



# **Installation, Operation, and Maintenance Manual**

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# INTRODUCTION

The purpose of this document is to outline proper installation, maintenance, operation, and care of the AyrDyne® Monitoring System Human Machine Interface (HMI). This document is in no way intended to be used to determine the reliability of this product outside of its originally intended application. It is the duty of the end user or integrator to perform the appropriate risk analysis in order to determine the relevance of its use within any specific application.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

Failure to follow the guidelines outlined in this manual may result in injury, harm, or improper operating results. Failure to observe this information may also result in equipment damage, premature wear, or failure.


# SAFETY 1.1

## SAFETY


**The installation, maintenance, operation, and care of the AyrDyne® Monitoring System Human Machine Interface (HMI) should only be performed by individuals who are qualified and trained to do so.** A “qualified” person in this context is a person who has skills and knowledge related to the construction and operation of electrical equipment and its installation through both work experience and training. Additionally, a qualified person is one who has received and undergone safety training specific to electrical maintenance. Anyone who has not undergone safety training specific to this system should not operate or perform maintenance on the system.

In terms of maintenance of this system, “lock out tag out” safety protocol applies. This means that any time maintenance on this system is performed, the machine must be shut down, unplugged and tagged or labeled, explaining that maintenance is taking place.

**DenTech is not liable for any consequences arising from misuse of this system.** If you are unsure of whether you are qualified to use or maintain this system, please contact an electrician or other qualified professional for assistance. Failure to follow safety protocol for this and any other system could result in serious bodily harm or other injury. **No responsibility is assumed by DenTech for any consequences arising out of the use of this material.**




This symbol indicates that an electrical hazard exists which could result in personal injury if the instructions are not followed.



This safety alert symbol is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

2.1


REMOVAL OF HMI

**CAUTION!**

MECHANICALLY UNSTABLE TERMINAL

Always keep HMI stable in panel cut-out while you are installing or removing installation fasteners.

FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN INJURY, OR EQUIPMENT DAMAGE.

**WARNING!**

ELECTRICAL SHOCK HAZARD EXISTS

- Ensure that the control enclosure within which you are working is powered down and locked out.
- Verify that all power sources are in a zero energy state.

FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN INJURY, DEATH, OR EQUIPMENT DAMAGE.



Figure 2.1.1a  
Front view of HMI.



Figure 2.1.1b  
Rear view of HMI.

REMOVAL OF HMI

2.1



Figure 2.1.1c  
Power connection removed from HMI.



Figure 2.1.2  
Ground wire with T-20 Torx screw.

2.1 REMOVAL OF HMI

- 1
- Pull green connector downward to remove power connection from HMI.
- 2
- Use a T-20 Torx screwdriver to remove the ground wire.



2.1 REMOVAL

- 3 With the HMI free from all electrical wiring, begin to loosen the 10 installation fasteners that secure the HMI to the control enclosure door using a small flat head screwdriver. Make sure to support the HMI with the other hand.
- 4 Continue to loosen fasteners until they can be removed from the HMI.



Figure 2.1.3  
Loosening HMI fasteners.



Figure 2.1.4  
Installation fasteners removed.

REMOVAL & INSTALLATION 2.1

- 5 Once the installation fasteners have been removed, gently remove the AyrDyne HMI from the front of the enclosure door, taking care not to damage or displace the installation gasket.

2.2 INSTALLATION OF HMI

- 1 To install the HMI, follow the steps on pages six through nine in reverse order.



Figure 2.1.5a  
Removal of the HMI from the front of the enclosure.



Figure 2.1.5b  
HMI completely removed.



2.3


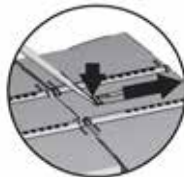

INSTALLING & REMOVING PLC

For the removal of the PLC portion of the Ayrdyne Monitoring System, please visit the Ayrdyne website for a link to the Siemens installation manual.

[Siemens S7-1200 Manual](#) System Manual, 04/2012, A5E02486680-06  
Pages 50-55

2.3.1 INSTALLING & REMOVING THE CPU ON A DIN RAIL




// A) INSTALLING THE CPU ON A DIN RAIL	
TASK	PROCEDURE
	<ol style="list-style-type: none"><li>1. Install the DIN rail. Secure the rail to the mounting panel every 75 mm.</li><li>2. Ensure that the CPU and all S7-1200 equipment are disconnected from electrical power.</li><li>3. Hook the CPU over the top of the DIN rail.</li><li>4. Pull out the DIN rail clip on the bottom of the CPU to allow the CPU to fit over the rail.</li><li>5. Rotate the CPU down into position on the rail.</li><li>6. Push in the clips to latch the CPU to the rail.</li></ol>
	




// B) REMOVING THE CPU FROM A DIN RAIL		
TASK		PROCEDURE
		<ol style="list-style-type: none"><li>1. Ensure that the CPU and all S7-1200 equipment are disconnected from electrical power.</li><li>2. Disconnect the I/O connectors, wiring, and cables from the CPU (Page 55).</li><li>3. Remove the CPU and any attached communication modules as a unit. All signal modules should remain installed.</li><li>4. If an SM is connected to the CPU, retract the bus connector:<ul style="list-style-type: none"><li>– Place a screwdriver beside the tab on the top of the signal module.</li><li>– Press down to disengage the connector from the CPU.</li><li>– Slide the tab fully to the right.</li></ul></li><li>5. Remove the CPU:<ul style="list-style-type: none"><li>– Pull out the DIN rail clip to release the CPU from the rail.</li><li>– Rotate the CPU up and off the rail, and remove the CPU from the system.</li></ul></li></ol>
		

INSTALLING & REMOVING PLC

2.3

2.3.2 INSTALLING & REMOVING AN SB, CB OR BB

// A) INSTALLING AN SB, CB, OR BB		
TASK	PROCEDURE	
	<ol style="list-style-type: none"><li>1. Ensure that the CPU and all S7-1200 equipment are disconnected from electrical power.</li><li>2. Remove the top and bottom terminal block covers from the CPU.</li><li>3. Place a screwdriver into the slot on top of the CPU at the rear of the cover.</li><li>4. Gently pry the cover up and remove it from the CPU.</li><li>5. Place the module straight down into its mounting position in the top of the CPU.</li><li>6. Firmly press the module into position until it snaps into place.</li><li>7. Replace the terminal block covers.</li></ol>	
		
		

// A) REMOVING AN SB, CB, OR BB		
TASK		PROCEDURE
		<ol style="list-style-type: none"><li>1. Ensure that the CPU and all S7-1200 equipment are disconnected from electrical power.</li><li>2. Remove the top and bottom terminal block covers from the CPU.</li><li>3. Place a screwdriver into the slot on top of the module.</li><li>4. Gently pry the module up to disengage it from the CPU.</li><li>5. Remove the module straight up from its mounting position in the top of the CPU.</li><li>6. Replace the cover onto the CPU.</li><li>7. Replace the terminal block covers.</li></ol>
		

2.3

# INSTALLING & REMOVING PLC

## 2.3.3 INSTALLING OR REPLACING THE BATTERY IN BB 1297 BATTERY BOARD

The BB 1297 requires battery type CR1025. The battery is not included with the BB 1297 and must be purchased by the user.



### TO INSTALL A NEW BATTERY, FOLLOW THESE STEPS:

- 1
- In the BB 1297, install a new battery with the positive side of the battery on top, and the negative side next to the printed wiring board.
- 2
- The BB 1297 is ready to be installed in the CPU. Follow the installation directions on page 11 to install the BB 1297.

### TO REPLACE THE BATTERY IN THE BB 1297:

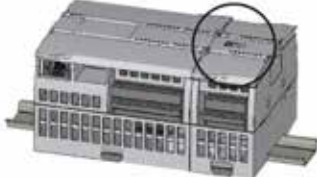
- 1
- Remove the BB 1297 from the CPU following the removal directions on page 11.
- 2
- Carefully remove the old battery using a small screwdriver. Push the battery out from under the clip.
- 3
- Install a new CR1025 replacement battery with the positive side of the battery on top and the negative side next to the printed wiring board.
- 4
- Re-install the BB 1297 battery board following the installation directions on page 11.

## 2.3.4 INSTALLING & REMOVING AN SM

// A) INSTALLING AN SM		
TASK		PROCEDURE
		<div>Install your SM after installing the CPU.</div> <div><div>1</div>Ensure that the CPU and all S7-1200 equipment are disconnected from electrical power.</div> <div><div>2</div>Remove the cover for the connector from the right side of the CPU.</div> <div><div>3</div>Insert a screwdriver into the slot above the cover.</div> <div><div>4</div>Gently pry the cover out at its top and remove the cover. Retain the cover for reuse.</div>

2.3

# INSTALLING & REMOVING PLC

// B) REMOVING AN SM	
TASK	PROCEDURE
	<div>You can remove any SM without removing the CPU or other SMs in place.</div> <div><div>1</div>Ensure that the CPU and all S7-1200 equipment are disconnected from electrical power.</div> <div><div>2</div>Remove the I/O connectors and wiring from the SM (Page 55).</div> <div><div>3</div>Retract the bus connector.<div><div>-</div>Place a screwdriver beside the tab on the top of the SM.</div><div><div>-</div>Press down to disengage the connector from the CPU.</div><div><div>-</div>Slide the tab fully to the right.</div></div>

If there is another SM to the right, repeat this procedure for that SM.




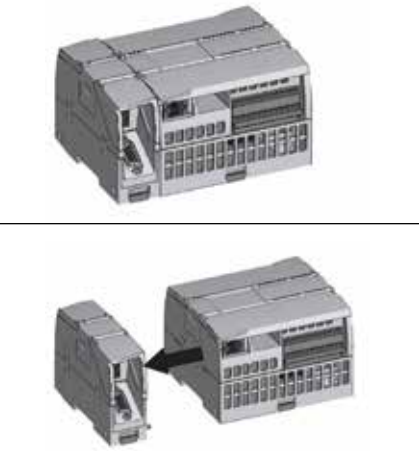
2.3


# INSTALLING & REMOVING PLC

## 2.3.5 INSTALLING & REMOVING A CM OR CP

Attach any communication modules to the CPU and install the assembly as a unit, as shown in Installing and Removing the CPU (page 49).

// A) INSTALLING A CM OR CP		
TASK		PROCEDURE
		<ol style="list-style-type: none"><li>1. Ensure that the CPU and all S7-1200 equipment are disconnected from electrical power.</li><li>2. Attach the CM to the CPU before installing the assembly as a unit to the DIN rail or panel.</li><li>3. Remove the bus cover from the left side of the CPU:<ul style="list-style-type: none"><li>– Insert a screwdriver into the slot above the bus cover.</li><li>– Gently pry out the cover at its top.</li></ul></li><li>4. Remove the bus cover. Retain the cover for reuse.</li><li>5. Connect the CM or CP to the CPU:<ul style="list-style-type: none"><li>– Align the bus connector and the posts of the CM with the holes of the CPU</li><li>– Firmly press the units together until the posts snap into place.</li></ul></li><li>6. Install the CPU and CP on a DIN rail or panel.</li></ol>

// B) REMOVING A CM OR CP	
TASK	PROCEDURE
	<p>Remove the CPU and CM as a unit from the DIN rail or panel.</p> <ol style="list-style-type: none"><li>1. Ensure that the CPU and all S7-1200 equipment are disconnected from electrical power.</li><li>2. Remove the I/O connectors and all wiring and cables from the CPU and CMs.</li><li>3. For DIN rail mounting, move the lower DIN rail clips on the CPU and CMs to the extended position.</li><li>4. Remove the CPU and CMs from the DIN rail or panel.</li><li>5. Grasp the CPU and CMs firmly and pull apart.</li></ol>

**CAUTION!**

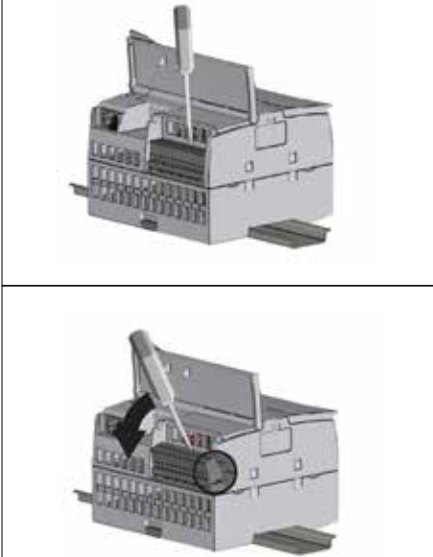
Do not use a tool to separate the modules because this will damage the units.

