



## Installation, Operation & Maintenance Instruction



Bulletin #: IOM-CTL-RVC-2003

**RV Controller**  
ROTARY VECTOR PUMP CONTROLLER

# Pulsafeeder Factory Service Policy

The RV Controller is a motor speed control device for use with Pulsafeeder® gear and peristaltic pumps. It includes extensive on-board diagnostics. If you are experiencing a problem with your RV Controller, first review the on-screen information, then consult the troubleshooting guide. If the problem is not covered or cannot be solved, please contact your local authorized Sales Representative or our Technical Service Department at (585) 292-8000 for further assistance.

Trained individuals are available to diagnose your problem and arrange a solution. Solutions may include purchasing a replacement unit or returning the RV Controller to the factory for inspection and repair. All returns require a Return Material Authorization (R.M.A.) number to be issued by Pulsafeeder. Parts purchased to correct a warranty issue may be credited after examination of the original parts by Pulsafeeder personnel. Parts returned for warranty considerations which are good will be sent back freight collect.

**Any field modifications will void the Pulsafeeder RV Controller warranty. Out-of-warranty repairs will be subject to Pulsafeeder's standard bench fees and testing costs associated with replacement components.**

## FCC Warning

This equipment generates and uses radio frequency energy. If not installed and used properly, in strict accordance with the manufacturer's instructions, it may cause interference to radio communications. Operation of this equipment in a residential area is likely to cause interference. In such cases, the user at their own expense will be required to take whatever measures necessary to correct the interference.

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## Conventions

For the remainder of this bulletin, the following conventions are in effect.



A warning defines a condition that could cause damage to both the equipment and the personnel operating it. This manual must be consulted in all cases where the warning symbol is marked in order to find out the nature of the potential hazards and any actions which have to be taken to avoid them.



Caution, possibility of electric shock



Notes are general information meant to make operating the equipment easier.

## Revision History:

Rev A	<u>Release Date June 2015</u> First revision
Rev B	<u>Release Date July 2015</u> Update spare parts and controller layout diagrams

# 1. Introduction

The RV Controller a vector driven control device for use only with Pulsafeeder gear and peristaltic pumps. Together with the HMI touchscreen and multiple I/O connections, this controller is designed for simplicity to reliably start, stop, and continuously pump fluids at a wide range of pressures and flows.

This instruction manual covers the RV Controller only. All standard features are covered in this manual and most options have instructions where applicable. For information specific to the pump or any other accessories, please refer to the appropriate IOM.

# 2. Forward

The pumps to which these “instructions” refer to are designed for use in industrial areas and therefore cannot be treated as retail products. The present documentation gives instructions to be used by qualified personnel only. It must be used in compliance with the regulations, laws and technical standards in force and cannot, under any circumstances, take the place of plant standard or additional regulations, including any which are not legally enforceable, which have been issued with the scope of ensuring safety.

Equipment with special manufacturing or constructive variances may differ in details with respect to this description.

In case of any difficulty, please contact an authorized Sales Representative or Pulsafeeder Technical Service.

The RV Controller is rated for NEMA 4X locations as identified on the controller nameplate.

# 3. Description

The RV Controller is designed for a wide variety of control applications. If delivered with a pump and motor, the device is factory configured. Field configuration may still be required in certain installations. Local setup and control is achieved through the touchscreen display. Flow calibration uses on-screen prompting and automated pump operation to facilitate setup. Once calibration is complete all subsequent flow monitoring may be done using flow units. Analog signal calibration is also accomplished by simple touchscreen entry. It includes a real-time display of signal level, eliminating the need for external meters.

The RV Controller can be controlled and monitored via remote SCADA control or the local touchscreen user interface. As a multifunctional controller this device combines the following functions:

- Sensorless vector type variable speed motor drive.
- Input / output processor (4-20mA or 0-20mA in and out, digital input/output), including PID loop for closed loop flow control.
- Power monitor for PULSAGuard, flow detection, and user connected alarm sensors
- A user configurable calibration engine allowing flow units as the main controllable parameter.

## 3.1 Standard Features

- HMI touchscreen for ease of local operation.
- Manual (Local) and Auto (Remote) operational modes.
- Displays pump operation in GPH, LPH, GPM, LPM, or RPM, Hz.
- One 4-20 mA or 0-20mA analog input signal for flow or speed control.
- One 4-20 mA or 0-20mA analog input dedicated to flow control (with an external, user supplied flow meter).
- Two Analog 4-20 mA or 0-20mA outputs for flow or speed feedback.
- Four menu selectable digital relays, 6A at 250VAC each
- 120 Volts, 50/60Hz, single phase AC input for .5HP motors.
- 200-240 Volts, 50/60 Hz, single phase AC input power for fractional to 1 HP motors.
- 200-240 Volts, 50/60 Hz, three phase AC input power for .5 HP to 5 HP motors.
- 380-500 Volts, 50/60Hz, three phase for 1 HP to 5 HP motors.
- Security code lockout of configuration menus.
- Standard configurable pump protection utilizing proprietary PULSAGuard technology.
- UL 508a, cUL, NEMA 4X rated enclosure.

## 4. Safety Considerations

The RV Controller yields tremendous control capacity – electrical and, in conjunction with a pump, mechanical and hydraulic in nature. In consideration of SAFETY, the user should be mindful of the following considerations in regards to personal, nearby personnel, and environmental safety. Please consider the following prior to the installation and operation of an RV controlled pump:

1. Read and understand all related instructions and documentation before attempting to install or maintain this equipment.
2. Observe all special instructions, notes, and cautions.
3. Act with care and exercise good common sense and judgment during all installation, adjustment, and maintenance procedures.
4. Ensure that all safety and work procedures and standards that are applicable to your company and facility are followed during the installation, maintenance, and operation of this equipment.



**This instruction manual covers the RV Controller only. For information and safety precautions specific to the pump or any other accessories, please refer to the appropriate IOM.**

### 4.1 General Safety

The RV Controller was designed for operation solely with Pulsafeeder gear and peristaltic pumps. Use for any other application is considered unsafe and voids all certification markings and warranties. See **Section 15 Maintenance** for additional operating and maintenance precautions.

## 4.2 Electrical Safety

The RV Controller is an industrial process controller. Improper application and use can be hazardous. The owner/operator is solely responsible for its use.

The electrical installation of the controller must conform to all relevant electrical codes. Installation and electrical maintenance must be performed by a qualified electrician. Before installing or servicing this device, all power must be disconnected from the source at the main distribution panel. The electrical installation must conform to all location relevant electrical codes.

The RV Controller emits electro-magnetic energy and may generate radio frequency interference and should only be used in industrial applications. The owner/operator is responsible for shielding this energy/interference.

Certain wiring procedures may require that the user wear a wrist strap to dissipate static charges.



**Wait a minimum of 15 minutes after disconnecting power before servicing the RV Controller or pump motor. Capacitors retain a charge even after power is removed from the controller.**

## 4.3 Fire Safety

In the event of an electrical fire, use a Class C fire extinguisher. **Never use water to extinguish a Class C fire.**

Class C fires involve electrical equipment, such as appliances, wiring, circuit breakers and outlets. Never use water to extinguish class C fires – for the high risk of electrical shock. Class C extinguishers do not have a numerical rating. The C classification means the extinguishing agent is non-conductive. The geometric symbol for a Class C extinguisher is a “C” in a blue circle.

## 4.4 Mechanical Safety

Users should note that the pump motor is always under the control of the RV Controller, and as such may actuate without warning. Care should be taken to keep loose clothing and other objects away from the pump motor.

The RV Controller was designed to require minimal maintenance or service. It contains no user-maintainable components. Access the inside of the RV Controller enclosure only for initial field wiring, or as instructed to do so within this manual. Evidence of unauthorized entry or disassembly shall void the warranty.

## 4.5 Hydraulic Safety

Thoroughly review and adhere to the contents of the pump Installation, Operation, Maintenance and Instruction manual for any pump used with the RV Controller. As a microprocessor controlled device, the RV Controller may activate the pump motor without warning – generating hydraulic pressure and fluid flow. Care should be taken to protect both users and systems should the pump activate.

## 4.6 Liability Exclusion

Pulsafeeder, Inc. is unable to monitor the observance of the instructions given in this manual, nor verify the actual working conditions and installation of the equipment, the correct operation and maintenance of the equipment and accessories. An incorrect installation, or misuse of the equipment, may cause serious damage and may pose a danger to persons or property. Any anomalies must be reported to the maintenance supervisor. The user is not authorized to tamper with the machine for any reason.





**Attempts to disassemble, modify or tamper in general by unauthorized personnel will void the guarantee and will release Pulsafeeder, Inc. from any liability for damage caused to persons or property resulting from such actions.**

Pulsafeeder, Inc. is considered released from any liability in the following cases:

- Improper installation
- Improper use of the equipment by non-professional or inadequately trained operators
- Use not in compliance with regulations in the Country of use
- Lack of maintenance or improperly performed
- Use of non-original spare parts or incorrect parts for the model in question
- Total or partial failure to observe the instructions
- Exceptional environmental events



**Do not perform any work on the pump, motor, or RV Controller with electrical power connected to the controller. Do not operate the RV Controller with the cover removed. Danger of electronic shock and mechanical pinch hazard.**



**Installation and repairs should only be performed by authorized personnel. Follow all safety/ local lock-out, tag-out procedures.**

## 5. Equipment Inspection

Upon equipment receipt, verify that the controller has not received any damage due to transportation and is complete with every eventual accessory. Shortages or damage should be reported immediately to the carrier and your Pulsafeeder Representative.

### 5.1 Consignment Receipt and Unpackaging

Immediately after receipt of the equipment it must be checked against the delivery/shipping documents for its completeness and that there has been no damage in transportation.

Check any crate, boxes, or wrappings for any accessories or spare parts that may be packed separately with the equipment or attached to side walls of the box or equipment.

Each product has a unique serial number. Check that this number corresponds with the order documents, and always reference this number in correspondence with your Pulsafeeder Representative for Pulsafeeder Technical Service.

### 5.2 Handling and Lifting

Boxes, crates, pallets or cartons may be unloaded using fork lift vehicles or slings dependent on their size and construction.

A crane must be used for all controller/pump sets in excess of 25 kg (55 lb). Fully trained personnel must carry out lifting, in accordance with local regulations.

Slings, ropes and other lifting gear should be positioned where they cannot slip and where a balanced lift is obtained.

## 5.3 Recycling and End of Product Life

At the end of the service life of the RV Controller or its parts, the materials and parts should be recycled or disposed of using an environmentally acceptable method and following all local requirements. If the product contains substances that are harmful to the environment, these should be removed and disposed of in accordance with current regulations. This also includes the liquids and/or gases that may be used in the "seal system" or other utilities.

Make sure that hazardous substances are disposed of safely and that the correct personal protective equipment is used. The safety specifications must be in accordance with the current regulations at all times.

## 5.4 Storage Instructions

The RV Controller can be successfully stored for extended periods. The key to this success is temperature and humidity control.

### Short Term

The RV Controller should be stored in a temperature and humidity controlled environment. It is preferable to keep the temperature constant in the range of 0° to 140°F ( -18° to 60°C). The relative humidity should be 0 to 90% non-condensing.

### Long Term

Storage of the RV Controller for periods of longer than twelve months is not recommended. If extended storage is unavoidable the RV Controller should be stored in accordance with those conditions stipulated for Short Term Storage. In addition, there is risk of degraded capacitor performance if storage periods are above 12 months. In this case, apply the following procedure prior to using the device:

1. Apply a variable AC supply to L1 and L2
2. Increase AC supply voltage to:
  - 80% of rated voltage for a duration of 30 minutes
  - 100% of rated voltage for an additional 30 minutes



**Failure to follow this procedure can result in serious damage to the equipment and personnel, including death or serious injury.**

## 6. Installation and Wiring

### 6.1 Installation Notes

The RV Controller is a microprocessor-based controller that uses electro-static sensitive CMOS components. Do not make any (high or low voltage) electrical connections without adequately grounding the RV Controller and the worker to eliminate an electro-static charge between the two. A conductive wrist strap worn by the worker and attached to the controller's internal ground plate is adequate to satisfy this requirement.

Conduit connections can carry fluids and vapors into the controller enclosure causing damage and void the warranty. Care should be taken when installing conduit to protect against fluid/vapor entry. In accordance with any applicable codes, provide sealed entries or conduit drains near the point of entry. The user must supply the correct connection for the power entry, as per the local codes and requirements. Any cable entrances that are not used should be appropriately sealed against moisture and vapors.

The power wiring should always be separated away from the signal wiring. If questions arise about the conduit or cable glands during installation or servicing contact your Pulsafeeder Representative or Pulsafeeder Technical Service for assistance.



**Review *Section 4 Safety Considerations* prior to installing the RV Controller. It contains information required to properly install and operate the RV Controller in a permanent installation.**

### 6.2 Location

The site selected for the installation of the RV Controller is largely dependent on the physical location of the pump. Review the Installation, Operation, Maintenance and Instruction manual provided with the pump. The pump IOM manual details system related issues that are important to proper operation of the pump.

Consider the following RV Controller installation related issues when selecting an installation site:

- Location of the controller enclosure must be within 100 feet (30.5 meters) of the pump motor, otherwise consult factory on longer distances if necessary. Shielded cable is recommended.
- Avoid locations where the controller would be subjected to extreme cold or heat (<32° or >104°F, <0° or >40°C).
- The device must not be located in direct sunlight.
- The installation of this device must comply with national, state, and local electrical codes.
- The controller must be mounted vertically.
- If the controller is already mounted to the pump, refer to the appropriate pump Installation, Operation, and Maintenance Guide for additional guidelines.

The RV Controller must be secured to an appropriate support with appropriate hardware before use. Check packaging for mounting hardware if the controller is not pump mounted at the factory. Installation of this device must comply with national, state, and local codes.

