Hayward Variable Speed Pump

Technical Training Guide

TSG-HCPSSa

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HAYWARD

Safety Precautions

High Voltage Electrocution Hazard

Hazardous voltage can shock, burn, cause serious injury and or death. To reduce the risk of electrocution and or electric shock hazards:

- Only qualified technicians should remove the panel
- Replace damaged wiring immediately
- Insure panel is properly grounded and bonded

Hayward Variable Speed Pump

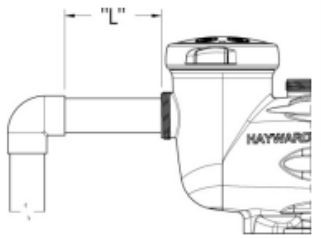
How To Guide

How to: Install Hayward Variable Speed Pump

- Install pump on a level concrete slab or other rigid base and secure pump to the base to reduce vibration noise.
- Allow pump inlet height to be as close to water level as possible.
- Install pump as close to pool as practical. Suction lines should be direct as possible to reduce friction loss.
- Allow space for valves in suction and discharge piping.
- 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.
- Allow adequate access for servicing pump. Keep motor clean. Pump motors require free circulation of air for cooling.
- It is recommended that a minimum length of straight piping (shown as "L" in below diagram), equivalent to 5 times the pipe diameter, be used between the pump suction inlet and any plumbing fittings (elbows, valves, etc.).

4.3. Pipe Sizing Chart

MAXIMUM RECOMMENDED SYSTEM FLOW RATE BY PIPE SIZE		
Pipe Size in. [mm]	**Maximum Flow Rate GPM [LPM]**	**Minimum Straight Pipe Length "L" in. [mm] ***
1 ½" [50]	45 [170]	7 ½" [190]
2" [63]	80 [300]	10" [254]
2 ½" [75]	110 [415]	12 ½" [317]
3" [90]	160 [600]	15" [381]



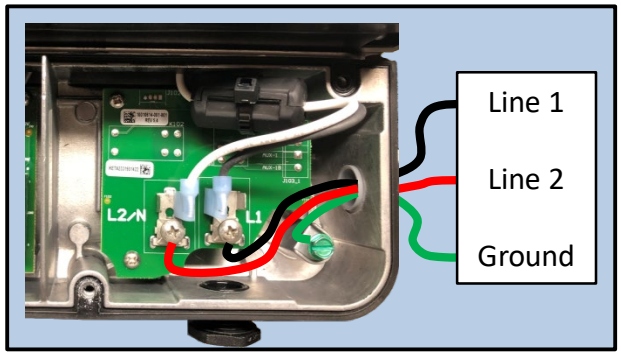
*When installing the 2.70 THP VS pump, ensure proper pipe and equipment sizing to handle the maximum flow required. It is recommended to set the maximum speed in order to not exceed the maximum flow rate.

HAYWARD

How to: Wire Hayward VS Motor

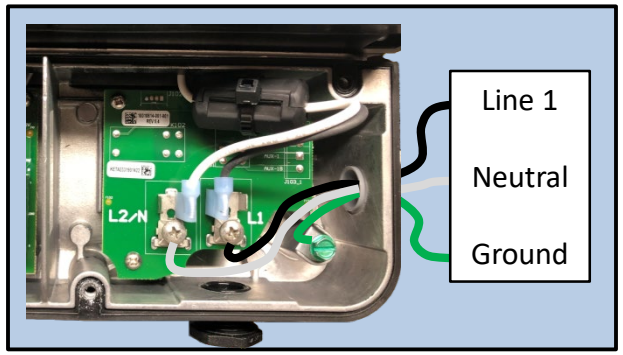
- For your convenience, conduit can be connected to the rear or the right side of the drive.
- The Generation 3 Hayward Variable Speed Pump utilizes a dual voltage drive assembly and can be wired for **either** 230vac or 115vac.
- Connect pump to a 15 amp branch circuit for 230VAC or a 20 amp branch circuit for 115VAC.
- There is **NO** conversion required on the pump when wiring for 115vac.
- Pump should be wired directly to the circuit breaker unless connected to a non Hayward Automation control system.
- Pump **MUST** be bonded using a #8 solid copper bond wire.

Wiring 230vac



For 230vac the drive must be supplied with two line lead conductors and one grounding conductor.

Wiring 115vac



For 115vac the drive must be supplied with one line lead conductor, one neutral conductor, and one grounding conductor.

HAYWARD

How to: Recommended for 230vac Applications

Siemens QF220
20 Amp 2 Pole 240vac GFCI

- ✓ *Plug in mounting style
- ✓ Class A - 20 amp GFCI protection
- ✓ UL listed at **5 milliamp** trip sensitivity
- ✓ 240vac two pole circuit breaker

Square D Homeline HOM220GFI
20 Amp 2 Pole 240vac GFCI

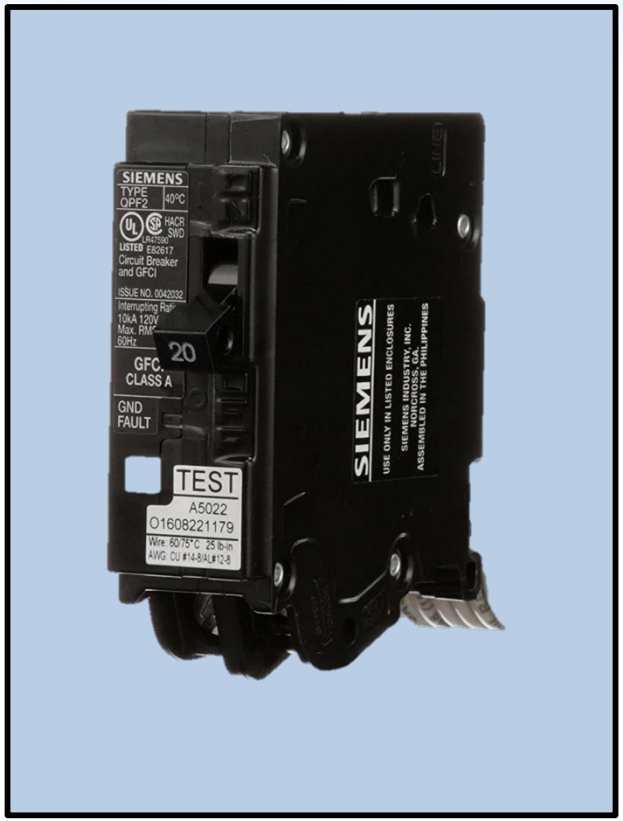
- ✓ *Plug in mounting style
- ✓ Class A - 20 amp GFCI protection
- ✓ UL listed at 6 **milliamp** trip sensitivity
- ✓ 240vac two pole circuit breaker

***The use of these circuit breakers can help reduce the occurrence of nuisance tripping of the GFCI**

HAYWARD

How to: Recommended for 120vac Applications

Siemens QF120
20 Amp 1 Pole 120vac GFCI



- ✓ *Plug in mounting style
- ✓ Class A - 20 amp GFCI protection
- ✓ UL listed at **5 milliamp** trip sensitivity
- ✓ 120vac single pole circuit breaker

Square D Homeline HOM120GFI
20 Amp 1 Pole 120vac GFCI

- ✓ *Plug in mounting style
- ✓ Class A - 20 amp GFCI protection
- ✓ UL listed at **6 milliamp** trip sensitivity
- ✓ 120vac single pole circuit breaker

***The use of these circuit breakers can help reduce the occurrence of nuisance tripping of the GFCI**

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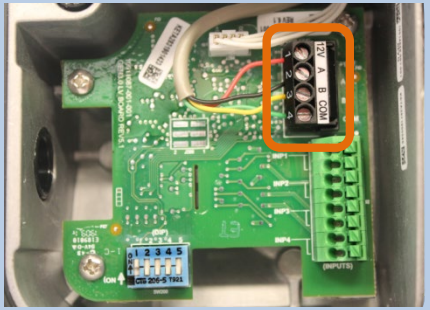
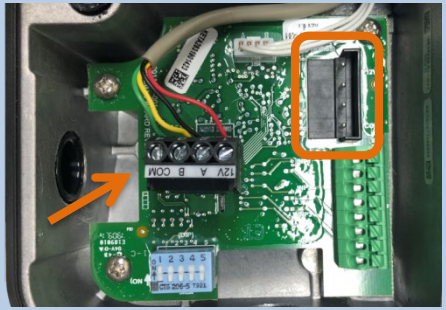
How to: Connect Control Wire to VS Pump

Step 1



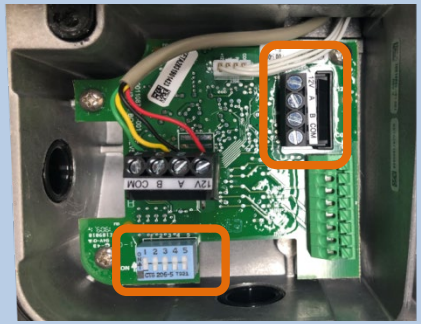
To connect to an automation control, disconnect power to the pump and locate the RS485 connector and display wires as shown.

Step 2



Remove the RS485 connector and display wires from the board and move it to the side as shown.

Step 3



Install the included additional RS485 connector as shown. *If necessary, adjust the dip switches at this time.

Step 4

Pump	Control
A	2
B	3
COM	4

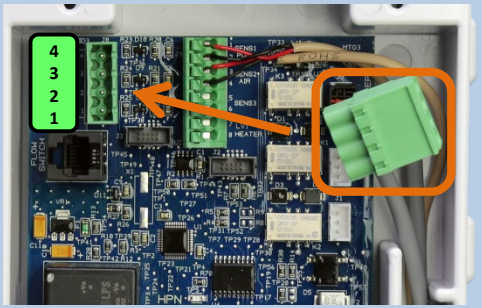
Connect the control wire to the additional RS485 connector. Take note of wire location for proper connection to the control system.

*Dip switch settings will NOT need to be adjusted when connecting to an OmniLogic, Omni Hub, or VS Omni system

HAYWARD

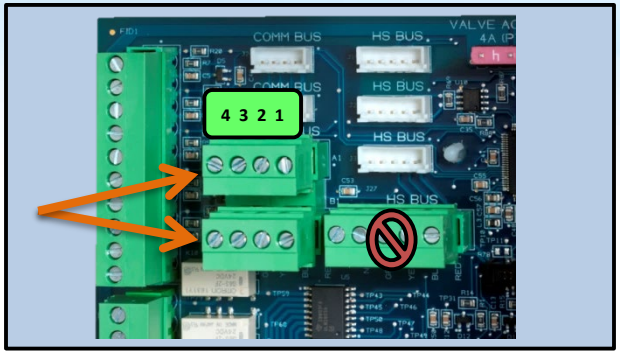
How to: Connect Control Wire to Automation

Omni Hub/ VS Omni



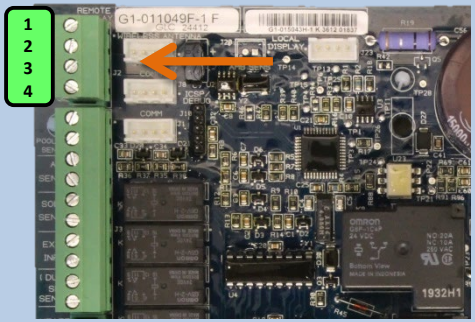
From the pump, connect A to 2, B to 3, and Com to 4. Pay attention to the orientation of the green RS485 Port on the board.

OmniLogic



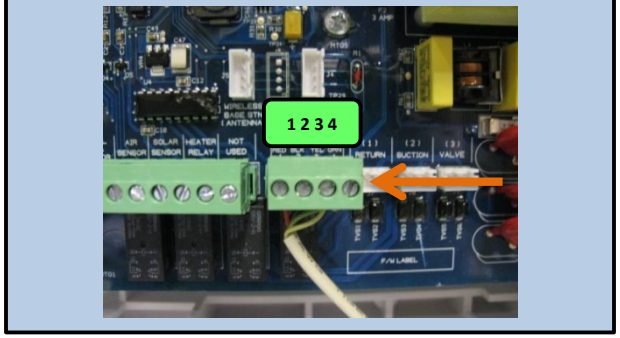
From the pump, connect A to 2, B to 3, and Com to 4. Use either/both 4 pin RS485 port on the board. Do **NOT** use the 5 pin RS485.

Pro-Logic/Aqua-Logic/E-Command



From the pump, connect A to 2, B to 3, and Com to 4. Adjust dip switches on pump per manual.

OnCommand



From the pump, connect A to 2, B to 3, and Com to 4. Adjust dip switches on pump per manual.

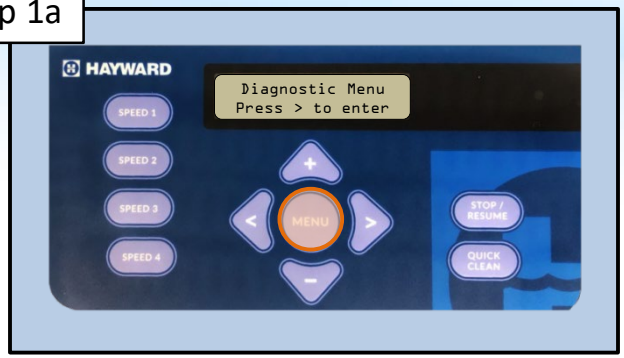
HAYWARD

How to: Locate Pump HUA

Step 1

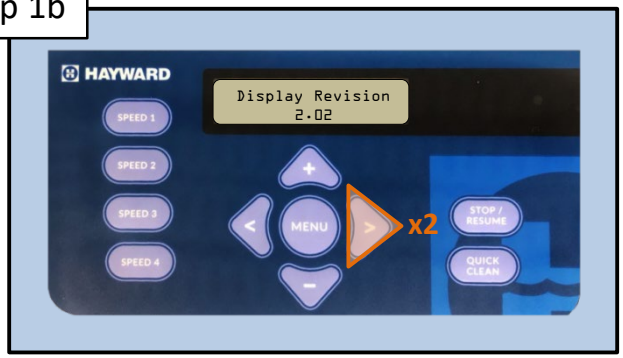
The Hayward Unique Address (HUA) is used to communicate to any Omni System and is located on the right side of the divider wall in the electrical compartment.

