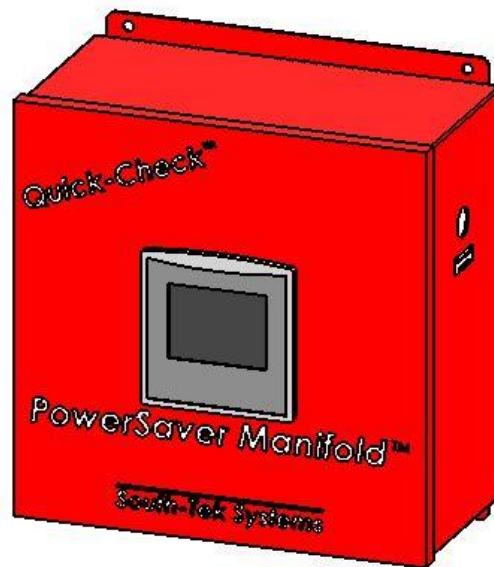


Quick-Check™ -PowerSaver Manifold 1-Port – 1 Port

With Nitrogen Purity Sensor



Operational Manual

Developed By: South-Tek Systems

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Revision 0

IMPORTANT NOTICE

This operational manual is provided for instructional purposes of the South-Tek Systems Quick-Check™-PowerSaver Manifold 1-Port only. It is intended to provide proper install and normal operational use of the device. South-Tek Systems is not responsible for damages concerning the use of this device when used in manners not approved by South-Tek Systems. The user(s) of this document should confer any questions with a qualified South-Tek System representative with respect to its commissioning and correct operational use.

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ACKNOWLEDGEMENTS

This document is based upon the R&D performed by the South-Tek Systems Engineering Team.

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1.0 Introduction

Nitrogen has become the preferred method for pressurizing Dry and Preaction Fire Protection Systems (FPS) to inhibit internal piping wall corrosion, Electrochemical, Galvanic and Microbiologically Influenced Corrosion (MIC). The N₂-Blast® - Nitrogen Generation System produces high purity Nitrogen on demand from the air we breathe, and introduces the Nitrogen into the FPS piping where the air compressor's air feed is normally connected (i.e. the Air Maintenance Device). Low pressure Nitrogen in turn replaces the compressed air to provide Supervisory Pressure as needed.

It is important to ensure that Nitrogen is equally distributed throughout all branches within the entire FPS. To make sure this is achieved; South-Tek Systems has designed the Quick-Check™ – PowerSaver Manifold 1-Port to monitor the purity of Nitrogen present within the FPS piping.

The Quick-Check™ – PowerSaver Manifold 1-Port is designed to attach to the outlet of a South-Tek AutoPurge System™ (APS). The Quick-Check™ is housed within a wall mountable NEMA 1, 6" x 6" x 4" enclosure requiring only 110V power. The Quick-Check™ has an integrated Nitrogen Level Alarm Relay and Dry Contact rated up to 240VAC 16amps (NC&NO contacts available) to provide Nitrogen purity information to the supervisory circuit on the Building Monitoring System. This allows you to monitor the Nitrogen levels remotely and to ensure you are obtaining, as specified, the highest level of protection from Electrochemical, MIC or Galvanic Corrosion.

The Quick-Check™ – PowerSaver Manifold 1-Port technology is the best available, proven, reliable method to ensure and document that the Nitrogen Generation System is maintaining the proper levels of Nitrogen, ultimately inhibiting FPS corrosion.

1.1 Purpose of Manual

The Quick-Check™– PowerSaver Manifold 1-Port is designed to read and display the Nitrogen purity content [within each individual Fire Protection System or Zone](#). This system works in multiple environments which includes but not limited to: storage vessels, piping systems, and enclosed rooms.

This manual provides information about installation, set-up, normal operation procedures, alarm setup/conditions, maintenance, calibration, communication, and troubleshooting. It also includes information on the Human-Machine Interface (HMI) control functions for maintenance personnel and supervisors with appropriate authorization.

1.2 Safety Guidelines

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. All in plant lock-out / tag-out safety procedures should be followed accordingly.

1.3 Potential Hazards

Be aware of all potential hazards on this machine before operating or working on this equipment. Always follow your organizational guidelines regarding safety procedures when working on or around this equipment.

Other non-obvious hazards are both 110-220 VAC electricity supplying power to the unit and low O2 content coming off the exhaust. The low O2 content is only hazardous if directly inhaling the exhaust. Normal ventilation of a room that houses the exhaust port is required.

Failure to follow these recommendations could result in serious injury to personnel, and / or damage to the machine.

