
INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

WITH PARTS LIST



T SERIES SILENT PUMP

MODEL
T6A3-F4L-SPA

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA Printed in U.S.A.

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The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

TABLE OF CONTENTS

INTRODUCTION	PAGE I – 1
RECORDING PUMP SERIAL NUMBER	PAGE I – 1
WARRANTY INFORMATION	PAGE I – 1
SAFETY SYMBOLS	PAGE I – 1
PUMP SAFETY – SECTION A	PAGE A – 1
INSTALLATION – SECTION B	PAGE B – 1
Pump Dimensions	PAGE B – 1
PREINSTALLATION INSPECTION	PAGE B – 1
Battery Specifications And Installation	PAGE B – 2
POSITIONING PUMP	PAGE B – 2
Lifting	PAGE B – 2
Positioning	PAGE B – 2
SUCTION AND DISCHARGE PIPING	PAGE B – 3
Materials	PAGE B – 3
Line Configuration	PAGE B – 3
Connections to Pump	PAGE B – 3
SUCTION LINES	PAGE B – 3
Fittings	PAGE B – 3
Strainers	PAGE B – 3
Sealing	PAGE B – 3
Suction Lines In Sumps	PAGE B – 4
Suction Line Positioning	PAGE B – 4
SUBMERSIBLE TRANSDUCER	PAGE B – 5
Installation	PAGE B – 5
Transducer Connections	PAGE B – 6
DISCHARGE LINES	PAGE B – 7
Siphoning	PAGE B – 7
Valves	PAGE B – 7
Bypass Lines	PAGE B – 7
AUTOMATIC AIR RELEASE VALVE	PAGE B – 8
Theory of Operation	PAGE B – 8
Air Release Valve Installation	PAGE B – 9
OPERATION – SECTION C	PAGE C – 1
PRIMING	PAGE C – 1
EPS CONTROL	PAGE C – 2
Features	PAGE C – 2
Functional Description	PAGE C – 2
EPS Functions	PAGE C – 3
EPS Calibration	PAGE C – 3
Zero Adjustment	PAGE C – 4
Span Adjustment	PAGE C – 4
Level Adjustment	PAGE C – 4
STARTING	PAGE C – 4
Manual Starting	PAGE C – 4
Automatic Starting	PAGE C – 4
OPERATION	PAGE C – 5

TABLE OF CONTENTS (continued)

Lines With a Bypass	PAGE C – 5
Lines Without a Bypass	PAGE C – 5
Leakage	PAGE C – 5
Liquid Temperature And Overheating	PAGE C – 5
Strainer Check	PAGE C – 5
Pump Vacuum Check	PAGE C – 6
STOPPING	PAGE C – 6
Manual Stopping	PAGE C – 6
Automatic Stopping	PAGE C – 6
Safety Shutdown System	PAGE C – 6
OPERATION IN EXTREME HEAT	PAGE C – 7
BEARING TEMPERATURE CHECK	PAGE C – 7
Cold Weather Preservation	PAGE C – 7
TROUBLESHOOTING – SECTION D	PAGE D – 1
TROUBLESHOOTING CHART	PAGE D – 1
ELECTRICAL SYSTEM	PAGE D – 3
Wiring Schematic	PAGE D – 3
PREVENTIVE MAINTENANCE	PAGE D – 3
PUMP MAINTENANCE AND REPAIR – SECTION E	PAGE E – 1
PERFORMANCE CURVE	PAGE E – 1
PARTS LISTS:	
Pump Assembly	PAGE E – 3
Pump Assembly	PAGE E – 4
Pump Assembly	PAGE E – 5
Pump Assembly	PAGE E – 6
Pump Assembly	PAGE E – 7
Muffler Enclosure Assembly	PAGE E – 8
Canopy Assembly	PAGE E – 10
Canopy Assembly	PAGE E – 11
Pump Subassembly	PAGE E – 13
Engine Modification Assembly	PAGE E – 15
Gauge Assembly	PAGE E – 17
Gauge Assembly	PAGE E – 19
Gauge Assembly	PAGE E – 21
Control Panel Sub-Assembly	PAGE E – 23
Pump End Assembly	PAGE E – 25
Repair Rotating Assembly	PAGE E – 27
Drive Assembly	PAGE E – 28
PUMP AND SEAL DISASSEMBLY AND REASSEMBLY	PAGE E – 29
Accessing Pump	PAGE E – 30
Back Cover and Wear Plate Removal	PAGE E – 30
Suction Check Valve Removal	PAGE E – 30
Canopy Removal	PAGE E – 30
Separating Pump End From Engine	PAGE E – 31
Loosening Impeller	PAGE E – 31
Rotating Assembly Removal	PAGE E – 32
Impeller Removal	PAGE E – 32
Seal Removal	PAGE E – 32

TABLE OF CONTENTS (continued)

Shaft and Bearing Removal and Disassembly	PAGE E – 33
Shaft and Bearing Reassembly and Installation	PAGE E – 33
Seal Installation	PAGE E – 34
Impeller Installation And Adjustment	PAGE E – 37
Rotating Assembly Installation	PAGE E – 37
Securing Pump End to Engine	PAGE E – 38
Suction Check Valve Installation	PAGE E – 38
Back Cover Installation	PAGE E – 39
Canopy Installation	PAGE E – 39
Final Pump Assembly	PAGE E – 39
PRESSURE RELIEF VALVE MAINTENANCE	PAGE E – 40
LUBRICATION	PAGE E – 40
Seal Assembly	PAGE E – 40
Bearings	PAGE E – 40
Engine	PAGE E – 40
TRAILER OPERATION, MAINTENANCE AND REPAIR – SECTION F .	PAGE F – 1
TRAILER SPECIFICATIONS	PAGE F – 2
Trailer Dimensions	PAGE F – 2
PRE-OPERATION INSPECTION	PAGE F – 3
OPERATION	PAGE F – 3
Brake System	PAGE F – 3
Hitching Trailer To Vehicle	PAGE F – 3
Towing	PAGE F – 4
Backing	PAGE F – 4
Parking	PAGE F – 5
PERIODIC SERVICE	PAGE F – 6
Wheel Bolt Adjustment	PAGE F – 7
Tires	PAGE F – 7
Brake Actuator Master Cylinder	PAGE F – 7
BRAKE SERVICE	PAGE F – 7
Bleeding Brakes	PAGE F – 7
Brake Adjustment	PAGE F – 7
WHEEL BEARING SERVICE	PAGE F – 8
Inspection	PAGE F – 8
Disassembly	PAGE F – 8
Cleaning And Inspection	PAGE F – 8
Repacking	PAGE F – 9
Reassembly	PAGE F – 9
Adjustment	PAGE F – 9
ELECTRICAL SYSTEM	PAGE F – 9
TRAILER COMPONENT PARTS LISTS	PAGE F – 10
Original Equipment Manufacturers	PAGE F – 10

INTRODUCTION

Thank You for purchasing a Gorman-Rupp pump. **Read this manual** carefully to learn how to safely install and operate your pump. Failure to do so could result in personal injury or damage to the pump.

This manual is designed to help you achieve the best performance and longest life from your Gorman-Rupp pump.

This pump is a T Series, semi-open impeller, self-priming centrifugal model with a suction check valve. It is designed for handling sewage containing large entrained solids and mild corrosives. The basic material of construction for wetted parts is gray iron, with ductile iron impeller and steel wearing parts.

The pump is close-coupled to a Deutz F4L diesel engine, and mounted on a 2-wheel trailer meeting D.O.T. specifications. It is housed in a sound-resistant enclosure that reduces the operating noise level below EPA 74 DBA standard at 23 feet (7 meters).

Standard equipment includes HAND-OFF-AUTO switch, suction vacuum and discharge pressure gauges, tachometer, oil pressure and engine temperature gauges, ammeter, elapsed running time meter, fuel level indicator, and Electronic Pressure Switch liquid level control with submersible transducer (see the separate literature for start/stop set point adjustments, troubleshooting and repair of the EPS switch). The unit is protected by an automatic safety system that will shut down the engine in the event of high temperature, low oil pressure, engine overcrank or engine over-speed.

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

The Gorman-Rupp Company
P.O. Box 1217
Mansfield, Ohio 44901--1217
Phone: (419) 755--1011

or:

Gorman-Rupp of Canada Limited
70 Burwell Road
St. Thomas, Ontario N5P 3R7
Phone: (519) 631--2870

RECORDING PUMP SERIAL NUMBER

Record the pump serial number in the following spaces. Your Gorman-Rupp distributor needs **both the model and serial number** of the unit when you require parts or service.

Serial Number: _____

WARRANTY INFORMATION

The warranty provided with your pump is part of Gorman-Rupp's support program for customers who operate and maintain their equipment as described in this and the other accompanying literature. Please note that should the equipment be abused or modified to change its performance beyond the original factory specifications, the warranty will become void and any claim will be denied.

SAFETY SYMBOLS

The following are used throughout this manual to alert personnel to procedures which require special attention, which could damage equipment, or which could be dangerous to personnel.



DANGER!

Immediate hazards which WILL result in severe personal injury or death. These instructions describe the procedure required and the injury which will result from failure to follow the procedure.



WARNING!

Hazards or unsafe practices which COULD result in severe personal injury or death. These instructions describe the procedure required and the injury which could result from failure to follow the procedure.



CAUTION

Hazards or unsafe practices which COULD

result in minor personal injury or product or property damage. These instructions describe the requirements and the possible damage which could result from failure to follow the procedure.

NOTE

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

PUMP SAFETY – SECTION A

This information applies to T Series engine driven pumps. Refer to the manual accompanying the engine before attempting to begin operation.

Because pump installations are seldom identical, this manual cannot possibly provide detailed instructions and precautions for each specific application. Therefore, it is the owner/installer's responsibility to ensure that applications not addressed in this manual are performed only after establishing that neither operator safety nor pump integrity are compromised by the installation.



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Set the HAND-OFF-AUTO switch to 'OFF', close and lock the control panel cover, and disconnect the positive battery cable to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the pump.



This pump is equipped with automatic liquid level controls, and is subject to automatic restart. Do not operate the unit in the automatic mode with the side doors open. Severe personal injury could occur if the unit starts while main-

tenance or checks are being performed. Before beginning any maintenance on the unit, set the HAND-OFF-AUTO switch to 'OFF', close and lock the control panel cover, and disconnect the positive battery cable to ensure that the pump will remain inoperative.



This pump is designed to handle sewage containing large entrained solids and mild corrosives. Do not attempt to pump volatile, flammable, or highly corrosive liquids which may damage the pump or endanger personnel as a result of pump failure.



Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. The lifting bail is intended for use in lifting the pump and trailer assembly only. Suction and discharge hoses and piping must be removed from the pump before lifting. Do not suspend the pump by the lifting device for extended periods of time. Make sure the area is clear of personnel when lifting.



After the unit has been installed, make certain that the pump and all piping or hose connections are tight, properly supported and secure before operation.



Do not operate the pump against a closed discharge valve for long periods of time. If operated against a closed dis-

charge valve, pump components will deteriorate, and the liquid could come to a boil, build pressure, and cause the pump casing to rupture or explode.



Do not remove plates, covers, gauges, pipe plugs, or fittings from an overheated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing.



This pump is designed to handle materials which could cause illness through direct exposure or emitted fumes. Wear adequate protective clothing when working on the pump or piping.



Do not operate an internal combustion engine in an explosive atmosphere. When operating internal combustion engines in an enclosed area, make certain that exhaust fumes are piped to the outside. These fumes contain carbon monoxide, a deadly gas that is colorless, tasteless, and odorless.



Fuel used by internal combustion engines presents an extreme explosion and fire hazard. Make certain that all fuel lines are securely connected and free of leaks. Never refuel a hot or running engine. Avoid overfilling the fuel tank, and clean up any fuel spills immediately. Always use the correct type of fuel.



Never tamper with the governor to gain more power. The governor establishes safe operating limits that should not be exceeded. The maximum continuous operating speed for this pump is 1800 RPM.



Read all instructions pertaining to the function and operation of the trailer (see Section F) before attempting to hitch or move the unit. Failure to comply could result in equipment damage or vehicle accident.



The trailer is intended for hauling only the Gorman-Rupp pump for which it was designed. Do not haul additional equipment which may damage the trailer or overload the axle. Never haul personnel on the trailer.



The maximum recommended towing speed for the unit is 55 mph (88 kph) under ideal conditions. Towing under unsafe conditions or at higher speeds could cause loss of control of the towing vehicle, resulting in injury or death to personnel, and damage to the equipment.



The approximate trailer tongue weight is 280 lbs. (127 kg). Be sure the tow vehicle hitch is rated for this capacity and fitted with the proper sized ball.



Do not attempt to operate the pump unless the unit is level. Be sure the trailer leveling stands are positioned on a solid surface, and the wheels are chocked.



Pumps and related equipment must be installed and operated according to all national, local and industry standards.

INSTALLATION – SECTION B

Review all SAFETY information in Section A.

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

Most of the information pertains to a standard **static lift** application where the pump is positioned above the free level of liquid to be pumped.

If installed in a **flooded suction application** where the liquid is supplied to the pump under pressure, some of the information such as mounting, line

configuration, and priming must be tailored to the specific application. Since the pressure supplied to the pump is critical to performance and safety, **be sure** to limit the incoming pressure to 50% of the maximum permissible operating pressure as shown on the pump performance curve.

For further assistance, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

Pump Dimensions

See Figure B–1 for the approximate physical dimensions of this unit.

OUTLINE DRAWING

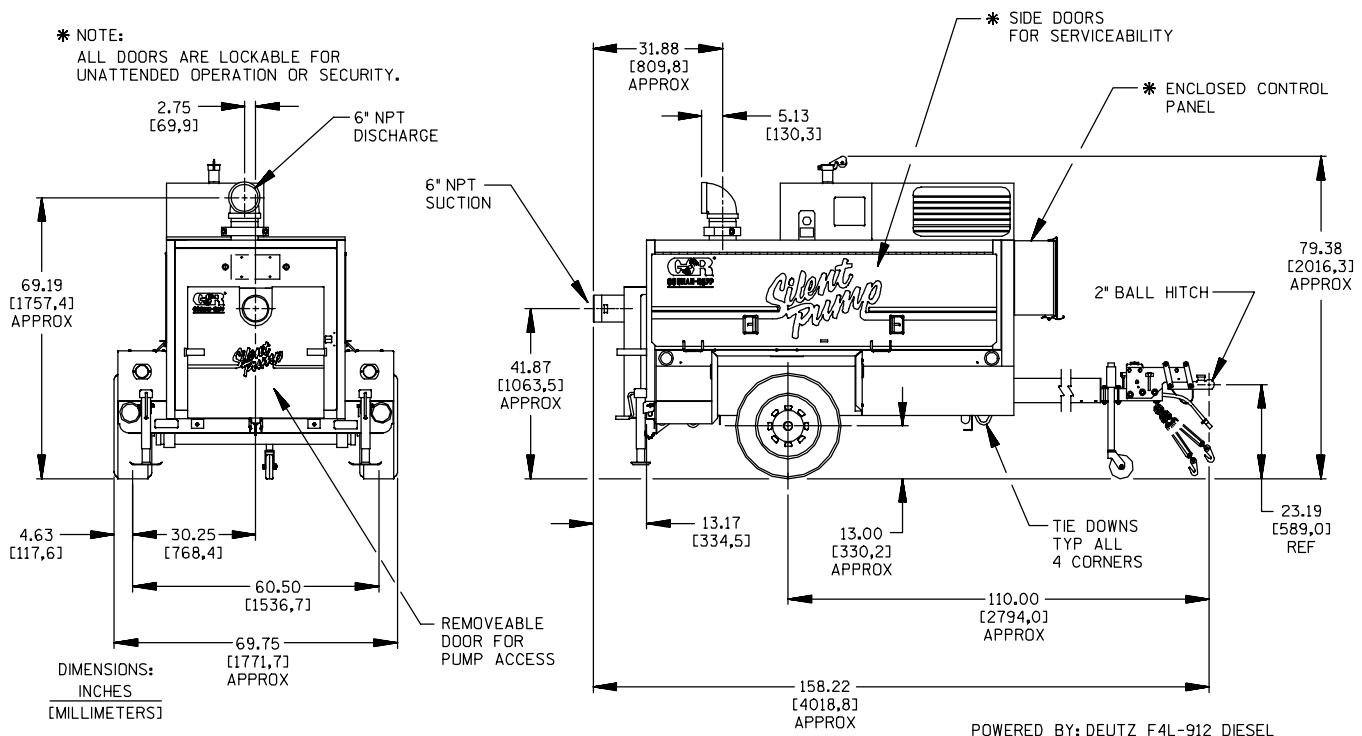


Figure B--1. Pump Model T6A3--F4L--SPA

PREINSTALLATION INSPECTION

The unit was inspected and tested before shipment from the factory. Before installation, inspect the pump, enclosure and trailer for damage which

may have occurred during shipment. Check as follows:

- Inspect the pump, enclosure and trailer for cracks, dents, damaged threads, and other obvious damage.

- b. Check for and tighten loose attaching hardware. Since gaskets tend to shrink after drying, check for loose hardware at mating surfaces.
- c. Carefully read all tags, decals, and markings on the unit, and perform all duties indicated.
- d. Check levels and lubricate as necessary. Refer to **LUBRICATION** in the **MAINTENANCE AND REPAIR** section of this manual, and perform duties as instructed.
- e. If the unit has been stored for more than 12 months, some of the components or lubricants may have exceeded their maximum shelf life. These **must be inspected or replaced** to ensure maximum pump service.

If the maximum shelf life has been exceeded, or if anything appears to be abnormal, contact your Gorman-Rupp distributor or the factory to determine the repair or updating policy. **Do not** put the unit into service until appropriate action has been taken.

Battery Specifications And Installation

Unless otherwise specified on the pump order, the engine battery was **not** included with the unit. Refer to the following specifications when selecting a battery.

Table 1. Battery Specifications

Voltage	Cold Crank Amps @ 0° F	Reserve Capacity @ 80° F (Minutes)	Amp/ Hr. Rating	Approx. Overall Dims. (Inches)
12 Volts	960–975	365	175	20.5L x 8.75W x 9.75H

Refer to the information accompanying the battery and/or electrolyte solution for activation and charging instructions.

Before installing the battery, clean the positive and negative cable connectors, and the battery terminals. Secure the battery by tightening the holddown brackets. The terminals and clamps may be coated with petroleum jelly to retard corrosion. Connect and tighten the positive cable first, then the negative cable.

POSITIONING PUMP



WARNING!

Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. The lifting bail is intended for use in lifting the pump and trailer assembly only. Suction and discharge hoses and piping **must** be removed from the pump before lifting. **Do not** suspend the pump by the lifting device for extended periods of time. **Make sure** the area is clear of personnel when lifting.

Lifting

Use lifting equipment with a capacity of at least **21,250 pounds (9639 kg)**. This pump weighs approximately **4,250 pounds (1928 kg)**, not including the weight of fuel, accessories or optional equipment. Customer-installed equipment such as suction and discharge piping **must** be removed before attempting to lift.



CAUTION

The pump, trailer, and/or canopy can be seriously damaged if the chains or cables used to lift and move the unit are improperly wrapped around the unit.

Positioning

Locate the pump in an accessible place as close as practical to the liquid being pumped. To ensure sufficient cooling of the engine during extremely hot or windy conditions, position the unit with the louvered cooling air outlet on the exhaust chamber directed downwind whenever possible.

Level mounting is essential for proper operation and safety. To ensure sufficient lubrication and fuel supply to the engine, **do not** position the unit more than 15° off horizontal for continuous operation. The unit may be positioned up to 30° off horizontal for **intermittent operation only**; however, the en-

gine manufacturer should be consulted for continuous operation at angles greater than 15°.

The hydraulic brake system is **not** designed to be used as a parking brake. When parking, make certain the unit is stationary by lowering the front and rear trailer jacks and chocking the wheels. Raise the front dolly wheel, and retract it to the storage position before attempting to operate the pump.



Do not attempt to operate the pump unless the trailer is level. Be sure the trailer leveling stands are positioned on a solid surface, and the wheels are chocked.

SUCTION AND DISCHARGE PIPING

Pump performance is adversely effected by increased suction lift, discharge elevation, and friction losses. See the performance curve on Page E-1 to be sure your overall application allows the pump to operate within the safe operation range.

Materials

Either pipe or hose may be used for suction and discharge lines; however, the materials 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. Using piping couplings in suction lines is not recommended.

Line Configuration

Keep suction and discharge lines as straight as possible to minimize friction losses. Make minimum use of elbows and fittings, which substantially increase friction loss. If elbows are necessary, use the long-radius type to minimize friction loss.

Connections to Pump

Before tightening a connecting flange, align it exactly with the pump port. Never pull a pipe line into place by tightening the flange bolts and/or couplings.

Lines near the pump must be independently supported to avoid strain on the pump which could cause excessive vibration, decreased bearing life, and increased shaft and seal wear. If hose-type lines are used, they should have adequate support to secure them when filled with liquid and under pressure.

SUCTION LINES

To avoid air pockets which could affect pump priming, the suction line must be as short and direct as possible. When operation involves a suction lift, the line must always slope upward to the pump from the source of the liquid being pumped; if the line slopes down to the pump at any point along the suction run, air pockets will be created.

Fittings

Suction lines should be the same size as the pump inlet. If reducers are used in suction lines, they should be the eccentric type, and should be installed with the flat part of the reducers uppermost to avoid creating air pockets. Valves are not normally used in suction lines, but if a valve is used, install it with the stem horizontal to avoid air pockets.

Strainers

Be certain to use the strainer provided with the pump; any spherical solids which pass through the strainer will also pass through the pump itself.

If a strainer is installed by the pump user, make certain that the total area of the openings in the strainer is at least three or four times the cross section of the suction line, and that the openings will not permit passage of solids larger than the solids handling capability of the pump.

This pump is designed to handle up to 3-inch (76,2 mm) diameter spherical solids.

Sealing

Since even a slight leak will affect priming, head, and capacity, especially when operating with a high suction lift, all connections in the suction line should be sealed with pipe dope to ensure an airtight seal. Follow the sealant manufacturer's rec-

ommendations when selecting and applying the pipe dope. The pipe dope should be compatible with the liquid being pumped.

Suction Lines In Sumps

If a single suction line is installed in a sump, it should be positioned away from the wall of the sump at a distance equal to 1–1/2 times the diameter of the suction line.

If there is a liquid flow from an open pipe into the sump, the flow should be kept away from the suction inlet because the inflow will carry air down into the sump, and air entering the suction line will reduce pump efficiency.

If it is necessary to position inflow close to the suction inlet, install a baffle between the inflow and the suction inlet at a distance 1-1/2 times the diameter of the suction pipe. The baffle will allow entrained air to escape from the liquid before it is drawn into the suction inlet.

If two suction lines are installed in a single sump, the flow paths may interact, reducing the efficiency of one or both pumps. To avoid this, position the suction inlets so that they are separated by a distance equal to at least 3 times the diameter of the suction pipe.

Suction Line Positioning

The depth of submergence of the suction line is critical to efficient pump operation. Figure B–2 shows recommended minimum submergence vs. velocity.

NOTE

The pipe submergence required may be reduced by installing a standard pipe increaser fitting at the end of the suction line. The larger opening size will reduce the inlet velocity. Calculate the required submergence using the following formula based on the increased opening size (area or diameter).

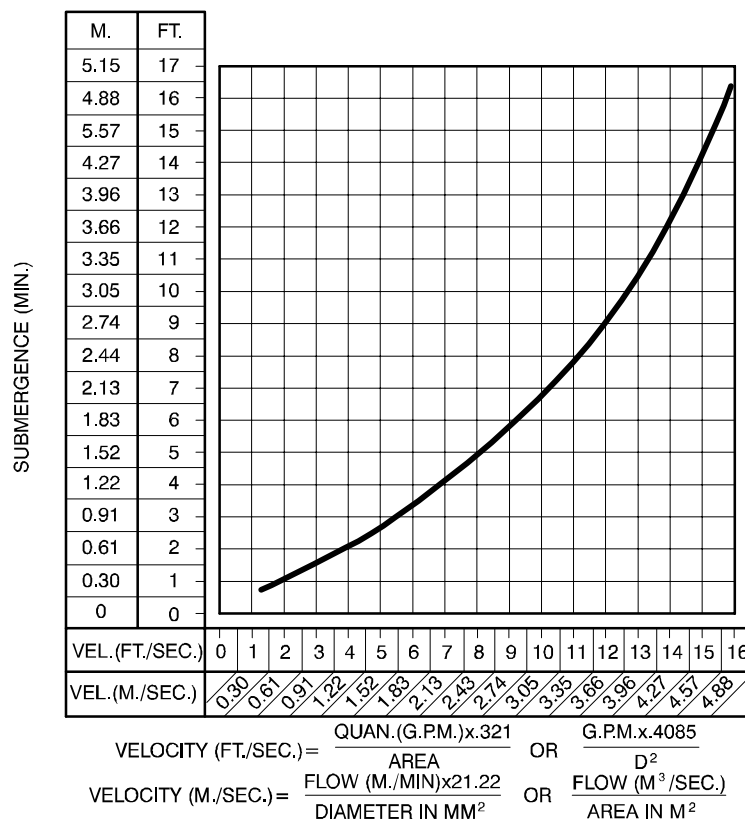


Figure B--2. Recommended Minimum Suction Line Submergence vs. Velocity

SUBMERSIBLE TRANSDUCER

Installation

This unit is equipped with an Electronic Pressure Switch (EPS) and a jumper cable with a multi-contact, environmentally-sealed connector. A submersible transducer level sensor with 25 feet (7,6 m) of signal cable and a corresponding connector is also supplied with the unit.

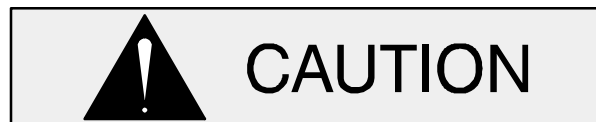
The submersible transducer converts pressure to an electrical signal proportional to liquid level. This electrical signal is distributed to the digital display on the EPS through a scaling circuit which converts the electrical signal to "feet of water".

When installing the submersible transducer, note the following:

- a. Handle the signal cable and transducer with care during installation. **Carefully** lower the transducer into the wet well or sump; **do not** drop it to the bottom. To avoid clogging, suspend the transducer off the bottom.
- b. **Be sure** to provide sufficient room in the wet well or sump so that the transducer does not get drawn into the suction line. To prevent this, a flexible suction hose may be extended to lay along the bottom of the wet well or sump. The transducer can then be attached to the hose

above the point where it bends along the bottom. See Figure B-3 for a typical installation.

- c. Connect the submersible transducer sensor cable to the jumper cable from the EPS control at the multi-contact connector. Allow slack in the signal cable so that the transducer weight does not pull on the connection.
- d. The wet well or sump must be vented to atmosphere.
- e. The EPS is scaled in feet of water column. If the measured medium is other than 1.0 specific gravity, the reading on the EPS should be divided by the specific gravity of the measured medium to obtain the actual level.
- f. **Thoroughly** clean the transducer after each use to prevent clogging.



Do not disassemble the transducer or loosen the compression nut at the signal cable entry. **This will void warranty.** There are no user-serviceable parts inside. Do not nick or cut the jacket of the signal cable; this will cause leakage and **void warranty.** Connect the signal cable **only** to the EPS terminals for this purpose and to no other power source.

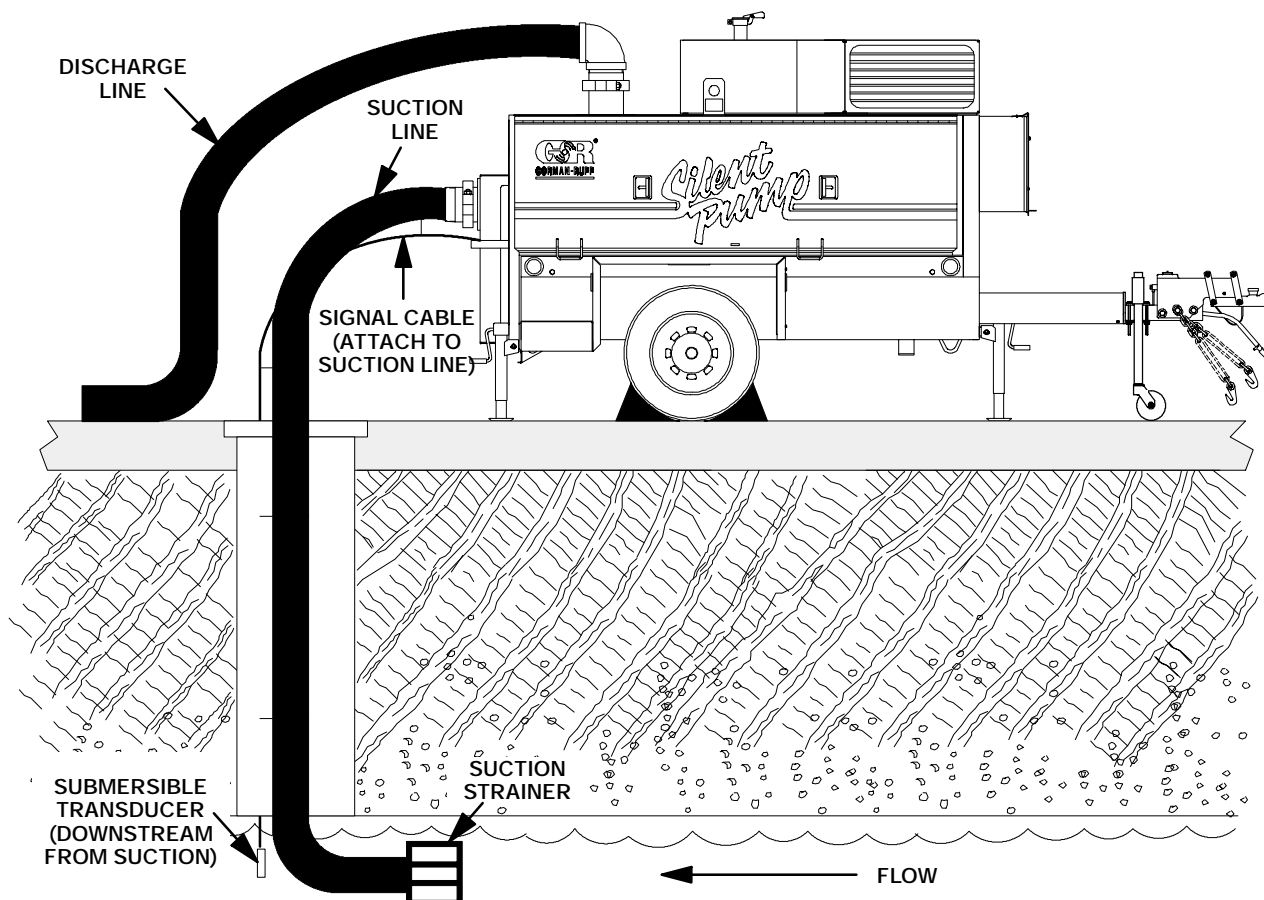


Figure B--3. Typical Silent Pump Installation

Transducer Connections

The submersible transducer jumper cable is factory-wired to the EPS control. If removal or replacement of the jumper cable is required, connect the jumper cable to the EPS terminal strip on the back

of the control panel as shown in Figure B--4. **Do not** connect any other equipment to these terminals, or damage to the EPS will result.

