3, and 3A) and the accompanying parts lists.

Pump End Only Disassembly

WARNING

```

////////////////////////////////////
//
// Before operating or servicing the pump, be certain prop- //
// er safety practices are followed. Provide adequate ven- //
// tilation, prohibit smoking, wear static-resistant //
// clothing and shoes. Clean up all fuel spills immediate- //
// ly after occurrence. //
// //
////////////////////////////////////

```

The instructions in this section are keyed to Figure 1 and the accompanying parts list.

Close all valves and remove the casing drain plug (15) to drain the pump. Clean and reinstall the drain plug.

Remove a section of suction piping at the suction head (24). Remove the nuts (17) securing the suction head to the pump casing (1), and remove the suction head. Inspect the wear ring (23) for excessive wear. If replacement is required, use a suitable puller to remove it from the suction head.

To remove the impeller, remove the impeller locknut and washer (21 and 22). Install three 1/4-20 UNC capscrews in the holes provided in the hub and use a suitable puller to slide the impeller off the shaft. Remove the impeller key (26). Use caution when sliding the impeller off the shaft; tension on the seal spring will be released.

Remove the impeller adjusting shims (27). For ease of reassembly, tie and tag the shims, or measure and record their thickness.

The shaft seal assembly (3) is now accessible. This seal prevents air from entering and liquid from escaping along the impeller shaft. If the gearbox lubricant is contaminated by the product being pumped, the shaft seal and gearbox oil seal (11) have failed and should be replaced.

Remove the seal spring. Apply oil to the shaft and work it up under the bellows. Slide the rotating portion of the seal off the shaft. Use a stiff wire with a hooked end to remove the rotating element and O-ring.

The presence of gearbox lubricant in the seal cavity indicates failure of the gearbox oil seal (11). To remove the oil seal, disconnect the discharge piping and drain the gearbox lubricant. Remove the nuts (13) securing the pump casing to the gearbox and separate the assemblies. Tie and tag the bearing adjusting shims (8) for ease of reassembly. Press or pry the oil seal from the pump casing.

Pump End Only Reassembly

Clean the shaft, the impeller hub bore, and the seal cavity with a soft cloth soaked in solvent.

WARNING

```

////////////////////////////////////
//
// Most cleaning solvents are toxic and flammable. Use //
// them only in a well-ventilated area free from excessive //
// heat, sparks, and flame. Read and follow all prec- //
// autions printed on solvent containers. //
// //
////////////////////////////////////

```

Press the gearbox oil seal (11) into the pump casing with the lip positioned as shown in Figure 1 (see Figure 4 for detail of seal area).

Align the square hole in the casing gasket (6) with the drainage passage through the pump casing and install it on the casing flange.

Before further reassembly, calculate the thickness of bearing adjusting shims (8) required to obtain a shaft end play of .005 to .012 inch (.127 to .305 mm). Use a depth micrometer to measure the depth of the bearing bore in the pump casing (gasket installed) and the distance that the bearing protrudes from the gearbox. Select a combination of shims to make up the difference between the two measurements. Install the bearing shims in the bearing bore and slide the O-ring (7) onto the protruding bearing.

It is recommended that a tapered sleeve be installed over the seal area of the shaft to prevent rolling the lip of the oil seal (11) during installation of the pump casing. Lubricate the oil seal and sleeve to ease installation. Slide the pump casing and oil seal over the shaft, and secure the casing to the gearbox with the nuts (13). Check the shaft end play.

Replace the discharge flange gasket (18), and reinstall the discharge piping.

Clean the seal cavity and shaft with a cloth soaked in fresh cleaning solvent.

WARNING

```

////////////////////////////////////
//
// Most cleaning solvents are toxic and flammable. Use //
// them only in a well-ventilated area free from excessive //
// heat, sparks, and flame. Read and follow all prec- //
// autions printed on solvent containers. //
// //
////////////////////////////////////

```

The seal is not normally reused because wear patterns on the finished faces cannot be realigned during reassembly. This could result in premature failure. If necessary to reuse an old seal in an emergency, **carefully** wash all metallic parts in fresh cleaning solvent and allow to dry thoroughly.

