Operation & Maintenance Instructions

FOR SAGE WATER & ENERGY CONSERVATION CONTROL SYSTEM



For EVAPCO Authorized Parts and Service, Contact Your Local EVAPCO Representative

EVAPCO, Inc. – World Headquarters & Research/Development Center

EVAPCO, Inc. • P.O. Box 1300 • Westminster, MD 21158 USA
PHONE: (410) 756-2600 • FAX: (410) 756-6450 • E-MAIL: SageSupport@evapco.com

EVAPCO North America

EVAPCO, Inc.
World Headquarters
PO Box 1300
Westminster, MD 21158, USA
Phone: (410) 756-2600
Fax: (410) 756-6450
Email: marketing@evapco.com

EVAPCO East
5151 Allendale Lane
Taneytown, MD 21787, USA
Phone: (410) 756-2600
Fax: (410) 756-6450
Email: marketing@evapco.com

EVAPCO Midwest
1723 York Road
Greenup, IL 62428, USA
Phone: (217) 923-3431
Fax: (217) 923-3300
Email: evapcomw@evapcomw.com

EVAPCO West
1900 West Almond Avenue
Madera, CA 93637, USA
Phone: (559) 673-2207
Fax: (559) 673-2378
Email: contact@evapcowest.com

EVAPCO Iowa
925 Quality Drive
Lake View, IA 51450, USA
Phone: (712) 657-3223
Fax: (712) 657-3226

EVAPCO Iowa
Sales & Engineering
215 1st Street, NE
Medford, MN 55049, USA
Phone: (507) 446-8005
Fax: (507) 446-8239
Email: evapcomn@evapcomn.com

EVAPCO Northwest
5775 S.W. Jean Road, Suite 210
Lake Oswego, OR 97035, USA
Phone: (503) 639-2137
Fax: (503) 639-1800

EVAPCO Newton
701 East Jourdan Street
Newton, IL 62448, USA
Phone: (618) 783-3433
Fax: (618) 783-3499
Email: evapcomw@evapcomw.com

Refrigeration Valves & Systems Corporation (RVS)
A wholly owned subsidiary of EVAPCO, Inc.
1520 Crosswind Drive
Bryan, TX 77808, USA
Phone: (979) 778-0095
Fax: (979) 778-0030
Email: rvs@rvscorp.com

EvapTech, Inc.
A wholly owned subsidiary of EVAPCO, Inc.
8331 Nieman Road
Lenexa, KS 66214, USA
Phone: (913) 322-5165
Fax: (913) 322-5166
Email: marketing@evaptech.com

Tower Components, Inc.
A wholly owned subsidiary of EVAPCO, Inc.
5960 US Highway 64 East
Ramseur, NC 27316, USA
Phone: (336) 824 2102
Fax: (336) 824-2190
Email: mail@towercomponentsinc.com

EVAPCO-BLCT Dry Cooling, Inc.
1011 US Highway 22 West
Bridgewater, NJ 08807, USA
Phone: (908) 379-2665
E-mail: info@evapco-blct.com

EVAPCO South America

EVAPCO SEMCO
Equipamentos de Refrigeracao Ltda.
Rua Alexandre Dumas, 1601 – 2 andar
04717-004 Sao Paulo – SP – Brazil
Phone: (55) 11-5184-0067

EVAPCO Europe

EVAPCO Europe BVBA
European Headquarters
Industrieterrein Oost 4010
3700 Tongeren, Belgium
Phone: (32) 12-395029
Fax: (32) 12-238527
Email: evapco.europe@evapco.be

EVAPCO Europe, S.r.l.
Via Ciro Menotti 10
I-20017 Passirana di Rho
Milan, Italy
Phone: (39) 02-939-9041
Fax: (39) 02-935-00840
Email: evapcoeurope@evapco.it

EVAPCO Europe, S.r.l.
Via Dosso 2
23020 Piateda Sondrio, Italy

EVAPCO Europe, GmbH
Meerbuscher Straβe 64-78
Haus 5
40670 Meerbusch, Germany
Phone: (49) 2159-69560
Fax: (49) 2159-695611
Email: info@evapco.de

Flex coil a/s
A subsidiary of EVAPCO, Inc.
Knøsgårdvej 115
DK-9440 Aabybro Denmark
Phone: (45) 9824 4999
Fax: (45) 9824 4990
Email: info@flexcoil.dk

EVAPCO S.A. (Pty.) Ltd.
A licensed manufacturer of EVAPCO, Inc.
18 Quality Road
Isando 1600
Republic of South Africa
Phone: (27) 11-392-6630
Fax: (27) 11-392-6615
Email: evapco@icon.co.za

EVAPCO Egypt Engineering Industries Co.
A licensed manufacturer of EVAPCO, Inc.
5 Al Nasr Road St.
Nasr City, Cairo, Egypt
Phone A: (20) 2-290-7483
Phone B: (20) 2-291-3610
Fax A: (20) 2-404-4667
Fax B: (20) 2-290-0892
Email: Primacool@link.net / Shady@primacool.net

EVAPCO Asia/Pacific

EVAPCO Asia/Pacific Headquarters
1159 Luoning Road
Baoshan Industrial Zone
Shanghai, 200949 P.R. China
Phone: (86) 21-6687-7786
Fax: (86) 21-6687-7008
Email: marketing@evapcochina.com

Evapco (Shanghai) Refrigeration Equipment Co., Ltd.
1159 Luoning Road
Baoshan Industrial Zone
Shanghai, 200949 P.R. China
Phone: (86) 21-6687-7786
Fax: (86) 21-6687-7008
Email: marketing@evapcochina.com

Beijing EVAPCO Refrigeration Equipment Co., Ltd.
Yan Qi Industrial District, Huai Rou
Beijing, 101407 P.R. China
Phone: (86) 10 6166-7238
Fax: (86) 10 6166-7395
Email: evapcobj@evapcochina.com

Evapco Australia Pty Ltd
34-42 Melbourne Road
Riverstone, NSW Australia 2765
Phone: (61) 2 9627-3322
Fax: (61) 2 9627-1715
Email: sales@evapco.com.au

Evapco Composites Sdn. Bhd
No. 70 (Lot 1289) Jalan Industri 2/3
Rawang Integrated Industrial Park
Rawang. Selangor, 48000 Malaysia
Phone: (60) 3 6092-2209
Fax: (60) 3 6092-2210

EvapTech Asia Pacific Sdn. Bhd
A wholly owned subsidiary of EvapTech, Inc.
IOI Business Park, 2/F Unit 21
Persiaran Puchong Jaya Selatan
Bandar Puchong Jaya,
47170 Puchong, Selangor, Malaysia
Phone: (60-3) 8070-7255
Fax: (60-3) 8070-5731
Email: marketing-ap@evaptech.com

Table of Contents

Introduction 3
Sage Water and Energy Conservation Control System 3
Installation and Wiring 4
Safety 4
Panel Installation Considerations 4
Temperature Sensor Installation 4
Wiring Considerations 5
Operation and Servicing 5
Operator Interface Screens 7
Welcome Screen 7
Sage Faceplate 8
Sage Home Screen 9
Main Menu Screen 11
Cell End View Screen 11
Login Button 13
Logout Button 14
Digital Status Screen 15
Analog Input Status Screen 16
Alarm Setup Screen 18
Alarm Display Screen 19
Bump Test Screen 22
Setup Options Screen 23
Control Setpoints Screen 25
Motor Runtimes Screen 26
Unit Operation Screen 26
Set Time and Backup Screen 28
Priority Selection Screen 30
BMS & Network Screen 31
Advanced Unit Setup Screen 32
Digital Output Test Screen 34
Terminology 35
Troubleshooting 36
Sage Troubleshooting 36

Alarm Event Description 40

Introduction

Sage Water and Energy Conservation Control System

Congratulations on the purchase of your fluid cooler unit with the Sage Water and Energy Conservation Control System. The Sage Control System will ensure that your fluid cooler unit is operating in the most efficient manner possible while using minimal resources. Along with proper fluid cooler unit maintenance, the Sage Control System will ensure that your fluid cooler unit provides years of service at peak efficiency.

The Sage Control System serves as a primary connection point for the fluid cooler unit and contains all the protection and logic devices required to run the fluid cooler unit in the most efficient manner possible.

To reduce downtime, Evapco recommends keeping a stock of spare fuses, filter fans with filters, contactors, MMPs and circuit breakers. For spare fuses, consult the wiring diagram for the quantity, type, and fuse size required. Contact your local Evapco representative for replacement or spare parts.

This bulletin includes a description of the screens and parameters that are available through the Human Machine Interface (HMI) located on the front of the Sage Control System. Also included in this bulletin are the functions of the Sage Control System, common terminology, and a troubleshooting guide. Please note that the screens displayed on your Sage Control System HMI may vary slightly from the images shown in this document.

Become familiar with the Sage Control System by thoroughly reading and understanding the content of this bulletin. A detailed wiring diagram and a Sensor Placement Drawing can be found in the data pocket inside of the Sage Control System.

If you should require any additional information about the operation or maintenance of this equipment, contact the Evapco Marketing Department via email at SageSupport@evapco.com or via phone at (410) 756-2600 Monday through Friday from 8 a.m. to 5 p.m. EST.

Installation and Wiring

Safety

Qualified personnel should use proper care, procedures, and tools when operating, maintaining, or repairing this equipment or any other connected equipment to prevent personal injury and/or property damage. The warnings listed below are to be used as guidelines only.

Warning: Evapco fluid cooler units should never be operated without fan screens and access doors should be properly secured and in place.

Warning: Avoid working on electrical circuits while they are live. Proper lock-out/tag-out and all applicable safety practices must be followed prior to servicing any equipment.

Warning: Before opening the panel door, allow sufficient time for VFD's to discharge after removing power. VFD's contain capacitive circuits which maintain a charge even after power is removed.

Warning: The three-position selector switch is not intended to replace or act as a disconnect to disable the fluid cooler unit and/or de-energize the Sage Control System. Be sure to follow lock-out/tag-out and all applicable electrical safety practices before servicing any equipment.

Warning: Do not attempt to service or enter the fluid cooler unit even if the fluid cooler unit status is indicated as being off. Unless power is completely removed from the fluid cooler unit, it may be possible for the fluid cooler unit to start at any time without notice. Be sure to follow lock-out/tag-out and all applicable electrical safety practices before servicing any equipment.

A laptop computer is the only device that may be powered by the electrical outlet located on the Sage Control System. All other electrical devices must not be plugged into the Sage Control System.

The following safety issues need to be addressed by those responsible for the installation, maintenance, and repair of the Sage Control System:

- Access to the control panel (including the disconnect switch).
- Sizing and protection of electrical circuits feeding the control panel(s) and branch circuits feeding the controlled equipment.
- Proper grounding of electrical circuits.
- Qualification of persons who will install, maintain, and service the electrical equipment.

Panel Installation Considerations

Placement of the Sage Control System should be in close proximity to the fluid cooler unit to reduce the wire lengths required. If the Sage Control System is within sight of the fluid cooler unit, the Sage Control System may be used as the main electrical disconnect for the basin heater(s), fan motor(s), and spray pump motor(s) for the fluid cooler unit. Otherwise, separate individual electrical disconnects may be required. Consult applicable electrical codes to make this determination. Do not mount the Sage Control System with a southern exposure. This will minimize the amount of solar heat gain the system will experience and will make it easier to view the operator interface.

Temperature Sensor Installation

Fluid cooler units are supplied with thermowells and RTD temperature sensors. Consult the Sensor Placement Drawing for detailed location information. The thermowells must be installed in the **horizontal sections of the coil piping**. For the most accurate temperature readings, the RTD should be installed a minimum of five pipe diameters downstream from an elbow or flow obstruction.

There is one Return Fluid Temperature sensor per cell that must be installed on the inlet coil piping.

There is one Supply Fluid Temperature sensor per cell that must be installed on the outlet coil piping.

For multi-cell or multi-unit installations, the number and placement of sensors may vary based on the control sequence. Please consult Evapco about these situations.

A coupling is located in the basin of the fluid cooler unit for installation of the basin temperature thermowell and sensor. One temperature sensor is provided per basin.

Each Sage Control System is supplied with one ambient air sensor. Placement of the air sensor must be indicative of the air entering the fluid cooler unit and out of direct sunlight.

Wiring Considerations

Consult the supplied wiring diagram for detailed wiring information. All field wiring is indicated by dashed lines on the wiring diagram.

All wiring in and out of the Sage Control System should be with copper conductors and **wire lengths must be kept as short as possible**. Consult the detailed wiring diagram for field wiring connections of each device. Applicable electrical codes for the location should be followed during the sizing and installation of the field wiring. **All wiring must be through the bottom of the Sage Control System. Top entry into the Sage Control System is not permitted. Any damage caused to any component within or connected to the Sage Control System due to a top entry connection is not warrantable!**

For wiring the Sage Control System to each fan motor, Belden® VFD cable 295XX (XX denotes gauge) or equivalent should be used. The shield for the VFD cable needs to be bonded to ground at both ends of the cable. Consult the user cover page of the wiring diagram to determine the maximum motor lead length.

For temperature sensor wiring into the Sage Control System, Belden® 8760 or equivalent should be used. The shield for the signal wire is only to be grounded in the panel, not at the sensor. Please consult the factory if temperature sensors will be placed in an area where high frequency radio signals may be present (cell phone antennas, television antennas, etc.). High frequency radio can cause unwanted interference with standard Sage Control System temperature sensors.

While the Sage Control System does provide provisions for connection to a BAS system, this connection is not required for the Sage Control System to operate.

Operation and Servicing

On the door of the Sage Control System there is a three position selector switch (Bypass-Off-Auto). The operation of each position is as follows:

Auto: The Auto position allows the Sage Control System to operate the unit based on the logic programmed into the controller. Note that the Standby Status must be set to Enabled before the cooling equipment begins to operate. Please see the **Setup Options Screen** section of this document for more information.

Off: In the Off position, the Sage Control System will be powered; however, output commands will not be sent to any of the attached equipment. This position is used for programming setpoints without action from the controller.

Bypass: In the Bypass position, the logic program is bypassed which allows the fan motor(s) and spray pump(s) to energize independent of sensor temperature or setpoints. Power is routed around the VFD(s) and thus the fan motor(s) will operate at full power.

When switching operation from Bypass to Auto there is a 30 second delay before the contactor of the VFD will energize. To notify the user that the delay is in effect the message Auto Switch Delay Enabled will be displayed on the home screen until the delay has ended (Figure 1).

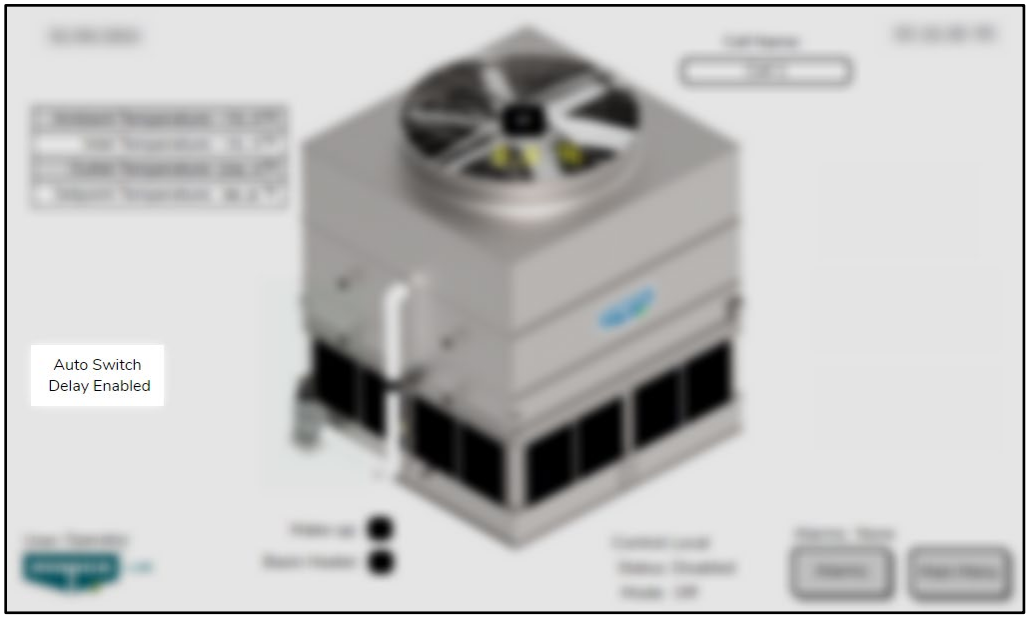


Figure 1: "Auto Switch Delay Enabled" Message.

The Sage Control System has several preprogrammed functions that automatically execute while the main selector switch is in the Auto position, the Standby Status is set to Enabled, and the fluid cooler unit is placed in Automatic operation:

> Cycle Pump: If a spray pump has been inactive for 24 consecutive hours, the spray pump will energize for a brief period. This routine is to help circulate water treatment through the fluid cooler unit. An indication of this routine may be found on the **Sage Home Screen**.
>
> Water Make-Up Disable: The water make-up may be disabled during winter operation or when the basin must be drained for maintenance (see **Setup Options Screen**). Disabling the water make-up will prevent the water make-up solenoid valve from filling the basin and will also disable the low water alarm. When the water make-up is re-enabled, the basin water level will fill until the high water alarm is reached. Until the high water alarm is activated, the spray pump(s) will not energize.

