

Location:

S&L S/N:

Project:

Equipment:

Purchaser:

Manufacturer: Smith & Loveless, Inc.

S&L Parts Phone: (800) 922-9048

S&L Service Phone: (800) 275-5201

Representative:

Rep Phone Number:

SERIAL NUMBER: EV – 01553

LOCATION: WICHITA, KS

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Pump Curve

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EVERLAST™ Series 1000 4B2B*1/4B2D*1/4C2B*1/4C2D*1/4B2X*1/4C2X*1/4B2C Pumps,
4" Piping, 4'/5'/6'/8' Diameter WW, 4"/6" Suction **CEV01553-001**

WaveStart™ Pump Assembly Drawings

4B2B/4B2D/4B2X 87B464

SECTION 1

Engineering Order



Smith & Loveless Inc.

Everlast™ Wet Well Mounted Pump Station Engineering Order

Date EO Prepared: 02/26/20
Job Serial Number: EV-01553-00-L

Standard Equipment

1000 SERIES - Relay Logic with Float Switch Control System, 120v Control Circuits, Vacuum Priming System, Prime Mode Selector - Constant or On-Demand Prime, Timed Alternation, High Water Alarm, Pump Fail/Prime Fail Sensors, Compound Pressure Gauges, Running Time Meters - Individual, Single Tilt Hood with Hood Assist, One Piece Hinged Aluminum Manway Cover, Spare Mechanical Seal

Pre-Engineered Packages

Station Monitoring Package

Pump Overload Power Failure, Time Delay Relay, Phase Monitor Relay

Cold Climate Package

Aux. Heater, Insulated Hood, Vacuum Release System

Enhanced Alarm Package

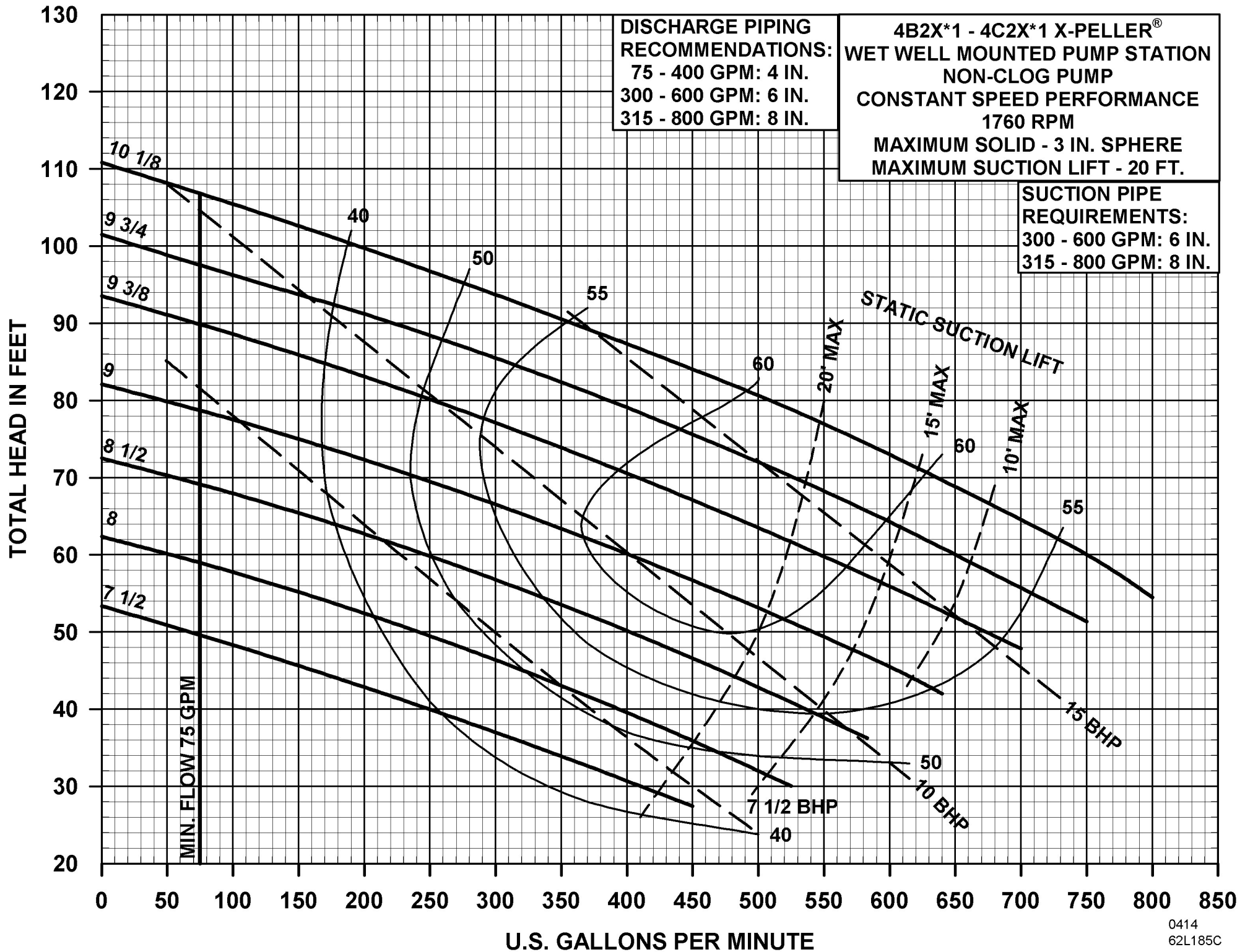
Intrusion Alarm, Operator Assist, Low Water

Building Package

Delete Hood, Panel Heater, Vent Blower & Manway Cover

Pre-Engineered Options

- | | | |
|---|---|---|
| <input checked="" type="checkbox"/> Low Water Alarm | <input checked="" type="checkbox"/> Panel Alarm Silence Switch Auto | <input type="checkbox"/> Add-a-Phase Interface |
| <input type="checkbox"/> High Level Alarm Back-Up Float Switch | <input type="checkbox"/> Panel Alarm Silence Switch Manual | <input type="checkbox"/> Roto-Phase Relay |
| <input type="checkbox"/> Low Level Alarm Back-Up Float Switch | <input type="checkbox"/> Remote Alarm Silence Switch Auto | |
| <input type="checkbox"/> Dedicated Prime Failure Alarm | <input checked="" type="checkbox"/> Surge Protective Device | <input type="checkbox"/> Amp Meters |
| <input type="checkbox"/> Dedicated Pump Failure Alarm | <input checked="" type="checkbox"/> Phase Monitor | <input type="checkbox"/> Premium Efficiency Motors |
| <input type="checkbox"/> 12-V Battery & Charger | <input type="checkbox"/> Single Phase Power Monitor | <input type="checkbox"/> Certified Pump Test Curves |
| <input checked="" type="checkbox"/> Vapor Proof Red Light 120 VAC | <input checked="" type="checkbox"/> Sequential Alternator | <input checked="" type="checkbox"/> Insulated Hood |
| <input checked="" type="checkbox"/> Weatherproof Horn 120 VAC | <input type="checkbox"/> Base1/Base2/Auto Alt Selector | <input checked="" type="checkbox"/> Auxiliary Heater |
| <input type="checkbox"/> Weatherproof Bell | <input type="checkbox"/> Main Disconnect Switch | <input type="checkbox"/> DeleteHood |
| <input type="checkbox"/> Alarm Light w/Flasher | <input type="checkbox"/> Main Circuit Breaker | <input type="checkbox"/> Delete Manway Access |
| <input checked="" type="checkbox"/> Parallel RunTime Meter | <input type="checkbox"/> Time Delay Relay | <input type="checkbox"/> Emergency Pump Connection |
| <input type="checkbox"/> Pump Run Lights | <input checked="" type="checkbox"/> Generator Interlock | <input type="checkbox"/> Wet Well Fall Barrier |
| <input type="checkbox"/> MultiSensor Tester | <input type="checkbox"/> Intrinsically Safe Float Relays | <input type="checkbox"/> Wet Well Vent Blower |
| | <input type="checkbox"/> Intrinsically Safe Transducer Barrier | <input type="checkbox"/> Wet Well Analog Signal Output |
| <input type="checkbox"/> Alarm Dialer Interface | <input type="checkbox"/> Non-Mercury Float Switches | <input type="checkbox"/> Transducer Signal Splitter |
| <input type="checkbox"/> Operator Assist Alarm | <input type="checkbox"/> Spare 20 Amp Circuit Breakers | <input type="checkbox"/> Additional Spare Mechanical Seal (One Standard |
| <input type="checkbox"/> Intrusion Alarm | | |
| <input checked="" type="checkbox"/> Remote Alarm Contacts | | |
1. HWA
 2. Pump/Prime fail 1
 3. Pump/Prime fail 2
 4. Phase Monitor
 5. LWA



SECTION 2

Getting Started



Smith & Loveless Inc.

Welcome!

You've made a wise investment. Your Smith & Loveless **EVERLAST™** Wet Well Mounted Pump Station was designed by some of the industry's most experienced engineers. Our engineers carefully selected materials and component equipment to provide reliable operation. Your **EVERLAST™** Wet Well Mounted Pump Station will continue to perform with proper operation and maintenance.

We have developed this manual to convey the background and technical information that you will need to safely operate and maintain your system at peak efficiency. Each section clearly identifies the information in that chapter, whether it is Start-Up, Operation, Maintenance, or Service. Read the Index to learn where each section is located. Keep this manual as a reference for future needs.



As you read this manual, please take extra notice of the safety warnings called out with the internationally known symbol seen here. We have inserted these warnings to help ensure operator safety.

If additional information is needed, the engineers and technicians at Smith & Loveless, Inc. are available to answer inquiries or offer suggestions regarding unusual operating conditions. You'll need the serial number that appears on the Index Page of this manual and on the **EVERLAST™** Wet Well Mounted Pump Station so that our Customer Service Department can give you prompt, efficient service. Call (913) 888-5201 and ask for Customer Service.

Smith & Loveless' personnel have taken great care in designing and constructing your **EVERLAST™** Wet Well Mounted Pump Station. If your station does require replacement parts, you can either call your local Smith & Loveless Manufacturer's Representative or the Smith & Loveless Parts Dept. at 1 (800) 922-9048.

From everyone at Smith & Loveless, Inc., we thank you for purchasing this product. Together, we are making a difference by providing safer and cleaner water to our community, our environment and our world.



Smith & Loveless Inc.

Warranty Certificate

SMITH & LOVELESS, INC., Lenexa, Kansas, manufacturer of the Factory Built Pump Station warrants it to be free from defects in materials and workmanship for a period of up to one (1) year commencing at the time the pump station is placed in operation by SMITH & LOVELESS-authorized personnel, but in no event is the pump station warranted for longer than eighteen (18) months from the date of shipment. This Warranty is contingent upon start-up of the equipment by SMITH & LOVELESS-authorized personnel, and THE WARRANTY WILL BE VOIDED IF START-UP IS PERFORMED BY ANYONE ELSE.

SMITH & LOVELESS will be the single source of responsibility to the owner for the Warranty of the pump station and all its components provided by SMITH & LOVELESS.

During the Warranty period, if any part is defective or fails to perform as specified when operating at design conditions and if the pump station has been environmentally and physically protected prior to start-up and has been installed and is being operated and maintained in accordance with the written instructions provided by SMITH & LOVELESS, SMITH & LOVELESS will repair or exchange at our discretion such defective part free of charge. Defective parts must be returned by the owner postage paid to SMITH & LOVELESS, if so requested.

SMITH & LOVELESS will provide, without cost to the owner, such labor as may be required to replace, repair or modify the following, but no other, major components: the steel structure. Except for labor provided by SMITH & LOVELESS under the preceding sentence, the cost of labor and any other expenses resulting from replacement of defective parts and from installation of parts furnished under this one (1) year Warranty shall be borne by the owner.

EVERLAST™ Warranty

In addition to the one (1) year Warranty set out above, Smith & Loveless provides the following Warranty. The Warranty time period commences on the date the pump station is shipped from Smith & Loveless.

- The fiberglass components of the fiberglass covers, impeller, adapter and volute, prorated over a 120-month period, starting from date of original product shipment.
- The baseplate against rust-through, prorated over a 120-month period, starting from date of original product shipment. Failure to properly maintain the coating of the baseplate will void Warranty.
- If applicable, the microprocessor controller, display unit, and submersible level transducer prorated over a 60-month period, starting from date of original product shipment.

The cost of labor and any other expenses resulting from replacement of defective parts and from installation of parts furnished under the **EVERLAST™** Warranty section shall be borne by the owner. Defective parts must be returned by the owner postage paid to SMITH & LOVELESS, if so requested.

SMITH & LOVELESS will not assume responsibility for the cost of any repairs or alterations made to the pump station structure or its components unless SMITH & LOVELESS has given specific written authority therefore.

The replacement or repair of parts normally consumed in service, such as pump seals, light bulbs, oil, grease, packing, V-belts, check valves, etc. is considered part of routine maintenance and upkeep and such parts are not eligible for repair or exchange free of charge under this Warranty.

This limited Warranty does not cover parts damaged by acts of vandalism, God or intentional misuse by the owner.

SMITH & LOVELESS makes no other Warranty expressed or implied and SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY AS TO THE MERCHANTABILITY OF THE FACTORY BUILT PUMP STATION OR AS TO ITS FITNESS FOR ANY PARTICULAR PURPOSE. SMITH & LOVELESS is not responsible for consequential or incidental damages of any nature resulting from such things as, but not limited to, defects in design, material, workmanship, or delays in delivery, replacements, or repairs.

The waiver or abridgment of any single provision or group of provisions, either by ruling or agreement, shall not be construed to alter or void any other provisions of this Warranty.



Smith & Loveless Inc.

OPERATOR SAFETY INSTRUCTIONS



As you read this manual, please take extra notice of the bodily injury warnings called out with the internationally known symbol seen here. We have inserted these warnings to help ensure operator safety. Following the bodily injury warning, one of the following three words will appear:



DANGER: *Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Signs appear on the equipment with a red background and white letters.*



WARNING: *Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Signs appear on the equipment with an orange background and black letters.*



CAUTION: *Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. Signs appear on the equipment with a yellow background and black letters.*

SAFETY SIGNS

Read and Obey These Safety Signs



WARNING: *Your equipment was furnished with safety signs to warn you of safety precautions. Inspect the safety signs regularly and replace any faded, damaged or missing signs immediately. New safety signs are available from Smith & Loveless by calling the Parts Department at 1-800-922-9048.*



Located on Control Panel



Located on Front of the Control Panel



Located on Wet Well Access Cover



Located on Baseplate



Located on Wet Well Access Cover

RECEIVING AND STORAGE INSTRUCTIONS

READ THIS MANUAL carefully to learn how to operate, service and maintain your pump station correctly. Proper operation and performing preventative maintenance on your station will increase the useful life of the equipment. Failure to do so could result in bodily injury or equipment damage.

This Manual is considered a permanent part of your pump station and must remain readily available for future reference.

Perform the following inspections as soon as your station has been delivered.

1. Inspect the interior of your pump station for touch-up paint kit, spare seal, floats, stainless steel float switch cover plate, discharge pipe coupling, control panel key and any optional equipment purchased.
2. Check your station for broken or loose components that have been damaged in transit.
3. Document any missing components and/or damage that has occurred. Report any missing parts or damage to the Transit Company and to the Customer Service Department of Smith & Loveless Inc. at 913-888-5201.

If you anticipate a delay in installation and operation of the station, we recommend that the unit be stored inside to protect it from the weather, and block the fiberglass station enclosure open several inches to prevent condensation from forming inside the hoods.

SECTION 3

Installation



Smith & Loveless Inc.

Your Smith & Loveless, Inc. **EVERLAST™** Wet Well Mounted Pump Station is a complete, factory-built unit. The mechanical and electrical equipment have been tested by operation at the Factory located in Lenexa, Kansas, USA. Your pump station has demonstrated proper operation and is ready for use.

ELECTRICAL POWER

Lack of electrical services can create long delays in completing an installation. Therefore, notify the Electrical Contractor and/or the Local Power Company well in advance of the actual need for electrical service.

ELECTRICAL SERVICE REQUIREMENTS



DANGER: *Disconnect and lock out power before performing any electrical work. Failure to do so could result in electrical shock, serious bodily injury or death.*

The **EVERLAST™** Wet Well Mounted Pump Station with standard components requires a three-phase, 60-cycle power supply plus a 120-volt, single-phase, 60-cycle control circuit supply. A weatherproof fused disconnect switch may be provided for the station power service and a separate weatherproof fused disconnect switch for the 120 VAC service, except where a 120-volt phase-to-ground service or a single-phase transformer is provided.

Where a single-phase transformer or one phase-to-ground service is used for the auxiliary single-phase potential, the fuse and wire size of that phase leg must be checked and increased to compensate for the auxiliary load, if necessary.

Confirm that the voltage from that phase-to-ground is in the range of 110 volts to 135 volts before the circuit breakers are energized. The neutral of the 120-volt single-phase supply must be solidly grounded externally from the station. A conduit or direct burial cable installed in accordance with the National Electrical Code and/or local codes must be supplied from the supply terminal, disconnect switch, or switches, to the connection on the station. Wire of adequate size and insulation must be supplied

from the fused disconnect switch to the solderless connectors in the control panel.

SETTING THE STATION

Prior to setting the station on top of the wet well, apply a layer of grout on the top surface of the wet well. The station will then bed down in the grout, giving the station firm support and reducing noise transmissions.



WARNING: *Lifting lugs have been provided on the equipment to facilitate installation. Lift the equipment ONLY by the lifting lugs labeled for lifting. Failure to do so could result in serious bodily injury or death.*

The station must be lifted by hooking a sling in the lifting loops located on the station baseplate. Assure that the cables and slings are clear of all station components. Be sure the station is rotated so the discharge pipe aligns with the force main pipe. Now lift the station and place it on the wet well.

NOTE: *Orient the base on the concrete wet well so the slot in the aluminum manway cover is positioned on top of the concrete wall (see Drawing 87A216 or 87A305).*

MOUNTING SUCTION PIPES

If the suction pipes are to be mounted in place after the station is set, the length of the suction pipes must be the distance from the suction flange to the bottom of the well, minus six inches. Check the Engineering Order for suction pipe size. The suction pipe (furnished by the Customer) must have a 150 lb. flange to mate with the suction flange on the station.

Smith & Loveless recommends Schedule 80 PVC as the preferred material for suction pipes with lengths over ten feet (10'). Caution must be used in that Schedule 40 PVC may result in vacuum leaks due to distortion of the material. For PVC pipe lengths of fifteen feet (15') or longer, an intermediate support at one-half the depth is recommended. Steel, cast iron and ductile iron suction pipes are not recommended for lengths in excess of ten feet (10'). If they are

required, the pipe must be supported from the wall of the wet well to minimize the strain of the station baseplate and piping. See Drawing 87B321 or 87B761 (included in this Section) for additional details concerning the suction pipe support details.



DANGER: *Wet wells and sewers may contain explosive, toxic or suffocating gases. Consult with proper authorities on entry procedures. Before entering, test for explosive atmosphere and oxygen deficiency. Supply fresh air to work area. Failure to do so could result in serious bodily injury or death.*

The suction pipes are lowered into the wet well through the manhole outside the station. Once the suction pipe is inside the wet well, rest it on the bottom of the wet well. Then raise the pipes from the bottom of the manhole and bolt them to the suction flanges.

The bolts, gaskets and gasket sealant required to mount the suction pipes to the station have been supplied by Smith & Loveless, Inc. These are located inside the station, along with the discharge coupling. Coat both sides of the ring gaskets with a thin coat of gasket sealant. When tightening the suction flange bolts, use a crisscross pattern to assure even pressure distribution on the ring gasket.

A bad connection at the suction pipes can cause a failure in the pump station vacuum priming system.

DISCHARGE PIPE INSTALLATION



DANGER: *Wet wells and sewers may contain explosive, toxic or suffocating gases. Consult with proper authorities on entry procedures. Before entering, test for explosive atmosphere and oxygen deficiency. Supply fresh air to work area. Failure to do so could result in serious bodily injury or death.*

The discharge is to be oriented in accordance with the engineer's plans. Generally, Smith & Loveless will provide a mechanical-type coupling to join the force main to the station discharge pipe. Two lugs are also provided (one on either side of the discharge) on the underside of the baseplate for securing the discharge pipe. Tie the discharge pipe to the station to prevent separation. An all-thread rod, cable or chain (not supplied by Smith & Loveless) can be used for this purpose. All discharge pipes must be secured.

PRIMING LOCK LOOP

The purpose of the Priming Lock Loop is to form a return bend or trap in the force main, either inside or just outside of the wet well. The priming lock loop must be below the Low-Level-Off elevation. This prevents the entire contents of the force main from returning by gravity to the wet well, or being siphoned back into the wet well if the check valve does not seal. On force mains that run horizontal or downhill from the station, the last few feet of this must run uphill to create a water trap effect. Smith & Loveless, Inc., does not supply the discharge piping required for the priming lock loop. If the station requires a Priming Lock Loop, assure that it is installed as shown on Drawing 87B289 or 87B293 included in this manual.

CONNECTING ELECTRICAL POWER



WARNING: *All electrical work must be performed by a qualified electrician in accordance to all applicable codes. Failure to do so could result in severe bodily injury or death.*

The station is provided with a conduit coupling connection through the baseplate. Power must be brought into the station through this connection. The three 460, 240 or 208-volt power wires must be connected to the terminals on the power distribution block, or the main disconnect breaker if installed in the panel. If a transformer is not provided in the station, the 120-volt single-phase connection must be made to the properly marked terminals.

SYSTEM GROUND

The system must be grounded at the service entrance switch in accordance with the National Electrical Code and/or any Local Codes, and a suitable ground conductor carried to the ground block connection in the pump station control panel.

The following table is provided for your convenience in selecting the proper switch, fuse and wire sizes for the electrical service to the station. Verify selections with the Local Regulatory Authority before installation of the station.

ELECTRICAL SERVICE DATA

Main Pump Motor Size Rated HP	Three-Phase Total Station Full Load AMPS		
	208-Volt	230-Volt	460-Volt
Each			
1	27.6	21.4	10.7
1-1/2	27.6	25.0	12.5
2	29.4	26.6	13.3
3	35.6	32.2	16.1
5	47.8	43.4	21.7
7-1/2	62.8	57.0	28.5
10	76.0	69.0	34.5
15	106.8	97.0	48.5
20	133.2	121.0	60.5
25	164.0	149.0	74.5
30	190.4	173.0	86.5
40	---	110.5	110.5
50	---	---	136.5

Assuming 3 KVA Load for Controls

NOTE: Refer to applicable station drawing for size of electrical conduit connection.

MOTOR

This motor is shipped ready for immediate service. If the motor has been in storage for a long period or has been subjected to a damp atmosphere, the insulation resistance of the stator winding must be checked before start-up.



DANGER: Disconnect and lock out power before servicing equipment. Failure to do so could result in serious bodily injury or death.

Use a high voltage resistance meter (megger) to check insulation resistance to the ground. Motor Standards recommend that the winding's insulation resistance of clean, dry motors at room temperature must not be less than:

$$\text{Insulation Res.} = \frac{(\text{Motor Rated Voltage} + 1000)}{1000} \text{ (Megohms)}$$

If the resistance is below the recommended value, the windings must be baked dry or replaced. The stator must be baked in an oven at not more than 200° F until the insulation resistance becomes constant.

STATION CONTROLS

The pump station level control is provided by float switches. The float switches are delivered factory packaged and ready to install once the station is set on the wet well. The float switch cables are threaded through cord grips, which are threaded into a common stainless steel float switch cover plate.



