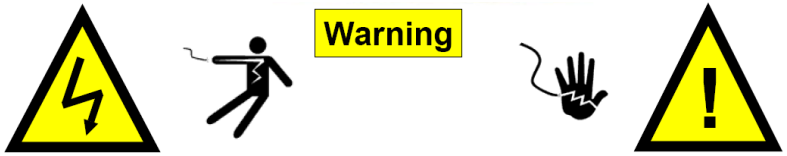
TriStar® VS Technical Guide

Version 1
Display Rev: 1.01
Comm Rev: 0.96
Drive Rev: 2.00.oz

Table of Contents

HAYWARD®

Safety Precautions



High Voltage Electrocution Hazard

- **Read and follow all instructions in the owner's manual and on the equipment. This guide does not supersede the owner's manual. Failure to follow instructions can cause severe injury and/or death.**

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

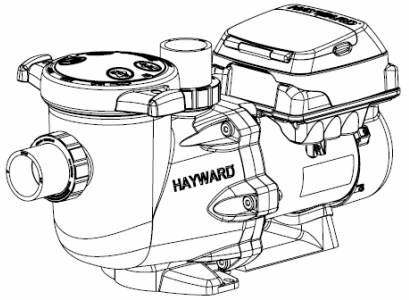
- **All electrical wiring MUST be in conformance with all applicable local codes, regulations, and the National Electric Code (NEC). Hazardous voltage can shock, burn, and cause death or serious property damage. To reduce the risk of electric shock, do NOT use an extension cord to connect unit to electric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

- **Failure to bond to bonding lug of drive to pool 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 drive. Also, contact a licensed electrician for information on local electrical codes for bonding requirements.**

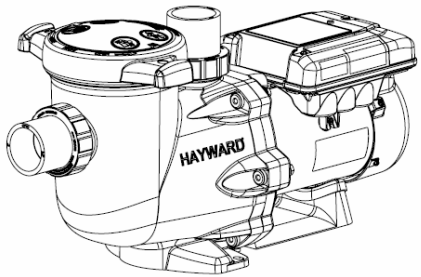
TriStar VS Overview

TriStar VS is available in the following two models:

- **TriStar VS SP3200VSP**, can operate by itself in Stand-alone Mode, or be controlled from third party controls and Hayward controls that are not software compatible, by using relay contacts and/or an actuator port. SP3200VSP includes a control interface on the pump. This model cannot communicate with controllers.



- **TriStar VS SP3200VSPND**, can communicate with and be controlled by Hayward automation systems, such as ProLogic or OnCommand controllers. SP3200VSPND does not have a control interface on the pump and a control interface cannot be installed on this model.

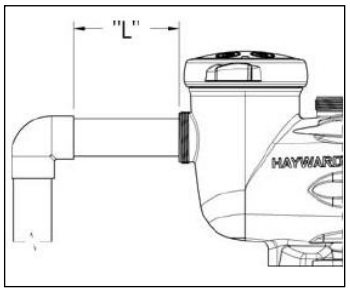


Installation - Plumbing

New Pools: When installing the TriStar VS on a new pool, care should be taken to ensure proper pipe and equipment sizing to handle the maximum flow required (fig 1).

Existing Pools: When installing the TriStar VS on existing pools, care should be taken to insure the maximum flow does not exceed the capacity of the pipe and equipment* (fig 1).

*** Refer to equipment manuals for flow rates.**



Note: Length of pipe (L) between pump suction port and first elbow or fitting should be at least 5 times pipe size.

MAXIMUM RECOMMENDED SYSTEM FLOW RATE BY PIPE SIZE			
1.5" Plumbing	**2" Plumbing**	**2.5" Plumbing**	**3" Plumbing**
38 GPM @ 6 fps 51 GPM @ 8 fps	63 GPM @ 6 fps 84 GPM @ 8 fps	90 GPM @ 6 fps 119 GPM @ 8 fps	138 GPM @ 6 fps 184 GPM @ 8 fps

Figure 1

Installation – SP3200VSP Electrical

1. Remove the two screws securing the control interface to the motor drive. (fig. 2)
2. Disconnect the cable that connects the motor drive to the interface. (fig. 3)
3. Loosen the three screws securing the interface mounting plate to the motor drive and remove the interface mounting plate to gain access to the drive wiring compartment. Note the screw location for re-installation. (fig. 4)
4. Disconnect the short cable on the interface mounting plate from the RS485 terminal block on the drive PCB. Note the screws on the RS485 face upwards. (fig. 5)

Figure 2

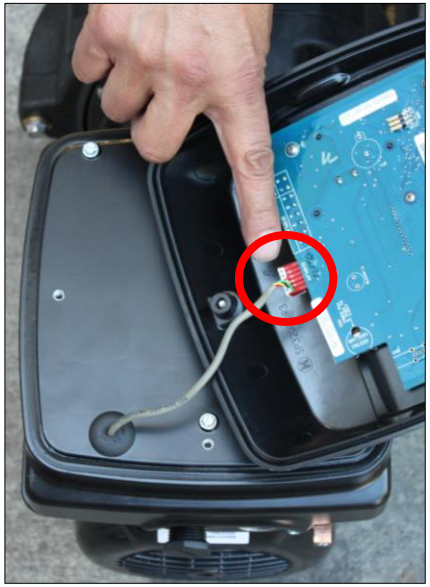


Figure 3

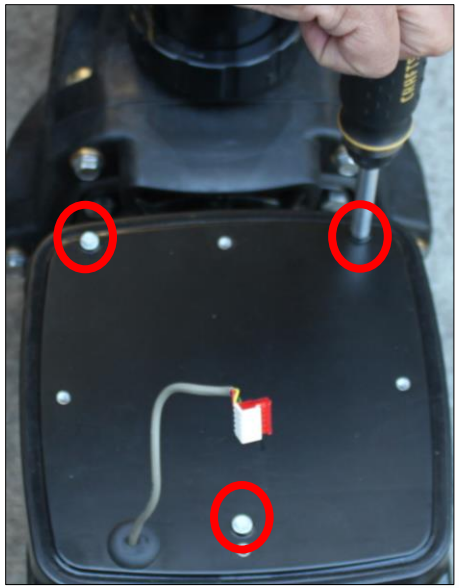


Figure 4

Figure 5

Installation – SP3200VSPND Electrical

1. Remove the screw securing the wiring compartment cover. (fig. 6 & 7)

Figure 6

Figure 7

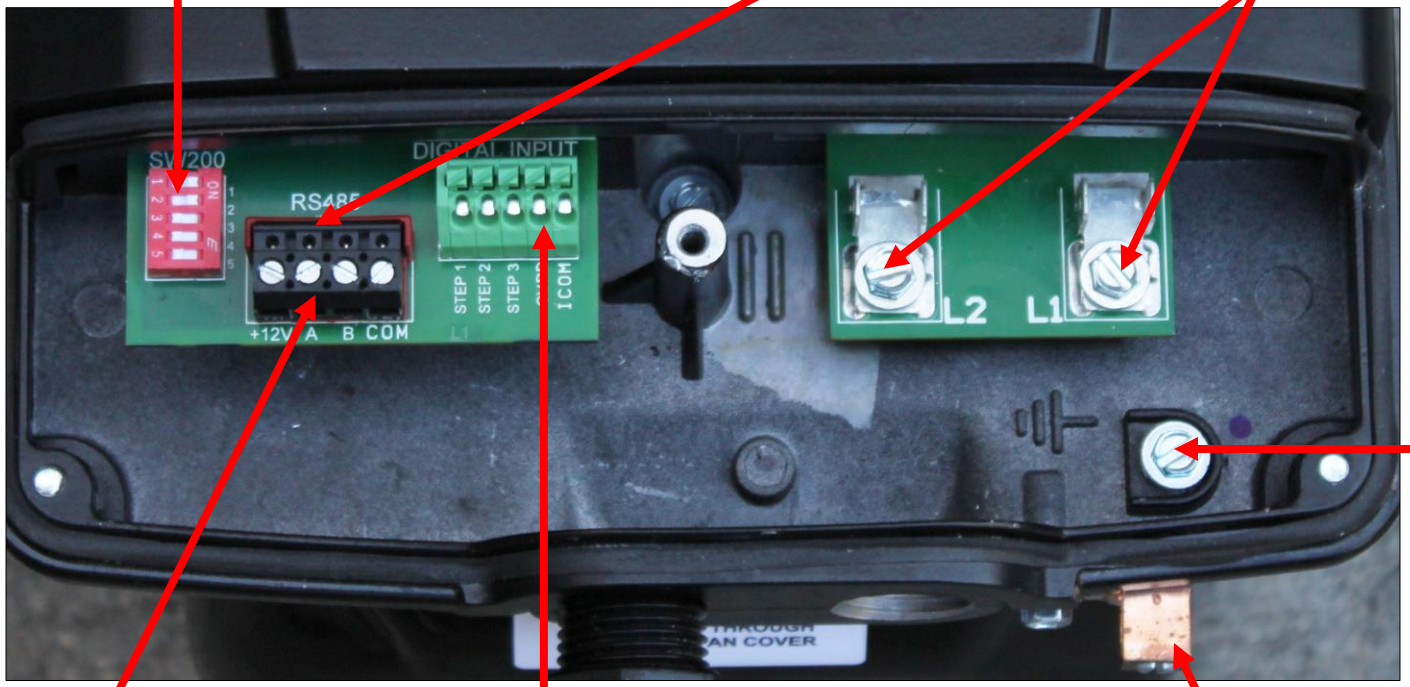
Installation – Electrical

Internal wiring locations (fig. 8)

Dip Switches for Pump Address (SP3200VSPND model only)

Wiring plug for wall mounted interface (SP3200VSP model only)

Wire connections for incoming line voltage (230v)



Ground Wire Terminal

Controller wiring for SP3200VSPND model.

External Speed Control connections for SP3200VSP model.

Bonding Lug

Figure 8

Installation–Interface removal/positioning

Figure 9

The interface assembly on model SP3200VSP can be configured in four different positions.

1. Remove the two screws as shown (fig 9).
2. Remove the interface assembly as shown (fig10).
3. Reposition interface assembly as shown (fig 11, 12, 13) and re-secure with the two screws (fig 9).

Figure 10

Figure 11

Figure 12

Figure 13

HAYWARD

Installation–Interface /Wall mount

SP3200VSP Models only

A wall mount kit (SPX3400DRKIT) can be used to remotely mount the interface. The kit includes a blank cover, mounting bracket, and new terminal block for connecting to the interface assembly. Maximum 500' for data cable used for wall mount or control connection.

1. Remove the interface assembly , interface mounting plate, and cable (Page 8).
2. Mount the wall mount plate in the desired location with the interface cable. (fig. 14)
3. Connect the interface cable to the motor drive RS485 (fig. 15) and interface PCB (fig. 16).
4. Mount the interface to the wall mount plate.
5. Install the blank cover on the motor drive (fig 17).
6. Dip Switches #1 & #2 on the drive must be "ON."