The door protecting the HMI must be shut unless an operator is using the HMI interface. This will protect the HMI interface from contamination and increase the life of the touchscreen.

The Sage Control System is supplied with air filters that must be inspected monthly for cleanliness. Filters must be replaced when they appear dirty or at least every 4 months. It is recommended that filters be replaced prior to peak ambient conditions to ensure the highest level of cooling. Depending on the installation environment, more frequent inspection and/or replacement may be required. A dirty filter can cause the internal panel temperature to increase and may cause component failure. Permanently removing the filter will allow dirt and particulates to enter the enclosure and may cause premature failure.

Please consult the proper Operation and Maintenance Instructions for start-up and maintenance guides for the fluid cooler unit attached to the Sage Control System.

Operator Interface Screens

Welcome Screen

When the Sage Control System is first energized, the system will do a self-diagnostic test and load the interface screens. The **Welcome Screen** (Figure 2) appears while the Sage Control System is in its startup state. After the Sage Control System has started up, the **Sage Home Screen** (Figure 3) will be displayed. If there is no interaction with the HMI within fifteen minutes, the **Welcome Screen** will reappear. Touching the HMI will return the screen to the **Main Home Screen**.



Figure 2: The Sage Welcome Screen.

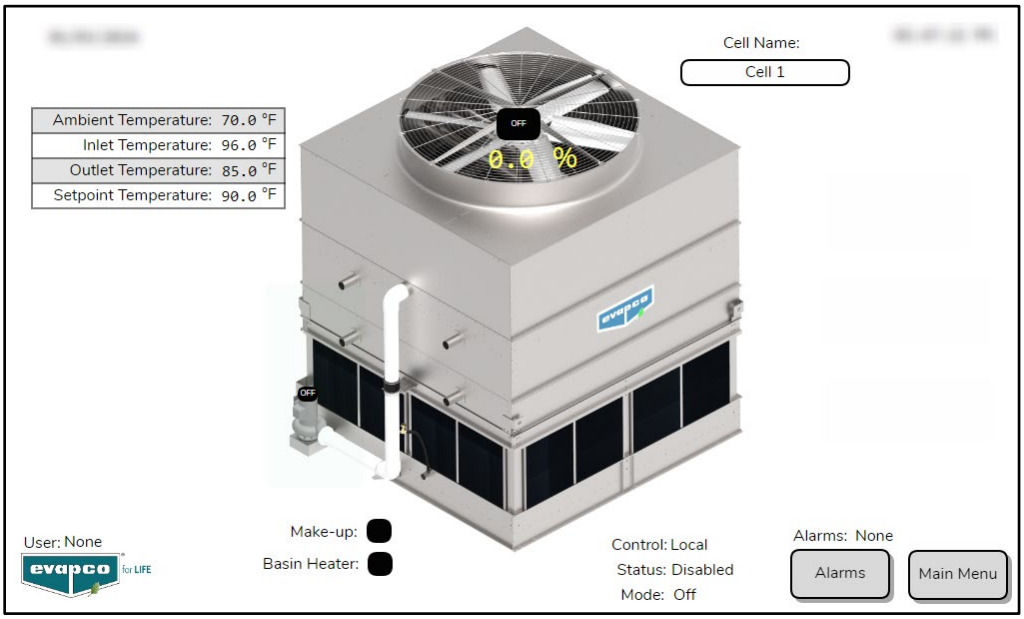


Figure 3: The Sage Home Screen.

Sage Faceplate

Located at the bottom of most screens is the **Sage Faceplate** (Figure 4). The left side of the faceplate shows the current logged in user as well as the on/off status of all pumps and fans. The Control parameter indicates if the Sage Control System is set to receive commands locally or from a BAS. The Control Modes include:

Local: The Sage Control System is set to Local via the **Setup Options Screen** and the Control Temperature Setpoint is set at the Sage Control System via the **Control Setpoints Screen**. Also, the Sage Control System is enabled or disabled (i.e. Standby Status) at the Sage Control System via the **Setup Options Screen**.

Remote-BAS: The Sage Control System is manually set to Remote at the Sage Control System via the **Setup Options Screen**. Wires must be landed at the appropriate BAS protocol terminal per the supplied wiring diagram. The Control Temperature Setpoint and the status of the system (enable or disable) is provided by the BAS. No other wire connections are required to run the Sage Control System in this Control mode.

Remote: The Sage Control System is manually set to Remote at the Sage Control System via the **Setup Options Screen**. Wires must be landed at the appropriate wire terminals per the supplied wiring diagram. A digital BAS Enable signal (i.e. a dry contact closure) and a digital BAS Start/Stop must be sent to the Sage Control System to enable or disable the Sage Control Sequence. Also, a 4-20 mA analog signal must be provided to the Sage Control System to set the desired Control Temperature setpoint. If no 4-20 mA analog signal is detected, the Sage Control System will default the Control Temperature setpoint to the last accepted value.

Note: It is possible to send enable, start/stop, and Control Temperature setpoint commands to the Sage Control System via a hardwire connection (see Remote) while monitoring other Sage Control System parameters via the BAS signal. However, temperature alarm setpoints will be set via the BAS signal.

The Status parameter indicates if the Sage Control System is enabled or disabled. Please see the Standby Status Description in the **Setup Options Screen** section of this document for more information.

The Mode parameter indicates which cooling mode the fluid cooler unit is in when the Sage Control System is set for Auto operation. Manual is shown as the active mode when in Manual operation.

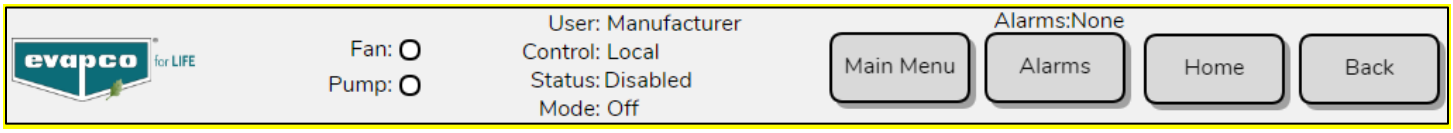


Figure 4: The Sage Faceplate located at the bottom of most screens.

There are also four navigation buttons located on the right side of the **Sage Faceplate**. Selecting the Alarm button will show the **Alarm Display Screen**. Selecting the Main Menu will take the user to the **Main Menu Screen**. Selecting the Home button will take the user to the **Sage Home Screen**, and selecting the back button will take the user to the previous screen.

Sage Home Screen

The **Sage Home Screen** displays an overview of the current operation of the fluid cooler unit. The Ambient Outside air temperature, Average Return (inlet) fluid temperature, Average Supply (outlet) fluid temperature, Active (leaving water) control setpoint, and current VFD speed (in percent) are shown.

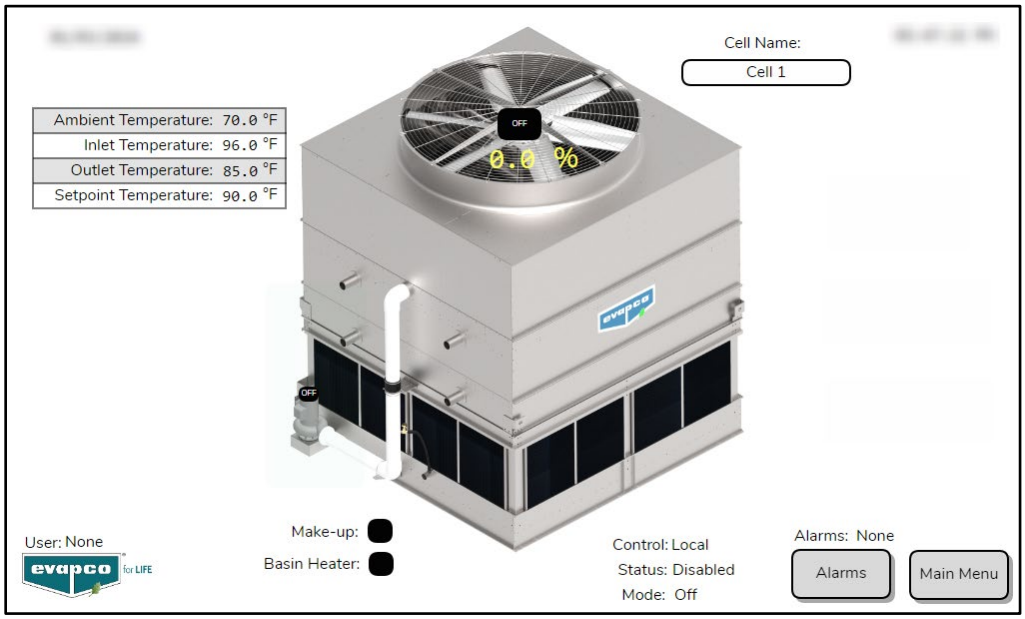


Figure 5: The Sage Home Screen.

The status of the fan motor(s) and spray pump motor(s) can be quickly determined by the HMI. If the device is black, then the device is not energized. If the device is green, the device is energized. Whenever a spray pump is energized, the corresponding riser pipe will turn blue to indicate spray water flowing over the coil (see Figure 6). Also, whenever a fan motor(s) is energized, the VFD speed is shown on the **Sage Home Screen** (see Figure 6). For multi-cell Sage Control Systems, each cell will be displayed on the home screen and be labeled as lag/lead.

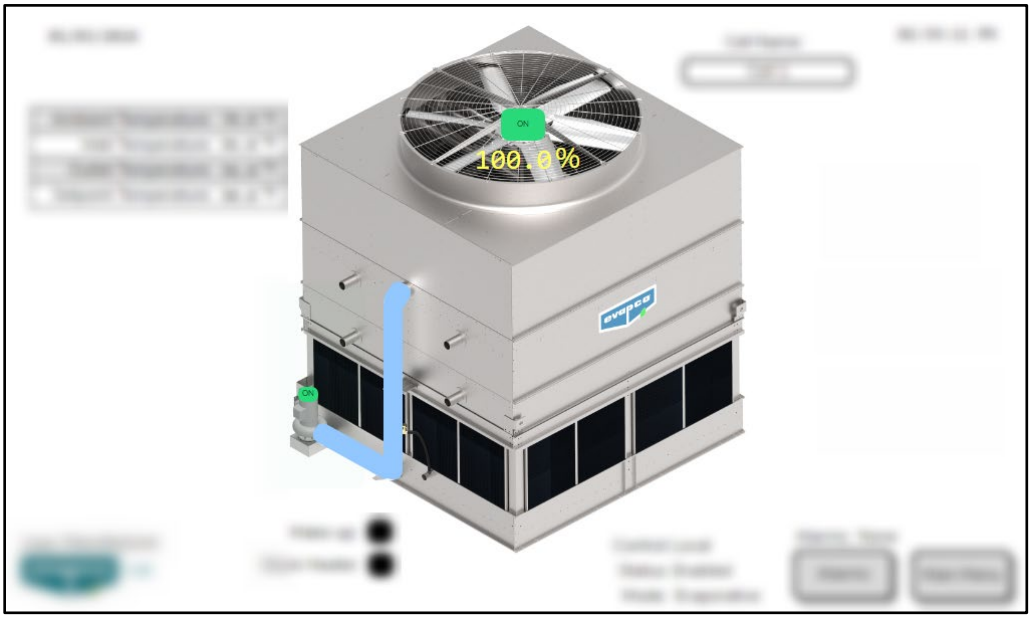


Figure 6: The status of the fan(s) and pump(s) is shown on the Sage Home Screen.

During initial startup, Evapco recommends naming each cell. This name will be used throughout the program when referencing the respective cell. To input a cell name, touch the text field below the Cell Name label. A data entry screen will open, and the cell name (up to 10 characters) can be entered. Touch the Enter button to register the name. Evapco also recommends that for Sage Control System's with multiple cells that a corresponding label is placed on the other fluid cooler unit to make it easier for users to correlate the Sage Control System. This makes it easier for users to identify each cell in the control system.

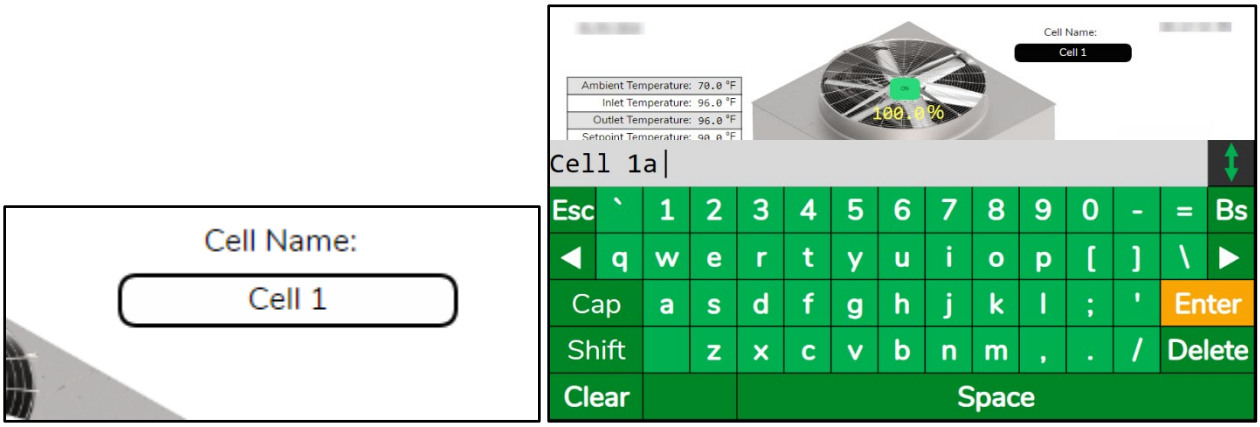


Figure 7: The on screen keyboard used to enter a name for the cell(s).

In addition to basic unit information, the **Sage Home Screen** will display when the fluid cooler unit is running advanced control routines such as Louver De-icing, Cycle Pump, or performing a Hot Start. Additional information including how much time is left before the routine will finish and when a new cycle will start will be shown (see Figure 8).

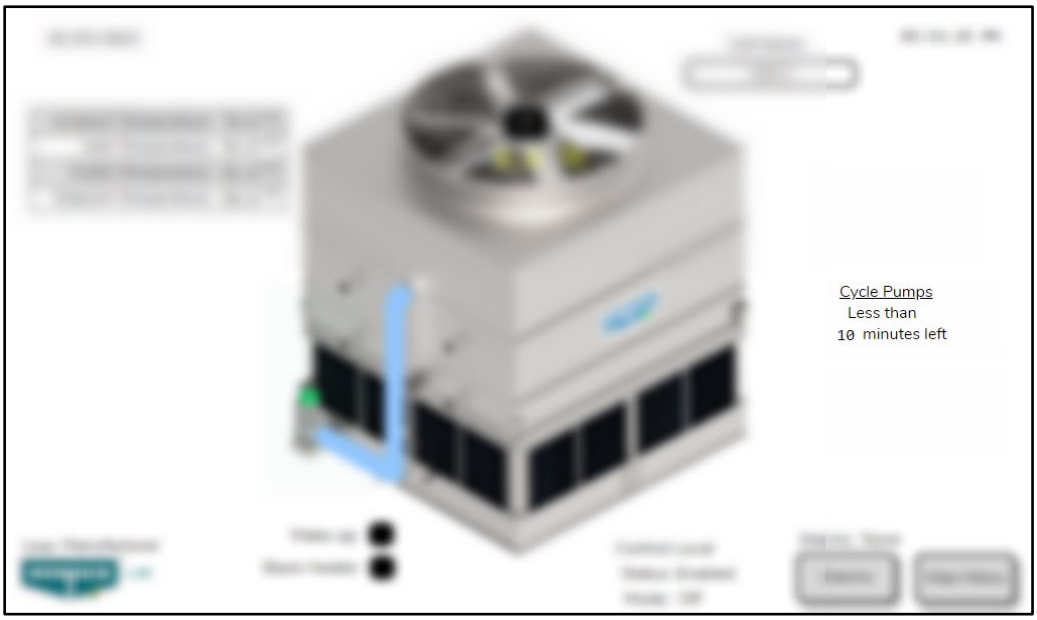


Figure 8: The time remaining in the Cycle Pumps sequence is displayed.

Main Menu Screen

The **Main Menu Screen** is available by touching the **Main Menu** button on the **Sage Faceplate**. The **Main Menu Screen** is used to navigate to additional screens that allow users to modify the current operation of the system or to view additional monitoring information.

