

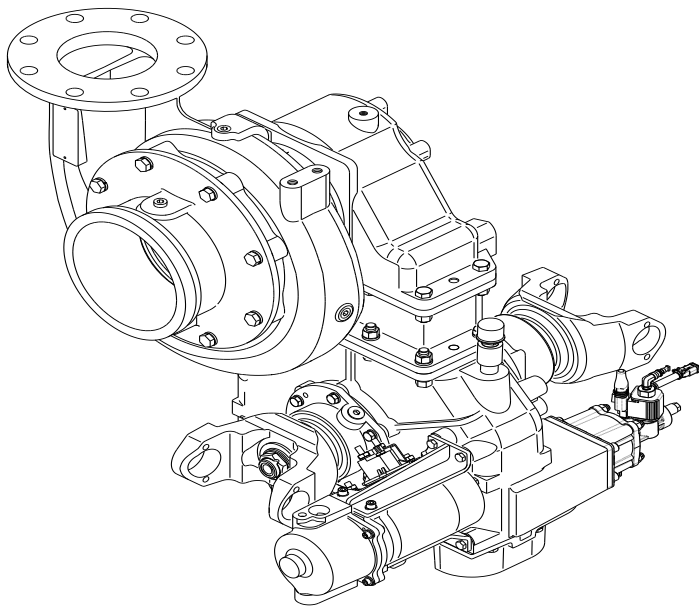
# S100 Series Centrifugal Fire Pumps

# Operation and Maintenance

Form No.	Section	Issue Date	Rev. Date
F-1031	2117	02/22/02	9/24/20

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IL 3292



Read through the safety information and operating instructions carefully before using your Waterous Fire Pump.



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## Safety Information



Read through the safety information and operating instructions carefully before using your Waterous Fire Pump.

### WARNING

Death or serious personal injury might occur if proper operating procedures are not followed. The pump operator, as well as individuals connecting supply or discharge hoses to the apparatus must be familiar with these pump operating instructions as well as other operating instructions and manuals for the apparatus, water hydraulics and component limitation.

### WARNING

**Unexpected Truck Movement. May result in serious personal injury or death.**

Failure to properly shift transmission in accordance to the transmission operating instructions may result in unexpected truck movement which may result in serious personal injury or death.

### WARNING

**Pressure Hazard. May result in personal injury.**

Prior to connection or removal of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains or bleeder valves. Bleeder valves should also be used while filling a hose connected to an intake with water.

### WARNING

Limit intake pressure to 75 psi (5.2 bar) if possible. Although the pump will operate properly with higher intake pressure, such operation will greatly accelerate mechanical seal wear.

### WARNING

**Scalding Water Hazard. May result in serious burns.**

When operating the pump, be sure to open at least one discharge valve slightly to prevent the pump from overheating. If the pump runs for a few minutes completely closed, it may heat the water enough to scald someone when the valve is opened. Overheating can damage the packing, seals and other pump parts. If the apparatus builder has installed a by-pass system or other provision designed to prevent overheating, opening a discharge valve may be unnecessary.

## Safety Information



Read through the safety information and operating instructions carefully before using your Waterous Fire Pump.



### WARNING

**Hose Testing Hazard. May result in serious personal injury.**

Due to a potential for catastrophic hose failure during service testing of fire hose, it is vital that safety precautions be taken to prevent exposure of anyone to this danger. Fire pumps on fire department apparatus are not designed for and should not be used for service testing of fire hoses. Hose testing machines should be used for service testing of fire hoses.



### WARNING

**Pressure Hazard. May result in serious personal injury.**

If a fire pump on a fire department apparatus is used for service testing of fire hoses, the procedures in NFPA 1962 **MUST be followed** including the use of a fire department gate valve with a ¼-inch (6 mm) hole drilled through the gate installed between the fire apparatus discharge outlet and the hose test layout to prevent a volume surge from the pump in the event a hose bursts during testing.



### WARNING

**Scalding Water Hazard. May result in serious burns.**

If a fire pump on a fire department apparatus is used for service testing of fire hoses, pump discharge water must be circulated through a by-pass system or discharged through a slightly open discharge valve, or some other provision must be used to prevent overheating. If the pump runs for a few minutes without adequate flow through the pump, water may be heated enough to scald someone when a valve is opened.

