EVAPCO

Integrated Controller

EVAPCO®

Pulse~Pure® Integrated Controller-2B

Instruction, Operation, and Installation Manual

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1.0 INTRODUCTION

The Evapco *Pulse*~Pure® Integrated Controller 2B (PPIC-2B) offers conductivity control of evaporative cooling water integrated into Evapco's patented water treatment system. This addendum should be used in conjunction with Evapco's standard *Pulse*~Pure Installation, Operation, and Maintenance Manual.

The PPIC-2B is microprocessor-driven with on/off control outputs. It is supplied with a temperature compensated toroidal conductivity sensor and associated mounting assembly for the sensor. Set points and operating parameters may be viewed without interrupting control. Each set point change will take effect as soon as entered.

The Timer output is scheduled on a user selectable daily, weekly, two week or four week recurring cycle. It may be programmed for one cycle per day (in weekly, two week or four week cycle) or up to 10 times per day (in daily cycle). The Timer output is equipped with a pre-bleed and bleed lockout feature.

All control outputs are interlocked with a flow input via the X-1 connector on the *Pulse*~Pure circuit board. An alternative arrangement allows only the blowdown and timer relays to be interlocked with flow while the *Pulse*~Pure chamber is continuously energized.

Our unique USB feature provides the ability to:

1. Export Config file to a standard USB flash stick to save all controller set points and load settings into another controller.
2. Download the last 2 months of data including, conductivity, temperature, water use (if equipped with optional water meters), and *Pulse*~Pure status onto a standard USB flash disk.

2.0 SPECIFICATIONS

2.1 Measurement Performance

Conductivity Range	0 - 12,000 µS/cm (microSiemens/centimeter)
Conductivity Resolution	1 µS/cm
Conductivity Accuracy	500 - 12,000 µS/cm ±1% of reading
Temperature Range	32 - 158°F (0 - 70°C)
Temperature Resolution	0.1°F or °C
Temperature Accuracy	± 1% of reading

2.2 Electrical: Input/Output

Input Power	120 or 460 VAC 60 Hz 230 VAC 50 Hz (Europe)
Input Signals	
Conductivity probe	Passive Electrodeless, RTD, PT1000 Temp. Element
Flow Switch (if equipped)	Isolated, dry contact closure required (i.e. relay, reed switch)
Water Meter (optional)	Digital 0-10 Hz, 50 msec minimum width
Outputs	
Mechanical Relays	Two - 6 Amp Total 115/230 VAC (resistive) fused One mechanical relay assigned to blowdown valve

2.3 Mechanical

Enclosure Material	Stainless Steel
NEMA Rating	NEMA 4X
Dimensions	16” x 16” x 9”
Display	5” TFT color display, 800 x 480 pixels with capacitive touchscreen
Operating Ambient Temperature	32 – 122°F (0 – 50°C)
Storage Temperature	-20 – 180°F (-29 – 80°C)
Electrodeless Sensor Pressure Rating	140 psi (9.7 Bar)

2.4 Variables and their Limits

	Low Limit	High Limit	Default
Conductivity Menu			
Units	µS/cm, mS/m, S/m		µS/cm
Bleed Menu			
Set Point	0 µS/cm	15,000 µS/	1000
Dead Band	Low end of range	High end of range	50
Water Meter Menus			
Units	Gallons, Liters, Cubic Meters		Gallons
Gallons per Contact	1 gal/contact	500 gal/contact	100
Liters per Contact	1 L/contact	500 L/contact	Not set
Cubic Meters per contact	0.001 cu. meters/contact	1000 cu. meters/contact	Not set
Timer Menu			
Pre-Bleed (0 disables pre-bleed)	1µS/cm	99 µS/cm	0
Lockout	0 minutes	9 hrs:59 min	0
Add Time			
Mode	Daily, weekly, two-week, four-week		Not Set
Daily Adds	0 minutes	144 minutes	0
All other modes	0 minutes	1440 minutes	0
Time of Day (Military)	0:00:00	23:59:00	0:00
Password Menu			
New Value	0000	9999	Not Set

3.0 INSTALLATION

3.1 Installation

Once the PPIC-2B is mounted, the blowdown valve may be located at any distance from the controller. The conductivity probe should be placed as close to the panel as possible. For field installed integrated controllers the probe and flow switch assembly must be located within 20 ft. of the integrated controller. Sufficient flow to the probe assembly should be ensured by piping supply from the discharge side of recirculating pump and return to either the basin or the suction side of recirculating pump. Always route low voltage (sensor) signals with at least a 6" separation from AC voltage wiring.

Locate the probe assembly where an active sample of cooling tower water is available. The probe and flow switch (system dependent) must be located where they can easily be removed for cleaning and inspection. They must be situated so that the assembly is always full of water when the tower is operating. Refer to **Figure 1** and **Figure 2** for typical installations.

IMPORTANT: To avoid cracking the female pipe threads on the supplied plumbing parts, use no more than 3 wraps of Teflon tape and thread in the pipe FINGER tight plus 1/2 turn! ***Do not use pipe dope to seal the threads of the flow switch because the clear plastic will crack!***

3.2 Icon Definitions

Symbol	Publication	Description
	IEC 417, No.5019	Protective Conductor Terminal
	IEC 417, No. 5007	On (Supply)
	IEC 417, No. 5008	Off (Supply)
	ISO 3864, No. B.3.6	Caution, risk of electric shock
	IEC 3864, No. B.3.1	Caution

3.3 Typical Mounting

Mount the PPIC-2B so that the Chamber cable will reach the bottom connector. **It is advisable to mount the *Pulse*~Pure Purification Chamber before mounting the panel to ensure that the shielded cable reaches the bottom of the panel without stress.** The panel should be mounted at a height and location that allows operators to fully open the panel door for routine access. Locate the conductivity probe in side stream piping which supplies a representative portion of evaporative cooling water and is within 20 feet of the panel. Install side stream piping with isolation valves so that the probe and flow switch (system dependent) can be easily removed for periodic cleaning and inspection. See **Figure 1** and **Figure 2** for typical mounting options. Contact your Evapco representative for specific installation recommendations.