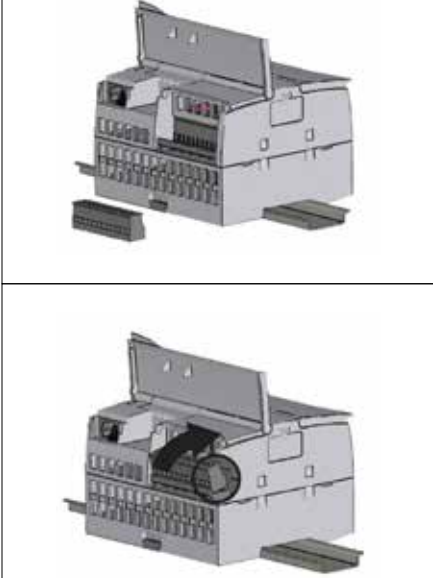
2.3

# INSTALLING & REMOVING PLC

## 2.3.6 REMOVING & REINSTALLING THE S7-1200 TERMINAL BLOCK CONNECTOR

The CPU, SB, and SM modules provide removable connectors to make connecting the wiring easy.

// A) REMOVING THE CONNECTOR	
TASK	PROCEDURE
	<p>Prepare the system for terminal block connector removal by removing the power from the CPU and opening the cover above the connector.</p> <ol style="list-style-type: none"><li>1. Ensure that the CPU and all S7-1200 equipment are disconnected from electrical power.</li><li>2. Inspect the top of the connector and locate the slot for the tip of the screwdriver.</li><li>3. Insert a screwdriver into the slot.</li><li>4. Gently pry the top of the connector away from the CPU. The connector will release with a snap.</li><li>5. Grasp the connector and remove it from the CPU.</li></ol>

// B) INSTALLING THE CONNECTOR	
TASK	PROCEDURE
	<p>Prepare the components for terminal block installation by removing power from the CPU and opening the cover for connector.</p> <ol style="list-style-type: none"><li>1. Ensure that the CPU and all S7-1200 equipment are disconnected from electrical power.</li><li>2. Align the connector with the pins on the unit.</li><li>3. Align the wiring edge of the connector inside the rim of the connector base.</li><li>4. Press firmly down and rotate the connector until it snaps into place.</li></ol> <p>Check carefully to ensure that the connector is properly aligned and fully engaged.</p>



NOTES

3.1.0 OPERATION OVERVIEW

This section convers the navigation and operation of the standard AyrDyne monitoring system. The operation and functionality of each screen is covered in detail in later sections. The table below shows the layout of the screens. Available screens depend on system requirements and configuration.

System	Contains system wide monitoring, settings, and controls	
	Overview	An overview of the system and the first screen to display when power is applied
	Metrics	System Metrics
	Alarms	Alarms monitoring and control
	Settings	
Filters	Contains all monitoring, settings, and controls related to the filters	
	Primary Info	Primary filter differential pressure monitoring and cleaning
	Primary Settings	Primary filter cleaning settings
	Primary Solenoids	Primary filter cleaning system monitoring and manual control
	Secondary Info	Secondary filter differential pressure monitoring
Airflow	Contains all monitoring, settings, and controls related to airflow	
	Airflow Control	Airflow monitoring and control settings
	VFD Settings	Airflow monitoring and control settings
	Maintenance	Motor maintenance
Discharge	Contains all monitoring, settings, and controls related to the discharge system	
Safety	Contains all monitoring, settings, and controls related to safety	

3.1

SYSTEM

3.1.1 STATUS BAR OVERVIEW



The status bar, which displays system information, is visible in all screens. This bar displays system information, active alarm description and corrective action.

- 1

**SYSTEM STATE INDICATOR**  
This graphic display shows the current system state.

Stopped

System is Stopped

Running

System is Running

Cleaning

System is Cleaning

! FAULT

System is Faulted
- 2

**SYSTEM FAULTS**  
This text display shows details of any active faults as well as corrective actions.

- 3

**USER**  
Shows the user that is currently logged in. Pressing the user icon will logout the current user.
- 4

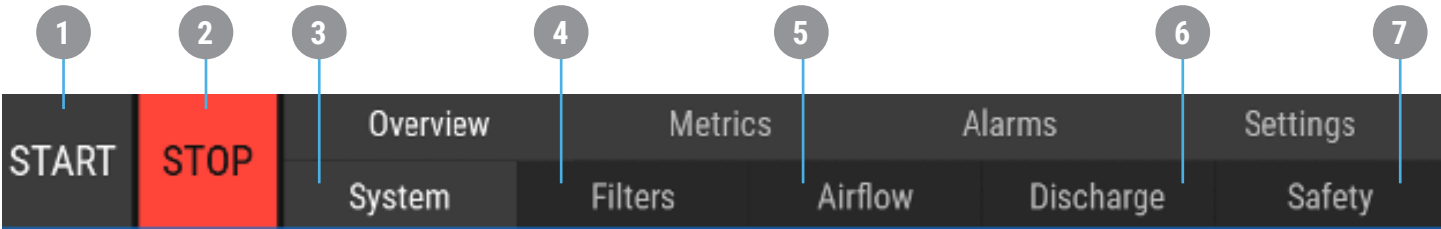
**TIME AND DATE**  
This graphic display shows the internal date and time. Pressing the time and will display a pop-up entry page where the date and time can be adjusted.
- 5

**LOGO**  
This graphic display shows the logo of the company that you may contact for information on the system, spare or replacement parts ordering and help with the system. Pressing the logo will display the contact information. Once on the information screen, you may press anywhere on the screen to return to the home screen.

SYSTEM

3.1

3.1.2 NAVIGATION BAR OVERVIEW



The navigation bar is located at the bottom of each screen and can be used to navigate through the various systems. The underline indicates the section currently displayed. The circle with the exclamation symbol denotes when a section is in alarm.

- 1

**START**  
This button starts the system.
- 2

**STOP**  
This button stops the system on the first press and stops the downtime cleaning, if running, on the second press.
- 3

**SYSTEM**  
This button displays the system screen
- 4

**FILTERS**  
This button displays the filters screen

- 5

**AIRFLOW**  
This button displays the airflow screen
- 6

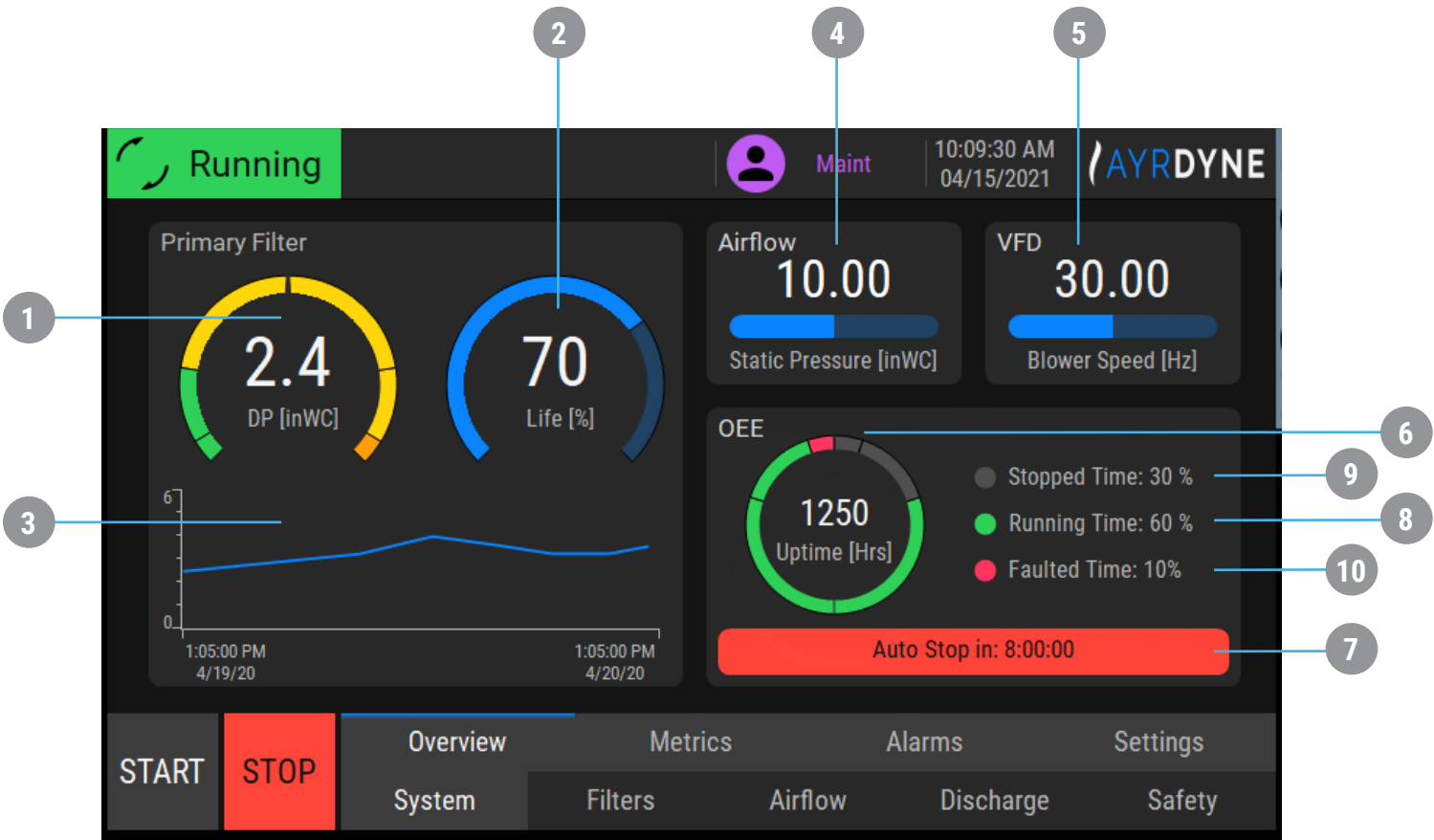
**DISCHARGE**  
This button displays the discharge screen
- 7

**SAFETY**  
This button displays the safety screen

3.1

SYSTEM

3.1.3 MAIN SCREEN OVERVIEW



SYSTEM

3.1

- 1

**PRIMARY FILTER DP**  
This numeric display and dial display show the filter differential pressure measured between the dirty and clean sides of the filters.
- 2

**PRIMARY FILTER LIFE**  
This numeric display and dial display show filter status and remaining life.
- 3

**DATA PLOT**  
This graphical display shows the filter differential pressure over time. The time line view can be changed from one day to 6 months.
- 4

**AIRFLOW**  
This numeric display and bar graph show the system static pressure, velocity or volume measured between the clean side of the filter and atmosphere.
- 5

**VFD (Hertz)**  
This numeric display shows VFD output frequency.
- 6

**UPTIME (Hrs)**  
This numeric display shows the total time that the collector has been powered on.
- 7

**AUTO STOP (Hrs)**  
This shows the status of the auto stop
  - a Auto Stop Disabled by REM run:**  
Auto stop is not available when using the remote run signal
  - b Schedule Auto Stop:**  
Press and follow onscreen prompts to schedule an auto stop
  - c Auto Stop in hhh:mm:ss:**  
Shows the remaining hours, minutes and seconds until the system automatically stops
- 8