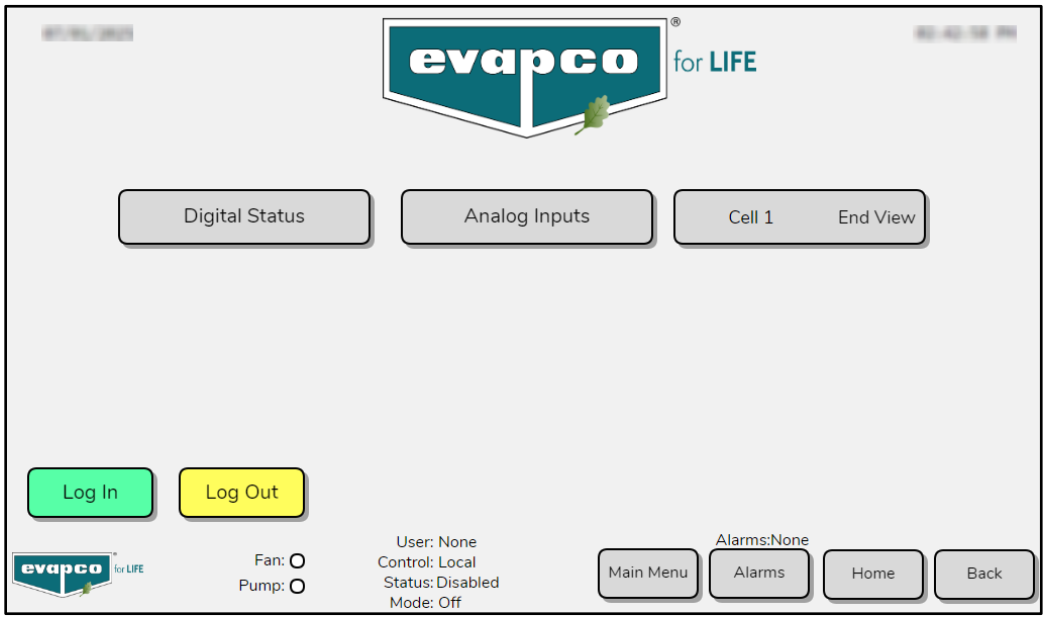


Figure 9: The Main Menu Screen.

Cell End View Screen

To view information for a specific cell, touch the individual cell on the **Sage Home Screen**. This will open the **Cell End View Screen**. Navigation to this screen is also available via the **Main Menu Screen**.

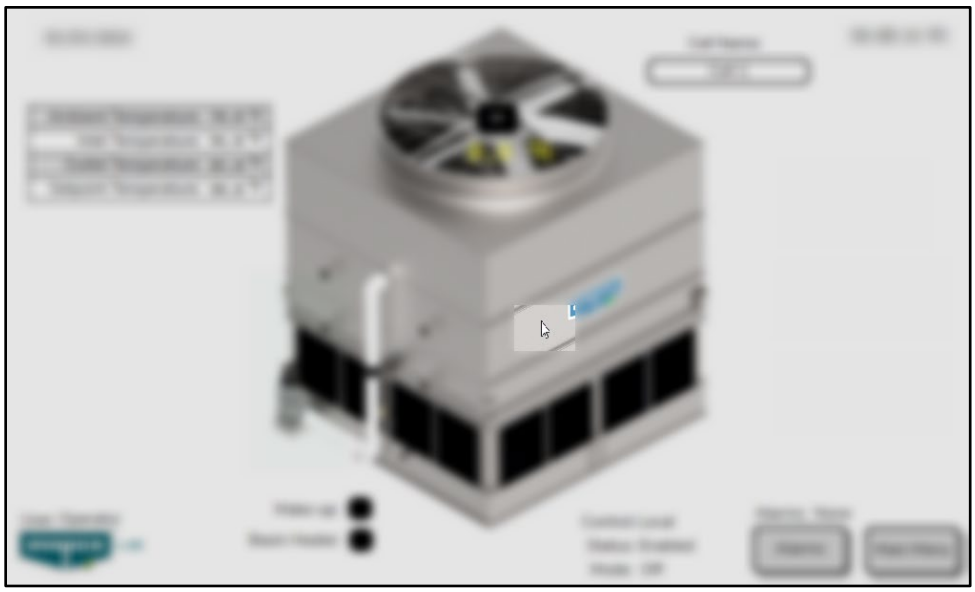


Figure 10: The Main Menu Screen.

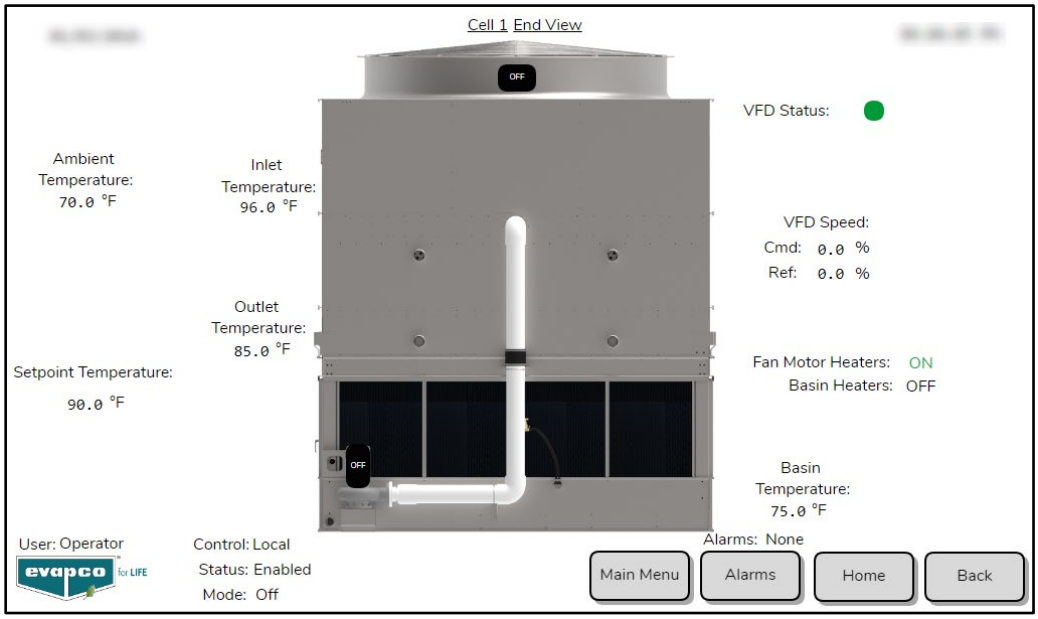


Figure 11: The Cell End View Screen.

The unique name of the cell is shown at the top of the screen to differentiate which cell's information is being displayed. The **Cell End View Screen** displays the Supply (outlet) fluid temperature for the coils, Basin Water temperature, Ambient Air temperature, Return (inlet) fluid temperature, Active (leaving fluid) control setpoint, fan motor status, VFD status, fan motor space heater status and basin heater status.

The VFD status of the selected cell will be displayed on the right side of the screen. Reference the table below to identify what each VFD status represents.

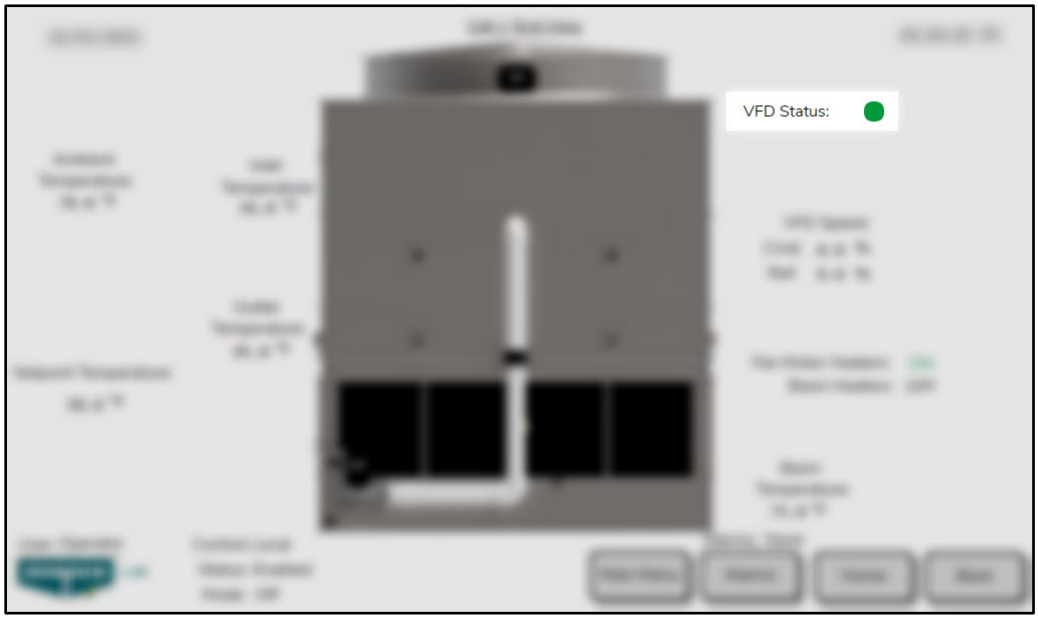


Figure 12: The Cell End View Screen.

Visual	Description
VFD Status: ●	VFD is not energized or is not communicating with the PLC.
VFD Status: ●	VFD is energized and communicating with the PLC.
VFD Status: ● VFD Faulted	VFD has a fault. Refer to the VFD display to identify the fault.

Table 1: VFD Status

Login Button

To prevent unauthorized access, users must login to obtain access to screens in which system performance or settings may be changed. Sage Control System passwords may only be changed onsite by Evapco personnel. The Sage Control System supports both Operator and Service levels of password protection which are detailed below:

Username	Password	Permissions
Operator	3627	Ability to change/reset setpoints, parameters, and alarms.
Service	2357	Ability to change higher level set points such as PID tuning and overall system performance.

Table 2: Login Passwords and Permissions

Pressing the **Login Button** on the **Main Menu Screen** will cause the **Login Screen** to open. Select Operator from the dropdown menu under Username. Select the password text field and input the password on the keypad that opens. Select Enter after inputting password, and then select Log In on the **Login Screen** to complete the login.

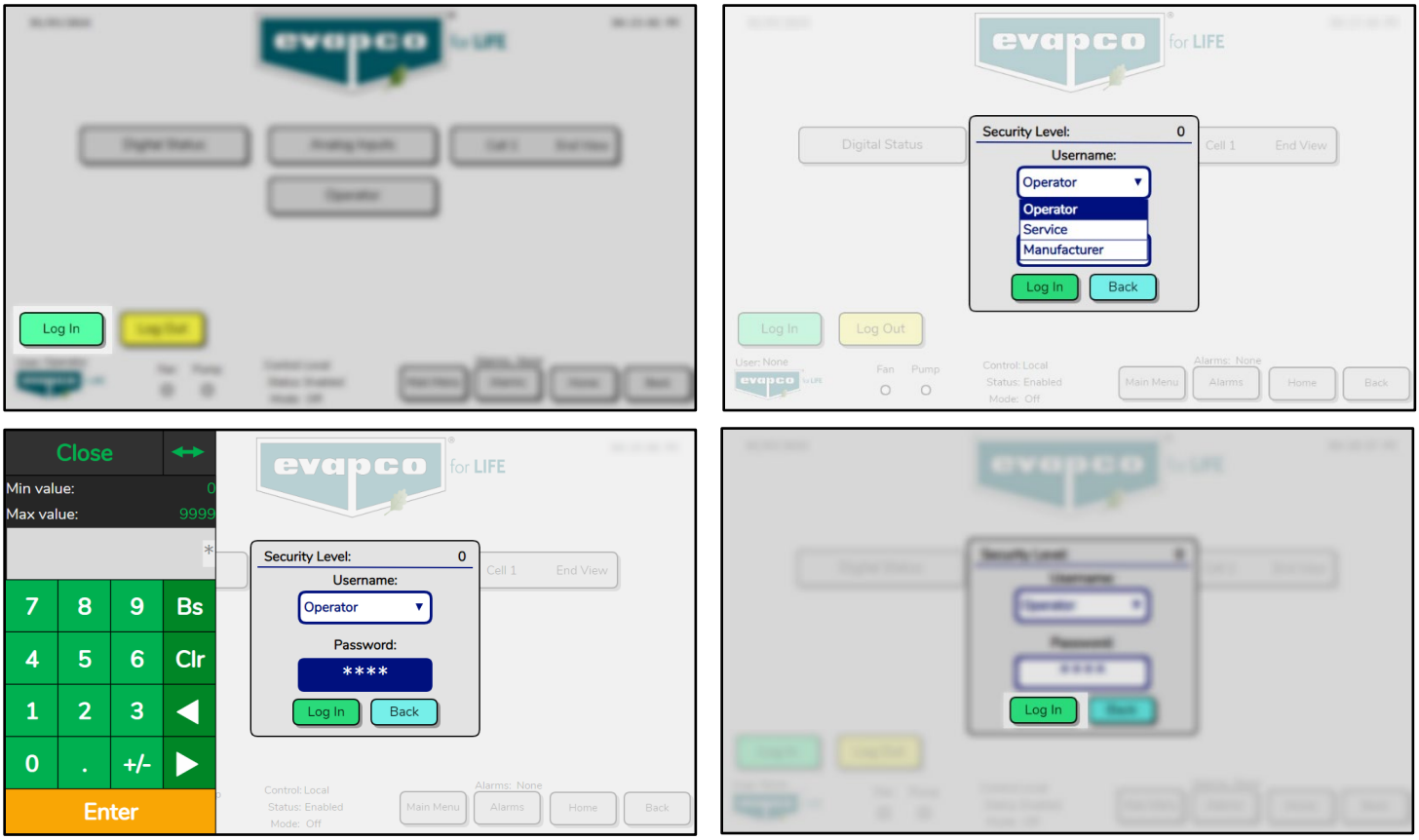


Figure 13: The Login Screen.

The login is now active with the appropriate permissions. If the username or password were not correctly entered, a pop up warning window will appear (see Figure 14).



Figure 14: Invalid Password message displayed due to a failed login or attempt at unauthorized access.

Logout Button

Pressing the **Logout Button** on the **Main Menu Screen** will immediately log the user out of the system. Always logout before leaving the Sage Control System to prevent unauthorized access. The system will automatically log out the user after 10 minutes of inactivity.

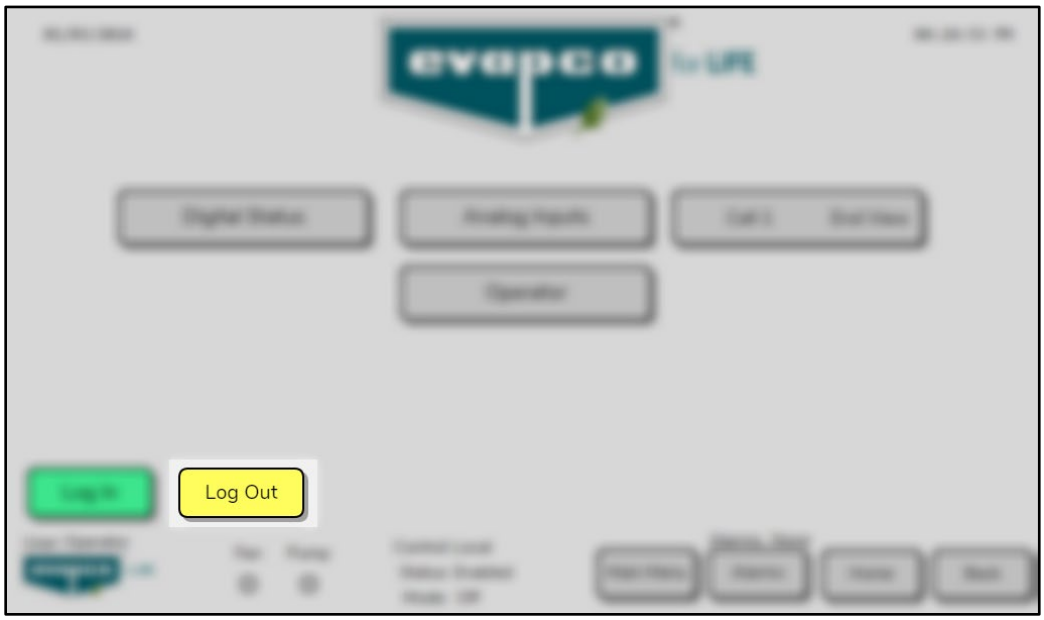


Figure 15: Log Out Button.

