GARDNER DENVER

Experience Proven Results™

IQ-7-200
Version: 02
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AIRSMART™ CONTROLLER

USER'S MANUAL

(Blower Application)

WARNING – PROHIBITION – MANDATORY LABEL INFORMATION

Gardner Denver positive displacement blowers are the result of advanced engineering and skilled manufacturing. To be assured of receiving maximum service from this machine, the owner must exercise care in its operation and maintenance. This book is written to give the operator and maintenance department essential information for day-to-day operation, maintenance and adjustment. Careful adherence to these instructions will result in economical operation and minimum downtime.

Boxed text formats are used, within this manual, to alert users of the following conditions:

Safety Labels are used, within this manual and affixed to the appropriate areas of the blower package, to alert users of the following conditions:

⚠ DANGER

Indicates a hazard with a high level of risk, which if not avoided, WILL result in death or serious injury.

Equipment Starts Automatically

Health Hazard – Explosive Release of Pressure

Cutting of Finger or Hand Hazard – Rotating Impeller Blade

High Voltage – Hazard of Shock, Burn or Death Present Until Electrical Power is Removed

Cutting of Finger or Hand Hazard – Rotating Fan Blade

Entanglement of Fingers or Hand – Rotating Shaft

⚠WARNING

Indicates a hazard with a medium level of risk, which if not avoided, <u>COULD</u> result in death or serious injury.

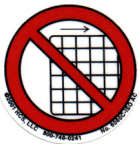
Asphyxiation Hazard – Poisonous Fumes or Toxic Gas in Compressed Air

⚠CAUTION

Indicates a hazard with a low level of risk, which if not avoided, <u>MAY</u> result in a minor or moderate injury.

Burn Hazard – Hot Surface

PROHIBITION - MANDATORY ACTION REQUIREMENTS



Do Not Operate Blower with Guard Removed

Lockout Electrical Equipment in De-Energized State

Do Not Lift Equipment with Hook – No Lift Point

Loud Noise Hazard – Wear Hearing Protection

Handle Package at Forklift Points Only

Read the Operator's Manual Before Proceeding with Task

SAFETY PRECAUTIONS

Safety is everybody's business and is based on your use of good common sense. All situations or circumstances cannot always be predicted and covered by established rules. Therefore, use your past experience, watch out for safety hazards and be cautious. Some general safety precautions are given below:

Failure to observe these notices could result in injury to or death of personnel.

- **Keep fingers and clothing away from rotating fan, belt drive, etc.**
- **Disconnect the blower unit from its power source, lockout and tagout before working on the unit – this machine is automatically controlled and may start at any time.**
- **Do not loosen or remove the oil filler plug, drain plugs, covers, the thermostatic mixing valve or break any connections, etc., in the blower air or oil system until the unit is shut down and the air pressure has been relieved.**
- **Electrical shock can and may be fatal.**
- **Perform all wiring in accordance with the National Electrical Code (NFPA-70) and any applicable local electrical codes. Wiring and electrical service must be performed only by qualified electricians.**
- **Open main disconnect switch, lockout and tagout before working on the control, wait 10 minutes and check for voltage.**

Failure to observe these notices could result in damage to equipment.

- **Stop the unit if any repairs or adjustments on or around the blower are required.**
- **Do not use the air discharge from this unit for breathing – not suitable for human consumption.**
- **An Excess Flow Valve should be on all compressed air supply hoses exceeding 1/2 inch inside diameter (OSHA Regulation, Section 1926.302).**
- **Do not exceed the rated maximum pressure values shown on the nameplate.**
- **Do not operate unit if safety devices are not operating properly. Check periodically. Never bypass safety devices.**

Table of Contents

1 General Information

The AirSmart™ Controller was designed for use in the Gardner Denver Global Line of positive displacement blowers. The AirSmart™ Controller is capable of controlling both variable speed and fixed speed blowers which use traditional motor starters. The microprocessor-based unit can easily control a Variable Frequency motor Drive (VFD) while at the same time monitoring all necessary temperature and pressure points within the blower in order to safely operate the machine and satisfy user air demand. The Control Panel displays a comprehensive overview of the blower status and allows easy access to operational parameters such as pressure set points, alarm set points and language selection.

1.1 AirSmart Controller Features

- ✓ Microprocessor controlled
- ✓ Low voltage 24 VDC operation
- ✓ Supports VFD via Modbus link
- ✓ Blower air regulation via PID control
- ✓ Can control variable speed or fixed speed blower.
- ✓ Intelligent limiting for operation in extreme environmental conditions
- ✓ Feature rich error handling for safe machine operation
- ✓ Expandable to meet the I/O needs of large blower packages
- ✓ Up to five pressure transducer inputs
- ✓ Up to five temperature transducer inputs
- ✓ Up to three discrete inputs for user control
- ✓ Up to two discrete outputs for user status
- ✓ Sequence capability for control of up to eight blowers (w/ opt. Communications Module)
- ✓ RS-232 Serial communications for local monitoring (w/ opt. Communications Module)
- ✓ Ethernet communications for remote monitoring (w/ opt. Communications Module)