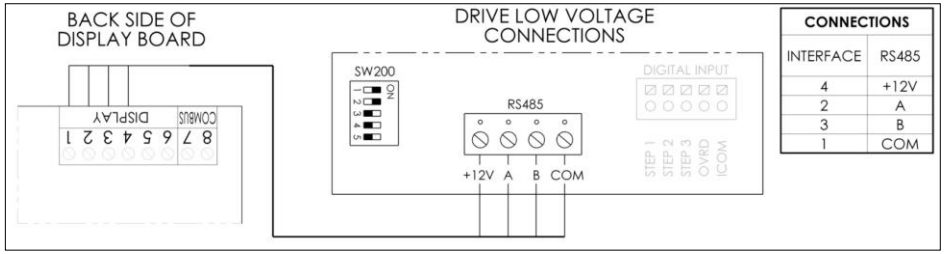


Figure 14

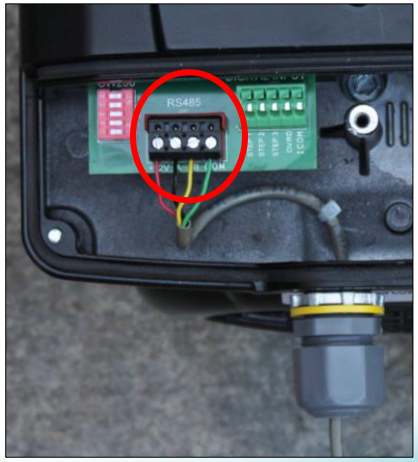


Figure 15

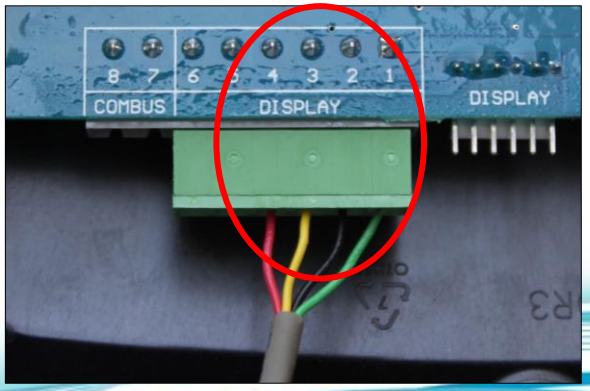


Figure 16

Figure 17

Installation-Hayward/Goldline Controls

SP3200VSPND Models only (Compatible software shown below)

Note: When connecting high voltage for a TriStar VS that is data connected to a Hayward/Goldline control, voltage needs to come directly from a breaker in the control, or in the case of an OnCommand, directly from the main or sub-panel and not from the filter pump relay.

1. Maximum 500' for data cable. The data cable needs to be run through the data conduit opening.
2. Remove the 4 connector data plug from the controller (fig 18) and the RS485 data plug (COMBUS & DISPLAY) from the wiring compartment on the pump (fig 19) . Wire "A" on the pump to 2 on the controller, "B" on the pump to 3 on the controller as shown (fig 18 & 19). Reinstall plugs.

Control Data Plug

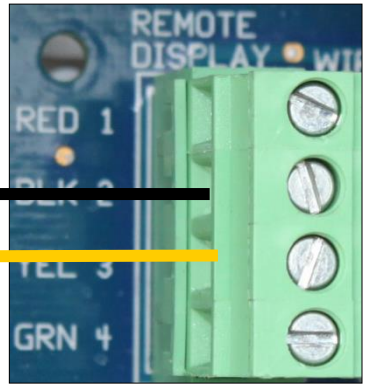


Figure 18

RS485 Pump Data Plug

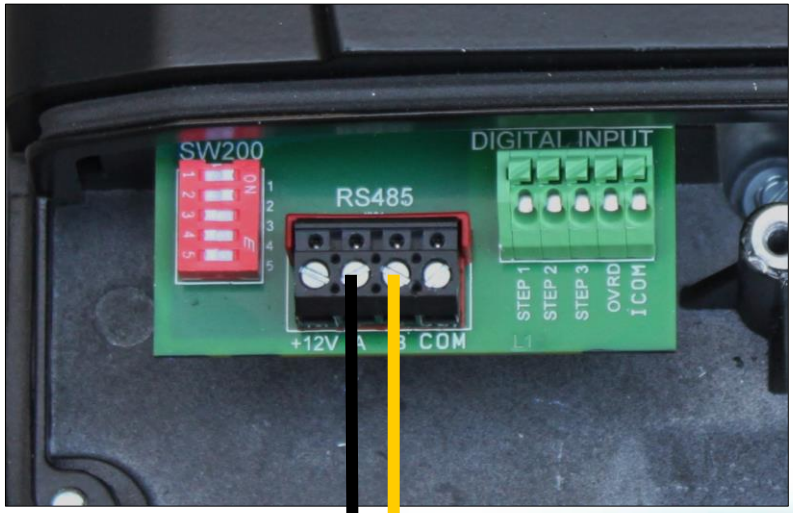


Figure 19

Installation-Hayward/Goldline Controls

SP3200VSPND Models only (Compatible software shown below)

Software versions necessary to operate the TriStar VSP SP3200VSPND	
Aqua Logic/Pro Logic/Aqua Plus v2.65 or higher	OnCommand 1.00 or higher
E-Command 4 (Original E-Command not compatible) v2.80 or higher	

3. The pump address must be set using the SW200 DIP switch on the drive PCB.

Note: If model of controller does not qualify based on the table above, then either the controller's main circuit board will need to be replaced or the SP3200VSP will need to be used in relay mode.

SW200 DIP SWITCH STATUS

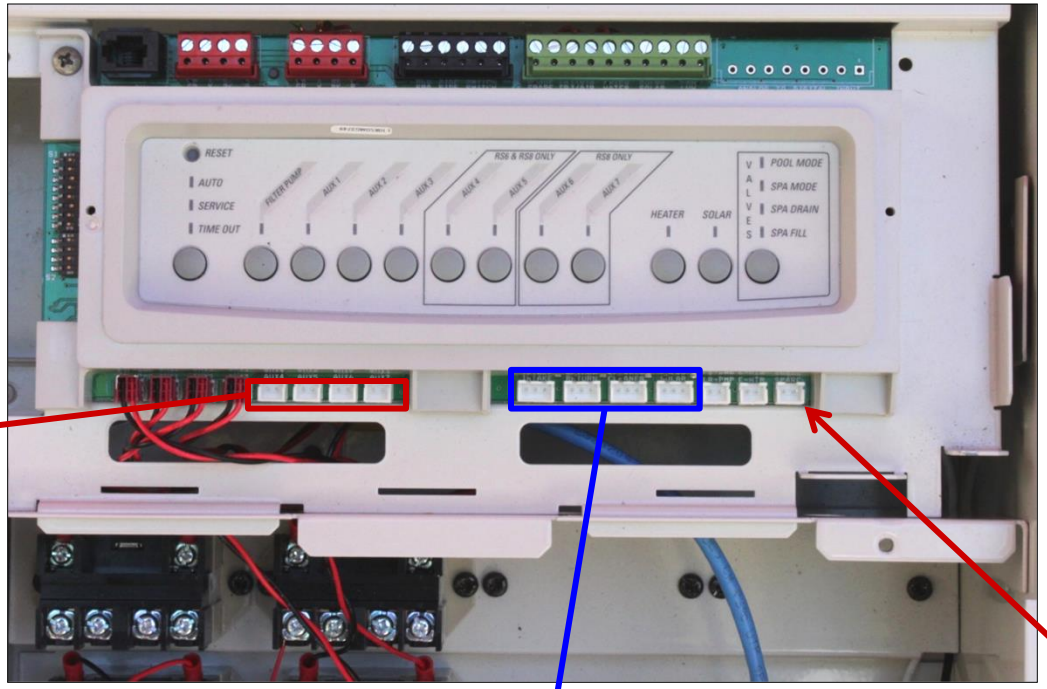
PUMP ADDRESS	#1	#2	#3	#4	#5
Pool Filter	OFF	OFF	OFF	OFF	OFF
Aux 1 / Spa Filter	OFF	ON	OFF	OFF	OFF
Aux 2	OFF	OFF	ON	OFF	OFF
Aux 3	OFF	ON	ON	OFF	OFF
Aux 4	OFF	OFF	OFF	ON	OFF
Aux 5	OFF	ON	OFF	ON	OFF
Aux 6	OFF	OFF	ON	ON	OFF
Aux 7	OFF	ON	ON	ON	OFF
Aux 8	OFF	OFF	OFF	OFF	ON
Aux 9	OFF	ON	OFF	OFF	ON
Aux 10	OFF	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

Figure 20

Installation–Valve Actuator Ports

(Jandy AquaLink to TriStar VS with Interface)

Port locations on Jandy AquaLink.



DC Relay ports (do not use).

Note: The photo to the left is one of the most common AquaLink in the field. Older or newer units may have the AC Actuator ports in a different position on the board. Some may only have three ports.

AC Valve Actuator Ports

Last 3 ports on right are DC

Installation–Valve Actuator Ports

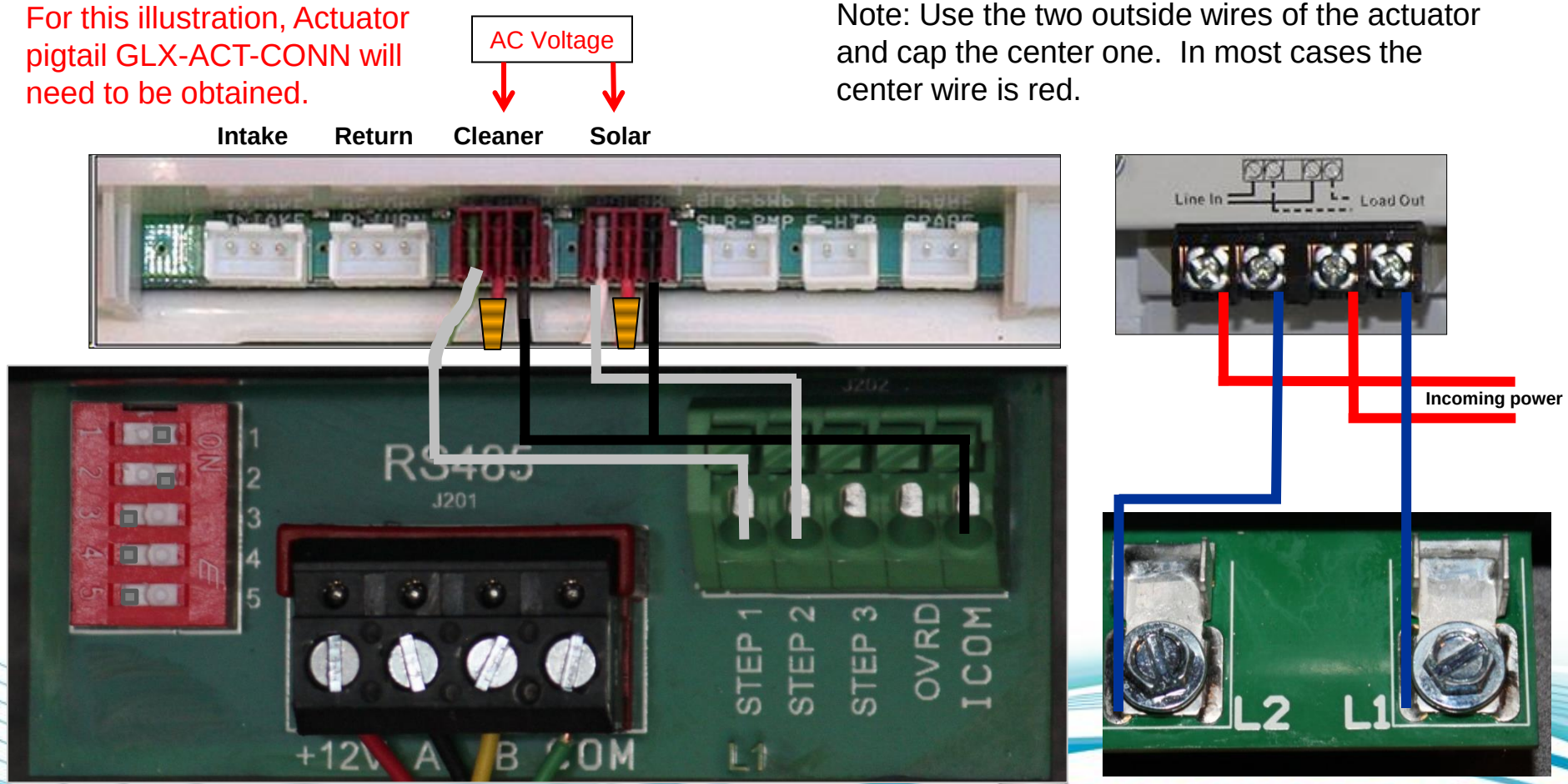
(Jandy AquaLink)

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.

