



# TrilliumSeries® Dry Cooler - TDFS

Startup Guide



TrilliumSeries® Dry Cooler - TDFS should be operated and maintained according to 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.

## Introduction and Assumptions

This Startup Guide supplements and is not a substitute for the TrilliumSeries Dry Cooler – TDFS [Operation & Maintenance Manual](#). Both documents should be thoroughly reviewed prior to undertaking any operation, maintenance, or any other activities related to the equipment.

The instructions in this Startup Guide are based on the following assumptions and operating conditions:

- 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.

## Safety Warnings

**⚠ 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. 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** 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.

# Powering On System and Fan Testing

## 1. Initial VFD Power On

If your unit is equipped with four (4) Danfoss VFDs, the main power switch should be energized and each of the four (4) VFDs should be put in "Auto On" mode (illustrated in the figure below). This step allows the human machine interface (addressed in the next section) to control the fans properly.



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

### A. Home Screen Overview

The human machine interface Home screen will appear when the system is powered on.

The Home screen is the basic command instruction center for the equipment. A graphical representation is shown below. The Home screen displays such equipment information as Leaving Fluid Temperature (LFT), Leaving Fluid Temperature Setpoint, Control Status, Feedback, and System Messages.

### Home Screen

The Home Screen interface displays the following information:

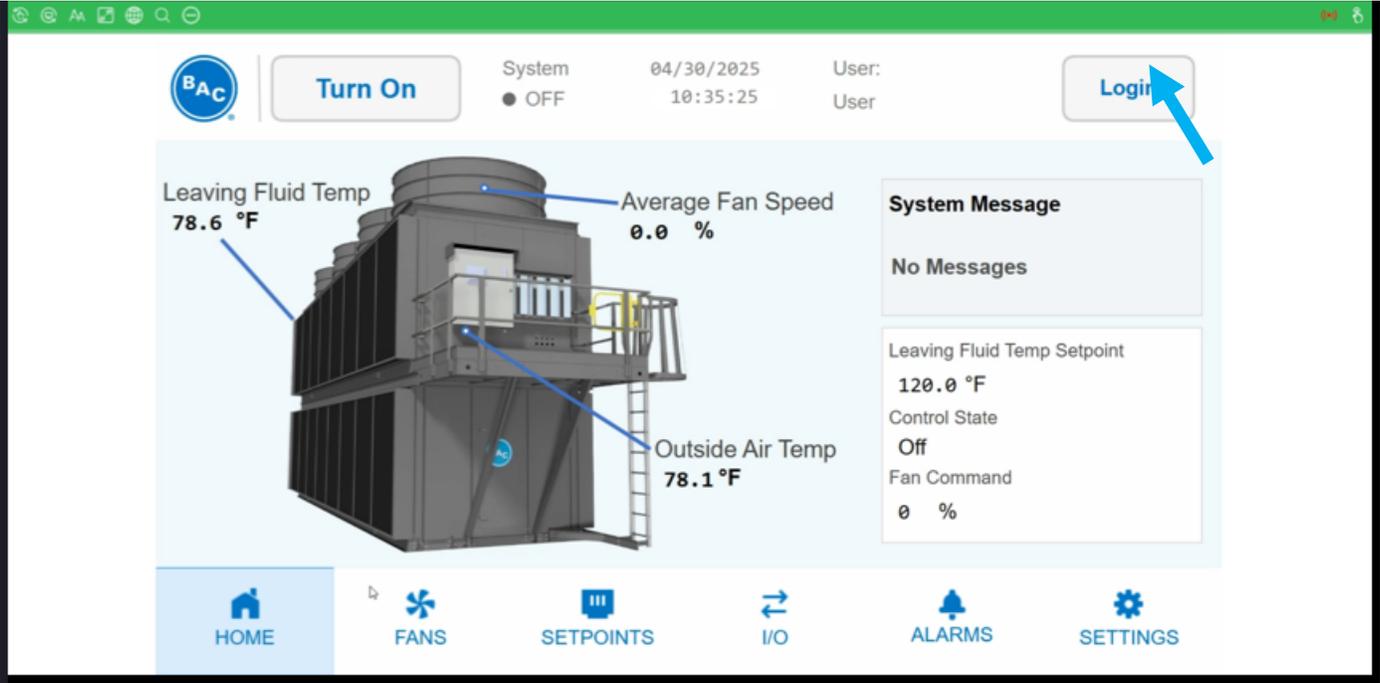
- Header:** Turn On, System OFF, 11/21/2024 16:36:26, User: User, Login
- Leaving Fluid Temp:** 0.0 °C
- Average Fan Speed:** 0.0 %
- System Message:** No Messages
- Control Status:** Leaving Fluid Temp Setpoint 0.0 °C, Control State Undefined, Fan Command 0 %
- Main Menu:** HOME, FANS, SETPOINTS, I/O, ALARMS, SETTINGS



