Installation, Operation, and Service Manual

BADU® EcoMV (2.7 THP)

Swimming Pool Pump

SPECK pumps

Table of Contents

1	*Pump Manual*	*3-8*
2	*Motor Manual*	*9-47*

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Fax: 904-737-5261

Website: www.usa.speck-pumps.com
Email: technical.usa@speck-pumps.com

Date of Installation:	
Installed by:	
Serial Number:	
For Service Call:	

SAVE THESE INSTRUCTIONS!

Rev 07/2017

OWNER'S MANUAL

Swimming Pool and Spa Pump

SPECK pumps

READ THIS MANUAL CAREFULLY

BEFORE USING THE SPECK PUMP

Important Notice: This manual contains important information about the installation, operation and safe use of this product. This information should be given to the owner and/or operator of this equipment.

WARNING: *This product must be installed and serviced by a qualified pool professional, and must conform to all national, state, and local codes.*

WARNING: *Before installing this product, read and follow all warning notices and instructions which are included. Failure to follow safety warnings and instructions can result in severe injury, death, or property damage. Call (800) 223-8538 or visit www.usa.speck-pumps.com for additional copies of these instructions.*

IMPORTANT SAFETY INSTRUCTIONS

When installing and using this electrical equipment, basic safety precautions should always be followed, including the following:

1. **READ AND FOLLOW ALL INSTRUCTIONS.**

2. ***WARNING*** - To reduce the risk of injury, ***DO NOT*** permit children to use this product unless they are closely supervised at all times.

3. ***WARNING*** - Risk of Electrical Shock. Connect only to a branch circuit protected by a ground-fault circuit interrupter (GFCI). Contact a qualified electrician if you cannot verify that a circuit is protected by a GFCI.

4. ***WARNING*** - To reduce the risk of electric shock, replace any damaged cord immediately.

5. ***DO NOT*** install within an outer enclosure or beneath the skirt of a hot tub or spa.

6. ***CAUTION*** - This pump is for use with permanently-installed pools and may also be used with hot tubs and spas if so marked. ***DO NOT*** use with storable pools. A permanently-installed pool is constructed in or on the ground or in a building such that it cannot be readily disassembled for storage. A storable pool is constructed so that it is capable of being readily disassembled for storage and reassembled to its original integrity.

7. 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 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.

8. **TO REDUCE RISK OF ELECTRICAL SHOCK**, A copper bonding connector (8 AWG) is provided for bonding the motor to all metal parts of the swimming pool, spa, or hot tub structure and to all electrical equipment, metal conduit, and metal piping within 5 feet of the inside walls of a swimming pool, spa, or hot tub, when the motor is installed within 5 feet of the inside walls of the swimming pool, spa, or hot tub.

NOTE: To installer and/or operator of the Speck Swimming Pool Pump; the manufacturer's warranty will be voided if the pump is improperly installed and/or operated.

9. **SAVE THESE INSTRUCTIONS!**

SECTION 1 EQUIPMENT OPERATION AND MAINTENANCE

1/1 LOCATION

1. Locate the pump as close to the pool as practical. Consult local codes for minimum distance between pool and pump.

2. The piping should be as direct and free from turns or bends as possible, as elbows and other fittings greatly increase friction losses.

3. Place pump on a solid foundation which provides a rigid and vibration-free support so that it is readily accessible for service and maintenance.

4. Install the pump in a well ventilated location protected from direct sunlight and excessive moisture. (rain, sprinklers, etc.)

5. Protect the pump against flooding and excess moisture, prevent foreign objects from clogging air circulation around motor. All motors generate heat that must be removed by providing proper ventilation.

6. ***DO NOT*** store or use gasoline or other flammable vapors or liquids in the vicinity of this pump. ***DO NOT*** store pool chemicals near the pump.

7. ***DO NOT*** remove any safety alert labels such as ***DANGER***, ***WARNING***, or ***CAUTION***. Keep safety labels in good condition and replace missing or damaged labels.

8. Provide access for future services by leaving a clear area around the pump. Allow plenty of space above the pump to remove lid and basket for cleaning.

1/2 INSTALLATION

1. When connecting pipework to pump with threaded ports it is recommended that thread seal tape be used. If the suction pipe is not sealed correctly, the pump will not prime properly and will pump small volumes of water or none at all.

2. When installing the pump, care should be taken to see that the suction line is below water level to a point immediately beneath and the pump to ensure quick priming via a flooded suction line. The height between the pump and the water level should not be more than five (5) feet.

3. Suction and discharge line should be independently supported at a point near the pump to avoid strains being placed on the pump.

4. It is recommended to install a gate check valve in both the suction and discharge line in the event that the pump must be removed for servicing.

5. Before starting the pump for the first time, remove the see-through lid. (Turn lid ring counterclockwise to remove.) Fill strainer tank with water until it is level with the suction inlet. Replace lid with locking ring. *Hand-tighten* the lid to make an air-tight seal. ***DO NOT use any tools to tighten the lid.***

6. When installing and using the motor, basic safety precautions should be done by a licensed electrician in accordance with local codes. Be certain that the motor frame is grounded. Motor name plate has voltage, phase, ampere draw and other motor information as well as wiring connection instructions.

BONDING: As required by National Electrical Code Article 680-22, the pump motor must be electrically bonded to the pool structure (reinforced bars, etc.) by a solid copper conductor not smaller than #8 AWG (8.4 mm^2) wire via the external copper bonding lug on the pump motor.

GROUNDING: Permanently ground the pump motor using a conductor of appropriate size. Connect to the #10 green headed ground screw provided inside the motor terminal box,

For more information about the motor operation refer to the motor manual provided.

NOTE: Do not connect to electric power supply until the unit is permanently grounded.

1/3 MAINTENANCE

The pump requires little or no service other than reasonable care and periodic cleaning of the strainer basket. ***DO NOT*** strike basket to clean. When cleaning the basket inspect the lid o-ring for damage and replace if necessary.

NOTE: It is normal for a few drops of water to escape from the mechanical seal from time to time. This is especially true during the break-in period.

The mechanical seal may come worn and/or loose during the course of time, depending on the running time and water quality. If water continually leaks out, a new mechanical seal should be fitted. After long periods of NOT operational (seasonal storage, etc.), the pump must be checked for ease of rotation while it is switched off.

WARNING: *Before servicing the pump, switch off the circuit breakers at the power source. Severe personal injury or death may occur if the pump starts while your hand is inside the pump.*

SECTION 1 EQUIPMENT OPERATION AND MAINTENANCE - continued

1/3 MAINTENANCE - continued

Place a screwdriver, allen wrench or appropriate tool in the end of the motor shaft and turn it clockwise. *OR* Remove the fan cover and turn the fan in a clockwise direction manually. This may require removal of the cover at the rear of the motor or small circular cap at the rear center of the motor.

To Replace the Mechanical Seal
To replace the mechanical seal, remove the ten (10) screws holding the casing to the flange. Slide the motor part including the seal housing out. Remove the diffuser by gently pulling the diffuser (the diffuser is the cover over the impeller) horizontally until the pins clear the seal housing. Remove the rear motor cover and secure the center motor shaft with a wrench. While holding the motor shaft, turn the impeller counter-clockwise when facing it. Pull the impeller from the motor shaft noting the position of the seal. Remove the seal from the impeller shaft. To re-assemble, reverse the process.

Use water only as a lubricant to install both sides of the seal. ***NO NOT*** *use grease or lube to install seal. It will damage the seal and cause failure.* Make sure both sides of the seal (ceramic and spring portion) are clean. Gently wipe polished faces with soft and dry cotton cloth. Surfaces can easily be damaged by dirt and scratching. *(Use a drop of loc-tite to secure the impeller nut.)*

1/4 WINTERIZING

CAUTION: *The pump must be protected when freezing temperatures are expected. Allowing the pump to freeze will cause severe damage and void the warranty.*

There are two options when winterizing the pump:

Option 1: Drain all the water from the pump, system equipment, and piping. Remove drain plugs. ***DO NOT*** replace plugs. Store the plugs in the empty strainer basket for winter. Keep the motor covered and dry.

Option 2: Drain all the water from the pump, system equipment, and piping. Remove the pump and motor from the plumbing and store indoors in a warm and dry location.

NOTE: When the winter season is over the pump will need to be check and primed prior to start.