Once the connections are made, check the installation, and refer to Section C for operational procedures.

NOTE: DO NOT CONNECT "GND" TERMINAL TO ANYTHING OTHER THAN THE JUMPER CABLE

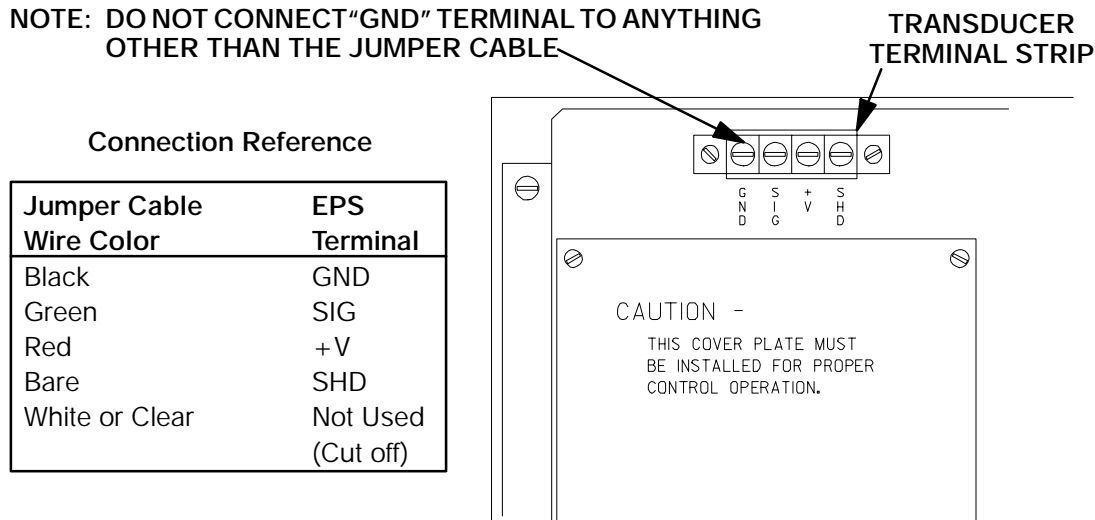


Figure B--4. Transducer Jumper Cable Connections

DISCHARGE LINES

Siphoning

Do not terminate the discharge line at a level lower than that of the liquid being pumped unless a siphon breaker is used in the line. Otherwise, a siphoning action causing damage to the pump could result.

Valves

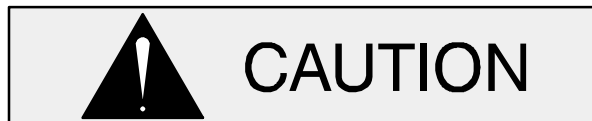
A check valve in the discharge line is normally recommended, but it is not necessary in low discharge head applications.

NOTE

A discharge check valve/air release valve kit is available from the factory as an option for this unit. Consult your Gorman-Rupp distributor, or contact the Gorman-Rupp Company for additional information for your specific application.

If a throttling valve is desired in the discharge line, use a valve as large as the largest pipe to minimize friction losses. Never install a throttling valve in a suction line.

With high discharge heads, it is recommended that a throttling valve and a system check valve be installed in the discharge line to protect the pump from excessive shock pressure and reverse rotation when it is stopped.



If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

Bypass Lines

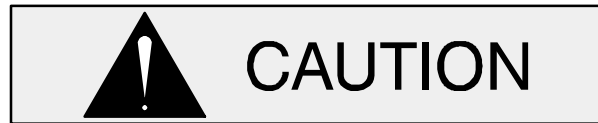
During the priming cycle, air from the suction line must be vented to atmosphere on the discharge side. If the discharge line is open, this air will be vented through the discharge. However, if a check valve has been installed in the discharge line, the discharge side of the pump must be opened to atmospheric pressure through a bypass line in-

stalled between the pump discharge and the check valve. A self-priming centrifugal pump **will not prime** if there is sufficient static liquid head to hold the discharge check valve closed.

NOTE

The bypass line should be sized so that it does not affect pump discharge capacity; however, the bypass line should be at least 1 inch (25,4 mm) in diameter to minimize the chance of plugging.

Since this unit is designed for portable installation, a 1-1/4 inch (31,8 mm) I.D. **smooth-bore** hose can be run back to the wet well to serve as a bypass line.



A bypass line that is returned to a wet well must be secured against being drawn into the pump suction inlet.

In **high discharge head applications** (more than 30 feet or 9,1 meters), an excessive amount of liquid may be bypassed and forced back to the wet well under the full working pressure of the pump; this will reduce overall pumping efficiency. **Therefore, it is recommended that a Gorman-Rupp Automatic Air Release Valve be installed in the bypass line for high discharge head applications.** See the following section, **AUTOMATIC AIR RELEASE VALVE**, for the theory of operation of the valve.

NOTE

A discharge check valve/air release valve kit is available from the factory as an option for this unit. Consult your Gorman-Rupp distributor, or contact the Gorman-Rupp Company for additional information for your specific application.



Never install a manual shut-off valve in any bypass line. A manual shut-off valve may inadvertently be left closed during operation. A pump which has lost prime may continue to operate without reach-

ing prime, causing dangerous overheating and possible explosive rupture of the pump casing. Personnel could be severely injured or killed.

Allow an over-heated pump to cool before servicing. Do not remove plates, covers, gauges, or fittings from an over-heated pump. Liquid within the pump can reach boiling temperatures, and vapor pressure within the pump can cause parts being disengaged to be ejected with great force. After the pump cools, drain the liquid from the pump by removing the casing drain plug. Use caution when removing the plug to prevent injury to personnel from hot liquid.

AUTOMATIC AIR RELEASE VALVE

Gorman-Rupp Automatic Air Release Valves are reliable, and require minimum maintenance. When properly installed and correctly adjusted to the specific hydraulic operating conditions of the application, the Gorman-Rupp Automatic Air Release Valve will permit air to escape through the bypass line, and then close automatically when the pump is fully primed and pumping at full capacity.

Theory of Operation

Figures B-5 and B-6 show a cross-sectional view of the Automatic Air Release Valve, and a corresponding description of operation.

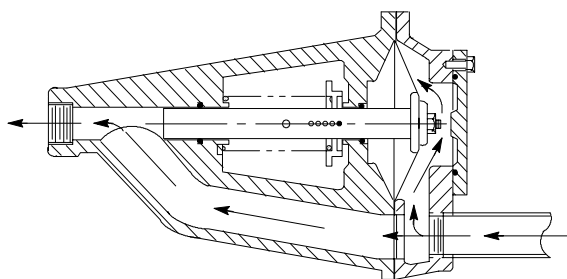


Figure B--5. Valve In Open Position

During the priming cycle, air from the pump casing flows through the bypass line, and passes through the Air Release Valve to the wet well (Figure B-5).

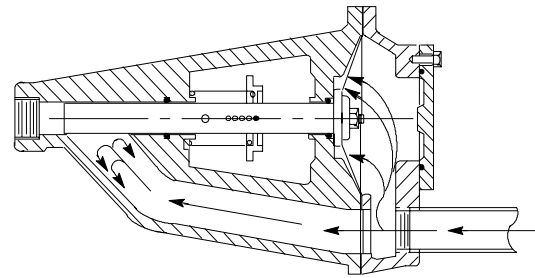


Figure B--6. Valve In Closed Position

When the pump is fully primed, pressure resulting from flow against the valve diaphragm compresses the spring and closes the valve (Figure B-6). The valve will remain closed, reducing the bypass of liquid to 1 to 5 gallons (3,8 to 18,9 liters) per minute, until the pump loses its prime or stops.



Some leakage (1 to 5 gallons or 4 to 19 liters per minute) will occur when the valve is fully closed. Be sure the bypass line is directed back to the wet well or tank to prevent hazardous spills.

When the pump shuts down, the spring returns the diaphragm to its original position. Any solids that may have accumulated in the diaphragm chamber settle to the bottom and are flushed out during the next priming cycle.

NOTE

The valve will remain open if the pump does not reach its designed capacity or head. Valve closing pressure is dependent upon the discharge head of the pump at full capacity. The range of the valve closing pressure is established by the tension rate of the spring as ordered from the factory. Valve closing pressure can be further adjusted to the exact system requirements by moving the spring retaining pin up or down the plunger rod to increase or decrease tension on the spring. Contact your Gorman-Rupp distributor or the Gorman-Rupp Company for information about an Automatic Air Release Valve for your specific application.

Air Release Valve Installation

If specified on the original pump order, the discharge check valve/air release valve kit will be installed on the unit at the factory. If the kit is ordered

separately at a later date, follow the installation instructions accompanying the kit.

The air release valve outlet is equipped with a 1–1/4 inch quick-connect adaptor. Connect the bleed line so that it slopes back to the wet well or sump.

OPERATION – SECTION C

Review all SAFETY information in Section A.

Follow the instructions on all tags, labels and decals attached to the pump.



Do not operate an internal combustion engine in an explosive atmosphere. When operating internal combustion engines in an enclosed area, make certain that exhaust fumes are piped to the outside. These fumes contain carbon monoxide, a deadly gas that is colorless, tasteless, and odorless.



This pump is designed to handle sewage containing large entrained solids and mild corrosives. Do not attempt to pump volatile, flammable, or highly corrosive liquids which may damage the pump or endanger personnel as a result of pump failure.



Never tamper with the governor to gain more power. The governor establishes safe operating limits that should not be exceeded. The maximum continuous operating speed for this pump is 1800 RPM.

PRIMING

Position the unit and install the piping and submersible transducer (if used) as described in **INSTALLATION**. 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.



Never operate this pump unless there is liquid in the pump casing. The pump will not prime when dry. Extended operation of a dry pump will destroy the seal assembly.

Add liquid to the pump 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 pump casing has evaporated.

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



After filling the pump casing, reinstall and tighten the fill plug. Do not attempt to operate the pump unless all connecting piping is securely installed; otherwise, liquid in the pump forced out under pressure could cause injury to personnel.

To fill the pump, raise the discharge flap on the canopy and remove the pump casing fill cover. Add clean liquid to the casing until the casing is filled. Replace the fill cover before operating the pump.

NOTE

If the suction or discharge piping is open, a hose can be used to fill the casing through the piping.

EPS CONTROL

Features

The pump is equipped with a 12VDC Electronic Pressure Switch which includes the following features:

- 3 Output Relays: 1. A output, delayed
2. B output, no delay
3. Horn output, no delay
- 3 Inputs: 1. Horn silence
2. Pressure transducer
3. Low Temp Thermostat
- LCD screen with backlight for function monitoring
- Bright LEDs to indicate output status and display modes
- Three switches on front panel for **all** adjustments
- Removable terminal strips for quick installation/removal of field wiring
- Battery level indicator on LCD screen to alert operator of low battery condition
- Microprocessor Control
- Error display to alert user of errors in calibration

Functional Description

Front Panel Controls/Displays

1. The LCD screen displays level information, A and B setpoint off/on levels, Horn delay, and calibration information.

Typical Messages on the display:

- a) EEP bAd... Eeprom memory is not correct, user **must** recalibrate unit.
- b) USr CAL... User calibrate mode, i.e., user **wants** to calibrate unit.
- c) SEt a.oF... A OFF setpoint, units of level.
- d) SEt a.on... A ON setpoint, units of level.
- e) SEt b.oF... B OFF setpoint, units of level.

- f) SEt b.on... B ON setpoint, units of level.
- g) Hrn dLy... Horn on, A output delay time, 5–30 seconds, in 5-second increments.
- h) LO BAT... Indicator, shows battery voltage level is below 12VDC.
- i) Lo tpt... Shows status of Low Temperature Thermostat contacts.




2. LEDs:

- a) When the green LED is lighted, the unit is showing level on the LCD display.
- b) When the A output LED is lighted, the A output relay is closed.
- c) When the B output LED is lighted, the B output relay is closed

NOTE

LED's and all segments of the display are lighted upon connection of power as a lamp test feature. However, no relay outputs are closed during test.

3. Switches:

- a) The  switch functions as a "round robin" type switch. Pressing this switch will cause the unit to show the next selection in the order listed above.
- b) The  switch functions to decrease the selection showing. This switch can be used to decrease the smallest digit by "bumping" the switch, or to continuously decrease the digit by pressing and holding for at least one second and releasing when desired setting is reached.
- c) The  switch functions to increase the selection showing. This switch can be used to increase the smallest digit by "bumping" the switch, or to continuously increase the digit by pressing and holding for at least one second and releasing when desired setting is reached.

Liquid level adjustment of the Electronic Pressure Switch is accomplished using the three buttons on the control. For EPS functions and level adjustment, refer to the following instructions.

EPS Functions

Actual functions of the control occur as follows:

Power is applied to the unit.

Unit performs display test for approximately 4 seconds.

When the pressure level showing is equal to or greater than the "A.on" setpoint, the Horn output contacts will close in approximately 1 second and a delay, equal to the "Hrn dLy" time, will occur before the A output contacts close.

When the level showing is equal to or greater than the "B.on" setpoint, the B output contacts will close in approximately 1 second.


When a "Horn Silence" switch closure occurs, the horn will silence in approximately 1 second.

When the pressure decreases to a level equal to or less than the "B.of" setpoint, B output contacts will open in approximately one second.


When the pressure decreases to a level equal to or less than the "A.of" setpoint, A output contacts will open in approximately one second.

When the Low Temperature Thermostat is connected to the unit and the thermostat contacts close, the unit displays "lo tpt" on the display. In approximately 1 second, the Horn output contacts close, then after the "Hrn dLy" time, A output contacts close. A output contacts will remain closed as long as Low Temperature Thermostat contacts are closed.

When the Low Temperature Contacts open, A output contact will open **only** if the level is equal to or less than the "A.off" setpoint.

As long as the Low Temperature Thermostat contacts are closed, the display will show "lo tpt" unless  switch is pressed to display some other information. Level is not viewable until the Low Temperature Thermostat contacts open.

The user may wish to check Setpoints Off/On and Horn output/A output delay times. "Bump-

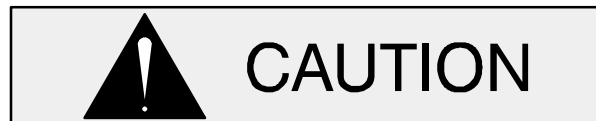
ing" the  switch will display all of the information desired.

NOTE

One second delays in contact opening/closing is a result of time sampling of the pressure signal to filter false signals that could cause "nuisance" tripping of the contacts.

NOTE

If the "Hrn dLy" is changed during the actual A output delay cycle, the current cycle is not changed; the change becomes effective on the next A output delay cycle.




Use caution to ensure that the "--.on" setpoint (i.e. "A.on") is not adjusted to a level less than the corresponding "--.of" setpoint (i.e. "A.of"). Improper adjustment of the off/on setpoints will render the unit non-functional, resulting in flooding of the wet well.

EPS Calibration


NOTE




Zero offset and span adjustments are only necessary to calibrate a new unit, or when replacing the transducer. Once calibrated, "ON" and "OFF" setpoints will be stored in the unit's memory. Liquid level adjustments will be used whenever "ON" and "OFF" liquid levels must be reset.


There are two reasons for the user to calibrate the unit. When power is applied, the unit confirms setpoints and other calibration information for validity. If the setpoints are not valid, the LCD screen shows "EEP bAd" and the unit must be recalibrated. Also, if the unit is moved, or some other external change takes place, the unit must be recalibrated.

When recalibration is desired, apply power to the unit and press the  switch. The LCD screen displays "USr CAL". Perform the following calibration procedures.


Zero Adjustment




With the LCD screen displaying "USr CAL", "bump" the  switch to advance the screen to "SET Zro" and a number. This number represents the current historical value of the "zero offset adjustment", and two options are available:


- Press the  switch to keep the historical value of the "zero offset adjustment" and advance to the span adjustment.
- Press the  or  switches to display a new number. Either switch has the same function. In normal operation, 0.00 psi is applied to the pressure transducer for this portion of the calibration procedure. If pressure in excess of 2.0 feet of water is applied to the transducer, the display will show "err" for approximately two seconds. During this time the unit will not respond to any of the switches. Make corrections to the pressure supplied to the transducer, and perform this step again.

Once the "zero offset adjustment" is completed, press the  switch to store the new setting, and advance to the span adjustment.


Span Adjustment



After checking or setting the "zero offset adjustment" and "bumping" the  switch, the LCD screen displays "SEt SPn" and a number. This number represents the current historical value of the "pressure applied to transducer" at the last calibration, and two options are available:




- Press the  switch to keep the historical value of the "pressure applied to transducer" and advance to show level and normal operation.
- Press the  or  switch to increase or decrease the value to a new setting. The "screen value" of pressure (in whatever units are desired) **must** be applied to the pressure transducer during this procedure, and increased or decreased at least 0.1 unit to complete the adjustment, or the span adjustment will be incorrect.

Once completed, press the  switch to store the new setting, and advance to the "level" display.

Level Adjustment

After checking or setting the "span adjustment" and pressing the  switch, the LCD screen displays "A.of" and a number. This number represents the current historical value of the level at which the pump shuts off.

Toggle either   switch to the desired level, wait 5 seconds, and the level will be set.

After setting the "off" level, depress the  switch to set "A.on". Toggle either   switch to the desired level, wait 5 seconds, and the level will be set.

STARTING

Consult the engine operations manual before attempting to start the unit.

Manual Starting

On initial start-up, depress the button in the center of the throttle knob on the control panel, and pull the engine throttle cable out to the half-throttle position. The cable will lock in place when the button is released. Set the 'HAND-OFF-AUTO' switch to 'HAND'. After the engine starts and the unit is fully primed, turn the throttle knob counterclockwise to increase, or clockwise to decrease engine RPM until the desired flow rate is achieved.



Pump speed and operating condition points must be within the continuous performance range shown on the curve on page E-1.

Automatic Starting

With the submersible transducer installed and the EPS setpoints adjusted, follow the procedures outlined for manual starting and throttle position adjustment. Switch the 'HAND-OFF-AUTO' switch to 'OFF' until the water level rises above the 'ON' setting, then switch the 'HAND-OFF-AUTO' switch to

'AUTO'. The unit will run until the submersible transducer signals the EPS control that the water in the wet well is at the previously set low or 'OFF' point, at which time the unit will shut down automatically. When the transducer signals the EPS that the water in the wet well is at the previously set high or 'ON' point, the unit will re-start automatically, repeating the cycle.



This pump is equipped with automatic liquid level controls, and is subject to automatic restart. Close and lock the control panel cover and side doors during automatic operation to prevent injury during automatic operation.

OPERATION

Lines With a Bypass

Open all valves in the discharge line and start the unit as previously described.

With the optional discharge check valve/air release valve kit installed, the air release valve will automatically open to allow the pump to prime, and automatically close after priming is complete (see **INSTALLATION** for air release valve operation). Priming is indicated by a positive reading on the discharge pressure gauge. The pump may not prime immediately because the suction line must first fill with liquid. If the pump fails to prime within five minutes, stop it and check the suction line for leaks.

With an open bypass line, air from the suction line will be discharged through the bypass line back to the wet well during the priming cycle. Liquid will then continue to circulate through the bypass line while the pump is in operation.

Lines Without a Bypass

Open all valves in the discharge line and start the unit as previously described. Air in the pump will be expelled through the discharge line.

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.

Liquid Temperature And Overheating

The **maximum** liquid temperature for this pump is 160° F (71° C). Do not apply it at a higher operating temperature.

Overheating can occur if operated with the valves in the suction or discharge lines 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 pump casing with cool liquid.



Do not remove plates, covers, gauges, pipe plugs, or fittings from an over-heated pump. Vapor pressure within the pump can cause parts being disengaged to be ejected with great force. Allow the pump to cool before servicing.

As a safeguard against rupture or explosion due to heat, this pump is equipped with a pressure relief valve which will open if vapor pressure within the pump casing reaches a critical point. If over-heating does occur, stop the pump immediately and allow it to cool before servicing it. **Approach any over-heated pump cautiously.** It is recommended that the pressure relief valve assembly be replaced at each overhaul, or any time the pump casing over-heats and activates the valve. **Never** replace this valve with a substitute which has not been specified or provided by the Gorman-Rupp Company.

Strainer Check

If a suction strainer has been shipped with the pump or installed by the user, check the strainer regularly, and clean it as necessary. The strainer should also be checked if pump flow rate begins to drop. If a vacuum suction gauge has been in-

stalled, monitor and record the readings regularly to detect strainer blockage. An increase vacuum will indicate strainer blockage.

Never introduce air or steam pressure into the pump casing or piping to remove a blockage. This could result in personal injury or damage to the equipment. If backflushing is absolutely necessary, **liquid pressure** must be limited to 50% of the maximum permissible operating pressure shown on the pump performance curve.

Pump Vacuum Check

Open the suction line, and read the vacuum gauge with the pump primed and at operation speed. Shut off the pump. The vacuum gauge reading will immediately drop proportionate to static suction lift, and should then stabilize. If the vacuum reading falls off rapidly after stabilization, the suction check valve could be sticking open, an air leak could exist in the suction line, or air may be entering through the air release or discharge line.

STOPPING

Manual Stopping

In the manual mode, reduce the throttle speed slowly, and allow the engine to idle briefly before switching the HAND-OFF-AUTO switch to 'OFF'.



If the application involves a high discharge head, gradually close the discharge throttling valve before stopping the pump.

After stopping the pump, close and lock the control panel cover, or disconnect the positive battery cable to ensure that the pump will remain inoperative.

Automatic Stopping

In the automatic mode, the pump will stop when the liquid in the wet well or sump reaches the pre-set level on the EPS control. The pump will restart

automatically when the liquid reaches the pre-set 'ON' level.

Safety Shutdown System

The unit is equipped with a safety system to automatically shut down the engine under certain conditions. The engine will automatically shut down:

1. If the engine exceeds its safe operating temperature.
2. If the engine oil pressure drops below design limits.
3. If the engine fails to start within a pre-set period of time.
4. If the engine speed exceeds the safe operating range.
5. If the engine fan belt breaks.

Lights on the control panel will indicate which of the safety features has caused the engine to shut down.

Should any of the safety features cause the engine to shut down, **the cause must be determined and corrected** before putting the unit back into service. The engine **will not restart** until the HAND-OFF-AUTO switch has been returned to the 'OFF' position for at least 10 seconds.

All safety shutdown features are pre-set at the factory for optimum performance and safety; **do not** attempt to adjust these settings.



Never disconnect any of the safety shutdown features; this will void the warranty and could result in serious damage to the unit and/or injury to personnel. Safety shutdown features are pre-set at the factory; do not attempt to adjust any of the settings. Determine the cause of shutdown before putting the unit back into service. Consult the factory for additional information.

OPERATION IN EXTREME HEAT

Whenever possible, position the unit with the lou-
vered cooling air outlet on the exhaust chamber
directed downwind during extremely hot or windy
conditions.

The safety shutdown system will automatically
stop the unit if engine operating temperature ex-
ceeds design limits. If engine over-temperature
shutdown occurs, allow the unit to cool before re-
starting.

If engine overheating continues, check the engine
lubricant level and viscosity. Consult the engine
operation manual for the recommended lubricant
for operation in extreme heat.

If the unit is being operated in the **automatic** mode,
adjust the EPS setpoints to allow shorter run and
longer cooling periods, if possible. If the unit is be-
ing operated in the **manual** mode, the side doors
may be opened to provide additional cooling. **Do**
not operate the unit in the automatic mode with the
side doors open.



This pump is equipped with automatic liquid level controls, and is subject to automatic restart. Do not operate the unit in the automatic mode with the side doors open. Severe personal injury could occur if the unit starts while main-tenance or checks are being performed.

BEARING TEMPERATURE CHECK

Bearings normally run at higher than ambient tem-
peratures because of heat generated by friction.

Temperatures up to 160°F (71°C) are considered
normal for bearings, and they can operate safely to
at least 180°F (82°C).

Checking bearing temperatures by hand is inaccu-
rate. Bearing temperatures can be measured accu-
rately by placing a contact-type thermometer
against the housing. Record this temperature for
future reference.

A sudden increase in bearing temperatures is a
warning that the bearings are at the point of failing
to operate properly. Make certain that the bearing
lubricant is of the proper viscosity and at the cor-
rect level (see **LUBRICATION** in Section E). Bear-
ing 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. Con-
tinued operation should bring the temperatures
down to normal levels.

Cold Weather Preservation

In below freezing conditions, open the drain cock
and drain the pump to prevent damage from freez-
ing. Also, clean out any solids by flushing with a
hose. Operate the pump for approximately one
minute; this will remove any remaining liquid that
could freeze the pump rotating parts. If the pump
will be idle for more than a few hours, or if it has
been pumping liquids containing a large amount of
solids, drain the pump, and flush it thoroughly with
clean water.

If the liquid being pumped contains large solids,
the drain valve may clog and prevent the pump
from completely draining. If this occurs, remove
and clean valve, and clean out any remaining sol-
ids in the pump by flushing with a hose.

TROUBLESHOOTING – SECTION D

Review all SAFETY information in Section A.



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Set the HAND-OFF-AUTO switch to 'OFF', close and lock the control panel cover, and disconnect the positive battery cable to ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and discharge valves.

6. Vent the pump slowly and cautiously.
7. Drain the pump.



This pump is equipped with automatic liquid level controls, and is subject to automatic restart. Before beginning any maintenance on the unit, set the HAND-OFF-AUTO switch to 'OFF', close and lock the control panel cover, and disconnect the positive battery cable to ensure that the pump will remain inoperative.

NOTE

Troubleshooting and maintenance of the trailer assembly is covered in Section F. Troubleshooting and maintenance of the EPS control is included in the separate literature accompanying the unit.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP FAILS TO PRIME	Not enough liquid in casing. Suction check valve contaminated or damaged. Air leak in suction line. Lining of suction hose collapsed. Leaking or worn seal or pump gasket. Suction lift or discharge head too high. Strainer clogged.	Add liquid to casing. See PRIMING . Clean or replace check valve. Correct leak. Replace suction hose. Check pump vacuum. Replace leaking or worn seal or gasket. Check piping installation and install bypass line if needed. See INSTALLATION . Check strainer and clean if necessary.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line. Lining of suction hose collapsed. Leaking or worn seal or pump gasket. Strainer clogged.	Correct leak. Replace suction hose. Check pump vacuum. Replace leaking or worn seal or gasket. Check strainer and clean if necessary.

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE (cont'd)	<p>Suction intake not submerged at proper level or sump too small.</p> <p>Impeller or other wearing parts worn or damaged.</p> <p>Impeller clogged.</p> <p>Discharge head too high.</p> <p>Suction lift too high.</p> <p>Pump speed too slow.</p> <p>EPS limit switches set improperly or submersible transducer clogged.</p>	<p>Check installation and correct submergence as needed.</p> <p>Replace worn or damaged parts. Check that impeller is properly centered and rotates freely.</p> <p>Free impeller of debris.</p> <p>Install bypass line.</p> <p>Measure lift w/vacuum gauge. Reduce lift and/or friction losses in suction line.</p> <p>Check engine output; consult engine operation manual.</p> <p>Check EPS limit settings; check and clean submersible transducer.</p>
PUMP REQUIRES TOO MUCH POWER	<p>Pump speed too high.</p> <p>Discharge head too low.</p> <p>Liquid solution too thick.</p> <p>Bearing(s) frozen.</p>	<p>Check engine output.</p> <p>Adjust discharge valve.</p> <p>Dilute if possible.</p> <p>Disassemble pump and check bearing(s).</p>
PUMP CLOGS FREQUENTLY	<p>Discharge flow too slow.</p> <p>Suction check valve clogged or binding.</p> <p>Liquid solution too thick.</p>	<p>Open discharge valve fully to increase flow rate, and run engine at maximum governed speed.</p> <p>Clean valve.</p> <p>Dilute if possible.</p>
EXCESSIVE NOISE	<p>Cavitation in pump.</p> <p>Pumping entrained air.</p> <p>Pump or drive not securely mounted.</p> <p>Impeller clogged or damaged.</p>	<p>Reduce suction lift and/or friction losses in suction line. Record vacuum and pressure gauge readings and consult local representative or factory.</p> <p>Locate and eliminate source of air bubble.</p> <p>Secure mounting hardware.</p> <p>Clean out debris; replace damaged parts.</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>

ELECTRICAL SYSTEM

Wiring Schematic

Refer to the following Electrical Wiring Schematic on Page D-4 when troubleshooting electrical connections. Trailer wiring is covered in Section F.

PREVENTIVE MAINTENANCE

Since pump applications are seldom identical, and pump wear is directly affected by such things as the abrasive qualities, pressure and temperature of the liquid being pumped, this section is intended only to provide general recommendations and practices for preventive maintenance. Regardless of the application however, following a routine preventive maintenance schedule will help assure trouble-free performance and long life from your Gorman-Rupp pump. For specific questions concerning your application, contact your Gorman-Rupp distributor or the Gorman-Rupp Company.

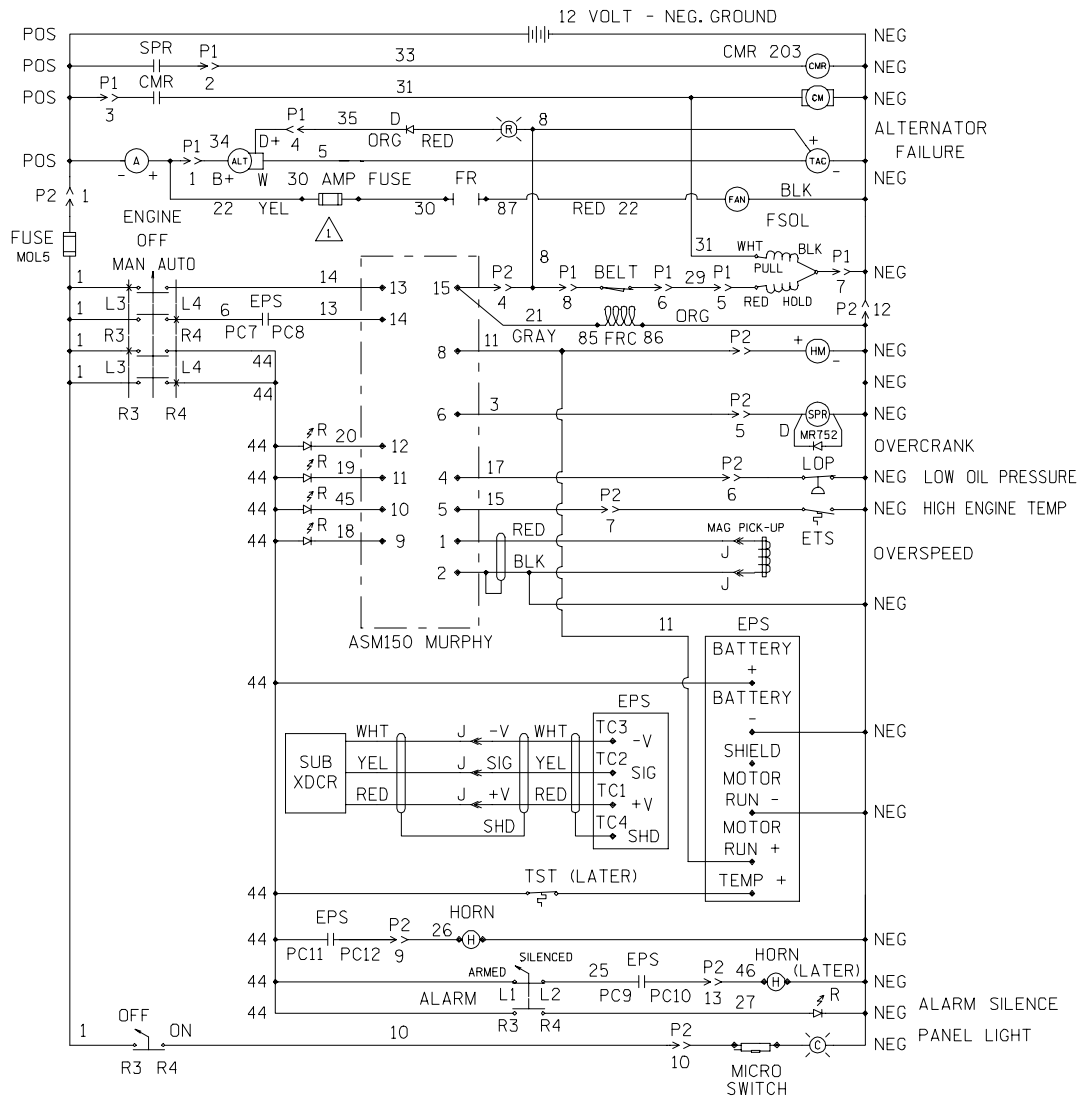
Record keeping is an essential component of a good preventive maintenance program. Changes in suction and discharge gauge readings (if so equipped) between regularly scheduled inspections can indicate problems that can be corrected before system damage or catastrophic failure occurs. The appearance of wearing parts should also be documented at each inspection for comparison as well. Also, if records indicate that a certain part (such as the seal) fails at approximately the same duty cycle, the part can be checked and replaced before failure occurs, reducing unscheduled down time.

