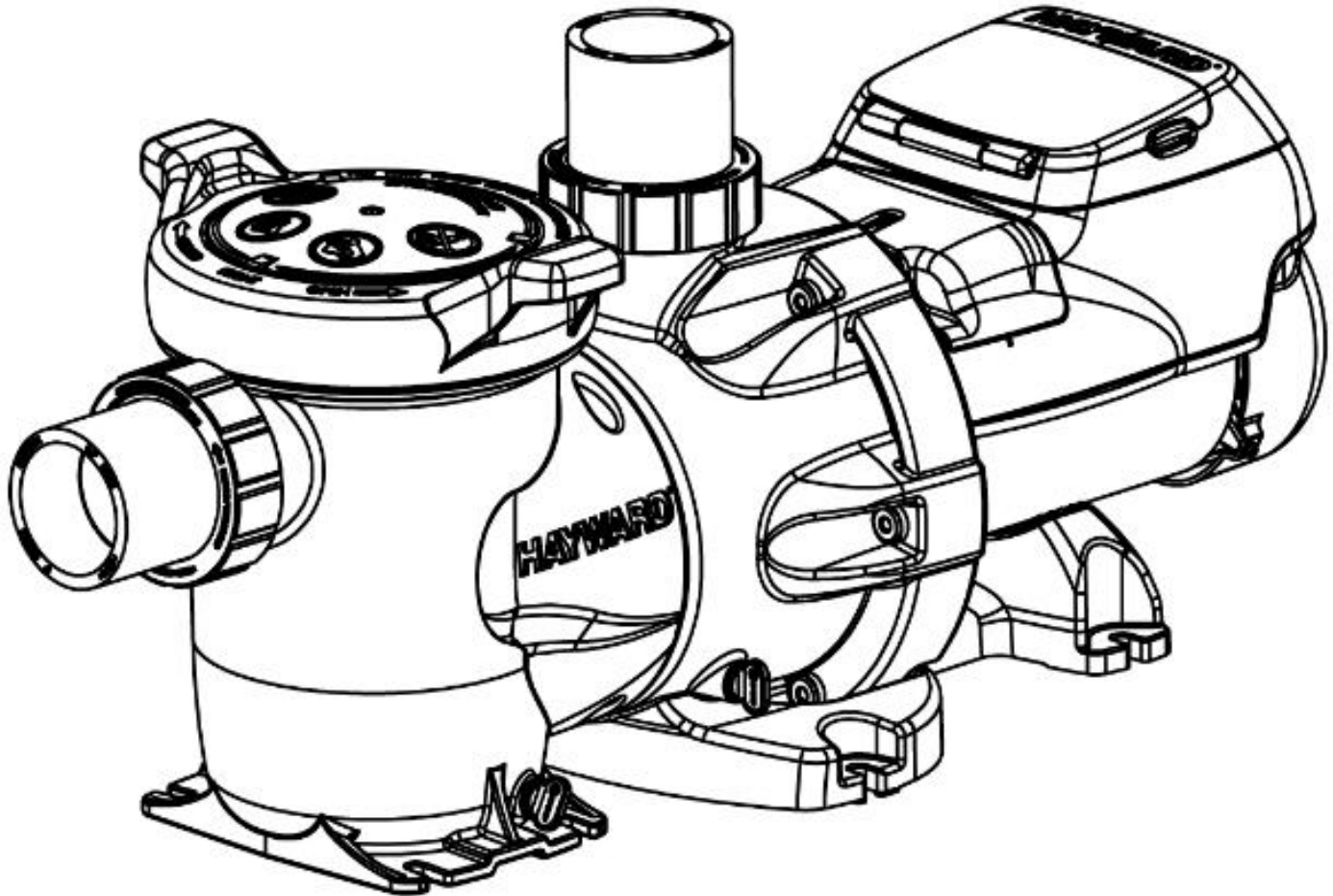


**HAYWARD FLOW CONTROL
LifeStar® MV-VS SERIES AQUATIC PUMP
INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS**



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PLEASE READ THE FOLLOWING INFORMATION PRIOR TO INSTALLING AND USING HAYWARD LifeStar® MV-VS SERIES AQUATIC PUMP. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PRODUCT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY, OR EVEN DEATH.

1. Hayward Flow Control (Hayward), a division of Hayward Industries, guarantees its products against defective material and workmanship only. Hayward assumes no responsibility for property damage or personal injury resulting from improper installation, misapplication, or abuse of any product.
2. Hayward assumes no responsibility for property damage or personal injury resulting from chemical incompatibility between its products and the process fluids to which they are exposed. Determining whether a particular PVC, CPVC, or PP product is suitable for an application is the responsibility of the user. Chemical compatibility charts provided in Hayward literature are based on ambient temperatures of 70°F and are for reference only.
3. Hayward products are designed for use with non-compressible liquids.

WARNING

Hayward PVC and CPVC products should NEVER be used or tested with compressible fluids such as compressed air or nitrogen. Use of PVC and CPVC products in compressible fluid applications may result in product damage, property damage, personal injury, or even death.

4. The maximum recommended fluid velocity through any Hayward product is eight feet per second (8 ft/s). Higher fluid velocity can result in damage due to the water hammer effect.
5. Piping systems must be designed and supported to prevent excess mechanical loading on Hayward products due to system misalignment, weight, shock, vibration, and the effects of thermal expansion and contraction.
6. The effect of temperature on plastic piping systems must be considered when the systems are initially designed. The pressure rating of plastic systems must be reduced with increasing temperature. Maximum operating pressure is dependent upon material selection as well as operating temperature. Before installing any Hayward product, consult Hayward product literature for pressure vs. temperature curves to determine any operating pressure or temperature limitations.
7. PVC and CPVC plastic products become brittle below 40°F. Use caution in their installation and operation below this temperature.

WARNING

Hayward PVC and CPVC products should not be used in services with operating temperature below 34°F.

8. Due to differential thermal expansion rates between metal and plastic, transmittal of pipe vibration and pipe loading forces, **DIRECT INSTALLATION INTO METAL PIPING SYSTEMS IS NOT RECOMMENDED.** Wherever installation of plastic equipment into metal piping systems is necessary, it is recommended that at least 10 pipe diameters in length of plastic pipe be installed upstream and downstream of the plastic equipment to compensate for the factors mentioned above.
9. Published operating requirements are based on testing of new pumps using clean water at 70°F. Pump performance is affected by many factors including fluid chemistry, viscosity, specific gravity, flow rate, and temperature. These should be considered when sizing Hayward products.
10. Systems should always be depressurized and drained prior to installing or maintaining any Hayward product.

WARNING

Failure to depressurize and drain system prior to installing or maintaining filter vessel may result in product damage, property damage, personal injury, or even death.

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1. IMPORTANT SAFETY INSTRUCTIONS

Before installing or servicing this electrical equipment, turn power supply OFF.

Basic safety precautions should always be followed, including the following: Failure to follow instructions may result in injury.

 This is the safety-alert symbol. When you see this symbol on your pump or in this manual, look for one of the following signal words, and be alert to the potential for personal injury.


 **WARNING** warns about hazards that **could** cause serious personal injury, death or major property damage and if ignored presents a potential hazard.


 **CAUTION** warns about hazards that **will** or **can** cause minor or moderate personal injury and/or property damage and if ignored presents a potential hazard. It can also make consumers aware of actions that are unpredictable and unsafe.

The **NOTICE** label indicates special instructions that are important but not related to hazards.




 **WARNING – READ AND FOLLOW ALL INSTRUCTIONS** in this owner's manual and on the equipment. Failure to follow instructions can cause severe injury and/or death.


 **WARNING** – This product should be installed and serviced only by a qualified professional.

 **CAUTION** – All electrical wiring **MUST** be in conformance with all applicable local codes, regulations, and the National Electric Code (NEC).


USE OF NON-HAYWARD REPLACEMENT PARTS VOIDS WARRANTY.

ATTENTION INSTALLER - THIS MANUAL CONTAINS IMPORTANT INFORMATION ABOUT THE INSTALLATION, OPERATION, AND SAFE USE OF THIS VARIABLE SPEED PUMP THAT MUST BE FURNISHED TO THE END USER OF THIS PRODUCT. FAILURE TO READ AND FOLLOW ALL INSTRUCTIONS COULD RESULT IN SERIOUS INJURY.


 **WARNING** – To reduce risk of injury, do not permit children to use or climb on this product. Closely supervise children at all times. Components such as the filtration system, pumps, and heaters must be positioned to prevent children from using them as a means of access to the system.


 **CAUTION** – This pump is intended for use on permanently installed systems. A permanently installed system is constructed in or on the ground or in a building such that it cannot be readily disassembled for storage. A storable system is constructed so that it is capable of being readily disassembled for storage and reassembled to its original integrity. Though this product is designed for outdoor use, it is strongly advised to protect the electrical components from the weather. Select a well-drained area, one that will not flood when it rains. It requires free circulation of air for cooling. Do not install in a damp or non-ventilated location. If installed within an outer enclosure, adequate ventilation and free circulation of air must be provided to prevent overheating of the motor.


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 **WARNING** – System components (seals, gaskets, etc.) have a finite life. All components should be inspected frequently and replaced at least every ten years, or if found to be damaged, broken, cracked, missing, or not securely attached.




 **WARNING – Risk of Electric Shock.** All electrical wiring **MUST** be in conformance with applicable local codes, regulations, and the National Electric Code (NEC). Hazardous voltage can shock, burn, and cause death or serious property damage. To reduce the risk of electric shock, do **NOT** use an extension cord to connect unit to electric supply. Provide a properly located electrical receptacle. Before working on pump or motor, turn off power supply to the pump.

 **WARNING** – To reduce the risk of electric shock replace damaged wiring immediately. Locate conduit to prevent abuse from lawn mowers, hedge trimmers and other equipment.

 **WARNING – Risk of Electric Shock.** In accordance with the National Electric Code (NEC), connect only to a branch circuit protected by a ground-fault circuit-interrupter (GFCI). Contact a qualified electrician if you cannot verify that the circuit is protected by a GFCI. The unit must be connected only to a supply circuit that is protected by a ground-fault circuit-interrupter (GFCI). Such a GFCI should be provided by the installer and should be tested on a routine basis. To test the GFCI, push the test circuit button. The GFCI should interrupt power. Push the reset button. Power should be restored. If the GFCI fails to operate in this manner, the GFCI is defective. If the GFCI interrupts power to the pump without the test button being pushed, a ground current is flowing, indicating the possibility of an electric shock. Do not use this pump. Disconnect the pump and have the problem corrected by a qualified service representative before using.

 **WARNING** – Failure to bond pump to system structure will increase risk for electrocution and could result in injury or death. To reduce the risk of electric shock, see installation instructions and consult a professional electrician on how to bond pump. Also, contact a licensed electrician for information on local electrical codes for bonding requirements.

