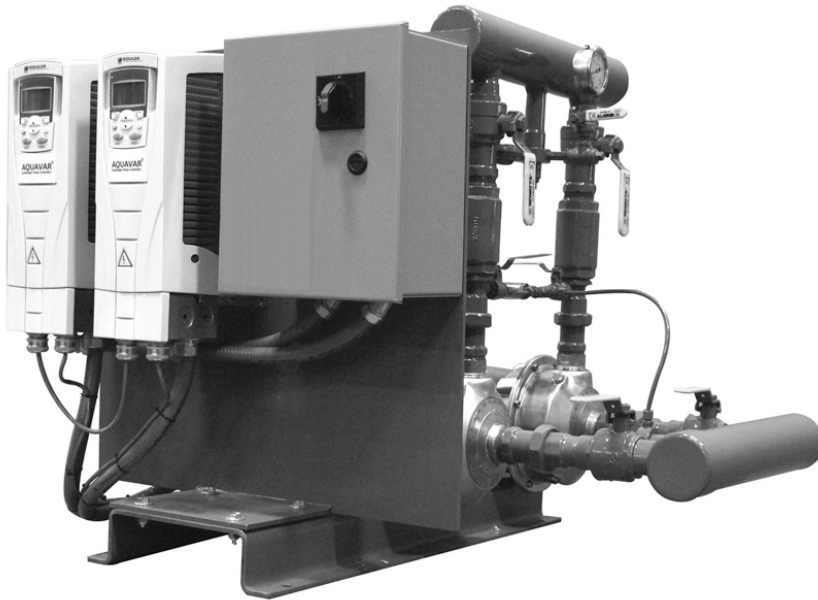
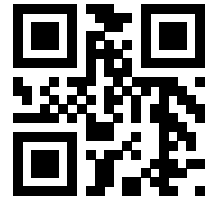




Variable Speed



AquaBoost VS Pumping Packages

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1 Introduction and Safety

1.1 Introduction

Purpose of this manual

The purpose of this manual is to provide necessary information for:

- Installation
- Operation
- Maintenance



CAUTION:

Read this manual carefully before installing and using the product. Improper use of the product can cause personal injury and damage to property, and may void the warranty.

NOTICE:

Save this manual for future reference, and keep it readily available at the location of the unit.

1.2 Safety



WARNING:

- The operator must be aware of safety precautions to prevent physical injury.
- Operating, installing, or maintaining the unit in any way that is not covered in this manual could cause death, serious personal injury, or damage to the equipment. This includes any modification to the equipment or use of parts not provided by Xylem. If there is a question regarding the intended use of the equipment, please contact a Xylem representative before proceeding.
- Do not change the service application without the approval of an authorized Xylem representative.



CAUTION:

You must observe the instructions contained in this manual. Failure to do so could result in physical injury, damage, or delays.

1.2.1 Safety terminology and symbols

About safety messages

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards:

- Personal accidents and health problems
- Damage to the product and its surroundings
- Product malfunction

Hazard levels

Hazard level	Indication
 DANGER:	A hazardous situation which, if not avoided, will result in death or serious injury

Hazard level	Indication
 WARNING:	A hazardous situation which, if not avoided, could result in death or serious injury
 CAUTION:	A hazardous situation which, if not avoided, could result in minor or moderate injury
NOTICE:	Notices are used when there is a risk of equipment damage or decreased performance, but not personal injury.

Special symbols

Some hazard categories have specific symbols, as shown in the following table.

Electrical hazard	Magnetic fields hazard
 Electrical Hazard:	 CAUTION:

1.2.2 Protecting the environment

Emissions and waste disposal

Observe the local regulations and codes regarding:

- Reporting of emissions to the appropriate authorities
- Sorting, recycling and disposal of solid or liquid waste
- Clean-up of spills

Exceptional sites



CAUTION: Radiation Hazard

Do NOT send the product to Xylem if it has been exposed to nuclear radiation, unless Xylem has been informed and appropriate actions have been agreed upon.

Recycling guidelines

Always follow local laws and regulations regarding recycling.

1.3 User safety

General safety rules

These safety rules apply:

- Always keep the work area clean.
- Pay attention to the risks presented by gas and vapors in the work area.
- Avoid all electrical dangers. Pay attention to the risks of electric shock or arc flash hazards.
- Always bear in mind the risk of drowning, electrical accidents, and burn injuries.

Safety equipment

Use safety equipment according to the company regulations. Use this safety equipment within the work area:

- Hard hat
- Safety goggles, preferably with side shields
- Protective shoes
- Protective gloves
- Gas mask
- Hearing protection
- First-aid kit
- Safety devices

NOTICE:

Never operate a unit unless safety devices are installed. Also see specific information about safety devices in other chapters of this manual.

Electrical connections

Electrical connections must be made by certified electricians in compliance with all international, national, state, and local regulations. For more information about requirements, see sections dealing specifically with electrical connections.

Precautions during work

Observe these safety precautions when you work with the product or are in connection with the product:

- Never work alone.
- Always wear protective clothing and hand protection.
- Stay clear of suspended loads.
- Always lift the product by its lifting device.
- Beware of the risk of a sudden start if the product is used with an automatic level control.
- Beware of the starting jerk, which can be powerful.
- Rinse the components in water after you disassemble the pump.
- Do not exceed the maximum working pressure of the pump.
- Do not open any vent or drain valve or remove any plugs while the system is pressurized. Make sure that the pump is isolated from the system and that pressure is relieved before you disassemble the pump, remove plugs, or disconnect piping.
- Never operate a pump without a properly installed coupling guard.

1.3.1 Wash the skin and eyes

Follow these procedures for chemicals or hazardous fluids that have come into contact with your eyes or your skin:

Condition	Action
Chemicals or hazardous fluids in eyes	1. Hold your eyelids apart forcibly with your fingers. 2. Rinse the eyes with eyewash or running water for at least 15 minutes. 3. Seek medical attention.
Chemicals or hazardous fluids on skin	1. Remove contaminated clothing. 2. Wash the skin with soap and water for at least 1 minute. 3. Seek medical attention, if necessary.

2 Transportation and Storage

2.1 Examine the delivery

2.1.1 Examine the package

1. Examine the package for damaged or missing items upon delivery.
2. Record any damaged or missing items on the receipt and freight bill.
3. If anything is out of order, then file a claim with the shipping company.
If the product has been picked up at a distributor, make a claim directly to the distributor.

2.1.2 Examine the unit

1. Remove packing materials from the product.
Dispose of all packing materials in accordance with local regulations.
2. To determine whether any parts have been damaged or are missing, examine the product.
3. If applicable, unfasten the product by removing any screws, bolts, or straps.
Use care around nails and straps.
4. If there is any issue, then contact a sales representative.