## Introduction

This instruction contains the information needed for operation and maintenance of S100 Series centrifugal pumps.

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## General Description

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The S100 series pumps are single stage centrifugal end suction pumps providing capacities up to 2000 GPM (7570 L/min). S100 models are midship mounted with a Victaulic intake fitting, S101 models are midship mounted with an intake crosspipe.

**OPERATION LIMITS: Do not operate pump beyond max. pressure (300 psi) or max. speed (4500 rpm). Fail to do that may result in personal injury or premature pump failure.**

## Components

### ***Body Assembly***

This assembly includes a double stripping edge volute body to minimize radial forces at all flow rates, intake adapter and related parts. The body and adapters are ductile iron.

### ***Impeller Shaft Assembly***

This assembly consists of a bronze, flame-plated impeller mounted on a stainless steel shaft, wear rings, mechanical seal and related parts. The impeller is balanced and the impeller shaft is supported by ball bearings.

### ***Mechanical Seal***

The mechanical seal consists of a flat, highly polished (lapped), spring-fed carbon ring that is sealed to and rotates with the impeller shaft. It presses against a highly polished (lapped) silicon carbide mating ring that is sealed in the volute body. This seals the shaft and prevents air from entering and water from leaving. A mechanical seal does not leak or drip water, even when pumping.

## Options

### ***Intake Screens***

Zinc die cast screens are normally used in the intake fittings, with brass screens available optionally. Although the screens are chemically treated (coated) to inhibit corrosion, the water being pumped may still corrode the screens. Such corrosion is "sacrificial"; that is, it will help prevent corrosion in the rest of the pump the same way the magnesium anodes protect the metal parts of a water heater.

### ***Anodes***

As additional corrosion protection for iron body pumps, Waterous has anodes available to fit any unused opening in the intake fitting. Anodes provide an additional sacrificial surface to the water to supplement the intake screens.

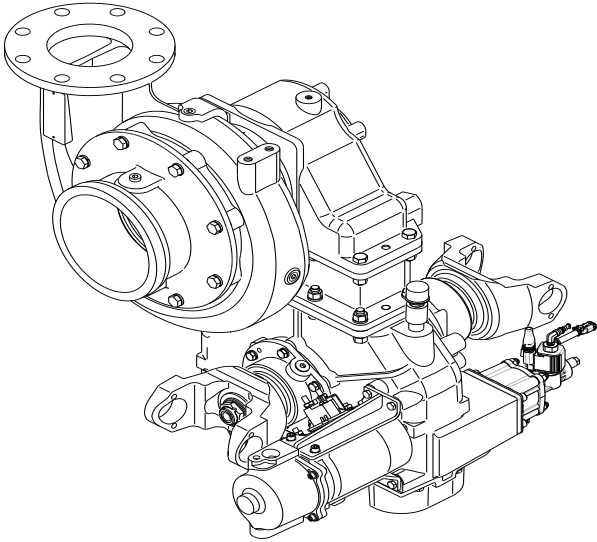
### ***Overheat Protection Manager (OPM)***

The Overheat Protection Manager (OPM) acts as a safety device by releasing hot water to the ground or back to the water tank from the discharge area of the pump.

# Pump Models

## S100C20 Series

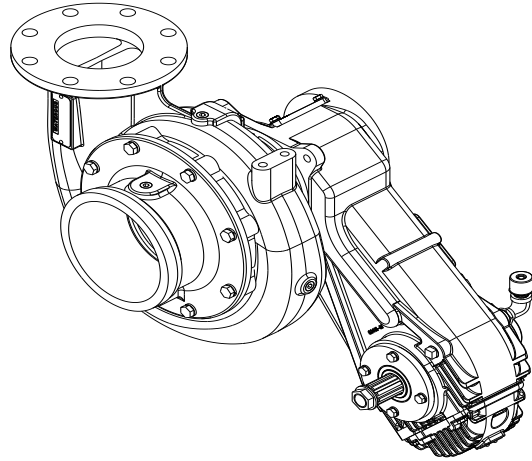
End Suction Intake  
C20 Series Chain Drive Transmission