CAUTION: DO NOT *run the pump dry. If the pump is run dry, the mechanical seal will be damaged and the pump will start to leak at the seal. If this occurs, the mechanical seal will need to be replaced.* ***ALWAYS*** *maintain the proper water level in your pool. Continued operation in this manner could cause a loss of pressure, resulting in damage to the pump casing, impeller, and mechanical seal.*

SECTION 2 TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSES	SOLUTION
1. Pump will not prime.	a. Suction air leak.	Make sure the see-through lid and o-ring are clean and properly positioned. Tighten see-through lid (hand tight). Tighten all pipes and fittings on suction side of the pump. Be sure water in the pool is high enough to flow through skimmer.
	b. No water in pump.	Make sure strainer tank is full of water.
	c. Closed valves or blocked lines.	Open all valves in system. Clean skimmer and strainer tank. Open pump and check for clogging of impeller.
	d. Low voltage to motor.	Check voltage at motor. If low, pump will not come up to speed.
2. Motor does not turn.	a. No power to motor.	Check that all power switches are on. Be sure fuse or circuit breaker is properly set. Time set properly? Check motor wiring at terminals.
	b. Pump jammed.	With power off, turn shaft. It should spin freely. If not, disassemble and repair.

SECTION 2 TROUBLESHOOTING GUIDE - continued

PROBLEM	POSSIBLE CAUSES	SOLUTION
3. Low flow.	a. Dirty filter.	Back wash filter when filter pressure is high, or clean cartridges.
	b. No water in pump.	Clean skimmer and pump strainer basket.
	c. Closed valves or blocked lines.	See problem 1.
	d. Low voltage to motor	See problem 1.
4. Noisy operation of motor.	a. Bad bearings.	Noise when shaft is turned up by hand. Motor is hot in bearing area when running. Replace bearing.
5. Motor runs hot.	These motors will run hot to the touch, however, this is normal. They are designed that way. Thermal overload protector will function to turn them off if there is an overload or high temperature problem. Excessive heat can be cause by:	
	a. Low voltage.	Increase size of electrical wire. Be sure motor is operating on correct voltage.
	b. Installed in direct sun.	Shield motor from sun's rays.
	c. Poor ventilation.	Do not tighten cover or enclosure motor.
6. Noisy operation of pump.	a. Air leak in suction line. Bubbles in water returning to pool at inlet.	Repair leak. Check suction pipe, see-through lid in place? O-ring clean?
	b. Restricted suction line due to blockage or under size pipe. Indicated by high vacuum reading at pump suction.	Remove blockage or increase suction pipe size. Make sure strainer tank is clean. Are all suction valves fully open?
	c. Foreign matter (gravel, metal, etc.) in pump impeller.	Disassemble pump and remove foreign matter from impeller.
	d. Cavitation.	Improve suction conditions. (Reduce suction life, reduce number of fittings, increase pipe size.) Increase discharge pressure and reduce flow by throttling discharge valve.
7. Motor overload protection "kicks out".	a. Motor is not connected properly.	Check wiring diagram on motor.
	b. Low voltage due to under size wire or low incoming voltage.	Check with volt meter. Increase size of supply wire. Reports low supply voltage to power company. Voltage at motor must be within 10% of motor nameplate voltage.
	c. Wrong size heaters in protective device.	Heaters should be one size larger than full load amps shown on motor nameplate.
	d. Overload due to binding in pump or wrong size impeller.	Indicated by high amperage readings on motor, binding shaft. Disassemble unit and correct.

SECTION 3 SERVICING INFORMATION

When calling the manufacturer regarding a question or problem with your pump, please have the serial number available. The serial number is located on the pump either on the flange or motor labels.

Replacement parts may be available from your installer. Call, fax, or write: Speck Pumps at 8125 Bayberry Road, Jacksonville, Florida 32256 Phone (904) 739-2626 Fax (904) 737-5261, e-mail: info.usa@speck-pumps.com

SECTION 4 LIMITED WARRANTY

Speck Pumps-Pool Products, Inc. grants solely to the original consumer purchaser ("Buyer") of the pump and motor the following personal, non-transferable and limited warranty on the following terms and conditions (the "Limited Warranty"): the pump and motor is warranted to be free of material defects in materials or workmanship under normal use for a period of two (2) year beginning on the date of the Buyer's purchase of the pump and motor. Not withstanding any provisions herein to the contrary, the warranties and obligations hereunder shall not in any event extend for more than three (3) years beyond the date of shipment of the pump and motor from the factory (the "Limited Warranty Period"). The Limited Warranty is subject to each of the following additional terms and conditions:

1. **IN THE EVENT OF ANY BREACH OF THE LIMITED WARRANTY, SPECK PUMPS - POOL PRODUCTS, INC.'S ENTIRE OBLIGATION AND LIABILITY TO BUYER, AND BUYER'S SOLE AND EXCLUSIVE REMEDY SHALL BE AS FOLLOWS:** Speck Pumps - Pool Products, Inc. will, at its option, either repair or replace the pump and motor or refund to Buyer the purchase price actually paid by Buyer for the pump and motor subject to the Limited Warranty. Speck Pumps - Pool Products, Inc. shall have no obligations under the Limited Warranty unless Buyer delivers timely written notice to Speck Pumps - Pool Products, Inc. of the Limited Warranty claim within the Limited Warranty Period and returns the pump and motor to Speck Pumps - Pool Products, Inc. if requested. To the fullest extent permitted by law, Speck Pumps - Pool Products, Inc. expressly disclaims any liability for, and the Limited Warranty does not include or cover, any labor, costs or other expenses in connection with the removal, transportation, shipment, insurance, replacement, repair, or installation of repaired or replaced parts or for any other costs or expenses or damages to property or things including, but not limited to, those arising in connection with the use of, or inability to use, the pump and motor.

2. To the fullest extent permitted by law, the Limited Warranty will be void and of no force or effect and Speck Pumps - Pool Products, Inc. will have no liability, responsibilities or obligations to Buyer or with respect to the pump and motor in the event of the occurrence of any one or more of the following:

(a) Any damage to the pump and motor caused by Buyer, any third party, ground movement, other natural forces, acts of God or any other sources or causes not arising from a breach of the Limited Warranty, excluding ordinary wear and tear;

(b) Any replacement, modification, alteration or repair of any parts or components of the pump and motor by anyone other than Speck Pumps - Pool Products, Inc.;

(c) Any abuse, misuse, accident, tampering with, improper installation or modification of the pump and motor or any other actions, inactions or failures to act that violate the terms and conditions of this Limited Warranty;

(d) Buyer's failure or inability to present an invoice, bill, receipt or other documentation clearly evidencing that the pump and motor was installed and maintained in strict compliance with this Limited Warranty and that the claim was timely submitted within the Limited Warranty Period; and/or

(e) Buyer's failure to comply with the conditions and contingencies set forth in paragraph 3 below.

3. The Limited Warranty is expressly conditioned and contingent upon Buyer's strict compliance with each of the following:

(a) Installation of the pump and motor by an experienced and qualified pool industry professional and a licensed electrician who is licensed within the jurisdiction in which the pump and motor is installed and will be used; and

(b) Buyer's operation and maintenance of the pump and motor in strict accordance with Speck Pumps - Pool Products, Inc.'s printed operator/maintenance manuals delivered with the pump and motor.

4. **DISCLAIMER: THE LIMITED WARRANTY IS THE ONLY WARRANTY MADE AND IS IN LIEU OF ALL OTHER WARRANTIES, AND ANY AND ALL IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, THE IMPLIED WARRANTY AGAINST INFRINGEMENT, AND THE IMPLIED WARRANTY OR CONDITION OF FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY LIMITED IN THEIR SCOPE AND DURATION TO THE TWO YEAR TERM OF THE LIMITED WARRANTY SET FORTH HEREIN. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO THE BUYER.**

SECTION 4 LIMITED WARRANTY - continued

5. **TO THE FULLEST EXTENT PERMITTED BY LAW, IN NO EVENT SHALL SPECK PUMPS - POOL PRODUCTS, INC. OR ITS OFFICERS, DIRECTORS, EMPLOYEES, SHAREHOLDERS, AGENTS, OR REPRESENTATIVES BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, EXEMPLARY OR CONSEQUENTIAL DAMAGES OR LOSS, INCLUDING TIME, MONEY, GOODWILL, AND LOST PROFITS IN ANY WAY WHICH MAY ARISE HEREUNDER OR FROM THE USE OF OR INABILITY TO USE THE PUMP AND MOTOR OR THE PERFORMANCE OR NONPERFORMANCE OF ANY OBLIGATION UNDER THIS LIMITED WARRANTY. THIS PARAGRAPH, THE WARRANTY DISCLAIMERS IN PARAGRAPH 4 ABOVE, AND THE SOLE AND EXCLUSIVE REMEDY SET FORTH IN PARAGRAPH 1 ABOVE SHALL APPLY EVEN IF SPECK PUMPS - POOL PRODUCTS, INC. HAS BEEN NOTIFIED OF THE POSSIBILITY OR LIKELIHOOD OF SUCH DAMAGES OCCURRING, WHETHER SUCH LIABILITY IS BASED ON CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY, PRODUCTS LIABILITY OR OTHERWISE, AND EVEN IF ANY REMEDY STATED HEREIN FAILS OF ITS ESSENTIAL PURPOSE. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF SPECIAL, INDIRECT, INCIDENTAL, EXEMPLARY OR CONSEQUENTIAL DAMAGES OR LOSS, SO THE ABOVE EXCLUSIONS AND LIMITATIONS MAY NOT APPLY.**

6. This Limited Warranty gives the Buyer specific legal rights, and the Buyer may also have other rights, which vary from state to state.