1.4 Qualified Personnel

Only **qualified personnel** should be allowed to install and work on this equipment. Qualified persons are defined as persons who are authorized to install, commission, and tag circuits, equipment, and systems in accordance with established facility safety practices and standards.

1.5 Correct Usage

This device and its components may only be used for the applications described in the manual or the technical descriptions, and only in connection with devices or components from other manufacturers which have been approved or recommended by South-Tek, LLC. This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

1.6 Required Basic Knowledge

To run the HMI controller it is not necessary to have an in depth knowledge of automation, just familiarization of the automated controls and safe guards.

1.7 Scope of the Manual

This manual is valid for the Quick-Check™– *PowerSaver Manifold 1-Port* only. It is not intended as a guideline for any and/or all controllers.

1.8 Additional Support

Contact South-Tek System at:

South-Tek Systems, LLC
2940 Orville Wright Way Ste 600
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Tel (888) 526-6284
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Or visit us at our website: www.southteksystems.com

Since deviations cannot be precluded entirely, the data in this manual can be reviewed regularly and any necessary corrections included in subsequent revisions. Suggestions for improvement are welcomed.

2.0 System Description and Overview

The Quick-Check™ - PowerSaver Manifold 1-Port was developed to measure the N₂ purity levels of up to 6 specific Fire Protection Systems or “Zones”. The device will display the reading of each Zone based on a predetermine sample period. Samples are taken periodically with the last sample reading representing the Zone purity level.

If the purity has not been met, the system will continue the normal purging process until the Zone reaches the desired spec. The device also has a built in power saving program to stop the purging of gas once the purity has been met. Periodic samples will be taken to ensure that the gas levels are still at an acceptable range. If they are not, the corresponding Zone that is out of spec will return to normal purge mode.

The Programmable Logic Controller (PLC) with an integrated Human Machine Interface (HMI) color graphic touch screen is used to display the Nitrogen concentration of up to 6 Zones. The operator can enter the Nitrogen alarm setpoint in percentage format, and the PLC will output a normally open relay contact to closure. The unit will also flash a reminder to change the Oxygen sensor filter on a yearly basis until an operator changes and acknowledges the alarm.

The yellow indication light beside each Zone name indicates that the current Zone is being sampled. The box below each Zone name shows the N₂%. A red box around indicates that the Zone is out of the specified N₂ range and green is within the specified N₂ range.

Below (**Figure 1**), is an image of the “Home screen” display.



Figure 1: Home Screen

2.1 Main Components

The Quick-Check™– *PowerSaver Manifold 1-Port* consists of these main components:

- PLC/HMI controller
- O₂ Sensor
- Pre-Filter
- Gas Input Solenoid Valves on a Manifold
- Exhaust Valve
- 110-220 VAC to 24 VDC power converter

The PLC/HMI controller is powered by 24 VDC. The device is setup with a 24 VDC power converter that will accept either 110 or 220 VAC power supply. The PLC has a built in 3.5” color touchscreen with 1MB of logic memory, 3MB for images, and 512K bytes for fonts. It has a logic application scan time of 15 microseconds per 1Kbytes of application code.

The O₂ Sensor is used to detect the O₂ content of each Zone. It is a galvanic cell type that implements a weak acid electrolyte and is unaffected by CO₂, CO, and NO_x. It has a response time of 25 seconds or less and will respond to a 90% step change in Oxygen concentration within 15 seconds or better. The output from the O₂ sensor is a 10mV to 15.5mV signal that is inputted to the PLC. The signal from the O₂ sensor is digitized on the PLC by a 10-bit analog to digital converter and calibrated to known O₂ calibrated sources.

The pre-filter is used to remove harmful contaminate in the gas streams that may reduce the life of the O₂ cell. Based on the quality of gas going through the filter, the filter may be required to be changed out more than the factory recommended replacement date.

The bank of solenoid valves on a manifold is located on the outside bottom of the cabinet. Each Zone’s sample (from the “*Auto-Purge System*”) will be connected to the one solenoid valve. Each valve is independently controlled and operated by the PLC based on the O₂ content of the corresponding Zone.

The exhaust valve is at the end of the manifold block. It is there to purge out the Zone to acceptable O₂ levels.

3.0 Installation, Set-up, and Maintenance

The device is capable of running off either 110VAC or 220 VAC at 50-60HZ. A standard US 3-prong power cord is provided with each unit unless otherwise specified. Mount the device in a ventilated, non-hazardous location away. The box has four screw holes at the corners that can be used to safely mount the box.

Once the Quick-Check™- PowerSaver Manifold 1-Port is securely mounted, connect the Auto-Purge Port to the PowerSaver Manifold.