**RUNNING TIME (%)**  
This numeric display shows what percentage of the up time was spent running.
- 9

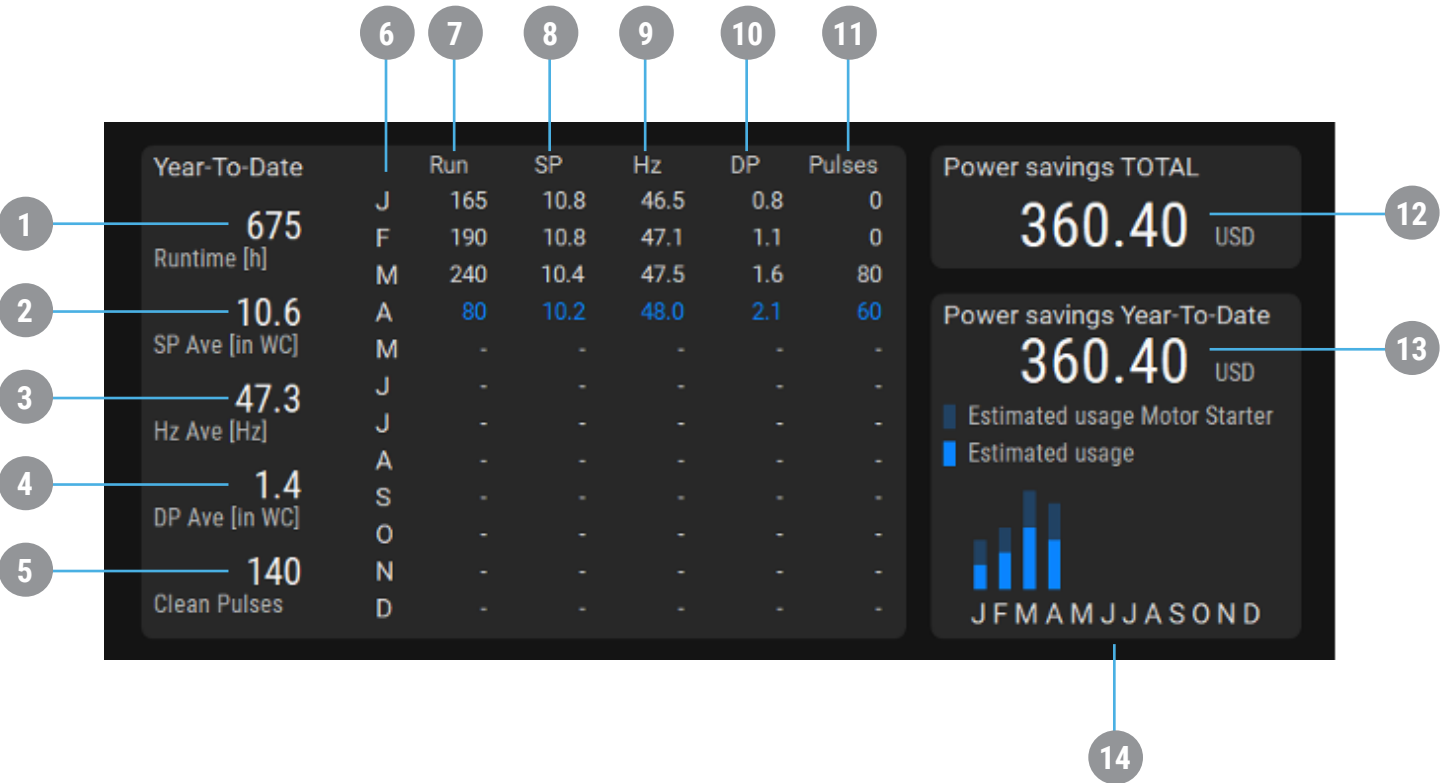
**STOPPED TIME (%)**  
This numeric display shows what percentage of the up time was spent stopped.
- 10

**FAULTED TIME (%)**  
This numeric display shows what percentage of the up time was spent in a fault condition.

3.1

SYSTEM

3.1.4 METRICS (STATIC PRESSURE)



SYSTEM

3.1

- 1

**RUNTIME (h)**  
This numeric display shows the total system runtime for the calendar year. This metric is not resettable.
- 2

**SP AVE (in WC)**  
This numeric display shows the average Static Pressure for the calendar year. This metric is not resettable.
- 3

**HZ AVE (Hz)**  
This numeric display shows the average blower frequency for the calendar year. This metric is not resettable.
- 4

**DP**  
This numeric display shows the average Differential Pressure for the calendar year. This metric is not resettable.
- 5

**CLEAN PULSES**  
This numeric display shows total cleaning pulses executed by the bag cleaning system for the calendar year if equipped.
- 6

**MONTH**  
This column shows the month of year for the saved metrics. Blue numbers in the corresponding rows represent the current month.
- 7

**RUN (H)**  
This numeric display shows the total system runtime for the corresponding month. This metric is not resettable.
- 8

**SP (in WC) / FPM**  
This numeric display shows the average Static Pressure or FPM, depending on system configuration, for the corresponding month. This metric is not resettable.
- 9

**HZ (Hz)**  
This numeric display shows the average blower frequency for the corresponding month. This metric is not resettable.
- 10

**DP**  
This numeric display shows the average Differential Pressure for the corresponding month. This metric is not resettable.
- 11

**PULSES**  
This numeric display shows the total number of cleaning pulses for the corresponding month. This metric is not resettable.
- 12

**POWER SAVINGS TOTAL (USD)**  
This numeric display, visible when equipped with a VFD, shows estimated power usage cost saved in comparison to a motor starter.
- 13

**POWER SAVINGS YEAR-TO-DATE (USD)**  
This numeric display, visible when equipped with a VFD, shows estimated power usage cost saved on a yearly basis in comparison to a motor starter.
- 14

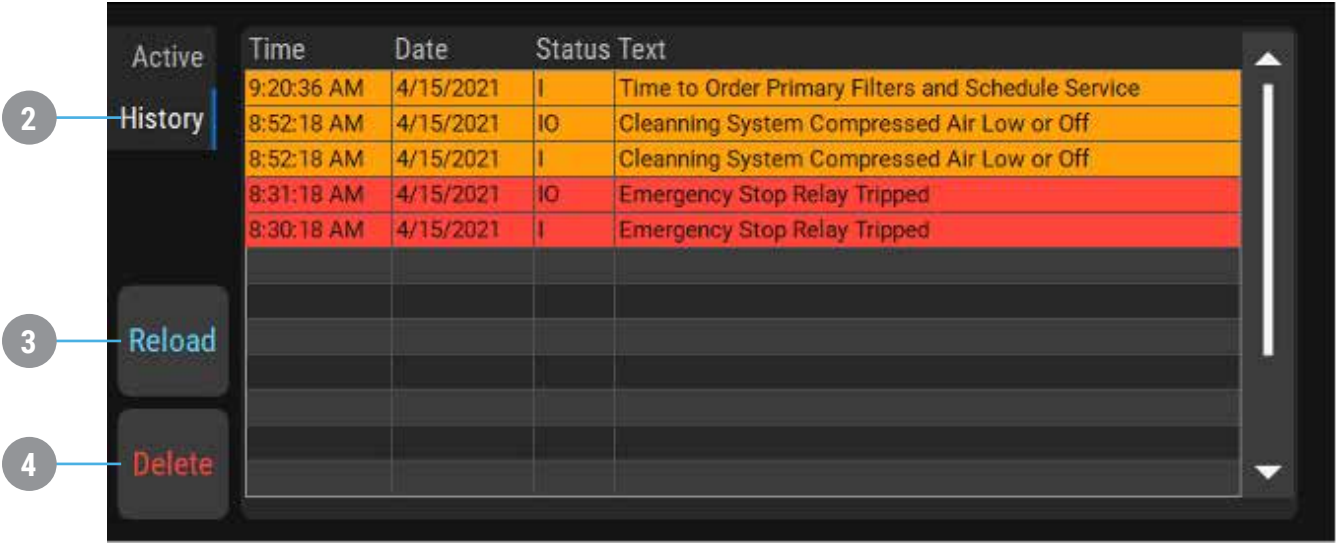
**ESTIMATED POWER USAGE MONTH DISPLAY**  
This bar graph shows estimated power usage each month if equipped with a VFD.



3.1.5 ALARMS



- 1
- ACTIVE**  
This tab shows currently active faults with a time stamp of when the fault occurred and description of that alarm.

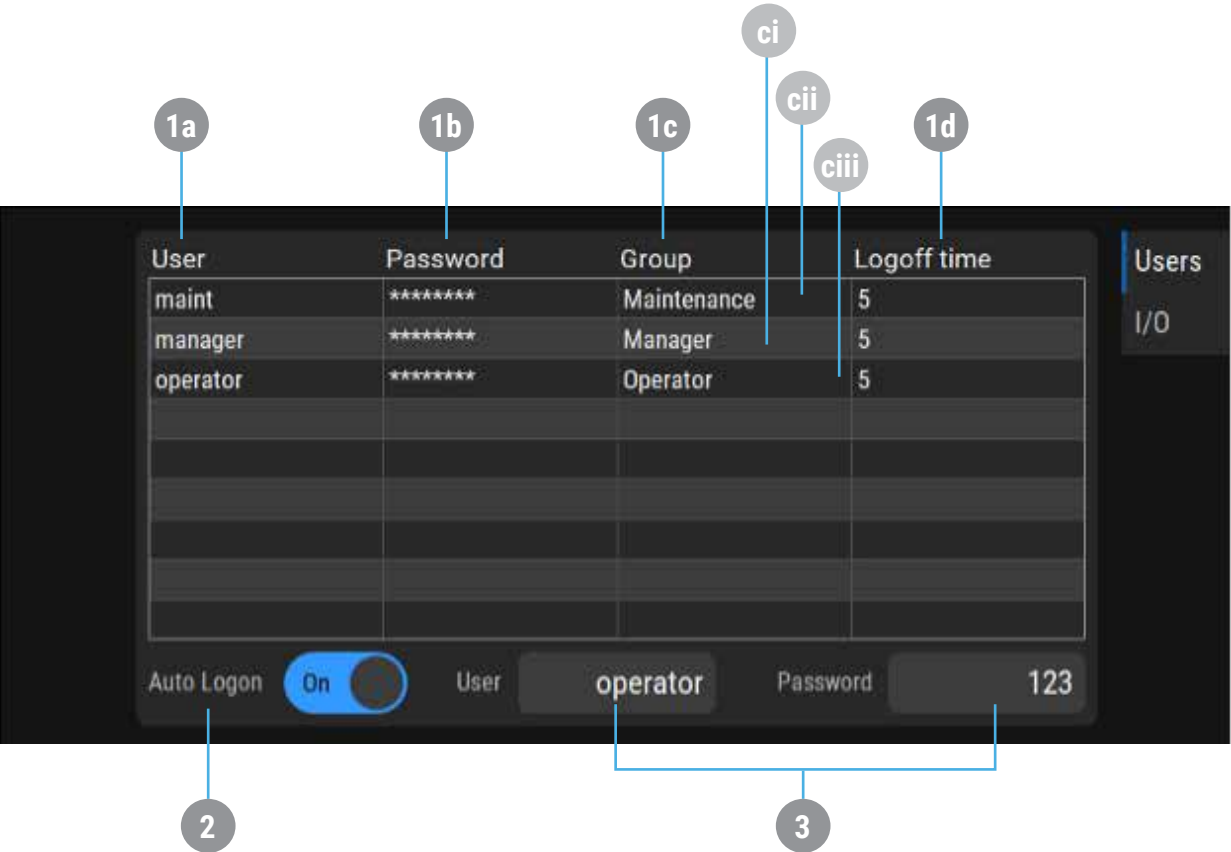


- 2
- HISTORY**  
This tab shows previously active faults with a time stamp and description of the fault.
- 3
- RELOAD**  
This button reloads the alarm history on the screen.
- 4
- DELETE**  
This button deletes the alarm history on the screen.

3.1

SYSTEM

3.1.6 SETTINGS - USERS



SYSTEM

3.1

1

**USER ADMINISTRATION TABLE**

This table allows administration of users. See the list of different

a

**User:**  
Shows the users in the system. To add a user, login as a manager and click on empty row and assign a user, password, group and logoff time.

b

**Password:**  
Shows the password for the respective user. To change, click on password and follow on-screen prompts.

c

**Group:**  
Shows the group for the respective user.

i.

**Manager:** Can perform any operation on the system as well as add / remove users, change group assignments and passwords for any user.

ii.

**Maintenance:** Can perform any operation except for user administration. May change its own password or logoff time.

iii.

**Operator:** Can change settings on the system that are not part of the airflow and balancing. May change its own password or logoff time.

d

**Logoff time:**  
Shows the inactivity time in minutes that the respective user would have prior to being logged off automatically.

2

**AUTO LOGON**

Allows the manager to setup Auto Logon. When enabled, the system will attempt to log on the user as specified in the user and password fields. Note that these fields are NOT linked to the user administration table and thus changing user names and passwords in the table, will break the auto logon feature until the user and password are updated in the auto logon fields.