2.2 Transportation guidelines

2.2.1 Lifting methods



WARNING:

- Assembled units and their components are heavy. Failure to properly lift and support this equipment can result in serious physical injury and/or equipment damage. Lift equipment only at the specifically identified lifting points. Lifting devices such as eyebolts, slings, and spreaders must be rated, selected, and used for the entire load being lifted.
 - Crush hazard. The unit and the components can be heavy. Use proper lifting methods and wear steel-toed shoes at all times.
-

2.3 Storage guidelines

Storage location

The product must be stored in a covered and dry location free from heat, dirt, and vibrations.

NOTICE:

Protect the product against humidity, heat sources, and mechanical damage.

NOTICE:

Do not place heavy weights on the packed product.

2.3.1 Long-term storage

If the unit is stored for more than 6 months, these requirements apply:

- Store in a covered and dry location.
- Store the unit free from heat, dirt, and vibrations.
- Rotate the pump shaft by hand several times at least every three months.

Treat bearings and machined surfaces so that they are well preserved. Refer to the drive unit and coupling manufacturers for their long-term storage procedures.

For questions about possible long-term storage treatment services, please contact your local sales and service representative.

3 Product Description

3.1 General description

AquaBoost VS pumping package

The AquaBoost Variable Speed pumping package can precisely match the pump discharge pressure to the system pressure by varying the speed of the pump. This is accomplished by using the variable-speed controllers such as the AquaBoost II and Aquavar CPC.

The pressure transducer monitors the system pressure, allowing the controller to start and regulate the pump speed. AquaBoost VS is available in simplex and duplex configurations.



WARNING:

This product can expose you to chemicals including Lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to: www.P65Warnings.ca.gov.

3.1.1 Operational limits

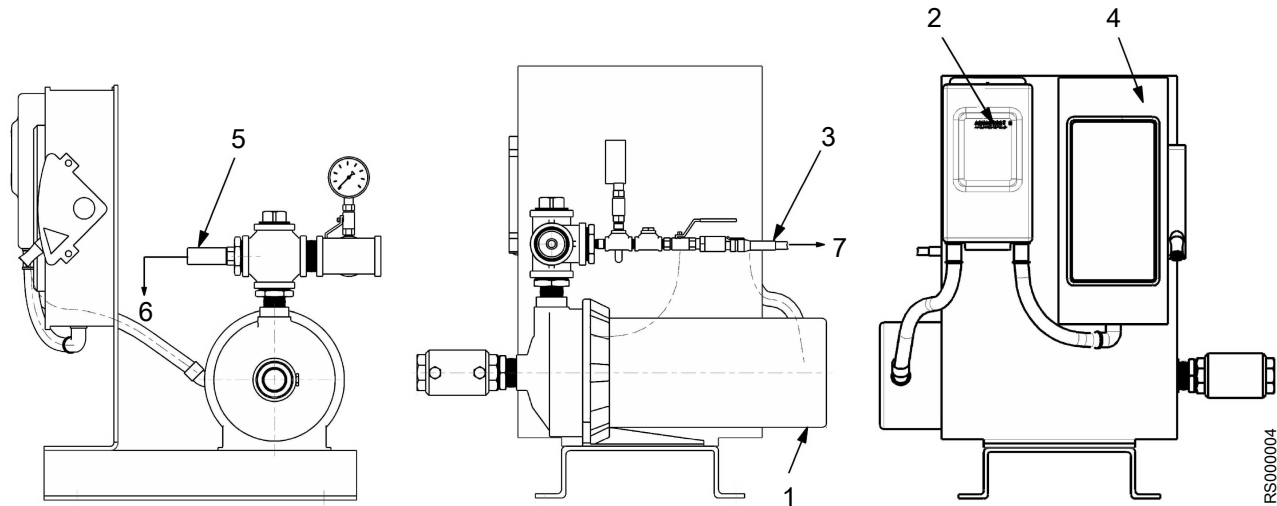
Ambient temperature and humidity

All electrical equipment is susceptible to failure if operated in ambient temperatures outside of its rating. Do not operate the unit outside these extremes.

Characteristic	Specification
Operating temperature range	32°F to 105°F (0°C to 40°C)
Maximum relative humidity	95% non-condensing

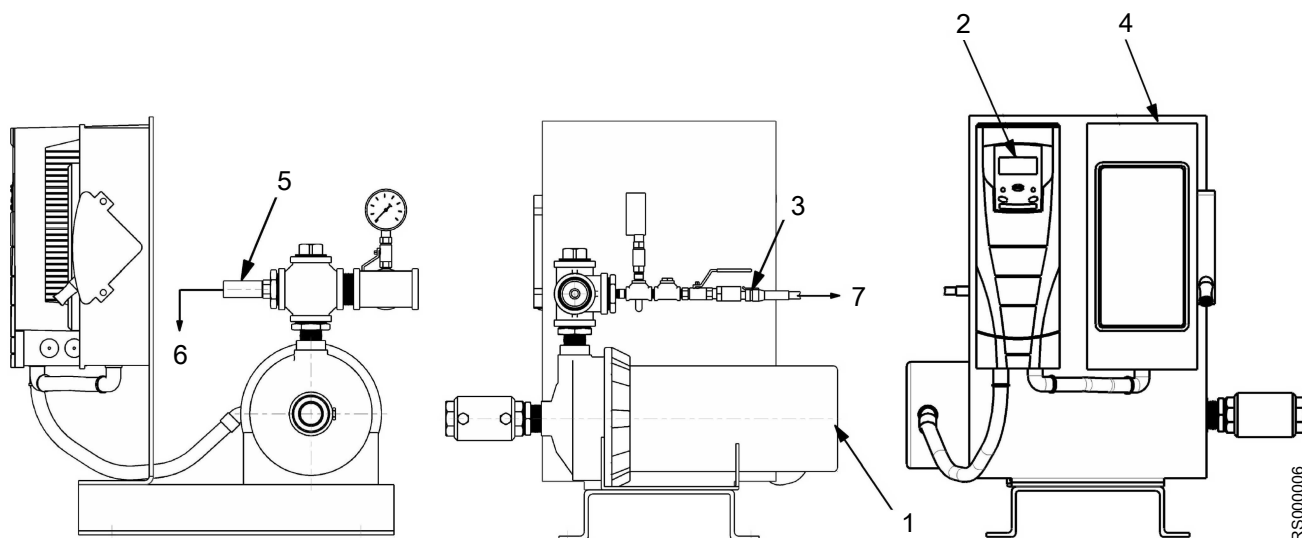
3.1.2 Package information

AquaBoost VS simplex



This variable-speed configuration uses the AquaBoost II controller model 1151AB2 or 2AB2 (for single-phase power supply: 115V - 0.75 hp; 230V - 1.5 to 2 hp range).