For new applications, a first inspection of wearing parts at 250 hours will give insight into the wear rate for your particular application. Subsequent inspections should be performed at the intervals shown on the chart below. Critical applications should be inspected more frequently.

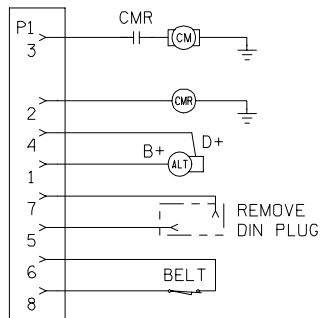
Preventive Maintenance Schedule					
Item	Service Interval*				
	Daily	Weekly	Monthly	Semi-Annually	Annually
General Condition (Temperature, Unusual Noises or Vibrations, Cracks, Leaks, Loose Hardware, Etc.)	I				
Pump Performance (Gauges, Speed, Flow)	I				
Bearing Lubrication		I			R
Seal Lubrication (And Packing Adjustment, If So Equipped)		I			R
V-Belts (If So Equipped)			I		
Air Release Valve Plunger Rod (If So Equipped)			I	C	
Front Impeller Clearance (Wear Plate)				I	
Rear Impeller Clearance (Seal Plate)				I	
Check Valve					I
Pressure Relief Valve (If So Equipped)					C
Pump and Driver Alignment					I
Shaft Deflection					I
Bearings					I
Bearing Housing					I
Piping					I
Driver Lubrication – See Mfgr's Literature					
Legend: I = Inspect, Clean, Adjust, Repair or Replace as Necessary C = Clean R = Replace * Service interval based on an intermittent duty cycle equal to approximately 4000 hours annually. Adjust schedule as required for lower or higher duty cycles or extreme operating conditions.					

WIRING SCHEMATIC

ENGINE CONTROL



ENGINE WIRING
(AS REC'D. FROM DEUTZ)



1 SPLICE SUPPLIED 30 AMP FUSE HOLDER INTO YELLOW WIRE INSIDE CONTROL PANEL DIRECTLY BELOW RELAY. SEE DRAWING 47651-125, SHEET 3 OF 3 FOR DETAILS.

WIRE	COLOR
YEL	YELLOW
ORG	ORANGE
WHT	WHITE
BLK	BLACK

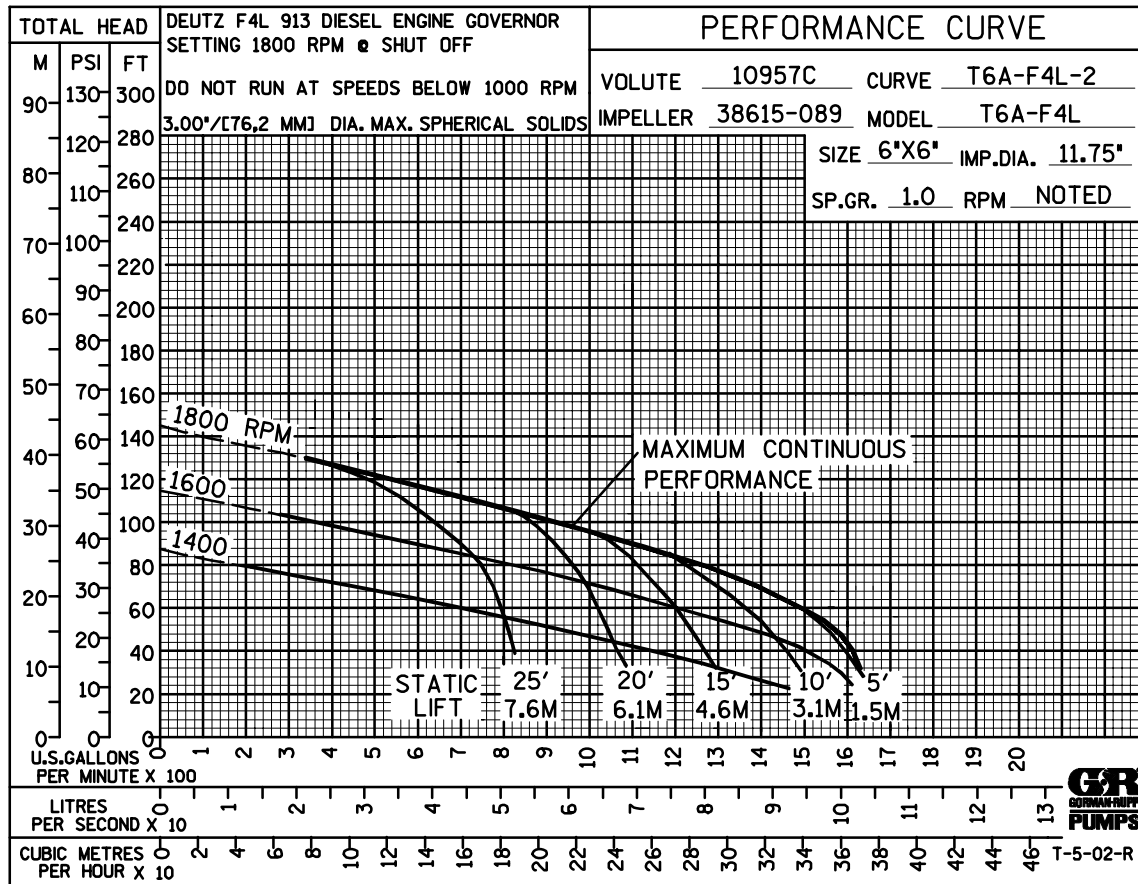
CM	CRANKING MOTOR
A	AMMETER - ENGINE
CMR	CRANKING MOTOR RELAY
ALT	ALTERNATOR
R	INDICATING LIGHT
FU	AUTOSTART CONTROL FUSE
TAC	TACHOMETER
FSOL	FUEL SOLENOID
HM	HOURMETER
ACM	AUTO CRANK MODULE
SPR	STARTER PILOT RELAY
D,C	DIODE - CAPACITOR
LDP	LOW OIL PRESSURE SWITCH
ETS	ENGINE TEMP SWITCH
EPS	ELECTRONIC PRESSURE SWITCH
TC	EPS TRANSDUCER CONNECTOR
PC	EPS POWER CONNECTOR
H	HERN
TST	THERMOSTAT (LATER)
FR	FRAN RELAY (PART OF WIRING HARNESS)
FRC	FRAN RELAY COIL (PART OF WIRING HARNESS)

Figure D–1. Wiring Schematic

PUMP MAINTENANCE AND REPAIR – SECTION E

(Maintenance and Repair of the Trailer Assembly is covered in Section F.)

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



* STANDARD PERFORMANCE FOR PUMP MODEL T6A3--F4L--SPA

* Based on 70° F (21° C) clear water at sea level with minimum suction lift. Since pump installations are seldom identical, your performance may be difference 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.



Pump speed and operating condition points must be within the continuous performance range shown on the curve.

SECTION DRAWING

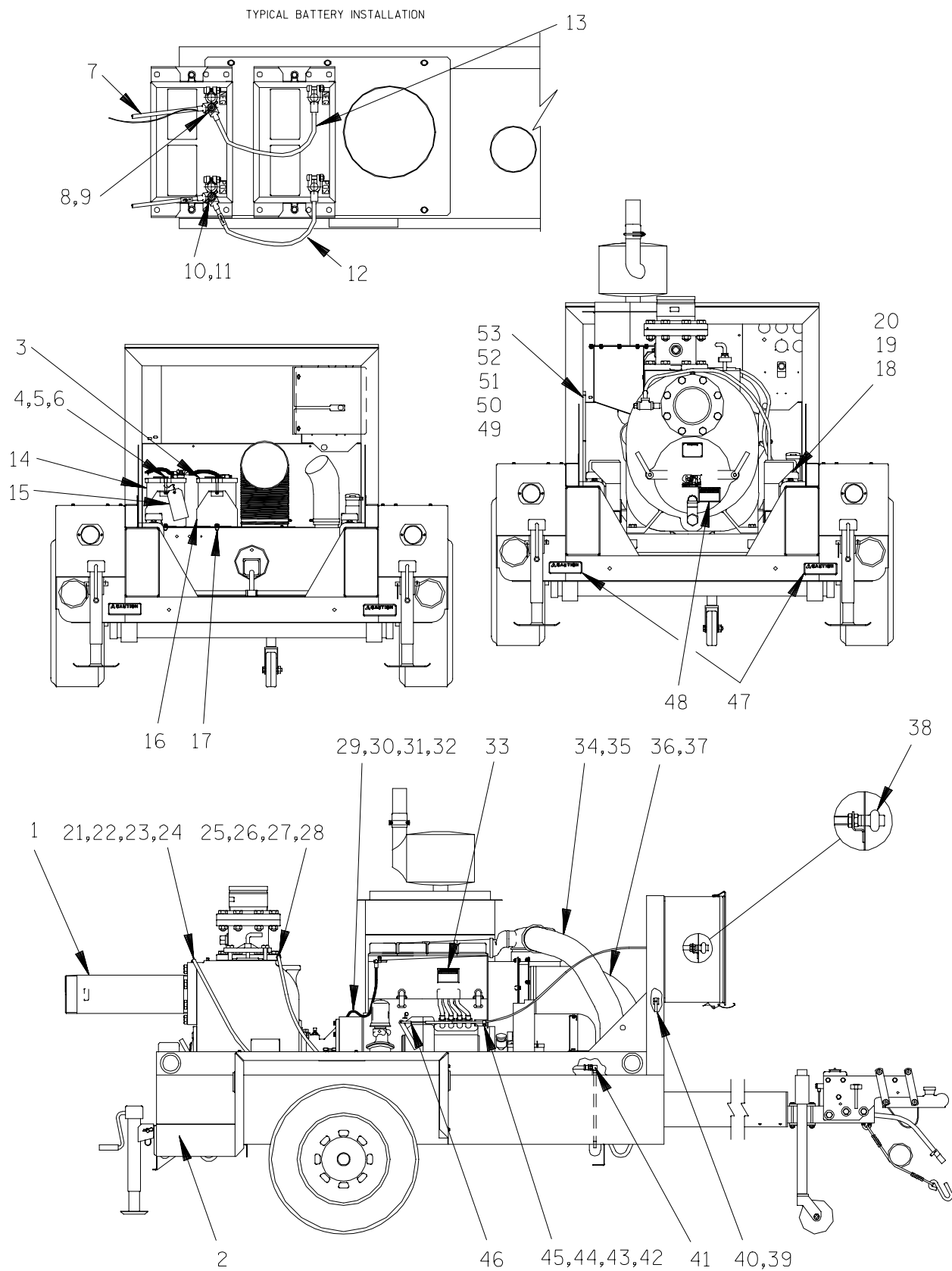


Figure E-1. T6A3-F4L-SPA Pump Assembly

PARTS LIST

T6A3–F4L–SPA Pump Assembly

(From S/N 1273960 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	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	PUMP SUB-ASSEMBLY	T6A3–F4L–SPA	---	1	27	DISCHARGE HOSE	46341–797	---	1
2	TRAILER ASSY	41583–747	---	1	28	PIPE ELBOW	R04	11999	1
	<i>See Page F-12 for Trailer Assembly Parts</i>				29	STREET ELBOW	RS04	11999	1
3	BATTERY FRAME	8355B	24000	2	30	HOSE BARB FITTING	26523–386	---	1
4	HEX HD CAPSCREW	B0611	15991	4	31	HOSE CLAMP	26518–641	---	2
5	FLAT WASHER	K06	15991	4	32	RED PIPE BUSHING	AP0604	15079	1
6	FLANGED HEX NUT	21765–314	---	4	33	WARNING DECAL	38816–244	---	2
7	GRND CABLE ASSY	47311–165	---	1	34	HOSE CLAMP	26518–678	---	2
8	BATT TERMINAL	27228–014	---	1	35	FLEX HOSE	18186–101	---	2'
9	WING NUT	BB06	15991	1	36	HI-TECH HOSE	18513–603	---	2.7'
10	BATT TERMINAL	27228–015	---	1	37	HOSE CLAMP	26518–680	---	2
11	WING NUT	BB05	15991	1	38	THROTTLE CABLE	24621–248	---	1
12	CABLE ASSY	47311–162	---	1	39	MTG BASE – CABLE TIE	27111–352	---	2
13	CABLE ASSY	47311–163	---	1	40	CABLE TIE	27111–202	---	2
14 *	12V BATTERY	29331–515	---	2	41	FUEL PICKUP ASSY	29332–141	---	1
15	BATTERY TAG	38818–515	---	1	42	RD HD MACH SCREW	X#10–02–1/4	15991	1
16	BATTERY BOX	34751–006	15120	2	43	T TYPE LOCK WASHER	AK#10	15991	2
17	FLANGED CAPSCREW	21634–515	---	4	44	HEX NUT	D#10	15991	1
18	CAPSCREW MM 16X45	22645–453	---	4	45	CABLE CLAMP	27111–321	---	1
19	SUPPORT PLATE	33461–119	15080	4	46	CLEVIS PIN	21135–003	---	1
20	LOCK WASHER	J10	15991	4	47	CAUTION DECAL	38816–140	---	2
21	CONNECTOR	S1447	---	1	48	WARNING DECAL	38816–244	---	1
22	STREET ELBOW	RS04	11999	1	49	BREATHING HOSE	11308D	---	1
23	SUCTION HOSE	46341–809	---	1	50	HOSE CLAMP	26518–641	---	1
24	PIPE ELBOW	R04	11999	1	51	STREET ELBOW	RS04	11999	1
25	CONNECTOR	S1447	---	1	52	HOSE BARB FITTING	26523–386	---	1
26	STREET ELBOW	RS04	11999	1	53	RED PIPE BUSHING	AP0604	15079	1

* INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

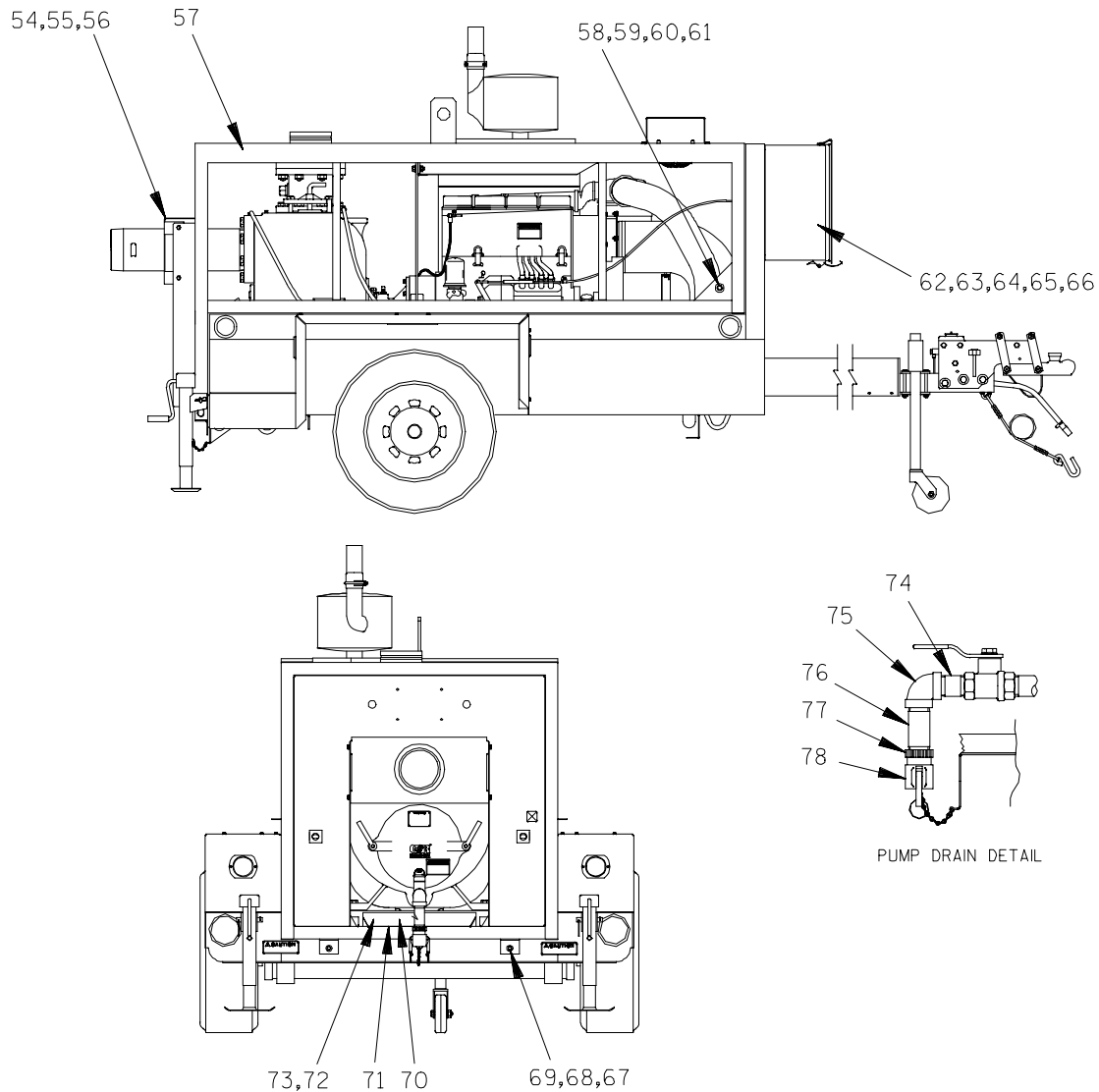


Figure E-2. T6A3-F4L-SPA Pump Assembly (Cont'd)

PARTS LIST

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
54	HEX HD CAPSCREW	B0603	15991	4	67	HEX HD CAPSCREW	B0606	15991	2
55	LOCK WASHER	J06	15991	4	68	FLAT WASHER	K06	15991	2
56	PANEL ASSY	42142-084	---	1	69	LOCK WASHER	J06	15991	2
57	CANOPY ASSY	41437-051	---	1	70	12" FOAM TAPE	18668-004	---	1
58	HEX HD CAPSCREW	B0805	15991	2	71	DRIP PAN ASSY	42114-090	24150	1
59	FLAT WASHER	K08	15991	6	72	18" VELCRO LOOP	18531-202	---	1
60	LOCK WASHER	J08	15991	2	73	18" VELCRO HOOK	18531-201	---	1
61	HEX NUT	D08	15991	2	74	PIPE NIPPLE	T2014	15079	1
62	GAUGE ASSY	47651-125	---	1	75	PIPE ELBOW	R20	11999	1
63	WARNING DECAL	38816-169	---	1	76	PIPE NIPPLE	T2020	15079	1
64	INSTRUCTION DECAL	38818-139	---	1	77	OPW ADAPTOR	26531-432	---	1
65	CURVE DECAL	38818-138	---	1	78	DUST CAP	26531-052	---	1
66	WARNING DECAL	38816-244	---	1					

* INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

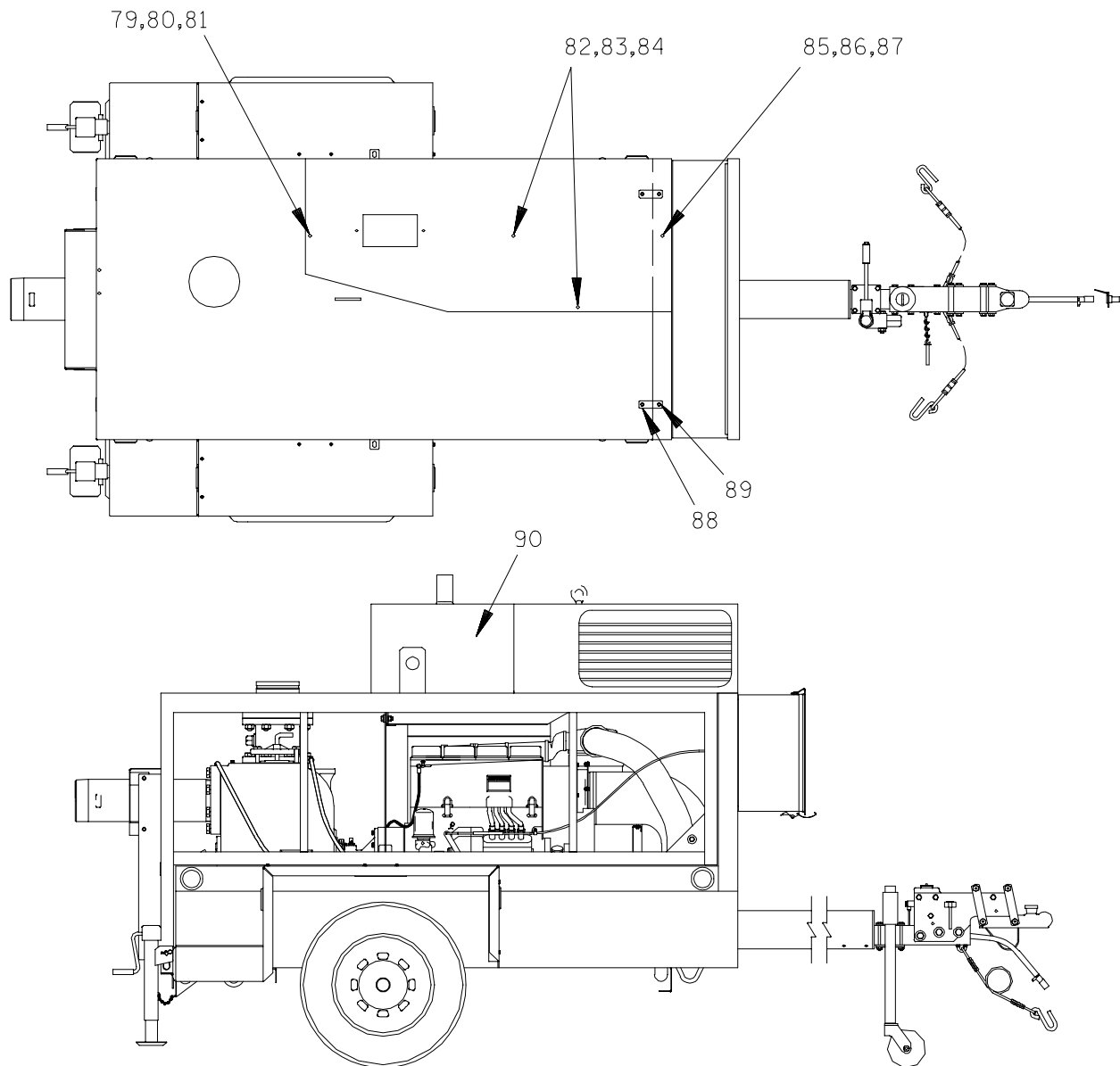


Figure E-3. T6A3-F4L-SPA Pump Assembly (Cont'd)

PARTS LIST

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
79	HEX HD CAPSCREW	B0604	15991	1	85	HEX HD CAPSCREW	B0618	15991	1
80	FLAT WASHER	K06	15991	1	86	FLAT WASHER	K06	15991	1
81	LOCK WASHER	J06	15991	1	87	LOCK WASHER	J06	15991	1
82	HEX HD CAPSCREW	B0604	15991	2	88	CANOPY BRACKET	33461-025	15020	2
83	FLAT WASHER	K06	15991	2	89	FLANGED CAPSCREW	21634-505	---	4
84	LOCK WASHER	J06	15991	2	90	MUFFLER ENCLOS ASSY	42164-005	---	1

* INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

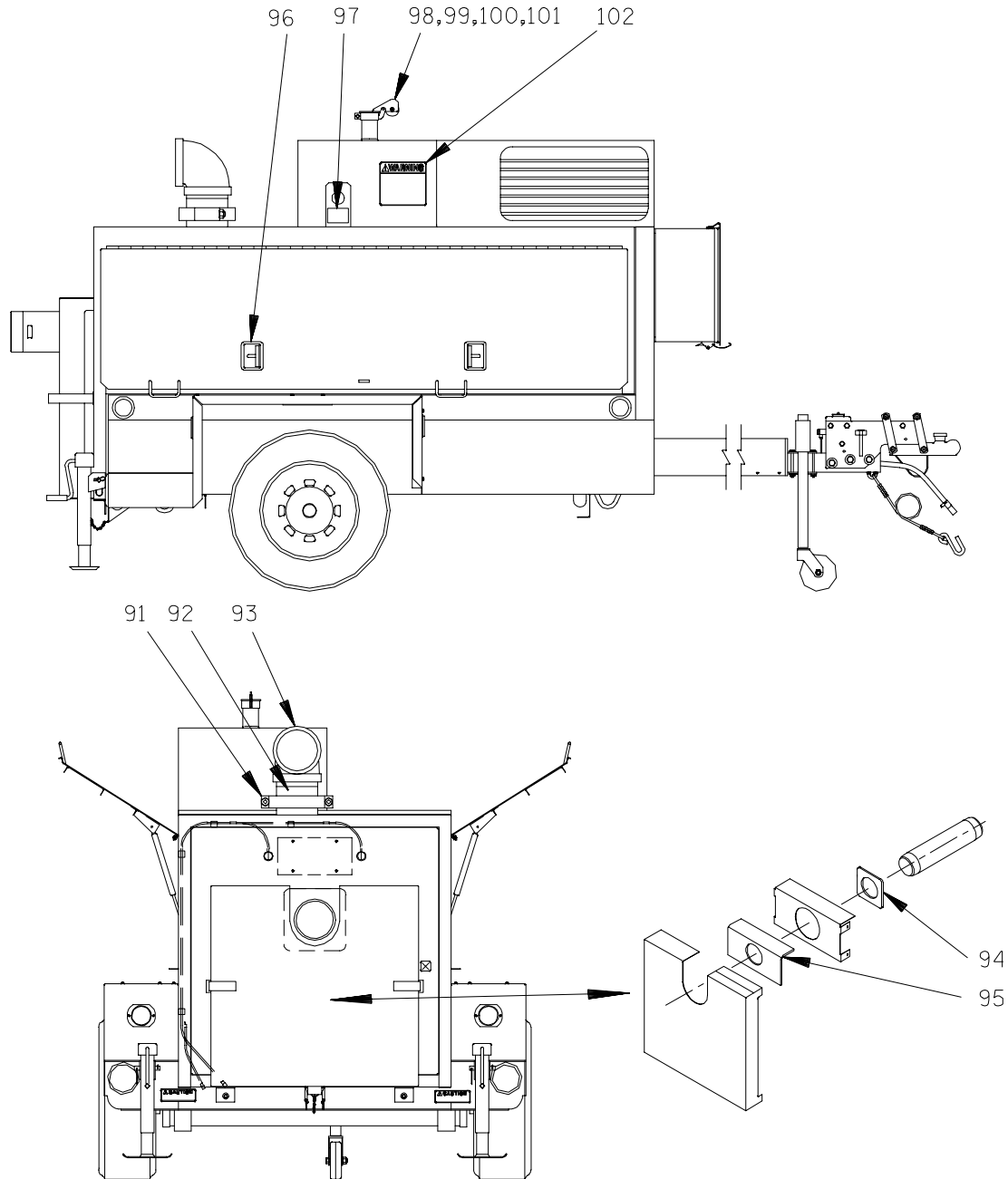


Figure E-4. T6A3-F4L-SPA Pump Assembly (Cont'd)

PARTS LIST

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
91	VICTAULIC COUPLING	S1562	---	1	97	WARNING DECAL	38816-218	---	2
92	PIPE NIPPLE	31572-005	15070	1	98	WEATHER CAP	S1710	---	1
93	PIPE NIPPLE	R96	11990	1	99	HEX HD CAPSCREW	B0503	15991	1
94	GASKET	38687-539	19020	1	100	FLANGED HEX NUT	21765-312	---	1
95	SUCTION GASKET	38687-547	19020	1	101	FLAT WASHER FIBER	21168-321	---	1
96	DOOR HANDLE	22814-509	---	4	102	WARNING DECAL	38816-175	---	1

* INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

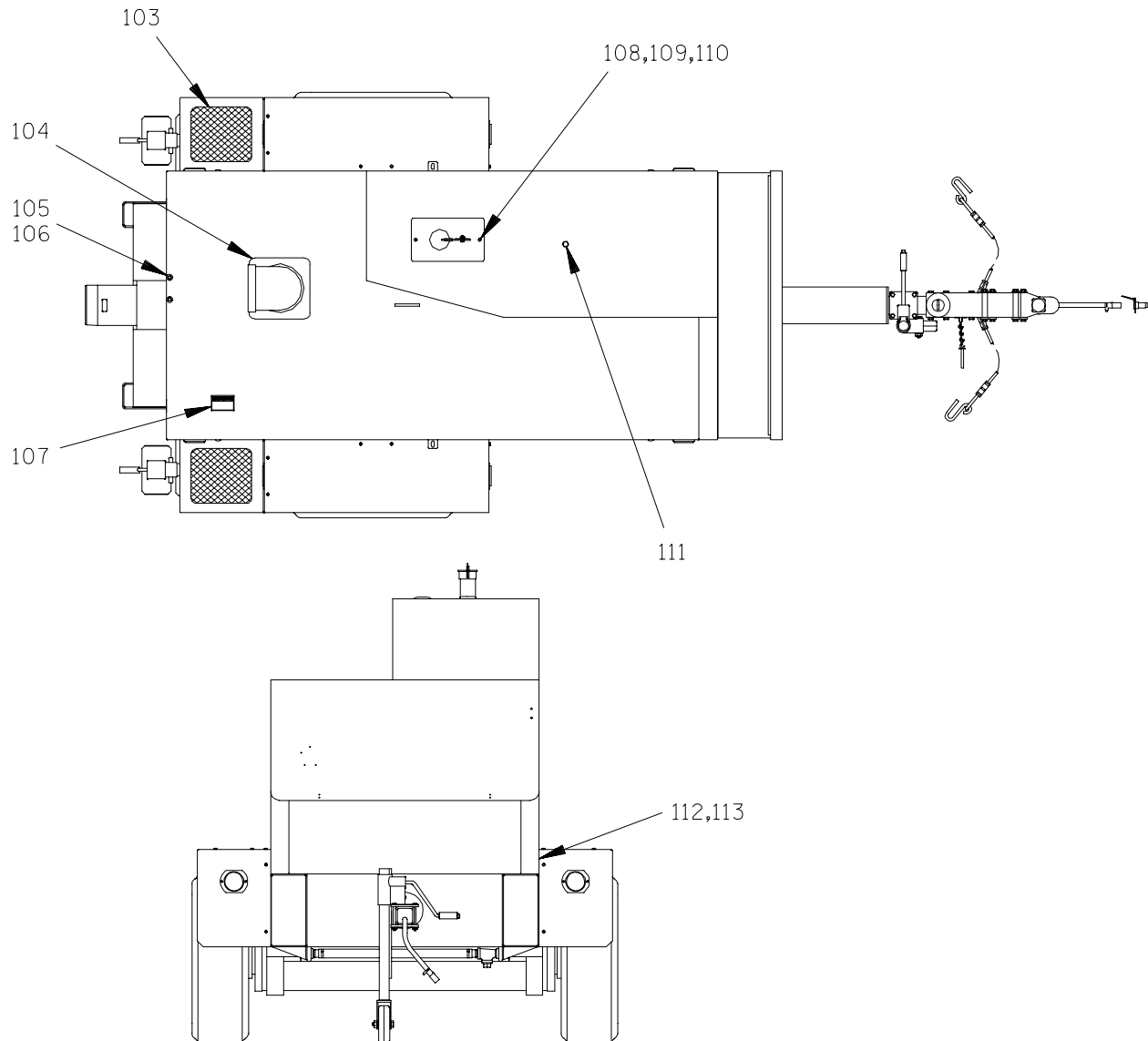


Figure E-5. T6A3-F4L-SPA Pump Assembly (Cont'd)

