



# Operation & Maintenance Manual





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## To the Owner and Operator

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### 1-1. Who Should Use, Service and Maintain This Vehicle

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This manual explains the operation of a Pierce® fire apparatus equipped with a water pump. The manual reviews basic principles of operation, highlights common safety concerns and procedures, and gives recommendations for using the pump.

This manual assumes that you are a pump operator and that:

- You have already been fully trained and certified to operate a pump.
- You have had formal education from a technical college or other fire fighter training institution.
- You understand, are proficient in, and meet all of the requirements set forth in NFPA 1002 *Standard on Fire Apparatus Driver/Operator Professional Qualifications* (latest edition).
- You already understand water pump operation.

All Pierce vehicles are delivered with a set of manuals for major components that your fire department selected.

If you need replacement manuals, or safety warning labels, contact Pierce customer service at 888-Y-PIERCE (888-974-3723).

BEFORE operating the pumping system, you, the operator, must read, understand, and follow the instructions found in:

- Pump manufacturer's operator and maintenance manuals.
- Operator and maintenance manuals for pumping components, such as valves, pressure controllers, flow controls, manual overrides, foam systems, and primer pumps.
- IFSTA *Pumping Apparatus Driver/Operator Handbook* (latest edition).

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### 1-2. What To Do If You Lack Knowledge

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Pump control systems require you to understand the function of each valve, each switch, each gauge, each Emergency Stop, and each manual override.

Before your fire department allows you to operate this pump, you already must be educated, trained, and have passed a test for pump logic and operations.

You also must know the principles of operation, so you can change operation when circumstances change.

Each valve, switch, or gauge has an important function. If you are uncertain about the function or don't know something, inform your fire department's training officer.

You are always welcome to call Pierce Customer Service at 888-Y-PIERCE (888-974-3723) with questions.

You are the only person who knows what you don't know. You must speak up about the things you don't know, so you can learn about them before someone is injured or killed because of your lack of knowledge.

You are responsible for learning how to operate the pumper under all conditions without having to read this manual at a fire or other emergency.

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## 1-3. Responsibility

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Study carefully this manual and the manuals for major components such as pump, engine, and other allied equipment. Make sure that all operators and other users also completely understand their contents.

The warnings, cautions, and procedures listed in these manuals must be part of the fire department's safety program.

As the operator of this vehicle and pumping equipment, you are responsible for:

- Understanding the function of each component of the pumping system.
- Understanding how to adjust each control to obtain the results you want.
- Maintaining control of the pumping system at all times.
- Remaining proficient in use, so at a fire you can operate and make successful changes in the operation quickly, without having to read the operator's instructions or safety warning labels.
- Practicing proper manual override and emergency shutdown procedures, so you can respond immediately in an emergency or during the failure of a component. Remember stress is high. Your failure to practice increases the odds you will forget or do it wrong in the heat of the moment.

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## 1-4. Daily Checks

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At start of shift, follow your department's apparatus check.

It is critically important that you turn each control—valve, gate, or switch, etc.—ON and OFF or OPEN and CLOSED. You want to make sure they work now. You don't want to find out at a fire.

ALWAYS check the controls you rarely use. That also reminds you of their location and their function.

If you find a control whose function you do not know, then right away find out what it does. Every control serves a purpose. You must know the purpose and how to use the control.

Pierce Customer Service is always available to help you and answer your questions. Call 888-Y-PIERCE (888-974-3723).

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## 1-5. Custom Products

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Your department developed specifications for this fire apparatus. It purchased a Pierce apparatus that is built to meet those specifications. The information in this manual will be generic at times.

Due to the highly customized nature of each Pierce fire apparatus, the exact location of each component in the pumper system will vary.

This manual describes basic controls. Not every apparatus will have all controls. Some will have extra controls, as determined by each fire department's specification.

Pictures describe typical components or devices. Actual parts might vary from those pictured.

You must learn the location and function of all controls, switches, gauges, valves, inlets, and discharges.

Major inconsistencies between your vehicle and the information contained in this manual should be directed to your Pierce Dealer or Sales Representative.

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## 1-6. Professional, Training, and Standards Organizations

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To keep up-to-date on knowledge and new standards that affect all facets of fire fighting, make sure that you check these organizations' catalogues and websites each month:

**National Fire Protection Association** (for standards and requirements)

One Batterymarch Park  
P.O. Box 9101  
Quincy, MA 02269-9101  
617-770-3000  
[www.nfpa.org](http://www.nfpa.org)  
Make sure you read the latest editions.

**Pierce Manufacturing Inc.**

Customer Service  
2600 American Drive  
P.O. Box 2017  
Appleton, WI, 54913  
888-Y-PIERCE (888-974-3723)  
[www.piercemfg.com](http://www.piercemfg.com) and [www.pierceparts.com](http://www.pierceparts.com)

**International Fire Service Training Association** (for textbooks and other training material)

Fire Protection Publications  
Oklahoma State University  
930 North Willis  
Stillwater, OK 74079-8045  
800-654-4055  
[www.ifsta.org](http://www.ifsta.org)

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## 1-7. Keeping Your Knowledge Refreshed and Up-to-Date

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This manual will be revised from time to time. Check the Pierce website, [www.piercemfg.com](http://www.piercemfg.com), to stay current.

Also review the latest edition of the IFSTA ([www.ifsta.org](http://www.ifsta.org)) manual *Pumping Apparatus Driver/Operator Handbook*.

Remember, if there's anything you don't understand, call Pierce Customer Service at 888-Y-PIERCE (888-974-3723).

## Safety

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### 1-8. Cautions, Warnings and Dangers

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#### 1-8.1 Safety Warning Labels

Throughout this manual, you will find Caution, Warning and Danger signals. Walk around the apparatus. Find each Safety Warning Label. Read the label. Identify and pay attention to the hazard it describes. Practice all the time to avoid the hazard, so you develop a habit to avoid the hazard:

#### **DANGER**

**DANGER** signals an imminently hazardous situation that, if not avoided, will result in death or serious injury.

#### **WARNING**

**WARNING** signals a potentially hazardous situation that, if not avoided, could result in death or serious injury.

#### **CAUTION**

**CAUTION** with the safety triangle signals a potentially hazardous situation that, if not avoided, might result in minor or moderate injury.

#### **CAUTION**

**CAUTION** used without the safety triangle symbol signals a potentially hazardous situation that, if not avoided, might result in property damage.

## 1-8.2 High Pressure Water Stream

### **WARNING**

**High Pressure Water Hazard.**  
**High pressure water will injure and pierce skin.**  
**Never place body parts in stream.**  
**Never point stream at people.**  
**Keep all hoses, nozzles, and couplings tight.**  
**If water pierces skin seek treatment immediately.**  
**Placing people or body parts in stream will injure or kill.**

Some apparatus use Ultra High Pressure (UHP) streams of water or foam solution to fight fires. While this method of fire fighting has many advantages over lower pressure approaches, it presents unique hazards and should be used only by trained-safety conscious personnel. UHP water or foam solution is discharged at pressure over 1000 PSI. At this pressure, the discharge stream may be capable of puncturing human skin and thus entering the blood stream. Fluid, even pure water, that is injected into human skin is extremely dangerous and must be treated by qualified medical personnel immediately.

Never search for leaks with your hands or other body parts. High pressure hydraulic fluid at pressure as low as 100 PSI can penetrate skin. Use a piece of wood or cardboard to detect leaks, keeping hands and other body parts well away from the potential source of the leak.

If you suspect that you have been exposed to a high pressure skin penetration, seek medical help immediately. The high pressure injection of a fluid such as water, hydraulic oil, grease and paint constitutes a medical and surgical emergency, requiring access to appropriate specialist surgical expertise as soon as possible. Often the injury appears minor, but it is not. Fluids injected under the skin are highly toxic. The injury will lead to gangrene, amputation, and death if not treated promptly.

Make sure the doctors are aware of the potential problems and get the recommended attention needed to treat the injury.

Tighten all fluid connections before operating this equipment and check the hoses, nozzles, and couplings after every use. A leak in a high pressure line can inject fluid into human skin just as it can when fluid comes from the nozzle. Replace worn, damaged and/or loose parts immediately.

The use of personal protective equipment (PPE) such as gloves, turn-out gear, boots, and a mask with a face shield should be worn whenever using UHP.

### 1-8.3 Intake and Discharge Cap Removal

#### **DANGER**

**ALWAYS OPEN Drain/Bleeder Valve BEFORE removing Inlet or Discharge cap.**

**Discharge lines can trap pressure if the valve is opened and left closed.**

**Discharge cap under pressure will blow off with explosive force.**

**Exploding cap may injure or kill.**

**NOTE:** One sign of trapped pressure is a cap that does not turn easily. If the cap is difficult to remove, double check that the drain valve of bleeder valve is not plugged and that all the pressure is relieved before proceeding.

Most fire apparatus include caps on the end of inlet and discharge pipes. These caps often have a control valve in the pipe just behind them. If this valve is opened and then closed again while the plumbing is pressurized, this pressure can be trapped between the valve and the cap even if the pump is not operating and all the gauges read zero pressure.

NEVER attempt to remove any inlet or discharge cap on your aerial apparatus until you are certain there is no trapped pressure. Open the bleeder valve or drain valve between the control valve and the cap to ensure that any trapped pressure is released. Then remove the cap slowly and carefully. Do not stand in front of the cap. If you remove a cap that has pressure trapped behind it the cap may fly off with great force, injuring yourself or others.

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## 1-9. Safety Defect Reporting

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If you believe your vehicle or any associated component might have a design defect that could result in failure or injury, please report this information immediately to Pierce Manufacturing.

Additionally, should any information in this manual prove to be seriously inconsistent with your Pierce fire apparatus also inform Pierce Customer Service.

Most service and support issues should be handled by the local Pierce dealer or sales representative. However, to report any design defects or request support directly from Pierce contact:

Customer Service  
Pierce Manufacturing, Inc.  
2600 American Drive, P.O. Box 2017  
Appleton, WI, 54913  
888-Y-PIERCE (888-974-3723)  
[www.piercemfg.com](http://www.piercemfg.com)



## Pump Chart and Intake Relief Valve

### 2-1. Create a Pump Chart

Use a Pump Chart to determine the pump discharge pressure that will provide desired nozzle pressure for various hose lay configurations and combinations.

The IFSTA *Pumping Apparatus Driver/Operator Handbook* tells how to develop a pump chart. Develop the chart for all situations.

Make sure this chart is always available during pump operation.

### 2-2. Check Adjustment of Intake Relief Valve

Figure 2-1: Typical Intake Relief Valve (*relief outlet pipe with threaded end shown on right*)



POM0016, 0017, 0018

All pumps have a relief valve on the intake side ([Figure 2-1](#)). It prevents a pressure spike in intake water from passing to hoses through the discharge side of the pump.

The intake relief valve is a pressure regulator. If intake pressure goes over the pressure setting, the valve opens and allows water to flow out the relief outlet.

Some departments choose to connect a hose to the relief valve outlet to direct the water discharge away from the apparatus. Pressure surges in this hose can occur without warning.