Figure 2: Quick-Check

After it has been connected to the correct solenoid valves, the user can power up the unit by plugging in the power cord. The screen will power up to the “Home” screen. Simple hit the start button in the lower left corner and the device will start running through its cycles.

3.1 Precautions When Testing Sprinkler System

Ensure to close each Auto-Purge System (APS) with the ball valve before performing pressure testing or scheduled hydro testing. If the APS is open during pressure testing, this may allow a slow purge that will negatively affect the results of the test. The APS is equipped with a ball check valve that will stop flow when a rush of pressure or water hits it, however, it is recommended to close the ball valve before introducing water to the system when possible to reduce potential maintenance after draining the water (See 3.2 Maintenance).

3.2 Maintenance

When performing maintenance or tests on the sprinkler piping, it is important to isolate the Quick-Check™– PowerSaver Manifold 1-Port and Auto-Purge Systems. If the APS's are not turned off at the ball valve before water is introduced to the sprinkler piping, the following steps should be followed to reset the system:

- Close the ball valve to the APS.
- Remove the red anodized section; drain, clean and allow to dry.
- Clean the wye strainer.
- Drain or blow air out of the entire length of tubing that connects the APS to the Quick-Check™.
- Reinstall all parts, slowly open ball valve and recalibrate the sample flow.

4.0 HMI Control Functions

The built in touch screen allows the user to input different variables / conditions to the device. The user will have access to multiple screens that will allow them to change or view current settings, alarm ranges, and maintenance history. At any time, the user can hit the “ESC” button on the bottom right of the PLC to return to the “Home Screen”. Some screens will also display “Prev” which will return the user to the previous screen and “Exit” will return to the home display.

Keypad entry will appear when touching a variable adjustable box. The keypad display is shown below, **Figure 3**:

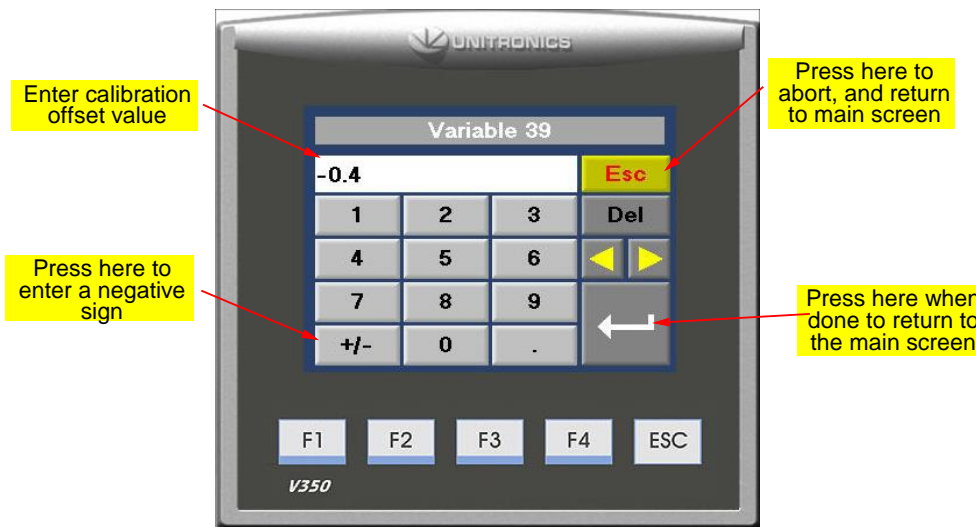


Figure 3: Keypad Display

4.1 Home Screen

The “Home Screen” displays Zone’s Nitrogen the purity level of each individual Zone and alarm conditions. The yellow light beside the Zone name indicates that the Zone is currently being sampled or in purging mode. Also displayed on the “Home Screen” are N2 alarm setpoint and filter notice if required. There are two user control options on the “Home Screen” – “Stop/Start” and “Menu”.

The “Stop/Start” button allows the user to start or stop the device at any time. Hitting “stop/start” will reset back to original parameter start point.

4.2 Menu Display

The “Menu” button will take the user to a new menu display seen below in **Figure 4**.