Picture 3.1 Float Switch Cover Plate with Cables Installed on Baseplate.

The cover plate has a gasket attached to the bottom to create a seal when installed onto the baseplate. The floats will be installed through the float switch hole in the base, and the cover plate will seal the opening (see Picture 3.1). The floats are factory wired into the control panel to the proper terminal blocks. Each cable is color-coded near the end attached to the control panel, and labels are installed on the float switch junction plate indicating the service of each item. The color-coding of the cables is as follows:

FLOAT SWITCH	COLOR
Low-Level Pump Shut-Off	Blue
Lead Pump Start	Orange
Lag Pump Start	Yellow
High Water Alarm	Red
Low Water Alarm (Optional)	Brown

INSTALLATION OF FLOAT SWITCHES

Remove the float switches from the packaging and assure that each item is not damaged, and all float switches are provided. Refer to the Engineering Order at the front of this manual to confirm the number of floats that are to be provided. Lay the float switches to the side.

Remove the nuts and washers from the stainless steel studs that hold down the temporary shipping cover over the float switch hole located in the base of the station.

Keep the nuts for future use. Discard the temporary cover. Adjust the float switches to the correct depth. The cables can be adjusted to the proper length outside of the wet well before the cover plate is installed and the floats are placed in the wet well. Adjust the cord length by loosening the cord grip restraints (see Picture 3.2). Pull the appropriate amount of cable through the grip until the desired length of cord is achieved.



Picture 3.2 Adjusting Cords Through Cord Grip

After the length adjustments to the cords are made, securely tighten the cord restraints in the cover plate. Check that the cords are securely restrained in each grip before proceeding.



DANGER: *Wet wells and sewers may contain explosive, toxic or suffocating gases. Consult with proper authorities on entry procedures. Before entering, test for explosive atmosphere and oxygen deficiency. Supply fresh air to work area. Failure to do so could result in serious bodily injury or death.*

See Lower each float switch one at a time into the wet well through the hole provided in the station baseplate (see Picture 3.3).



Picture 3.3 Lowering Float Through Baseplate.

Check to see that each cable is hanging straight and is not tangled. After all the float switches are lowered into the wet well, set the cover plate over the hole in the baseplate. Assure that the gasket on the bottom of the cover plate is not damaged and provides a flat seal when placed against the baseplate.

Slide the plate over the stainless steel studs, assuring that the studs are located within the notch on each side of the plate and that the opening in the base is completely covered by the cover plate. Install one washer and nut to each stud and tighten securely. Be sure that the cover plate is securely attached to the base and does not move.

NOTE: *Do not overtighten the nut onto the studs. Overtightening could cause the stud to twist off or break from the baseplate.*

Once the cords have been installed and all final adjustments are made to the level settings, neatly coil the remainder of the cords located inside the station, and place over the cover plate. Use the spiral wrap provided with the stations to neatly bind the float switch cables from the cover plate to the control panel. The extra cable for the floats that is located above the cover plate may be shortened to reduce the amount of coiled cable, if desired.

SHORTENING THE FLOAT CORDS

NOTE: *Assure that the float switch settings are correct prior to shortening any cords. The float switch cords cannot be spliced together once they are cut. Splicing the cord could cause poor connections and could lead to improper operation of the pump station.*

Shorten the float switch cables one at a time. Unwrap the cables from the spiral wrap if that has been completed previously. Pull the additional cord from the extra placed over the cover plate until the extra length of cord is under the control panel.



DANGER: *Disconnect and lock out power before performing any electrical work. Failure to do so could result in electrical shock, serious bodily injury or death.*



WARNING: *All electrical work must be performed by a qualified electrician in accordance to all applicable codes. Failure to do so could result in severe bodily injury or death.*

Open the panel and locate the appropriate cords and follow each cord to its termination on the terminal blocks. Look at the blocks and write down the numbers of the blocks on which each specific cord is attached.

Loosen the cord restraint located on the bottom of the control panel for the specific cord that will be shortened. Pull the desired amount of cable through the restraint. Be sure to leave some slack in the cord from the control panel to the cover plate. Loosen the terminal block and pull the cable from the block. Detach the cable completely from the terminal block. Measure and cut the cord to the desired length. Strip the cord to expose the individual wires and install each wire to the appropriate terminal block. Make sure the connections are tight and the wires do not pull out. Tighten the cord restraint on the bottom of the control panel to securely hold the cord. Repeat the above for each cable that is to be shortened. Once the cords are shortened, neatly wrap all of the transducer and float switch cords in the station together with the spiral wrap provided.

Test the operation of the station to confirm that the level transducer and the float switches are properly connected.

Wet Well Air Bubbler Controls (Optional)

NOTE: Refer to the Engineering Order to determine if your pump station has an Air Bubbler Control instead of a Submersible Level Transducer.

Install a 1/2" pipe in the coupling protruding through the station base. This pipe must be cut six inches (6") above the end of the pump suction pipes, and distanced as far away from the suction lines as practicable. Support the lower end of the pipe to prevent breakage, if necessary.

Battery with Automatic Trickle Charger Unit (Optional)

NOTE: Refer to the Engineering Order to determine if your pump station has a Battery with Automatic Trickle Charger Unit.

Refer to the Manufacturer's Instructions included in this manual for further information concerning this unit.



DANGER: Disconnect and lock out power before servicing equipment. Failure to do so could result in serious bodily injury or death.

The Battery with Automatic Trickle Charger Unit is installed at the Factory with the positive lead wire from the battery left disconnected for shipping and storage purposes. This battery lead will need to be connected to the circuit board in the unit immediately prior to energizing the AC power to the station.

Remove the cover on the Unit and locate the positive lead wire from the battery. Securely connect the positive lead to the B+ terminal located in the upper left corner of the circuit board. Replace and secure the cover on the Unit.

Once the battery lead is connected and the cover replaced, energize the station. The battery will need to charge for at least eight (8) hours prior to initial operation. Test the trickle charger

according to the Manufacturer's instructions, and assure the unit is operating correctly.

TOUCH-UP PAINT



WARNING: Prior to using paint, read the Material Safety Data Sheet and the instructions for its proper application. Failure to do so could result in serious bodily injury or death.

The EVERLAST™ Pump Station is delivered finish coated. However, it is necessary to paint over all nicks and scratches and any field welds or other areas exposed before completing the installation. A container of paint is provided with the station for this purpose.

REMOVE DEBRIS FROM WET WELL



DANGER: Wet wells and sewers may contain explosive, toxic or suffocating gases. Consult with proper authorities on entry procedures. Before entering, test for explosive atmosphere and oxygen deficiency. Supply fresh air to work area. Failure to do so could result in serious bodily injury or death.

All trash and debris must be removed from the wet well and upstream manholes before placing the station in service. This includes all construction-type remnants such as loose concrete, surveyor stakes, re-bar, bricks, rags, construction material wrappings, lumber and pipe plugs, as well as normal domestic trash items, lawn and tree debris and excess sediment.

CLEANUP

Clean up inside the station using an industrial soap-based cleaner to remove the dirt and debris.



WARNING: *Prior to using paint, read the Material Safety Data Sheet and the instructions for its proper application. Failure to do so could result in serious bodily injury or death.*

Using the Smith & Loveless paint supplied with the station, touch up any scratches or bare metal areas.

FINAL INSTRUCTIONS

- a) Read the station Installation Instructions carefully and verify with the installing contractor that these instructions were followed.
- b) Read the entire Maintenance Manual carefully and set up a preventative maintenance program.
- c) Instruct operating personnel in the care and operation of the pump station.

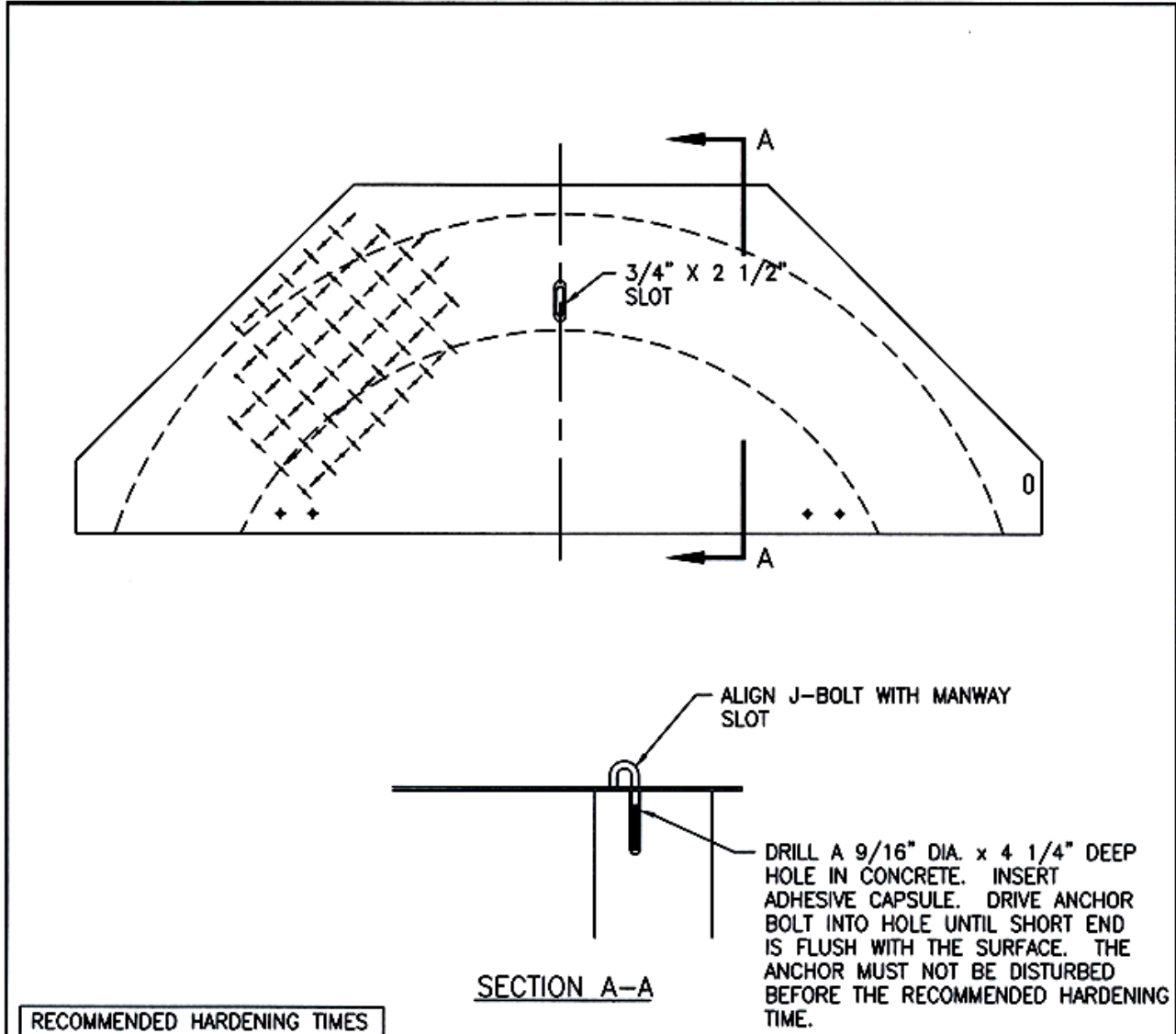
NOTE: *It is mandatory that a Smith & Loveless authorized Representative perform the initial “Start-Up” of the Station in order to validate the Manufacturer’s Warranty.*

If any trouble develops through malfunction of equipment or any damage that might have occurred through shipment or otherwise is observed, contact Smith & Loveless’ Customer Service Department for assistance at:

(913) 888-5201 or Toll Free in the United States at 1 (800) 922-9048, Option 7.

INSTALLATION

Manway Locking Detail – Drawing 87A216



RECOMMENDED HARDENING TIMES	
TEMPERATURE	TIME
ABOVE 68° F	20 MINUTES
50° F TO 68° F	30 MINUTES
32° F TO 50° F	1 HOUR
23° F TO 32° F	5 HOURS

SHEET 1 OF 1

87A216

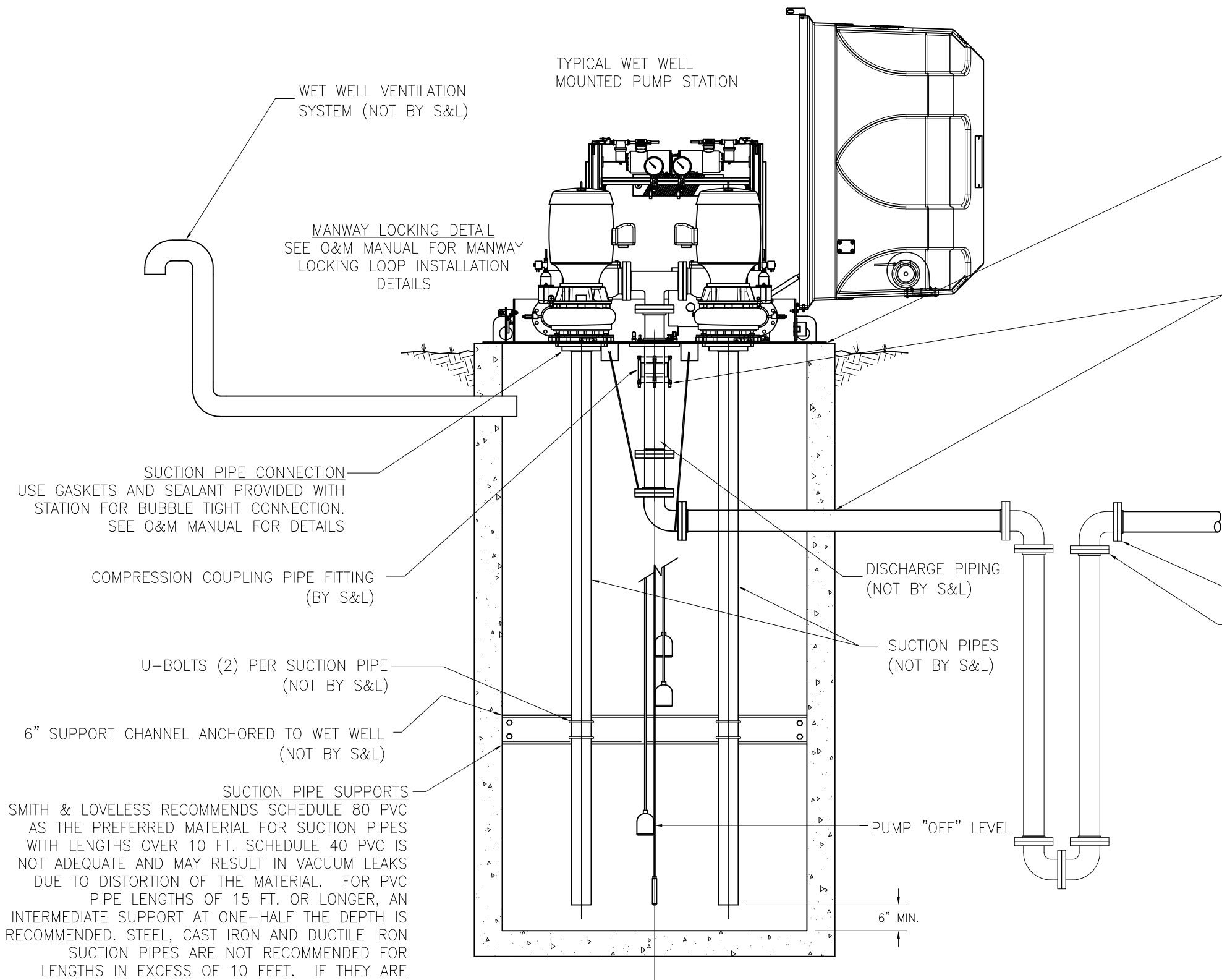
				DRAWN BY:	DATE:	ALLOWABLE TOLERANCES	MANWAY LOCKING DETAIL			
				ALEX	11/13/95	FRACTIONS	SIZE	U/M	EA	WT.
				CHECKED BY:	DATE:	DECIMALS	FILE NAME	PLOT SCALE 1=10.667		
				DF	11/95	ANGLES	SERIAL NO	DWG NO	87A216	REV
				APPROVED BY:	DATE:		ORIGINAL ISSUE	N91-45 © Smith & Loveless, Inc. 1995		
				MEW	11/95					
LET	ECN NO	DATE	BY APPV'D	SCALE:	CODE:					
				NTS	9					

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INSTALLATION DETAILS

EVERLAST™ 1000/3000 SERIES



WET WELL VENTILATION SYSTEM (NOT BY S&L)

TYPICAL WET WELL MOUNTED PUMP STATION

MANWAY LOCKING DETAIL
SEE O&M MANUAL FOR MANWAY LOCKING LOOP INSTALLATION DETAILS

GENERAL WETWELL COMMENTS

THE WETWELL SHOULD BE INSTALLED SO THE TOP REMAINS AS LEVEL AS POSSIBLE. CONTRACTOR IS TO INSTALL SLOPES AROUND THE INTERIOR BOTTOM CORNER OF THE WETWELL.

GROUTING STATION TO WET WELL

PRIOR TO SETTING THE STATION ON TOP OF THE WET WELL, APPLY A LAYER OF NON-SHRINK OR EPOXY GROUT ON THE TOP SURFACE OF THE WET WELL. THE STATION WILL THEN BED DOWN IN THE GROUT, GIVING THE STATION FIRM SUPPORT AND REDUCING NOISE TRANSMISSIONS. THE BASE PLATE SHOULD BE LEVEL IN ALL DIRECTIONS WHEN COMPLETE.

ANCHORING DISCHARGE CONNECTION

THE DISCHARGE IS TO BE ORIENTED IN ACCORDANCE WITH THE ENGINEER'S PLAN. GENERALLY, SMITH & LOVELESS®, INC. WILL PROVIDE A COMPRESSION TYPE COUPLING TO JOIN THE FORCE MAIN TO THE STATION DISCHARGE PIPE. COMPRESSION TYPE COUPLINGS DO NOT PROVIDE PIPE END RESTRAINT. TWO LUGS ARE ALSO PROVIDED (ONE ON EITHER SIDE OF THE DISCHARGE) ON THE UNDERSIDE OF THE BASEPLATE FOR SECURING THE VERTICAL SECTION OF THE DISCHARGE PIPE FROM SEPARATING IN THE COUPLING. TIE THE DISCHARGE PIPE TO THE STATION TO PREVENT SEPARATION FROM THE COUPLING IN THE VERTICAL DIRECTION BY USING AN ALL-THREADED ROD, CABLE OR CHAIN (NOT SUPPLIED BY S&L). THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE ADEQUATE RESTRAINT AGAINST ANY HORIZONTAL THRUST DEVELOPED. THE RESTRAINT SHALL BE TIED TO THE STRUCTURE, AS THE STATION BASEPLATE IS NOT DESIGNED TO WITHSTAND HORIZONTAL THRUST FORCES. ALL DISCHARGE PIPES SHOULD BE SECURED.

SUCTION PIPE CONNECTION
USE GASKETS AND SEALANT PROVIDED WITH STATION FOR BUBBLE TIGHT CONNECTION. SEE O&M MANUAL FOR DETAILS

COMPRESSION COUPLING PIPE FITTING (BY S&L)

DISCHARGE PIPING (NOT BY S&L)

DISCHARGE PIPING (NOT BY S&L)

U-BOLTS (2) PER SUCTION PIPE (NOT BY S&L)

SUCTION PIPES (NOT BY S&L)

PRIMING LOCK LOOP (IF REQUIRED DUE TO DOWNHILL OR SHORT FORCE MAIN)
THE PURPOSE OF THE PRIMING LOCK LOOP IS TO FORM A RETURN LOOP OR TRAP IN THE FORCE MAIN, EITHER INSIDE OR JUST OUTSIDE THE WET WELL. THE LOOP MUST BE BELOW THE LOW LEVEL OF ELEVATION, THIS PREVENTS THE ENTIRE CONTENTS OF A SHORT FORCE MAIN FROM RETURNING BY GRAVITY TO THE WET WELL OR BEING SIPHONED BACK INTO THE WET WELL IF THE CHECK VALVE DOES NOT SEAT.

6" SUPPORT CHANNEL ANCHORED TO WET WELL (NOT BY S&L)

PUMP "OFF" LEVEL

ON FORCE MAINS THAT RUN HORIZONTAL OR DOWN HILL FROM THE STATION. EITHER USE THE PRIME LOCKING LOOP OR THE LAST FEW FEET OF THE FORCE MAIN SHOULD RUN UP HILL TO CREATE A WATER TRAP EFFECT TO PREVENT WATER DRAINING THE FORCE MAIN IN THE FORWARD DIRECTION.

SUCTION PIPE SUPPORTS
SMITH & LOVELESS RECOMMENDS SCHEDULE 80 PVC AS THE PREFERRED MATERIAL FOR SUCTION PIPES WITH LENGTHS OVER 10 FT. SCHEDULE 40 PVC IS NOT ADEQUATE AND MAY RESULT IN VACUUM LEAKS DUE TO DISTORTION OF THE MATERIAL. FOR PVC PIPE LENGTHS OF 15 FT. OR LONGER, AN INTERMEDIATE SUPPORT AT ONE-HALF THE DEPTH IS RECOMMENDED. STEEL, CAST IRON AND DUCTILE IRON SUCTION PIPES ARE NOT RECOMMENDED FOR LENGTHS IN EXCESS OF 10 FEET. IF THEY ARE REQUIRED, THE PIPE SHOULD BE SUPPORTED FROM THE WALL OF THE WET-WELL TO MINIMIZE THE STRAIN ON THE STATION PIPING.

6" MIN.

NOTE:

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87B761/A

SHEET 1 OF 1

DRAWN BY: CAS		DATE: 1/12/2016	ALLOWABLE TOLERANCES	FOR													
CHECKED BY: HJM		DATE: 1/12/2016	FRACTIONS -	INSTALLATION DETAILS VACUUM PRIME STATIONS EVERLAST™ 1000/3000													
APPROVED BY: PRH		DATE: 1/12/2016	DECIMALS -														
A	N2019-25	2/5/19	BTG HJM	SCALE: NTS	CODE: -												
LET	ECN NO	DATE	BY APPV'D	SCALE:	ANGLES												
ORIGINAL ISSUE	N2009-29	© Smith & Loveless, Inc. 2016		SERIAL NO	DWG NO 87B761												
RECIPIENT AGREES THE INFORMATION ON THIS DRAWING AND THE EQUIPMENT DEPICTED HEREIN IS CONFIDENTIAL, PROPRIETARY AND PROTECTED UNDER UNITED STATES AND FOREIGN INTELLECTUAL PROPERTY LAWS AND IS OWNED BY SMITH & LOVELESS, INC. UNLESS SPECIFIC WRITTEN CONSENT IS GIVEN BY SMITH & LOVELESS, INC. YOU MAY NOT COPY, REPRODUCE, TRANSMIT, DISPLAY, DISTRIBUTE, ALTER, OR OTHERWISE USE IN WHOLE OR IN PART ANY INFORMATION ON THIS DRAWING OR THE EQUIPMENT DEPICTED HEREIN, OR PERMIT SUCH ACTIONS TO BE TAKEN BY A THIRD PARTY. SMITH & LOVELESS, INC. TRANSFERS NO RIGHTS IN THIS DRAWING OR THE INFORMATION AND EQUIPMENT DEPICTED HEREIN. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.				<table border="1"> <tr> <td>U/M</td> <td>EA</td> <td>WT.</td> </tr> <tr> <td>FILE NAME</td> <td colspan="2">87B761.dwg</td> </tr> <tr> <td>PLOT SCALE</td> <td colspan="2">1=30</td> </tr> <tr> <td>REV</td> <td colspan="2">A</td> </tr> </table>		U/M	EA	WT.	FILE NAME	87B761.dwg		PLOT SCALE	1=30		REV	A	
U/M	EA	WT.															
FILE NAME	87B761.dwg																
PLOT SCALE	1=30																
REV	A																

SECTION 4

Initial Operation



Smith & Loveless Inc.