1.2 Control Panel Features

- ✓ 4 x 20 Character LCD display with LED back lighting is easy to read in all lighting conditions.
- ✓ 9 Buttons for easy blower control and menu navigation
- ✓ 4 status LEDs for “at-a-glance” blower status
- ✓ Password protection of setup parameter menus
- ✓ Multiple language support

2 Controller Operation

2.1 Example Blower Control Panel

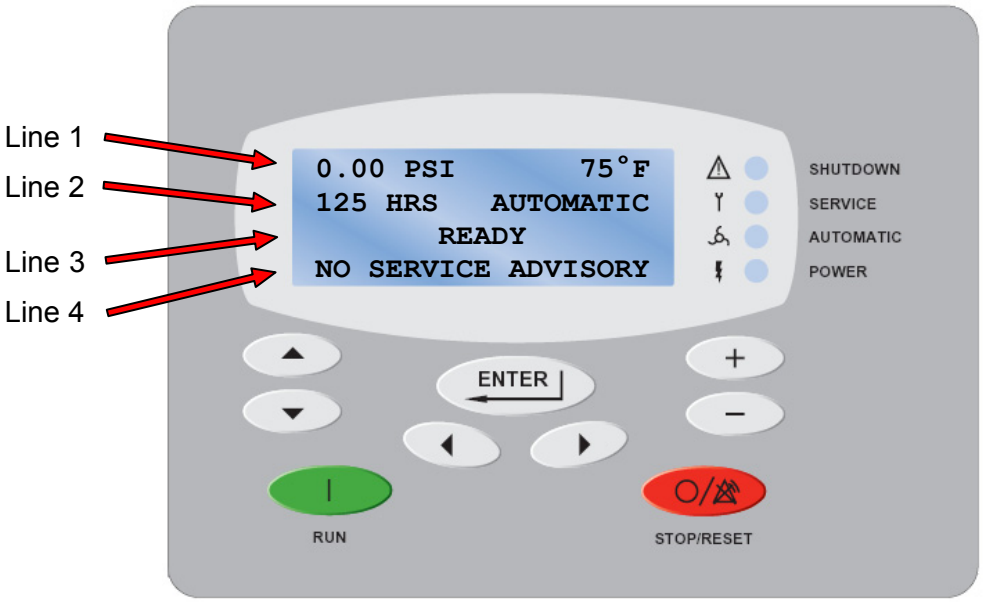
1. **AirSmart Controller Control Panel**

   The Control Panel is mounted on the front panel of the blower and is used to operate the blower and observe system status using its four-line LCD display, four status LED indicators and nine buttons.

2. **Emergency Stop Button**

   The Emergency Stop button, when pressed, will immediately shut down the blower. To reset the blower after an Emergency Stop, pull the Emergency Stop button out and then press the STOP/RESET button on the Control/Display Panel to clear the Emergency Stop fault.

2.2 Control Panel Four-Line Display



1. **Line 1**

   The first line of the display is used to show the package pressure or inlet vacuum and discharge temperature while the blower is operating. When editing parameters in the Adjustment Menus, the first line is used to show the menu heading.

2. **Line 2**

   The second line of the display is used to show the total operating hours and operating mode while the blower is running. The second line is also used to show Shutdown fault information. When editing parameters in the Adjustment Menus, the second line is used to show the parameter heading.

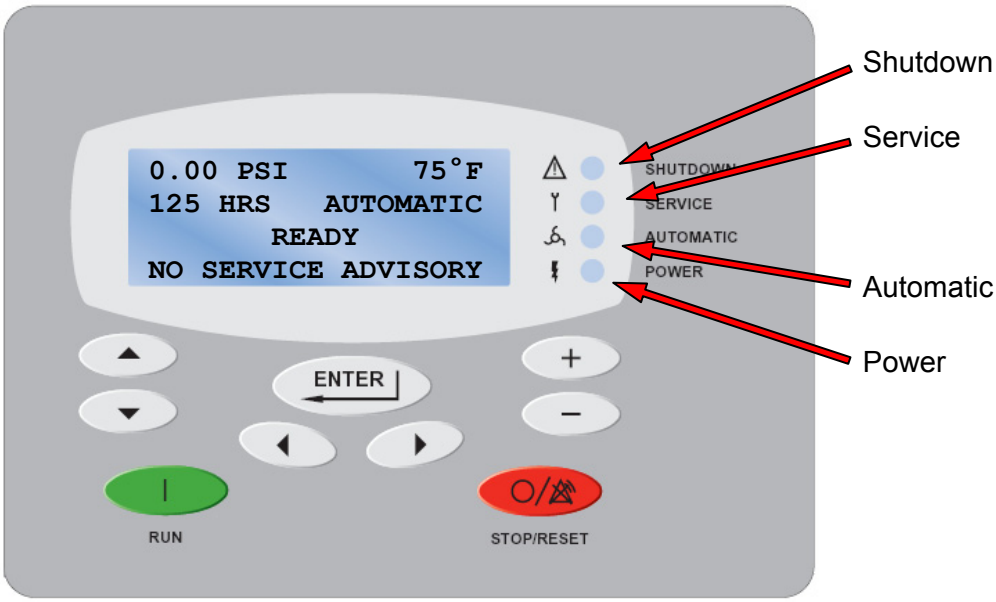
3. **Line 3**

   The third line of the display is used to show the state of the blower while it is operating. The third line is also used to show additional Shutdown fault information. When editing parameters in the Adjustment Menus, the third line is used to show the parameter value.