**⚠ WARNING**

**Secure unattended hoses.**

**Water discharged from hose will cause hose to whip violently.**

**Whipping hose can injure or kill.**

To adjust this valve for desired pressure, the intake pressure to the pump must be higher than the normal static pressure of the municipal water supply. The best method to adjust the valve is to use another pumper to supply water at the desired pressure.

1. Increase inlet pressure until the master inlet pressure gauge reads the relief pressure you want.
2. With a wrench, slowly open the adjusting screw on the valve until water starts to flow from the valve outlet.
3. Slowly close the adjusting screw until the water stops flowing.

Read the valve manufacturer's documentation for complete instructions.



## Before Fire Fighting Operations

### 3-1. Approaching the Apparatus

#### 3-1.1 Stepping and Walking Surfaces

##### **⚠ WARNING**

**ALWAYS** be careful when climbing up or down to avoid a slip and fall, and potential injury to yourself and others.

Enter and exit cabs slowly, deliberately, and carefully.

**NEVER** jump to ground. You can injure yourself.

**ALWAYS** maintain three points of contact when climbing up or down.

Keep contact with one hand and two feet, or two hands and one foot.

Use steps, hand-holds, or sturdy features on the apparatus.

**ONLY** grasp or step on items appropriate for climbing on or firmly attached objects.

Keep steps and hand-holds in good repair, and free of grease, mud, dirt, fuel, ice, and snow.

Make sure all attaching bolts and hardware are tight, thus eliminating any movement of steps and hand-holds.

**NEVER** step or climb on any vehicle surface unless it is slip-resistant and hand-holds are provided.

Replace slip-resistant material when worn.

All surfaces intended for stepping or walking are designed or treated with slip-resistant material your department specified. **NEVER** step or walk on surfaces not designed for stepping or walking, such as:

- Chromed surfaces or objects
- Painted surfaces
- Hose rollers
- Compartment doors or hatches
- Valves
- Controls
- Inlet or Outlet Connections

### 3-1.2 Compartment Doors

#### **⚠ WARNING**

**NEVER step on open compartment doors.**  
**They do not support your weight.**  
**Falls can cause serious injury or death.**

Always close swing-up or swing-out compartment doors. People can walk into doors left open at lower levels. Personnel working on top of the apparatus can mistake an open horizontal door for a walking surface.

### 3-1.3 Hose Bed Covers

#### **⚠ WARNING**

**CLOSE hose covers after use.**  
**Hose bed covers can cause serious injury if blown shut by wind.**  
**Keep personnel clear of open hose bed covers during windy conditions.**

Some apparatus are equipped with aluminum hose bed covers. Always close after use. They protect hose from sun and weather. Hose bed covers are heavy. They might require two or more people to open or close safely.

### 3-1.4 Folding Steps or Platforms

#### **⚠ WARNING**

**High voltage electricity can travel down a water stream.**  
**NEVER spray through electric wires.**  
**High voltage can cause death or serious injury.**

**Keep OFF the ground when operating an aerial device.**  
**ALWAYS stand with both feet on the pump operator's platform of an aerial device.**  
**High voltage can jump gaps between wires and apparatus.**  
**Electrical power will pass through people who stand on the ground and touch the apparatus.**  
**Electrical power lines can cause death or serious injury.**

Before beginning pump operations, make sure that folding steps or platforms are DOWN and firmly engaged in their weight-bearing position.

When operating the pump on an aerial apparatus, always stand with both feet on the operator's platform and off the ground.

Your body will become an electrical path to ground if you stand with one foot on the platform and one on the ground, or with both feet on the ground and your hands on the apparatus. If the aerial device contacts or comes close to high voltage power lines, electricity can shoot through you. You can die.

## 3-2. Hose

### 3-2.1 Hose Storage

The hose is stored in:

- Body Compartments
- Bumper Compartments
- Cross-Lay Trays
- Speed-Lay Trays
- Hose Beds
- Reels
- Hose Chutes

Evaluate each way of storing hose. Determine the most efficient and safest way to pack hose for your fire department's use.

### 3-2.2 Hose Restraint

#### **WARNING**

##### **Entanglement Hazard**

**Secure hose and other equipment before placing vehicle in motion.**

**Loose hose may drag behind vehicle and injure or kill.**

**Hose restraints (nets, doors, webbing, ropes, etc.) must be used to secure the hoses after repacking. Failure to comply may result in hoses deploying while the vehicle is in motion, causing injury to bystanders and/or damage to equipment.**

This vehicle may be provided with a means to store water hose. Anytime hose is stored on this vehicle it must be restrained to ensure that it does not fall out of its storage area while the vehicle is in motion. NFPA standards state that *“any hose storage area shall be equipped with a positive means to prevent unintentional deployment of the hose from the top, sides, front, and rear of the hose storage area while the apparatus is underway in normal operations.”*

Fire departments and manufacturers have developed various methods of preventing inadvertent deployment, including fully enclosed hose bed covers, buckled straps, hook-and-loop straps, fabric covers, webbing mesh, wind deflectors, and other material restraints or combination of restraints.

Operational methods vary between fire departments, and methods of restraining the hose may vary as a result. Whether you use the hose restrain feature provided with your apparatus, or develop your own means, it is your responsibility to ensure that whatever method you employ will adequately restrain the hose in those working environment the apparatus will be exposed to. Always restrain the hose properly before placing the vehicle in motion.

### 3-2.3 Hose Chutes

Some aerial apparatus have a hose “chute.” The chute guides the hose from the hose bed around the aerial turntable, then out the back of the vehicle.

NEVER pack hose in the hose chute, because that can cause snagging and snarling.

To avoid creating a jam of tangled hose in the hose chute:

- Lay couplings so they are pulled out straight, without flipping around.
- Lay hose so that it never crosses over itself when paying out.
- Maintain vehicle speed of 5 MPH or less. At 5 MPH, seven feet of hose is pulled out each second. If you travel more than 5 MPH, you are likely to cause a hose jam in the hose chute.

### 3-2.4 Hose Beds

#### **WARNING**

**Pack hose carefully in any hose bed to minimize the risk of hose snags or snarls as it lays out.  
Hose that snags or snarls during layout from a moving vehicle can fly about, causing serious injury or death to bystanders.**

Hose beds come in many shapes and sizes. Hose characteristics vary with the size, type, and age of the hose. Experiment with different methods of packing a specific hose, bed, and chute combination to determine a packing method that will lay out without snagging or snarling. Make sure you learn the maximum MPH at which hose can be laid out.

### 3-2.5 Hose Deployment

#### **WARNING**

**NEVER ride on rear steps or other areas outside the cab.**

**Limit speed to 5 MPH when laying hose.**

**ALWAYS use a spotter when backing up.  
Keep the spotter and all other people clear of the vehicle's path.**

**All occupants MUST be seated and belted while vehicle is in motion.**

If hose is to be laid from a moving apparatus, first test the packing method under controlled conditions to learn the MPH at which hose will lay out smoothly, without snags or snarls.

Any operation where people are working around a moving vehicle is dangerous. All occupants must be seated and belted while the vehicle is in motion. NEVER ride on rear steps or other areas outside the cab.

**⚠ WARNING**

**Flying hose is extremely hazardous.**  
**Keep all people clear of hose being laid by a moving vehicle.**  
**Flying hose can injure or kill.**

**Fire hose under pressure can burst without warning.**  
**NEVER straddle or stand over a charged hose.**  
**Always wear complete protective gear, even when testing.**  
**Burst hose can injure or kill.**

When laying hose, an anchorman must protect himself from the dangers of flying hose.

It is safest to use rope to tie the hose to the hydrant. In the absence of rope, anchor the hose by wrapping the end half way around the hydrant in a J-pattern only. Never wrap more than half way around the hydrant. Wedge the end fitting against the hydrant with a booted foot. Stand clear of the hose so that you will be away from the hose if it becomes taut and swings out from the hydrant. A snag in the hose bed can pull the hose loose. The metal fitting can swing around and break your leg.

Keep people clear of the hose being laid before driving the vehicle.

When laying hose, limit vehicle speed to 5 MPH to minimize risk to personnel, equipment, and bystanders.

Avoid kinks, crimps, and twists when laying fire hose.

### 3-2.6 Hose Connections

**⚠ WARNING**

**Hose fittings can fail without warning.**  
**Inspect hose fittings for cracks, chips or other damage and replace when worn or damaged.**  
**Damaged or worn fittings can burst without warning.**  
**Burst fittings can injure or kill.**

Hose fittings are critical to safe delivery of water to a fire. Treat hose connections with care and inspect regularly.

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### 3-3. Positioning the Apparatus

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#### 3-3.1 Fire Scene Positioning

##### **WARNING**

**Operate apparatus away from burning embers that can be sucked into the air intake system.**

**Burning embers in the engine air filter can cause engine fire.**

**Engine fire can cause property damage, serious injury, or death.**

Heat from a fire can damage electrical systems, rubber seals and gaskets, and plastic components. Always place apparatus upwind from the fire and at a safe distance away from flames.

Diesel engines consume as much as 1200 cubic feet of clean air every minute. Hot embers sucked into the air intake can cause the air cleaner element to ignite. Although Pierce Custom Chassis are equipped with ember barriers composed of mesh screens or perforated metal, they are not a foolproof guarantee of protection.

Always leave a way out. Always position the apparatus in a location that allows a quick retreat if conditions change.

Always park upwind of the fire. Never park the apparatus downwind of the fire.

Always avoid electrical lines. Never park under electrical lines.

#### 3-3.2 Positioning on Roads

Position the apparatus so that it protects emergency personnel. Many departments choose to park the apparatus at an angle so that personnel can work behind the vehicle, out of the direct path of oncoming vehicles.

Keep emergency response lighting ON to alert traffic.

#### 3-3.3 Lighting

As soon as possible, provide good lighting for people working on and around the apparatus. Use extendable lighting or lighting from another apparatus.

Make sure that the pump operator can clearly observe controls, gauges, and hose connections, and can watch the condition of hoses and attack personnel to the greatest extent possible.

#### 3-3.4 Chock the Wheels

ALWAYS place wheel chocks on both front and rear of tire when vehicle is parked.

Chock wheels as soon as you exit the cab.

## Pump Engagement and Disengagement

### 3-4. Driveline Driven Pump

#### 3-4.1 Pump Engagement


#### **⚠ WARNING**

**NEVER** operate pump with Pump Shift Control in ROAD position.  
Vehicle can move. Vehicle can override parking brake.  
Moving vehicle can injure or kill.

If equipped with 4WD, engage the water pump with the transfer case in 2WD ONLY. Vehicle will move if the pump is engaged when in 4WD. Death or injury may occur.