PARTS LIST

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
103	NON-SKID PAD	33541-026	18020	2		DECAL KIT	48154-804	---	1
104 *	DISCHARGE GASKET	38687-539	19020	1		ENGINE STARTUP TAG	38816-269	---	1
105	HEX HD CAPSCREW	B0604	15991	2		INSTRUCTION TAG	38817-085	---	1
106	FLAT WASHER	K06	15991	2		SOCKET WIRING TAG	38817-078	---	1
107	WARNING DECAL	38816-244	---	1		WARNING DECAL	38816-179	---	1
108	COVER PLATE	33461-118	15120	1		INSTRUCTION LABEL	2613DK	---	1
109 *	GASKET	38687-541	19000	1		G-R DECAL	GR-03	---	1
110	FLANGED CAPSCREW	21634-505	---	2		OPTIONAL:			
111	HEX HD CAPSCREW	B1003	15991	1		CASTER WHEEL KIT	48134-001	---	1
112	TRAILER INFO PLATE	38814-057	17000	1		PMP ACCESS DOOR KIT	48155-008	---	1
113	DRIVE SCREW	BM#04-03	17000	4		PUMP DRAIN EXTNSN	46341-018	---	1
NOT SHOWN:						CHECK VALVE/	46421-050	---	1
						AIR RELEASE KIT			

* INDICATES PARTS RECOMMENDED FOR STOCK

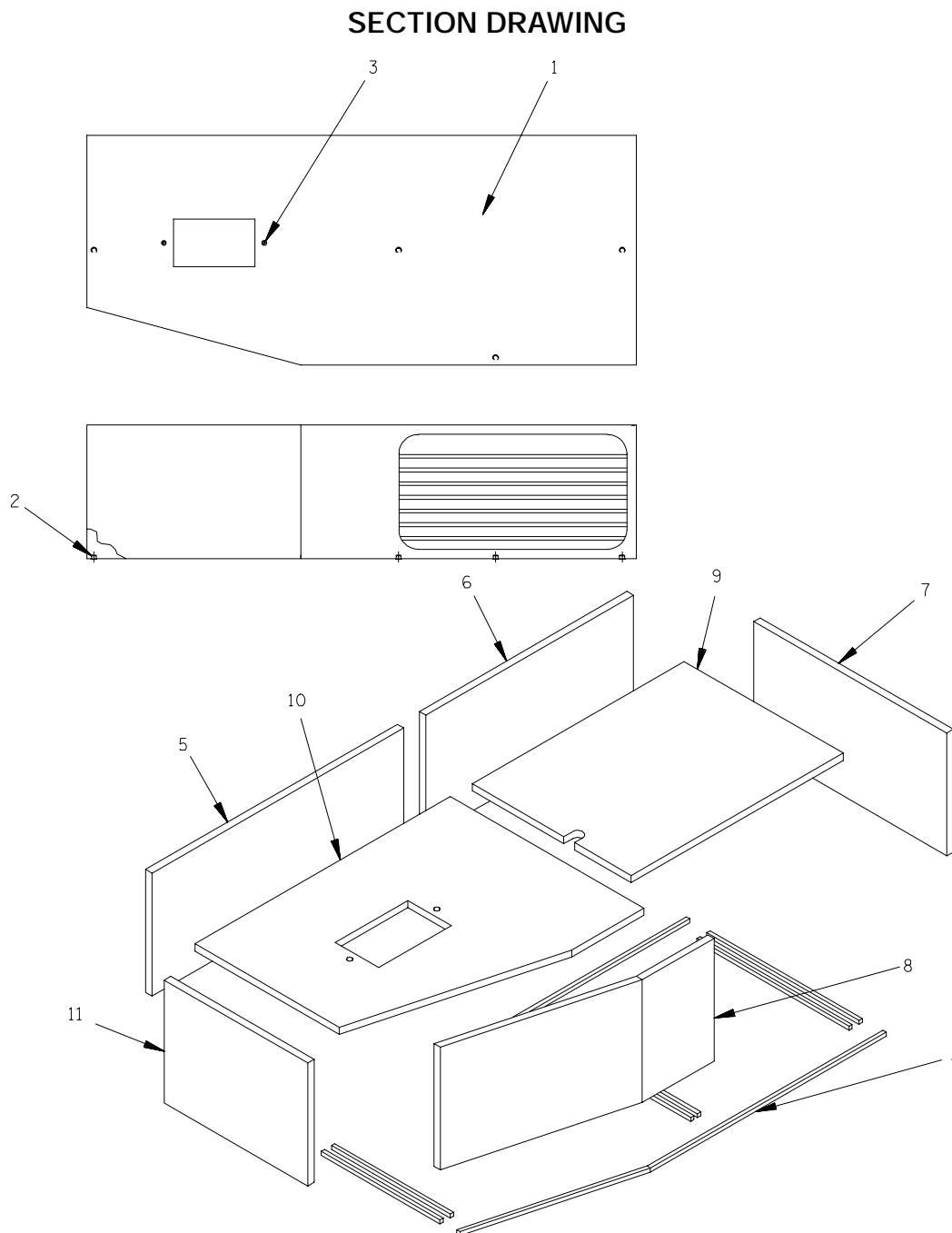


Figure E-6. 42164-005 Muffler Enclosure Assembly

PARTS LIST

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	ENCLOSURE ASSY	42164-004	24150	1	6	ABSORBER PANEL	33147-017	19460	1
2	.375-16 UNC NUTSERT	21769-163	---	4	7	ABSORBER PANEL	33147-018	19460	1
3	.250-20 UNC NUTSERT	21769-155	---	2	8	ABSORBER PANEL	34161-019	19460	1
4	.38 x .75 FOAM TAPE (REQUIRES CUTTING TO LENGTH)	18668-004	---	20'	9	ABSORBER PANEL	33643-128	19460	1
5	ABSORBER PANEL	33188-038	19460	1	10	ABSORBER PANEL	33414-006	19460	1
					11	ABSORBER PANEL	33147-016	19460	1

SECTION DRAWING

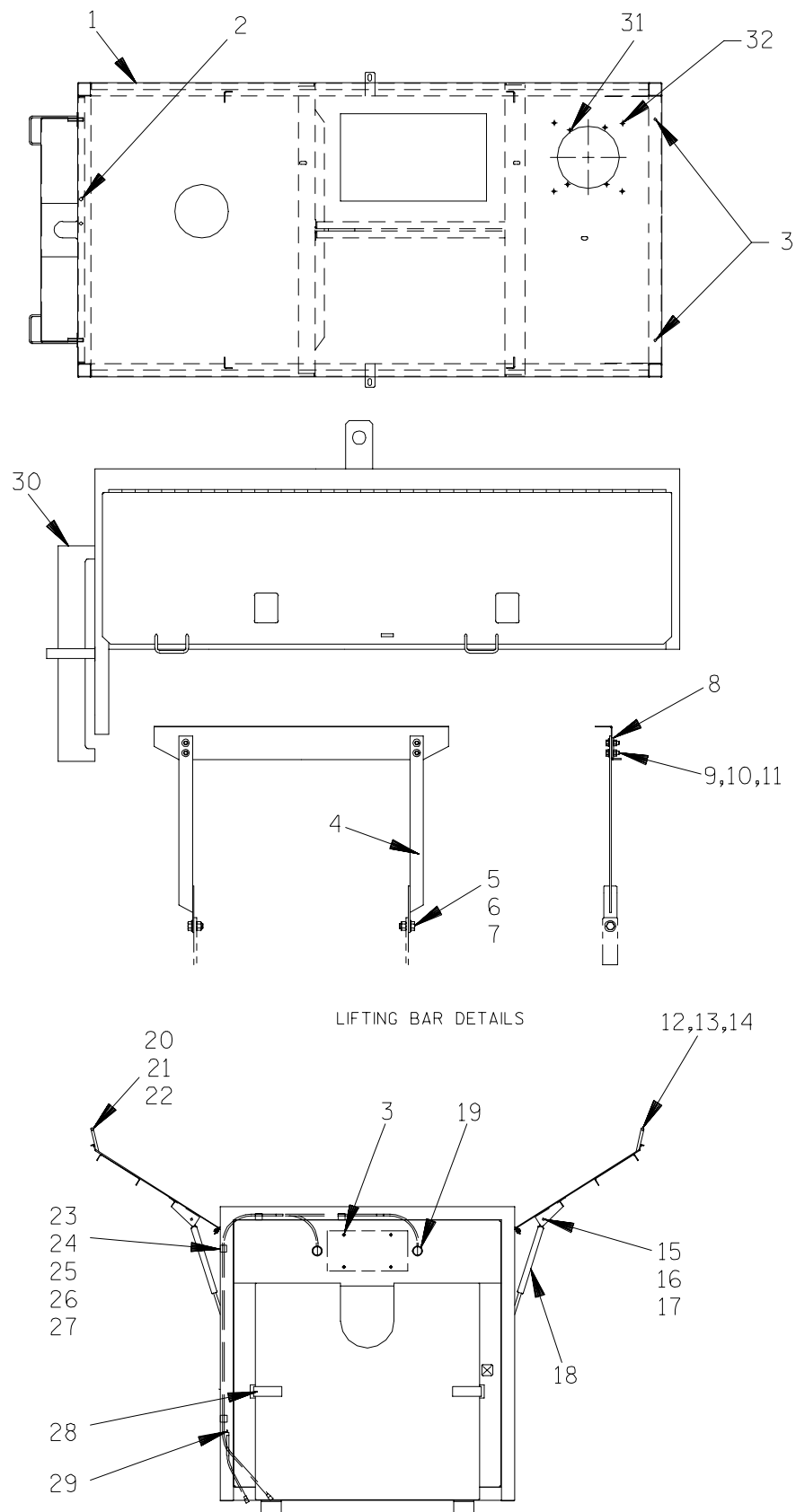


Figure E-7. 41437-051 Canopy Assembly

PARTS LIST

41437-051 Canopy Assembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	CANOPY SUBASSY	41437-049	24150	1	17	RETAINING CLIP	24613-034	---	8
2	.38-16 UNC NUTSERT	21769-163	---	2	18	LIFTING STRUT	29337-521	---	4
3	.25-16 UNC NUTSERT	21769-155	---	6	19	UTILITY LIGHT	29338-911	---	2
4	LIFTING BAR ASSY	44711-018	24150	2	20	FLANGED CAPSCREW	21634-504	---	23
5	HEX HD CAPSCREW	B1207	15991	2	21	LH DOOR ASSY	42121-452	24150	1
6	3/4" DISC LOCKWASHER	21177-105	---	4	22	LH HINGE ASSY	44171-106	---	1
7	HEX NUT	D12	15991	2	23	RING TONGUE CONN	27214-514	---	1
8	SUPPORT PLATE	33241-035	15080	2	24	MALE TERMINAL DISC	27236-444	---	2
9	HEX HD CAPSCREW	B0806	15991	4	25	BUTT CONNECTOR	27284-202	---	2
10	1/2" DISC LOCKWASHER	21177-103	---	8	26	16 GA. BROWN WIRE	18125-018	---	5'
11	HEX NUT	D08	15991	4	27	16 GA WHITE WIRE	18125-011	---	9"
12	RH HINGE ASSY	44171-105	---	1	28	T-NUT ASSY	41111-518	24150	2
13	RH DOOR ASSY	42121-451	24150	1	29	RD HD TAPSCREW	CC#08-01-1/2	15991	1
14	FLANGED CAPSCREW	21634-504	---	23	30	DOOR ASSY	42114-088	24150	1
15	HEX NUT	D05	15991	8	31	.25 THREADED INSERT	21769-155	---	4
16	BALL STUD	24623-011	---	8	32	.25 THREADED INSERT	21769-155	---	4

* INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

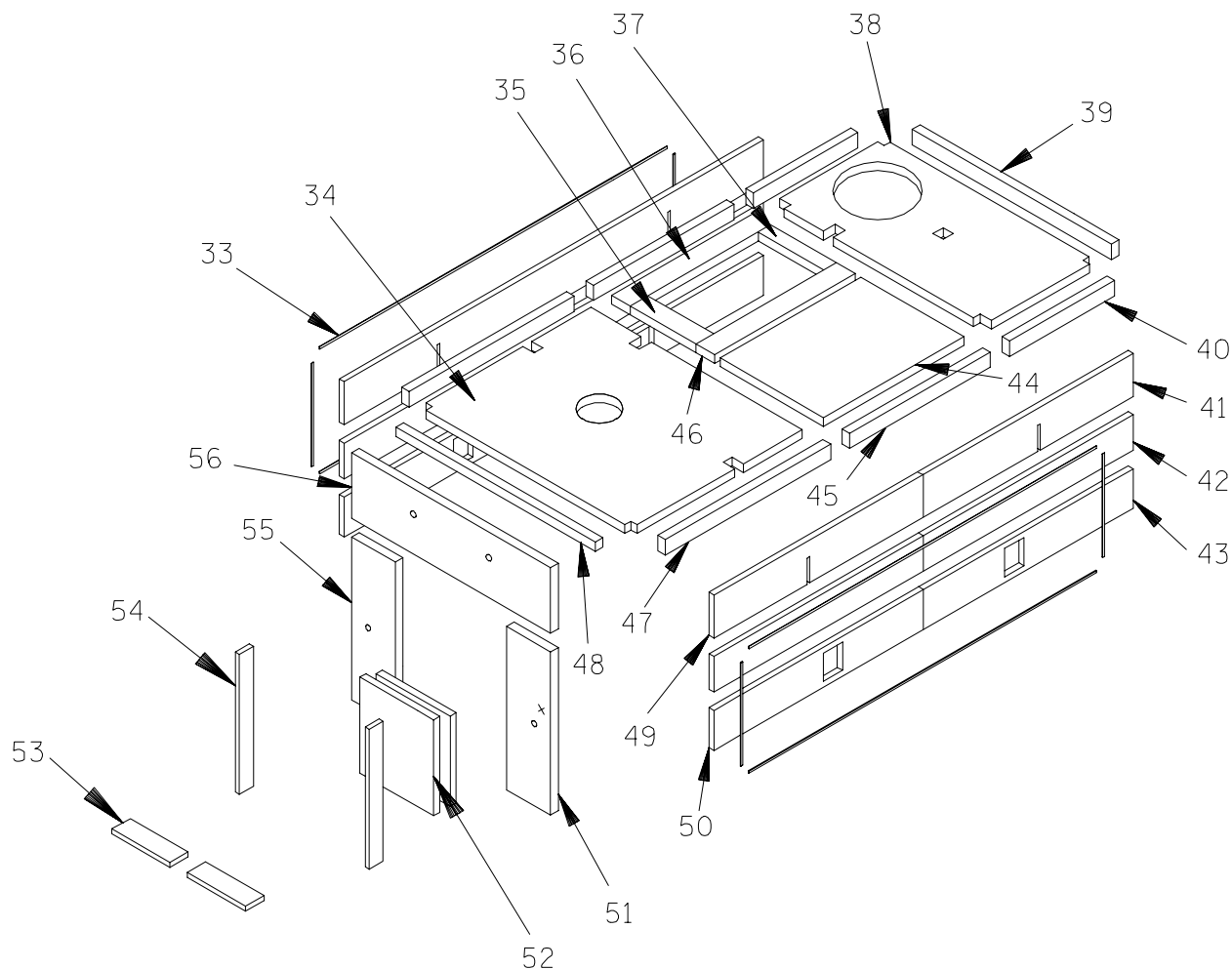


Figure E-8. 41437-051 Canopy Assembly (Cont'd)

PARTS LIST

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
33	FOAM TAPE	18668-003	---	35.5'	47	CANOPY ABSORB PNL	33188-040	19460	2
34	CANOPY ABSORB PNL	33641-151	19460	1	48	CANOPY ABSORB PNL	33188-041	19460	1
35	CANOPY ABSORB PNL	33185-011	19460	1	49	LH DOOR ABSORB PNL	33641-160	19460	2
36	CANOPY ABSORB PNL	33187-024	19460	1	50	LH DOOR ABSORB PNL	33321-102	19460	2
37	CANOPY ABSORB PNL	33185-012	19460	1	51	CANOPY ABSORB PNL	33226-021	19460	1
38	CANOPY ABSORB PNL	33641-152	19460	1	52	REAR DOOR ABSORBER	33147-020	19460	2
39	CANOPY ABSORB PNL	33188-039	19460	1	53	REAR DOOR ABSORBER	33187-029	19460	2
40	CANOPY ABSORB PNL	33187-026	19460	2	54	REAR DOOR ABSORBER	33187-028	19460	2
41	RH DOOR ABSORB PNL	33641-153	19460	2	55	CANOPY ABSORB PNL	33226-022	19460	1
42	RH DOOR ABSORB PNL	33188-042	19460	4	56	CANOPY ABSORB PNL	33247-028	19460	1
43	RH DOOR ABSORB PNL	33321-095	19460	2	NOT SHOWN:				
44	CANOPY ABSORB PNL	33147-019	19460	1	SPEED CLIP				
45	CANOPY ABSORB PNL	33187-027	19460	2			21181-301	---	22
46	CANOPY ABSORB PNL	33187-025	19460	1	PROTECTIVE SLEEVE				
							25141-262	---	22

* INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

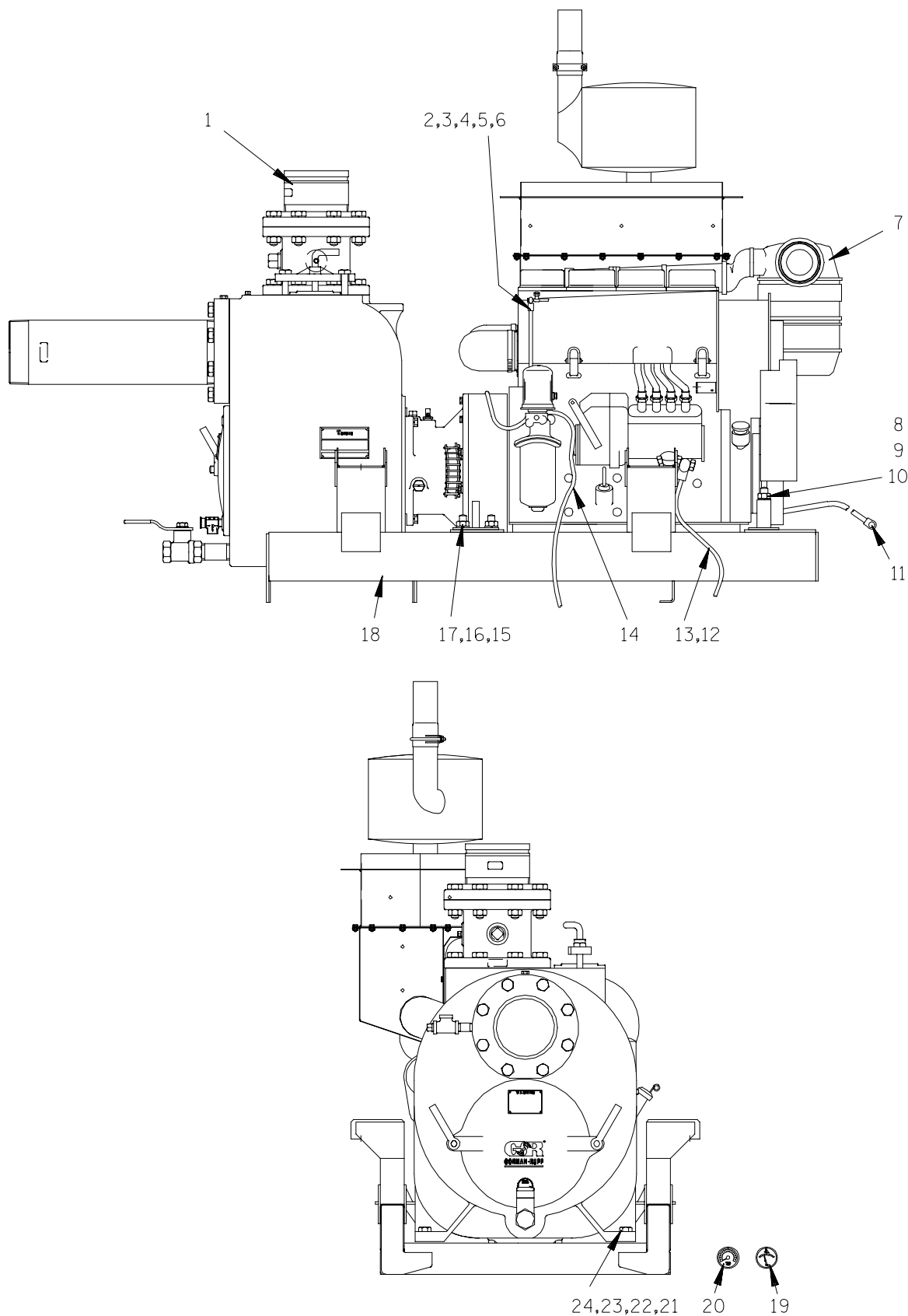


Figure E-9. T6A3-F4L-SPA Pump Subassembly

PARTS LIST
T6A3 – F4L – SPA Pump Subassembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	PUMP END ASSY	T6A3 – (F4L – SP)	---	1
2	FUEL LINE	11308F	---	1
3	HOSE CLAMP	26518 – 641	---	1
4	HOSE BARB FITTING	26523 – 443	---	1
5	FUEL CHECK VALVE	29277 – 151	---	1
6	COPPER WASHER	29277 – 152	---	3
7	ENGINE MODIFICATION ASSY	44311 – 013	---	1
8	HEX HD CAPSCREW	B1017	15991	2
9	LOCKWASHER	J10	15991	2
10	HEX NUT	D10	15991	2
11	BATTERY CABLE	47311 – 164	---	1
12	26" HOSE ASSY	46341 – 796	---	1
13	MALE CONNECTOR	S1447	---	1
14	OIL PRESS LINE	29336 – 101	---	1
15	HEX HD CAPSCREW	B1006	15991	4
16	LOCKWASHER	J10	15991	4
17	HEX NUT	D10	15991	4
18	COMBINATION BASE	41437 – 118	24150	1
19	OIL PRESSURE GAUGE	26851 – 645	---	1
20	TACHOMETER	26861 – 021	---	1
21	HEX HD CAPSCREW	B1008	15991	4
22	FLAT WASHER	K10	15991	4
23	LOCKWASHER	J10	15991	4
24	HEX NUT	D10	15991	4

SECTION DRAWING

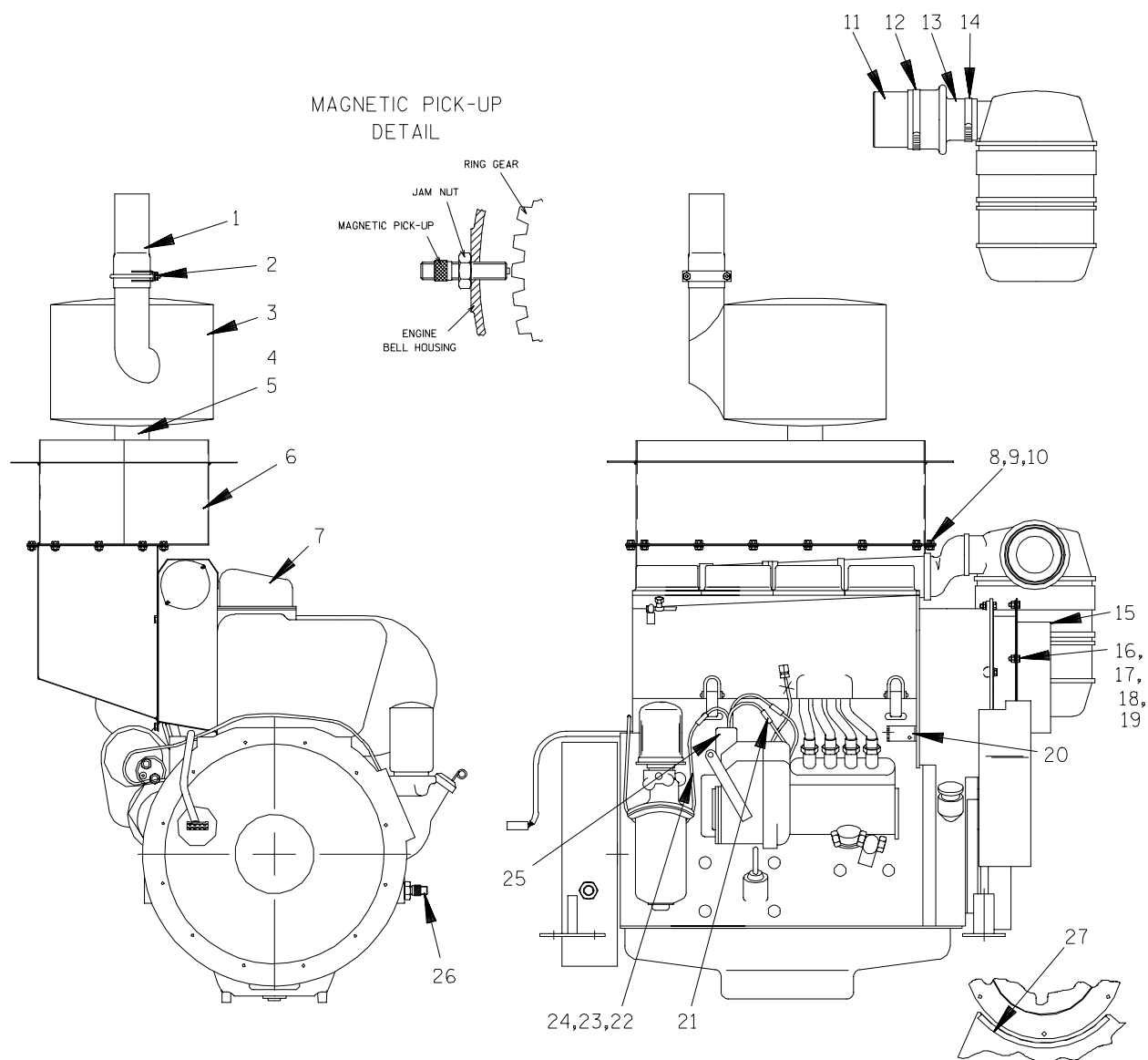


Figure E-10. T6A3-F4L-SPA Engine Modification Assembly

PARTS LIST
T6A3 – F4L – SPA Engine Modification Assembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	MUFFLER EXTENSION PIPE	31615-028	15130	1
2	MUFFLER CLAMP	29334-261	---	1
3	MUFFLER	29334-155	---	1
4	MUFFLER CLAMP	29334-261	---	1
5	MUFFLER EXTENSION PIPE	31615-023	15130	1
6	EXHAUST TOWER ASSY	46281-902	24150	1
7	DEUTZ F4L ENGINE	29217-044	---	1
8	HEX HD CAPSCREW	B0402	15991	18
9	FLANGED HEX NUT	21765-310	---	18
10	FLAT WASHER	K04	15991	18
11	TUBE	31144-032	15130	1
12	HOSE CLAMP	26518-678	---	1
13	ADAPTOR	26413-001	---	1
14	HOSE CLAMP	26518-675	---	1
15	AIR DUCT RING	42167-008	24150	1
16	HEX HD CAPSCREW	B0402-1/2	15991	6
17	FLAT WASHER	K04	15991	6
18	LOCK WASHER	J04	15991	6
19	HEX NUT	D04	15991	6
20	THROTTLE BRACKET	34874-056	15120	1
21	BUTT CONNECTOR	27284-202	---	3
22	#16 GA. WIRE	18125-011	---	3.4'
23	RING TERMINAL	27214-518	---	1
24	CABLE TIE	27111-207	---	7
25	SHUTDOWN KIT	29331-432	---	1
26	MAGNETIC PICKUP	27417-901	---	1
27	EDGE TRIM	18516-103	---	1.08'
NOT SHOWN:				
	ENGINE FOAM PACKAGE	46823-144	---	1
	3" WIDE x 16 FT LG METALIZED TAPE	18668-021	---	16'