Handle the seal parts with extreme care to prevent damage. Be careful not to contaminate precision finished faces; even fingerprints on the faces can shorten seal life. If necessary, clean the faces with a non-oil based solvent and a clean lint free tissue. Wipe **lightly** in a concentric pattern to avoid scratching the faces.

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. If any components are worn, replace the complete seal; **never mix old and new seal parts.**

If a replacement seal is being used, remove it from the container and inspect the precision finished faces to ensure that they are free of any foreign matter.

To ease installation of the seal, lubricate the shaft and stationary element O-ring with water or a very small amount of oil, and apply a drop of light lubricating oil on the finished faces. Assemble the seal as follows, (see Figure 4).

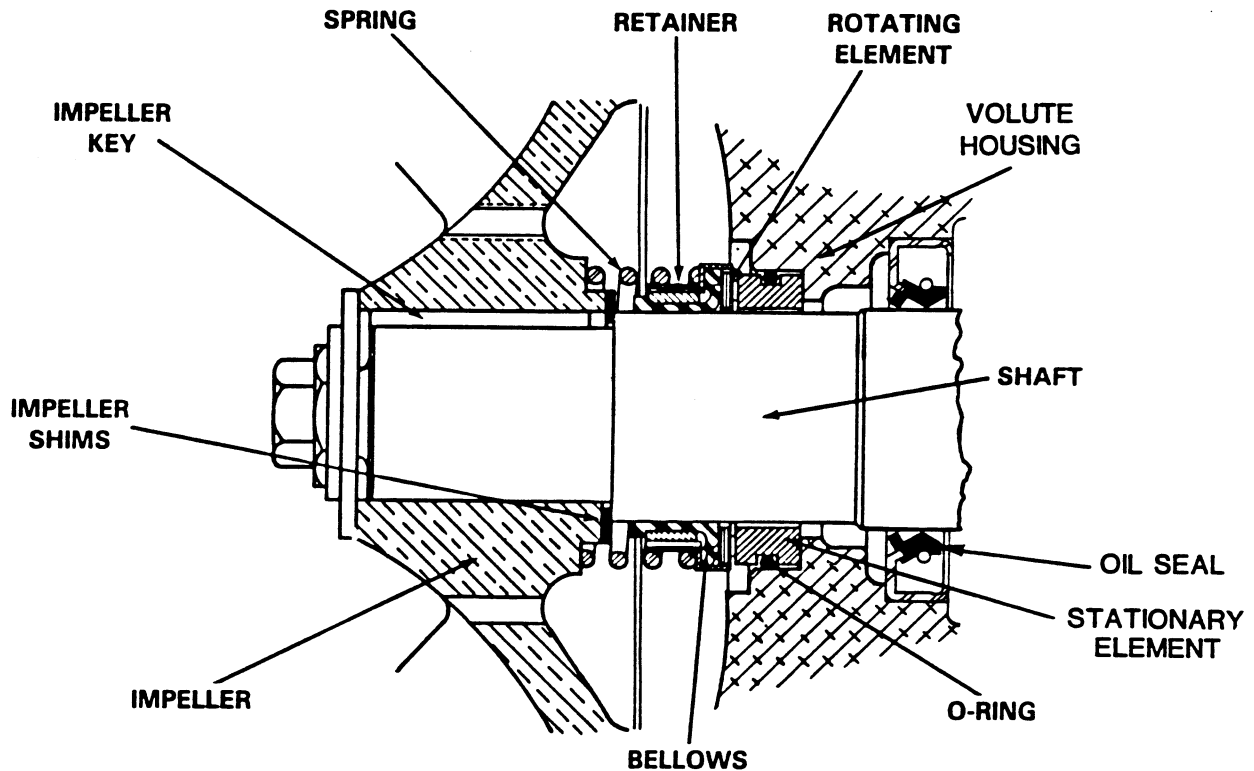


Figure 4. 25271-903 Seal Assembly

CAUTION

This seal is not designed for operation at temperatures above 160° F (71.1° C). Do not use at higher operating temperatures.