7. A return merchandise authorization ("RMA") must be obtained from Speck Pumps - Pool Products, Inc. before returning any product. Products returned without an RMA will be refused and returned, unopened, to the Buyer. All returned products are to be sent freight prepaid and insured for Buyer's protection to the manufacturer at 8125 Bayberry Road, Jacksonville, Florida 32256. Under no condition will products be accepted after the expiration of the Limited Warranty Period. Speck Pumps - Pool Products, Inc. shall not bear any costs or risks incurred by Buyer in shipping a defective pump and motor to Speck Pumps - Pool Products, Inc. or in shipping a repaired or replaced pump and motor to Buyer.

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Installed by:	
Serial Number:	
For Service Call:	

V-Green™

VARIABLE SPEED USER MANUAL

Premium Efficiency Variable Speed Motor

A.O. Smith®

SAFETY

Safety is emphasized throughout the user manual. These are safety alert symbols. They alert the user to potential personal injury hazards. Obey all safety messages to avoid possible injury or death or damage to equipment.

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

CAUTION

CAUTION identifies potential equipment damage or failure conditions. Also, alerts personnel to potentially dangerous situations.

WARNING

WARNING indicates a hazardous situation which if not avoided could result in death or serious injury.

Table of Contents

1. **Introduction** 3
2. **User Interface** 5
   - 2.1 Quick Start Guide (Using Factory Schedule) 5
   - 2.2 Quick Start Guide (Using Custom Schedule) 6
3. **Overview** 7
4. **Wiring** 8
5. **User Interface Operation** 10
   - 5.1 Navigation Overview 10
   - 5.2 Menu Structure for 8 Selector Knob Positions 11
   - 5.3 Set the Clock 12
   - 5.4 Set the Schedule 13
     - 5.4.1 Schedule Tables 14
   - 5.5 Service 17
   - 5.6 Setup 18
     - 5.6.1 Freeze Protection 19
   - 5.6.2 Auxiliary Load Setup 20
   - 5.6.3 Prime Configuration 22
   - 5.6.4 Reset Factory Defaults 23
   - 5.6.5 Set Contrast 23
   - 5.7 Run Schedule 24
   - 5.8 Override Low 25
   - 5.9 Override High 27
   - 5.10 Key Lockout Feature 29
6. **Care and Maintenance** 29
7. **Remote Mounting User Interface** 29
8. **Fault Tables** 34
9. **Specifications** 35
10. **Troubleshooting Guide** 36

1 Introduction

The V-Green is a premium efficiency variable speed motor that provides tremendous flexibility in motor speed and time settings. The variable speed V-Green motor is intended to run on the lowest speeds needed to maintain a sanitary environment, which, in turn, minimizes energy consumption. Conditions such as pool size, other water features, chemicals used, and environmental factors help determine how to optimize the motor settings to maximize energy conservation.

The integrated electronics interface controls the power supply to the motor, speed settings between 600 and 3450 rpm, and the start and stop times. The motor can run at speeds between 600 and 3450 rpm. The motor is rated for 230Vrms (+10% or -7%) at an input frequency of 60 Hz.

Features

- Innovative user interface with step-by-step on-screen navigation and ergonomic selector switch
- Power factor correction
- Auxiliary load circuit with configurable run time
- Motor design reduces noise emissions
- Real time clock with 5 year battery back-up to protect programming
- Integrated LCD backlight and adjustable contrast
- UV and rain-proof enclosure
- Adjustable freeze protection
- Manual High and Low overrides

Benefits

- Set-up and programming ease – preset program
- Ease of installation, with no additional wiring required
- Display can be mounted on or off board, facing the pump or facing the lead-end
- Lower power consumption
- Design reliability
- Lower internal peak currents; Input current reduced from 16A to 10A
- Ability to install and program extra load (i.e., salt chlorine generator, booster pump, etc.)
- No need to replace battery or reset time/settings during a power outage or off-season
- Ensures the display can be viewed easily in dark, shady, or direct sunlight conditions

2 User Interface

2.1 Quick Start Guide (Using factory schedule)

The V-Green™ is programmed with a pre-set schedule that complies with California Title 20 requirements. Only the clock setting is required to enable the V-Green to operate at three different speeds and durations using the pre-set schedule. The preset speeds and schedule times are detailed in Table 4.

- ❑ Observe all safety warnings and cautions
- ❑ Verify the user interface is plugged in
- ❑ Make certain the motor is properly wired (refer to Figure 1)
- ❑ Turn selector knob to SET CLOCK
- ❑ Set the Time and Date using the +, -, ←, → buttons
- ❑ Turn the Selector knob to RUN

NOTE: Must wait until “PRIME MODE” is complete to make changes to OVERRIDE settings.

2.2 **Quick Start Guide** (Using custom schedule)

- ❑ Observe all safety warnings and cautions
- ❑ Verify the user interface is plugged in to the controller
- ❑ Make certain the motor is properly wired (refer to Figure 1)
- ❑ The green Power On LED illuminates when the unit is powered on
- ❑ The red Fault LED illuminates when a fault occurs
- ❑ Use the ← and → arrow buttons to select menu areas
- ❑ Use the + and – to change menu selection parameters
- ❑ Turn selector knob to SET CLOCK
- ❑ Adjust the Time and Date
- ❑ Turn selector knob to Set Schedule (STEP 1, 2, 3)
- ❑ Set the Motor Speed, Start, and Stop times for steps 1, 2, 3
- ❑ Turn selector knob to SETUP **(Use ← and → to scroll thru SETUP items)**
- ❑ Enable/disable freeze protection
- ❑ Set display screen contrast
- ❑ Set External Relay Speed and Time
- ❑ Set Prime speed and duration
- ❑ Reset Factory defaults (Will return settings to factory defaults)
- ❑ Turn selector knob to RUN
- ❑ Press OVERRIDE HIGH button (not required to run normal schedule)
- ❑ Press SET to change Override High speed and duration (not required to run normal schedule)
- ❑ Press OVERRIDE LOW button (not required to run normal schedule)
- ❑ Press SET to change Override Low speed and duration (not required to run normal schedule)

3 Overview

The V-Green motor can be optimized to suit individual pool conditions. Specific conditions, including pool size, other devices, and environmental factors all help determine the optimal settings.

This may require some trial and error to determine the most satisfactory settings. In all cases, setting the V-Green motor at the lowest speed for the longest duration is the best choice to minimize energy consumption. However, filtration needs may dictate running the VGreen motor at a higher speed for some duration of time each day to maintain proper sanitation.

The User Interface is located on top of the motor controller. To the left of the screen are the Power Saver (Override Low) button and the Clean (Override High) buttons. These buttons can be used to operate the motor at speeds outside of the normal operating schedule.

The rotating selector knob allows the user to do the following:

- Set the clock
- Schedule the motor speed and timings
- View the serial number, software versions, and fault codes
- Enable or disable freeze protection
- Configure auxiliary load
- Adjust screen contrast
- Reset the factory defaults
- Set the prime time and speed

4 Wiring

The controller must be wired according to the local NEC guidelines. A licensed, qualified electrician should complete the wiring for this product.

The controller is designed to operate with 230Vrms, single phase power. The wire insulation should be stripped to a length of approximately 0.33." The terminal block is capable of handling solid or stranded wire up to 12 AWG in size.