4. **Line 4**

   The fourth line of the display is used to show Service Advisory fault information and the Operational Menus. When editing parameters under the Adjustment Menus, the fourth line is used to show the editing mode.

2.3 Control Panel Indicator Functions



1. **Shutdown LED Indicator (red)**

   The Shutdown LED indicates a shutdown fault in the blower. The type of shutdown fault will be shown in the four-line display. When the Shutdown LED is flashing, the shutdown fault condition is active. When the Shutdown LED is on steady, the shutdown fault condition no longer exists, but the fault has not been acknowledged. To acknowledge a shutdown fault and reset the blower, press the STOP/RESET button on the Control Panel.

   Pressing the STOP/RESET button will not clear an active shutdown fault. The shutdown fault condition must be removed before it can be reset.

2. **Service LED Indicator (yellow)**

   The Service LED indicates a service advisory fault in the blower. The type of service advisory fault will be shown in the four-line display. When the Service LED is on steady, the advisory fault condition is active, but the fault has not been acknowledged. To acknowledge an advisory fault, press the ENTER button on the Control Panel.

   If the service advisory fault condition has not been cleared before it is acknowledged, the advisory fault indication will occur again in a short period of time.

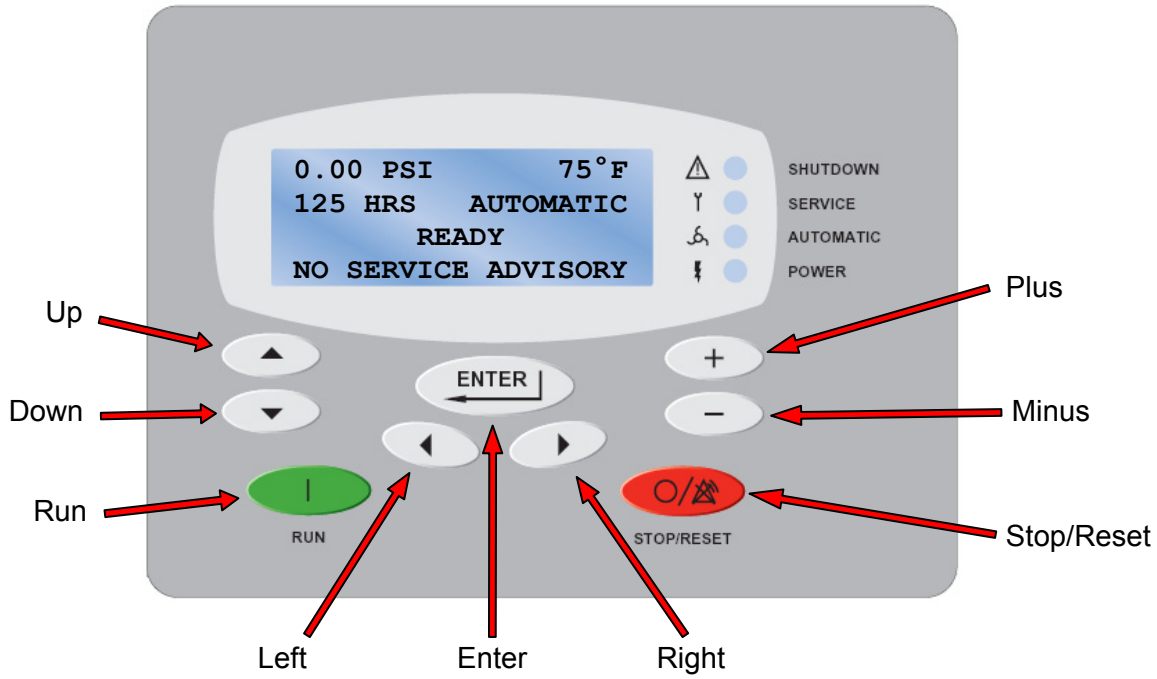
3. **Automatic LED Indicator (green)**

   The Automatic LED indicates that the blower is capable starting automatically.

4. **Power LED Indicator (white)**

   The Power LED indicates that power has been applied to the blower package.

2.4 Control Panel Button Functions



1. **RUN Button**

The RUN button is used to start the blower.

2. **STOP/RESET Button**

The STOP/RESET button is used to stop the blower. The STOP/RESET button is also used to acknowledge and reset shutdown faults or exit from the Adjustment Menu tree.

3. **ENTER Button**

The ENTER button is used to acknowledge a service advisory fault. The ENTER button is also used to enter the Adjustment Menu tree, select a parameter for editing or save an edited parameter.

4. **Left Arrow Button**

The Left Arrow button is used to navigate horizontally to the next Operational or Adjustment menu.