Step 1a



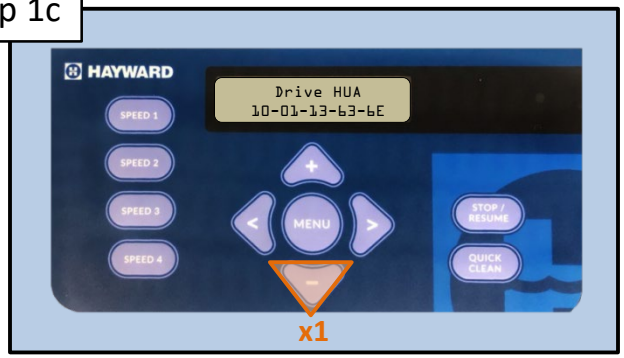
If sticker is damaged or missing, the HUA can be found within the LCD display. Press the menu button repeatedly until the Diagnostic Menu appears.

Step 1b



Press the right arrow button twice to reach the Display Revision screen

Step 1c



Press the down (-) button once to populate the pumps HUA number.

HAYWARD

How to: External Relay Control Wiring

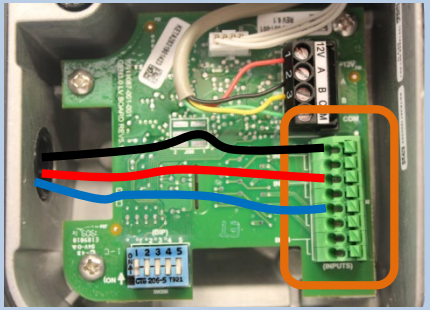
***Note:* When using external relay control, high voltage to pump MUST be wired through load side of filter pump relay**

Step 1

Timer Speed	STEP 1 Status	STEP 2 Status	STEP 3 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

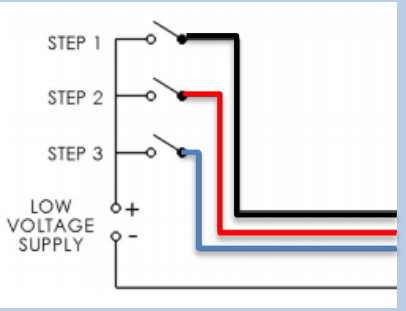
*Use the chart above to determine how many relays will be required for desired number of speeds.

Step 2



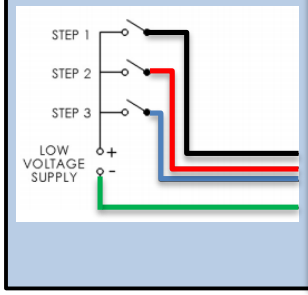
For pump connection, use a 300v rated conductor to connect between the control and one side of each input/step.

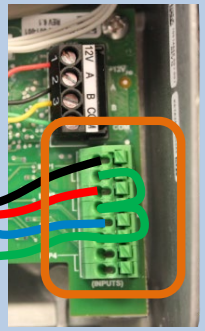
Step 3



Connect the wires to the load side of each control relay. The low voltage power supply (18-30vac) should be connected to the line side of the control relay.

Step 4





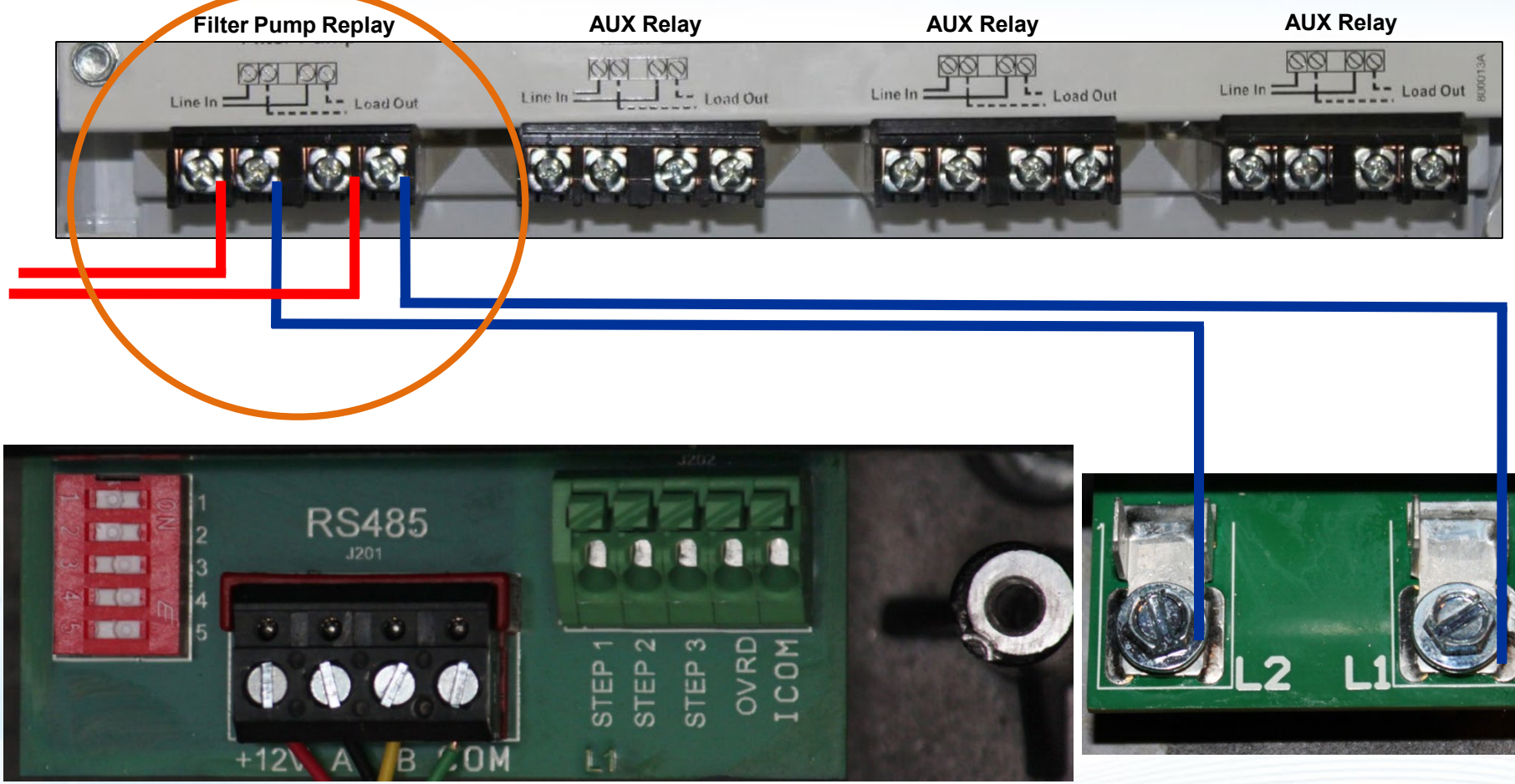
The common/neutral side of the power supply must be connected to the other side of each step/input on the pump. Dip switches 1 and 2 are to remain in the on position.

***For third party controls and non compatible Hayward controls**

HAYWARD

How to: External Relay Control Wiring (cont.)

1. Pump power (230 VAC) needs to be brought into the “line in” contacts on the Filter Pump Relay from a breaker in the control box. The “load out” side will feed the incoming high voltage for the pump.

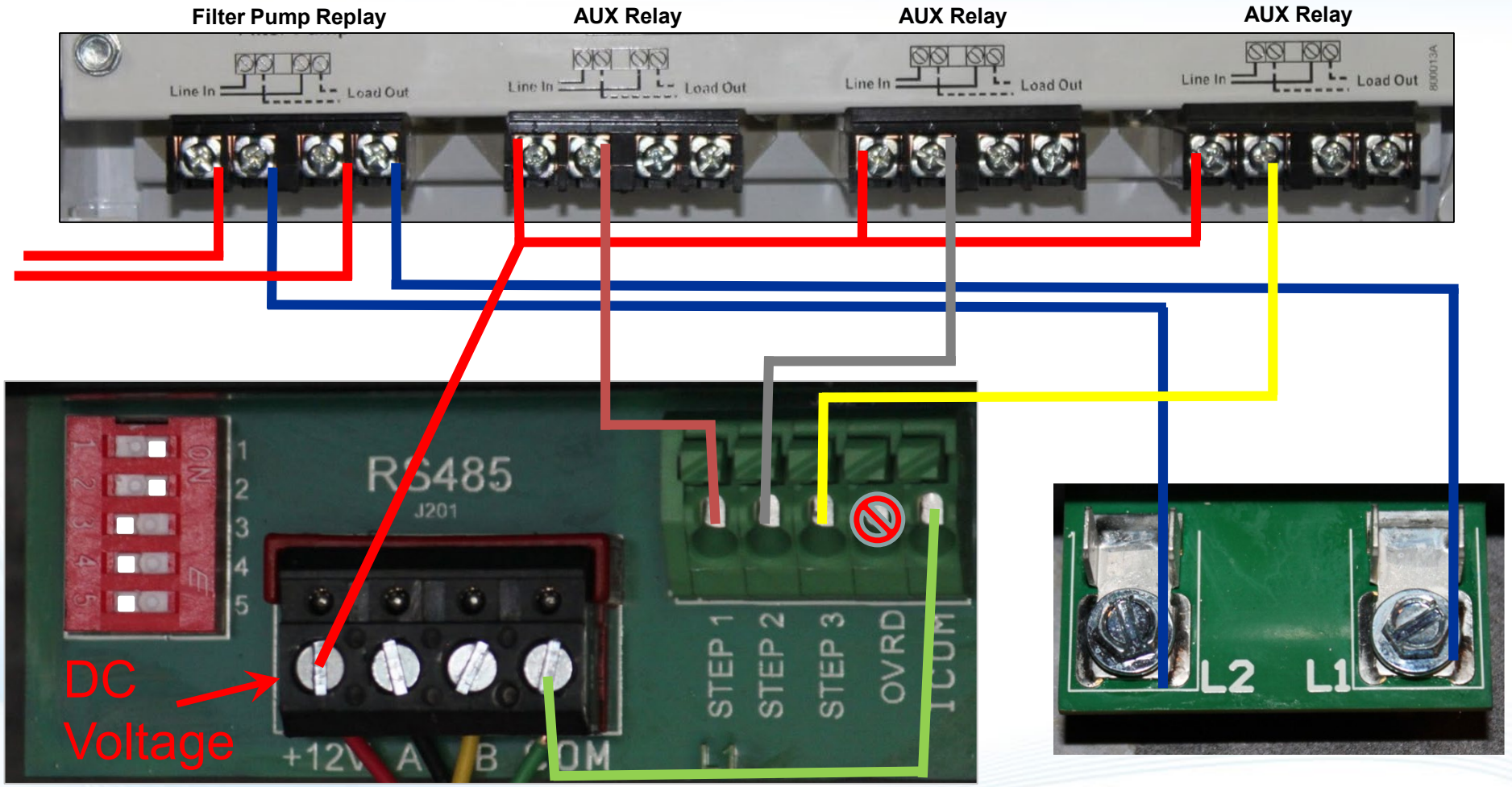


*For third party controls and non compatible Hayward controls

HAYWARD

How to: External Relay Control Wiring (cont.)

2. DC voltage from RS485 needs to be brought into the “line in” contacts on the Aux Relays being used. Load out from the Aux Relays will go to Step 1, 2 , or 3 as needed. “COM” on RS485 connects to “ICOM” on pump interface.



*For third party controls and non compatible Hayward controls

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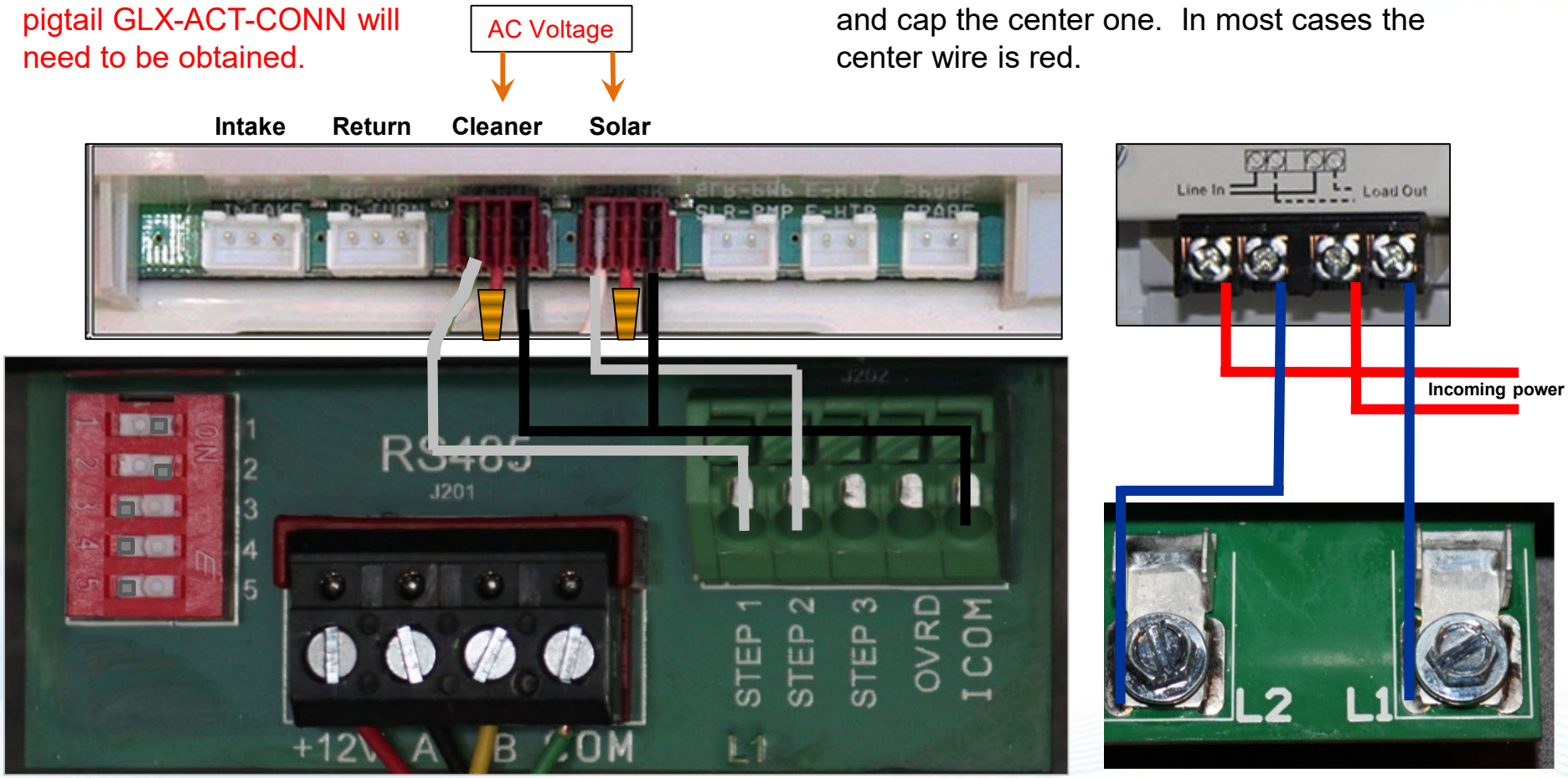
How to: External Relay Control Using Valve Ports

Shown below, on the Jandy AquaLink, are the cleaner and solar sockets with plugs installed. These sockets in many installations are not being used and would be open. Speeds are set in the TriStar VS timers menu, times are set in the controller.

