



# Trillium™ Adiabatic Cooler TRFS

## START-UP GUIDE



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# 1. Introduction

The Trillium™ Adiabatic Cooler TRFS should follow all guidelines and instructions outlined in the **Operation & Maintenance Manual**, which should be thoroughly reviewed prior to operation of the equipment. Keep a copy of the equipment submittal package for your unit(s) available for reference. If you do not have a copy of the submittal package, or if you need additional information about your unit(s), contact your BAC Representative whose information is on the label on the control panel door. The model and serial numbers of the unit are also located in this area.

This Start-up Guide supplements but does not substitute the **Trillium™ Adiabatic Cooler TRFS Operation & Maintenance Manual**. Both documents should be thoroughly reviewed prior to undertaking any operation, maintenance, or any other activities related to the equipment.

Before starting a unit, make sure the listed below conditions are followed:

- All rigging, piping, and electrical connections have been properly installed and tested in accordance with the **Rigging & Assembly Manual** and all applicable codes and regulations.
- The system is energized but in an OFF state, as indicated in the Home Screen header.
- There are no alarms or other system messages displayed on the Home Screen.
- The system date and time have been correctly set in accordance with the **Operation & Maintenance Manual**.
- This guide shows how to log in as a technician to access commonly used functions. Other logins with different forms of access are possible; please refer to the **Operation & Maintenance Manual** for details.
- The outside air temperature is above 45° F. The unit can be started in colder conditions with no heat load, but it may set off an alarm, which is covered in the **Operation & Maintenance Manual** as well as in the **Alarm section of this Start-up Guide**.

## 2. Safety Warnings

**⚠ DANGER** This unit must be installed in locations not accessible to the general public. Adequate safeguards (including the use of protective enclosures where necessary) should be taken with this equipment to safeguard the public from injury and to prevent property damage.

**⚠ DANGER** This unit has rotating fan equipment that can cause severe personal injury or death upon contact. Never step or walk on the fan guard. Always disconnect, lock out, and tag out all power sources to the fan motor(s) before performing any inspection or maintenance.

**⚠ DANGER** Performing work on an energized unit poses a risk of electrocution, which can cause severe personal injury, death, and/or property damage. Do not perform any service on or near the unit without first ensuring the unit is de-energized and all lockout / tagout procedures have been followed. Wait five minutes after disconnecting the voltage at all poles before opening the fan and motor assembly.

**⚠ WARNING** To prevent bodily injury or property damage, only qualified personnel should undertake the installation, operation, maintenance, and repair of this equipment. Proper care, procedures, and tools must be used in handling, lifting, installing, operating, maintaining, and repairing this equipment.

**⚠ WARNING** Do not walk on the top horizontal surface of the unit. It is not intended as a walking surface or working platform. Doing so risks falling through the surface, resulting in severe physical injury or equipment damage.

## 3. VFD Introduction

### 3.1 Danfoss VFDs

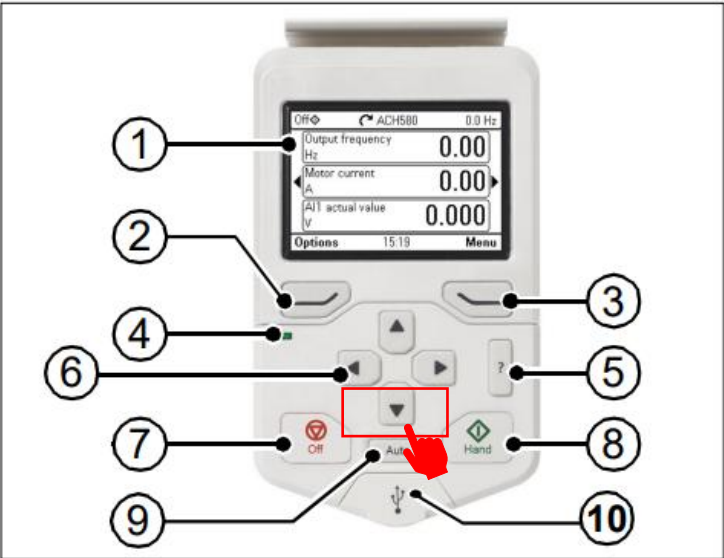
If your unit is equipped with four Danfoss brand VFDs, the main power switch should be energized and each of the four VFDs should be put in “Auto On” mode as shown in **Figure 1**. This step allows the human machine interface (HMI) to control the fans properly. For additional information on HMI, refer to **Section 4**.



Figure 1. Danfoss VFD

### 3.2 ABB VFDs

If If your unit is equipped with four ABB brand VFDs, the main power switch should be energized and each of the four VFDs should be put in “Auto” mode as shown in **Figure 2**. This step allows the human machine interface (HMI) (addressed in the next section) to control the fans properly. For additional information on HMI, refer to **Section 4**.



|   |                                                                                                                                        |
|---|----------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <a href="#">Layout of the control panel display</a>                                                                                    |
| 2 | <a href="#">Left softkey</a>                                                                                                           |
| 3 | <a href="#">Right softkey</a>                                                                                                          |
| 4 | Status LED, see chapter <i>Maintenance and hardware diagnostics</i> , section <i>LEDs</i> in the <i>Hardware manual of the drive</i> . |
| 5 | <a href="#">Help</a>                                                                                                                   |

|    |                                                                                 |
|----|---------------------------------------------------------------------------------|
| 6  | <a href="#">The arrow keys</a>                                                  |
| 7  | Off (see <a href="#">Hand</a> , <a href="#">Off</a> and <a href="#">Auto</a> )  |
| 8  | Hand (see <a href="#">Hand</a> , <a href="#">Off</a> and <a href="#">Auto</a> ) |
| 9  | Auto (see <a href="#">Hand</a> , <a href="#">Off</a> and <a href="#">Auto</a> ) |
| 10 | USB connector                                                                   |

Figure 2. ABB VFD

## 4. Home Screen Navigation, Logging In, and Adjusting LFT Setpoint

### 4.1 Home Screen Overview

The human machine interface (HMI) displays the Home screen when the system is powered on. The Home screen is the basic command instruction center for the equipment, refer to **Figure 3**. The Home screen displays such equipment information as Leaving Fluid Temperature (LFT), Leaving Fluid Temperature Setpoint, Control Status, Feedback, and System Messages.



Figure 3. HMI Screen

### 4.2 Technician-level Login

1. To log in as a "Technician," press Login, located in the upper right corner of the Home screen shown in **Figure 4**.



Figure 4. Login Button Location

2. **Figure 5** shows the login screen. Enter TECH as the username and 4734 for the password and press Login.



Figure 5. Technician-level Login

3. On the Home screen, verify that the user identified in the screen header is now Technician and the Logout button appears in the upper right corner of the Home screen as shown in **Figure 6**.



*Figure 6. Home Screen After Login*

4. If no heat load is present, verify that the Leaving Fluid Temp and the Outside Air Temp readings are the same. If they are different, double check the leaving fluid temperature sensor and the outdoor air temperature sensors on the equipment. Refer to the **Operations & Maintenance Manual** for more information.
5. Verify that:
  - the System status showing the screen header shows as OFF
  - Average Fan Speed is 0%
  - Control State is OFF
  - Fan Command is 0%
6. Take note of the Leaving Fluid Temp Setpoint. Instructions for adjusting this value to activate the fans are provided in **Section 4.3** below.

### 4.3 Adjusting Leaving Fluid Temp Setpoint

The Leaving Fluid Temperature (LFT) Setpoint functions like the temperature setpoint of a home HVAC thermostat. When the LFT value is above the LFT Setpoint value, the fans will turn on and the fan speed will ramp up. If the LFT is below the LFT Setpoint, the fans will turn off.