3

**DEFAULT USERS AND PASSWORDS**

The system ships with the default users and passwords below. Make sure to make your passwords secure and document them.

a

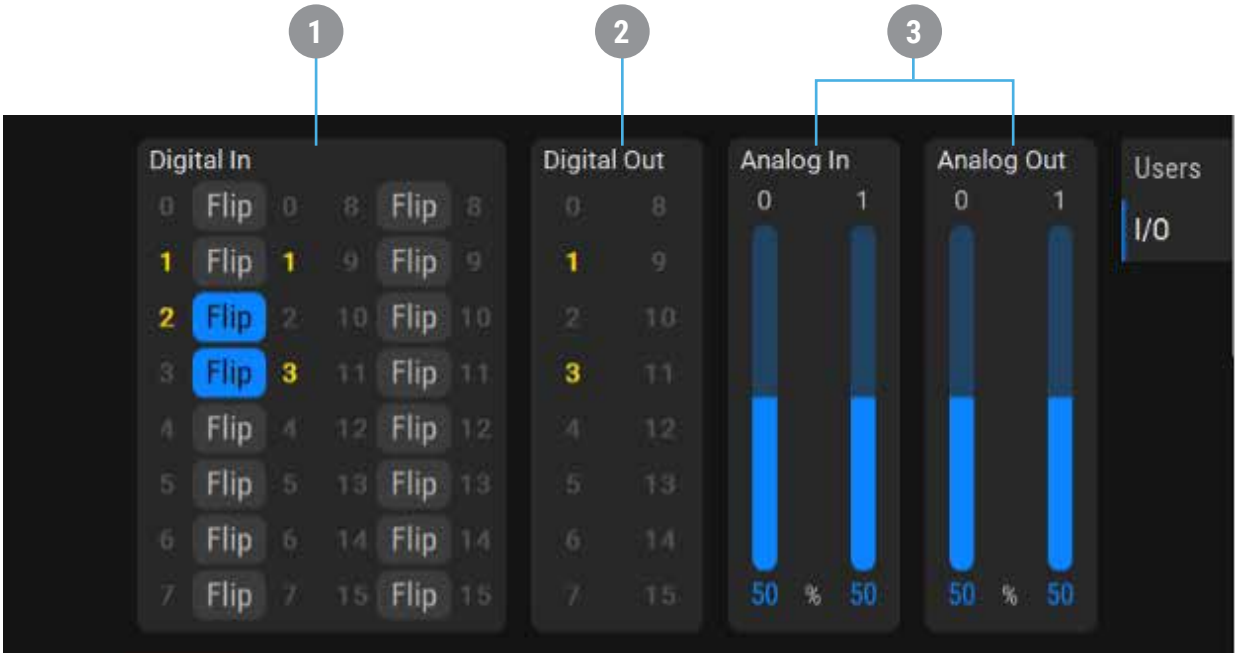
**User:** maint **Password:** 123

b

**User:** manager **Password:** 123

c

**User:** operator **Password:** 123



- 1
- DIGITAL IN**  
This graphic display shows the status of each input. A gray number indicates that the corresponding input is OFF; a yellow number indicates that the corresponding input is ON. Each input may also be flipped by the "Flip" button immediately to the right. When the "Flip" button is gray, the input remains as wired; when the "Flip" button is blue, the input state is flipped. The number immediately to the right of the "Flip" button shows the status of the input as evaluated in the program.
- 2
- DIGITAL OUT**  
This graphic display shows the status of each output. A gray number indicates that the corresponding output is OFF; a yellow number indicates that the corresponding output is ON.
- 3
- ANALOG IN / OUT**  
This graphic display shows the signal of each analog input / output from 0 – 100%.

3.2

FILTERS

3.2.1 PRIMARY INFO



FILTERS

3.2

- 1

**PRIMARY FILTER DP**

This numeric display and bar-graph show the filter differential pressure measured between the dirty and clean sides of the filters.
- 2

**ZERO METER**

The Zero push button will zero the differential pressure reading, should it wander from zero over the lifespan of the differential pressure sensor. This can only be done when the system is not running. Additionally, the pneumatic tubing should be disconnected from the control panel.
- 3

**ALARM SET POINT**

This numeric entry/display shows the set point that the differential pressure must rise above to initiate an alarm. This value is adjustable between the Clean Start Set Point and max transmitter output. Recommended setting is 6 inWC.
- 4

**AUTO CLEAN START**

This numeric entry/display shows the set point that the differential pressure must rise above to start On Demand cleaning. This value is adjustable between the Clean Stop Set Point and Alarm Set point. Recommended setting is 2.4 inWC.
- 5

**CLEAN STOP SET POINT**

This numeric entry/display shows the set point that the differential pressure must fall below to stop On Demand cleaning. This value is adjustable between min transmitter output and the Clean Start Set Point. Recommended setting is 1.2 inWC
- 6

**DATA PLOT**

This graphical display shows the filter differential pressure over time. The time line view can be changed from one day to 3 months.
- 7

**PRIMARY FILTER LIFE**

The filter life shows the remaining life of the filter. When the filter is nearing end of life, it will remind you to order or schedule the filter change. Once the filter has reached end of life, it will prompt you to change the filter.
- 8

**RESET**

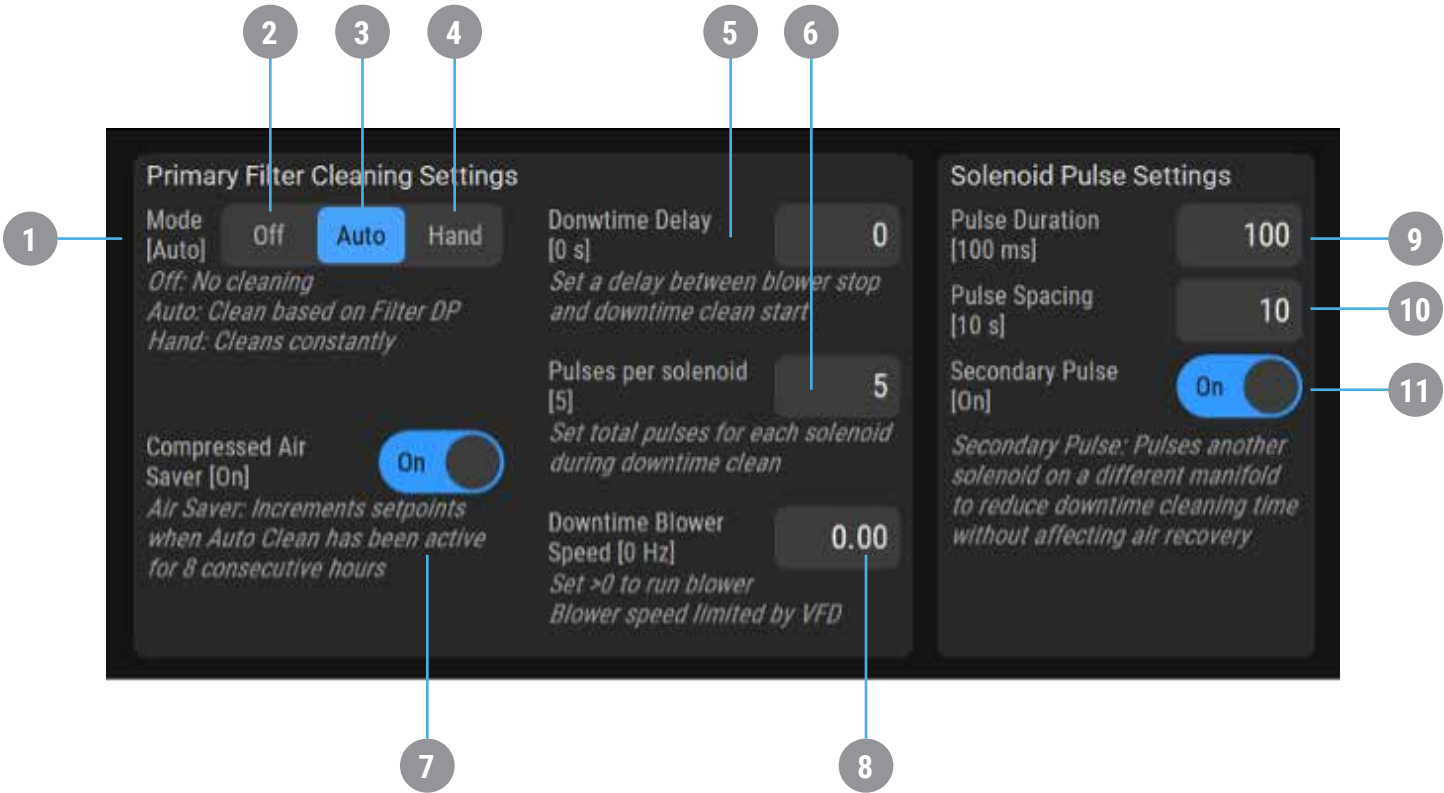
This button resets the hour meter or date, after the filters have been replaced.



3.2

FILTERS

3.2.2 PRIMARY SETTINGS



FILTERS

3.2

- 1

**MODE**  
These toggles select the mode of cleaning
- 2

**OFF**  
This toggle switch turns the cleaning system off.
- 3

**AUTO**  
This toggle switch turns the cleaning system to automatic mode. In this mode, the cleaning sequence is activated anytime the differential pressure reaches Auto Clean Start setpoint and stops when it reaches the Auto Clean Stop setpoint.
- 4

**HAND**  
This toggle switch turns the cleaning system on to clean constantly.
- 5

**DOWNTIME DELAY (s)**  
This numeric entry/display shows how long after the collector is shut down that the downtime cleaning will start in seconds.
- 6

**PULSES PER SOLENOID**  
This numeric entry/display shows how many times each solenoid should be pulsed during downtime cleaning.
- 7

**COMPRESSED AIR SAVER**  
This toggle turns the Compressed Air saver on and off. When enabled, the Auto Clean Start and Auto Clean Stop setpoints will be increased if the Auto Clean is active for 8 consecutive hours.
- 8

**DOWNTIME BLOWER SPEED (Hz)**  
This numeric entry/display shows how long after the collector is shut down that the downtime cleaning will start in seconds.
- 9

**PULSE DURATION (ms)**  
This numeric entry/display shows the duration of each cleaning pulse. This value is adjustable between 50 and 500 milliseconds. Recommended setting is 100 ms.
- 10

**PULSE SPACING (s)**  
This numeric entry/display shows the delay between each cleaning pulse. The elapsed time display (xx /) shows how long until the next pulse. This value is adjustable between 1 and 20 seconds. Recommended setting is 10 s.
- 11

**SECONDARY PULSE**  
This toggle switch turns on pulsing of alternating manifolds to reduce downtime cleaning time without affecting air recovery.

3.2

FILTERS

3.2.3 PRIMARY SOLENOIDS

This screen enables the user to manually pulse each solenoid valve on the selected Module. Each solenoid is numbered and may be pressed to manually fire the solenoid valve.