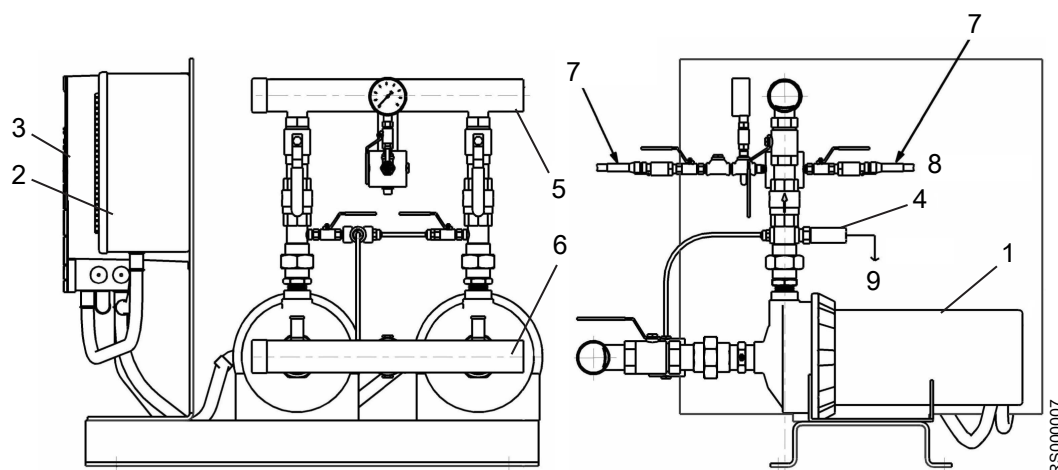
- 1. Pump: NPE with TEFC motor
- 2. AquaBoost II controller
- 3. Transducer assembly
- 4. Safety switch
- 5. Temperature relief valve
- 6. To drain
- 7. To controller



This variable-speed configuration uses the Aquavar CPC controller (for 3 & 5 HP 208-230/1, and 1.5-to-5 HP 3 PH power supply).

1. Pump: NPE with TEFC motor
2. Aquavar CPC controller
3. Transducer assembly
4. Safety Switch
5. Temperature relief valve
6. To drain
7. To controller

AquaBoost VS duplex



This variable-speed duplex configuration uses the Aquavar CPC controller (for 3-phase power supply: 1.5 to 5 hp range).

1. Pump: NPE with TEFC motor
2. Safety switch single-point power panel
3. Aquavar CPC controller
4. Temperature relief valve
5. Discharge header: copper L-type
6. Suction header: copper L-type
7. Pressure transducer assembly
8. To controller
9. To drain

3.2 Nameplate information

Nameplate

Every pump station has a nameplate that provides information about the pump station. The pump station nameplate is located on the outside of the control enclosure door.

When ordering spare parts, please be prepared to identify the nameplate information when contacting the factory.

- Model
- Size
- Serial number
- Item numbers of the required parts

Diagram of a pump station nameplate with the following fields:

- Model number
- Serial number
- Voltage
- Phase
- Hz
- SCCR
- FLA
- Max. HP

The nameplate is labeled RS000033.

Nameplate field	Explanation
Model number	The model number of the pump station
Serial number	The serial number of the pump station
Voltage	Input voltage required for the pump station
Phase	Single-phase or 3-phase
Hz	Frequency
SCCR	Short circuit current rating
FLA	Full load amps
Max. HP	Maximum horsepower

Model number designation

Number of pumps	Pump model / rpm	HP	Voltage / Phase	Impeller diameter (inches)	Control
1	A (1x1-1/4, 3600)	05 = 1/2	1 = 115/1/60	A = 4-5/8	
2	B (1-1/4x1-1/2, 3600)	07 = 3/4	2 = 208/3/60	B = 5-1/16	-VS = variable speed
		10 = 1	3 = 380/3/50	C = 5-3/16	
		15 = 1.5	4 = 460/3/60	D = 5-3/4	
		20 = 2	5 = 575/3/60	E = 5-15/16	
		30 = 3	6 = 230/1/60	F = 6-1/8	
		50 = 5	7 = other	Z = other	
			8 = 230/3/60		
			A = 208-230/3/60*		
			B = 208-230/1/60*		

Owner's information

Fill in the right-hand column with the information specific to your pump station.

AquaBoost CS/VS model number	
Pump model number	
Pump serial number	
Control panel model number	
Dealer	
Dealer phone number	
Date of purchase	
Date of installation	

Electrical ratings at startup	Current	
	Voltage	
	Phase	

4 Installation

4.1 Field connections

Review the field piping diagrams and wiring diagrams before you install and operate the unit.

Electrical precautions



WARNING:
Electrical shock hazard. The electrical supply must match the control panel nameplate specification. Incorrect voltage can cause a fire, which damages the electrical components and voids the warranty. Failure to follow these instructions could result in serious personal injury or death, or property damage.

NOTICE:
Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.

Power wiring

Select power wire types and sizes based upon conformance with the National Electrical Code and all local codes and restrictions. In addition, only copper (Cu) wire rated for at least 167°F (75°C) can be used for the power connections. Refer to the input current as listed on the motor nameplate when sizing wire.

Power supply requirements

The power supply required for the AquaBoost VS unit depends on its model number. It can be one of the following with a dedicated ground wire:

- 115/1/60
- 230/1/60
- 208, 230, 460, 575/3/60
- 380/3/50



WARNING:
Electrical shock hazard. Conduit grounds are not adequate. You must attach a separate ground (earth) wire to the ground (earth) lug provided in the enclosure in order to avoid potential safety hazards. Failure to follow these instructions can result in serious personal injury, death, or property damage.

Input voltage tolerance

The input voltage tolerance is $\pm 10\%$ of the voltage indicated on the nameplate.

Overload protection for constant-speed units

Motor type	Overload protection	Description
Single-phase	Internal	• Disconnecting means • Fuses for short-circuit protection
Three-phase	External in the control panel	• Disconnecting means • GV2Ps / manual starters with thermal overload for short-circuit protection in the control panel