Notes to electrician: Use a solid copper conductor, size 8 or larger. Run a continuous wire from external bonding lug to reinforcing rod or mesh. Connect a No. 8 AWG (8.4 mm²) [No. 6 AWG (13.3 mm²) for Canada] solid copper bonding wire to the pressure wire connector provided on the pump housing and to all metal parts of system and to all electrical equipment, metal piping (except gas piping), and conduit within 5 ft. (1.5 m) of inside walls of system. **IMPORTANT** - Reference NEC codes for all wiring standards including, but not limited to, grounding, bonding and other general wiring procedures.

 **WARNING – Suction Entrapment Hazard.** Suction in suction outlets and/or suction outlet covers, which are damaged, broken, cracked, missing, or unsecured cause severe injury and/or death due to the following entrapment hazards (symbols complements of APSP):



Hair Entrapment - Hair can become entangled in suction outlet cover.



Limb Entrapment - A limb inserted into an opening of a suction outlet sump or suction outlet cover that is damaged, broken, cracked, missing, or not securely attached can result in a mechanical bind or swelling of the limb.




Body Suction Entrapment - A differential pressure applied to a large portion of the body or limbs can result in an entrapment.

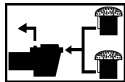


Evisceration/ Disembowelment - A negative pressure applied directly to the intestines through an unprotected suction outlet sump or suction outlet cover which is damaged, broken, cracked, missing, or unsecured can result in evisceration/disembowelment.

Mechanical Entrapment - There is potential for jewelry, clothing, hair decorations, fingers, toes, or knuckles to be caught in an opening of a suction outlet cover resulting in mechanical entrapment.


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 **WARNING** – To Reduce the risk of Entrapment Hazards:





- When outlets are small enough to be blocked by a person, a minimum of two functioning suction outlets per pump must be installed. Suction outlets in the same plane (i.e. floor or wall), must be installed a minimum of three feet (3') [0.91 meter] apart, as measured from near point to near point.
- Dual suction fittings shall be placed in such locations and distances to avoid “dual blockage” by a user.
- Dual suction fittings shall not be located on seating areas or on the backrest for such seating areas.
- The maximum system flow rate shall not exceed the values shown in the “Pipe Sizing Chart” found in section □ below.
- Never use system if any suction outlet component is damaged, broken, cracked, missing, or not securely attached.
- Replace damaged, broken, cracked, missing, or not securely attached suction outlet components immediately.
- In addition to two or more suction outlets per pump installed in accordance with latest APSP standards and CPSC guidelines, follow all national, state, and local codes applicable.
- Installation of a vacuum release or vent system, which relieves entrapping suction, is recommended.





 **WARNING** – **Hazardous Pressure.** System water circulation systems operate under hazardous pressure during start-up, normal operation, and after pump shut-off. Stand clear of circulation system equipment during pump start-up. Failure to follow safety and operation instructions could result in violent separation of the pump housing and cover due to pressure in the system, which could cause property damage, severe personal injury, or death. Before servicing system water circulation system, all system and pump controls must be in off position and filter manual air relief valve must be in open position. Before starting pump, all system valves must be set in a position to allow system water to return back to the system. Do not change filter control valve position while pump is running. Before starting pump, fully open filter manual air relief valve. Do not close filter manual air relief valve until a steady stream of water (not air or air and water mix) is discharged from the valve. All suction and discharge valves **MUST** be **OPEN** when starting the circulation system. Failure to do so could result in severe personal injury and/or property damage.



 **WARNING** – **Separation Hazard.** Failure to follow safety and operation instructions could result in violent separation of pump components. Strainer cover must be properly secured to pump housing with strainer cover lock ring. Before servicing, all system and pump controls must be in off position and filter manual air relief valve must be in open position. Do not operate system if a system component is not assembled properly, damaged, or missing. Do not operate system unless filter manual air relief valve body is in locked position in filter upper body. All suction and discharge valves **MUST** be **OPEN** when starting the circulation system. Failure to do so could result in severe personal injury and/or property damage.

 **WARNING** – Never operate the circulation system at more than 50 PSI maximum.

 **WARNING** – **Fire and burn hazard.** Motors operate at high temperatures and if they are not properly isolated from any flammable structures or foreign debris they can cause fires, which may cause severe personal injury or death. It is also necessary to allow the motor to cool for at least 20 minutes prior to maintenance to minimize the risk for burns.

 **WARNING** – Failure to install according to defined instructions may result in severe personal injury or death.

SAVE THESE INSTRUCTIONS

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2. General Information

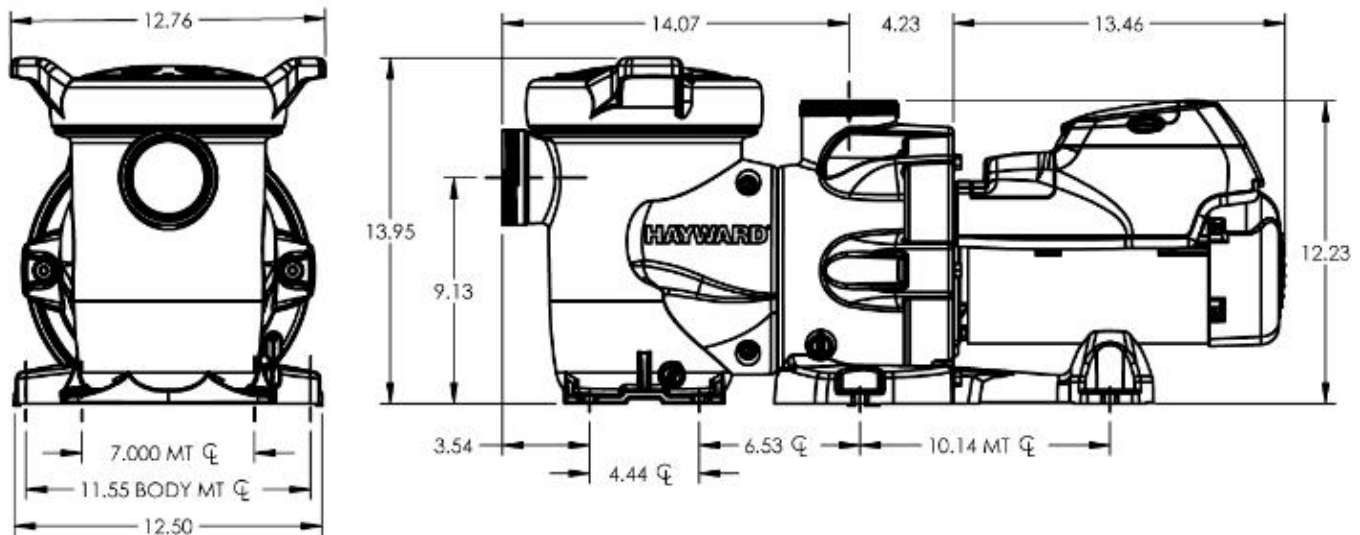
2.1 Introduction

This manual contains information for the proper installation and operation of the Hayward LifeStar® MV Variable Speed Pump. The instructions in this manual **MUST** be followed precisely.

2.2 Primary Features

- Totally enclosed, permanent magnet motor
- Advanced hydraulic design
- Fully programmable with a self-contained 24-hour clock and up to 8 custom speed and timer functions
- For enhanced system management, can be controlled by Hayward or third party control platforms, without the need for additional accessories
- Digital control interface that can be mounted in four different positions on the pump or removed and mounted on the wall
- The extra large basket design ensures easy debris removal and extends time between cleanings
- Motor drive includes built-in protection for high temperatures and voltage fluctuations. Drive is also designed to withstand temperatures below freezing without issue

2.3 Product Dimensions



3. Energy Efficiency Overview

The energy consumed by a system pump is measured in terms of Watts (W) or Kilowatts (kW). The LifeStar® MV Variable Speed Pump displays power consumption in Watts. Given this information, you can determine the cost of operating the pump:

Power consumption of pump X Cost of electricity = Cost of Pump Operation per Hour

Example: LifeStar® MV-VS Pump operating at 300 W. Cost of electricity = \$0.10 per kWh
 Convert Watts to Kilowatts: 300 W = 0.3 kW
 0.3 kW X \$0.10/kWh = \$0.03 per hour

Note the power consumption is greatly affected by the speed of the pump. Lowering the speed of the pump can drastically reduce the power that is consumed. Below are some of the major benefits of running the pump at lower speeds.

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Benefits of running at low speeds

- Save electricity and money
- Improved filtration – the filter can often remove smaller particles when the water moves slower
- Quiet operation
- Reduced Total Dynamic Head – less stress on equipment (e.g. filter) which can lengthen equipment life

When determining the speed(s) to operate your pump, you must also take into account the minimum requirements for proper sanitation and equipment/water feature functionality.

It is recommended you filter (“turnover”) all the water in the system at least once every 24 hours. Check with local requirements for the minimum turnover rate. Running the pump at a lower speed may require running the pump for a longer period of time in order to meet the turnover requirements for proper sanitation.

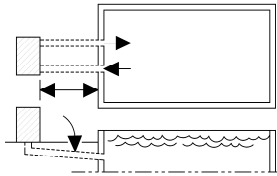
Equipment such as heaters, skimmers, and chlorinators require minimum flows to operate correctly. Refer to individual equipment manuals for specific flow requirements.

After setting the pump speed(s), it is recommended you check that all other equipment/water features are functioning as intended. For example, when running at a low speed for daily filtration, verify water is adequately flowing over the skimmer weirs. Operate the pump at higher speeds for the shorter periods of time needed to operate a heater, water feature, etc.

4. Installation and Wiring

⚠ WARNING – This product should be installed and serviced only by a qualified professional.

4.1 Pump Location



Locate pump as close to system as practical and run suction lines as direct as possible to reduce friction loss. Suction lines should have continuous slope upward from lowest point in line. Joints must be tight (but not over-tightened). Suction line diameter must equal or be larger than the discharge line diameter.

Though the pump is designed for outdoor use, it is advised to place pump and filter in the shade to shield them from continuous direct heat. Select a well-drained area that will not flood when it rains. Do NOT install pump and filter in a damp or non-ventilated location. Keep motor clean. Pump motors require free circulation of air for cooling.

4.2 Pump Mounting

Install pump on a level concrete slab or other rigid base to meet all local and national codes. Secure pump to base with screws or bolts to further reduce vibration and stress on pipe or hose joints. The base must be level, rigid, and vibration free.

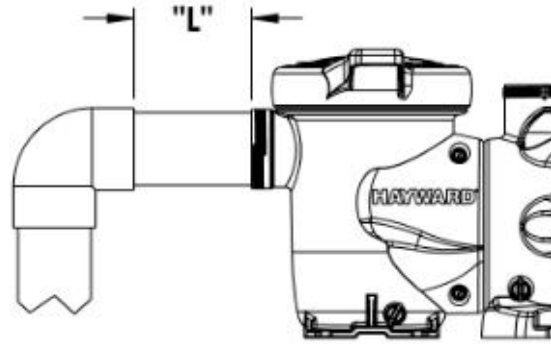
Pump mount must:

- Allow pump inlet height to be as close to water level as possible.
- Allow use of short, direct suction pipe (to reduce friction losses).
- Allow for valves in suction and discharge piping.
- Be protected from excess moisture and flooding.
- Allow adequate access for servicing pump and piping.