(All work performed must be done with power disconnected to the controller and pump)

For this illustration, Actuator pigtail GLX-ACT-CONN will need to be obtained.

Note: Use the two outside wires of the actuator and cap the center one. In most cases the center wire is red.

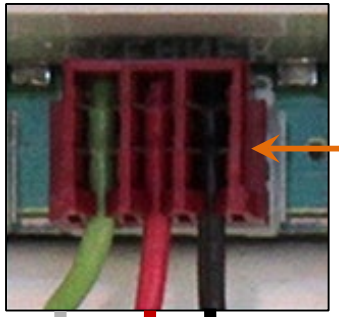


HAYWARD

How to: External Relay Control Using Valve Ports (cont.)

If an open actuator port is not available, or more than 4 speeds is needed, one of the existing ports being used can be piggybacked in some situations. The wiring for this tie-in is shown below. Care needs to be taken to ensure that the speed being used corresponds with the use of the actuator, since both will be activated simultaneously .

Note that the center wire only goes to the actuator and not the pump

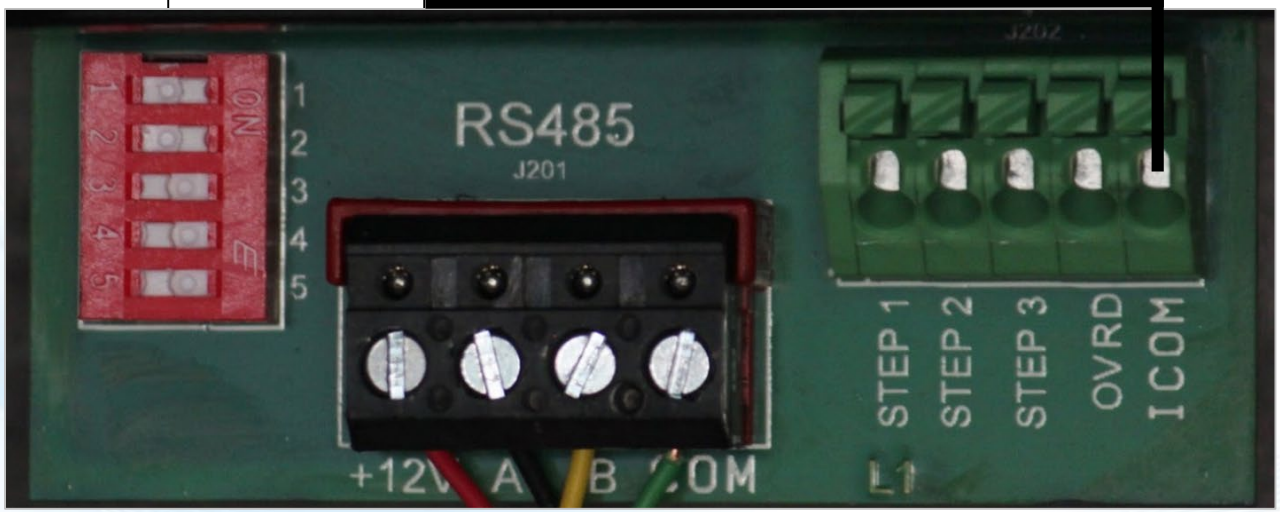


AC Voltage

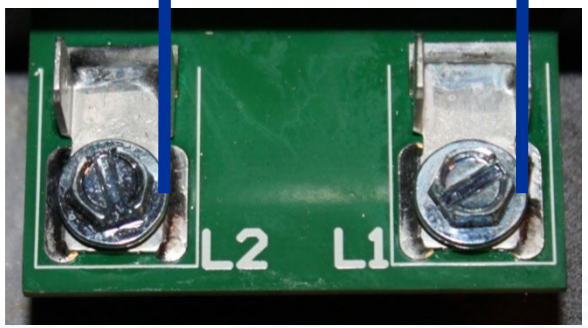
(All work performed must be done with power disconnected to the controller and pump)

Run to Step 1, 2 or 3 as needed

To Actuator



Incoming 230 VAC to Pump



*For third party controls and non compatible Hayward controls

HAYWARD

How to: Dip Switch Settings

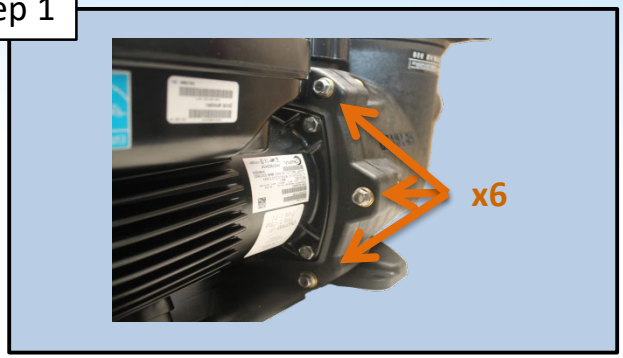
Use these dip switch settings when controlling pump with the following Hayward Controls: Pro-Logic, On-Command, E-Command, Aqua-Logic

Pump Address	#1	#2	#3	#4	#5
Pool Filter	OFF	OFF	OFF	OFF	OFF
Aux 1/Spa Filter	OFF	ON	OFF	OFF	OFF
Aux 2	OFF	OFF	ON	OFF	OFF
Aux 3	OFF	ON	ON	OFF	OFF
Aux 4	OFF	OFF	OFF	ON	OFF
Aux 5	OFF	ON	OFF	ON	OFF
Aux 6	OFF	OFF	ON	ON	OFF
Aux 7	OFF	ON	ON	ON	OFF
Aux 8	OFF	OFF	OFF	OFF	ON
Aux 9	OFF	ON	OFF	OFF	ON
Aux 10	OFF	OFF	ON	OFF	ON
Aux 11	OFF	ON	ON	OFF	ON
Aux 12	OFF	OFF	OFF	ON	ON
Aux 13	OFF	ON	OFF	ON	ON
Aux 14	OFF	OFF	ON	ON	ON
Lights Button	OFF	ON	ON	ON	ON

***Disconnect power to the pump prior to making dip switch adjustments.**

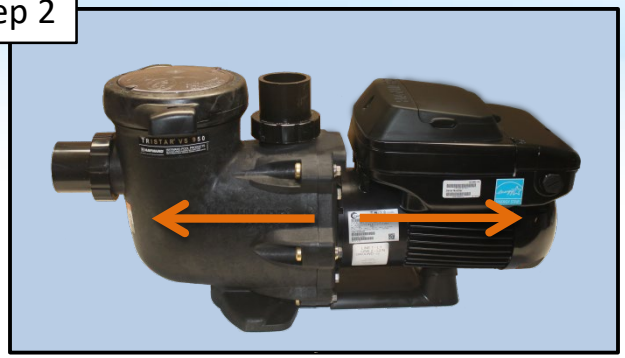
How to: Replace Shaft Seal Assembly

Step 1



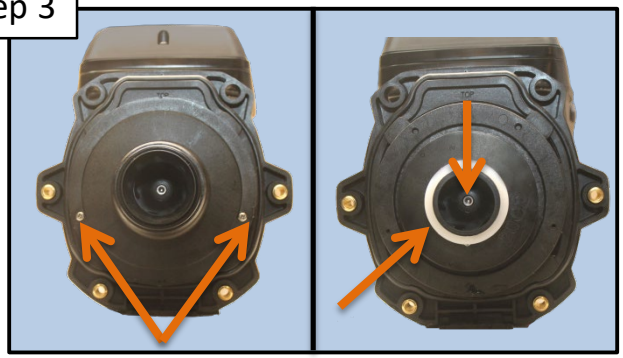
Remove the six (6) ½" bolts from the seal plate. The bolt anchors should stay housed within the pump housing.

Step 2



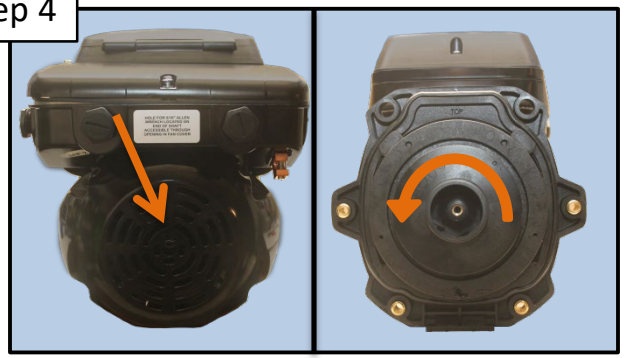
Pull powerend assembly away from pump housing to access diffuser, impeller, and shaft seal.

Step 3



Remove the two (2) diffuser screws and pull diffuser off the seal plate. Slide impeller ring off impeller. *Remove the 3/16" Allen head impeller screw.

Step 4



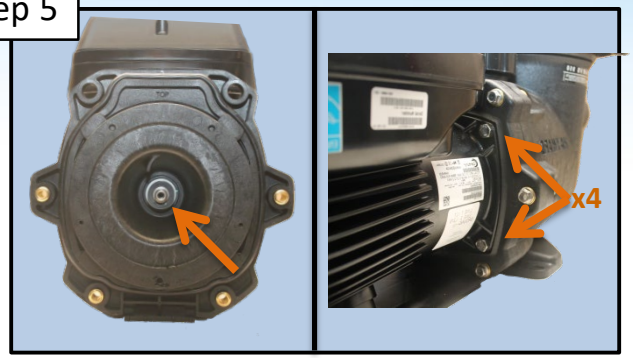
Slide a 5/16" Allen wrench through the center of the fan shroud to secure the shaft so it does not spin. Rotate the impeller counter-clockwise to remove.

***The impeller screw is reverse thread and must be turned clockwise to be loosened and counter clockwise to be tightened**

HAYWARD

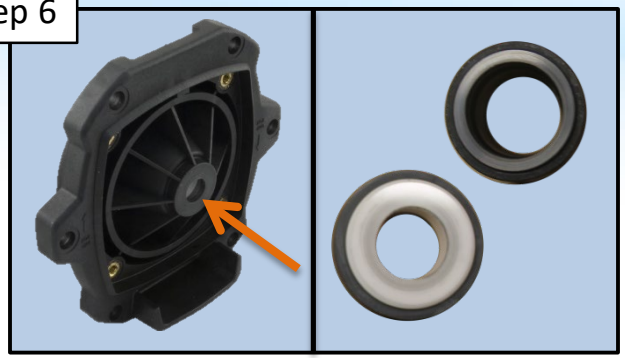
How to: Replace Shaft Seal Assembly (cont.)

Step 5



Remove spring seal assembly. Remove four 9/16” motor mount bolts. Slide seal plate off the motor to access ceramic side of the seal.

Step 6



Remove remaining portion of shaft seal from seal plate. Replace with P/N **SPX3200SA**. Do not use lubricant or sealant on shaft seal.

Step 7

If replacing the powerend, it is important to use the correct powerend for the pump model. See parts breakdown on pages 41-44.

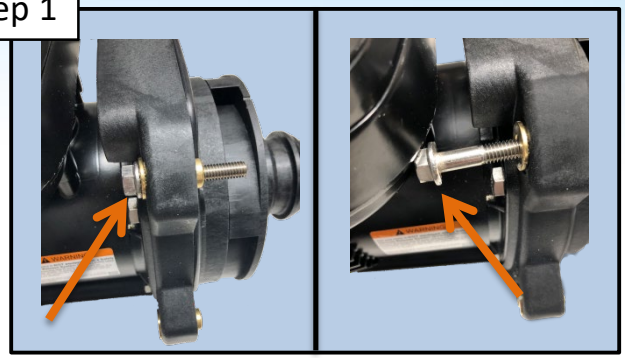
Step 8

Reverse steps 1-7 to re-assemble pump. Be sure to configure the wiring properly for input voltage.

HAYWARD

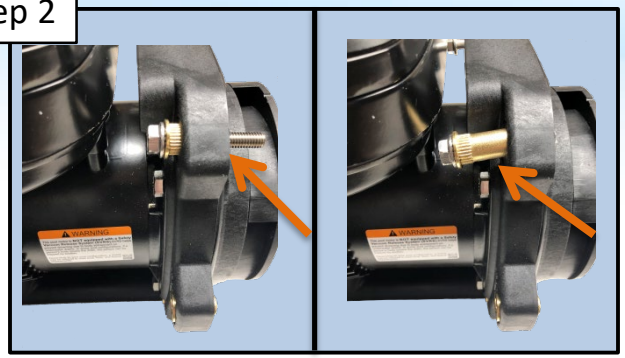
How to: Remove/Install Upper Seal Plate Bolts

Step 1



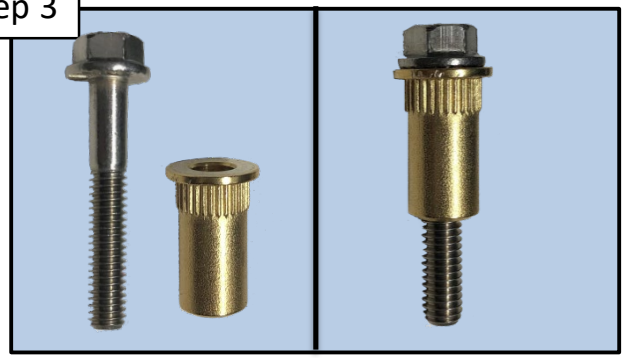
There is not sufficient clearance to remove the upper seal plate bolts by sliding the bolt out of the bolt sleeve.

Step 2



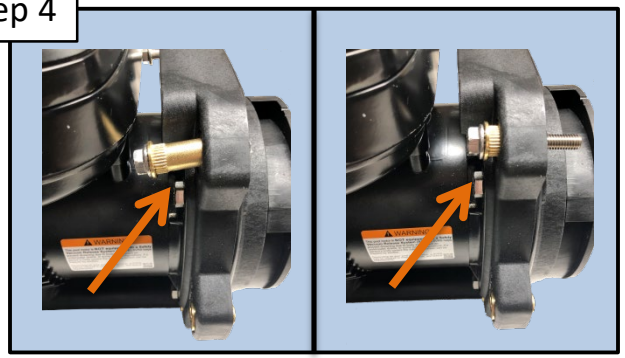
Tap on the end of the bolt sleeve. This will allow you to remove the bolt sleeve and bolt at the same time.