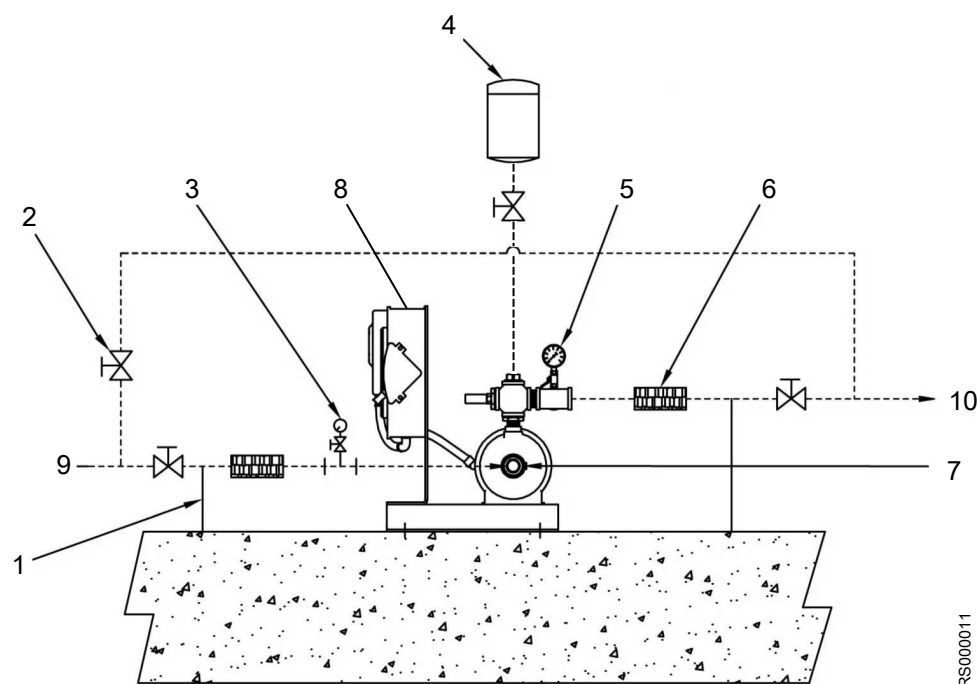
Overload protection for variable-speed units

Variable-speed units have a single-point power panel with fuses for protection against voltage spikes. In addition, the controllers have inherent features that protect the unit against:

- short circuit
- undervoltage
- overload
- motor temperature
- dead heading
- run out
- suction loss
- sensor fault
- bound pump
- overvoltage
- static discharge

4.1.1 Field piping diagrams

AquaBoost VS simplex

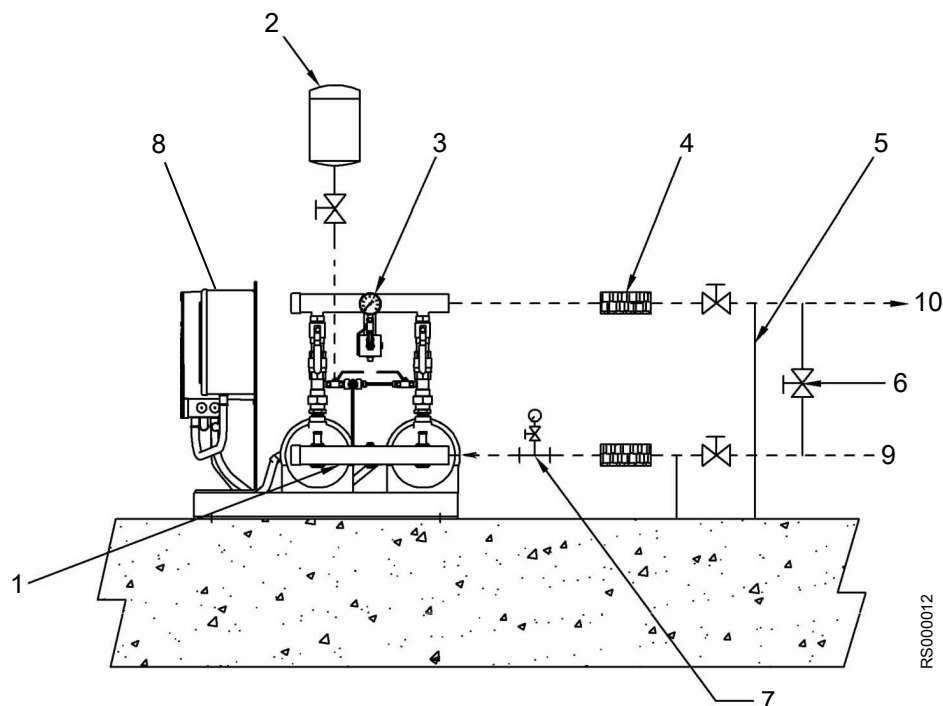


Typical field piping arrangement for the AquaBoost Variable Speed simplex pumping package.

1. Anchor the pipe securely if vibration eliminators are used.
2. If a bypass line is installed, then this valve must be kept closed during normal operation. Do not install a check valve.
3. Suction gauge, recommended
4. Optional tank
5. Discharge gauge
6. Vibration eliminator
7. 1/4 in. inlet tap on the check valve for low-suction pressure switch
8. Controller: AquaBoost II or Aquavar CPC
9. City supply
10. To system

--- Dashed lines indicate field installation.

AquaBoost VS duplex



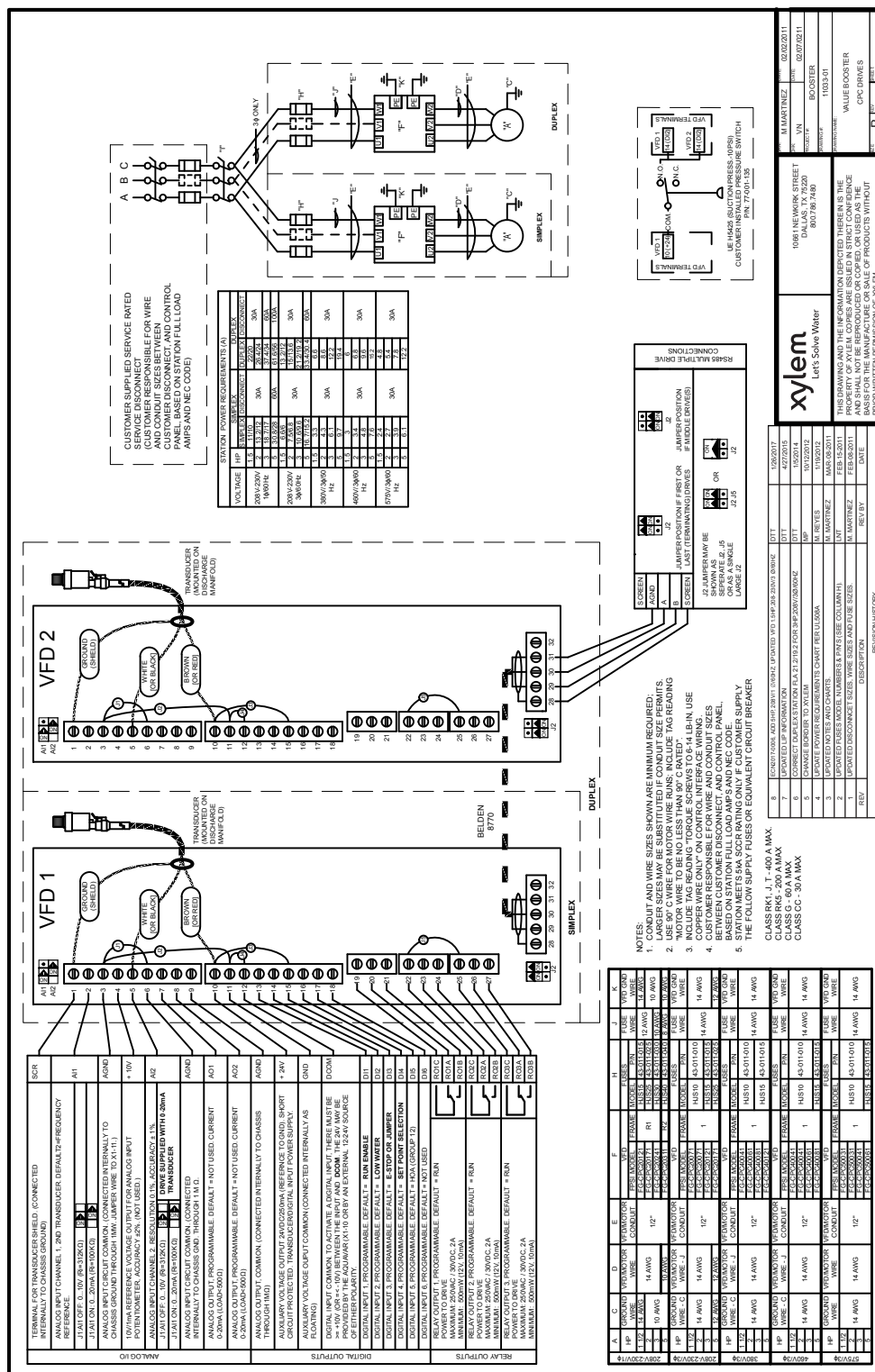
Typical field piping arrangement for the AquaBoost Variable Speed duplex pumping package.