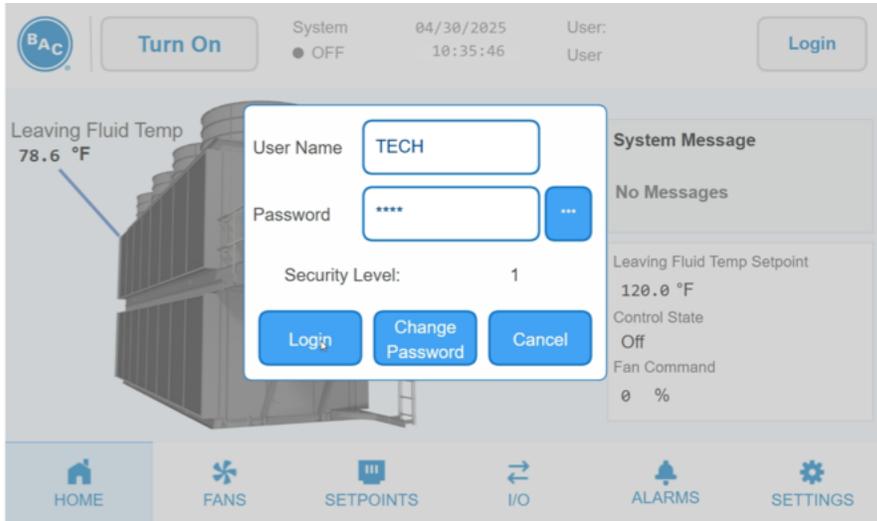
85

## B. Logging In as a Technician

1. To log in as a “Technician,” press Login, located in the upper right corner of the Home screen (indicated by the arrow below). Other forms of access besides Technician are available; refer to the Operation & Maintenance Manual for details.



- When the pop-up box (illustrated below) appears, enter TECH as the User Name and 7434 for the Password. Then, press Login located at the bottom left of the pop-up box.



- 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. See the screenshot example below.
- If no heat load is present, verify that the Leaving Fluid Temp and the Outside Air Temp readings are similar. 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. In the screenshot example below, both values are approximately 78° F.
- Verify that (a) the System status showing the screen header shows as OFF, (b) Average Fan Speed is 0%, (c) Control State is Off, and (d) Fan Command is 0%.
- Take note of the Leaving Fluid Temp Setpoint. Instructions for adjusting this value to activate the fans are provided in the next section.

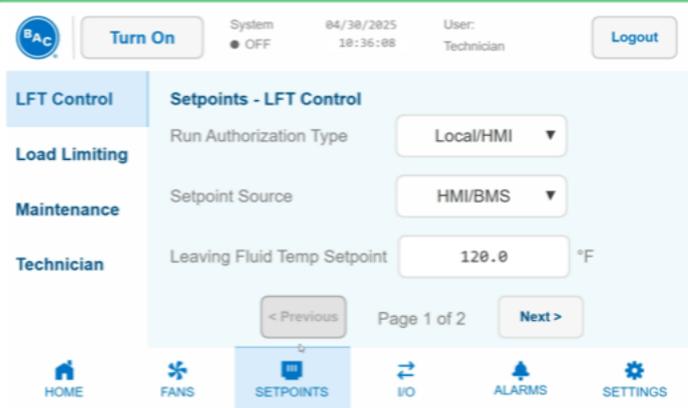


### C. Adjusting Leaving Fluid Temp Setpoint

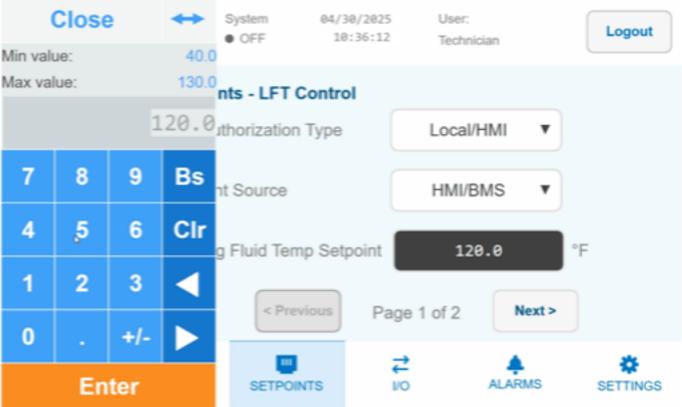
The Leaving Fluid Temperature (LFT) Setpoint functions like the temperature set point of a home HVAC thermostat. When the LFT value is above the LFT Setpoint value, the fans will turn on and the fan speed will ramp up. If the LFT is below the LFT Setpoint, the fans will turn off.

In the following example, we adjust the LFT Setpoint artificially low to force the fans to turn on for testing purposes. After testing is complete, set the LFT Setpoint to the value indicated in the Submittal Documents for your unit(s).