Digital Status Screen

The **Digital Status Screen** shows the current state of all digital inputs and/or outputs. A quick overview of the status of all external components connected to the Sage Control System is shown on this screen. **Note: All digital outputs are delayed being energized by 30 seconds after a power cycle.**

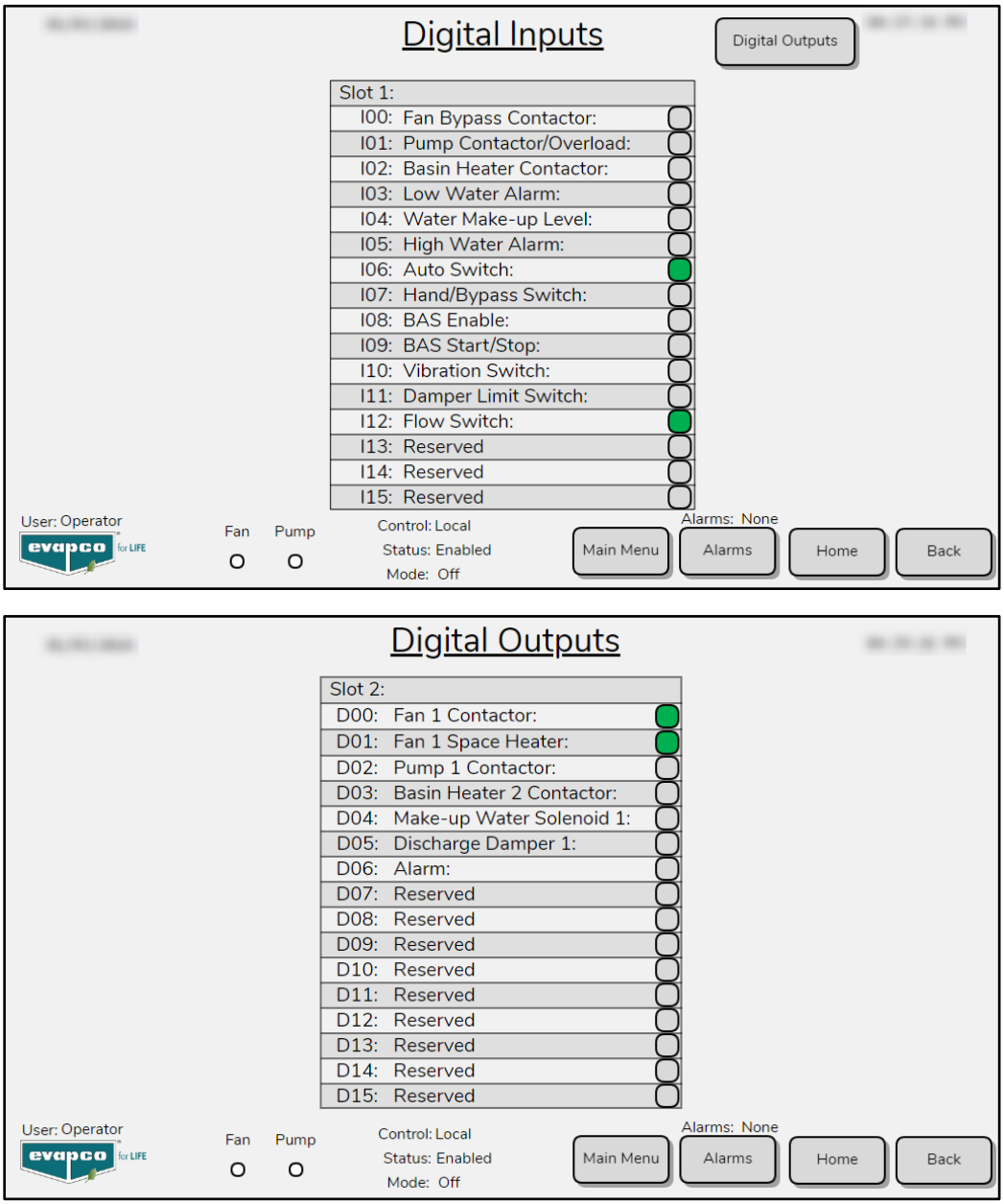


Figure 16: The Digital Status Screens.

Analog Input Status Screen

The **Analog Input Status Screen** shows the current value of all analog inputs. A quick overview of the values of all temperature sensors connected to the Sage Control System is shown on this screen.

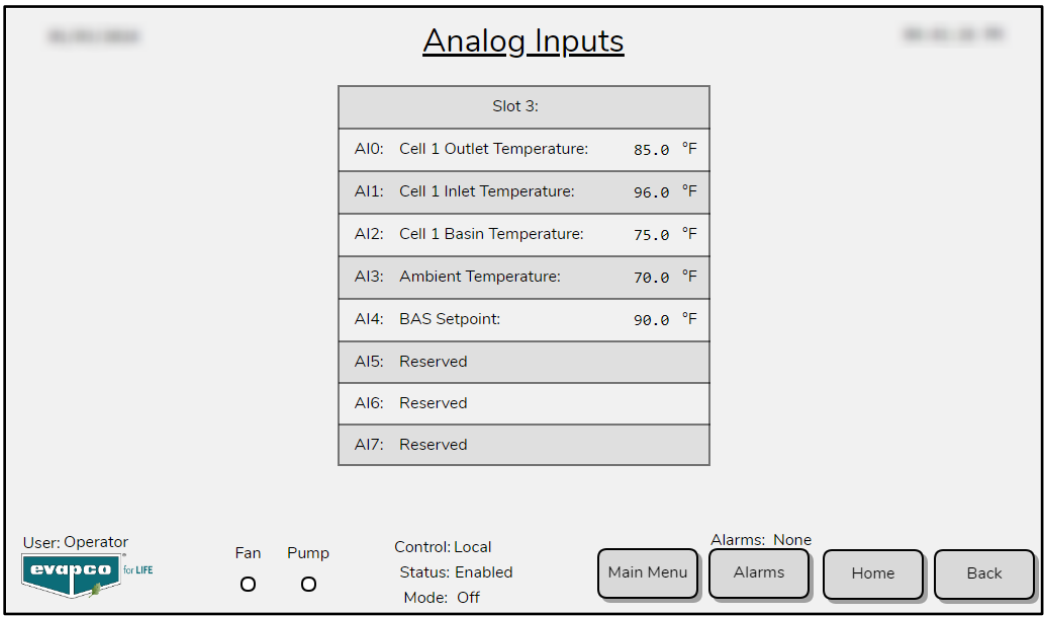


Figure 17: The Analog Input Status Screen.

To perform a sensor calibration the user must be logged in at the service level. Navigate to the **Sensor Calibration Screen** from the **Temperature Offset Screen** in the **Operator Menu.**

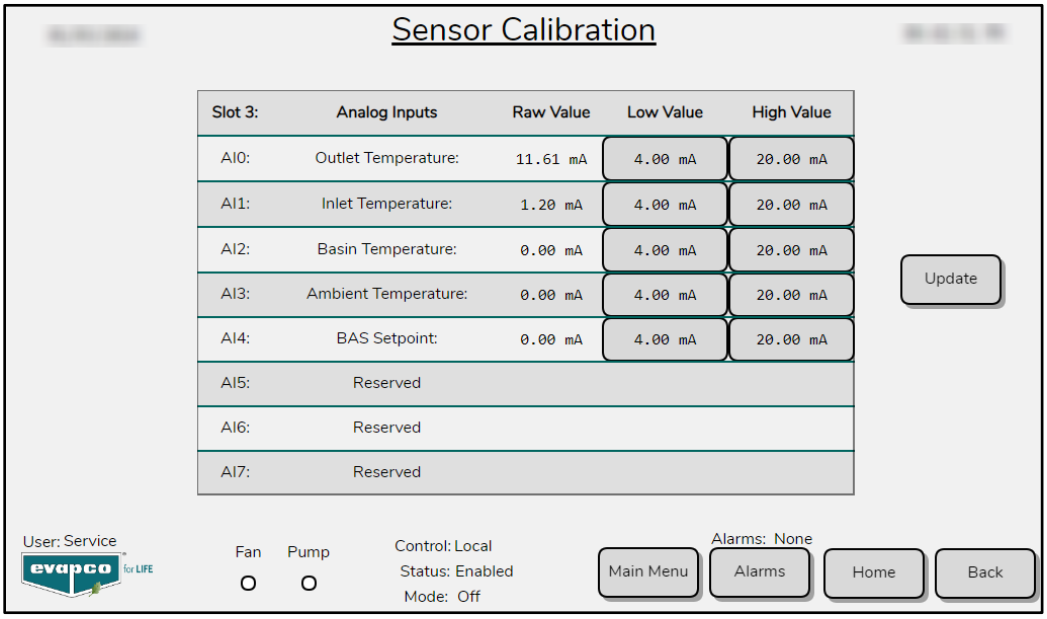


Figure 18: Sensor Calibration Screen

To begin, provide a 4mA signal to the corresponding analog input on the analog input card. Reference the wiring diagram to identify which terminals are used for the sensor currently being calibrated. Once the 4 mA signal is sent, look at the raw value to see if it matches the low value of the analog input. If it does not, change the low valve to what is currently being displayed as the raw value.

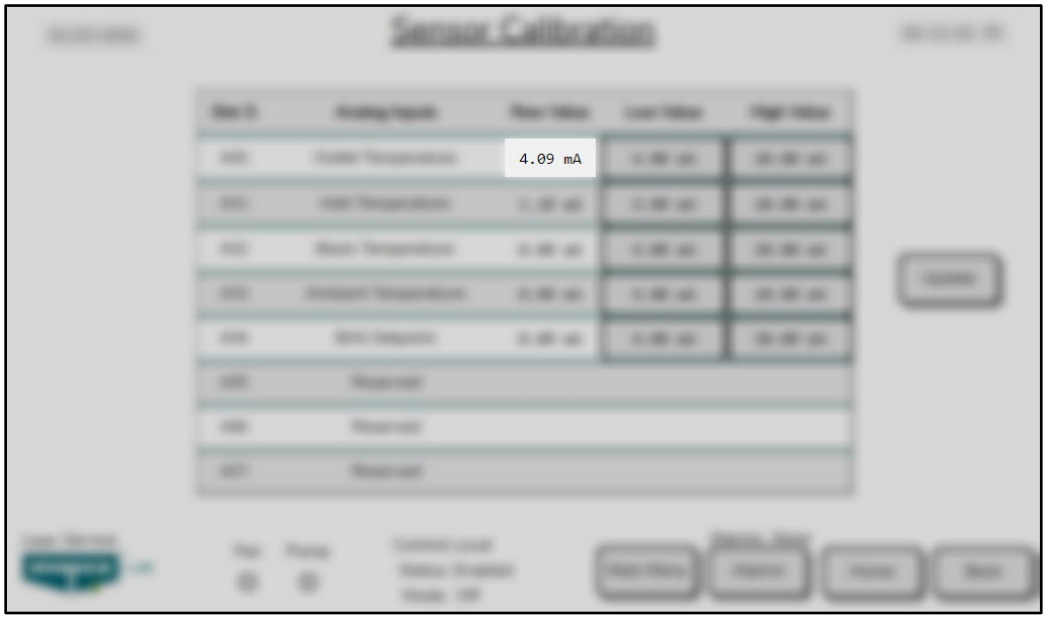


Figure 19: 4mA signal applied to AI0.

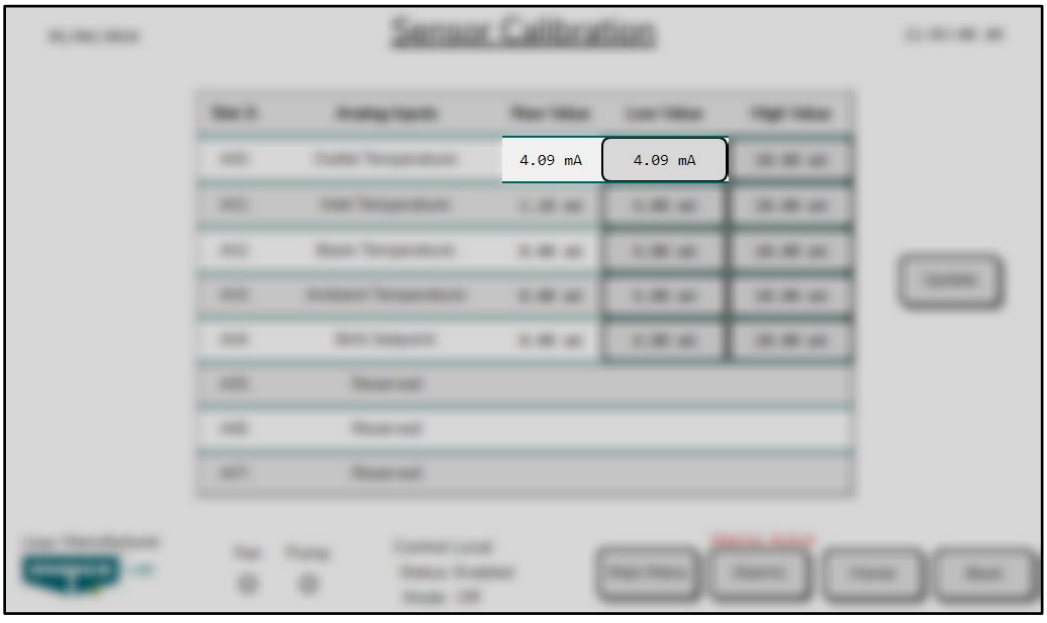


Figure 20: Low Value Adjusted.

Complete the previous steps but now with a 20 mA signal. Once you have calibrated all the necessary analog inputs, press and hold the Update button until the Updated text becomes visible under the Update button (Figure 21).

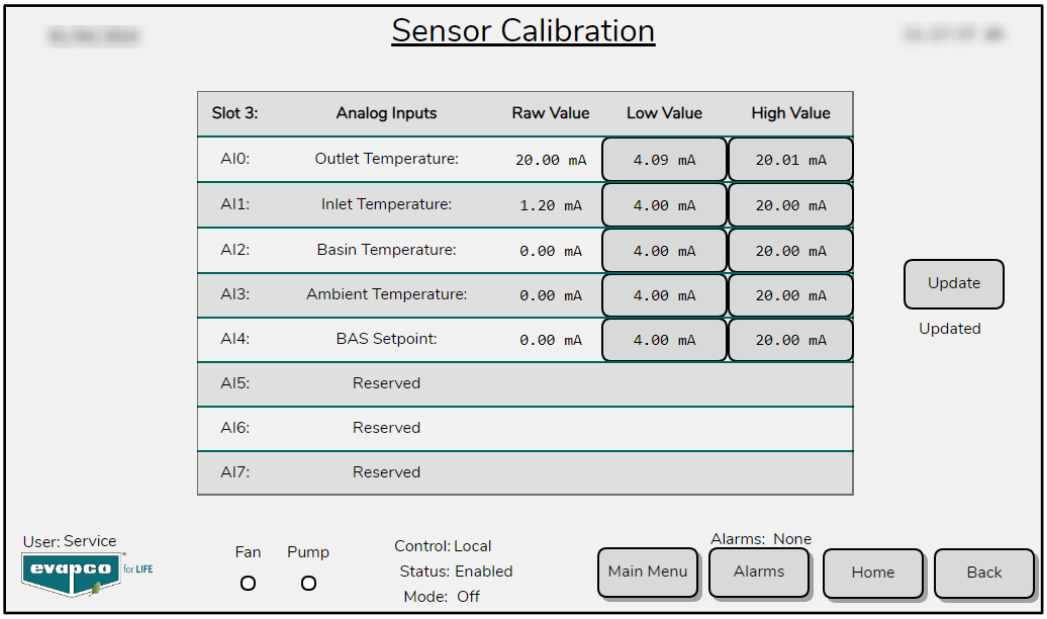


Figure 21: Updated Low and High Values.

Alarm Setup Screen

The **Alarm Setup Screen** (Figure 22) can only be viewed by users logged in at the Service level. This screen is used to set general device and temperature alarms and reset specific alarms. To toggle an alarm indicator action, push the appropriate button. Turning an alarm off will suppress the alarm on a given output device. For example, if a user does not want to see a Basin Heater Contactor Fault alarm on the HMI screen, the appropriate button under the HMI column should be toggled to Off. The following alarms need to be reset after being active: Fan Vibration Alarm, Pump Contactor/Overload Alarm, Pump No Flow Alarm and Basin Heater Contactor Alarm. Perform an physical investigation of the equipment associated with the alarm before resetting the alarm on on the **Alarm Setup Screen**.To see a history of past triggered alarms, refer to the **Alarm History Screen**. For a description of each alarm, please see the **Alarm Event Description** section of this document. To view active alarms, refer to the **Alarm Display Screen**.

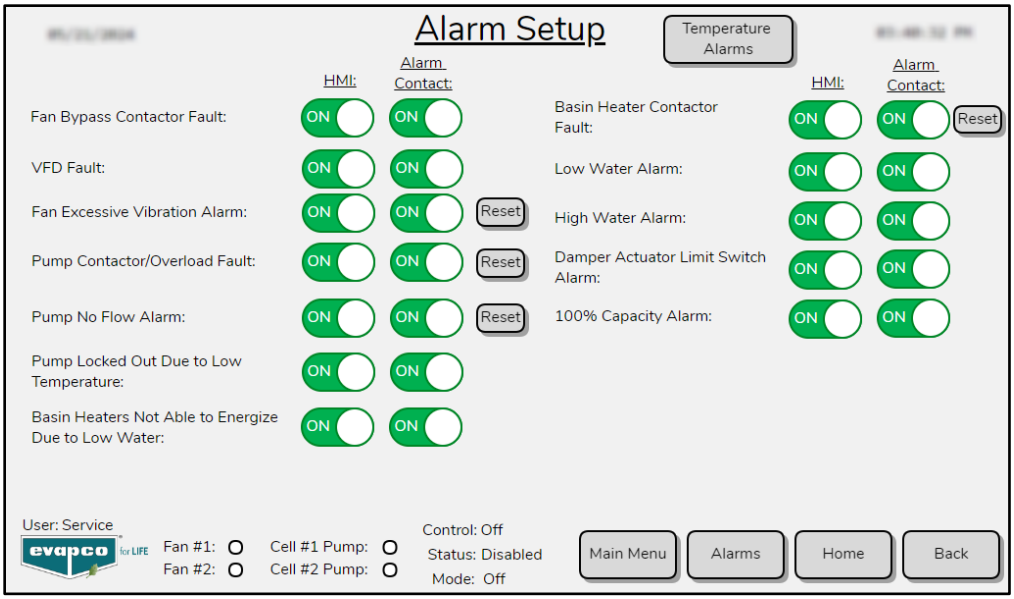


Figure 22: The Alarm Setup Screens.