1. 1/4 in. tap on the suction manifold for low-suction pressure switch
2. Optional tank
3. Discharge gauge
4. Vibration eliminator
5. Anchor the pipe securely if vibration eliminators are used.
6. If a bypass line is installed, then this valve must be kept closed during normal operation. Do not install a check valve.
7. Suction gauge, recommended
8. Controller: Aquavar CPC
9. City supply
10. To system

— — — Dashed lines indicate field installation.

4.1.2 Wiring diagrams

AquaBoost VS - Aquavar CPC controls





Electrical shock hazard. Conduit grounds are not adequate. You must attach a separate ground (earth) wire to the ground (earth) lug provided in the enclosure in order to avoid potential safety hazards. Failure to follow these instructions can result in serious personal injury, death, or property damage.

A grounding terminal is provided for a dedicated ground (earth) wire connection. You must follow all provisions of the National Electrical Code and local codes.

4.3 Pump package location guidelines



WARNING:

Assembled units and their components are heavy. Failure to properly lift and support this equipment can result in serious physical injury and/or equipment damage. Lift equipment only at the specifically identified lifting points. Lifting devices such as eyebolts, slings, and spreaders must be rated, selected, and used for the entire load being lifted.

Guideline	Explanation/comment
Make sure that the space around the pump package is sufficient.	This facilitates ventilation, inspection, maintenance, and service.
If you require lifting equipment such as a hoist or tackle, make sure that there is enough space above the pump package.	This makes it easier to properly use the lifting equipment and safely remove and relocate the components to a safe location.
Use traditional lifting equipment (safety belt, sling, or chain) to secure assembly. Corner holes in base have been provided for installation of an approved lifting eyebolt and nuts (not furnished with package).	Prevention against overturning the package
Protect the unit from weather and water damage due to rain, flooding, and freezing temperatures.	This is applicable if nothing else is specified.
Do not install and operate the equipment in closed systems unless the system is constructed with properly-sized safety and control devices.	Acceptable devices: • Pressure relief valves • Compression tanks • Pressure controls • Temperature controls • Flow controls If the system does not include these devices, consult the engineer or architect in charge before you operate the pump.
Take into consideration the occurrence of abnormal noise and vibration.	The best pump location for noise and vibration absorption is on a concrete floor with subsoil underneath.

4.4 Foundation requirements

Requirements

- The foundation must be able to absorb any type of vibration and form a permanent, rigid support for the unit.
- The foundation must weigh at least 2-1/2 times the weight of the pump unit.
- Provide a flat, substantial concrete foundation in order to prevent strain and distortion when you tighten the foundation bolts.
- Sleeve-type and J-type foundation bolts are most commonly used. Both designs allow movement for the final bolt adjustment.
- Tie the concrete pad in with the finished floor.

4.5 Level the base on a concrete foundation

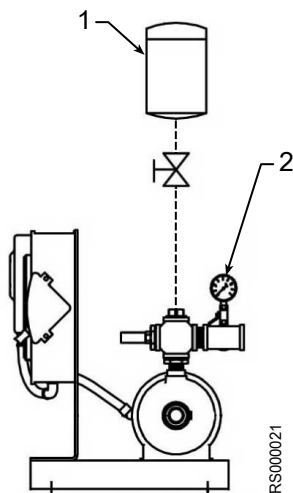
1. Place the pump package on its concrete foundation.
2. Place 1.00 in. (25.40 mm) thick steel shims or wedges on both sides of each anchor bolt in order to support the pump package.

Make sure that you also place the shims or wedges midway between the bolts.

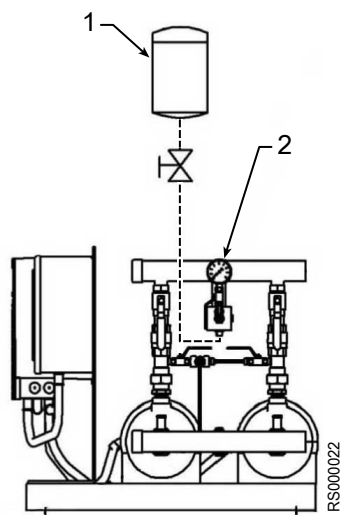
This also provides a means of leveling the base.

4.6 Connect the optional storage tank

1. If the unit is a simplex configuration, then install the tank to the top connection of the discharge cross as shown:



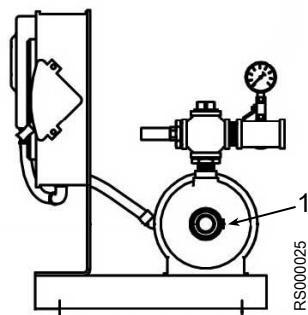
1. Storage tank
 2. Discharge gauge
2. If the unit is a duplex configuration, then connect the tank to the discharge manifold as shown:



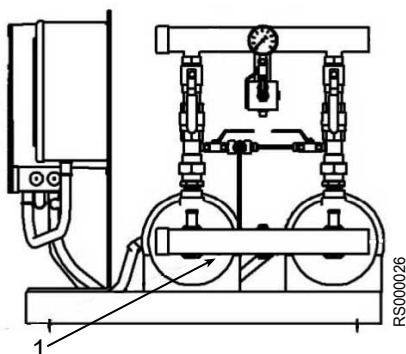
1. Storage tank
 2. Discharge gauge
3. Precharge the tank according to the tank-specific IOM.