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4.3 Pipe Sizing Chart

MINIMUM INLET PIPING SIZE CHART	
Pipe Size in. [mm]	Minimum Suction Pipe Length "L" in. [mm] *
2 ½" [64]	12 ½" [317]
3" [76]	15" [381]
4" [102]	20" [508]
6" [152]	30" [762]



Note: It is recommended that a minimum length of straight piping (shown as "L" in above diagram), equivalent to 5 pipe size diameters, be used between the pump suction inlet and any plumbing fittings (elbows, valves, etc.).

When installing the LifeStar® MV Variable Speed Pump, care should be taken to ensure proper pipe and equipment sizing to handle the maximum flow required. It is recommended to set the maximum speed in order to not exceed the maximum flow rate. See section 6.6 item #7.



⚠ WARNING – Hazardous Pressure. Pumps, filters, and other equipment/ components of a filtration system operate under pressure. Incorrectly installed and/or improperly tested filtration equipment and/or components may fail resulting in severe personal injury or death.

4.4 Plumbing

1. Use PTFE tape to seal threaded connections on molded plastic components. All plastic fittings must be new or thoroughly cleaned before use. NOTE - Do NOT use Plumber's Pipe Dope as it may cause cracking of the plastic components. When applying PTFE tape to plastic threads, wrap the entire threaded portion of the male fitting with one to two layers of tape. Wind the tape clockwise as you face the open end of the fitting, beginning at the end of the fitting. The pump suction and outlet ports have molded-in thread stops. Do NOT attempt to force hose connector fitting past this stop. It is only necessary to tighten fittings enough to prevent leakage. Tighten fitting by hand and then use a tool to engage fitting an additional 1 ½ turns. Use care when using PTFE tape as friction is reduced considerably; do NOT over-tighten fitting or you may cause damage. If leaks occur, remove connector, clean off old PTFE tape, re-wrap with one to two additional layers of PTFE tape, and re-install connector.
2. Fittings (elbows, tees, valves, etc.) restrict flow. For better efficiency, use the fewest possible fittings. Avoid fittings that could cause an air trap. Fittings MUST conform to the International Association of Plumbing and Mechanical Officials (IAPMO) standards.

4.5 Electrical



⚠ WARNING – All electrical wiring MUST conform to local codes, regulations, and the National Electric Code (NEC).

⚠ WARNING – Ground and bond pump before connecting to electrical power supply. Failure to ground and bond pump can cause serious or fatal electrical shock hazard. Do NOT ground to a gas supply line. To avoid dangerous or fatal electrical shock, turn OFF power to pump before working on electrical connections. Fire Hazard - match supply voltage to pump nameplate voltage. Insure that the electrical supply available agrees with the pump's voltage, phase, and cycle, and that the wire size is adequate for the amps rating and distance from the power source. Use copper conductors only.

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4.6 Electrical Specs

1. Voltage: 230VAC, 60Hz, Single Phase
2. Amps: 10.9
3. Speed Range: 600-3450 rpm

Use copper conductors only. For indoor & outdoor use. Connect pump to a 15 amp branch circuit in accordance with local codes, regulations, and the National Electric Code (NEC). A disconnecting means located at least 5 ft. from the inside wall of the system must be provided.


4.7 Voltage

Voltage at pump MUST NOT be more than 10% above or below nameplate rated voltage, or components may overheat, causing overload tripping and reduced component life. If voltage is less than 90% (207 VAC) or more than 110% (253 VAC) of rated voltage (230 VAC) when pump is running at full load, consult the power company.

4.8 Grounding and Bonding

1. Install, ground, bond, and wire pump in accordance with local or national electrical code requirements.
2. Permanently ground pump. Use green ground terminal provided under access plate; use size and type wire required by code. Connect ground terminal to electrical service ground.
3. Bond pump to system structure. Bonding will connect all metal parts within and around the system with a continuous wire. Bonding reduces the risk of a current passing between bonded metal objects, which could potentially cause electrical shock if grounded or shorted. Reference NEC codes for all wiring standards including, but not limited to, grounding, bonding and general wiring procedures.
4. Use a solid copper conductor, size 8 or larger. Run wire from external bonding lug to reinforcing rod or mesh. Connect a No. 8 AWG (8.4 mm²) [No. 6 AWG (13.3 mm²) for Canada] solid copper bonding wire to the pressure wire connector provided on the motor housing and to all metal parts of system and to all electrical equipment, metal piping (except gas piping), and conduit within 5 ft. (1.5 m) of inside walls of system.

4.9 Wiring

 **WARNING** – All electrical wiring MUST conform to local codes, regulations, and the National Electric Code (NEC).

1. Pump MUST be permanently connected to circuit. If other lights or appliances are also on the same circuit, be sure to add their amp loads before calculating wire and circuit breaker sizes. Use the circuit breaker as the master On-Off switch.
2. If the LifeStar® MV Variable Speed Pump is being used to replace an existing pump that was controlled by a separate mechanical time clock, the LifeStar® MV Variable Speed Pump should be connected directly to the line power supply, bypassing the time clock. The time clock can then be used to power other equipment (such as a heater, heat pump, or booster pump) that requires the filter pump to be operating when used. If the time clock is used in this manner, it should be set to power the equipment during a time cycle when the LifeStar® MV Variable Speed Pump is operating at an appropriate flow rate to operate the other equipment, as defined by the timers set in the Timer Menu. See section 6.7

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4.10 Remote Control Wiring/Operation

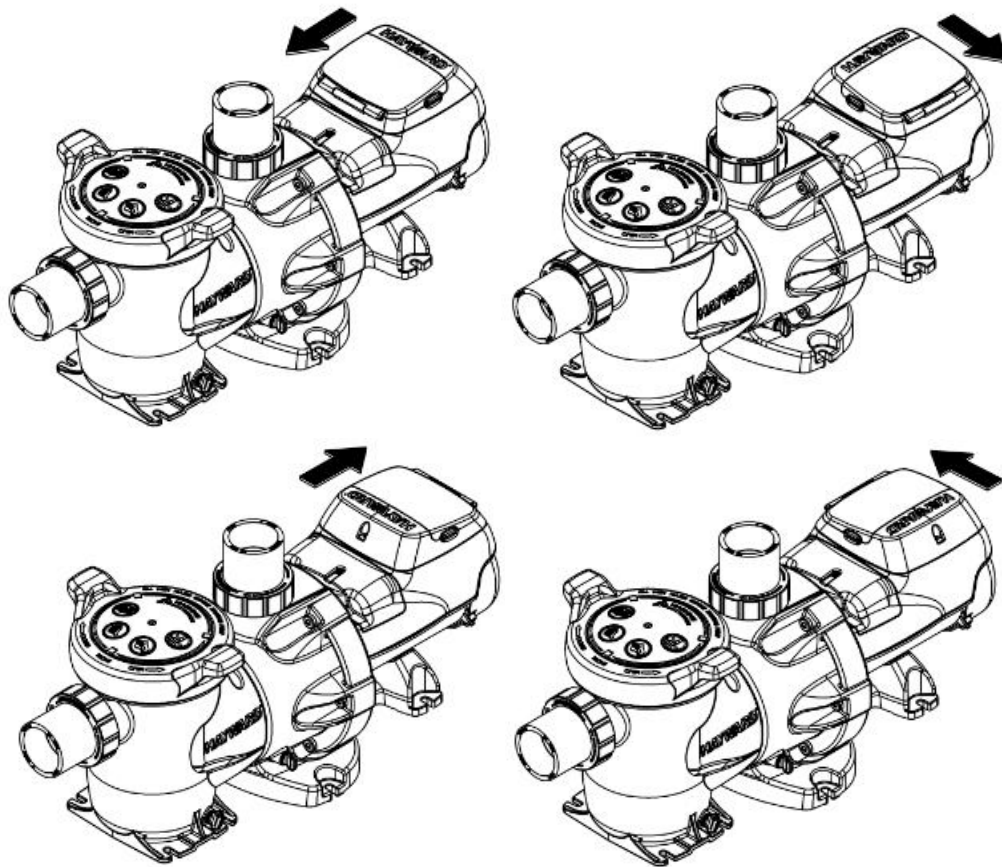
The LifeStar® MV Variable Speed Pump can be controlled in a wide variety of ways as described below:

1. Pump can operate by itself in Stand-Alone Mode using its built-in programmable timers.
2. Pump can communicate with and be controlled by a variety of Hayward controls. See Section 5.3 for more information regarding connecting the LifeStar® MV Variable Speed Pump and Hayward controls.
3. Pump can also be controlled from third party controls (i.e. another manufacturer's control) using relay contacts. See Section 5.4 for more information regarding connection the LifeStar® MV Variable Speed Pump and third party controls.

4.11 Digital Control Interface Orientation

The Digital Control Interface can be rotated to any of four desired positions after installation by loosening the two screws securing the user interface to the motor drive, lifting the user interface and rotating it to the desired position, and tightening the two screws in the new position. (Figure 4.11-1)

Figure 4.11-1



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4.12 Interface Wall Mounting

The interface can also be wall mounted using the parts supplied in the wall mount kit using the following procedure.

1. **TURN OFF THE ELECTRICAL POWER AT THE CIRCUIT BREAKER.**
2. Loosen the two screws securing the user interface to the motor drive & remove the user interface. (Figure 4.12-1)
3. Disconnect the short cable that extends out from the motor drive to the user interface. (Figure 4.12-1)
4. Install the blank cover, SP3200DR9, on the motor drive in the desired orientation. This cover is important to protect internal electronics. (Figure 4.12-2)
5. Mount the wall mount plate, SP3200DR10, in the desired location. (Figure 4.12-3)
6. Connect the interface cable as shown in the 5.2 Wall Mounted Digital Control Interface Wiring diagram shown in section 0 to the motor drive and user interface PCB. Use multi-conductor, jacketed cable suitable for the installation location. The cable must be routed through the “DATA” conduit opening on the motor drive and through the slot provided on the backside of the wall mount plate, SP3200DR10. Use a liquid tight cordgrip, appropriately sized for the cable being used, to seal the conduit opening. Cable used may be up to 500 feet in length. (Figure 4.12-3)
7. Mount the user interface to the wall mount plate, SP3200DR10, using the two screws. (Figure 4.12-3)
8. Apply power to the system and resume normal operation.

The following diagrams on the next page help illustrate the interface wall mounting procedure.