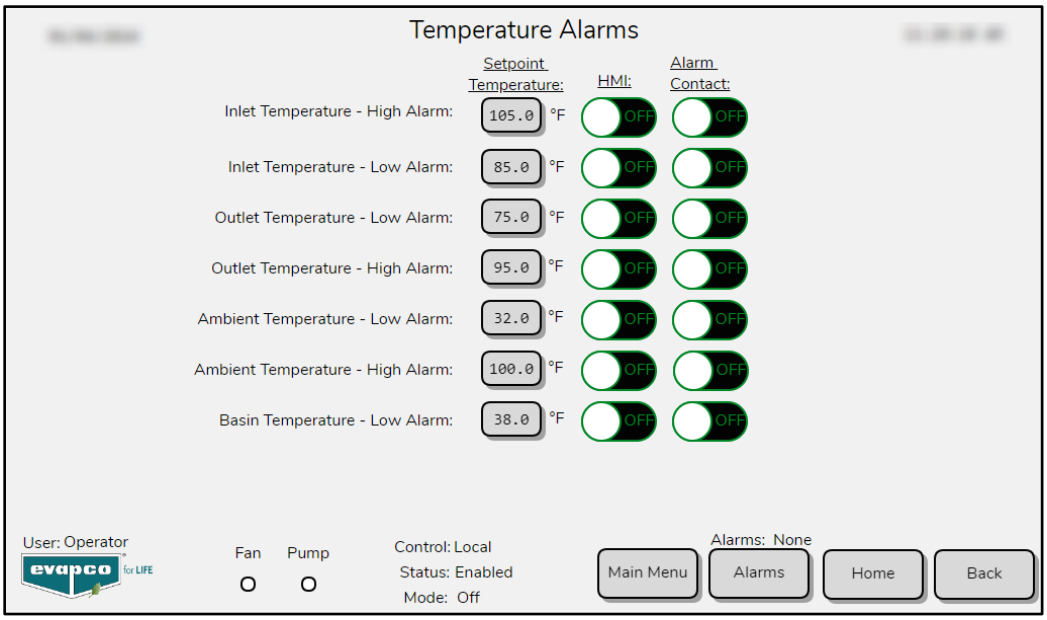


Figure 22: The Alarm Setup Screens.

Alarm Display Screen

All active alarms can be viewed on the **Active Alarm Display Screen** (Figure 23) by pressing the Alarm button on the **Sage Faceplate** at the bottom of every screen. Any user can acknowledge all currently active alarms without logging in. The function to acknowledge all alarms can also be triggered by the BAS communications if the Sage Control System is set for remote control.



Figure 23: The Active Alarm Display Screen.

To see a historical log of previous alarms, select the toggle switch in the top right of the screen (Figure 24). Reference Table 3 for a visual of each alarm state. The return state of an alarm means the alarm was active but now has returned off. This screen displays the time and date when the alarm was generated, the time and date for when the alarm was

acknowledged by a user, the time when the alarm returned off, and a message describing the alarm condition. For a description of each alarm and possible causes for each alarm, please see the **Alarm Event Description** section of this document.



Figure 24: Toggle Switch Between Alarm Screens.

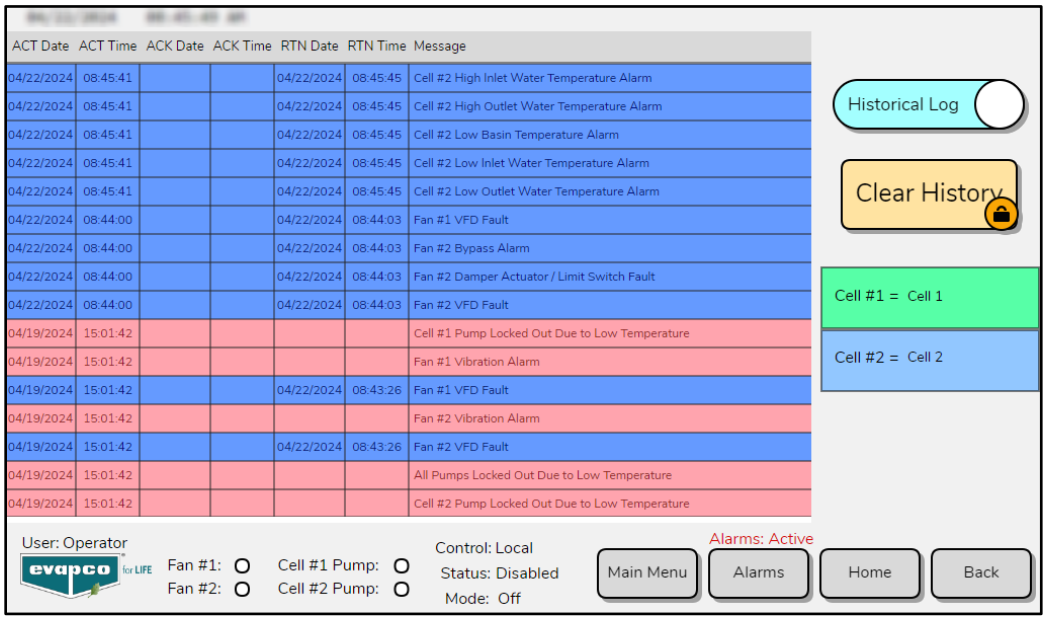


Figure 25: The Active Alarm Display Screen.

Status	Image
Active	Date Time ACK Time RTN Time Message 11/27/2023 15:18:11 Cell #1 Low Basin Temperature Alarm
Ack	Date Time ACK Time RTN Time Message 11/27/2023 15:18:11 15:30:35 Cell #1 Low Basin Temperature Alarm
Return	Date Time ACK Time RTN Time Message 11/27/2023 15:18:11 15:30:35 15:36:40 Cell #1 Low Basin Temperature Alarm

Table 3: Alarm Status Visuals

If the user has changed the name of a cell, the table on the right side of the alarm screen shows the name of the cell in the alarm table and what the name of the cell has been changed to. This is used to properly identify which cell the alarm is associated with in multi-cell Sage Control Systems.

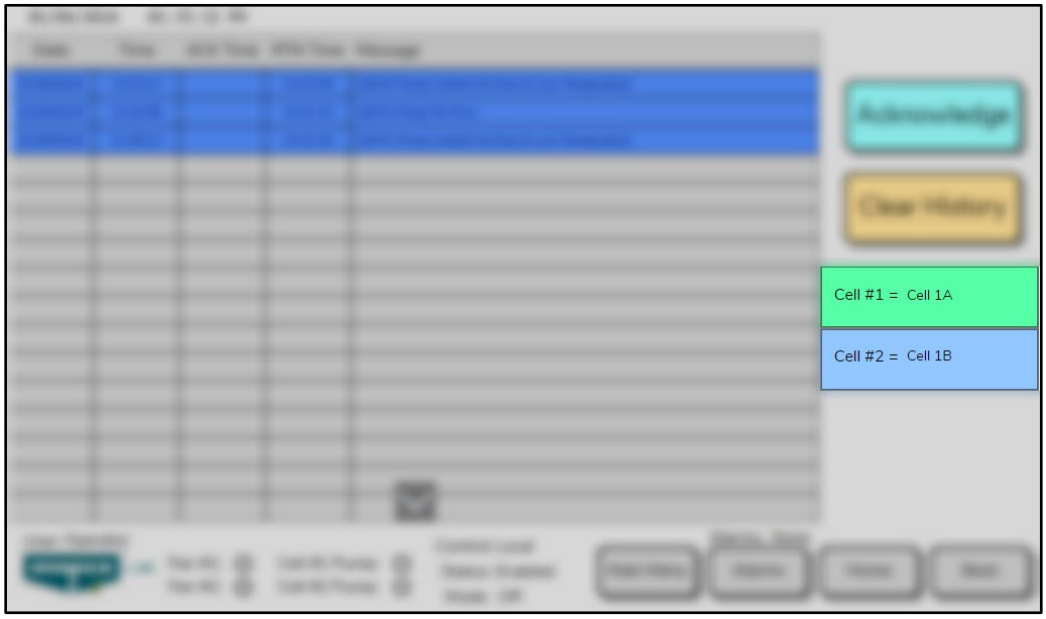


Figure 26: Cell Alarm Naming Table

The alarm display table also keeps a history of previously active and currently active alarms. Use the arrows at bottom right hand corner of the table to scroll through the alarm history. Once the table is full, the oldest alarm will be replaced by the newest alarm. The Clear History button will delete all the alarm entries in the table. The clear history button can only be used when logged in at the Service level or higher. **Caution**: **this action cannot be undone, and any alarms cleared will never reappear in the Historical Log table unless a new instance of that alarm occurs afterwards**. All active alarms will still be shown in the active alarms table.

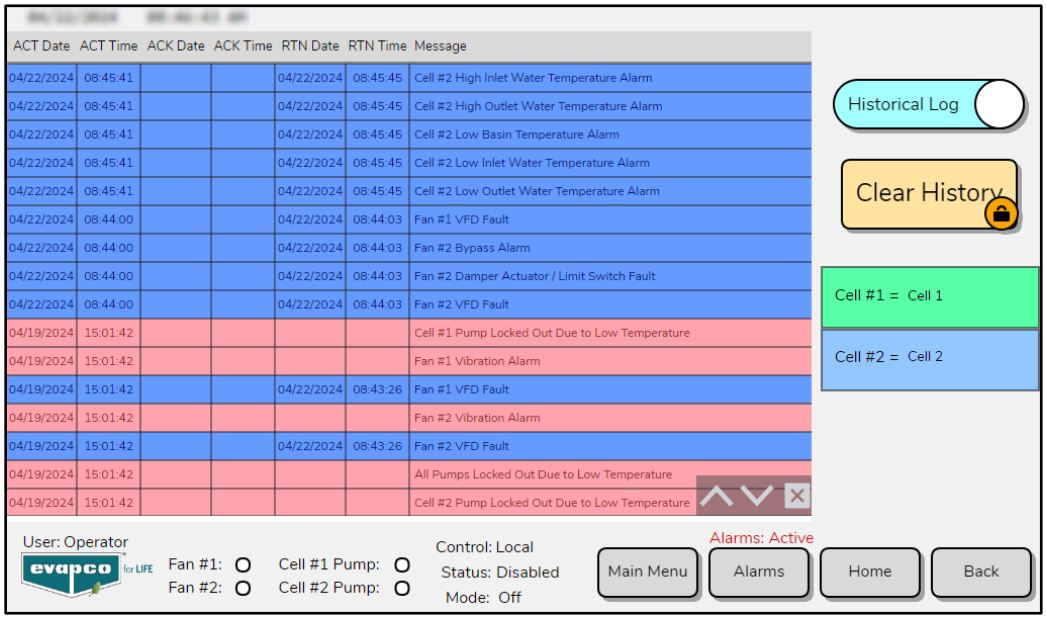


Figure 27: Alarm Display Screen with History.

Bump Test Screen

The **Bump Test Screen** may be accessed from the **Operator Screen**. Only logged in users may access this screen. Please follow the following steps to perform a bump test to check the rotation of the fan and spray pump motors.

1. Place the door switch into the Auto position.
2. In the **Setup Options Screen**, place the fluid cooler unit in Local control.
3. In the **Setup Options Screen**, ensure that the fluid cooler unit standby status is Disabled.
4. In the **Unit Operation Screen**, place the fluid cooler unit in Auto.
5. Press the Bump Button next to each device.

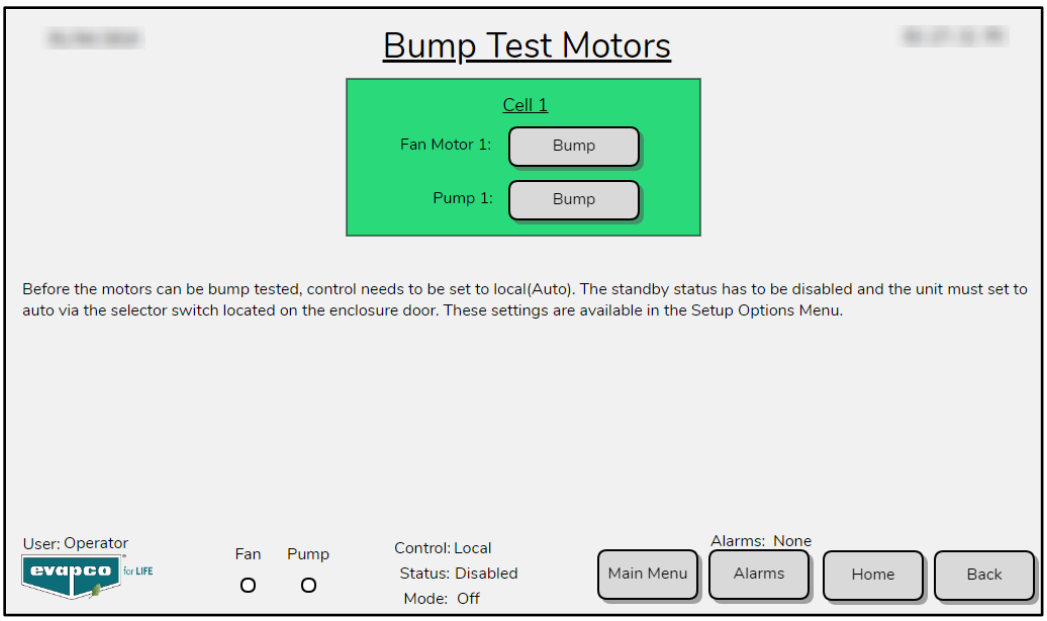


Figure 28: The Bump Test Screen.

A spray pump motor will energize for five seconds after the Bump Button is pressed. A fan motor will energize for five seconds at 50% fan speed after the Bump Button is pressed.

Setup Options Screen

The **Setup Options Screen** is restricted to logged in users. This screen is responsible for enabling local/remote control and enabling/disabling unit accessories.

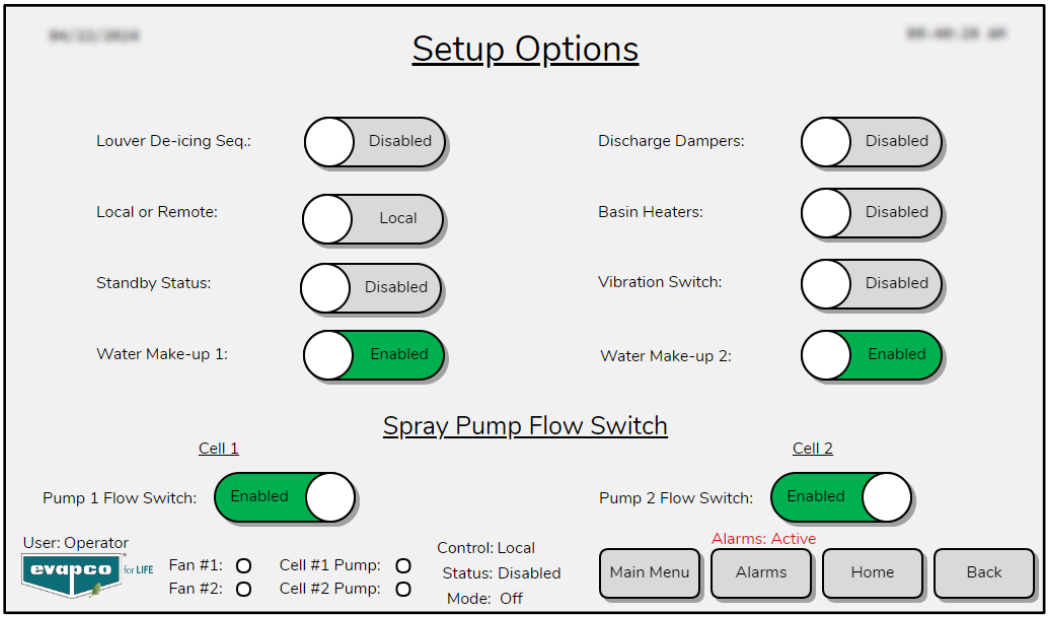


Figure 29: The Setup Options Screen.

The vibration switch, discharge dampers, basin heaters, and flow switch must only be enabled if each accessory is properly installed on the fluid cooler unit and appropriately wired to the Sage Control System. Enabling an accessory that is not installed or wired to the Sage Control System will cause the fluid cooler unit to not function correctly. Also,

disabling an installed accessory will cause the Sage Control System to ignore all feedback and will disable all control for that accessory.

Louver De-icing Sequence: Enabling the Louver De-icing Sequence will allow the Louver De-icing Routine to execute when required. More information regarding the Louver De-icing Sequence may be found in the **Control Setpoints Screen** section of this document.

Local or Remote: This setting allows the user to configure the temperature setpoint and the Standby Status of the Sage Control System locally via the HMI or by a remote BAS source. To control the Sage Control System in Remote, the user must first manually place the unit in Remote Control via the HMI. Please see the **Sage Faceplate** section of this document for more information. **Caution: Switching between Local and Remote may energize/de-energize equipment.**

Standby Status: To energize the spray pump(s), fan motor(s), or basin heater(s) in Local control, this setting must be enabled. When disabled, these components will not energize.

Water Make-up: The user must disable the Water Make-up to stop make-up valve operation while draining the basin for maintenance or winter operation. Otherwise, a low water alarm will be generated, and the make-up valve will attempt to fill the basin.