Pin #	Wire Color	Description
TB1 - L1	Black	Hot 1
TB1 - L2	Red or White	Hot 2
TB1 - GND	Green	Earth
J108 - A1	Any	Aux 1 (Normally Open)
J108 - A2	Any	Aux 2 (Normally Open)

Table 1: Power Connection

Pin #	Wire Color	Description
J103 - 1	Red	+10V
J103 - 2	Green	RS485 - A
J103 - 3	Black	RS485 - B
J103 - 4	Yellow	Isolated ground

Table 2: Communication Connection Table

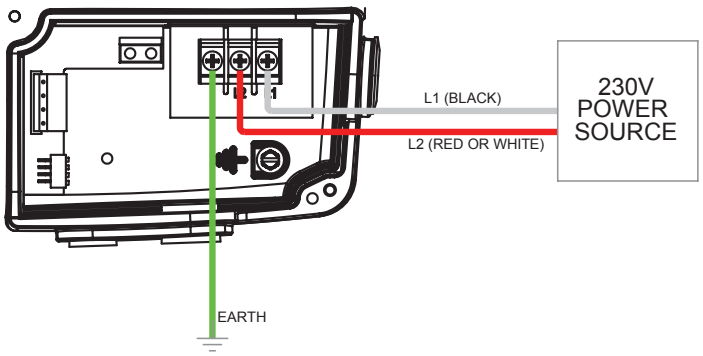


Figure 1: Wiring Diagram without Aux Load

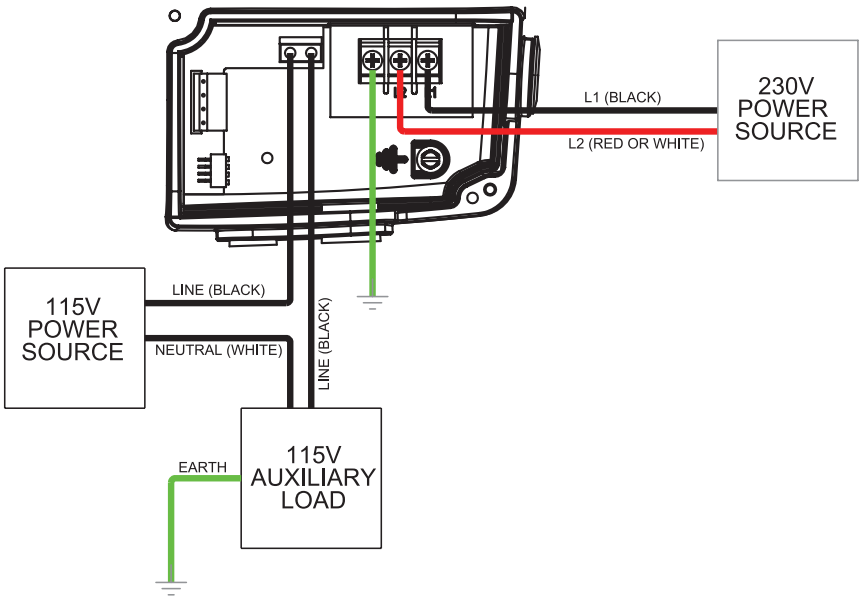


Figure 2: Wiring Diagram with 115V Aux Load

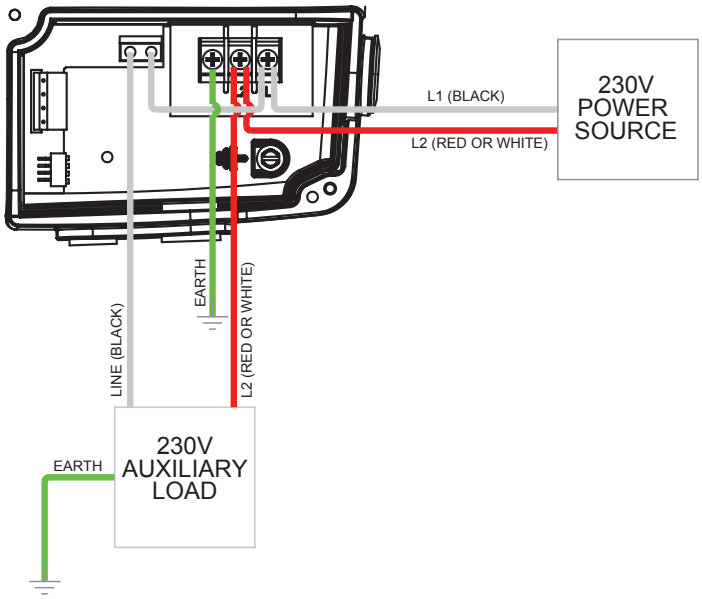


Figure 3: Wiring Diagram with 230V Aux Load

5 User Interface Operation

5.1 Navigation Overview

1. +, - increases/decreases selected value
2. ←, → navigates to adjustable value (digit)
3. (SET) accepts the current screen values
4. (BACK) returns to previous program setting and does NOT accept current screen values

Figure 4: UI Overview

❶ Display Screen	❹ Navigation Buttons
❷ LED Lights Power On Light (Green) Fault Light (Red)	❺ Interface Selector Knob ❻ Override Buttons
❸ Back Button	

Table 3: UI Button Descriptions

NOTE: The selector knob must be turned to RUN for the motor to operate. When the user presses ← or → the cursor moves to the next or previous position. If the cursor is at the end of a line when the user presses the arrow, the cursor moves to the next line.

5.2 Menu Structure for Selector Knob Positions

1. **SET CLOCK**
    a. Date and Time
2. **STEP 1 (Set Schedule)**
    a. Speed, Start Time, Stop Time
3. **STEP 2 (Set Schedule)**
    a. Speed, Start Time, Stop Time
4. **STEP 3 (Set Schedule)**
    a. Speed, Start Time, Stop Time
5. **SERVICE**
    a. UNIT SERIAL NUMBER
    b. DC CAP VOLTAGE
    c. IGBT TEMPERATURE
    d. PCB TEMPERATURE
    e. FAULT HISTORY (1,2,3,4)
    f. CONTROLLER SOFTWARE VERSION
    g. INTERFACE SOFTWARE VERSION
6. **SETUP**
    a. FREEZE PROTECTION
        i. Enabled/Disabled
        ii. Turn ON Temperature
    b. AUX LOAD SETUP
        i. Minimum Turn On Speed
        ii. Maximum Run Time (in 24 hours)
    c. PRIME CONFIGURATION
        i. Speed
        ii. Time
    d. RESET FACTORY DEFAULTS
        i. Yes/No
    e. SET CONTRAST
7. **RUN**
    a. Manual Override High
        i. Speed and Duration
    b. Manual Override Low
        i. Speed and Duration
8. **OFF**

5.3 Set the Clock

The first time the user interface is turned ON, the clock must be set to the current time.

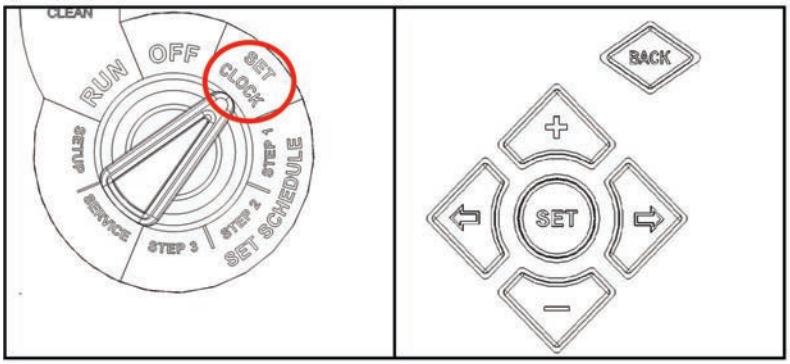


Figure 5: SET CLOCK Menu Buttons

1. Turn the selector knob (see Figure 5) to SET CLOCK.
2. At any time, the user can press BACK to return to the previous area.
3. Press + or – to change the Month. Press → to move to the Day setting.
4. Press the + or – to change the Day. Press → to move to the Year setting.
5. Press + or – to change the Year. Press → to move to the Hour setting.

6. Press + or – to change the Hour. Press → to move to the Minute setting.

7. Press + or – to change the Minute. Press → to move to the AM or PM setting.

8. Press SET when the time is correct.

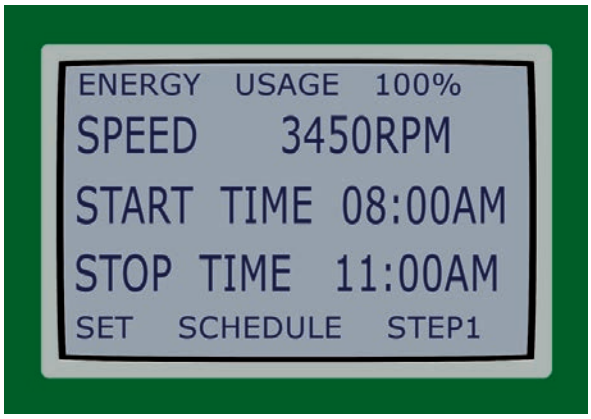
9. Press SET again if the user needs to make additional changes. The cursor returns to the Month setting.

10. If the date and time are correct, move the selector knob to Set Schedule, Step 1.

NOTE: Neither of the Override buttons affects this menu. The message "Invalid Key" appears if the user presses an Override button.

5.4 Set the Schedule

Set the Speed and Start/Stop times for the motor in the Set Schedule menu. The schedule is based on a 24-hour cycle and will repeat each day of the week.



The highest speed rating for this motor is 3450 rpm and the lowest is 600 rpm. The following table shows the pre-set schedule.

Setup #1			
	Step 1	**Step 2**	**Step 3**
Speed	3450 RPM	2600 RPM	1725 RPM
Start Time	8:00 AM	11:00 AM	1:00 PM
Stop Time	11:00 AM	1:00 PM	9:00 PM

Table 4: Pre-set Schedule

5.4.1 Schedule Tables

Use these tables to enter a personalized operating schedule. By writing down the planned schedule, it will make the programming process easier and will help the user to remember the user's settings in case the programming is inadvertently lost. The User Interface will not allow the user to program an overlap between different steps of the schedule. The most recent setting will always take priority over any previous settings.