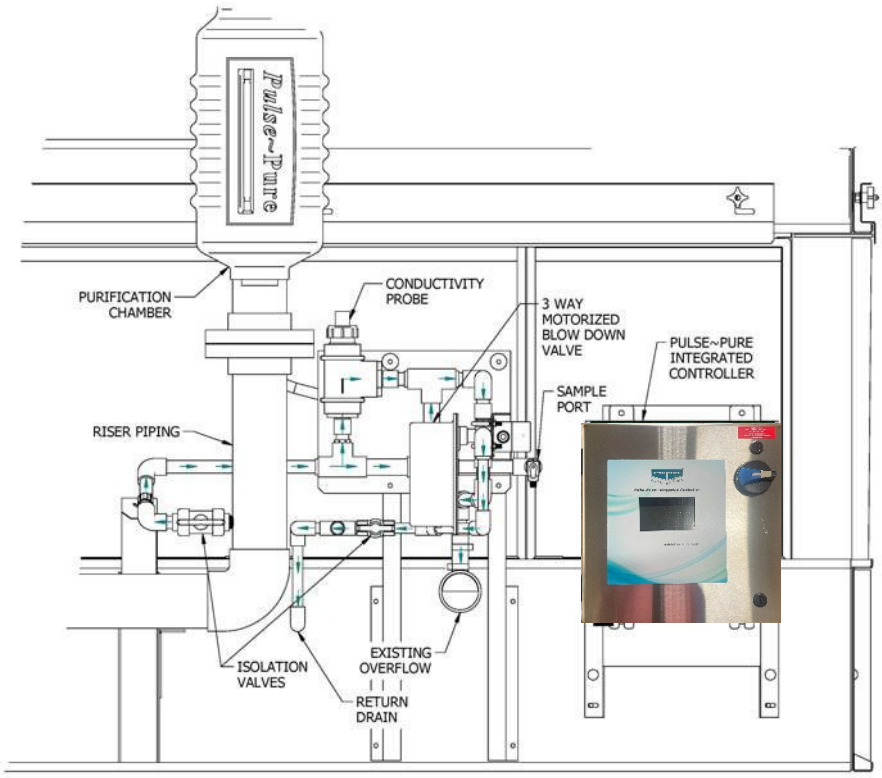


Figure 1 Typical Installation – Closed-Circuit Cooler or Condenser (self-draining sidestream)