The main pumps in Smith & Loveless' **EVERLAST™** Wet Well Mounted Pump Stations come equipped with "Non-Clog" type impellers that pass the industry standard 3" spherical solid and effectively handle solids commonly found in sanitary sewage. However, the pumps will not handle large rocks, bricks, sticks and other heavy materials of a similar nature.



DANGER: *Wet wells and sewers may contain explosive, toxic or suffocating gases. Consult with proper authorities on entry procedures. Before entering, test for explosive atmosphere and oxygen deficiency. Supply fresh air to work area. Failure to do so could result in serious bodily injury or death.*

To prevent damage to the pumps, it is important that the wet well be thoroughly cleaned before starting the station. While inspecting the wet well, be sure that the submersible level transducer and float switches are hanging freely, and the float switches are at the elevations required by the Owner's Engineer. Keep the discharge plug valve(s) in the "Closed" position until the station has been fully checked and is ready for operation.

3-WAY LEVER ACTUATED VALVES

For stations furnished with six-inch (6") 3-way discharge plug valves, the following actuation procedure must be followed. Loosen the lock screw several turns and lift the handle to raise the plug from the seat. Turn the plug handle down to seat the plug, and tighten the lock screw.

NOTE: *The valve cannot be turned unless the plug is first raised from its seat. Attempting to turn the valve without unseating the plug can cause damage. Any change in the valve position must be done with both pumps "Off".*

PUMP OPERATION

The pump cycle is controlled by the submersible pressure transducer in the wet well. With a rising wet well, the lead pump "On" level is reached, and the base pump starts. If the wet well level continues to rise, the lag pump "On" level is reached, and the standby pump is started. Both pumps then pump the wet well to a level below the low level "On" setting and the "Off" level shuts off both pumps. The pumps can be alternated, either sequentially or by a set time, or a Lead Pump can be designated.

MOTOR START-UP

The motor must rotate freely. It should run quietly on initial start-up.



CAUTION: *Do not hold the switch in the "Hand" position longer than five (5) seconds to prevent severe pump damage from occurring.*

Operate the motor at normal load for a short period of time. Check pump for proper rotation, unusual noise, heating or excessive current. Excessive current will result in overheated windings.

Clearing Blockages



WARNING: *Water hammer can create high-pressure surges that may cause serious damage to pumps, valves and piping. If the equipment would fail, this could cause serious bodily injury.*

Pumps must not be backflushed in an attempt to clear blockage from the pump impeller or suction lines. There is always a danger that the check valve can slam, creating a large pressure surge in the pump and piping. The bang occurs because the water is incompressible, and when a valve closes suddenly the water hits it like a hammer (water hammer).



WARNING: *Disconnect and lock out power before servicing equipment. Failure to do so could result in electrical shock, serious bodily injury or death.*

If a blockage should occur, it must be cleared by lifting the pump rotating assembly and removing the blockage.



WARNING: *Lifting lugs have been provided on the equipment to facilitate installation. Lift the equipment ONLY by the lifting lugs labeled for lifting. Failure to do so could result in serious bodily injury or death.*

One of the features of Smith & Loveless pumps is that just by removing a few bolts, the rotating assembly can be easily removed and hoisted to allow access to the impeller, volute and suction line. The rotating assembly is then easily reinstalled.

DOMES INSPECTION

A part of the Operator's routine maintenance of a pumping station must include inspecting the domes. During regular service, the domes could be physically or chemically damaged. To inspect for physical damage, visually check the inside and outside surface of the dome. Any cracks, deep dents, or scratches indicate that the dome has been physically damaged, and may be in a weakened condition.

The makeup of wastewater varies considerably, and it is possible that chemicals or solvents may be present that can attack the dome. Chemical attack usually results in an opaque or cloudy appearance of the plastic. There could also be a crazed appearance similar to the surface of old porcelain.

If any signs of physical or chemical damage are discovered, the dome must be replaced.

NOTE: *The dome must be replaced every two (2) years regardless of its appearance. Consult Operation and Maintenance Section for the cleaning procedure.*

HOW TO RESET COMBINED PUMP/PRIME FAILURE

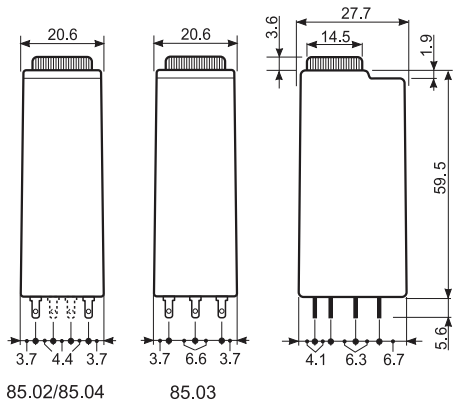
If the station includes combined pump/prime failure and a pump/prime failure occurs, that pump and vacuum pump motor are disabled from running until the pump/prime failure alarm is reset. The alarm is reset automatically if the lag pump completes the pump cycle by pumping the wet well level down to the off level. The alarm can be manually reset by cycling power to the single phase control circuit breaker. Alternatively the alarm can be reset by placing the selector switch for that pump in OFF. Place the selector switch back into AUTO after resetting the alarm.

Features

Plug-in timer

- 85.02 - 2 Pole 10 A
- 85.03 - 3 Pole 10 A
- 85.04 - 4 Pole 7 A

- Multifunctions
- Seven time scales, from 0.05s to 100h
- 94 series sockets



FOR UL RATINGS SEE:

"General technical information" page V

Contact specification

Contact configuration	2 CO (DPDT)	3 CO (3PDT)	4 CO (4PDT)
Rated current/Maximum peak current	A 10/20	A 10/20	A 7/15
Rated voltage/Maximum switching voltage V AC	250/400	250/400	250/250
Rated load AC1	VA 2,500	VA 2,500	VA 1,750
Rated load AC15 (230 V AC)	VA 500	VA 500	VA 350
Single phase motor rating (230 V AC)	kW 0.37	kW 0.37	kW 0.125
Breaking capacity DC1: 30/110/220 V	A 10/0.25/0.12	A 10/0.25/0.12	A 7/0.25/0.12
Minimum switching load	mW (V/mA) 300 (5/5)	mW (V/mA) 300 (5/5)	mW (V/mA) 300 (5/5)
Standard contact material	AgNi	AgNi	AgNi

Supply specification

Nominal voltage (U _N)	V AC (50/60 Hz)	230...240	230...240	230...240
	V AC/DC	12 - 24 - 48 - 110...125 (non polarized)		
Rated power AC/DC	V AC (50 Hz)/W	2/2	2/2	2/2
Operating range	AC	(0.85...1.1)U _N	(0.85...1.1)U _N	(0.85...1.1)U _N
	DC	(0.85...1.1)U _N	(0.85...1.1)U _N	(0.85...1.1)U _N

Technical data

Specified time range		(0.05...1)s, (0.5...10)s, (5...100)s, (0.5...10)min, (5...100)min, (0.5...10)h, (5...100)h		
Repeatability	%	± 2	± 2	± 2
Recovery time	ms	≤ 20	≤ 20	≤ 20
Minimum control impulse	ms	—	—	—
Setting accuracy-full range	%	± 5	± 5	± 5
Electrical life at rated load in AC1	cycles	200 · 10 ³	200 · 10 ³	150 · 10 ³
Ambient temperature range	°C	-20...+60	-20...+60	-20...+60
Protection category		IP 40	IP 40	IP 40

Approvals (according to type)

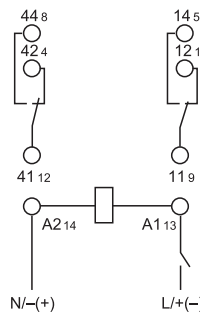


85.02



- 2 pole, 10 A
- AC/DC supply non polarized
- Plug-in for use with 94 series sockets

- AI:** On-delay
- DI:** Interval
- SW:** Symmetrical flasher (starting pulse on)
- GI:** Pulse delayed



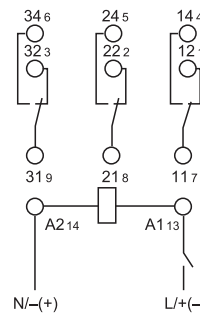
Wiring diagram (without control signal)

85.03



- 3 pole, 10 A
- AC/DC supply non polarized
- Plug-in for use with 94 series sockets

- AI:** On-delay
- DI:** Interval
- SW:** Symmetrical flasher (starting pulse on)
- GI:** Pulse delayed



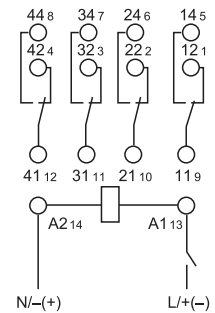
Wiring diagram (without control signal)

85.04



- 4 pole, 7 A
- AC/DC supply non polarized
- Plug-in for use with 94 series sockets

- AI:** On-delay
- DI:** Interval
- SW:** Symmetrical flasher (starting pulse on)
- GI:** Pulse delayed



Wiring diagram (without control signal)

Ordering information

Example: 85 series timer, 4 CO (4PDT), 24 V AC/DC supply voltage, AI, DI, GI, SW functions.



Series

Type

0 = Multifunction (AI, DI, GI, SW)*

* AI = On-delay

DI = Interval

GI = Pulse delayed

SW = Symmetrical flasher (starting pulse on)

No. of poles

2 = 2 pole - 10 A

3 = 3 pole - 10 A

4 = 4 pole - 7 A

Supply voltage

012 = 12 V AC/DC

024 = 24 V AC/DC

048 = 48 V AC/DC

125 = (110...125)V AC/DC

240 = (230...240)V AC

Supply version

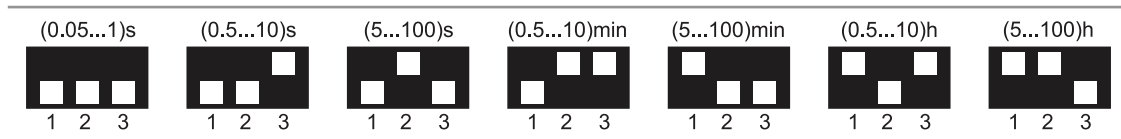
0 = AC (50/60 Hz)/DC

8 = AC (50/60 Hz) for 240 V only

Technical data

Insulation		85.02, 85.03		85.04
Dielectric strength	between input and output circuit	V AC	2,000	2,000
	between open contacts	V AC	1,000	1,000
	between adjacent contacts	V AC	2,000	1,550
Insulation (1.2/50 µs) between input and output		kV	6	4
EMC specifications				
Type of test		Reference standard		
Electrostatic discharge	contact discharge		EN 61000-4-2	n.a.
	air discharge		EN 61000-4-2	8 kV
Radio-frequency electromagnetic field (80 ÷ 1,000 MHz)			EN 61000-4-3	15 V/m
Fast transients (burst) (5-50 ns, 5 kHz) on Supply terminals			EN 61000-4-4	4 kV
Surges (1.2/50 µs) on Supply terminals	common mode		EN 61000-4-5	4 kV
	differential mode		EN 61000-4-5	2 kV
Radio-frequency common mode (0.15 ÷ 80 MHz) on Supply terminals			EN 61000-4-6	10 V
Power-frequency (50 Hz)			EN 61000-4-8	30 A/m
Radiated and conducted emission			EN 55022	class B
Other data				
Power lost to the environment	without contact current	W	1.6	
	with rated current	W	3.7 (85.02)	4.7 (85.03) 3.6 (85.04)

Times scales



NOTE: time scales and functions must be set before energising the timer.

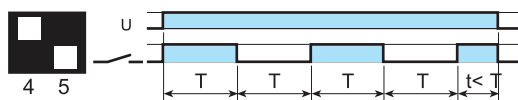
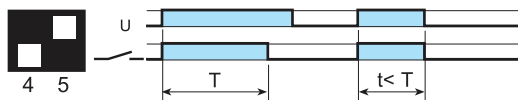
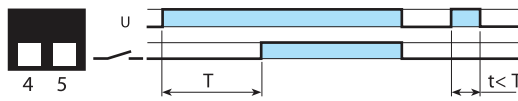
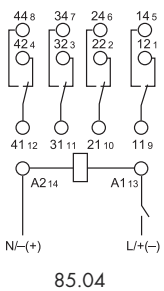
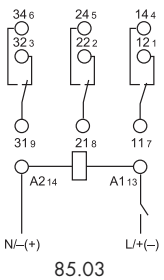
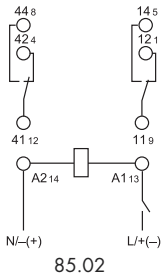
Functions

U = Supply voltage
 = Output contact

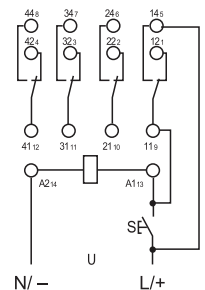
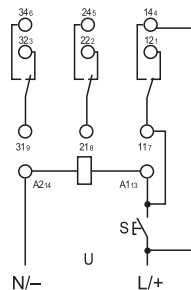
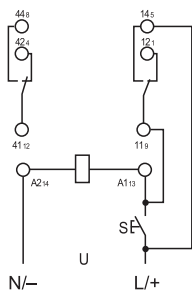
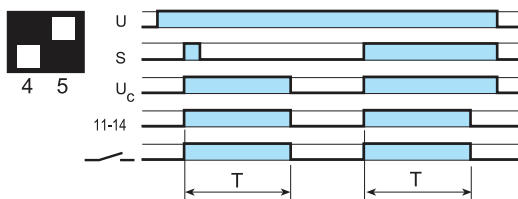
LED	Supply voltage	NO (SPDT-NO) output contact	Contacts	
			Open	Closed
	OFF	Open	x1 - x4	x1 - x2
	ON	Open	x1 - x4	x1 - x2
	ON	Open (Timing in Progress)	x1 - x4	x1 - x2
	ON	Closed	x1 - x2	x1 - x4

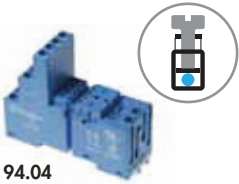
Wiring diagram

Type: 85.02, 85.03, 85.04



U = Supply voltage
S = Signal switch
U_c = Supply voltage to the timer
11-14 = Self-holding contact
 = Output contact



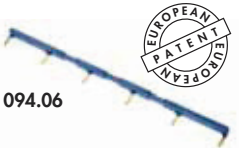
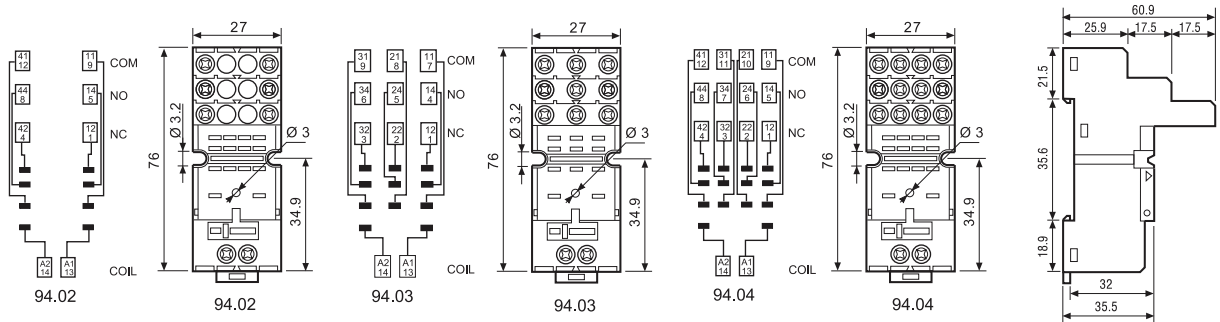


94.04

Approvals
(according to type):



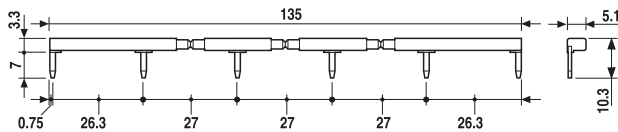
Screw terminal (Box clamp) socket	94.02	94.02.0	94.03	94.03.0	94.04	94.04.0
panel or 35 mm rail (EN 60715) mount	Blue	Black	Blue	Black	Blue	Black
For timer type	85.02		85.03		85.04	
Accessories						
Metal retaining clip (supplied with timer)	094.81					
6-way jumper link	094.06	094.06.0	094.06	094.06.0	094.06	094.06.0
Identification tag	094.00.4					
Technical data						
Rated values	10 A - 250 V					
Dielectric strength	2 kV AC					
Protection category	IP 20					
Ambient temperature	°C -40...+70					
⊕ Screw torque	Nm 0.5					
Wire strip length	mm 8					
Max. wire size for 94.02, 94.03 and 94.04 sockets	solid wire			stranded wire		
	mm ² 1x6 / 2x2.5			1x4 / 2x2.5		
	AWG 1x10 / 2x14			1x12 / 2x14		

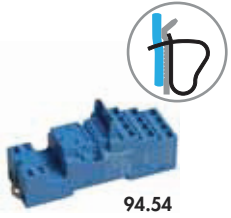


094.06



6-way jumper link for 94.02, 94.03 and 94.04 sockets	094.06 (blue)	094.06.0 (black)
Rated values	10 A - 250 V	



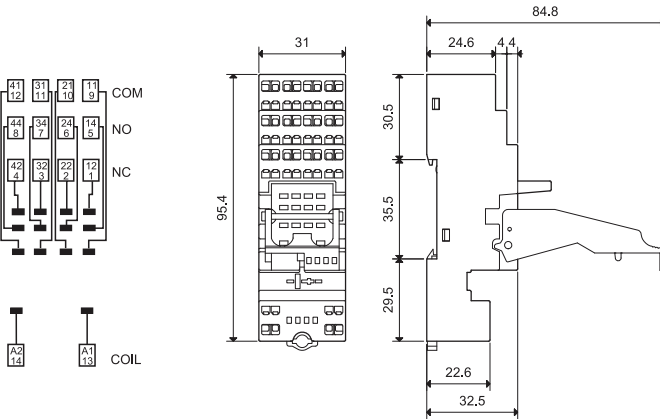
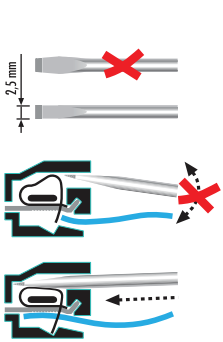


94.54

Approvals
(according to type):



Screwless terminal socket 35 mm rail (EN 60715) mount	94.54 (blue)	
For timer type	85.02, 85.04	
Accessories		
Metal retaining clip	094.81	
6-way jumper link	094.56	
Technical data		
Rated values	10 A - 250 V	
Dielectric strength	2 kV AC	
Protection category	IP 20	
Ambient temperature	°C -25...+70	
Wire strip length	mm 10	
Max. wire size for 94.54 socket	solid wire	stranded wire
	mm ² 2x(0.2...1.5)	2x(0.2...1.5)
	AWG 2x(24...14)	2x(24...14)



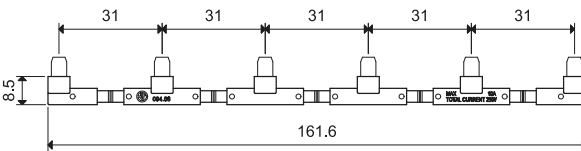
Sockets +
jumper link

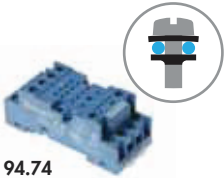


094.56



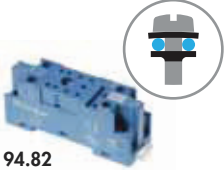
6-way jumper link	094.56 (blue)
Rated values	10 A - 250 V





94.74

Approvals
(according to type):

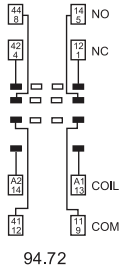


94.82

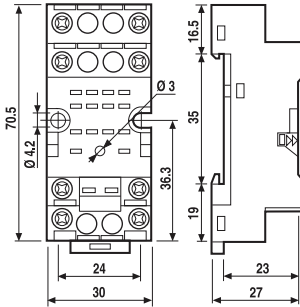
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(according to type):



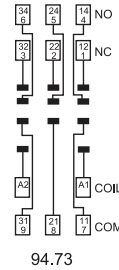
Screw terminal (Plate clamp) socket panel or 35 mm rail (EN 60715) mount	94.72 Blue	94.72.0 Black	94.73 Blue	94.73.0 Black	94.74 Blue	94.74.0 Black
For timer type	85.02		85.03		85.02, 85.04	
Accessories	Metal retaining clip (supplied with timer) 094.81					
Screw terminal socket panel or 35 mm rail (EN 60715) mount	94.82 Blue			94.82.0 Black		
For timer type	85.02			85.02		
Accessories	Metal retaining clip (supplied with timer) 094.81					
Technical data	Rated values 10 A - 250 V					
	Dielectric strength 2 kV AC					
	Protection category IP 20					
	Ambient temperature °C -40...+70					
	Screw torque Nm 0.5					
	Wire strip length mm 8 (94.72, 94.73, 94.74)			9 (94.82)		
	Max. wire size for 94.72, 94.73, 94.74 and 94.82 sockets solid wire			stranded wire		
	mm ² 1x2.5 / 2x1.5			1x2.5 / 2x1.5		
	AWG 1x14 / 2x16			1x14 / 2x16		



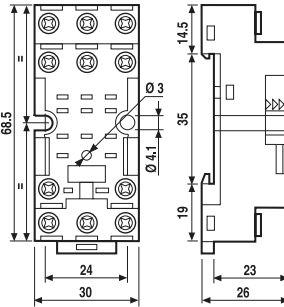
94.72



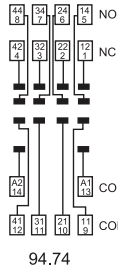
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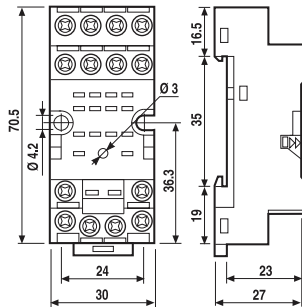
94.73



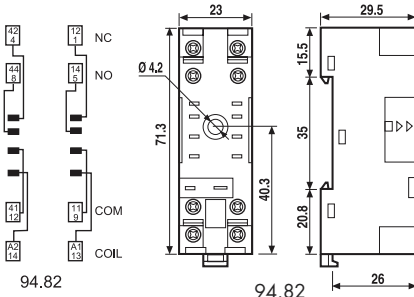
94.73



94.74

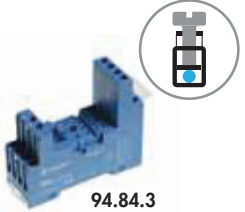


94.74



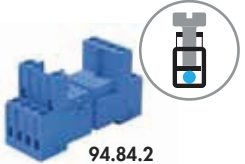
94.82

94.82



94.84.3

Approvals (according to type):

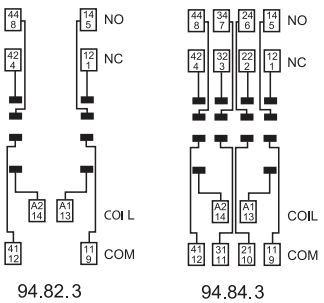


94.84.2

Approvals (according to type):