Discharge Dampers: If the fluid cooler unit is equipped with discharge dampers, they will open when the fan motor(s) needs to operate. When the discharge dampers are enabled, the VFD will wait for feedback that the discharge dampers are open before energizing the fan motor. In Bypass, before energizing the fan bypass contactor there needs to be feedback that the discharge damper has opened. For advanced discharge damper settings, refer to the **Advanced Unit Setup Screen** section of this document.

Basin Heaters: If enabled, the basin heater(s) will energize if there is adequate water in the basin, the basin water temperature is below the Pump Cut Out Temperature (set on the **Advanced Unit Setup Screen**) or the Heater Control Temperature (set on the **Control Setpoints Screen**), and the spray pump(s) are not energized. For more information on basin heater operation, refer to the **Advanced Unit Setup Screen** and the **Control Setpoints Screen** sections of this document.

Vibration Switch: If enabled, the vibration switch will de-energize the fan motor if excessive vibration is detected. In addition to de-energizing the fan motor, an alarm is generated, and the spray pump(s) will energize if there is not a low water level, low basin water temperature, or a no flow condition. The vibration switch must be physically reset when it trips, and the alarm must be reset on the HMI before the fan is allowed to be energized.

Spray Pump Flow Switch: The flow switch(es) may be enabled or disabled from the **Setup Options Screen**. If a spray pump is energized and a flow switch detects no flow, an alarm will activate, and the spray pump will turn off. The Sage Control System will then try to restart the spray pump(s) two more times after a short delay between each attempt. After three “no flow” starts, the spray pump will remain off until the flow switch is reset from the **Alarm Setup Screen**. If the spray pump does not energize due to a no flow indication by the flow switch, physical investigation of the fluid cooler unit should be performed prior to resetting the flow switch to rectify the no flow situation.

Control Setpoints Screen

Logged in users can access the **Control Setpoints Screen** through the **Main Menu Screen**.

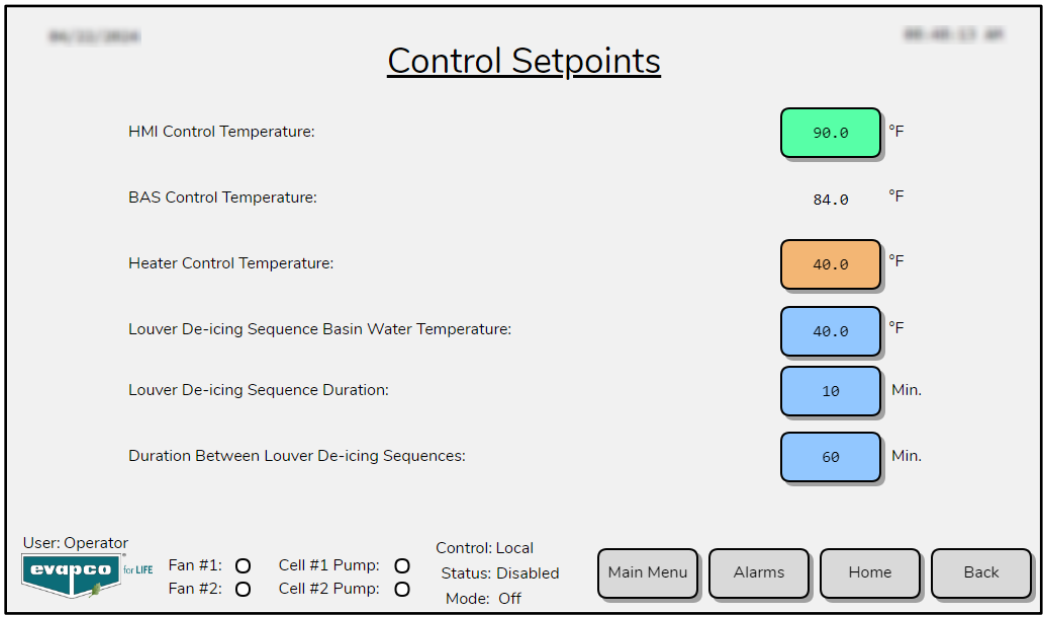


Figure 30: The Control Setpoints Screen.

HMI/BAS Control Temperature: The HMI Control Temperature may be set on this screen and is the Supply (outlet) fluid temperature for which the Sage Control System will attempt to maintain when the Sage Control System is placed into Local operation. The BAS Control Temperature may only be viewed and is the Supply (outlet) fluid temperature for which the Sage Control System will attempt to maintain when the Sage Control System is placed into Remote operation. The BAS Control Temperature may be set remotely via the BAS communication or via a 4-20 mA analog signal.

Heater Control Temperature: The Heater Control Temperature is the temperature at which the basin heater(s) will turn on. Ice may develop in the basin if this setpoint is set lower than 40°F.

Louver De-Icing Sequence Basin Water Temperature: The Basin Water Temperature below which the automatic Louver De-icing sequence will be triggered by the Sage Control System. The Louver De-icing sequence will only run if the Louver De-icing routine is enabled on the **Setup Options Screen**.

Louver De-Icing Sequence Duration: The length of time for which the Louver De-icing routine will run.

Duration Between Louver De-Icing Sequences: The time between Louver De-icing sequences. To ensure the unit does not continually run in the Louver De-icing sequence when the basin temperature is below the Louver De-Icing Sequence Basin Water Temperature, the length of time between Louver De-icing sequences may be adjusted.

Motor Runtimes Screen

The **Motor Runtime Screen** is only available to users that are logged into the Sage Control System. This screen displays the runtime hours for all fan motors and spray pumps. To reset any counter, press the appropriate **Reset Button**. Runtime counters may also be reset via a BAS connection (if connected).

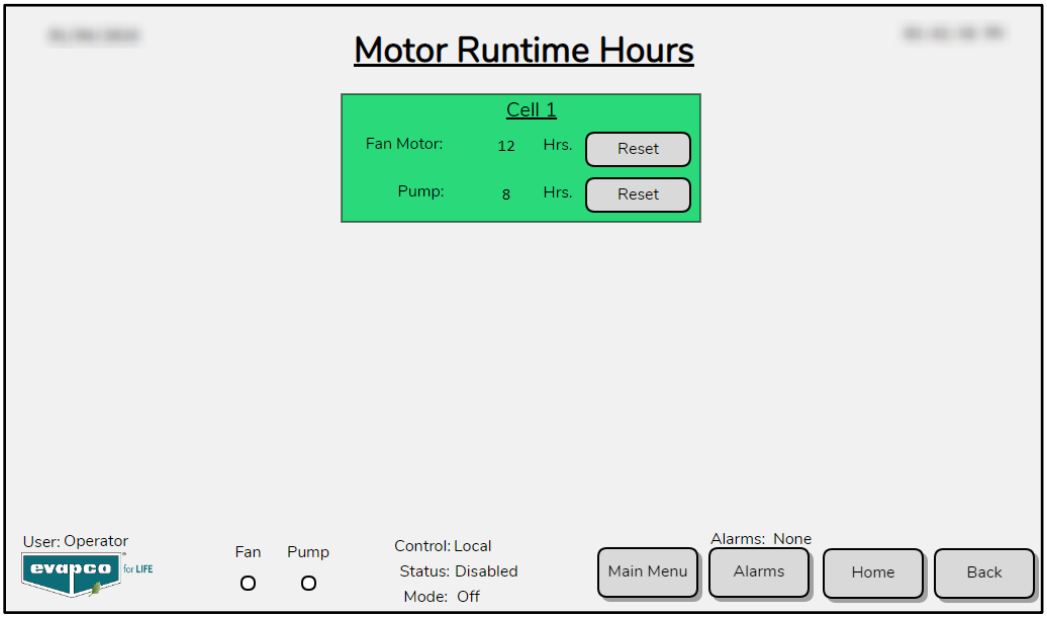


Figure 31: The Motor Runtimes Screen.

Unit Operation Screen

Logged in users can access the **Unit Operator Screen** through the **Operator Screen**. The user can toggle the Sage Control System operation between Auto and Manual control. The three position selector switch must be in the Auto position and the Standby Status must be Enabled for the fluid cooler unit to operate in Automatic or Manual operation.

Automatic Operation: In Auto, the PLC will determine how the fluid cooler unit needs to operate to meet the Active Temperature setpoint based on the feedback it receives.

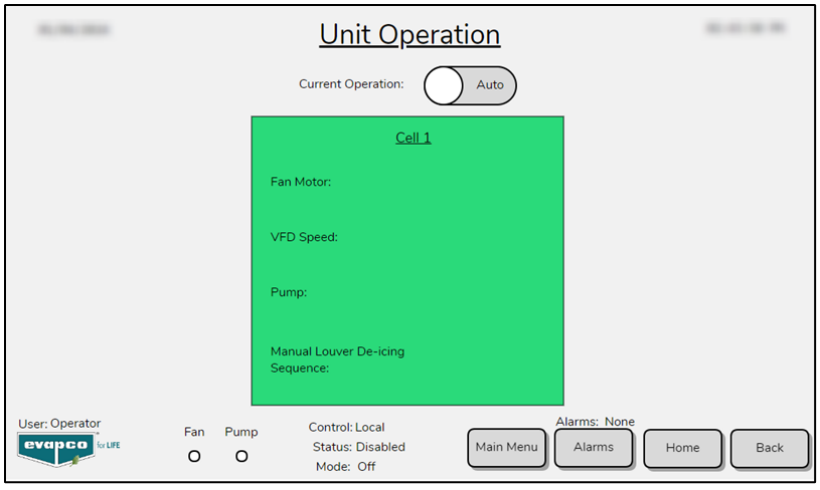


Figure 32: The Unit Operation Screen with the Sage Control System in Auto.

Manual Operation: In Manual, the user controls if the fan motor(s) and spray pump(s) are on or off. If a fan motor is Enabled, the user can change the VFD speed. Note that the Sage Control System will not automatically maintain an Active Control Temperature setpoint in this mode. Manual operation may be used during the passivation period to energize the spray pump(s) and fan motor(s) when no heat load is present. Please consult your local water treatment specialist for more information about passivation.

Manual Louver De-icing Sequence: This screen also includes the Manual Louver De-icing Sequence which may be started as deemed necessary.

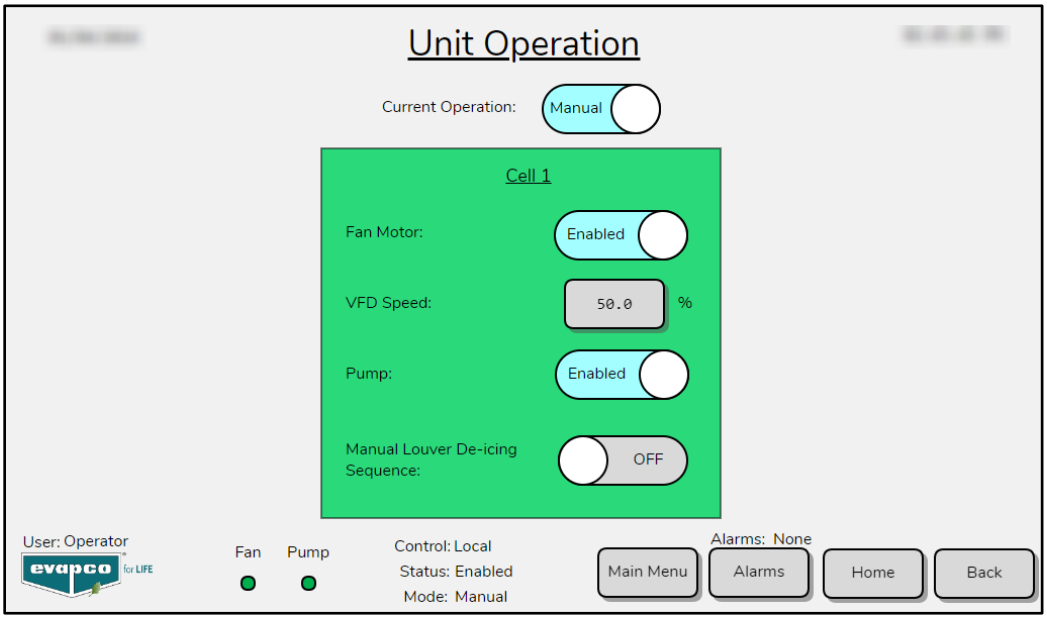


Figure 33: The Unit Operation Screen with the Sage Control System in Manual.

Cell Priority (For Multi-Cell Units Only): Cell Priority allows the user to toggle which cell is the lead cell and which cell is the lag cell. The lead/lag configuration is not automatically changed by the Sage Control System and must be set manually by the user. Please see the **Priority Selection Screen** section for a detailed description and the effect of lead/lag on unit operation.

Set Time and Backup Screen

This screen is shown by selecting the **Set Time/Backup** button on the **Operator Screen**.

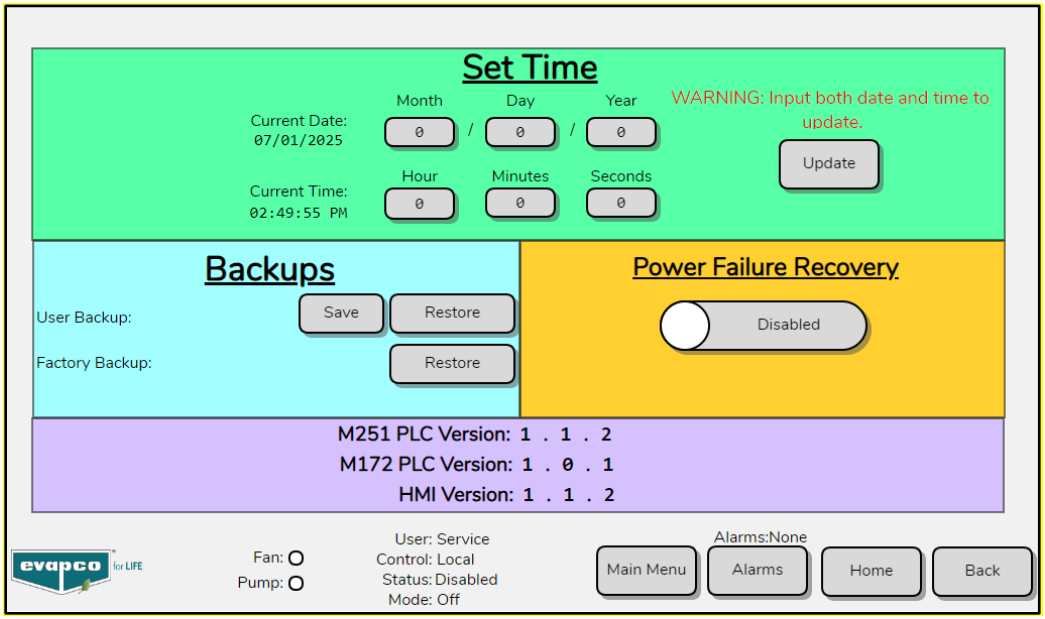


Figure 34: The Set Time and Backup Screen.

The time and date may be set by using the appropriate buttons. For accurate time and date stamping of alarms, the PLC time must be set to the local time. The PLC has a battery backup, but the time may require occasional adjustment. Please note that the hours must be between 0 and 23 to indicate a.m. or p.m. (13:00 is 1:00 p.m.). When updating the date and/or time, input all values even if only intending to change one variable. Once all time and date information are entered, press and hold the Update Button for at least 3 seconds to save the time and date to the PLC.

To preserve critical settings and setpoints before making a major change, users may backup the current settings by touching the Save Button. After selecting the Save Button, ensure that the word Saved is displayed as shown in Figure 35. If no text is shown, the save did not register. System settings may also be reset to the factory settings at any time by touching Restore in the row indicated by the text Factory Backup.

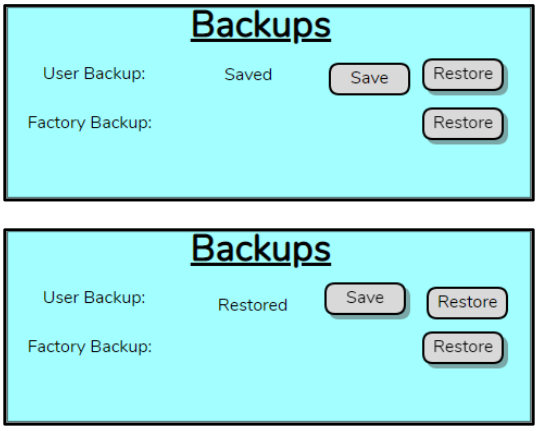


Figure 35: A saved or restored is indicated by the text flashed on the screen.

Power Failure Recovery: When the Sage Control System loses power, it may be desirable for the fluid cooler unit to resume running in the same mode it was in prior to the power failure. The Power Failure Recovery option makes it possible to adjust the amount of time the fluid cooler unit can be without power and still return to the previous operating mode. For example, if the Sage Control System is operating in a mode with the spray pump(s) energized and power is disconnected but then reestablished within the set amount of time, the Sage Control System will resume operating in that same mode. This allows the fluid cooler unit to quickly return the supply fluid temperature to the desired setpoint. After a power cycle, the digital outputs have a 30 second delay before energizing, which will allow alarms to enable and keep any faulted equipment from trying to energize. If the incoming power is out longer than the designated time, the Sage Control System will be in an off state upon restart. Once the Sage Control System senses the supply fluid temperature is above the Active Control Temperature setpoint, it will begin increasing the capacity of the fluid cooler unit until it meets the required load. To enable the Power Failure Recovery option, toggle the switch to enable and input the Power Outage Duration Before Restarting time.