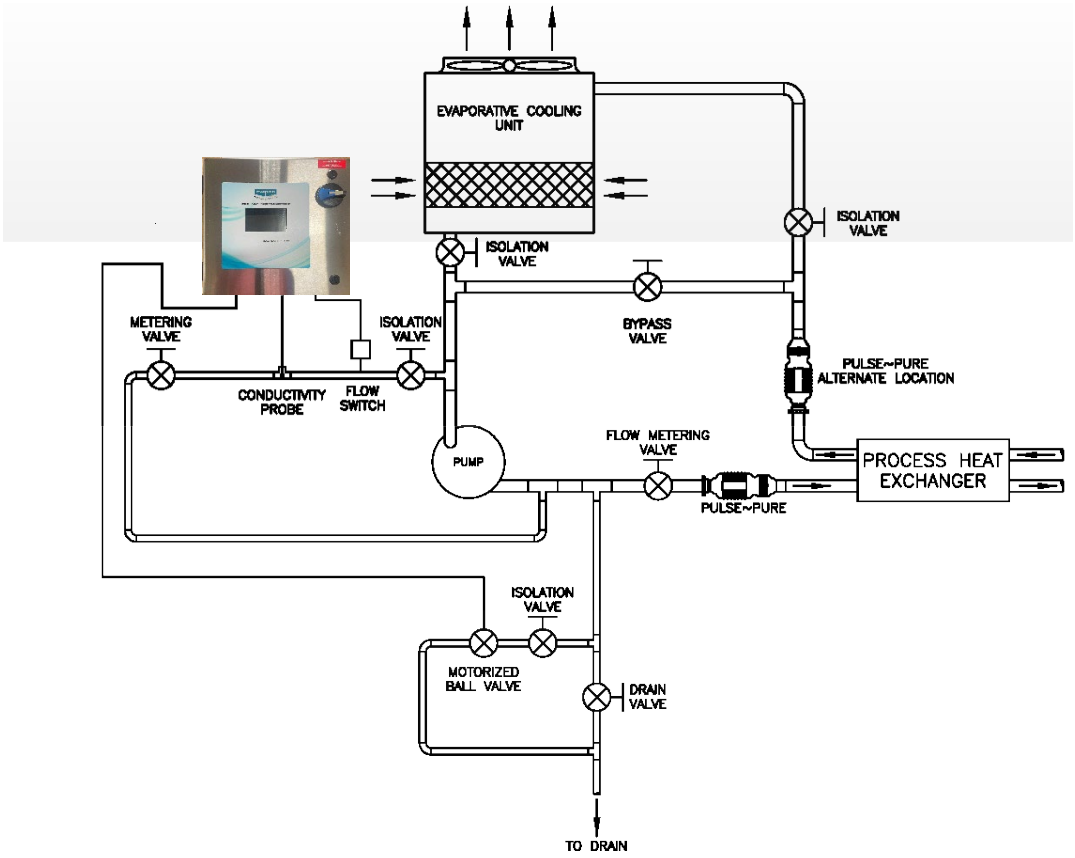


Figure 2 Typical Installation – Single Tower

3.4 General Panel Layout

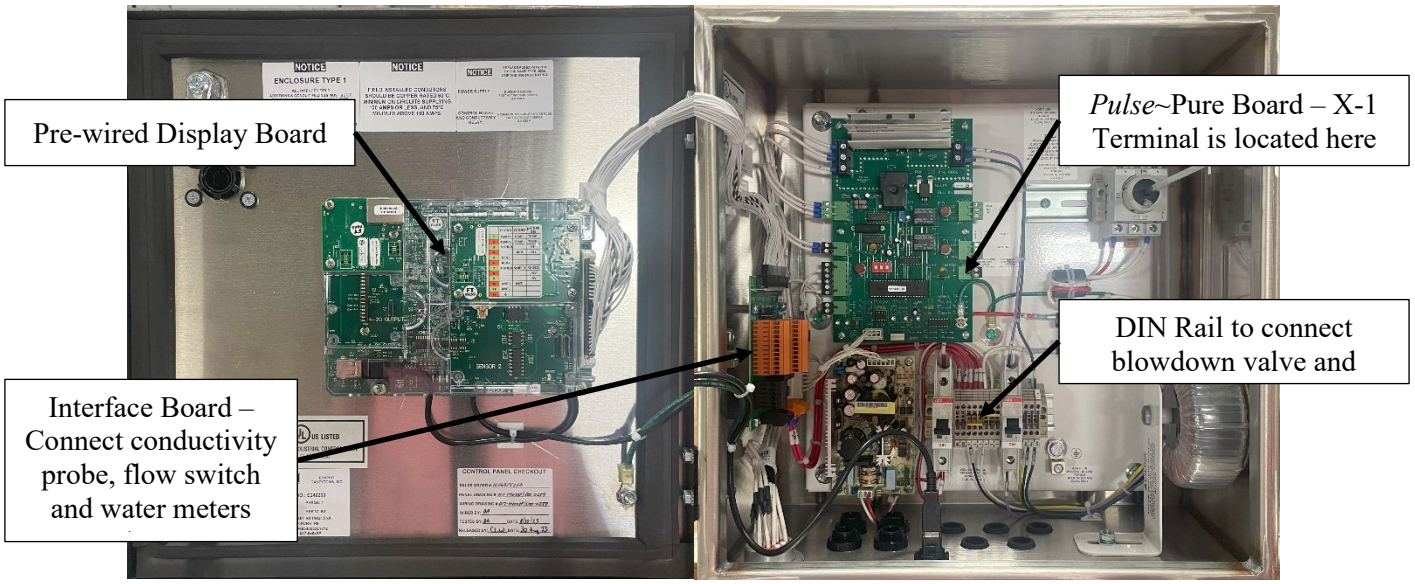


Figure 3 PPIC-2B General Panel Layout

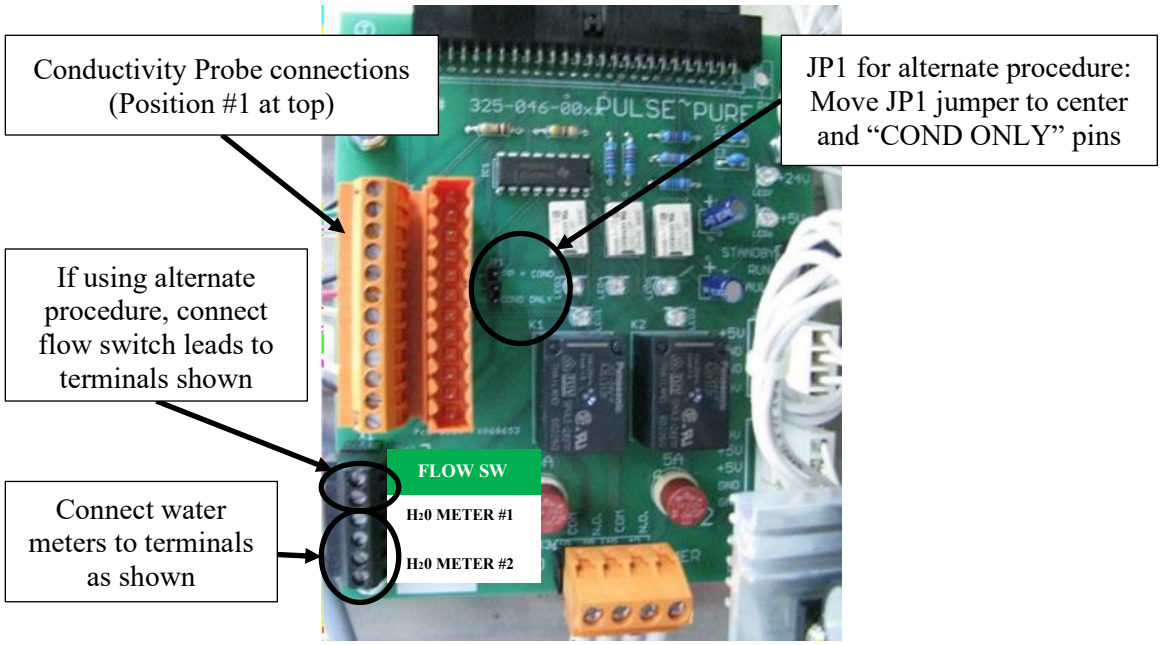


Figure 4 Interface Board Located on Left Side of Panel

3.5 Conductivity Probe, Flow Switch and Water Meter Connections

3.5.1 Conductivity Probe

The conductivity probe contains eight wires. Lace conductivity probe wires through the probe's locking nut before wiring into panel. Bring wire into panel through supplied waterproof strain-relief cord grip located on the bottom of Integrated Panel.

Connect wires to connector on Interface Board located on the left-hand side of panel door. Be sure to connect the named, color-coded wires to the proper connector. See door label or **Figure 5** for wiring sequence. From top of connector the sequence is:

Position	Wire Label	Wire Color
1	TEMP -	BLACK
2	TEMP+	GREEN
3	R-SHLD	CLEAR
4	NOT USED	
5	RCV -	BLACK
6	RCV+	RED
7	X-SHLD	CLEAR
8	NOT USED	
9	NOT USED	
10	XMT+	WHITE
11	XMT-	BLACK
12 - 18	NOT USED FOR CONDUCTIVITY PROBE	

Figure 5 Conductivity Probe Wiring Connections

3.5.2 Flow Switch (System Dependent)

In the preferred configuration, a secondary contact (dry) from the tower recirculating water pump-starter is wired into the X1 connection on the main Pulse~Pure circuit board. (See the Pulse~Pure IOM for details of this connection). For an installation with multiple pumps where it is impractical to connect the PPIC-2B in this manner, the alternate procedure should be used.

Alternate Procedure

A flow switch is used to control the conductivity-actuated blowdown-relay and timer-relay while the Pulse~Pure Chamber operates continuously. Flow switches require regular maintenance and may fail in the open (No Flow) position. For the alternate procedure, jumper the X1 terminal on the Pulse~Pure circuit board and move jumper JP-1 on the Interface Board from "PP + COND" and center pins to center and "COND ONLY" pins. Connect a dry-contact flow switch to the "FLOW SW" terminals on the Interface Board. See **Figure 4**.

3.5.3 Water Meters (Optional)

Water meter totalizers are digital counters designed to operate with a contacting head water meter. Two water meters can be connected to the PPIC-2B. See **Figure 4**.

3.6 Blowdown Valve and Timer Connections

The PPIC-2B allows 5 Amps of current for incoming power of 120V, 230V or 460V for operating a conductivity-actuated blowdown valve and timer- actuated device.

Make all connections to the DIN rail located inside the panel at the bottom. Feed wires from the devices through waterproof stress-relief cord grips provided.
Connect the HOT lead from blowdown valve to the **BLDN** terminal and NEUTRAL to **#2** terminal. Connect the HOT lead from a timer-actuated device to the **TMR** terminal and NEUTRAL wire to **#2** terminal. See **Figure 6.**