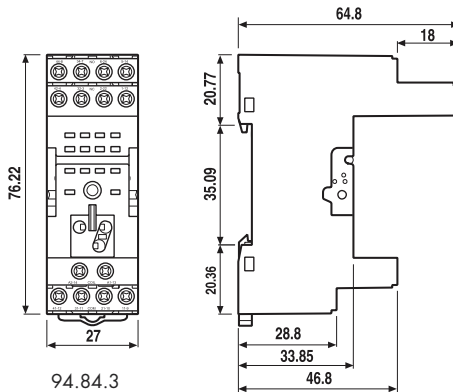


Screw terminal (Box clamp) socket panel or 35 mm rail (EN 60715) mount	94.82.3 Blue	94.82.30 Black	94.84.3 Blue	94.84.30 Black
For timer type	85.02			
Accessories				
Metal retaining clip	094.81			
6-way jumper link	094.06	094.06.0	094.06	094.06.0
Identification tag	094.80.2			
Screw terminal (Box clamp) socket panel or 35 mm rail (EN 60715) mount	94.84.2 Blue	94.84.20 Black		
For timer type	85.02, 85.04			
Accessories				
Metal retaining clip	094.81			
6-way jumper link	094.06	094.06.0		
Identification tag	094.80.2			
Technical data				
Rated values	10 A - 250 V			
Dielectric strength	2 kV AC			
Protection category	IP 20			
Ambient temperature	°C	-40...+70		
⊕ Screw torque	Nm	0.5		
Wire strip length	mm	7		
Max. wire size for 94.82.3, 94.84.3 and 94.84.2 sockets		solid wire	stranded wire	
	mm ²	1x6 / 2x2.5	1x4 / 2x2.5	
	AWG	1x10 / 2x14	1x12 / 2x14	

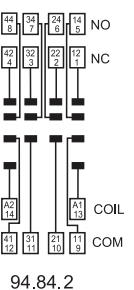


94.82.3

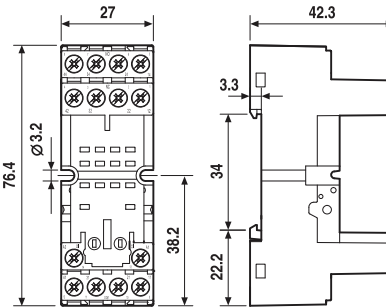
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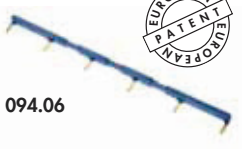
94.84.3



94.84.2



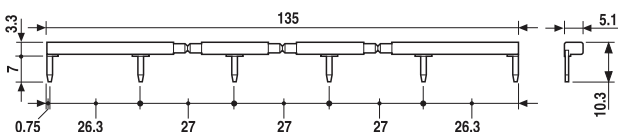
94.84.2

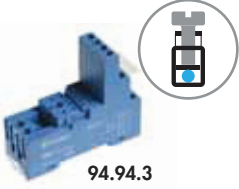


094.06



6-way jumper link for 94.82.3, 94.84.3 and 94.84.2 sockets	094.06 (blue)	094.06.0 (black)
Rated values	10 A - 250 V	



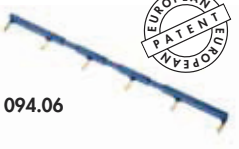
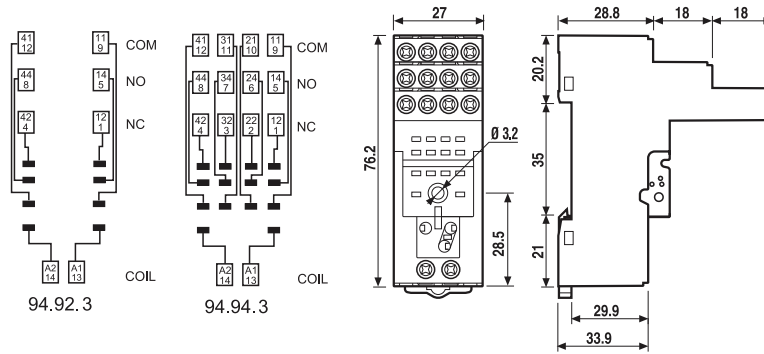


94.94.3

Approvals
(according to type):



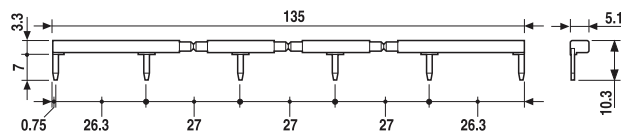
Screw terminal (Box clamp) socket	94.92.3	94.92.30	94.94.3	94.94.30
panel or 35 mm rail (EN 60715) mount	Blue	Black	Blue	Black
For timer type	85.02		85.02, 85.04	
Accessories				
Metal retaining clip	094.81			
6-way jumper link	094.06	094.06.0	094.06	094.06.0
Identification tag	094.80.2			
Technical data				
Rated values	10 A - 250 V			
Dielectric strength	2 kV AC			
Protection category	IP 20			
Ambient temperature	°C -25...+70			
⊕ Screw torque	Nm	0.5		
Wire strip length	mm	8		
Max. wire size for 94.92.3 and 94.94.3 sockets		solid wire	stranded wire	
	mm ²	1x6 / 2x2.5	1x4 / 2x2.5	
	AWG	1x10 / 2x14	1x12 / 2x14	



094.06



6-way jumper link for 94.92.3 and 94.94.3 sockets	094.06 (blue)	094.06.0 (black)
Rated values	10 A - 250 V	



SECTION 5

Operation & Maintenance



Smith & Loveless Inc.

The mechanical and electrical equipment on your Smith & Loveless, Inc. EVERLAST™ Series 1000 Wet Well Mounted Pump Station has been tested by actual operation at the Factory, and is ready for installation and use. Your pump station will give continuous reliable service when the station is provided with reasonable care and a routine maintenance program. A clean pump station reduces maintenance. Therefore, clean up the station after each visit.

ROUTINE MAINTENANCE PROCEDURES

Smith & Loveless, Inc. recommends that a routine preventive maintenance program be established for your equipment. The following schedule is recommended for your equipment. However, each station installation can have specific conditions that may require modifications to the recommended schedule. Monitor your installation and refine the scheduling as required.

Monthly Inspections

Visit your station and check the following items to be sure your equipment is operating correctly. The operation and the maintenance instructions for the station components are included in this section. Assure that your station is operating correctly and replace any component that is not operating correctly, is damaged, or has excessive wear.

- Float switches
- Main pump operation
- Main pump mechanical seals
- Vacuum priming operation
- Float check valve bowls
- Hood operation and seal
- Station cleanliness

Semi-Annual (Every 6 months) Inspections:

Perform the following procedures.



WARNING: *Disconnect and lock out power before servicing equipment. Failure to do so could result in electrical shock, serious bodily injury or death.*

- Inspect the dome and WaveStart™ sensors. Thoroughly remove and clean any coating or debris from the domes and/or the WaveStart™ sensors. See Section 5 for directions to clean the dome and WaveStart™.
- Dump out any water and clean the trap bowls on the Float Check Valve assemblies.

Maintenance Records

Keep a logbook with the station. Log the date of each visit to the station, and document the status of the items inspected. List any maintenance performed on the station, parts used and the operator's name for future reference.

For assistance with maintenance problems, contact the Smith & Loveless Service Department at (913) 888-5201 or Toll Free in the United States at 1 (800) 922-9048, Option 7. Experienced technicians are available to answer questions and assist you.

STATION OPERATION

Float switches are provided to control the pumping cycles of the station. As the wet well liquid rises to its "On" set point, power is provided to the vacuum priming pump relay. If the pump is not already primed, it will start the vacuum pump and run until the liquid level rises in the pump adapter housing and contacts the WaveStart™. The vacuum pump is stopped. The main pump is now primed and starts. The wet well liquid level will lower as the main pump operates until it reaches the set "Off" point, opening the centrifugal pump motor starter, completing the pump cycle. This process will repeat itself as the wet well liquid level rises. Should one pump fail to handle the flow to the wet well, or upon failure of one of the pumps, the wet well liquid rises until it reaches the "On" set point of the second (lag) pump.

If the pump is not already primed, this will energize the vacuum pump of the lag pump. When the lag pump is primed, this will initiate power to the motor starter, and cut off the vacuum pump. Both main pumps will operate

until the wet well level drops to the low-level “Off” level, which will cut off both pumps.

NOTE: *Special design requirements may prevent the lead and lag pumps from operating in parallel. Some standby power sources cannot provide full power requirements. In this case, only the lead pump will operate.*

PUMPS AND PIPING

Pump Motor Lubrication

NOTE: *Caution must be taken whenever lubricants are applied to the motor bearings. Thoroughly study the Lubrication Section in this manual before lubricating.*

The most important single factor in securing good service from ball bearing motors is to keep dirt, dust and foreign particles out of the bearing. To do this:

- Use only clean grease from clean containers and handle so as to keep it clean.
- Never open a bearing housing in a dusty atmosphere.
- Never open a bearing housing without first cleaning off all dirt from adjacent surfaces.
- Always protect an exposed bearing by a protective cover (clean paper or lint-free cloth).

The heavy-duty bearings supplied on Smith & Loveless pump motors are lubricated at the Factory. In normal service, lubrication once every year is adequate since the bearing housing has an additional supply of grease. Recommended lubricant is Polyrex EM (Exxon Mobil) unless a special grease is specified on the motor. If motors run continuously or over 4,000 hours per year, they must be greased every six (6) months.

NOTE: *Refer to the motor nameplate to determine the type of bearing on your motor.*

It is sometimes necessary to use 5000 or 7000 series bearings. These bearings have two (2) rows of balls or one (1) bearing on top of the other. This type bearing requires a different

lubrication procedure. These bearings do not have shields. The lubrication enters the bearing proper. The lubricant will work out of the upper race of the bearing into the lower race or grease reservoir below the bearing.

The 5000 or 7000 series bearing requires more lubricant. This type bearing must be greased every three (3) months if the motor operates continuously or more than 4,000 hours per year. If the surrounding temperature rises above 90°F, the bearings must be lubricated with a general-purpose lithium base Grade 3 grease.

When lubrication is required, clean the grease fitting and pressure relief fitting to make sure they are not plugged.

NOTE: *If no relief fitting is provided, remove grease relief plug. After lubricating, run motor ten (10) minutes before replacing plug.*



Picture 5.1 Lubricating Motor

Add grease with a low-pressure gun (see Picture 5.1). For 1 through 30 HP motors, put five (5) pumps of grease in the top bearing, and ten (10) pumps in the bottom bearing. For 40 HP and larger, put ten (10) pumps in the top bearing, and twenty (20) pumps in the bottom bearing.

NOTE: *In most cases, grease will not appear at the grease relief. The grease relief is provided to allow excessive pressure and grease to escape. An indicator of excessive lubrication is grease coming out of the grease relief. If this occurs, stop current lubrication.*

Avoid excessive lubrication, since bearing and/or motor damage could occur. Excessive lubrication could cause:

- Excessive pressure which may damage bearing shield.
- Excessive supply of grease in bearing raceway may cause overheating and premature failure.
- Excess grease may be forced into motor housing and collect on windings, causing winding deterioration.

Motor Storage



WARNING: *Disconnect and lock out power to the motor before servicing equipment. Failure to do so could result in serious bodily injury or death.*

If the station has been stored, or the motors not operated for more than two (2) weeks, especially out-of-doors or in a moist area, the motor insulation may have absorbed moisture. Use a high voltage resistance meter (megger) to check insulation resistance to ground. AIEE Standards recommend that the winding's insulation resistance of clean, dry motors at room temperature must not be less than:

$$\text{Insulation Resistance (Megohms)} = \frac{\text{Motor Rated Voltage} + 1000}{1000}$$

If the resistance is below the recommended value, the windings must be baked dry or replaced. The stator must be baked in an oven at not more than 200° F. until the insulation resistance becomes constant.

CENTRIFUGAL PUMPS

There are two (2) specially designed centrifugal pumps in this station. The motor adapter is hollow. The vacuum pump draws air from the housing, as shown in the schematics. Liquid rises from the wet well up the suction pipe, filling the volute and hollow adapter until it reaches the level sensor probe. This means that

all air has been extracted from the pump and suction pipe.

The pump has a specially designed mechanical seal. The adapter has a hole in one side to the shaft and seal mounting plate. Any seal leakage can be observed through this hole. If there is a leak, replace the seal. See the Mechanical Seal Replacement pages of this section.

PIPING

The suction pipe extends from the fronthead to near the bottom of the wet well. Liquid rises up this pipe as the impeller in the pump turns. The liquid is thrown outward in the volute. The volute conveys the liquid to the pump discharge nozzle. The liquid passes into a special elbow and to a swing-type wafer check valve.

The check valve has a brass clapper arm and a stainless steel shaft. The clapper seats against a rubber seat. An external spring-loaded arm makes the valve non-slamming. The liquid passes from the check valve to a “plug” valve. This valve has a rubber covered plug that seats against a cast iron seat. A wrench to operate the valve is provided with each station.

The liquid discharged through the plug valve passes through to the discharge line. The discharge line is connected to the station piping by a “Dresser” type coupling.

WET WELL ACCESSWAY

The EVERLAST™ SERIES 1000 Wet Well Mounted Pump Station incorporates a single manway access cover to aid in the station wet-well maintenance tasks.



DANGER: *Always secure and lock the wet well cover(s) in the “Open” position when accessing the wet well. Failure to do so could allow the cover(s) to fall, resulting in serious bodily injury or death.*

A lockable latch is provided to hold the cover in the “Up” or “Open” position. The latch is located on the side of the station near the corner of the station base.

To open and secure the manway cover, lift the cover to a vertical position. Hold the cover in this position and lift the latch mounted to the station base so that the latch rod passes through the eye in the bracket that is mounted to the manway lid. Rotate the rod to assure the rod does not fall out of the eye on the lid. The bracket on the station base has a hole that will allow for a lock and tag to be inserted to secure the latch so it will not rotate and disengage from the bracket. Be sure that the bracket is secure and locked into position before accessing the wet well.



DANGER: *Always lock the wet well covers when they are not in use to prevent access to the wet well by unauthorized personnel. Failure to do so could result in serious bodily injury or death.*

When the lid is to be closed, hold the lid in the vertical position and disengage the latch by rotating it and pulling it down so the pin is taken out of the bracket on the manway lid.

Lower the cover down carefully until it sets firmly on the wet well. Lock the cover down to the wet well using a padlock, and keep the cover locked unless authorized personnel will require access to the wet well.

COOLING FAN

A cooling fan is mounted in the end of one hood section. The cooling fan intake and vent louvers must be opened in warm weather and closed in cold weather. The fan is controlled by a thermostat inside the control panel and is not adjustable.



Picture 5.2 Fan Installed In Station Enclosure

VENTILATION LOUVERS

During cold weather, the ventilation louvers in the fiberglass cover should be closed, and during warm weather, they should be opened for cooling. The louvers are to be moved individually by hand (see Picture 5.3). There is no lubrication required for the louvers.



Picture 5.3 Adjusting Vent Louvers

HEATER

There is a 500-watt heater mounted on the back of the control panel. The heater is controlled by a thermostat inside the heater. The on set point is adjusted by turning the “Warmer” knob on the heater.

WaveStart™ SENSOR

The liquid level in the pump priming chamber is monitored by a **WaveStart™** liquid level sensor incorporating Multi-Variable sensing technology to detect when the sensor is covered by liquid. If water covers the sensor, and the relay inside the **WaveStart™** changes state.

There are four (4) indicating lights located around the sensor near the threaded M12 connector plug on the **WaveStart™**. A steady green on all (4) lights indicates that the **WaveStart™** is receiving power and can operate. The green light should be lit whenever the 24 VDC power to the sensor is turned on. The green lights will be lit continuously when the pump is not primed, and all (4) lights will turn yellow when the pump is primed. Flashing yellow lights means that there is an overload or short-circuit in the **WaveStart™** wiring. If the yellow lights are flashing, first check the wiring and then try to switch either the **WaveStart™** connector or the **WaveStart™** sensor itself to determine if the problem is in the wiring or the **WaveStart™** sensor.

If the flashing yellow lights stay with the **WaveStart™** then the **WaveStart™** needs to be replaced. If the flashing yellow lights stays with the plug, then it is a wiring problem.

WaveStart™ OPERATING MODULE

When the vacuum pump draws air from the pump housing, water rises into the pump casing and makes contact with the **WaveStart™** sensor. The **WaveStart™** sensor sends a signal to the operating module, and the operating module turns off the vacuum pump and solenoid valve, and the pump motor starter is energized to start the pump.

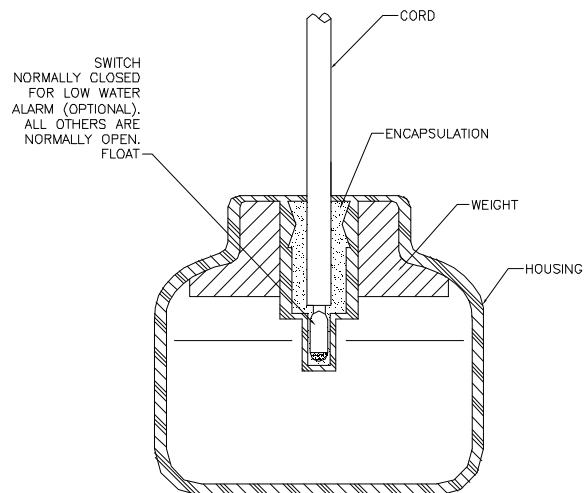
LEVEL CONTROLS

Your pump station contains displacement (float) switches for wet-well level control.

Displacement (Float) Switches

Four (4) displacement switches are provided on the **EVERLAST™ SERIES 1000** Wet Well Mounted Pump Station: one for Pump 1 “On”, one for Pump 2 “On”, one for Pumps “Off”, and one for high water alarm. The switches are mercury switches encapsulated in a weighted ball. These switches do not float. They tip as the water level rises about them, which closes a switch inside the case.

If the pump is not primed, the vacuum pump will run until the water level reaches the **WaveStart™**. The probe will cut off the vacuum pump and energize the centrifugal pump motor starter. The centrifugal pump will pump the wet well level down to the “Off” float switch. The “Off” float switch will break, shutting off the centrifugal pump. The process will repeat itself as the wet well level rises. Should one pump fail to handle the flow to the wet well, or upon failure of one pump, the wet well level will rise to the next float switch. The float switch will energize the vacuum pump of the other centrifugal pump. When the centrifugal pump primes, this will initiate power to the motor starter, and cut off the vacuum priming pump. Both centrifugal pumps will operate until the wet well level drops to the low-level “Off” float switch, which will cut off both pumps.



WET WELL AIR BUBBLER CONTROL (OPTIONAL)

Please refer to the Engineering Order to determine if your pump station has an Air Bubbler Assembly.

Air Bubbler Controller

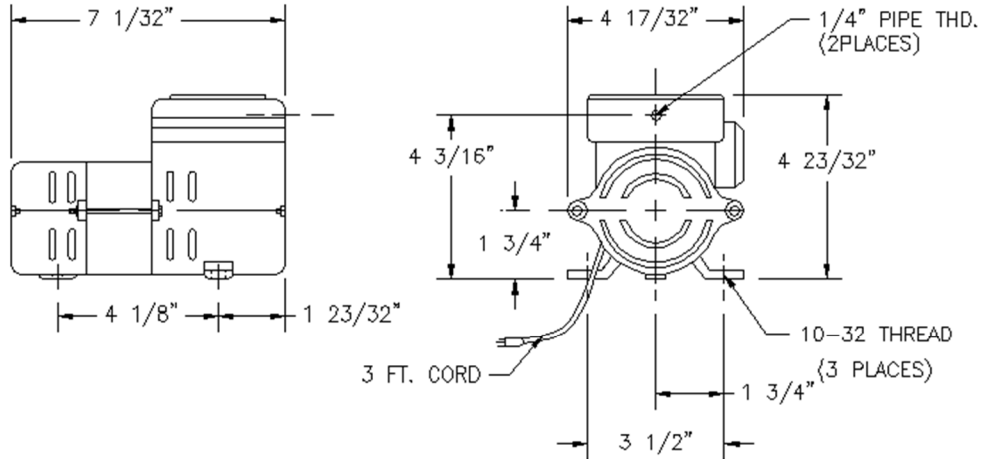
The pump station is provided with an air bubbler control system with pressure transmitter to supply the level control signal to the controller. Install a ½" pipe in the coupling protruding through the station base. This pipe should be cut and installed six inches (6") above the end of the pump suction pipes, and distance as far away from the suction lines as practical. If necessary, support the lower end of the pipe to prevent breakage.

Direct Air – Air Bubbler Assembly

The direct air system consists of two air compressors, flow indicator, bubbler line, and the necessary controls for each pump. A motor-driven timer is provided to automatically alternate the compressor every five minutes so that one of the compressors is always running. The air from the compressors goes into the bubbler line and the pressure in the bubbler line varies with the wet well level. The higher the water level is in the wet well, the higher the pressure is in the bubbler line.

The pressure transducer is connected to the bubbler line and provides the signal to the controller to operate the pumps.

The two air compressors are of the close-coupled, oil-less type. Each compressor has a minimum capacity of 0.2 cubic feet of free air per minute at 10 PSI. The compressors incorporate a single-phase, 60-cycle, 115-volt, drip-proof, brushless-type electric motor.



PART NO. 9L25C

Air Bubbler System – 9L25C – Diaphragm Air Compressor

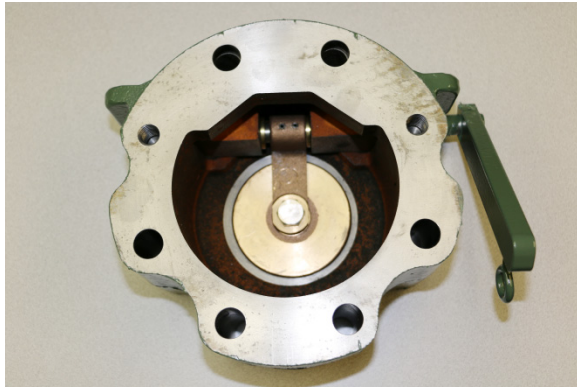
CFM FREE AIR						
PSIG	0	10	20	30	40	50
CFM	.51	.40	.25	.20	.11	.02

NOTES:

1. MOTOR – 1575 RPM SHADED POLE, 115-VOLT, 1 PHASE, 2.35 AMPS
2. THERMOTECTOR INCLUDED
3. MAXIMUM DUTY 50 PSIG
4. 3-FOOT (3') CORD

RAPIDJACK™ CHECK VALVES

The patent pending **RAPIDJACK™** check valve is a valve assembly that allows for the valve top, which includes the check valve arm and flapper, to be easily removed for maintenance without removing the valve body from the station piping. The cast-iron body remains bolted in the discharge piping of each pump. One right hand and one left hand check valve is provided in the station. All valve parts are interchangeable, except for the valve tops, where each fits one of two external arm locations.



Picture 5.2 RAPIDJACK™ Check Valve

Check Valve Performance

Check valves are required to permit flow in one direction, and prevent flow from reversing back into the station. As the pump shuts down, the flow in the discharge pipe decreases and the weight of the external arm and the spring on the valve forces the valve disc towards its seat. At the moment the flow reaches zero velocity, the disc contacts the seat, avoiding any slamming of the disc and restricting any flow from passing back through the valve to the station. The external valve arm position also provides a visual indication whether the valve flapper is open, indicating whether the pump is actually discharging liquid or not.