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## S100PA Series

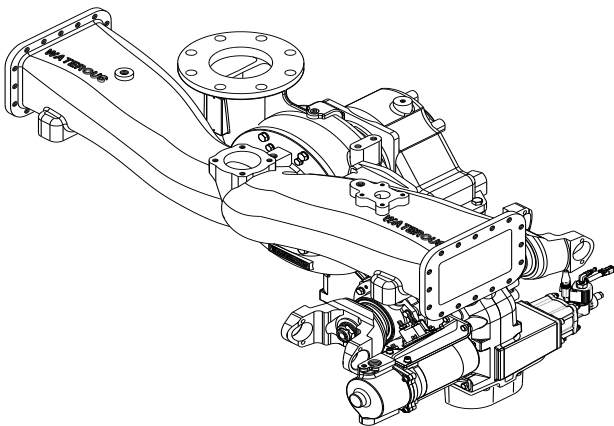
End Suction Intake  
PA Series Chain Drive Transmission



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## S101C20 Series

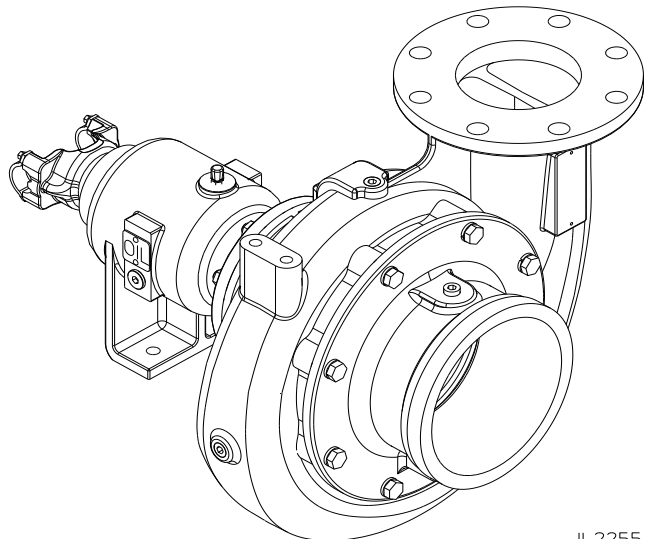
Crosspipe Intake  
C20 Series Chain Drive Transmission



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## S100D Series

End Suction Intake Direct  
Drive, Pedestal Mounted



IL 2255

# Operating Instructions

## Transmission Operation

Refer to the C20 Transmissions: Operation and Maintenance Instructions, See F-1031-2413

Refer to the PA Transmissions: Operation and Maintenance Instructions, See F-1031-2207

### Pumping from Water Tank

#### WARNING

**Pressure Hazard. May result in personal injury or death.**

Prior to connection of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains.

#### WARNING

**Scalding Water Hazard. May result in serious burns.**

When operating the pump, be sure to open at least one discharge valve slightly to prevent the pump from overheating. If the pump runs for a few minutes completely closed, it may heat the water enough to scald someone when the valve is opened. Overheating can damage the packing, seals and other pump parts. If the apparatus builder has installed a by-pass system or other provision designed to prevent overheating, opening a discharge valve may be unnecessary.

1. Open valve(s) in piping between water tank and pump intake and at least one discharge valve.
2. Allow about 30 seconds for water to flow into pump.

**NOTE: Priming the pump may be necessary due to air trapped in piping.**

3. **S100D Only:** Engage pump drive and accelerate engine to obtain desired discharge pressure and capacity.

#### WARNING

**Unexpected Truck Movement. May result in personal injury or death.**

Failure to properly shift transmission in accordance with the transmission operating instructions may result in unexpected truck movement which may result in serious personal injury or death.

4. **S100C20 and S101C20 Only:** Engage pump in accordance with transmission instructions.
5. **S100C20 and S101C20 Only:** Open discharge valves and accelerate engine to obtain desired discharge pressure and capacity.

#### NOTICE

Do not attempt to pump more water than is available from the water tank. Always make sure the intake pressure compound gage reading stays above zero.

6. Set relief valves or other pressure governing device to desired pressure.

#### After Pumping

#### WARNING

**Pressure Hazard. May result in personal injury or death.**

Prior to removal of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains.

1. Disengage pump drive. If equipped with a C20 transmission (S100C20 or S101C20) disengage pump drive in accordance with the transmission instructions.
2. If pumping anything but clean water, remove all intake and discharge caps, open all valves and open all drains. Flush entire system with clean, fresh water for several minutes to remove all traces of impurities.
3. If pump is kept full of water when not in use, make sure water is clean and non-corrosive. Make sure the pump is completely full or completely drained - never partially full.