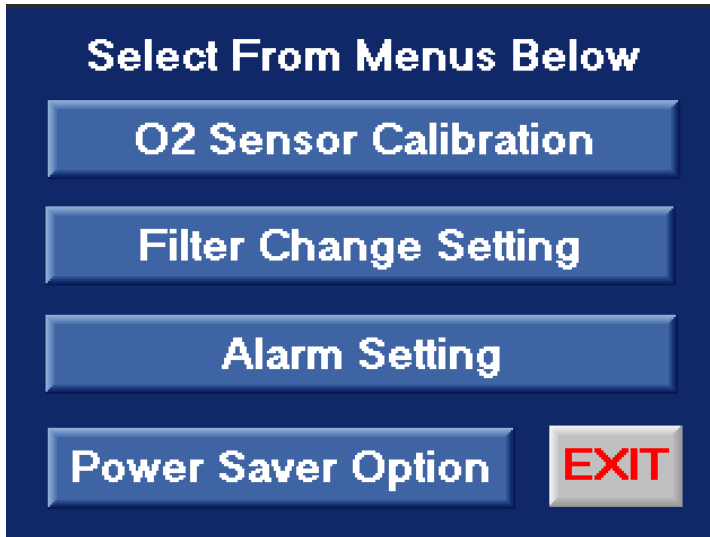


Figure 4: Menu Display

The user will have 5 different display options to choose from: O2 Sensor Calibration, Filter Change Setting, Alarm Setting, PowerSaver Option, and Exit. Each button will take the user to the corresponding screens.

4.3 O2 Sensor Calibration

To perform routine O2 sensor calibration, press the “O2 Sensor Calibration” button on the “Menu Display” screen (**Figure 4**). It will bring up the first O2 sensor calibration seen below in **Figure 5**.

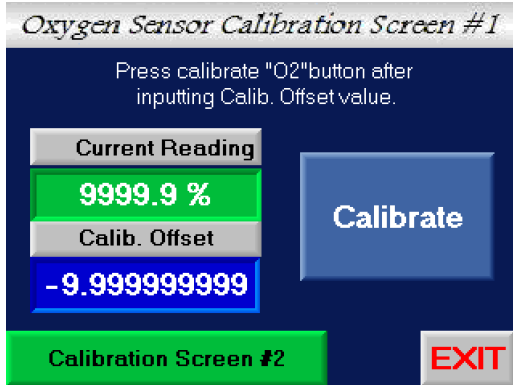


Figure 5: O2 Sensor Calibration Screen #1

This first calibration option allows the user to apply an offset to the O2 calibration reading. The user will only want to do this after applying a known gas to the O2 sensor and applying the difference in reading to the calibration offset button in the blue box. Once that value has been determined and entered, touch the light blue “Calibrate” button to set the new O2 reading.

This device also has the option to do a full scale calibration on the O2 sensor. If the user presses the green “Calibration Screen #2” button it will bring up the display seen below in Figure 6.

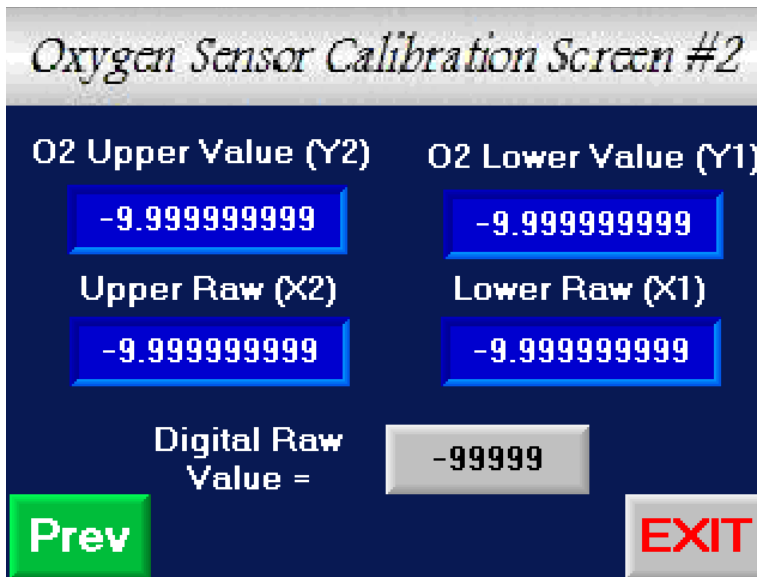


Figure 6: O2 Sensor Calibration Screen #2

To do a full scale calibration, the user will need two known calibration sources - one at the lower end reading (0.5% - 2% O2) and one at the upper end (10% - 21% O2). Apply the upper O2 gas to the device at 2-3 liters per minute. Leave the gas on for 60 seconds for the sensor reading to settle. Enter and type the upper O2 calibrated source value in the “O2 Upper Value (Y2) box”. Then read the digital value (gray box) and enter that value in the box below the “Upper Raw (X2)” text.

Remove the Upper O₂ gas source and apply the lower end calibrated source to the device at 2-3 liter per minute. Again, wait 60 second until the sensor reading settle out and type in the lower calibrated gas source value in the “O₂ Lower Value (Y1)” box. Next, type in the lower O₂ digital raw value into the “Lower Raw (X1)” box.

Note: you should see a change in the digital raw value from the upper gas and the lower gas.