The normal operation of the check valve is that it opens steadily and smoothly. As you observe the check valve arm when the pump starts to operate, the valve arm should rise steadily to the normal operating position without bouncing or pulsating. This is due to the fact that water is

incompressible, and entire contents of the suction pipes, station and force main must move in unison.

If there is air in the force main, the check valve will operate in an erratic manner. The check valve arm will rise rapidly to the full open position, then dip almost to a full closed position, open gradually to the normal operating position. If there is air at more than one location in the force main, the check valve arm will usually swing open, then almost closed more than once.

When the pump is shut off, and there is air in the force main, the check valve arm will shut suddenly and then open back up. If the air problem is severe enough, the check valve will slam shut. If this occurs contact the Smith & Loveless Customer Service Department at **(913) 888-5201**, or toll free in the United States at **1 (800) 922-9048, Option 7**.

The reason the check valve operates this way is because air is compressible. When the pump comes on, it pumps rapidly as it compresses the air pocket. This is when the check valve arm swings open. After the air bubble is compressed, the contents of the force main downstream are still at rest, the water in the station slows down as it pushes against the stationary water in the force main. This is when the check valve handle will dip. The water on both sides of the air bubble now accelerates together, and the check valve arm rises to its normal operating position.

When the pump is shut off, the energy that kept the bubble compressed is lost. The bubble now pushes the water on the pump side back toward the pump and pushes the downstream water to the outfall. At this time, the check valve arm dips and can slam violently. When the air bubble expands to its maximum volume, the downstream water is moving at a much higher velocity than the water in the pumps. The energy of the downstream water pulls the water in the pumps up to the decaying velocity of the downstream water. As the energy dissipates, the two columns of water de-accelerate together until flow ceases. This is when the check valve arm closes gradually. The quantity and location

of air will affect the performance of the check valve, the time required for the arm to gyrate and the number of cycles that occur.

Check Valve Maintenance

Normally, Smith & Loveless patent pending **RAPIDJACK™** check valves need very little maintenance. However, if maintenance is required, it is quite easy to disassemble the valve for service. Refer to the detailed drawings of the check valve in this section for more information on the valve.

Normal maintenance on the check valve can be done by removing the valve top, including the arm and disc. During this time, the pump station must be turned off and power disconnected. Assure that the work can be done in sufficient time that the wet-well will not overflow, or make provisions to be able to pump the influent wastewater during this time.



WARNING: *Disconnect and lock out power to the pump before servicing the pump or piping. Failure to do so could result in shock, serious bodily injury or death.*

To remove the valve top for maintenance, first turn off the pumps in the station. Close the discharge plug valve. Disconnect and lock out the power to the pumps. Before beginning disassembly of the valve, note the position of the external arm with relationship to the internal arm and clapper disc, and match mark the shaft and arms to ensure correct re-assembly. Remove the spring.



WARNING: *Remove the valve top only using the lifting tabs on each side of the top. Keep fingers and hands clear from between the valve top and the valve body. Failure to do so could result in serious bodily injury.*

Remove valve top by loosening and removing the two fastening bolts located on the top of the valve top.

NOTE: *The holes for the fasteners that hold down the valve top are offset from the centerline. This is to assure the valve top assembly is installed in the correct direction to the valve body. Assure the fastener holes line up when re-assembling the valve.*

Loosen and remove the two horizontal fastening bolts that mount to the valve body. Gently remove the valve top (with attached arm and clapper) from the valve body by lifting it upward. You may need to slightly twist the top to allow the disc to clear the body.



Picture 5.3.A Removing Valve Top



Picture 5.3.B Removing Valve Top

Place the valve top assembly on a sturdy and clean work surface. Do not drop the assembly.

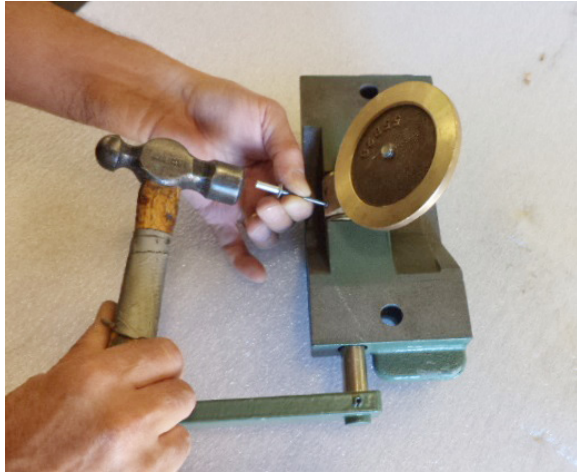
Check the valve body and remove any debris that may exist. Cover the opening in the valve body so that no debris can fall into the piping.

OPERATION AND MAINTENANCE

RAPIDJACK™ Check Valve – 6-inch

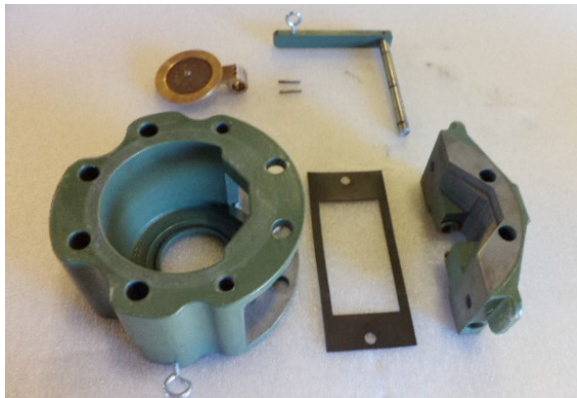
Page 5.10

With the top assembly on a sturdy work surface, rotate the arm to set the disc in the “Open” position. Use a 3/16" drift pin or punch to drive out the two roll pins holding the internal arm to the shaft (see Picture 5.4).



Picture 5.4 Removing Roll Pins (Qty 2)

You can now remove the shaft from the valve by pulling the shaft straight out of the cap. Clean and inspect all parts of the valve and replace any parts that show signs of wear or damage.



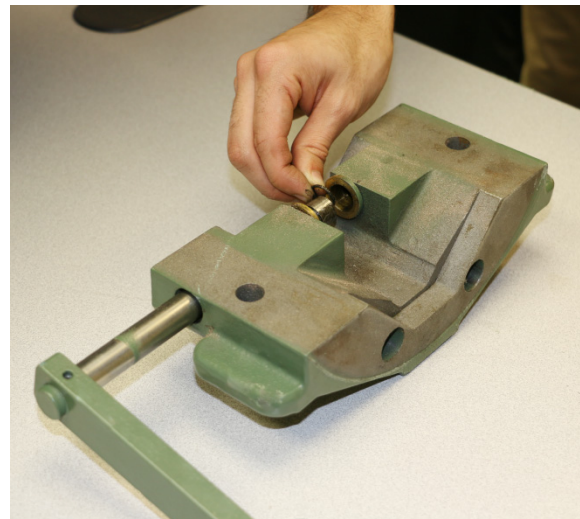
Picture 5.5 Check Valve Components

To replace the shaft bushings, a rod is needed to punch out the old bushings. Once the bushings are removed, lightly sand the holes in the valve body to remove the existing retaining compound and/or any accumulated debris.

Install the new bushings and insert the shaft through them (without “O”-rings to align the bushings). One at a time, slide the bushings out

3/4 of an inch. Coat the bushing heavily with a retaining compound such as Loctite 610, and rotate the bushing as it is pushed into place. Allow the retaining compound to harden approximately ten (10) minutes before removing the shaft.

When reassembling the valve, the following procedure must be followed to avoid damaging the “O”-ring seals (always use new “O”-rings when re-assembling the valve). First, coat the shaft and the shaft bore in the valve housing with a thin film of silicone grease. Next, place an “O”-ring in the groove nearest the external handle end of the shaft. Then, holding the internal arm in place, slide the shaft through the housing and internal arm, and just far enough out the other side of the housing so that the other “O”-ring may be installed (see Picture 5.6).



Picture 5.6 Installing “O”-Ring on Valve Shaft

When replacing the “O”-ring seat, remove the old “O”-ring by prying it out of the dovetail groove with a small screwdriver. Carefully clean out the “O”-ring groove.

NOTE: When removing the old “O”-ring and cleaning the “O”-ring groove, be careful not to damage the “O”-ring groove.

Apply “O”-ring lubricant to the new “O”-ring and press the new “O”-ring evenly into the groove.

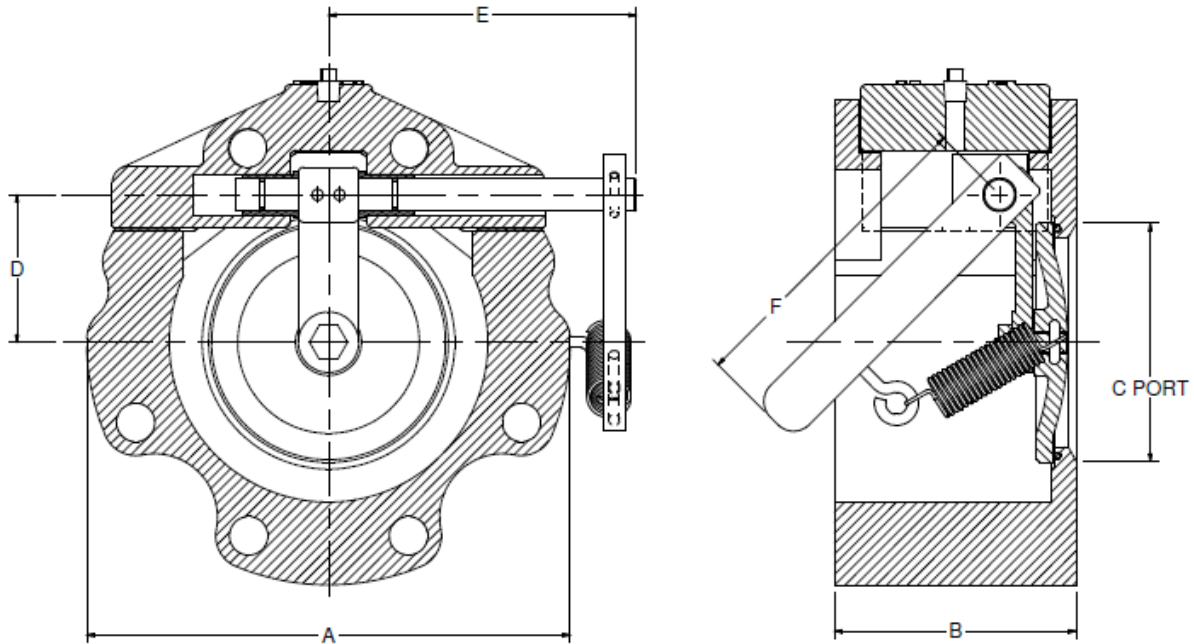
Do not use ordinary oil or grease to lubricate the “O”-ring, because this will damage the “O”-ring. Make sure the “O”-ring is fully pressed into the groove and secure.

Slide the shaft into the other half of the housing and line up the holes in the internal arm and shaft. Do not attempt to push an “O”-ring through the arm, as this will damage the “O”-ring. Be sure that the match marks line up and the arms are in their proper positions. Replace the roll pins, driving them in flush. Check the operation of the valve to be sure that it operates freely and does not bind. Assure that the roll pins are securely in place.

Check the existing gasket surface that seals the valve top to the body and assure that it is clean, and not damaged. Replace the seal if necessary. Install the top of the check valve back onto the body and install the four bolts to secure the top in place. Re-install the spring to the arm. Operate the valve manually to see that the external arm clears all obstructions and operates smoothly.

Once the valve is re-installed and is securely fastened, open the discharge plug valve, and re-connect power to the pumps. Turn on the pumps, and observe the pump cycle to assure the station and the valve are operating correctly, and there are no leaks.

**SMITH & LOVELESS, INC. PATENT PENDING
RAPIDJACK™ CHECK VALVES**



LEFT HAND VALVE SHOWN

PART NO.	SIZE	A	B	C	D	E	F
56B18A	4" L.H.	8-15/16"	5"	3-5/8"	2-1/2"	5-7/8"	6-3/4"
56B18B	4" R.H.						
56B19A	6" L.H.	11"	5-1/2"	5-3/8"	3-3/8"	7"	7-1/4"
56B19B	6" R.H.						

NOTES: 1. Valves to be assembled per drawings as follows:

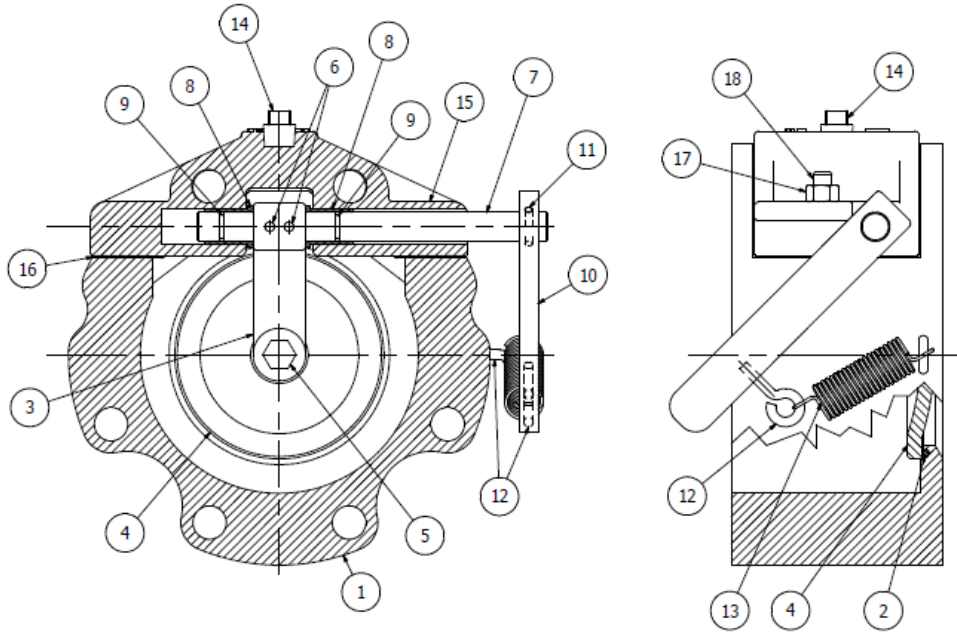
56B18A, B VALVES – 56B18

56B19A, B VALVES – 56B19

2. See Sheet 2 for 4" Valve Replacement Parts.
See Sheet 3 for 6" Valve Replacement Parts.

3. Centerline of Clapper must be concentric to valve O-ring within 1/16".

CHECK VALVE PARTS LIST
6" Diameter RAPIDJACK™ Check Valves – Patent Pending
56B19A (Left Hand) and 56B19B (Right Hand)
Drawing No. 56B19



REPLACEMENT PARTS - 56B19

ITEM NO.	PART NO.	DESCRIPTION
1	55B51	VALVE BODY, 6" CHECK, CAST-IRON
2	11L207G	O-RING, 6" CHECK, CAST-IRON
3	55A39	CLAPPER ARM – BRASS
4	55B40	CLAPPER – BRASS
5	6L184B	BOLT, SHOULDER – S.S., 1/2-13 x 3/4"
6	2L153C-12	PIN, S.S., 1/4" x 1-3/8" HDK
7	55B37	SHAFT, 6" CHECK VALVE
8	55A35	BUSHING 3/4" BORE
9	2L153C-9	O-RING
10	55A37	ARM, 6" CHECK VALVE
11	2L153A-11	PIN – S.S.
12	6L55M	EYE BOLT – GALV., 1/4-20 x 1"
13	11L104M	SPRING S.S., 3-1/2" x 1" O.D.
14	1L69D	PIPE PLUG CI GALV., 3/4"
15	55B50A / B	VALVE TOP, 6" CHECK, CAST-IRON
16	55B52	GASKET, 6" CHECK VALVE
17	6L60J	NUT, HEX, GALV., GRADE 2
18	6L51GL	STUD, FULL THREAD, GALVANIZED

OPERATION AND MAINTENANCE

DAMTITE® Mechanical Seal Replacement – Vacuum Primed Pumps

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The Smith & Loveless, Inc. “Non-Clog” Pumps are designed for maximum accessibility, easy maintenance and speedy replacement of all components subject to wear.

In normal service, a seal may be expected to last a minimum of one year. Seal life is usually considerably longer than this. Seal life is determined mainly by the amount of lubrication it receives, the “pumping head” and the material to be handled. Wastewater containing sand, rocks, sticks and other debris can clog the pump or lodge in the impeller, causing excessive vibration and reducing seal life.

Periodically, it becomes necessary to replace the mechanical seal. The pump has been designed so that the seal may be replaced with a minimum of time and effort.

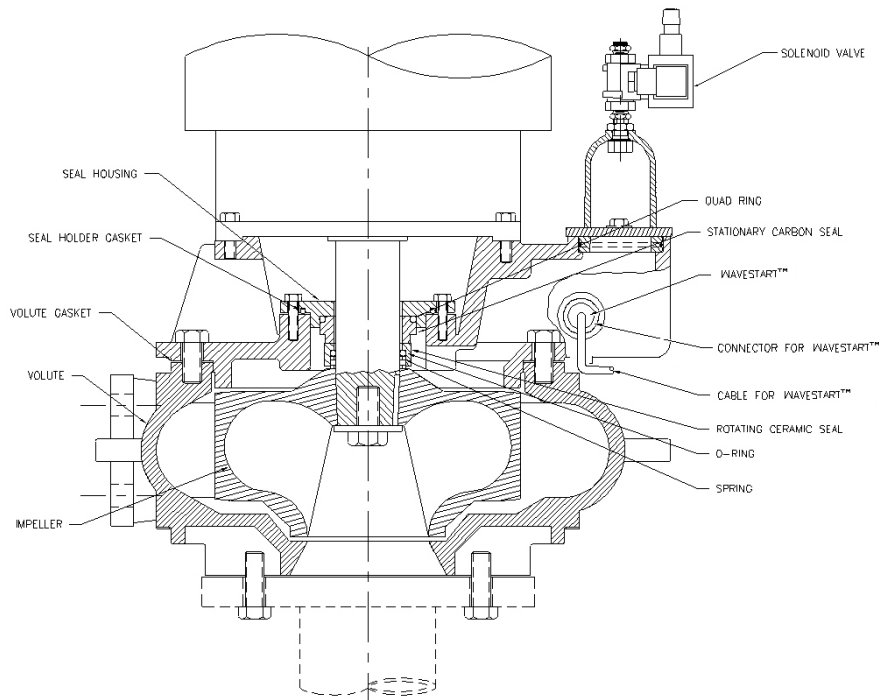


5.14 Main Pump Motor

TOOLS NEEDED TO REPLACE THE MECHANICAL SEALS:

1. Combination Wrenches 1/2” Through 1”
2. 1-1/8” Socket
3. 6” T-Handle 11 x 1/2” Drive Extension
4. 1/2” Drive Socket Wrench
5. #3 Rawhide Mallet
6. Ratchet-Type Hoist – 2-Ton Capacity
7. Motor Lifting Bar
8. Two 4” x 4” x 12” Boards
9. Lint-Free Cloth
10. Non-Pumice Detergent or Hand Soap
11. 10” Disc of Plywood or Heavy Cardboard
12. Four Impeller Wedges (Plastic or Wood)

SEAL ASSEMBLY DRAWING



The **DAMTITE®** Mechanical Seal consists basically of a carbon, ceramic and stainless steel spring. The flat or lapped surface of the carbon is held against the lapped surface of the mating ceramic by pressure from the stainless steel spring to form a “dead-tight” seal.

The lapped surfaces of the carbons and ceramics are finished to a light band flatness, and must be handled carefully to prevent chipping or marring. The carbon is held stationary in the seal plate by a quad ring. The ceramic is secured to the motor shaft by an o-ring, and rotates with the motor shaft. The ceramic will, however, slide on the motor shaft vertically as the spring automatically adjusts for wear.

To disassemble the pump and replace the **DAMTITE®** Mechanical Seal, follow these instructions carefully:



DANGER: *Disconnect and lock out power before servicing equipment. Failure to do so could result in serious bodily injury or death.*

First, put the motor circuit breaker in the top of the control panel for the pump being worked on to the “Off” position. Then, turn the selector for the pump to be serviced to the “Hand” position. If the pump does not operate, turn the selector to the “Off” position. Padlock the circuit breaker. Turn the selector switch for the other pump to the “Hand” position briefly. This should start the other pump. If so, switch it back to “Auto” and proceed.

Mark the **WaveStart™** cable so it may be reinstalled in the correct location. Use a screwdriver to loosen the retaining screw on the solenoid valve connector and disconnect the solenoid valve and **WaveStart™** cables. Reference Picture 5.15.

Remove the pipe plug from the vacuum release valve and open the vacuum release valve.



Picture 5.15 Removing the WaveStart™ Cable

Remove the vacuum tubing from the top of the dome. To remove the tubing, push down on the plastic ring on the fitting and pull the tubing up. Reference Picture 5.16.



Picture 5.16 Removing the Vacuum Tubing

Close the discharge plug valve on the side of the pump being worked on. Place the straight motor lifting arm stanchion extension in the socket on the baseplate that is next to the motor to be lifted. Place the “L” shaped motor lifting arm in the extension socket.



WARNING: *Lifting lugs have been provided on the equipment to facilitate installation. Lift the equipment ONLY by the lifting lugs labeled for lifting. Failure to do so could result in serious bodily injury or death.*

Hook a hoist on the lifting arm and connect the motor lifting bar to the lifting eye(s) on top of the motor. Reference Picture 5.17.



Picture 5.17 Motor Ready to Be Lifted

Remove the hex-head capscrews that bolt the motor adapter to the volute. Keep the capscrews. Reference Picture 5.18.



Picture 5.18 Removing Motor Adapter to Volute Capscrews

Slowly raise the motor impeller assembly. Hold the motor steady while lifting so the impeller shroud does not get caught on the volute. Raise the motor assembly above the volute high enough to gain access to the impeller locking bolt.

Place a disc of plywood or heavy cardboard down inside the volute, covering the suction opening, to avoid losing parts down the suction pipe. Place a cloth in the center of the volute to prevent the ceramic of the seal from breaking if it falls when the motor adapter is removed. Reference Picture 5.19.

OPERATION AND MAINTENANCE

DAMTITE® Mechanical Seal Replacement – Vacuum Primed Pumps

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Picture 5.19 Covering Volute Opening



DANGER: Do not completely remove the impeller bolt while the impeller is suspended or is not supported under the lower shroud. Failure to do so could result in equipment damage, serious bodily injury or death.

Use the 1-1/8" socket to loosen the impeller locking bolt, leaving it engaged in the shaft. Only loosen the bolt, do not remove the bolt. Reference Picture 5.20.



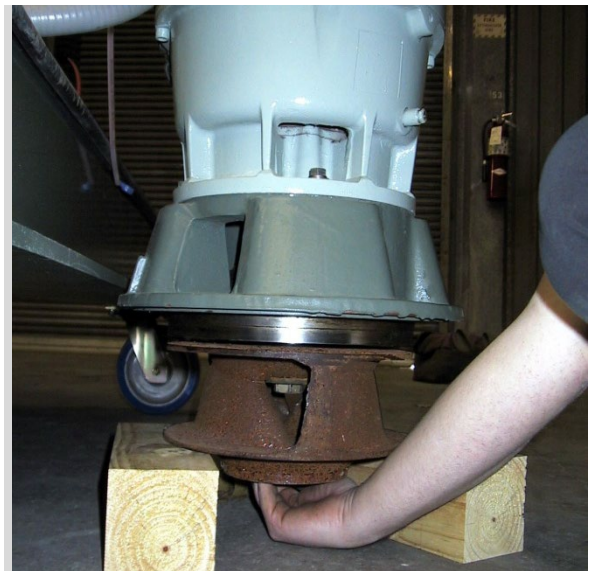
Picture 5.20 Loosening the impeller bolt.