- 1. Press SETPOINTS on the Main Menu at the bottom of the screen. The following screen will appear:

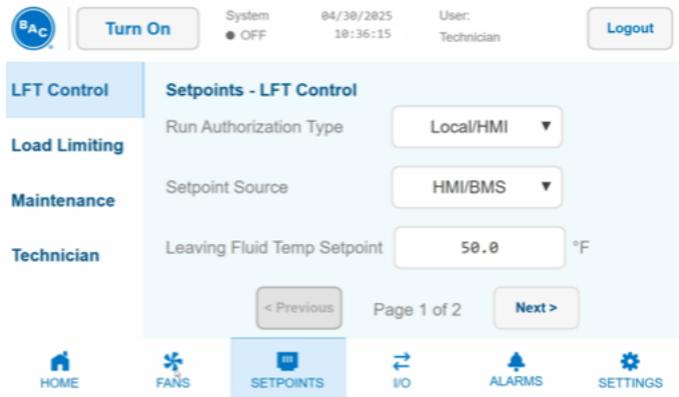


- 2. Press the white box to the right of Leaving Fluid Temp Setpoint and a numeric keypad will appear on the left side of the screen. In this example, the current setting of 120.0 F° will be changed. You may select a value between 40.0° F and 130.0° F. If you do not wish to change the setting, press Close at the top of the numeric keypad.



- 3. In this example, we will set the Leaving Fluid Temp Setpoint to 50.0° F. Press 5, then 0 on the numeric keypad. You may enter a decimal point and values to the right of the decimal point if desired. When finished entering the desired LFT Setpoint value, press Enter (in orange at the bottom of the numeric keypad).

- The keypad will disappear, and you'll see the newly set LFT Setpoint value (in this example, 50.0° F).



### 3. Turning Fans On and Off

The fans have various operational capabilities that are fully described in the Operation & Maintenance Manual. For simplicity, this section covers the steps to turn on all four (4) fans simultaneously to 100% forward capacity and then to turn off all four (4) fans simultaneously. For individual fan control, Night Quiet Mode, Reverse, and Coil Cleaning Modes, please refer to the Operation & Maintenance Manual.

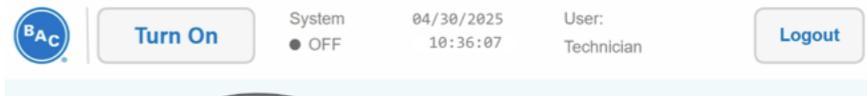
#### A. Turning On All 4 Fans Simultaneously

In the example we used in Section 2, the LFT Setpoint is 50.0° F, and the LFT is 78.3° F. When the LFT Setpoint is at a value below the LFT, the unit will turn on all 4 fans, ramping up to 100% speed to cool the cooling water to the LFT Setpoint. Once the cooling water reaches the LFT Setpoint, the fans will ramp down and eventually turn off completely—to 0% speed.

1. From the Home screen, confirm the LFT Setpoint value is lower than that of the LFT. Confirm that System indicator shows OFF (as displayed below).



2. Press the Turn On button on the upper left side of the Home screen (as displayed below).



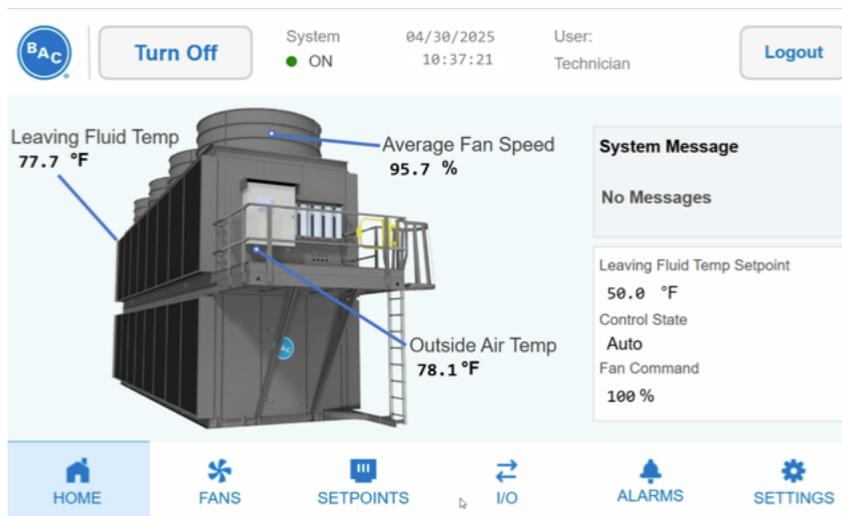
3. The text on the Turn On button will change to Turn Off and the System indicator will switch to ON with a green dot next to it (as displayed below).



4. All four (4) fans in the unit will turn on, ramping up to 100% speed. Each fan may not start at exactly the same time as the others. It may take a fan approximately 45 seconds to ramp up from

a dead stop to 100% speed. On the Home screen, you will see the Average Fan Speed value slowly increase from 0.0% to a value slightly below the maximum fan speed setting which is set by the equipment.