Set the LFT Setpoint to the value indicated in the submittal package for your unit(s). This section shows how to adjust this value.

1. Press SETPOINTS on the Main Menu at the bottom of the screen. The screen shown in **Figure 7**. LFT Setpoint will appear.

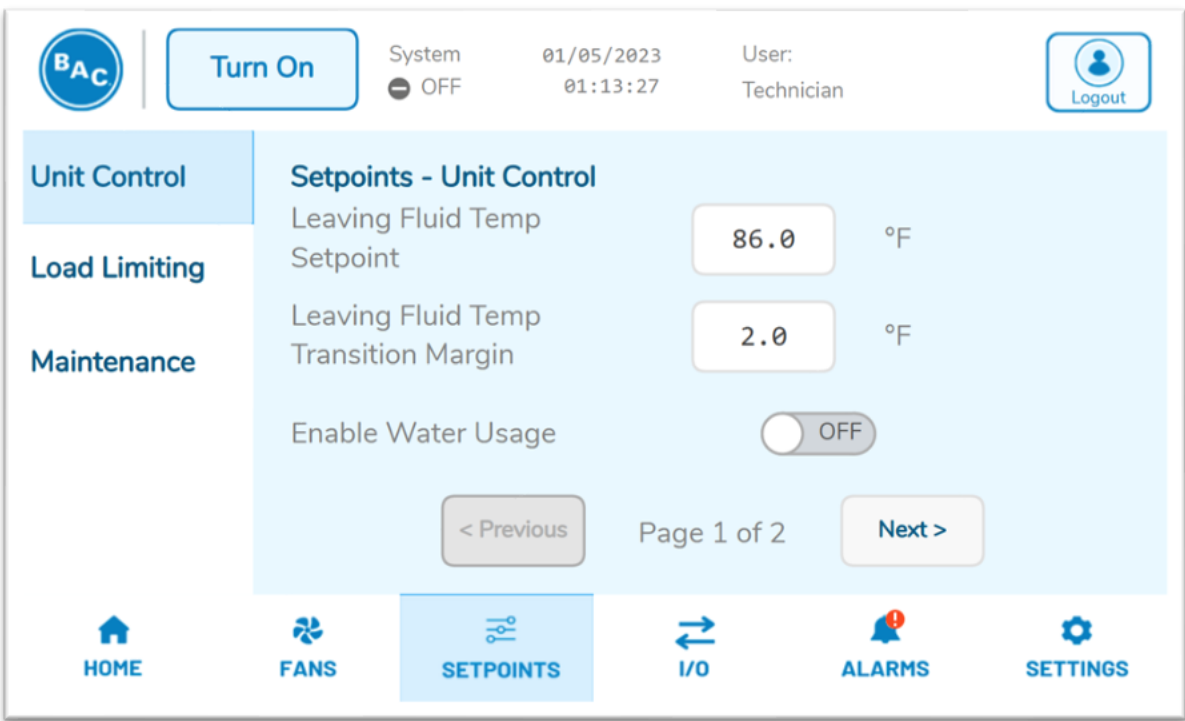


Figure 7. LFT Setpoint

2. Press the white box to the right of Leaving Fluid Temp Setpoint and a numeric keypad will appear on the left side of the screen as shown in **Figure 8**. You may select a value between 40.0° F and 122.0° F. If you do not wish to change the setting, press Close at the top of the numeric keypad.