**NOTE:** In manual override mode, the pump speed will be controlled only by the throttle pedal.

#### 3-4.1a Engaging Pump, Cummins or Detroit Engine with Allison Transmission

Pump Engagement - Cummins or Detroit Engines	
	
1. With the engine running at idle, shift transmission to NEUTRAL (N).	
2. Apply parking brake.	
<p><b>NOTE:</b> If parking brake is OFF, safety interlocks prevent hand throttles or pressure governors from operating.</p> <p><b>NOTE:</b> If parking brake is released during pump operation, the pump will disengage. Engine speed will fall to idle and water pressure will fall.</p>	
3. Chock the wheels.	
<p><b>NOTE:</b> Chock front and rear of tire every time vehicle is parked.</p>	
4. Apply the service brake by pressing and holding the brake pedal.	
<i>continued</i>	

**Pump Engagement - Cummins or Detroit Engines (continued)**

**⚠ WARNING**

Keep pump water cool. Do not operate the pump for extended periods with the discharge valves closed or the pump may overheat. The pump is fitted with a thermal relief valve to help prevent overheating.

**⚠ CAUTION**

Engage pump only at engine idle speed.

Supply water to pump immediately after engaging pump. Running pump dry for more than a few minutes will cause damage.

**⚠ CAUTION**

Air pressure gauges should indicate 80 PSI or greater. Pump may not shift out of road position if the air pressure is below 80 PSI.

**5. Engage the pump shift control lever.**

Flip pump shift control lever DOWN to engage pump. Wait up to 4 seconds for pump engagement.

**6. Check “Pump Engaged” indicator light.**

Indicator light turns ON when the pump shift control is moved from ROAD to PUMP, *and* when the pump shift actuator has moved.

- If light OFF, pump is NOT engaged. Check:
- Air pressure 80psi (551 kPa) or above
- Parking Brake Applied
- Wheels Chocked

Pump may not engage if gear teeth fail to mesh. In this case:

Shift to N → Shift to R → Shift to N → Shift to D

Transmission should shift into pump. Repeat steps as necessary to complete the shift into pump mode.

**7. Shift transmission to DRIVE (D).**

After PUMP ENGAGED light is ON. A driveline driven pump must have the transmission shifted into DRIVE for pumping.

**8. Check the speedometer.**

**NOTE:** GHG17 Detroit Diesel engine-equipped apparatus will not indicate a speedometer reading.

If the speedometer indicates some value of road speed (approx. 12-18 MPH) AND the vehicle is not moving, the pump is successfully engaged.

**⚠ CAUTION**

Begin pumping immediately after engaging pump.

Recirculate water if hoses are not ready to keep water cool.

Running pump dry for more than a few minutes will cause pump damage.

**9. Check the “OK to Pump” indicator light. The “OK to Pump” light turns on when:**

- Pump shift Control has successfully engaged the pump, AND
- Transmission has been successfully shifted into DRIVE, AND
- Transmission torque converter is in the locked mode.

You are now ready to pump water. See *“Supply Water to Pump”* on [page 3-18](#).

### 3-4.1b Engaging Pump, Ford Engine With Ford 6R140 Transmission

Pump Engagement - Ford Engine	
<p><b>PUMP ENGAGED LAMP</b></p>	
<p><b>OK TO PUMP LAMP</b></p>	
<p><b>1. With the engine running at idle, shift transmission to NEUTRAL (N).</b></p>	
<p><b>2. Apply parking brake.</b></p> <p style="margin-left: 40px;"><b>NOTE:</b> If parking brake is OFF, safety interlocks prevent hand throttles or pressure governors from operating.</p> <p style="margin-left: 40px;"><b>NOTE:</b> If parking brake is released during pump operation, the pump will disengage. Engine speed will fall to idle and water pressure will fall.</p>	
<p><b>3. Chock the wheels.</b></p> <p style="margin-left: 40px;"><b>NOTE:</b> Chock front and rear of tire every time vehicle is parked.</p>	
<p><b>4. Keep feet off pedals.</b></p>	
<div style="border: 1px solid black; background-color: #ffcc00; padding: 5px; margin-bottom: 10px;"> <p><b>⚠ WARNING</b></p> </div> <p>Keep pump water cool. Do not operate the pump for extended periods with the discharge valves closed or the pump may overheat. The pump is fitted with a thermal relief valve to help prevent overheating.</p>	
<div style="border: 1px solid black; background-color: #ffff00; padding: 5px; margin-bottom: 10px;"> <p><b>⚠ CAUTION</b></p> </div> <p>Engage pump only at engine idle speed.</p> <p>Supply water to pump immediately after engaging pump. Running pump dry for more than a few minutes will cause damage.</p>	
<div style="border: 1px solid black; background-color: #ffff00; padding: 5px; margin-bottom: 10px;"> <p><b>⚠ CAUTION</b></p> </div> <p>Air pressure gauges should indicate 80 PSI or greater. Pump may not shift out of road position if the air pressure is below 80 PSI.</p>	
<p><b>5. Engage the pump shift control lever.</b></p> <p style="margin-left: 40px;">Flip pump shift control lever DOWN to engage pump. Wait up to 4 seconds for pump engagement.</p>	

*continued*

Pump Engagement - Ford Engine (continued)	
<b>6. Check “Pump Engaged” indicator light.</b>	<p>Indicator light turns ON when the pump shift control is moved from ROAD to PUMP, <i>and</i> when the pump shift actuator has moved.</p> <ul style="list-style-type: none"> <li>• If light is OFF, pump is NOT engaged. Check:</li> <li>• Air pressure 80psi (551 kPa) or above</li> <li>• Parking Brake Applied</li> <li>• Wheels Chocked</li> </ul> <p>Pump may not engage if gear teeth fail to mesh. In this case: Shift to N → Shift to R → Shift to N → Shift to D</p> <p>Transmission should shift into pump. Repeat steps as necessary to complete the shift into pump mode.</p>
<b>7. Apply the service brake by pressing and holding the brake pedal.</b>	
<b>8. Shift transmission to DRIVE (D).</b>	<p>After PUMP ENGAGED light is ON. A driveline driven pump must have the transmission shifted into DRIVE for pumping.</p> <p><b>NOTE:</b> Remove foot from brake pedal immediately after D4 displays on the shift pad. If brake is not released, the transmission will drop out of fourth gear lock-up.</p> <p>If any pedal is depressed while in fourth gear lock-up, transmission will drop out of gear.</p>
<b>9. Check Shift Pad indicator light for shift indication.</b>	<p>The shift pad will indicate “D4” when the transmission has successfully shifted.</p> <p>Release foot from service brake immediately after “D4” displays,</p>
<b>10. Check the speedometer.</b>	<p>If the speedometer indicates some value of road speed (approx. 12-18 MPH) AND the vehicle is not moving, the pump is successfully engaged.</p>
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <b>⚠ CAUTION</b> </div> <p>Begin pumping immediately after engaging pump. Recirculate water if hoses are not ready to keep water cool. Running pump dry for more than a few minutes will cause pump damage.</p>	
<b>11. Check the “OK to Pump” indicator light. The “OK to Pump” light turns on when:</b>	<ul style="list-style-type: none"> <li>• Pump shift Control has successfully engaged the pump, AND</li> <li>• Transmission has been successfully shifted into DRIVE, AND</li> <li>• Transmission torque converter is in the locked mode.</li> </ul> <p>You are now ready to pump water. See <i>“Supply Water to Pump”</i> on <i>page 3-18</i>.</p>

### 3-4.2 Manual Pump Shift Override (Optional)

#### CAUTION

Pump Shift Control must be in the PUMP position when running pump.

#### CAUTION


**ONLY** operate manual pump shift when **BOTH** automatic transmission **AND** pump shift control are in **NEUTRAL**.

Engine or transmission damage can occur.


The manual pump shift control is located on the pump panel. This handle also controls the shift lever on the pump. If the air shift fails to engage the pump, THEN use the manual pump shift instead of the air shift. This is a manual override and requires two people to operate.

Practice using the manual pump shift, so you and a partner can do it automatically if the air shift fails.

#### 3-4.2a Manual Pump Shift Override Operation - Cummins or Detroit Engine with Allison Transmission

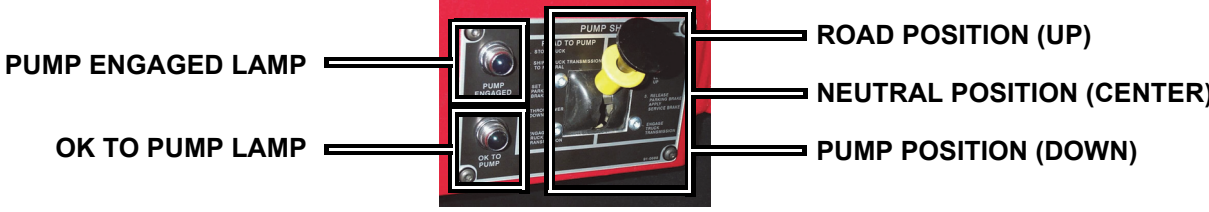
Manual Pump Shift Override (optional)	
	
1. Position one person in the driver's seat and one person at the pump panel.	
2. Shift transmission Into NEUTRAL (N).	
3. Apply parking brake.	
4. Apply service brake by pressing and holding the brake pedal.	
5. Place pump shift control in NEUTRAL.	
Move the pump shift control lever located in the cab to the middle or NEUTRAL position.	
<p><b>NOTE:</b> Depending on pump model, pull in or push out the manual shift T-handle, using steady pressure.</p> <p>Read the instruction plate near the manual T-handle for operation method.</p>	
6. Engage the manual shift handle.	
7. Place pump shift control in PUMP position.	
Move the pump shift control lever down into pump mode.	
8. Shift the transmission into DRIVE (D).	

3-4.2b Manual Pump Shift Override Operation - Ford Engine With Ford 6R140 Transmission

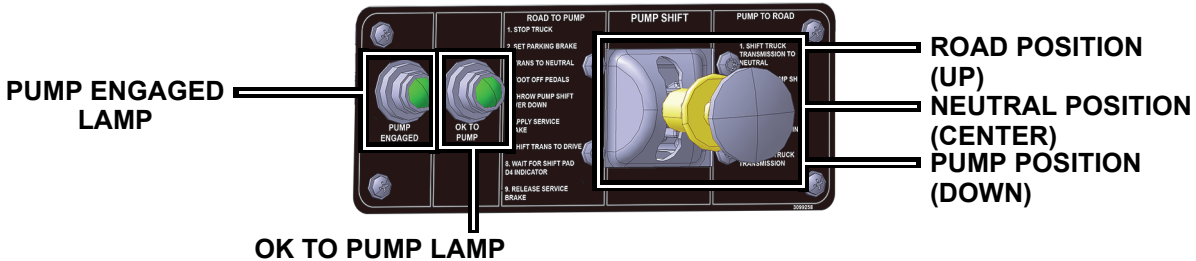
Manual Pump Shift Override (optional)	
	
1.	<b>Position one person in the driver's seat and one person at the pump panel.</b>
2.	<b>Shift transmission Into NEUTRAL (N).</b>
3.	<b>Apply parking brake.</b>
4.	<b>Place pump shift control in NEUTRAL.</b> Move the pump shift control lever located in the cab to the middle or NEUTRAL position.
	<p><b>NOTE:</b> Depending on pump model, pull in or push out the manual shift T-handle, using steady pressure.</p> <p>Read the instruction plate near the manual T-handle for operation method.</p>
5.	<b>Engage the manual shift handle.</b>
6.	<b>Place pump shift control in PUMP position.</b> Move the pump shift control lever down into pump mode.
7.	<b>Apply service brake by pressing and holding the brake pedal.</b>
8.	<b>Shift the transmission into DRIVE (D).</b>  <b>NOTE:</b> Remove foot from brake pedal immediately after D4 displays on the shift pad. If brake is not released, the transmission will drop out of fourth gear lock-up.  If any pedal is depressed while in fourth gear lock-up, transmission will drop out of gear.
9.	<b>Remove foot from service brake as soon as "D4" appears on the shift pad display.</b>