5. **Right Arrow Button**

The Right Arrow button is used to navigate horizontally to the next Operational or Adjustment menu.

6. **Up Arrow Button**

The Up Arrow button is used to navigate vertically to the next item inside a menu**.**

7. **Down Arrow Button**

The Down Arrow button is used to navigate vertically to the next item inside a menu.

8. **Plus Button**

The Plus button is used increment the value of a selected parameter while in the edit mode.

9. **Minus Button**

The Minus button is used decrement the value of a selected parameter while in the edit mode.

3 Quick Start Guide Fixed Speed Packages

Operation of the AirSmart controller is easy. If the controller display does not show any alarms or faults (display should read “READY” on line 3 as shown below), simply press the Run  button to start the blower. All settings are preset at the factory, no other settings are required.


```
0.00 PSI          75°F
10 HRS       AUTOMATIC
         READY
 NO SERVICE ADVISORY
```

If different alarm and fault settings are desired, see the appropriate sections of this manual.

4 Quick Start Guide for Variable Speed Drive Packages

Operation of the AirSmart controller is easy. Simply select a Target Pressure (or inlet vacuum) and then press the Run  button to start the blower, no other settings are required. The Target Pressure/Vacuum comes preset from the factory. If a different pressure or vacuum setting is desired, the following steps can be used as a guide. If different alarm and fault settings are also desired, see the appropriate sections of this manual.

4.1 Setting the Target Pressure/Vacuum

The Target Pressure/Vacuum setting is used to set the operating point of the blower. To make any adjustments in the operation of the blower, the machine must be stopped and in the Ready mode.

Stop the blower by pressing the Stop/Reset  button. The front panel display should read “READY” on line 3.


```
0.00 PSI          75°F
10 HRS       AUTOMATIC
         READY
 NO SERVICE ADVISORY
```

Next, press the Enter  button to access the Adjustment Menu tree


```
   ADJUSTMENT MENU
OPERATION ADJUSTMENT

  (SELECT SUB MENU)
```

Since the Target Pressure/Vacuum setting is under the Operation Adjustment menu, press Enter 

again to access that sub-menu

```
OPERATION ADJUSTMENT
  LANGUAGE-LANGUAGE
     ENGLISH (US)
  (SELECT PARAMETER)
```

The Target Pressure is the second item in the Operation Adjustment sub-menu so press the Down  button to navigate to the Target Pressure/Vacuum setting.

```
OPERATION ADJUSTMENT
   TARGET PRES/VAC
        9.0 PSI
  (SELECT PARAMETER)
```

To change the Target Pressure/Vacuum, press the Enter 

button to edit the value.

```
OPERATION ADJUSTMENT
   TARGET PRES/VAC
        9.0 PSI
   (EDIT PARAMETER)
```

A flashing cursor will appear covering the least significant digit in the Target Pressure/Vaccum value, use the Plus  and Minus  buttons to change its value. Use the Right  and Left  buttons to move the cursor to other digits in the Target Pressure value. When the desired Target Pressure value is displayed, press the Enter 

button to save the new value. Pressing the Stop/Reset 

button will abort the change and restore the previous value.

In order to save the changes made to parameters, press the Stop/Reset button to go back to the heading of the current menu and then press the Stop/Reset button again. If parameter changes have been made, the following screen will appear.

```
   STORE MODIFIED
    PARAMETERS?
     STOP = NO
    ENTER = YES
```

To permanently save the changes that were made, press the Enter 

button. If the Stop/Reset button is pressed, the parameter changes will be lost the next time the blower power is turned off.

5 AirSmart Controller Menus

The AirSmart Controller has two sets of menus that serve as a window into the operation of the blower. The first set is the Operational Menus, which allow the user to observe the current status of various parts of the blower like the discharge temperature or the motor current. The second set of menus are the Adjustment Menus, which allow the user to change the operating parameters of the blower such as the target pressure set point and the discharge temperature alarm limit. The default values for the adjustable parameters are determined by the Controller Model Table stored in the controller's memory.

5.1 Operational Menus

The Operational Menus are available at all times - while the blower is running, stopped or even while in a fault condition. To enter the Operational Menu trees press the Right  or Left  buttons to access one of four different menus. Once the desired menu heading is shown in the fourth line of the display, use the Up  and Down  buttons to access the individual items in the selected menu, which are also shown in the fourth line of the display. If the Up or Down buttons are not pressed within five seconds of pressing the Right or Left buttons, the fourth line of the display will return to its previous state.