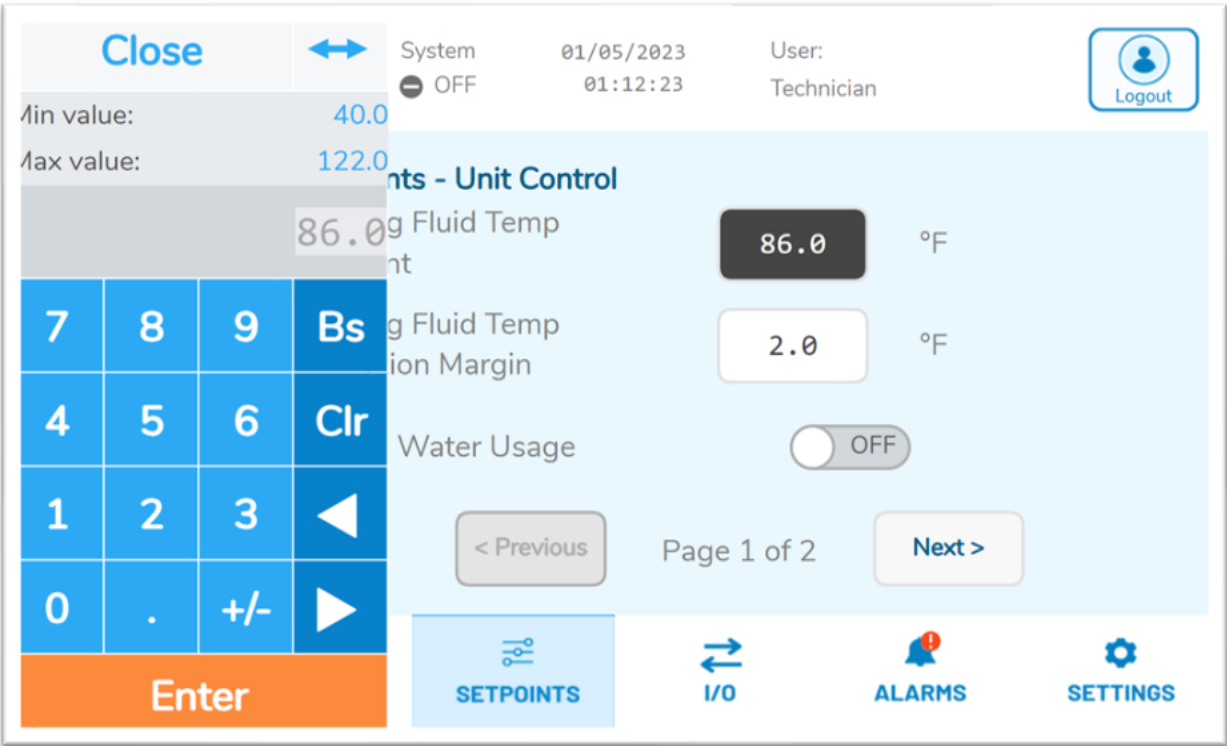


Figure 8. Numeric Pad

### 4.4 Enabling Water Usage

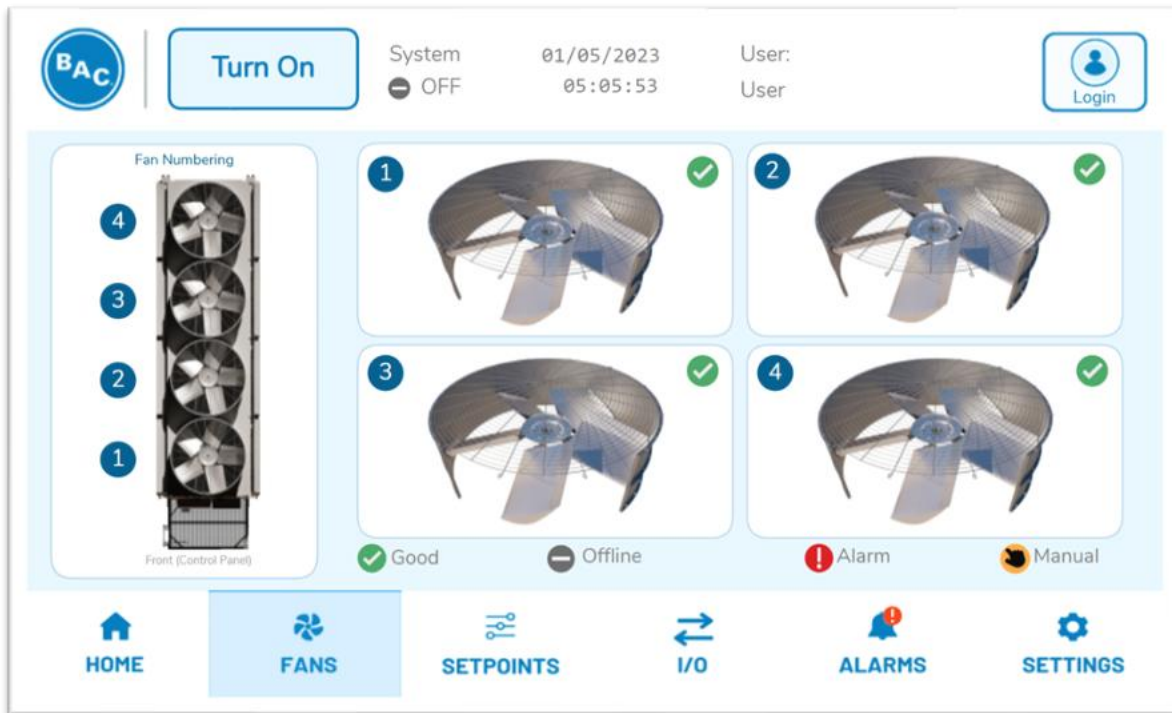
To use the wet mode of the unit, ensure that the Water Usage (see [Figure 7](#)) is set to “ON”. By default, this setting is “OFF.”

## 5. Additional Menu Controls

This Section covers the options available in the FANS and I/O (Input/Output) menus. For more details about other menus and sub-menus, refer to the **Operation & Maintenance Manual**.

### 5.1 Fans Menu

The Fans menu in **Figure 9** allows the user to check on the status of each fan.



*Figure 9. Fans Menu*

Clicking on the Fan Numbering graphic on the left side of the FANS screen will access the All Fans - Overview page (see **Figure 10**) which displays the average Fan Command along with the Average Fan Speed.

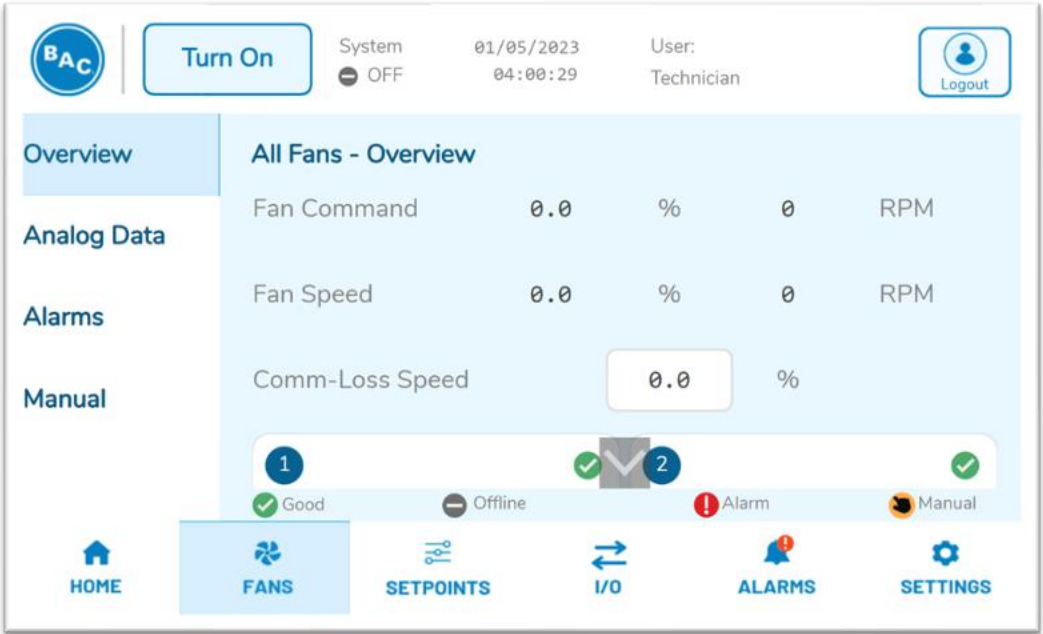


Figure 10. All Fans Overview Menu

Navigating to the “Manual” tab as shown in **Figure 11** and **Figure 12** allows the user to command the fans manually. By default, all fans are set to “Auto,” and their operation is controlled by the PLC’s logic. Setting a fan to “Manual” commands the fan according to its respective “Manual Setpoint” input on this page, where setting a fan to “Off” turns the fan off.