### 3-4.3 Pump Disengagement (Driveline Driven Pump)

#### 3-4.3a Disengaging Pump, Cummins or Detroit Engine With Allison Transmission

Pump Disengagement - Cummins and Detroit	
	
1. <b>Reduce engine speed to IDLE.</b> Adjust Hand Throttle or Pressure Governor to bring engine to IDLE.	
2. <b>Close discharge valves.</b> Close all discharge and inlet valves SLOWLY to prevent water hammer.	
3. <b>Shift transmission to NEUTRAL (N).</b> If the display flashes "N", then the transmission has FAILED to shift because the engine speed is too high. If this occurs: a. Make sure engine speed is at IDLE. b. Shift back to DRIVE. c. Shift back to NEUTRAL.	
4. <b>WAIT 3-5 seconds after shifting to NEUTRAL (N) for pump drive shaft to stop spinning.</b>	
5. <b>Check tachometer.</b> Make sure engine has remained at IDLE. If the engine speed has increased, the pump panel throttle control may not have been properly reset to IDLE. Exit the cab and reset hand throttle or pressure governor to IDLE.	
6. <b>Check speedometer.</b> Speedometer should read 0 MPH. If the speedometer reads ANY speed e.g. 1-10 MPH or more), then repeat the entire procedure.	
7. <b>Apply the service brake by pressing and holding the brake pedal.</b>	
8. <b>Shift pump lever to ROAD position.</b>	
9. <b>Check pump indicator lights.</b> If one or both lights are on, the pump was not successfully shifted from PUMP to ROAD. If this happens, repeat the entire procedure.	
<div style="background-color: yellow; border: 1px solid black; padding: 2px; display: inline-block;"><b>⚠ CAUTION</b></div>	
If there is a loud grinding noise when attempting to move the truck, the shift to ROAD has not completed. Shift to NEUTRAL, wait for the grinding noise to stop, and shift back to DRIVE.	
10. <b>Shift transmission to DRIVE.</b>	
11. <b>Release parking brake.</b>	
12. <b>Move the truck forward to confirm the shift to ROAD has completed.</b>	

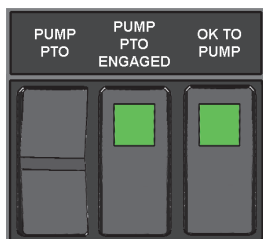
### 3-4.3b Disengaging Pump, Ford Engine With Ford 6R140 Transmission

Pump Disengagement - Ford Engine	
	
1. <b>Reduce engine speed to IDLE.</b>	Adjust Hand Throttle or Pressure Governor to bring engine to IDLE.
2. <b>Close discharge valves.</b>	Close all discharge and inlet valves SLOWLY to prevent water hammer.
3. <b>Shift transmission to NEUTRAL (N).</b>	If the display flashes "N", then the transmission has FAILED to shift because the engine speed is too high. If this occurs: <ul style="list-style-type: none"> <li>d. Make sure engine speed is at IDLE.</li> <li>e. Shift back to DRIVE.</li> <li>f. Shift back to NEUTRAL.</li> </ul>
4. <b>WAIT 3-5 seconds after shifting to NEUTRAL (N) for pump drive shaft to stop spinning.</b>	
5. <b>Check tachometer.</b>	Make sure engine has remained at IDLE. If the engine speed has increased, the pump panel throttle control may not have been properly reset to IDLE. Exit the cab and reset hand throttle or pressure governor to IDLE.
6. <b>Check speedometer.</b>	Speedometer should read 0 MPH. If the speedometer reads ANY speed e.g. 1-10 MPH or more), then repeat the entire procedure.
7. <b>Shift pump lever UP to ROAD position.</b>	
8. <b>Apply the service brake by pressing and holding the brake pedal.</b>	
9. <b>Check pump indicator lights.</b>	If one or both lights are on, the pump was not successfully shifted from PUMP to ROAD. If this happens, repeat the entire procedure.
<div style="background-color: yellow; border: 1px solid black; padding: 5px; display: inline-block;"> <b>CAUTION</b> </div> <p>If there is a loud grinding noise when attempting to move the truck, the shift to ROAD has not completed. Shift to NEUTRAL, wait for the grinding noise to stop, and shift back to DRIVE.</p>	
10. <b>Shift transmission to DRIVE.</b>	
11. <b>Release parking brake.</b>	
12. <b>Move the truck forward to confirm the shift to ROAD has completed.</b>	

### 3-5. PTO-Driven Pump

#### 3-5.1 To Engage the Pump—Stationary Operation

**NOTE:** In manual override mode, the pump speed will be controlled only by the throttle pedal.

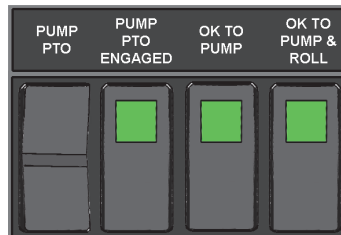
PTO Pump Engagement (Stationary Operation)	
	<p><b>TYPICAL PUMP CONTROLS AND INDICATORS</b></p> <p style="text-align: right;">1541</p>
<p><b>1. With the engine running at idle, shift transmission to NEUTRAL. (N)</b></p> <p>Before engaging a PTO-driven pump for stationary operation, shift the transmission into NEUTRAL (N). Vehicles with a PTO-driven pump display a “Pump in Neutral” label.</p>	
<p><b>2. Apply parking brake.</b></p> <p><b>NOTE:</b> If the parking brake is released during pump operation, the hand throttle or pressure governor is disconnected AND the engine speed falls to IDLE. Water pressure to the hose will drop. The pump speed will then be controlled only by the driver's throttle pedal. That is the manual override.</p>	
<p><b>3. Chock the wheels.</b></p> <p><b>NOTE:</b> Chock front and rear of tire every time vehicle is parked.</p>	
<p><b>⚠ WARNING</b></p> <p>Keep pump water cool. Do not operate the pump for extended periods with the discharge valves closed or the pump may overheat. The pump is fitted with a thermal relief valve to help prevent overheating.</p>	
<p><b>⚠ CAUTION</b></p> <p>Begin pumping immediately after engaging pump. Recirculate water if hoses are not ready to keep water cool. Running pump dry for more than a few minutes will cause pump damage.</p>	
<p><b>4. Engage the pump.</b></p> <p>Activate the PTO Pump Shift control located on the driver's panel in the cab.</p>	
<p><b>5. Check PUMP ENGAGED and OK TO PUMP indicator lamps.</b></p> <p>The PUMP ENGAGED and OK TO PUMP indicator lamps turn ON when:</p> <ul style="list-style-type: none"> <li>• PTO is engaged AND</li> <li>• Pump is spinning.</li> </ul> <p>You are now ready to pump water. See <i>“Supply Water to Pump”</i> on <a href="#">page 3-18</a>.</p>	

### 3-5.2 Engaging PTO-Driven Pump when Vehicle is Driving (*Optional*)

#### **⚠ WARNING**

Pump-and-roll operation is dangerous.  
**NEVER** ride outside the cab when the vehicle is moving.  
 Keep personnel walking to the side of the vehicle and in sight of driver at all times.  
 Drive slowly.

#### PTO Pump Engagement (Pump and Roll)



TYPICAL PUMP CONTROLS AND INDICATORS

1540

1. Stop vehicle.
2. Shift transmission Into **NEUTRAL (N)**.
3. Apply parking brake.

#### **⚠ WARNING**

Keep pump water cool. Do not operate the pump for extended periods with the discharge valves closed or the pump may overheat. The pump is fitted with a thermal relief valve to help prevent overheating.

#### **⚠ CAUTION**

Begin pumping immediately after engaging pump.  
 Recirculate water if hoses are not ready to keep water cool.  
 Running pump dry for more than a few minutes will cause pump damage.

4. Engage the pump.  
 Activate the PTO Pump Shift control switch located on the driver's panel in the cab.
5. Check **PUMP ENGAGED** indicator lamp.  
 The PUMP ENGAGED indicator lamp turns ON when:
  - PTO is engaged AND
  - Pump is spinning.
6. Provide water supply to pump by opening the tank to pump valve.
7. Shift transmission to **DRIVE (D)**. Transmission must be in **DRIVE** for Pump-and-Roll operations.
8. Release parking brake.
9. Check indicator lamps:  
 The OK TO PUMP indicator lamps turn ON when:
  - PTO is engaged AND
  - Transmission has been successfully shifted into DRIVE (D), AND
  - Parking brake is released.
 You are now ready to pump water. See *"Supply Water to Pump"* on [page 3-18](#).

### 3-5.3 Disengaging the Pump - PTO Driven Pump (Stationary Operation)

Pump Disengagement (Stationary Operation)	
	<b>TYPICAL PUMP CONTROLS AND INDICATORS</b>
1541	
<ol style="list-style-type: none"> <li><b>1. Reduce engine speed to IDLE.</b> Adjust Hand Throttle or Pressure Governor to bring engine to IDLE.</li> <li><b>2. Check tachometer.</b> <ul style="list-style-type: none"> <li>Make sure engine has remained at IDLE. If the engine speed has increased, the pump panel throttle control may not have been properly reset to IDLE.</li> <li>Exit the cab and reset hand throttle or pressure governor to IDLE.</li> </ul> </li> <li><b>3. Close discharge valves.</b> Close all discharge and inlet valves SLOWLY to prevent water hammer.</li> <li><b>4. Move the PTO pump control to the OFF position.</b></li> <li><b>5. Check pump indicator lights.</b> If the PUMP ENGAGED light is on, the pump was not successfully shifted out of pump mode. If ON, repeat the entire procedure.</li> </ol>	

### 3-5.4 Disengaging the Pump - PTO Driven Pump (Pump and Roll Operation)

Pump Disengagement (Pump and Roll Operation)	
	<b>TYPICAL PUMP CONTROLS AND INDICATORS</b>
1540	
<ol style="list-style-type: none"> <li><b>1. Stop apparatus.</b> Bring apparatus to a full stop and reduce engine speed to idle.</li> <li><b>2. Shift transmission to NEUTRAL (N).</b></li> <li><b>3. Apply parking brake.</b></li> <li><b>4. Close discharge valves.</b> Close all discharge and inlet valves SLOWLY to prevent water hammer.</li> <li><b>5. Move the PTO pump control to the OFF position.</b></li> <li><b>6. Check pump indicator lights.</b> <ul style="list-style-type: none"> <li>If the PUMP ENGAGED light is on, the pump was not successfully shifted out of pump mode. If ON, repeat the procedure.</li> </ul> </li> </ol>	

## Supply and Discharge Water and Foam

### 3-6. Supply Water to Pump

Figure 3-1: Water Supply Valves and Indicators



TANK TO PUMP VALVES



TANK FILL OR RECURCULATING VALVE



RECURCULATING VALVE  
(DEDICATED, OPTIONAL)



ENGINE COOLER VALVE



PUMP OVERHEAT  
INDICATOR

POM0007, 1551, 1552, 1549, 1548, 1550

**1. Open tank-to-pump valve.**

The tank-to-pump valve controls the flow between the water tank and pump inlet. With this valve OPEN, water from the tank floods the pump intake manifold and slowly primes the pump.