Step 3



In order to re-install the upper seal plate bolts, remove bolt sleeve from seal plate if necessary, slide bolt into bolt sleeve as shown.

Step 4



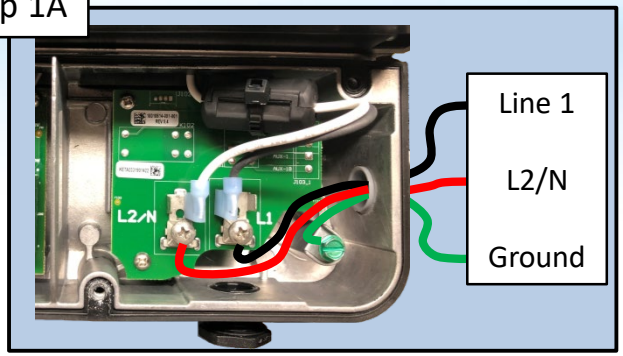
Slide bolt and bolt sleeve into the seal plate. Bolt sleeve may not slide completely in until bolt is tightened to bolt anchor.

Hayward Variable Speed Pump

Troubleshooting Guide

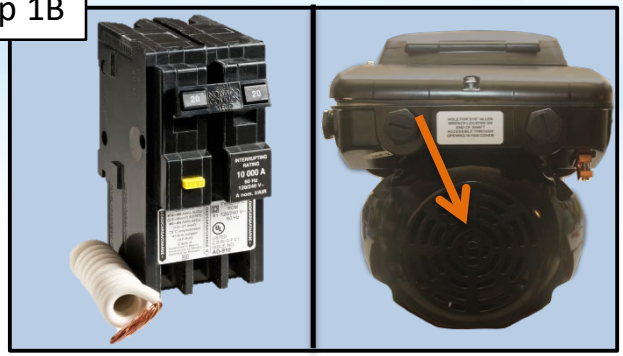
Motor Will Not Start

Step 1A



Verify correct voltage is being supplied to the motor. Line lead connections should be secure. If motor does not start proceed to Step 1B.

Step 1B



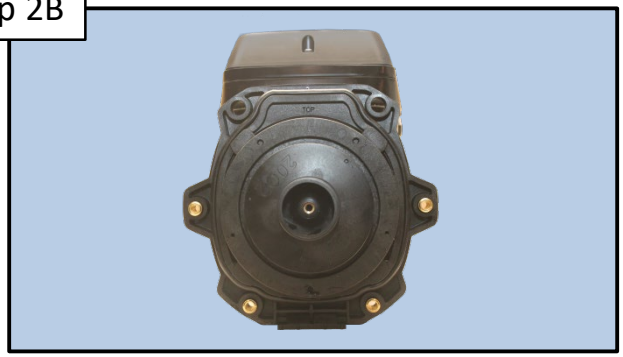
Verify breaker has not tripped. With power off, verify shaft spins freely in a clockwise rotation. If motor still does not start, replace powerend.

Motor Shuts Off or Hums

Step 2A

Verify voltage is not too low for the application. Applied voltage must be within 10%+/- nominal voltage. Once verified, proceed to Step 2B.

Step 2B

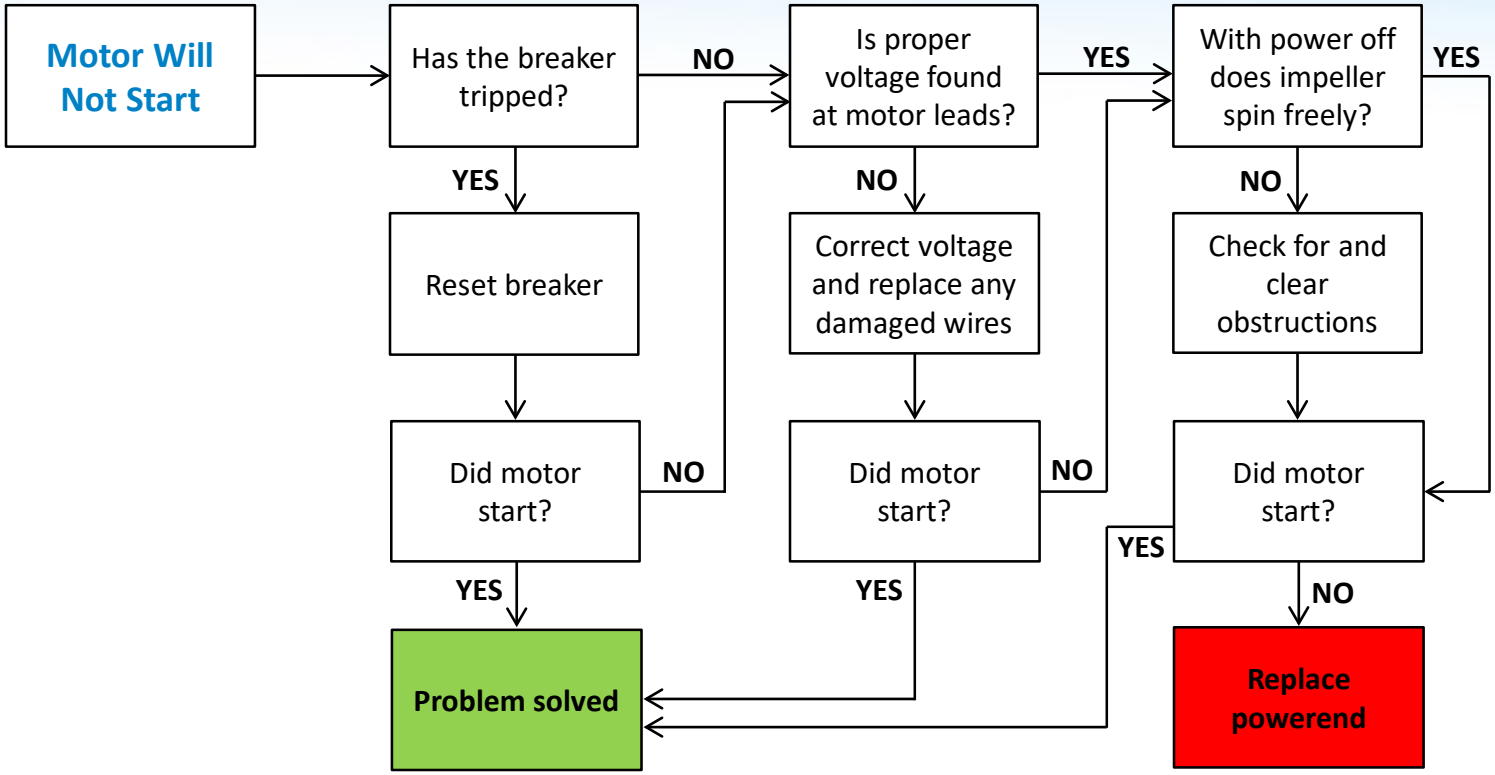


Check the impeller for and remove any obstructions. If motor still shuts off or hums, replace the powerend.

*Low input voltage will cause motor to overheat and shut off

HAYWARD

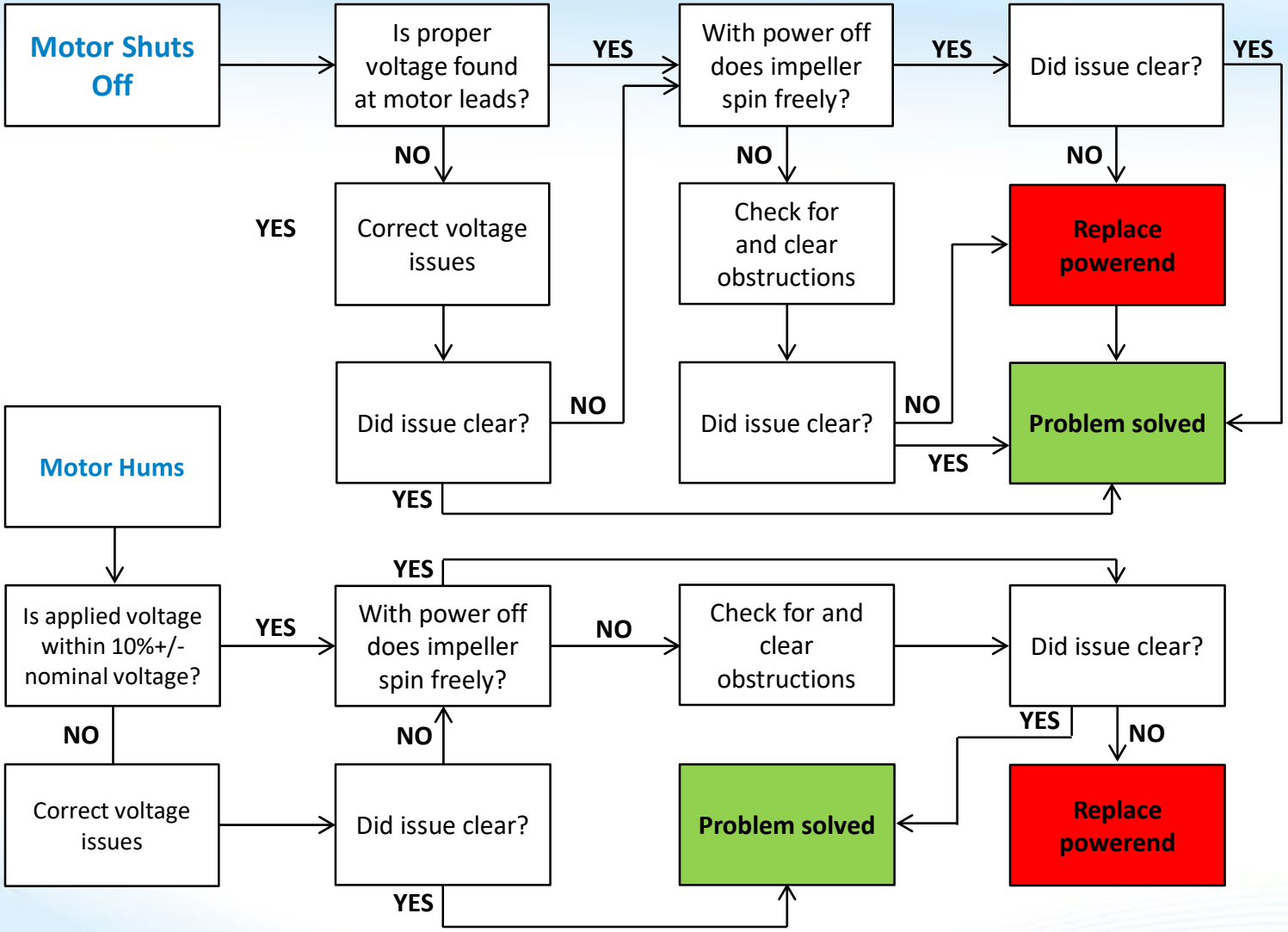
Motor Will Not Start



*For verification of diagnosis contact Hayward Technical Support
908-355-7995

HAYWARD

Motor Shuts off or Hums



*For verification of diagnosis contact Hayward Technical Support
908-355-7995

HAYWARD

Pump Will Not Prime

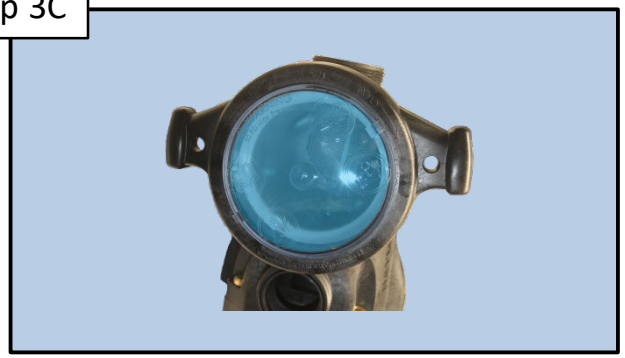
Step 3A

Check unions to make sure they are properly tightened. Loose unions will cause pump to pull air and not prime. Proceed to step 3B.

Step 3B

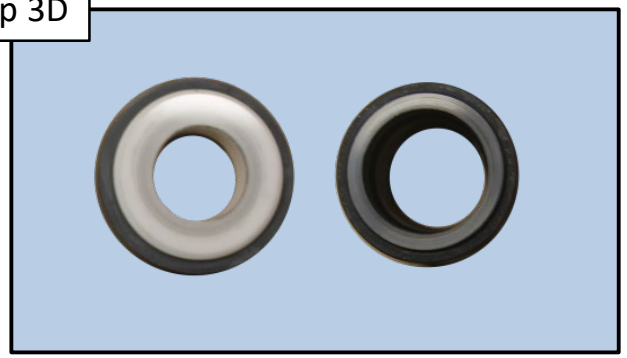
Make certain pump lid is installed correctly. Check O-ring inside the pump lid for any debris or signs of damage. Proceed to step 3C.

Step 3C



Clear any debris from basket and fill completely with water. Secure lid to housing and attempt to prime pump. If pump does not prime proceed to step 3D.