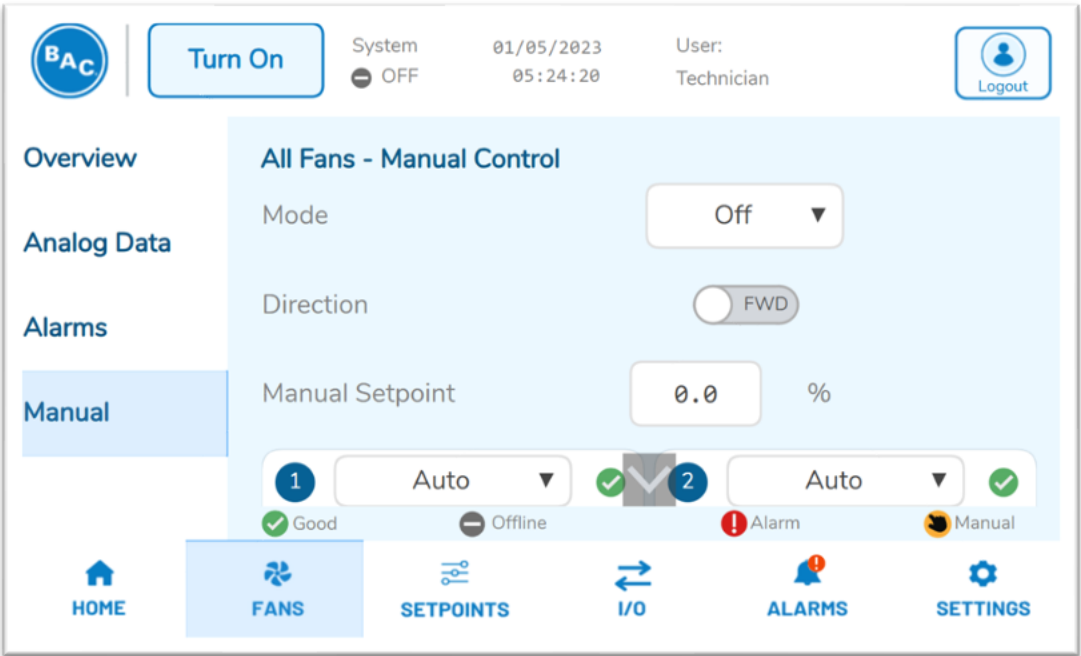


Figure 11. All Fans Menu – Manual Tab

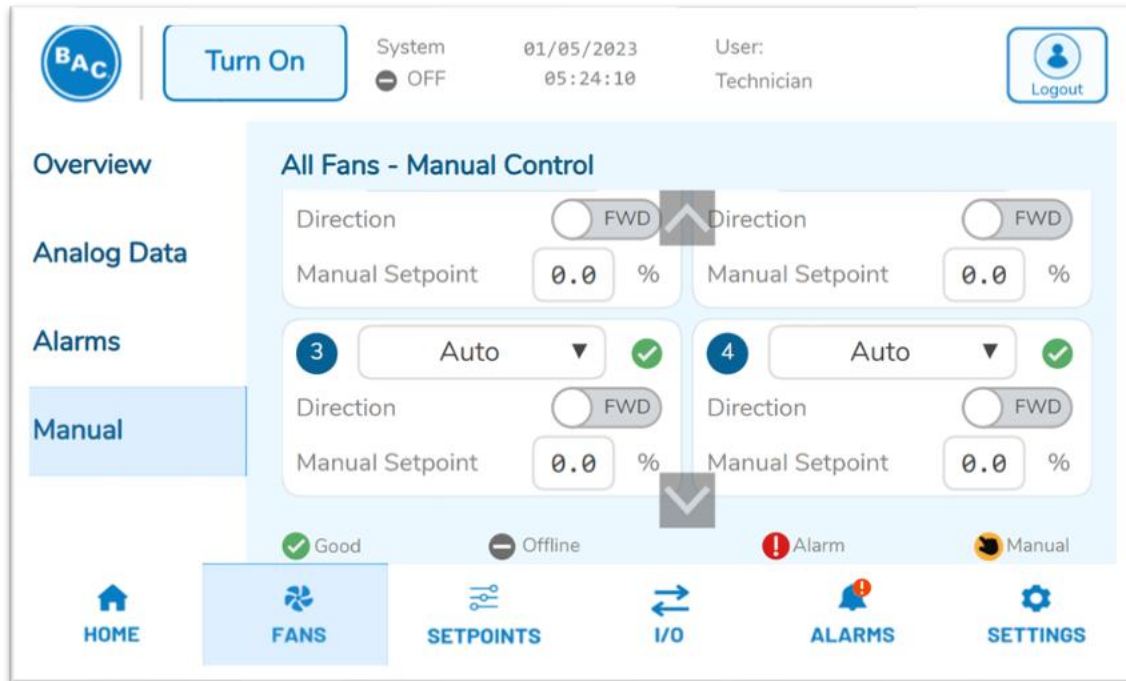


Figure 12. All Fans Menu – Manual Tab (continued)

## 5.2 I/O (Input/Output) Menu

The I/O menu has several submenus. This section will address the principal ones. For detailed information on each submenu, please refer to the **Inputs & Outputs Section** of the **Operation & Maintenance Manual**.

**Overview** – This screen shown in **Figure 13** displays the following parameters:

- Leaving Fluid Temperature
- Outside Air Temperature
- Relative Humidity

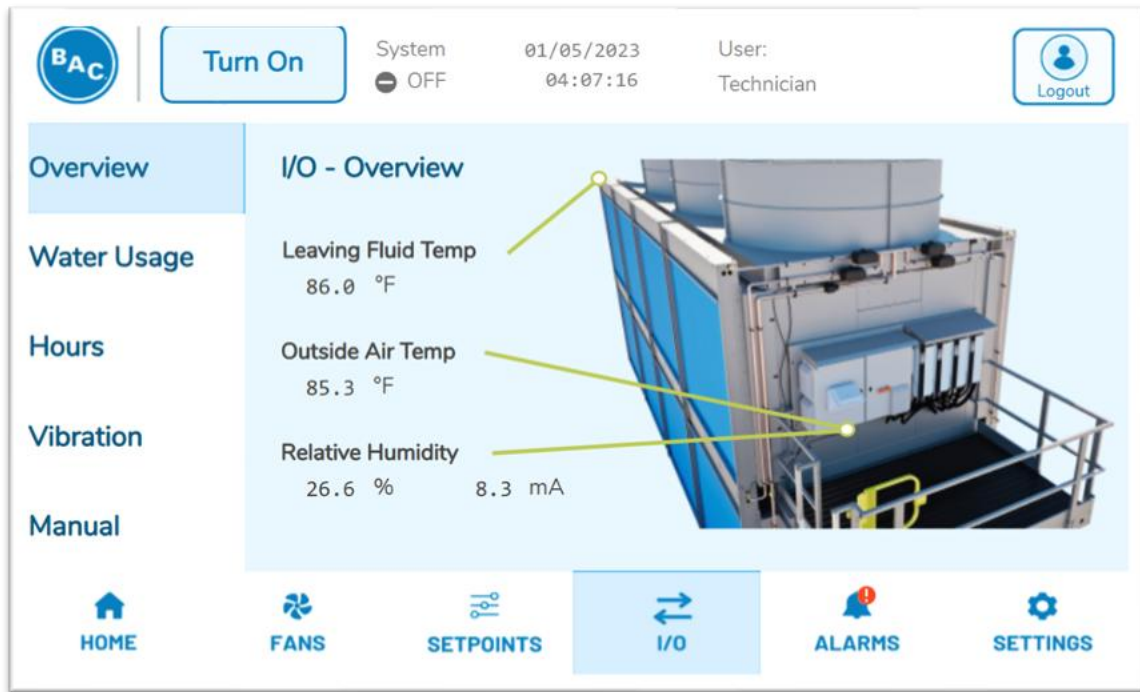


Figure 13. I/O Overview

**Water Usage** – This screen shown in **Figure 14** and **Figure 15** Figure 13 displays the following:

- The status of the water supply valve
- the status of the drain valve command
- the reading of the main flow sensor
- the reading of the distribution flow sensor
- the current estimate of the evaporation rate
- the target flow rate
- the command and feedback signals of the four proportional valves