**2. Open primer valve.**

If the pump is dry, engage primer to expel air in the pump to get prime.

**⚠ WARNING**

Keep pump water cool.  
**ALWAYS** circulate fresh water through the pump.  
 Pump can heat trapped water to boiling in seconds.  
 Burst lines can spray personnel with scalding water.  
 Scalding water can injure or kill.

**⚠ WARNING**

Do not exceed the specified inlet pressure and/or maximum fill rate.  
**Maximum Fill Rate = 1,000 GPM (3,800 LPM) or the tank's capacity in GPM (LPM) (500 Gallon tank = 500 GPM) whichever is less.**  
**Maximum inlet pressure for tank filling is 100 psi (7 bar).**  
**Gate back flow into tank before reaching full level. Continue filling at a rate which allows excess water to be completely evacuated by the overflow pipe. Do not allow water to spill from the tank fill tower.**  
**Failure to comply may cause over-pressurization of the tank and tank failure, which may result in severe personal injury or death.**

**3. Open tank fill or recirculating valve.**

The tank fill valve opens the connection from the discharge side of the pump to the water tank. Open the tank fill valve to refill the water tank from a water source that is connected to an intake fitting.

With the tank-to-pump valve and the tank fill valve both OPEN, water recirculates from the tank, through the pump, and back to the tank. This cools the pump before you begin flowing water to a discharge line.

**ALWAYS** crack open the tank fill valve when running the pump. If you fail to continuously circulate water through the pump chamber, the water trapped in the pump chamber heats to boiling in seconds. Boiling water and steam can injure people. It also damages pump seals and gaskets.

When recirculating water, the water in the tank will eventually become too hot to cool the pump. Exchange tank water with fresh water to keep pump cooled.

Keep track of water temperature:

- a. Touch the outlet pipe to see how warm it is. If it is hot to the touch, it is time to bring fresh, cool water into the water tank or turn OFF pump.
- b. Watch tank temperature gauge (if your fire department selected this option). When temperature reaches 175° F, then add fresh cool water or turn OFF pump.

**4. Open recirculating valve (optional).**

A dedicated recirculating valve opens a small water flow from the pump to the tank. The flow through this line cools the pump. The recirculating line does not let water flow from the tank to the pump, so it works only if the Tank to Pump valve is OPEN, or if the intake is supplied by a water source.

### CAUTION

Engine Cooler adds engine heat to the pump water.  
Tank water will heat up faster when engine cooler valve is open.

#### 5. Open engine cooler valve.

OPEN the engine cooler valve (*Figure 3-1*) to provide more engine cooling when air temperature is above 80 degrees F, or if engine overheats. Heavy pumping in hot temperatures requires extra engine cooling.

The engine cooler transfers heat to the pump discharge water through a heat exchanger.

Turn the knob one-quarter turn counterclockwise to the left to OPEN the valve. To CLOSE the valve again, turn the knob one-quarter turn clockwise to the right.

Many departments leave this valve fully OPENED during summer and CLOSED during winter.

CLOSE the engine cooler valve for road operation during cold weather for more cab heat.

#### 6. Observe pump-overheat indicator (optional).

Watch the pump-overheat indicator during pumping operations to make sure that the pump stays cool.

If the overheat indicator light turns ON, add fresh water, recirculate, discharge water, or shut engine OFF to cool the pump.

3-7. Discharging Foam

See Foam System Operator's Manual.

3-8. Discharging Water

3-8.1 Discharge and Drain/Bleeder Valves

Figure 3-2: Typical Discharge Valves



1139A, 0020, 1542, 1543


Discharge Valve Operation			
T-Handle	Lever	Hand Wheel	Electronic
Rotate clockwise (to right) to unlock.	Rotate counter-clockwise (to left) to unlock).	Rotate counter-clockwise (to left) to open valve.	Follow instruction on controls. Read manufacturer's operator manual.
Pull to open valve.	Pull to open valve.		
Push to close valve.	Push to close valve.	Rotate clockwise (to right) to close valve.	
Rotate counter-clockwise (to left) to lock.	Rotate clockwise (to right) to lock).		

Figure 3-3: Drain/Bleeder Valves




1544/POM0021

### 3-8.2 Connecting Attack Line Hose

Discharge Water - Connect Attack Line Hoses	
 <p><b>DRAIN/BLEEDER VALVES</b></p>	
<ol style="list-style-type: none"> <li> <b>1. Close discharge valve.</b>            CLOSE to keep water from flowing once discharge cap is removed.         </li> </ol>	
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <b>⚠ DANGER</b> </div> <p><b>ALWAYS OPEN drain/bleeder valve BEFORE removing inlet or discharge cap.</b>  <b>Discharge lines can trap pressure if valve is opened and left closed.</b>  <b>Discharge cap under pressure will blow off with explosive force.</b>  <b>Exploding cap will injure or kill.</b></p>	
<ol style="list-style-type: none"> <li> <b>2. Open drain/bleeder valve.</b>            Pull up or turn counterclockwise (to the left) to OPEN.            Air pressure can be trapped between the discharge valve and the discharge cap. You must bleed off this pressure BEFORE the cap is removed. Otherwise, any trapped air pressure can blow the cap off with great force and injure someone.         </li> </ol>	
<ol style="list-style-type: none"> <li> <b>3. Open discharge cap vent (if one is present).</b>            Some discharge cape have a pressure release vent on the cap. If present, OPEN vent before removing the cap.         </li> </ol>	
<ol style="list-style-type: none"> <li> <b>4. Remove discharge cap.</b>            BEFORE removing discharge cap, OPEN the pressure release valve or drain bleeder valve to make sure trapped air pressure escapes.            Remove the discharge cap after you are certain that pressure has been bled from it. You cannot tell by how hard the cap rotates whether pressure exists or not.         </li> </ol>	
<ol style="list-style-type: none"> <li> <b>5. Connect discharge hose to the discharge coupling.</b>            Connect the discharge hose to the discharge connection.         </li> </ol>	
<ol style="list-style-type: none"> <li> <b>6. Adjust discharge swivel.</b>            If a discharge connection has a swivel fitting, move the swivel so the hose points AWAY from the pump operator's area.         </li> </ol>	
<ol style="list-style-type: none"> <li> <b>7. Close drain/bleeder valve.</b> </li> </ol>	

### 3-8.3 Charging Line

Discharge Water - Charging Line	
	<p><b>TYPICAL TANK LEVEL INDICATORS</b></p> <p>POM0001, 0022</p>
<p><b>⚠ WARNING</b></p> <p>Opening valves rapidly can cause pressure spikes. Open and close valves slowly. Pressure spikes can cause hoses to kick with great force, causing injury.</p>	
<p><b>⚠ CAUTION</b></p> <p>Opening valves rapidly can cause water hammer. Water hammer can damage the pump and other water system components.</p>	
<ol style="list-style-type: none"> <li>1. <b>With pump engaged, water fed to pump, and hose connected, SLOWLY open discharge valve.</b> <ul style="list-style-type: none"> <li>— Open and close discharge valves slowly to avoid a pressure spike in other hoses.</li> <li>— OPEN discharge valve one-half OPEN until attack line is filled with water and air is escaped from hose.</li> <li>— Observe personnel on the end of the attack line while the hose is filling.</li> </ul> </li> <li>2. <b>Adjust discharge valve.</b> AFTER air is released from the line and water is flowing steadily from the attack nozzle, adjust the discharge valves.</li> <li>3. <b>Observe tank level indicator.</b> Water level in the tank drops as water flows to the attach lines. Watch the tank level indicator and plan ahead to add external water before emptying the tank.  Learn how to open and close discharge valves using the controls on your pump panel. See <i>“Discharge and Drain/Bleeder Valves”</i> on <a href="#">page 3-21</a>.</li> </ol>	

### 3-9. Operating from a Static (Draft) Water Supply

#### CAUTION

Do not use pump without the strainer or inlet screen installed.

Operating the pump from a draft source is the most demanding type of pump operation. Learn about the hazards of this operation by studying the IFTSA *Pumping Apparatus Driver/Operator Handbook* and through formal training.

#### 3-9.1 Supply Water to Pump From Open or Draft Supply

##### Supply Water to Pump From Open or Draft Supply

#### ⚠ WARNING

Keep pump water cool. Do not operate the pump for extended periods with the discharge valves closed or the pump may overheat. The pump is fitted with a thermal relief valve to help prevent overheating.

1. If pump is running, reduce speed to IDLE and disengage pump.
2. **CLOSE all valves, foam proportioning valve, and drains.**
  - Close discharge, drain, bleed, tank valves to prime the pump (or the primer will fail to work).
3. **Deploy suction line and connect to pump using all proper precautions:**
  - g. Always attach a rope to submerged side of hose.
  - h. Always use a strainer with holes of maximum 3/8" inch or 10mm diameter on the end of the suction hose.
  - i. Hose should be submerged at least 1ft or 30cm but 4 inches or 10cm above the bottom of the bed.
  - j. Use caution to keep mud, sand, stones, or other materials from blocking the end of the hose.
  - k. Avoid a lift greater than 10 feet or 3 meters.
4. **Switch pressure governor to THROTTLE (RPM) CONTROL mode.**

For an apparatus equipped with a pressure governor, place it in THROTTLE (RPM) CONTROL mode. For governor equipped apparatus, this will hold the prime better than starting out in PRESSURE mode.
5. **Increase engine speed.**

Increase the engine speed to 1000 RPM. This should provide about 50 PSI of water pressure once the prime is established.
6. **Open primer valve.**

Pull to OPEN the primer valve and engage the primer motor. Listen to the sound of the primer motor as it pumps air out of the water pump to draw a vacuum. Listen for the tone change as the primer pump begins to expel a mix of air & water, and then begins expelling only water.
7. **Watch pressure gauge to make sure water has entered the pump and pressure is building.**
8. **Open discharge valve SLOWLY to begin water flow.**
9. **Switch pressure governor to PRESSURE CONTROL mode.**

For pressure governor equipped apparatus, switch from THROTTLE (RPM) CONTROL mode back to PRESSURE CONTROL mode.
10. **Increase pump pressure.**

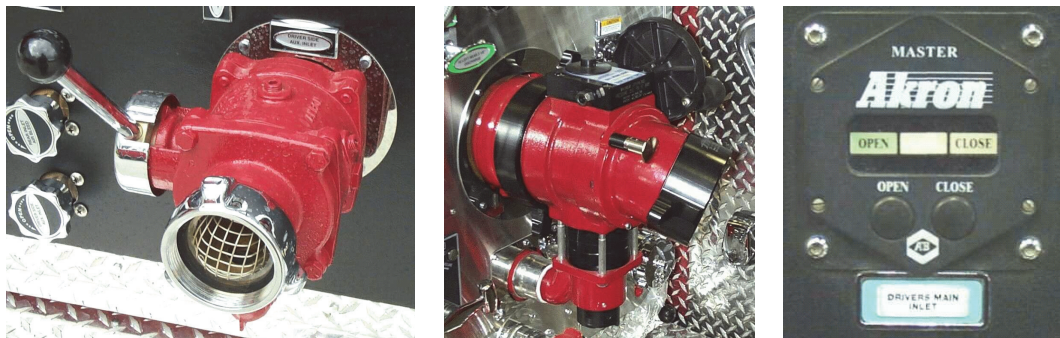
Continue to watch the master pressure gauge. Increase the pressure until you reach the desired discharge pressure.