Step 3D

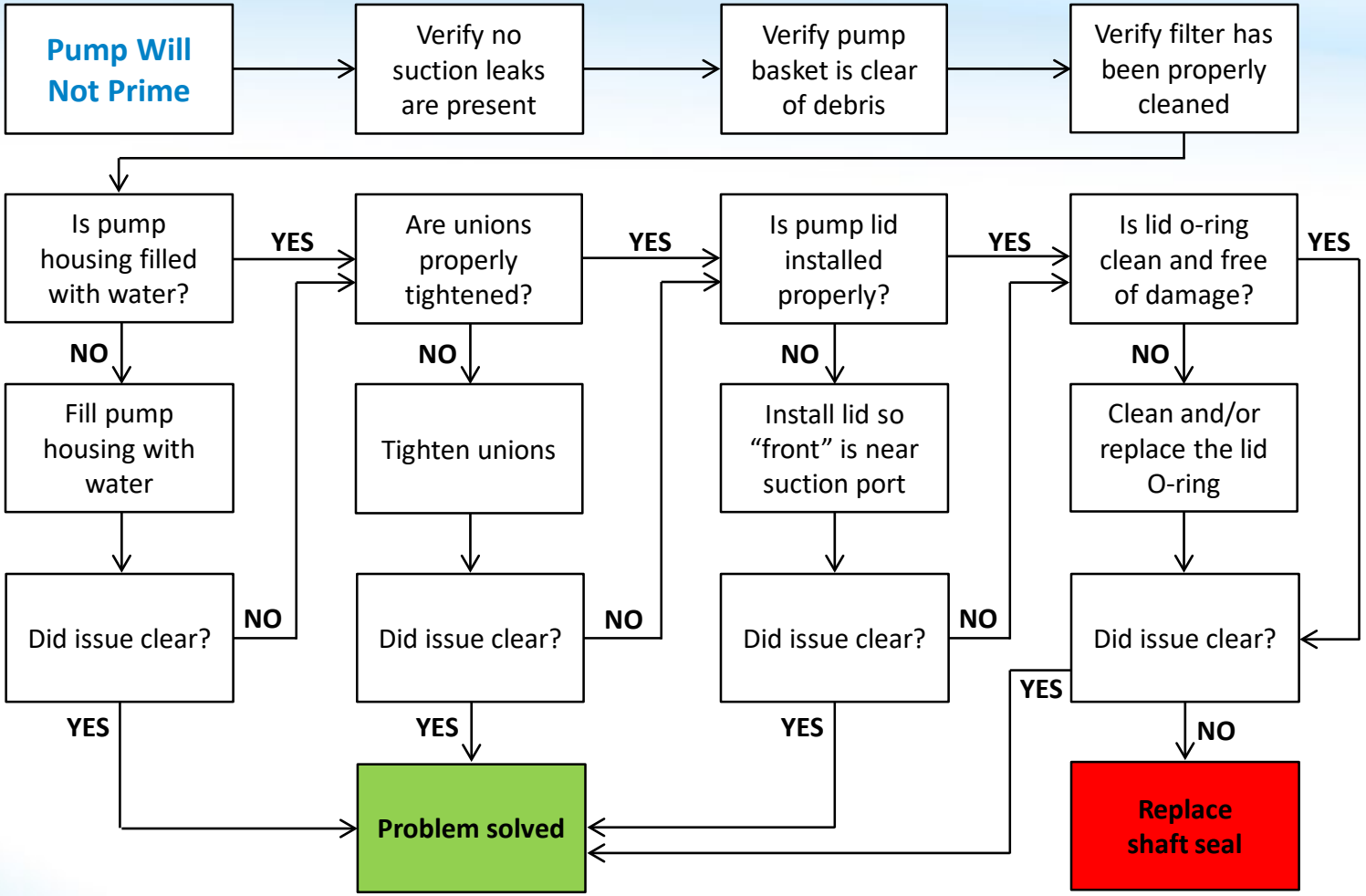


Inspect shaft seal for any cracks or signs of wear. Replace with correct shaft seal if necessary. After pump is back together repeat step 3C to prime.

***If pump still will not prime, inspect suction line plumbing for obstructions and leaks**

HAYWARD

Pump Will Not Prime

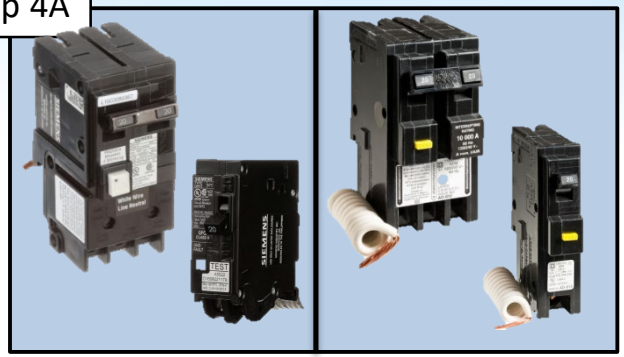


*For verification of diagnosis contact Hayward Technical Support
908-355-7995

HAYWARD

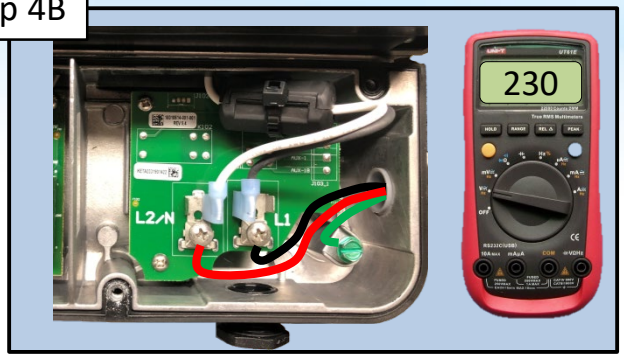
G.F.C.I. Breaker Trips

Step 4A



If GFCI breaker is nuisance tripping, verify recommended breaker has been installed for the application. Proceed to step 4B.

Step 4B



Use a multi-meter to test incoming voltage to the pump. Verify voltage is within 10% +/- nominal voltage. Proceed to step 4C.

Step 4C

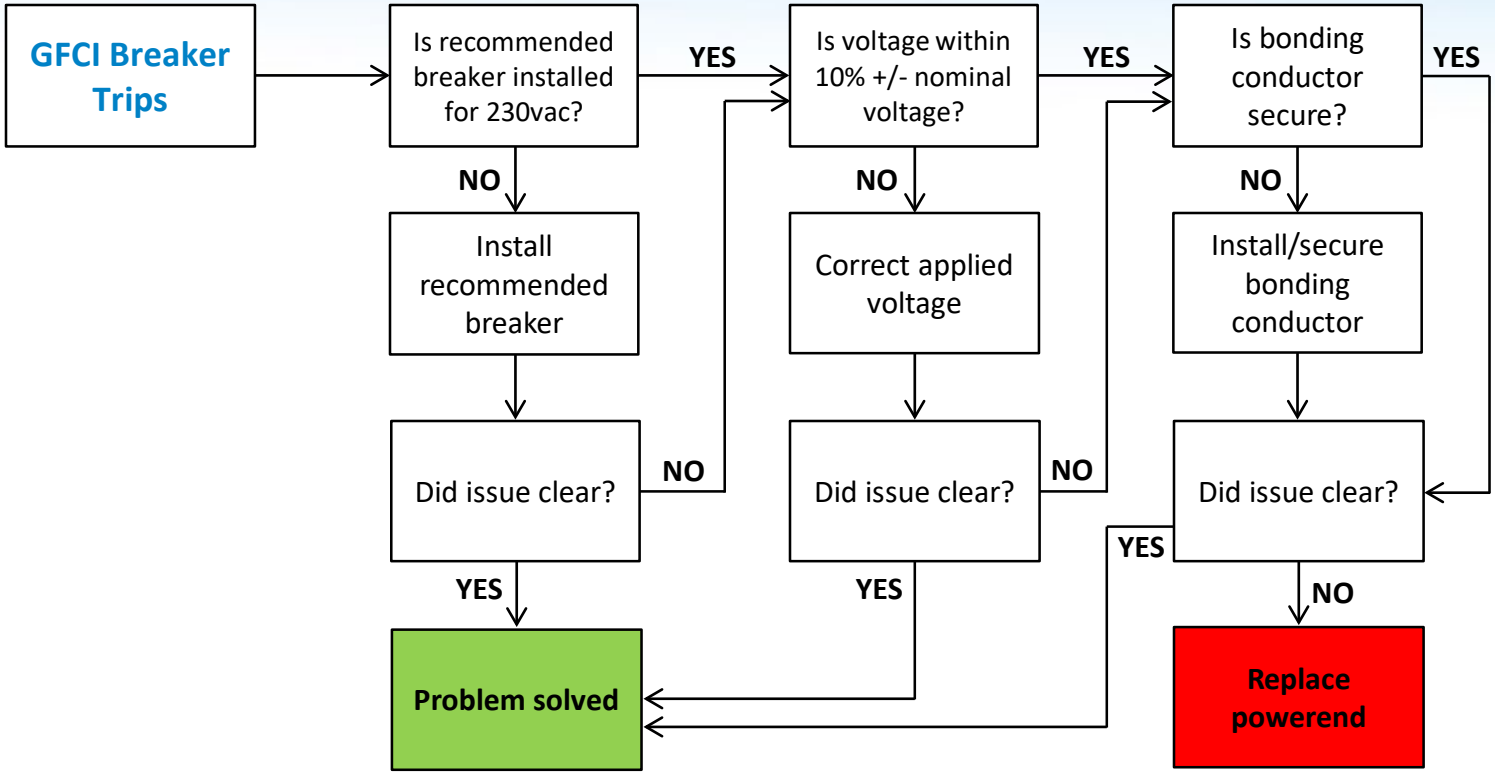
Verify bonding conductor is installed and secure to pump drive. If wire is not present, one MUST be installed. Proceed to step 4D.

Step 4D

If correct breakers are installed, proper voltage is supplied, and bonding conductor is securely fastened, replace the powerend of the pump.

HAYWARD

GFCI Breaker Trips

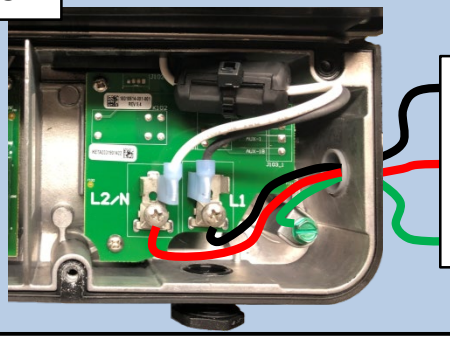


*For verification of diagnosis contact Hayward Technical Support
908-355-7995

HAYWARD

Blank Display

Step 5A



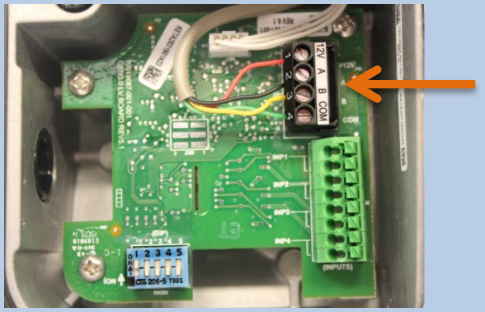
Line 1

L2/N

Ground

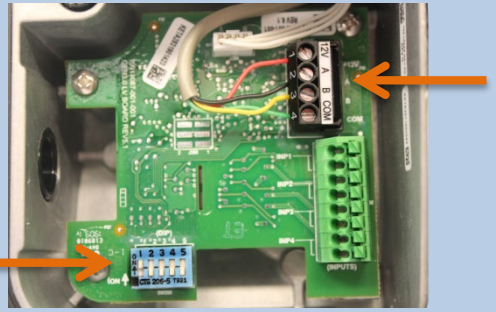
Verify input voltage to the pump is within 10%+/- nominal voltage. Proceed to step 5B.

Step 5B



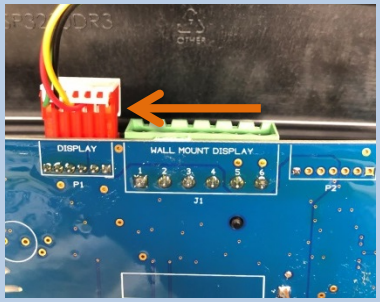
With power on, use a multi-meter to test pins 12v and Com for 12vdc. Proceed to step 5C.

Step 5C



*Verify wires to display are securely connected to RS485 bus and dip switches 1&2 are in the ON position. Proceed to step 5D.

Step 5D

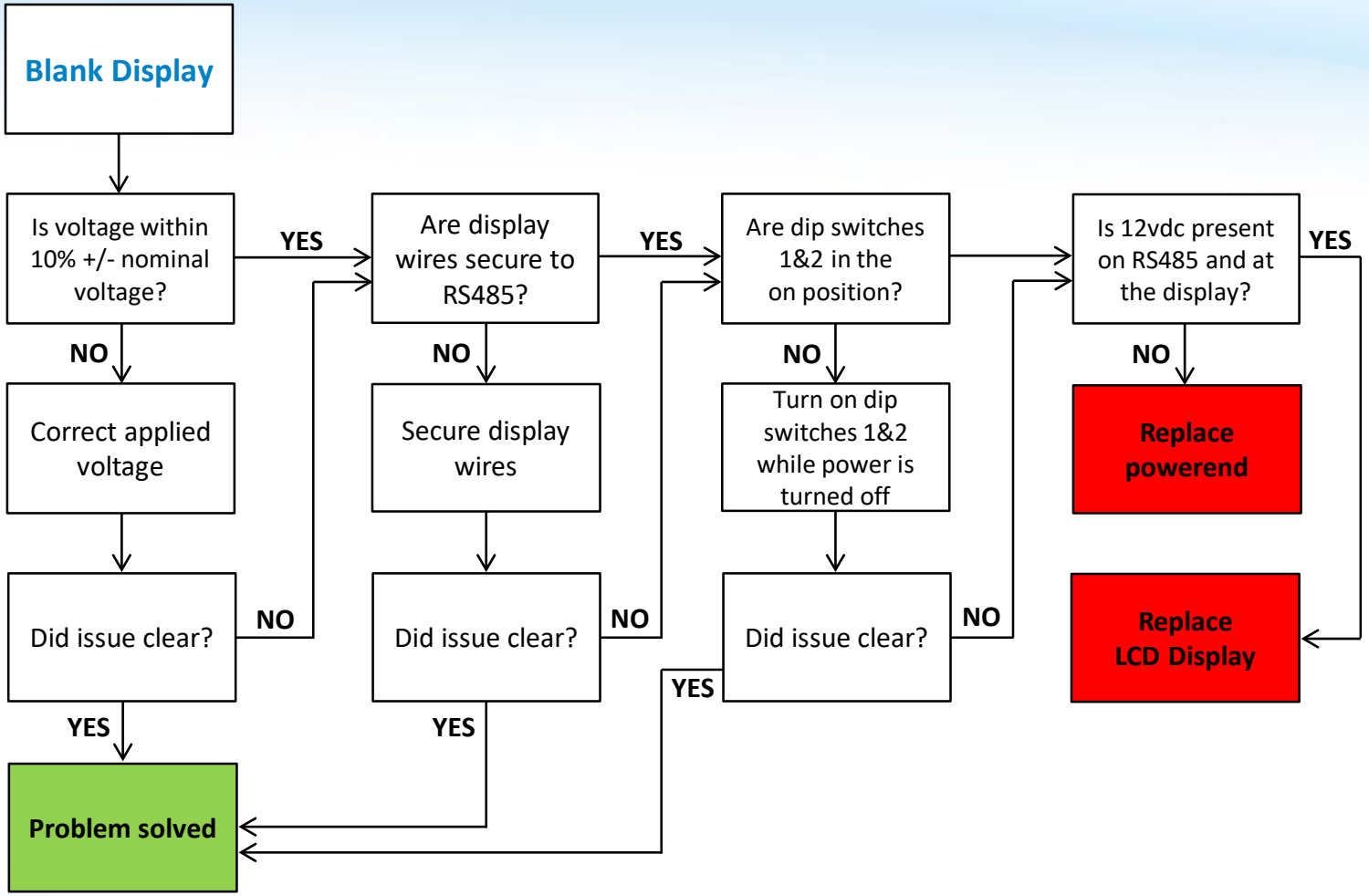


Verify 12vdc on plug at display across the red and green wires. If 12vdc is present, replace the display. Otherwise, replace the powerend.