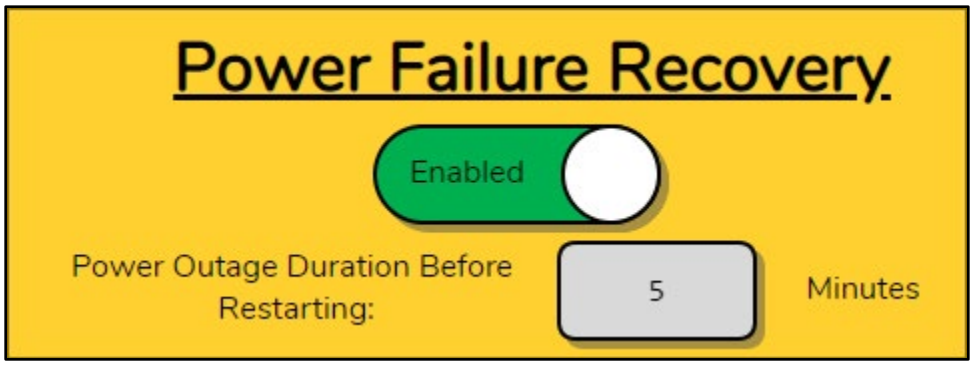


Figure 36: Power Failure Recovery Sequence Enabled.

Listed toward the bottom of the screen are the program versions of the PLC and HMI applications. This can be used for troubleshooting with Evapco personnel.

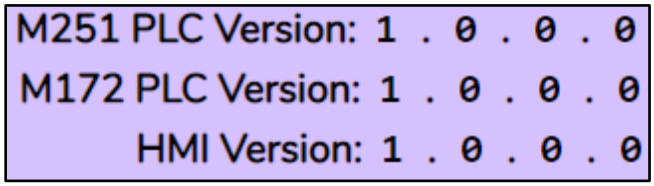


Figure 37: PLC and HMI Application Versions Listed.

Priority Selection Screen

To access the **Priority Selection Screen**, the user must be logged in as an Operator or Service user. This screen allows the user to toggle between Energy and Water Savings priorities. The chart on the screen indicates which mode the fluid cooler unit is currently operating. The current VFD speed is also shown. To ensure long life of the spray pump(s), the Sage Control System limits the frequency that it changes between modes of operation. Once a spray pump is started, the spray pump is locked on for a set amount of time. The **Priority Selection Screen** displays if a spray pump is locked and the duration until the spray pump is unlocked.

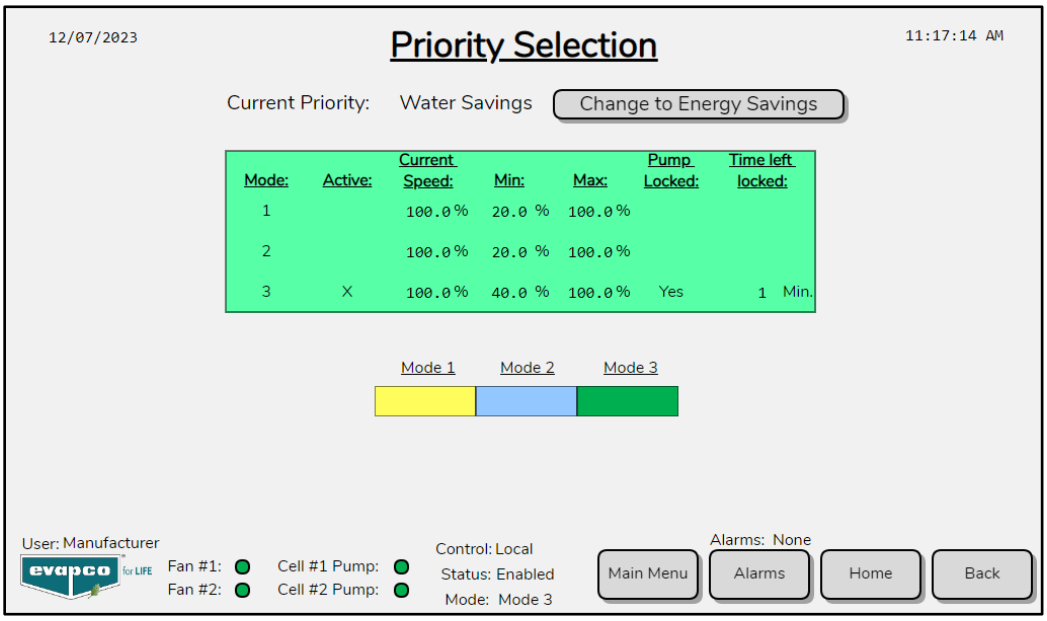


Figure 38: The Priority Selection Screen.

Water Savings Priority: With this setting, the Sage Control System maximizes water savings by utilizing the spray pump(s) as little as possible while still meeting the desired Control Temperature setpoint. The VFD speed will increase to 100% in dry mode before switching to the next mode of operation which will energize the spray pump(s) and consume water.

Energy Savings Priority: With this setting, the Sage Control System will operate in the manner in which the least amount of electricity is consumed by the fluid cooler unit. **Note: there may be a point at which it is more energy efficient to shutoff a spray pump and increase the fan motor power. The Sage Control System calculates this point for each configuration.**

BMS & Network Screen

To access the BMS & Network Screen the user needs be logged in at the Service level and the status of the system needs to be disabled in the **Setup Options Screen**. All Sage controllers can communicate with BMS via Modbus RTU, Modbus TCP/IP, BACnet MS/TP, and BACnet IP. Consult the supplied wiring diagram for the proper wiring configuration. The BMS configuration screen allows the various communication parameters to be set. After changing any of the communication parameters, the Update button must be pressed for 3 seconds for the change to take effect. **Note: pressing the Update button will restart the protocol converter PLC (PLC2: M172PBG07R).**

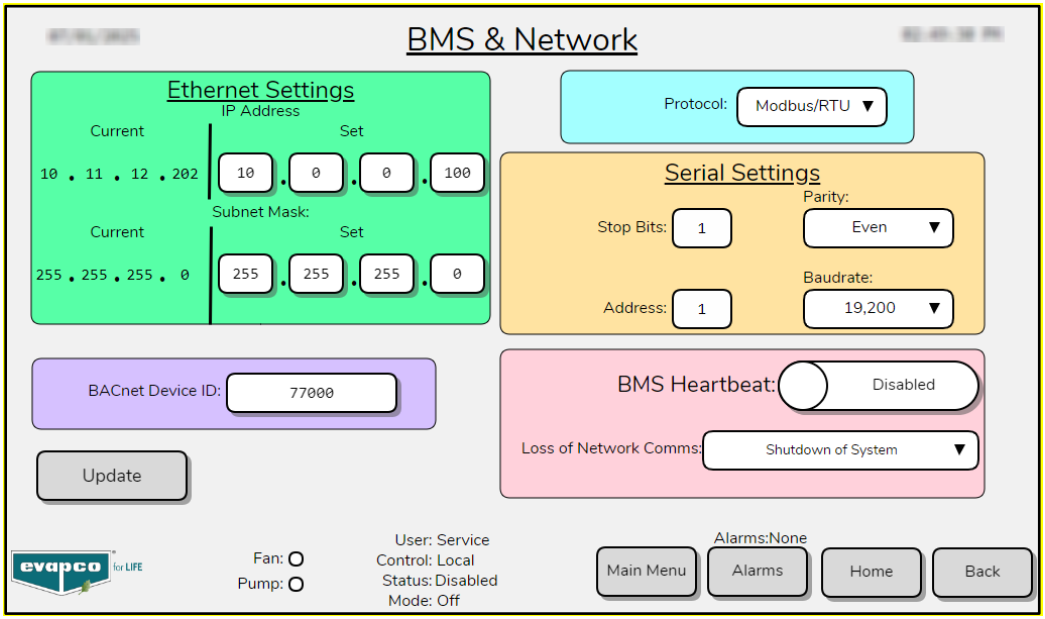


Figure 39: BMS & Network Screen

Parameter	Description	Default
Protocol	Select which protocol will be communicated on the serial network: Modbus RTU or BACnet MS/TP	Modbus RTU
Address	The node address of the EVAPCO Controller: 1 to 247. **Caution: The node of the address of PLC1 (TM251MESE) is 2.**	1
Baud rate	The baud rate of the Modbus RTU or BACnet MS/TP signal: 19200, 38400, 57600, 76800, 115200.	19200
Parity	The parity of the Modbus RTU signal: None, Even, Odd	Even
Stop Bits	The number of stop bits: 1 or 2.	1
BACnet Device ID	The unique device ID number for the unit: 1 to 4,194,303	77000

Table 4: BMS Settings

The BMS Heartbeat can be enabled or disabled from the **BMS & Network Screen** while the system is in Remote Control mode. Status of the communication between the Sage controller and the remote BMS controller can be monitored using the BMS Heartbeat. To maintain communication, the heartbeat status bit must have a zero written to it from the remote BMS controller within 30 seconds after the value has changed to a one. Once the bit has been changed to zero, then the Sage Controller will change the bit back to one after 5 seconds. If the bit does not have a zero written to it after 30 seconds, then an alarm will energize, and the Loss of Network Comms response will go into effect. There are two options to choose from if communication has been lost:

Shutdown of System: The control mode of the system will be moved to Off. This means fans and pumps will turn off, they can come back on once the fault is cleared or if the system is put into Local mode.

Move to Local Control: The control mode will move to Local control and will function based off Local Setpoints. Fan(s) and pump(s) may turn off when moved to Local mode.

Advanced Unit Setup Screen

The **Advanced Unit Setup Screen** may be accessed from the **Operator Screen**. Only users logged in as Service user may access this screen. Before modifying the PID tuning parameters, it is recommended that a backup be performed (see **Set Time and Backup Screen**). Adjusting the tuning parameters may alter the performance and response of the control system leading to oscillations or a slow response to changes in temperature. The Active Control Temperature Setpoint, Average Outlet (supply) Fluid Temperature, VFD Command Speed, and Actual VFD Speed are displayed for reference.

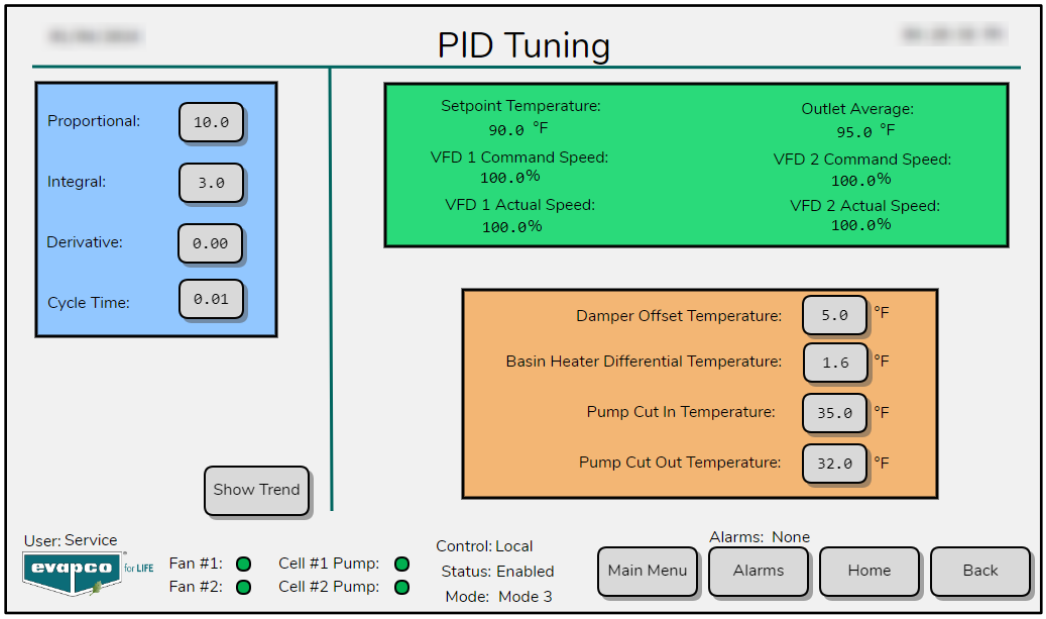


Figure 40: The Advanced Unit Setup Screen.

To see a real time response of the VFD select the Show Trend button in the bottom left area of the screen. A trend of the VFD Speed, Outlet Temperature and Active Setpoint will appear. To make the trend graph disappear choose Hide Trend.

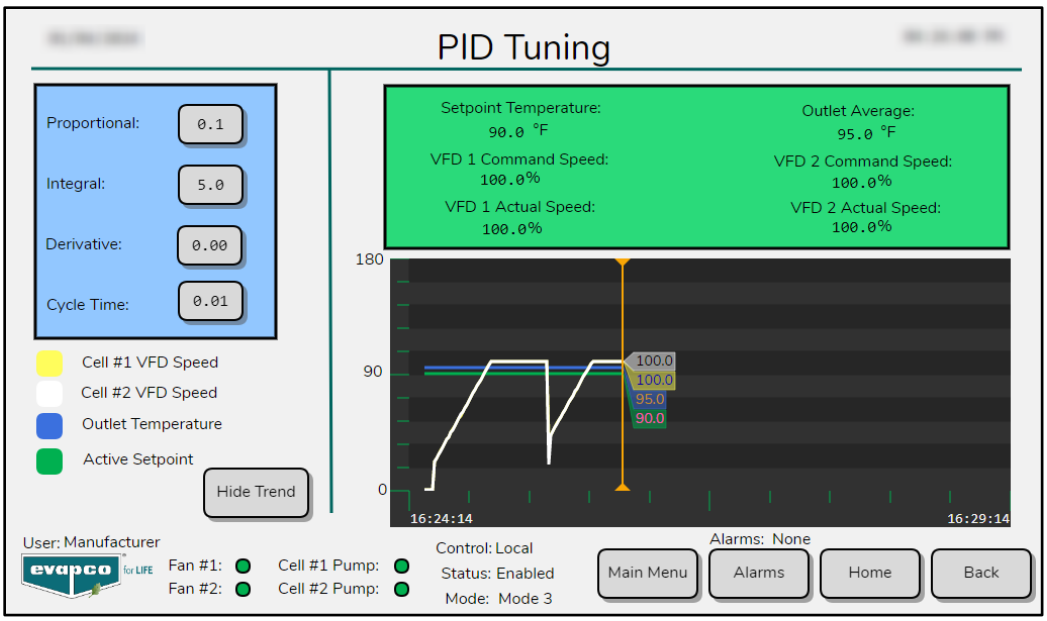


Figure 41: Trend Graph of VFD Speed

Discharge Damper Offset Temperature: If the fluid cooler unit is equipped with discharge dampers, there is a calculated temperature at which the dampers will close if no cooling capacity is required from the fluid cooler unit. The temperature at which the dampers close is equal to the Active Control Temperature minus the Damper Offset Temperature.

Basin Heater Differential Temperature: The Basin Heater Differential Temperature defines how warm the water in the basin will be heated before the basin heater(s) turn off. The basin heater(s) will energize only if they are enabled on the **Setup Options Screen**, the spray pump(s) are off, and there is sufficient water level in the basin. The basin heater(s) will stay on until the basin temperature is greater than the sum of the Heater Control and Heater Differential Temperatures. For example, if the Heater Control Temperature is 40°F and the Basin Heater Differential Temperature is 3°F, the basin heater(s) will energize if the basin water temperature is below 40°F and will stay on until the basin water temperature reaches 43°F. If a spray pump is running when the basin water temperature reaches 40°F, the spray pump will continue to run, and the basin heaters will not energize until the Pump Cut Out Temperature is reached. The basin heater(s) will only energize if the spray pump(s) are off.

Pump Cut In and Cut Out Temperature: The Pump Cut In and Cut Out Temperatures are intended to prevent the spray pump(s) from energizing when the basin may contain ice. The basin heater(s) are interlocked with the spray pump(s) so the basin heater(s) will not energize if a spray pump is running. For example, if the Pump Cut Out Temperature is 35°F, the Pump Cut In Temperature is 42°F, the spray pump(s) will continue to run until the basin water temperature reaches 35°F. At 35°F, the spray pump(s) will turn off and the basin heater(s) will energize. Once the basin heater(s) energize, the spray pump(s) will not run until the basin temperature reaches the Pump Cut In Temperature (42°F).

Digital Output Test Screen

This screen is shown by selecting the **Digital Output Test** button on the **Main Menu Screen**.

