SIMPLICITY VERTICAL MULTISTAGE PUMP SKID

APPLICATION, INSTALLATION

AND MAINTENANCE

MANUAL (V1.0)

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REVISION NUMBER	DATE	DESCRIPTION
1	03/25/2017	INSTALLATION AND APPLICATION MANUAL

TABLE OF CONTENTS

SAFETY AND COMMON SENSE

THIS DEVICE USES 220V SINGLE OR THREE PHASE OR 480V 3 PHASE POWER. REFER TO LABEL ON THE SIDE OF THE VFD OF PROPER VOLTAGE AND PHASE BEFORE WIRING.

PLEASE TAKE PRECAUTIONS WHEN WIRING HIGH VOLTAGE WIRING.

APPROPRIATE CIRCUIT PROTECTION PER LOCAL CODES NEED TO BE OBSERVED

BASED ON SYSTEM FLA IN TOTAL X NUMBER OF MOTORS X 150%

ELECTRICAL INSTALLATION

DANGER!

- The following information is merely a guide for proper installation. Comply with the applicable local regulations for electrical installations.
- Make sure the power supply is disconnected before starting the installation.
- The Pump must not be used as an emergency stop device. Provide other devices for that purpose.

Identification of the Power Terminals and Grounding Points

The location of the power, grounding and control connections are shown

Description of the power terminals:

- **Terminal X1 (L1/L, L2/N and L3 (R, S, T, ⏚)):** AC power supply.
- **Terminal X2 (U/T1, V/T2, W/T3, ⏚):** connection for the motor.

Grounding Connections

DANGER!

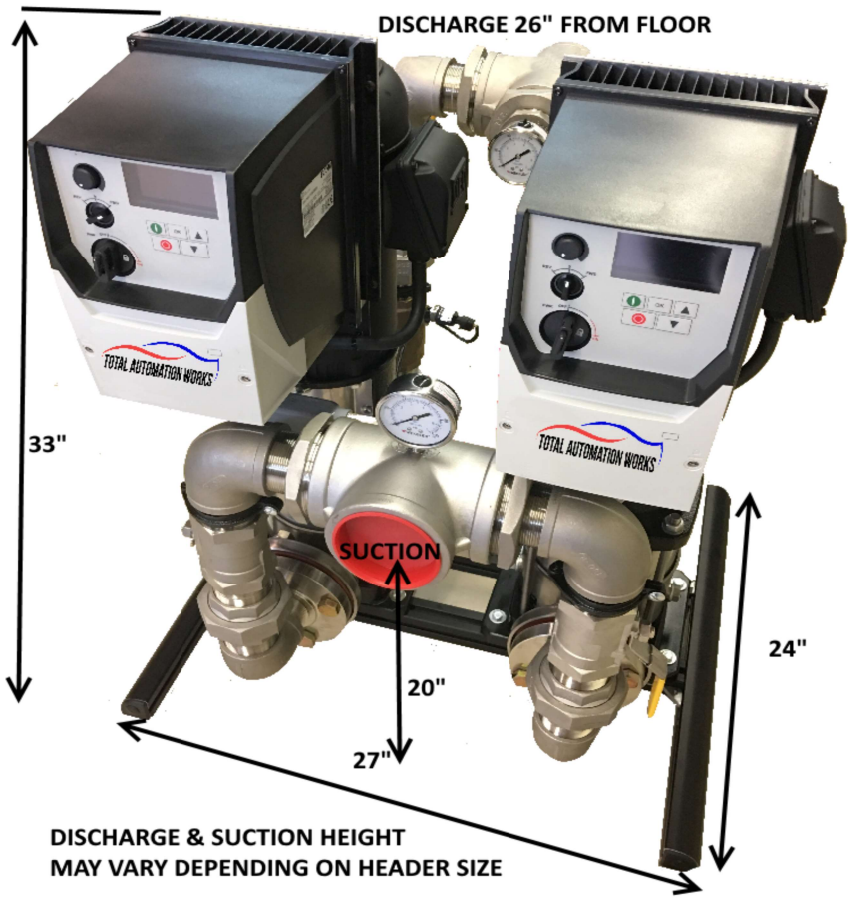
- The inverter must be connected to a protection grounding (PE).
- Use grounding wiring with a gauge at least equal to that indicated in Table
- The maximum tightening torque of the grounding connections is of 1.7 N.m (15 lbf.in).
- Connect the grounding points of the inverter to a specific grounding rod, or specific grounding point or to the general grounding point (resistance ≤ 10 Ω).
- Do not share the grounding wiring with other equipment that operate with high currents (e.g. high power motors, soldering machines, etc.).