Install the O-ring in the stationary element. Use thumb pressure to press the element and O-ring squarely into the seal bore until fully seated. Be careful not to damage the seal face.

NOTE

It is recommended that a tapered sleeve be installed over the shaft keyway to ease installation of the rotating portion of the seal.

Lubricate the tapered sleeve and use even pressure against the seal retainer to press the rotating portion of the seal (consisting of the retainer, bellows and rotating element) onto the shaft until the seal faces contact. Install the seal spring, making certain that all components of the seal are seated squarely.

Install the same thickness of impeller adjusting shims (27) as previously removed. For maximum pump efficiency, the impeller vanes **must** be centered within the volute scroll. The impeller should be correctly centered if the same thickness of adjusting shims as previously removed are reinstalled.

To verify the impeller positioning, measure the pump casing and impeller as shown in Figure 5. Use these measurements to calculate the required impeller location (dimension E). Add or remove impeller adjusting shims until dimension E is obtained.

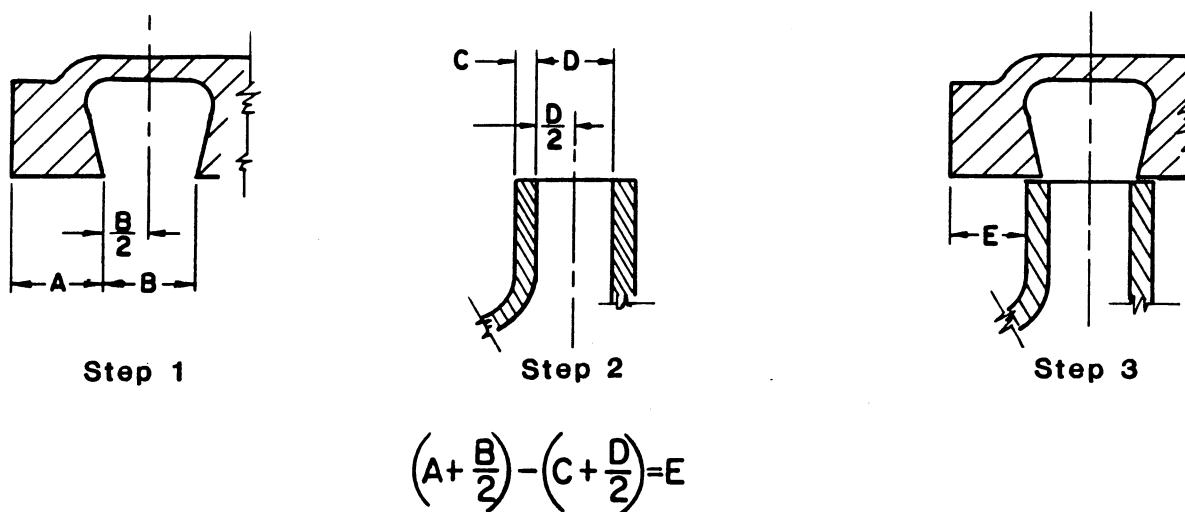


Figure 5. Centering Impeller Within Volute Scroll

NOTE

After the impeller has been properly positioned, check for free rotation. Correct any scraping binding before further reassembly.

Inspect the impeller, and replace it if cracked or badly worn. Apply 'Loquic Primer Grade T' to the keyway, key and shaft threads, followed by 'Loctite Keyfit-CVV'. **Use no substitutes.** Install the impeller key, and slide the impeller onto the shaft until it seats squarely against the impeller adjusting shims. Install the impeller washer (21) and torque the locknut (22) to 125 ft. lbs.

If the suction head wear ring (23) was removed at disassembly, press the replacement ring into the suction head until fully seated.

NOTE

The wear ring must seat squarely in the suction head or binding and/or excessive wear will result. The surface finish and clearance between the impeller and wear ring are critical to efficient pump operation. Replace damaged parts which would permit excessive leakage through this close tolerance area.