***Display WILL be blank when pump is connected to a Hayward Automation Control.**

HAYWARD

Blank Display



*For verification of diagnosis contact Hayward Technical Support
908-355-7995

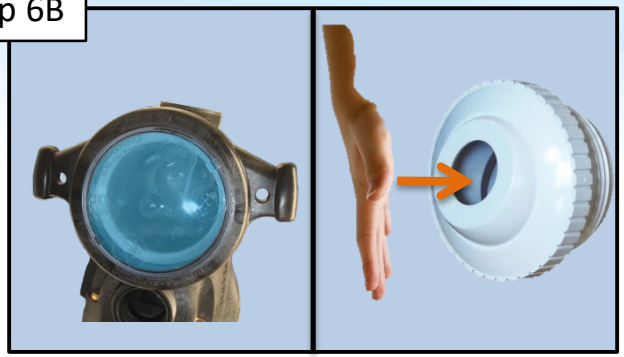
HAYWARD

Pump is Noisy

Step 6A

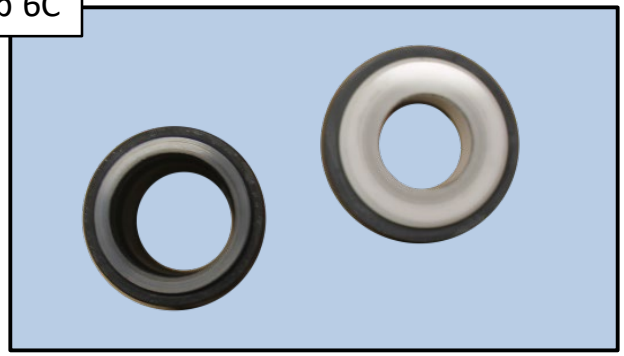
If pump is not level on the pad it will vibrate against the pad. Re-level pump and/or pad, secure pump to pad. Proceed to step 6B.

Step 6B



Air bubbles can cause cavitation noise. Correct suction leak and/or throttle return line. Proceed to step 6C

Step 6C



Inspect the shaft seal. Damage to seal can allow water into motor bearings and lead to a loud bearing noise. Proceed to step 6D.

Step 6D

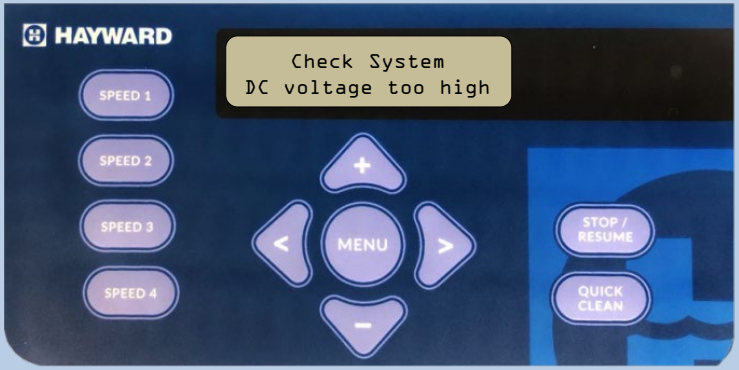
A loud pump is a symptom of a larger issue. Make sure all issues found are corrected then replace the powerend.

Hayward Variable Speed Pump

Check System Messages

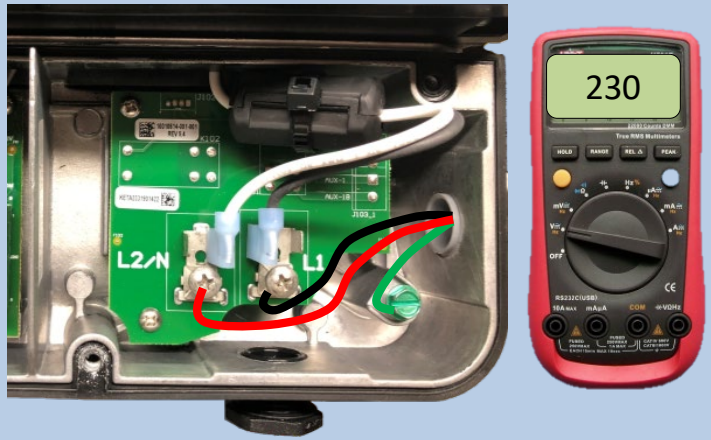
Check System: DC Voltage Too High

Step 1A



Indicates the internal **DC** bus voltage is too high. Turn off power to the pump. Wait 5 minutes and turn power back on. Error should clear. If not, proceed to step 1B.

Step 1B

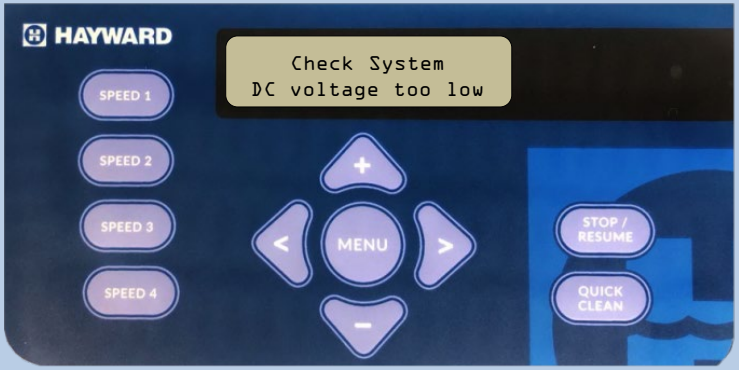


Verify the input **AC** voltage is within 10% of pump rated voltage. If not within 10%, have the voltage corrected. If within 10%, replace the pump powerend.

HAYWARD

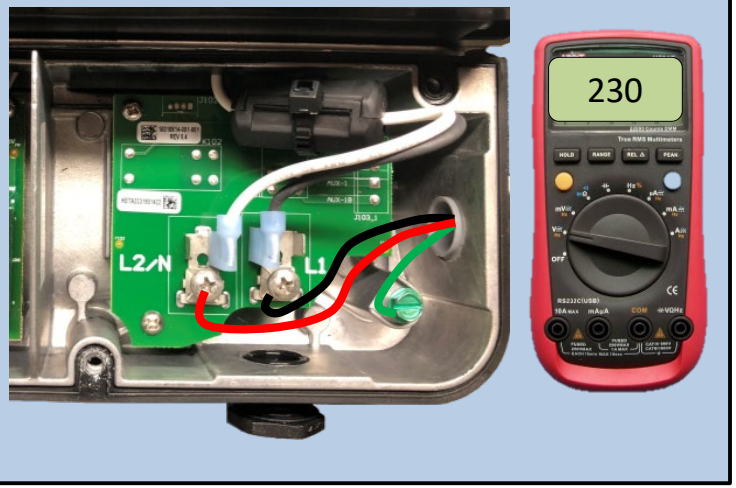
Check System: DC Voltage Too Low

Step 2A



Indicates the internal DC bus voltage is too low. Turn off power to the pump. Wait 5 minutes and turn power back on. Error should clear. If not, proceed to step 2B.

Step 2B

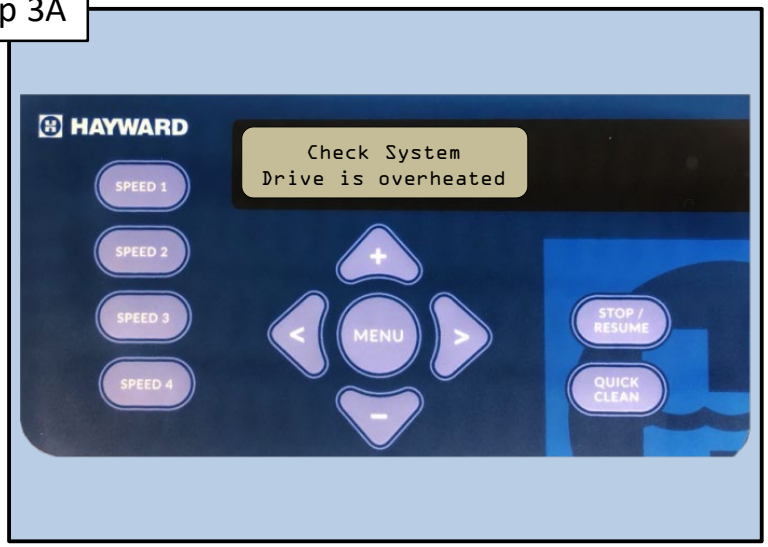


Verify line leads are secure and input **AC** voltage is within 10% of pump rated voltage. Correct voltage if needed, otherwise replace powerend.

HAYWARD

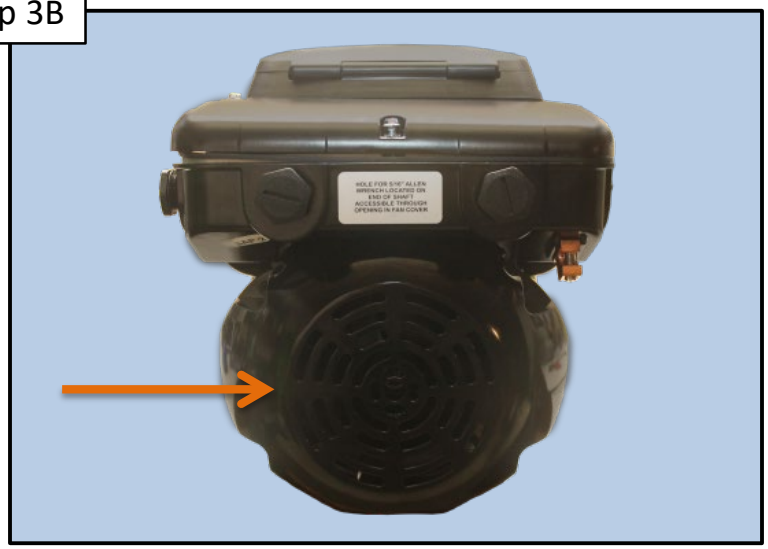
Check System: Drive Is Overheated

Step 3A



Indicates the internal components of the drive have become overheated. Check ambient temperature is below the pump rating of 50°c/122°f. If so, proceed to step 3B.

Step 3B

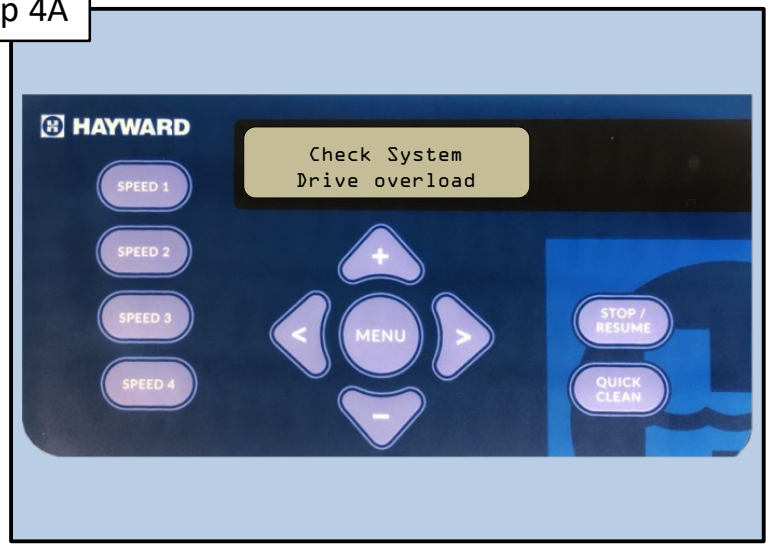


Motor airflow path and fan should be checked for obstructions and cleared if necessary. If issue persists, replace the powerend.

HAYWARD

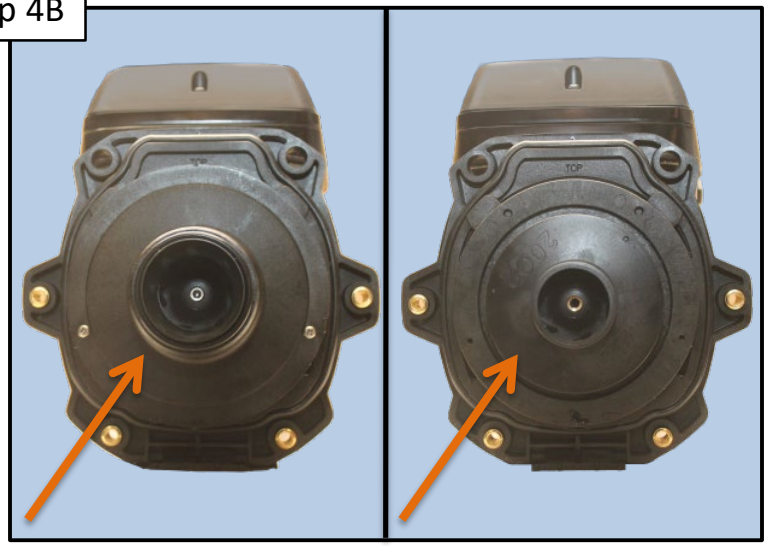
Check System: Drive Overload

Step 4A



Indicates the motor current is too high. Turn off power to the pump. Wait 5 minutes and turn power back on. Error should clear. If not, proceed to step 4B.