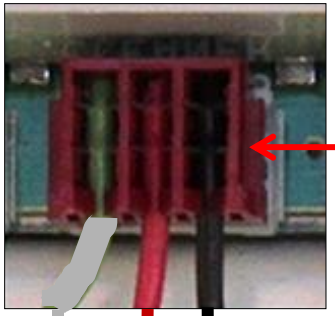


Installation–Valve Actuator Ports

(Jandy AquaLink)

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



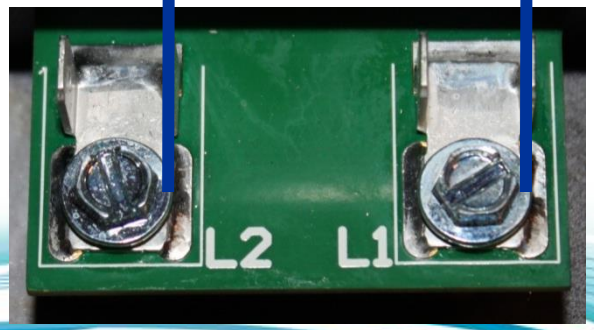
AC Voltage

(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

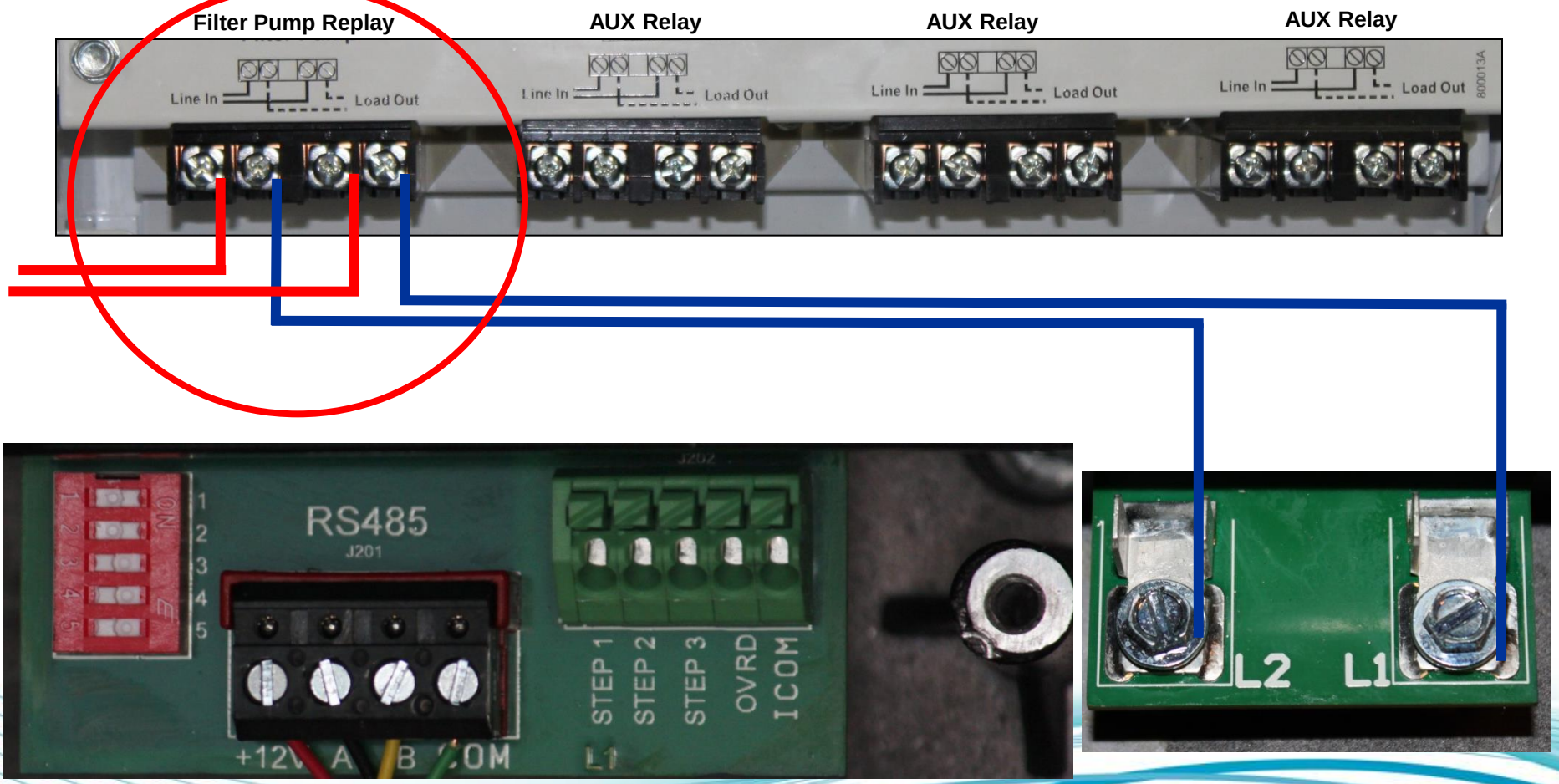
Incoming 230 VAC to Pump



Installation–Relay Connected Controls

(Non Hayward/Goldline third party controls)

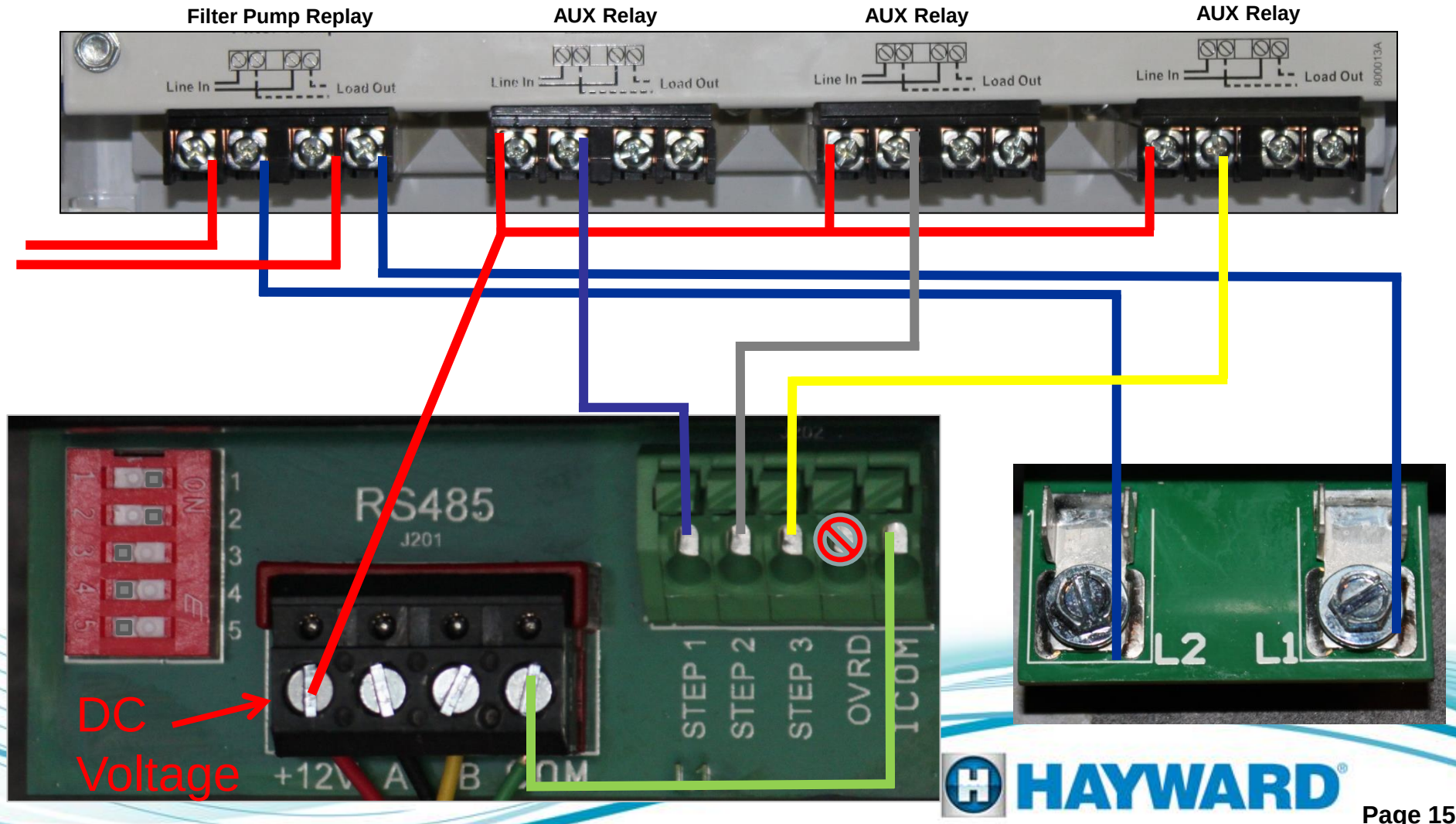
1. Pump power (230 VAC) needs to be brought into the “line in” contacts on the Filter Pump Relay from a breaker in the control box. The “load out” side will feed the incoming high voltage for the pump.



Installation–Relay Connected Controls

(Non Hayward/Goldline third party controls)

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.



Installation–Relay Connected Controls

(Non Hayward/Goldline compatible software & third party controls)

3. The number of speeds available depends on the number of aux relays used.
    - Filter pump relay plus 1 auxiliary relay allows control of 2 speeds.
    - Filter pump relay plus 2 auxiliary relays allows control of 4 speeds.
    - Filter pump relay plus 3 auxiliary relays allows control of 8 speeds.

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

Figure 21

Installation–Remote Stop Switch

1. **Wire the remote stop switch to terminals “OVRD” and “ICOM” on Digital Input block of pump.**

Note: The emergency switch needs to be a latching style that is normally open (NO). Some switches have wiring for both NO and NC (normally Closed). Refer to the e-switch for its internal wiring. When the switch is pressed the 24v circuit is completed and the pump will shut down operation.