Setup #2			
	Step 1	**Step 2**	**Step 3**
Speed			
Start Time			
Stop Time			

Setup #3			
	Step 1	**Step 2**	**Step 3**
Speed			
Start Time			
Stop Time			

Table 5: Custom Schedules

1. Make certain the selector knob points to Set Schedule, Step 1.

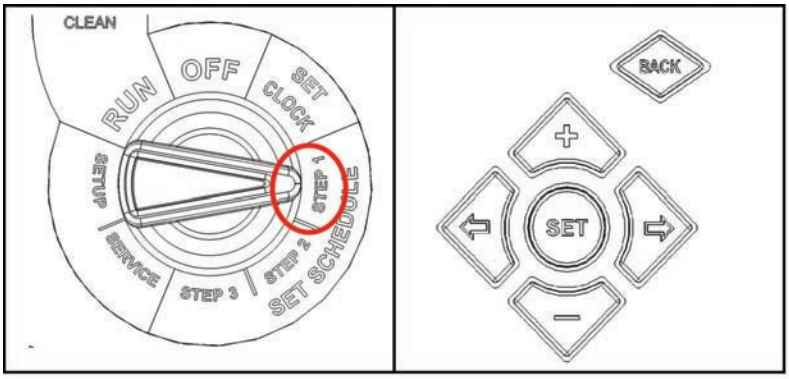


Figure 6: Set STEP 1 Menu Buttons

2. The first digit in the Speed setting flashes. Press + or – to change the first digit in the Speed setting. The number increases one unit at a time.

3. Press → to move to the second digit in the Speed setting. Press + or – to change the second digit. The number increases one unit at a time.

4. Press → to move to the third digit in the Speed setting. Press + or – to change the third digit. The number increases one unit at a time.

5. Press → to move to the fourth digit in the Speed setting. Press + or – to change the fourth digit. The number increases five units at a time.

6. Press → to move to the Start Time setting.

7. Press the + or – to change the Hour. Press → to move to the Minute setting.

8. Press the + or – to change the Minute. Press → to move to the AM or PM setting.

9. Press → to move to the Stop Time setting. Follow steps 6 through 8 to set the Stop Time settings.

10. Press Set to save the settings. If necessary, press Set again to move the cursor back to the first digit.

Unless changes are necessary, move the selector knob to Steps 2 and 3 and repeat procedural steps 2 through 10.

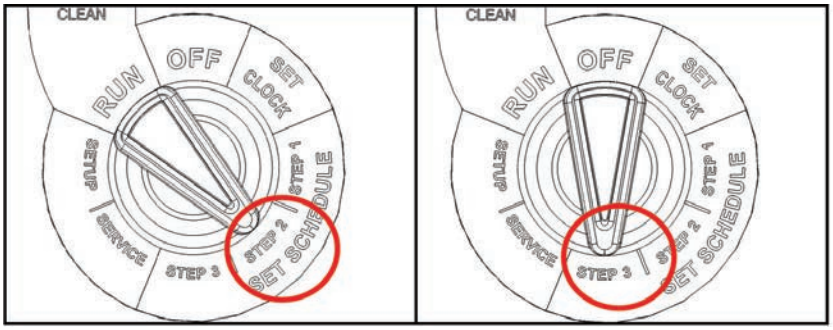


Figure 7: Set STEP 2 and STEP 3 Locations

Move the selector knob to Service when the settings for Steps 1, 2, and 3 are set.

NOTE: Neither of the Override buttons affects this menu. The message "Invalid Key" appears if the user presses an Override button.

5.5 Service

The Service menu allows the user to view, but not change, the following information.

- Unit model number and serial number
- User Interface Version number
- Controller Software Version
- The four most recent faults
- PCB Temperature
- IGBT Temperature
- DC Cap Voltage

Press the arrows to navigate between items viewed on the display screen.

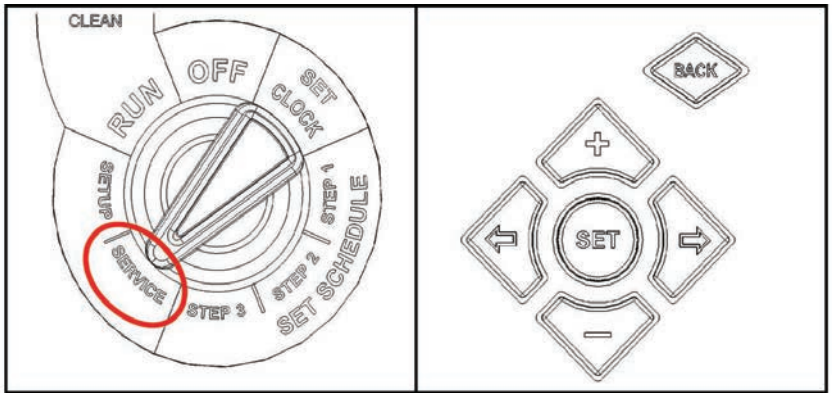


Figure 8: Service Menu Buttons

5.6 Setup

Setup allows the user to configure the following parameters:

- Freeze Protection
- Auxiliary Load Settings
- Prime Settings
- Reset Factory Defaults
- Set Contrast Level

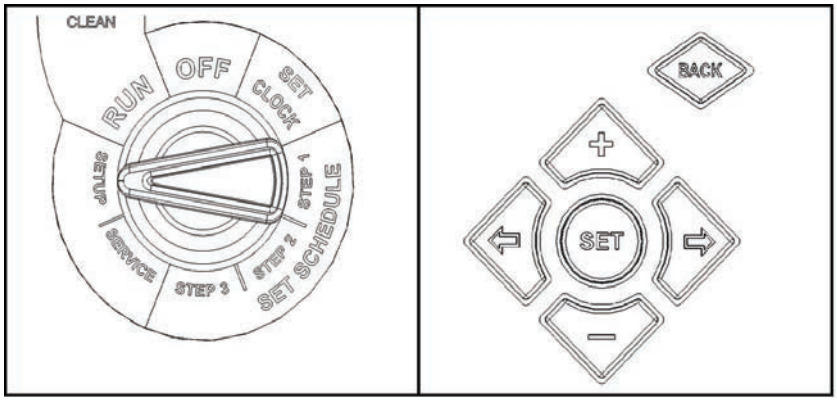


Figure 9: Setup Menu Buttons

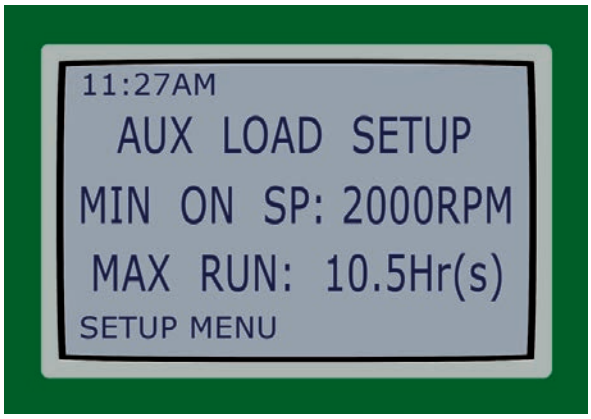
5.6.1 Freeze Protection

Freeze Protection can be either enabled or disabled when the user turns the User Interface selector knob to Setup. If it is enabled, the user will be able to set the temperature at which the pump will turn on. The control is designed to run the pump for 8 hours at 2600 RPM if the temperature drops below the setpoint.

1. Make certain the selector knob points to Setup.
2. Press either + or – to change the Freeze Protection setting. Press Set to save any changes.

WARNING: Freeze Protection will ONLY function with the selector knob in the RUN position. Damage may occur to the user's pool system if Freeze Protection is enabled and the switch is not in the RUN position.

5.6.2 Auxiliary Load Setup



The Auxiliary Load is a relay inside the control designed to provide AC power to a load that should not be energized without adequate water flow from the pump (i.e. heater, boost pump, salt water chlorinator).

The control is designed to turn on the Auxiliary Load relay when the pump speed is above the MINIMUM ON SPEED (default is 2000RPM). The Auxiliary Load relay will stay closed as long as the pump speed is above the MINIMUM ON SPEED. In addition, the control can be programmed to limit the amount of time the Auxiliary Load relay is closed in a 24-hour period. For example, if the pump runs at 3450RPM for 12 hours a day, but the auxiliary load only needs to be powered for 6 hours, the user can set the MAXIMUM RUN TIME. Two examples of different settings are provided in Table 6 and Table 7.

1. Make certain the selector knob points to Setup.
2. Press → one time to change the Auxiliary Load settings. Press SET to enter “change mode.” Press + or – to increase or decrease the Minimum Speed. Press → to change the Maximum Run Time. Press the + or – to increase or decrease the Maximum Run Time. Press SET to save changes.