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### 3-10. Changing from Tank to External Pressurized Water Supply (with Gated Intake Valve)

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Figure 3-4: Typical Gated Intake Valves



POM0034, 0035, 0036

Soon after the pump is running and water is being supplied to the discharge lines, you need to establish an external source of water **BEFORE** the water tank is empty. This supply can come from a hydrant, from another apparatus, or from a draft source, such as a pond, river, or portable tank.

A gate intake allows you to maintain water flow at the same pressure at the same time you switch to an external water supply.

In the absence of a gate intake valve, clear fire fighters from the attack area before you change to external water supply, because you will lose all water pressure.

Most fire departments provide their own gate valves. Pierce recommends use of a gate valve.

Before using water from a hydrant, open and vent the hydrant for about 30 seconds to flush out gravel or debris. Always use intake strainers. Gravel can damage the pump and reduce pressure.

## Connecting the Intake Hose

### Tank to Hydrant - Connect Intake Hose - WITH Gated Intake Valve



TYPICAL GATED INTAKE VALVES

AIR BLEED VALVE

INTAKE CAP

#### 1. Close intake gate valve.

Close the gate valve on the intake connection to which the intake hose will be attached.

### **⚠ DANGER**

Always OPEN Drain Valve or Bleed Valve BEFORE removing Intake Cap.

Intake Lines can trap pressure.

Intake Cap under pressure will blow off with explosive force.

Exploding cap will injure or kill.

Always bleed air from Intake Line.

Air in lines can cause pressure spikes.

Air forced from nozzle can increase intensity of fire or cause a pressure surge. Air discharge can injure or kill.

#### 2. Open air bleed valve for intake BEFORE cap is removed.

Intake connections with a shut-off (or gate) valve can trap pressure if valve is opened and left closed with cap in place. ALWAYS OPEN the intake air bleed valve to let trapped pressure escape BEFORE removing cap.

Air bleed valves are attached to a tube that is connected to the highest point of the pipe.

Opening the intake air bleed valve allows air trapped in the intake pipe to escape.

Rotate the knob one-quarter turn counterclockwise to the left to open the valve.

To make sure that all air pressure is removed from the system, keep the air bleed valves OPEN until you start flowing water. Only then may you close it.

#### 3. Remove intake cap.

Remove the intake cap only after you are certain that trapped air pressure has escaped.

Make sure to OPEN the air bleed valve or drain valve so that trapped air pressure escapes.

### **⚠ WARNING**

Point intake hose away from personnel.

Hoses and connections under pressure can burst without warning.

Burst hose can injure or kill.

Inspect hoses and fittings regularly.

Replace if worn or damaged.

Worn or damaged hoses and fittings can burst.

Burst hose or fittings can injure or kill.

#### 4. Connect intake hose.

Connect the intake hose that has been laid from the hydrant to the intake connection.


#### 5. Adjust the intake swivel.

If the intake connection includes a swivel fitting, adjust the swivel so that the hose points AWAY from the pump operator's area.

## Charging the Intake Line (Pressurized Supply)

Tank to Hydrant - Connect Intake Hose - WITH Gated Intake Valve (continued)	
<b>6. Charge the intake line.</b>	Once the intake hose is properly connected to the intake fitting, open the valve at the hydrant to allow water into the intake hose. Air will escape out the air bleed valve as it is forced from the hose by the incoming water.
<b>7. Close the air bleed valve.</b>	Close the air bleed valve after the air is gone from the intake line.

## Supplying the Pump

Tank to Hydrant - Connect Intake Hose - WITH Gated Intake Valve (continued)	
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">  <b>DANGER</b> </div> <p>Perform change to external water source properly.  Water flow can stop if change is performed incorrectly.  Loss of water flow can endanger fire attack crews, resulting in death or injury.</p>	
<b>8. Open intake gate valve.</b>	<p>OPEN the intake gate valve slowly to change the flow to the external supply.</p> <p>Always open the intake gate valve slowly. Air in the intake line will then enter the pump slowly. Air will be sucked through with a steady flow of water.</p> <p>If a large slug of air enters the pump, the pump can lose prime. Centrifugal pumps cannot pump air. If prime is lost, the attack lines will lose water pressure.</p>
<b>9. Close the tank-to-pump valve.</b>	<p>Once the intake gate valve is open, the water pressure from a pressurized source keeps water from flowing from the tank. A check valve in the tank-to-pump line keeps the pressurized supply from flowing water back into the tank.</p> <p>A draft source lacks intake pressure. Therefore water can continue to be drawn from the tank. If the tank is run dry, the pump can lose prime.</p> <p>After the gated intake valve is fully open, then slowly CLOSE the tank-to-pump valve to make sure that water is drawn from the external supply only.</p>
<b>10. Close tank-fill and recirculating valves.</b>	<p>As long as the discharge lines are flowing water, the pump will have fresh water to keep it cool. With the tank-to-pump valve closed and the tank-fill or recirculating valves OPEN, the tank will continue to fill until it overflows through the fill hatch.</p> <ol style="list-style-type: none"> <li>CLOSE the tank-fill or recirculating valves to avoid tank overflow.</li> <li>OPEN both valves again when pump cooling is required because discharge lines are CLOSED.</li> </ol>

### 3-11. Changing from Tank to Pressurized Water Supply (Without Gated Intake Valve)

If you change from the water tank to an external water source without an Intake Gate Valve, the water flow to the discharge attack lines must be stopped.

Pierce recommends that every pumper apparatus have an Intake Gate Valve.

Use these procedures if Gate Valve is absent.

#### **CAUTION**

Do not use pump without the inlet screen fitted.

#### Stopping Water Flow and Connecting the Intake Hose

**IMPORTANT:** Make sure fire fighters are withdrawn from attack area, because hoses will lose water.

#### Supply Water to Pump from Hydrant Without Gated Intake Valve

#### **WARNING**

Keep pump water cool. Do not operate the pump for extended periods with the discharge valves closed or the pump may overheat. The pump is fitted with a thermal relief valve to help prevent overheating.

##### 1. Close discharge valves.

Water pressure during transition period will fluctuate. Protect attack line personnel by closing discharge valves.

##### 2. Reduce pump speed to IDLE.

Running the pump without water will damage the seals and bearings. Reduce engine speed to IDLE to minimize wear on the pump while the water supply from the tank is stopped.

##### 3. Close tank-to-pump valve before removing intake cap.

CLOSE Tank-to-Pump Valve before the removing the Intake Cap to prevent tank water from flowing out the intake.

**NOTE:** Before connecting intake hose to pump, open hydrant valve and vent for 30 seconds to flush out gravel and debris.

##### 4. Connect intake hose to pump.

- a. Remove the Intake Cap.
- b. Connect the Intake Hose.

**Charging the Intake Hose**

<b>Supply Water to Pump from Hydrant Without Gated Intake Valve (continued)</b>	
<b>5. Open tank fill valve or discharge valve.</b>	OPEN the tank fill valve. Air in the intake hose must be expelled before water can reach the pump. Air will pass through the pump and out the OPEN tank fill valve.
- OR -	
	OPEN discharge valve and discharge drain valve. Water will flow out the discharge drain valve once the air escapes. Close the drain valve once air has escaped.
<b>6. Charge the intake hose.</b>	OPEN the water valve on the hydrant to allow water to flow through the intake hose and into the pump.
<b>7. CLOSE the tank fill valve once water tank is full.</b>	

**Resuming Discharge Operations**

<b>Supply Water to Pump from Hydrant Without Gated Intake Valve (continued)</b>	
<b>8. Open discharge valves slowly to resume attack operations.</b>	
<b>9. Increase pump speed to reach desired pressure.</b>	Continue to watch the master pressure gauge. Increase speed until you reach the pump discharge pressure you want.

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## 3-12. Refilling the Tank

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### **WARNING**

Do not exceed the specified inlet pressure and/or maximum fill rate.

**Maximum Fill Rate = 1,000 GPM (3,800 LPM) or the tank's capacity in GPM (LPM) (500 Gallon tank = 500 GPM) whichever is less.**

**Maximum inlet pressure for tank filling is 100 psi (7 bar).**

**Gate back flow into tank before reaching full level. Continue filling at a rate which allows excess water to be completely evacuated by the overflow pipe. Do not allow water to spill from the tank fill tower.**

**Failure to comply may cause over-pressurization of the tank and tank failure, which may result in severe personal injury or death.**

ALWAYS refill water tank as soon as possible. If the supply source is interrupted, a full tank of water allows you to continue flowing water to the attack lines while an external water source is being restored.

### **1. Open tank fill valve.**

OPEN the tank fill valve slowly to ¼ OPEN to divert some supply water into the water tank.

### **2. Watch intake and discharge pressure.**

Watch the discharge pressure gauges to make sure that you maintain attack hose flow at the desired pressure while you also fill the water tank.

If intake or discharge pressure drops below the desired pressure, either CLOSE the Tank Fill Valve to divert less water to the tank OR increase engine speed to maintain pressure.

Always keep the water tank full so that a steady discharge flow can be maintained if the intake supply must be shifted.

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## 3-13. Pump Priming Problem Solutions

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### **3-13.1 Control Valves That Leak**

#### **1. Cap unused discharge and intake pipes.**

Cap all unused discharge and intake pipes to reduce air leakage from a leaky valve.

## Pump Pressure Control and Systems Monitoring

### 3-14. Pump Pressure Control

#### 3-14.1 Engine Speed and Pump Pressure

##### **WARNING**

**Hand Throttle Systems can malfunction.**

**If engine control is lost at pump panel, assign someone to use foot pedal in cab to continue pumping operation.**

The pump pressure is controlled by regulating the engine speed. If the apparatus is equipped with a pressure governor, the governor will regulate the engine speed automatically to maintain the desired pump pressure.

#### 3-14.2 Determining Discharge Pressure

##### **WARNING**

**Hoses and nozzles can explode if over-pressurized.**

**NEVER exceed pressure rating of downstream devices.**

**Exploding devices can injure or kill.**

**Keep control of hose under pressure.**

**Hose under pressure wants to fly about.**

**Flying hose can injure or kill.**

The desired pump pressure is determined by:

- Engine speed
- Pump size
- Discharge restriction (size and length of discharge hose)
- Intake restriction (size and length of intake hose)
- System restriction (size and shape of valves, fittings, manifolds, etc.)