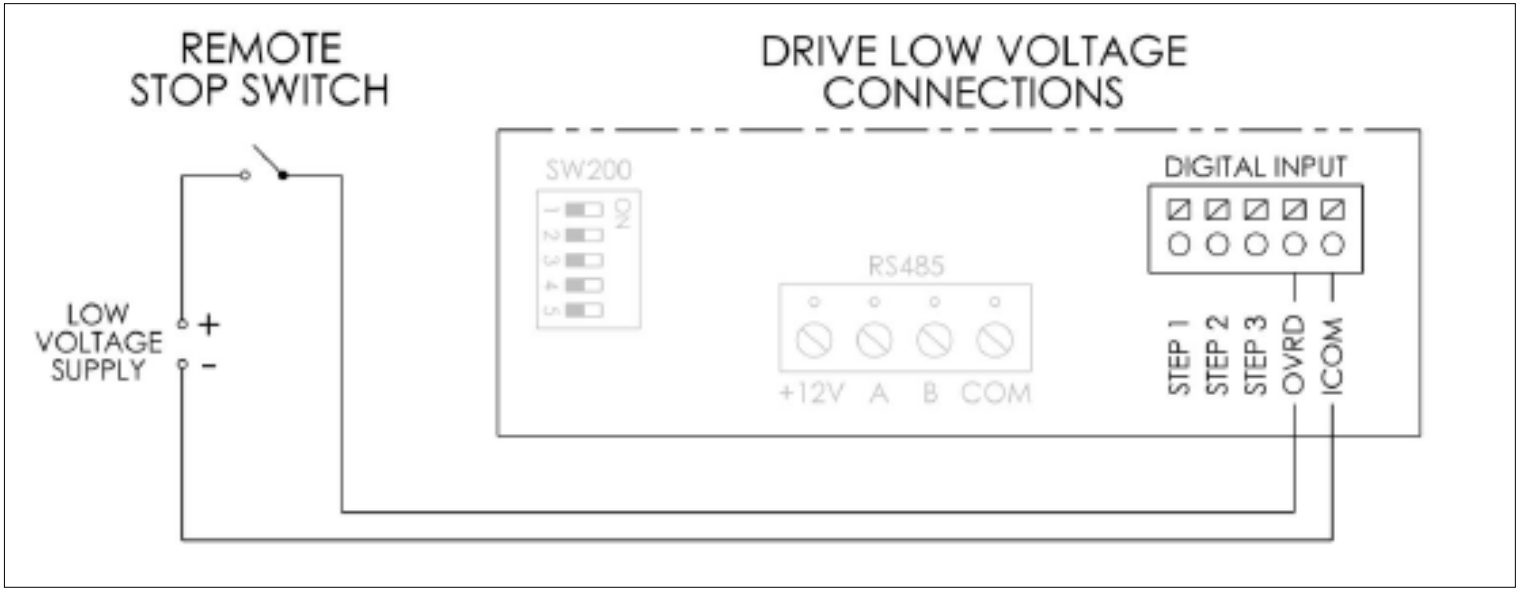


Figure 22

Remote stop switch purchased separately

Programming – User Interface

PRESET SPEEDS

4 buttons that can be programmed to run at a pre-determined speed for a certain length of time. LED illuminates when favorite speed is selected.

Default settings:
Speed 1 1000 RPM 29%
Speed 2 1750 RPM 51%
Speed 3 2500 RPM 72%
Speed 4 3250 RPM 94%

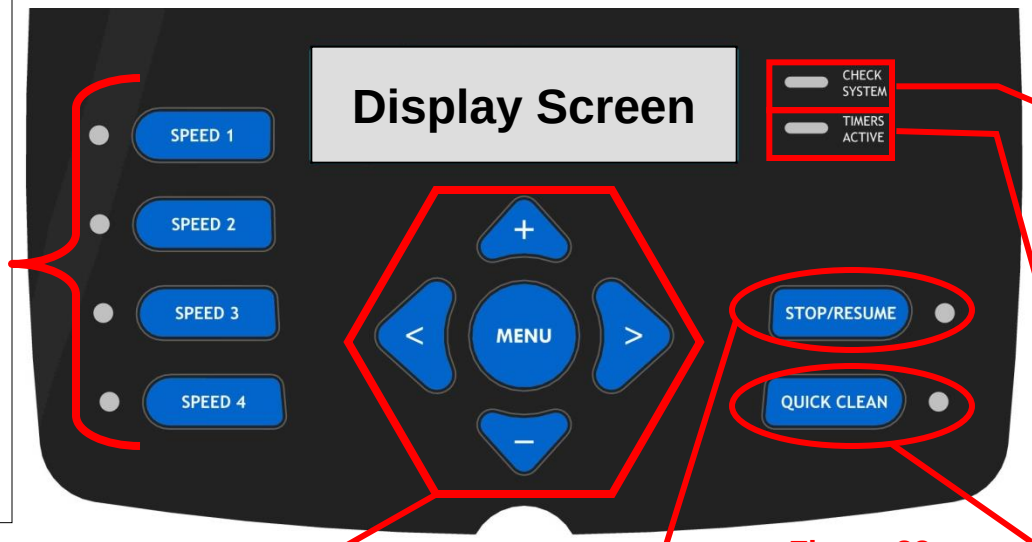


Figure 23

CHECK SYSTEM LED

LED will illuminate solid when there is an error condition.

TIMERS ACTIVE LED

LED will illuminate once the timers have been programmed., even if the pump is not running.

MENU/NAVIGATION BUTTONS

The MENU button will scroll through the setup menus when pressed. The < & > arrow buttons are used to move between displays and to select parameters to edit when in a specific setup menu. The + & − buttons are used to change the parameters.

STOP /RESUME

When pressed it will stop the pump for maintenance, end a favorite speed choice or end quick clean. Pressed again the pump will resume normal operations. LED will illuminate indicating the pump has stopped.

QUICK CLEAN

Elevates the speed of the pump to max set speed for one hour.

Programming

1. When power is supplied to the pump, the pump model will display, then the following screens (fig 24 & 25). Timer 1 will have default setting of 1750 RPM (50%), 7 days a week from 12:00 am – 11:45 pm.
2. Since timer 1 has a factory default setting the pump will come on and run until the timer is changed or set as off.
3. Press the MENU button (fig 25) to select the Configuration menu (fig 26).
3. Press and hold down the < & > buttons as shown to unlock and enter the Configuration menu (fig 26).

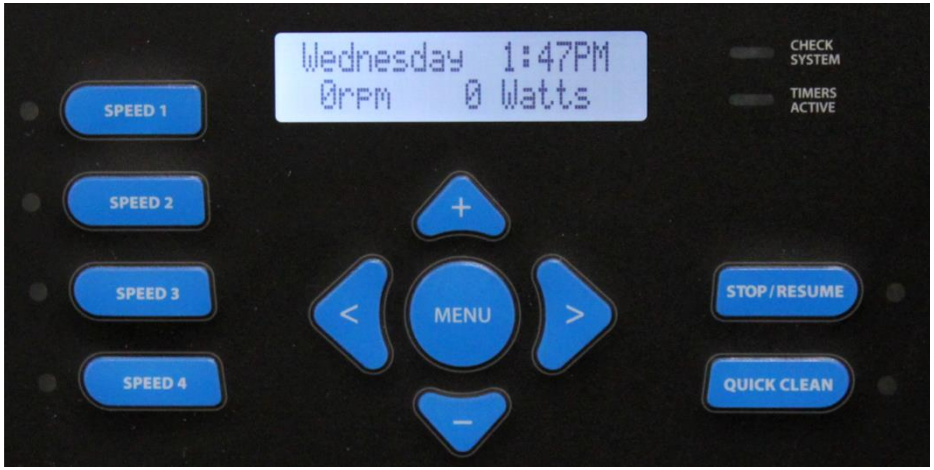


Figure 24

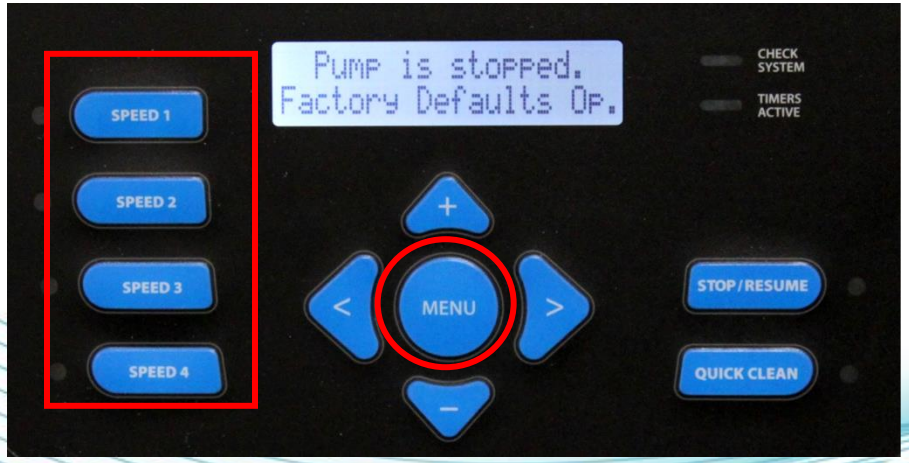


Figure 25

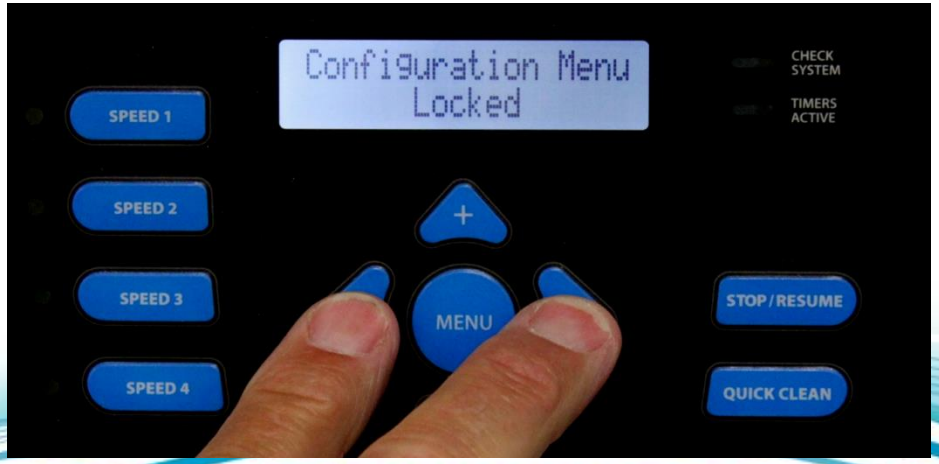


Figure 26

Programming-Configuration

4. On the next screen you will be asked to press the > button to enter the Configuration Menu (fig 27).

5. On the next screen it will tell you how to use the + & − buttons to adjust, and the > to go to the next item (fig 28). Press the > button to continue.