5.6.2.1 Setup Tables (for Auxiliary Load)

Example #1

	Pump Motor Settings			Aux. Load Settings
	Step 1	Step 2	Step 3	
Speed	3450 RPM	2600 RPM	1725 RPM	
Start Time	8:00 AM	11:00 AM	1:00 PM	
Stop Time	11:00 AM	1:00 PM	9:00 PM	
MIN ON SPEED				2000 RPM
MAX RUN TIME				10.5 Hours

Total run time for pump motor	13 Hours
Total run time for aux. load	5 Hours

Table 6: Auxiliary Load Setup Example #1

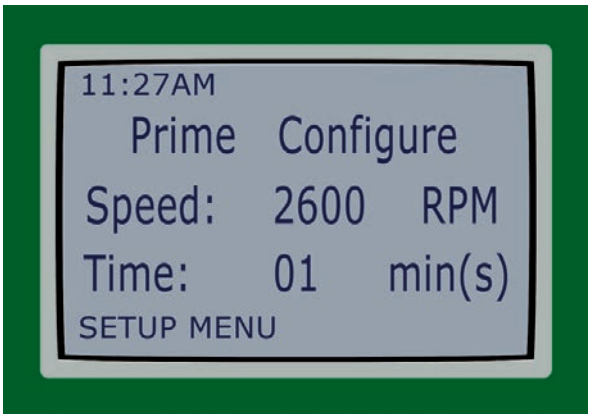
Example #2

	Pump Motor Settings			Aux. Load Settings
	Step 1	Step 2	Step 3	
Speed	3450 RPM	2600 RPM	1725 RPM	
Start Time	8:00 AM	4:00 PM	8:00 PM	
Stop Time	4:00 PM	8:00 PM	11:00 PM	
MIN ON SPEED				2000 RPM
MAX RUN TIME				10.5 Hours

Total run time for pump motor	15 Hours
Total run time for aux. load	10.5 Hours

Table 7: Auxiliary Load Setup Example #2

5.6.3 Prime Configuration



The priming speed and time can be adjusted within this menu. The minimum priming speed is 1500 RPM. The maximum priming time is 10 minutes.

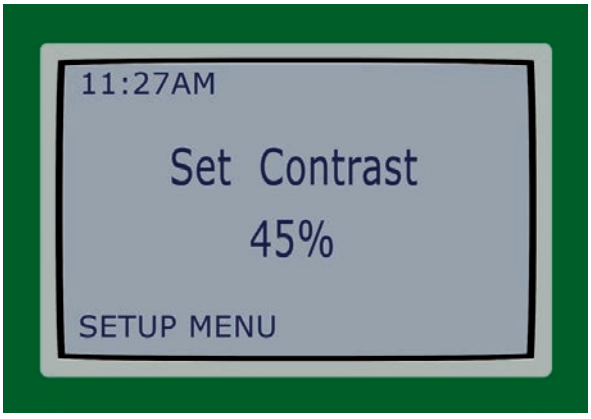
1. Make certain the selector knob points to Setup.
2. Press → two times to change the Prime settings.
3. Press SET to enter “change mode.”
4. Press + or – to increase or decrease the Prime Speed.
5. Press → to change the Prime Time. Press the + or – to increase or decrease the Maximum Run Time.
6. Press SET to save changes.

5.6.4 Reset Factory Defaults

This menu will permit the user to reset all settings in the control to the factory default settings.

1. Make certain the selector knob points to Setup.
2. Press → three times to Reset to Factory Default settings. Press SET two times to verify intent to Reset to the Factory Default settings.

5.6.5 Set Contrast



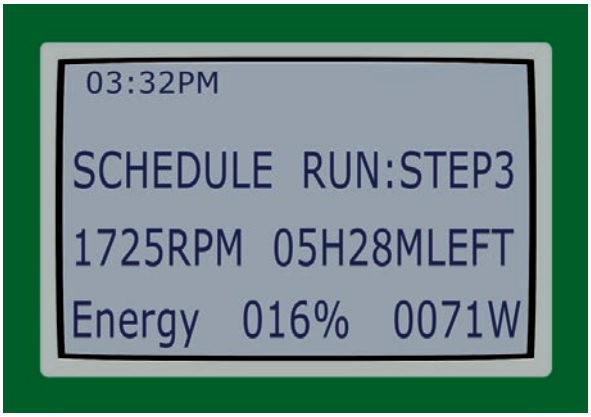
This menu will change the contrast of the LCD screen to optimize viewing for various lighting conditions.

1. Make certain the selector knob points to Setup.
2. Press → four times to change the Contrast setting. Use + and – to adjust the contrast level. Press SET to save the setting.

5.7 Run Schedule

The display screen in the Run switch position shows the following.

- Current clock time
- Remaining time
- Which Step or Prime is running and at what RPM
- Motor status (for example, Program Running)



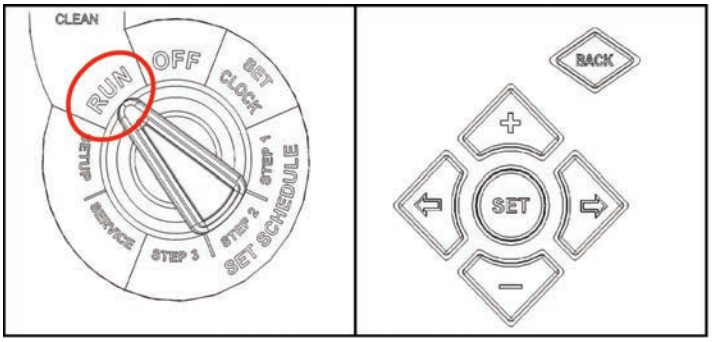


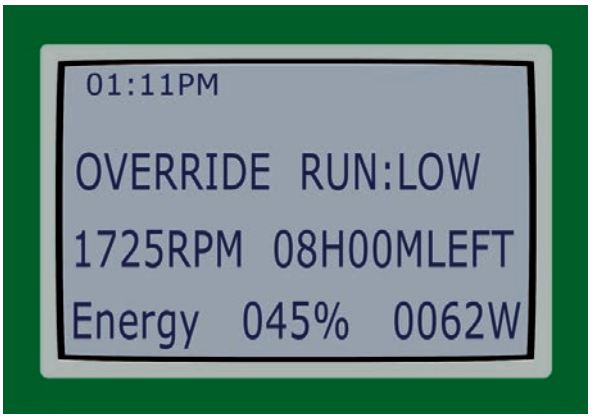
Figure 10: RUN Schedule Buttons

Motor Run allows the user to set the Override parameters. Run the Override settings if the motor needs to perform a certain function immediately.

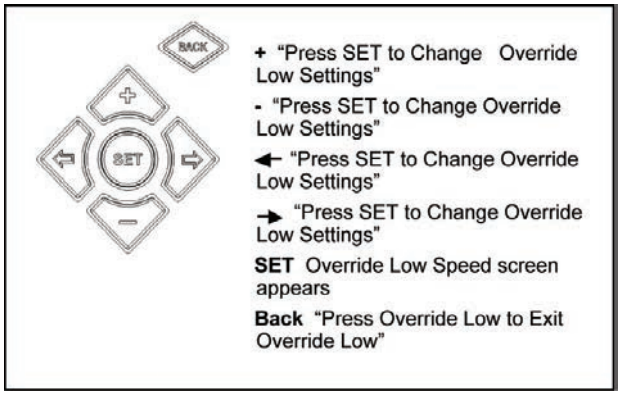
If the user presses +, -, ←, or → the message “Speed and Time Cannot be Changed” appears.

If the user presses the Back button the message “Speed and Time Cannot be Changed” appears unless an Override setting is running.

5.8 Override Low



The Override Low button can program the motor to temporarily run at speeds between 600 and 3450 RPM. Override Low is recommended for low circulation requirements that exist outside of the daily operating schedule. Once the Override Low duration is completed, the motor will automatically return to the programmed schedule.



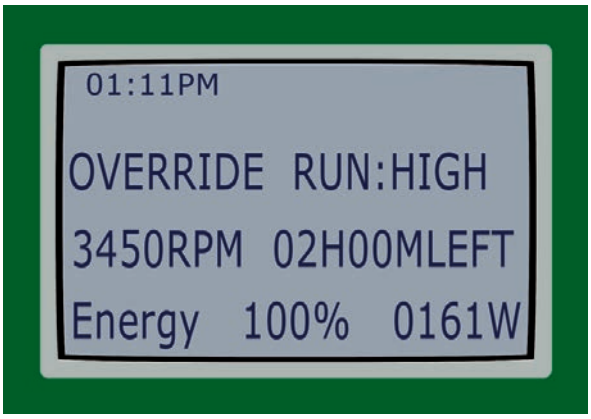
NOTE: Press + to increase the speed. If the value is at 3450, the screen reads “Maximum Speed for this Motor is 3450 RPM.” If the fourth digit is flashing, press + and the speed increases by 5.