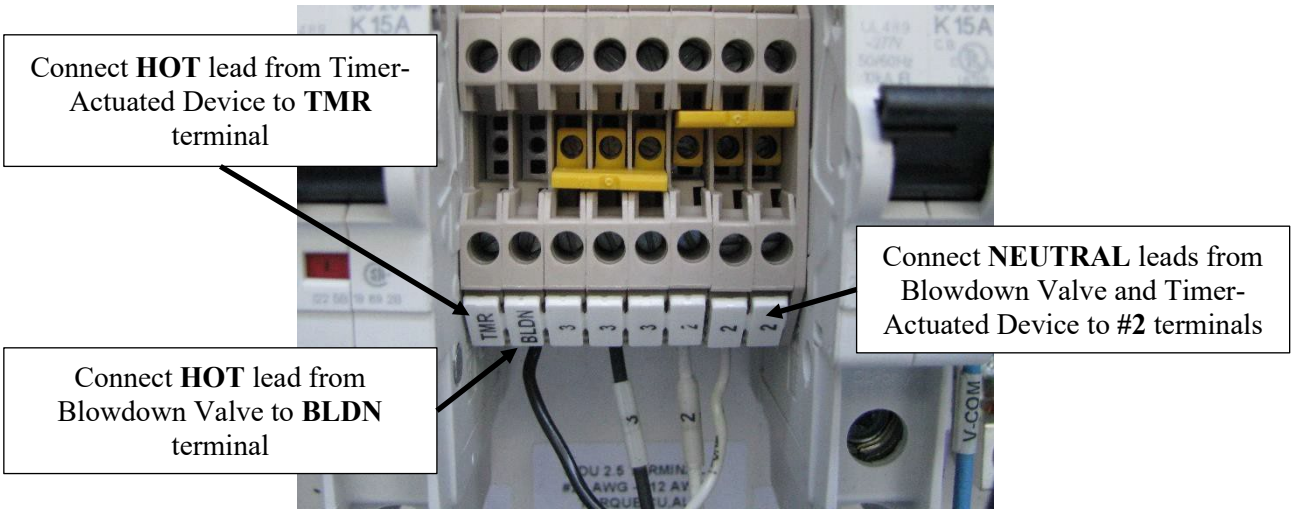


Figure 6 DIN Rail Connections for Blowdown Valve and Timer-Actuated Device

4.0 FUNCTION OVERVIEW

4.1 Front Panel

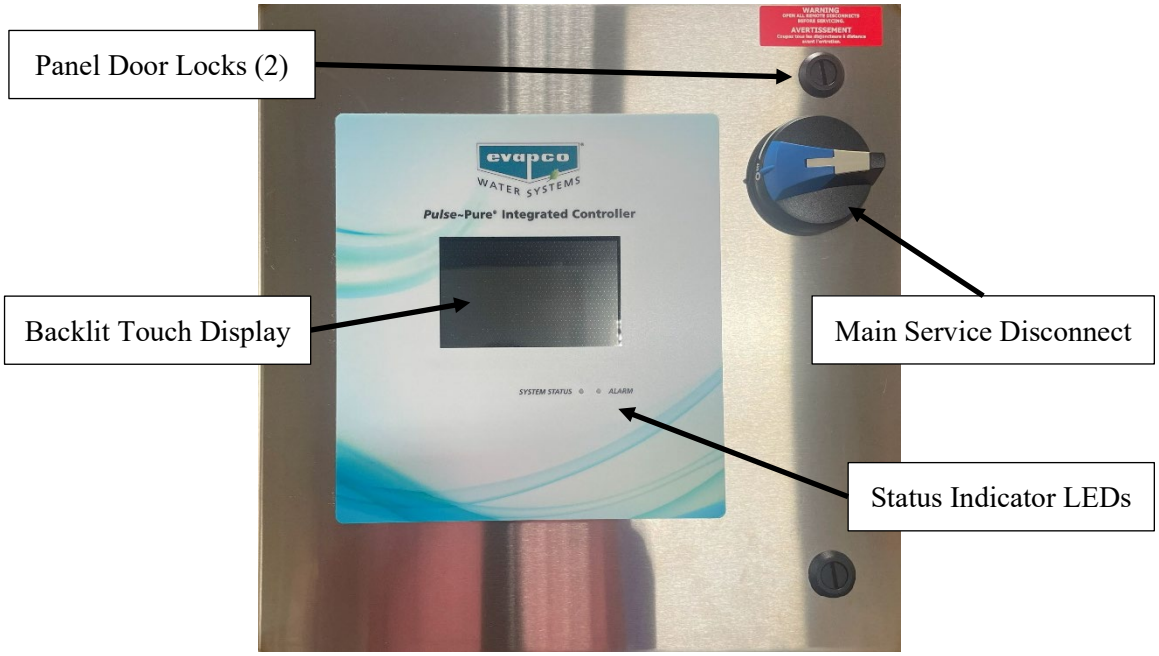


Figure 7 Front Panel

4.2 Touch Screen Display

A Home screen is displayed while the controller is on. Across the top of the screen are tabs for each major menu group: Home, Inputs, Outputs, Graphs, HOA (Hand – Off – Auto output operation), Configuration, and Alarms. Touching the tab brings up the menus associated with that group.

Below these tabs, this display shows user-defined fields containing input readings or status of outputs. Touching any of these fields on the Home Screen will bring up the item's Details Screen, where you can access calibration and setting menus or graph that parameter. If more than one page of items is selected to be displayed on the Home screen, it will automatically scroll between them, or swiping up or down manually moves to the next page. A yellow bar on the right will indicate if multiple pages are available and where the current page is relative to the others.

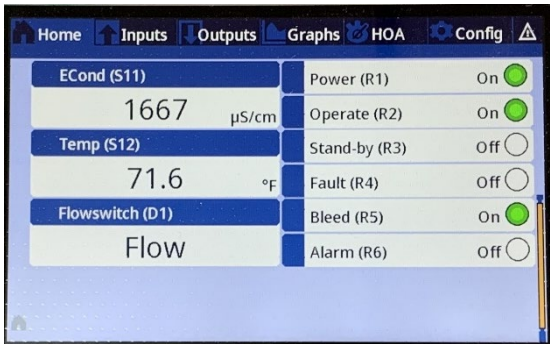


Figure 8 Home Screen

4.2.1 Icons

The following icons appear on the Home screen. Touch the icon to get to the menu selections.

 Alarm Menu

 Inputs Menu

 Outputs Menu

 Configuration Menu

 HOA Menu

 Graph Menu

 Home Page

 Filter

Other icons may appear in the menu screens.

 Calibration icon appears in sensor input menus and brings up the calibration menu

 Graph icon appears in Input menus and brings up the Graphs menu showing that input

 Edit icon appears in Input and Output details menus and allows the editing of settings

 Information icon appears in Input and Output menus in place of the Edit icon and is used to leave edit mode and return to viewing information related to that Input or Output

 Close icon closes a menu and returns to the previous menu

 Confirm icon saves changes and returns to the previous menu

 Filter icon is used in menus to limit the choices displayed when selecting items from a list

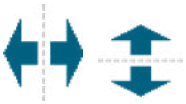
Character Delete icon erases part of an alphanumeric entry

Shift icon is used for upper-case characters

Double Arrow icons appear in Graphs menu and move the time frame of the graph

Calendar icon appears in Graphs menu and brings up the Time Range settings

Dim and Bright icons appear in Display Settings menu



Split icons appear in Edit Home Screen Layout and are used to change a larger cell into two smaller ones

Merge icons appear in Edit Home Screen Layout and are used to change two smaller cells into one larger one

Move Up or Down icons appear in Edit Home Screen Layout and are used to move a parameter up and down in it's position on the screen

Delete icon appears in Edit Home Screen Layout and is used to delete all contents in that section of the Home screen <task_delete>

Return con appears in Output menu HOA Setting and returns to the list of settings for that output. <nav_back>

4.3 Password

The controller is shipped with the password disabled. If you wish to enable it, see Section 5.2.2 for operation. With the password enabled, any user can view but not change settings. Note that this provides protection only against casual tampering.

4.4 Startup

Initial Startup

After the PPIC-2B has been wired and the conductivity probe and blowdown valve are plumbed and wired, the controller is ready to be started.