Place the two 4" x 4" boards directly under the impeller and lower the impeller onto the boards. Reference Picture 5.21.



Picture 5.21 Impeller Resting on Two (2) 4" x 4" Boards

Remove the impeller bolt. The Smith & Loveless, Inc. impeller bolt contains a locking insert. The insert deforms as the impeller bolt is installed. Smith & Loveless, Inc. recommends that a new impeller bolt with locking insert be used to reinstall the impeller; therefore, the existing bolt can be discarded. Reference Picture 5.22.



Picture 5.22 Removing Impeller Bolt

OPERATION AND MAINTENANCE

DAMTITE® Mechanical Seal Replacement – Vacuum Primed Pumps
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Raise the motor until the bottom of the impeller is approximately 1" above the boards. Make sure the boards are positioned so that the impeller will drop onto the boards.

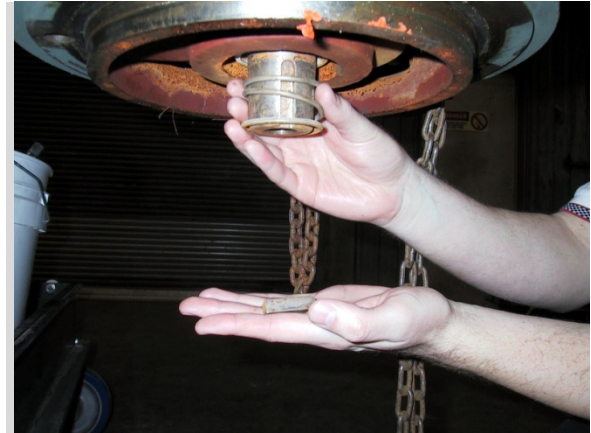
Insert the four impeller wedges between the top of the impeller and the motor adapter. Insert one wedge every 90 degrees so that they are equally spaced around the impeller. Reference Picture 5.23.



Picture 5.23 Wedges installed between impeller and motor adapter.

With the mallet, tap one of the wedges. Then move to the next wedge and tap it. Continue moving around the motor and tapping each of the wedges until the impeller drops.

Raise the motor assembly clear of the impeller. Remove the key from the motor shaft. Then remove the seal spring from the motor shaft. Keep the key and spring, as they will be reused. Reference Picture 5.24.



Picture 5.24 Key Removed and Removing Spring

Set the impeller and boards aside. Lower the motor assembly back into the volute.

Remove the hex-head capscrews that bolt the motor adapter to the motor. Keep the capscrews. Reference Picture 5.25.



Picture 5.25 Removing Motor to Motor Adapter Capscrews

Raise the motor clear of the motor adapter. The rotating ceramic and its o-ring may drop loose into the volute onto the cloth. The seal housing is detached from the motor adapter by removing the capscrews. Keep the capscrews. The bronze seal housing contains the stationary carbon and its quad ring. Reference Picture 5.26.

OPERATION AND MAINTENANCE



Picture 5.26 Removing Seal Housing to Motor Adapter Capscrews

Take out the old seal parts from the seal housing and volute.

Clean the seal housing with a good commercial solvent and wipe dry with a lint free cloth.

Carefully remove the new DAMTITE® Mechanical Seal from the container. Do not touch or handle the seal faces.

The sealing faces of the carbon and ceramic are precision lapped and **MUST BE KEPT CLEAN AND FREE FROM GREASE**. Assemble the new seal in the seal housing carefully. The parts can be damaged.

REASSEMBLY

Place the cleaned seal housing on a flat surface with the groove for the quad ring facing up. Put a light coating of non-pumice detergent or hand soap on the larger quad ring and install it in the groove in the seal housing. Reference Picture 5.27.



Picture 5.27 Installing Larger Quad Ring into The Seal Housing

EVERLAST™ Series 1000/2000/3000/4000 WWMPs

Put a very light coating of non-pumice detergent or hand soap on the smaller quad ring and wipe off any excess. Place the smaller quad ring on the non-lapped side of the carbon. The non-lapped side is not as shiny as the lapped side and has two white dots on the face. Do not touch the lapped face or get any non-pumice detergent or hand soap on it. Reference Picture 5.28.



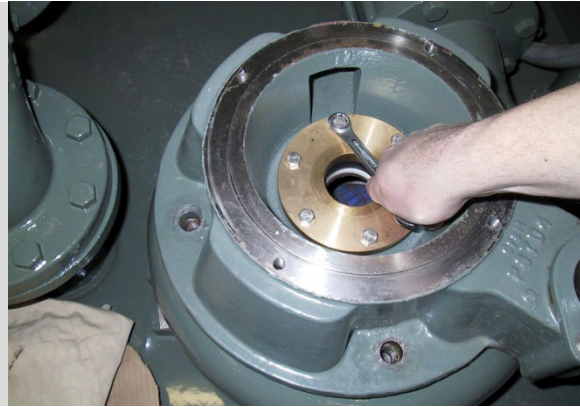
Picture 5.28 Installing Smaller Quad Ring on The Carbon

Install the carbon and quad ring into the seal housing. Place a clean rag over the face of the carbon and push it down into the recess. Reference Picture 5.29.



Picture 5.29 Installing Carbon into Seal Housing

Place the seal housing onto the motor adapter and reinstall the capscrews. Reference Picture 5.30.



Picture 5.30 Installing Seal Housing to Motor Adapter Capscrews

Lower the motor carefully so the shaft passes through the seal housing. Be careful not to let the motor shaft hit the carbon and unseat it. Bolt the motor to the motor adapter. Reference Picture 5.31.



Picture 5.31 Installing Motor to Motor Adapter Capscrews

Raise the motor up and coat the shaft with a light coat of non-pumice detergent or hand soap. Wipe the excess non-pumice detergent or hand soap off the shaft with a clean rag. It is important not to use excessive non-pumice detergent or hand soap. Place the o-ring inside the ceramic. Reference Picture 5.32.



Picture 5.32 Installing “O”-Ring Inside the Ceramic

Carefully slide the rotating ceramic and its “O”-Ring onto the motor shaft with the lapped (shiny) surface toward the motor. Be careful as the o-ring passes the motor shaft keyway so the keyway edges will not cut the “O”-Ring. Use the seal spring to press the rotating ceramic into place against the stationary carbon. Reinstall the motor key to hold the spring in place. Reference Picture 5.33.



Picture 5.33 Motor Shaft with Key, Spring and Ceramic Installed

Place the impeller on the 4” x 4” boards so that the motor can be lowered onto the impeller. Turn the impeller so that the key slot is in a position that can be seen while the motor is being lowered. Reference Picture 5.34.

OPERATION AND MAINTENANCE



Picture 5.34 Impeller on 4" x 4" Boards

Slowly lower the motor onto the impeller. Turn the motor so that the key on the motor lines up with the keyway in the impeller. Be sure that the impeller is firmly seated on the motor shaft taper. Install the impeller using a new Smith & Loveless, Inc. impeller bolt with locking insert. Tighten the bolt by hand. Reference Picture 5.35.



Picture 5.35 Installing New Impeller Bolt

Once the impeller bolt is hand tight, raise the rotating assembly and tighten the impeller bolt to 100 ft./lbs. of torque. Replace the volute gasket (a spare was shipped with the station). Use a non-

EVERLAST™ Series 1000/2000/3000/4000 WWMPs

hardening silicone (such as DuPont Permatex No. 2) to hold the volute gasket in place during installation. Reference Picture 5.36.

NOTE: Do not use hardening silicone or an adhesive to hold the gasket or seal this joint. Using these materials will make pump disassembly difficult, and could cause equipment damage.



Picture 5.36 Replacing Volute Gasket

Remove the cloth and plywood or cardboard disc from the volute. Lower the motor impeller assembly into the volute and install the motor adapter to volute capscrews. Reference Picture 5.37.



Picture 5.37 Installing Motor Adapter to Volute

Connect the **WaveStart™** cable to the **WaveStart™** sensor. Reference Picture 5.38.



Picture 5.38 Installing WaveStart™ Cable

When the pump is primed, it will start pumping in normal fashion. Check for pump seal leaks or other high pressure leaks. Consult the troubleshooting section if there are leaks.

Connect the vacuum tubing to the dome. If the end of the tubing is worn or grooved, cut the damaged end off of the tubing. The tubing must not be strained in order for the fittings to seal properly. Reference Picture 5.39.



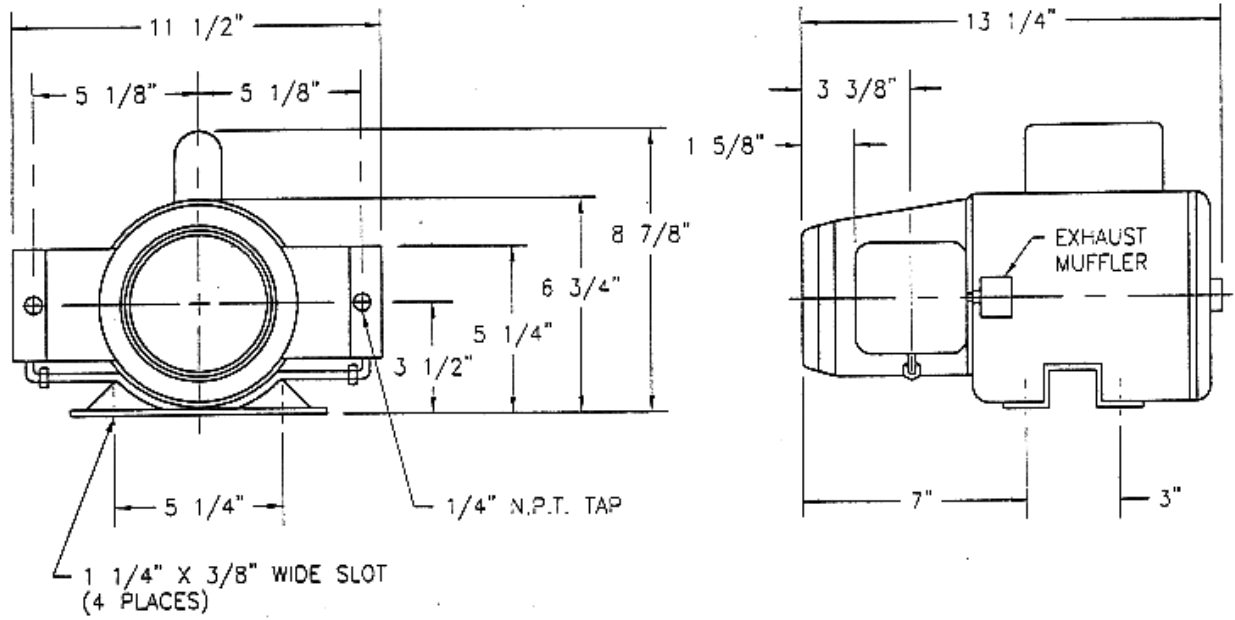
Picture 5.39 Installing Vacuum Tubing

Close the vacuum release valve and install the pipe plug in the valve.

Open the discharge plug valve.

Return motor circuit breaker to the “On” position. Turn the selector for the serviced pump to the “Auto” position. The pump will not prime until sufficient water in the wet well calls for pump operation. If the pump primes normally, there are no leaks. If it does not prime, consult the section entitled “Service Procedures for Vacuum Priming System”.

**Dual Head Vacuum Pump
Single-Phase**



**Dual Head Vacuum Pump
S&L Part Number 8L32
Parts List**

S&L Part Number	Description	Quantity Required
B300A	Inlet Filter Assembly	2
8L32-6*	Felt	2
8L32-14	Cylinder Head	2
8L32-2 *	Head Gasket	2
8L32-3 *	Valve, Outlet	2
8L32-10	Valve Plate	2
8L32-4*	Valve, Inlet	2
8L32-5*	Gasket, Cylinder	2
8L32-15	Cylinder	2
8L32-7*	Piston Ring	4
8L32-8*	Piston Seal	4
AF561F	Piston Rod Assembly	2
8L32-9*	Rider Ring	2
AB136D	Flat Key	1
8L32-13	Fan / Fan Assembly	1
8L32-12	Shroud	1
AF567A*	Manifold Sleeve	2
8L32-1	Service Kit	1

*** Denotes parts included in the Service Kit.**

Parts listed are for stock models. For specific OEM models, consult the Factory.

When corresponding or ordering parts, please give complete model and serial numbers.

CHECKING FOR VACUUM LEAKS IN SEAL AND PIPING

To check for vacuum leaks, apply a coating of shaving cream to the fittings in the vacuum system while the system is priming, and look for areas where the shaving cream is sucked into the vacuum system.

To check for leaks in the vacuum fittings, apply shaving cream to all of the fittings between the vacuum pump and the electrode dome. If there is a leak at the fitting, you should be able to see where the shaving cream has been sucked into the vacuum system. Tighten and/or apply thread sealant to the leaky fitting and retest.



DANGER: *Do not enter wet well. Before entering, test for explosive atmosphere. Test for oxygen deficiency; supply fresh air to work area. Failure to do so could result in serious bodily injury or death.*

To check for leaks in the suction pipe flange, apply shaving cream all around the suction pipe flange. If shaving cream is sucked into the suction pipe, tighten the bolts and/or replace the flange gasket and retest.

To check for leaks in the pump piping, apply shaving cream to the area between the volute and the motor adapter, to the volute discharge flange and to the volute/fronthead mating surface if your pump has a separate front head. Tighten the bolts and/or replace the gasket of any places where the shaving cream is sucked in.

To check for leaks in the mechanical seal, fill the access opening to the seal housing that is on the motor adapter with shaving cream. If any shaving cream is sucked into the opening, the seal should be replaced. A spare seal is provided with the station. Consult the Operation and Maintenance Section for seal replacement instructions.

INSPECTION OF THE DOME AND WaveStart™

The Operator must inspect the dome and probe as part of the routine maintenance of the pumping station. During regular operation, the domes could be physically or chemically damaged, and each WaveStart™ could become coated or corroded.

Inspect the dome for physical damage on both the inside and the outside surfaces. Any cracks, deep dents or scratches indicate that the dome has been physically damaged, and may be in a weakened condition. The makeup of wastewater varies considerably, and it is possible that chemicals or solvents may be present that can attack the dome. Chemical attack usually results in an opaque or cloudy appearance of the dome. There could also be a crazed appearance similar to the surface of old porcelain. If any signs of physical or chemical damage are discovered, the dome must be replaced.

NOTE: *The dome must be replaced every two (2) years regardless of its appearance.*

Inspect the WaveStart™ for corrosion (pitting) of the metal surface, and for coating or a buildup of foreign matter on the probe. Any buildup will need to be scraped off, and the WaveStart™ cleaned of any material that has coated the WaveStart™

CLEANING THE DOME AND WaveStart™

Turn off the control circuit breaker.



WARNING: *Disconnect and lock out power before servicing equipment. Failure to do so could result in electrical shock, serious bodily injury or death.*

Remove the vacuum tubing from the top of the dome. To remove the tubing, push down on the plastic ring on the fitting and pull the tubing up.

OPERATION AND MAINTENANCE

Service Procedures for Vacuum Priming System

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Picture 5.40 Removing the Vacuum Tubing

Remove the two (2) nuts holding the dome retaining ring in place. Reference Picture 5.41.



Picture 5.41 Removing the Retaining Ring Fasteners



Picture 5.42 Removing the Retaining Ring

Remove the dome assembly from the motor adapter. Reference Picture 5.42. Clean the dome with mild detergent and water. Do not clean the dome with any harsh solvents or by scraping the dome.

OPERATION AND MAINTENANCE

Service Procedures for Vacuum Priming System
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WARNING: Do not clean the dome housing with a solvent. Certain solvents can damage the dome material. If damage occurs, the dome can fail which could result in severe bodily injury and/or equipment damage.

Remove any debris or buildup from the **WaveStart™**. Normally, the **WaveStart™** may be cleaned while it is still installed in the motor. Put a light coating of non-pumice soap or petroleum jelly on the “O”-ring that is contained on the outer side of the bottom of the dome.

Install the dome assembly in the motor adapter and be sure it is set completely down into the machined opening in the adapter. Install the dome retaining ring and the two nuts that hold it in place. Reconnect the **WaveStart™** cable and vacuum line. Close the vacuum release valve and install the pipe plug in the valve.



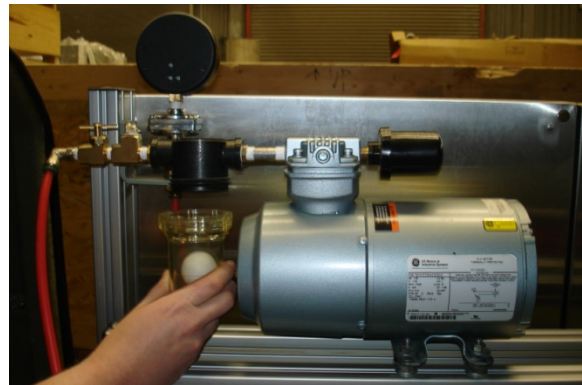
Picture 5.43 Installing the **WaveStart™** Cable

Turn on the control circuit breaker and check for leaks.

SERVICING THE FLOAT CHECK ASSEMBLY

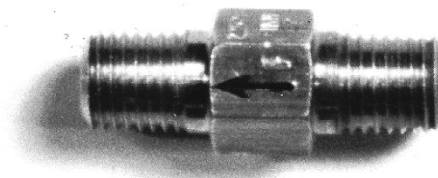
Remove the plastic bowl from the float check valve assembly. Clean the ball and bowl in soapy water. Do not use solvents. Reference Picture 5.44.

adapter, and this is the preferred method. If necessary, the **WaveStart™** can be removed from the motor adapter. To remove the **WaveStart™** first disconnect the **WaveStart™** cable and then use a wrench to take the **WaveStart™** out. When reinstalling, apply thread sealant to the **WaveStart™** threads and reconnect the **WaveStart™** cable.



Picture 5.44 Float Check Valve Body with Ball and Bowl Removed

Check the rubber seat in the cap of the unit. It must be soft and free of cracks. Clean with soapy water and rinse with clean water. Reinstall bowl.



SERVICING THE DRAIN CHECK VALVE

Unscrew the drain check valve from the bottom of the float check bowl. This valve may not be disassembled, but must be cleaned by soaking in a solvent that will not damage neoprene or brass. Thoroughly flush any foreign material from the valve and check its operation by blowing through it. Air must pass freely in the direction of the arrow, but not the other way. When reassembling the drain check valve to the float bowl, be sure the arrow on the valve points downward.

CHECKING DISPLACEMENT (FLOAT) SWITCHES

Inspect the displacement (float) switches for visible damage. If the cord is cut or loose, or the ball punctured, it will be necessary to replace the entire switch. Shake the ball to see that no water is inside. Set the Hand-Off-Automatic switches to “Automatic” for both pumps. Tipping the off and low level float switches will run or prime Pump 1 or the lead pump on relay logic stations. Tipping the off and high level float switches must run or prime Pump 2 or the lag pump on relay logic stations. If you cannot make the pumps operate by tipping the switch manually, run a continuity check to test the mercury switch and wiring.



DISASSEMBLING AND CLEANING THE SOLENOID VALVE



WARNING: *Disconnect and lock out power to the motor before servicing. Failure to do so could cause electrical shock, serious bodily injury or death.*



CAUTION: *Disconnect power to the solenoid valve before disassembling and cleaning. Failure to do so could cause electrical shock.*

The valve need not be removed from the line to clean it. Loosen the screw holding the DIN connector to the solenoid valve body, and remove DIN connector. Reference Picture 5.45.



Picture 5.45 Removing Solenoid Valve DIN Connector

Remove the retainer clip from the top of the solenoid valve. Use a screwdriver to pry the clip up over the solenoid valve stem. Reference Picture 5.46.



Picture 5.46 Removing Solenoid Valve Retaining Clip

Remove the solenoid valve coil by pulling the coil straight with the valve stem. Reference Picture 5.47.



Picture 5.47 Removing Solenoid Valve Coil

NOTE: Support the solenoid valve piping while removing the valve stem so that the solenoid valve piping is not damaged.

Using a one-inch (1") wrench, remove the solenoid valve stem. Reference Picture 5.48.



Picture 5.48 Loosening The Solenoid Valve Stem

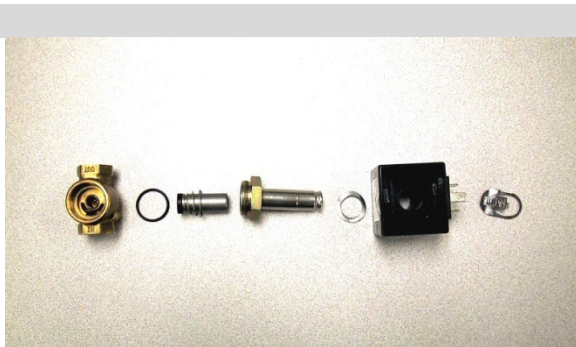
Inside the "stem" is a valve poppet and a spring.



WARNING: Do not scratch or mark the inside of the brass body while cleaning it out.

Clean all internal parts and clean out any foreign material from the openings inside the valve body. Reference Picture 5.49.

Inspect the rubber seats in the valve poppet for damage or wear, and use a new poppet if necessary. Reassemble the valve and check its operation.



Picture 5.49 Exploded View of Solenoid Valve Parts

NOTES ON PRIMING

Occasionally, due to the location of the inlet to the wet well and the influent flow rate, air will be entrained in the pumped liquid. Entrained air may accumulate in the main pumps and cause them to lose prime, or make priming very difficult. The remedy for this is to baffle the inlet to the wet well so that the incoming flow does not fall near the suction pipes.

When a station is first started up, or if the discharge force main slopes downward from the station, there will be no water in the discharge line to help hold the discharge check valve closed and seal it. This may allow vacuum leaks through the check valve.

In the case of a new station, the station discharge valve may be closed temporarily or the check valve handle held down to obtain initial prime, and thereafter the discharge force main pressure will hold the check valve closed.

In the case of a system where the force main drains by gravity, it may be necessary to add an upturned elbow and length of pipe at the outlet to prevent draining. Other solutions are to elevate the force main at one point and install a siphon break valve, or install a priming lock loop (See Section 3).

In the case of the short force main draining back into the wet well, it may be necessary to install a check valve in the discharge force main of the station, or install a priming lock loop (See Section 3).

PUMP FAILURE MULTI-SENSOR SWITCH

If your Station is supplied with a pump failure option, the Smith & Loveless, Inc. multi-sensor switches are installed on the discharge check valve handles for each pump in the Station. The multi-sensor is connected to the Station control panel by a cable that attaches to the sensor with a special connector. When the pump operates and flow lifts the disk in the check valve, the check valve handle will rise, and the Smith & Loveless multi-sensor switch Opens. The Switch closes when the flow decreases or stops and the check valve disk closes, allowing the handle to rotate Down. The Smith & Loveless multi-sensor switches are installed on the check valve handles and are set for proper operation at the Factory. The switch box must be relatively level, and the switch must be Closed, when the check valve handle is at its lowest point and no flow is being discharged through the valve. If a switch requires level adjustment in the field, follow the procedure below. The switch boxes are a sealed unit and do not require any maintenance.