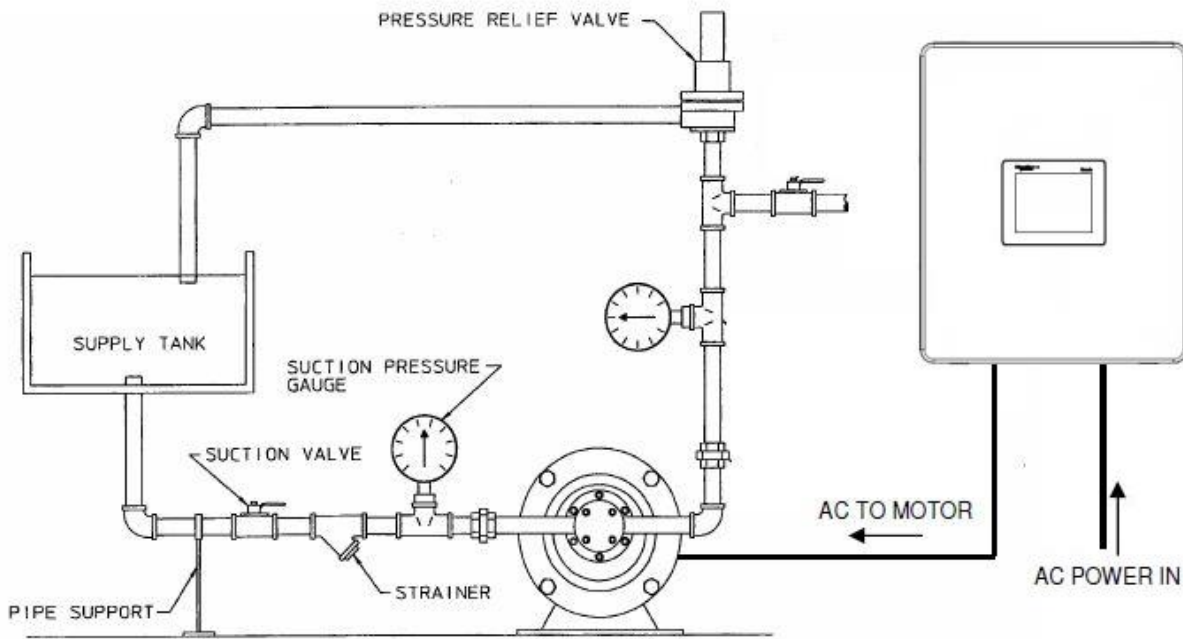


Figure 1 – Typical Installation



**Avoid locations where the RV Controller would be subjected to extreme cold or heat [less than 32° F (0° C) or greater than 104° F (40°C)] or direct sunlight. Failure to observe this warning could damage the RV Controller and void its warranty.**

### 6.3 Controller Layout

The design of the RV Controller incorporates all control wiring onto one easily accessed terminal strip located on the inside of the controller enclosure. Gain access to this strip by opening the latches allowing the cover to hinge open.

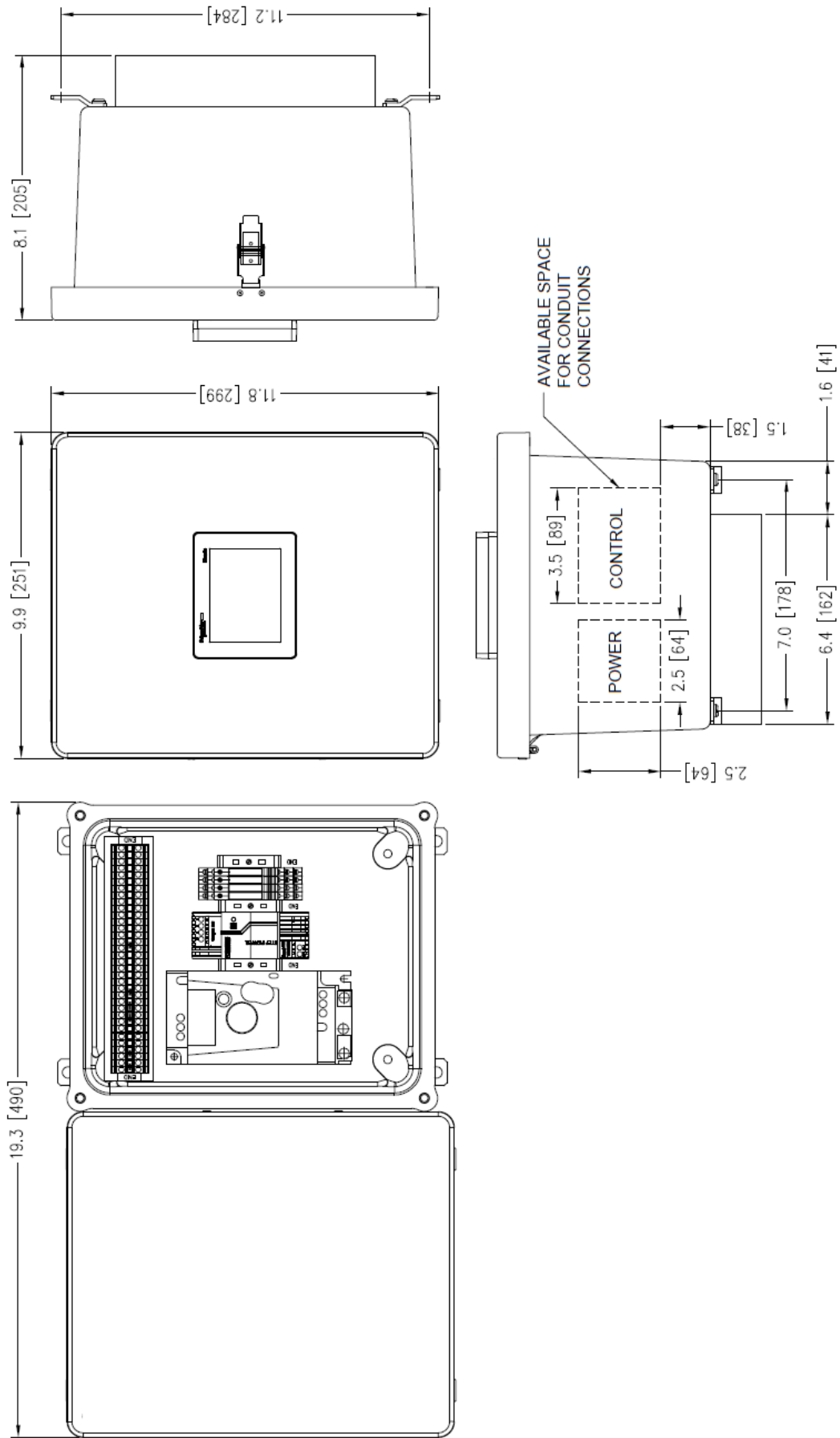


Figure 2 – Controller Layout, Code A and B, Size 1

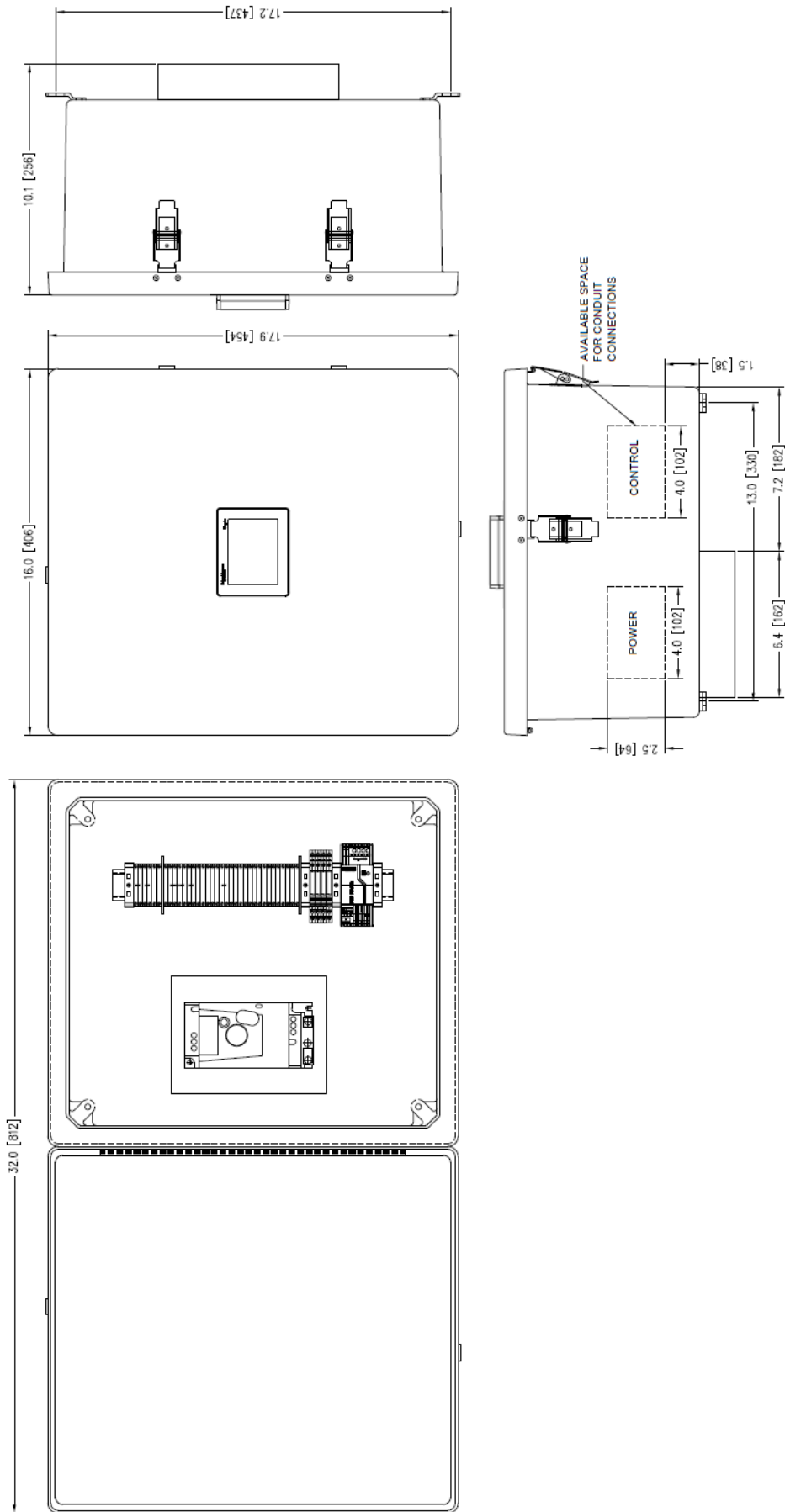


Figure 3 – Controller Layout, Code C – F, Size 2

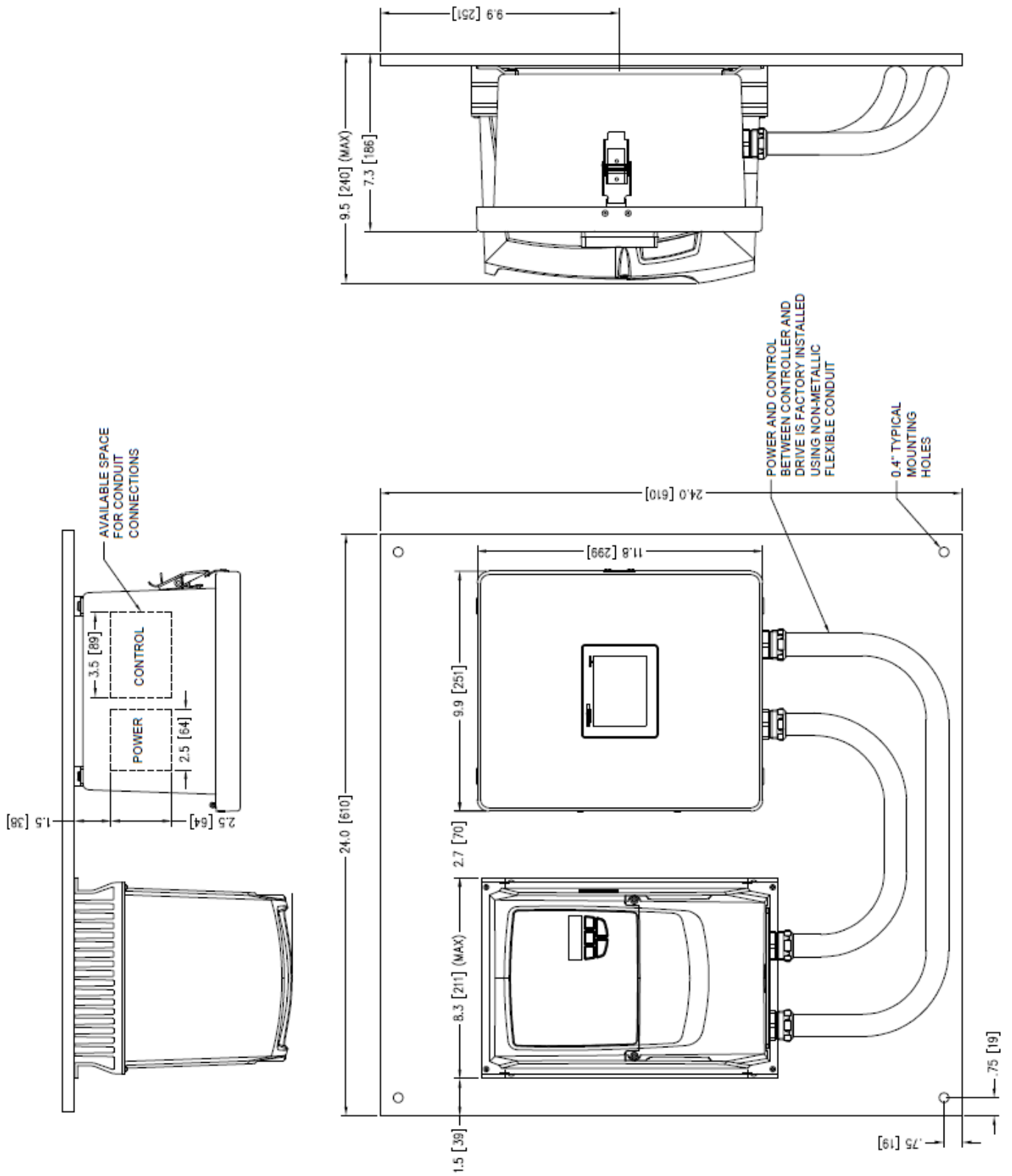


Figure 4 – Controller Layout, Code G – R



Failure to observe the guidelines below may lead to erratic and possibly unsafe operating conditions.

## 6.4 Electrical Wiring



If previously supplied with power, wait a minimum of 15 minutes after disconnecting power before servicing the RV Controller or pump motor. Capacitors retain a charge even after power is removed from the controller. Follow all local Lockout/Tagout procedures.

Depending on the pump/controller package received from the factory, the input power, pump motor, and system I/O wiring will need to be completed at the installation site.

The following is a summary of the electrical wiring and steps necessary to install the RV Controller. See the appropriate sections for detailed instructions and diagrams.

1. Connect the 3 phase pump motor to the controller.
2. Connect optional system control wiring.
  - a. Analog input signal(s) to accept a process input signal or flow meter input.
  - b. Analog output signal to monitor pump speed or flow.
  - c. Digital input signals, for additional inputs such as start/stop or tank level inputs.
  - d. Digital output signals, for status or alarm outputs such as auto/manual or leak detection.
3. Connect the input/supply voltage (can be single or three phase).
4. Conduct a power-up and test the RV Controller to confirm the connections and check for proper operation.
  - a. Go to **Section 8 Input/Output Set** for details on how to configure I/O and perform power-up tests



Consult Section 15.1 Maintenance Precautions prior to completing any wiring or maintenance work inside the RV Controller.



Field Wiring conductors shall be copper conductors only!

### 6.4.1 Power Wiring Information

Verify the supply voltage rating with the nameplate affixed to the RV Controller. Ensure that the supply voltage matches the controller configuration.

SERIAL	<input type="text"/>	NEMA	<input type="text"/>
MODEL	<input type="text"/>	POWER	<input type="text"/>
Hz	VOLTS	AMPS	PHASE
50/60	<input type="text"/>	<input type="text"/>	<input type="text"/>

**WARNING: SHOCK HAZARD**  
DO NOT OPEN COVER UNLESS POWER HAS BEEN SWITCHED OFF.  
MAXIMUM OPERATING TEMPERATURE 104°F (40°C). THIS  
EQUIPMENT IS SUITABLE FOR NON-HAZARDOUS LOCATIONS ONLY

ENGINEERED PRODUCTS  
 2883 Brighton Henrietta Town Line Rd.  
 Rochester, New York 14623  
NP250214-000

Figure 5 – RV Controller Nameplate





Applicable national and local electrical codes take precedence over recommendations in the table below.