Supply power to the unit by switching the main power disconnect to the "ON" position. The disconnect is located on the upper right of the panel door. All circuit breakers in the panel should be in their ON position. The display will briefly show the message "Evapco Controller Initializing" then revert to the Home display.

4.4.1 Temperature sensor is included as part of the electrodeless conductivity sensor. Verify that the conductivity probe is calibrated accurately for temperature. For most probes the factory- calibration is adequate. If the temperature calibration needs adjustment see Section 5.3.2

4.4.2 Follow the procedure for Open Air calibration before inserting the electrodeless probe into the process flow. Once completed, perform the steps for a One Point Process calibration. **The probes must be calibrated during initial start-up of the system (see Section 5.3.1) or when a conductivity probe has been replaced.**

4.4.3 Enter Bleed conductivity set point value. Refer to Evapco's PPF1.0 document for the initial recommended conductivity set point.

Once Inputs and Outputs are connected to the PPIC-2B, calibration has been completed and Bleed set point entered, the controller will continuously manage all Inputs and Outputs within the desired programming parameters.

4.5 Shutdown

To shut the controller down, turn off the power to the PPIC-2B using the main power disconnect. Programing remains in memory when the controller is de-energized. Shutdown only if maintenance or troubleshooting requires the panel door to be opened, or if the cooling system is to remain off for an extended period of time, e.g., winter shutdown. During periods of intermittent operation, the controller should remain energized. De-energizing the controller disables system water treatment.

5.0 OPERATION

The PPIC-2B operates continuously when it is powered. The Touch Screen is used to program operating settings and set points. Controllers have been programmed by Evapco prior to shipment with default settings. The settings can be manually customized in the field as required. Keep track of any manual programming changes made for future reference.

The Main Menu provides access to Inputs, Outputs and Configuration settings. Conducting sensor calibration, assigning Input/Output channels, changing set points or timer values, and configuring operating modes are available from the main menu. After ten minutes of inactivity, the display will return to the Home display. The Integrated panel is still controlling even while browsing through menus.

5.1 Main Menu

All controller settings are accessed from the Main Menu. To view / adjust settings select the Main Menu icon located in the lower left-hand corner of the Home display. PPIC-2B are configured for operation at the factory prior to shipment. Some item settings may be customized in the field.
Caution: Changing designation or settings associated with some attributes may affect PPIC-2B operation. Please read this Technical Manual carefully before changing settings.

Inputs
- Conductivity
  - Hi and Low Alarm Settings
- Temperature
- Flowswitch
- Flowmeter (Water Meter 1)
- Flowmeter (Water Meter 2)

Outputs
- Bleed
  - Set Point and Dead Band
- Timer
  - Frequency and duration of events
  - PreBleed
  - Bleed Lockout
  - Add Last Missed
- Alarm
  - Selection

Configuration
- Global Settings
  - Date
  - Time
  - Global Units of Measure
  - Language

Security Settings
- Local Password

Display Settings
- Adjust Display (contrast, brightness)
- Key Beep

File Utilities
- Data Log Range and Frequency
- Export Data, Event and System Logs
- Export/Import User Configuration

Controller Details
- Controller Serial Number
- Controller Software Version

5.2 Configuration

5.2.1 Global Settings

Date
From the Main Menu screen, select Configuration Settings. Select Global Settings. Touch the Scroll Up or Down icon until Date is displayed, and then select it. Touch the Move Cursor icon to assign year, month and date. Select the Confirm icon to accept the change.

Time
From the Main Menu screen, select Configuration Settings. Select Global Settings. Touch the Scroll Up or Down icon until Time is displayed and then select it. Time is displayed in 24-hour format. Touch the Move Cursor icon to highlight the digit to change, then use the numeric touchpad to change the time. Select the Confirm icon to accept the change.

Global Units of measure
The controller can be set to use either Imperial or Metric units of measure. The controller has been pre-set to Imperial units. To change this setting;
From the Main Menu screen, select the Configuration Settings icon. Select Global Settings. Touch the Scroll Up or Down icon until Global Units is displayed and then touch it. Select Metric. Select the Confirm icon to accept the change.

Temperature Units of measure
The controller has been pre-set to Fahrenheit. To change this setting to Celsius, select the Configuration icon from the Main Menu screen. Select Global Settings. Touch the Scroll Up or Down icon until Temperature Units is displayed and then touch it. Select ºC to change the units to Celsius. Select the Confirm icon to accept the change.

HVAC Mode
The controller has been pre-set to Enabled. **Do not** disable HVAC mode.

Language
The controller language default setting is English. To change this setting;
From the Main Menu screen, select the Configuration Settings icon. Select Global Settings. Select the Scroll Down icon until the English word "Language" is displayed and then touch it. Select the Scroll Down icon until the language you wish to use is displayed and select it. Select the Confirm icon to change all menus to your language.

5.2.2 Security Settings

This menu determines whether the password feature of the controller is enabled or disabled and allows you to customize the password to your own value. When Security Settings are disabled, any user may view and change any setting. When Security Setting are enabled, any user can view, but cannot change setting unless they log in with Password. **Controllers are shipped with Security Settings disabled.**

To enable Security Settings, select the Configuration icon from the Main Menu screen. Touch the Scroll Up or Scroll Down icons until Security Settings is displayed. Select Security Settings then Security. To enable Security, the default Access Code 5555 must be entered first, then select Enabled. Confirm selection by selecting the Confirm icon. (This should be changed if Security is enabled.) When Security is enabled the controller requires immediate use of a password to calibrate or change settings. Once finished making changes, log out to prevent unauthorized changes by someone else. The controller will automatically log out after 10 minutes of inactivity.

Local Password
Enable Security. Select Local Password from Menu. The user can enter their own Local Password (up to 10 digits). Accept the new Password by touching the Confirm icon. **Record the new passcode and keep it in a safe place. The Factory cannot reset forgotten or lost Local Passwords.**

5.2.3 Display Settings

Note: Changing "Home" Screen display assignments may affect operation. Do not attempt to modify the settings without prior approval from Evapco Water Systems.

Adjust Display
From the Main Menu screen, select Configuration Settings. Select Display Settings. Touch the Scroll Down icon until Adjust Display is observed and select it. Adjust Brightness and contrast slide bar to achieve desired appearance. When complete select the Confirm icon to accept the change.

Key Beep
Key Beep factory default setting is disabled. To enable, select Configuration on the Main Menu. Select Display Settings. Touch the Scroll Down Button until Key Beep is displayed and select. Select Enabled and press the Confirm icon to accept the change.

5.2.4 File Utilities

The controller collects and stores data for user download to a standard USB flash drive. The controller has three logs, Datalog, Event Log, and Reset Log. All files are in a CSV format that may be opened in a spreadsheet such as Microsoft Excel.