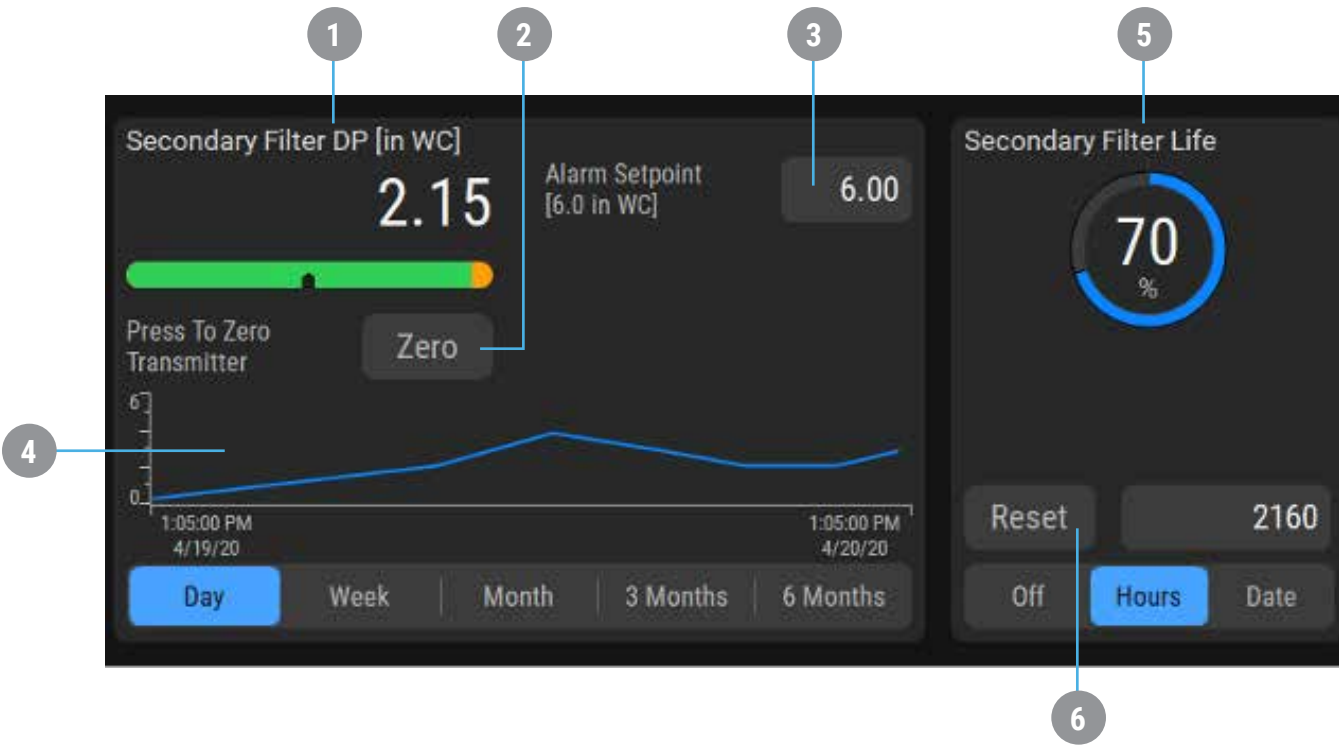
The Compressed Air Monitoring Device detects solenoid failures and leaks, if equipped with the airflow monitoring device. When the same solenoid fails to pulse three times, it is highlighted orange and an alarm produced. In addition, the monitoring system will also detect air leaks on the solenoid manifold, at which time it will alarm. The leak can also be pointed to a solenoid if it started after a specific solenoid was pulsed.

- 1
- COMPRESSED AIR MONITORING**  
When equipped with a *Compressed Air Monitoring Device*, the solenoids will appear with an orange highlight, if a fault is detected. The number of modules and valves per module is dependent upon the user's system. Modules not displayed on the screen may be selected from the navigation buttons on the left of the screen.

FILTERS

3.2

3.2.4 SECONDARY INFORMATION

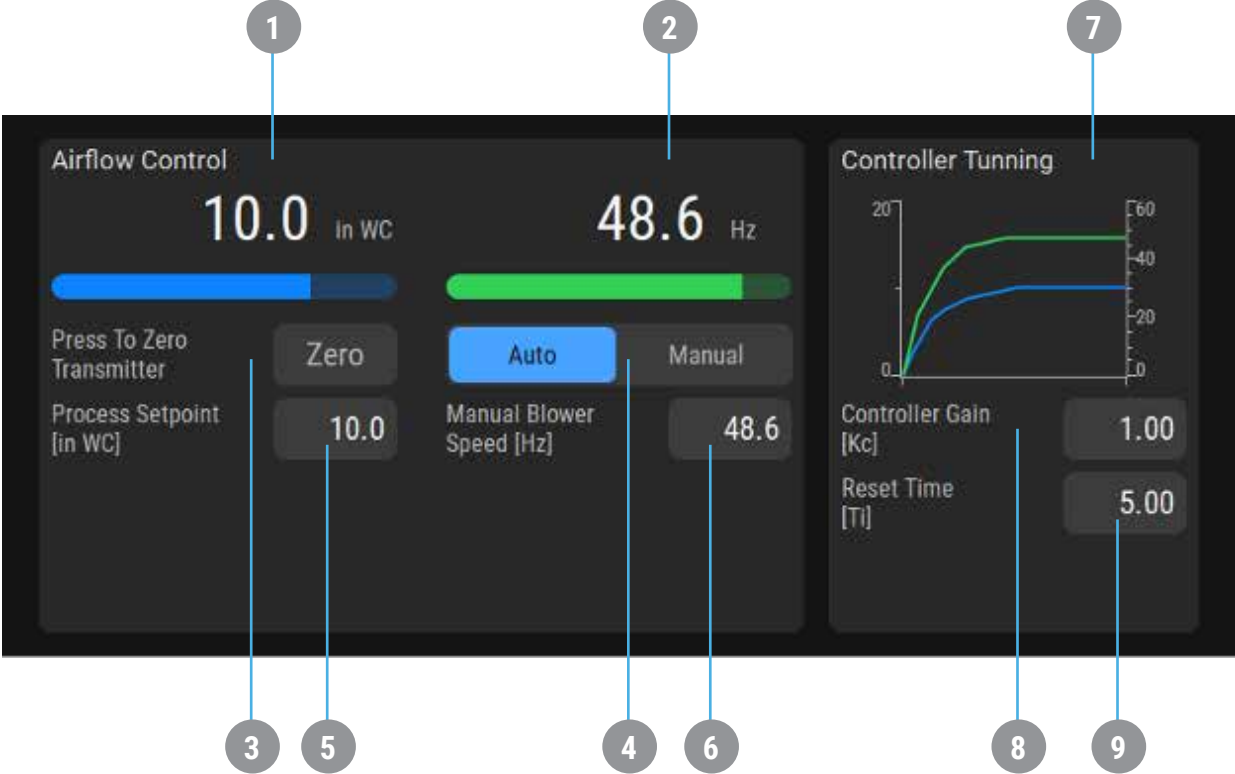


- 1
- SECONDARY FILTER DP**  
This numeric display and bar-graph show the filter differential pressure measured between the dirty and clean sides of the filters.
- 2
- ZERO METER**  
The Zero push button will zero any differential pressure reading, should it wander from zero over the lifespan of the differential pressure sensor. This can only be done when the system is not running. Additionally, the pneumatic tubing should be disconnected from the control panel.
- 3
- ALARM SET POINT**  
This numeric entry/display shows the set point that the differential pressure must rise above to initiate an alarm. This value is adjustable between the min and max transmitter outputs. Recommended setting is 6 inWC.
- 4
- DATA PLOT**  
This graphical display shows the filter differential pressure over time. The time line view can be changed from one day to 6 months.
- 5
- SECONDARY FILTER LIFE**  
The filter life shows the remaining life of the filter. When the filter is nearing end of life, it will remind you to order or schedule the filter change. Once the filter has reached end of life, it will prompt you to change the filter.
- 6
- RESET**  
This button resets the hour meter or date, after the filters have been replaced.

3.3

AIRFLOW

3.3.1    STATIC PRESSURE *(If equipped)* (3.5)



AIRFLOW

3.3

- 1

**AIRFLOW DISPLAY**  
This numeric display and bar graph show the system static pressure, measured between the clean side of the filter and atmosphere
- 2

**BLOWER SPEED (Hertz)**  
This numeric display, bar graph shows blower speed in Hertz.
- 3

**ZERO METER**  
The Zero push button will zero any reading, should it wander from zero over the lifespan of sensor. This can only be done when the system is not running. Additionally, the pneumatic tubing should be disconnected from the control panel.
- 4

**MODE SELECTION**  
The mode selection allows the user to choose between Auto or Hand control of the Airflow Controller system.

a

**Auto**  
Default and recommended mode of operation. The controller adjusts the blower speed in order to maintain a constant airflow.

b

**Hand**  
Blower speed set according to Blower Speed numeric entry/display.
- 5

**PROCESS SET POINT**  
This numeric entry/display is visible in Auto mode shows the desired set point for the static pressure. The Airflow Controller will automatically adjust the blower speed to best meet this set point. Factory default setting is 4 inWC.
- 6

**MANUAL BLOWER SPEED (HZ)**  
This numeric entry/display is visible in Hand mode shows the desired set point for the Blower Speed.
- 7

**TUNING DISPLAY**  
Theis graphical display shows the relationship between the blower frequency (In green) and the static pressure (In blue).
- 8

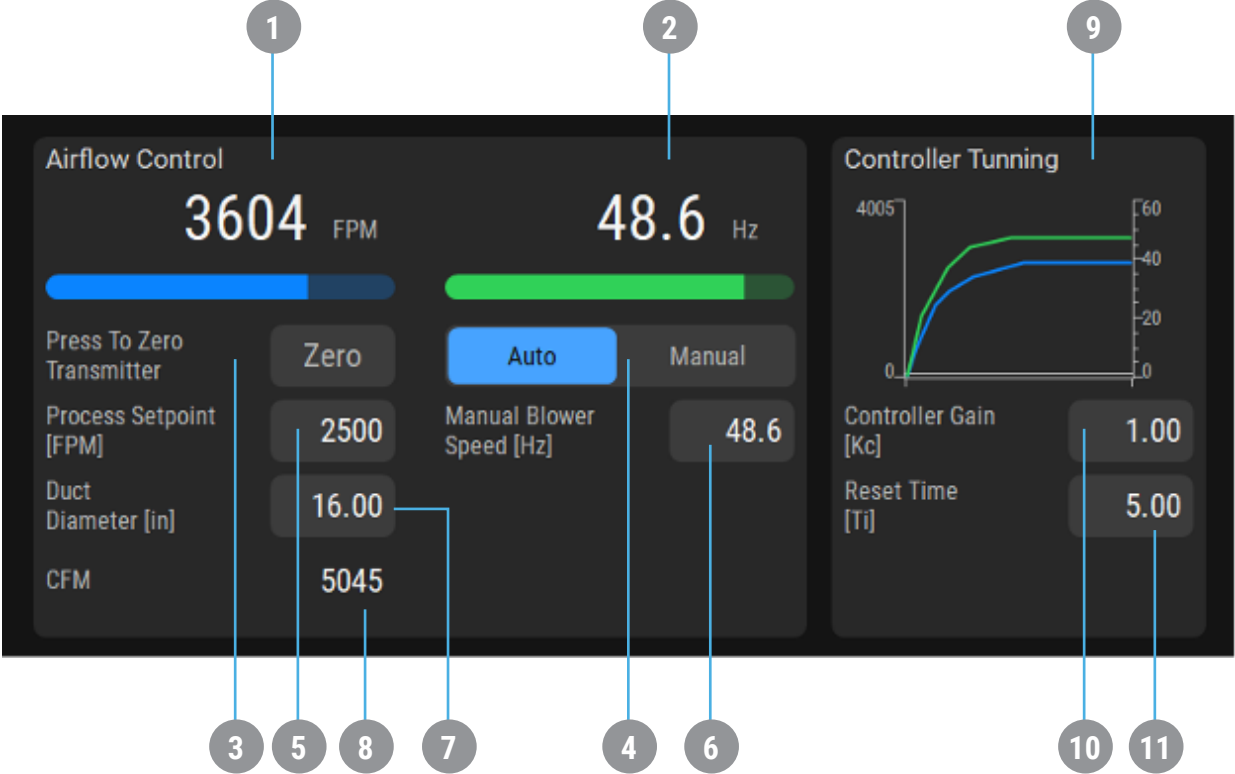
**CONTROLLER GAIN (Kc)**  
This numeric entry/display allows for advance tuning of the airflow controllers PID loop.
- 9

**RESET TIME (Ti)**  
This numeric entry/display allows for advance tuning of the airflow controllers PID loop.

3.3

AIRFLOW

3.3.2 VELOCITY (If equipped) (3.5)



AIRFLOW

3.3

- 1

**AIRFLOW DISPLAY**  
This numeric display and bar graph show the system air velocity, measured inside of the duct.
- 2

**BLOWER SPEED (Hertz)**  
This numeric display, bar graph shows blower speed in Hertz.
- 3

**ZERO METER**  
The Zero push button will zero any reading, should it wander from zero over the lifespan of sensor. This can only be done when the system is not running. Additionally, the pneumatic tubing should be disconnected from the control panel.
- 4

**MODE SELECTION**  
The mode selection allows the user to choose between Auto or Hand control of the Airflow Controller system.

a

**Auto**  
Default and recommended mode of operation. The controller adjusts the blower speed in order to maintain a constant airflow.

b

**Hand**  
Blower speed set according to Blower Speed numeric entry/display.
- 5

**PROCESS SET POINT**  
This numeric entry/display is visible in Auto mode shows the desired set point for the air velocity. The Airflow Controller will automatically adjust the blower speed to best meet this set point. Factory default setting is 2500 FPM.
- 6

**MANUAL BLOWER SPEED (HZ)**  
This numeric entry/display is visible in Hand mode shows the desired set point for the Blower Speed.
- 7