Figure 4.12-1: Removing the Digital Control Interface for Wall Mounting

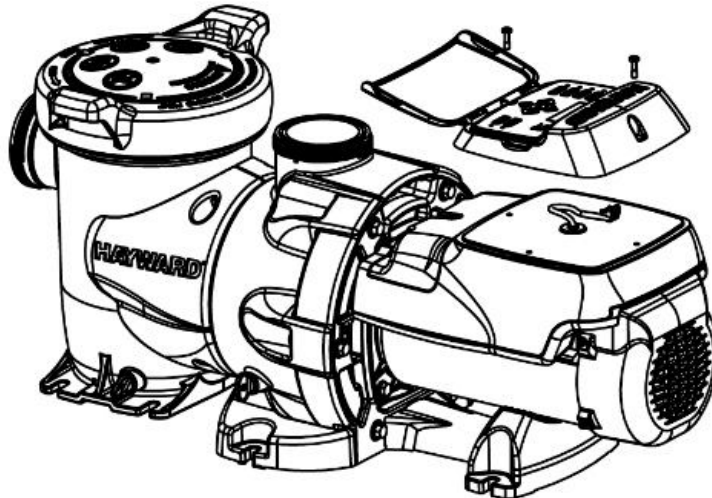
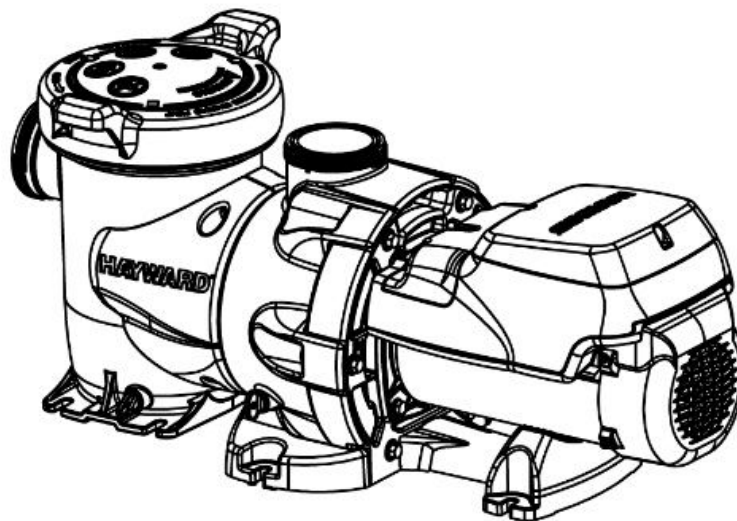
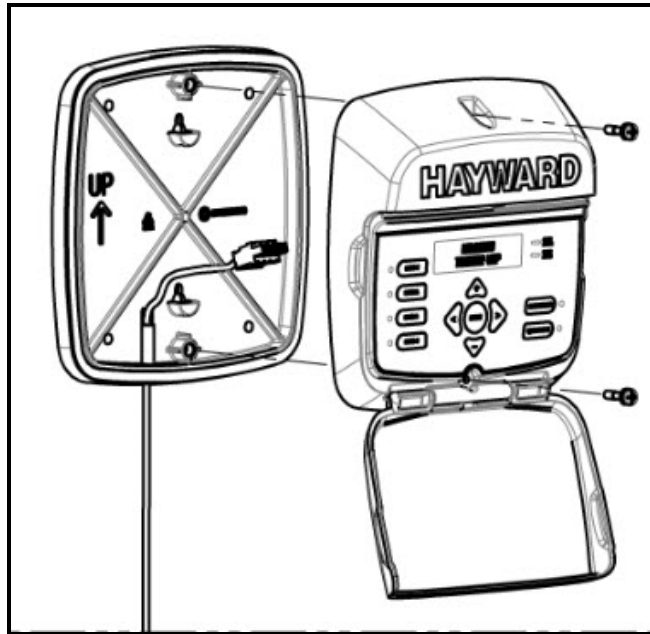


Figure 4.12-2: Adding the Blank Cover



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Figure 4.12-3: Wall Mounting the Interface



4.13 Installation Procedure

Please review sections 4.1 through 4.12 before continuing with this section.

- 1. TURN OFF THE ELECTRICAL POWER AT THE CIRCUIT BREAKER.**
- Remove the wiring access cover on the motor drive.
- Connect 230VAC line power supply wiring to the terminal block and ground screw as shown in the 5.1 Input Power/Motor Wiring diagram. Wiring must be routed through the conduit opening labeled “POWER”. See section 5.1 for diagram.
- If the pump will be controlled using a Hayward system control, connect a two-conductor cable as shown in the 5.3 Hayward Control Wiring diagram. See section 5.3.
- If the pump will be controlled using relay contacts from an external control, connect the INP1-INP3 and 12VAC power out terminals to the external relays as shown in the External Relay Speed Control Wiring diagram. See section 5.4 and 0.11.
- If the installation will use the remote stop feature of the drive, connect INP4 and 12VAC power out terminals to the remote stop switch as shown in the Remote Stop Wiring diagram. See section 5.5.
- Wiring for remote control and/or remote stop functions must be routed through the conduit opening labeled “DATA”. Use a multi-conductor, jacketed cable suitable for the installation location. Use a liquid tight cordgrip, appropriately sized for the cable being used, to seal the conduit opening.
- Connect the pump to the system bonding system using 8AWG (6AWG for Canada) wire. A lug for bonding is provided on the outside of the drive enclosure.
- After all electrical connections have been made, replace the wiring access cover on the motor drive ensuring that the motor lead wires are routed such that the wiring access cover can be installed and seated fully without interference. Tighten the supplied screw on the access cover. Note: The wiring access cover must be installed properly to provide environmental protection for the wiring compartment.
- Apply power to the system, and proceed to “6.6 Configuration Menu”, section 0.

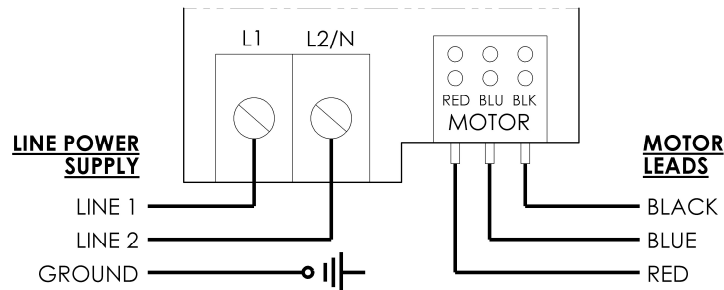
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5. Wiring Diagrams

5.1 Input Power/Motor Wiring (Required)

Figure 5.1-1

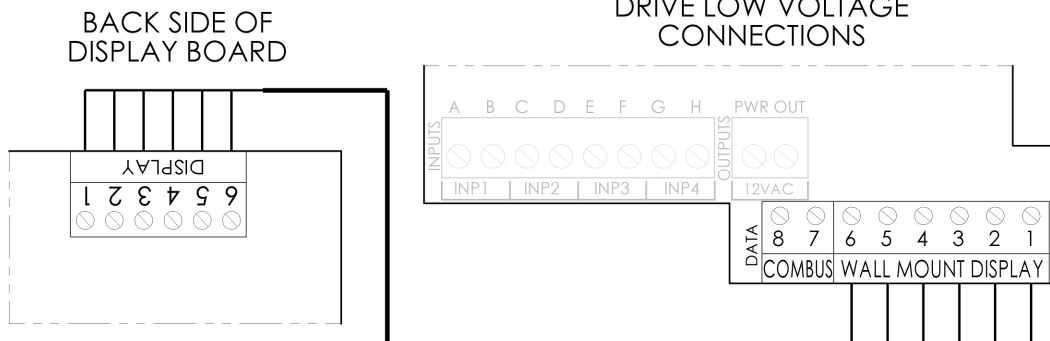
DRIVE HIGH VOLTAGE CONNECTIONS



5.2 Wall Mounted Digital Control Interface Wiring (Optional)

Figure 5.2-1

DRIVE LOW VOLTAGE CONNECTIONS



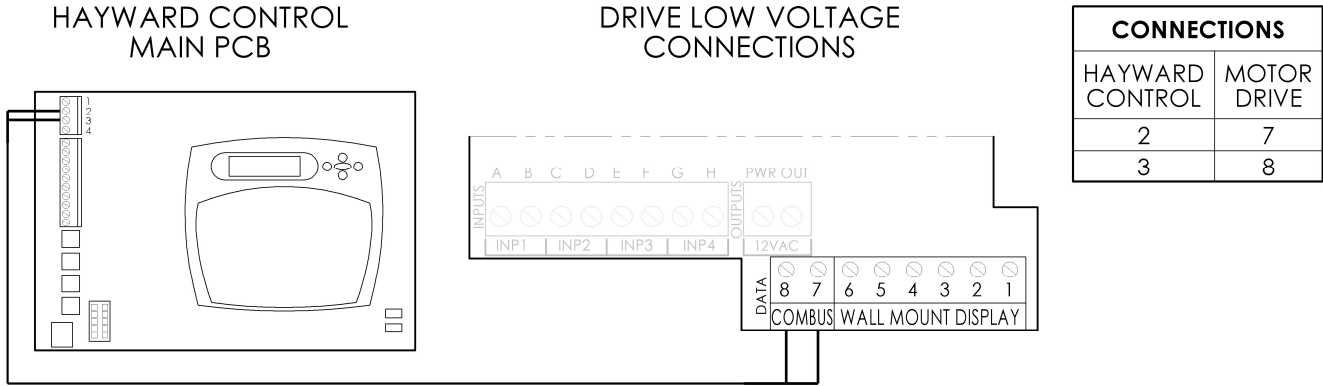
Connection wire must be rated for a minimum of 300V, and may be up to 500 feet in length. Use removable position terminal block connectors for wiring connection to display and motor drive board taking care to note the wire colors and corresponding numbers next to the connectors. Do **not** connect to the upper input terminals shown as light gray above.

5.3 Hayward Control Wiring (For remote control of pump speed)

Note: For software compatible Hayward controls only

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Figure 5.3-1
DRIVE LOW VOLTAGE CONNECTIONS



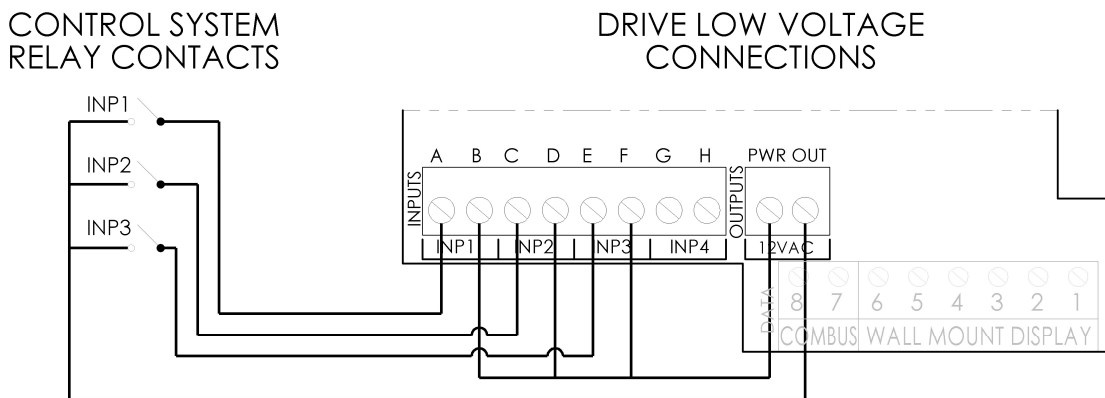
The LifeStar® MV Variable Speed Pump can communicate with and be controlled by Hayward system controls such as OmniLogic™, ProLogic®, E-Command® 4, and OnCommand®. Minimum software revision requirements: OmniLogic R1.0.0, ProLogic 3.00, OnCommand 1.00, E-Command 2.65, E-Command 4 2.80, AquaLogic 2.65, and AquaPlus 2.65. To determine Hayward control software revision, consult the appropriate Hayward system control installation manual or visit our website at www.haywardssystem.com. Connection wire must be rated for a minimum of 300V, and may be up to 500 feet in length. Use removable 2-position terminal block connector for wiring connection to motor drive board taking care to note the wire colors and corresponding numbers next to the connectors. Do **not** connect to the upper input terminals shown as light gray above.