#### NOTICE

**Freezing water hazard. May cause damage to the pump.**

If the pump is exposed to freezing temperatures, drain all water from pump, lines and accessories.

4. Close all drains and install intake and discharge caps.
5. If truck is equipped with a priming pump, operate it until fluid is discharged from priming pump discharge pipe. If equipped with a priming tank, check fluid level and refill if necessary.

# Pumping from Hydrant or in Relay

## WARNING

### **Pressure Hazard. May result in personal injury or death.**

Prior to connection of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains or bleeder valves.

## WARNING

### **Scalding Water Hazard. May result in serious burns.**

When operating the pump, be sure to open at least one discharge valve slightly to prevent the pump from overheating. If the pump runs even for a few minutes completely closed it may heat the water enough to scald someone when the valve is opened. Overheating can damage the packing, seals and other pump parts. If the apparatus builder has installed a by-pass system or other provision designed to prevent overheating, opening a discharge valve may be unnecessary.

1. **S100D Only:** Engage pump drive and accelerate engine to obtain desired discharge pressure and capacity.

## WARNING

### **Unexpected Truck Movement. May result in personal injury or death.**

Failure to properly shift transmission in accordance with the transmission operating instructions may result in unexpected truck movement which may result in serious personal injury or death.

2. **S100C20 and S101C20 Only:** Engage pump in accordance with transmission instructions.
3. Open intake, hydrant and other valves as necessary to allow water to enter the pump.

**NOTE: Bleeder valves should be used while filling a hose connected to an intake with water.**

- 1.

## *NOTICE*

Limit intake pressure to 75 psi (5.2 bar) if possible. Although the pump will operate properly with higher intake pressure, such operation will greatly accelerate mechanical seal wear.

4. **S100C20 and S101C20 Only:** Open discharge valves and accelerate engine to obtain desired discharge pressure and capacity.
5. Set relief valves or other pressure governing device to desired pressure.

## *NOTICE*

Do not attempt to pump more water than is available from the hydrant or relaying pumper. Always make sure the intake pressure compound gage reading stays above zero.

**NOTE: Some fire departments operate at a minimum intake pressure of 10 psi (.7 bar) when pumping from hydrant or in relay to prevent a "soft" intake hose from collapsing.**

## *After Pumping*

## WARNING

### **Pressure Hazard. May result in personal injury or death.**

Prior to removal of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains or bleeder valves.

Disengage pump drive. If equipped with a C20 transmission (S100C20 and S101C20) disengage pump drive in accordance with the transmission instructions.

2. If pumping anything but clean water, remove all intake and discharge caps, open all valves and open all drains. Flush entire system with clean, fresh water for several minutes to remove all traces of impurities.
3. If pump is kept full of water when not in use, make sure water is clean and non-corrosive. Make sure the pump is completely full or completely drained (never partially full).

## *NOTICE*

4. Close all drains and install intake and discharge caps.
5. If truck is equipped with a priming pump, operate it until fluid is discharged from priming pump discharge pipe. If equipped with a priming tank, check fluid level and refill if necessary.

## Pumping from Draft

### **WARNING**

#### **Pressure Hazard. May result in personal injury or death.**

Prior to connection of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains.

### **WARNING**

#### **Scalding Water Hazard. May result in serious burns.**

When operating the pump, be sure to open at least one discharge valve slightly to prevent the pump from overheating. If the pump runs even for a few minutes completely closed it may heat the water enough to scald someone when the valve is opened. Overheating can damage the packing, seals and other pump parts. If the apparatus builder has installed a by-pass system or other provision designed to prevent overheating, opening a discharge valve may be unnecessary.

### **WARNING**

#### **Unexpected Truck Movement. May result in personal injury or death.**

Failure to properly shift transmission in accordance with the transmission operating instructions may result in unexpected truck movement which may result in serious personal injury or death.

#### **NOTE: To get full capacity, quick prime and maintain pump efficiency:**

- a) Position vehicle as near as possible to water supply.
- b) Avoid humps and sharp bends in intake hose. Make sure no part of hose is higher than pump inlet. (Air pockets in intake hose may cause loss of prime or erratic pump action, and may reduce pump capacity.)
- c) Make sure all intake connections are tight and discharge valves are closed.
- d) Immerse intake strainer at least two feet below water surface to prevent pump from drawing air. (Whirlpools forming above intake strainer indicate that strainer is too close to surface of water.)
- e) Make sure intake strainer is far enough from bottom to prevent sand, gravel and other foreign matter from being drawn into the pump.