THE DRIVE IS WATER PROOF BUT THE SUN CAN OVERHEAT THE DRIVE. TAW SELLS AN OPTIONAL SUN SHIELD TO INSTALL ABOVE THE DRIVE IF YOU CAN NOT SHADE THE DRIVE FROM THE SUN WITH OTHER MEANS. THE PUMPS ARE WATER RESISTANT BUT CAN NOT BE SUBMERGED. PUMPS THAT HAVE BEEN SUBMERGED VOID WARRANTY.

CONTACT TAW FOR THE OPTIONAL SUN SHIELD KIT AT (407) 493.2355.

DIMENSIONS 1-3 HP shown.

5HP, 7.5HP & 10HP heights are 36, 42 & 48” respectively

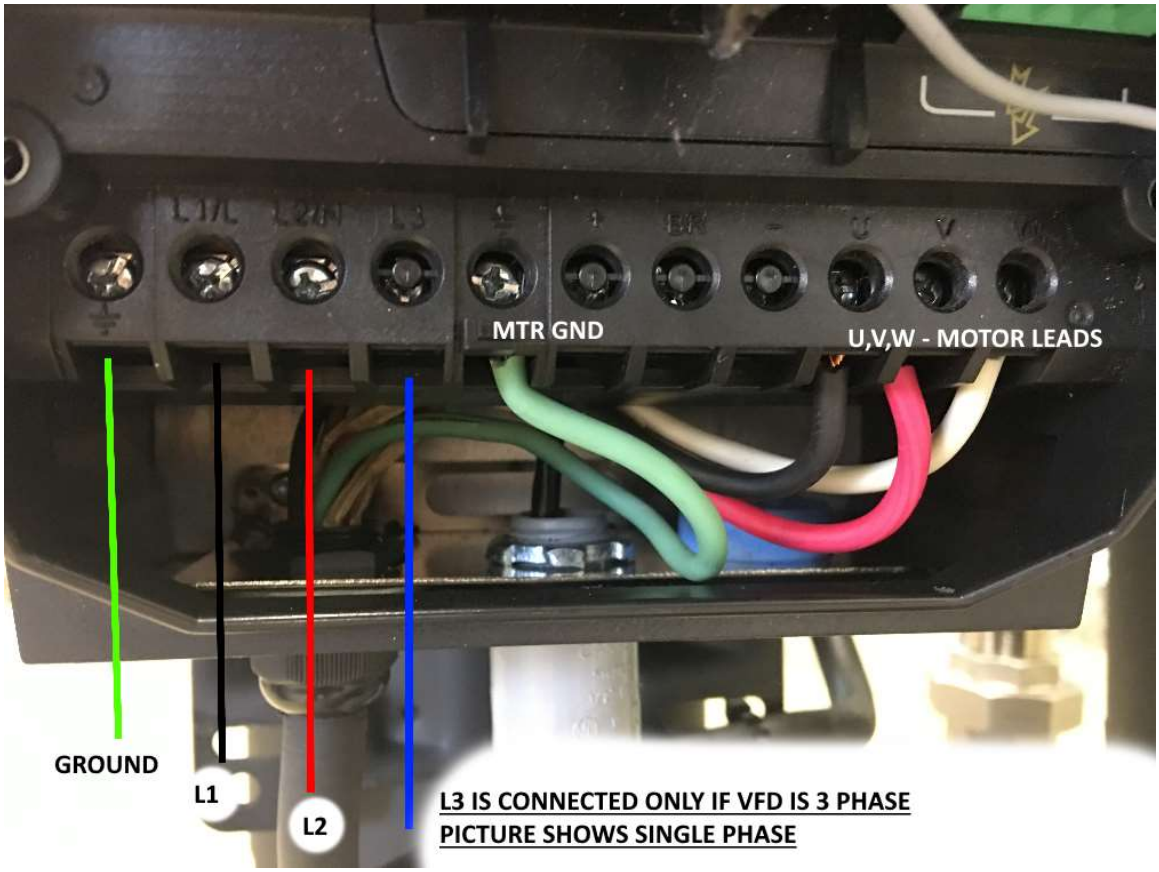


NOTE: DISCHARGE AND SUCTION HEADERS CAN BE REVERSED BY REMOVING THE HEADER AT THE UNION AND TURNING IT AROUND 180 DEGREES. THIS ALLOWS THE DISCHARGE TO FACE FORWARD AND THE SUCTION TO FACE BACK. OPPOSITE FROM THE PICTURE ABOVE.