Replace the suction head gasket (14). Apply 'Locquic Primer Grade T' followed by 'Loctite Pipe Sealant Grade HVV' or equivalent on the pump housing studs (16) and secure the suction head. Reinstall the suction piping.

Lubricate the trunnion bracket and gearbox as indicated in **LUBRICATION**, Section E. Make certain that all piping connections to the pump are secure. Open all valves and make certain that there is a supply of liquid to the pump before starting the pump.

GEARBOX DISASSEMBLY

When the pump is properly operated and maintained, the gearbox should not require disassembly. Disassemble the shifting mechanism, shafts, and bearings **only** when there is evidence of wear or damage.

CAUTION

Gearbox disassembly in the field is not recommended. These operations should be performed only in a properly-equipped shop by qualified personnel.

The instructions in this section are keyed to Figure 3 and 3A and the accompanying parts lists.

Removing Pump Unit

Close all valves in the piping system, drain the pump, and disconnect the suction and discharge piping (see **Pump End Only Disassembly**).

Remove the drain plug (44) to drain the gearbox. Clean and reinstall the drain plug.

Disconnect the air shift linkage from the shifter shaft (14).

Disconnect the input and output companion flanges at their respective universal joints.

Remove the hardware securing the trunnion to the front cross member, and the hardware securing the pump and gearbox mounting flanges to the rear cross member. Remove the pump and gearbox assembly from the vehicle chassis.

CAUTION

Due to the confined mounting location, specialized equipment such as a transmission jack with custom brackets should be used to lift and position the pump and gearbox.

Air Shift Cover Disassembly

To remove the air shift cover assembly (1), disengage the capscrews (79 and 80) securing the assembly to the gearbox housing (42).

The air supply lines and cylinder cap (15) must be removed before the shaft and piston assembly (12) can be removed. To remove the cylinder cap, disengage the capscrews (17).

To remove the shifter fork (5), remove the lock wire (6) installed on the allen screws (7) securing the fork to the shifter shaft. Disengage the screws and remove the shifter fork.

Remove and inspect the shaft (14), piston (13), and piston O-ring (11) replacing parts as necessary. Remove the oil seal (2) and shaft O-ring (8).

Drive Flange Removal

Disengage the locknuts (27 and 59) securing the input and output companion drive flanges to their respective shafts, and use a suitable puller to remove the flanges.

NOTE

After the flanges have been removed, reinstall the locknuts to protect the shaft threads.

Output Shaft Disassembly

Before attempting to remove the output shaft assembly (53), disengage the drain pipe (51) from the brake bracket (70) to prevent damage to the pipe.

To remove the output shaft assembly, which includes the output drive shaft (60) and all related components, remove the capscrews (52) and pull the assembly from the gearbox housing. Remove the brake bracket gasket (50).

Disengage the hardware (61 and 62) and separate the bearing cap (63) and shims (57) from the brake bracket (70). Tie and tag the bearing shims for ease of re-assembly. Inspect the oil seal (58) and, if replacement is required, press it from the bearing cap.

If the output shaft (60) is to be removed from the assembly, first remove the speedo gear (75) by disengaging the sleeve nut (74). Continue to disassemble the remaining parts from the shaft.

Input Shaft Disassembly

To remove the input drive shaft (26), disengage the capscrews (82) and separate the bearing cap (28) and gasket (22) from the gearbox housing. Inspect the oil seal (29) and, if replacement is required, press it from the bearing cap.

Use a suitable puller to remove the bearings (30 and 68). Remove the bearing spacer (24) and retaining ring (23).

Remove the sliding clutch (49). Remove the retaining ring (34). Slide the input shaft from the housing and reach through the top of the gearbox to remove the drive gear assembly (31), slinger/spacer (20), and key (21). The ball bearings (33) and retaining ring (32) can now be removed from the drive gear.

Idler Shaft Disassembly

Disengage the capscrews (83) and remove the bearing cover (38) and gasket (41). There is a tapped hole (3/4-10 UNC X 5/8 deep) at the end of the idler shaft (36) to accommodate a puller. Pull the shaft and key (35) through the idler gear (39), and remove the idler gear through the top of the gearbox. Pull the front roller bearing (37) off the shaft. Use a suitable puller to remove the rear roller bearing from the gearbox cavity.