- Review the table below for supply voltage and horsepower ratings.
- Wires should be routed within the enclosure in a manner that maintains separation between high voltage and low voltage conductors. High voltage conductors should be routed to the side opposite the control circuitry.
- Incoming power wiring should adhere to all applicable local and national electrical codes and regulations. A circuit breaker or fuse must be provided as noted below.
- Upon initial application of AC power, a current inrush will occur to charge the DC bus capacitors. This is normal operation, and breakers and other circuit protection devices should be sized accordingly.

Power Requirements	Recommended Minimum Wiring and Circuit Breaker					
	Voltage In	Output Current	Circuit Breaker	Wire Size	Wire Size	Safety Approvals <sup>1</sup>
.5 HP	115VAC, single phase	9 A	15 A	14 AWG	2.5mm <sup>2</sup>	UL, CUL
.5 HP	200-240 VAC, single phase	5 A	10 A	14 AWG	2.5mm <sup>2</sup>	UL, CUL
.75 HP	200-240 VAC, single phase	7 A	15 A	14 AWG	2.5mm <sup>2</sup>	UL, CUL
1.0 HP	200-240 VAC, single phase	8.5 A	15 A	14 AWG	2.5mm <sup>2</sup>	UL, CUL

Power Requirements	Recommended Minimum Wiring and Circuit Breaker					
	Voltage In	Output Current	Circuit Breaker	Wire Size	Wire Size	Safety Approvals <sup>1</sup>
.5 HP	200-240 VAC, three phase	3 A	10 A	14 AWG	2.5mm <sup>2</sup>	UL, CUL
1.0 HP	200-240 VAC, three phase	6 A	10 A	14 AWG	2.5mm <sup>2</sup>	UL, CUL
2.0 HP	200-240 VAC, three phase	7 A	15 A	14 AWG	2.5mm <sup>2</sup>	UL, CUL
3.0 HP	200-240 VAC, three phase	10.5 A	20 A	12 AWG	4.0mm <sup>2</sup>	UL, CUL
5.0 HP	200-240 VAC, three phase	18 A	30 A	10 AWG	6.0mm <sup>2</sup>	UL, CUL

Power Requirements	Recommended Minimum Wiring and Circuit Breaker					
	Voltage In	Output Current	Circuit Breaker	Wire Size	Wire Size	Safety Approvals <sup>1</sup>
1.0 HP	380-500 VAC, three phase	2 A	10 A	14 AWG	2.5mm <sup>2</sup>	UL, CUL
2.0 HP	380-500 VAC, three phase	4 A	10 A	14 AWG	2.5mm <sup>2</sup>	UL, CUL
3.0 HP	380-500 VAC, three phase	6 A	10 A	14 AWG	2.5mm <sup>2</sup>	UL, CUL
5.0 HP	380-500 VAC, three phase	10 A	20 A	12 AWG	4.0mm <sup>2</sup>	UL, CUL

Note 1: Applicable standards are UL61010-1, and CSA C22.2#61010-1 and EN61010-1 3<sup>rd</sup> edition.

Table 1: Power and Wiring Requirements

## 6.4.2 Motor Power Wiring Diagram



Applicable national and local electrical codes take precedence over recommendations made here. Input Power must be run in a separate conduit. Do not combine Power and Control wires in a common conduit.

Motor HP	Voltage In	Voltage Out
.5 HP	115VAC, single phase	230 VAC, three phase
.5 HP	200-240 VAC, single phase	230 VAC, three phase
.75 HP	200-240 VAC, single phase	230 VAC, three phase
1.0 HP	200-240 VAC, single phase	230 VAC, three phase
.5 HP	200-240 VAC, three phase	230 VAC, three phase

Table 2: Low Power

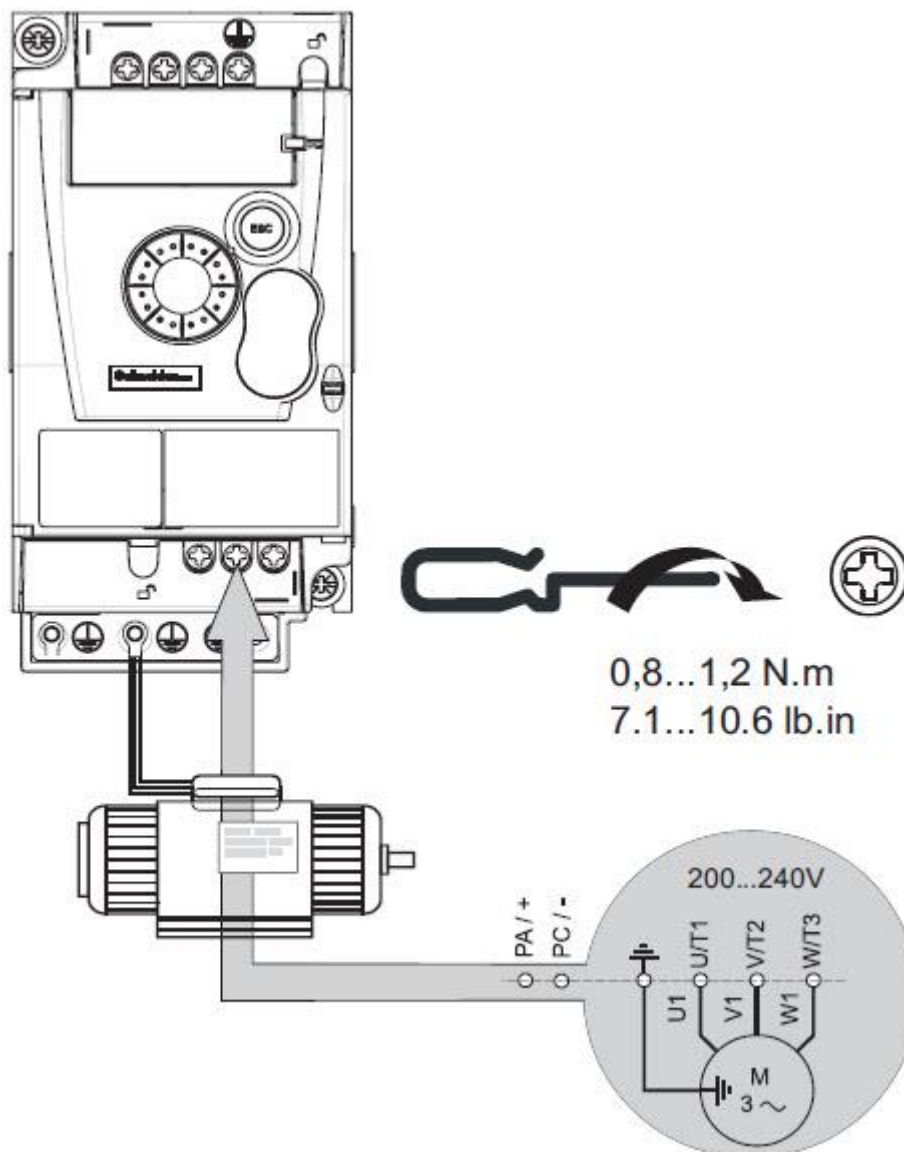
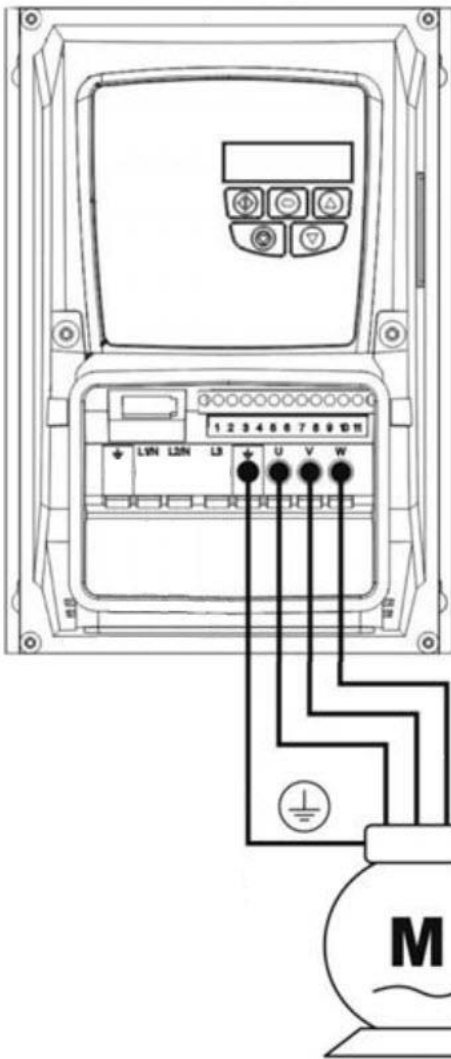


Figure 6 – Power Wiring .5 HP – 1 HP, 120VAC – 240VAC

Motor HP	Voltage In	Voltage Out
1.0 HP	200-240 VAC, three phase	230 VAC, three phase
2.0 HP	200-240 VAC, three phase	230 VAC, three phase
3.0 HP	200-240 VAC, three phase	230 VAC, three phase
5.0 HP	200-240 VAC, three phase	230 VAC, three phase
1.0 HP	380-500 VAC, three phase	460 VAC, three phase
2.0 HP	380-500 VAC, three phase	460 VAC, three phase
3.0 HP	380-500 VAC, three phase	460 VAC, three phase
5.0 HP	380-500 VAC, three phase	460 VAC, three phase

Table 3: High Power



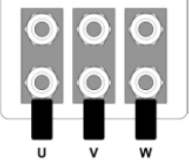
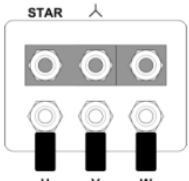
Incoming Supply Voltage	Motor Nameplate Voltages	Connection
230	230 / 400	DELTA $\Delta$ 
400	400 / 690	
400	230 / 400	STAR $\star$ 

Figure 7 – Power Wiring 1 HP – 5 HP, 200 – 500 VAC, Three Phase Only

### 6.4.3 Input/Output Signal Wiring



Digital outputs must not be activated at power up until they have been defined in the controller settings. See Section 10 Digital I/O Configurations for instructions.

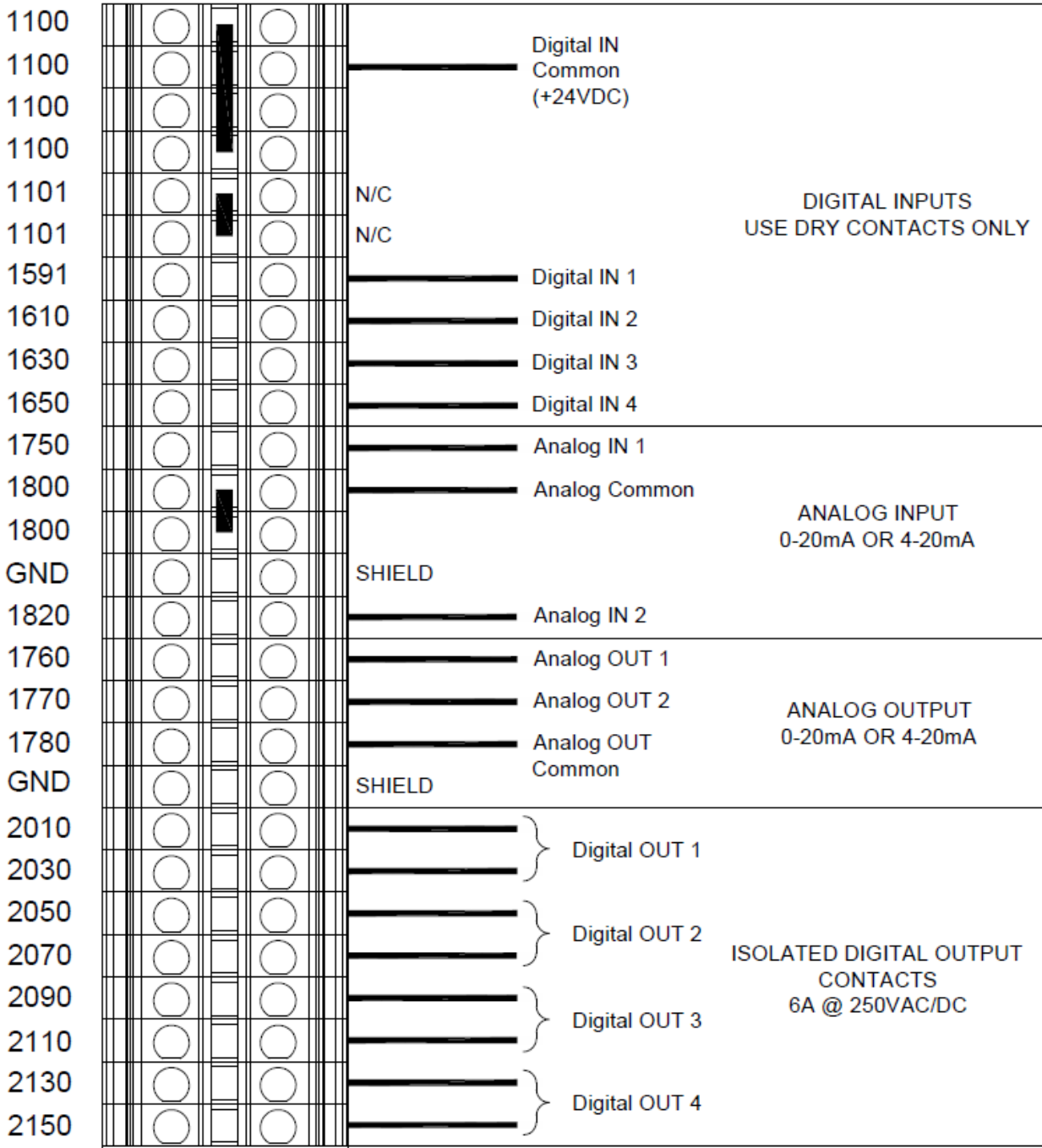


Figure 8 – Analog and Digital Signal Connections

## 6.4.4 Input Power Wiring

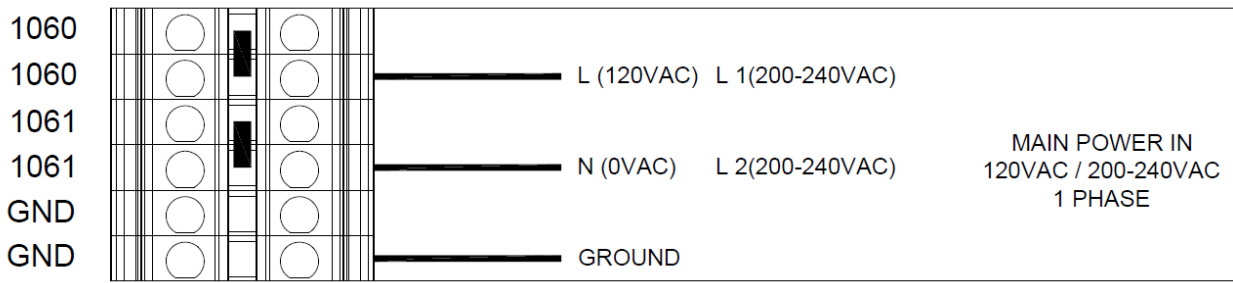


Figure 9 – Single Phase Power In Wiring

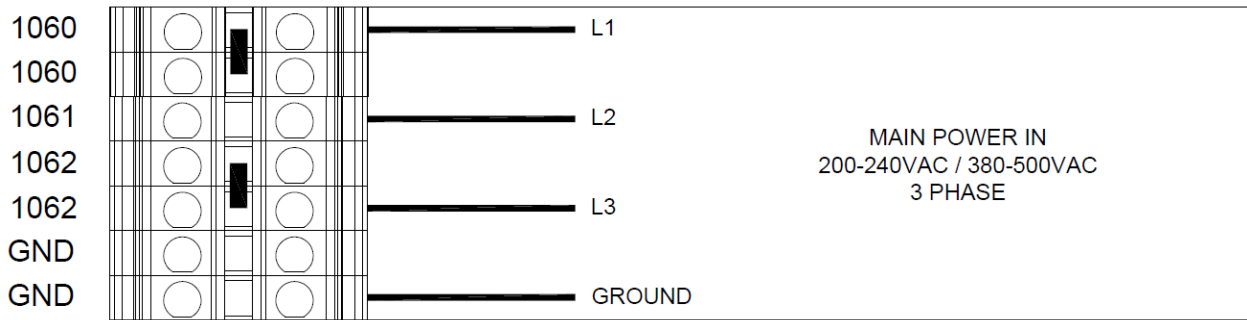


Figure 10 – Three Phase Power In Wiring

## 6.5 Check Wiring and Confirm Incoming Power

Re-check all electrical connections. Pay attention to polarity of all inputs and outputs. Additionally, insure that all terminals are clamping onto the bare conductor and not on the wire insulation. Remove any excess insulation; this can lead to poor connections or faulty operation. Ensure that wires will not be trapped or pinched when front cover is replaced and secured.