1. Prime the pump (see separate instructions supplied with primer).
2. **S100D Only:** Engage pump drive and accelerate engine to obtain desired discharge pressure and capacity.
3. **S100C20 and S101C20 Only:** Engage pump in accordance with transmission instructions.
4. **S100C20 and S101C20 Only:** Open discharge valves and accelerate engine to obtain desired discharge pressure and capacity.
5. Set relief valves or other pressure governing device to desired pressure.

### **After Pumping**

### **WARNING**

#### **Pressure Hazard. May result in personal injury or death.**

Prior to removal of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains.

1. Disengage pump drive. If equipped with a C20 transmission (S100C20 and S101C20) disengage pump drive in accordance with the transmission instructions.
2. If pumping anything but clean water, remove all intake and discharge caps, open all valves and open all drains. Flush entire system with clean, fresh water for several minutes to remove all traces of impurities.
3. If pump is kept full of water when not in use, make sure water is clean and non-corrosive. Make sure the pump is completely full or completely drained (never partially full).

### **NOTICE**

#### **Freezing water hazard. May cause damage to the pump.**

If the pump is exposed to freezing temperatures, drain all water from pump, lines and accessories.

4. Close all drains and install intake and discharge caps.
5. If truck is equipped with a priming pump, operate it until fluid is discharged from priming pump discharge pipe. If equipped with a priming tank, check fluid level and refill if necessary.



# Fire Hose Testing



## WARNING

### **Hose Testing Hazard. May result in serious personal injury.**

Due to a potential for catastrophic hose failure during service testing of fire hose, it is vital that safety precautions be taken to prevent exposure of anyone to this danger. Fire pumps on fire department apparatus are not designed for and should not be used for service testing of fire hoses. Hose testing machines should be used for service testing of fire hoses.

NFPA 1962 *Standard for the Inspection, Care, and use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose* provides requirements and testing procedures for service-testing fire hose at least annually. NFPA 1962 includes procedures for service testing with either a hose testing machine or with a pump on a fire department fire apparatus.



## WARNING

### **Pressure Hazard. May result in serious personal injury.**

If a fire pump on a fire department apparatus is used for service testing of fire hoses, the procedures in NFPA 1962 **MUST be followed** including the use of a fire department gate valve with a ¼-inch (6 mm) hole drilled through the gate installed between the fire apparatus discharge outlet and the hose test layout to prevent a volume surge from the pump in the event a hose bursts during testing.

During fire hose testing with a fire pump on a fire department fire apparatus, the fire pump is required to be operated at high discharge pressure with little or no flow out of the apparatus.



## WARNING

### **Scalding Water Hazard. May result in serious burns.**

If a fire pump on a fire department apparatus is used for service testing of fire hoses, pump discharge water must be circulated through a by-pass system or discharged through a slightly open discharge valve, or some other provision must be used to prevent overheating. If the pump runs for a few minutes without adequate flow through the pump, water may be heated enough to scald someone when a valve is opened.

## NOTICE

If a fire pump on a fire department apparatus is used for service testing of fire hoses, operating the pump at high discharge pressure with little or no flow may result in severe damage to the pump.