4.4 Filter Change Setting

From the “Menu” display, the user can access the filter information page by pressing the “Filter Change Setting” button. The following screen will appear, **Figure 7**:



Figure 7: Filter Display

Press this button to reset the filter change alarm as shown in **Figure 7**. This will silence the audible alarm which will beep every minute until the alarm is acknowledged. This alarm is for a yearly filter change that is required on the Oxygen sensor inlet port. There is also a visible alarm banner that appears on “Home” screen to alert the operator. A dry alarm contact is also available for the customer to use for other alarm notification methods.

4.5 Alarm Setting Button

Press the “Alarm Setting” button shown in the “Menu” screen to access the alarm settings. The alarm display is shown below:

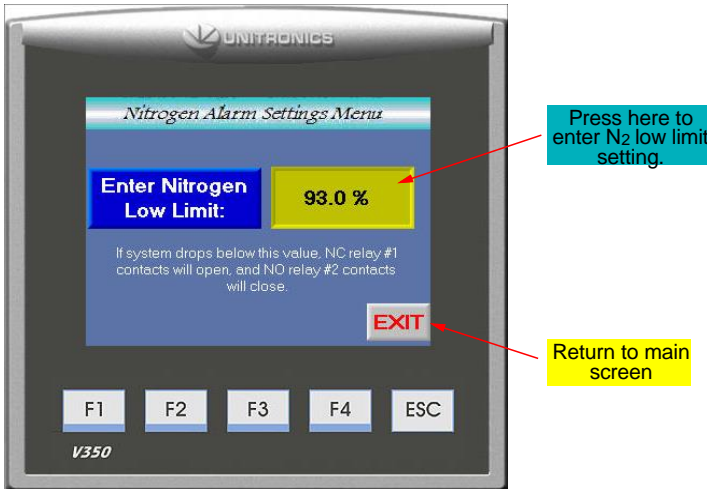


Figure 8: Alarm Setting Display

Enter the lower limit for the Nitrogen concentration in percent. For Example, if you want 95% N₂ to be the alarm setpoint, then enter in 95. If the N₂ concentration drops below this value, alarm relay contact will trigger.

4.6 PowerSaver

From the “Menu” display, the user can access the PowerSaver setting by pressing the “PowerSaver Option” button.

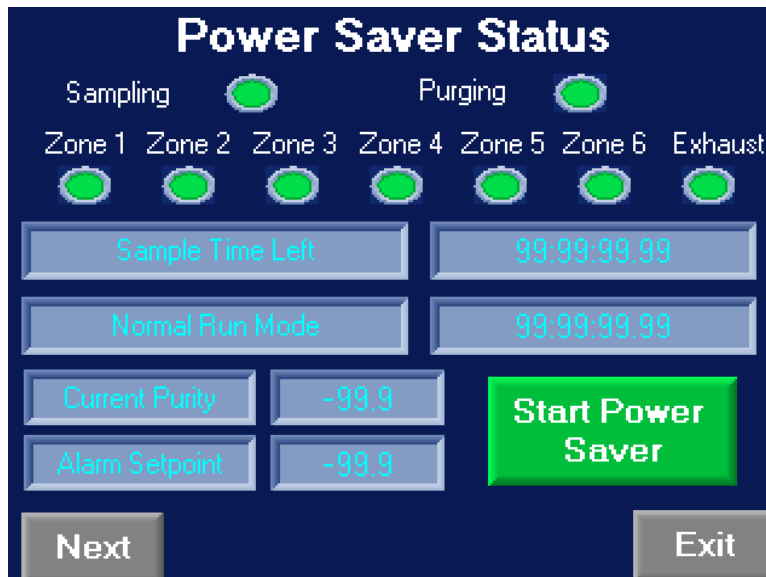


Figure 9: PowerSaver Display

This screen allows the user to start and stop the PowerSaver as well as view the current stages on the system. There is a sample timer that displays how much time is left before the next Zone’s sampling phase begins a timer for the normal run mode, and the current purity and alarm setpoint.

The next screen displays the timer setup.