4.7 Connect the optional low-suction pressure switch

1. If the unit is a simplex configuration, then install the low-suction pressure switch piped to the 1/4 in. inlet tap on the check valve as shown:



1. 1/4 in. inlet tap on check valve
2. If the unit is a duplex configuration, then install the low-suction pressure switch piped to the 1/4 in. tap on the suction manifold as shown:



1. 1/4 in. inlet tap on check valve

4.8 Piping checklist



WARNING:

- The heating of water and other fluids causes volumetric expansion. The associated forces can cause the failure of system components and the release of high-temperature fluids. In order to prevent this, install properly sized and located compression tanks and pressure-relief valves. Failure to follow these instructions can result in serious personal injury or death, or property damage.
- Avoid serious personal injury and property damage. Make sure that the flange bolts are adequately torqued.

NOTICE:

Never force piping to make a connection with a pump.

Check	Explanation/comment	Checked
Check that the suction and discharge pipes are supported independently by use of pipe hangers near the pump station.	This eliminates pipe strain on the pump station.	
Check that there is a strong, rigid support for the suction and discharge lines.	As a rule, ordinary wire or band hangers are not adequate to maintain proper alignment.	
Check that the suction or discharge lines are not forced into position.	Component failure will result if suction or discharge lines are forced into position.	
Check that fittings for absorbing expansion are installed in the system when considerable temperature changes are expected.	This helps to avoid strain on the pump.	
Check that eccentric reducers, if used, are installed with the flat side on top.	This eliminates air pockets.	

Check	Explanation/comment	Checked
Check that a three-valve bypass has been installed between the suction and discharge connections.	This is a recommended field option.	
Check that the piping to which optional vibration eliminators are connected is properly anchored to the floor.	This is necessary for maximum effectiveness.	

Fastening



WARNING:

- Only use fasteners of the proper size and material.
 - Replace all corroded fasteners.
 - Make sure that all fasteners are properly tightened and that there are no missing fasteners.
-

5 Commissioning, Startup, Operation, and Shutdown

5.1 Preparation for startup



DANGER:

Electrical hazard sufficient to kill. Always disconnect and lock out the power before you service the unit.



WARNING:

- Failure to follow these precautions before you start the unit will lead to serious personal injury and equipment failure.
- Always disconnect and lock out power to the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.
- Operating the pump in reverse rotation can result in the contact of metal parts, heat generation, and breach of containment.

NOTICE:

- Verify the driver settings before you start any pump.

You must follow these precautions before you start the pump:

- Flush and clear the system thoroughly to remove dirt or debris in the pipe system in order to prevent premature failure at initial startup.
- If temperatures of the pumped fluid will exceed 200°F (93°C), then warm up the pump prior to operation. Circulate a small amount of fluid through the pump until the casing temperature is within 100°F (38°C) of the fluid temperature.

At initial startup, do not adjust the variable-speed drivers or check for speed governor or over-speed trip settings while the variable-speed driver is coupled to the pump. If the settings have not been verified, then uncouple the unit and refer to instructions supplied by the driver manufacturer.

5.1.1 Final installation checks

Installation checklist



CAUTION:

Serious damage to the pump may result if it is started dry. Make sure that the pump is completely filled with liquid before it is started.

Check	Checked
Check that the unit base is properly leveled and secured.	
Check that all lubrication points are properly lubricated.	
Check that the shut-off valves to the suction and discharge lines are open.	
Check that the system is purged of debris and air. This includes the pumps and PRVs.	
Check that the pump and motor shafts are properly aligned.	
Check that the pump rotation is correct.	

Final piping checklist

Check	Checked
Check that the bypass valve is closed, if used.	
Check that the piping is properly supported. This prevents strain on the unit.	

Electrical wiring and control checklist

**WARNING:**

- Electrical shock hazard. Conduit grounds are not adequate. You must attach a separate ground (earth) wire to the ground (earth) lug provided in the enclosure in order to avoid potential safety hazards. Failure to follow these instructions can result in serious personal injury, death, or property damage.
- Always disconnect and lock out power to the package and the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.

NOTICE:

Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.

Check	Checked
Check that the feeder line voltage corresponds to the unit voltage. Check the unit nameplate or motor terminal connection.	
Check that the feeder wires are correctly sized according to local and NEC codes.	

5.1.2 Final adjustments

Make the final adjustments on these adjustable devices in order to match the exact system requirements.

Low-suction pressure switch (optional)

**WARNING:**

Always disconnect and lock out power to the package and the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.

The pressure switch is piped into the suction line. An adjusting dial is located inside of the control. This adjustment controls the low-suction cutout. The differential pressure setting is fixed at 1.5 psi. Therefore cut-in pressure will be the switch setting plus 1.5 psi.

Although the scale is calibrated in psi, it may not correspond exactly to the actual suction gauge indication. Therefore, for critical installations, the setting should be adjusted according to the gauge reading. The approximate settings should be set prior to placing the unit in operation in order to suit the pressure conditions at the installation.

System pressure switches for constant speed units

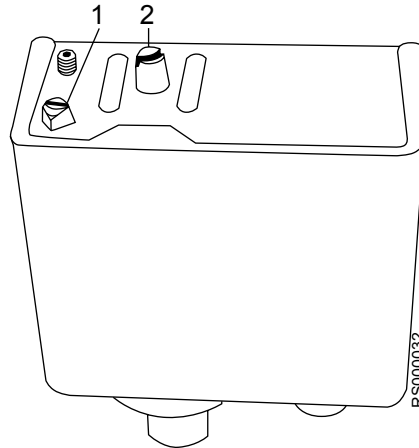
**WARNING:**

Always disconnect and lock out power to the package and the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.

The simplex unit has one switch and the duplex unit has two switches: one for each pump. Each switch is piped to the discharge piping.

Two adjusting screws are located on the top of the control. Facing the switch, the screw on the right-hand side sets the cutout pressure. Make this adjustment first.

The screw to the left and towards the front sets the cut-in point. Turn this screw until the proper cut-in pressure is obtained.



1. The silver adjusting screw on the left front is for cut-in adjustment.
2. The yellow adjusting screw on the right is for cutout adjustment.

Although the scales are calibrated in psi, they may not correspond exactly to the actual discharge gauge indication. Therefore, for critical installations, adjust the settings according to the gauge reading.

Aquastat

The aquastat for high temperature cutout is set at the factory for 100°F (38°C). Adjust the setting if a different cutout temperature is desired. Do not set the switch above 225°F (107°C).

Optional tank

A variety of different tanks can be used with either the simplex or duplex units. Refer to the specific IOM that was shipped with the tank for installation and operating instructions.

5.2 Pump package operation description



CAUTION:

A unit that shows symptoms of possible problems, such as overflow, noise, leaks, vibrations, or continual operation, must be corrected immediately.

5.2.1 Variable speed operation

Variable speed simplex - for capacities up to 110 gpm

The pressure transducer monitors the system pressure and sends a feedback signal to the controller. Depending upon the feedback, the controller then changes the speed of the pump.