Datalog	Contains the following data taken at 1-hour intervals for the past two months: Conductivity Conductivity Set Point Temperature Water Meter 1 and 2 Totals (if equipped) After two months, the oldest data will be overwritten with new data. The file will always contain the last two months of data.
Event Log	Records set point changes, user calibrations, alarms, relay status changes (noted by change from 0 to 1 in log), file exports, etc.
System Log	This records hardware changes, automatic calibrations, power loss, etc..

Data Log Range
The controller default setting is 2 months. To change, select Configuration from the Main Menu screen. Select File Utilities. Select Data Log Range. Ranges from "Since Previous" to 3 Months are available for the User to select. Touch the desired range and select the Confirm icon to accept.

Log Frequency
The controller default setting is 1 hour. To change, select Configuration from the Main Menu screen. Select File Utilities. Select Log Frequency. The controller data log frequency selections range from 15 minutes to 1 Day.

Export; Data Log File, Event Log, System Log
Place a USB flash drive with at least a 10 MB capacity into the USB port located on the bottom of the panel. Select the log you wish to export (Data Log, Event Log or System Log) from the File Utilities menu on the controller display. Touch the confirm icon when you are ready to export the file to the USB flash drive. Multiple logs can be exported to the same USB stick. The controller will display the progress of the file download process. If the file was successfully copied to the USB disk the controller will display Transfer Success.

Export/Import User Configuration

These functions allow the user to export a file that contains controller settings (e.g., conductivity set point) to a standard USB flash disk drive for system backup or import to another PPIC-2B.
Do not attempt to import user configuration files from equipment other than Pulse~Pure Integrated Controllers. Damage to the program may result. User configuration files are in a WCF format. These files are not viewable with standard software programs. Keep track of any field changes made to controller settings.

Export

The USB flash drive used for this process must be free of any other files or programs. A safe practice to ensure success is to format the USB drive before exporting the configuration file. Place a USB flash drive with at least 10 MB capacity into the USB port located on the bottom of the Pulse~Pure panel. From the File Utilities menu select Export User Configuration File. Touch the confirm icon when ready to export the file. The controller will display the progress of the download progress. When the file is successfully exported to the USB stick the controller will display Transfer Success.

Import

Using the USB flash drive containing the user configuration file, insert into the USB port located on the bottom of a Pulse~Pure panel. Select Import User Configuration file from the File Utilities menu. Touch the confirm icon when you are ready to import the file from the USB drive. The controller will display the progress of the download progress. When the file has been successfully imported, the controller will display Transfer Success. The controller will go through a re-initialization process. This may take a few minutes, do not switch controller off during this process. When completed, the controller will return to the Home Screen.

When export or import of files has been completed, be certain to reseat weather cover over USB port to maintain weather tight protection of panel.

5.2.5 Controller Details

Controller Serial Number and Software Version may be needed to facilitate troubleshooting.

Controller Serial Number

From the Configuration Menu scroll down to find Controller Details. Select controller details. Serial number may be viewed from this screen.

Software Version

From the Configuration Menu scroll down to find Controller Details. Select controller details. Software Version may be viewed from this screen.

5.3 Inputs

5.3.1 Conductivity

The controller has been configured by Evapco for an electrodeless conductivity sensor. The sensor input is defined as ECond (S11) in the controller programming. Changing this designation may affect its operation in the field.

Field Configurable Settings

Item	Factory Default Setting
LoLo Alarm	0
Low Alarm	0
High Alarm	15000
HiHi Alarm	15000

From the Home Screen, press ECond (S11) menu item. Select the tool icon, located on the lower right side of display. Select the item you wish to configure. Using the keypad on the screen display enter the alarm value. When configuration is complete select the Confirm icon to save.

Do not attempt to modify other settings associated with this sensor input without prior approval from Evapco Water Systems.

See **Figures 4 and 5** for wiring connections.

Electrodeless Sensor Calibration

Open Air (Zero) Calibration

This menu is used to calibrate the sensor to read zero when it is dry. Air calibration should be conducted during system commissioning or when installing a new sensor. The sensor must be dry and in air when performing this procedure.

From the Home screen, touch ECond (S11), select the Calibrate icon, and select Open Air Calibration from the calibration menu. Select the Confirm icon to disable control. The controller will automatically determine the correct Air offset wait until "Calibration Successful" is displayed on the touch screen before proceeding. Select the Confirm icon to save calibration results. Touch the Confirm icon to return the sensor to the process. Place the probe in the probe tee and initiate water flow. Continue with One-point Process Calibration

One-point Process Calibration

Use a calibrated conductivity meter to determine the actual conductivity of the cooling water. Select the Calibrate icon from the ECond (S11) menu. Touch One-point Process Calibration from the menu. Enter the actual cooling water conductivity value and touch the Confirm icon.

5.3.2 Temperature

Temperature is measured by a thermistor within the electrodeless conductivity sensor. The temperature sensor has been designated as (S12). Changing this designation or any input settings associated with this sensor may affect its operation in the field. **Do not** attempt to modify settings associated with this sensor input without prior approval from Evapco Water Systems.

The Temperature sensor has been calibrated prior to shipment. Should it be necessary to calibrate temperature, use a calibrated thermometer to measure the fluid temperature and adjust the controller to match. From the Home screen, select Temperature (S12). Select the Calibrate icon then One Point Process Calibration. Enter the fluid temperature measured from the thermometer and touch the Confirm icon wait until "Calibration Successful" is displayed on the touch screen. Select the Confirm icon to save calibration results.

5.3.3 Flow Switch (D1)

Digital Input (D1) has been reserved for the Flow Switch input. Changing this designation may affect controller function. Refer to section 3.5.

Settings associated with this input have been preset at the factory prior to shipment. When system pump is de-energized (no water flow, switch is open) "No Flow" message is displayed on the Home Screen. "No Flow" warning message also appears at the top of the Home Screen. When system pump is energized (water flow, switch is closed) "FLOW" is displayed on the Home screen. Contact Evapco Water Systems before adjusting settings associated with this input.

5.3.4 Water Meters (optional)

Digital Inputs D2 and D3 have been reserved for contacting head water meters (Flowmeters). Settings have been configured at the factory.

Factory Default Settings:

Item	**Setting**
Volume/Contact	100 gallons
Flow Units	Gallons

Ensure the input being configured is connected to the correct point on the interface board. Water meter #1 is (D2), Water meter #2 is (D3).

To change the Factory default settings;

- Select the Main Menu icon from the Home Screen.
- Select the Inputs icon.
- Select appropriate Flowmeter input (D2) or (D3).
- Select the Tool icon to set measurement parameters.
- Select the Tool icon to modify the Volume/Contact appropriate to the meter.
- Select the appropriate units of volume flow will be measured. Gallons is the factory default unit. If units of volume other than gallons is selected, the controller automatically performs conversion to the volume unit selection.

5.3.5 Other Digital Inputs

Digital Inputs D4, D5 and D6 have been reserved for Pulse~Pure status functions. Do not attempt to modify settings or designations associated with these inputs without prior approval from Evapco Water Systems.