Impeller Shaft Disassembly

With the pump end disassembled (see **Pump End Only Disassembly**) and idler shaft removed, the impeller shaft (43) and bearings (40 and 45) can be tapped out from either side of the gearbox.

Use a suitable puller to remove the bearings from the shaft as required.

Gearbox Reassembly

Clean the gearbox, shafts, and all component parts (except the bearings) with a soft cloth soaked in cleaning solvent. Inspect all parts for wear or damage and replace as necessary.

WARNING

```

////////////////////////////////////
//
// Most cleaning solvents are toxic and flammable. Use //
// them only in a well-ventilated area free from excessive //
// heat, sparks, and flame. Read and follow all prec- //
// autions printed on solvent containers. //
// //
////////////////////////////////////

```

Check all oil seal and gasket seating surfaces for nicks and scratches. Dress small nicks and burrs with a fine file or emery cloth. Be careful not to distort the shape of the surface.

Clean the bearings thoroughly in **fresh** cleaning solvent. Dry the bearings with filtered compressed air and coat with light oil.

Rotate the bearings by hand to check for roughness or binding, and inspect the bearing balls and rollers. If rotation is rough or the balls or rollers discolored, replace the bearing.

CAUTION

<p>Bearings must be kept free of all dirt and foreign material. Failure to do so will greatly shorten bearing life. DO NOT spin dry bearings. This may scratch the balls, rollers or other parts and cause premature bearing failure.</p>

Bearing tolerances provide a tight fit into the receiving part or onto the shaft. Replace the bearing, shaft or receiving part if the proper bearing fit is not achieved.

When reassembling the gearbox, replace all gaskets and O-rings. Apply a light coating of oil on mating surfaces of shaft, gears, and oil seals to ease reassembly.

Idler Shaft Reassembly

NOTE

Position the gearbox housing (42) so that the bearing cover (38) opening faces up. Rest the housing on wooden blocks while in this position.

Install the rear roller bearing (37) so that the shoulder of the outer race is snug against the gearbox (42). (The shoulder of the inner race must face toward the gear).

Press the front roller bearing (37) onto the shaft until the shoulder of the inner race is snug against the shaft shoulder.

NOTE

When installing the bearings onto the shaft, **never** press or hit against the rollers, balls, outer race or roll cage. Press **only** on the inner race.

Reach through the top of the gearbox and lay the idler gear in position next to the rear bearing. Install the key (35) in the idler shaft (36) and push the shaft through idler gear into rear bearing. Make certain the idler gear is engaged by the key, and tap the shaft and outer bearing into the gearbox housing until the shaft shoulder is snug against the gear, and the gear is snug against the rear bearing.

NOTE

When installing shafts and bearings into the housing, push against the outer race. **Never** hit the balls, rollers or cage.

Replace the bearing cover gasket (41) and secure the bearing cover (38) to the gearbox housing with the capscrews (83).

NOTE

Reposition the gearbox housing assembly so that the input shaft opening faces down. Place a block under the input bearing flange area to level and add support during further assembly.

Impeller Shaft Reassembly

Press the front bearing (40) onto the impeller shaft (43). Position the rear bearing (45) on the shaft with the loading groove on the **outer** race facing **toward** the gear. Press the bearing onto the shaft until seated squarely against the gear.

Press the assembled shaft and bearings into the gearbox housing (42) until the front bearing seats squarely against the bearing cover (38).

Temporarily cover the bearing (45) to protect it from dirt and dust.

Input Shaft Reassembly

NOTE

Reposition the gearbox assembly on its side providing access to the shaft through the shifter cover opening.

Install the retaining ring (23) in the proper groove on the shaft. Slide the spacer (24) onto the shaft. Press the outer bearing (30) onto the shaft until it seats squarely against the spacer.

Before installing the input shaft, position the slinger/spacer (20) in the gearbox with the flat side toward to the input shaft opening.