**DUCT DIAMETER (IN)**  
This numeric entry/display is used to enter the duct size at the point where the airflow measuring device is installed for the purpose of calculating CFM.
- 8

**CFM**  
This numeric text display is used to show the calculated CFM based on air velocity and duct size.
- 9

**TUNING DISPLAY**  
This graphical display shows the relationship between the blower frequency (In green) and the static pressure (In blue).
- 10

**CONTROLLER GAIN (Kc)**  
This numeric entry/display allows for advance tuning of the airflow controllers PID loop.
- 11

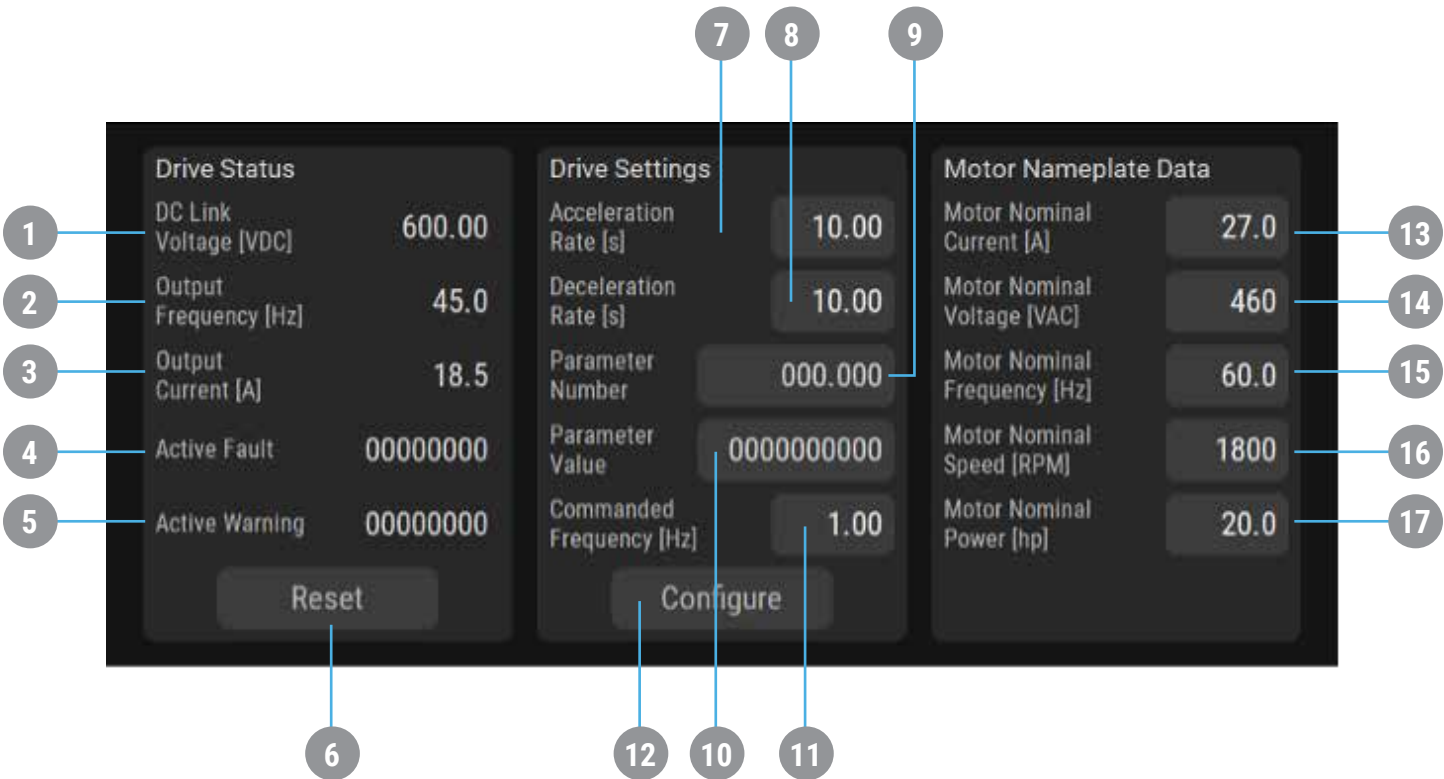
**RESET TIME (Ti)**  
This numeric entry/display allows for advance tuning of the airflow controllers PID loop.



3.3

AIRFLOW

3.3.3 VFD SETTINGS



AIRFLOW

3.3

- 1

**DC LINK VOLTS (VDC)**  
This numeric display shows the VFD DC Bus voltage.
- 2

**OUTPUT FREQUENCY (Hertz)**  
This numeric display shows VFD output frequency.
- 3

**OUTPUT CURRENT (A)**  
This numeric display shows VFD output current.
- 4

**ACTIVE FAULT**  
This text display shows the current status of the VFD. If faulted, a fault code will be shown.
- 5

**ACTIVE WARNING**  
This text display shows the current status of the VFD. If a warning is present, a warning code will be shown.
- 6

**RESET**  
This button will reset VFD faults.
- 7

**ACCELERATION RATE (s)**  
This numeric entry/display shows the acceleration time. This value is adjustable between 1s and 500s. Factory default setting will vary with size of motor.
- 8

**DECELERATION RATE (s)**  
This numeric entry/display shows the deceleration time. This value is adjustable between 1s and 500s. Factory default setting will vary with size of motor.
- 9

**PARAMETER NUMBER**  
This numeric entry/display shows which parameter to view or edit.
- 10

**PARAMETER VALUE**  
This numeric entry/display shows the value of the parameter selected to view or edit. Use caution when modifying parameters as it may render the drive unusable
- 11

**COMMANDED FREQUENCY (Hz)**  
This text display shows the commanded blower frequency in Hertz.
- 12

**CONFIGURE**  
This button will re-download configuration. This does not reset all parameters to factory default. Consult the VFD manual for instructions on how to reset all parameters to factory default. After resetting to factory default, make sure to press configure button to download parameters needed for operation of the drive. Button must be held for 3 seconds. Indicators on the button will turn blue once operation is complete.
- 13

**MOTOR NOMINAL CURRENT (A)**  
This numeric entry/display shows the motor full load amperage. Set to the motor nameplate rated full load amps.
- 14

**MOTOR NOMINAL VOLTS (VAC)**  
This numeric entry/display shows the motor voltage. Set to the motor nameplate rated volts.
- 15

**MOTOR NOMINAL FREQUENCY (Hz)**  
This numeric entry/display shows the motor frequency. Set to the motor nameplate rated Hertz
- 16

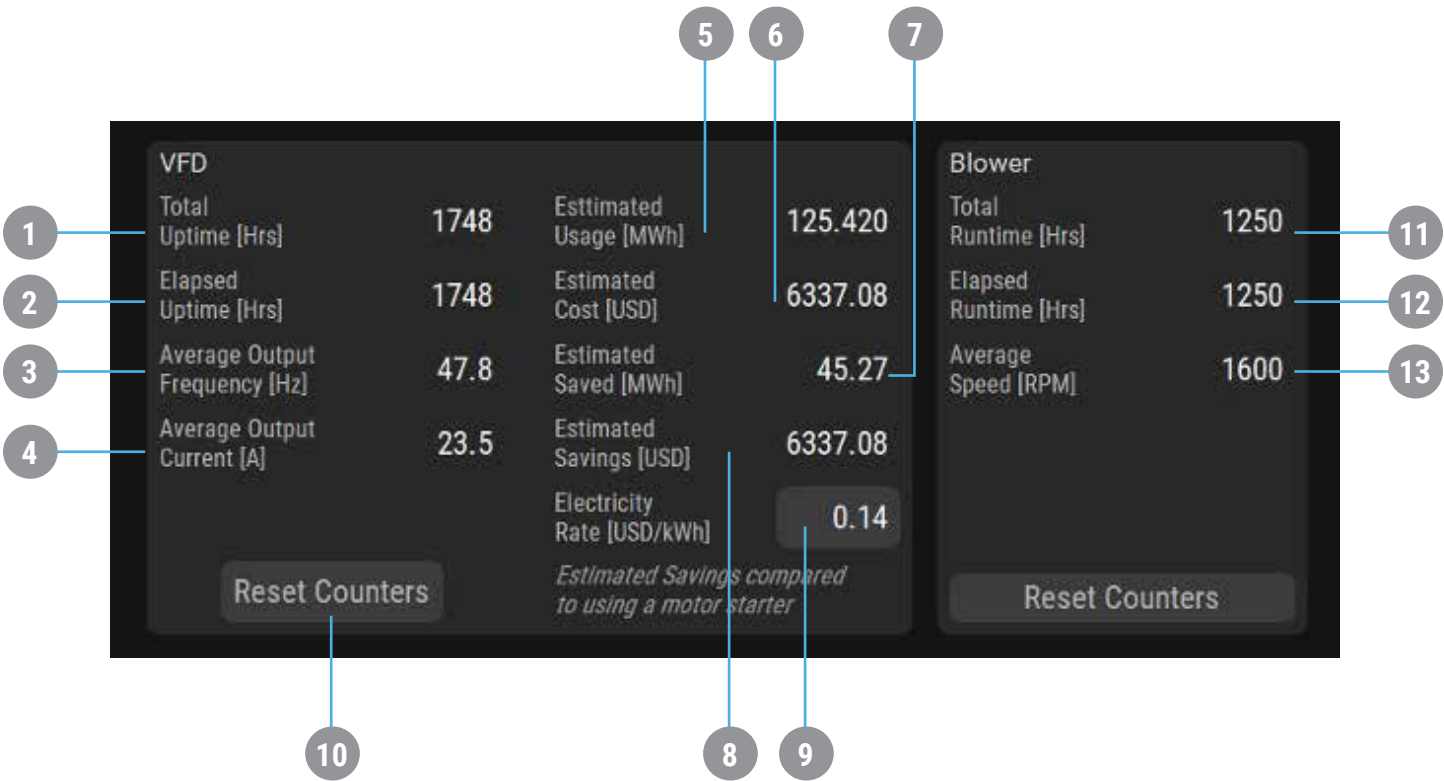
**MOTOR NOMINAL SPEED (RPM)**  
This numeric entry/display shows the motor speed. Set to the motor nameplate rated RPM
- 17

**MOTOR NOMINAL POWER (hp)**  
This numeric entry/display shows the motor power. Set to the motor nameplate rated horsepower

3.3

AIRFLOW

3.3.4 BLOWER AND VFD MAINTENANCE SCREEN



AIRFLOW

3.3

- 1

**TOTAL UPTIME (HRS)**  
This numeric display shows the total hours that the VFD has been powered up in either stopped or running conditions.
- 2

**ELAPSED UPTIME (HRS)**  
This user resettable numeric display shows the total hours that the VFD has been powered up in either stopped or running conditions.
- 3

**AVERAGE OUTPUT FREQUENCY (HZ)**  
This user resettable numeric display shows average frequency commanded by the VFD
- 4

**AVERAGE OUTPUT CURRENT (A)**  
This user resettable numeric display shows average current commanded by the VFD
- 5

**ESTIMATED USAGE (MWH)**  
This user resettable numeric display shows estimated power consumed by the VFD.
- 6

**ESTIMATED COST (USD)**  
This user resettable numeric display shows estimated power cost incurred by the VFD.
- 7

**ESTIMATED SAVED (MWH)**  
This user resettable numeric display shows estimated power saved by the VFD compared to a motor starter.
- 8

**ESTIMATED SAVINGS (USD)**  
This user resettable numeric display shows estimated power saved by the VFD compared to a motor starter.
- 9