When the Fan Command is set to 100%, the Average Fan Speed may run a few percentage points below that value, which is normal and not a defect. In the example below, the Average Fan Speed ran up to 95.7%.



## B. Turning Off All 4 Fans Simultaneously

There are two options for turning off all four (4) fans simultaneously; both are essentially the reverse of the instructions in Section 3A.

### Option 1:

1. Press the Turn Off button on the upper left of the Home screen header.
2. The text on the Turn Off button will change to Turn On and the System indicator will turn to OFF with a gray dot next to it (as displayed below).

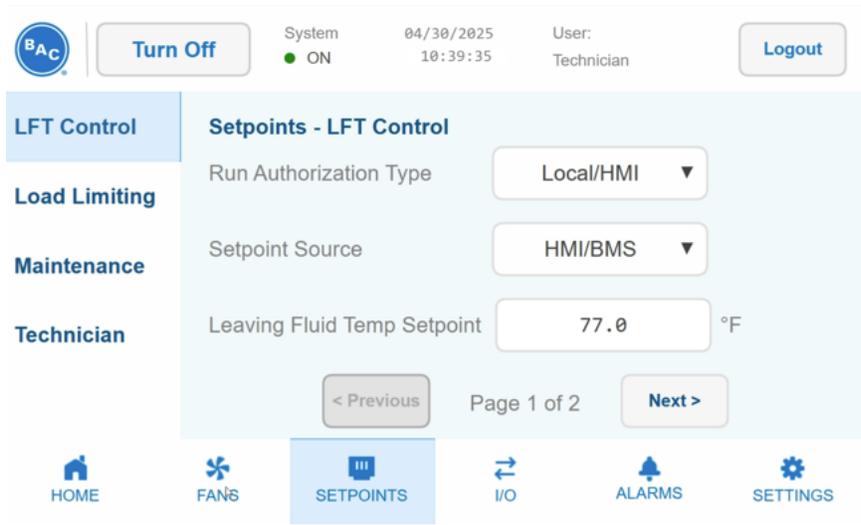
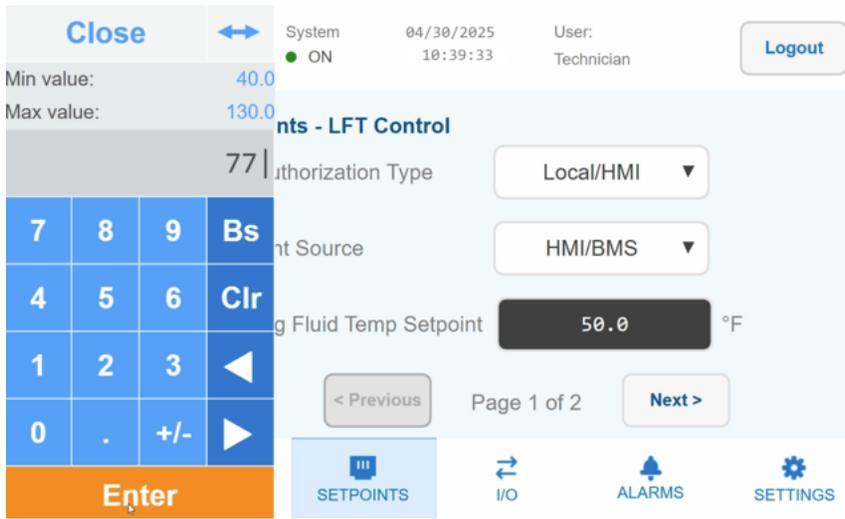


3. The fans will slowly ramp down. It may take about 30 seconds for the fans to go from 100% speed to a complete stop.

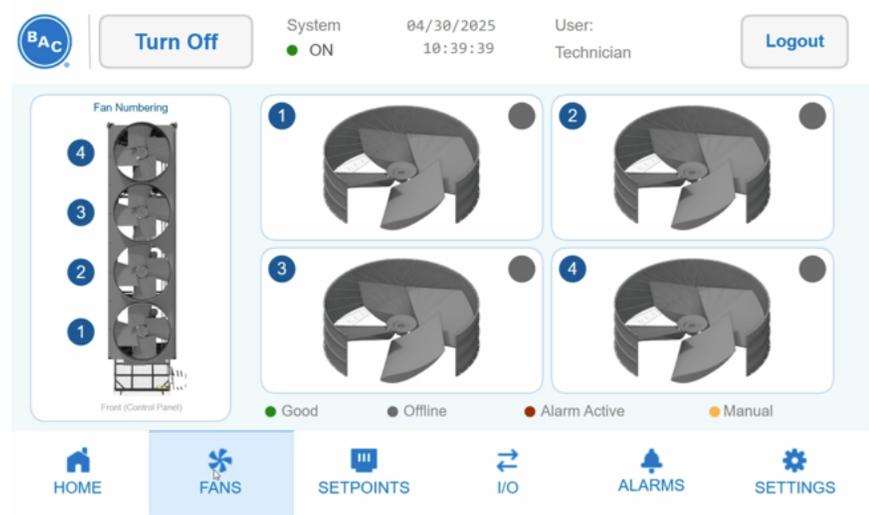
### Option 2:

1. Press the SETPOINTS button at the bottom of the Main Menu.
2. Adjust the LFT Setpoint to a temperature equal to or above the LFT.