SECTION DRAWING

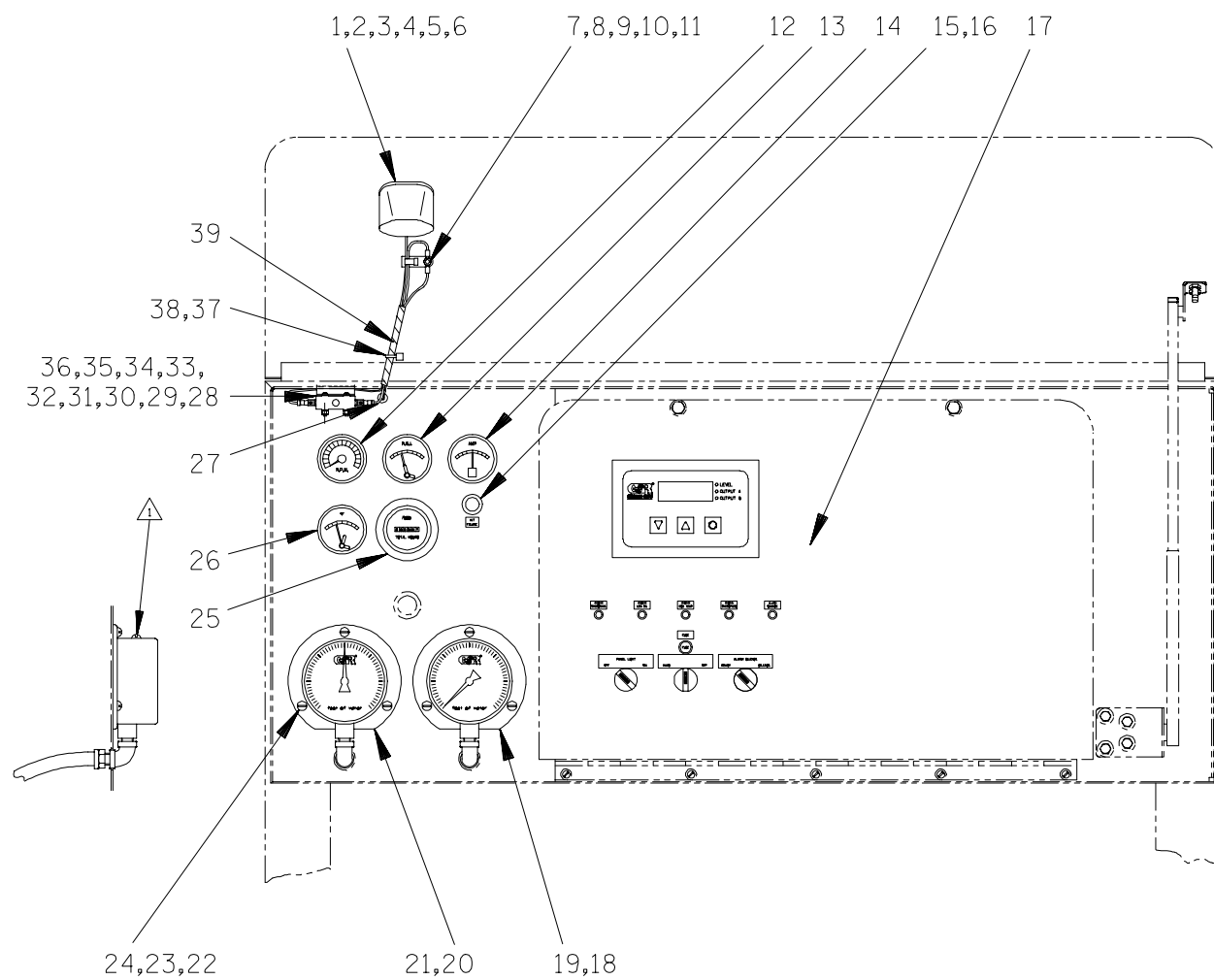


Figure E-11. Gauge Assembly

PARTS LIST Gauge Assembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	LIGHT ASSY	29330-804	---	1
2	RD HD MACH SCREW	X#10-02-1/2	15991	2
3	FLAT WASHER	K#10	15991	4
4	SEAL WASHER	S1590	---	2
5	LOCKWASHER	AK#10	15991	2
6	HEX NUT	D#10	15991	2
7	CABLE TIE W/CLAMP	27111-232	---	1
8	RD HD MACH SCREW	X#10-02	15991	1
9	FLAT WASHER	K#10	15991	1
10	LOCKWASHER	AK#10	15991	1
11	HEX NUT	K#10	15991	1
12	TACHOMETER	26861-021	---	REF
13	PIL PRESSURE GAUGE	26851-645	---	REF
14	AMMETER	26865-018	---	1
15	BULB	27831-106	---	1
16	RED INDICATING LIGHT	27856-353	---	1
17	CONTROL PANEL SUB-ASSEMBLY	47631-519	---	1
18	DISCH PRESSURE GAUGE	26851-302	---	1
19	PIPE ELBOW	R04	11999	1
20	SUCT PRESSURE GAUGE	26853-851	---	1
21	PIPE ELBOW	R04	11999	1
22	RD HD MACH SCREW	X#10-03	15991	6
23	LOCKWASHER	AK#10	15991	6
24	HEX NUT	D#10	15991	6
25	HOURLMETER	26862-119	---	1
26	AIR TEMP GAUGE	26857-302	---	1
27	FLG BEARING BUSHING	23181-001	---	1
28	BRACKET	34512-047	15120	1
29	SWITCH	S1744	---	1
30	RD HD MACH SCREW	X#10-02-1/4	15991	2
31	FLAT WASHER	K#10	15991	4
32	LOCKWASHER	J#10	15991	2
33	HEX NUT	K#10	15991	2
34	RD HD MACH SCREW	X#10-04	15991	2
35	LOCKWASHER	J#06	15991	2
36	HEX NUT	D#06	15991	2
37	1-1/4" CABLE TIE	27111-205	---	1
38	CABLE TIE MTG BRACKET	27111-352	---	1
39	12" LG SPIRAL WRAP	18763-003	---	1

SECTION DRAWING

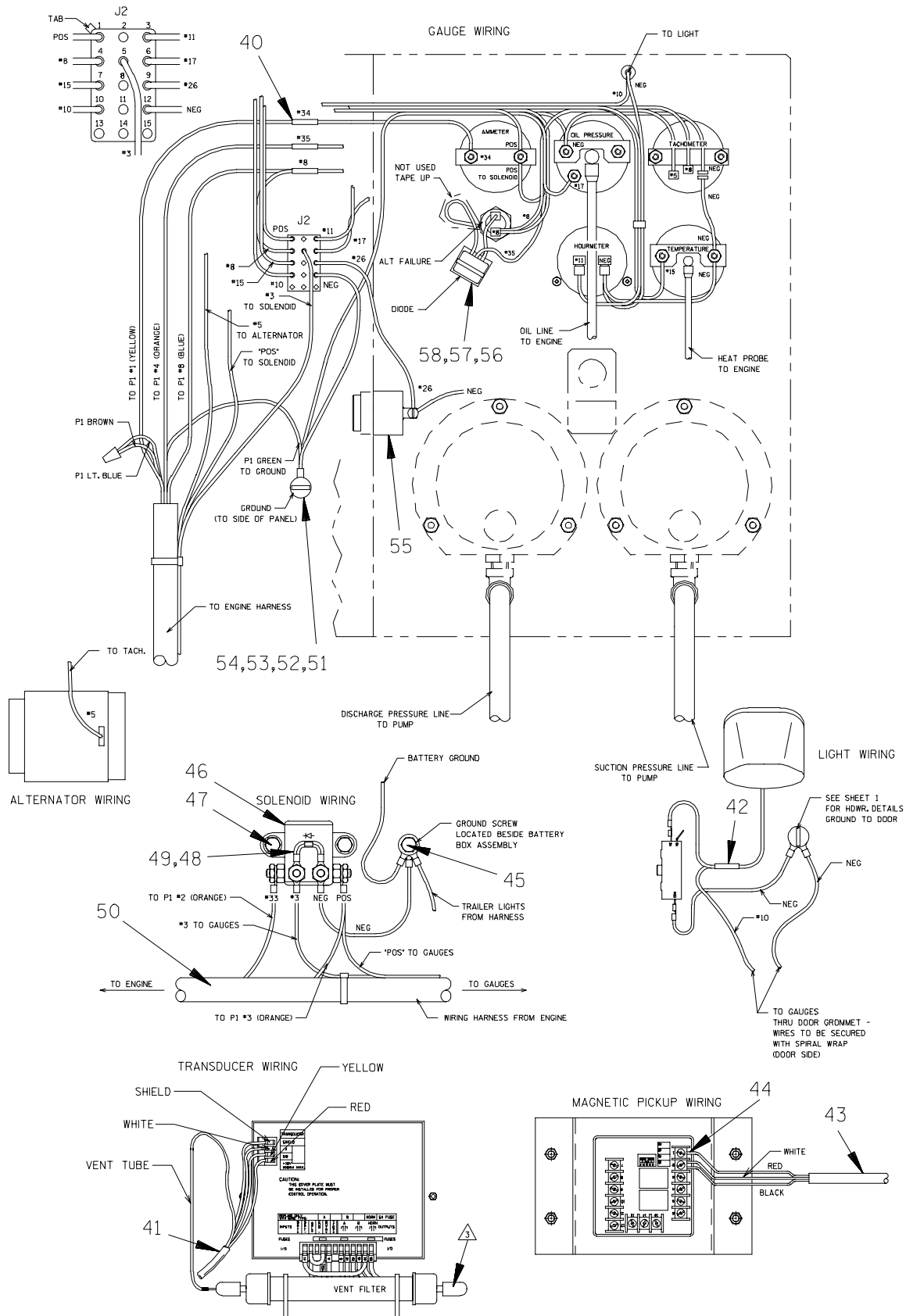


Figure E-12. Gauge Assembly (cont'd)

PARTS LIST
Gauge Assembly (cont'd)

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
40	BUTT SPLICE CONNECTOR	27824-202	---	3
41	SUB TRANSDUCER W/75 FT. CABLE	27788-183	---	1
42	#16-14 BUTT SPLICE	27284-202	---	2
43	MAG PICKUP CABLE	27417-921	---	1
44	16-14-#8 FORK TERMINAL	27215-404	---	3
45	HEX HD CAPSCREW	21634-507	---	1
46	SOLENOID	27422-003	---	1
47	HEX HD CAPSCREW	21634-505	---	2
48	DIODE	27761-003	---	1
49	3" LG SPIRAL WRAP	18763-003	---	1
50	ENGINE WIRING HARNESS	29331-942	---	1
51	RD HD MACH SCREW	X#10-02-1/2	15991	1
52	LOCKWASHER	AK#10	15991	1
53	HEX NUT	D#10	15991	1
54	COPPER LUG	27222-002	---	2
55	ALARM HORN	26848-072	---	1
56	DIODE PACKAGE	27762-101	---	1
57	CABLE TIE	27111-202	---	1
58	CABLE TIE MTG BLOCK	27111-352	---	1

SECTION DRAWING

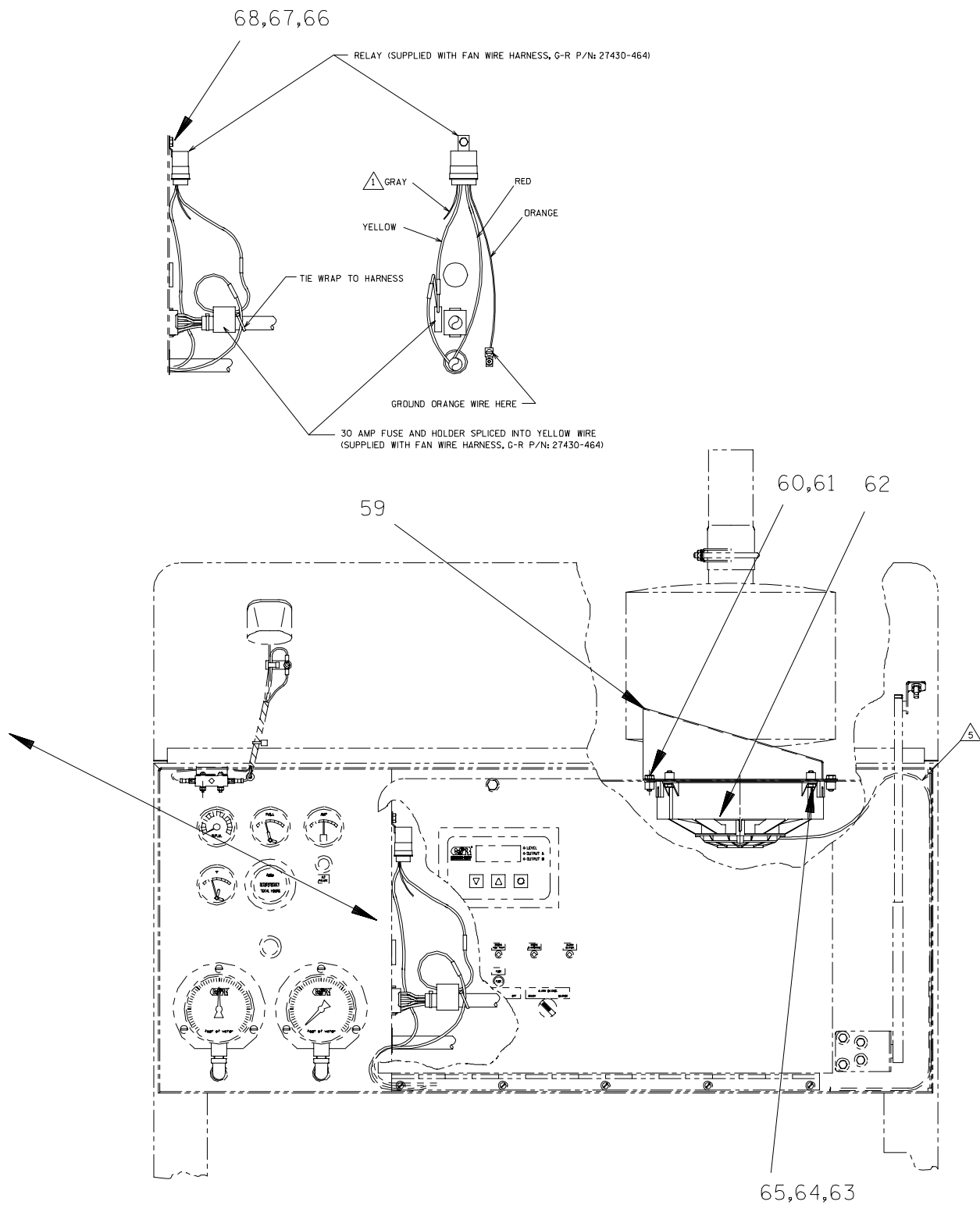


Figure E-13. Gauge Assembly (cont'd)

PARTS LIST
Gauge Assembly (cont'd)

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
59	OUTLET SCOOP	34874-060	15020	1
60	HEX HD CAPSCEW	B0403	15991	4
61	FLAT WASHER	K04	15991	4
62	AXIAL MOTOR FAN	26761-011	---	1
63	HEX HD CAPSCREW	B0403	15991	4
64	LOCKWASHER	J04	15991	4
65	FLAT WASHER	K04	15991	4
66	HEX HD CAPSCREW	B0402	15991	1
67	LOCKWASHER	J04	15991	1
68	HEX NUT	K04	15991	1
NOT SHOWN:				
	#10 RING TONGUE CONNECTOR	27214-515	---	REF
	.25 RING TONGUE CONNECTOR	27214-516	---	REF
	FORK TONGUE CONNECTOR	27215-057	---	6
	15 FT. #16 GA BLUE WIRE	18162-017	---	1
	INSULATING BUSHING	27137-505	---	1
	CONDUIT NUT	DF12	15990	1
	RELAY W/PLUG/WIRE HARNESS	27430-464	---	1

SECTION DRAWING

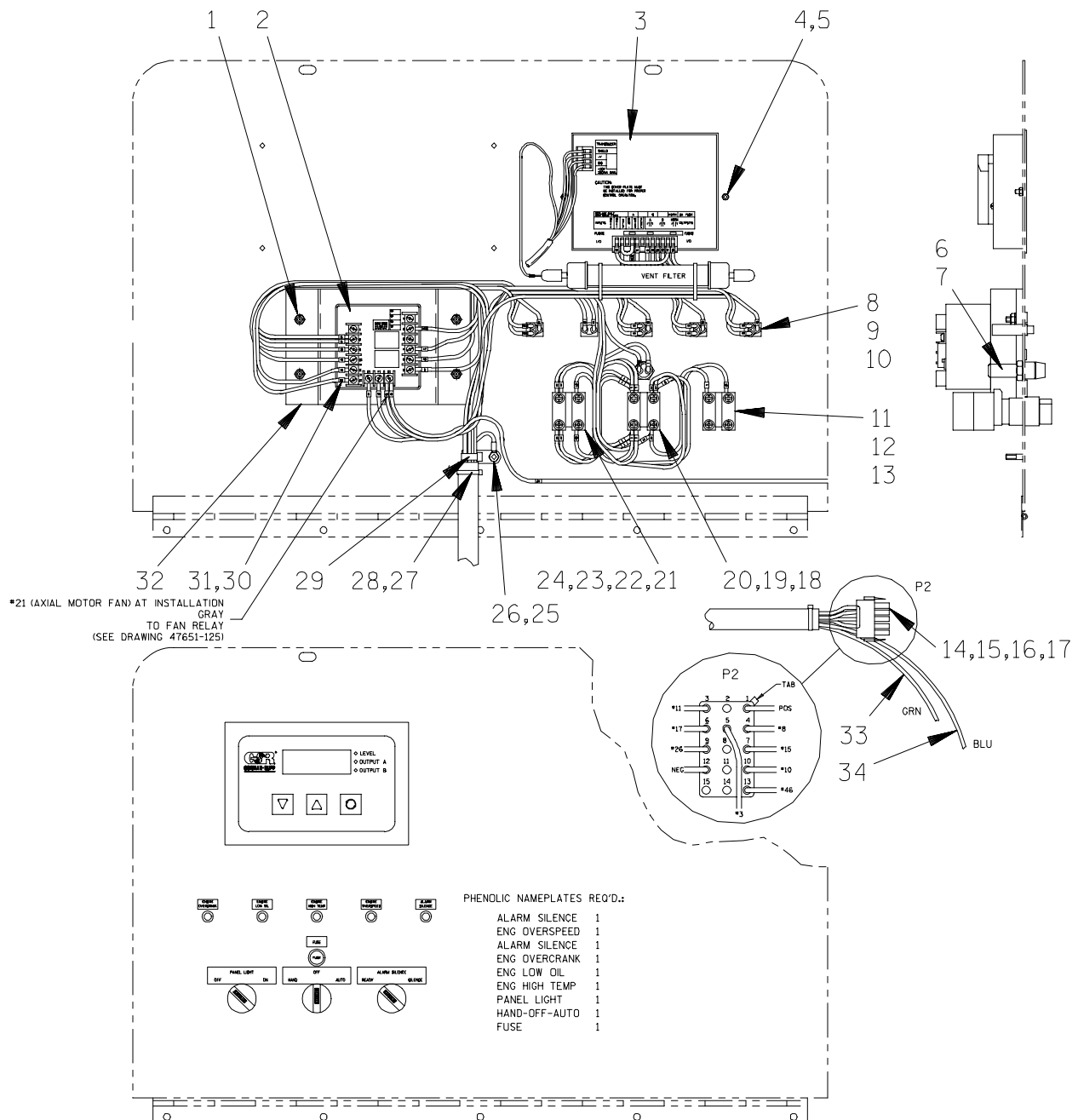


Figure E-14. Control Panel Sub-Assembly

PARTS LIST **Control Panel Sub-Assembly**

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	HEX NUT	D#10	15991	4
2	MURPHY ASM 150 MODULE	29331-405	---	1
3	MICRO EPS	27781-036	---	1
4	LOCKWASHER	AK#06	15991	2
5	HEX NUT	D#06	15991	2
6	BUSS FUSE MDL5	27311-554	---	1
7	BUSS FUSE HOLDER	27314-102	---	1
8	12V DC RED LED	27762-006	---	5
9	"Y" TERMINAL	27236-202	---	4
10	SPADE TERMINAL	27236-023	---	16
11	A/B 2-POS 800EM-SM22 STND	27385-471	---	1
12	A/B 2X N.O. 800E-2X10	27381-081	---	1
13	A/B 2X LATCH 800E-A2L	27382-001	---	1
14	CONNECTOR PLUG	27245-115	---	1
15	CONNETOR CAP	27245-135	---	1
16	CONNECTOR PIN	27228-505	---	10
17	#20/14 AMP SOCKET	27228-515	---	10
18	A/B 3 POS 800EM-SM32 STND	27385-481	---	1
19	A/B 2X LATCH 800E-A2L	27382-001	---	1
20	A/B 2X N.O. 800E-2X10	27381-081	---	4
21	A/B 2 POS 800EM-SM22 STND	27385-471	---	1
22	A/B 2X LATCH 800E-A2L	27382-001	---	1
23	A/B 2X N.O. 800E-2X10	27381-081	---	1
24	A/B 2X N.C. 800E-2X01	27381-082	---	1
25	HEX NUT	D#10	15991	1
26	RING TERMINAL	27214-515	---	1
27	2 FT. LG. LOOM	18763-026	---	1
28	CABLE TIES	27111-205	---	65
29	CABLE TIE W/CLAMP	27111-232	---	1
30	WIRE MARKERS	AS REQUIRED		
31	16-14 #8 FORK TERMINAL	27215-404	---	14
32	MODULE MOUNTING BRACKET	34621-298	15120	1
33	6 FT. #16 GA. GREEN WIRE	18162-015	---	1
34	25 FT. #16 GA. BLUE WIRE	18162-017	---	1

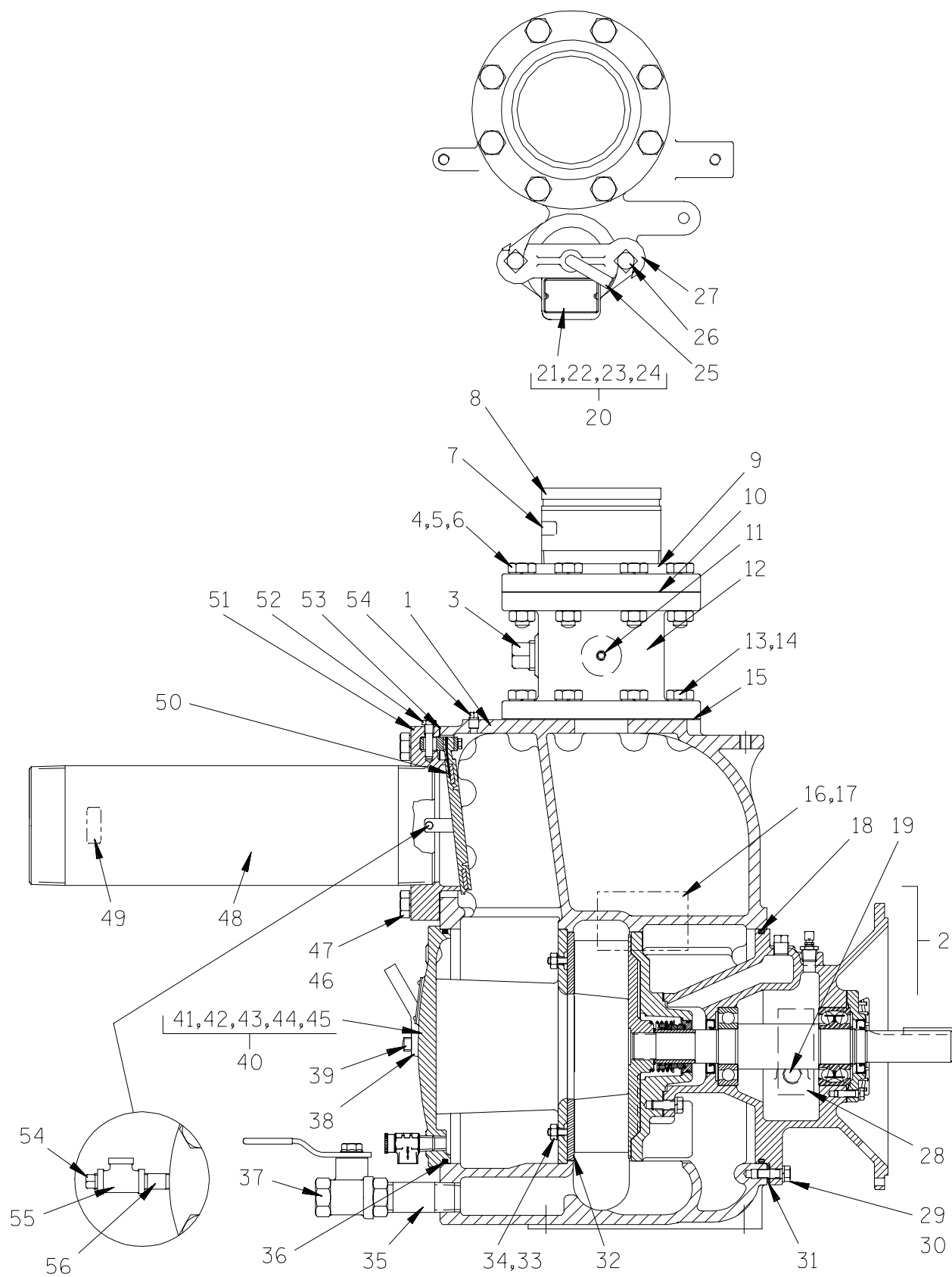


Figure E-15. T6A3-(F4L-SP) Pump End Assembly

PARTS LIST

T6A3--(F4L--SP) Pump End Assembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	PUMP CASING	10957C	10010	1	34	HEX NUT	D06	15991	4
2	REP ROTATING ASSY	44163-236	---	1	35	PIPE NIPPLE	T2018	15079	1
3	PIPE PLUG	P20	10009	1	36 *	O-RING	S1676	---	1
4	HEX HD CAPSCREW	B1212	15991	8	37	BALL VALVE	26631-031	---	1
5	LOCKWASHER	J12	15991	8	38	HAND NUT	38115-202	15040	2
6	HEX NUT	D12	15991	8	39	STUD	C1211	15991	2
7	DISCHARGE STICKER	6588BJ	---	1	40	BACK COVER ASSY	42111-905	---	1
8	VICTAULIC NIPPLE	31673-046	15070	1	41	- BACK COVER	NOT AVAILABLE	---	1
9	DISCHARGE FLANGE	1758	10010	1	42	- WARNING PLATE	2613EV	13990	1
10 *	DISCH FLANGE GSKT	25113-036	---	1	43	- DRIVE SCREW	BM#04-03	17000	4
11	PIPE PLUG	P04	15079	1	44	- PRESS RELIEF VALVE	26662-005	---	1
12	DISCH SPOOL FLANGE	11402B	10010	1	45	- WARNING DECAL	38816-302	---	1
13	HEX HD CAPSCREW	B1208	15991	8	46	HEX HD CAPSCREW	B1210	15991	8
14	LOCKWASHER	J12	15991	8	47	LOCKWASHER	J12	15991	8
15 *	DISCH FLANGE GSKT	25113-036	---	1	48	PIPE NIPPLE	31476-570	15070	1
16	NAME PLATE	38818-040	13990	1	49	SUCTION STICKER	6588AG	---	1
17	DRIVE SCREW	BM#04-03	17000	4	50 *	SUCT CHK VLV ASSY	46411-064	---	1
18 *	INTERMEDIATE O-RING	S1676	---	1	51	SUCTION FLANGE	11402	10010	1
19	SIGHT GAUGE	S1471	---	1	52	CHECK VALVE PIN	11645	17010	1
20	FILL COVER ASSY	42111-344	---	1	53 *	SUCT FLANGE GASKET	11402G	19370	1
21	- COVER PLATE	NOT AVAILABLE	---	1	54	PIPE PLUG	P04	15079	2
22	- WARNING PLATE	38816-097	13990	1	55	PIPE TEE	U04	11999	1
23	- DRIVE SCREW	BM#04-03	17000	2	56	PIPE NIPPLE	T0406	15079	1
24	- FILL COVER GASKET	50G	19210	1		NOT SHOWN:			
25	CLAMP BAR	38111-004	11010	1		STRAINER	7823A	24000	1
26	MACHINE BOLT	A1014	15991	2		WARNING DECAL	2613FE	---	1
27	CLAMP BAR SCREW	31912-009	15000	1		PRIMING STICKER	6588AH	---	1
28	LUBE DECAL	11421A	---	1		DRIVE ASSY	44162-156	---	1
29	HEX HD CAPSCREW	B0806	15991	4		OPTIONAL:			
30	LOCKWASHER	J08	15991	4		ASTL WEAR PLATE	46451-729	24160	1
31 *	ROT ADJ SHIM SET	13131	17040	REF		IMP CLEAN-OUT KIT	48783-003	---	1
32 *	WEAR PLATE ASSY	46451-723	24150	1					
33	LOCKWASHER	J06	15991	4					

* INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

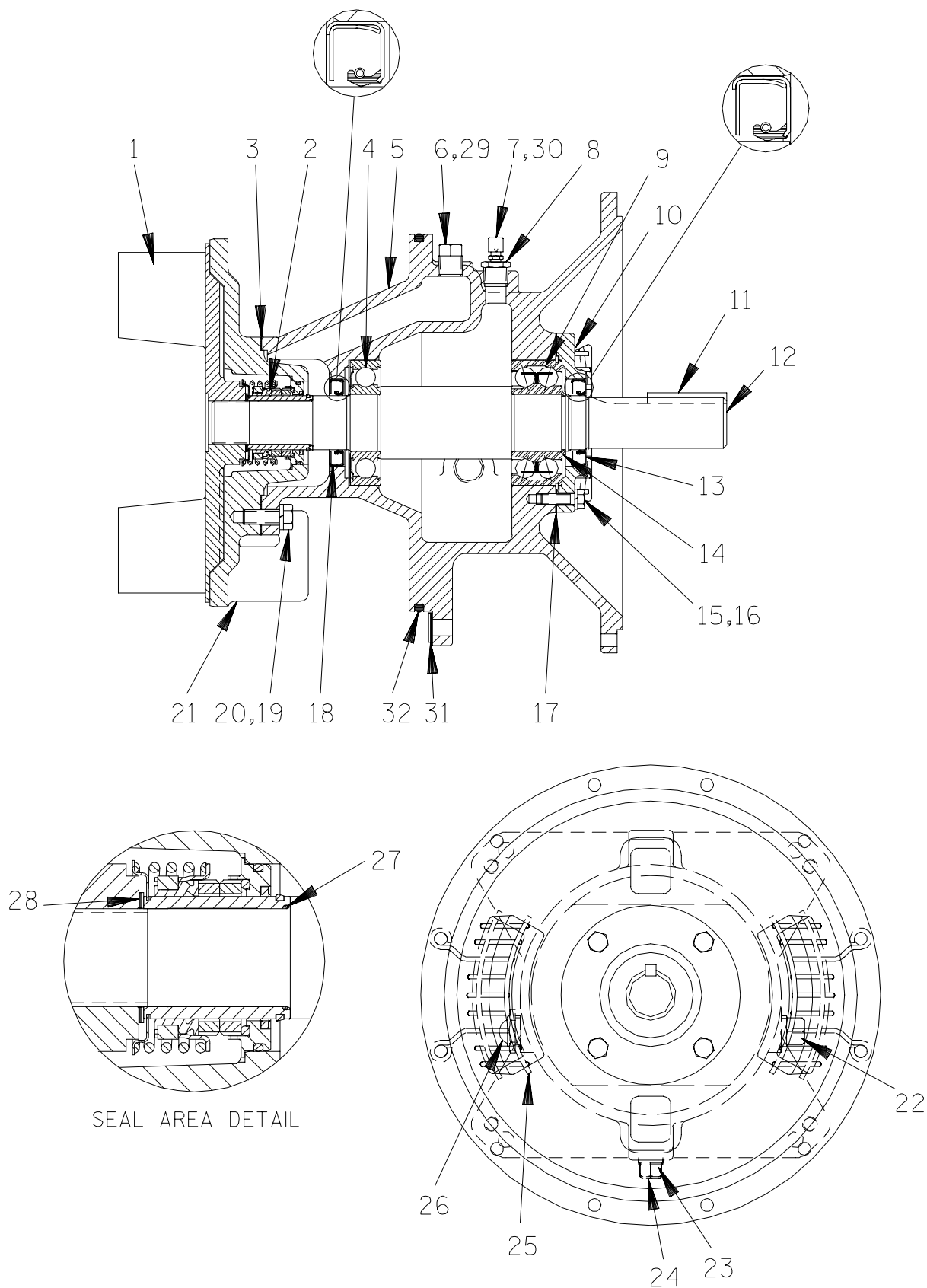


Figure E-16. 44163-236 Repair Rotating Assembly

PARTS LIST 44163-236 Repair Rotating Assembly

ITEM NO.		PART NAME	PART NUMBER	MAT'L CODE	QTY
1	*	IMPELLER	38615-089	11010	1
2		SEAL ASSEMBLY	46513-153	---	1
3	*	SEAL PLATE GSKT	10959G	20000	1
4	*	BALL BEARING	S616	---	1
5		INTERMEDIATE	38266-008	10010	1
6		VENTED PLUG	4823A	15079	1
7		AIR VENT	S1530	---	1
8		REDUCING BUSHING	AP0802	15079	1
9	*	BALL BEARING	S1030	---	1
10		BEARING CAP	38322-430	10010	1
11	*	SHAFT KEY	N0611	15990	1
12	*	IMPELLER SHAFT	38514-816	1706H	1
13	*	OIL SEAL	S1917	---	1
14		SNAP RING	24124-425	---	1
15		HEX HD CAPSCREW	B0605	15991	4
16		LOCKWASHER	J06	15991	4
17	*	BEARING CAP GASKET	38683-473	18000	1
18	*	OIL SEAL	S1917	---	1
19		HEX HD CAPSCREW	B0805 1/2	15991	4
20		LOCKWASHER	J08	15991	4
21		SEAL PLATE	38272-254	10010	1
22		PIPE PLUG	P12	15079	1
23		INTERMEDIATE DRAIN PLUG	P08	15079	1
24		SEAL CAVITY DRAIN PLUG	P08	15079	1
25		INTERMEDIATE GUARD ASSY	42381-509	24152	2
26		SIGHT GAUGE	S1471	---	1
27	*	SHAFT SLEEVE O-RING	25154-026	---	REF
28	*	IMPELLER ADJ SHIM SET	5091	17090	REF
29		SHIPPING PLUG	11495B	15079	1
30		SHIPPING PLUG	11495B	15079	1
31	*	ROTATING ASSY SHIM SET	13131	17040	4
32	*	INTERMEDIATE O-RING	S1676	---	1
NOT SHOWN:					
		INSTRUCTION TAG	6588U	---	1
OPTIONAL:					
		ADI IMPELLER	10958	1102H	1
		ADI SEAL PLATE	11837E	1102H	1