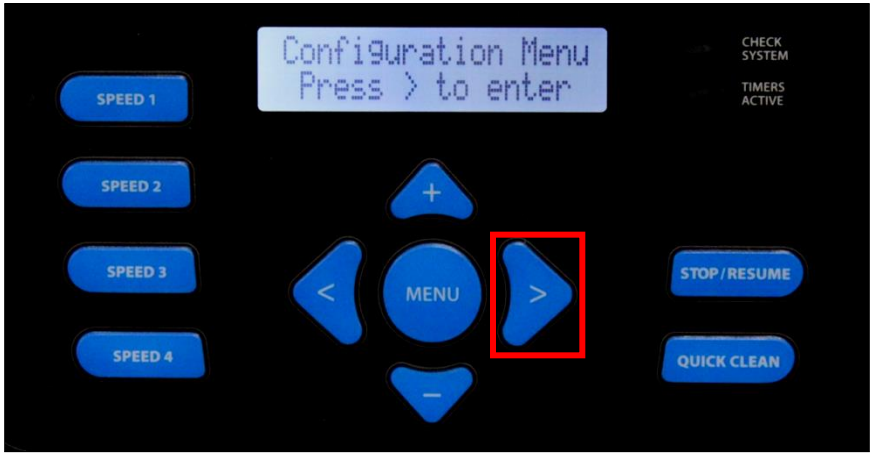


Figure 27

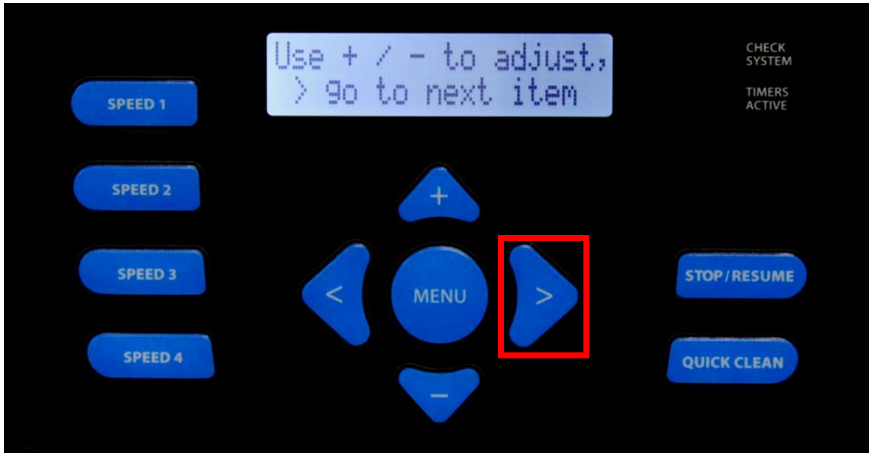


Figure 28

Programming-Configuration

6. This screen allows you to change the day and time by pressing the + button to access or skip by pressing the > button (fig 29).

7. You now Use the > button to highlight the day, hour, minute and AM/PM. Use the + & − buttons to change (fig 30). After setting the AM/PM press the > button to continue.

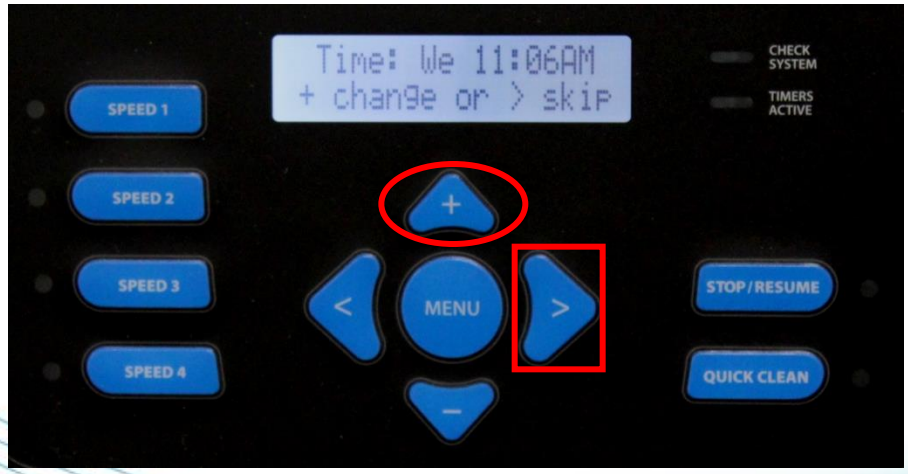


Figure 29

Figure 30

Programming-Configuration

8. You now select the speed indicator for RPM (revolutions per minute) or % of full speed (100% equals 3450 RPM) by pressing the + & − buttons (fig 31 & 32). The setting you select will be used throughout programming. Press the > button to continue.

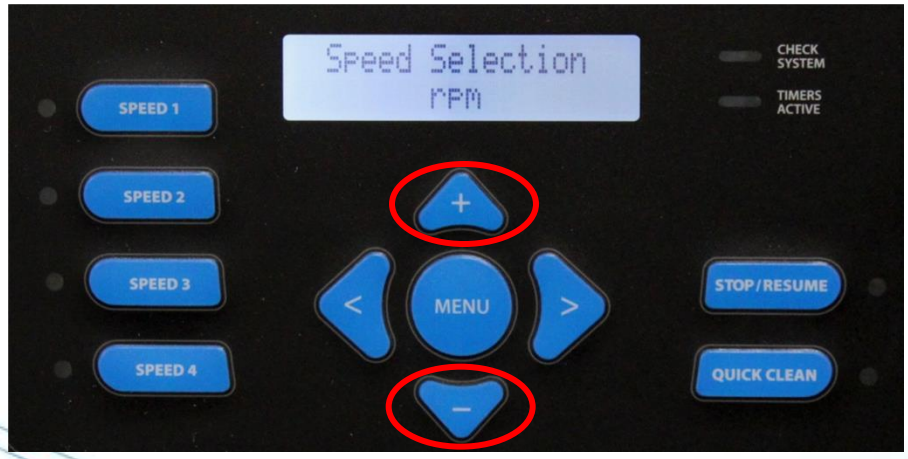


Figure 31

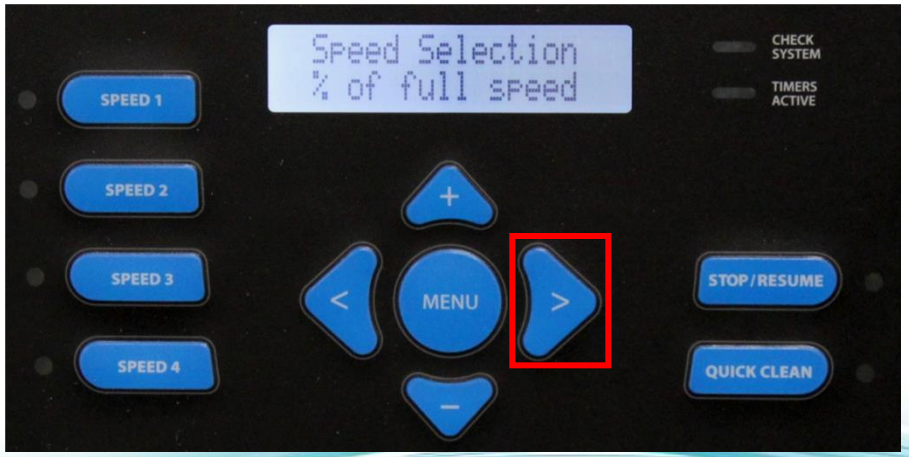


Figure 32

Programming-Configuration

9. You will now see the MAX allowed speed. You can set this from 600-3450 RPM or 17 to 100% by pressing the + & − buttons (fig 33). See page 3 for the max allowed flow for pipe.

10. You will now see the MIN allowed speed. Same as #10 above for setting speed (fig 34). Press the > button to continue.

Note: When hooked up to a Hayward/Goldline compatible software controls place the MIN and MAX settings at the lowest and highest settings respectively so as to not conflict with the setting within the controller.

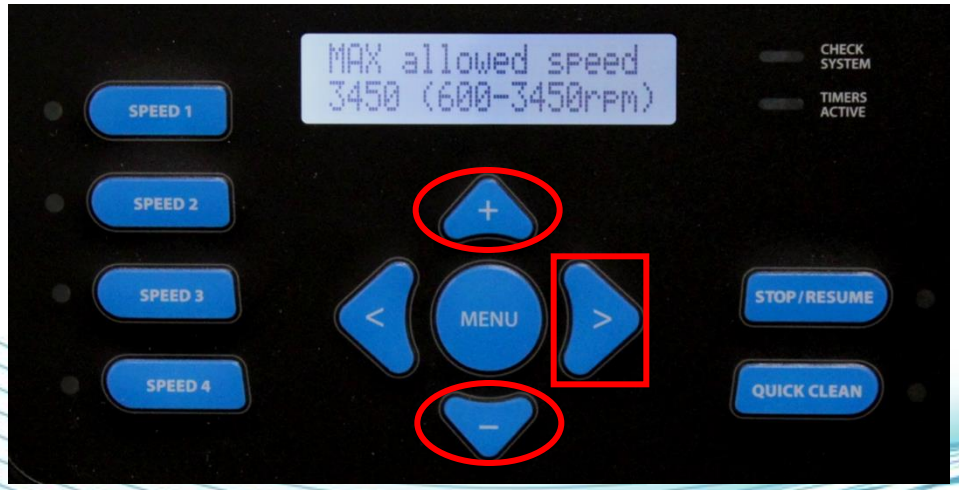


Figure 33

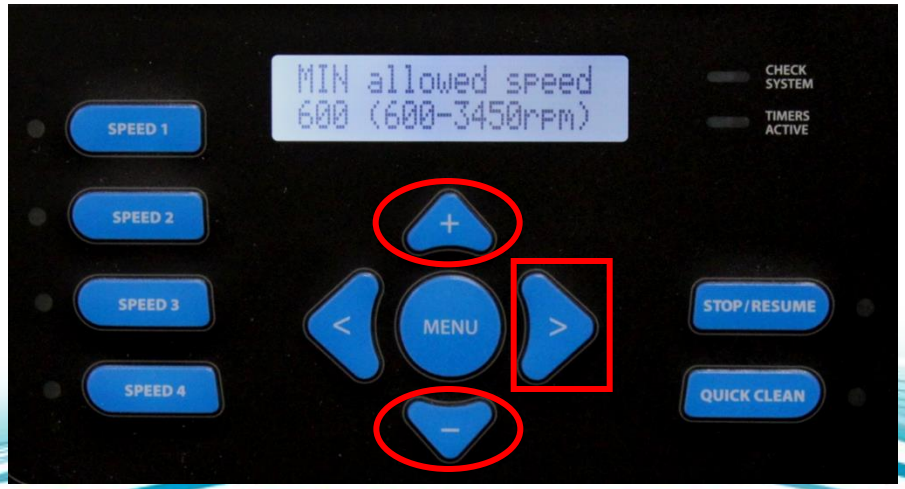


Figure 34

Programming-Configuration

11. You will now see the Prime Duration period. Press + & − buttons to change the duration in 30 second intervals. The default duration is 8 minutes, and can be set between 15 minutes and zero minutes (fig 35). Press the > button to continue.

12. You will now see the Remote Control Mode screen. Use the + & − buttons to toggle between Stand Alone (default) or Relay Control (other controls including third party models) (fig 36 & 37). Press the > button to continue .