5.4 Outputs

Relay outputs R1, R2, R3, R4 have been reserved for Pulse~Pure status functions. Do not attempt to modify settings or designations associated with these inputs without prior approval from Evapco Water Systems.

5.4.1 Bleed (R5)

When the controller measures a conductivity value equal to, or greater than, the Set Point the Bleed relay is powered causing a connected valve to open. The relay remains powered until the conductivity measured is less than the set point minus the dead band setting. For example, if the Set Point is 1000µS/cm and the Dead Band is 50µS/cm the bleed relay is energized, causing the connected bleed valve to open, when the measured conductivity is ≥1000µS/cm. The relay remains powered until the measured conductivity is ≤ 950uS/cm.

The Bleed (Blowdown) relay is assigned to Relay 5 (R5). Changing this designation may affect its operation in the field. Set point, Dead band and Hand/Off/Auto settings are available for field adjustment.

Bleed Set Point
The Bleed Set point has been pre-set at the factory to 1000µS/cm. Upon start-up and commissioning of the cooling system the Bleed Set Point must be adjusted to the Evapco recommended set point for the specific project. The Evapco set point recommendation is found on the project's PPF1.0 report. Contact Evapco Water Systems for a copy of the report if it is not available at the job site.

To adjust the set point value, select Outputs from the Main Menu. Scroll down the Outputs menu and select Bleed (R5). Select the Tool icon. Select Setpoint. Using the keypad display enter desired set point. Select the Confirm icon to save.

Bleed Deadband
The Deadband factory default setting is 50 µS/cm. To adjust the Deadband value, select Outputs from the Main Menu. Scroll down the Outputs menu and select Bleed (R5). Select the Tool icon. Select Deadband. Using the keypad display enter desired Deadband. Select the Confirm icon to save setting.

HOA
Selects the operating mode of the Bleed output; Hand (stays on for 10 minutes), Off (Stays off indefinitely), Auto (Automatically operates Bleed output based on conductivity value). The Factory default setting for Bleed output is Auto.

To change this setting for maintenance or troubleshooting, select Outputs from the Main Menu. Scroll down the Outputs menu and Select Bleed (R5). Select the Tool icon. Select HOA Setting and make desired selection. Select Return icon.

To prevent unintentional system water loss the Bleed valve has been assigned a Hand Time limit of 10 minutes. When placed in Hand mode, the Bleed relay will remain powered for a maximum of 10 minutes. After 10 minutes the relay automatically de-energizes to close the valve.

To change this setting, select Outputs from the Main Menu. Scroll down the Outputs menu and Select Bleed (R5). Select the Tool icon. Select HOA Setting. Scroll down the Bleed menu and select Hand Time Limit. Using the keypad enter desired time. Select the Confirm icon to save setting.

Once the task requiring HOA selection to be changed from Auto has been completed return the setting to Auto.

5.4.2 Biocide Timer and Alarm Relay (R6)
Output relay (R6) may be used to manage operation of ancillary equipment such as chemical metering pumps or power a device (visual or audible, not included) to warn that an alarm condition exists.

Timer (R6)
The Timer relay is used to control the circuit shown in Figure 4. Up to 10 separate event settings may be programmed. Timer operation is specific to local site requirements. Site specific programming should be performed at the site.

Programming settings for Timer (R6) Relay

- Select the Main Menu icon from the Home Screen
- Select Outputs icon
- Scroll down Outputs menu to Alarm(R6) and select
- Select the Tool icon
- Scroll down menu to Mode and select
- Scroll up and select Biocide Timer, touch Confirm icon to save this setting.
- Select Tool icon
- Select HOA setting and change to Auto
- Select Event 1
- Select Repetition, make selection and touch Confirm icon to save setting
    - None (Default)
    - Daily (programmed events occur at same time and same duration once per day)
    - 1 Week (programmed events occur weekly on specified day, time and for same duration)
    - 2 Week (programmed events occur every other week on specified day, time and for same duration)
    - 4 Week (programmed event occurs once every four weeks on specified day, time and for same duration)

If Daily repetition selected,

- Select Start Time and enter desired time using keypad. Select Confirm icon to save setting.
- Select Duration and enter desired time using keypad. Select Confirm icon to save setting.

If 1, 2 or 4 Week repetition is selected,

- Select Day of Week and Confirm icon to save setting.
- Select Start Time and enter desired time using keypad. Select Confirm icon to save setting.
- Select Duration and enter desired time using keypad. Select Confirm icon to save setting.

Timer may be programmed for up to 10 separate events. Repeat above process for each additional event.

PreBleed

One can choose to bleed cooling water from the system before activating the Timer event. Prebleed is the first step in a timed event. Prebleed may be tied to a conductivity target, or a fixed duration of time.

- Scroll down Timer Menu to Bleed. Scroll down menu and select BLEED (R5). Select Confirm icon to save setting.
- Scroll down Timer Menu to set Prebleed control.

Prebleed to Conductivity Target

The operating conductivity (measured by ECOND (S11) will be lowered to the set point value before powering the Timer relay. When the conductivity is higher than this set point, the blowdown valve opens, lowering system conductivity. Select Prebleed To and enter target conductivity using keypad. Select the Confirm icon to save setting. To disable, set the prebleed conductivity target value to zero.

Prebleed for Fixed Time Duration

When using this feature the bleed valve is opened for the user selected time before powering the Timer relay. Select Prebleed Time and enter the desired duration. Select the Confirm icon to save setting.

Bleed Lockout

This setting determines how long bleed will be locked out after completing a timer event. This value is set in hours and minutes.

To configure Bleed Lockout

- Select Bleed Lockout from Timer(R6) menu.
- Enter desired lockout time and select Confirm icon to save setting.
- Bleed Lockout time is set to zero if lockout is not desired.

Add Last Missed

When Add Last Missed is enabled the last event missed due to controller interlock (e.g. no flow) will occur once the interlock has been relieved.

To enable,

- Scroll down Timer menu and select Add Last Missed. Select Enabled and touch Confirm icon to save setting.
- Interlock Timer (R6) with Flowswitch (D1) to prevent Timer operation during period of system stand-by or lay-up (i.e. no flow).
- Scroll down Timer menu and select Interlock Channels. Select Digital Input D1 and touch Confirm icon to save this setting.

Alarm (R6)

To program settings for Alarm (R6) Relay

- Select the Main Menu icon from the Home Screen
- Select Outputs icon
- Scroll down Outputs menu to Alarm(R6)
- Select the Tool icon
- From the Tool menu select Alarm Mode. The alarm mode allows the user to select the conditions to place relay (R6) into an alarm state. The user can select either All Alarms (all inputs or outputs) or Select Alarms (user selected inputs or outputs).
- Once Alarm Mode is chosen, scroll down the Alarm menu to Select Alarms. A list of inputs and outputs are displayed. Scroll through the list and select a parameter of interest. Touch each alarm to check the box indicating the alarm is selected. Touch the confirm icon to save the changes. Repeat the process for each desired input and output.
- From the Alarm menu select Output. The output menu allows the user to select if the relay will be active when in the alarm state (i.e., Normally Open) or if the relay will be active when not in the alarm state (i.e., Normally Closed).
- The Alarm menu also allows the user to define Hand Time Limit, Minimum Relay Cycle time and Name. If desired scroll down the Alarm menu to find and customize these attributes.