Step 4B

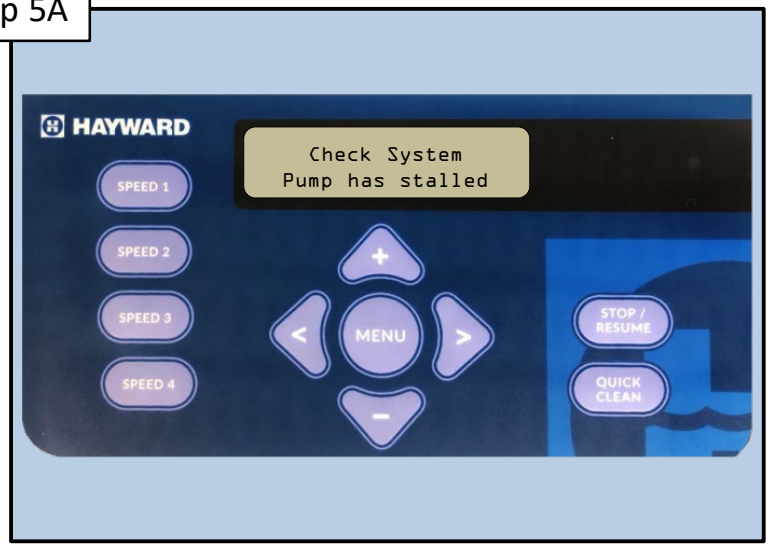


Check impeller, diffuser, shaft seal, and motor for any binding issues and replace each as necessary. If issue persists, replace the powerend.

HAYWARD

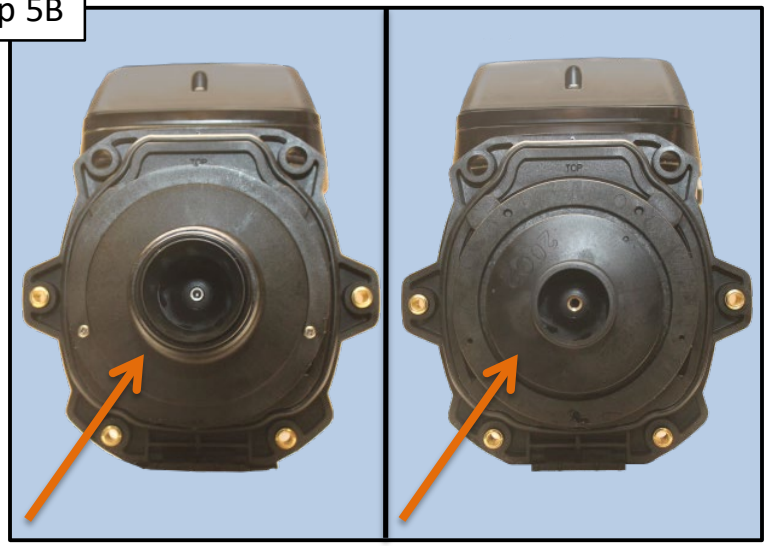
Check System: Pump Has Stalled

Step 5A



Indicates drive has lost control over motor shaft rotation. Turn off power to pump. Wait 5 minutes and turn power back on. If error does not clear, proceed to step 5B.

Step 5B

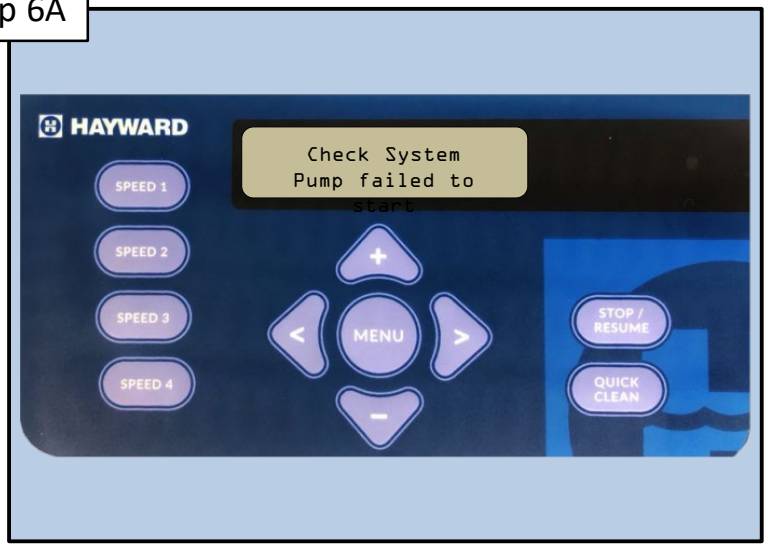


Check impeller, diffuser, shaft seal, and motor for any binding issues and replace each as necessary. If issue persists, replace the powerend.

HAYWARD

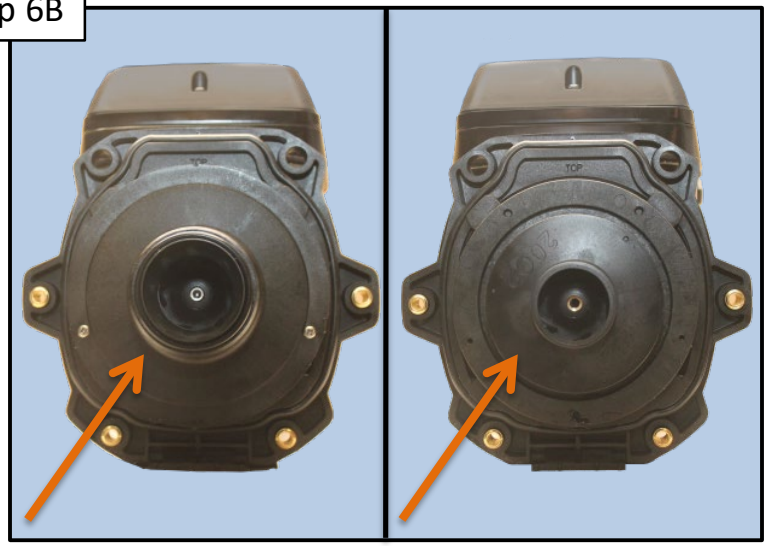
Check System: Pump Failed To Start

Step 6A



Indicates drive was not able to start the motor. Turn off power to pump. Wait 5 minutes and turn power back on. If error does not clear, proceed to step 6B.

Step 6B

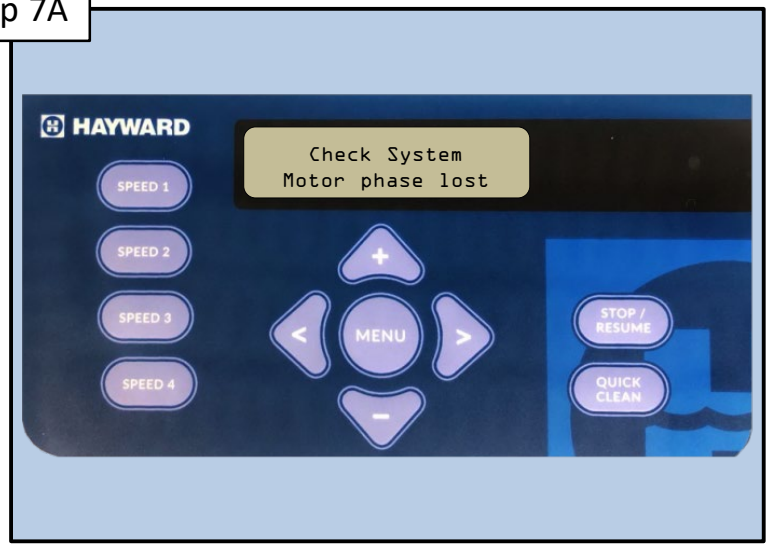


Check impeller, diffuser, shaft seal, and motor for any binding issues and replace each as necessary. If issue persists, replace the powerend.

HAYWARD

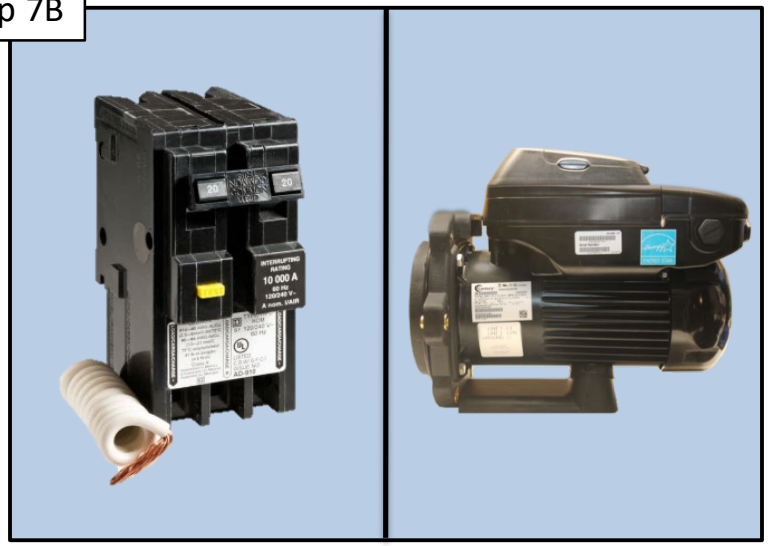
Check System: Motor Phase Lost

Step 7A



Indicates that one of the motor phases is open and that the motor/drive may need to be replaced. Proceed to step 7B.

Step 7B

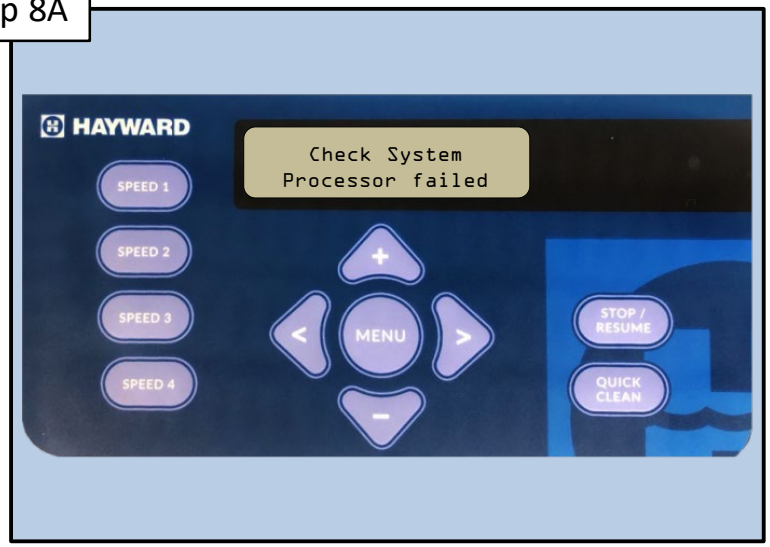


Turn off power to pump. Wait 5 minutes and turn power to the back on. If error does not clear, replace the powerend.

HAYWARD

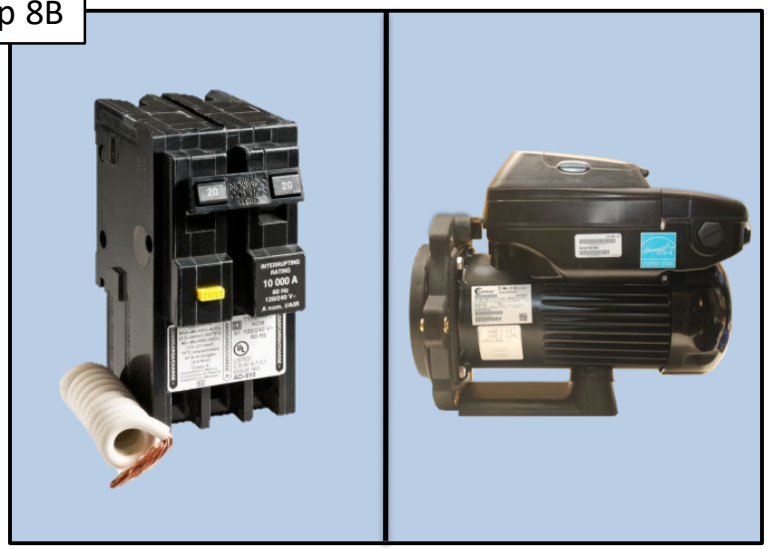
Check System: Processor Failed

Step 8A



Indicates that there is a problem with the processor in the motor/drive, and that the motor/drive may need to be replaced. Proceed to step 8B.

Step 8B

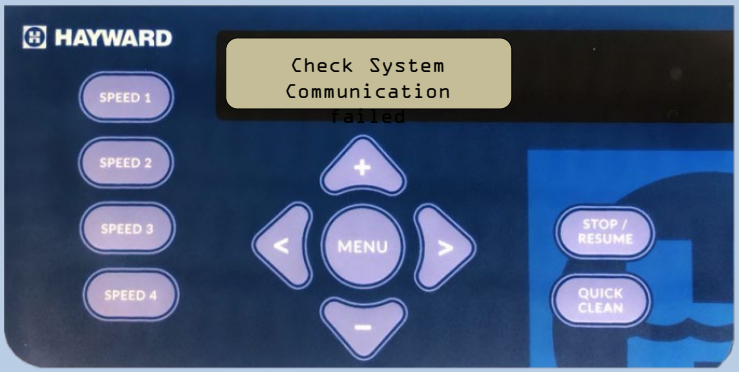


Turn off power to the pump. Wait 5 minutes and turn power to the back on. If error does not clear, replace the powerend.

HAYWARD

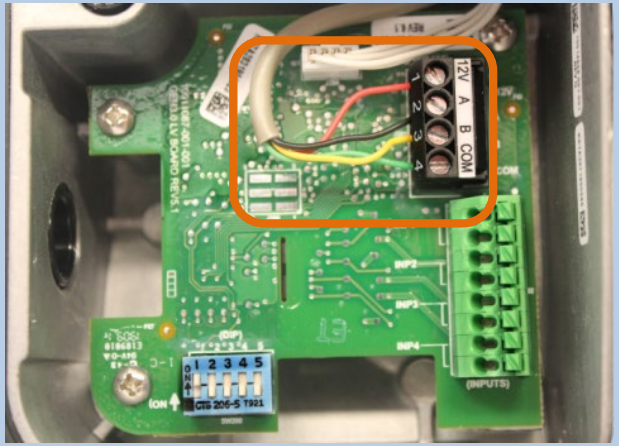
Check System: Communication Failed

Step 9A



Indicates that there are communication problems between the user interface and the motor/drive. Proceed to step 9B.

Step 9B

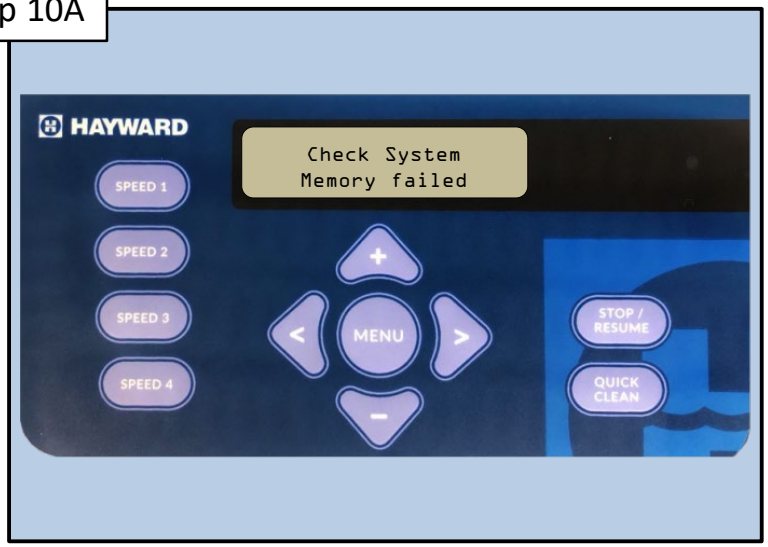


Connections between the user interface and motor/drive should be verified. If error does not clear, replace the powerend.