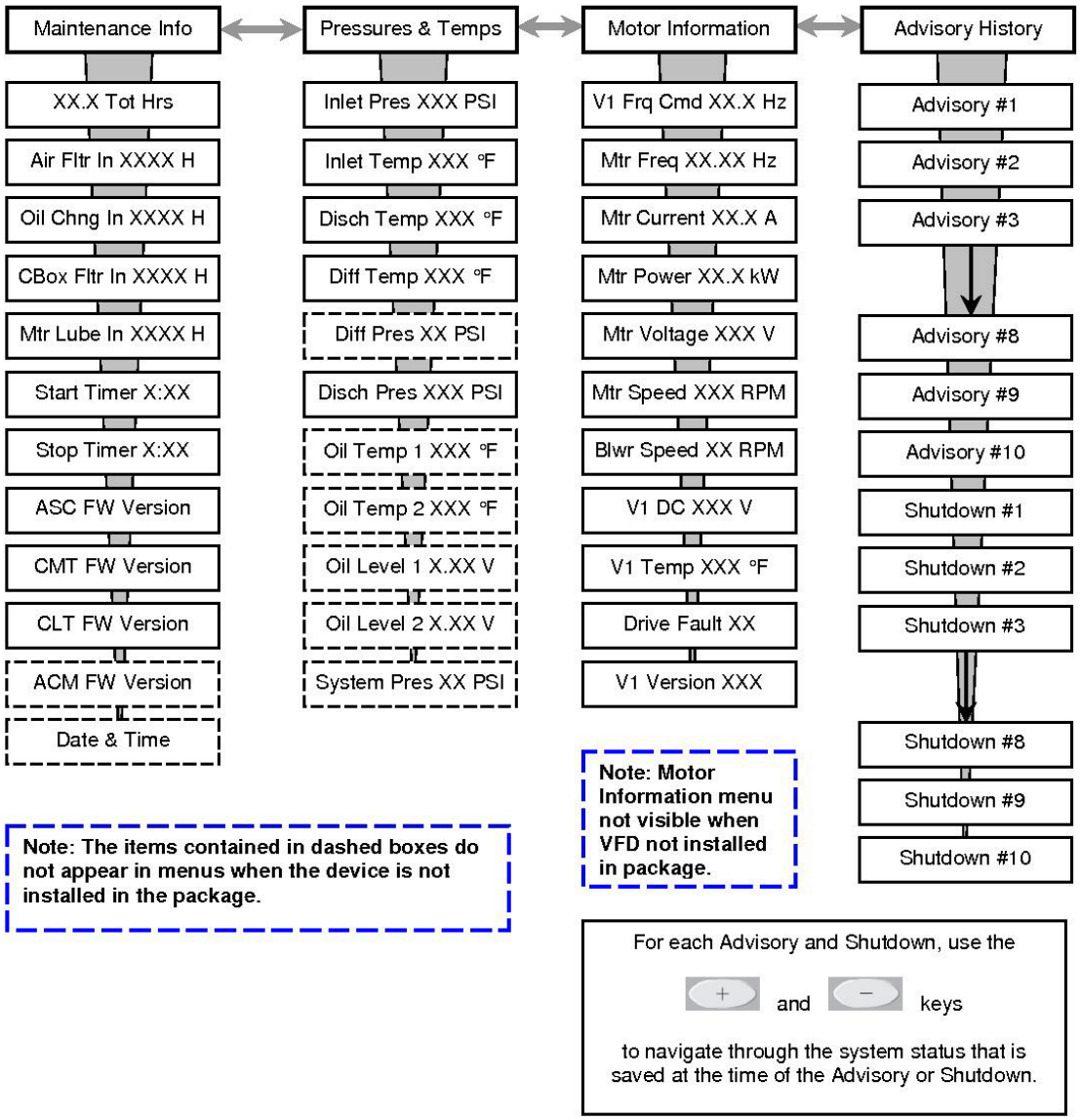
It is not necessary to navigate back to the top of a particular menu in order to enter another menu. Simply press the Right  or Left  buttons to go back to the heading of the current menu and then use the Right or Left buttons again to find the desired menu heading as described above.

- *Note: Advisory fault information is also shown in the fourth line of the display. If an advisory is active and the fault condition has not been cleared, the Operational Menu text will be periodically replaced by the advisory text*.

AirSmart Controller Operational Menus (Blower Application)

Use the  keys to navigate through the horizontal main menus. These keys are also used to exit the vertical menu items.

Use the  keys to navigate through the vertical menu items.



Note: The items contained in dashed boxes do not appear in menus when the device is not installed in the package.

Note: Motor Information menu not visible when VFD not installed in package.

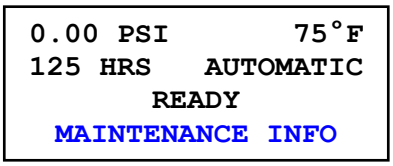
For each Advisory and Shutdown, use the

 and keys

to navigate through the system status that is saved at the time of the Advisory or Shutdown.

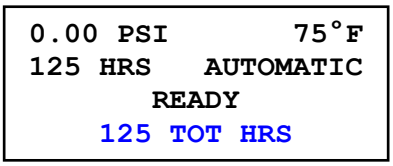
4.1.1 Maintenance Info Menu

The Maintenance Menu gives the user access to the current status of all the maintenance counters and system timers.



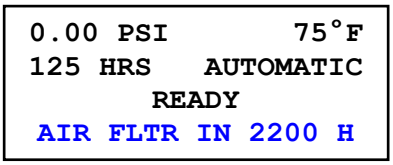
1. **Total Hours**

   The first item in the Maintenance Info menu is the total number of hours the blower has been in operation. This information is also available in the second line of the display during normal blower operation.