**ELECTRICITY RATE (USD/KWH)**  
This numeric entry/display shows electricity rate used in power cost calculations.
- 10

**RESET COUNTERS**  
This button resets all resettable VFD counters in this screen.
- 11

**TOTAL RUNTIME (HRS)**  
This numeric display shows the total hours that the Blower has been energized.
- 12

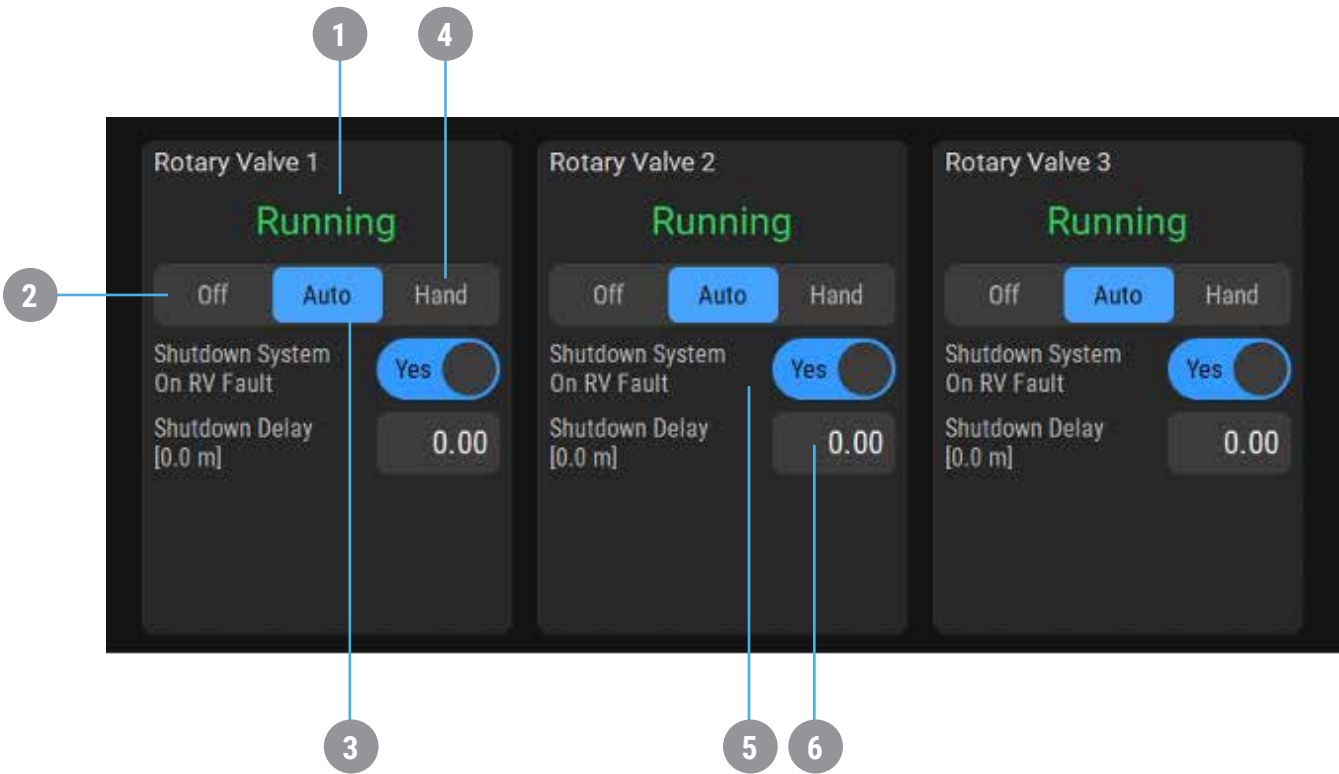
**ELAPSED RUNTIME (HRS)**  
This user resettable numeric display shows the total hours that the Blower has been energized.
- 13

**AVERAGE SPEED (RPM)**  
This user resettable numeric display shows the average blower speed.

3.4

DISCHARGE

3.4.1 ROTARY VALVE (IF EQUIPPED)



DISCHARGE

3.4

- 1

**STATUS**

This text display shows the following conditions:

a

**Stopped**

Valve is stopped

b

**Running**

Valve is running

c

**Over Load Tripped**

Valve is faulted on overload condition

d

**Zero Speed Tripped**

Valve is told to run but the Zero speed switch does not detect motion (If Equipped)

e

**Field Disconnect Open**

Field Disconnect is open and valve will not operate (If Equipped)
- 6

**SHUTDOWN DELAY (MIN)**

This numeric entry/display shows the amount of time a rotary valve fault must be active before shutting the collector is shut down.
- 2

**OFF**

This button places the rotary valve in Off Mode and prevents the valve from running. This is not intended for servicing the valve. Follow LOTO rules when servicing.
- 3

**AUTO**

This button places the rotary valve in Auto Mode. When engaged, the valve will run if the blower is running, or if the system is cleaning the primary filters.
- 4

**HAND**

This button places the rotary valve in Hand Mode. When engaged, and all interlocks are met, the valve will run continuously.
- 5

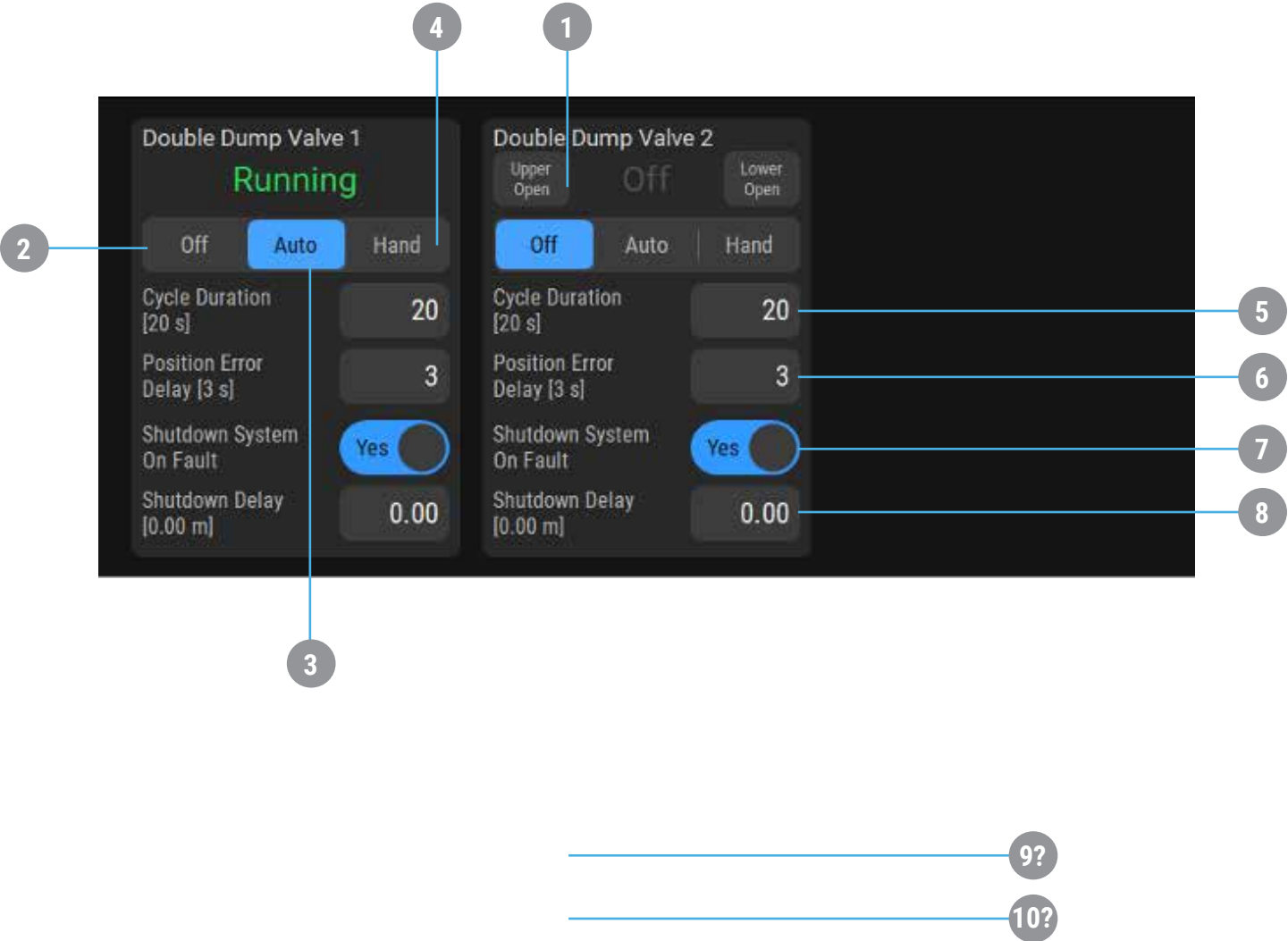
**SHUTDOWN SYSTEM ON RV FAULT**

This toggle enables a shutdown fault of the collector when the rotary valve has a fault condition. When switched off, the collector will continue to run, but a warning indicator will continue to display the active fault.

3.4

DISCHARGE

3.4.2 DOUBLE DUMP VALVE (IF EQUIPPED)



DISCHARGE

3.4

- 1

**VALVE STATUS**

This text display shows the status of the valve. Some of the following conditions relay on the position sensor.

  - a Open**  
Valve is in the open position (if equipped with position sensor)
  - b Closed**  
Valves is in the closed position (if equipped with position sensor)
  - c Opening**  
Valve is being told to open but has not reached the open position
  - d Closing**  
Valve is being told to close but has not reached the closed position
  - e Position Error**  
Valve has not reached position in time  
**Note:** Clear Faults – Turning the valve off and back to auto will clear any faults if the condition is not present.
- 2

**OFF**

This button places the double dump valve in Off Mode and prevents the valve from running. This is not intended for servicing the valve. Follow LOTO rules when servicing.
- 3

**AUTO**

This button places the double dump valve in Auto Mode. When engaged, the valve will run if the blower is running, or if the system is cleaning the primary filters.
- 4

**HAND**

This button places the double dump valve in Hand Mode. When engaged, and all interlocks are met, the valve will run continuously.
- 5

**CYCLE DURATION (s)**

This numeric entry/display shows how long the valves will take to complete a full cycle. This value is adjustable between 0 and 60 seconds. Factory default setting is 20 s.
- 6

**POSITION ERROR DELAY (s)**

This numeric entry/display shows how long the valves have to open or close before a position fault is produced. This value is adjustable between 0 and 10 seconds. Factory default setting is 3 s. If set to 0, position fault is disabled.
- 7

**SHUTDOWN SYSTEM ON FAULT**

This toggle enables a shutdown fault of the collector when the double dump valve has a fault condition. When switched off, the collector will continue to run, but a warning indicator will continue to display the active fault.
- 8

**SHUTDOWN DELAY (Min)**

This numeric entry/display shows the amount of time a double dump valve fault must be active before shutting the collector is shut down.
- 9

**POSITION ERROR TIME (s)**

This numeric entry/display shows how long the valves have to open or close before a position fault is produced. This value is adjustable between 0 and 10 seconds. Factory default setting is 10 s. If set to 0, position fault is disabled.
- 10

**FORCE OPEN / FORCE CLOSE**

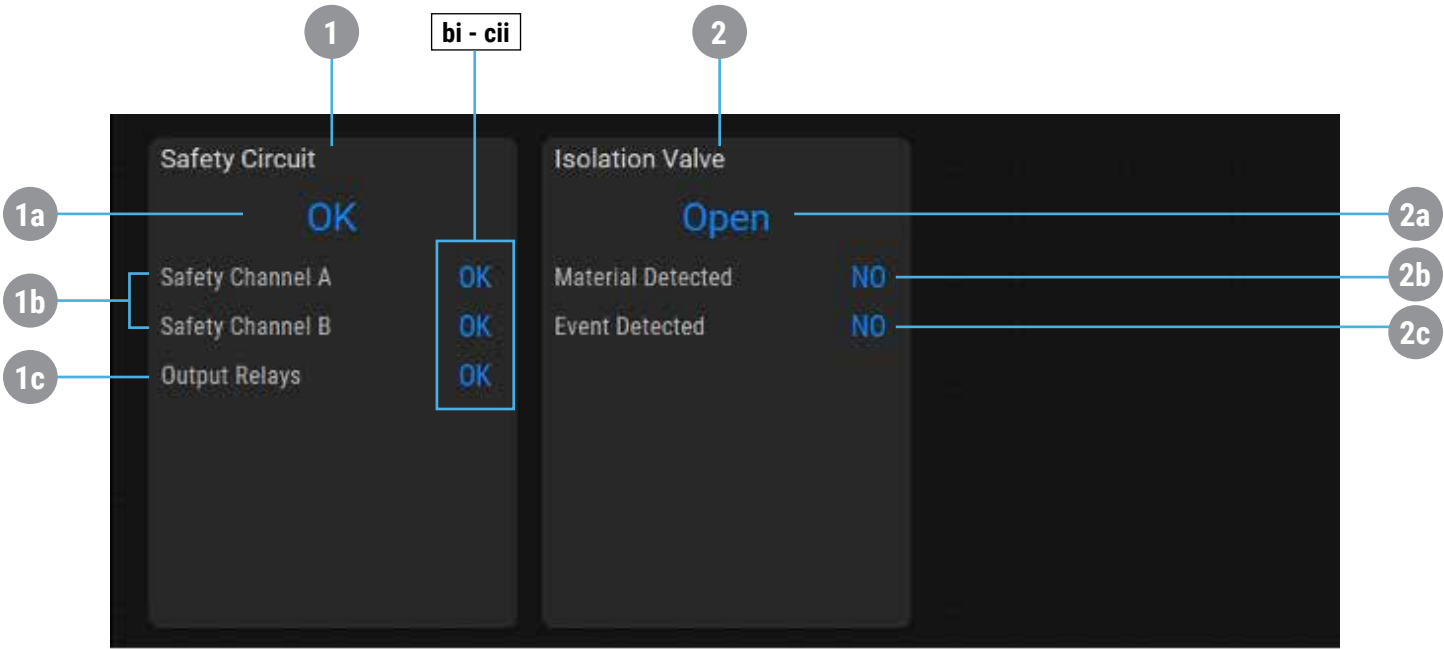
These buttons are intended for service and are only visible when the Double Dump Valve is set to OFF. The buttons will force the valve open or close. The upper and lower dump are interlocked so that they can never both be open at the same time.