Once installed, Remote Control Mode must be set to Standalone/Hayward in the pump Configuration Menu (see section 0), and for all controls other than OmniLogic, Comm Bus Address must be set according to instructions provided in the Hayward system control installation manual (see section 6.6.11). It is best to leave the max/min allowed speeds in the pump configuration menu set to their factory defaults to prevent conflict with these settings in the Hayward system control configuration menu. Preset Speeds 1-4 and Quick Clean are disabled when the pump is remotely controlled. Prime Duration is disabled only when the pump is communicating with a Hayward system control.

5.4 External Relay Speed Control Wiring (For remote selection of pump speed)

Note: For third party controls and Hayward controls that are NOT software compatible.

Figure 5.4-1



Connection wire must be rated for a minimum of 300V. See section 0.11 for more details. Do **not** connect to the lower “COMBUS” or wall mount “DISPLAY” data terminals.

The LifeStar® MV Variable Speed Pump can also be controlled from third party system controls using relay contacts to select the speeds set in the Timer Menu (see section 6.7). In addition to this section you may also consult the third party system control installation manual for electrical connection details. Once installed, Remote Control Mode must be set to Relay Control in the pump Configuration Menu (see section 0). Preset Speeds 1-4 and Quick Clean are disabled when the pump is

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remotely controlled. When Inputs 1-3 are activated via the system control relays, timer speeds 1-8 are selected according to the following table:

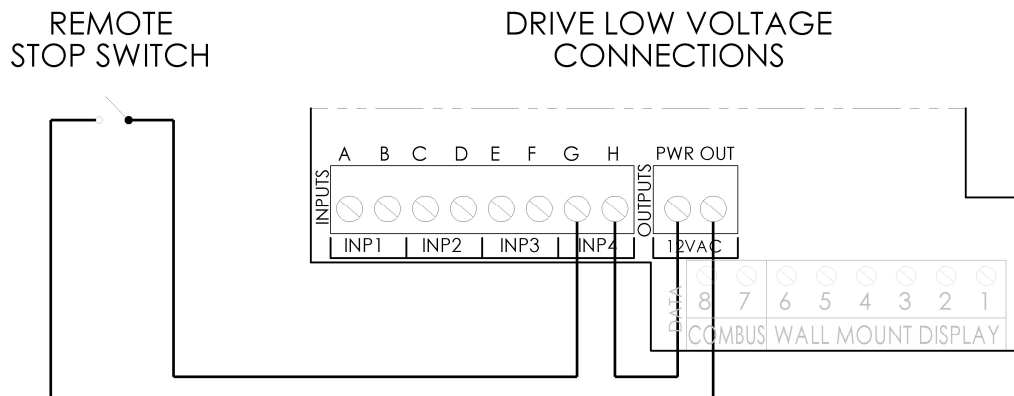
Timer Speed	INP1 Status	INP2 Status	INP3 Status
1	OFF	OFF	OFF
2	ON	OFF	OFF
3	OFF	ON	OFF
4	ON	ON	OFF
5	OFF	OFF	ON
6	ON	OFF	ON
7	OFF	ON	ON
8	ON	ON	ON

The number of speeds available depends on the number of auxiliary relays used as noted below:

1. Filter pump relay plus 1 auxiliary relays allows control of 2 speeds
2. Filter pump relay plus 2 auxiliary relays allows control of 4 speeds
3. Filter pump relay plus 3 auxiliary relays allows control of 8 speeds

5.5 Remote Stop Switch Wiring (Optional)

Figure 5.5-1



Connection wire must be rated for a minimum of 300V. Switch must be latching type; pump is stopped when circuit is closed.

6. Startup & Operation

6.1 Prior to Start-Up

If it is necessary to perform a water pressure test prior to initial use to ensure plumbing system is functioning properly, then the following criteria should be maintained for this test:

1. Have a professional perform this test.

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2. Ensure all Hayward pump and system components are removed from system prior to performing test.

⚠ WARNING – If circulation equipment must remain in the plumbing system during water pressure test, do not apply more than 10 psi pressure to the system. Be sure water pressure has been released, using the filter manual air relief valve, before removing pump strainer cover.

⚠ WARNING – All suction and discharge valves **MUST** be OPEN, as well as filter air relief valve (if available) on filter, when starting the circulating pump system. Failure to do so could result in severe personal injury.

6.2 Starting/Priming the Pump

Refer to item #9 in section 6.6 for priming mode selection.

Fill strainer housing with water to suction pipe level. If water leakage occurs from anywhere on the pump or filter, **DO NOT** start the pump. If no leakage occurs, stand at least 10 feet from pump and/or filter and proceed with starting the pump.

⚠ WARNING – Return to filter to close filter manual air relief valve when a steady stream of water (not air or air and water) is discharged from valve. Failure to do so could result in severe personal injury.

⚠ ATTENTION – **NEVER OPERATE THE PUMP WITHOUT WATER.** Water acts as a coolant and lubricant for the mechanical shaft seal. **NEVER** run pump dry. Running pump dry may damage seals, causing leakage, flooding, and voids warranty. Fill strainer housing with water before starting motor.

⚠ ATTENTION – Do **NOT** add chemicals to system directly in front of pump suction. Adding undiluted chemicals may damage pump and voids warranty.

⚠ ATTENTION – Before removing strainer cover:

1. **STOP PUMP** before proceeding.
2. **CLOSE VALVES** in suction and outlet pipes.
3. **RELEASE ALL PRESSURE** from pump and piping system using filter manual air relief valve. See filter owner's manual for more details.
4. If water source is higher than the pump, pump will prime itself when suction and outlet valves are opened. If water source is lower than the pump, unscrew and remove strainer cover; fill strainer housing with water.
5. Clean and lubricate strainer cover O-ring with "Jack's 327" if necessary.
6. Replace strainer cover on strainer housing; turn clockwise to tighten cover.

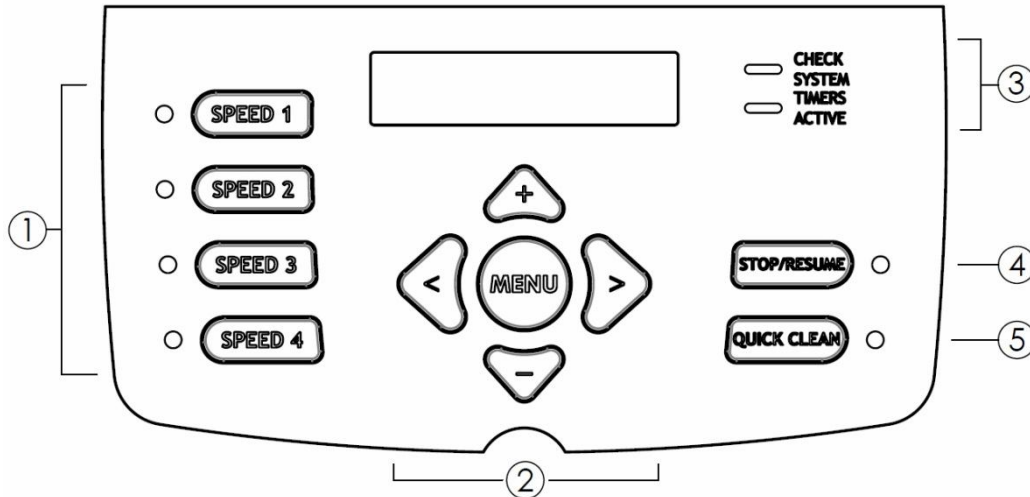
Note: Tighten strainer cover lock ring by hand only (no wrenches).

Turn on power and wait for pump to prime, which can take up to fifteen (15) minutes. Priming time will depend on vertical length of suction lift and horizontal length of suction pipe. If pump does **NOT** prime within 15 minutes, stop motor and determine cause. Be sure all suction and discharge valves are open when pump is running. See Troubleshooting Guide.

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6.3 User Interface Summary

Figure 6.3-1



- Preset Speeds:** Buttons labeled SPEED 1 thru SPEED 4 can be used to run the pump at a predetermined speed for a certain length of time. Preset Speed settings can be quickly updated using the + and - arrow buttons to change the speed and then pressing the > button to save the new speed setting. When a speed is selected, the LED beside the button will illuminate to indicate operation.
 - Default Speeds:**
 - Speed 1: 1000 rpm
 - Speed 2: 1750 rpm
 - Speed 3: 2500 rpm
 - Speed 4: 3250 rpm
- Menu/navigation buttons:** The MENU button will scroll through the setup menus when pressed. The < and > arrow buttons are used to move between displays and to select parameters to edit, and the + and - arrow buttons are used to change parameters.
- Status LEDs:** The CHECK SYSTEM LED will illuminate when the pump is experiencing an error condition. The TIMERS ACTIVE LED will illuminate once timers have been programmed to run the pump, even if the pump is not presently running.
- Stop/Resume:** This button is used to stop the pump to allow strainer basket cleaning, etc. When this button is pressed, the pump will remain stopped until the button is pressed a second time to resume normal operation. When the pump is stopped, the red LED beside the button will illuminate to indicate that the pump has been stopped.
- Quick Clean:** QUICK CLEAN is a mode intended for use when the system will be cleaned with a suction side vacuum. Users will be prompted to check and verify that all bathers are out of the system during this time. The LED beside the button will illuminate when Quick Clean is active.

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6.4 Menu Outline

1. **Configuration Menu** (see section 0 for basic product configuration)
 - a. Set Day and Time
 - b. Speed Selection
 - c. MAX Allowed Speed
 - d. MIN Allowed Speed
 - e. Prime Duration
 - f. Remote Control Mode
 - g. Set Comm Bus Address
 - h. Low Temp Operation
 - i. Password Protection
 - j. Low Temp Speed
 - k. Drive Temp Setting
2. **Timer Menu** (see section 0 to program the 8 speeds with timer functions)
 - a. Rename Timer “X” (where “X” equals 1 through 8)
 - b. Pump Speed for Timer “X” (where “X” equals 1 through 8)
 - c. Start/Stop Time for Timer “X” (where “X” equals 1 through 8)
 - d. Choose Days for Timer “X” (where “X” equals 1 through 8)
3. **Preset Speed Setup Menu** (see section 0 to program the 4 preset speeds)
 - a. Speed “X” Name (where “X” equals 1 through 4)
 - b. Speed “X” Duration (where “X” equals 1 through 4)
 - c. Speed “X” Speed (where “X” equals 1 through 4)
4. **Diagnostics Menu** (see section 0 to view product diagnostic information)
 - a. Drive Serial Number
 - b. Motor Display/Drive Firmware Revisions
 - c. Input Voltage Status
 - d. Motor Current
 - e. Power Usage
 - f. Drive/Heatsink Temperatures
 - g. Comm Bus Status
 - h. Event Log (if applicable)

6.5 Initial startup

After plumbing and wiring are complete, the variable speed drive must be configured prior to use. When power is applied to the drive for the first time, the following informational screens are displayed.