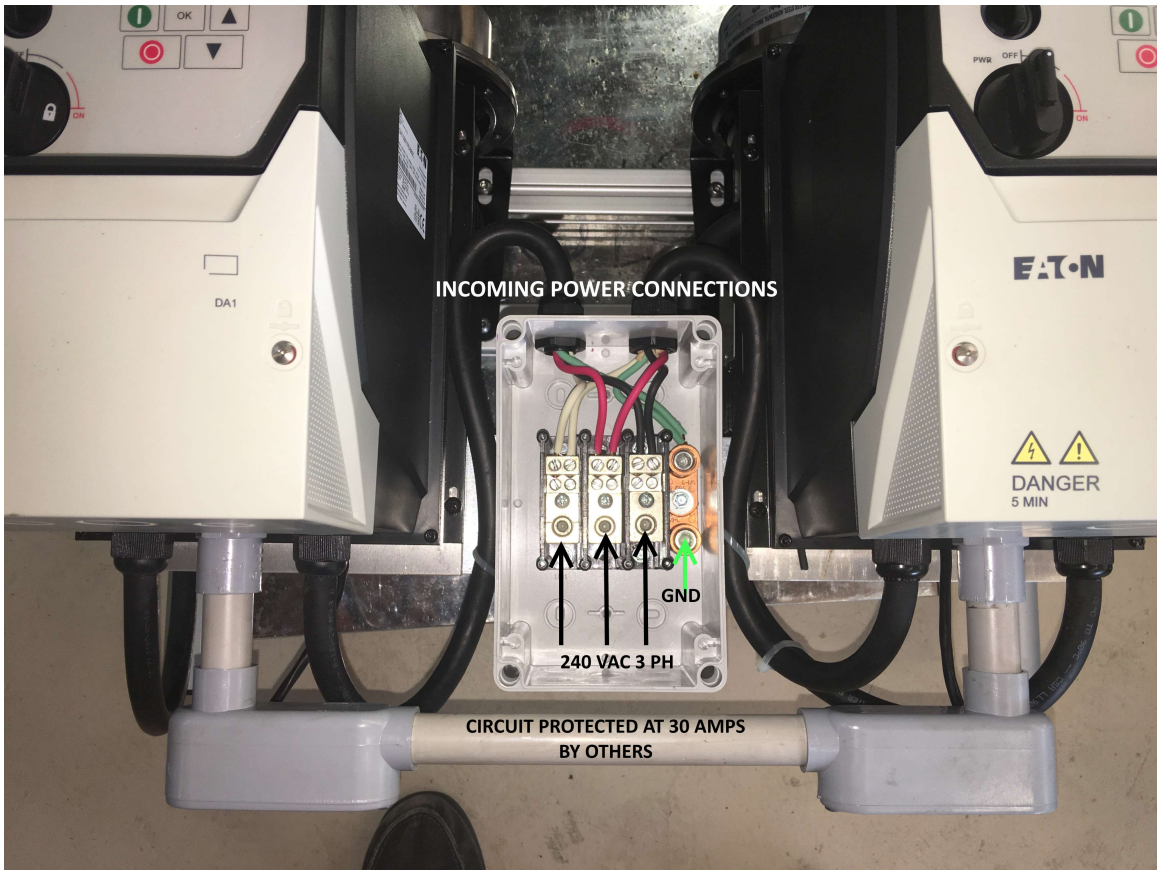
POWER CONNECTIONS TO DRIVE

THE INVERTER IS POWERED BY EITHER 230V SINGLE OR THREE PHASE OR 460V THREE PHASE, PLEASE REFER TO THE SIDE LABEL ON THE DRIVE BEFORE POWERING UNIT UP TO INSURE PROPER VOLTAGE WITHOUT DAMAGE.

. GROUND MUST BE CONNECTED AND AN ADDITIONAL MOTOR GROUND TIED TO A GOOD GROUND ROD FOR OUTSIDE MOUNTING IS RECOMMENDED TO HELP PROTECT AGAINST LIGHTENING. LIGHTENING PRONE AREAS ARE RECOMMENDED TO ADD A LIGHTENING PROTECTION DEVICE TO THE INCOMING POWER. TAW CAN PROVIDE OPTIONAL PROTECTION DEVICES. CONTACT TAW AT (407) 493.2355.



Make note for proper wire gauge based on amp output on side of VFD. Skids with single point entry may have external terminal box as shown below.



3HP duplex shown wire size in should be no less than 12 gauge rated for 30 amps for 230VAC single or three phase input.