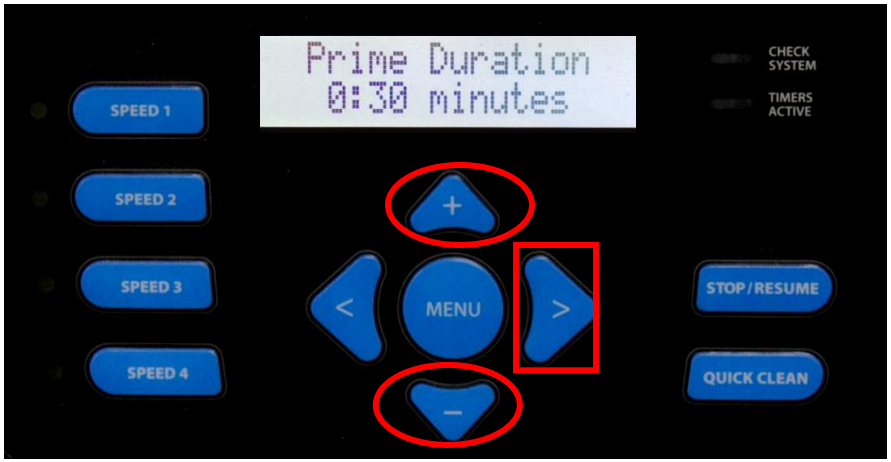


Figure 35

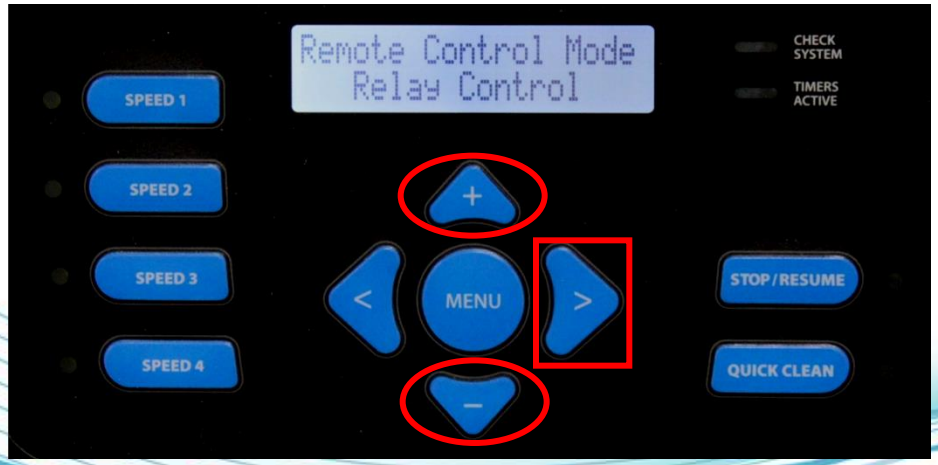


Figure 36

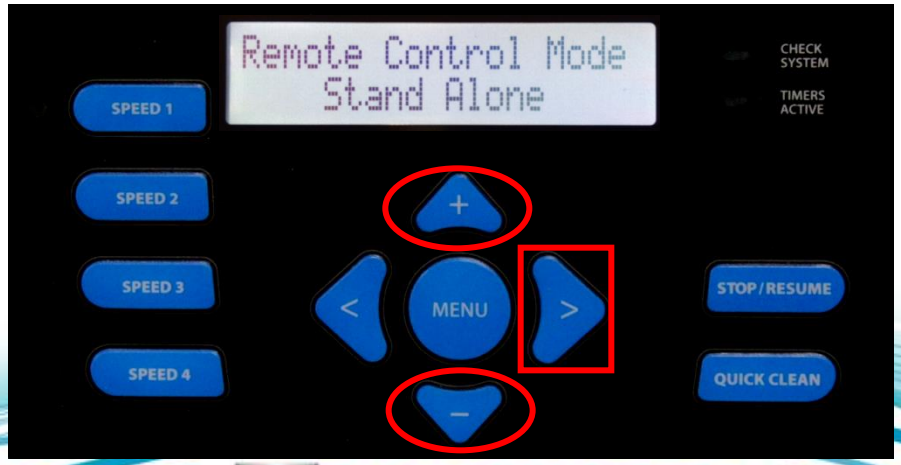


Figure 37

Programming-Configuration

15. If the pump is not being remotely controlled, you will be asked to enable or disable the Low Temp Operation (Default is Disabled) by pressing the + & − buttons (fig 38). Enabling this feature will turn on the TriStar VS, if stopped, to protect the drive . If enabled, you will be asked to set the temperature to activate the Low Temp Operation (fig 39). Press the > button to continue.

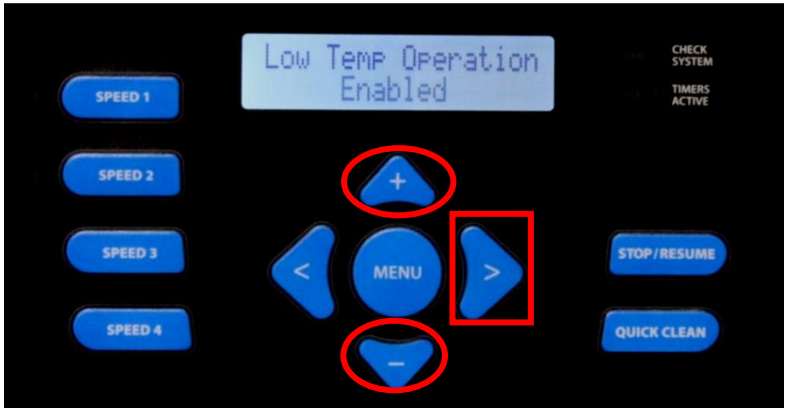


Figure 38

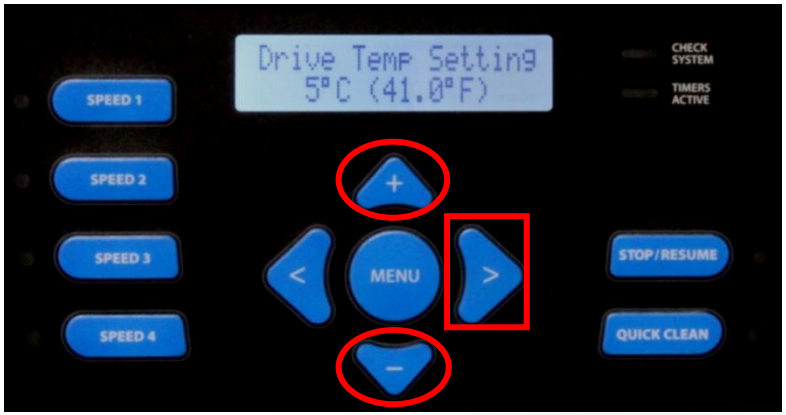


Figure 39

Programming-Configuration

18. At this point you will be asked if you would like to reset to the default parameters (factory settings) (fig 40). If yes, press + and confirm on the next screen. If no, press the > button to continue (fig 41).

19. If the Relay Control or the Stand alone feature is being used the timer menus would be the next to program. There will be a screen telling you to use the timers mode to set or change time clock perimeters. Press the > button to continue.

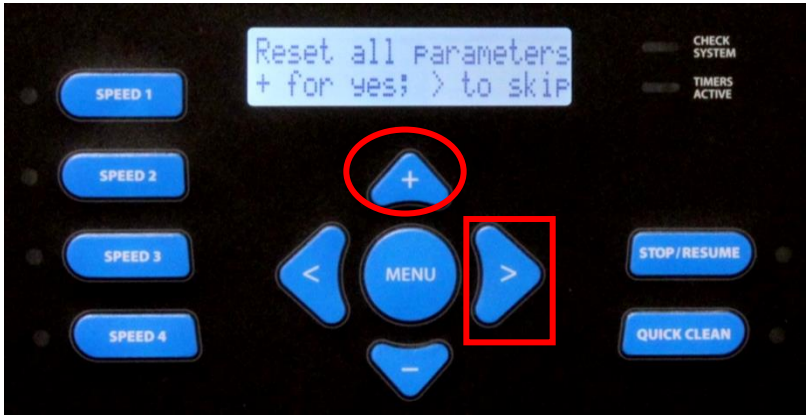


Figure 40

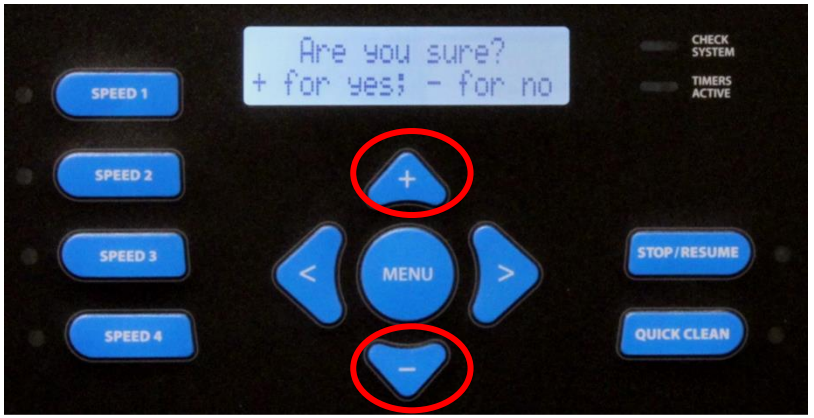


Figure 41

Programming-Timers

Stand alone/Hayward	Stand alone:	Both times and speeds need to be set.
	Compatible Software controller:	No timer or speed settings necessary. Dip Switch needs to be set.
Relay Control	Only requires that speed be set as relays on controller will start and stop pump.	

Note: All speed settings in the timer menu are limited to the Max Settings set in Configuration.

1. Press the MENU button until you see the Timers Menu (fig 42). Press the > button to continue.
2. Timer 1 will be factory set to 1725 rpm (50%), 7 day operation from 12 am to 11:45 pm (fig 43). This is used to run the pump if the data link fails on control connected pumps. Timer 1 can be changed as needed. Timer 1 can also be set to 0 rpm when relay controlled.

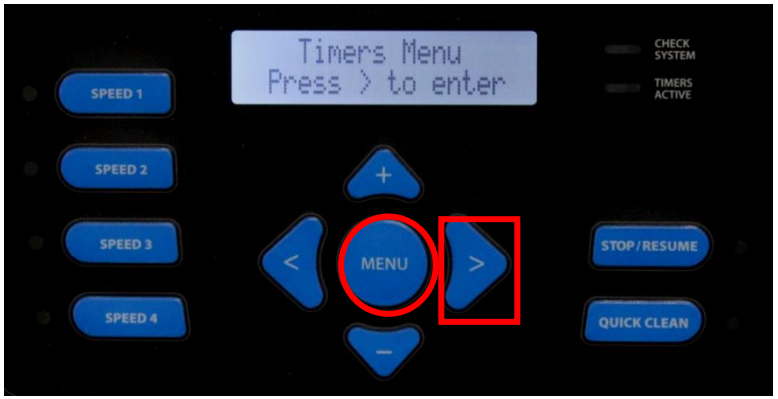


Figure 42

Figure 43

Programming-Timers

3. This screen (fig 44) will alternate with fig 43 on the previous page. This screen tells you to use the + button to modify the timer setting or the button > to go to the next timer.

4. This screen allows you to rename Timer 1 to match a selection including; Cleaner, Water Feature, Clean, etc by pressing the + & − button (fig 45). Press the > button to continue.

5. This screen will allow you to adjust the speed setting from 600 RPM (17%) to 3450 RPM (100%) by pressing the + & − buttons (fig 46). Press the > button to continue.