Following all necessary safety precautions, turn power on at the mains or distribution panel. If the incoming power is connected correctly the touchscreen will illuminate and begin the display initialization. If the display is not illuminated, first check the line voltage with a voltmeter. If the voltage is not correct, return to **Section 6.4 Electrical Wiring** and review connections.

# 7. Start Up and Operation

## 7.1 Introduction

The RV Controller touchscreen interface controls the main functions of the device. The Pump Status screen displays current speed or flow data as well as allows for manual (local) operations at the pump. The easy to navigate Menu system allows the user to input motor data, pump parameters, and I/O configurations to set up a successful installation. A single touch on an executable button will prompt the controller to act or allow for user input.

## 7.2 Pump Status screen

Once the RV Controller is connected to power and the display initialization is complete, the Pump Status screen will appear. This is the main screen of the device to monitor speed and flow locally. Speed and flow units can be switched by touching the units (RPM or Hz and GPM, GPH, LPM, or LPH). From this screen, the Menu button can be selected to access additional features of the controller. Users may have to Log In to access certain menu settings.



**A notification box will appear upon start up to confirm the USB storage device is installed and active. This can be cleared from the screen by touching the “X” button.**

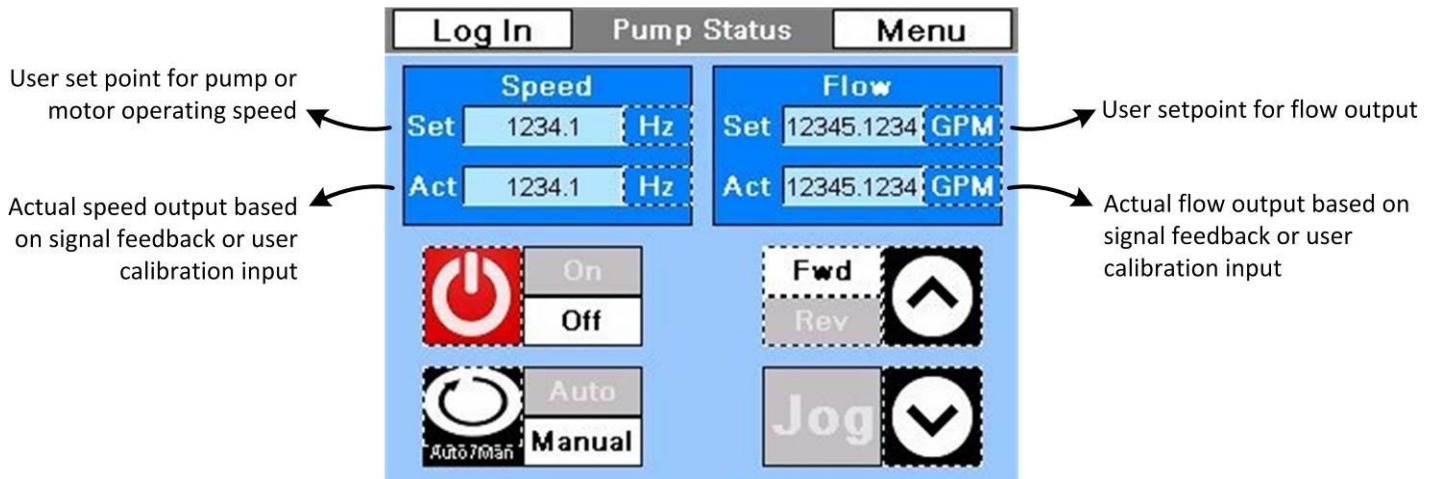


Figure 11 – Pump Status Screen











Key	Function	Description	Mode
	Defines User Access	Press to open Log In screen to access menu options.	Local, Remote
	Access Feature Menus	Press to access additional menu screens for motor settings, I/O configuration, Flow Calibration, Alarms Log, PID Setup, and additional settings.	Local
	Motor ON/OFF	Press to turn the motor/pump <b>ON</b> or <b>OFF</b> . On or Off status will be highlighted.	Local, Remote
	Auto/Manual	Press to change operation mode between <b>AUTO</b> (remote) and <b>MANUAL</b> (local).	Local, Remote
	Forward Run	Indicates pump is running in forward direction. Press to change motor to reverse direction.	Local, Remote
	Reverse Run	Indicates pump is running in the reverse direction. Press to change motor to forward direction. (Pump Reversing must be enabled).	Local, Remote
	Arrow Up	Press to increase value (pump speed or flow).	Local
	Arrow Down	Press to decrease value (pump speed or flow).	Local
	Jog Motor	Press to prepare the controller to incrementally jog the motor in the forward or reverse direction. Button will highlight when mode is activated.	Local
	FWD Jog	Press and hold to jog the motor in the forward direction and set incremental speed.	Local, Jog Mode
	REV Jog	Press and hold to jog the motor in the reverse direction and set incremental speed.	Local, Jog Mode

Table 4 – Pump Status Screen Definitions

## 7.2.1 User Log In

Every user type has the ability to view all Menu selections but only some have the ability to input/edit parameter values in configuration and selection screens. Different user levels of access are available for **Maintenance** and **Operator**. See **Section 16.1 User Access Levels** for user type security limits.

**Maintenance:** access to menus required for initial controller set up and configuration or calibration as well as menus required for operating and local control. Maintenance users can also restore the controller to factory settings.

Username: maint  
Default password: password

**Operator:** access to menus required for operating and local control only.

Username: op  
Default password: password



**See Section 11 Controller and Other Settings for instructions to change user type passwords. Passwords and usernames are case sensitive.**

1. Select  from the Pump Status screen. The Log In screen will appear.

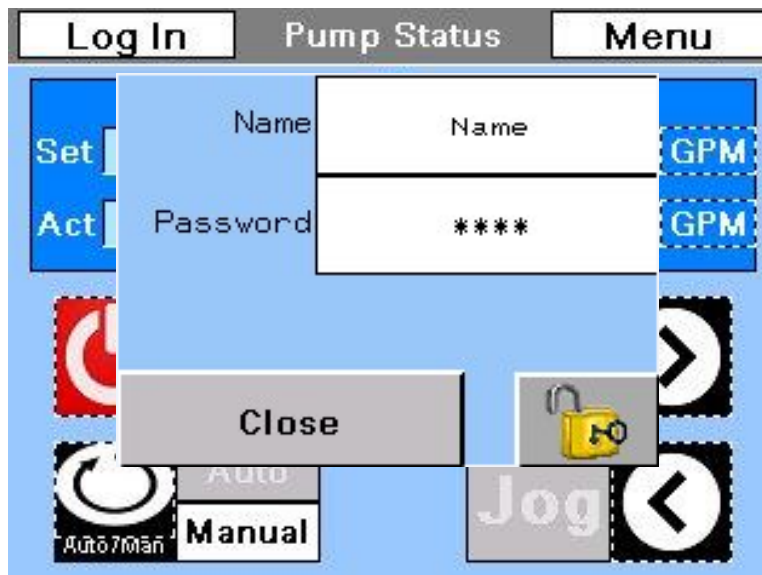




Figure 12 – Log In

2. Select the white text field next to **Name**. Use the keyboard pop up to enter the username and push Enter.
3. Select the white text field next to **Password**. Use the keyboard pop up to enter the password and push Enter.

4. Select  to unlock menu capabilities for the entered user. The Current User will be displayed in the Log In screen. Touch  to exit to the Log In screen.



5. Note that selecting  before unlocking the desired user type will close the Log In screen and no change to user type will be made.

## 7.2.2 Menu Selection


1. Select  from the Pump Status screen. The Menu selection screen will appear. Touch an option to access that particular selection.





Figure 13 – Menu Selections

2. Press **Pump Status** to return to the main Pump Status screen. Selecting **Close** will exit the Menu Selection screen and return to the last viewed screen.

## 7.3 Motor Settings

If the RV Controller was mounted to a pump and wired to a motor at the factory, the motor settings will already be entered into the controller.

If the RV Controller was received separately from the pump and/or motor, enter the following parameters into the controller based on the motor nameplate or manufacturer's information.

1. Select  from the Pump Status screen. The Menu Selection screen will appear. Select .
2. The first Motor Settings screen will appear. The Set Point column is used to enter the motor information that can be found on the motor nameplate or provided by the motor manufacturer. The column labeled **ATV12** displays the values currently stored in the controller.

Motor Settings		Menu
	SP	Drive
Standard Freq	60 Hz NEMA	60 Hz NEMA
Rated Frequency	12.1	12.1 Hz
Max Frequency	12.1	12.1 Hz
Min Frequency	12.1	12.1 Hz
Rated Voltage	123	123 VAC
Rated Current	1234.1	1234.1 A
		Next

Figure 14 – Motor Settings Screen 1

- a. Touching the **Standard Freq** selection box will switch the input between “60Hz NEMA” and “50Hz IEC.”
  - b. **Rated Frequency, Max Frequency, Min Frequency, Rated Voltage, and Rated Current** can all be entered by touching the accompanying text box and entering the value in the pop up number pad according to the motor nameplate or manufacturer’s specification.
3. Press  to navigate to the second Motor Setting screen.

Motor Settings		Menu
	SP	Drive
Rated Speed	1234	1234 RPM
Rated Motor Power Factor	1.12	1.12
Rated Power	12.12 HP	12.12 HP
Jog Speed	1234	Hz
Gear Ratio	1234.1	: 1
<input type="button" value="Previous"/>		<input type="button" value="Next"/>

Figure 15 - Motor Settings Screen 2

- a. **Rated Speed, Power Factor, Rated Power, Jog Speed, and Gear Ratio** can be entered in the **SP** column according to the motor nameplate or manufacturer’s specification. **Rated Power** units are dependent on the **Standard Freq** selection on the first Motor Settings screen.

**Jog Speed** units can be switched between **Hz** and **RPM** by touching the displayed unit selection.



Only enter a Gear Ratio value if the pump is mounted to a gear reducer. The Gear Ratio will need to be accounted for when entering RPM speed values in any other screen.

4. Press  to navigate to the last Motor Setting screen.

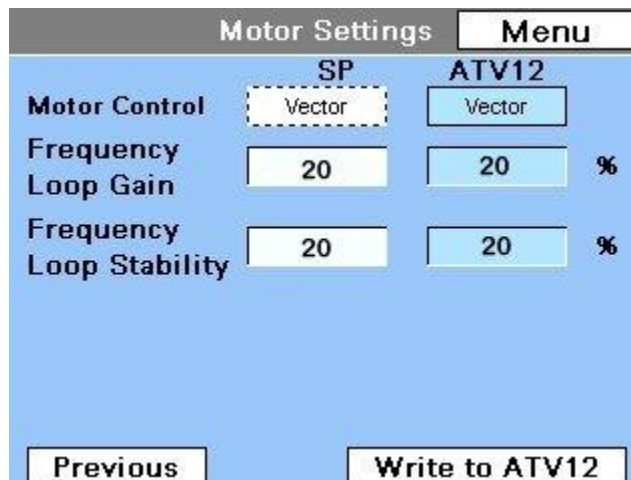


Figure 16 - Motor Settings Screen 3

- a. **Motor Control:** select as Vector for high performance starting and operation.
- b. **Frequency Loop Gain** and **Frequency Loop Stability** values can be entered by touching the accompanying text box and entering the value in the pop up number pad.



The default Frequency Loop Gain and Stability values are recommended unless otherwise specified from the factory.

- c. Press  to save the entered motor setting data to the controller. A notification box will appear while writing the values to the controller.


5. The Motor Settings input is now complete. Touch  to navigate to the next desired screen.



It is recommended to confirm the pump and flow direction is correct for the application once the motor settings are stored in the controller. Use appropriate precautions when starting pump operation. For information and safety precautions specific to the pump or any other accessories, please refer to the appropriate IOM.

6. Touch  to return to the **Pump Status** screen. Check that the  pump direction is highlighted.



7. Touch the  button to turn the pump on. Observe the direction of pump rotation or flow.
- If pump direction is correct, turn the pump off and continue the controller set up procedure.
  - If it is incorrect, stop the pump and disconnect from the power source to check the motor wiring. Or, follow the steps in **Section 11** to change the Pump Direction on the **Other Settings** screen.

## 7.4 Control Modes

The RV Controller can provide two types of flow process control. This is dependent on whether an analog flow meter is included in the system or not. Each control mode involves a user assisted flow calibration procedure.

### 7.4.1 Sensorless Vector Control

Without an analog flow meter feedback, the RV Controller can be calibrated based upon a theoretical or empirical flow rate versus motor or pump RPM. The internal calibration engine calculates the appropriate speed based upon the desired flow rate of the system.

The user supplies two points of calibration, one point at the high speed/high flow (maximum motor speed is recommended) and a second point at the low speed/low flow (recommended to use the minimum design speed/flow required). These two points provide an open loop linear flow and speed relationship which is used to adjust all new flow set points.