5HP duplex wire size 10 GAUGE rated for 40 amps.

7.5HP duplex wire size 8 gauge rated for 60 amps.

10HP duplex wire size 6 gauge rated for 80 amps.

External breakers supplied by others.

DUAL feed duplex power is brought directly into each VFD and wire gauges and CB ratings are ½ of those shown above.

GROUND CONNECTION:

DANGER! The inverter must be connected to a protection grounding (PE). „ Use grounding wiring with a gauge at least equal to the L1, L2 & L3 power leads. „ The maximum tightening torque of the grounding connections is of 1.7 N.m (15 lbf.in). Connect the grounding points of the inverter to a specific grounding rod, or specific grounding point or to the general grounding point (resistance ≤ 10 Ω). ④ Do not share the grounding wiring with other equipment that operate with high currents (e.g. high power motors, soldering machines, etc.).

Before powering up the drive, double check the connections by pulling on the wire to insure they are fully seated. Install the cover of the drives to protect against potential arc flash when first powering up any electrical device.

Take similar precautions with single point entry power box cover.

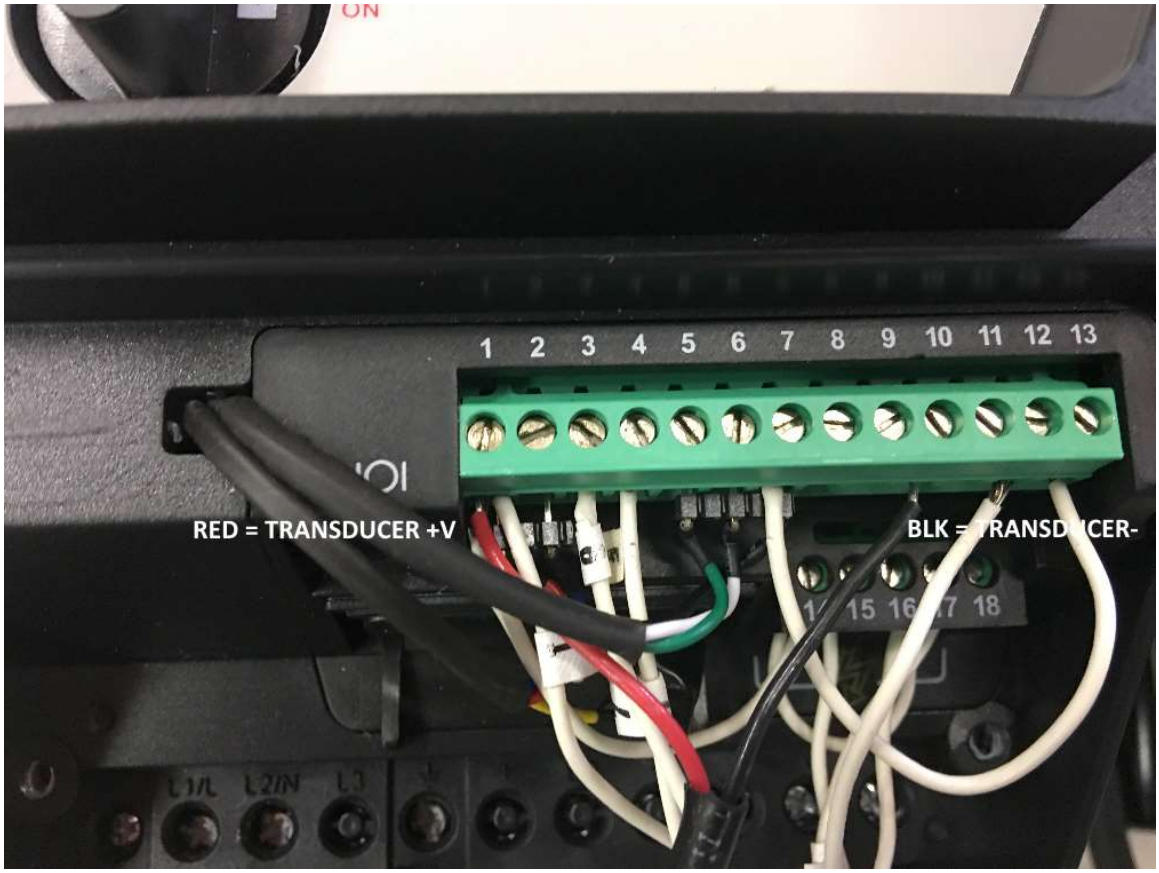
MOTOR CONNECTIONS

THE MOTOR CONNECTION SHOULD ALREADY BE CONNECTED TO THE DRIVE INTERNALLY FROM THE FACTORY. IF A MOTOR IS NEEDED TO BE REPLACED, PLEASE NOTE THE ORIENTATION OF THE UVW OUTPUT TERMINAL WIRE COLORS. IF THE MOTOR ROTATES IN REVERSE (CCW), TWO OF THESE PHASES MUST BE REVERSED.