In the example below, the LFT value is 77.7° F (from the screenshot in Section 3A4 above), and we have adjusted the LFT Setpoint from 55.0° F up to 77.0° F. Because 77.7° F is greater than 77.0° F, the fans will shut off.



3. It may take about 30 seconds for the fans to go from 100% to a complete stop. To witness the fan speed decreases, select FANS from the Main Menu at the bottom of the Home screen (as displayed below). Refer to Section 4 for more information about the FANS menu.



## 4. 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.

### A. Fans Menu

The FANS menu allows the user to check on the status of each fan. Clicking on the Fan Numbering graphic on the left side of the FANS screen (top graphic) will access the Overview page (bottom graphic).

The top screenshot shows the 'Fans' menu interface. At the top, there is a 'Turn Off' button, system status 'ON', date '04/30/2025', time '10:39:14', and user 'Technician'. Below this is a 'Fan Numbering' diagram on the left and four fan status cards (1-4) on the right. Each card shows a fan icon and a green status indicator. A legend at the bottom indicates: Green dot = Good, Grey dot = Offline, Red dot = Alarm Active, Orange dot = Manual. The bottom navigation bar includes HOME, FANS, SETPOINTS, I/O, ALARMS, and SETTINGS.

The bottom screenshot shows the 'All Fans - Overview' table. The left sidebar has 'Overview' selected. The table has the following data:

Parameter	Value	Unit
Fan Command	100.0	%
Fan Speed	95.7	%
Maximum Speed	0	%
Comm-Loss Speed	0	%
Comms Timeout	25.0	Sec

The bottom navigation bar is the same as in the top screenshot.

If the fans are ramping up or down, Fan Command will display the fans' speed setting and Fan Speed will show the fans' actual speed percentage and RPM. In the example below, the fans are ramping up. Note that the Fan Command is at 100% and 362 RPM, and Fan Speed is at 50.3% and 181 RPM.

BACnet Logo | **Turn Off** | System: ON | 04/30/2025 10:36:42 | User: Technician | **Logout**

Section	Parameter	Value	Unit
All Fans - Overview	Fan Command	100.0	% 362 RPM
	Fan Speed	50.3	% 181 RPM
Alarms	Maximum Speed	100	%
Manual	Comm-Loss Speed	0	%
Manual	Comms Timeout	25.0	Sec

Navigation: HOME | **FANS** | SETPOINTS | I/O | ALARMS | SETTINGS

In the example below, the fans are ramping down. Note that the Fan Command is at 0% and 0 RPMs and Fan Speed is at 72.5% and 262 RPM.

BACnet Logo | **Turn Off** | System: ON | 04/30/2025 10:39:43 | User: Technician | **Logout**

Section	Parameter	Value	Unit
All Fans - Overview	Fan Command	0.0	% 0 RPM
	Fan Speed	72.5	% 262 RPM
Alarms	Maximum Speed	100	%
Manual	Comm-Loss Speed	0	%
Manual	Comms Timeout	25.0	Sec

Navigation: HOME | **FANS** | SETPOINTS | I/O | ALARMS | SETTINGS

If the System status is ON and the LFT Setpoint is only slightly lower than the LFT (i.e., ~3° F or less), the fans will operate at a reduced percentage capacity. In the example below (top graphic), the LFT Setpoint is 75.0° F, and the LFT is 77.7° F – a difference of less than 3° F. The fans are running at a Fan Speed of 18.7% and 67 RPM (bottom graphic)