	<u>Screen</u>	<u>Comments</u>
1.	Hayward EcoStar Pump SP3400VSP	Pump SKU will be shown at the bottom of the screen.
2.	Thursday 1:27p 1725rpm 380 Watts	
3.	Timer 1 timer will end at 11:45p	

Note: Speeds can be selected at this time to temporarily run the pump, however, it is recommended that the drive configuration and timers be set according to individual installation site requirements (see section 6.7 for more details). At this point, pressing the MENU button will select the Configuration Menu.

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6.6 Configuration Menu

	<u>Screen</u>	<u>Buttons Used</u>	<u>Comments</u>
1.	Configuration Menu Locked	< >	Press & hold < and > buttons for several seconds to unlock Configuration Menu
2.	Configuration Menu press > to enter	< >	Use > to enter Configuration Menu
3.	Use + / - to adjust, > go to next item		
4.	Time: Th 1:27PM + change or > skip	+ - < >	Use + to change clock setting Use > if clock is correct
5.	Set Day and Time Thursday 1:27p	+ - < >	Adjust day/time setting Move to next selection, then to next menu item
6.	Speed Selection rpm	+ - < >	Select whether to display speed in rpm (Revolutions per Minute) or % of full speed Move to next menu item
7.	MAX allowed speed 3250 (600-3450rpm)	+ - < >	Set maximum running speed of pump Move to next menu item
8.	MIN allowed speed 600 (600-3450rpm)	+ - < >	Set minimum running speed of pump Move to next menu item
9.	Prime Duration 8:00 minutes	+ - < >	Select pump prime duration Move to next menu item
<p>Note: User may set the pump to prime at the maximum allowed speed for 0-15 minutes in 30 second increments.</p>			
10.	Remote Control Mode Standalone/Hayward	+ - < >	Select Standalone/Hayward or Relay Control Move to next menu item
<p>Note: See sections 5.3 and 5.4 for more detail.</p>			
11.	Set Comm Bus Address System Filter	+ - < >	Select Comm Bus Address for pump Move to next menu item

Note: The pump can be controlled by a Hayward control through the Comm Bus, or by a third party control using relay contacts to select speeds set in the Timer Menu. When communicating with Hayward controls other than OmniLogic, a bus address must be chosen for the pump. When communicating with OmniLogic, the Comm Bus Address screen is not shown and the HUA (Hayward Unique Address) is used. If Relay Control is selected, the timer speed settings are invoked when inputs 1-3 (INP1-INP3) are selected according to the table in section 5.4.

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- | | | | |
|-----|---|------------|--|
| 12. | Low Temp Operation
Disabled | + -
< > | Enable or Disable Low Temp Operation
Move to next menu item |
| 13. | Password Protection
Disabled | + -
< > | Use to enable or disable password protection
Move to next menu item |

Note: See section 6.13 for details on Password Protection configuration.

- | | | | |
|-----|--|------------|--|
| 14. | Low Temp Speed
1000 (600-3450rpm) | + -
< > | Set pump speed for Low Temp Operation
Move to next menu item |
| 15. | Drive Temp Setting
5°C (41.0°F) | + -
< > | Set temperature to activate Low Temp Operation
Move to next menu item |

Note: When the pump is stopped and the internal motor drive temperature reaches the operation temperature set point, then the pump will prime and then run according to the set speed until the internal drive temperature becomes 10° F higher than the temperature set point. The internal drive temperature does *not* correlate to the ambient outside temperature. Low temperature operation is *not* active when the pump is being remotely controlled. **Low temperature operation is NOT intended to protect the pump, system plumbing, or system from freezing.** If Low Temp Operation is disabled, the speed and temperature setting screens are not shown.

- | | | | |
|-----|---|------------|---|
| 16. | Reset all parameters
+ for yes; > to skip | + -
< > | Use + to reset to factory default settings
Use > to skip reset |
| 17. | Are you sure?
+ for yes; - for no | + -
< > | Confirm reset of all parameters
Move to next menu item |
| 18. | Use Timers Menu to
set timeclocks. | | |

6.7 Timer Menu

	<u>Screen</u>	<u>Buttons Used</u>	<u>Comments</u>
1.	Timer Menu Press > to enter	< >	Use > to enter Timer Menu
2.	Timer 1 1725rpm 12:00a to 11:45p		
3.	Press + to change; Press > next timer	+ - < >	Use + to change displayed timer Use > to skip to next timer
4.	T1: Timer 1 +/- rename; speed >	+ - < >	Use + to rename timer Use > to set motor speed for timer

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- | | | | |
|----|---|------------|---|
| 5. | Timer 1 1725rpm
+/- adjust; times > | + -
< > | Use to set speed for timer
Use > to set start/stop time |
| 6. | Timer 1 1725rpm
8:00a to 6:00p | + -
< > | Use to set start/stop time for timer
Use > to choose days of operation for timer |
| 7. | Choose Days
7D 7 days a week > | + -
< > | Use to choose days of operation for timer
Move to next menu item |

Note: When start/stop times are set to be the same, the timer is deactivated. Each timer can be set to run on specific days of the week. Options are to run 7 days per week, 5 days per week (Monday thru Friday), or on a single day (Monday thru Sunday). Each timer is set up in this same manner. When the pump is powered and the timers are set up, the Timers Active LED will illuminate. If the timers are set up such that their run times overlap, the timers will run in priority from Timer 1 to Timer 8. In other words, if Timer 1 is set to run from 8:00 am to 12:00 pm, and Timer 2 is set to run from 10:00 am to 2:00 pm, the pump will run Timer 1 from 8:00 am to 12:00 pm, and will then switch to run Timer 2 until 2:00 pm. Default setting for Timer 1 is to start at 12:00 am, and end at 11:45 pm. When Remote Control Mode is set to Relay Control, the speed for Timer 1 may be set to 0 rpm to allow the pump to be stopped without having to remove power.

6.8 Preset Speed Setup Menu

- | | <u>Screen</u> | <u>Buttons
Used</u> | <u>Comments</u> |
|----|---|-------------------------|--|
| 1. | Speeds Menu
Press > to enter | < > | Use > to enter Speeds Menu |
| 2. | Speed 1 Name
Speed 1 | + -
< > | Use to rename displayed speed
Move to next menu item |
| 3. | Speed 1 Duration
0:30 hours | + -
< > | Use to set duration of speed
Move to next menu item |
| 4. | Speed 1 Speed
1725 (600-3450rpm) | + -
< > | Use to set motor speed for displayed speed
Move to next menu item |

Note: Each time a preset speed is selected, it will run for the programmed duration. Multiple presses of the speed button will add more time according to the set duration up to a maximum of 12 hours.

Note: Preset Speed settings can also be quickly updated without entering the Speeds Menu using the + and - arrow buttons to change the speed and then pressing the > button to save the new speed setting.

6.9 Diagnostic Menu

- | | <u>Screen</u> | <u>Buttons
Used</u> | <u>Comments</u> |
|----|--|-------------------------|---|
| 1. | Diagnostic Menu
Press > to enter | < > | Use > to enter Diagnostic Menu
and toggle between displays |

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2.	Serial Number 03100002	Displays motor drive serial number.
3.	Disp Rev: R3.1.0C Drive Rev: 1.20	Displays display board and drive board firmware revisions.
4.	Product Version SP3400VSP	Displays pump SKU.
5.	Input Voltage Within Range	Real-time display of line voltage status connected to drive (within range, too high, or too low).
6.	Motor Current 1.1A (0-13.0A)	Real-time display of motor input current.
7.	Power Usage 225W (0-2650W)	Real-time display of pump power usage.
8.	Drive: 38°C Heatsink: 32°C	Display showing temperature of motor drive module and heatsink.
9.	Comm Bus: Online HUA: 10-00-00-00-55	Display showing Comm Bus communication status between the motor drive and Hayward control, and pump address for communication.
10.	Event log Press + to view	+ - Use + to view event log

Note: For troubleshooting purposes, the Event Log will record the last twenty error/trip conditions and/or status messages, as well as the amount of time that has elapsed since the condition occurred. See section 11.2 for more detail.

6.10 Stop/Resume

Screen

1.

Pump is stopped;
press STOP/RESUME
2.

again to resume
normal operation.

Note: When Stop/Resume is pressed at any time during normal operation, the above message will be displayed. The pump will stop within several seconds, and will remain stopped until Stop/Resume is pressed a second time, at which point the pump will resume normal operation.

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6.11 Quick Clean

Screen

1.

Quick Clean
Quick Clean running
2.

Quick Clean
3450 rpm for 60 min;
3.

Quick Clean
press resume to end.

Note: The above message will be displayed while Quick Clean is running. Quick Clean mode runs at the MAX allowed speed and expires after 60 min, and it may be cancelled early by pressing the Stop/Resume button, at which time the pump would return to normal operation.

6.12 Remote Stop

Screen

1.

Remote Stop
is engaged

Note: The above message will be displayed when an installed remote stop switch is activated. The pump will remain stopped until the remote stop switch is deactivated.

6.13 Password Protection

In order to set password protection, access the configuration menu as explained in section 6.6. Use > to advance to the Password Protection screen and follow the procedure below.

	<u>Screen</u>	<u>Buttons</u>	<u>Comments</u>
1.	Password Protection Disabled	+ - < >	Use to enable or disable password protection Move to next menu item
2.	Password Timeout 0:15	+ - < >	Use to set password timeout Move to next menu item

Note: This sets the amount of time from the last button activation after the system has been unlocked to the point where the system becomes locked again.

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- | | | | |
|----|--|------------|--|
| 3. | System Password
+ change or > skip | + -
< > | Use change system password if desired
Move to next menu item |
| 4. | Set Password
0 ____ | + -
< > | Use to set selected password character
Move to next password character/next menu item |
| 5. | Confirm Password
0 ____ | + -
< > | Use to set selected password character
Move to next password character/next menu item |

Note: If the new password is not confirmed correctly, then the user will be prompted again to confirm the password. If a mistake is made when entering the password, pressing Stop/Resume will cancel the action.

After a password has been set, follow the procedure below to unlock the system from the Home screen.

<u>Screen</u>	<u>Buttons Used</u>	<u>Comments</u>	
6.	System Locked Password: 0 ____	+ - < >	Use to set selected password character Move to next password character

Note: When password protection is enabled and the timeout has elapsed, the user will be prompted to enter the password to unlock the display when any of the display buttons (other than Stop/Resume) are selected. The user may use Stop/Resume to stop the pump and resume normal operation without having to enter the password. The factory default password is 1234. If the password has been changed, it may be reset to factory default by pressing and holding the Speed 1 and Speed 4 buttons at the same time while powering on the drive, or by resetting all parameters in the Configuration Menu. If a mistake is made when entering the password, pressing Stop/Resume will cancel the action. If the pump is being controlled by a Hayward or third party system control, the pump display can be locked by the password, however, the pump will respond to any and all commands being sent from the system control.