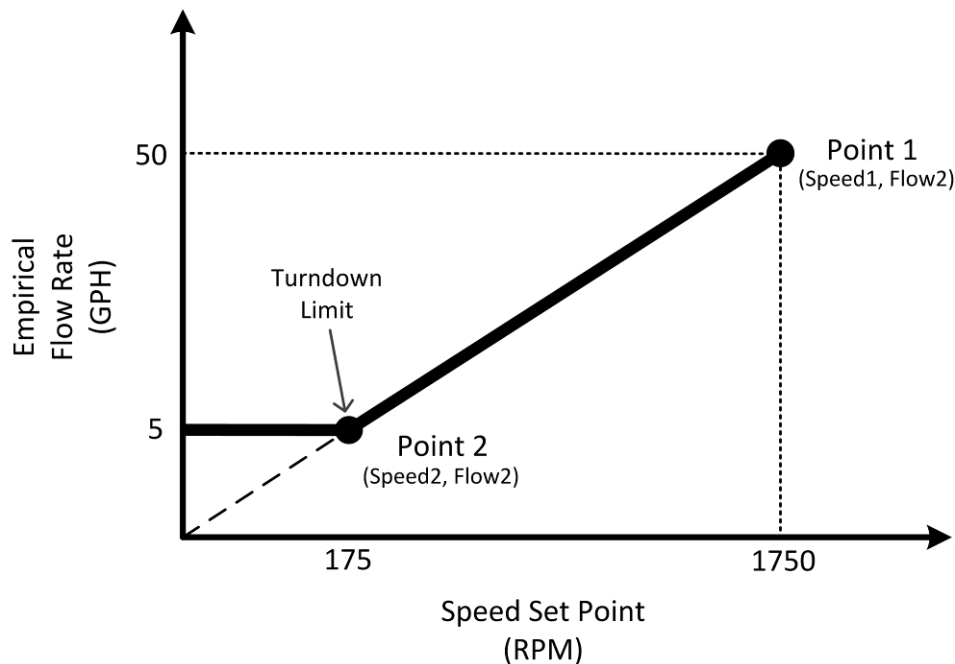


Figure 17 – Example Open Loop Flow Calibration Curve

### 7.4.2 Closed Loop Control

This mode uses an analog flow meter placed in the flow path to provide feedback to the controller. With the process fluid flow rate, the controller is able to adjust motor speed based on a PID algorithm.

The flow meter should be located as close as possible to the pump on the discharge piping to reduce inaccuracies due to flow stability. The flow signal must be connected to Analog Input #2 and activated with the **Analog I/O Configuration** steps in **Section 8.2**.

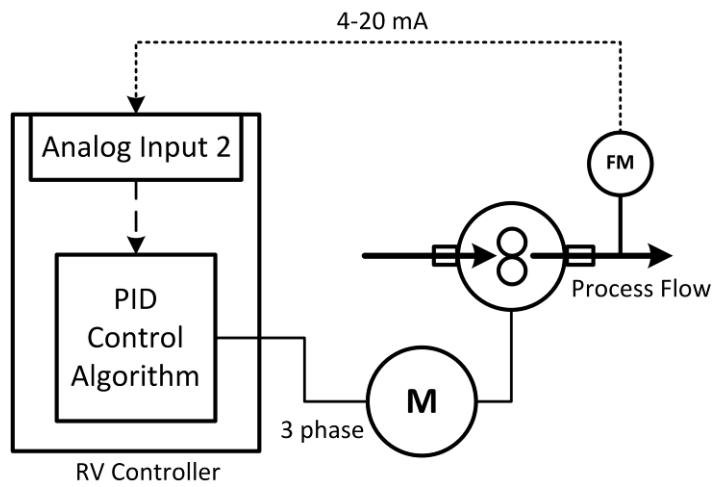


Figure 18 – Closed Loop Typical Installation

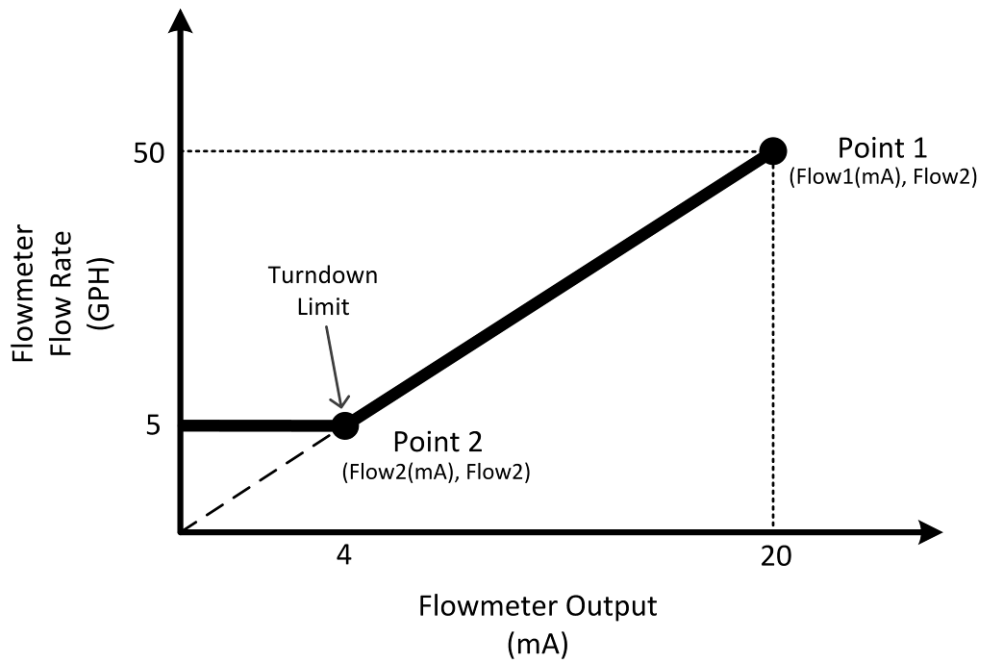


Figure 19 – Example Closed Loop Flow Calibration Curve

# 8. Input/Output Setup

## 8.1 Introduction

The RV Controller uses dedicated analog channels for flow and speed control. Each channel can be configured and calibrated for optimized feedback. Digital inputs and outputs can be selected for various alarm and notification configurations.

## 8.2 Analog I/O Configuration

1. Select **Menu** from the upper right hand corner of the touchscreen. Select **Analog I/O Configuration**
2. The Analog I/O Configuration screen will appear. Analog Channel #1 determines the mode of operation of the pump, whether it is in Speed Control mode or in Flow Control mode. Analog Channel #2 is dedicated to a flow feedback signal.

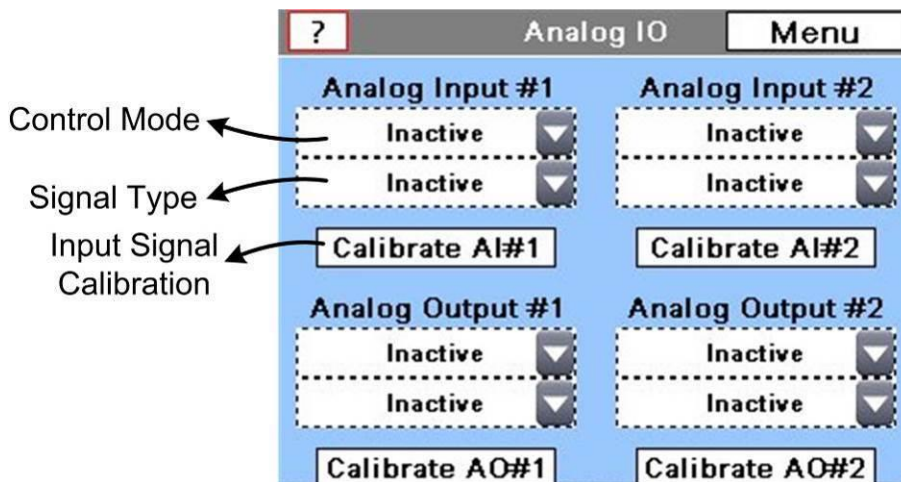


Figure 20 – Analog Input Configuration

- a. Press the first drop down arrow under **Analog Input #1** to choose the control mode; **Inactive**, **Speed SP**, or **Flow SP**. This will determine which setpoint is selectable on the Pump Status screen.

Inactive
Speed SP
Flow SP

Analog channel is not in use.

Analog channel is in use with a device for speed control (Hz or RPM)

Analog channel is in use with a device for flow control (GPM, GPH, LPM, or LPH).



**If Analog Input #1 remains Inactive, the default Control Mode will be speed control.**

- b. Press the second drop down arrow under **Analog Input #1** to choose the signal type; **4-20 mA** or **0-20 mA**, based on the control device.
3. Set up the Output channel to match the active Control Mode.

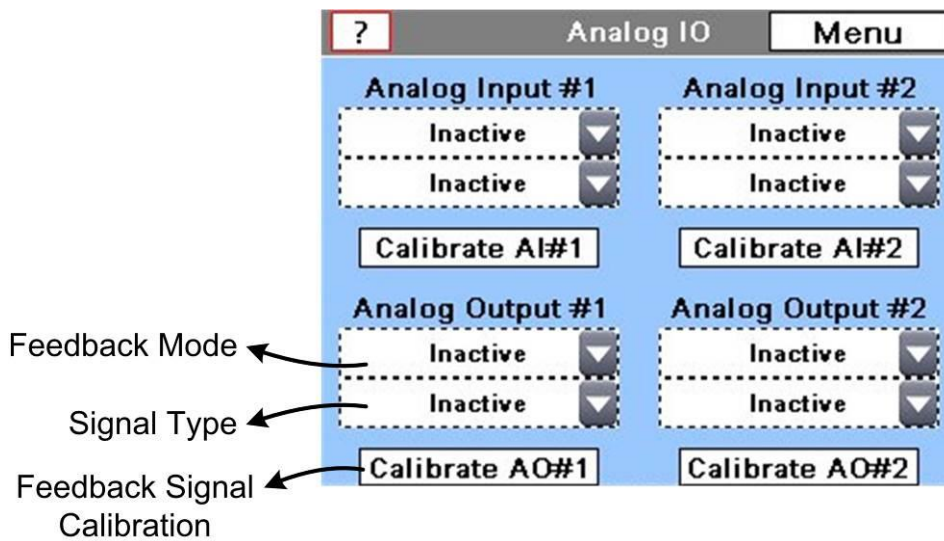


Figure 21 – Analog Output Configuration

- a. Press the first drop down arrow under **Analog Output #1** to choose the control mode; **Inactive**, **Speed Fdbk**, or **Flow Fdbk**.
- b. Press the second drop down arrow under **Analog Output #1** to choose the signal type; **4-20 mA** or **0-20 mA**, based on the control device.
4. Repeat steps 2 and 3 as needed for **Analog Input #2** and **Analog Output #2**.

## 9. Calibrations

Calibration is an important element of successful RV Controller and pump operation. If a flow meter is being used for process feedback, the flow meter must be calibrated according to the manufacturer's recommendations prior to the RV Controller calibration.

1. Select **Calibrate AI#1** to open the Calibration screen for **Analog Input #1**. The calibration screen will depend on the control mode selected, **Speed SP** or **Flow SP**.
  - c. The **Analog Input #1** display box identifies the true input from the remote command signal.

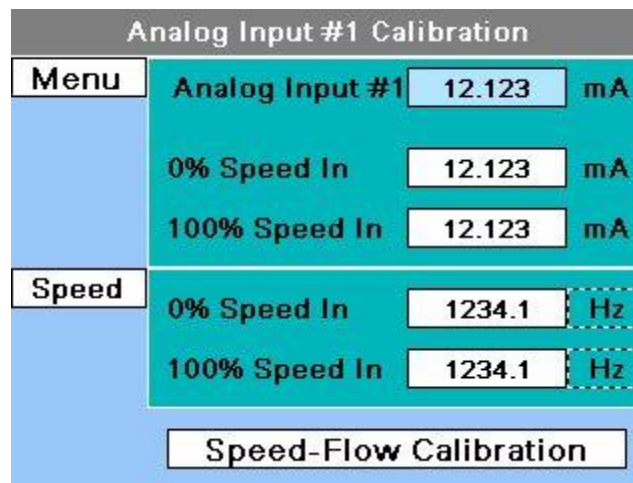


Figure 22 – Speed Calibration



**Speed** - If the command signal is varied throughout its range, the **0% Speed In** and **100% Speed In** values (in mA) can be edited by touching the accompanying text box and entering the value in the pop up number pad.

The commanded speed is determined by the motor ratings. Enter the minimum and maximum **Speed** values for **0% Speed In** and **100% Speed In** by touching the accompanying text box and entering the value in the pop up number pad. The **Speed** units can be switched between **Hz** or **RPM** by touching the displayed units.

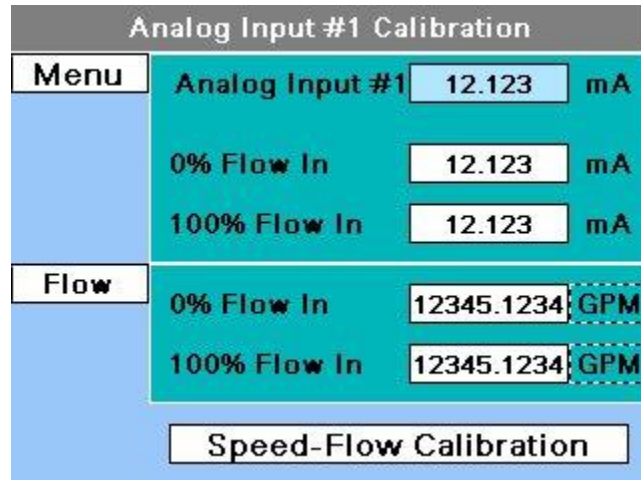


Figure 23 – Flow Calibration

**Flow** - If the command signal is varied throughout its range, the **0% Flow In** and **100% Flow In** values (in mA) can be edited by touching the accompanying text box and entering the value in the pop up number pad.

The commanded flow rate is determined by the rating of the flow meter and pump capabilities. Enter the minimum and maximum **Flow** values for **0% Flow In** and **100% Flow In** by touching the accompanying text box and entering the value in the pop up number pad. The **Flow** units can be switched between **GPM**, **GPH**, **LPM**, or **LPH** by touching the displayed units.

- Press **Speed-Flow Calibration** to begin the calibration process. Choose **Calibration Type** **Dry** or **Wet** depending on the conditions.

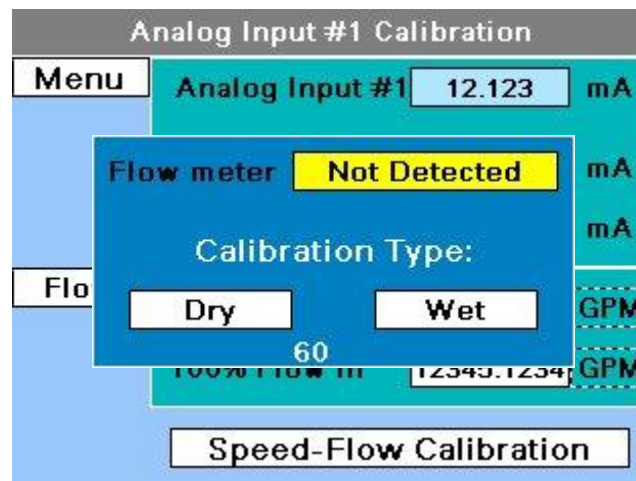


Figure 24 – Flow Calibration Screen 1



**Dry** – no flow monitoring device (flow meter, calibration column, scale, etc.) is present to measure actual pump flow output. Or, a flow monitoring device is present but will not be used for calibration. **Dry calibrations will not turn the pump on.** Flow and speed parameters are entered based on known or calculated values.