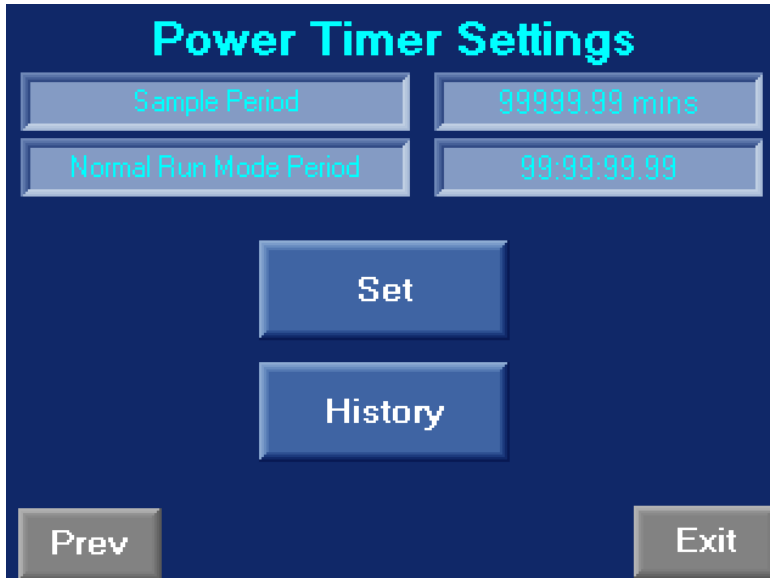


Figure 10: PowerSaver Time Setup

These numbers are factory set and should only be changed if advised by a South-Tek Systems’ representative. The “History” button will bring up a history showing the last day each individual Zone was out of spec and how many subsequent days each individual Zone has been out of spec for.

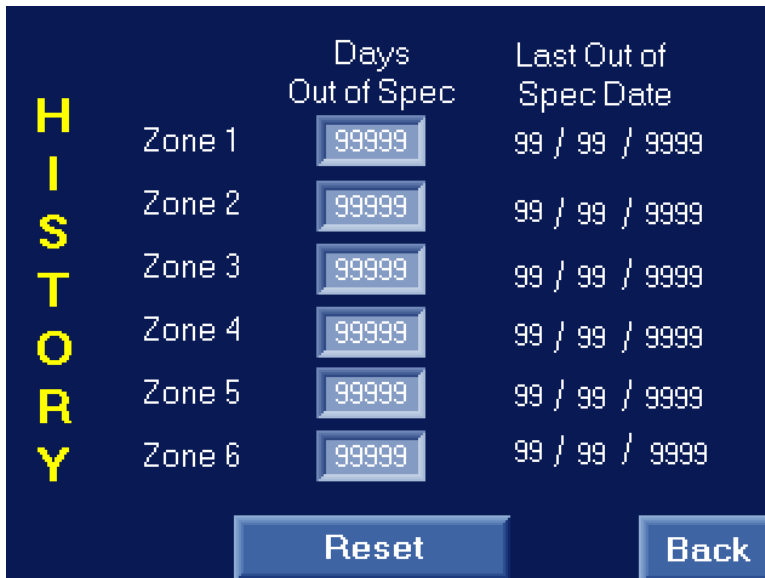


Figure 11: Power Saver History

5.0 System Outputs

| The [Quick-Check™](#)– *PowerSaver Manifold 1-Port* is equipped with 2 analog outputs, a 24 VDC alarm contact and a dry contact relay.

5.1 Alarm Contacts

For external connection to customer’s DCS, BMS, or PLC’s there are 2 analog outputs that can be used to monitor the O₂ sensor raw output. Analog output #0 is a 4-20mA signal, and analog output #1 is a 0-10Vdc signal that mirror’s the input signal from the Oxygen sensor. Both analog outputs have a resolution of 12 bits (4096 units) with a linearity of +/- 0.1%.

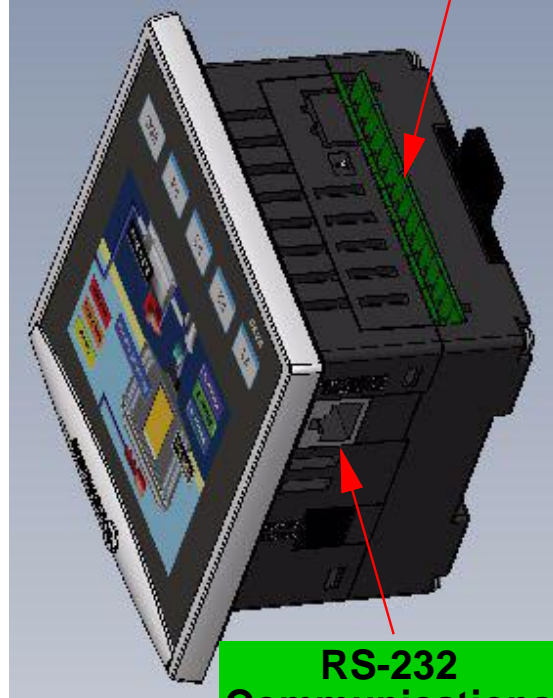
The analog output pins are located on the lower green terminal block on the PLC. Analog Output #0 is pin # and Analog Output #1 is pin 2. Pin #1 serves as the common 0V for both. See the Electrical Diagram in **Appendix B – Quick-Check™**– *PowerSaver Manifold 1-Port* **Electrical Connection**.