CAUTION: *Do not open the Smith & Loveless multi-sensor box. There are no repairable parts in the box. Opening the box could cause damage to the Smith & Loveless multi-sensor, possibly resulting in equipment damage.*

MULTI-SENSOR SWITCH ADJUSTMENT FOR RELAY LOGIC CONTROL SYSTEMS

You will need to have a Smith & Loveless multi-sensor tester and tester cable to be able to properly set the Smith & Loveless multi-sensor switches. If you do not have these items, contact your local Smith & Loveless, Inc. Representative or the Smith & Loveless, Inc. Parts Department at (913) 888-5201.



CAUTION: *Disconnect and lock out power to the pumps before servicing any equipment. Failure to do so could result in bodily injury or equipment damage.*

Detach the control cable from the bottom of the Smith & Loveless multi-sensor switch by turning the top knurled nut counterclockwise (reference Figure A). Attach the multi-sensor tester cable by aligning the keyway slot in the connector with the key located in the pin connector of the multi-sensor (reference Figure B). The key is located toward the front of the multi-sensor. The cable connector can only fit into the pin connector one way. Do not force the cable connector onto the pin connector. This can damage the pins on the connector and cause it to not operate. Push the cable into the pin connector and turn the knurled nut clockwise until finger tight (reference Figure A). Loosen the pivot nut and bolt on the switch bracket slightly so that you can adjust the angle of the box. Do not remove the nut from the pivot bolt. The LED light on the multi-sensor switch should be On when the pump is Off, and the check valve handle is Down. Adjust the level of the Smith & Loveless multi-sensor switch until the light is On. Raise the check valve handle. The LED light should go Off.

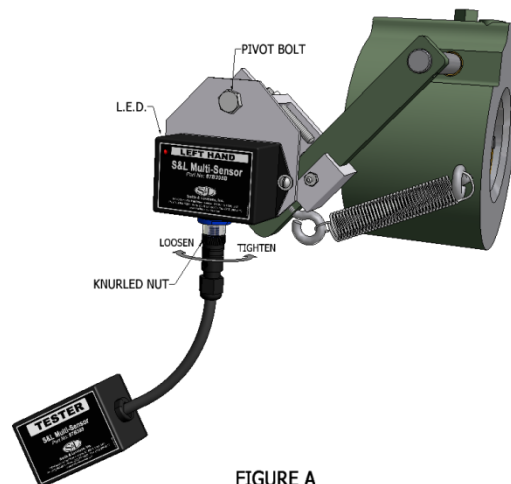


FIGURE A

Once the switch is properly adjusted, tighten the pivot bolt on the switch bracket. You only need to tighten the bolt so that the switch stays in position. Do not over-tighten the pivot bolt. Disconnect the Smith & Loveless multi-sensor tester cable and reconnect the control cable. Assure that the control cable connector and the pins on the switch are aligned, and the control cable is securely attached.

OPERATION AND MAINTENANCE

Pump Failure Multi-Sensor Switch

Page 5.31



FIGURE B

outlined above to readjust the bracket. The LED light on the Smith & Loveless multi-sensor switch does not operate during normal operation with a relay logic control system. The LED light is only functional when the multi-sensor tester cable is attached for adjustment.

A time delay relay in the control panel will prevent a false signal of pump failure during the start-up of the pump. Proper operation of the time delay relay in the control panel can be checked by the operation of the lights on the relay (reference Figure C).

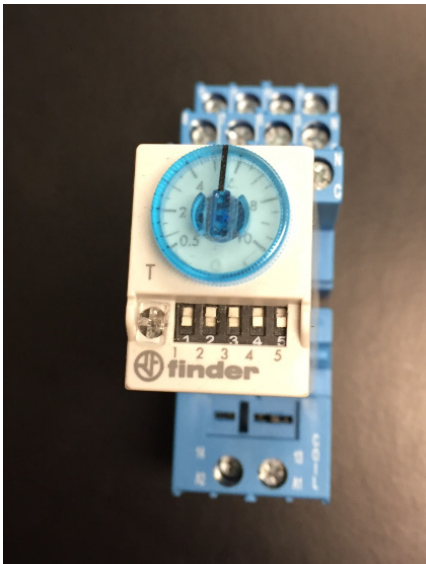


Figure C

Connect the power back onto the pump. Run the pump and watch the time delay relay in the control panel. The bottom light should come on and blink briefly and go out; when the light is blinking it indicates that the time delay relay is On and timing. The light should not stay on constantly because this would indicate that the relay has timed out. Cycle the pump several times to make sure the Smith & Loveless multi-sensor switch is correctly adjusted. If the switch is not properly adjusted, complete the steps as

OPERATION AND MAINTENANCE

Listed below are spare parts that may be required for your station. They are categorized into Pumps and Piping, Vacuum Priming System, Station and Electrical Controls. The Smith & Loveless, Inc. part number is also shown for the specific part to make ordering more efficient. All Smith & Loveless, Inc. parts are original manufacturer quality, and not rebuilt parts. They are made to fit your station properly and provide proper service. Do not use other manufacturer's parts in your station. Using non-Smith & Loveless, Inc. parts may cause equipment damage.

Contact either your local Smith & Loveless, Inc. Representative or the Smith & Loveless, Inc. Parts Department at (800) 922-9048 if you have questions or need to order parts.

PUMPS AND PIPING

PART DESCRIPTION	TYPE	S&L PART NO.
DAMTITE® Single Mechanical Seal Kit	B-Shaft (1-7/8")	H87A28
DAMTITE® Single Mechanical Seal Kit	C-Shaft (2-1/8")	H87A97
DAMTITE® Single Mechanical Seal Kit	D-Shaft (3")	H87A182
Impeller Bolt with Locking Insert	B-Shaft (1-7/8") or C-Shaft (2-1/8")	60A12
Impeller Bolt with Locking Insert	D-Shaft (3")	60A87
Check Valve, 4" Extended Body Wafer	Left Hand	56B20A
Check Valve, 4" Extended Body Wafer	Right Hand	56B20B
Check Valve, 6" Extended Body Wafer	Left Hand	56B21A
Check Valve, 6" Extended Body Wafer	Right Hand	56B21B
Check Valve, 4" RAPIDJACK™	Left Hand	56B18A
Check Valve, 4" RAPIDJACK™	Right Hand	56B18B
Check Valve, 6" RAPIDJACK™	Left Hand	56B19A
Check Valve, 6" RAPIDJACK™	Right Hand	56B19B
Volute Gaskets	Vacuum Primed Pump 4B2_, 4C2_	60A26
Volute Gaskets	Vacuum Primed Pump 4B3_, 4C3_, 4D3_, 6B3_, 6C3_, 6D3_	60A28

VACUUM PRIMING SYSTEM

PART DESCRIPTION	TYPE	S&L PART NO.
Vacuum Pump, Single Piston	4-inch suction piping	8L29
Vacuum Pump, Dual Piston	6-inch suction piping	8L32
Vacuum Pump Repair Kit, Single Piston		8L29AB
Vacuum Pump Repair Kit, Dual Piston		8L32-1
Dome Assembly	One dome assembly	87B728
WaveStart™ - 24VDC		4L1178A
WaveStart™ Operating Module – 24VDC	8-pin socket required	4L264E
WaveStart™ Operating Module 8-pin socket		5L49B
SONIC START® – 120 VAC		4L628F
SONIC START® – 24 VDC		4L628G
SONIC START® Operating Module – 120 VAC	8-pin socket required	4L264S
SONIC START® Operating Module – 24 VDC	8-pin socket required	4L264E
Solenoid Valve	5/16 inch orifice, 2-way port	1L545A
Din Connector for Solenoid Valve		1L545A-1
WaveStart™ Cable Assembly		87A538

STATION

PART DESCRIPTION	TYPE	S&L PART NO.
Tip Fiberglass Hood, 68" by 54"	Non-insulated	87B876A
Tip Fiberglass Hood, 68" by 62"	Non-insulated	87B876B
Tip Fiberglass Hood, 70" by 62"	Non-insulated	87B876C
Tip Fiberglass Hood, 68" by 54"	Insulated	87B877A
Tip Fiberglass Hood, 68" by 62"	Insulated	87B877B
Tip Fiberglass Hood, 70" by 62"	Insulated	87B877C
Ventilation Blower		7L195
Ventilation Louver		11L138A
Heater	Panel Mounted	4L364A

ELECTRICAL CONTROLS

PART DESCRIPTION	TYPE	S&L PART NO.
Motor Circuit Protectors	Provide Station Serial Number	Consult Factory
Motor Starters, NEMA and IEC Rated	Provide Station Serial Number	Consult Factory
Motor Starters, Soft-Start	Provide Station Serial Number	Consult Factory
Single-Phase Breakers	7 Amp	4L673V
Single-Phase Breakers	15 Amp	4L673HA
Single-Phase Breakers	20 Amp	4L673S
Single-Phase Breakers	30 Amp	4L673MB
Single-Phase Breakers	32 Amp	4L673X
Single-Phase Breakers	35 Amp	4L82RG
Single-Phase Breakers	40 Amp	4L673CA
Single-Phase Breakers	50 Amp	4L673DA
Pump Alternator	Timed	4L365A
Pump Alternator	Sequential	4L187B
Timer	120 VAC	4L665D
Relay, Din Rail Mounted	Double Pole, Double Throw	4L571C or 4L264
Power Supply, 24VDC	10 Amp output rating	4L452Z
Power Supply, 24VDC	5 Amp output rating	4L637L
Float Switch	N/O	4L291A
Float Switch	N/C	4L291B
Vacuum Pump Relay		4L107A
Surge Protective Device		4L430G

Troubleshooting a problem must be done in a systematic approach, so that the chances of correctly establishing the cause are greatly enhanced. As an aid in establishing a logical step-by-step method of troubleshooting, we have made the following flow charts. To use these flow charts, you must first define the problem according to the symptoms. Then find the flow chart whose heading most nearly matches your problem.



WARNING: *This Troubleshooting Guide requires that the power be turned On. It must only be performed by a qualified electrician. Live parts could cause electric shock, resulting in serious bodily injury or death.*

Control Panel Components

ISSUE	POSSIBLE CAUSE	ACTION
Pumps will not alternate.	<ol style="list-style-type: none"> 1. Circuit protective devices or starter overloads have tripped. 2. Floats/level sensors are not set correctly. 3. Auxiliary contacts on motor starters are not functional. 4. Prime or pump failure has locked out one pump. 	<ol style="list-style-type: none"> 1. Reset circuit protector or starter overloads. 2. Set floats to the proper level. 3. Check contacts to assure they operate freely and do not stick. Replace as necessary. 4. Reset alarm after resolving failure cause.
Pumps not operating correctly.	<ol style="list-style-type: none"> 1. Circuit protectors or starter overloads have tripped. 2. Floats/level sensors not set in correct relation to controller set points when a controller is provided. 	<ol style="list-style-type: none"> 1. Reset circuit protector or starter overloads. 2. Set floats per requirements in the O&M Manual.

Vacuum Prime System

ISSUE	PROBABLE CAUSE	ACTION
Vacuum Pump continues to run with water visible in the dome.	<ol style="list-style-type: none"> 1. Wire to the WaveStart™ is not properly connected. 2. WaveStart™ operating module is non-functional. 3. Vacuum pump relay is non-functional. 4. WaveStart™ is fouled. 	<ol style="list-style-type: none"> 1. Reconnect or tighten the wiring from the control panel to the WaveStart™ 2. Turn the power Off and exchange the two operating modules to see if there is a problem with the operating module. Replace any bad modules. 3. Turn the power Off and check the control relay for the problem pump. Look to see if it has arced closed. Replace any bad relays. 4. Clean WaveStart™ and dome.
Pump runs when it is not primed.	<ol style="list-style-type: none"> 1. WaveStart™ is fouled. 2. WaveStart™ operating module is non-functional 	<ol style="list-style-type: none"> 1. Clean WaveStart™ and dome. 2. Turn the power Off and exchange the two operating modules to see if there is a problem with the operating module. Replace any bad modules.

Vacuum Prime System (Continued)

ISSUE	PROBABLE CAUSE	ACTION
<p>Vacuum pump runs but the pump does not prime.</p>	<ol style="list-style-type: none"> 1. Drain valve on float check valve not functional. 2. Tubing is restricted. 3. Fittings are loose allowing leaks to occur. 4. Vacuum pumps and/or solenoid valves are not operating correctly. 5. Pump seal is leaking. 	<ol style="list-style-type: none"> 1. Put your finger on the bottom of the float check valve. If you can feel suction, the drain valve is not working properly. Clean or replace the drain valve. 2. Check the tubing to make sure it has no kinks or holes. Replace any damaged tubing. 3. To find a vacuum leak, put shaving cream on the fittings and sealing points. Look for areas where the cream has been pulling in towards the fitting. Tighten any loose fittings. 4. Install a compound gauge that goes to 30" of Hg and to a pressure suitable for the station in the fitting by the solenoid valve and close the valve by the solenoid valve briefly. <ul style="list-style-type: none"> • If the gauge reads 24" of Hg or more, the vacuum pump and solenoid valve are fine. • If it reads nothing, the solenoid valve is not allowing the air through. Clean the solenoid valve and check the electrical connection. The solenoid valve may be bad. • If the gauge reads from 0 to 23" of Hg, clean the solenoid valve in case it is plugged with debris. If that does not fix it, the vacuum pump isn't working properly. The vacuum pump may have bent reeds that can be replaced. Sometimes they can be flattened back out for a temporary fix. 5. Check the mechanical seal. A cracked ceramic or bad O-ring could prevent the pump from priming.

SECTION 6

Drawings



Smith & Loveless Inc.

TERMINAL STRIP SCHEDULE

TB1

N	N	N	N	N	N	N	N	N	N	N	G	G	G	G	G	G	1	1	2	4	6	7	7	7	7	8	8	8	8	9	11	12	14	15	16
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	----	----	----	----	----

TB1 - CONTINUED

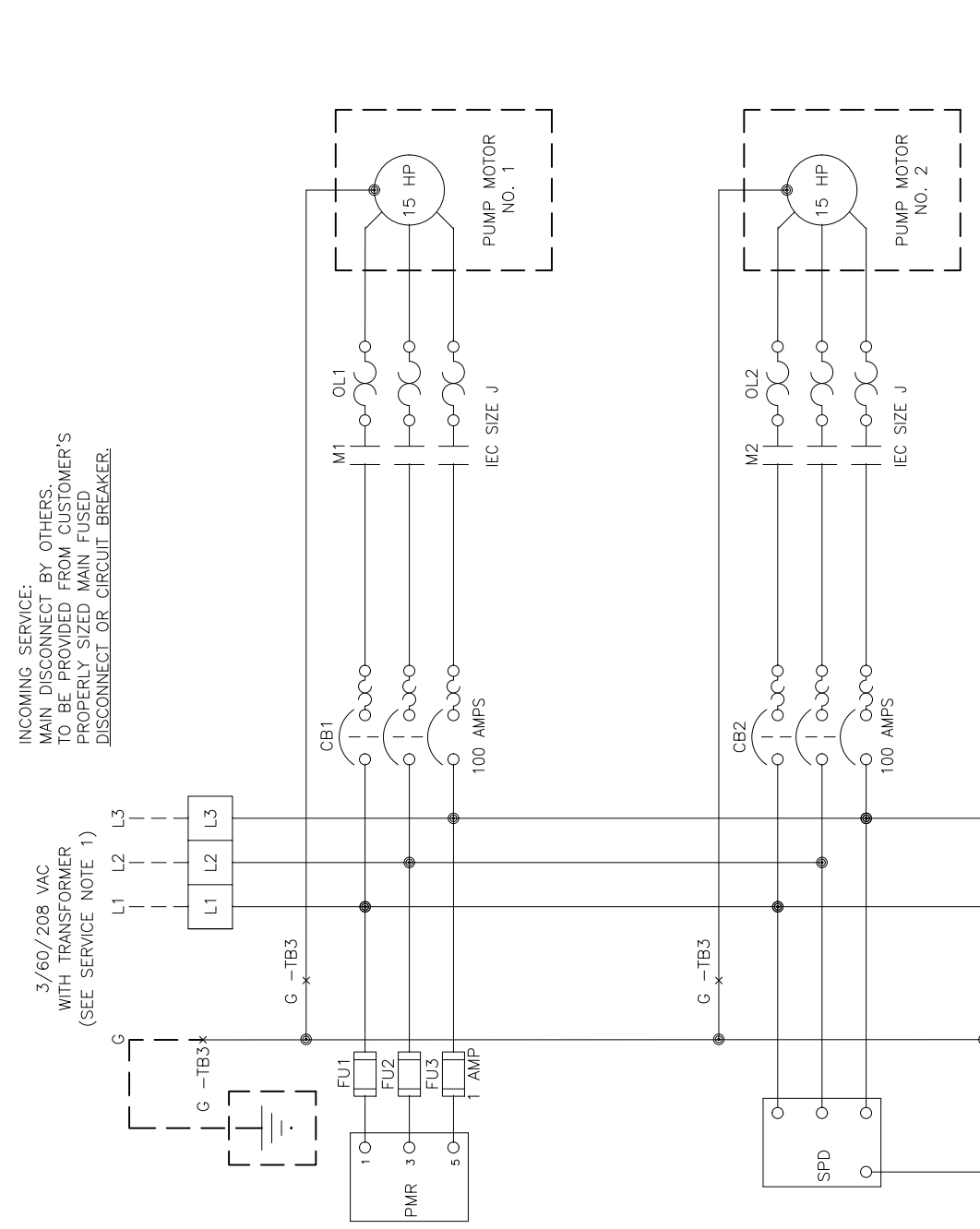
18	19	21	22	23	24	28	29	30	31	34	34	35	35	38	40	41	41	42	43	44	45	46	47	48	49	50	51	52	53	10	20	36	36	37	37
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TB2 - CONTROL CIRCUIT BREAKERS

X	X	X	X
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TB3 - SEPARATE GROUND BUS

G	G	G	G	G
---	---	---	---	---



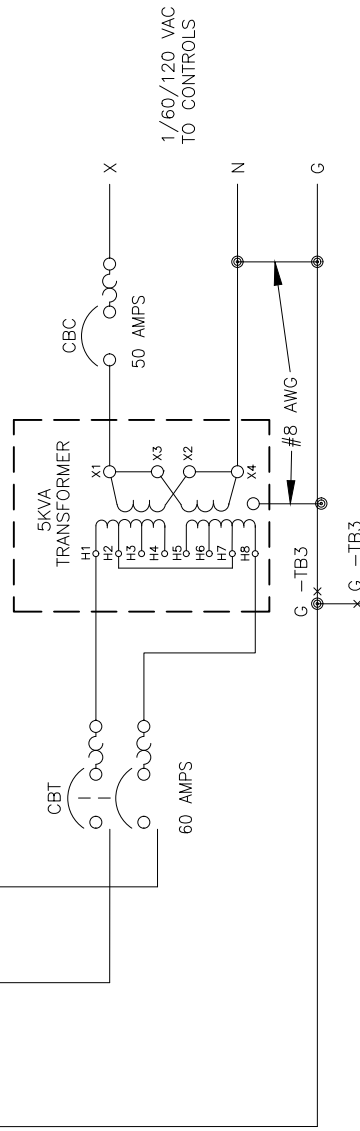
INCOMING SERVICE:
MAIN DISCONNECT BY OTHERS.
TO BE PROVIDED FROM CUSTOMER'S
PROPERLY SIZED MAIN FUSED
DISCONNECT OR CIRCUIT BREAKER.

SERVICE NOTES

- BEFORE CLOSING THE CONTROL CIRCUIT BREAKERS, VERIFY THAT THE VOLTAGE BETWEEN X AND N IS WITHIN THE RANGE OF 105-135 VAC. PUMP STATION MUST BE GROUNDED IN ACCORDANCE WITH NEC ARTICLE 250 AND TABLE 250.122, USING THE GROUNDING TERMINAL PROVIDED IN CONTROL PANEL.
- WIRING THAT INTERLOCKS CONTROL CIRCUITS ON THE PANEL, THAT IS ENERGIZED FROM AN EXTERNAL SOURCE, IS TO BE YELLOW IN COLOR.

WIRE NOTES

- WIRING BELOW 150 V IS CONTROL AND TAGGED AS INDICATED.
- WIRING ABOVE 150 V IS POWER AND NOT TAGGED.
- NEUTRAL (N) IS WHITE.
- GROUND (G) IS GREEN OR BARE COPPER.
- DASHED ITEMS SIGNIFY FIELD CONNECTIONS.
- ITEMS INSIDE RECTANGULAR BOXES DRAWN WITH DASHED LINES ARE OUTSIDE OF THE CONTROL PANEL.
- LAST WIRE NUMBER USED: 53
- WIRE NUMBER(S) NOT USED: 7-10, 11-14, 15-17, 18-20, 21-24, 25-27, 28-30, 31-33, 34-37, 38-40, 41-43, 44-46, 47-49, 50-52, 54-56, 57-60



LEGEND

- AL PUMP ALTERNATOR: SEQUENTIAL
- AR1 RELAY: ALTERNATOR CONTROL
- AR2 RELAY: HIGH WATER ALARM
- AR3 RELAY: LOW WATER ALARM
- AS1 RELAY: ALARM: SILENCE
- CB1 CIRCUIT BREAKER: MOTOR NO.1
- CB2 CIRCUIT BREAKER: MOTOR NO.2
- CB3 CIRCUIT BREAKER: AUXILIARY EQUIPMENT
- CB4 CIRCUIT BREAKER: VACUUM PUMP NO.1
- CB5 CIRCUIT BREAKER: VACUUM PUMP NO.2
- CB6 CIRCUIT BREAKER: CONTROL
- CB7 CIRCUIT BREAKER: MAIN CONTROL
- CBT CIRCUIT BREAKER: TRANSFORMER
- CVLS1 CHECK VALVE LIMIT SWITCH: PUMP NO.1
- CVLS2 CHECK VALVE LIMIT SWITCH: PUMP NO.2
- FN FAN
- FS/HL FLOAT SWITCH: HIGH LEVEL
- FS/HWA FLOAT SWITCH: HIGH WATER ALARM
- FS/LL FLOAT SWITCH: LOW LEVEL
- FS/LWA FLOAT SWITCH: LOW WATER ALARM
- FS/OFF FLOAT SWITCH: PUMPS OFF
- FU1 FUSE: PMR LEG 1
- FU2 FUSE: PMR LEG 2
- FU3 FUSE: PMR LEG 3
- GFI GROUND FAULT INTERRUPTER
- G/R RELAY: GENERATOR INTERLOCK
- HTR HEATER: AUXILIARY
- HT2 HEATER: MOTOR NO.1
- M1 STARTER: MOTOR NO.1
- M2 STARTER: MOTOR NO.2
- MS1 MANUAL SWITCH: ALTERNATOR OFF-ON
- OL1 OVERLOAD RELAY: MOTOR STARTER NO.1
- OL2 OVERLOAD RELAY: MOTOR STARTER NO.2
- PB1 PUSHBUTTON: ALARM SILENCE
- PMR POWER SUPPLY: 24VDC
- PS SURGE PROTECTIVE DEVICE
- RT1 RUNNING (ELAPSED) TIME METER: PUMP NO.1
- RT2 RUNNING (ELAPSED) TIME METER: PUMP NO.2
- RT3 RUNNING (ELAPSED) TIME METER: PARALLEL OPERATION
- SPD SURGE PROTECTIVE DEVICE
- SS1 SELECTOR SWITCH: PUMP NO.1 HAND-OFF-AUTO
- SS2 SELECTOR SWITCH: PUMP NO.2 HAND-OFF-AUTO
- SS3 SELECTOR SWITCH: ON DEMAND-CONSTANT PRIME
- SV1 PRIMING SOLENOID: PUMP NO.1
- SV2 PRIMING SOLENOID: PUMP NO.2
- T2 THERMOSTAT: FAN
- T3 THERMOSTAT: AUXILIARY HEATER
- TD1 TIME DELAY RELAY: SOLENOID VALVE NO.1
- TD2 TIME DELAY RELAY: SOLENOID VALVE NO.2
- TD7 TIME DELAY RELAY: PUMP NO.1 PUMP/PRIME FAILURE
- TD8 TIME DELAY RELAY: PUMP NO.2 PUMP/PRIME FAILURE
- VC1 CONTACTOR: VACUUM PUMP NO.1
- VC2 CONTACTOR: VACUUM PUMP NO.2
- VP1 VACUUM PUMP NO.1
- VP2 VACUUM PUMP NO.2
- WSM1 WAVESTART MODULE: PUMP NO.1
- WSM2 WAVESTART MODULE: PUMP NO.2
- WS1 WAVESTART SENSOR: PUMP NO.1
- WS2 WAVESTART SENSOR: PUMP NO.2