Install bearing (33), retaining ring (32), and the second bearing (33) in the drive gear (31). Position the drive gear assembly in the gearbox with the exposed bearing next to the slinger/spacer.

NOTE

Be certain all retaining rings are fully seated in their respective grooves.

Install the key (21) in the shaft keyway. Slide the shaft through the gearbox opening until the key engages the slinger/spacer.

Protect the threaded end of the input shaft, and tap the assembly through the slinger/spacer and drive gear assembly until the retaining ring on the outer bearing (30) seats against the gearbox housing. Install the bearing retaining ring (34) in the proper groove on the input shaft (26).

Install the oil seal (29) in the input bearing cap (28) and secure the cap to the gearbox housing with the capscrews ((83)).

Push the sliding clutch (49) over the long splined end of the input shaft. The narrow row of teeth must face toward the retaining ring. Check for free movement by sliding the clutch back and forth over the full length of the spline.

Press the bearing (68) onto the input shaft. Again, check for free clutch movement and proper engagement with drive gear.

If the output shaft assembly (53) is fully assembled, it may be installed at this time using a new gasket (50). Take care to align the input shaft bearing (68) in the bell shaped end of the output shaft.

Output Shaft Reassembly

Install the retaining ring (54) in the groove in the brake bracket (70). Press the bearing cup (67) into the brake bracket from the output shaft end until it seats against the retaining ring.

Slide the output shaft (60) through the bearing cup and brake bracket.

From the output end, press the tapered bearing cone (55) over the shaft until it seats in the bearing cup.

With the brake bracket positioned on the gearbox end, slide the speedo gear (66), and spacer (65) onto the shaft. Press the bearing cone (64) onto the shaft until fully seated against the spacer. Press the bearing cup (56) into the brake bracket until fully seated in the bearing cone. **Be sure** the bearing cup is in full contact with the bearing cone.

NOTE

Use a depth micrometer to measure the distance from the housing flange to the bearing cup at four different locations around the bearing bore. This dimension should be the same at all four readings, indicating that the cup is square with the shaft. Square the bearing as required.

Before further reassembly, calculate the thickness of bearing adjusting shims (57) required to obtain a bearing preload of .000 to .002 inch (.000 to .051 mm). Use a depth micrometer to measure the length of the shoulder on the bearing cap (63) and the distance the bearing cup (56) is recessed into the bearing bore. Select a combination of shims to make up the difference between these two measurements to obtain the correct endplay.

After proper shimming is determined, press the oil seal (58) into the bearing cap and secure the shims and bearing cap to the brake bracket with the hardware (61 and 62).

NOTE

Be sure the drain holes in the bearing cap and shims are aligned with the passage in the brake bracket.

Install the drain pipe (51) in the brake bracket.

If the speedo gear (75) was removed, reinstall it and secure with the sleeve nut (74).

If the input shaft has been installed, install a new gasket (50) and secure the output shaft assembly to the gearbox housing with the capscrews (52). Be sure the input shaft bearing (68) seats properly in the output shaft bearing bore.

Disengage the sliding clutch (49) from the output shaft and turn the shaft by hand. No drag or play should be evident in the output shaft or bearings. Recheck the bearing cap shims, adding or subtracting shims as required to ensure correct endplay.

Drive Flange Reassembly

The shaft splines are designed to produce a slight interference fit with the drive flange splines. This fit is intentional to eliminate fretting corrosion.

Coat the input and output shaft splines with oil. Apply oil to the leading area of the drive flanges where the oil seal lips seat. Position the input and output drive flanges on their respective shafts.

It is recommended that a sleeve be used to drive the flanges onto the shaft until fully seated. The sleeve must be sized to fit over the shaft and into the flange counterbore (2 1/4-inch O.D. X 7/8-inch I.D. sleeve recommended).

After the flanges have been installed and fully seated, install the locknuts (27 and 59) and torque to 500 ft. lbs..