TRANSDUCER & CONNECTIONS:

THE STAINLESS STEEL TRANSDUCER PROVIDED WITH EACH PUMP WILL CONVERT PRESSURE INTO A 4-20 MA SIGNAL TO CONTROL THE PUMP. IF THIS TRANSDUCER FAILS OR THE WIRE IS CUT OR DAMAGED THE DRIVE WILL FAULT AND THE DISPLAY WILL SHOW "TRANSDUCER FAIL". THIS PREVENTS THE DRIVE FROM RUNNING FULL SPEED THINKING THE PRESSURE IS AT ZERO.
IN A DUPLEX SYSTEM THE ALTERNATE PUMP WILL TAKE OVER AND THE FAULTED DRIVE AUTOMATICALLY TAKEN OUT OF ROTATION.

THE TRANSDUCER SHOULD ALREADY BE CONNECTED TO THE VFD FROM THE FACTORY. THE RED WIRE CONNECTS TO TERMINAL 1 (+24VDC) AND THE BLACK WIRE CONNECTS TO TERMINAL 10(AI2).
NOTE: THIS PHOTO IS FOR REFERENCE ONLY. THE CONNECTION SHOULD ALREADY BE MADE FROM THE FACTORY.


ON
1 2 3 4 5 6 7 8 9 10 11 12 13
RED = TRANSDUCER +V
BLK = TRANSDUCER-
15 16 17 18
L1/L
L2/N
L3

PUMP MOUNTING & CONSIDERATIONS

Simplicity pump skids are either clear or black anodized aluminum. Clear is standard and black is optional.
This prevents corrosion due to moisture. The skids have 4 leveler feet and a 5/16 captive nut on the inside rails to allow and "L" bracket to be used to bolt the frame to the floor if desired.
Considerations:

When mounting the pump outside, realize the pump is water resistant when the cover is properly tightened down by 2 locking screws that hold it down. The pump should be orientated away from direct sunlight. The organic LED (OLED) displays should not be exposed to direct sunlight. Sun protection should be used.
TAW also can provide an optional Sun Shield. Contact TAW.

Mount the pumps where they will not be flooded. Submerged pumps void their warranty.

PLUMBING PUMP

Pump plumbing material is based on local code. Please check local codes for proper material. The inlets are typically female NPT thread but optional ANSI flange in and out is available depending on application needs.

Each Pump will come complete with stainless steel check valve, transducer, pressure gauge, inlet and outlet isolation valves and stainless steel piping .

The pump contains no lead and features all stainless steel components. All TAW units are NSF 61 & 372 rated by Truesdail Labs.

Certificate is available at : http://perfectpressurepump.net/wp-content/uploads/NSF-Cert-1.pdf

Note: Incoming pressure gauge is supplied standard on all simplicity skids.
The pump output pressure should always be set at least 10 PSI above incoming pressure. The pumps will turn on to pump up pressure to set point if pressure drops below 10 psi.

DISCHARGE PRESSURE SETTING SHOULD ALWAYS BE AT LEAST 10 PSI ABOVE INLET PRESSURE. FAILURE TO DUE THIS MAY RESULT IN THE PUMP NOT TURNING OFF WITH NO DEMAND.

OPERATION

Now that the pump is mounted, plumbed and mounted in a dry, sun shielded location, we are ready to operate the pump.

First, all air needs to be evacuated from the pump. Follow this procedure to properly remove all air from the pump body.

1) Make certain the covers are totally locked and tight on the VFDs to prevent water from entering the drives.

2) Open the discharge water plug shown . On a vertical Multistage it will be a small plug on the discharge side of the pump as shown:

Turn this plug CCW until air is released, it does not need to be totally turned out. Once all air is released there will be only water being released. Tighten plug back until water stops leaking. DO NOT over tighten this plug.

Once all the air is released and no leaks remain, apply power by turning on breaker(s) supplied by others. Realize that power will not be applied to the drives until the main disconnect switch is turned on. This switch is shown below and is mounted on the VFD front.

See photo below.

Turn power disconnect switch to the on position. The display will now light green.
Turn the On/Off switch to "FWD" and the display will show the set point pressure and the actual pressure every 2 seconds.