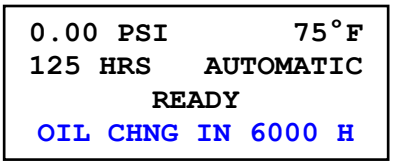
2. **Time To Next Air Filter Change**

   The next item in the Maintenance Info menu is the number of hours before the next air filter change is needed. The Air Filter Change Interval Timer can be reset under the Maintenance Adjust menu. The Air Filter Change Interval Time can be changed under the Unit Setup Adjust menu.



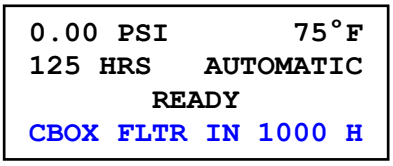
3. **Time To Next Oil Change**

   The next item in the Maintenance Info menu is the number of hours before the next oil change is needed. The Oil Change Interval Timer can be reset under the Maintenance Adjust menu. The Oil Change Interval Time can be changed under the Unit Setup Adjust menu.



4. Time To Control Box Filter Change

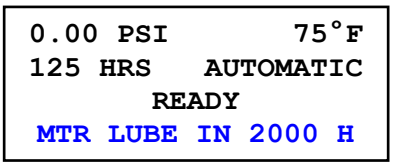
The next item in the Maintenance Info menu is the number of hours before the next control box filter change is needed. The Control Box Filter Change Interval Timer can be reset under the Maintenance Adjust menu. The Control Box Filter Change Interval Time can be changed under the Unit Setup Adjust menu.



- **Note: This parameter is only available packages with a variable frequency drive.**

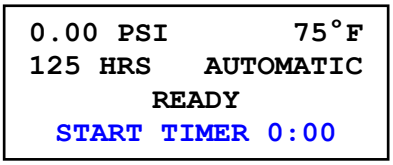
5. Time To Next Motor Lubrication

The next item in the Maintenance Info menu is the number of hours before motor lubrication is needed. The Motor Lubrication Interval Timer can be reset under the Maintenance Adjust menu. The Motor Lubrication Interval Time can be changed under the Unit Setup Adjust menu.



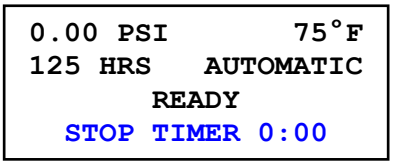
6. Start Timer

The next item in the Maintenance Info menu is the current value of the Start Timer. The Start Timer is used to control the amount of time the blower will run before moving on to the modulation phase after the RUN button has been pressed. The Start Timer Interval is set under the Operation Adjust menu in the Adjustment menu tree.



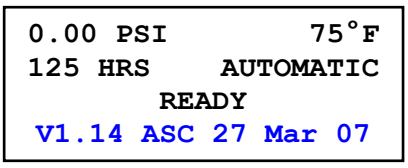
7. Stop Timer

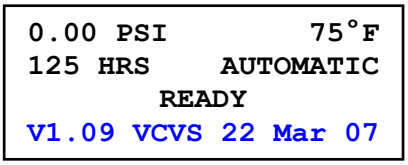
The next item in the Maintenance Info menu is the current value of the Stop Timer. The Stop Timer is used to control the amount of time the blower will continue running after the STOP/RESET button has been pressed. The Stop Timer Interval is set under the Operation Adjust menu in the Adjustment menu tree.

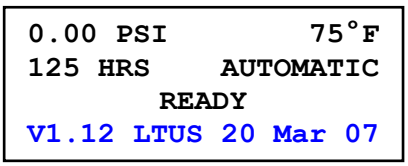


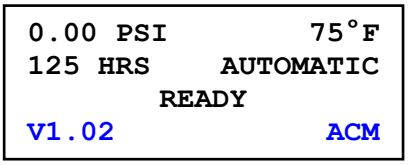
8. Firmware Version

The next four items in the Maintenance Info Menu show the current versions of the AirSmart Controller Firmware, the Controller Model Table, the Controller Language Table and the Communications Module firmware (if installed) that are loaded into the AirSmart Controller.





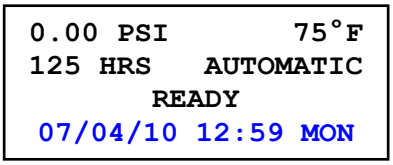




- **Note: This parameter is only available when Communications Module is installed.**

9. Time and Date

The last item in the Maintenance Info Menu is the current time and date kept by the battery backed, real time clock on the Communications Module. The time and date can be changed under the Time Adjust menu. This menu item is not displayed if the optional Communications Module is not installed.