7. Maintenance

- Clean strainer basket regularly. Do NOT strike basket to clean. Inspect strainer cover gasket regularly and replace as necessary.
- Hayward pumps have self-lubricating motor bearings and shaft seals. No lubrication is necessary.
- Keep motor clean. Insure motor air vents are free from obstruction to avoid damage. Do NOT use water to hose off motor.
- Occasionally, shaft seals must be replaced, due to wear or damage. Replace with genuine Hayward seal assembly kit. See “Shaft Seal Change Instructions” in this manual.

8. Storage / Winterization



⚠ WARNING – Separation Hazard. Do not purge the system with compressed air. Purging the system with compressed air can cause components to explode, with risk of severe injury or death to anyone nearby. Use only a low pressure (below 5 PSI), high volume blower when air purging the pump, filter, or piping.

⚠ ATTENTION – Allowing the pump to freeze with water in it will void the warranty.

⚠ ATTENTION – Use ONLY propylene glycol as antifreeze in your system. Propylene glycol is non-toxic and will not damage plastic system components; other anti-freezes are highly toxic and may damage plastic components in the system.

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Drain all water from pump and piping when expecting freezing temperatures or when storing pump for a long time (see instructions below). Gravity drain system as far as possible.

Keep motor dry and covered during storage. To avoid condensation/corrosion problems, do NOT cover or wrap pump with plastic film or bags.

8.1 Storing Pump For Winterization



⚠ WARNING – To avoid dangerous or fatal electrical shock hazard, turn OFF power to motor before draining pump. Failure to disconnect power may result in serious personal injury or death.

1. Drain water level below all inlets to the system.
2. Remove drain plugs and strainer cover from strainer housing. (See “10.1 Parts Diagram” in section 0 of this manual for pump component locations.)
3. Disconnect pump from mounting pad, wiring (after power has been turned OFF), and piping.
4. Once the pump is fully drained of water, re-install the strainer cover and drain plugs. Store pump in a dry area.

9. Shaft Seal Change Instructions

IMPORTANT SAFETY INSTRUCTIONS PLEASE READ AND FOLLOW ALL INSTRUCTIONS

When servicing electrical equipment, basic safety precautions should always be observed including the following. Failure to follow instructions may result in injury.

- **⚠ WARNING** – To reduce risk of injury, do not permit children to use this product.
- Disconnect all electrical power service to pump before beginning shaft seal replacement.
- Only qualified personnel should attempt rotary seal replacement. Contact your local authorized Hayward Dealer or service center if you have any questions.
- Refer to Figure 9.6-1 for motor drive removal and mounting.
- Refer to Figure 10.1-1 for pump component locations.

Exercise extreme care in handling both the rotating and the stationary sections of the two-part replacement seal. Foreign matter or improper handling will easily scratch the graphite and ceramic sealing surfaces.

9.1 Removing the Motor Assembly

1. Remove the six (6) 5/16" x 2" hex head bolts (item #20) which hold the motor assembly to the pump housing (item #9), using a 1/2" wrench or socket.
2. Slide the motor assembly out of the pump housing (item #9), exposing diffuser (item #12). Remove the four (4) diffuser screws (item #11) and pull the diffuser off of the seal plate (item #18) to expose the impeller (item #15).

9.2 Removing the Impeller

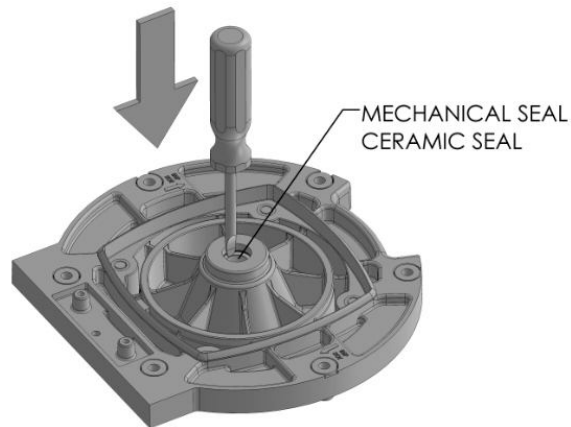
3. To prevent motor shaft from turning, insert a 5/16" allen wrench into the end of the motor shaft through the center hole in the motor end cover/canopy.
4. Rotate the impeller (item #15) counterclockwise and remove. The spring portion of the seal assembly (item #16) is now exposed. Note carefully the position of the spring seal, and remove it. NOTE - Replace motor cover to protect delicate motor parts.

9.3 Removing the Ceramic Seat

5. Remove the seal plate (item #18) from the motor by removing the four (4) 3/8" x 1" hex head bolts (item #21) that secure it to the motor, using a 1/2" wrench or socket.
6. Press the ceramic seat with rubber cup out of the seal plate. If tight, use a small screwdriver to tap seal out. See Figure below.

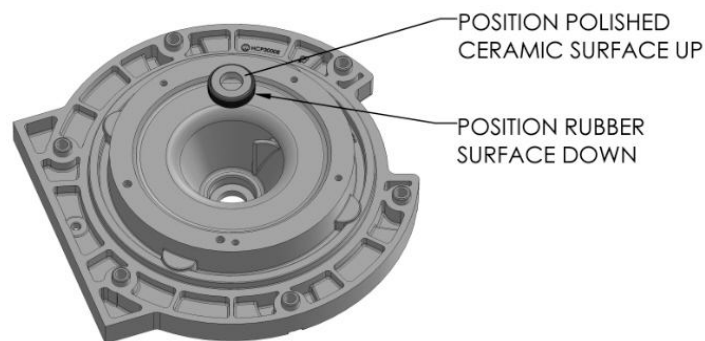
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STOP - Clean all recesses & parts to be reassembled. Inspect gaskets & replace if necessary.



9.4 Seal Installation

7. Clean and lightly lubricate the motor shaft and seal recess in the seal plate (item #18) with a dilute solution of non-granulated liquid-type soap. Gently wipe the polished surface of the ceramic seal with a clean, soft, cotton cloth. Lubricate the rubber cup on the ceramic seat and press it firmly and evenly into the recess of the seal plate (item #18) with the polished side of the ceramic facing out.
8. Assemble the motor to the seal plate (item #18) with the four (4) 3/8" x 1" hex head bolts (item #21). Torque bolts to 95-105 in-lbs.
9. Gently wipe the black, polished surface of the spring seal assembly with a clean, soft, cotton cloth.
10. Press the spring seal assembly (item #16) onto the motor shaft – black polished surface facing toward the polished surface of the ceramic seat. See Figure below.



9.5 Replacing the Impeller and Diffuser

11. Screw the impeller (item #15) onto the motor shaft in a clockwise direction. Tighten snugly by holding motor shaft with wrench as noted in step #4.
12. Place the diffuser (item #12) over the impeller (item #15) onto the seal plate (item #18), aligning the two (2) protruding pins with the matching holes in the seal plate (item #18). Replace four (4) diffuser screws (item #11), Torque screws to 16-27 in-lbs range.

9.6 Replacing the Motor Assembly

13. Re-attach motor end cover/canopy by using the two (2) hex shaped screws. Slide the motor assembly with the diffuser (item #12) in place, into pump housing (item #9), being careful not to disturb the diffuser o-ring (item #10).
14. Re-attach assembly to pump housing (item #9) using the six (6) 5/16" x 2" hex head bolts. (Be sure housing o-ring (item #17) is in place, and lubricated. Replace if damaged). Tighten alternately and evenly to 185-195 in-lbs range using torque pattern in the following diagram.

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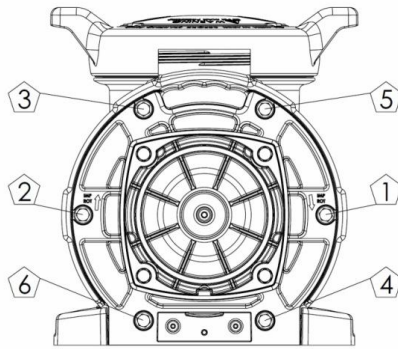
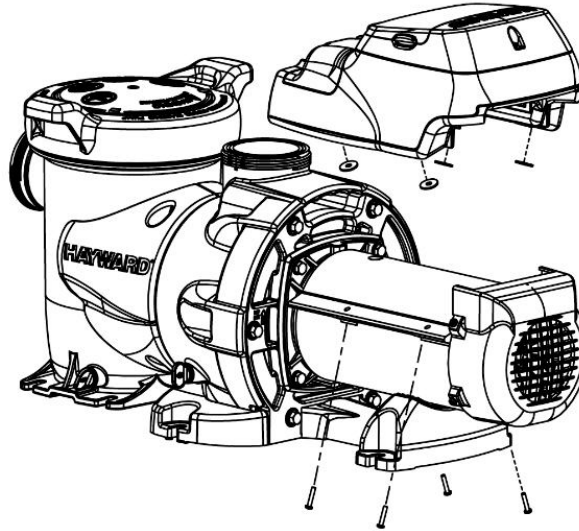


Figure 9.6-1: Removing the Variable Speed Drive



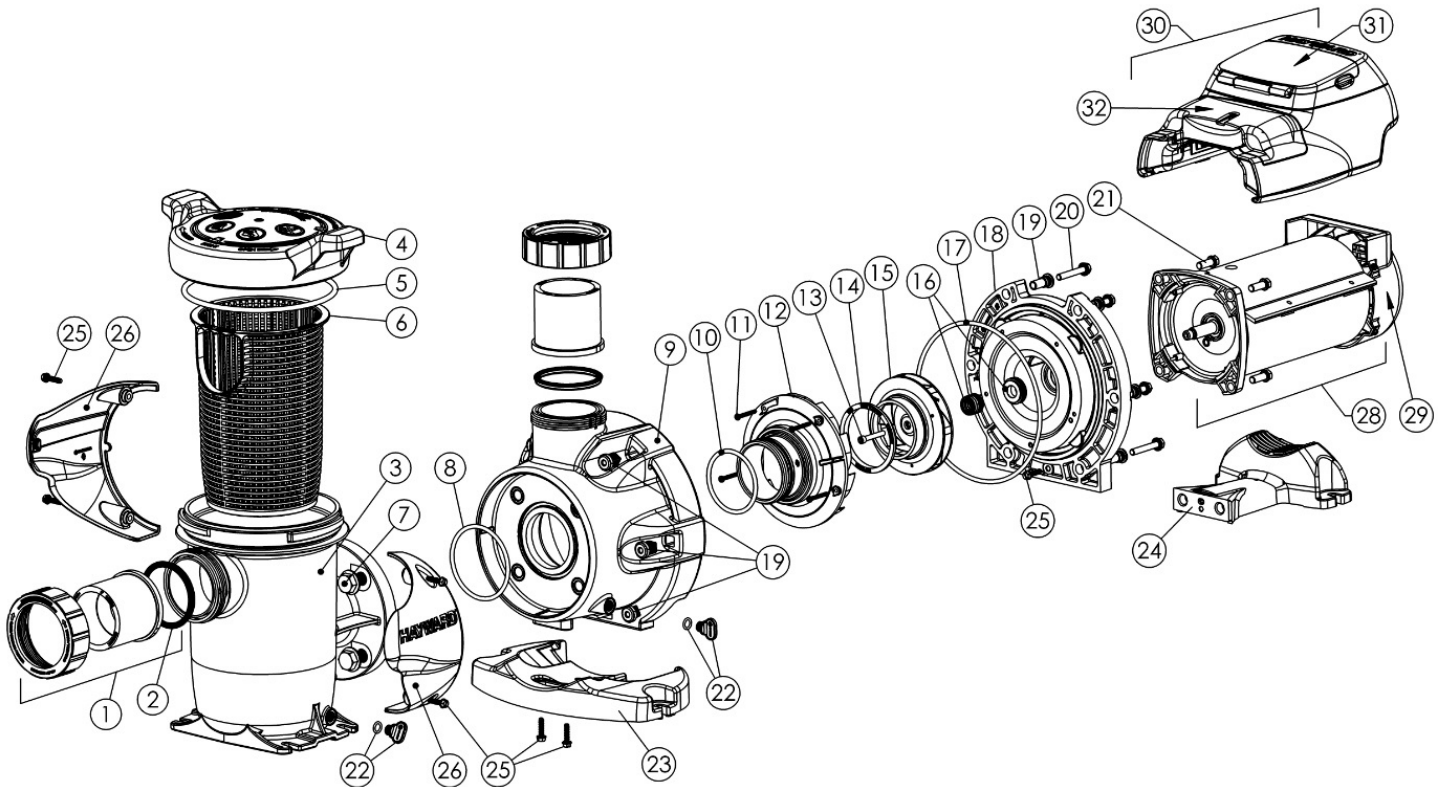
Note: Motor leads must be disconnected prior to removing drive, and reconnected when new drive is mounted. Take care to ensure that the motor leads are not pinched between the drive enclosure and the motor during assembly. The drive mounting screws must be tightened to 30 inch-pounds.