**Wet** – A flow monitoring device is present in the system, but does not have to be connected to a remote monitoring system.



**Wet calibrations will turn the pump on for a 60 second time period. Ensure the pump is prepared for operation prior to starting the calibration. External command signals will be ignored during this process.**



Speed-Flow Calibration can also be accessed by pressing  and selecting , then select Calibration Type.

## 9.1 Dry Calibration

1. After selecting the  Calibration Type, the parameter pop up windows will appear.

Figure 25 – Dry Calibration Screen 1

2. Enter the minimum speed set point for pump operation. The speed units can be switched between **Hz** or **RPM** by touching the displayed units.



**If a flow meter is connected to the controller but not used for calibration the speed parameters are to be entered based on the reference signal in mA.**

3. Enter the corresponding minimum flow set point. The **Flow** units can be switched between **GPM**, **GPH**, **LPM**, or **LPH** by touching the displayed units.
4. Select  to enter the maximum speed and flow set points for pump operation.

Figure 26 – Dry Calibration Screen 2

5. Select  to complete the Dry Calibration. Press  to close the calibration pop up.

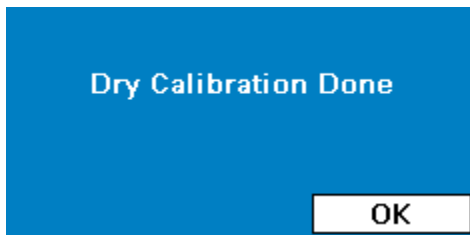


Figure 27 – Dry Calibration Complete

- Press **Menu** to open the Menu Selection screen. Press **Analog I/O Configuration** to return to the Analog I/O Configuration screen to complete additional configurations/calibrations as necessary or navigate to the next desired screen.

## 9.2 Wet Calibration – Flow Meter Feedback

- After selecting the **Wet** Calibration Type, the parameter pop up windows will appear.
- Enter the low speed set point. The **Speed** units can be switched between **Hz** or **RPM** by touching the displayed units.

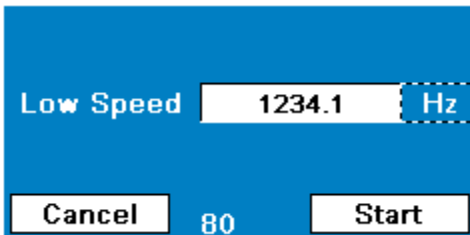


Figure 28 – Wet Calibration Low Speed Set Point

- Press **Start** to begin the calibration sequence. The pump will turn on and operate at the low speed set point for 60 seconds. The calibration window will indicate **Pump Running**.
- Observe the flow meter readings – a stable flow value (typically in the last 10 seconds of the sequence) must be manually entered on the **Next** calibration screen.

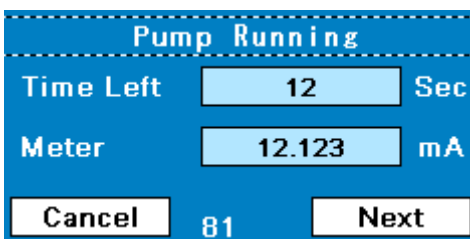


Figure 29 – Wet Calibration Low Speed Sequence

Figure 30 – Wet Calibration Low Speed Observed Flow Entry



Press  at any time to interrupt the calibration. The pump will stop and the Speed-Flow Calibration will have to be restarted.

5. Press  to enter the High Flow speed set point. The **Speed** units can be switched between **Hz** or **RPM** by touching the displayed units.

Figure 31 – Wet Calibration High Speed Set Point

6. Press  to begin the calibration sequence. The pump will turn on and operate at the high speed set point for 60 seconds. The calibration window will indicate **Pump Running**.
7. Observe the flow meter readings – a stable flow value (typically in the last 10 seconds of the sequence) must be manually entered on the  calibration screen.

Figure 32 – Wet Calibration High Speed Sequence

Figure 33 – Wet Calibration High Speed Observed Flow Entry

8. Press  to complete the Wet Calibration sequence. Pressing  will navigate back to the Calibration screen. Select  to navigate to the next desired screen.

## 9.3 Wet Calibration – Non Feedback Flow Meter

1. After selecting the  **Calibration Type**, the parameter pop up windows will appear.
2. Enter the low speed set point. The **Speed** units can be switched between **Hz** or **RPM** by touching the displayed units.

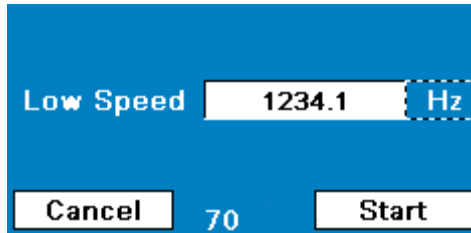


Figure 34 – Wet Calibration

3. Press  to begin the calibration sequence. The pump will turn on and operate at the low speed set point for 60 seconds. The calibration window will indicate **Pump Running**.
4. Observe the flow meter readings – a stable flow value (typically in the last 10 seconds of the sequence) must be manually entered on the  calibration screen.

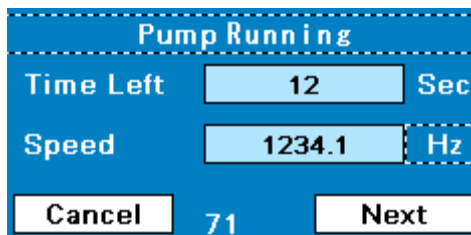


Figure 35 – Wet Calibration, Low Speed Sequence

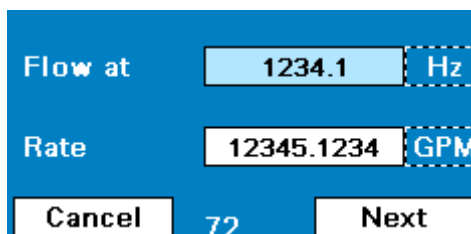


Figure 36 – Wet Calibration, Low Speed Observed Flow Entry



Press  at any time to interrupt the calibration. The pump will stop and the **Speed-Flow Calibration** will have to be restarted.

5. Press  to enter the High Flow speed set point. The **Speed** units can be switched between **Hz** or **RPM** by touching the displayed units.

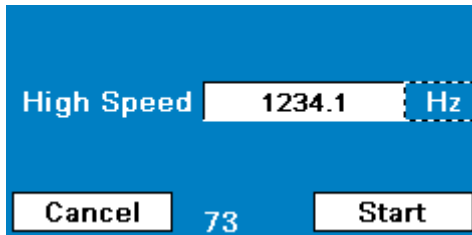


Figure 37 – Wet Calibration, High Speed Set Point

6. Press  to begin the calibration sequence. The pump will turn on and operate at the high speed set point for 60 seconds. The calibration window will indicate **Pump Running**.
7. Observe the flow meter readings – a stable flow value (typically in the last 10 seconds of the sequence) must be manually entered on the  calibration screen.

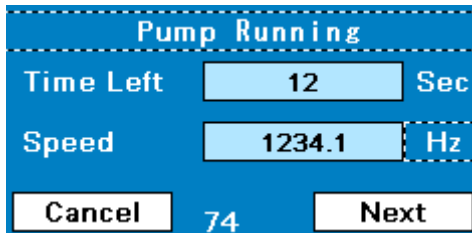


Figure 38 – Wet Calibration, High Speed Sequence

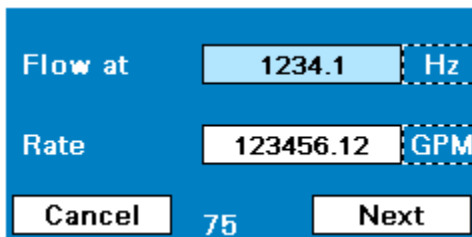
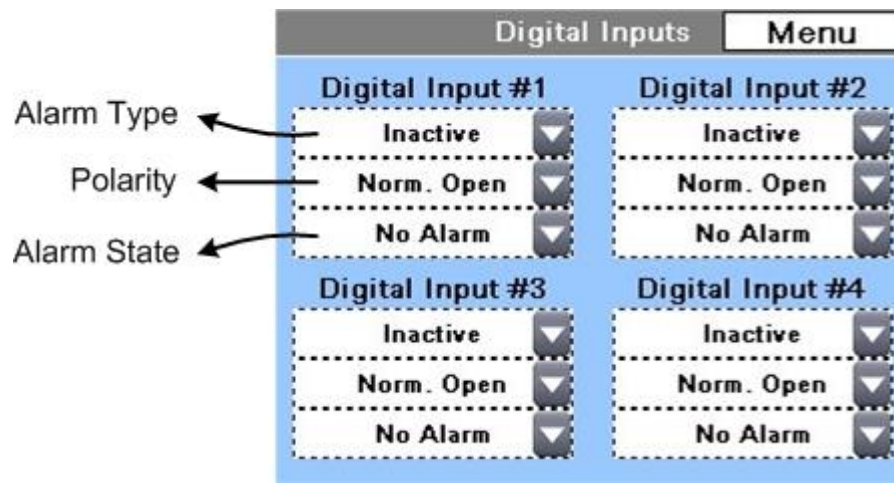


Figure 39 – Wet Calibration, High Speed Observed Flow Entry

8. Press  to complete the Wet Calibration sequence. Pressing  will navigate back to the Calibration screen. Select  to navigate to the next desired screen.

## 10. Digital I/O Configuration

1. Select  from the upper right hand corner of the touchscreen. Select
2. The Digital Input Configuration screen will appear. Each channel can be selected for a number of monitoring or alarm devices such as flow or leak detection, or over pressurization.



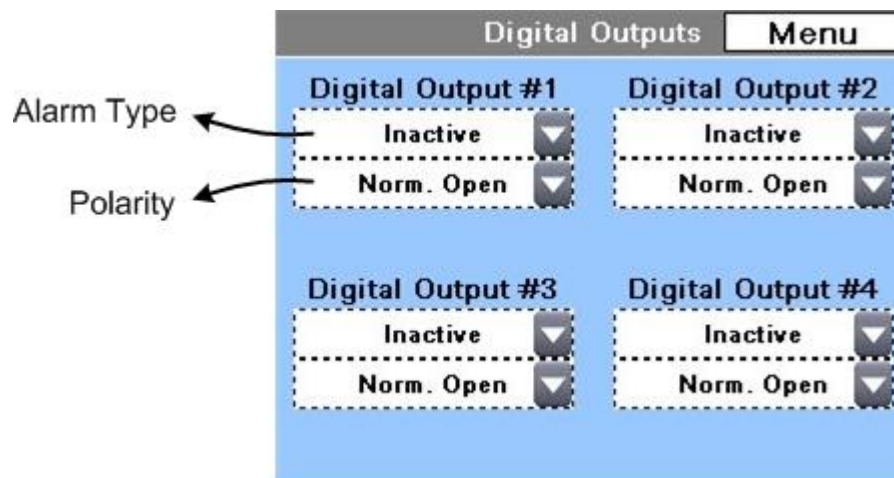
- a. Press the first drop down arrow under **Digital Input #1** to choose the alarm type; **Inactive**, **Flow Det.**, **Leak Det.**, **Remote On**, **Level Sw#1**, **Level Sw#2**, **Pressure Sw#1**, **Pressure Sw#2**, or **Diagnostic Reset**.
- b. Press the second drop down arrow to choose the polarity of the alarm; **Norm. Open** or **Norm. Closed**.
- c. Press the third drop down arrow to choose the alarm state;

**No Alarm** – Event log only. No Active Alarm screen or action is generated to stop the pump. Typically used for functions like Remote ON and Remote OFF.

**Alarm Only** – Generates alarm only. The touchscreen will display an Active Alarm pop up screen and the event will be logged.

**Stop Pump** – Generates alarm and stops pump operation. The touchscreen will display an Active Alarm pop up screen and the event will be logged.

3. Complete the input set up for additional input channels as necessary.
4. Select **Menu** from the upper right hand corner of the touchscreen. Select **Digital Outputs**
5. The Digital Outputs Configuration screen will appear.



- a. Press the first drop down arrow under **Digital Output #1** to choose the alarm type; **Inactive**, **Auto/Man**, **Running Status**, **Active Alarm**, **Leak Det.**, **Flow Det.**, **Level Sw#1**, **Level Sw#2**, or **Pressure Sw**.
  - b. Press the second drop down arrow to choose the polarity of the alarm; **Norm. Open** or **Norm. Closed**.
6. The Digital I/O Configuration is now complete. Touch Menu to navigate to the next desired screen.

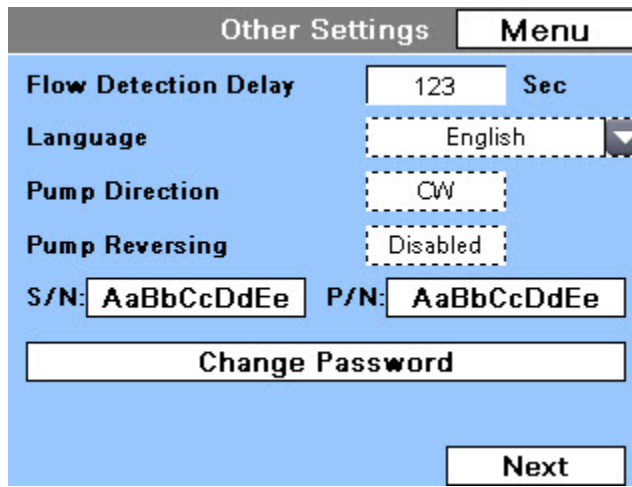
## 11. Controller and Other Settings

Additional screens are accessible to identify and change basic controller settings.

1. Select Menu from the upper right hand corner of the touchscreen. Controller Settings
2. The Controller Settings screen will appear. Use this screen to adjust the date settings for the HMI.

The screenshot shows the 'Controller Settings' screen. At the top, there is a header with 'Controller Settings' and a 'Menu' button. Below the header, there is a section for 'Actual HMI Time'. This section contains two input fields: a date field 'mm/dd/yy' and a time field '24:00:00'. The date field is further divided into three sub-fields: 'M' (Month) with the value '12', 'D' (Day) with the value '12', and 'Y' (Year) with the value '1234'. The time field is divided into three sub-fields: 'H' (Hour) with the value '12', 'M' (Minute) with the value '12', and 'S' (Second) with the value '12'. Below these input fields, there are two buttons: 'Set HMI Time' and 'OFF line mode'.

- a. Touch the white text fields below the **Actual HMI Time** to enter the date and time using the pop up number pad. Touch Enter to save each value. Once all values are entered press Set HMI Time to store the settings.
3. Touch Menu to navigate to Other Settings. This screen allows the user to make changes that affect pump and I/O operation, as well as view the serial and part number of your specific controller.