Turning the pressure setting knob clockwise will raise the set point pressure, once this pressure is above the actual pressure the drive will start the pump. If the pump does not generate pressure within 20 seconds it will shut down and display "Suction problem". If this occurs make certain the pump is not "air bound" and the suction has sufficient water supply. The pumps are designed to have a flooded suction, meaning the suction always has a positive pressure. The pumps are not designed to suck pressure although they can do this if the pump is primed. Consult factory if this is the case.
If pressure comes to set point within 20 seconds the pump will turn off within 30 seconds if there is no flow demand. If there is a demand the pump will run and maintain the set point pressure until the demand goes away.

SETTING PRESSURE

Once the plumbing is verified and the gauge has pressure and there are no leaks, first make certain that there is no pre-charge or air in the system. You can do this by the following.

While the PSI knob is full CCW (pump off) turn on each faucet to evacuate the air in every line in the system, you may need to run each fixture for several minutes until no more air escapes. Next keep only one faucet on, This will equalize the pumps inlet (suction) and outlet (discharge) pressures. With the one faucet on, turn the PSI knob on the pump CW slowly until the pressure reaches the desired set point.
The pump will start and accelerate to the pressure set on the knob. Maximum pressure is limited from the factory to the application specifications so no need to be concerned that the system will over pressurize the pipes.

The pump will now turn on whenever there is a demand for flow and the set-point pressure is at least 10 PSI ABOVE the incoming pressure. If the set-point pressure and incoming pressure differential is less than 10 PSI, the pump will not start. This is intentional and a safety feature of the pump to prevent pump cycling.

When flow starts the pump will start within 0.3 seconds and quickly raise to 90% of set point (within 2 seconds). The unit will slowly raise to set-point from there within 5 seconds.

The pump will maintain the set-point as long as the supply has enough water capacity.

Once the demand stops, fixture turns off the pump will run for up to 30 seconds and then shut off. The pump should not run for longer than 90 seconds. If it does, there is flow somewhere in the home OR there is air in the line.
Removing air is simple, unscrew the 20 mm stainless steel plug at the 11 o'clock position on the PUMP casing UNTIL water starts coming out, you will typically hear air escaping. You will need a towel to wipe up the water that will escape while removing the air.
Air in the pump will make the pump sound noisy. There are automatic air vent valves that can be used if you are pumping hot water. Water temperature can not exceed 160 degrees F.

ALTERNATION

Multiple pump skids will automatically alternate to maintain equal run time on each pump. Alternation occurs on the following conditions:

1) every time both pumps turn off the pumps will alternate.

2) If any pump faults or its power is turned of the pump is taken out of alternation.

3) Pressure Transducer fails the system will alternate.

LOAD SHARE

If the demand exceeds the ability of one pump the second pump will come on in a few seconds. The second pump will turn off first when demand decreases to the point that one pump can handle the load. The first pump will turn off when the demand goes away entirely.

IMPORTANT NOTES ON PUMP OPERATION

The pump will automatically turn on and off based on demand. It is normal for the pump to stay off and leak down to suction pressure when no water is demanded. The pressure will increase from city pressure to the set pressure over a period of about 1-2 seconds. This gradual increase is intentional and desired to increase fixture life. The pump may not turn on if there is a very slight flow. Cracking a fixture to the point of allowing a trickle of water will not signal the pump to come on. This is again intentional. If you do not desire full flow, then you do not need full pressure.

If the pump turns off while a fixture is on full, typically the differential from the street pressure and the desired pressure is too low, turn up the pressure set-point 5 PSI and reattempt a pump start by turning off the faucet and turning it back on. Make certain screens on faucets are clean. Very low flows may cause the pump to turn off. Bladder tanks, filters and anything in the water system that makes the system spongy such as air may hamper the turn on or off operation. Tun on all faucets in the home to evacuate air that may have been trapped when installing the pump.

NORMAL OCCURRENCES

The drive will shut down if it gets too hot. the suns UV, the drive can get exceedingly hot and can cause premature drive failure.

A good indication of this is you will hear the internal fan come on. If this occurs, good practice is to shade the product from the sun. This is easily done by a variety of methods or you can purchase an optional sun shield from TAW.

If you continuously turn on and off a fixture the pump will not be able to regulate the pressure. It is assumed that a fixture will be turned on and left on for at least 3 seconds. Faster fixture cycling will not adversely effect the product, the pressure will not stabilize if faucets or valves are turned on and off quickly and continuously.