Appendix – A – PLC Connector Locations

+24V DC Input & 4-20ma Analog Input Connector



Relay Output Connector



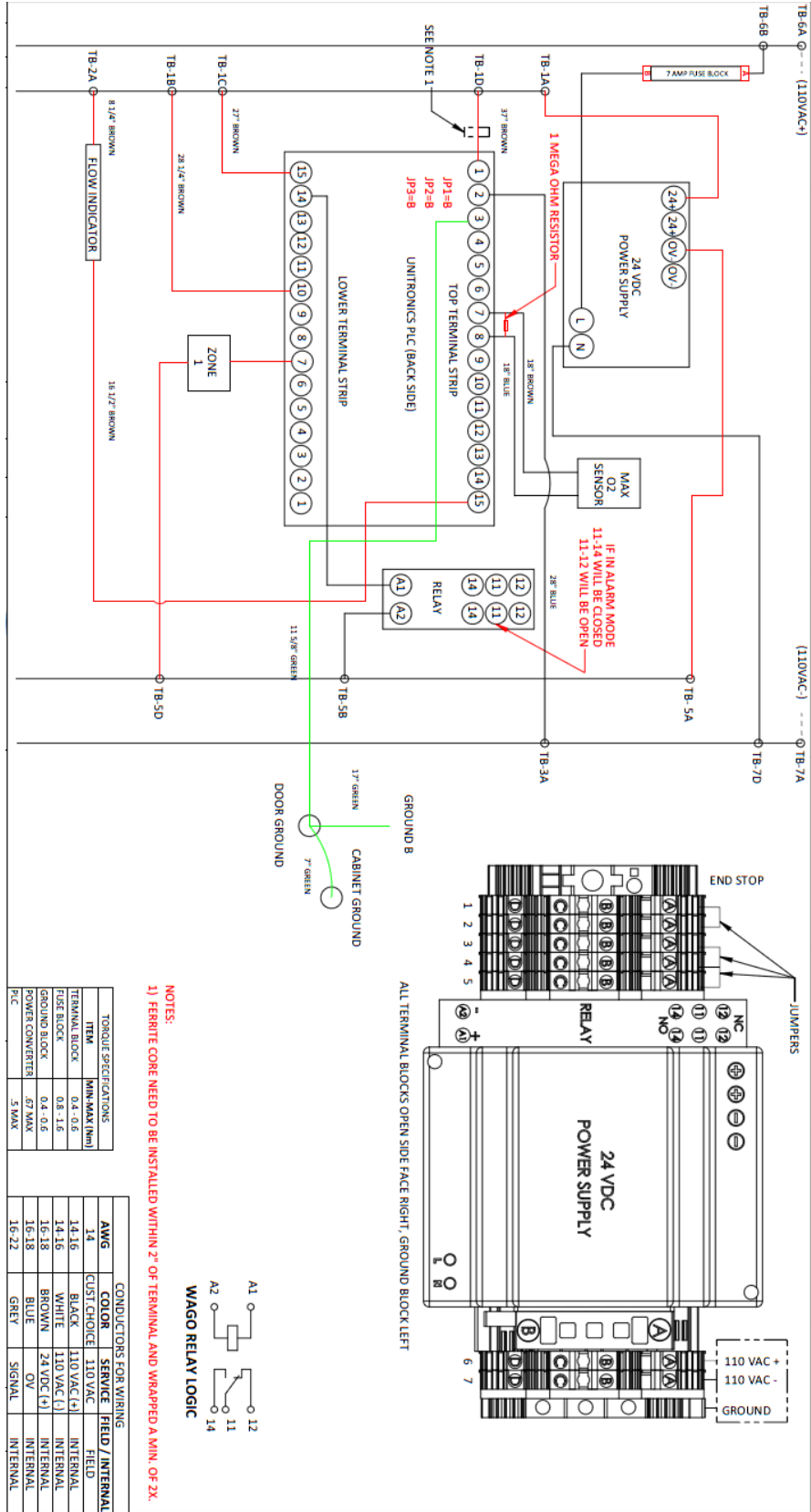
RS-232 Communications Port

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
+V	0V	⊕	I11	I10	I9	I8	I7	I6	I5	I4	I3	I2	I1	I0
24VDC			CM	PT	PT	PT	PT	AN	AN				B	A
				T+	T-	T+	T-	2	3					HSC
Input: 12 x 24VDC Output: 4 x Relay, 30VDC, 250VAC, 3A Resistive 4 x 24VDC, npn, 0.1A Resistive														
O7	O6	O5	O4	0V	HS	HS	HS	HS					Analog out	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
													A1	A0
														OV