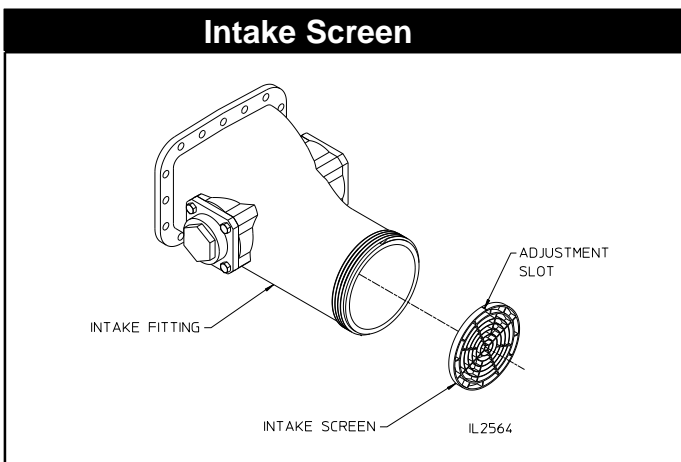
# Maintenance

## Corrosion Protection

### Optional Intake Screens

Once per month check to make sure the intake screens are not clogged or damaged. Also check for corrosion, and replace screens if damage is severe. For the screen to adequately control corrosion, there must be a strong electrical contact between the screen and the fitting. Remove any corrosion, debris or paint from the counter bore that will insulate the screen from the intake fitting. If the screen does not fit tightly, adjust the gap of the slot on the outside diameter of the screen to ensure a tight fit.

**NOTE: These screens are die-cast which results in a slight taper from one side to the other. Install the screen with the thinner cross-section facing out to minimize flow restriction.**



### Optional Anodes

Twice per year, remove the anodes and check for erosion of the replaceable elements. Replace the elements if more than half of either of the elements has eroded. Anodes are normally mounted on the pump intake piping, but they may also be installed in the discharge piping if no intake mounting locations were available. Physical mounting of the anode may be via an NPT tap or bolt-on flange as described below.

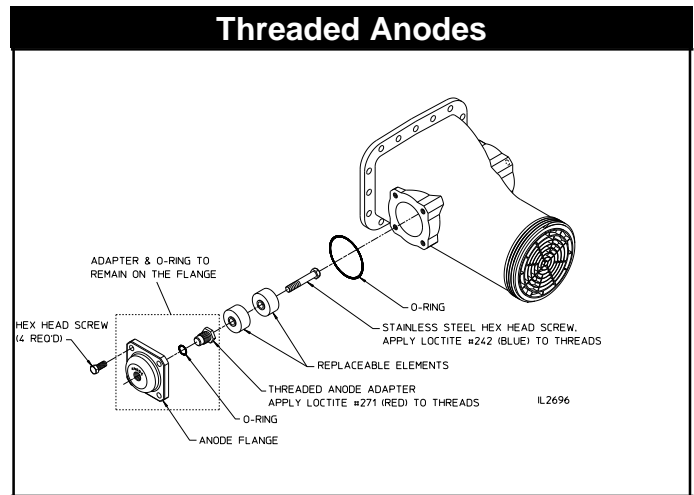
**NOTE: The replaceable elements must make contact with water to be effective. Do not paint or use any other coating on the replaceable elements.**

#### Bolt-on Anodes

Unscrew the (4) hex head screws from the pump. If elements require replacement, unscrew the hex head cap screw.

**NOTE: There is no need to remove the threaded anode adapter from the anode flange for element replacement. The screw was installed using thread sealant so higher force than normal may be necessary to remove.**

Replace one or both elements as necessary. Install the hex head screw using Loctite 242 (blue) on the screw threads. Mount the anode assembly back on the fitting.



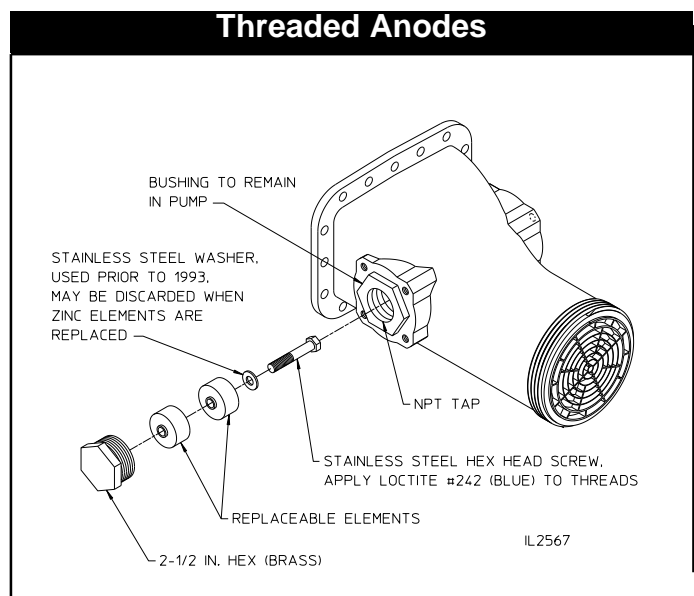
### Threaded Anodes

**NOTE: The 2-1/2 in. hex is threaded into a bushing that should remain on the pump. Be sure to restrain the bushing when removing the 2-1/2 in. hex.**

Unscrew the 2-1/2 in. hex from the pump. If the elements require replacement, unscrew the hex head cap screw.