You must determine a pump pressure that will provide the desired nozzle pressure, based on the number and size of attack lines that are deployed.

Determine this pressure for all fire-fighting situations you might encounter, and record them on a pump chart. Keep the pump chart in a location accessible to the pump operator.

Refer to the IFSTA *Pumping Apparatus Driver/Operator Handbook* (latest edition) for procedures on creating a pump chart.

## 3-14.3 Pump Pressure Control - Without Pressure Governor

This section applies to apparatus not equipped with a pressure governor. See *“Pump Pressure Control With Pressure Governor (Pumping)”* on [page 3-34](#) for pressure governor-equipped apparatus.

**Figure 3-5: Engine Speed and Pump Pressure**



**HAND THROTTLE**



**DISCHARGE RELIEF VALVE**



**MASTER DISCHARGE PRESSURE GAUGE (RIGHT)**

POM0014, 0013, 0003

### 1. Observe interlock lamp.

If the interlock light above the Hand Throttle Control on the pump panel is ON, it means you can change engine RPMs.

Two sets of conditions will turn ON the light:

- Parking brake applied.
- Transmission in 4th gear lockup.
- Pump shift complete.

OR

- Parking brake applied.
- Transmission is in NEUTRAL.

If either set of conditions fails, the hand throttle will be disabled. Engine speed control is then controlled **ONLY** by the foot throttle pedal in the cab. That is the manual override.

## CAUTION

**For non-emergency situations, return the engine speed to idle by turning the hand throttle knob. Continual use of the red button will wear out the threads on the screw and cause premature failure of the hand throttle.**

### 2. Increase engine speed using hand throttle.

- a. Turn counterclockwise to the left to INCREASE engine speed.
- b. Turn clockwise to the right to DECREASE engine speed.
- c. Adjust friction collar to set resistance to main constant engine speed.
- d. Press red button to return engine speed to IDLE.

**⚠ WARNING**

**Emergency Stop button drops the engine to IDLE only.**

**Engine at IDLE creates water pressure.**

- If an emergency requires that water stop flowing, close the discharge valves.
- If an emergency requires that the engine stop, turn OFF the ignition switch in the cab.

**CAUTION**

**Press red shutdown button on the hand throttle after use to make sure it is set to lowest possible idle speed.**

**Hand throttle left at a higher speed will return to that speed when hand throttle control is resumed.**

**Practice hitting the Emergency Stop switch.**

**The Emergency Stop switch will drop the engine RPM to IDLE.**

**Practice this action until it is second nature, so you can bring engine to IDLE in an emergency.**

### **3. Emergency shut-off.**

- a. Push IN the red button to return engine speed to IDLE.
- b. Practice hitting the emergency stop button until the movement becomes automatic. In an emergency you want to react automatically.
- c. If you fail to shift from ROAD to PUMP, you can override the parking brake as you increase engine RPMs. If you feel the apparatus move, IMMEDIATELY push IN the emergency stop. It drops engine speed to IDLE. The wheel chocks and parking brake will then hold the vehicle in place.

### **4. Increase engine speed using optional electronic throttle.**

- a. Adjust engine speed using toggle switch.
- b. Press red button to return to IDLE. Red button is also an Emergency Stop. Practice using the Emergency Stop.

### **5. Observe master discharge pressure gauge.**

Increase or decrease engine speed to maintain the pump pressure you want. Watch the master discharge Gauge and adjust the engine speed faster or slower to get the pressure you want.

### **6. Activate discharge relief valve.**

For apparatus equipped with an ON/OFF switch, turn the discharge relief valve ON.

The discharge relief valve prevents pressure spikes. It limits the maximum discharge pressure by opening a gate and bypassing water back to inlet side of pump.

If the discharge pressure goes above the relief valve setting, water goes from the discharge manifold back into the intake manifold until the water pressure in the discharge manifold drops below the relief pressure.

### **WARNING**

**Pressure hazard. May result in personal injury. Always reduce pressure with engine throttle to ensure the relief valve is closed before turning the valve OFF.**

#### **7. Adjust discharge relief pilot valve.**

The discharge relief pilot valve controls the pressure relief setting.

Turn the pilot knob counterclockwise to the left until the amber OPEN indicator light is ON and there is a slight drop in discharge pressure. Then turn the pilot knob clockwise to the right slowly to the point where the amber OPEN light is OFF and the green CLOSED light is ON.

If the amber light is ON, the relief valve is open and flow is being bypassed. If more pressure is desired, the relief valve must be adjusted upward. If the current pressure setting is adequate, reduce the engine speed until the green light is ON.

#### **3-14.4 Pump Pressure Control With Pressure Governor (Pumping)**

In an apparatus equipped with a pressure governor, the governor will regulate the engine speed automatically to maintain the desired pump pressure. When placed in the PRESSURE CONTROL mode, the system will monitor pressure, increasing or decreasing the engine speed to maintain the set pressure.

### **WARNING**

**Apparatus equipped with pressure governors normally do not have pressure relief valves. The pressure governor performs the function of the relief valve.**

**Always pump in pressure control mode.**

**Pumping in throttle (RPM) control mode can cause high pressure and/or pressure spikes. Pressure spikes can injure or kill.**

**NOTE:** For additional information concerning the operation of specific pressure governors, refer to the following:

- PV-P-TM350, Pierce Pressure Governor Operator's Guide on CD-ROM and Group 2825-P-001, Pierce Pressure Governor System (in Service Manual)
- Group 2825-P-003, Pierce Hydraulic Water Pump Pressure Controller (in Service Manual)
- Group 2825-V-001, Class 1 Pressure Governor (in Service Manual)
- Group 2825-V-002, Detroit Diesel Electronic Fire Commander (in Service Manual)

#### **1. Select pressure control mode.**

Place pressure governor in the PRESSURE CONTROL mode. Switching methods will vary depending on the manufacturer of the pressure governor.

#### **2. Adjust desired pressure.**

Use the INCREASE or DECREASE controls to change the desired pressure setting.

### 3-14.5 Pump Pressure Control With Pressure Governor (Not Pumping)

The THROTTLE (RPM) CONTROL mode allows the operator to increase engine speed when not pumping, to increase alternator output, warm the engine, or other non-pumping operations.

**NOTE:** For additional information concerning the operation of specific pressure governors, refer to the following:

- PV-P-TM350, Pierce Pressure Governor Operator's Guide on CD-ROM and Group 2825-P-001, Pierce Pressure Governor System (in Service Manual)
- Group 2825-P-003, Pierce Hydraulic Water Pump Pressure Controller (in Service Manual)
- Group 2825-V-001, Class 1 Pressure Governor (in Service Manual)
- Group 2825-V-002, Detroit Diesel Electronic Fire Commander (in Service Manual)

**1. Select throttle (RPM) control mode.**

**2. Adjust desired engine speed (RPM).**

Press the red button to cancel the current mode and return the engine speed to idle.

The red button also serves as the emergency stop. Practice using the emergency stop.

### 3-14.6 Controlling Engine Speed with Multiple Controls

#### **WARNING**

**Transferring engine speed control between Hand Throttle and Pressure Governor can cause a jump in engine speed.**

**Engine speed changes can cause discharge water pressure spikes.**

**Spikes in discharge pressure can cause hoses to kick with great force, causing injury.**

Some apparatus have both a hand throttle and a pressure governor. The throttle selector switch determines which control is ON.

If hand throttle is selected, you will control engine speed manually.

If pressure governor is selected, the pressure governor controls engine speed.

ALWAYS return the control you are not using to the IDLE position.

---

### 3-15. Monitoring Intake Pressure

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#### **DANGER**

Maintain positive intake pressure with soft intake hose.  
Negative intake pressure will collapse soft intake hose.  
Attack lines will lose water pressure if hose collapses.  
Loss of water supply will endanger fire fighters on attack lines.

#### **CAUTION**

**NEVER** cavitate pump.  
Low intake pressure or high vacuum can cause pump cavitation.  
Cavitation can:

- Cause loss of water pressure.
- Damage pump components, requiring expensive repairs.

Avoid water hammer.  
Water hammer can damage the pump system.

The master intake gauge shows the intake manifold pressure.

**1. Watch intake pressure.**

Look often at the intake pressure on master intake gauge while pumping.

**2. Maintain 20 PSI intake pressure (pressurized supply).**

Maintain intake pressure at or above 20 PSI when operating from a pressurized external supply.

This provides a safety factor to avoid drawing a vacuum on the intake hose.

Changes in supply pressure can cause intake pressure to drop without warning. Drop in pressure below zero (0) PSI can cause water hammer, pump cavitation, or collapse the intake hose AND cause loss of water flow.

**NOTE:** 20 PSI may not be attainable in certain areas, depending on the hydrant system. For additional information, consult your Fire Department standard operating procedures.

**3. Maintain 20 in. Hg. vacuum (draft supply).**

When operating from draft, always maintain 20 in. Hg. of vacuum or less. Intake vacuum of more than 20 in. Hg. can cause pump to cavitate.

**4. Avoid pump cavitation.**

Pump cavitation is happening when:

- Discharge pressure changes up and down.
- You hear a sound like gravel churning in the pump.
- Discharge pressure remains the same when you change engine speed.

Reduce discharge flow until cavitation ceases.

### 3-16. Engine Status Display

Figure 3-6: Typical Engine Status Displays



POM0027, 0028

The Engine Status Display is either a group of gauges and indicator lights or an electronic display that gives you critical information on engine performance.

You must watch this information often during pump operation, and react to any abnormal readings.

Engine information includes:

- **Engine Speed:** shows current engine speed in RPMs.
- **Engine Oil Pressure Gauge:** shows engine oil pressure.
- **Engine Temperature Gauge:** shows oil temperature of the engine.
- **Electrical System Voltage Meter:** measures the voltage level of the vehicle's battery system.
- **Stop Engine Light**

#### **⚠ DANGER**

Replace apparatus when STOP ENGINE light is ON.

Engine can fail at any time without further warning.

Engine failure will stop water flow to attack lines, putting fire-fighting personnel in danger.

If the Stop Engine light turns ON, the engine's ECU (electronic control unit) has detected a critical error condition. That means engine failure is possible at any moment. Read and study the engine manufacturer's operations manual so you know how to react. **Practice your reaction to all different kinds of failure.** You need to be prepared in advance so you can react properly in an emergency.

Fire apparatus programming does not allow a critical engine failure to automatically stop the engine. The engine will continue to run until it self-destructs or fails.

It is your judgment call to balance the risks of damage to the engine with the need for the fire apparatus to remain operational.

If possible, replace the apparatus with another apparatus RIGHT AWAY if this light comes on.

- **Check Engine Light**

If the Check Engine light turns ON, the engine's ECU detects a non-critical error condition. Immediately check all gauges at the pump panel and compare with the readings of those in the cab. Compare both readings to normal operating parameters. This will help you make the decision to continue to run the apparatus or replace it with another. If the Check Engine light remains ON, schedule the engine for maintenance.