If the third digit is flashing and the value of the speed is 3445 then the speed increases to 3450. If the third digit is flashing and is less than 3445, the speed increases by 10. If the second digit is flashing and greater than or equal to 3350, the speed increases to 3450. If the third digit is flashing and less than 3350, the speed increases by 100. If the first digit is greater than or equal to 2450, the speed increases to 3450. If the first digit is flashing and less than 2450, the speed increases by 1000. Hold + and the values increase rapidly.

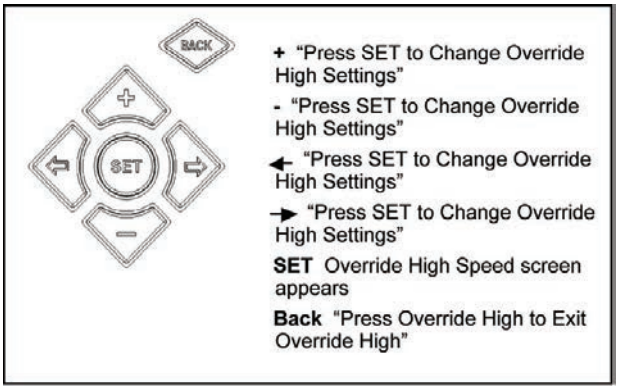
Press – to decrease the speed. If the value is at 0 RPM, the screen reads “Minimum Speed for this Motor is 0 RPM.” If the value of the high speed is 600 then it decreases to 0 RPM. If the fourth digit is flashing, press – and the speed decreases by 5. If the third digit is flashing and the value of the speed is 605, the speed decreases to 600. If the third digit is flashing and greater than 605, the speed decreases by 10. If the second digit is flashing and less than or equal to 700, the speed decreases to 600. If the second digit is flashing and greater than 700, the speed decreases by 100. If the first digit is less than or equal to 1600, the speed decreases to 600. If the first digit is flashing and greater than 1600, the speed decreases by 1000. Hold – and the values decrease rapidly.

1. Press Override Low.
2. Press SET to change the Override Low settings.
3. Press + or – to increase or decrease the first digit in the speed. The maximum speed is 3450 RPM and the minimum speed is 600 RPM.
4. Press → to move to the second, third, and fourth digits in the speed.
5. Press SET to save the speed setting. The motor runs at the Override Low setting. The Override Low Duration Time setting flashes.
6. Press + or – to increase or decrease the Override Low Duration Time. The maximum duration is 24 hours and the minimum is . 5 hours (half an hour).
7. Press SET to save the Override Low Duration Time setting.

5.9 Override High



The Override High button can program the motor to temporarily run at speeds between 600 and 3450 RPM. Override High is recommended for high flow uses such as a pool heater startup, backwash, filtering, and cleaner water requirements that exist outside of the daily operating schedule. Once the Override High duration is completed, the motor will automatically return to the programmed schedule.



NOTE: Press + to increase the speed. If the value is at 3450, the screen reads “Maximum Speed for this Motor is 3450 RPM.” If the fourth digit is flashing, press + and the speed increases by 5. If the third digit is flashing and the value of the speed is 3445 then the speed increases to 3450. If the third digit is flashing and is less than 3445, the speed increases by 10. If the second digit is flashing and greater than or equal to 3350, the speed increases to 3450. If the third digit is flashing and less than 3350, the speed increases by 100. If the first digit is greater than or equal to 2450, the speed increases to 3450. If the first digit is flashing and less than 2450, the speed increases by 1000. Hold + and the values increase rapidly.

Press – to decrease the speed. If the value is at 0 RPM, the screen reads “Minimum Speed for this Motor is 0 RPM.” If the value of the high speed is 600 then it decreases to 0 RPM. If the fourth digit is flashing, press – and the speed decreases by 5. If the third digit is flashing and the value of the speed is 605, the + speed decreases to 600. If the third digit is flashing and greater than 605, the speed decreases by 10. If the second digit is flashing and less than or equal to 700, the speed decreases to 600. If the second digit is flashing and greater than 700, the speed decreases by 100. If the first digit is less than or equal to 1600, the speed decreases to 600. If the first digit is flashing and greater than 1600, the speed decreases by 1000. Hold – and the values decrease rapidly.

1. Press Override High.
2. Press SET to change the Override High settings.
3. Press + or – to increase or decrease the first digit in the speed. The maximum speed is 3450 RPM and the minimum speed is 600 RPM.
4. Press → to move to the second, third, and fourth digits in the speed.
5. Press SET to save the speed setting. The motor runs at the Override High setting. The Override High Duration Time setting flashes.
6. Press + or – to increase or decrease the Override High Duration Time. The maximum duration is 24 hours and the minimum is .5 hours (half an hour).
7. Press SET to save the Override High Duration Time setting.

5.10 Key Lockout Feature

The A. O. Smith User Interface has a key lockout feature to prevent unwanted changes to the settings. To lock the keys, hold down the "+, -, and SET" buttons for more than 3 seconds. The display will then show a symbol of a key indicating the buttons are locked. The user can unlock the keys by holding down the same buttons for more than 3 seconds.

6 Care and Maintenance

The V-Green™ motor is very reliable and robust in harsh environments. However, this product does contain electronics that are cooled by a fan mounted to the motor. In order to ensure optimum reliability of this product, it is recommended to clean the fan inlet on the back of the motor once a month. It is important to keep this area free of large debris such as leaves, branches, mulch, plastic bags, etc.

7 Remote mounting User Interface

The V-Green user interface can be mounted remotely from the controller. In order to complete this procedure, the following steps should be followed:

A. Remove main power from the controller.

B. Remove the terminal box cover from the controller (two screws).

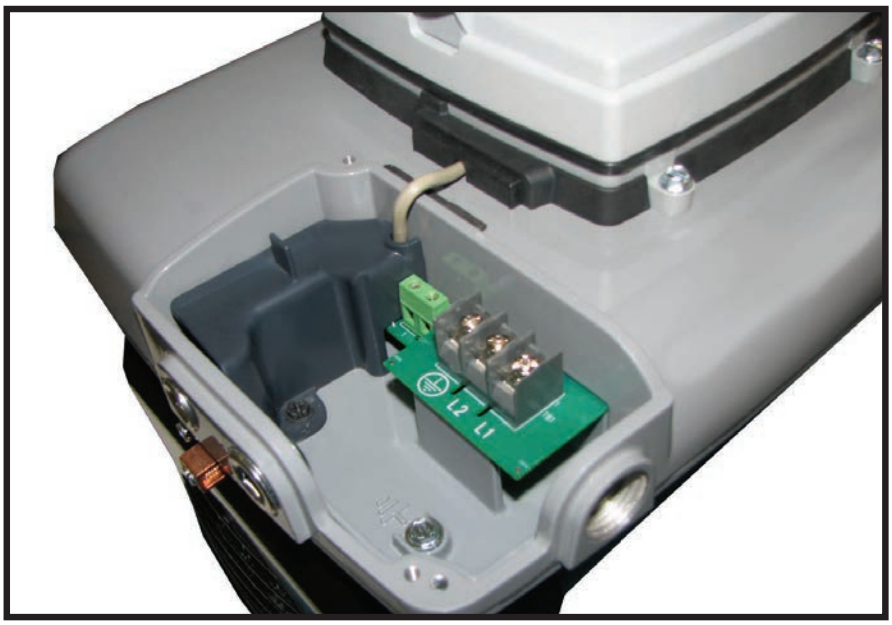


Figure 11: Terminal Box Cover Removed

C. Remove the plastic wiring cover inside the terminal box (one screw).

Figure 12: Internal Plastic Cover Removed

D. Disconnect the 4-pin communication connector (J103) by pulling up on the connector.

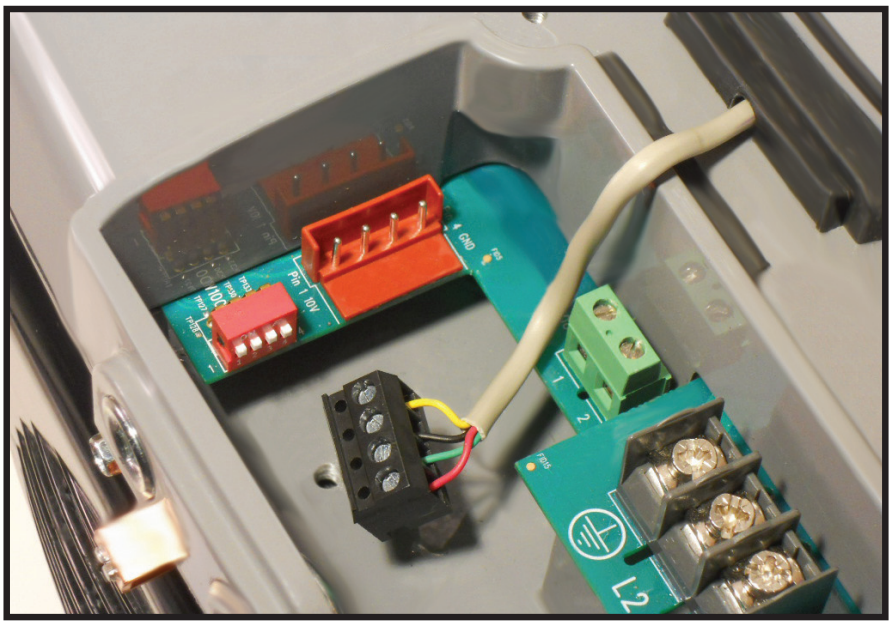


Figure 13: Communication Connector Removed

E. Install a longer cable of the desired length to the J103 connector on the controller.

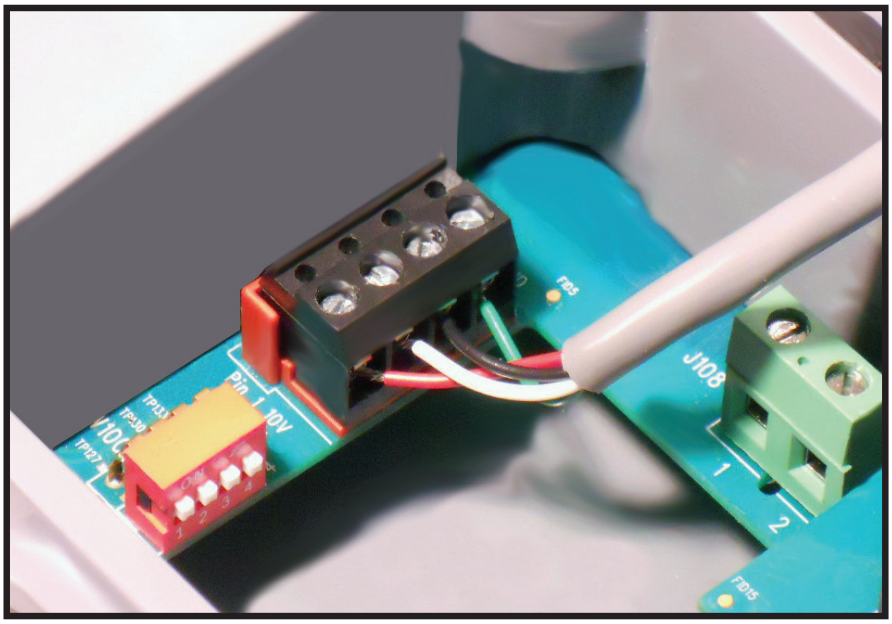


Figure 14: UI connector installed

F. Replace the plastic cover inside the terminal box (one screw).

Figure 15: Plastic Cover Installed In Terminal Box

G. Replace the metal terminal box cover. It is VERY IMPORTANT to make sure the communication cable fits into the slot on the terminal box cover BEFORE the screws are tightened. This will prevent the cable from being damaged.

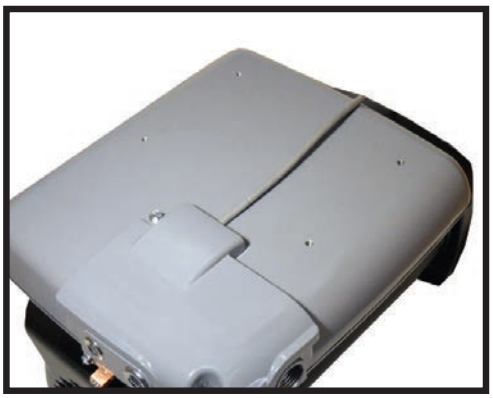


Figure 16: Cover Installed

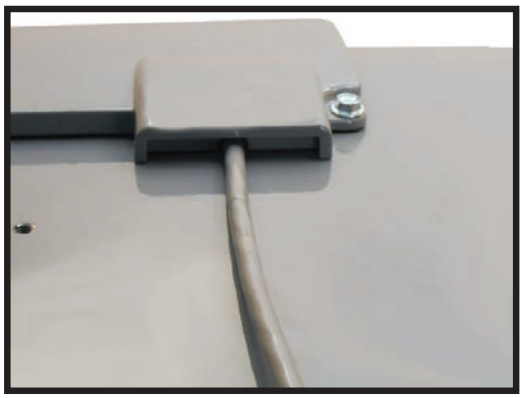


Figure 17: Wire Routing

H. Remove the small cover on the back of the User Interface (two screws).

I. Remove the 4-pin connector from the CN1 connector on the User Interface.

J. Attach the other end of the longer cable to the CN1 connector on the User Interface.

Figure 18: Wire Routing

K. Replace the small cover on the back of the User Interface.

L. Mount the User Interface to the desired location (i.e. wall, post, fence, etc.)

In addition, we offer an optional kit for mounting the User Interface remotely (AOS PN: 2512723-001). However, it is not mandatory to purchase this kit to mount the User Interface remotely.

8 Fault Tables

The following table shows possible faults and descriptions. If the motor does not restart following motor retry, please contact your service professional or wholesaler.

Display Value	Description
Fault “SW Overcurrent” Control will retry	Software overcurrent
Fault “HW Overcurrent” Control will retry	Hardware overcurrent
Fault “DC Overvoltage” Control waiting voltage to drop	DC capacitor over voltage
Fault “DC Undervoltage” Control waiting voltage to rise	DC capacitor under voltage
Fault “PCB Temperature” Control waiting temperature to drop	Printed circuit board over temperature
Fault “IGBT Temperature” Control waiting temperature to drop	Inverter IGBT over temperature
Fault “Imbalance Current” Control will retry	Motor current imbalance
Fault “Prime Failure” Control will retry	Failure to Prime Pump
Fault “Startup Failure” Control will retry	Failure to Start Motor
Fault “Low Power” Verify motor connected Control will retry	Low Power
Fault “Loss of Phase” Verify motor connected. Control will retry	Loss of Phase
Fault “Processor Failure” Control will retry	Processor Failure

Display Value	Description
POWERING DOWN	Power down
Fault “Generic Fault” Control will retry	All other faults

NOTE: The fault message “Communication Error, Check Connections” appears if the user interface is unable to establish communications with the controller within five seconds.

Please see troubleshooting guide for troubleshooting issues and their resolutions.

9 Specifications

Overall Ratings	
Input Voltage	230Vrms +10% -7%
Input Current	11Arms
Phase Frequency	Single phase, 60 Hz
Control Terminals	
Auxiliary Load Terminals	230Vrms (11Arms Max)
Maximum Continuous Load	2.7 THP (Total Horsepower)
Speed range	600-3450 RPM
Power factor	>90%
Peak Efficiency	88%
Environmental Rating	NEMA Type 3R
Agency Approval	UL and CUL A. O. Smith UL (E302804)
Ambient Conditions	
Storage	-40ºC to +85ºC (-40ºF to +185°)
Operating	0ºC to +50ºC (+32°F to +122°F)
Humidity	Relative 0 to 95 % non-condensing

10 Troubleshooting Guide

Symptom	Possible Causes	Potential Solutions
MOTOR FAILS TO START	Controller DIP switches not configured properly	Verify that the DIP switches of SW100 under the controller terminal box cover are in the correct position
	Mains Voltage is not present	Replace fuse, reset breaker/GFI
		Tighten mains wire connections
	User Interface is not connected	Check connections at J103 connector of motor
		Check connections at CN1 connector of User Interface
	Motor shaft is locked	Check if the motor can be rotated by hand and remove any blockage
	Motor shaft is damaged	Replace motor
MOTOR RUNS THEN STOPS	Prime Failure	Tighten basket lid
		Tighten pump inlet/outlet connections
		Check suction side for blockage
	Overtemperature fault	Check that back of motor is free from dirt and debris. Use compressed air or water to clean
	Overcurrent fault	Motor will automatically restart after 1 minute
MOTOR IS NOISY	Debris in contact with fan	Check that back of motor is free from dirt and debris. Use compressed air or water to clean
	Debris in strainer basket	Clean strainer basket
	Loose mounting	Check that mounting bolts of motor and pump are tight
MOTOR RUNS, BUT NO FLOW	Impeller is loose	Check that motor is spinning by looking at fan on back of motor. If so, check that pump impeller is correctly installed
	Air leak	Check plumbing connections and verify they are tight
	Clogged or restricted plumbing	Check for blockage in strainer or suction side piping
		Checked for blockage in discharge piping including partially closed valve or dirty pool filter

Disclaimer

Please refer to our website

www.aosmithmotors.com

for updates to this printed manual.

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