HAYWARD

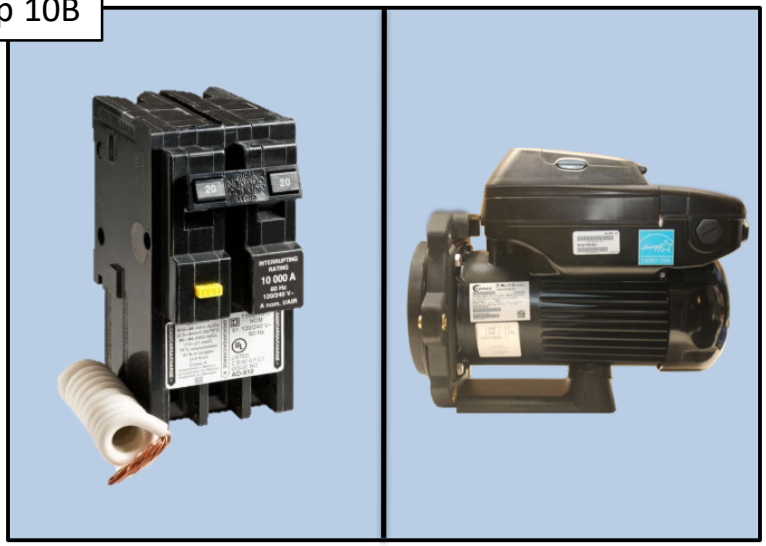
Check System: Memory Failed

Step 10A



Indicates that the drive memory has been damaged or corrupted, and that the motor/drive may need to be replaced. Proceed to step 10B.

Step 10B

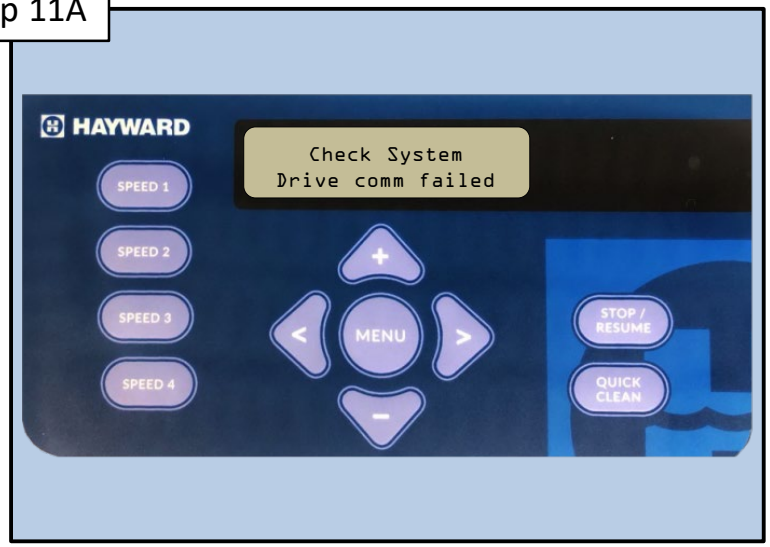


Turn off power to the pump. Wait 5 minutes and turn power to the back on. If error does not clear, replace the powerend.

HAYWARD

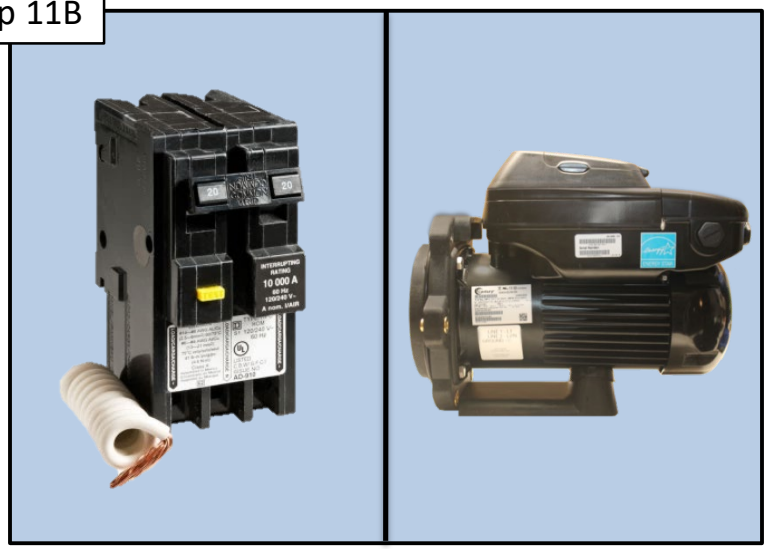
Check System: Drive Comm Failed

Step 11A



Indicates that there are communication problems inside the motor/drive, and that the motor/drive may need to be replaced. Proceed to step 11B.

Step 11B

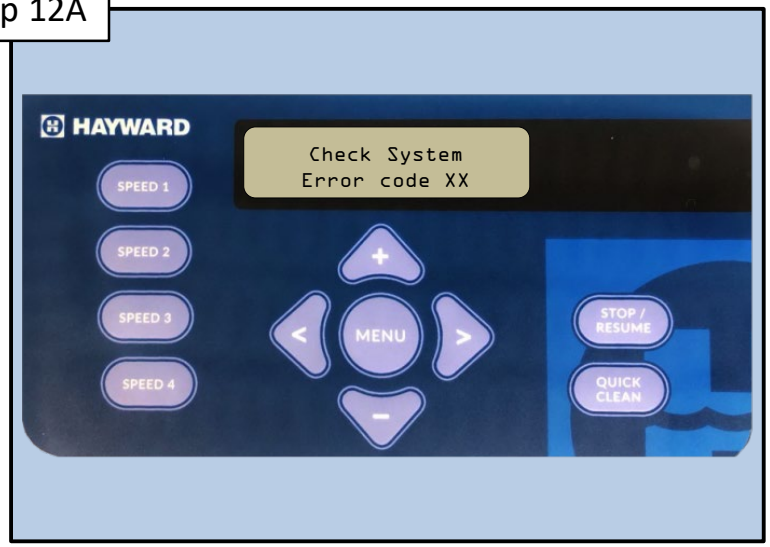


Turn off power to the pump. Wait 5 minutes and turn power to the back on. If error does not clear, replace the powerend.

HAYWARD

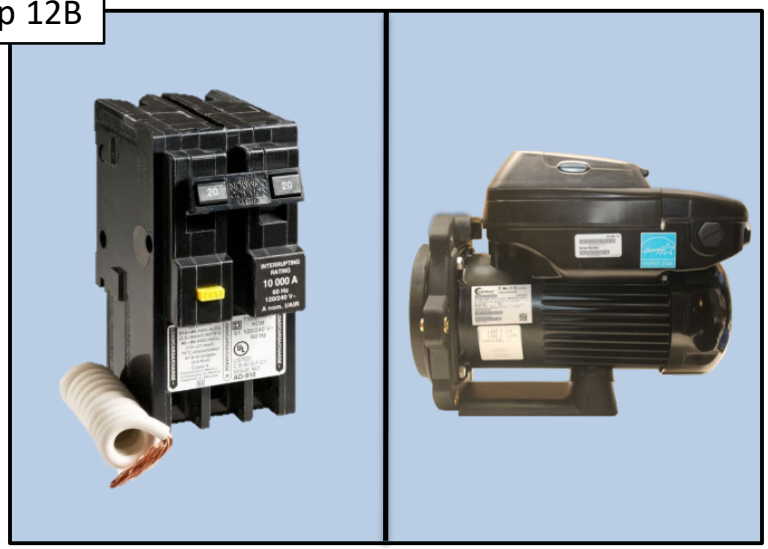
Check System: Error Code XX

Step 12A



Indicates the user interface is receiving an error from the motor/drive it does not understand. "XX" refers to any two numbers shown for the error code. Proceed to step 12B.

Step 12B



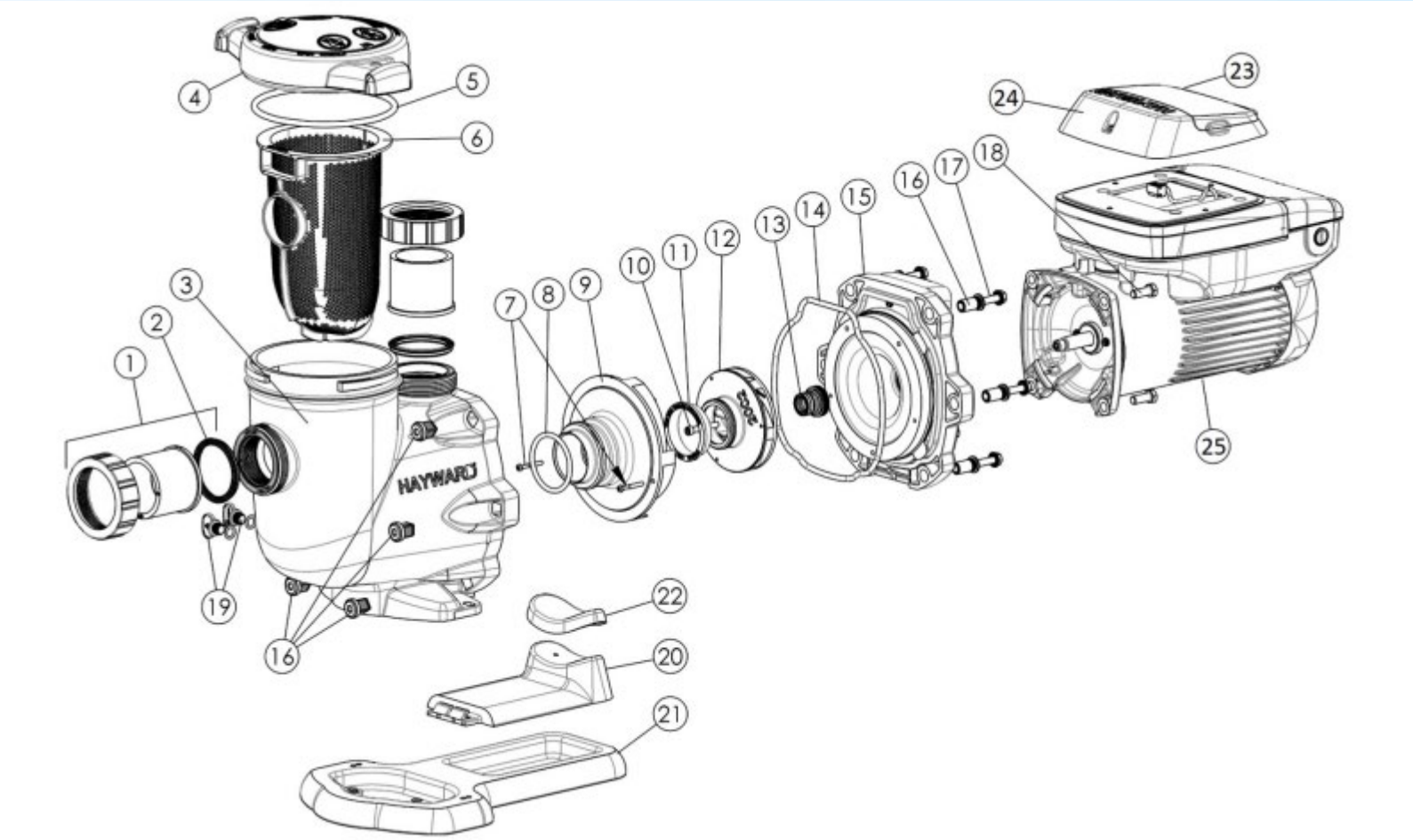
Turn off power to the pump. Wait 5 minutes and turn power to the pump back on. If error does not clear, replace the powerend.

HAYWARD

Hayward Variable Speed Pump

Parts Breakdown

Parts Breakdown



HAYWARD

Parts Breakdown Cont'd

Ref #	Part #	Description
1	SPX3200UNKIT	Union Kit (Includes 2 Nuts, Connectors, and Gaskets)
2	SPX3200UG	Union Gasket
3	SPX3200A	Pump Strainer Housing 2" x 2 1/2'with Drain Plugs
4A	SPX3200DLS	Strainer Cover Kit (Includes Strainer Cover, Lock Ring, & O-Ring)
4B	SPX3200DLSB	Strainer Cover Kit (Biguanide Sanitizer Applications Only (NOT pressure testable)
5	SPX3200S	Strainer Cover O-Ring
6	SPX3200M	Strainer Basket
7	SPX3200Z8	Diffuser Screw
8	SPX4000Z1	Diffuser O-Ring
9	SPX3200B3	Diffuser
10	SPX3200Z1	Impeller Screw
11	SPX3021R	Impeller Ring
12	SPX3220C	Impeller with Impeller Screw
13A	SPX3200SA	Shaft Seal Assembly
13B	SPX3200SAV	Shaft Seal Assembly (Viton)

Parts Breakdown Cont'd

Ref #	Part #	Description
14	SPX3200T	Housing O-ring
15	SPX3200E	Seal Plate
16	SPX3200Z211	Housing Insert/Seal Plate Spacer Kit
17	SPX3200Z3	Housing Bolt
18	SPX3200Z5	Motor Bolt
19	SPX4000FG	Drain Plug with O-ring
20	SPX3200GA	Motor Support
21	SPX3200WF	Optional Riser Base Aligns with Pentair® Whisperflo® Pump
22	SPX3200Q	Motor Support Adaptor
23	SPX3400DR4	Motor Drive Display Cover (Cover Only)
24	SPX3200LCD	Digital Control Interface Assembly
25A	SPX3206Z1VSPE	Powerend Assembly, Non SVRS (Includes #7-15, 2ea. #16-17, #18, #24 & Motor Assembly
25B	SPX3206Z1VSPEVR	Powerend Assembly, SVRS (Includes #7-15, 2ea. #16-17, #18, #24 & Motor Assembly
-	SPX3400DRKIT	Wall Mount Kit
-	SPX3200DRCC	Communication Cable Kit