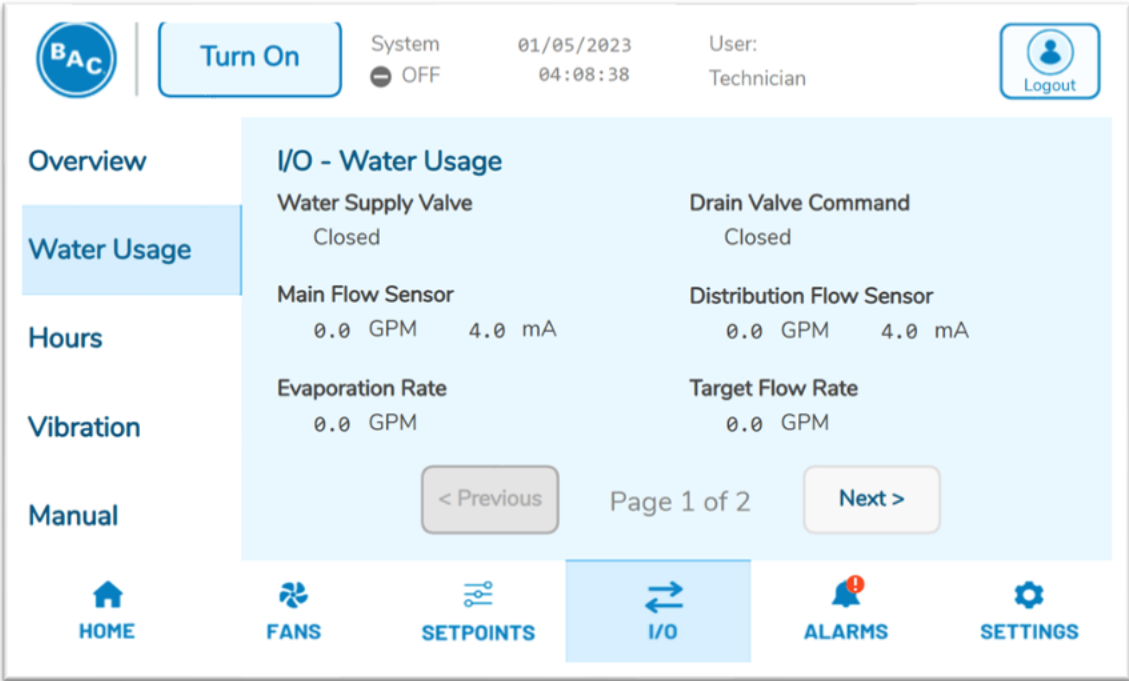


Figure 14. Water Usage Parameters

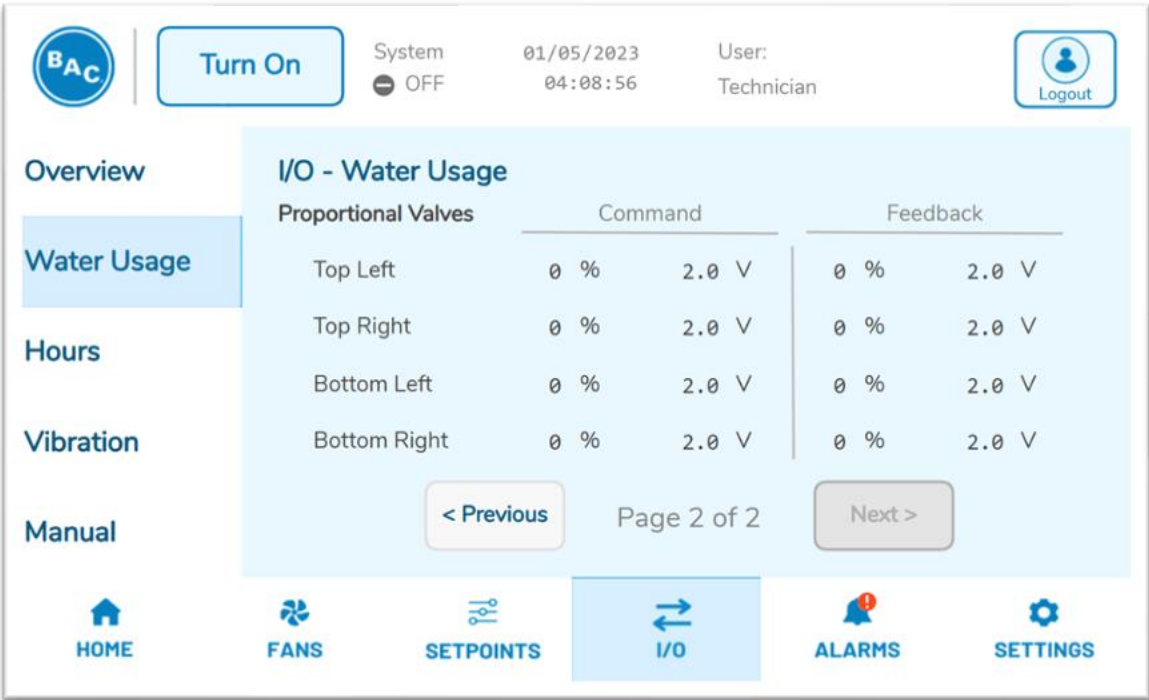


Figure 15. Water Usage Parameters (continued)

**Hours** – This screen shown in **Figure 16** and **Figure 17** displays how many hours each device has on it. For fans, these hours are counted since installation and start up. For the rest of the devices, the hours are counted since the last “Reset”.

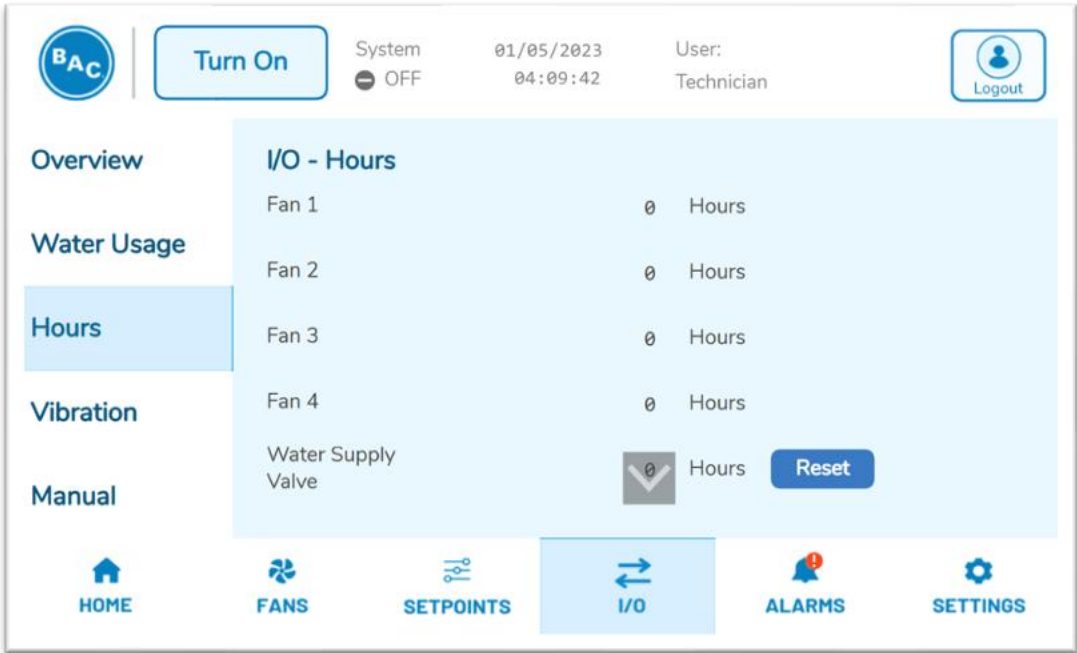


Figure 16. Device hours in Operation

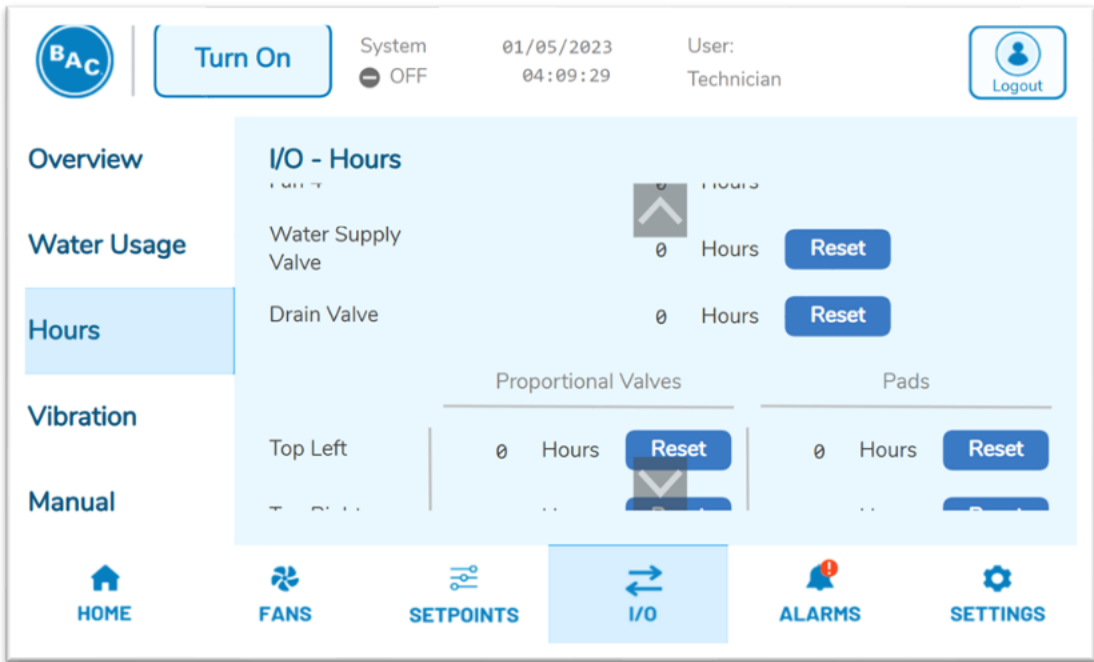


Figure 17. Device hours in Operation (continued)

**Vibration** – This screen in **Figure 18** shows each individual fan’s vibration as detected by the electronic vibration cutout switch (EVCOS).