Condition	Description
The system pressure falls below the set point.	The pump starts automatically and pump speed continues to ramp up until the system pressure satisfies the set point.
The system pressure rises above the set point.	The pump automatically reduces speed until the system pressure reaches the set point, provided the minimum run timer has expired.

Variable speed duplex - for capacities up to 220 gpm

The pressure transducer monitors the system pressure and sends feedback signal to the controller. Depending upon the feedback, the controller changes the speed of the pump or stages/de-stages the other pump.

Condition	Description
The system pressure falls below the set point.	The pump starts automatically and pump speed continues to ramp up until the system pressure satisfies the set point.
The system pressure rises above the set point.	The pump automatically reduces speed until the system pressure reaches the set point, provided the minimum run timer has expired.

Low-suction pressure switch

Simplex and duplex units will run when there is demand unless the optional low-suction pressure switch trips due to low city pressure.

The low-suction condition resets automatically when city pressure returns to an acceptable level.

Temperature relief valve

The variable-speed units have a temperature relief valve that senses water temperature inside the pump.

The valve opens and closes depending on the water temperature. This modulating action maintains a relatively constant fluid temperature even as operating conditions vary.

Condition	Description
The water temperature exceeds the valve opening temperature, typically 120°F (49°C).	The valve automatically opens to allow relatively cooler supply water to refill the pump as the hot water is discharged to the drain or low pressure return.
The water temperature falls below the opening temperature by 10° F (5.5°C).	The valve automatically closes in order to conserve water and reduce waste.

6 Maintenance

6.1 Precautions



DANGER:

Electrical hazard sufficient to kill. Always disconnect and lock out the power before you service the unit.



WARNING:

- This manual clearly identifies accepted methods for disassembling units. These methods must be adhered to. Trapped liquid can rapidly expand and result in a violent explosion and injury. Never apply heat to impellers, propellers, or their retaining devices to aid in their removal.
 - Make sure that each pump and the package are isolated from the system and that pressure is relieved before you disassemble the pump, remove plugs, open vent or drain valves, or disconnect the package piping.
 - Always disconnect and lock out power to the package and the driver before you perform any installation or maintenance tasks. Failure to disconnect and lock out driver power will result in serious physical injury.
 - Crush hazard. The unit and the components can be heavy. Use proper lifting methods and wear steel-toed shoes at all times.
-

6.2 Monthly maintenance

Motor lubrication checks

- For grease-filled bearings, make sure that grease is not all over the inside of the motor and in the bottom of the motor. This could be a sign of overfilling. Refer to the lubrication instructions from the motor manufacturer.

Close-coupled pumps

- For a horizontal pump, verify that the mechanical seal is not leaking between the pump and the motor.

Sound and visual checks of the whole station

- Listen for any odd sounds that rub or grind, electrical arcing, and check for anything that is binding or unusual. These conditions can indicate a serious problem.
Note that there is going to be some harmonic vibration with the pumps and motor. Listen for excessive vibration or noise as this requires immediate service. Do not operate the pump if there is excessive vibration.
- Confirm that the building cooling and ventilation systems are operating and clear of all obstructions. The maximum operating range for equipment is 104°F (40°C).
- Verify that water, grease, oil, and hardware are not leaking or loose on the pump station.

Station skid

- Visually inspect for leaks in the station piping, valves, and other components.
- Visually inspect the piping and skid for any stress cracks in the welds.
- Visually inspect the station for loose or damaged paint or areas of rust.

7 Troubleshooting

7.1 Pump station troubleshooting



DANGER:

- Personal injury hazard. Troubleshooting a live control panel exposes personnel to hazardous voltages. Electrical troubleshooting must be done by a qualified electrician. Failure to follow these instructions will result in serious personal injury, death, and/or property damage.
- Electrical hazard sufficient to kill. Always disconnect and lock out the power before you service the unit.



WARNING:

Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.

Note that some troubleshooting procedures apply to only constant speed systems or only variable speed systems.

7.1.1 The pump station does not power up

Cause	Remedy
The site voltage does not match the pump station voltage.	Make sure that the site voltage matches the pump station design voltage.
Line-to-line voltage is not balanced.	Check incoming voltage and amperage. Line-to-line voltage should be balanced. Line-to-ground voltage should also be balanced.
The power fuses are blown or breakers are tripped.	Check power fuses and breakers. Breakers are shipped in the OFF position. Replace blown fuses.
The pump station is not properly grounded (earthed).	Check that proper grounding (earthing) techniques have been used for the pump station.
There is a fault.	Check for fault codes or fault lights on the PLC. Correct the fault.

7.1.2 The station powers up, but the pumps do not run

Cause	Remedy
Pumps are not enabled.	Check the PLC to make sure that the pumps are enabled. Check for faults. Correct any faults.
The desired pressure is satisfied.	Check to see if the desired pressure is satisfied. If the actual pressure is greater than the set point pressure, then the pumps are automatically stopped.
There is a fault.	Check for fault codes or fault lights on the PLC. Correct the fault.
The motor is tripped.	Check for a tripped motor thermal protector. Allow motor to cool, and then reset the thermal protector.
The fuses are blown or breakers are tripped.	Check circuit breaker and fuses.
Transducer isolation valves are closed.	Make sure that the transducer isolation valves are in the open position.
Automatic mode is faulty.	Check to see if the pump can be run in Manual mode on the PLC.

Cause	Remedy
The impeller is bound.	Check to see if you can turn the pump by hand. Check for a bound impeller.
A pressure transducer is faulty.	Replace faulty pressure transducers.
Motor wiring is loose.	Make sure that motor wiring is securely connected.
Motor windings have lost insulation strength.	Test the motor leads with a megger in order to check the motor windings.
Variable speed drive is wired incorrectly.	Check corresponding variable speed drive. Make sure drive is wired correctly.
Motor is defective.	Repair or replace motor.

7.1.2.1 Troubleshoot the pump operation

If the pump still does not operate after you have checked initial causes, then use this procedure to further investigate and correct the problem.

1. Momentarily turn the HOA switch to the HAND position and then back to OFF. Does the starter pull in?
 - If the starter does not pull in, then go to the next step.
 - If the starter does pull in, then go to the last step.
2. Turn the HOA switch to the HAND position. Check the voltage across the terminals for the coil in the starter.
 - If voltage is present and the starter is not pulled in, the coil is defective and must be replaced.
 - If no voltage is present, then go to the next step.
3. With the HOA still in the HAND position, check the voltage between the hot side of the starter coil and the neutral (white) wire. 120 volts should be measured.
 - If no voltage is measured, then check incoming power and fuses.
 - If voltage is measured, then go to the next step.
4. With the HOA still in the HAND position, check the voltage between the hot side of the coil and the neutral (white) wire for overload block. 120 volts should be measured.
 - If voltage is measured, then replace the GV2P block.
 - If no voltage is present, then contact your local Goulds Pumps representative to service the control circuit.
5. With the starter pulled in, check the voltage at the bottom of the GV2P block. The voltage should be the same as the incoming power.
 - If no voltage is present, then replace the starter.
 - If voltage is present, then contact an electrician to check the leads and motor.