4. Touch the white text field next to **Flow Detection Delay** to enter the number of seconds that passes before an alarm is initiated if the pump output does not reach the target flow or speed.
5. To select the desired pump FORWARD direction, press the white text box next to **Pump Direction** to switch between **CW** (clockwise) and **CCW** (counter clockwise).



**For peristaltic pumps, this is the direction of rotation for the entire rotor assembly. For gear pumps, this is the direction of rotation for only the drive gear.**

6. Press the white selection box next to **Pump Reversing** to switch between **Enabled** and **Disabled**. Enabling pump reversing will allow the user to switch the pump flow direction from FWD to REV on the Pump Status screen.
7. Touch **Change Password** to edit the user passwords. The user type to be edited must be logged in prior to completing the password change. A pop up window will appear to enter and confirm a new password.

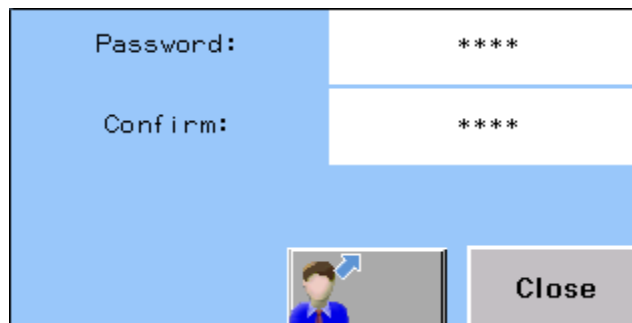



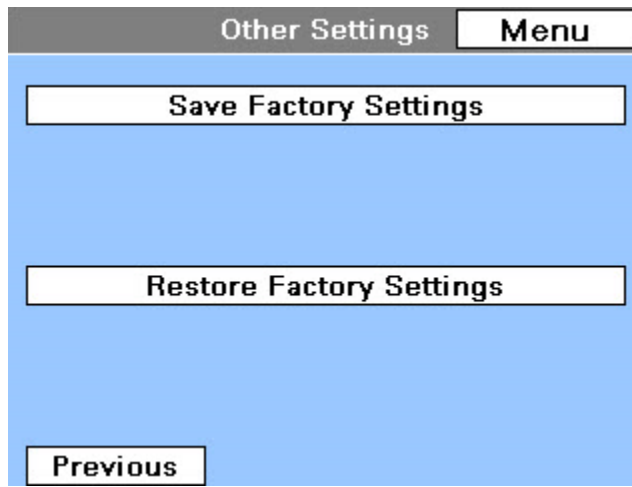


Figure 40 – Change Password

- a. Press  to save the new password then press  exit the pop up and return to the Other Settings screen.
8. Select  to navigate to the second settings page.





**Save Factory Settings** is only available to Pulsafeeder personnel or a Pulsafeeder representative. This button saves all Motor Settings, Speed and Flow Calibration setup variables, PID parameters, PULSAGuard parameters, and other functions that may be entered before shipment from the factory.

**Restore Factory Settings** function is available to any user with a Maintenance or higher security level. This button will restore the settings entered into the controller before shipment from the factory.

## 12. PulsGuard and Maintenance Warning System



### 12.1 Introduction

PulsGuard is a protective system that will stop the pump and generate an alarm when flow has fallen below a user set point or if the minimum flow point is not reached within a timeout limit. A flow meter must be present and active to utilize PulsGuard.

The Maintenance Warning System (MWS) is a mathematical function to measure deviation and wear on a two point, calibrated flow/frequency system. After the RV Controller is calibrated with a flow meter and MWS is enabled, the controller will periodically capture flow data. If the flow drops below the Min Flow set point, an alarm will be generated to indicate the pump requires maintenance (check wear on internal parts, replace pump KOPkit parts, lubricate the pump, etc.).

 **NOTE** For information, safety precautions, and maintenance instructions specific to the pump or any other accessories, please refer to the appropriate IOM.

### 12.2 Configuration

1. Review the diagrams in **Section 6.4.3** to wire a flow meter to the RV Controller. Configure and Calibrate according to **Section 8** and **Section 9**.
2. Select  from the upper right hand corner of the touchscreen and select .
3. The PulsGaurd configuration screen will appear. Press the **Enabled / Disabled** button at the top of the screen to activate PulsGuard.

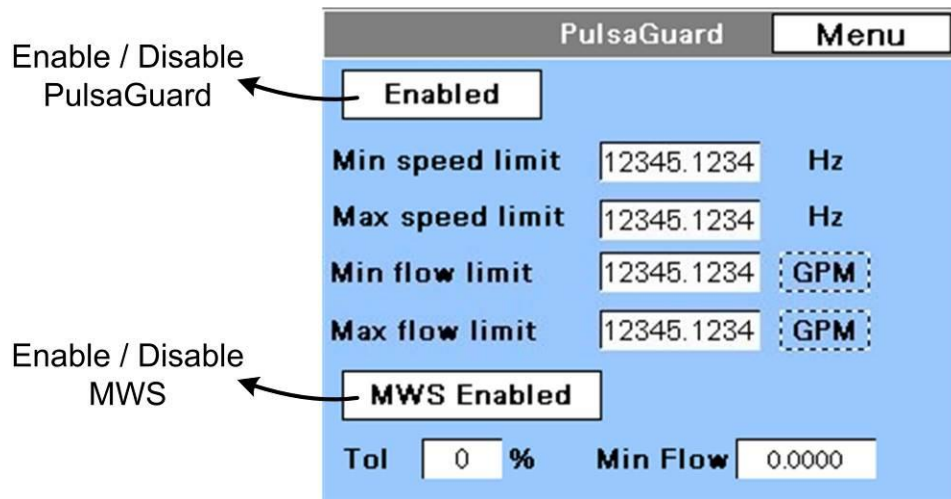


Figure 41 – PULSAGuard and Maintenance Warning System

- a. Enter the **Min speed limit** by touching the accompanying text box and entering the value in the pop up number pad.
  - b. Enter the **Max speed limit** by touching the accompanying text box and entering the value in the pop up number pad.
  - c. The speed units can be switched between **Hz** or **RPM** by touching the displayed units.
  - d. Enter the **Min flow limit** by touching the accompanying text box and entering the value in the pop up number pad.
  - e. Enter the **Max flow limit** by touching the accompanying text box and entering the value in the pop up number pad.
  - f. The flow units can be switched between **GPM**, **GPH**, **LPM**, or **LPH** by touching the displayed units .
4. To enable the Maintenance Warning System, press the **MWS Enabled / Disabled** button.
    - a. Enter the **Tol** by touching the accompanying text box and entering the value in the pop up number pad. The **Tol**, or Tolerance, creates an upper and lower percentage limit of how much flow can vary over the life of the pump, given that flow will change as wear items reach their service limits.
    - b. Enter the **Min Flow** by touching the accompanying text box and entering the value in the pop up number pad. The **Min Flow** is the user set point that generates the MWS alarm if the pump flow rate falls below it.
    - c. The flow units can be switched between **GPM**, **GPH**, **LPM**, or **LPH** by touching the displayed units until the desired units are selected.

# 13. Diagnostics and Trend Graphing

The RV Controller has built in capabilities to record, calculate, and graph key operating characteristics, valuable for maintaining a successful operation. These values are also helpful in diagnosing and troubleshooting complications.

## 13.1 Diagnostics

1. To access the Diagnostics screen, select **Menu** from the upper right hand corner and select **Diagnostics**
2. The Diagnostics screen will appear. This is screen displays cumulative and calculated values regarding flow, speed, and runtime. The flow units can be switched between **Gallons**, **Liters**, **GPM**, **GPH**, **LPM**, or **LPH** by touching the displayed units.

Diagnostics		Menu
Controller run time	12345678.1	Hrs
Pump run time	12345678.1	Hrs
Average speed	1234.1	RPM
Peak speed	1234.1	RPM
Total flow	1234567890.1	Gallons
Average flow	12345.1234	GPM
Peak flow	12345.1234	GPM
Idle time	12345678.1	Hrs
Cycle count	123456789012	
<b>Reset</b>	Last reset	12/12/12 12:12

Figure 42 – Diagnostic Data

3. Touching the **Reset** button will erase all the accumulated data and record the date and time of reset.



**NOTE** It is recommended to reset the Diagnostics ONLY after significant pump or system maintenance such as changing a hose or KOPkit (Keep on Pumping kit) or a significant change in operating conditions. Detailed maintenance records of past pump performance can be invaluable for determining future preventative maintenance intervals.

**Cycle Count** – Calculated number of rotations of the pump rotor or drive shaft. This number is calculated with motor speed and if a gear ratio is entered in Motor Settings. One full rotation equals one cycle.

## 13.2 Trend Data

The RV Controller can plot the speed or flow output of the pump calculated from the Motor Settings input and Calibration data or flow meter input. The trend data can also be exported to the PLC USB storage device inside the controller and viewed and saved on a computer. Contact Pulsafeeder for additional information regarding data transfer.

1. To access the Trend Data screen, select **Menu** from the upper right hand corner and select **Trend Data**. The Trend Graph will appear with either a **Flow Trend** or **Speed Trend** title depending on the **Analog Control Mode** currently selected for **Analog Input #1**.

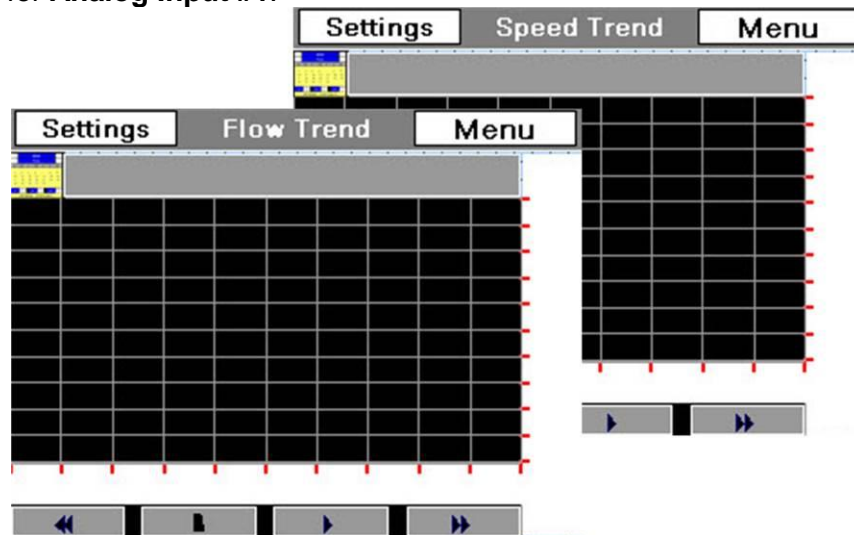


Figure 43 – Trend Data Graph Options

2. To edit the graph settings, touch **Settings**. Here the maximum and minimum axis limits can be defined in terms of speed or flow and time span.
  - a. Enter each of the limits by touching the accompanying white text box and entering the value in the pop up number pad. Units can be switched by touching the displayed units until the desired units are selected.
  - b. Press **Back To Trend** to navigate back to the graph screen.

Trend Settings		Menu
Flow Max	12345.1234	GPM
Flow Min	12345.1234	GPM
Flow Time Range	123	Minutes
Speed Max	1234.1	Hz
Speed Min	1234.1	Hz
Speed Time Range	123	Minutes
		Back To Trend

Figure 44 – Trend Settings

3. Touch the calendar icon in the upper left hand corner to  date and time to view the flow or speed for that  period. Touch  to confirm the date and view the graph. Select  to return to the current Trend graph.
4. Use the buttons at the bottom of the screen to stop, resume, or move forward and back along the time scale.

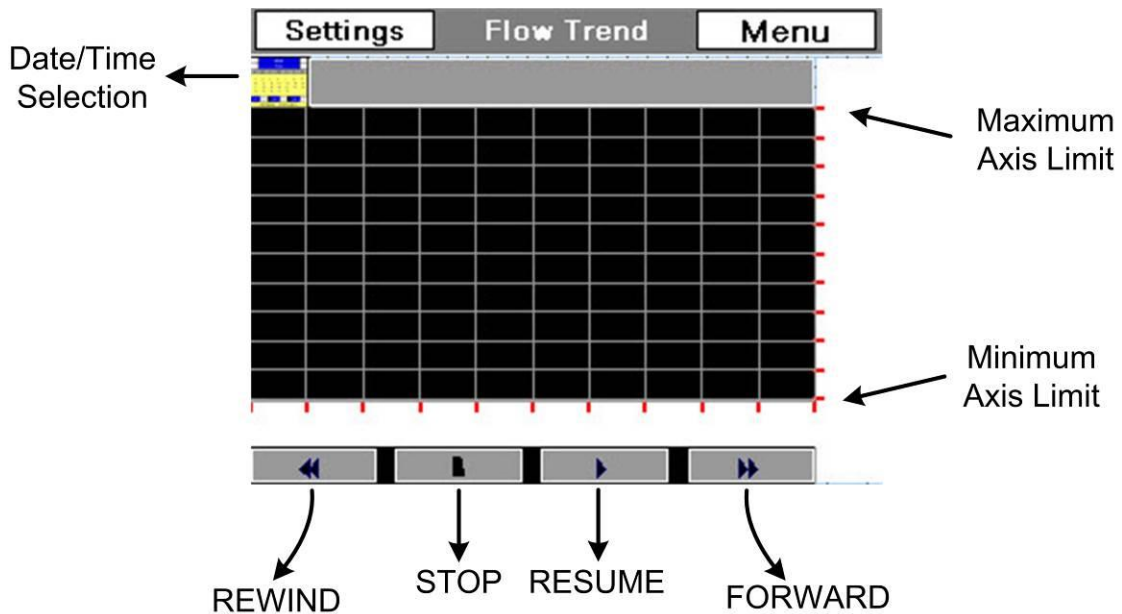


Figure 45 – Graph Viewing Options

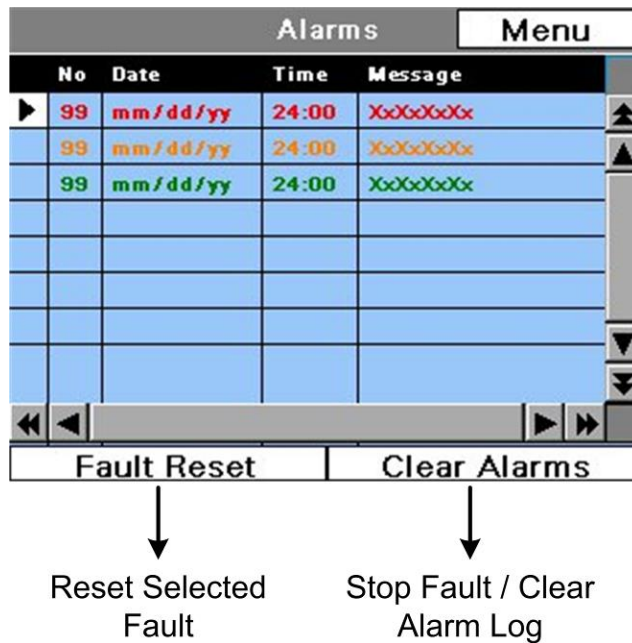
## 14. Alarms and Error Messages

In the event the RV Controller or system monitoring device connected to the controller is triggered, an alarm will be generated. The alarm is a visible and communicable alert generated by a change of state from the controller, connected device, or control signals. Alarms may or may not stop pump operation depending on how the parameters are configured, see **Section 10 Digital I/O Configuration** for details.