* INDICATES PARTS RECOMMENDED FOR STOCK

SECTION DRAWING

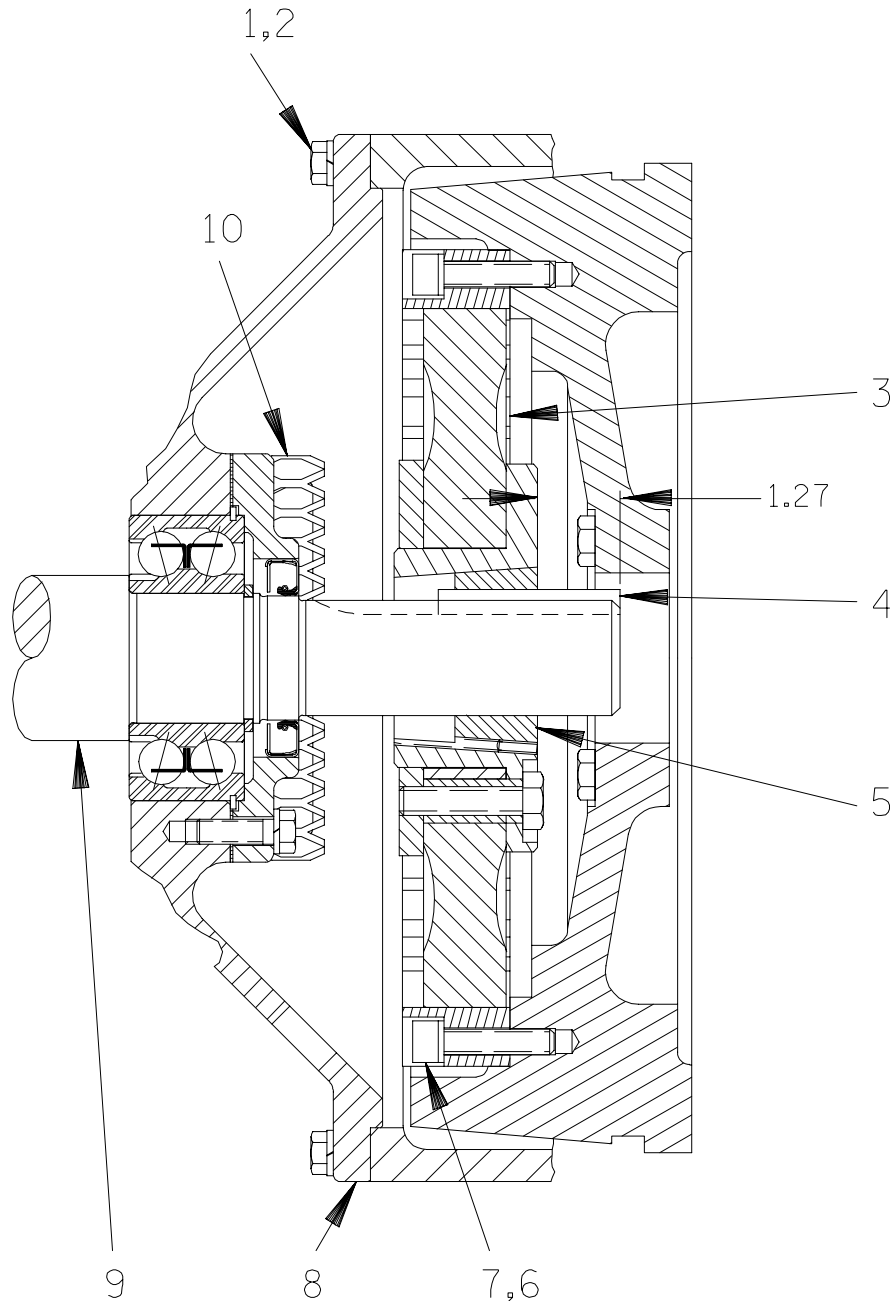


Figure E-17. Drive Assembly For T6A3-F4L-SPA

PARTS LIST

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	HEX HD CAPSCREW	22645-164	---	12	6	SOC HD CAPSCREW	22644-220	---	8
2	LOCKWASHER	21171-511	---	12	7	LOCKWASHER	21171-536	---	8
3	COUPLING ASSEMBLY	44165-016	---	1	8	INTERMEDIATE	38266-008	10010	REF
4	SHAFT KEY	N0611	15990	REF	9	IMPELLER SHAFT	38514-816	1706H	REF
5	BUSHING	24131-046	---	1	10	INTERMEDIATE GUARD	42381-504	---	REF

* INDICATES PARTS RECOMMENDED FOR STOCK

PUMP AND SEAL DISASSEMBLY AND REASSEMBLY

Review all **SAFETY** information in Section A.

Follow the instructions on all tags, label and decals attached to the pump.

This pump requires little service due to its rugged, minimum-maintenance design. However, if it becomes necessary to inspect or replace the wearing parts, follow these instructions which are keyed to the sectional views (see Figures E-1 thru E-17) and the accompanying parts lists.

As described on the following page, this manual will alert personnel to known procedures which require special attention, to those which could damage equipment, and to those which could be dangerous to personnel. However, this manual cannot possibly anticipate and provide detailed precautions for every situation that might occur during maintenance of the unit. Therefore, it is the responsibility of the owner/maintenance personnel to ensure that **only** safe, established maintenance procedures are used, and that any procedures not addressed in this manual are performed **only** after establishing that neither personal safety nor pump integrity are compromised by such practices.

Some service functions, such as wear plate and suction check valve replacement, may be performed by draining the pump and removing the back cover assembly. If major repair is required, such as impeller, seal, or rotating assembly removal, the piping must be disconnected and the canopy removed to provide access. The following instructions assume complete disassembly is required.

Before attempting to service the pump, set the HAND-OFF-AUTO switch to 'OFF' and close and lock the control panel cover, or disconnect the positive battery cable to ensure that the pump will remain inoperative. Close all valves in the suction and discharge lines.

Maintenance of the trailer assembly is covered in Section F. Maintenance of the EPS control is covered in the separate literature accompanying the control.

For engine disassembly and repair, consult the literature supplied with the engine, or contact your local Deutz engine representative.



Before attempting to open or service the pump:

1. Familiarize yourself with this manual.
2. Set the HAND-OFF-AUTO switch to 'OFF', close and lock the control panel cover, and disconnect the positive battery cable ensure that the pump will remain inoperative.
3. Allow the pump to completely cool if overheated.
4. Check the temperature before opening any covers, plates, or plugs.
5. Close the suction and discharge valves.
6. Vent the pump slowly and cautiously.
7. Drain the pump.



This pump is equipped with automatic liquid level controls, and is subject to automatic restart. Before beginning any maintenance on the unit, set the HAND-OFF-AUTO switch to 'OFF', close and lock the control panel cover, and disconnect the positive battery cable to ensure that the pump will remain inoperative.



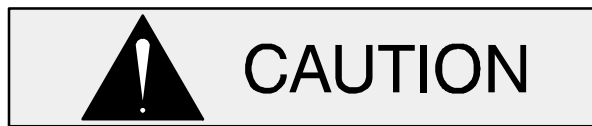
Use lifting and moving equipment in good repair and with adequate capacity to prevent injuries to personnel or damage to equipment. The bail is intended for use in lifting the pump and trailer assembly only. Suction and discharge hoses and piping must be removed

from the pump before lifting. **Do not** suspend the pump by the lifting device for extended periods of time. **Make sure** the area is clear of personnel when lifting.

Accessing Pump

(Figure E--7)

Some service functions, such as wear plate or suction check valve replacement, may be performed without disturbing the suction and discharge piping.



There are no provisions for securing the access door for service. Secure the door to the pump discharge piping with an elastic strap or length of rope during service.

To access the pump, unscrew the T-nuts (28) securing the access door (30) to the canopy. Slide the access door off the T-nut studs, rotate it 180°, and secure the door to the pump discharge piping with an elastic strap or length of rope.

Back Cover and Wear Plate Removal

(Figure E--15)

Before attempting to service the pump, open the ball valve (37) and drain the pump. The wear plate (32) and check valve assembly (50) are easily accessible and may be serviced by removing the back cover assembly (40).

Remove the hand nuts (38), and pull the back cover and assembled wear plate from the pump casing (1). Inspect the the back cover O-ring (36) and replace it if damaged or worn.

Inspect the wear plate and replace it if badly scored and worn. To remove the wear plate, disengage the hardware (33 and 34).

Suction Check Valve Removal

(Figure E--15)

The check valve assembly (50) may be serviced by removing the check valve pin (52). Reach through the back cover opening and pull the complete assembly from the suction flange.

NOTE

Further disassembly of the check valve is not required since it must be replaced as a complete unit. Individual parts are not sold separately.

Canopy Removal

(Figure E--2)

To service the impeller, seal, or rotating assembly, the canopy (572) must first be removed.

(Figure E--4)



If the unit has been running, allow the engine exhaust system to cool before attempting to remove the weather cap.

Remove the hardware (99, 100 and 101) and weather cap (98) from the engine exhaust.

Disconnect the suction and discharge piping. Remove the shoulder-type discharge coupling (91). If the unit is equipped with an optional air release valve (not shown), disengage the hardware securing the air release valve to the canopy. Remove the discharge nipple and elbow (92 and 93).

Slide the access door (30, Figure E--7) off the pump suction nipple (48, Figure E--15). To ease removal of the canopy, unscrew the pump suction nipple from the pump suction flange (51, Figure E--15). Disconnect the license plate wires (not shown) at the blade connectors inside the canopy.

(Figure E--2)

Remove the pump drain piping (74, 75, 76, 77 and 78) from the ball valve (37, Figure E--15). Remove the hardware (58, 59, 60 61, 67, 68 and 69).

(Figure E--3)

Remove the capscrews (89) securing the brackets (88) to the canopy and frame.

(Figure E--7)

Remove the hardware (5, 6 and 7) securing the lifting bar assembly (4) to the frame.

Attach a lifting device of sufficient capacity to the lifting bail, and carefully separate the canopy from the trailer by lifting the canopy straight up.

Separating Pump End From Engine**(Figures E--1, E--9 and E--16)**

Disconnect the suction vacuum and discharge pressure lines (23 and 27, Figure E--1) at the pump casing.

Remove the access covers (not shown) from the under side of the trailer to provide access to the pump casing mounting hardware (21, 22, 23 and 24, Figure E--9), and remove the hardware.

See Figure E--16, and remove the hardware (1 and 2) securing the intermediate (8) to the engine fly-wheel. Install a standard 5/8-11 UNC lifting eye in the tapped hole in the top of the pump casing. **Be sure** to screw the eye into the casing until fully engaged. Use a hoist and sling of suitable capacity to separate the pump end from the engine by pulling the pump end straight away.

**WARNING!**

Do not attempt to lift the complete pump unit using the lifting eye. It is designed to facilitate removal or installation of individual components only. Additional weight may result in damage to the pump or failure of the eye bolt.

As the assemblies separate, the flexible portion of the coupling assembly (3) will remain on the shaft. To remove the coupling from the shaft, unscrew the two allen head setscrews from the taper-lock bushing (5). Screw one of the setscrews into the puller hole on the circumference of the bushing. As the coupling and bushing separate, remove the bushing, and slide the coupling off the shaft. Remove the shaft key (4).

Remove any leveling shims used under the casing mounting feet. Tie and tag the shims for ease of reassembly.

Move the pump end to a clean, well equipped shop area for further disassembly.

Loosening Impeller**(Figure E--16)**

Before attempting to loosen the impeller, remove the seal cavity drain plug (24) and drain the lubricant. This will prevent the oil from escaping as the impeller is removed. Clean and reinstall the drain plug.

With the pump end separated from the engine, and the back cover removed, wedge a block of wood between the vanes of the impeller and the pump casing to prevent rotation.

Reinstall the key (11) in the shaft keyway. Install a lathe dog on the drive end of the shaft (12) with the "V" notch over the key.

With the impeller rotation still blocked, see Figure E--18, and use a long piece of heavy bar stock to pry against the arm of the lathe dog in a counter-clockwise direction (when facing the drive end of the shaft). **Use caution** not to damage the shaft or keyway. When the impeller breaks loose, remove the lathe dog, wood block and shaft key.

NOTE

Do not remove the impeller until the rotating assembly has been removed from the pump casing.

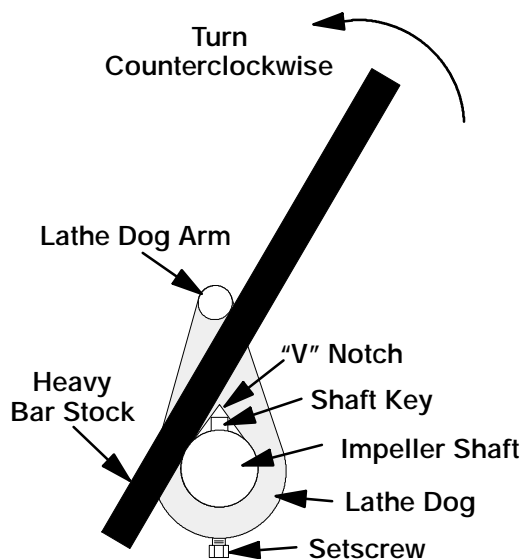


Figure E--18. Loosening Impeller

Rotating Assembly Removal

(Figure E--15)

Remove the hardware (29 and 30) securing the rotating assembly to the pump casing. Separate the rotating assembly by pulling straight away from the pump casing.

NOTE

*An optional disassembly tool is available from the factory. If the tool is used, follow the instructions packed with it. A similar tool may be assembled using 1/2-inch pipe (schedule 80 steel or malleable iron) and a standard tee (see Figure E--19). All threads are 1/2-inch NPT. **Do not pre-assemble the tool.***

To install the tool, remove the vented plug (6, Figure E--16) from the intermediate, and screw the longest length of pipe into the vent hole until fully engaged. Install the tee, and screw the handles into the tee. Use caution when lifting the rotating assembly to avoid injury to personnel or damage to the assembly.

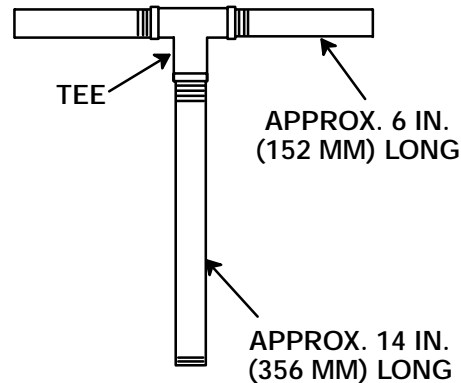


Figure E--19. Rotating Assembly Tool

Remove the intermediate O-ring (18).

Impeller Removal

(Figure E--16)

With the rotating assembly removed from the pump casing, unscrew the impeller from the shaft. Inspect the impeller and replace if cracked or badly worn.

Remove the impeller adjusting shims (28); tie and tag the shims, or measure and record their thickness for ease of reassembly.

Seal Removal

(Figure E--16)

Remove the seal spring. Slide the shaft sleeve and rotating portion of the seal off the shaft as a unit. If the old seal must be reused In an emergency, **do not** attempt to separate the rotating portion of the seal from the shaft sleeve. The rubber bellows will be damaged.

Apply oil to the sleeve and work it up under the bellows. Slide the rotating portion of the seal off the sleeve.

Remove the seal sleeve O-ring (27).

Use a pair of stiff wires with hooked ends to remove the stationary element and seat.

An alternate method of removing the stationary seal components is to remove the hardware (19 and 20) and separate the seal plate (21) and gas-

ket (3) from the intermediate (5). Position the seal plate on a flat surface with the impeller side down. Use a wooden dowel or other suitable tool to press on the back side of the stationary seat until the seat, O-rings and stationary element can be removed.

If no further disassembly is required, refer to **Seal Installation**.

Shaft and Bearing Removal and Disassembly (Figure E--16)

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



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

Remove the intermediate drain plug (23) and drain the lubricant. Clean and reinstall the drain plug.

Disengage the hardware (15 and 16) and remove the bearing cap (10) and gasket (17). Use an arbor (or hydraulic) press to remove the oil seal (13) from the bearing cap.

Place a block of wood against the impeller end of the shaft (12) and tap the shaft and assembled bearings (4 and 9) from the intermediate. **Be careful** not to damage the shaft.

Press the inboard oil seal (18) out of the intermediate bore.

After removing the shaft and bearings, clean and inspect the bearings **in place** as follows.



To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings

be replaced **any** time the shaft and bearings are removed.

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



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 precautions printed on solvent containers.

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



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 or races and cause premature bearing failure.

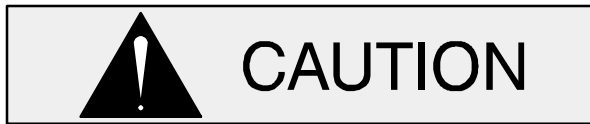
Rotate the bearings by hand to check for roughness or binding and inspect the bearing balls. If rotation is rough or the bearing balls are discolored, replace the bearings.

The bearing tolerances provide a tight press fit onto the shaft and a snug slip fit into the intermediate. Replace the bearings, shaft, or intermediate if the proper bearing fit is not achieved.

If bearing replacement is required, remove the outboard bearing retaining ring (14). Use a bearing puller to remove the bearings from the shaft.

Shaft and Bearing Reassembly and Installation (Figure E--16)

Clean and inspect the bearings as indicated in **Shaft and Bearing Removal and Disassembly**.



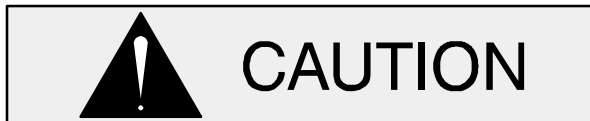
To prevent damage during removal from the shaft, it is recommended that bearings be cleaned and inspected **in place**. It is **strongly** recommended that the bearings be replaced **any** time the shaft and bearings are removed.

The bearings may be heated to ease installation. An induction heater, hot oil bath, electric oven, or hot plate may be used to heat the bearings. Bearings should **never** be heated with a direct flame or directly on a hot plate.

NOTE

*If a hot oil bath is used to heat the bearings, both the oil and the container must be **absolutely** clean. If the oil has been previously used, it must be **thoroughly** filtered.*

Heat the bearings to a uniform temperature **no higher than** 250°F (120°C), and slide the bearings onto the shaft, one at a time, until they are fully seated. This should be done quickly, in one continuous motion, to prevent the bearings from cooling and sticking on the shaft.



Use caution when handling hot bearings to prevent burns.

NOTE

Position the inboard bearing (4) on the shaft with the shielded side toward the impeller end of the shaft. Position the outboard bearing (9) on the shaft with the retaining ring on the bearing toward the drive end of the shaft.

After the bearings have been installed and allowed to cool, check to ensure that they have not moved out of position in shrinking. If movement has occurred, use a suitable sized sleeve and a press to reposition the bearings against the shaft shoulders.

If heating the bearings is not practical, use a suitably sized sleeve and an arbor (or hydraulic) press to install the bearings on the shaft.



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

Secure the outboard bearing on the shaft with the retaining ring (14).

Position the inboard oil seal (18) in the intermediate (5) with the lip positioned as shown in Figure E-16. Press the oil seal into the intermediate until it is centered in the bore.

Slide the shaft and assembled bearings into the intermediate until the retaining ring on the outboard bearing seats against the intermediate. Be careful not to damage the oil seal lip.



When installing the shaft and bearings into the bearing bore, push against the outer race. **Never** hit the balls or ball cage.

Press the outboard oil seal (13) into the bearing cap (10) with the lip positioned as shown in Figure E-16. Replace the bearing cap gasket (17), and secure the bearing cap with the hardware (15 and 16). Be careful not to damage the oil seal lip on the shaft keyway.

Lubricate the intermediate as indicated in **LUBRICATION** at the end of this section.

Seal Installation

(Figures E-16 and E-20)



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

precautions printed on solvent containers.

Clean the seal cavity and shaft with a cloth soaked in fresh cleaning solvent. Inspect the stationary seat bore in the seal plate for dirt, nicks and burrs, and remove any that exist. The stationary seat bore **must** be completely clean before installing the seal.



A new seal assembly should be installed **any time** the old seal is removed from the pump. Wear patterns on the finished faces cannot be realigned during reassembly. Reusing an old seal could result in premature failure.

To ease installation of the seal, lubricate the shaft sleeve O-ring and the external stationary seat O-ring with a very **small** amount of light lubricating oil. See Figure E–19 for seal part identification.

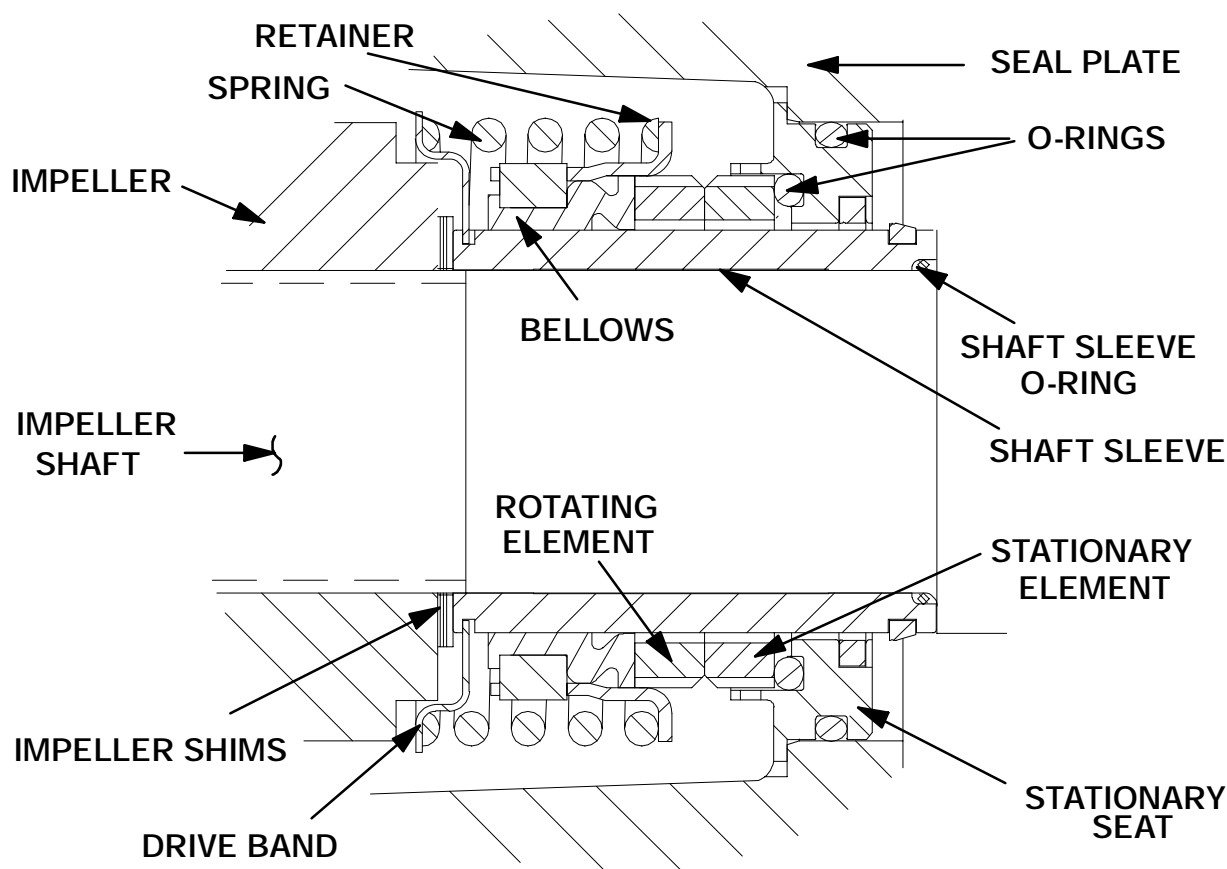


Figure E--20. 46513--153 Seal Assembly

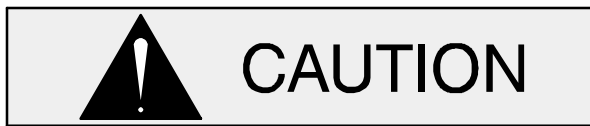


This seal is not designed for operation at temperatures above 160°F (71°C). Do not use at higher operating temperatures.

If the seal plate was removed, install the seal plate gasket (3). Position the seal plate over the shaft and secure it to the intermediate with the hardware (19 and 20).

To prevent damaging the shaft sleeve O-ring (27) on the shaft threads, stretch the O-ring over a piece of tubing a little larger than the shaft. Slide the tube over the shaft threads, then slide the O-ring off the tube and onto the shaft. Remove the tube, and continue to slide the O-ring down the shaft until it seats against the shaft shoulder.

When installing a new cartridge seal assembly, remove the seal from the container, and remove the mylar storage tabs, if so equipped, from between the seal faces.



New cartridge seal assemblies may be equipped with mylar storage tabs between the seal faces. If so equipped, these storage tabs **must** be removed before installing the seal.

Lubricate the external stationary seat O-ring with light oil. Slide the seal assembly onto the shaft until the external stationary seat O-ring engages the bore in the seal plate.

Clean and inspect the impeller as described in **Impeller Installation and Adjustment**. Install the full set of impeller shims (28) provided with the seal, and screw the impeller onto the shaft until it is seated against the seal (see Figure 21).

Continue to screw the impeller onto the shaft. This will press the stationary seat into the seal plate bore.

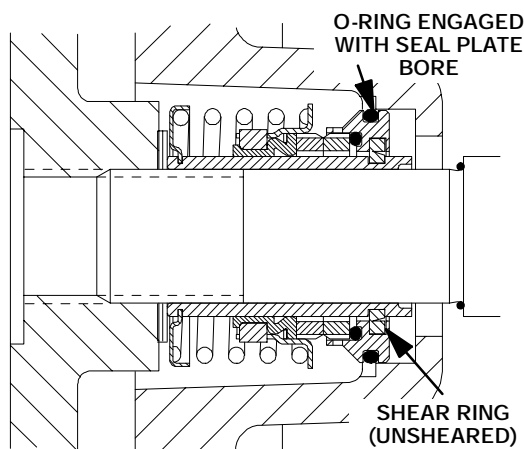


Figure 21. Seal Partially Installed

NOTE

A firm resistance will be felt as the impeller presses the stationary seat into the seal plate bore.

As the stationary seat becomes fully seated, the seal spring compresses, and the shaft sleeve will break the nylon shear ring. This allows the sleeve to slide down the shaft until seated against the shaft shoulder. Continue to screw the impeller onto the shaft until the impeller, shims, and sleeve are fully seated against the shaft shoulder (see Figure 22).

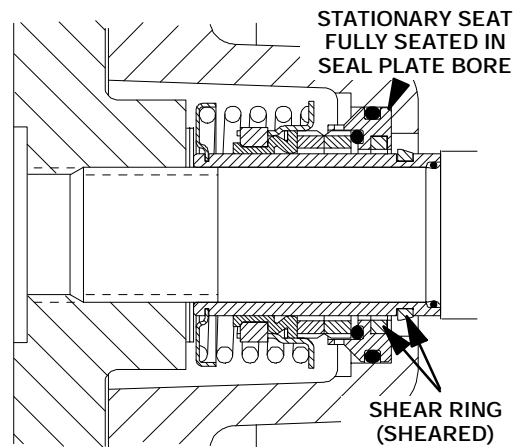


Figure 22. Seal Fully Installed

Measure the impeller-to-seal plate clearance, and remove impeller adjusting shims to obtain the proper clearance as described in **Impeller Installation and Adjustment**.

If necessary to reuse an old seal in an emergency, carefully separate the rotating and stationary seal faces from the bellows retainer and stationary seat.



A new seal assembly should be installed **any time** the old seal is removed from the pump. Wear patterns on the finished faces cannot be realigned during reassembly. Reusing an old seal could result in premature failure.

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.

Carefully wash all metallic parts in fresh cleaning solvent and allow to dry thoroughly.



Do not attempt to separate the rotating portion of the seal from the shaft sleeve

when reusing an old seal. The rubber bellows will adhere to the sleeve during use, and attempting to separate them could damage the bellows.

Inspect the seal components for wear, scoring, grooves, and other damage that might cause leakage. Inspect the integral shaft sleeve for nicks or cuts on either end. If any components are worn, or the sleeve is damaged, replace the complete seal; **never mix old and new seal parts.**

Install the stationary seal element in the stationary seat. Press this stationary subassembly into the seal plate bore until it seats squarely against the bore shoulder. A push tube made from a piece of plastic pipe would aid this installation. The I.D. of the pipe should be slightly larger than the O.D. of the shaft sleeve.

Slide the rotating portion of the seal (consisting of the integral shaft sleeve, spring centering washer, spring, bellows and retainer, and rotating element) onto the shaft until the seal faces contact.

Proceed with **Impeller Installation and Adjustment.**

Impeller Installation And Adjustment

(Figure E--16)

Inspect the impeller, and replace it if cracked or badly worn.



The shaft and impeller threads **must** be completely clean before reinstalling the impeller. Even the slightest amount of dirt on the threads can cause the impeller to seize to the shaft, making future removal difficult or impossible without damage to the impeller or shaft.

Apply a small amount of 'Never-Seez' or equivalent anti-lock compound on the shaft threads. Screw the impeller onto the shaft until tight. Make sure the seal spring seats squarely over the shoulder on the back of the impeller.