SHEET 1 OF 2

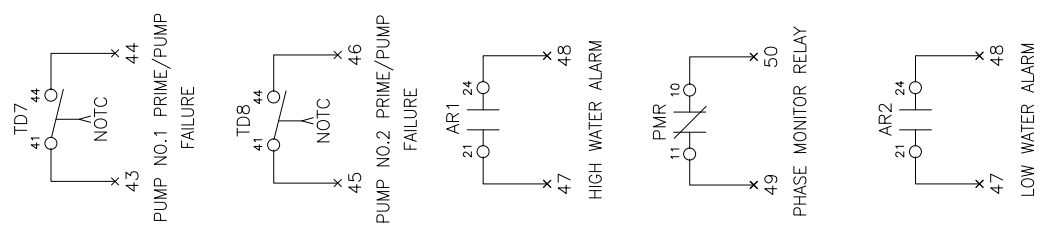
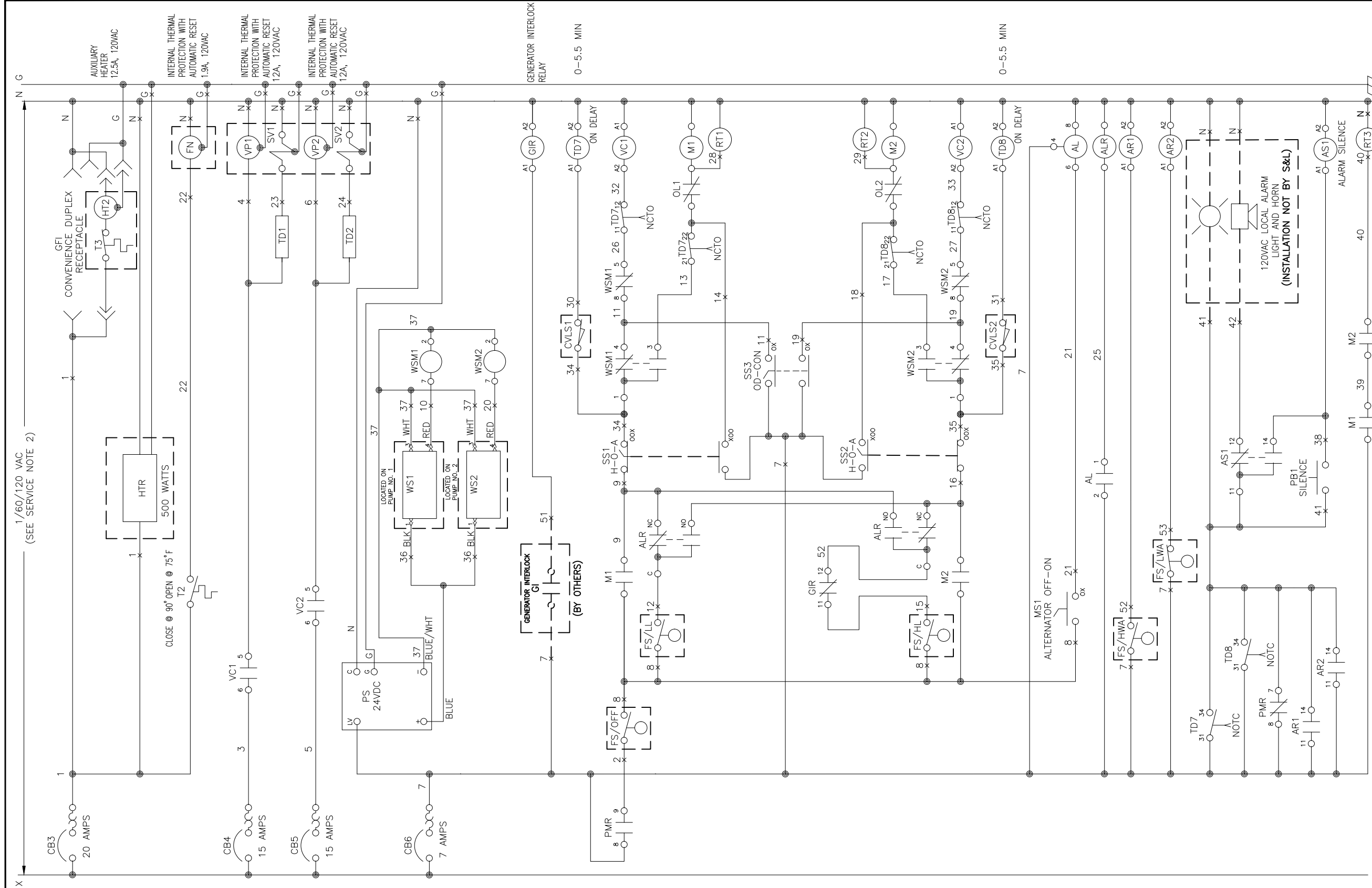
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ORIGINAL ISSUE					

FOR WICHITA, KS		
EVERLAST™ 1000 WWMPs NEMA 1		
UL SCHEMATIC WIRING DIAGRAM		
3ØFLA=116.4A SCCR=5KAIC		
SIZE	U/M EA	WT.
FILE NAME	CEV01553-300.dwg	PLOT SCALE
SERIAL NO	EV-01553	DWG NO
		CEV01553-300
		REV B

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UL INDUSTRIAL CONTROL PANEL

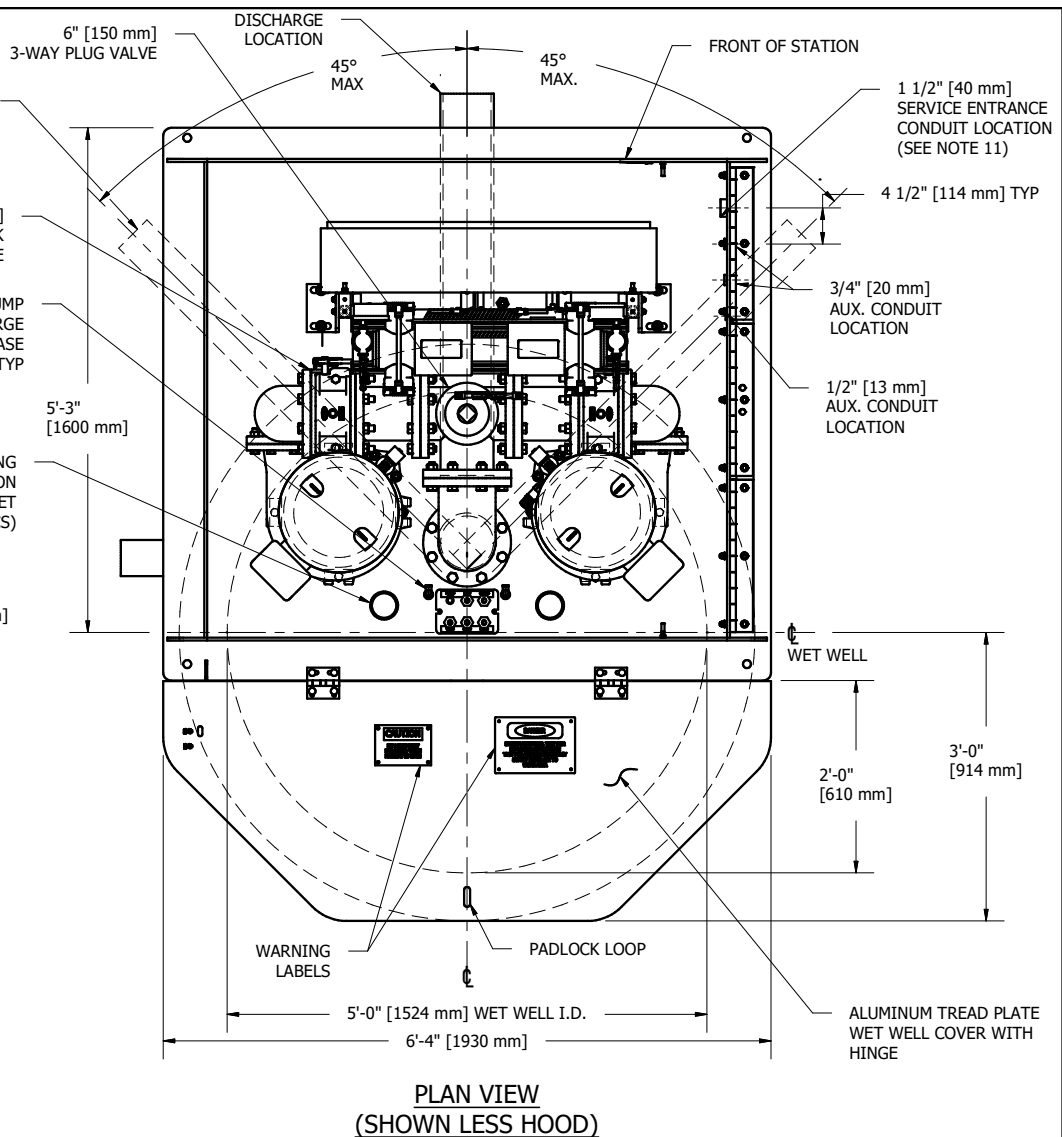
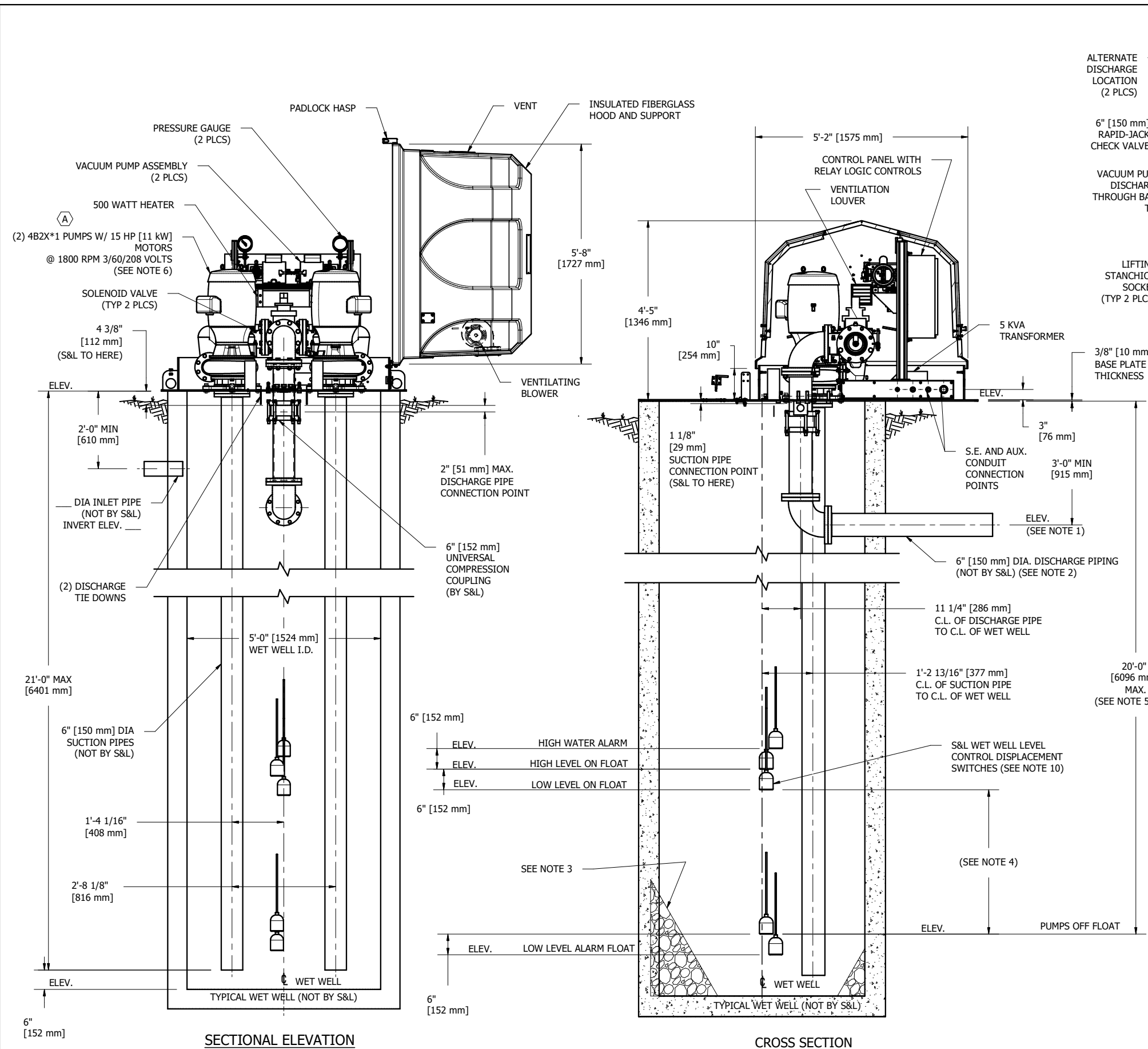


SHEET 2 OF 2

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FOR WICHITA, KS
EVERLAST™ 1000 WWMPs NEMA 1
UL SCHEMATIC WIRING DIAGRAM
3ØFLA=116.4A SCCR=5KAIC





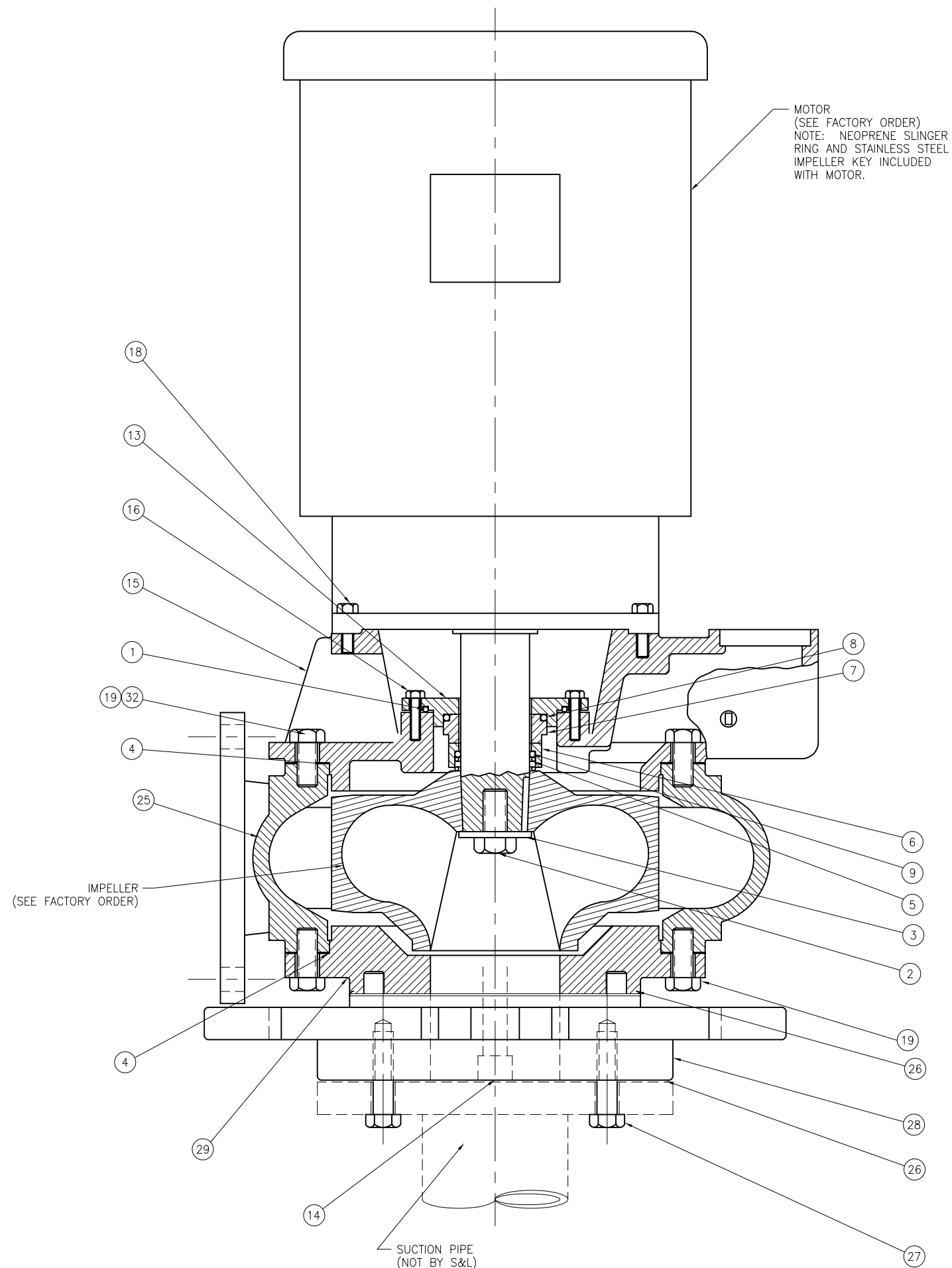
- NOTES:**
- IF THE END OF THE DISCHARGE LINE IS BELOW THE ELEVATION OF THE DISCHARGE LINE AT THE POINT OF LEAVING THE WET WELL, A PRIMING LOCK LOOP MAY BE REQUIRED. SEE DRAWING 87B761 FOR PRIMING LOCK LOOP DETAILS. CONSULT FACTORY.
 - IF THE DISCHARGE LINE IS LESS THAN 200 FEET [61 m] IN LENGTH, A CHECK VALVE OR PRIMING LOCK LOOP MAY BE REQUIRED. SEE DRAWING 87B761 FOR PRIMING LOCK LOOP AND INSTALLATION DETAILS.
 - PROVIDE 60° SLOPE IN WET WELL AS REQUIRED.
 - VOLUME BETWEEN L.L. ON AND PUMPS OFF SHOULD BE EQUAL TO, OR GREATER THAN, THE PUMPING RATE PER MINUTE.
 - 20'-0" MAXIMUM AT MAX. SUCTION LIFT AND MAXIMUM 85 DEGREES FAHRENHEIT SHOULD BE DERATED FOR HIGHER ALTITUDES AND TEMPERATURES.
 - PUMP MOTORS - 20 HP [15 kW] MAXIMUM.
 - MAXIMUM DISCHARGE CAPACITY - 600 GPM [37 L/s].
 - SEE DRAWING 87B761 FOR INSTALLATION DETAILS.
 - SEE DRAWING 87B721 FOR TYPICAL WET WELL LEVEL SETTINGS.
 - FLOAT SWITCH CONTROLS SHOWN. OPTIONAL PRESSURE TRANSDUCER, HIGH WATER AND LOW WATER ALARMS FLOAT SWITCHES CONTROLS ARE AVAILABLE ON REQUEST.
 - U.S. CUSTOMARY CONDUIT COUPLING SIZES SHOWN. ALTERNATE METRIC SIZES ARE AVAILABLE. CONSULT FACTORY.
 - 1/2" GROUT REQUIRED FOR STATIONS WITH A 4' WET WELL OPENING TO AVOID CLASHES WITH THE WET WELL STRUCTURE.
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DRAWN BY: BTG		DATE: 3/23/2020	ALLOWABLE TOLERANCES	FOR WICHITA, KS	
CHECKED BY: HJM		DATE: 3/24/2020	FRACTIONS	EVERLAST™ 1000 4" [100 MM] PIPING W/ 4B2X*1 PUMPS	
APPROVED BY: RMV		DATE: 3/24/2020	DECIMALS		
LET	EON NO	DATE	BY APPVD	SCALE: NTS	CODE: ANGLES
ORIGINAL ISSUE			© Smith & Loveless, Inc. 2020		FILE NAME: CEV01553-001.dwg
SERIAL NO: EV-01553			DWG NO: CEV01553-001		PLOT SCALE: 1:1
REV B					

THIRD ANGLE PROJECTION

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Smith & Loveless, Inc.



COMMON BILL OF MATERIAL

Item	Qty	UM	Part Number	Raw Matl	Description	Size	Wt Ea
1	1	EA	60A110		SEAL HOLDER GASKET QUAD RING		
2	1	EA	60A12		IMPELLER BOLT		
3	1	EA	60A20		IMPELLER WASHER		
4	2	EA	60A26		VOLUTE GASKET		
5	1	EA	60A30		SPRING		
6	1	EA	60A32		ROTATING CERAMIC SEAL		
7	1	EA	60A36		STATIONARY CARBON SEAL		
8	1	EA	60A38		QUAD RING		
9	1	EA	60A39		"O" RING		
13	1	EA	87B2		SEAL HOLDER		
15	1	EA	60B165A		MOTOR ADAPTER MODIFICATION		
16	6	EA	6L59BC		CAPSCREW - SS	5/16"-18 X 1"	
18	4	EA	6L20DC		CAPSCREW	3/8"-16 X 1"	
19	8	EA	6L20HD		CAPSCREW	5/8"-11 X 1 1/4"	
25	1	EA	87B945		VOLUTE	4"	
32	4	EA	6L229L		WASHER, FLAT - REDUCED O.D.	5/8"	

4" SUCTION PUMP

14	8	EA	6L178B		CAPSCREW, SOCKET HEAD	5/8"-11 X 2 3/4"	
26	2	EA	11L1AA		GASKET	4"	
27	8	EA	6L20HF		CAPSCREW	5/8"-11 X 1 3/4"	
28	1	EA	87B239		MOUNTING ADAPTER		
29	1	EA	87C1		FRONT HEAD		

6" SUCTION PUMP

14	8	EA	6L178F		CAPSCREW, SOCKET HEAD	3/4"-10 X 2 3/4"	
26	2	EA	11L1CA		GASKET	6"	
27	8	EA	6L20JG		CAPSCREW	3/4"-10 X 2"	
28	1	EA	87B241		MOUNTING ADAPTER		
29	1	EA	60C156		FRONT HEAD		

87B464/E

SHEET 1 OF 1

REV	DATE	BY	CHKD	DATE	SCALE	ANGLES	FOR
E	N2018-01	01/2018	JAM				PUMP ASSEMBLY 4B2B*1/4B2D*1/4B2X*1 X-PELLER®
D	N2007-71	1/2008	JKK	JRB	6/1/2004	ALLOWABLE TOLERANCES	
C	N2007-72	12/2007	ADB	RGD	6/2004	FRACTIONS	
B	N2007-67	12/2007	JK	FT	6/2004	DECIMALS	
A	N2006-60	8/2006	FRED	FT		DECIMALS	
LET	ECN NO	DATE	BY	SCALE	CODE	ANGLES	SIZE
			APPV'D	NTS			U/M EA
							WT.
							FILE NAME 87B464E.dwg
							PLOT SCALE 1=2.667
							SERIAL NO
							DWG NO 87B464
							REV E

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