For electrical troubleshooting of variable speed units, refer to the manuals of the corresponding variable speed controllers.

7.1.3 The pumps run but do not build desired pressure

Cause	Remedy
Pumps are running off their design curve.	Check the application. Is the system running in an open discharge condition (excessive flow rate)? For example, is the system filling a large irrigation line for the first time of the season?
Pumps are running at less than full speed.	Check to see if the pumps are running at full speed. If they are running less than full speed, they could be experiencing electrical issues. Check the panel for power status.

Cause	Remedy
The inlet pressure does not match the project specifications.	Check to see if the inlet pressure matches the project specifications. Variations in inlet pressure can have detrimental effects on performance.
A pipe is broken.	Check for broken pipes.
The transducer isolation valves are closed.	Check to be sure that the transducer isolation valves are in the open position.
The NPSH is insufficient.	Check the NPSH. Are proper flooded conditions or positive pressure being delivered to the pump station? Check for air in the supply lines. Check for properly filled supply tanks (if applicable). Excessive suction lift or piping losses will limit the life expectancy of the pumps.
The pump station has lost its prime.	Check to be sure that the pump station has been primed properly. Make sure that all pumps and components are properly filled with water.
The pump rotation is incorrect.	Check the pump rotation. Proper rotation is indicated on the pump volute. (See the pump IOM.)
A suction or discharge valve is closed or clogged.	Check the isolation valves and check valves. Are all suction/discharge valves open? Could any valves be plugged? Could the pumps be plugged?
The motor is not operating at the rated RPM.	Check the voltage and amperage. Check for possible phase loss to the motor.
The impeller is worn or plugged.	Take the pump to an authorized pump repair facility.
The pump bearings are worn.	Take the pump to an authorized pump repair facility.

7.1.4 The pump station experiences excessive vibration

Cause	Remedy
The motor, pump, or piping is loose.	Make sure that all fasteners and components are properly tightened.
Pump station vibration dampers are missing or improperly installed.	Check for properly installed pump station vibration dampers.
Pumps are running off their design curve.	Check the application. Is the system running in an open discharge condition (excessive flow rate)? For example, is the system filling a large irrigation line for the first time of the season?
Air or gases are present in the pumped liquid.	Check water supply lines and tanks. Check for air or gases in liquid. Bleed the lines.
Discharge piping is plugged.	Check discharge piping/valves. Could the piping be plugged? Could the pump be plugged? Are the isolation valves open? Clear any clogs.
Supply piping has excessive suction/lift conditions or friction loss.	Check for excessive suction/lift conditions or friction loss on supply piping.
The impeller is bound or worn.	Take the pump to an authorized pump repair facility.
Pumps and pipes are not properly aligned.	Correct the alignment between pumps and pipes.

7.1.5 The pump station does not shut down and no water is used

Cause	Remedy
The pump station is in Hand or Manual mode.	Put the system in the AUTO position.
The system pressure is set beyond capability of the station.	Check the system set pressure. Is this duty point beyond the capability of the pump station?
The RTDs are incorrectly installed.	Check to make sure that the RTDs are installed correctly. (CS only)

Cause	Remedy
There are leaks or broken pipes.	Check for broken pipes or leaks. Does the system pressure decrease if the pump station is turned off?
The diaphragm tank is faulty.	Check for a properly installed diaphragm tank. Has the tank failed? Has the tank been charged to the proper operating pressure before installation? (~ 10 psi below the desired set point)
The pressure transducers are faulty.	Check the pressure transducers. Does the actual mechanical gauge pressure match the pressure displayed on the VFDs and the PLC?
The VFDs are in Local mode.	Put the VFDs in Remote mode.
A check valve is malfunctioning.	Check for malfunctioning check valves. Does the system hold pressure when the pump package is shut down? Replace faulty valves.

7.1.6 The pump station cycles or hunts erratically

Cause	Remedy
The pumps are oversized for the current demand.	Check the application. Possibly increase the size of the bladder tank for low demand situations.
The inlet pressure is fluctuating.	–
There are leaks or broken pipes.	Check for broken pipes or leaks. Does the system pressure decrease when the pump station is turned off?
The diaphragm tank is faulty.	Check for a properly installed diaphragm tank. Has the tank failed? Has the tank been charged to the proper operating pressure before installation? (~ 10 psi below the desired set point)
The pressure transducers are faulty.	Check the pressure transducers. Does the actual mechanical gauge pressure match the pressure displayed on the VFDs.
A check valve is malfunctioning.	Check for malfunctioning check valves. Replace faulty valves.
There is an error in the PLC programming.	Check the customer programming on the PLC. Correct any errors.

8 Other Relevant Documentation or Manuals

8.1 Manuals for AquaBoost components

Further information pertaining to the installation, operation, and maintenance of your AquaBoost Pumping System can be found in the IOMs provided for the associated equipment:

Equipment	Manual
Goulds Pumps Model NPE	IM013
Aquavar CPC	IM167
Aquaboost II 115AB2-2AB2	IM156
Tank	Model-specific

9 Product warranty

Commercial warranty

Warranty. For goods sold to commercial buyers, Seller warrants the goods sold to Buyer hereunder (with the exception of membranes, seals, gaskets, elastomer materials, coatings and other "wear parts" or consumables all of which are not warranted except as otherwise provided in the quotation or sales form) will be (i) be built in accordance with the specifications referred to in the quotation or sales form, if such specifications are expressly made a part of this Agreement, and (ii) free from defects in material and workmanship for a period of one (1) year from the date of installation or eighteen (18) months from the date of shipment (which date of shipment shall not be greater than thirty (30) days after receipt of notice that the goods are ready to ship), whichever shall occur first, unless a longer period is specified in the product documentation (the "Warranty").

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Warranty. For goods sold for personal, family or household purposes, Seller warrants the goods purchased hereunder (with the exception of membranes, seals, gaskets, elastomer materials, coatings and other "wear parts" or consumables all of which are not warranted except as otherwise provided in the quotation or sales form) will be free from defects in material and workmanship for a period of one (1) year from the date of installation or eighteen (18) months from the product date code, whichever shall occur first, unless a longer period is provided by law or is specified in the product documentation (the "Warranty").

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To make a warranty claim, check first with the dealer from whom you purchased the product or visit www.xyleminc.com for the name and location of the nearest dealer providing warranty service.

Xylem |'zīləm|

- 1) The tissue in plants that brings water upward from the roots;
- 2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services settings. Xylem also provides a leading portfolio of smart metering, network technologies and advanced analytics solutions for water, electric and gas utilities. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

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