The RV Controller automatically records events and alarms with a time and date stamp for maintenance tracking and malfunction diagnosis. The alarm log will record the last 200 sequential set of alarms/events by description, date, and time. All users have access to the Alarms Log.

1. To access the Alarms Log, select  from the upper right hand corner. Select .
2. The Alarms Log screen will appear. The most recent Alarms or Events are listed at the top of the log. The type of Alarm/Event can be identified by color code as shown below. Touch the scroll bar arrows to view more lines.





2. Review the alarm description to determine what caused the alarm to activate. Assess the pump, system, and connected devices and take action as needed. Alarm banners will have a grace period of 3 minutes before they re-initiate.

3. Touch the active alarm line to select it. The arrow indicates which line has been selected. Touch **Fault Reset** to remove the alarm and allow for continued operation.

- **Alarms created by configuration errors** (like loss of signal, input polarity) Check I/O wiring and configuration settings to ensure proper set up and prevent alarms.
- **Alarms created by sensors** (like leak detection or flow meter) The motor will remain in an OFF state until the cause of the alarm is identified, corrected, and reset.



**Once the Alarms Log is visited after an alarm is triggered, the alarm pop up will no longer be active. The pump may remain inoperable until the alarm is reset in the Alarms Log.**

4. Only when all alarms have been reset can the alarms log be cleared. Touch **Clear Alarms** to erase all stored alarm/event data.



**This is not recommended unless the cause has been reviewed, corrected by appropriate local and/or Pulsafeeder personnel.**



# 15. Maintenance



All maintenance work must be carried out only when the RV Controller and connected equipment is stopped and disconnected from mains supply (including auxiliary circuits). Maintaining original characteristics over time must be ensured by an efficient maintenance and inspection plan, developed and managed by qualified technicians, taking into account the service and the actual environmental conditions in which it operates.

## 15.1 Maintenance Precautions

All operations must be performed by qualified personnel. Work on the unit should only be performed with safety supervisor authorization after having verified that:

- a) Power is disconnected at the source following local Lockout/Tagout procedures.
- b) The power line is disconnected and no parts are energized, including any auxiliaries.
- c) Ensure that any risk of accidental restart has been excluded.
- d) Consult the pump Installation and Operating Manual for instructions on minimizing risk due to pressurized or chemically dangerous conditions within the pump system.
- e) With pump switched off, that the valves on the suction and discharge pipelines are closed.
- f) Pump has been adequately cleaned, when operating in environments exposed to aggressive chemicals.
- g) Maintenance personnel shall refer to the **Section 6.4 Electrical Wiring** for safe return to service after repair.

Since the machine object of supply is a product designed and intended for operation in industrial areas, **additional measures must be adopted and assured by the person responsible for the installation, should more restrictive safety conditions be required.**

## 15.2 Spare Parts

Should you require replacement components for the RV Controller, contact your local authorized Pulsafeeder Sales representative.

Model Number	Part Number	Description	Spare Part Category
RVHAX	RV510001-000	DRIVE, .5HP 115V 1PH BP	Variable Frequency Drive
RVHBX	RV510002-000	DRIVE, .5HP 230V 1PH BP	
RVHCX	RV510003-000	DRIVE, .75HP 230V 1PH BP	
RVHDX	RV510004-000	DRIVE, 1HP 230V 1PH BP	
RVHEX	RV510005-000	DRIVE, .5HP 230V 3PH BP	
RVHFX	RV510006-000	DRIVE, 1HP 230V 3PH BP	
RVHGX	RV510007-000	DRIVE, 2HP 230V 3PH 4X	
RVHHX	RV510008-000	DRIVE, 3HP 230V 3PH 4X	
RVHJX	RV510009-000	DRIVE, 5HP 230V 3PH 4X	
RVHMX	RV510010-000	DRIVE, 1HP 480V 3PH 4X	
RVHPX	RV510011-000	DRIVE, 2HP 480V 3PH 4X	
RVHQX	RV510012-000	DRIVE, 3HP 480V 3PH 4X	
RVHRX	RV510013-000	DRIVE, 5HP 480V 3PH 4X	
RVHAX - RVHJX	RV530001-000	PWR SUP, 24VDC .75A 18W	Power Supply
RVHMX - RVHRX	RV530002-000	PWR SUP, 24VDC 5A 120W	
All Models	RV530003-000	HMI PROCESS CTL, 3.5IN 24VDC	HMI / PLC Touchscreen
All Models	RV530004-000	USB DRIVE, 4GB	USB Storage Device



## 15.3 Cleaning and Decontamination

The RV Controller enclosure may be cleaned with water and mild detergent. Decontamination shall occur when the RV is exposed to a release of process chemicals. Follow the SDS for clean-up in the event of a chemical spill.

## 16. Model Identification

Position	Code	Description	Specifications
1 and 2	RV	Model	Rotary Vector Controller
3	H	HMI Version	NEMA 4X enclosure with touchscreen

		Horsepower	Input Voltage	Phase
4	A	up to 0.5 HP (0.33 kW)	120 VAC, 50/60 Hz	1 phase
	B	up to 0.5 HP (0.33 kW)		
	C	3/4 HP (0.5 kW)	200-240 VAC, 50/60 Hz	1 phase
	D	1 HP (0.75 kW)		
	E	up to 0.5 HP (0.33 kW)		
	F	1 HP (0.75 kW)		
	G	2 HP (1.5 kW)	200-240 VAC, 50/60 Hz	3 phase
	H	3 HP (2.2 kW)		
	J	5 HP (3.75 kW)		
	M	1 HP (0.75 kW)		
	P	2 HP (1.5 kW)	380-500 VAC, 50/60 Hz	3 phase
	Q	3 HP (2.2 kW)		
R	5 HP (3.75 kW)			

		Description	Specifications
5	X	Language	English

Order documents may include “-M” to indicate the controller was mounted to a pump at the Pulsafeeder factory.

## 16.1 User Access Levels

	Maintenance	Operator	All
Pump Status Screen	✓	✓	View Only <sup>1</sup>
Motor Settings	✓	View Only	View Only
Analog IO Configure	✓	View Only	View Only
Flow Calibration	✓	View Only	View Only
Digital IO Configure	✓	View Only	X
PULSAGuard	✓	View Only	X
Other Settings	✓	View Only	X
Save Factory Settings	View Only	View Only	X
Restore Factory Settings	✓	View Only	X
Controller Settings	✓	View Only	X
Alarms Log	✓	View Only	X
Diagnostics	✓	View Only	View Only
Trend Graphing	✓	View Only	View Only
PID Setup	Pulsafeeder or Rep Access Only		

*Note 1 – Pump ON / OFF, Up and Down arrows are always functional*

# 17. Troubleshooting Guide

Symptom	Probable Cause	Remedy
<b>Controller will not turn on / controller will not turn pump on.</b>	Incorrect wiring.	Check incoming and outgoing power wiring.
	An alarm is still active.	Navigate to Alarms Log and review active alarms. Take action(s) as necessary to clear the alarm and restart the pump.
	Incorrect wiring.	Check incoming and outgoing power wiring.
	Controller is in Auto (remote) mode.	Touch <b>Auto/Manual</b> to switch from Auto (remote) mode into Manual (local) then press the power button to turn the pump on.
<b>Cannot access Menu Selections</b>	Valid user not logged in.	Navigate to Pump Status screen, select Log In from the upper left hand corner, Log In with valid username and password.
<b>Flow input or feedback not available</b>	Controller not configured for Flow SP or Feedback.	Navigate to Analog IO Configuration and reconfigure for Flow SP and Flow Fdbk. Recalibrate as necessary.
	Flow meter not detected.	Check IO wiring and verify flow meter signal to the controller.
<b>Speed input or feedback not available</b>	Controller not configured for Speed SP or Feedback.	Navigate to Analog IO Configuration and reconfigure for Speed SP and Speed Fdbk. Recalibrate as necessary.
	Signal not detected.	Check IO wiring and verify signal to the controller.
<b>Drive Fault Error/ Communications Fault Error</b>	Internal drive error.	Consult factory.
	Data connection or signal error.	Check Modbus or USB connection between HMI/PLC and internal drive. Consult factory.
	Motor overload	Review application requirements and consult factory.
	Ground fault	Check wiring is properly grounded.
<b>Diagnostic or Trend Data Errors</b>	Trend Data not graphing	Check Analog channels for control mode is active for Speed or Flow.
		Check IO wiring and verify flow meter signal to the controller.
	Line not visible on graph area	Edit Trend Settings for axis constraints.
	Diagnostics errors	Check motor settings entered according to motor nameplate and are written to the ATV drive.
Re-do calibration sequence.		
Verify units visible are as desired.		
		USB storage device not formatted as FAT32.

## 18. Recommended / Default Values

Recommended Parameter Settings / Factory Default Values	
Parameter	Set Point
Jog Speed	5 Hz
Gear Ratio (not pump mounted)	1:1
Motor Control	Vector
Frequency Loop Gain	20%
Frequency Loop Stability	20%
Analog Input #1 Control	Speed SP
Flow Detection Delay	5 secs
Pump Direction	CW
Pump Reversing	Disabled
Trend Settings	
Flow Time Range	2 minutes
Speed Time Range	2 minutes

# 19. Definitions

Term	Definition
<b>Pump Status Screen</b>	
Log In	Press to open log in screen to access additional menu options.
Menu	Press to access additional menu screens for I/O configuration, motor settings, Alarms Log, PID Setup, and additional settings.
(Power + ON/OFF)	Press to turn the pump <b>ON</b> or <b>OFF</b> . On or Off status will be highlighted.
(Arrow + Auto/Manual)	Press to change operation mode to <b>AUTO</b> (remote). Press to change operation mode to <b>MANUAL</b> (local).
FWD/REV	Indicates pump is running in forward direction. Press to change motor to reverse direction.
	Indicates pump is running in the reverse direction. Press to change motor to forward direction. (Pump Reversing must be enabled).
Up Arrow	Press to increase value (pump speed or flow).
Down Arrow	Press to decrease value (pump speed or flow).
Jog	Press to prepare the controller to incrementally jog the motor in the forward or reverse direction. Button will highlight when mode is activated.
Right Arrow	Press and hold to jog the motor in the forward direction and set incremental speed.
Left Arrow	Press and hold to jog the motor in the reverse direction and set incremental speed.
<b>Menu screen</b>	
Pump Status	Opens main Pump Status screen to monitor and change flow, speed, and pump modes.
Motor Settings	Enter pump motor nameplate or manufacturer specifications.
Analog IO Configuration	Select analog channel modes for various pump operation modes.
Flow Calibration	Pump and controller calibration sequencing using automated prompts and pump operation.
Digital Inputs	Select digital channel modes for various system monitoring / alarm features.
Digital Outputs	Select digital channel modes for various system monitoring / alarm features.
Other Settings	Additional pump operating variables as well as controller serial and part numbers. Also has functions to Save Factory Settings or Restore Factory Settings.
Alarms Log	Listing of the last 200 alarms with type of alarm, date and time. Also has functions to reset active faults and clear alarm history.
Diagnostics	Calculated and stored values based on controller and pump operation.
PID Setup	Factory default settings for closed loop flow control.
Trend Data	Visual graphing of pump speed or flow output.
PulsaGuard	Enter PulsaGuard alarm system setpoints to alert low flow.
Controller Settings	Enter time/date for HMI touchscreen.
Close	Exit Menu screen.
<b>Motor Settings screen</b>	
Motor Control	Vector: for applications needing high performance during pump start up or operation.

## Analog IO

<b>Control Mode</b>	
Inactive	Analog channel is not in use.
Speed SP	Analog channel is in use with a device for speed control (Hz or RPM).
Flow SP	Analog channel is in use with a device for flow control (GPM, GPH, LPM, or LPH).

## Digital Inputs

<b>Alarm Type</b>	
Inactive	Digital channel is not in use.
Flow Det.	Flow meter and flow detection is in use.
Leak Det.	Leak detection device is activated and in use.
Remote On	Auto mode is enabled.
Level Sw#1	Process fluid level (such as in a holding tank or reservoir) device is activated and in use.
Level Sw#2	
Pressure Sw#1	Pressure switch is activated and in use.
Pressure Sw#2	
Diagnostic Reset	Clears stored data from Diagnostic screen and identifies time and date of reset.

## Alarm State

No Alarm	Event log only. No Active Alarm screen or action is generated to stop the pump. Typically used for functions like Remote ON and Remote OFF.
Alarm Only	Generates alarm only. The touchscreen will display an Active Alarm pop up screen and the event will be logged.
Stop Pump	Generates alarm and stops pump operation. The touchscreen will display an Active Alarm pop up screen and the event will be logged.

## Digital Outputs

<b>Alarm Type</b>	
Inactive	Digital channel is not in use.
Auto/Man	Indicates if pump is in Auto (remote) or Manual (local) operation mode.
Running Status	Identifies if the pump is powered and in operation or not.
Active Alarm	An alarm has been generated.
Leak Det.	Leak detection device has been activated.
Flow Det.	Flow detection is achieved.
Level Sw#1	Fluid level indicating device has been activated.
Level Sw#2	
Pressure Sw.	Pressure switch device has been activated.
<b>Errors</b>	
Drive Fault Error	Internal error, consult factory.
Communications Fault	Communications link to the drive is not operating correctly.

<b>Alarms Log</b>	
Alarm	A visible and communicable alert generated by a change of state from the controller or devices monitoring the pump and system. Alarms may or may not stop the pump depending on how the input/output is configured.
Event	An alert that is recorded in the controller alarm log but does not stop the pump or generate a visible alarm that requires resetting.

<b>PULSAGuard and MWS</b>	
MWS	Maintenance Warning System to measure deviation in the flow/frequency system to indicate pump wear.
Tol	A percentage limit above or below the minimum flow rate set for MWS

<b>Diagnostics</b>	
	Values based on data since the last Diagnostic reset.
Controller Run Time	Total time the controller has been powered on.
Pump Run Time	Total time pump has been powered and in operation.
Average Speed	Calculated average speed of the pump.
Peak Speed	Maximum speed the pump has reached.
Total Flow	Calculated total volume of process fluid pumped.
Average Flow	Calculated average flow rate of the pump.
Peak Flow	Maximum flow rate the pump has reached.
Idle Time	Total time controller has been powered on but not in operation.
Cycle Count	Calculated number of pump rotor or drive shaft rotations. Based on motor speed and gear ratio (if entered).

<b>Other Settings</b>	
Flow Detection Delay	The length of time that passes before an alarm is initiated if pump output does not reach target flow or speed.
Pump Direction	Selects if the motor shaft rotates in the clockwise or counter clockwise direction.
Pump Reversing	Enables or disables the user's ability to switch the pump from FWD to REV on the Pump Status screen.



# RV Controller

ROTARY VECTOR PUMP CONTROLLER

Bulletin #: IOM-CTL-RVC-2003



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