- **Note: This parameter is only available when Communications Module is installed.**

The date & time format reads as follows:

YY/MM/DD HH:MM DOW

Where:
YY = Year
MM = Month
DD = Date
HH = Hour (using 24 hour clock)
MM = Minute
DOW = Day of week

4.1.2 Pressures and Temps Menu

The Pressures and Temps menu gives the user access to the current status of all pressure and temperature values in the blower package as well as the status of any optional sensors installed in the blower package.

```
9.00 PSI      185°F
125 HRS   AUTOMATIC
      RUNNING
PRESSURES AND TEMPS
```

1. Inlet Pressure/Vacuum

The first item in the Pressures and Temps menu is the Inlet Pressure, which reflects the current air pressure at the inlet of the blower package. In the case of a vacuum package, the Inlet Vacuum is also shown in the first line of the display.

```
10.0 inHgV    185°F
125 HRS   AUTOMATIC
      RUNNING
 INLT P 10.0 inHgV
```

2. Inlet Temperature

The next item in the Pressures and Temps menu is the Inlet Temperature, which reflects the current temperature at the inlet of the blower package.

```
9.00 PSI      185°F
125 HRS   AUTOMATIC
      RUNNING
  INLET TEMP 80°F
```

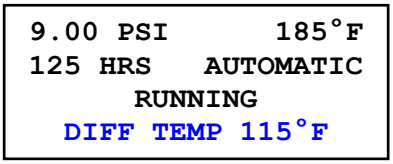
3. Discharge Temperature

The next item in the Pressures and Temps menu is the Discharge Temperature, which reflects the current temperature at the discharge of the airend. The Discharge Temperature value is also seen in the first line of the display.

```
9.00 PSI      185°F
125 HRS   AUTOMATIC
      RUNNING
 DSCHRG TMP 185°F
```

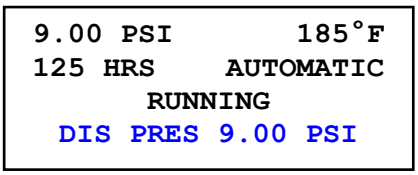
4. Differential Temperature

The next item in the Pressures and Temps menu is the Differential Temperature, which reflects the current temperature difference across inlet and the discharge of the airend.



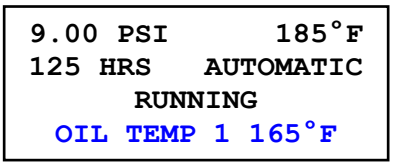
5. Discharge Pressure

The next item in the Pressures and Temps menu is the Discharge Pressure, which reflects the current air pressure value at the discharge of the airend. In the case of a pressure package, the Discharge Pressure is also shown in the first line of the display.



6. Oil Temperature

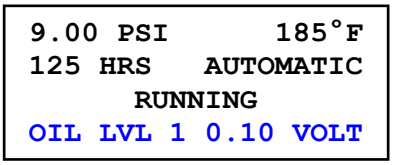
The next item in the Pressures and Temps menu is the Oil Temperature, which reflects the current temperature in the oil sump of the blower when the optional temperature sensors are installed. “OIL TEMP 1” (drive end) is followed by “OIL TEMP 2” (gear end) depending on which sump temperature is being observed.



- **Note: This parameter is not available in all blower packages.**

7. Oil Level

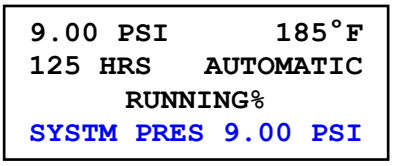
The next item in the Pressures and Temps menu is the Oil Level, which reflects the current oil level in the oil sump of the blower when the optional oil level sensors are installed. The voltage value displayed represents the change in oil level from the zero point when the blower is at rest. “OIL LVL 1” (drive end) is followed by “OIL LVL 2” (gear end) depending on which oil level is being observed. Note: add conversion to in or mm formula.

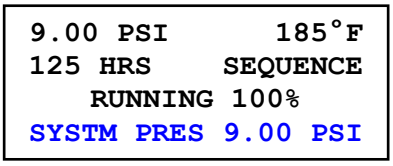


- **Note: This parameter is not available in all blower packages.**

8. System Pressure

The next item in the Pressures and Temps menu is the System Pressure, which reflects the current pressure at the system manifold. This parameter is only available when the Communications Module is installed and the blower is set up for sequencing. The System Pressure value is used to control blower modulation in the Sequence mode. While in the sequence mode, the System Pressure is shown in the fourth line of the display when the unit is running.

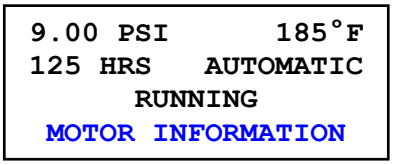




- **Note: This parameter is only available when Communications Module is installed.**

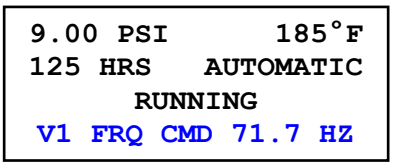
4.1.3 Motor Information Menu

The Motor Information menu gives the user access to the current status of all the Variable Frequency Drive (VFD) controlled motor that is installed in the blower. The Motor Information menu is not visible if a VFD is not installed in the system.



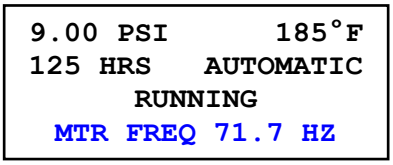
1. Commanded Motor Frequency

The first item in the Motor Information menu is the Commanded Motor Frequency value the drive in the system. This value indicates the speed at which each VFD has been commanded to run by the AirSmart Controller.