Turn Off

System  
● ON

04/30/2025  
10:40:07

User:  
Technician

Logout

LFT Control

Setpoints - LFT Control

Run Authorization Type Local/HMI

Setpoint Source HMI/BMS

Leaving Fluid Temp Setpoint 75.0 °F

< Previous

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Next >

HOME

FANS

SETPOINTS

I/O

ALARMS

SETTINGS



Turn Off

System  
● ON

04/30/2025  
10:41:02

User:  
Technician

Logout

Overview

All Fans - Overview

Fan Command 19.4 % 70 RPM

Fan Speed 18.7 % 67 RPM

Alarms

Maximum Speed 100 %

Manual

Comm-Loss Speed 0 %

Comms Timeout 25.0 Sec

HOME

FANS

SETPOINTS

I/O

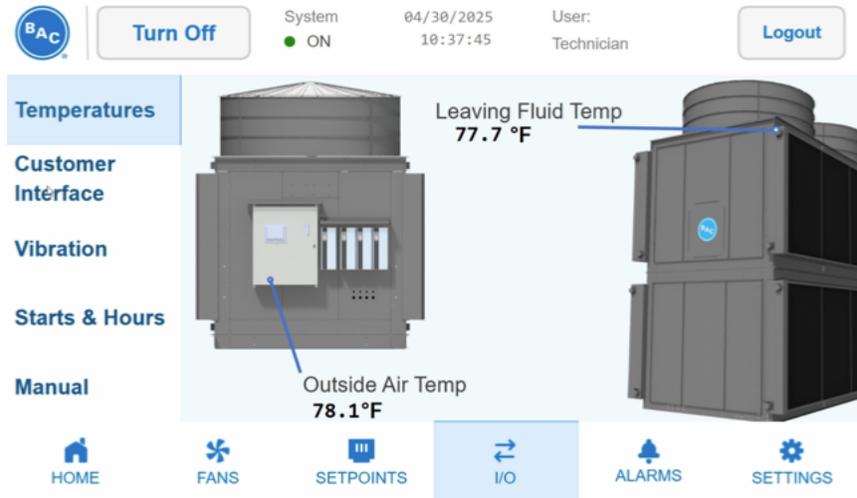
ALARMS

SETTINGS

## B. 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,

**Temperatures** – This screen shows current Outside Air Temp and Leaving Fluid Temp.



**Customer Interface** – This screen shows:

- Leaving Fluid Temperature Setpoint
- Remote Run Enable – Digital inputs that activate Remote Unit
- General Alarm DO – Digital Output that indicates an alarm is active



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

System: ON | 04/30/2025 10:38:00 | User: Technician | Logout

**Vibration**

Fan 1 Vibration	0.19 in/sec
Fan 2 Vibration	0.21 in/sec
Fan 3 Vibration	0.21 in/sec
Fan 4 Vibration	0.20 in/sec

**Starts & Hours** – This screen shows how many start-ups each fan has had and how many hours each fan has run since installation and start Up or the previous reset. The hours should be reset if the fan motor has been replaced; this requires a Technician Access Level.

System: ON | 04/30/2025 10:38:04 | User: Technician | Logout

**Starts & Hours**

Fan	Starts	Hours	Action
Fan 1	4.00	24.00	Reset Starts
Fan 2	4.00	20.00	Reset Starts
Fan 3	4.00	18.00	Reset Starts
Fan 4	5.00	18.00	Reset Starts

**Manual** – Enables or Disables Manual Mode for Digital Outputs. The default setting is OFF. Digital outputs can be used for other components such as valves or pumps. Refer to the Operation & Maintenance Manual for more details.



Turn Off

System  
● ON

04/30/2025  
10:38:08

User:  
Technician

Logout

Temperatures

Customer  
Interface

Vibration

Starts & Hours

Manual

### Digital Outputs

#### General Alarm DO

Manual Mode  OFF

Manual Command  OFF V

HOME

FANS

SETPOINTS

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ALARMS

SETTINGS

## 5. 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 Home screen Main Menu (as shown below). To see all active alarms, the toggle switch at the upper left of the screen must be switched to Active.

### A. No Active Alarms

In the ALARMS menu with the toggle set to Active, the following light green screen (top graphic) will display if there are no currently Active Alarms. Similarly, the ALARMS icon in the Main Menu will not show any indication of an alarm and the Home screen (bottom graphic) will display No Messages in the System Message box on the right of the Home screen.

The top screenshot shows the 'Active Alarms' screen. At the top left is a 'Turn Off' button. The system status is 'ON' with a green dot. The date is 04/30/2025 and the time is 10:38:11. The user is 'Technician'. There is an 'Info' button and an 'Acknowledge' button. Below this is a toggle switch set to 'Active'. The main area is a table with columns for 'Date', 'Time', and 'Alarms'. The table is empty. At the bottom is a navigation bar with icons for HOME, FANS, SETPOINTS, I/O, ALARMS, and SETTINGS.

The bottom screenshot shows the 'Home' screen. At the top left is a 'Turn On' button. The system status is 'OFF' with a grey dot. The date is 04/30/2025 and the time is 11:09:26. The user is 'Technician'. There is a 'Logout' button. Below this is a 3D model of a dry cooler. Callouts point to 'Leaving Fluid Temp 44.1 °F', 'Average Fan Speed 0.0 %', and 'Outside Air Temp 79.0 °F'. To the right is a 'System Message' box containing 'No Messages'. Below that is a box with 'Leaving Fluid Temp Setpoint 120.0 °F', 'Control State Off', and 'Fan Command 0 %'. At the bottom is a navigation bar with icons for HOME, FANS, SETPOINTS, I/O, ALARMS, and SETTINGS.

## B. General Active Alarms

In the ALARMS menu with the toggle set to Active, the following screen will display if there are one or more Active Alarms. The alarms will display against a pink background, including the date, time, and alarm description. Previous alarms can be viewed in the Log, which is covered in the next section.