Exceeding the home water supply will occur when demand exceeds the maximum flow of the pipes. The pressure will not reach set-point and the drive will be at full speed. Pressure can only be maintained when there is a sufficient amount of water. The pump can not compensate for the lack of water. A boost pressure benefit will still be observed but the set pressure may not be reached due to lack of water supply. The PUMP will automatically slow down to compensate. A cavitating pump sounds like a popcorn maker and long term operation under cavitation will damage a pump although this will typically take days.

MINIMUM PRESSURE PUMP UP.

There is a setting in the drive to adjust the absolute minimum allowed pressure. When the discharge falls to or below this setting the pumps will turn on. This is set default to 20 PSI. If a higher or lower setting is required, please contact TAW for instructions.

HIGH DEMAND – TWO PUMP LOAD SHARE

If the lead pump can not maintain pressure at 60 hz. A second pump will come on within 5 seconds. Each pump can modulate past 60 hz due to our pump curve extension algorithm. The system will not allow any motor to over load or burn out.

Once the demand reduces the lag pump will turn off after 20 seconds. These delays are adjustable, contact the factory for instructions.

PROTECTIONS

AN ALARM LED WILL LIGHT IF THE PRESSURE EXCEEDS PRESET HIGH PSI.

IT WILL NOT SHUT DOWN THE PUMP BUT IS SIMPLY AN INDICATION THAT THE PRESSURE HAS REACHED THIS LEVEL.

THE DRIVE WILL SHOW A FAULT IF PRESSURE CAN NOT MEET SET POINT IN 20 SECONDS.

THIS PROTECTS THE PUMP FROM RUNNING DRY. THE PUMP WOULD EVENTUALLY BURN ITSELF OUT IF IT RAN DRY. DISPLAY WILL SHOW "SUCTION PROBLEM".

IF THE TRANSDUCER FAILS, THE DRIVE WILL FAULT.

THIS PREVENTS THE PUMP FROM RUNNING TO FULL SPEED IF THE PRESSURE FEEDBACK FAILS. DISPLAY WILL SHOW "TRANSDUCER FAULT".

THE DRIVE WILL FAULT IF THE MOTOR DRAWS TOO MUCH CURRENT FOR A PERIOD OF OVER 1 MINUTE. DISPLAY WILL SHOW "OVER CURRENT".

THE DRIVE WILL FAULT IF THERE IS TOO HIGH A LINE VOLTAGE OR TOO LOW A LINE VOLTAGE.

LINE VOLTAGE MUST BE MAINTAINED BETWEEN 190 AND 255 VAC. ON 230V OR 380 AND 510VAC ON 480V SYSTEMS. DISPLAY WILL SHOW "LOW OR HIGH VOLTAGE".

THE DRIVE WILL FAULT IF THE MOTOR GETS WATER IN IT OR GROUND FAULTS.

RESETTING ANY OF THESE FAULTS IS DONE BY PUSHING THE "OK" BUTTON ON THE KEYPAD. GROUND FAULTS CAN NOT BE RESET WITHOUT CYCLING POWER. PLEASE CHECK WIRING PRIOR TO RESTARTING AS GROUND FAULTS CAN DAMAGE A DRIVE IF THEY CONTINUE.

IF THE FAULT CONTINUES TO OCCUR AND THE PRESSURE SHOWS GOOD PRESSURE ON THE GAUGE, CALL THE FACTORY FOR FURTHER TROUBLESHOOTING.

TROUBLESHOOTING

PUMP DOES NOT TURN ON.

CHECK THERE IS POWER, THE GREEN OLED DISPLAY SHOULD BE LIT.

DRIVE FAULTED

THE DRIVE WILL FLASH A FAULT MESSAGE.

MAKE CERTAIN THE PUMP HAS PRESSURE ON IT BY LOOKING AT THE PRESSURE GAUGE.

PUMP CYCLES ON WHEN NO DEMAND IS PRESENT.

MAKE CERTAIN THE CHECK VALVE DOES NOT HAVE DIRT IN IT. THIS IS APPARENT BY NOTICING A FAST PRESSURE DROP ONCE THE PUMP STOPS PRESSURING THE SYSTEM. A SLOW DROP IS NORMAL (1 PSI OR LESS PER SECOND) BUT A FAST PRESSURE DROP IS AN INDICATION THAT THE CHECK VALVE HAS DIRT IN IT.

YOU CAN ATTEMPT TO CLEAN THE VALVE BY REMOVING THE VALVE, PUSHING THE PIN WITH YOUR THUMB KEEPING IT OPEN AND DIPPING IT IN A BUCKET OF CLEAN , SOAPY WATER. DO NOT USE ANY TOXIC CHEMICALS AND BE CERTAIN TO RINSE WELL AFTER YOU CLEAN IT.