**NOTE: The screw was installed using thread sealant so higher force than normal may be necessary to remove.**

Replace one or both elements as necessary. Install the hex head screw using Loctite 242 (blue) on the screw threads. Remove any paint or corrosion from the face around the NPT tap on the pump. Apply thread sealant to the threads and screw the 2-1/2 in. hex into the pipe tap until tight.



## Mechanical Seal

A mechanical shaft seal is used and no adjustment is required. When the pump operates, the water being pumped cools and lubricates the shaft seal to prevent it from overheating.

### *NOTICE*

Prolonged dry pump operation or operating a dry pump at high speeds will reduce the life of the mechanical seal.

If the mechanical seal leaks, replace the entire seal.

The S100 is equipped with drain notches on the pump body/transmission mounting flange or bearing housing. If any water seeps through the mechanical seal in the fire pump or oil seeps through the oil seal in the transmission or bearing housing, a V-ring on the impeller shaft directs the oil or water into the drain notches. This prevents water from entering into the oil in the transmission/bearing housing or oil from entering into the water supply of the pump.

## Overheat Protection Manager

Check the electrical circuit by pressing the test button located on the panel plate every 100 hours of pump operation or every six months, whichever comes first.

If the light does not flash, the light bulb or flasher may need replacement (provided all wire connections are solid).

# Lubrication

1. Check the lubrication fluid level monthly by checking the sight plug or by removing the oil level plug. The fluid should be level with the bottom of the oil level hole.

## NOTICE

**Low or excessive lubrication fluid may cause damage.**

If lubricant fluid level is low, locate source of leak and repair. If level is high, loosen oil level plug and drain until proper level is reached. If any water drains out, change lubrication fluid and determine source of water leakage and repair.

2. Change lubrication fluid and clean breather once a year or after each 100 hours of operation, whichever

comes first. Lubrication fluid may be added through the oil level hole or by removing the breather and adding fluid through the opening. Any type of automatic transmission fluid (ATF) may be used.

3. Quantities of lubrication fluid if system is completely drained and refilled:

### S100C20, S100PA and S101C20 Series Models:

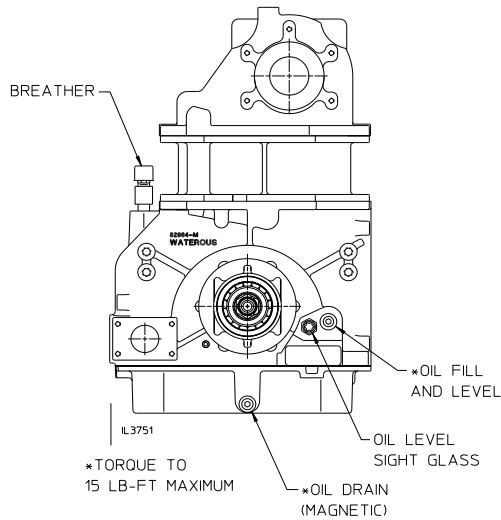
C20 Transmissions: Approximately 6 quarts of ATF.

PA Transmissions: Approximately 3 quarts of ATF.

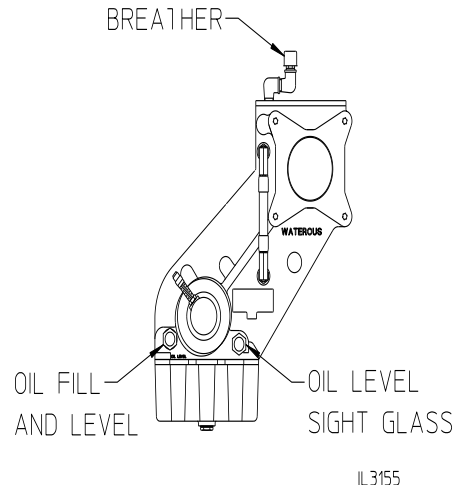
### S100D Direct Drive Models:

Fill bearing housing with approximately 1/2 quart of non-detergent SAE 30 oil.

## C20 Transmission



## PA Transmission



## S100D Bearing Housing