NOTE

*At the slightest sign of binding, **immediately** back the impeller off, and check the threads for dirt. **Do not** try to force the impeller onto the shaft.*

A clearance of .025 to .040 inch (0,64 to 1,0 mm) between the impeller and the seal plate is necessary for maximum pump efficiency. Measure this clearance, and add or remove impeller adjusting shims as required.

Rotating Assembly Installation

(Figure E--15)

NOTE

*If the pump has been completely disassembled, it is recommended that the suction check valve and back cover assembly be reinstalled in the pump casing at this point (see **Back Cover Installation**). The back cover assembly must be in place to adjust the impeller face clearance.*

Lubricate the intermediate O-ring (18) with light grease and install it on the intermediate. Ease the rotating assembly into the pump casing using the rotating assembly tool. **Be careful** not to damage the O-ring. Remove the rotating assembly tool, and reinstall the vented plug (6, Figure 16).

Install the same thickness of adjusting shims (31) as previously removed, and secure the rotating assembly to the pump casing with the hardware (29 and 30). **Do not** fully tighten the capscrews until the back cover assembly (40) has been reinstalled and the impeller face clearance has been set.

A clearance of .010 to .020 inch (0,25 to 0,5 mm) between the impeller and the wear plate is also recommended for maximum pump efficiency. This clearance can be obtained by adding or removing an equal thickness of shims from each rotating assembly shim set (31) until the impeller scrapes against the wear plate when the shaft is turned. After the impeller scrapes, add approximately .010 inch (0,25 mm) of shims to each shim set.

NOTE

An alternate method of adjusting this clearance is to reach through the priming port with a feeler gauge

and measure the gap. Add or subtract rotating assembly shims accordingly.

After the face clearance has been set, tighten the hardware securing the rotating assembly to the pump casing.

Securing Pump End to Engine

(Figure E--17)

Install the shaft key (4). Position the flexible portion of the coupling assembly (3) on the shaft as shown in Figure E--16.

NOTE

*The flexible portion of the coupling must be properly positioned on the shaft. The heads of the capscrews in the center of the coupling **must be positioned toward the pump end of the shaft.***

Align the keyway in the taper-lock bushing (5) with the shaft key, and slide it onto the shaft to the dimension shown in Figure E--16. Rotate the flexible portion of the coupling until the tapped holes for the two setscrews align with those in the bushing, and install the setscrews.



Make certain that the flexible portion of the coupling is mounted in accordance with the dimension shown in Figure E--16. **This dimension is critical.** If the coupling is not properly positioned on the shaft, the coupling parts may not fully engage, or a pre-load condition can cause premature bearing failure.

The end of the shaft must protrude approximately **1.27 inch (32 mm)** from the face of the taper-lock bushing. This will allow the two portions of the coupling to fully engage when the intermediate is secured to the engine bellhousing, without pre-loading the bearings.

With the flexible portion of the coupling and the taper-lock bushing properly positioned on the shaft,

tighten the two allen head setscrews in an alternating sequence until the bushing and coupling are fully secured. Torque the setscrews to 23.3 ft. lbs. (280 in. lbs. or 3,22 m. kg.).

Using a suitable lifting device, position the pump end so the flexible portion of the coupling seats inside the outer ring attached to the engine flywheel.

NOTE

*To ease installation, the O.D. of the rubber portion of the coupling may be **lightly** lubricated with a **non-petroleum** based lubricant such as vegetable oil or glycerin, or a silicone-based lubricant such as "WD40" or equivalent. **Do not** use petroleum-based lubricants or any other substance which may soften or otherwise damage the rubber.*

Secure the intermediate (8) to the engine bellhousing with the hardware (1 and 2).

See Figure E--9, and install any leveling shims used under the pump casing mounting feet. Secure the casing to the base (18) with the hardware (21, 22, 23 and 24). Reinstall the previously removed access covers (not shown) on the bottom of the trailer.

If a lifting eye was used to move the pump end, **be sure** to remove the lifting eye from the pump casing.



Do not attempt to lift the complete pump unit using the lifting eye. It is designed to facilitate removal or installation of individual components only. Additional weight may result in damage to the pump or failure of the eye bolt.

Suction Check Valve Installation

(Figure E--15)

Inspect the check valve assembly (50) and replace it if badly worn.

NOTE

The check valve assembly must be replaced as a complete unit. Individual parts are not sold separately.

ately.

Reach through the back cover opening with the assembled check valve, and position the check valve adaptor into the mounting slot in the suction flange. Align the adaptor with the flange hole and secure the assembly with the check valve pin (52).

NOTE

If the discharge and suction flanges (12 and 51) were removed, apply 'Permatex Aviation No. 3 Form-A-Gasket' or equivalent to the mating surfaces, replace the gaskets (15 and 53), and secure the flanges to the pump casing with the attaching hardware (13, 14, 46 and 47).

Back Cover Installation

(Figure E--15)

If the wear plate (32) was removed for replacement, carefully center it on the back cover (40), and secure it with the hardware (33 and 34). The wear plate **must** be concentric to prevent scraping when the back cover is installed.

Clean any scale or debris from the contacting surfaces in the pump casing that might interfere or prevent a good seal with the back cover. Replace the back cover O-ring (36), and lubricate it with a generous amount of No. 2 grease. Slide the back cover assembly into the pump casing. Be sure the wear plate does not scrape against the impeller.

NOTE

To ease future disassembly, apply a film of grease or 'Never-Seez' on the back cover shoulder, or any surface which contacts the pump casing. This action will reduce rust and scale build-up.

Secure the back cover assembly by **hand-tightening** the hand nuts (38) evenly. **Do not** over-tighten

the hand nuts; they should be just tight enough to ensure a good seal at the back cover shoulder.

Canopy Installation

Attach a lifting device of sufficient capacity to the lifting bail, and carefully lower the canopy into position onto the trailer.

(Figure E--7)

Install the hardware (5, 6 and 7) securing the lifting bar assembly (4) to the frame.

(Figure E--3)

Secure the brackets (88) to the canopy and frame with the capscrews (89).

(Figure E--1 And E--2)

Secure the canopy to the trailer with the hardware (49, 50, 51, 52, 53, 58, 59, 60 and 61). Reinstall the pump drain piping (74, 75, 77 and 78).

(Figure E--4)

If removed, screw the pump suction nipple (48, Figure E--15) into the pump suction flange. Reconnect the license plate wires (not shown) at the blade connectors inside the canopy.

Slide the access door (30, Figure E--7) over the pump suction nipple, and secure it with the T-nuts (28, Figure E--7).

Install the shoulder-type discharge coupling (91), and the discharge nipple and elbow (92 and 93). Reinstall the optional air release valve (if so equipped). Reconnect the suction and discharge piping.

Secure the weather cap (98) to the engine exhaust with the hardware (99, 100 and 101).

Final Pump Assembly

See Figure E--9, and **be sure** the pump assembly (1) is secured to the sub-base (18) and engine.

Make certain that all piping connections are tight, properly supported and secure. Open all valves in the suction and discharge lines.

Be sure the pump and engine have been properly lubricated, see **LUBRICATION**.

Fill the pump casing with clean liquid. Reinstall the fill cover plate (20, Figure E--15) and tighten it.

Refer to **OPERATION**, Section C, before putting the pump back into service.

PRESSURE RELIEF VALVE MAINTENANCE

(Figure E--15)

The back cover is equipped with a pressure relief valve (44) to provide additional safety for the pump and operator (refer to **Liquid Temperature And Overheating** in **OPERATION**).

It is recommended that the pressure relief valve be replaced at each overhaul, or any time the pump overheats and activates the valve. **Never** replace this valve with a substitute which has not been specified or provided by the Gorman-Rupp Company.

Periodically, the valve should be removed for inspection and cleaning. When reinstalling the relief valve, apply 'Loctite Pipe Sealant With Teflon No. 592', or equivalent compound on the relief valve threads. Position the valve as shown in Figure E--14 with the discharge port pointing down.

LUBRICATION

Seal Assembly

(Figure E--16)

Before starting the pump, remove the vented plug (6) and fill the seal cavity with approximately 18 ounces (0,5 liter) of SAE No. 30 non-detergent oil. Clean and reinstall the vented plug. Maintain the oil at this level.

Bearings

(Figure E--16)

The intermediate was fully lubricated when shipped from the factory. Check the oil level regularly through the sight gauge (26) and maintain it at the middle of the gauge. When lubrication is required, add SAE No. 30 non-detergent oil through the hole for the air vent (7). **Do not** over-lubricate. Over-lubrication can cause the bearings to over-heat, resulting in premature bearing failure.

NOTE

The white reflector in the sight gauge must be positioned horizontally to provide proper drainage.

Under normal conditions, drain the intermediate once each year and refill with approximately 21 ounces (0,6 liter) of clean oil. Change the oil more frequently if the pump is operated continuously or installed in an environment with rapid temperature change.



Monitor the condition of the bearing lubricant regularly for evidence of rust or moisture condensation. This is especially important in areas where variable hot and cold temperatures are common.

For cold weather operation, consult the factory or a lubricant supplier for the recommended grade of oil.

Engine

Consult the literature supplied with the engine, or contact your local Deutz engine representative.

TRAILER OPERATION, MAINTENANCE AND REPAIR – SECTION F

Review all **SAFETY** information in Section A.

Follow the instructions on all tags, labels and decals attached to the trailer assembly.

This section contains specifications and information necessary for operation and routine maintenance of the trailer portion of the unit. Follow all operating and safety precautions to ensure safe and proper operation of the trailer. Regular maintenance and repair of the trailer, as any other piece of machinery, will ensure long life and safe, trouble-free operation.

Parts for the trailer are listed in **MAINTENANCE AND REPAIR - SECTION E**.

NOTE

The brake actuator, axle and wheel brake assemblies are proprietary items purchased by Gorman-Rupp for use on the trailer. Complete replacement kits for these proprietary items are available from the factory (see Figure E – 1 and the accompanying parts lists). Gorman-Rupp does not, however, stock or furnish individual repair parts for these assemblies. Repair parts for these assemblies may be ordered directly from the original vendors listed in this section.



Read this entire section before hitching the trailer to the towing vehicle and at-

tempting to tow it. Failure to follow proper operating and safety precautions in this section could result in equipment damage and/or personal injury.



This trailer is intended for hauling only the Gorman-Rupp pump for which it was designed. Do not haul additional equipment which may damage the trailer or overload the axle. Never haul personnel on the trailer.



The maximum recommended towing speed for the unit is 55 mph (88 kph) under ideal conditions. Towing under unsafe conditions or at higher speeds could cause loss of control of the towing vehicle, resulting in injury or death to personnel, and damage to the equipment.



Do not attempt to operate the pump unless the trailer is level. Be sure the trailer leveling stands are positioned on a solid surface, and the wheels are chocked.

TRAILER SPECIFICATIONS

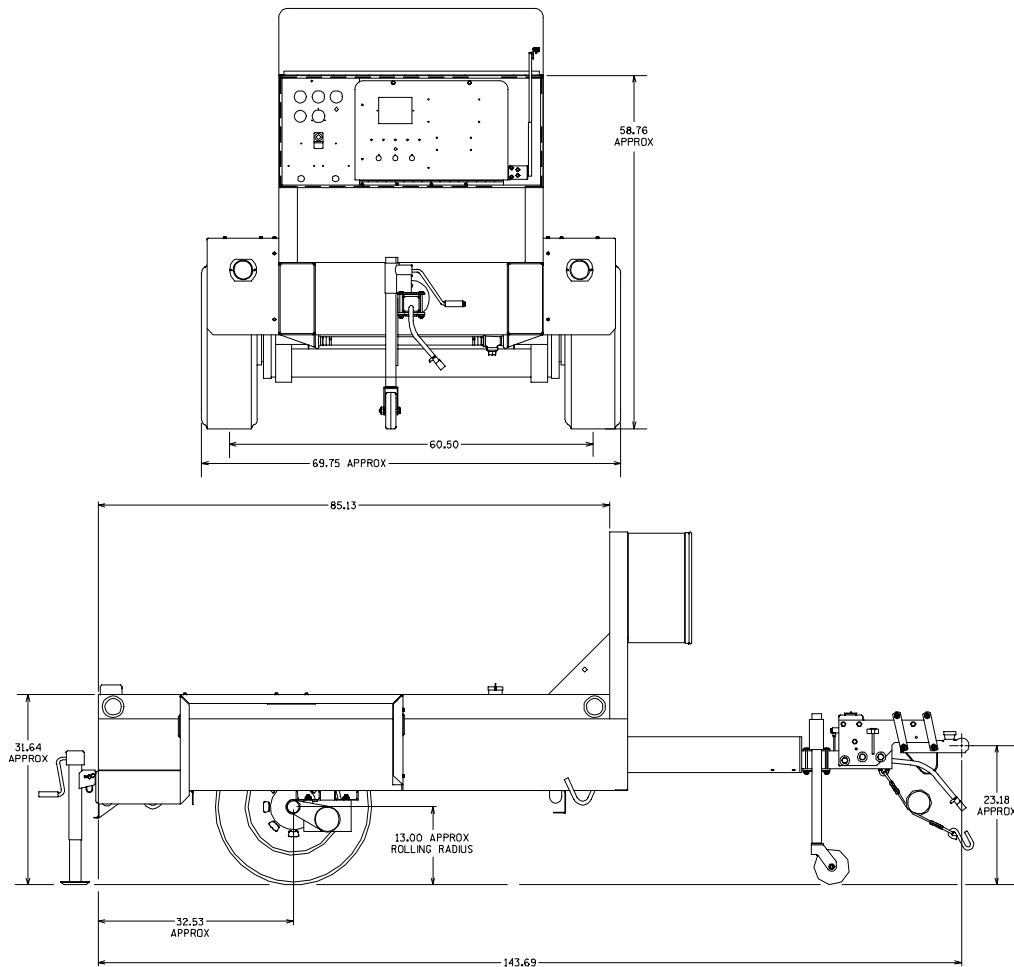


Figure F -- 1. Trailer Dimensions

ITEM	SPECIFICATION
Axle.	Torsion Type.
Axle capacity.	5,200 lbs. (2358,7 kg.)
Tongue weight (approx).	280 lbs. (127 kg.)
Maximum recommended towing speed.	55 mph (88 kph).
Tire size/inflation.	H78 – 15 S.T. Bias 8-ply, D Rating/65 psi cold, max.
Wheel bolt torque.	90 – 95 ft. lbs. (12,4 – 13,1 m. kg.)
Hitch connection.	2 in. (50,8 mm) ball
Electrical system.	12 volt, supplied by towing vehicle.
Braking system.	Self-contained hydraulic surge type. (Use SAE j1702 or j1703 motor vehicle brake fluid in actuator master cylinder as required.)

Table 1. Trailer Specifications

PRE-OPERATION INSPECTION

This section offers only general recommendations and practices required for safe hitching and towing of the unit. Consult the appropriate sections in this manual for installation, operation and maintenance of the pump assembly.

The unit was inspected and tested before being shipped from the factory; however, the following items should be inspected and checked before hitching or moving the unit.

- Inspect the trailer for scratched paint, dents, broken lights or other obvious damage.
- Check the brake fluid level in the actuator master cylinder and inspect complete hydraulic system for leaks.
- Be sure the capacity and hitch size of the tow vehicle is compatible with the trailer.
- Be sure the electrical connector on the tow vehicle mates with trailer connector, and all lights function properly.
- Check the trailer and tow vehicle tire inflation (noted on tires).
- Check the trailer wheel bolts for proper torque (90–95 ft. lbs. or 12,4–13,1 m. kg.).

See **Periodic Service** under **TRAILER MAINTENANCE AND REPAIR** in this section for further information.

OPERATION

Brake System

The unit is equipped with a self-contained, surge-type hydraulic brake system which functions independent of the tow vehicle brake or electrical systems.

The trailer brakes are automatically engaged when the tow vehicle slows down and the weight of the unit pushes against the actuator mounted on the tongue. The actuator forces brake fluid to the wheel cylinders, applying the brakes. The faster the deceleration of the tow vehicle, the greater the braking effort on the unit.

The actuator master cylinder was filled and the brakes were tested at the factory; however, periodic adjustment may be required. The complete brake system should be inspected and serviced on a regular schedule. (See **TRAILER MAINTENANCE AND REPAIR** in this section). Failure to observe normal maintenance procedures may result in ineffective operation or complete failure of the brake system.

Hitching Trailer To Vehicle

The following instructions are referenced to Figure F–2.

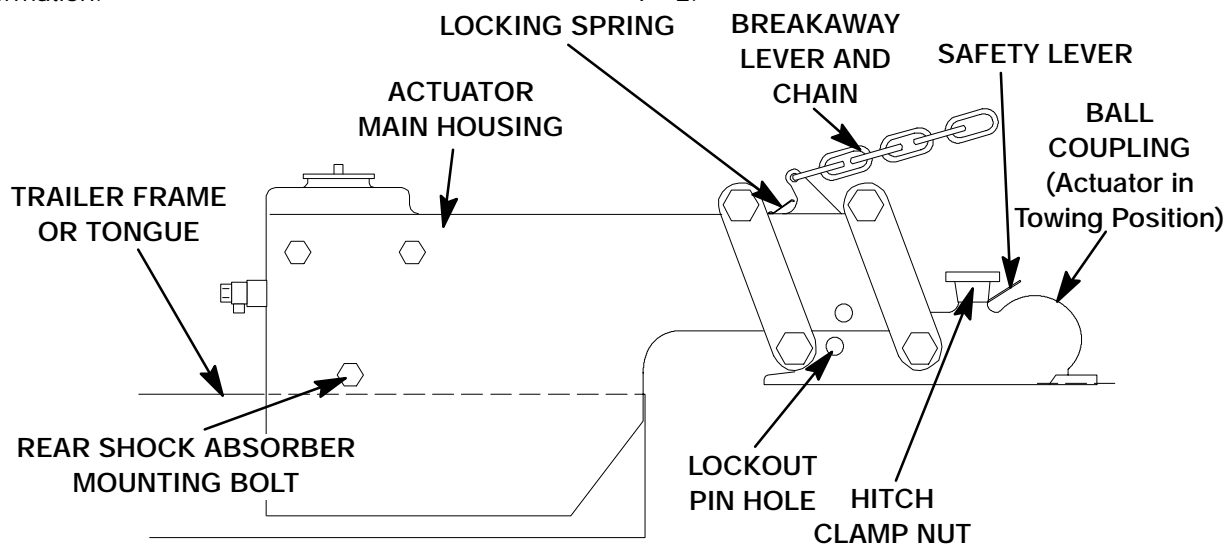


Figure F--2. Trailer Hitch

Remove the lock-out pin assembly from the brake actuator and insert it into the storage clip. Check that the breakaway lever on the brake actuator is fully released (pointing all the way back toward the rear of the trailer) and that the locking spring is not engaging any teeth in the breakaway lever. Check the actuator for free movement through its full range of travel (do not mistake brake shock absorber resistance for binding).

Use the front trailer jack to raise the trailer tongue high enough to permit alignment of the tow vehicle hitch with the ball coupling.

NOTE

Lubricate the hitch ball with a small amount of bearing grease before hitching the trailer to the tow vehicle.

Lower the trailer tongue until the tow vehicle ball is **fully seated in the ball coupling**. Turn the hitch clamp nut until the hitch ball is secure and the safety lever locks in one of the notches in the nut.

Fully retract the front trailer jack and rotate it 90° and secure it with the locking pin.

Plug the 4-way connector on the trailer wiring harness into the mating connector on the tow vehicle. Check the brake lights, turn signals, tail and clearance lights. (See Figures F-3 and F-8 for the electrical wiring harness and connections.)

Cross the safety chains under the trailer tongue so the chains will cradle the tongue in the event of a breakaway. Attach the safety chains to the tow vehicle with sufficient slack to permit full turns.

Fasten the emergency breakaway chain securely to the tow vehicle in a manner and position that will permit normal operation of the tow vehicle and trailer, but assure application of the trailer brakes if the two vehicles accidentally separate.



Always check to ensure that the breakaway lever is fully released and the breakaway chain does not pull taut during towing. Accidental application of the lever will

cause the trailer brakes to drag, heat up, and possibly burn out. Secure the lockout pin in the lockout pin hole.

Fully retract the rear trailer jack.

Towing

The maximum recommended towing speed is 55 mph (88 kph).



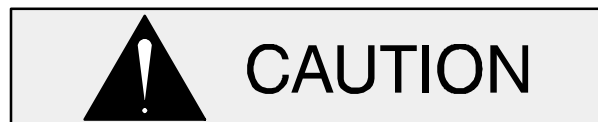
The maximum recommended towing speed for the trailer and pump assembly is **55 mph (88 kph)** under **ideal conditions**. Towing under unsafe conditions or at higher speeds could cause loss of control of the towing vehicle, resulting in injury or death to personnel, and damage to the equipment.

The brakes should release when the trailer is pulled from a dead stop. Because a slight drag may not be noticeable to the driver, perform the following test periodically to ensure the brakes are releasing properly.

1. Tap each brake drum with a hammer while the actuator is fully compressed.
2. Fully extend the actuator mechanism and tap on the brake drums again. The drums should ring clearly when the brakes are released.

The trailer should not push the tow vehicle or jackknife during stops. Investigate **any** erratic brake performance **immediately**.

Do not attempt tighter turns than the vehicle combination is capable of making.



Tight turns and jackknifing while backing can damage the actuator or other equipment.

Backing

The brake actuator is designed to permit backing when on a level surface. Limited braking occurs

during backing but should not interfere with maneuvering the trailer under normal conditions. Back slowly and steadily to avoid jamming. Do not lurch.

When backing up hill or on loose gravel, the brake actuator can be temporarily immobilized by removing the lock-out pin assembly from the storage clip and inserting it into the lock-out hole in the actuator. This will prevent the tow vehicle from compressing the master brake cylinder.



If the lock-out pin is used to immobilize the actuator during backing, be sure to re-

move the pin and check that the mechanism is operating freely before resuming normal operation.

Parking

The hydraulic system is not designed to be used as a parking brake. When parking, lower the front and rear trailer jacks and chock the wheels.



Do not attempt to operate the pump unless the trailer is level. Be sure the trailer leveling stands are positioned on a solid surface, and the wheels are chocked.

Trailer Troubleshooting

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
BRAKES GRABBING OR LOCKING	Grease on lining. Loose parts. Rust on brake drums from non-use.	Replace seals and lining. Check for broken springs, loose rivets and bolts. Normal use will remove rust.
NOISY BRAKES	Poor bearing adjustment. Loose parts. Lining worn to rivets. Bent backing plate. Grease on lining. Brake release.	Adjust bearings. Check for worn or damaged bearings and replace if necessary. Check for broken springs, loose rivets and bolts. Install new linings. Replace if necessary. Replace seals and lining. Eliminate or minimize through adjustment.
INOPERATIVE STOP LIGHTS OR TURN SIGNALS	Defective light bulb. Incorrectly wired. Blown fuse on tow vehicle.	Replace bulb. Check wiring harness drawing and rewire. Replace fuse.

Trailer Troubleshooting (cont'd)

TROUBLE	POSSIBLE CAUSE	PROBABLE REMEDY
WEAK BRAKES	Actuator master cylinder low on fluid. Improper adjustment. Air in lines. Grease on lining. Excessive trailer load. Bent backing plate.	Add brake fluid. Adjust brakes to compensate for wear. Bleed brakes. Replace seals and lining. Reduce load to within limits. Replace if necessary.
INTERMITTENT OR SURGING BRAKES	Loose wheel bearings. Drums out of round.	Adjust bearings to compensate for wear. Resurface drums if over .015 inch out of round.
BRAKES DRAGGING OR OVER HEATING	Improper adjustment. Bent backing plate. Breakaway lever engaged. Weak or broken shoe return springs. Rusted brake assembly.	Adjust brakes to compensate for wear. Replace if necessary. Replace lever. Replace if necessary. Clean and lubricate.

PERIODIC SERVICE

Table 2. Trailer Periodic Service Table

COMPONENT	SERVICE REQUIRED	FREQUENCY
WHEEL BOLTS	Torque to 90–95 ft. lbs.	At delivery/After first 100 miles (161 km)/Monthly or every 2,500 miles (4023 km) thereafter.
TIRE INFLATION	Check pressure – inflate as required.	At delivery/Monthly or every 2,500 miles (4023 km) thereafter.
BRAKE ACTUATOR MASTER CYLINDER	Check level – add brake fluid. Bleed system if necessary.	At delivery/As required.
BRAKES	Check function – adjust brakes.	As required.
WHEEL BEARINGS	Inspect – Repack.	Every 20,000 miles (32187 km)/ After 4 months or more of non-use.

Refer to the specific instructions on the following pages for further information.

Wheel Bolt Adjustment

Under normal operating conditions, the wheel bolts will seat in within the first 100 miles (161 km), resulting in a drop in torque. Each bolt should be checked at that time and re-torqued to 90–95 ft. lbs. (12,4–13,1 m. kg.). Re-check the bolt torque every month or 2,500 miles (4023 km), whichever comes first.

When reinstalling the wheel after service, install each bolt and torque to no more than 20 ft. lbs. (2,8 m. kg.) each. Continue torquing the bolts in an opposite and alternating sequence, increasing the torque each time around by 20–25 ft. lbs. (2,8–43,7 m. kg.) until each is torqued to 90–95 ft. lbs. (12,4–13,1 m. kg.).

Tires

The tires are sized and rated for the capacity of the trailer. For proper operation, inflate the tires to a maximum of 65 psi cold, and check them regularly. Always use a quality tire pressure gauge when checking inflation pressure.

When replacing tires, **always** use tires of the proper size and rating (H78–15 S.T. Bias 8-ply, D Rating).

Brake Actuator Master Cylinder

The brake actuator master cylinder was filled and the brake lines were pressurized before the trailer left the factory.

If necessary to add brake fluid, remove the master cylinder plug and add clean SAE j1702 or j1703 motor vehicle brake fluid. Clean and replace the fill plug.



Use of improper brake fluid will void all brake system warranties.

Keep the system protected from dirt and moisture during storage. Inspect and test the complete system after long periods of idleness. Look for rust inside the master cylinder reservoir and around the mouth of the cylinder bore. Replace cloudy, dirty, or watery brake fluid.

BRAKE SERVICE

Bleeding Brakes

Use of a pressure bleeder to bleed the brake system is preferable, but the brakes may be bled manually by pumping the actuator coupler back and forth through its full range of travel. Manual bleeding requires a two-man team.

To simplify manual bleeding, remove the rear shock absorber mounting bolt from the actuator assembly (see Figure F–2) to eliminate shock absorber resistance to the compression and extension strokes. Leave the bolt out until the brakes have been fully adjusted.

Check that the breakaway lever is fully released (pointing all the way back toward the rear of the trailer).

Bleed one wheel cylinder at a time. Connect a tube or hose to the wheel cylinder bleeder screw. Place the free end of the hose in a glass jar containing clean brake fluid.

Remove the master cylinder fill plug and make sure the cylinder is full. The first operator should open the bleeder screw while the second operator compresses the actuator coupler. The first operator then closes the bleeder screw **before** the coupler is pulled forward. Repeat this procedure until no bubbles appear in the jar of brake fluid. Close the bleeder screw, remove the hose and repeat the complete procedure on the other wheel cylinder.

Make sure to keep the master cylinder full to prevent air from being reintroduced to the system. All air must be removed from the system or the brakes will not work properly.

When bleeding is complete, install the fill plug, apply pressure and check the system for leaks.

If no further adjustments are necessary, align the shock absorber and reinstall the mounting bolt.

Brake Adjustment

Position the trailer on a solid, level surface and jack up the wheels just high enough to rotate freely. **Be sure** to rest the trailer frame securely on blocks or jack stands to ensure personal safety.

With the brake drums cool, the breakaway lever fully released, and the brake actuator in the towing position, remove the shock absorber rear mounting bolt from the actuator assembly (see Figure F-2) and proceed as follows:

1. Compress the actuator several times to center the shoes in the brake drum.
2. Return the actuator to the fully-extended towing position.
3. While turning the wheel by hand, use a brake adjusting tool or screwdriver to turn the brake adjusting screw (located at the bottom of the drum and accessible through the backplate) until there is enough drag on the wheel to make it difficult to turn. Back off the adjusting screw until the wheel turns freely.
4. Repeat the procedure for the other wheel.
5. Be sure to replace the shock absorber rear mounting bolt after both brakes are adjusted.

WHEEL BEARING SERVICE

Inspection

The wheel bearings were adjusted and fully packed before the trailer left the factory. The bearings should be inspected and repacked every 20,000 miles (32187 km), or if the unit has been idle for 4 months or longer.

Position the unit on a solid, level surface and jack one wheel off the ground just far enough to allow free rotation and perform the following checks. **Be sure** to rest the axle securely on a block or jack stand to ensure personal safety.

1. Check the wheel end play by pushing and pulling on each wheel several times. Excess wheel play indicates loose adjustment or defective bearing(s).
2. Spin each wheel by hand to check for freedom of rotation. Drag or difficult rotation can indicate improper bearing or brake adjustment.

3. While rotating each wheel, listen for any unusual noise. If there is any unusual noise, further examination will likely show a defective bearing.

Perform the following steps if repacking, replacement or adjustment of bearings is indicated.

Disassembly

Remove the wheel bolts and wheel.

Remove the dust cap and cotter pin. (If repacking or replacement of wheel bearings is not required, see **Adjustment** in this section.) Remove the spindle nut, and spindle washer.

Loosen the outer cup and bearing by shaking the hub slightly. In most cases this will loosen the outer bearing so that it can be removed by hand.

Remove the entire hub and drum. This assembly contains the inner cup and bearing and the grease seal.

NOTE

Pay particular attention to the position of the inner cup and bearing and the grease seal. You will need to remember this during reassembly.

Remove the inner cup and bearing and grease seal from the hub by inserting a brass drift pin or piece of wood through the small end of the hub and tapping gently until the bearing and seal loosen.

Use a soft cloth soaked in solvent to clean all dirt and grease from the inside of the hub and spindle.



WARNING!

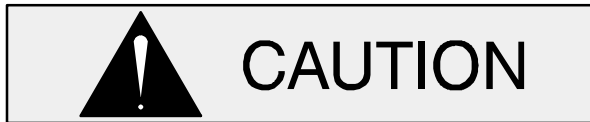
Most cleaning solvents are toxic and flammable. Use them only in a well ventilated area free from excessive heat, sparks, and flame. Read and follow all precautions printed on solvent containers.

Cleaning And Inspection

Prior to lubrication, used bearings must be thoroughly cleaned.

Do not immerse the grease seals in solvent. Merely wipe them clean with a cloth.

Immerse the cups and bearings in solvent and rotate the bearings by hand. When the bearings appear clean, remove the bearings and cups and allow the bearings to drain free of solvent. Solvent on bearings may dilute and harm the lubricant effectiveness.



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 or races and cause premature bearing failure.

Carefully inspect the bearing cups (races) and bearing cones for pitting, scratches, spalling, wear, discoloration, or other damage. Rotate the bearings by hand to check for roughness or binding. If rotation is rough or any physical damage is observed, replace the entire bearing assembly. **Never replace a bearing cone without replacing its mating cup.**

Inspect the grease seals and replace them if cracked or brittle.

Repacking

Bearings should be repacked with the **minimum** amount of the lightest-bodied lubricant that will keep the bearing surfaces separated. Bearings can overheat if too much, too little or too heavy a lubricant is applied. The lubricant must allow the bearings to function under high temperatures caused by loads and brake heat, and still return to its original consistency, with little or no oil separation, when cool. Sunoco 802 or Sunoco Prestige 742 EP lubricant, or their equivalent, is recommended.