- **Check Transmission Light**

The Check Transmission light turns ON if the transmission's control unit detects a non-critical error. If the Check Transmission light remains ON, schedule the transmission for maintenance.

## Two-Stage Pump

### 3-17. Two-Stage Pump Operation (Optional)

Two stage pumps have two smaller impeller chambers instead of one large chamber. Water is directed through both chambers in parallel when large flow is desired at moderate pressure.

Water is directed through each chamber in series when moderate flow at high pressure is desired.

Read, understand, and practice the procedures for two-stage pump operation found in the pump manufacturer's operation manual.

#### 3-17.1 Select Either Volume or Pressure Mode

Figure 3-7: Typical Electric Transfer Valve Controls



POM0025, 0026

Shift the Transfer Valve to the VOLUME setting for high flow at moderate pressure.

Shift the Transfer Valve to the PRESSURE setting for moderate flow at high pressure.

#### 3-17.2 Mode Selection with Pressurized Sources

**NOTE:** For departments operating with higher hydrant pressures:

- If the external intake pressure is high, then a pump in PRESSURE mode is able to run with engine RPM slightly above IDLE to provide desired discharge pressure. In this condition, the engine speed cannot be reduced enough for a pressure governor to react to pressure spikes caused when discharge lines are shut OFF.
- To avoid such pressure spikes, operate the Two-Stage Pump in VOLUME mode. This causes the engine to operate at a higher speed. The pressure governor then has more ability to control pressure spikes.

Operate a Two-Stage Pump in the VOLUME mode when pump is supplied by a pressurized external water source AND a pressure governor is used.

### 3-17.3 Priming a Two-Stage Pump

#### **CAUTION**

Changing between stages on a two-stage pump can cause a pressure spike in discharge hoses.  
Give all fire suppression crews warning **BEFORE** changing stages.

Shift the Transfer Valve to the VOLUME setting when priming a two-stage pump.

## After Operation

### 3-18. Ending Water Flow Operation

#### 3-18.1 Shutting Off Water Flow

**1. Reduce engine speed to IDLE.**

**2. Close discharge valves.**

Close all discharge and inlet valves slowly to prevent water hammer.

**3. Disengage the pump.**

For driveline driven pump:

- See *“Pump Disengagement (Driveline Driven Pump)”* on *page 3-13*.
- For PTO-driven pump:
- See *“Disengaging the Pump - PTO Driven Pump (Stationary Operation)”* on *page 3-17* or *“Disengaging the Pump - PTO Driven Pump (Pump and Roll Operation)”* on *page 3-17*.

### 3-19. Securing Pump System

#### ⚠ CAUTION

The pumping system should be drained during cold weather. See *“Draining the Pumping System”* on *page 4-2* for additional information.

Securing Pump System	
<b>1. Open drain valves and bleed valves.</b>	Open all pressure release valves to vent any trapped air pressure and water.
<b>2. Open nozzles.</b>	Relieve pressure from un-gated inlet hose by opening discharge nozzles.
<b>3. Remove hose.</b>	Remove all hoses from discharge and intake lines.
<b>4. Replace caps.</b>	Install caps on intake and discharge connections to protect from contamination.
<b>5. Flush pump.</b>	Flush the priming system with clean, fresh water if required.
<b>6. Purge primer.</b>	If equipped with a fluid-lubricated primer pump, operate the primer pump until primer fluid comes out of the primer pump discharge. Check primer fluid tank level, and fill if needed.





## General Maintenance

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### 4-1. Annual Testing

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Test all pumping apparatus annually per the specifications in NFPA 1911, *Standard for the Inspection, Maintenance, Testing and Retirement of In-Service Automotive Fire Apparatus* (latest edition).

These tests are necessary to make sure that the apparatus will continue to perform to specification.

These tests help prevent breakdowns.

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### 4-2. Inspection, Cleaning, and Maintenance

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#### 4-2.1 Maintenance Schedule

Develop a Standard Operating Procedure for the daily, weekly, monthly, and annual inspection and maintenance of this fire apparatus after careful review of all documentation provided. Inspection and maintenance requirements for components such as monitors, foam systems, flow meters, valves, etc., must be established by referencing the service manuals.

Follow the pump manufacturer's inspection and maintenance recommendations.

Follow the procedures for inspection, cleaning, and maintenance found in the IFSTA *Pumping Apparatus Driver/Operator Handbook* (latest edition).

Follow instructions regarding inspection, cleaning, and maintenance located in the Pierce Custom Chassis Operation & Maintenance Manual (Publication No. PM-C-OM014) or the Pierce Commercial Chassis Supplement (Publication No. PM-C-OM090).

## Pump Maintenance

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### 4-3. Draining the Pumping System

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#### CAUTION

Freezing water can damage pipes, valves, primers, and gauges.

If you are moving a truck containing water outside when temperatures will approach freezing (32°F / 0°C), make sure that all fittings, valves, waterlines and caps have been opened or removed.

These include, but are not limited to: drain valves, discharge valves, intake valves, etc.

Following this recommendation could prevent damage to critical water system components and avoid costly repairs.

**NOTE:** If it is desired to retain water in the water tank, the Tank to Pump and Tank Fill valves should be left in the closed position.

Every part of the water pump system must be drained if exposed to freezing temperatures.

1. **Locate the lowest points on every plumbing line and the drain valve that opens it.**
2. **Remove caps.**  
AFTER opening air bleeder valves, remove all intake and discharge caps.
3. **Open master pump drain.**

**Figure 4-1: Typical Master Pump Drains**

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POM0029, 0030

The master pump drain ([Figure 4-1](#)) will empty both the discharge and inlet manifolds of water when opened.

4. **Open discharge line drains.**  
Locate each discharge line and open the drain valves.
5. **Open intake line drains.**  
Locate each intake line and open the drain valves.
6. **Open intake relief valve drain—on apparatus equipped with relief valves.**
7. **Open control valves.**  
Open all intake and discharge valves.

#### 8. **Purge primer.**

Primer should be purged regularly in cold weather to prevent the primer from freezing.

#### 9. **Allow water to drain.**

#### 10. **Close all valves.**

**NOTE:** If your apparatus is equipped with a foam system, refer to the applicable foam system manual for draining procedures.

---

### 4-4. **Flushing the Drain Valves**

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#### 4-4.1 **Forward Flushing**

Drain valves are the lowest point in the pump system. Dirt and debris in the water will settle in the drain valve bodies. Flush each drain valve with clean water monthly or after pumping dirty or salty water. Flush drain valves to prevent sediment from accumulating in the valve body and hurting proper operation of the drain valve.

##### 1. **Fill water tank.**

Begin flushing procedure with a full water tank of clean, fresh water.

##### 2. **Cap all intake and discharge connections.**

Cap all connections to hold the clean water from the tank in the pumping system.

##### 3. **Open all intake and discharge valves.**

Open all control valves to allow fresh water to reach all points in the pumping system.

##### 4. **Open the tank-to-pump valve.**

Open the tank-to-pump valve to flood the pumping system with clean water.

##### 5. **Open drain valves one at a time.**

Open each drain valve. Keep open until a steady stream of water flows from the valve for 20 seconds. If no water or reduced water flows, find out why water fails to drain and make a repair.

##### 6. **Close tank-to-pump valve.**

Close the tank-to-pump valve to prevent any more water from entering the pumping system.

##### 7. **Open drain valves.**

Open each drain valve again until remaining water is drained from the system.

##### 8. **Remove caps.**

Remove intake and discharge caps.

##### 9. **Allow water to drain.**

##### 10. **Close all intake and discharge valves.**

##### 11. **Replace caps.**

Replace intake and discharge caps.

##### 12. **Close drain valves.**

##### 13. **Refill water tank.**

### 4-4.2 Back Flushing

The pump should be back flushed with municipal water after salt water or other debris have entered the pump.

**1. Remove suction strainers.**

Remove the suction strainers so they are not blown out of the pump.

**2. Open transfer valve (if applicable).**

Hold the transfer valve clapper, in the second stage volute entrance, open so debris is not trapped behind it.

**3. Pump water.**

Pump fresh, clean water through all of the inlets and outlets, until you see only clear water.

**4. Open & close valves.**

Open and close all discharge and intake valves to flush them with clean water.

**5. Activate primer.**

In the case of salt water pumping, activate the primer to get clear water through the primer valve and pump.

**6. Activate pressure relief valve.**

Activate the pressure relief valve with the pilot valve to flush that system, and move the transfer valve from volume to pressure a few times (if the pump is so equipped).

---

### 4-5. Flushing and Draining the Pump

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#### **DANGER**

**Pump packing gland and pump body heats to high temperatures during operation.  
Touching hot areas of pump will burn.  
Allow pump to cool before servicing.**

Flush the pumping system after pumping dirty, contaminated, or salty water.

**1. Supply clean, fresh water.**

Supply clean, fresh water to the pumping system.

**2. Open discharge valves.**

Open all discharge valves so that clean, fresh water flows through each discharge line and valve for one minute.

**3. Fill tank.**

Fill the water tank with clean, fresh water.

**4. Flush drain valves.**

Flush all drain valves using the procedure listed under *“Flushing the Drain Valves”* on [page 4-3](#).

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## 4-6. Pump Storage

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### CAUTION

Store pump completely full of clean water, or completely dry.

Do not leave pump partially full of water.

Always store pump dry in freezing weather.

In warm temperatures store pump either entirely full of water or completely empty.

Pumps stored partially full of water will rust at the air-to-water interface.

In freezing temperatures store pumps dry, without any water in the pump chamber.

---

## 4-7. Primer Pump Lubrication

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### CAUTION

Use environmentally-friendly priming lubricants or use procedures that capture the oil as it is expelled.

Expelling standard motor oil used as a lubricating fluid in the primer pump does not meet EPA regulations.

Figure 4-2: Primer Pump Lubrication Fluid or Oil Reservoir



POM0031

Some primer pumps require a lubricating fluid or oil. The fluid reservoir ([Figure 4-2](#)) is normally located in the pump house behind an access panel or access door.

For oil-type priming pumps, the lubricant is expelled with the air as the pump is primed.

Use only lubricating fluid that is approved by the manufacturer of the pump and approved for use in the environment.

### 4-8. Manual Pump Shift

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Operate the manual pump shift control weekly to prevent build up of dirt, grime, and road debris that will inhibit the smooth operation of the cable.

### 4-9. Intake & Discharge Relief Valve Drains *(Optional)*

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Figure 4-3: Relief Valve Drain



POM0032

Inlet and discharge relief valves can trap water inside the mechanism of the valve. Drain trapped water from the valve daily, and before operating apparatus in freezing temperatures. Frozen water will damage the valve.

### 4-10. Master Gauge Ports

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Vacuum and pressure test ports are provided for use during the annual testing and certification of the pump.

#### CAUTION

Master gauge testing and calibration should only be performed by trained maintenance personnel. NEVER remove plugs in these ports except for test purposes.

#### 1. Test master gauges annually.

- The VACUUM test port leads directly to the master intake gauge line.
- The PRESSURE test port leads directly to the master discharge gauge line.
- Use certified test gauges to check and calibrate master gauges.



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