Air Shift Cover Reassembly

Reinstall the shifter shaft O-ring (8), and oil seal (2). Be sure the lip of the oil seal is pointing toward the shifter fork. Replace the plunger O-ring (11). Lubricate the O-rings, piston and cylinder I.D. with 'Parker-O-Lube' or equivalent and reinstall the shaft and piston assembly (12). Secure the cylinder cap by tightening the capscrews (17) equally to prevent cocking the cylinder body; torque the capscrews to 35 ft. lbs. Check for free movement of the shaft and piston.

Inspect the shifter fork (5) and replace as necessary. Position the shifter fork on the shaft and in the shifter cover (4), and secure the fork to the shaft by torquing the allen screws (7) to 40-45 ft. lbs. Secure the allen screws with the lock wire (6).

Engage the shifter fork with the sliding clutch, and secure the air shift cover to the gearbox housing.

Apply 'Permatex' or equivalent on the hose fittings before installing the air supply lines to the air cylinder. Air check all possible leak points with 120 to 150 psi before further reassembly.

Check the shifter fork and sliding clutch alignment by working the shifter fork back and forth. The shaft should travel 1 5/8 inches between the two positions.

If the pump end only was removed, reinstall it (see **Pump End Only Reassembly**) on the impeller shaft and secure it to the gearbox housing.

Reinstalling Pump Unit

Secure the trunnion bracket and the pump and gearbox mounting flanges to the front and rear cross members, respectively. Position the mounted pump on the vehicle chassis side rails.

WARNING

```

////////////////////////////////////
//                               //
// Use lifting and moving equipment in good repair and with //
// adequate capacity to prevent injuries to personnel or //
// damage to equipment. //
//                               //
////////////////////////////////////

```

For installation of piping, transmission linkage, and installation and alignment of universal joints and drive shafts, see **Installation**, Section B.

LUBRICATION

Pump Shaft Seal

The seal assembly is lubricated by the liquid being pumped, and no additional lubrication of the seal is required.

Trunnion Bracket

(Figure 1).

To lubricate the trunnion (5) and the bearing retainer, add SAE No. 2 lithium-based pressure gun grease through the lubrication fitting (9) until grease escapes from the trunnion area.

Gearbox Assembly

(Figure 3)

WARNING

```

////////////////////////////////////
//
// This pump is shipped from the factory dry of gearbox //
// lubricant. Dow Corning 'Molykote® M Gear Guard' is //
// added to the gearbox at the factory after the pump has //
// been tested and the gearbox has been drained; however, //
// the gearbox MUST BE LUBRICATED before the pump is oper- //
// ated. //
// //
////////////////////////////////////

```

For initial lubrication of the gearbox, remove the gearbox fill plug (83) and add 5 pints (2.36 l) - or fill until the fill plug opening overflows - of a premium quality, multi-purpose, extreme pressure gear lubricant with an SAE rating per the following ambient temperatures:

SAE No. 80	Below 40° F/4° C
SAE No. 90	From 40° F/4° C to 100° F/38° C
SAE No. 140	From 100° F/38° C to 150° F/66° C

Multi-grade lubricants such as 80 W 140 are also suitable.

Change the lubricant in a new gearbox after an initial break-in period of 24 hours, and before 100 hours of operation. The lubricant should be changed while the pump is at operating temperature. Remove the magnetic drain plug (44) to drain the gearbox. Always clean the magnetic plug thoroughly before reinstalling it.

NOTE

It is recommended that 4 ounces (0.12 l) of 'Molykote® M Gear Guard' or equivalent lubricant be added to the gearbox at each lubrication change.

After the initial change, the lubricant should be changed every 500 hours of operation or every six months, whichever comes first. The lubricant should be changed more frequently when the pump is operating under severe conditions, such as in heavily dusty atmospheres or in areas of temperature change.

Check the oil in the gearbox monthly, and maintain it at the proper level. A monthly check of the gearbox for leaks is also recommended.

NOTE

Contaminated gearbox lubricant or metal chips on the magnetic drain plug may indicate impending pump or gearbox failure. Monitor operation closely and schedule maintenance accordingly.

**For U.S. and International Warranty Information,
Please Visit www.grpumps.com/warranty
or call:
U.S.: 419-755-1280
International: +1-419-755-1352**

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or call:
519-631-2870**