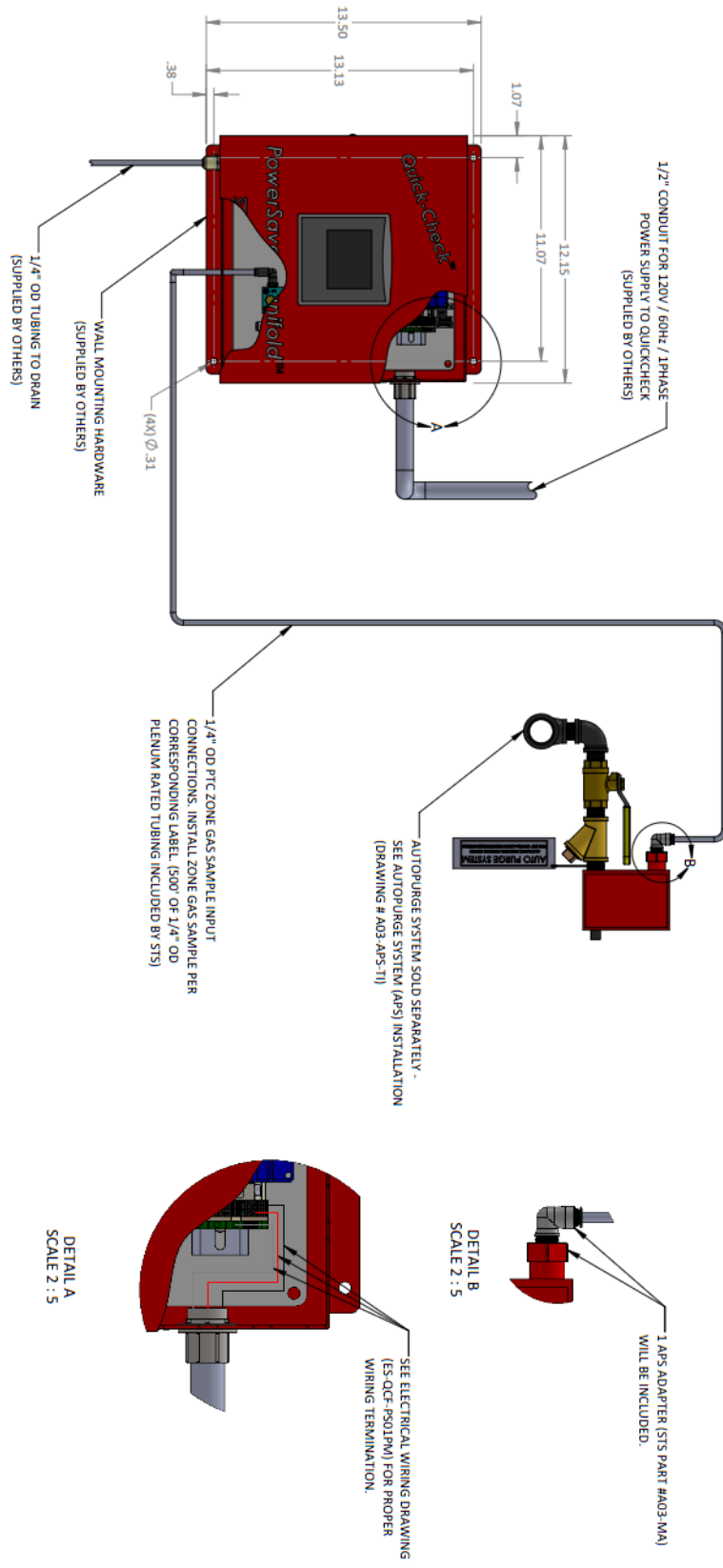
Bottom of V350 showing terminal strip labeling

- Output 7 = Relay Alarm Output – Normally Open (N/O)
- Analog Output 0 = 4- 20mA current loop
- Analog Output 1 = 0 – 10Vdc
- Thermocouple Input #1 (pins #7- and 8+) = -5mV – 15mV input for O2 sensor with 1Mega-ohm resistor across terminals.

Appendix B – Quick-Check™– PowerSaver Manifold 1-Port Electrical Connection



Appendix C – Quick-Check™– PowerSaver Manifold 1-Port Install Setup



GENERAL NOTES:
 (1) A MINIMUM OF 3" CLEARANCE FROM CABINET'S SIDES FOR PROPER VENTILATION. LEAVE ROOM TO OPEN AND CLOSE CABINET DOOR AND TO INSTALL ZONE GAS SAMPLE LINE.