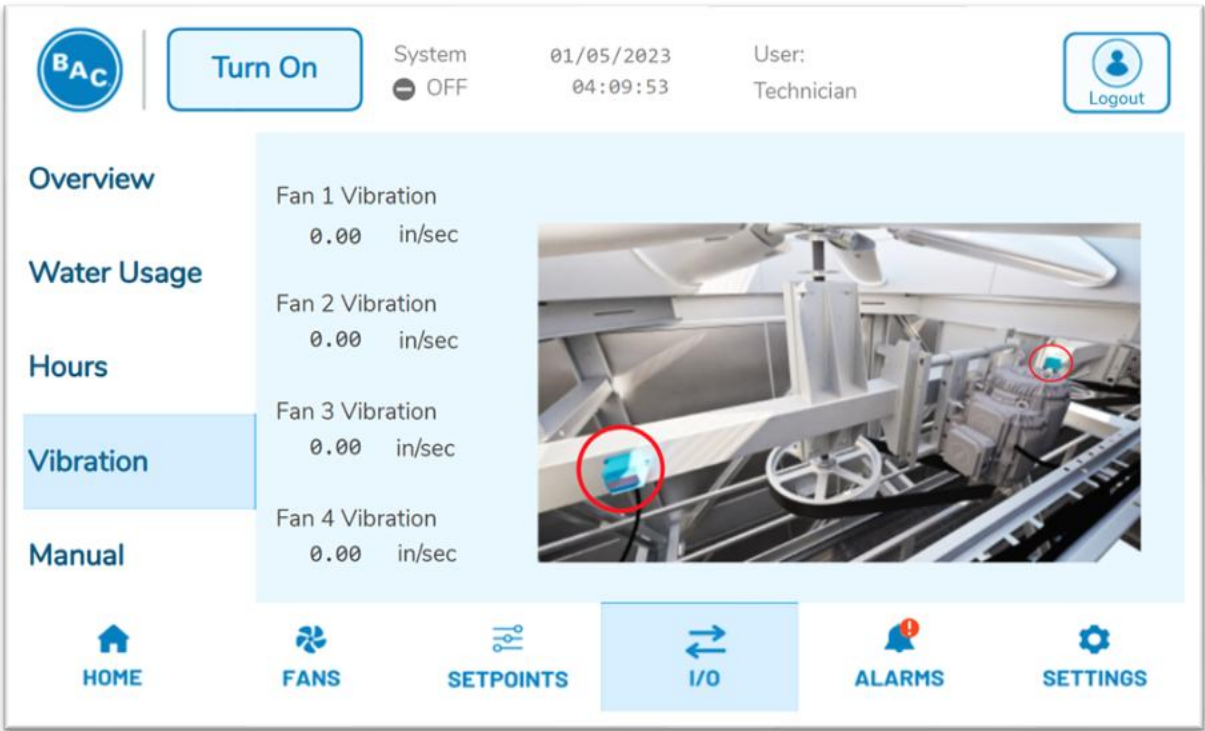


Figure 18. Vibration Parameters

**Manual** – This tab in **Figure 19** and **Figure 20** is used to switch the various outputs of the PLC between “Manual”, “Off,” and “Auto” control. By default, all outputs are set to “Auto,” such that their operation is controlled by the PLC’s logic. Setting an output to “Manual” will command the output according its respective “Command” input on this page, where setting an output to “Off” will turn the output off (in terms of valves, “Off” generally means “Closed”).