In this example, the LFT is low, which has triggered its own alarm and has also tripped the General Unit Alarm. (This can happen if the unit is operated without a heat load (such as first start-up) in colder ambient conditions.)

The screenshot shows the ALARMS menu interface. At the top, there is a 'Turn On' button, system status 'OFF', date '04/30/2025', time '11:09:45', and user 'Technician'. A 'Logout' button is also present. Below this, there is a toggle for 'Active' and buttons for 'Info' and 'Acknowledge'. The main area is a table with columns for 'Date', 'Time', and 'Alarms'. Two rows are highlighted in pink, indicating active alarms: '04/30/2025 11:09:27 General Unit Alarm Active' and '04/30/2025 11:09:27 Low Leaving Fluid Temperature'. At the bottom, there is a navigation bar with icons for HOME, FANS, SETPOINTS, I/O, ALARMS (highlighted), and SETTINGS.

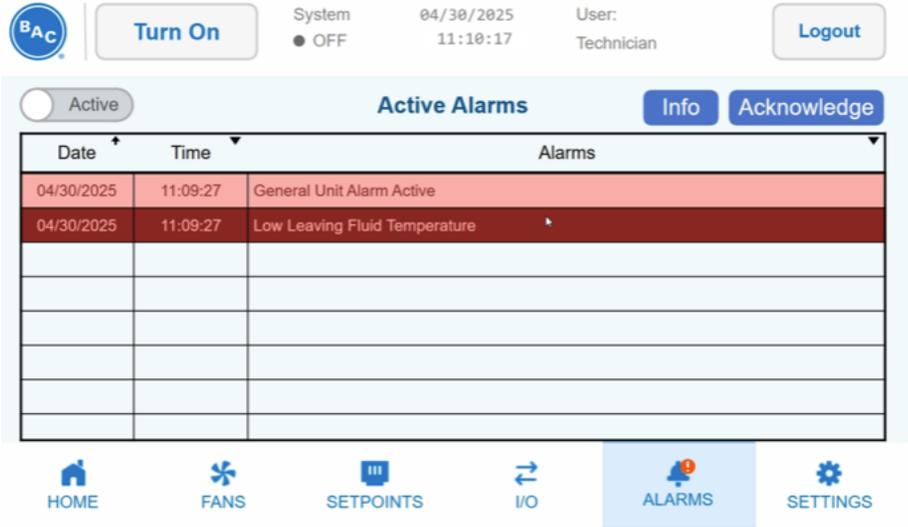
Date	Time	Alarms
04/30/2025	11:09:27	General Unit Alarm Active
04/30/2025	11:09:27	Low Leaving Fluid Temperature

In addition, when there are Active Alarms, the System Message box to the right of the Home screen will display a General Alarm Active indicator and that ALARMS icon in Main Menu will include a red warning indicator (as displayed below).

The screenshot shows the Home screen interface. At the top, there is a 'Turn On' button, system status 'OFF', date '04/30/2025', time '11:09:29', and user 'Technician'. A 'Logout' button is also present. Below this, there is a 3D model of a dry cooler with labels for 'Leaving Fluid Temp 43.0 °F', 'Average Fan Speed 0.0 %', and 'Outside Air Temp 79.0 °F'. To the right of the model is a 'System Message' box showing '1 of 1' messages: 'General Alarm Active'. Below the message box, there is a 'Leaving Fluid Temp Setpoint 120.0 °F', 'Control State Off', and 'Fan Command 0 %'. At the bottom, there is a navigation bar with icons for HOME, FANS, SETPOINTS, I/O, ALARMS (highlighted with a red arrow), and SETTINGS. A red arrow also points to the 'General Alarm Active' message in the System Message box.

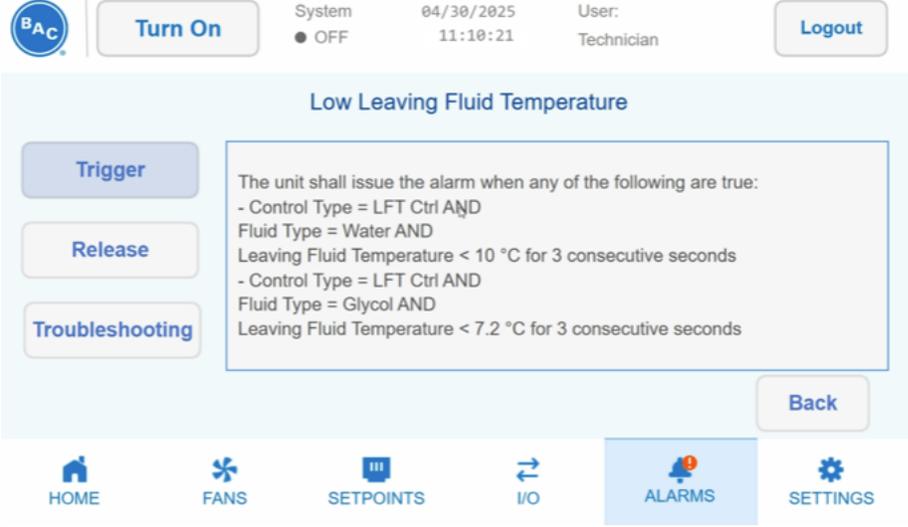
To access more details and troubleshooting tips related to each alarm and/or to acknowledge the alarm:

1. Press the specific Alarm line for which you want more information. The Alarm background will become maroon and the Info button in the right corner above the Alarm table will become blue (as displayed below).