3.5

SAFETY

3.5.1 SAFETY CIRCUIT - ISOLATION VALVE



SAFETY

3.5

1 SAFETY CIRCUIT

- a Status**  
This text display shows the status of the safety relay.
- b Safety Channel A and B**  
Safety relay circuit status
  - i. OK**  
All devices in safety circuit are set
  - ii. OPEN**  
At least one device in the safety circuit is not set
- c Output Relays**  
Safety relay condition
  - i. OK**  
Safety Relay is set
  - ii. TRIPPED**  
Safety Relay is tripped

2 ISOLATION VALVE

- a Status**  
This text display shows the status of the isolation valve.
- b Excessive Material Accumulation Detected**  
YES or NO
- c Event Detected**  
YES or NO

4.1

ALARMS

This section contains some basic troubleshooting guidelines. Only a qualified individual should troubleshoot the system.

The alarms list below is to be used as a method of troubleshooting. Alarms may differ based on system configuration and features.

ALARM TEXT	POTENTIAL CAUSE	CORRECTIVE ACTION
Remote Stop Button Missing or Pressed	<ul style="list-style-type: none"> <li>Remote stop button missing or pressed</li> </ul>	<ul style="list-style-type: none"> <li>Install Remote Stop</li> <li>Release Remote Stop</li> </ul>
Schedule System Maintenance	<ul style="list-style-type: none"> <li>System is nearing maintenance due set point</li> </ul>	<ul style="list-style-type: none"> <li>Schedule System Maintenance</li> </ul>
Perform System Maintenance	<ul style="list-style-type: none"> <li>System has reached maintenance due set point</li> </ul>	<ul style="list-style-type: none"> <li>Perform System Maintenance</li> </ul>
Primary Filters Clogged	<ul style="list-style-type: none"> <li>Filters are dirty or clogged</li> <li>Clogged or damaged tubing</li> </ul>	<ul style="list-style-type: none"> <li>Inspect filters and replace as needed</li> <li>Unclog or repair tubing</li> </ul>
Time to Order Primary Filters and Schedule Service	<ul style="list-style-type: none"> <li>Filters are nearing end of life</li> </ul>	<ul style="list-style-type: none"> <li>Order and Schedule Primary Filters Service</li> </ul>
Time to Replace Primary Filters	<ul style="list-style-type: none"> <li>Filters have reached end of life</li> </ul>	<ul style="list-style-type: none"> <li>Replace Primary Filters</li> </ul>
Cleaning System Pulse Solenoid Failure	<ul style="list-style-type: none"> <li>Cleaning solenoid failed</li> <li>Compressed air low or off</li> </ul>	<ul style="list-style-type: none"> <li>Inspect solenoid and replace as needed</li> <li>Adjust or turn on compressed air</li> </ul>
Cleaning System Compressed Air Leak Detected	<ul style="list-style-type: none"> <li>Compressed air leak detected</li> <li>Compressed air flow switch stuck ON</li> </ul>	<ul style="list-style-type: none"> <li>Inspect cleaning system for compressed air leaks</li> <li>Inspect compressed air flow switch for proper operation</li> </ul>
Cleaning System Compressed Air Low or Off	<ul style="list-style-type: none"> <li>Compressed air low or off</li> <li>All cleaning solenoids failed</li> <li>Compressed air flow switch stuck OFF</li> </ul>	<ul style="list-style-type: none"> <li>Adjust or turn on compressed air</li> <li>Inspect solenoids and replace as needed</li> <li>Inspect compressed air flow switch for proper operation</li> </ul>
Secondary Filter Clogged	<ul style="list-style-type: none"> <li>Filter Dirty or Clogged</li> <li>Clogged and/or damaged tubing</li> </ul>	<ul style="list-style-type: none"> <li>Inspect filters and replace as needed</li> <li>Unclog or repair tubing</li> </ul>
Blower Running at Limit	<ul style="list-style-type: none"> <li>System not balanced</li> </ul>	<ul style="list-style-type: none"> <li>Schedule System Balancing</li> </ul>
Blower VFD Faulted. Check VFD screen for fault code.	<ul style="list-style-type: none"> <li>VFD Fault</li> </ul>	<ul style="list-style-type: none"> <li>Obtain fault codes from the VFD Settings screen</li> <li>Reference VFD manual for detailed corrective actions</li> </ul>
Blower Motor Overload Tripped	<ul style="list-style-type: none"> <li>Overload tripped</li> </ul>	<ul style="list-style-type: none"> <li>Inspect motor for proper operation</li> <li>Reset the overload</li> <li>Verify motor current draw is within nameplate parameters</li> </ul>
Rotary Valve Motor Overload Tripped	<ul style="list-style-type: none"> <li>Overload tripped</li> </ul>	<ul style="list-style-type: none"> <li>Clear any material from valve</li> <li>Verify proper chain tension</li> <li>Reset the overload</li> <li>Verify motor current draw is within nameplate parameters</li> </ul>
Rotary Valve Bypassed	<ul style="list-style-type: none"> <li>Rotary Valve OFF while the system is running</li> </ul>	<ul style="list-style-type: none"> <li>Place the Rotary Valve in either AUTO or HAND mode</li> </ul>
Rotary Valve Not Turning	<ul style="list-style-type: none"> <li>Valve not turning</li> <li>Sensor needs adjustment</li> </ul>	<ul style="list-style-type: none"> <li>Clear any material from valve</li> <li>Verify proper chain tension</li> </ul>
Double Dump Valve Bypassed	<ul style="list-style-type: none"> <li>Double Dump Valve OFF while the system is running</li> </ul>	<ul style="list-style-type: none"> <li>Place the Double Dump Valve in either AUTO or HAND mode</li> </ul>

ALARMS

4.1

ALARM TEXT	POTENTIAL CAUSE	CORRECTIVE ACTION
Double Dump Valve Upper Dump Valve Position Fault	<ul style="list-style-type: none"> <li>Compressed air low or off</li> <li>Error delay time low</li> <li>Solenoid malfunction</li> <li>Sensor malfunction</li> </ul>	<ul style="list-style-type: none"> <li>Adjust or turn on compressed air</li> <li>Adjust error delay time</li> <li>Inspect solenoid for proper operation and replace if needed</li> <li>Inspect sensor for proper operation and replace if needed</li> </ul>
Double Dump Valve Lower Dump Valve Position Fault	<ul style="list-style-type: none"> <li>Compressed air low or off</li> <li>Error delay time low</li> <li>Solenoid malfunction</li> <li>Sensor malfunction</li> </ul>	<ul style="list-style-type: none"> <li>Adjust or turn on compressed air</li> <li>Adjust error delay time</li> <li>Inspect solenoid for proper operation and replace if needed</li> <li>Inspect sensor for proper operation and replace if needed</li> </ul>
Emergency Stop Circuit Tripped	<ul style="list-style-type: none"> <li>LOTO (lock-out tag-out)</li> <li>Power outage</li> <li>Emergency Stop</li> </ul>	<ul style="list-style-type: none"> <li>Verify that all devices in the E-Stop circuit are ready</li> <li>Verify that all E-Stop buttons are twisted out</li> <li>Press the E-Stop Reset button</li> </ul>
Fire Suppression System Activated	<ul style="list-style-type: none"> <li>Fire suppression system activated or malfunctioned</li> </ul>	<ul style="list-style-type: none"> <li>Reset fire suppression system as per manufacturer's guidelines</li> </ul>
Isolation Valve Excessive Material Accumulation Detected	<ul style="list-style-type: none"> <li>Material accumulation detected</li> <li>Sensor needs adjusted</li> </ul>	<ul style="list-style-type: none"> <li>Clear water or debris from sensor</li> <li>Adjust sensor as per manufacturer's guidelines</li> </ul>
Isolation Valve Flap Failed to Open	<ul style="list-style-type: none"> <li>Material build up</li> <li>Start delay time too low</li> <li>Sensor needs adjusted</li> </ul>	<ul style="list-style-type: none"> <li>Clear debris</li> <li>Increase start delay time</li> <li>Adjust sensor as per manufacturer's guidelines</li> </ul>
Isolation Valve Flap Failed to Close	<ul style="list-style-type: none"> <li>Material build up</li> <li>Stop delay time too low</li> <li>Sensor needs adjusted</li> </ul>	<ul style="list-style-type: none"> <li>Clear debris</li> <li>Increase stop delay time</li> <li>Adjust sensor as per manufacturer's guidelines</li> </ul>
Isolation Valve Event Detected	<ul style="list-style-type: none"> <li>Potential explosion</li> </ul>	<ul style="list-style-type: none"> <li>Inspect pertinent explosion protection components</li> </ul>
Isolation Valve Excessive Wear Detected	<ul style="list-style-type: none"> <li>Isolation valve has excessive wear</li> </ul>	<ul style="list-style-type: none"> <li>Inspect the Isolation Valve per manufacturer's guidelines</li> <li>Repair or replace worn out components</li> </ul>
Isolation Valve Wiring or Sensor Problem	<ul style="list-style-type: none"> <li>Wiring problem</li> <li>Sensor problem</li> </ul>	<ul style="list-style-type: none"> <li>Inspect and correct position sensor wiring</li> <li>Inspect position sensor and replace if needed</li> </ul>



**The installation, maintenance, operation, and care of the AyrDyne® Monitoring System Human Machine Interface (HMI) should only be performed by individuals who are qualified and trained to do so.**

A “qualified” person in this context is a person who has skills and knowledge related to the construction and operation of electrical equipment and its installation through both work experience and training. Additionally, a qualified person is one who has received and undergone safety training specific to electrical maintenance. Anyone who has not undergone safety training specific to this system should not operate or perform maintenance on the system.

In terms of maintenance of this system, “lock out tag out” safety protocol applies. This means that any time maintenance on this system is performed, the machine must be shut down, unplugged and tagged or labeled, explaining that maintenance is taking place.

**DenTech is not liable for any consequences arising from misuse of this system.** If you are unsure of whether you are qualified to use or maintain this system, please contact an electrician or other qualified professional for assistance. Failure to follow safety protocol for this and any other system could result in serious bodily harm or other injury. **No responsibility is assumed by DenTech for any consequences arising out of the use of this material.**

# GLOSSARY

**QUALIFIED INDIVIDUAL:**  
One who meets the skill level and experience to perform the essential functions of the activity

**DIFFERENTIAL PRESSURE (DP):**  
The difference in pressure measured between two points. In this system, DP is measured between the clean and dirty sides of the filter. The higher the number, the more restriction across the filter.

**STATIC PRESSURE (SP):**  
The pressure exerted by a still liquid or gas. In this system, SP is measured between the dirty side of the filter and atmosphere. The higher the number, the more suction capacity.

**HUMAN MACHINE INTERFACE (HMI):**  
A mechanism, often graphical, used for monitoring and controlling a machine or process.

**PROGRAMMABLE LOGIC CONTROLLER (PLC):**  
A modular computer which performs various tasks based on customized instructions.

**VARIABLE FREQUENCY DRIVE (VFD):**  
A motor control system that manipulates output frequency in order to run an electrical motor at any desired speed.



## **Installation, Operation, and Maintenance Manual**

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1975 N. Reading Road, Denver, PA 17517  
717-335-4820 | [www.ayrdyne.com](http://www.ayrdyne.com)