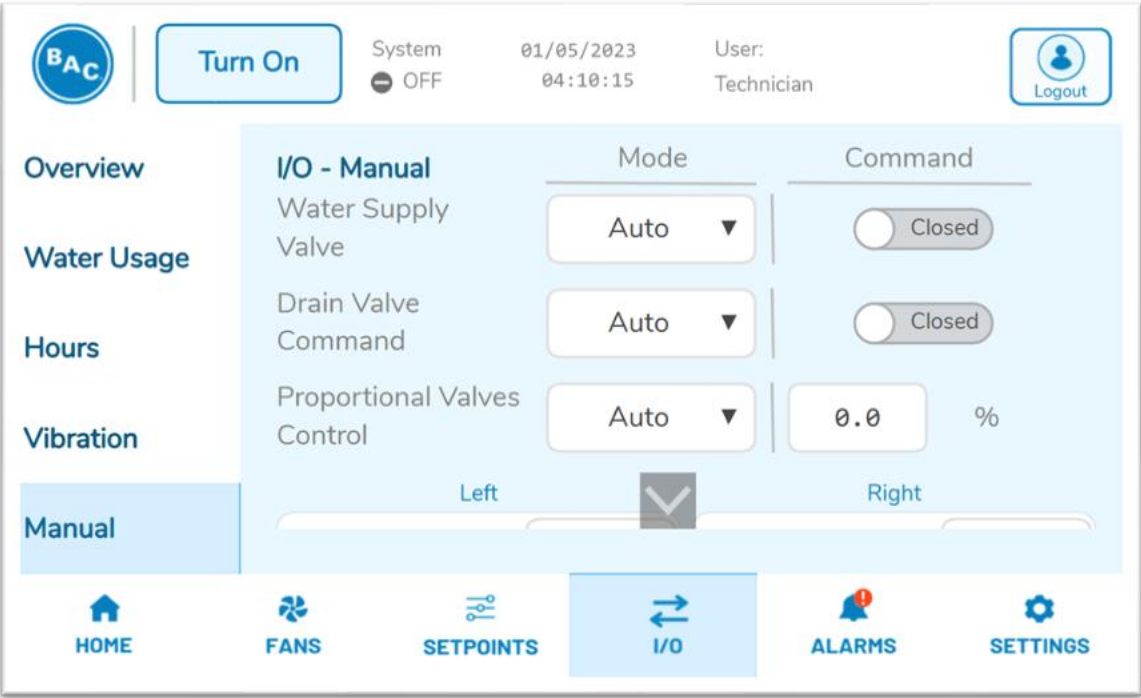


Figure 19. Manual Parameters

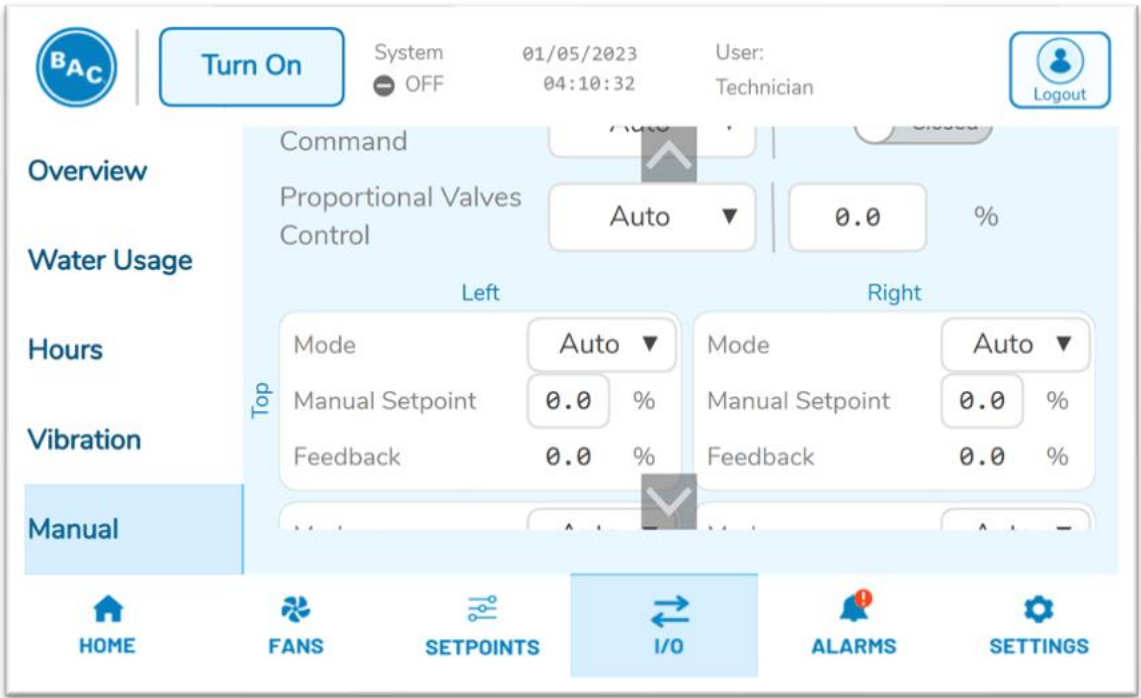


Figure 20. Manual Parameters (continued)

# 6. Alarms Overview

This section reviews general alarm functionality. For information about all other alarms, please refer to the **Alarms Section** of the **Operation & Maintenance Manual**.

The Alarms menu is accessed by pressing the Alarms icon at the bottom of the screen as shown in **Figure 21**). When the toggle switch to the upper left of the screen is set to “Active,” this screen will show alarms that are currently active. If the toggle switch is instead set to “Log”, then the screen will show both active and historic alarms.

## 6.1 Active Alarms

When there are one or more active alarms and the toggle is set to “Active,” the Alarm log will display the current alarms as shown in **Figure 21**.

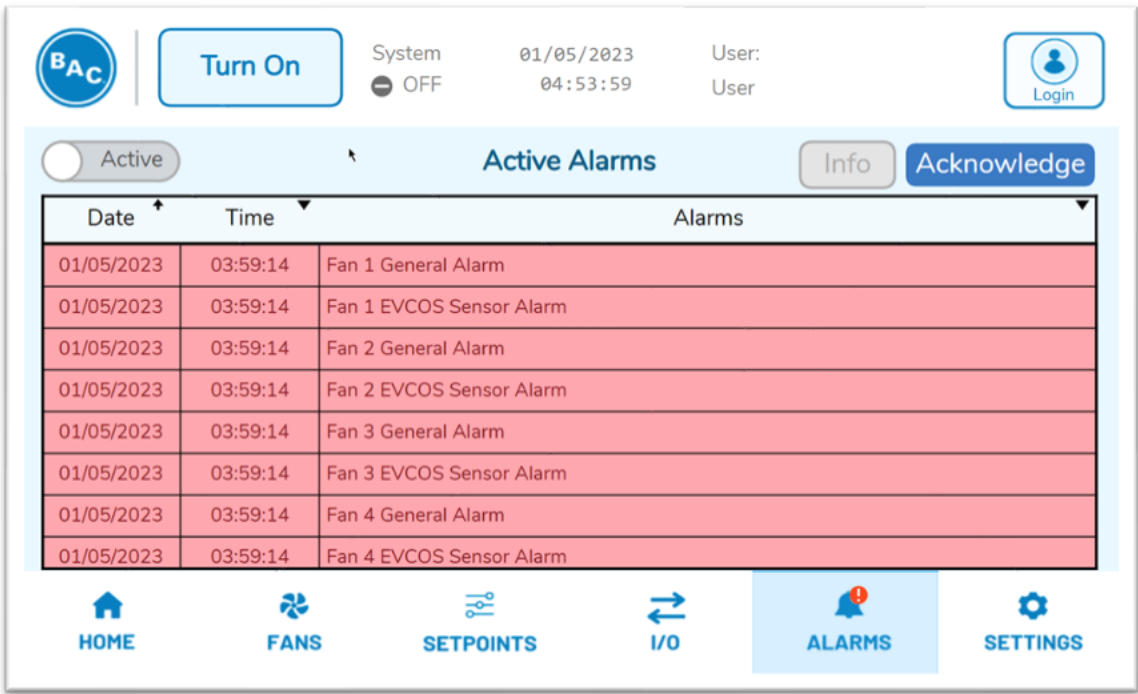


Figure 21. Active Alarms

Clicking on an alarm item unlocks the “Info” button at the top right of the Alarms menu, refer to **Figure 22**. Note that this feature is not implemented for fan alarms as these are determined by the drives and information on these should be viewed through the drive manufacturer’s documentation.

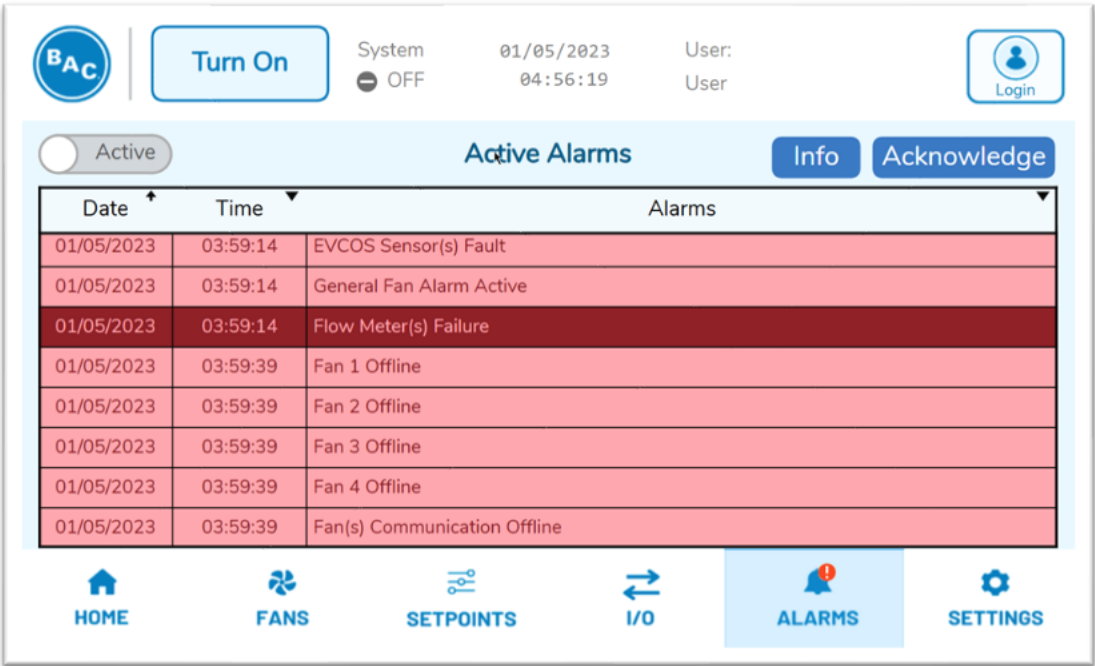


Figure 22. Alarm Info

Once the Info button has been pressed, the user can navigate to either the “Trigger,” “Release,” or “Troubleshooting” sections as shown in **Figure 23 - Figure 25** to determine what caused the alarm, how to clear the alarm, and troubleshooting recommendations.