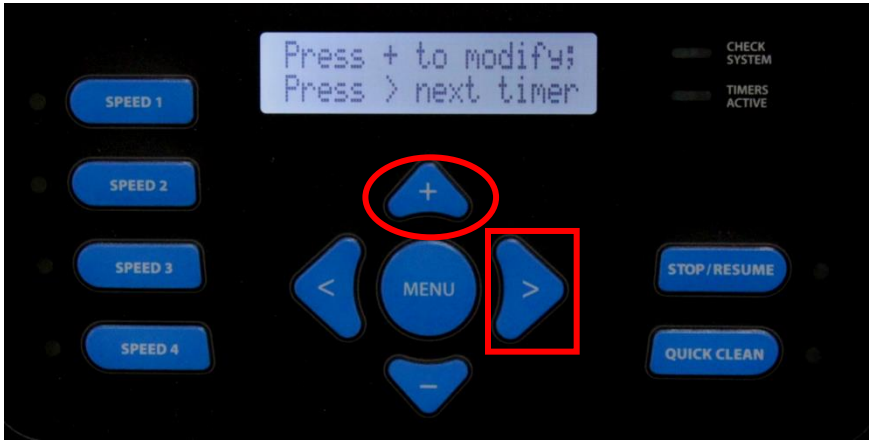


Figure 44

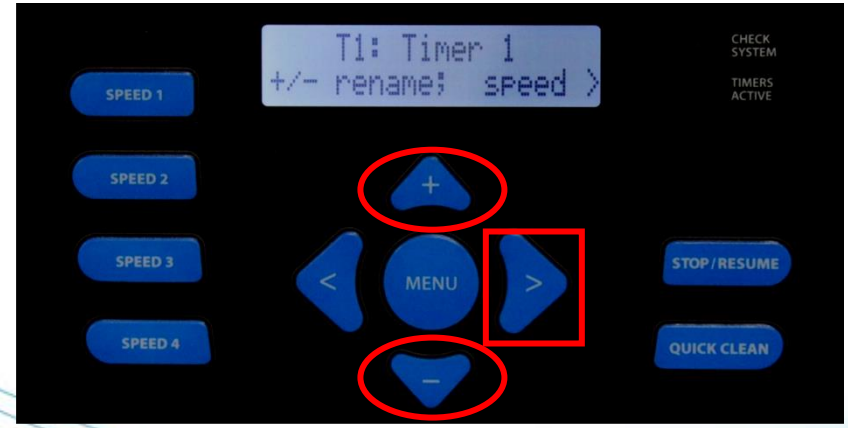


Figure 45

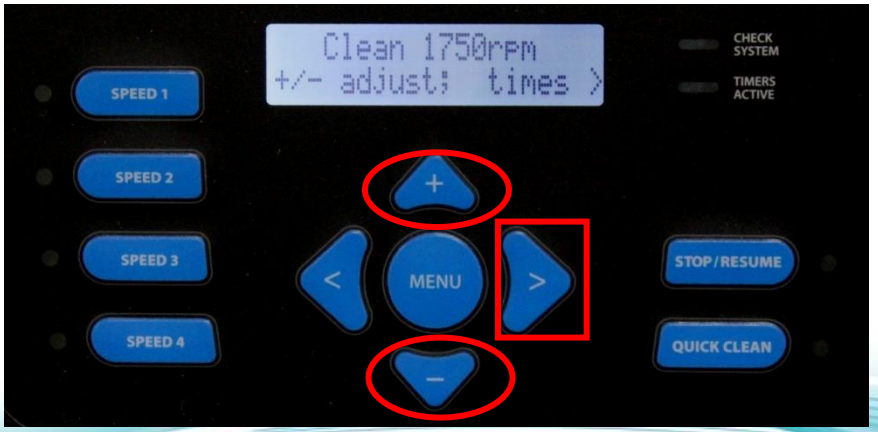


Figure 46

Programming-Timers

6. This screen will allow you to change the start and stop time for the specific timer. Start time will be blinking, press the + & − buttons to change. Press the > button to change the stop time, also using the + & − buttons (fig 47). Press the > button to continue.

7. This screen will allow you to choose the days this timer will be active. You can choose an individual day, 7 day or 5 day by using the + & − button (fig 48). Press the > button to continue to the next timer.

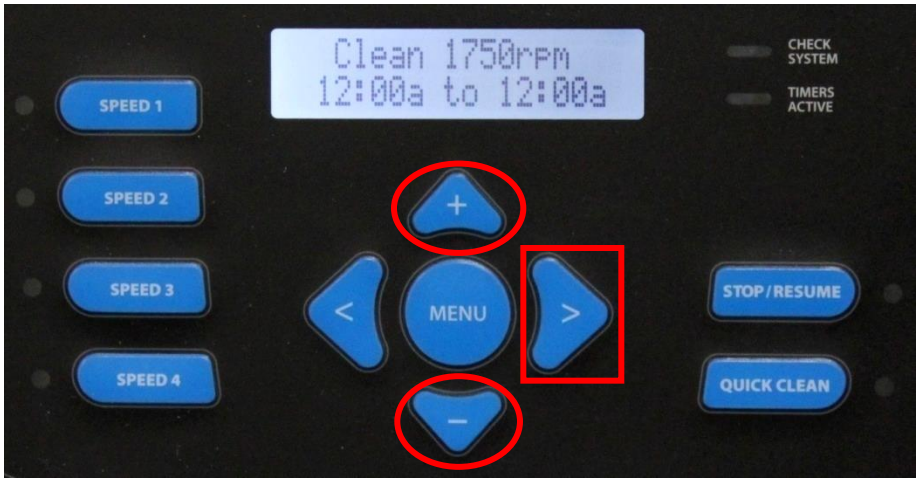


Figure 47

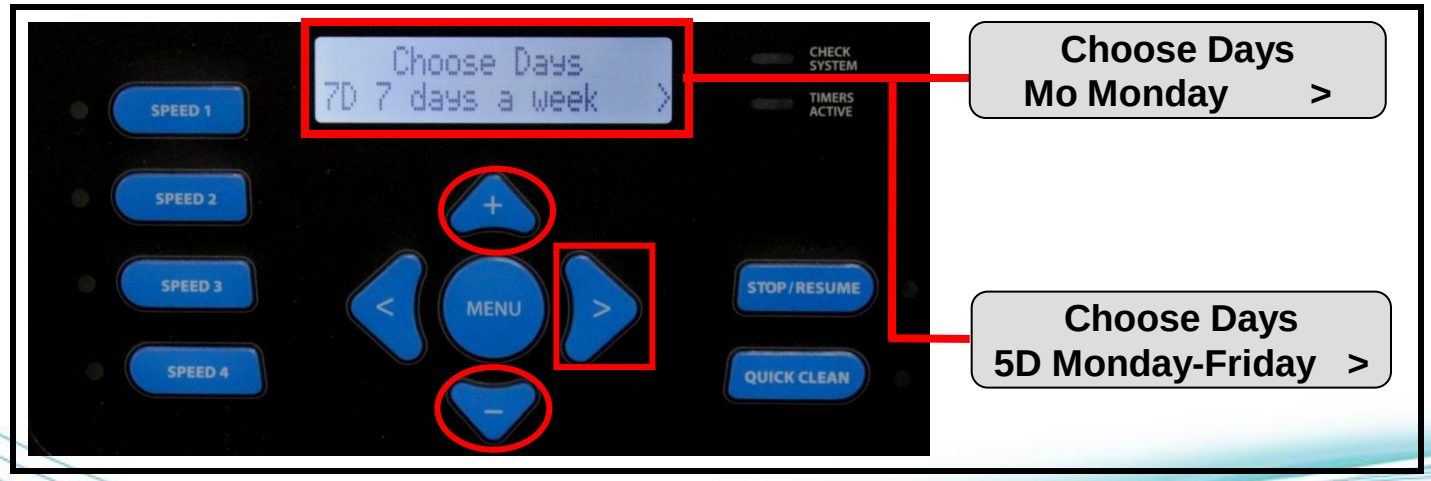


Figure 48

Note: There are 8 timers available. The lower numbered timer will be the most dominate. If setting one timer to cover low speed for overall time period, make it timer #8 as it is the least dominate.

Setting the start and stop time the same will disable that timer and show that it is off.

Programming - Speeds 1-4

1. Press the MENU button until Speeds Menu appears (fig 49). There are four (4) Speed buttons that can be set. Press the > button to enter Speeds Menu.
2. Pressing the + & − buttons allows you to select a variety of names to apply to this Speed button (fig 50). Press the > button to continue.
3. While in this screen you can change the speed duration from 30 minutes to 12 hrs in 30 minute increments by pressing the + & − button (fig 51). Press the > button to continue.

Note: The timers active light is now on as the timers have been set per previous steps.

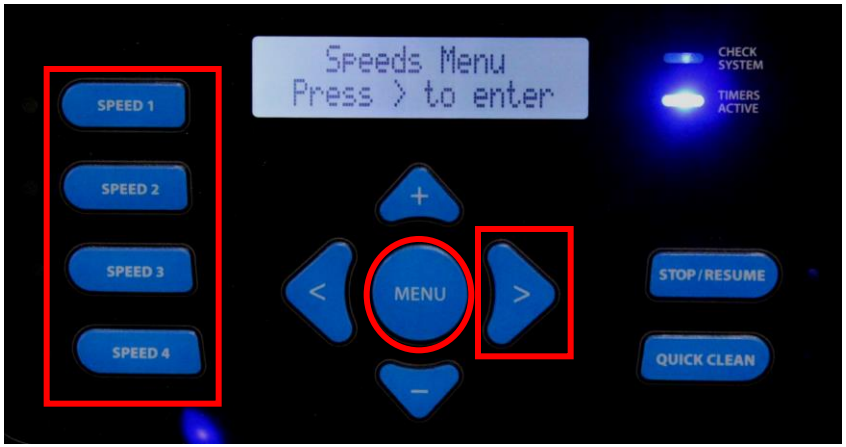


Figure 49

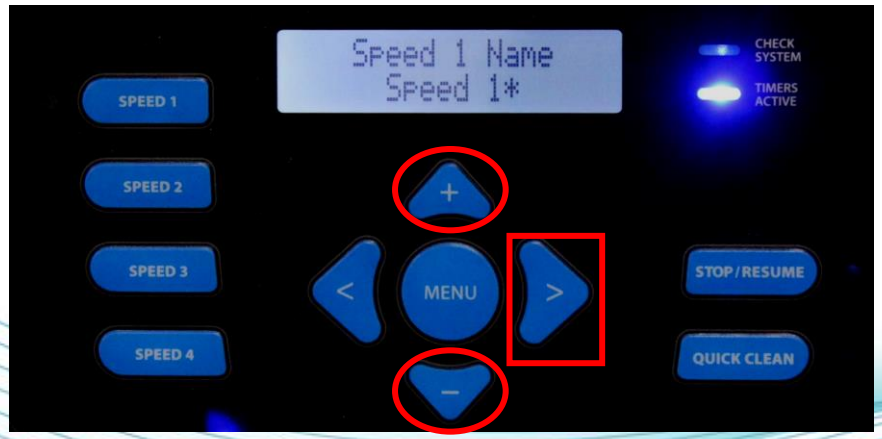


Figure 50

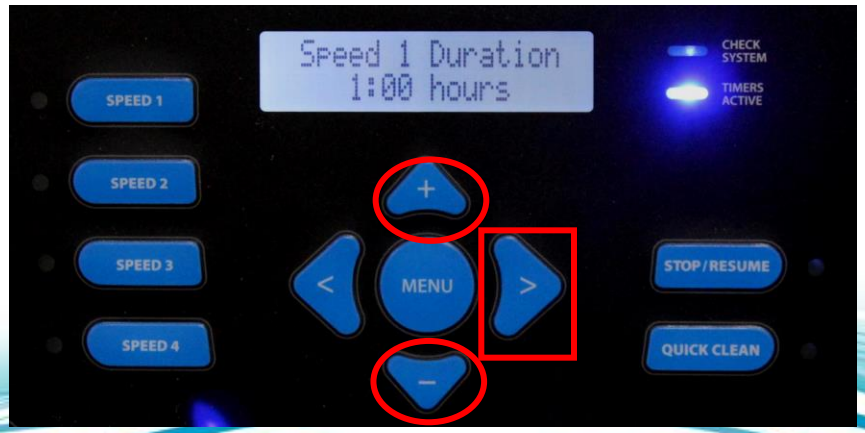


Figure 51

Programming - Speeds 1-4

4. While in this screen you can set the speed from 600 RPM (17%) to 3450 RPM (100%) by pressing the + & − button (fig 52). Press the > button to continue.