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10. Replacement Parts

10.1 Parts Diagram

Figure 10.1-1



10.2 Parts Listing

Ref. No.	Part No.	Description	No. Req'd
1	HCXP3000UNKIT	Union Connector Kit (Includes Union Nut, Union Connector, Union Gasket – 2 each)	1
2	HCXP3000UG	Union Gasket	1
3	HCXP3000H	Strainer Housing with Drain Plug	1
4	HCXP3000DLS	Strainer Cover Kit (Includes Strainer Cover, Lock Ring, O-Ring)	1
5	SPX4000S	Strainer Cover O-Ring	1
6	HCXP3000M	Strainer Basket	1
7	HCXP3000Z3	Strainer Housing Flange Bolt/Washer	4
8	HCXP343V70	Strainer Housing Flange O-Ring	1
9	HCXP3000A	Pump Housing with Drain Plug	1
10	HCXP338V60	Diffuser O-Ring	1
11	SPX2700Z3FCPAK4	Diffuser Screws (4 Pack)	1
12	HCXP3000B	Diffuser	1
13	SPX3200Z1FC	Impeller Screw	1
14	HCXP3000R	Impeller Ring	1
15	HCXP3020C	2 HP Impeller with Impeller Screw	1
16	1AX3SESSA	Shaft Seal Assembly	1
17	HCXP369V70	Pump Housing O-Ring	1
18	HCXP3000E	Seal Plate	1
19	SPX3200Z211FC	Housing Insert/Seal Plate Spacer	6
20	SPX3200Z3	Housing Bolt	6
21	SPX3200Z34PAK4	Motor Bolt (4 Pack)	1

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Ref. No.	Part No.	Description	No. Req'd
22	SPX4000FG	Drain Plug with O-Ring	1
23	HCXP3000F	Pump Housing Base	1
24	HCXP3001G	Motor Support Base	1
25	SPX1600Z5SSPAK7	Base Screws (7 Pack)	1
26	HCXP3000N251	Right and Left Side Plate Set, Blue Color	1
28	SPX3400Z1ECM	Motor Assembly	1
29	SPX3400FAN	Motor Fan Shroud	1
30	HCXP3400DR	Motor Drive	1
31	SPX3400DR4	Motor Drive Display Cover	1
32	SPX3400DR2	Motor Drive Wiring Cover	1
-	HCXP3400LCD	Digital Control Interface Assembly	1
-	SPX3400DRKIT	Wall Mount Kit	1

11. Troubleshooting

11.1 General Problems

- **Motor Will NOT Start:**
 1. Make sure the terminal board connections agree with the wiring diagram on the pump data plate label.
 2. Be sure the pump is wired for the available field supply voltage (230VAC).
 3. Check for and correct any improper or loose wiring connections; open switches or relays; tripped circuit breakers, or blown fuses.
 4. Manually check the rotation of the motor shaft for free movement and lack of obstruction. Correct if necessary.
- **Motor Shuts OFF:**
 1. Check for low voltage or power drop at the motor (frequently caused by undersized wiring). Contact a qualified professional to verify the electrical connections.
- **Motor Hums, But Does NOT Start:**
 1. Impeller jammed with debris. Have a qualified repair professional open the pump and remove the debris.
- **Pump Won't Prime:**
 1. Empty pump/strainer housing. Make sure the pump/strainer housing is filled with water and the cover o-ring is clean. Ensure the o-ring is properly seated in the cover o-ring groove. Ensure the o-ring sealing surface is lubricated with "Jack's 327" and that the strainer cover is locked firmly in position. Lubricant will help to create a tighter seal.
 2. Loose connections on the suction side. Tighten the pipe/union connections.
Note: Any self-priming pump will not prime if there are suction air leaks. Leaks will result in bubbles emanating from the return fittings on the system wall.
 3. Leaking O-ring or packing glands on valves. Tighten, repair, or replace the valves.
 4. Strainer basket or skimmer basket loaded with debris. Remove the strainer housing cover or the skimmer cover. Clean the basket, and refill the strainer housing with water. Tighten the cover.

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5. Suction side clogged. Contact a qualified repair professional. You should have 5” - 6” of vacuum at the strainer cover (your system dealer can confirm this with a vacuum gauge). You may be able to check by removing the skimmer basket and holding an object over the bottom port with the skimmer full and the pump running. If no suction is felt, check for line blockage.
 - a. If the pump develops a vacuum, check for a blocked suction line or a dirty strainer basket. An air leak in the suction piping may be the cause.
 - b. If the pump does not develop a vacuum and the pump has sufficient “priming water”:
 - i. Re-check the strainer housing cover and all threaded connections for suction leaks. Check if all system hose clamps are tight.
 - ii. Check voltage to ensure that the motor is rotating at full rpm’s.
 - iii. Open the housing cover and check for clogging or obstruction in suction. Check the impeller for debris.
 - iv. Remove and replace the shaft seal only if it is leaking.

- **Low Flow – Generally:**

1. Clogged or restricted strainer or suction line. Contact a qualified repair professional.
2. Undersized system piping. Correct the piping size.
3. Plugged or restricted discharge line of filter, valve partially closed (high gauge reading). Sand filters – backwash as per manufacturer’s instructions; D.E. filters – backwash as per manufacturer’s instructions; Cartridge filters – clean or replace the cartridge.
4. Air leak in suction (bubbles issuing from return fittings). Re-tighten the suction and discharge connections using Teflon tape. Inspect other plumbing connections, and tighten as required.
5. Plugged, restricted, or damaged impeller. Replace the impeller including a new seal assembly.

- **Noisy Pump:**

1. Air leak in suction piping, cavitations caused by restricted or undersized suction line or leak at any joint, low water level in system, and unrestricted discharge return lines. Correct the suction condition or throttle return lines, if practical. Holding your hand over the return fitting will sometimes prove this, or by putting in a smaller eyeball fitting.
2. Vibration due to improper mounting, etc. Mount the pump on a level surface and secure the pump to the equipment pad.
3. Foreign matter in the pump housing. Loose stones/debris hitting the impeller could be the cause. Clean the pump housing.
4. Motor bearings noisy from normal wear, rust, overheating, or concentration of chemicals causing seal damage, which will allow chlorinated water to seep into bearings wiping out the grease causing bearing to whine. All seal leaks should be replaced at once.

- **Interference With Automation/Power Line Communication Equipment:**

1. Make sure the terminal board connections agree with the wiring diagram on the pump data plate label.
2. Check for and correct any improper or loose wiring connections.
3. Install noise filter (from automation/power line communication equipment vendor) to prevent equipment interference.

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11.2 Check System Messages

Code	Troubleshooting
Check System AC voltage too high	Indicates that the AC line voltage has risen above 270 VAC. Verify that line voltage is within 10% (207-253 VAC) of pump rated voltage at the terminal block.
Check System AC voltage too low	Indicates that the AC line voltage has dropped below 183 VAC. Verify that line voltage is within 10% (207-253 VAC) of pump rated voltage at the terminal block. Also, verify that power supply connections are properly made at the circuit breaker as well as at the terminal block.
Check System DC voltage too high	Indicates that the internal DC bus voltage has risen above 395 VDC. Verify that line voltage is within 10% (207-253 VAC) of pump rated voltage at the terminal block.
Check System DC voltage too low	Indicates that the internal DC bus voltage has dropped below 270 VDC. Verify that line voltage is within 10% (207-253 VAC) of pump rated voltage at the terminal block. Also, verify that power supply connections are properly made at the circuit breaker as well as at the terminal block.
Check System Drive is overheated	Indicates that the internal components of the drive have become overheated. Motor airflow path should be checked for obstructions and cleared if present. Check ambient temperature and verify against motor nameplate (50°C/122°F).
Check System Heatsink overheated	Indicates that the heatsink of the drive has become overheated. Motor airflow path should be checked for obstructions and cleared if present. Check ambient temperature and verify against motor nameplate (50°C/122°F).
Check System Drive overload	Indicates the motor current is too high. Check impeller, diffuser, shaft seal, and motor for issues. Motor connections to drive should be verified.
Check System Pump has stalled	Indicates that the drive has lost control over motor shaft rotation, or that the drive was not able to start the motor after 3 attempts. Motor connections to drive should be verified.
Check System Pump failed to start	Indicates that the drive was not able to start the motor. Check impeller, diffuser, shaft seal, and motor for issues. Motor connections to drive should be verified. Drive will attempt to start the motor 3 times before pump stall error is displayed.
Check System Defaults loaded	Indicates that the drive memory has been temporarily corrupted. Contact Hayward Technical Service for additional assistance.
Check System Memory failed	Indicates that the drive memory has been damaged, and that the drive may need to be replaced. Contact Hayward Technical Service for additional assistance.
Check System Communication failed	Indicates that there are communication problems between the user interface and drive. Connections between the user interface and the motor drive should be verified.
Check System Error code XX	Indicates that the user interface is receiving an error from the drive that it does not understand. Contact Hayward Technical Service for additional assistance.

Note: All errors can be manually reset by pressing Stop/Resume when the error message is shown, or by cycling power applied to pump after the error has occurred. If the troubleshooting steps listed above do not help to resolve the error condition, then the problem may be internal to the motor/drive. Contact Hayward Technical Service at (908) 355-7995 for additional assistance.

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