2. Next, click the blue Info button. The screen will display the Trigger, Release and Troubleshooting menu buttons on the left side of the screen. In the below example, we will use those buttons to get more details on the Low Leaving Fluid Temperature alarm.

**Trigger** – Shows what conditions cause the alarm.



**Release** – Shows what conditions will end the alarm.

The screenshot shows the BACnet interface with the 'Release' button highlighted. The system status is 'OFF' and the user is 'Technician'. The alarm title is 'Low Leaving Fluid Temperature'. The 'Release' button is highlighted in blue. The text in the central box reads: 'The unit shall release the alarm when any of the following is true: - Fluid Type = Water AND Leaving Fluid Temperature > 13 °C for 3 consecutive seconds - Fluid Type = Glycol AND Leaving Fluid Temperature > 10.2 °C for 3 consecutive seconds'. The bottom navigation bar includes HOME, FANS, SETPOINTS, I/O, ALARMS (highlighted), and SETTINGS.

**Troubleshooting** – Provides suggestions for how to troubleshoot the alarm.

The screenshot shows the BACnet interface with the 'Troubleshooting' button highlighted. The system status is 'OFF' and the user is 'Technician'. The alarm title is 'Low Leaving Fluid Temperature'. The 'Troubleshooting' button is highlighted in blue. The text in the central box reads: '- Check Leaving Fluid Temperature sensor installation. - Check Leaving Fluid Temperature sensor and wiring.' The bottom navigation bar includes HOME, FANS, SETPOINTS, I/O, ALARMS (highlighted), and SETTINGS.

3. To acknowledge an Active Alarm, which is like a snooze function on an alarm clock, highlight the line displaying the alarm you wish to address, then press the blue Acknowledge button above the right side of the alarm table. **This will not clear the alarm until the root cause is fixed.**



Turn On

System  
● OFF

04/30/2025  
11:10:58

User:  
Technician

Logout

Active

### Active Alarms

Info

Acknowledge

Date	Time	Alarms
04/30/2025	11:09:27	General Unit Alarm Active
04/30/2025	11:09:27	Low Leaving Fluid Temperature

HOME

FANS

SETPOINTS

I/O

ALARMS

SETTINGS

The user cannot clear an alarm. The unit must detect that it's no longer in an alarm state in order for that alarm to clear. When that happens, the background color for that Active Alarm entry will turn pale green.

Example:

04/30/2025	11:10:53	General Unit Alarm Active
04/30/2025	11:10:56	Low Leaving Fluid Temperature

## C. Checking Previous Alarm Log

To see a record of previous Active Alarms that were addressed, toggle the switch above the left side of the alarm table to display Log (versus Active). The following screen will appear.

The screenshot shows the BAC control interface. At the top, there is a 'Turn On' button, system status 'OFF', date '04/30/2025', time '11:12:09', and user 'Technician'. A 'Logout' button is also present. Below this is the 'Alarm Log' section, which has a 'Log' toggle switch turned on. The table below shows the following data:

Date	Time	Alarms
04/29/2025	09:59:50	General Unit Alarm Active
04/29/2025	10:00:56	Emergency Stop Active
04/29/2025	10:01:00	Emergency Stop Active
04/29/2025	10:01:00	General Unit Alarm Active
04/30/2025	11:09:27	General Unit Alarm Active
04/30/2025	11:09:27	Low Leaving Fluid Temperature
04/30/2025	11:10:53	General Unit Alarm Active
04/30/2025	11:10:56	Low Leaving Fluid Temperature

Navigation icons at the bottom include HOME, FANS, SETPOINTS, I/O, ALARMS (highlighted), and SETTINGS.

The items against a pink background are currently Active Alarms that have not yet been Acknowledged.

Example:

04/29/2025	09:59:50	General Unit Alarm Active
04/29/2025	10:00:56	Emergency Stop Active

The items against a teal background are items that have been Acknowledged as described in Section 5B3.

Example:

04/29/2025	10:01:00	Emergency Stop Active
04/29/2025	10:01:00	General Unit Alarm Active

## Conclusion

This Startup Guide explains how to start the equipment and offers a basic operational overview. For more details, refer to the Operation & Maintenance Manual or contact BAC for additional support.

# TrilliumSeries® Dry Cooler - TDFS

## Startup Guide



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