5. You can now set Speed 2, 3 & 4 following the directions for Speed 1. After Speed 4 is set press the MENU button to continue.

Note: Refer to page 33 for instructions on speed changing while operating speeds.

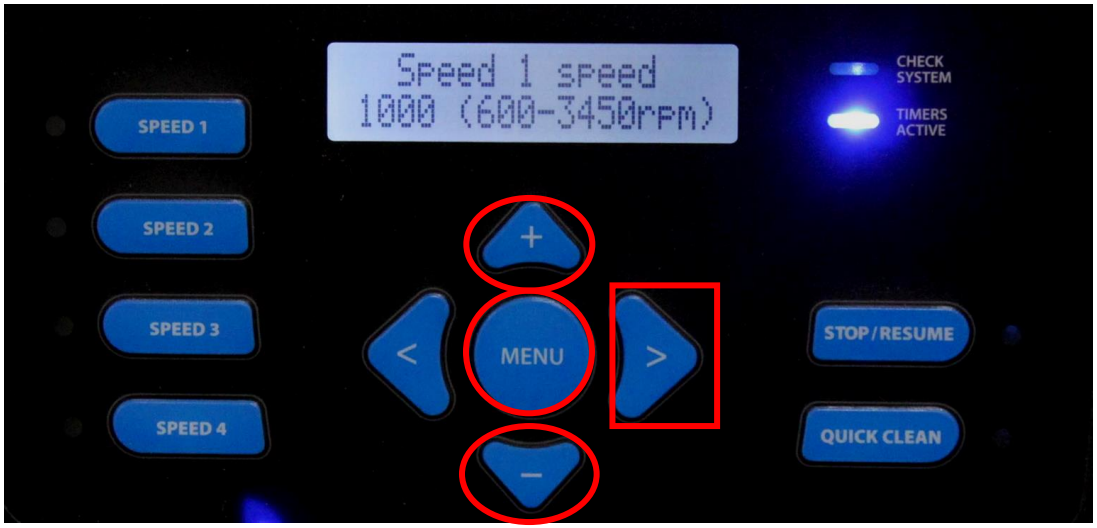


Figure 52

If at any time during settings for any menu item you press the menu button, you will be asked to confirm any changes.

Operation

1. Once configuration is completed and 1 or more timers are set, the pump will begin to operate, as long as one or more of the timer settings matches the current time.
2. If the timer setting does not match the current time, the pump will not start unless one of the speed buttons or the quick clean button is pressed.
3. When the pump starts it will go into the prime mode selected during configuration, prior to the speed selected or timed.
4. The consumption in watts will show on the display while the pump is running.

Operation

PRESET SPEEDS

Any time one of the speed buttons is pressed it will go to the speed and duration that was set in the Speed Setup Menu. Each subsequent pressing of the speed button will add the preset speed time up to 12 hrs maximum.

Pressing the '+' or'-' key during a speed choice will raise or lower the speed. To save the speed, press the '>' key when prompted. If not saved, the speed setting will revert back to the original setting when it expires.

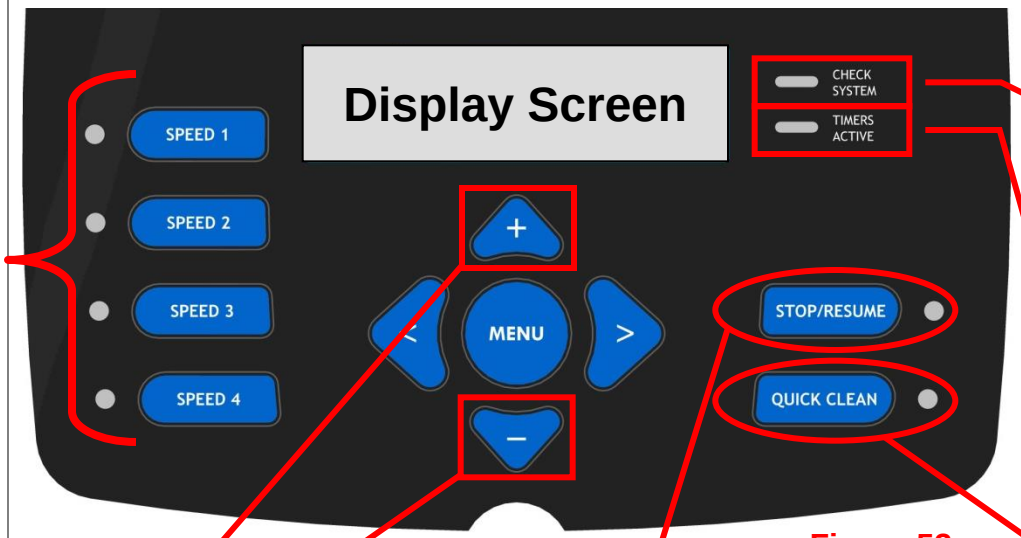


Figure 53

CHECK SYSTEM LED

LED will illuminate solid when there is an error condition.

TIMERS ACTIVE LED

LED will illuminate once the timers have been programmed. Even if the pump is not running.

STOP RESUME

When pressed it will stop the pump for maintenance, end a favorite speed choice or end quick clean. Pressed again the pump will resume normal operations. LED will illuminate indicating the pump has stopped.

QUICK CLEAN

Elevates the speed of the pump to the maximum set speed for cleaning.

Programming Scenarios

Below is one possible Stand Alone scenario.

Timer 8: Pump comes on at 6 am and goes off at 5:45 am
Set to run the entire timing sequence at the low speed setting.

The lower the timer number the higher the priority. In other words, timer 1 will override timer 8 settings if they are set over each other.

6 am — 9 am → 12 noon — 1 pm → 3 pm — 5:45 am

Timer 1: At 9 am pump kicks into the speed needed for cleaner to operate. Goes back to timer 8 speed at 12 noon.

Timer 2: At 1 pm pump kicks into speed needed for solar operation. Goes back to timer 8 speed at 3 pm.

Speed settings can be set to meet spa jet or any water feature requirement.

HAYWARD®

Diagnostics

1. Press the Menu button until the Diagnostic screen appears (fig 54). This menu provides important information about the performance of the pump that can be used during troubleshooting. Below are the different screens and their meaning. These are all real-time displays. Press the > button to view information.

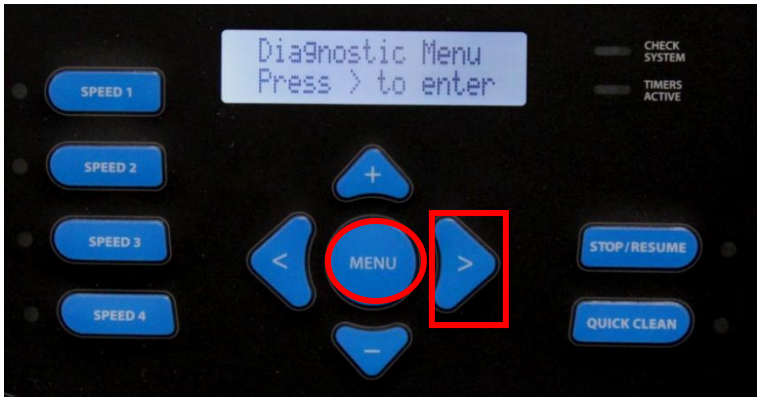


Figure 54

Display Revision 1.01 ← Displays the firmware revision of the display PCB.

Drive Serial Number DET-3581200032 ← Displays motor drive serial #.

Comm Rev: 0.96 Drv Rev: 2.00 ← Displays firmware revisions of the motor drive and drive communication PCBs.

DC Bus Voltage Within Range ← Displays status of internal DC bus voltage.

Motor Current 1.1A (8.5A Max) ← Real-time display of motor input current.

Power Usage 225W (1700W Max) ← Estimated Real-time display of pump power usage.

Drive Temperature 67° C (110° C Max) ← Real-time display of motor driver temperature.

Event Log Press + to View ← By pressing the + button you will see the last 20 errors and or trip conditions, as well as the amount of time that has elapsed since the condition occurred.

Troubleshooting/Fault Codes

This guide will cover only those problems with the VSC and Motor. All other pump problems, including seals, gaskets, impellers, etc., along with priming problems are addressed in the owners manual.

Do not attempt to remove the drive from motor, or service the motor.

The EcoStar display is not compatible with the TriStar VS.

For each code or fault, always reboot the pump to attempt to clear the error code or fault first.

Code/Fault	Indications
Drive Error! **Drive is Overheated**	Indicates that the internal components of the drive have become overheated. Motor airflow path should be checked. Check fan and shroud for blockage.
Drive Error! **Processor failed**	Indicates that there is a problem with the processor in the motor drive, and that the motor drive may need to be replaced.
Drive Error! **Drive Overload**	Indicates that the motor is drawing excessive current. Check impeller, diffuser and shaft seals for issues.

Troubleshooting/Fault Codes

Code/Fault	Indications
Drive Error! **Keypad stuck**	Indicates that one of the interface buttons has been pressed for more than 2 minutes, and that the interface may need to be replaced. With power off, press the buttons repeatedly to attempt to unstick.
Drive Error! **DC Voltage low**	Indicates that the DC bus voltage has dropped below 230 VDC and pump stops. Check incoming line voltage (page 6) and verify that it is within 10% of pump rated voltage.
Drive Error! **DC Voltage High**	Indicates that the DC bus voltage has risen above 400 VDC and pump stops. Verify that line voltage is within 10% of pump rated voltage.
Drive Error! **Motor phase lost**	Indicates that one of the motor phases is open and that the motor may need to be replaced.
TriStar VS is connected to a GL/Hayward control. Control reads "Pool bridge comm"	This indicates interference on the comm. ground between the control and TriStar VS. This is caused by frequency noise emitted from the pump drive. It travels on the comm. ground and AC ground wire and interferes with the commands being sent from the control.

Troubleshooting/Fault Codes

Code/Fault	Indications
Drive Error! Comm failed	Indicates that there are communication problems inside the motor drive, and that the motor drive may need to be replaced.
Drive Error! Memory Failed	Indicates that the drive memory has been damaged or corrupted and drive needs to be replaced.
Drive Error! Unknown opcode	Indicates that the drive software has been corrupted, and that the motor drive may need to be replaced.
Drive Error! Startup failed	Indicates that the drive was not able to start the motor. Check impeller, diffuser, shaft seal, and motor for issues.
Drive Error! Unknown error	Indicates that the interface is receiving an error from the motor drive that it does not understand.
The breaker is tripping.	Check input wiring and breaker. If still tripping breaker, replace drive and motor.