If possible, use a bearing packer to repack the bearing cones. If a bearing packer is not available, the bearings may be lubricated by hand by pressing grease into and around each and every roller. Additional grease within the hub is not required.

Reassembly

Install the inner bearing and cup in the hub and replace the grease seal by tapping gently with a wooden block. Make sure the seal is installed **exactly** as it was before disassembly.

Replace the hub on the spindle taking extreme care not to damage the spindle thread or the grease seal. **This must be done very carefully.**

Replace the outer bearing and cup, washer and spindle nut.

Adjustment

Slowly rotate the hub in either direction while tightening the spindle nut to 50 ft. lbs. (7 m. kg.) torque, or until there is a slight bind. When this occurs, back the adjusting nut off to the nearest locking hole in the castellation. This should allow the wheel to rotate freely without excessive end play.

NOTE

The total amount of internal running clearance between the roller and the raceway of the bearings should be between .002 and .008 inch (0,05 – 0,2 mm). Since this clearance can only be measured accurately with the use of special instruments, the common method of measuring end play is by pushing inward and pulling outward on the hubs several times. A very slight end play should be felt.

Install the cotter pin, bend it to a lock position and install the dust cap.

Reinstall the wheels and wheel bolts (see **Wheel Bolt Torque**, this section).

ELECTRICAL SYSTEM

Figure F – 3 shows a detail of the 4-way trailer connector. This connector consists of two parts; one part which is attached to the wiring harness and the other shipped loose to be attached to the tow vehicle electrical system. Be sure to connect the correct wires from the tow vehicle electrical system to the proper contacts in the tow vehicle connector indicated in parenthesis under the wire color.

NOTE

The ground wire from the tow vehicle connector to

the frame is not supplied.

A schematic of the entire trailer electrical system appears on page F-17.

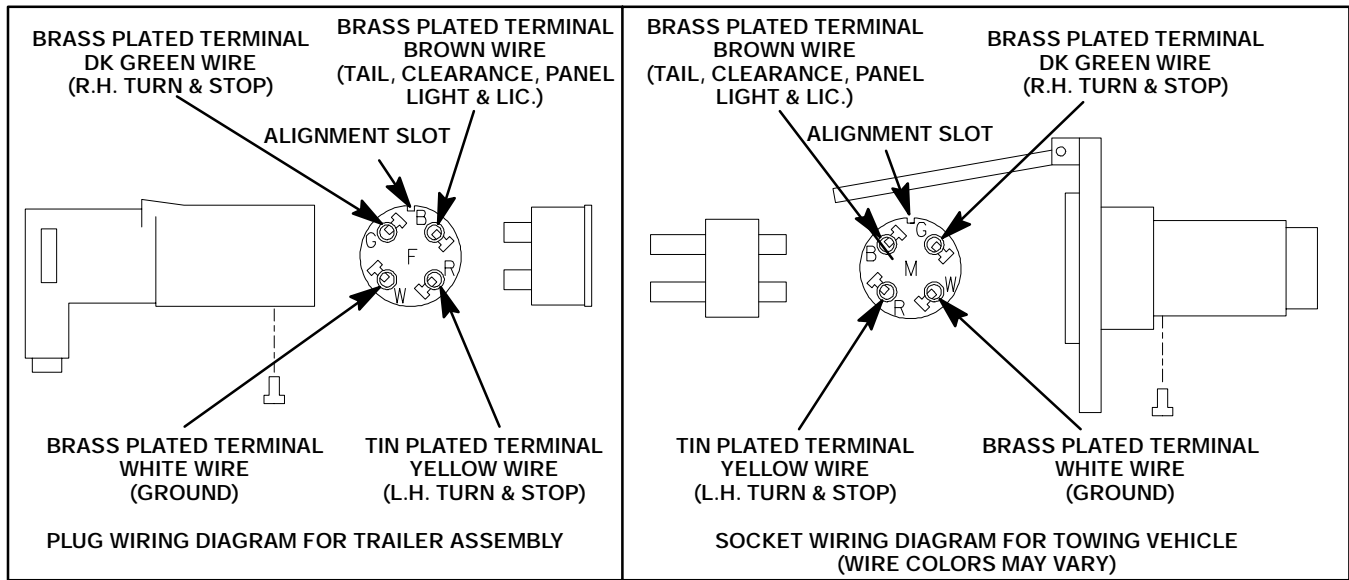


Figure F--3. 4-Way Connector

TRAILER COMPONENT PARTS LISTS

Original Equipment Manufacturers

Replaceable parts for the trailer assembly are shown in Figures F-4 through F-6 and the accompanying parts lists.

The brake actuator and axle assemblies are proprietary items purchased by Gorman-Rupp for use on the trailer. Complete replacement kits for these proprietary items are available from the factory (see Figures F-4 through F-6 and the accompanying parts lists). Gorman-Rupp does not, however, stock or furnish individual repair parts for these assemblies. Repair parts for these assem-

blies may be ordered directly from the following Original Equipment Manufacturers.

1. Coupler With Actuator (Ball Type)
 - a. Balcrank Model TA6 – O.E.M. P/N 16005
Manufactured by:
Balcrank products
One Balcrank Way
Weaverville, NC 28787
Phone - (704) 645-4261
2. 5200 lb. Axle Assembly
 - a. O.E.M. Model H-52
Manufactured by:
AL-KO Kober Corp.
25784 Borg Rd.
Elkhart, Indiana 46514

ASSEMBLY DRAWING

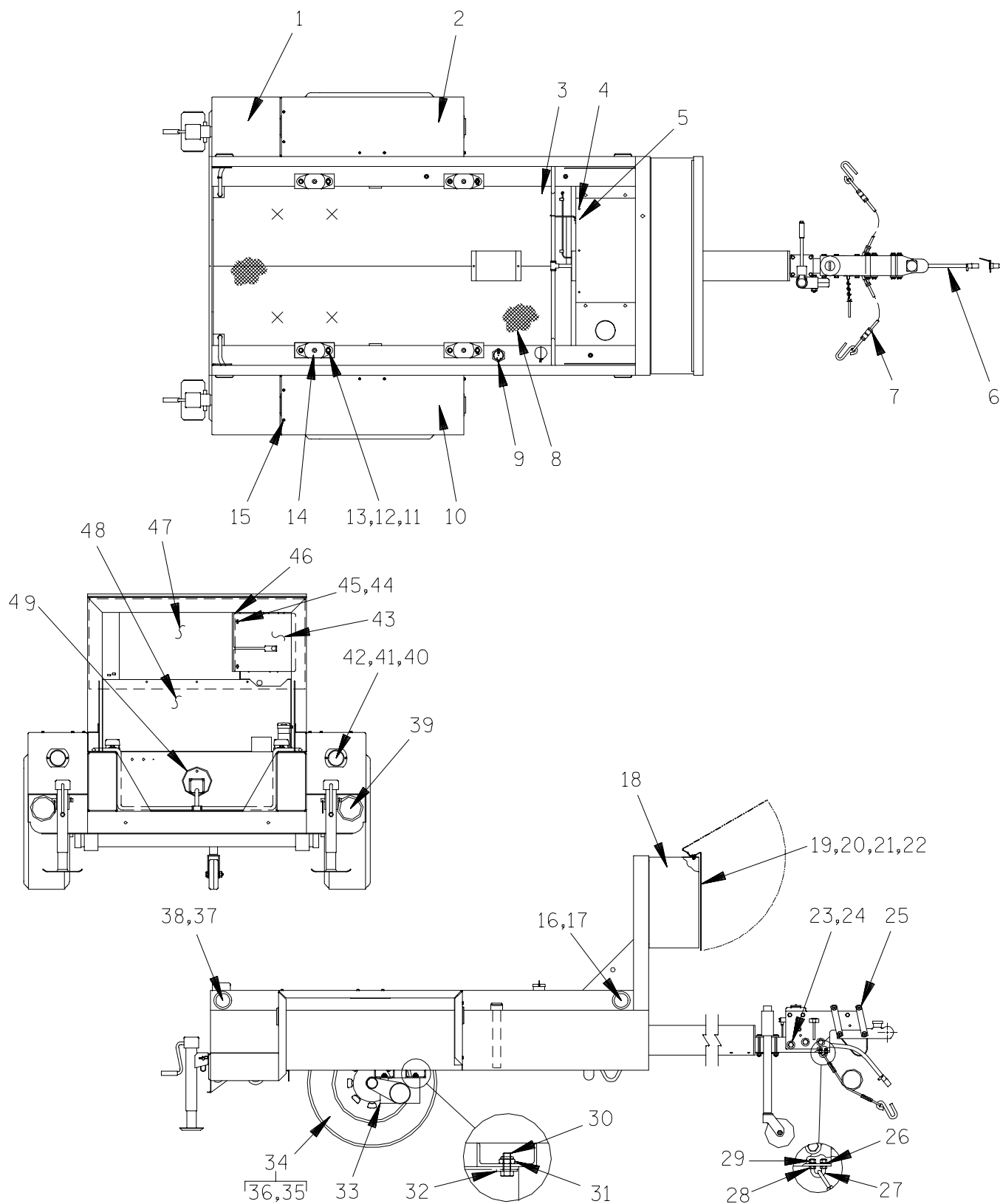


Figure F-4. 41583-747 Trailer Assembly

PARTS LIST

41583–747 Trailer Assembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	TRAILER SUBASSEMBLY	41583–746	---	1	26	LOCKWASHER	J06	15991	4
2	LH FENDER	34851–188	15120	1	27	U-BOLT	5495	15991	2
3	LH FLOOR LINER	38689–036	19000	1	28	JAM NUT	AT06	15991	4
4	HEX HD CAPSCREW	21634–505	---	4	29	HEX NUT	D06	15991	4
5	BATT SUPPORT COVER	41431–005	24150	1	30	HEX HD CAPSCREW	B0805	15991	4
6	ELECTRICAL ASSY	SEE PAGE F–18		1	31	FLAT WASHER	K08	15991	4
7	SAFETY CABLE	22822–012	---	2	32	DEFORM LOCKNUT	DD08	15991	4
8	RH FLOOR LINER	38689–025	19000	1	33	AXLE ASSY	29311–508	---	1
9	FUEL GAUGE	26855–043	---	1	34	TIRE & WHEEL ASSY	29337–283	---	2
10	RH FENDER	34851–187	15120	1	35	– WHEEL	29337–273	---	1
11	HEX HD CAPSCREW	B0806	15991	8	36	– TIRE	29337–176	---	1
12	FLAT WASHER	K08	15991	8	37	LAMP ASSY KIT	29330–807	---	2
13	LOCKWASHER	J08	15991	8	38	RED CLRNC LAMP	29330–806	---	2
14	FLOAT MOUNT	24631–101	---	4	39	TAIL/DIR LIGHT	29330–808	---	2
15	FLANGED HEX NUT	21634–505	---	12	40	RED REFLECTOR	29338–404	---	2
16	AMBER CLRNC LAMP	29330–805	---	2	41	HEX HD CAPSCREW	B0403	15991	4
17	LAMP ASSY KIT	29330–807	---	2	42	FLANGED HEX NUT	21765–310	---	4
18	CONTROL PANEL ASSY	42821–307	24150	1	43	COVER PLATE	33659–036	15120	1
19	CONT PNL DOOR ASSY	42121–449	24150	1	44	FLANGED CAPSCREW	21634–505	---	2
20	LOCKWASHER	J04	15991	9	45	.25–20 UNC NUTSERT	21769–155	---	2
21	HEX NUT	D04	15991	9	46	FOAM TAPE	18668–003	---	1.24'
22	43" LG FOAM TAPE	18668–003	---	3.5'	47	TRAILER ABSORBER	33188–043	19460	1
23	HEX HD CAPSCREW	B0816	15991	3	48	TRAILER ABSORBER	33641–156	19460	1
24	DEFORM LOCK NUT	DD08	15991	3	49	CANOPY ABSORBER	31112–023	19460	1
25	BRAKE ACTUATOR	46115–001	24150	1					

* INDICATES PARTS RECOMMENDED FOR STOCK

ASSEMBLY DRAWING

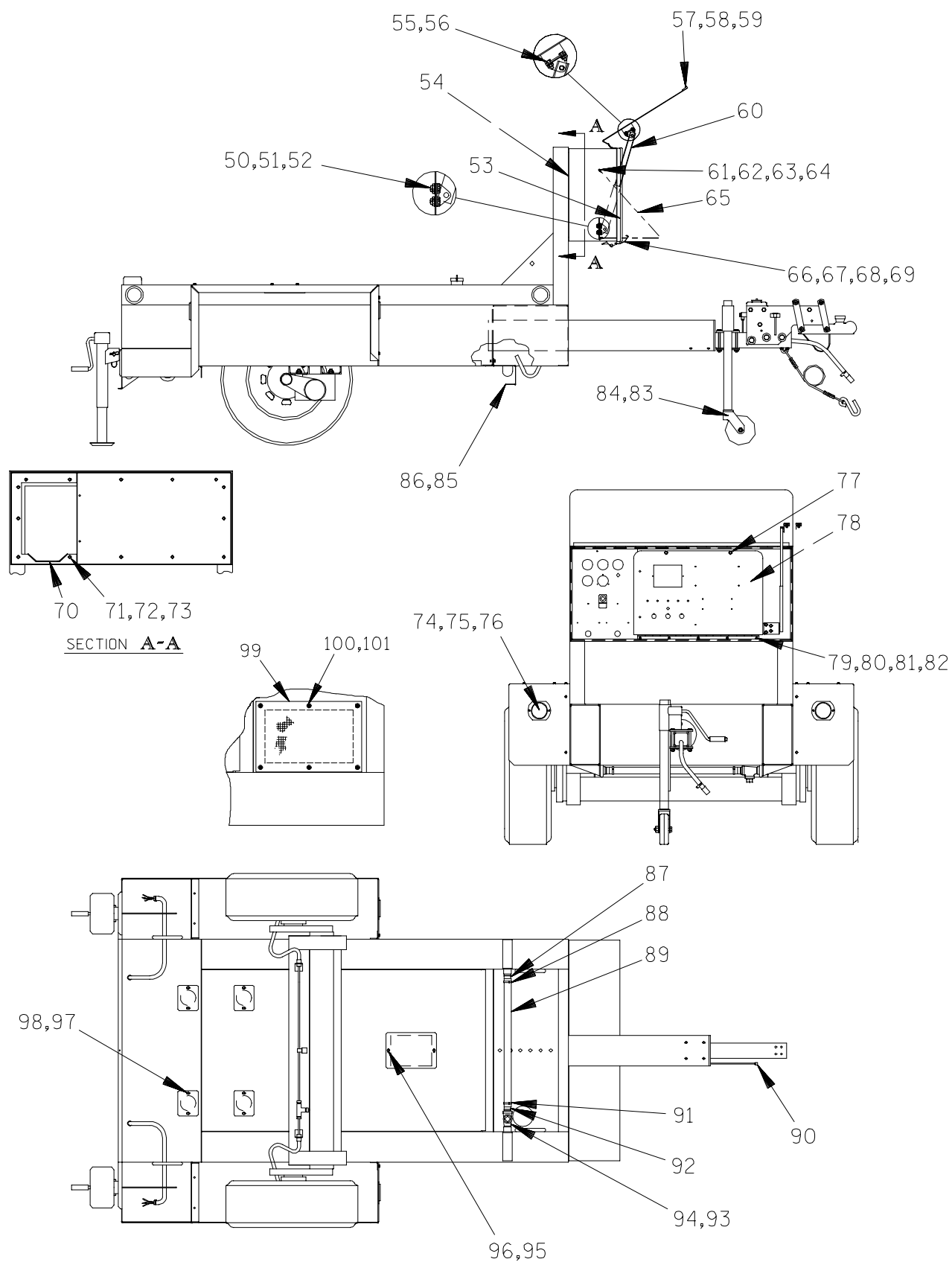


Figure F-5. 41583-747 Trailer Assembly (Cont'd)

PARTS LIST **41583 – 747 Trailer Assembly (Cont'd)**

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
50	HEX HD CAPSCREW	B0403	15991	4	78	DOOR ASSY	42121-518	24150	1
51	FLAT WASHER	K04	15991	4	79	RD HD MACH SCREW	X#10-02	15991	5
52	FLANGED HEX NUT	21765-310	---	4	80	FLAT WASHER	K#10	15991	5
53	EDGE TRIM	18516-103	---	10.3'	81	HEX NUT	D#10	15991	5
54	FOAM TAPE	18668-003	---	10.1'	82	LOCKWASHER	J#10	15991	5
55	HEX HD CAPSCREW	B0403	15991	2	83	JACK ASSY W/STL WHL	29313-151	---	1
56	FLANGED HEX NUT	21765-310	---	2	84	HEX HD CAPSCREW	B0616	15991	4
57	RD HD MACH SCREW	21765-004	---	4	85	HOSE GUARD	34651-021	15120	1
58	LOCKWASHER	AK#10	15991	4	86	FLANGED CAPSCREW	21634-505	---	2
59	CAP NUT	BA#10	15991	4	87	HOSE NIPPLE	S2242	---	1
60	DOOR HOLDER	22814-942	---	1	88	HOSE CLAMP	26518-667	---	1
61	RD HD MACH SCREW	X#10-03	15991	1	89	FUEL HOSE	18513-045	---	2.13'
62	FLAT WASHER	K#10	15991	1	90	BRAKE LINE KIT	SEE PAGE F-16		
63	LOCKWASHER	AK#10	15991	1	91	HOSE CLAMP	26518-667	---	1
64	HEX NUT	D#10	15991	1	92	HOSE NIPPLE	S2242	---	1
65	CABLE ASSY	41158-805	---	1	93	PIPE PLUG	P16	10009	1
66	DOOR LATCH	22814-510	---	2	94	STREET TEE	US16	11999	1
67	RD HD MACH SCREW	21765-004	---	4	95	COVER PLATE	33461-024	15120	1
68	LOCKWASHER	AK#10	15991	4	96	FLANGED CAPSCREW	21634-505	---	2
69	CAP NUT	BA#10	15991	4	97	COVER PLATE	33461-021	15120	4
70	EDGE TRIM	18516-103	---	.72'	98	FLANGED CAPSCREW	21634-505	---	8
71	HEX HD CAPSCREW	B0404	15991	14	99	SCREEN .683 SQ FT	12971-104	---	1
72	FLAT WASHER	K04	15991	14	100	SELF-TAP CAPSCREW	21281-444	---	6
73	LOCKWASHER	J04	15991	14	101	FLAT WASHER	K#10	15991	6
74	AMBER REFLECTOR	29338-405	---	2	OPTIONAL:				
75	HEX HD CAPSCREW	B0403	15991	4		ACTUATOR W/EYE	29310-321	---	1
76	FLANGED HEX NUT	21765-310	---	4		LUNETTE EYE KIT	29310-314	---	1
77	FLANGED CAPSCREW	21634-505	---	2					

* INDICATES PARTS RECOMMENDED FOR STOCK

ASSEMBLY DRAWING

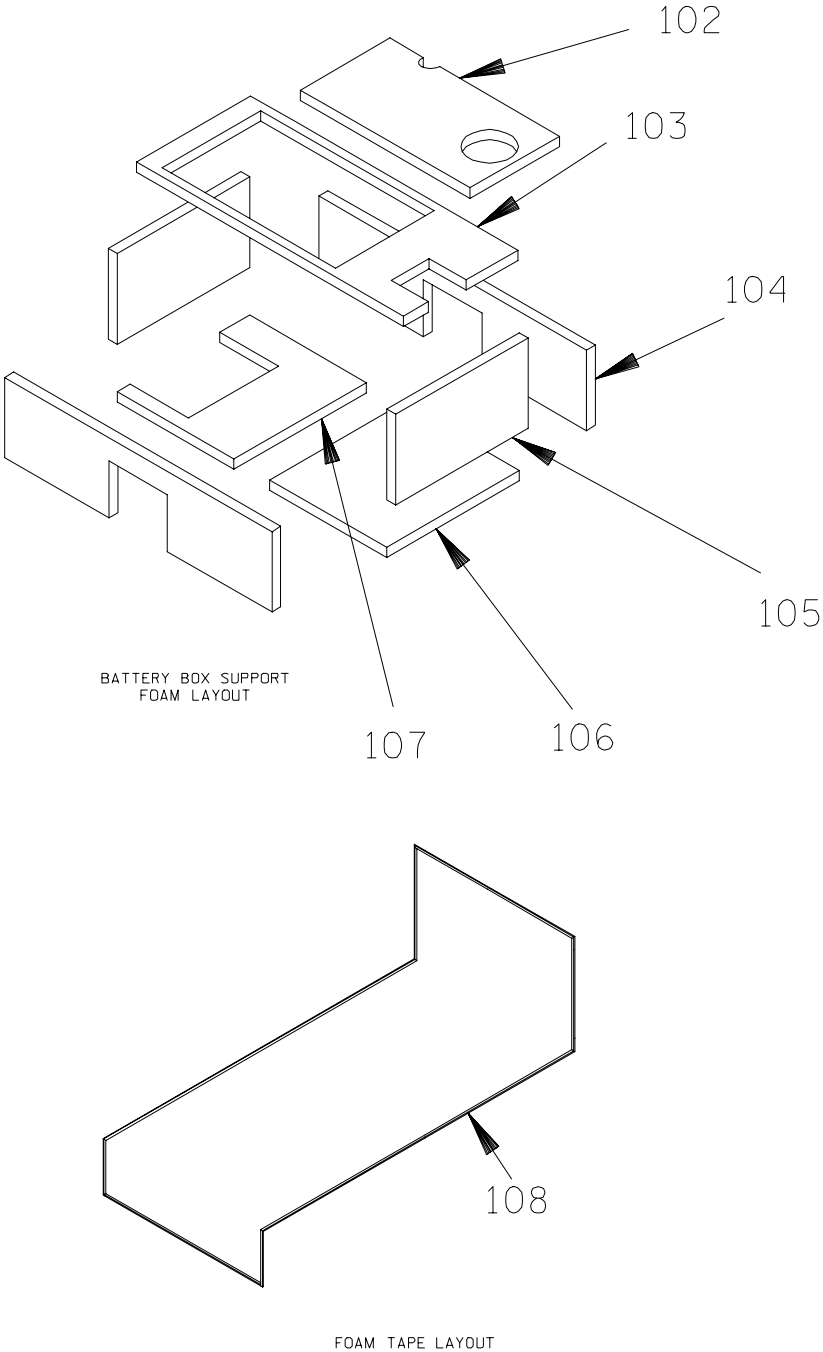


Figure F –6. 41583–747 Trailer Assembly (Cont'd)
PARTS LIST

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
102	CANOPY ASSY ABSRBR	33147–021	19460	1	106	BATT SUPT ABSORBER	33146–004	19460	1
103	BATT SUPT ABSORBER	33641–155	19460	1	107	BATT SUPT ABSORBER	33641–157	19460	1
104	BATT SUPT ABSORBER	33641–154	19460	2	108	28.5' LG FOAM TAPE	18668–004	---	28.4'
105	BATT SUPT ABSORBER	33146–003	19460	2					

ASSEMBLY DRAWING

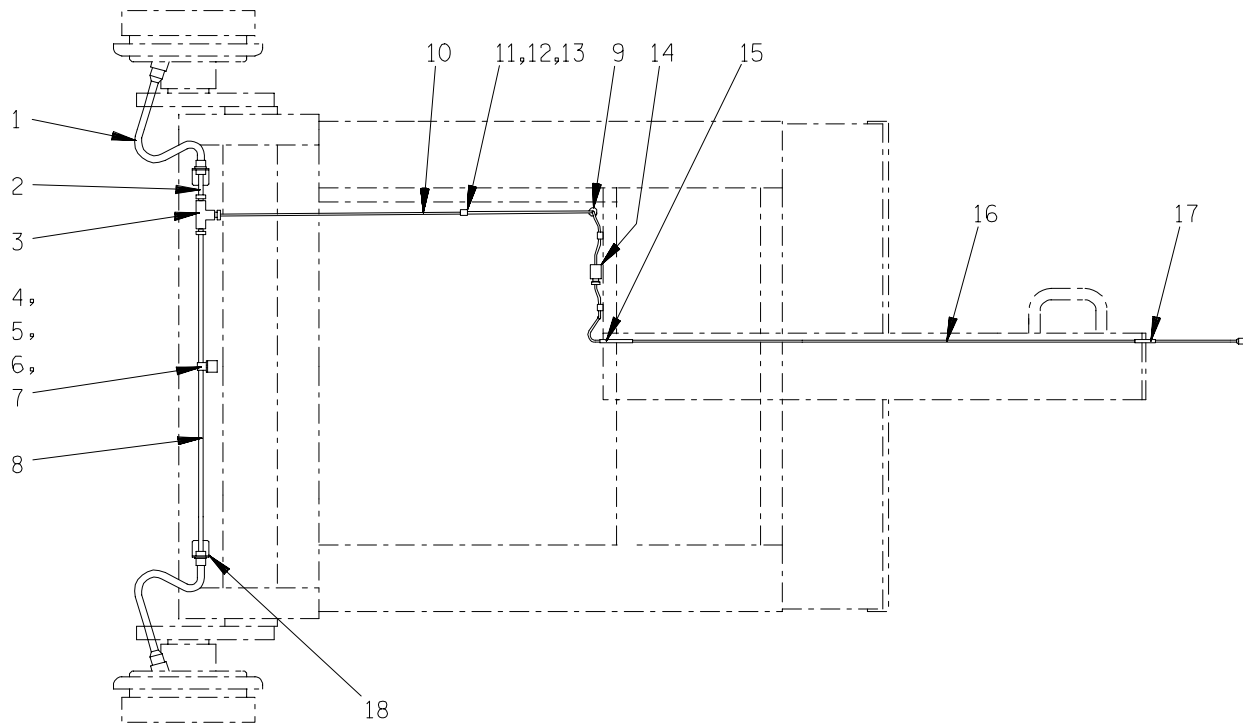


Figure F – 7. 48213–066 Brake Line Kit

PARTS LIST

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	HOSE ASSEMBLY	29313–901	---	2
2	TUBING – 12 IN.	29313–902	---	1
3	TEE	26357–212	---	1
4	CABLE CLAMP	27111–321	---	1
5	RD HD MACHINE SCREW	X#0602	15991	1
6	LOCKWASHER	J#06	15991	1
7	HEX NUT	D#06	15991	1
8	TUBING – 30 IN.	29313–503	---	1
9	GROMMET	27135–019	---	1
10	TUBING – 60 IN.	29313–505	---	1
11	CABLE CLAMP	27111–321	---	3
12	PAN HD TAPSCREW	CC#0801–1/2	15991	3
13	T–TYPE LOCKWASHER	AK#08	15991	3
14	TUBE UNION	29313–506	---	1
15	SPIRAL WRAP (2) 4 IN.	18763–003	---	.67'
16	TUBING – 60 IN.	29313–505	---	1
17	SPIRAL WRAP (2) 4 IN.	18763–003	---	.67'
18	CLIP	29313–903	---	2

ASSEMBLY DRAWING

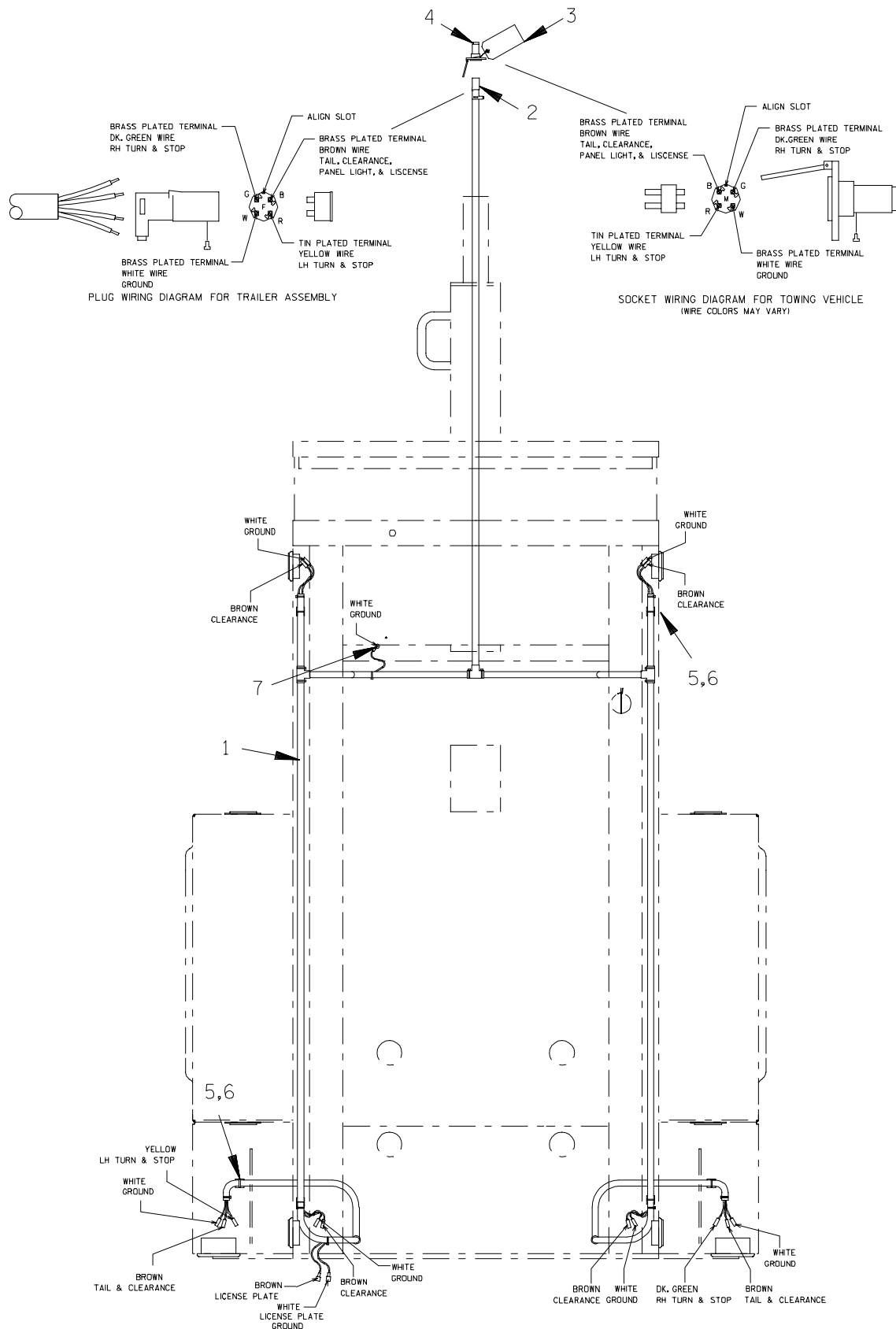


Figure F-8. Trailer Electrical Assembly

PARTS LIST
Trailer Electrical Assembly

ITEM NO.	PART NAME	PART NUMBER	MAT'L CODE	QTY
1	WIRING HARNESS	47381-024	---	1
2	PLUG CONNECTOR	27261-301	---	1
3	SOCKET WIRING TAG	38817-078	---	1
4	SOCKET CONNECTOR	27263-001	---	1
5	CABLE MOUNTING BLOCK	27111-352	---	10
6	CABLE TIE	27111-202	---	10
7	FLANGED CAPSCREW	21634-507	---	1

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