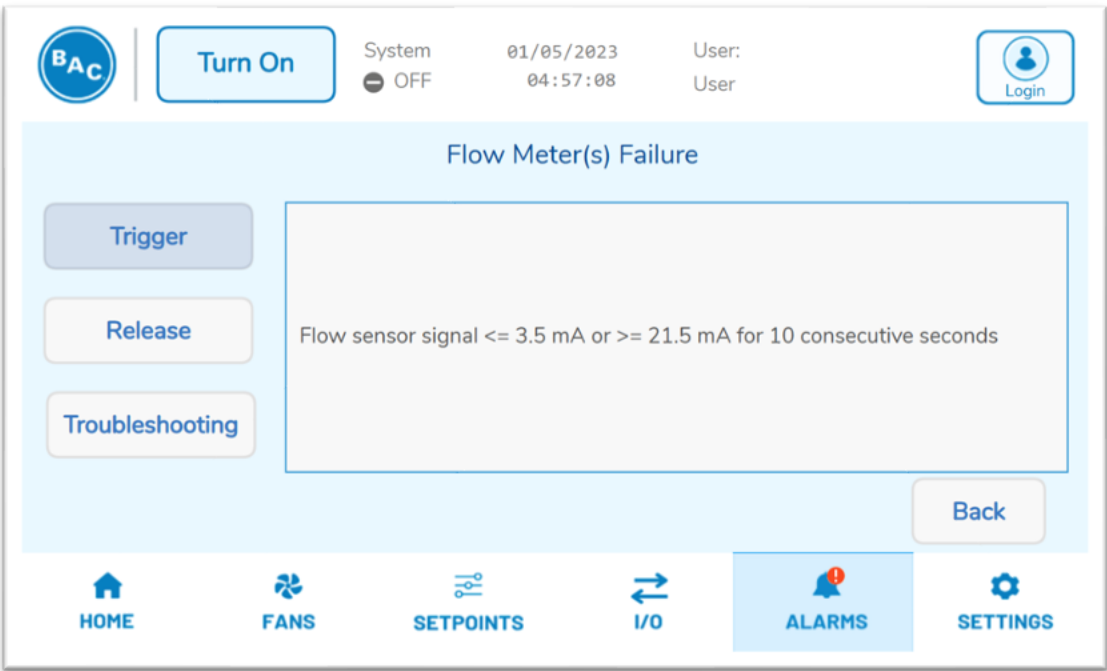


Figure 23. Alarm Trigger

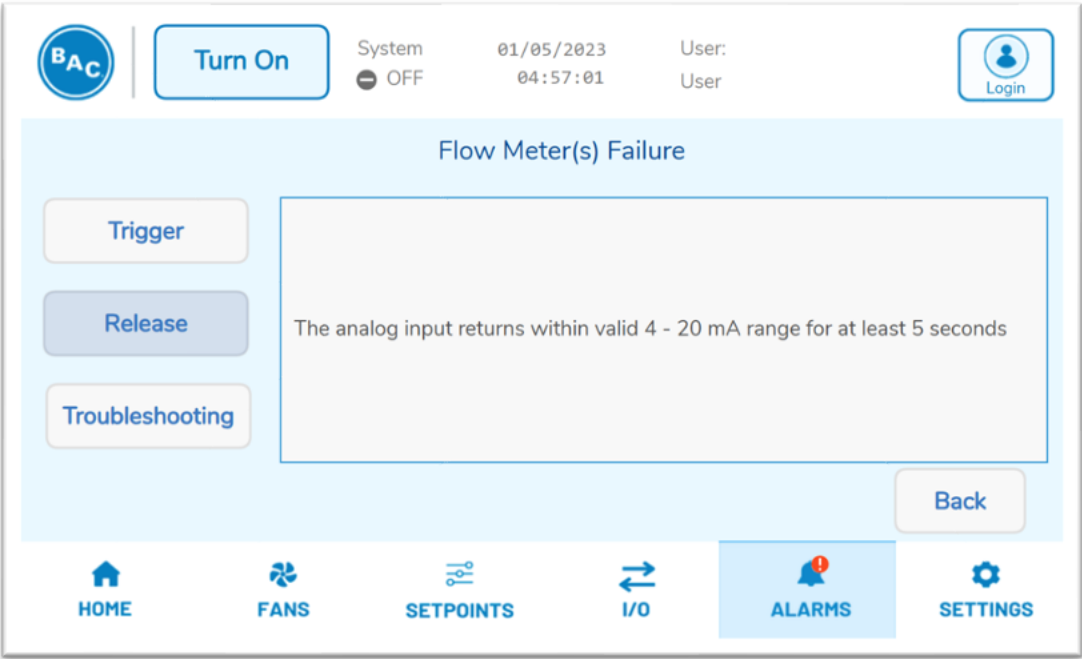


Figure 24. Alarm Release

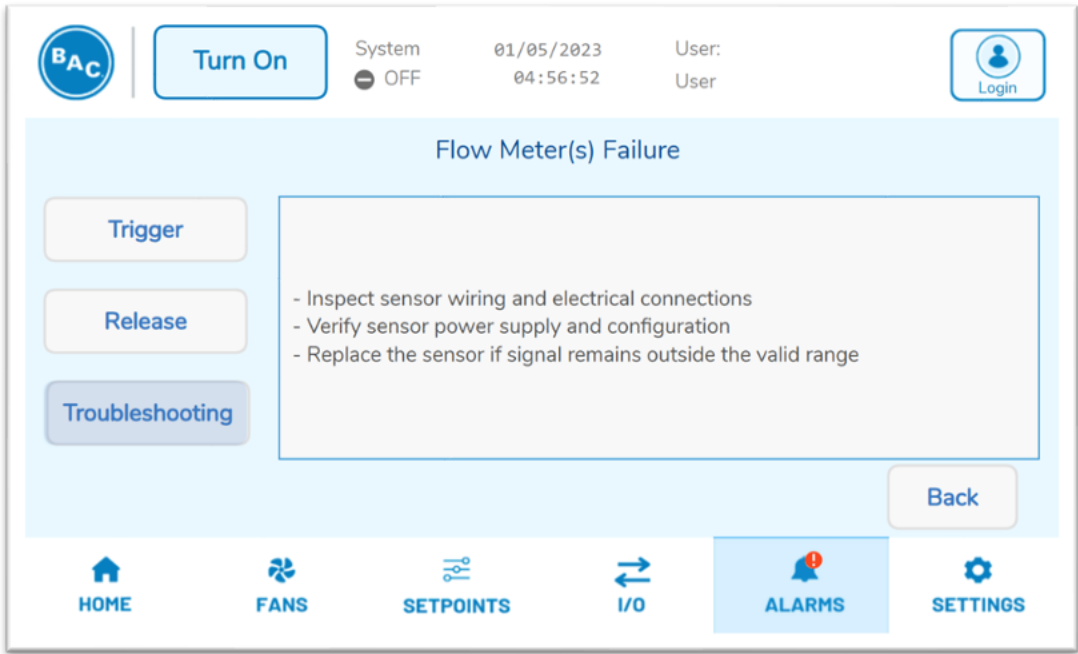


Figure 25. Alarm Troubleshooting

For additional information about the controls operation, refer to the **Trillium™ Adiabatic Cooler TRFS Controls Manual**.

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