These settings will be part of the local user configuration file for this controller. It is recommended that the user save a copy of the configuration file and store it in a safe place in the event custom settings are inadvertently lost or changed.

6.0 MAINTENANCE

The controller itself requires very little maintenance. Wipe with a damp cloth. Do not spray down the controller unless the enclosure door is closed and latched.

6.1 Sensor Cleaning

NOTE: The controller must be recalibrated after cleaning the sensor.

Frequency

The sensor should be cleaned periodically. The frequency required will vary by installation. In a new installation, it is recommended that the sensor be cleaned after two weeks of service. To determine how often the sensor must be cleaned, follow the procedure below.

1. Read and record the conductivity.
2. Remove, clean, and replace the conductivity sensor.
3. Read conductivity and compare with the reading in step 1 above.

If the variance in readings is greater than the accuracy you require, increase the frequency of sensor cleaning. If it is less than the accuracy you require, the sensor was not dirty and can be cleaned less often.

Cleaning Procedure

An accumulation of dirt, debris or scale on the sensor can affect the accuracy and the thermal time constant. This accumulation should be removed periodically. This can be accomplished by scrubbing with a toothbrush or stiff bottlebrush. Soap or hand cleaner may help. A mild acid solution will remove scale. Harsh abrasives should be avoided. Rinse the sensor thoroughly before returning to service.

6.2 Replacing the Fuse Protecting Powered Relays

CAUTION: Disconnect power to the controller before opening front panel!

The fuse on the circuit board is located at the back of the controller enclosure under the plastic safety cover. Gently remove the old fuse from its retaining clip and discard. Press the new fuse into the clip, secure the front panel of the controller and return power to the unit.

Warning: Use of non-approved fuses can affect product safety. Use 5 x 20 mm, 6A 250V fuses only.

7.0 TROUBLESHOOTING

CAUTION: Disconnect power to the controller before opening front panel!

Troubleshooting and repair of a malfunctioning controller should only be attempted by qualified personnel using caution to ensure safety and limit unnecessary further damage. Contact the factory.

7.1 Alarm Messages

HIGH or HIGH-HIGH ALARM Occurs if the sensor reading rises above the high alarm set points. If the unit is programmed for an alarm relay output, the alarm relay will activate. The controller will continue to check the sensor reading and any outputs using the sensor will remain active.	
Possible Cause	**Correction Action**
Dirty probe	Clean probe (see Sect. 6.1)
Faulty bleed valve	Repair or replace bleed valve.
Faulty sensor	Replace sensor.
Improper wiring of valve or controller	Correct wiring. See Section 3.4.
Conductivity rose over alarm limit while Timer lockout occurred.	Allow normal bleed to occur.
Faulty bleed relay	Replace relay. (Consult factory.)
Control output has been left in "Hand" mode	Switch back to "Auto"
Bleed relay has been left in "Off" mode.	Switch back to "Auto"
LOW or LOW-LOW ALARM Occurs if the sensor reading drops below the low alarm set points. If the unit is programmed for an alarm relay output, the alarm relay will activate. The controller will continue to check the sensor reading and any outputs using the sensor will remain active.	
Possible Cause	**Corrective Action**
Sensor disconnected	Check connections, reconnect as needed.
Sensor dry	Check tee for obstruction. Verify flow. Change location of sensor tee.
Pre-bleed set too low	Check pre-bleed setting compared to % low.
Bleed valve stuck open	Repair or replace Bleed valve. (Consult your Evapco Rep).
Faulty sensor	Replace sensor.
Improper wiring of probe	Correct wiring. See Section 3.4.
Bleed relay has been left in "Hand" mode	Switch back to "Auto"
NO FLOW Occurs if the flow switch is opened. A message will be displayed. If the unit is programmed for an alarm relay output, the alarm relay will activate. The conductivity is updated but all interlocked outputs are deactivated.	
Possible Cause	**Corrective action**
No Flow - Normal condition if condenser pumps not operating	Check controller when pumps are operating
Faulty flow switch/cable (if using flow switch)	Check for open circuit. Disconnect flow switch and short the input with piece of wire.
Insufficient pressure drop through sample stream (if using flow switch)	Check piping. Check for clog in sample line.
Faulty contact on condenser pump starter (if using a secondary contact on condenser pump to monitor flow).	Disconnect flow switch and short the input with a piece of wire. If "no flow" message disappears, then contact or cable may be faulty.
Pulse~Pure X1 control contact not closed or RS-485 comm. problem	Consult Pulse~Pure IOM Troubleshooting section

TEMP ERROR This error condition will stop conductivity control. It indicates that the temperature signal from the conductivity sensor is no longer valid. This prevents controlling based upon a false conductivity reading.	
Possible Cause	**Corrective Action**
Improper wiring of sensor to controller.	Correct wiring
Temperature input is set to the incorrect element	Reprogram to RTD 1000 Ohm Element
Faulty sensor.	Replace sensor.
SENSOR FAULT This error condition will stop conductivity control. It indicates that the conductivity signal from the sensor is no longer valid. This prevents controlling based upon a false conductivity reading.	
Possible Cause	**Corrective Action**
Sensor wire disconnected.	Reconnect
Sensor wires shorted	Check and disconnect short
Faulty sensor.	Replace sensor.
Faulty controller.	Replace or repair controller (Contact factory)
BATTERY POWER LOW This alarm indicates that the battery which holds the date and time in memory is below 2.4 VDC	
Possible Cause	**Corrective Action**
Faulty Battery	Replace Battery
CONTROLLER, POWER, SENSOR or DISPLAY BOARD VARIANT This alarm occurs if the type of board detected is not valid.	
Possible Cause	**Corrective Action**
Poor ribbon cable connection	Reseat ribbon cable
Faulty ribbon cable	Replace ribbon cable
Faulty board	Replace board listed in the error message
Incompatible software version	Install correct software version (Contact factory)
CONDUCTIVITY READOUT DOES NOT CHANGE	
Possible Cause	**Corrective Action**
Readout is stuck at or near zero: Dry Sensor Sensor is disconnected	 Check for water flow through sample loop Check sensor wiring
Readout is stuck at another number: Dirty sensor Stagnant sample Faulty sensor	 Clean sensor (Refer to Section 6.1) Check system for proper flow Replace sensor

7.2 Procedure for Evaluation of Conductivity Sensor

Try cleaning the sensor first (refer to Section 6.1). Check the sensor connections to the terminal strip. Make sure that the correct colors go to the correct terminals, the connections are tight and that the connectors are pinching on exposed wire lead, not insulation. Restore power and check to see if the conductivity is back to normal. If not, replace the sensor.