IF CLEANING FAILS, YOU CAN OPEN IT UP BY MOUNTING THE UNIT IN A VICE AND TURNING THE TWO HALF'S CCW WITH A PIPE WRENCH. IT WILL BE HARD TO BREAK LOOSE, AN ALTERNATIVE IS TO ORDER A NEW ONE FROM THE FACTORY.

THERE IS A SETTING TO REDUCE THE TURN ON SENSITIVITY. CALL TAW FOR INSTRUCTIONS.

PUMP TURNS OFF WHEN DEMAND IS REQUESTED.

THIS TYPICALLY IS AN ISSUE IF THERE IS NOTE ENOUGH DIFFERENTIAL BETWEEN THE INLET AND OUTLET PRESSURE. THE PUMP REQUIRES A MINIMUM OF 10

PSI differential from the inlet pressure and outlet. There is a setting to reduce the turn off sensitivity. Call TAW for instructions.

Pump gets hot.

Make certain the sun is not hitting the pump. Shade it however possible.

Make certain the pump turns off when no demand is requested. The longest the pump should run is 90 seconds with no flow. If the pump continues to run and the pump gets hot, the check valve may have debris in it and may need cleaning , refer to maintenance section on how to clean the check valve.

Pump leaks

Seals may need replacing. The seals are typically long lasting but eventually could wear out. Call the factory for a rebuild kit.

Pump makes noise

Try installing pieces of rubber between the mounting surface and the pump mount. Pumps mounted on cement will resonate. resiliently mounting the pump dramatically improves the whining noise you may experience. A high pitched whine is resonance, a lower frequency noise (rumbling) is either air in the pump . A good way to isolate resonance problems is to put your hands over the fins on the motor. If the motor quiets down appreciably, resilient mounting is advised.

Motor Runs backwards.

The three phase wires could have been changed but they come factory installed and should not need changing.

MAINTENANCE

The pump is designed to be maintenance free but several issues may result over time.

Debris in the motor fan.

Clear weeds that may be growing around the pump as they will prevent proper cooling.

Wash down the pump and dry it off with a clean rag if too much dirt or dust has accumulated on it.

Check the plumbing fitting for leaks and tighten if necessary.

Stainless steel fittings only need to be tightened ¼ turn past hand tight. If the fitting leaks at this point remove the fitting and reapply 3 wraps of teflon tape on the first 5 threads of the fitting and re-assemble.

Hand tighten and then tighten down ½ turn further. Leaks should be fixed.

Over tightening of stainless steel fittings will result in ceasing and further leaking. At times, stainless steel fittings require a thread sealant to prevent leaks, TAW recommends LockTite 577 stainless steel thread sealant in these situations. It is designed for potable water.

Apply sealant on the second thru fifth thread and work the paste into the threads on the male connector only. Re-thread and tighten ¼ turn past hand tight. All 1 hour to cure before applying pressure.

Teflon Tape is not needed when sealant us used.

Check mount

insure it is fastened securely to the slab or mount it is affixed to.

CHECK WIRING

INSURE NO ANIMALS HAVE CHEWED INTO THE TRANSDUCER CABLE.

POWER DOWN THE DRIVE AND OPEN THE COVER OF THE DRIVE BY UNSCREWING THE 4 STAINLESS STEEL PHILLIPS HEAD SCREWS AND INSURE THE INSIDE OF THE DRIVE IS TRY AND NO WATER HAS ENTERED.

THIS MAINTENANCE SHOULD BE PERFORMED ONCE A YEAR OR IF THERE IS A SUSPECTED NEED.

We appreciate your business and always welcome suggestions and comments to make our products better.
Please contact TAW with any questions or concerns regarding any of our products. TAW can be reached via email at sales@perfectpressurepump.com or via phone at (407) 493.2355 or you can visit the Perfectpressurepump.com website to view videos and other information . This website continues to be updated with media and information as we continue to develop and improve the most innovative booster pump on the planet.

BTW, your pump can be updated to the newest firmware at anytime by simply calling TAW and arranging an update module to be sent to your location. There is a deposit for the module but is refunded on its return. This allows your product to be updated as we create new and innovative algorithms to the pump.

Thank you for your continued support and business. We hope you enjoy your pump for years to come.

Phil Tuttobene
President, owner and lead engineer - Total Automation Works,LLC
Engineering ideas into reality since 1978