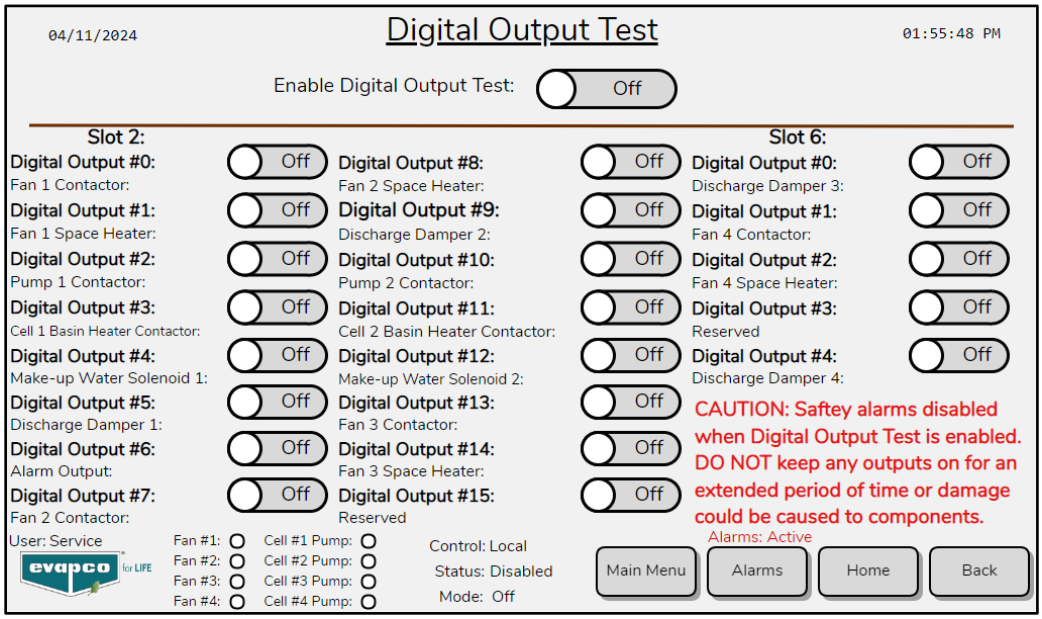


Figure 42: Trend Graph of VFD Speed

Only users logged in as Service may access this screen. The Digital Output test is used to test wiring at the commissioning level or for general troubleshooting. In the **Setup Options Screen**, ensure that the fluid cooler unit Standby Status is Disabled. First enable the test using the On/Off toggle switch at the top of the screen. Then toggle the On/Off switch for each digital output one at a time checking that the correct response occurs. For example, if checking Digital Output #2 is wired correctly then the contactor for pump one should be energized. Once testing is complete be sure to turn OFF all digital outs and then disable the Digital Output Test. **CAUTION: Safety alarms are disabled when Digital Output Test is enabled. DO NOT keep any outputs enabled for an extended period or damage could be caused to devices.**

Terminology

BAS (Building Automation System): A system that allows users to control multiple process equipment in a central location.

Cycle Pump Routine: A programmed sequence that will cycle on a spray pump to maintain proper water treatment.

Dry Mode (Single Cell Unit): The fan motor(s) is energized, and the spray pump(s) is de-energized.

Evaporative Mode (Single Cell Unit): The fan motor(s) is energized and the spray pump for a cell is energized.

EWLC (Electronic Water Level Controller): A device used to detect basin water level.

HMI (Human to Machine Interface): A graphical interface that allows information to be transmitted between a PLC and a user.

Hot Start Routine: A programmed sequence that allows the fluid cooler unit to quickly ramp up from no load to full load. When the unit is Off/No Load and a large load is diverted to the unit, the Hot Start Routine will determine the best mode to achieve the desired supply water temperature most quickly. If the Hot Start Routine is not enabled, the PID loop will go through each mode before proceeding to the next mode, thus taking longer for the fluid cooler unit to ramp up to achieve the desired supply water temperature. The need for the Hot Start Routine will be determined by Evapco during start-up.

HWA (High Water Alarm): Alarm that indicates a high water level condition.

Louver De-icing Sequence: A programmed sequence designed to remove any accumulated ice from the louvers. During the de-icing sequence, the fan motor turns in reverse forcing warm air over the coil and out through the louvers.

LWA (Low Water Alarm): The alarm that indicates a low water condition.

Mode 1 to X (Multi-Cell Unit): The sequence of operation of the fan motor(s) and spray pump(s) of a multi-cell unit. Mode 1 is dependent on the priority selection. Mode X is typically all cells operating in Evaporative Mode.

PID (Proportional-Integral-Derivative) Controller: A control loop feedback mechanism used in industrial control systems. By adjusting control outputs, a PID controller attempts to minimize the difference between a measured process variable and a desired setpoint.

PLC (Programmable Logic Controller): A programmable microprocessor that performs switching, timing, and process control tasks.

Return Fluid Temperature: Temperature of the process fluid entering the fluid cooler unit.

RTD (Resistance Temperature Detector): A device in which the electrical resistance of the sensor varies with temperature.

Supply Fluid Temperature: Temperature of the process fluid leaving the fluid cooler unit.

VFD (Variable Frequency Drive): A controller that drives an electric motor by varying the input frequency and voltage to the electric motor.

Water Efficient Mode (Single Cell Unit): The fan motor(s) is energized and a single spray pump of a two pump cell is energized.

Troubleshooting

Sage Troubleshooting

Problem	Possible Cause	Remedy
Sage Control System Will Not Energize	Circuit breaker is off	• Turn on the circuit breaker
	Tripped circuit breaker	• Investigate cause before resetting.
No Automatic Control By Sage Control System	Switch on Sage Control System door is in the incorrect position	• Turn the switch to the Auto position.
	Sage Control System is not enabled	• For Local control, ensure the Standby Status is Enabled (see **Setup Options Screen**). • For Remote control, ensure a start signal is being transmitted (see **Sage Faceplate**).
Active Control Temperature Setpoint is Not Displayed Correctly	Sage Control System is not set in the proper control mode	• Verify the Sage Control System is set to the desired control mode (see **Setup Options Screen** for Local/Remote settings). • Verify the desired Active Control setpoint is set (see **Control Setpoints Screen**).
	In remote, setpoint is out of range	• Ensure Active Control Temperature setpoint is being sent (4-20 mA). • Ensure desired Active Control Temperature setpoint is between 0°F and 180°F.
Not Maintaining Active Control Temperature Setpoint	Fluid is too cold	• Cycle pump routine is keeping a spray pump energized. • PID loop is not tuned properly. • Ensure the Active Control Temperature setpoint is as desired.
	Fluid is too hot	• PID loop is not tuned properly. • Ensure the Active Control Temperature setpoint is as desired. • Spray pump is unable to energize. Examine the system for any alarms. • Fan motor is unable to energize. Examine the system for any alarms. • Fluid cooler unit is running at full capacity. • Active Control Temperature setpoint is unrealistic. • Coil is not piped correctly. • Temperature sensors are not in the correct locations. • Measured temperature is not correct.
Bump Test is Not Functioning	Sage Control System is not set in the proper control mode	• See **Bump Test Screen**.

Problem	Possible Cause	Remedy
Fan Motor Will Not Energize	Tripped circuit breaker ahead of VFD	• Investigate cause before resetting.
	Vibration Switch	• Check to see if there is an excessive vibration alarm (see • **Alarm Event Description Alarm Event Description**). Reset the vibration switch if necessary, after examining the cause of the excessive vibration and making all proper corrections. • Reset the sensitivity of the switch if vibration is acceptable. • Disable the vibration switch if one is not installed on the fluid cooler unit (see **Setup Options Screen**).
	Damper Limit Switch	• Ensure the discharge dampers are able to open freely. Clear any foreign debris or ice. • Check to see if there is a discharge damper limit switch fault alarm (see **Alarm Event Description**). • Disable the discharge dampers if they are not installed on the fluid cooler unit (see **Setup Options Screen**).
	VFD Fault	• Check to see if there is a VFD fault alarm (see **Alarm Event Description**). Examine the cause of the fault and make all proper corrections before clearing the fault.
	Sage Control System is not set in the proper control mode	• If set to manual via the HMI with the door switch in Auto, the fan motor must be manually enabled (see **Unit Operation Screen**).
Fan Spinning Backward	Louver De-icing routine is being executed	• This is a preprogramed function that must be enabled by the user. Check the **Sage Home Screen** or the remote signal (if equipped) to see how long the Louver De-icing sequence will last.
	Power wiring of fan is backwards	• Switch 2 legs of power wiring from MMP to fan motor in the control panel at the MMP.
Fan Motor Space Heaters Not Energized	Tripped Circuit Breaker	• Investigate cause before resetting.
	Fan is energized	• The fan motor space heaters will only energize while the fan motor is not energized.

Problem	Possible Cause	Remedy
Spray Pump Motor is Energized	Cycle Pump routine is active	• This is a preprogramed function. Check the **Sage Home Screen** or the BAS setpoint (if connected) to see how long the Cycle Pump routine will continue.
	Pump is locked on	• Once energized in Auto control, a spray pump will be locked on for a predetermined amount of time. Check the **Priority Selection Screen** or the BAS setpoint (if equipped) to see how long the pump will be locked on.
	Fan issue	• A fan issue (excessive vibration, VFD fault, etc.) will cause a spray pump to energize.
Spray Pump Motor is Not Energized	Low water condition	• Examine the system for a low water alarm (see **Alarm Event Description**). • Water level has not reached the high alarm level after refilling the basin following an enable of the water make-up.
	Motor starter has tripped	• Verify the motor wiring to determine the cause of the high amp draw. Make all proper corrections before resetting the motor starter. Measure the actual amp draw of the motor and troubleshoot if above the service factor.
	Sage Control System is not set in the proper control mode	• If set to Manual, the spray pump must be manually enabled (see **Unit Operation Screen**)
	No flow is detected	• Check to see if there is a No Flow Alarm (see **Alarm Event Description**). • Disable the flow switch if it is not installed on the fluid cooler unit (see **Setup Options Screen**).
	Low basin water temperature	• Check to see if there is an alarm indicating the spray pump(s) are locked out due to Low Basin Water temperature (see **Alarm Event Description**).
	Water make-up is disabled	• Ensure the water make-up has not been disabled (see **Setup Options Screen**).
	Dry mode	• Check the current mode on the HMI (see **Sage Faceplate**).
	Contactor damaged	• Inspect contactor to see if it has been damaged. • Check to see if voltage is present on the output of the contactor when the contactor is energized. • Check that voltage is present on the contactor coil.

Problem	Possible Cause	Remedy
Pump Rotating Backwards	Power wiring of pump is backwards	• Switch 2 legs of power wiring to pump motor in the control panel at the motor starter.
Louver De-icing Sequence Will Not Start	Spray pump not on	• Automatic Louver De-icing will not be performed unless the spray pump is energized.
	Basin water temperature is too high	• Basin water temperature must be below the Louver De-Icing Sequence Basin Water Temperature setpoint for the de-icing sequence to start (see **Control Setpoints Screen**).
	Time duration not met	• Louver De-icing will only begin after the duration between Louver De-icing cycles is greater than the setpoint value (see **Control Setpoints Screen**).
Basin Heaters Not Energized	Blown fuses	• Check and replace fuses if necessary.
	Spray pump is energized	• The basin heaters will not energize if any spray pump is energized.
	Low water condition	• Examine the system for a Low Water Alarm (see **Alarm Event Description**).
	Water make-up is disabled	• Ensure the water make-up has not been disabled (see **Setup Options Screen**).
	Contactor damaged	• Inspect contactor to see if it has been damaged. • Check to see if voltage is present on the output of the contactor when the contactor is energized. • Check that voltage is present on the contactor coil.
	Basin heaters not enabled	• Enable the basin heaters (see **Setup Options Screen**)
	Basin water is too warm	• Ensure the basin water temperature is below the Heater Control Temperature (see **Control Setpoints Screen**)
System Stuck in Local Mode or Off	BMS Heartbeat	• Make sure the BMS Heartbeat is disabled on the **BMS and Network Screen.** • If user wants BMS Heartbeat enabled, then check that the BMS Heartbeat bit is being changed to 0 every 30 seconds on the customer's BMS side.

Alarm Event Description

Alarm	Description	Corrective Action
100% Capacity*	All pumps and all VFD's are running at 100%.	• Notification only.
Basin Heater Contactor Fault*	The basin heater contactor failed to energize.	• Check the contactor, output wiring from the PLC to the contactor, and input wiring from the auxiliary contact to the PLC.
Basin Heaters Not Able to Energize Due to Low Water*	The water level in the basin is too low. This protects the heaters from burning out.	• Close unit drain valves. • Ensure water is flowing freely to the make-up valve. • Check and clean the wye strainer. • Ensure the make-up valve is operating. • Ensure the EWLC is operating correctly. • Inspect the EWLC standpipe for damage.
Damper Actuator Limit Switch Fault*	The damper limit switch did not close.	• Ensure the dampers are operating properly. • Disable the discharge dampers if not installed. • Check limit switch wiring.
Fan Contactor/Overcurrent Fault*	The fan motor contactor failed to energize or too much current was detected by the motor protector.	• Check the contactor, output wiring from the PLC to the contactor, and input wiring from the auxiliary contact to the PLC. • Inspect the fan motor and wiring. • Check the amperage setting on the motor protector. • Check the input wiring to the PLC.
Fan Excessive Vibration Alarm*	The vibration switch detected excessive vibration and de-energized the fan.	• Check the vibration switch and reset if necessary. • Check the fan blades and bearings. • Disable the vibration switch if not installed.
High Ambient Temperature Alarm*	The ambient temperature is above the user setpoint.	• Notification only. • Raise the high ambient temperature alarm setpoint.
High Inlet Water Temperature Alarm*	The inlet fluid temperature is above the user setpoint.	• Notification only. • Raise the high inlet water temperature alarm setpoint.
High Outlet Water Temperature Alarm*	The outlet fluid temperature is above the user setpoint.	• Notification only. • Raise the high outlet water temperature alarm setpoint.

Alarm	Description	Corrective Action
High Water Alarm*	The EWLC detected high water level in the basin.	• If this occurs after dumping the basin, this is normal and is required to ensure spray pump priming. No action required. • If this occurs after spray pump(s) turn off, this is normal. No action required. • Check make-up bypass valves and ensure they are closed. • Ensure the make-up solenoid valve is off. • Ensure the EWLC is operating correctly.
Low Ambient Temperature Alarm*	The ambient temperature is below the user setpoint.	• Notification only. • Lower the low ambient temperature alarm setpoint.
Low Basin Water Temperature Alarm*	The basin water temperature is below the user setpoint.	• Notification only. • Lower the low basin water temperature alarm setpoint. • Check if the basin heaters are operational. • If the basin is drained, but the alarm is still active, ensure the water make-up is disabled (see **Setup Options Screen**).
Low Inlet Water Temperature Alarm*	The inlet fluid temperature is below the user setpoint.	• Notification only. • Lower the low inlet water temperature alarm setpoint.
Low Outlet Water Temperature Alarm*	The outlet fluid temperature is below the user setpoint.	• Notification only. • Lower the low outlet water temperature alarm setpoint. • The cooling load is reduced if the spray pump(s) is locked on.
Low Water Level Alarm	The EWLC detected low water level in the basin.	• Close unit drain valves. • Ensure water is flowing freely to the make-up valve. • Check and clean the wye strainer. • Ensure the make-up valve is operating. • Ensure the EWLC is operating correctly. • Inspect the EWLC standpipe for damage. • If the basin is drained, but the alarm is still active, ensure the water make-up is disabled (see **Setup Options Screen**).

Alarm	Description	Corrective Action
No Pump Flow Alarm*	Water is not flowing through the riser pipe.	• Ensure water is in the basin. • Ensure there are no flow obstructions. • Bleed off excessive air in unit pipework. • Inspect the spray pump to ensure the spray pump is able to prime.
	Water is flowing through the riser pipe, but the flow switch did not detect flow.	• Check the flow switch wiring. • Disable the flow switch if not installed. • Reset the flow switch. • Ensure flow switch is in proper operating condition.
Pump Contactor/Overcurrent Fault*	The spray pump motor contactor failed to energize or there was too much current detected through the motor protector.	• Check the contactor, output wiring from the PLC to the contactor, and input wiring from the auxiliary contact to the PLC. • Inspect the spray pump motor and wiring. • Check the amperage setting on the motor protector. • Check the input wiring to the PLC
Pump Locked Out Due to Low Basin Water Temperature*	The spray pump(s) de-energized due to the basin water temperature being below the Pump Cut Out Temperature.	• Check basin heater operation. • Wait for the basin heaters to warm the basin water. This is necessary to prevent ice formation in the basin. • Check the Active Control Temperature setpoint (see **Control Setpoints Screen**). The setpoint may be unrealistic for the fluid cooler unit to maintain.
VFD Fault	The VFD has experienced a fault condition and is no longer sending a speed command to the fan motor.	• Inspect the VFD display or HMI for fault codes. • Ensure the VFD is powered. • Inspect fuses. • Check Ethernet switch and cables.
PLC and BMS System Comms. Loss: Moved to Local Mode	The system is operating in remote mode, the BMS heartbeat is enabled and “move to local control” is selected if there is a loss of comms.	• Check that the BAS heartbeat Modbus bit is set to 1 from the Sage system and the BAS system is changing it to 0 within 30 seconds. • Check that the PLC does not have a fault.
PLC and BMS System Comms. Loss: Shutdown of System	The system is operating in remote mode, the BMS heartbeat is enabled, and “shutdown of system” is selected if there is a loss of comms.	• Check that the BAS heartbeat Modbus bit is set to 1 from the Sage system and the BAS system is changing it to 0 within 30 seconds. • Check that the PLC does not have a fault.

* Indicates that the alarm may be disabled via the HMI. Please refer to the **Alarm Setup Screen** section of this document.