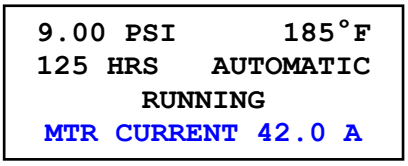
2. Motor Frequency

The next item in the Motor Information menu is the Motor operating Frequency value of the main motor in the system.



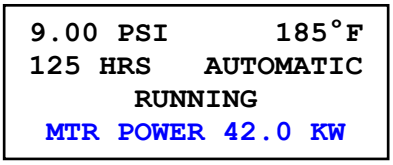
3. Motor Current

The next item in the Motor Information menu is the Motor Current consumption value of the main motor in the system.



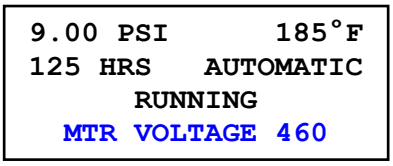
4. Motor Power

The next item in the Motor Information menu is the Motor Power consumption of the main motor in the system.



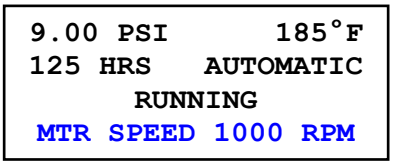
5. Motor Voltage

The next item in the Motor Information menu is the AC Voltage level being delivered by the VFD to the main motor in the system.



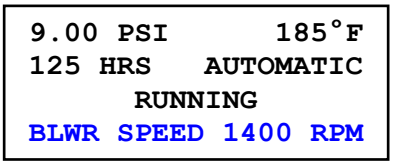
6. Motor Speed

The next item in the Motor Information menu is the Motor Speed value of the main motor in the system.



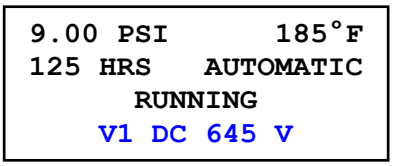
7. Blower Speed

The next item in the Motor Information menu is the Blower Speed value which is calculated using the Motor Speed value above and the Belt Drive Ratio parameter value in the Unit Setup menu.



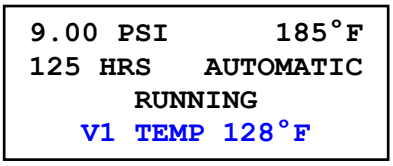
8. **Drive DC Bus Voltage**

The next item in the Motor Information menu is the DC Bus Voltage value of the main motor drive in the system.



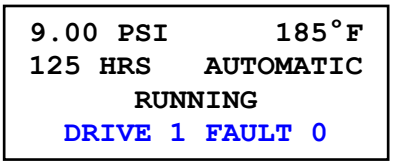
9. **Drive Temperature**

The next item in the Motor Information menu is the VFD Heat Sink Temperature the main motor drive in the system.



10. **Drive Fault**

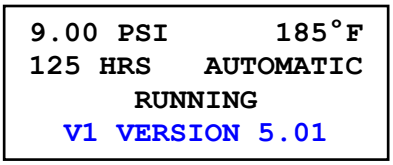
The next item in the Motor Information menu is the fault value of the main motor drive in the system.



Note: Consult the appropriate VFD user's manual for a listing of fault values and their meaning depending on which drive have been installed in the blower.

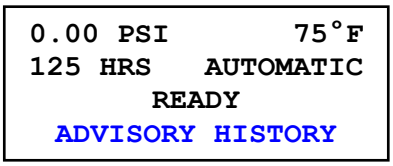
11. **Firmware Version**

The next item in the Motor Information menu is the Firmware Version of the main motor drive in the system.



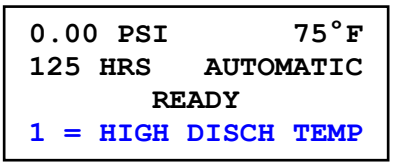
4.1.4 Advisory and Shutdown History Menu

The Advisory and Shutdown History menu gives the user immediate access to the system status during the last ten (10) advisory and shutdown faults in the blower.

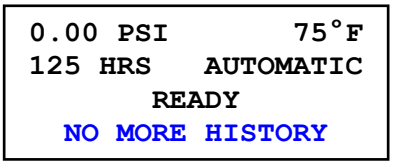


1. Advisory #1 through #10

By using the Up and Down buttons, each of the advisories (up to ten) is shown in the fourth line of the display.

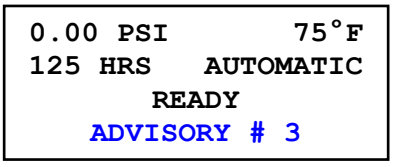


If less than ten advisories are stored in the controller, the display will indicate the end of the list as shown below.



2. System Status

When the desired advisory is shown in the fourth line of the display, use the Plus and Minus buttons to access the system status that was stored at the time of the advisory. The status values will also be shown in the fourth line of the display.



3. System Status List

The following is the list of the status items that are stored at the time of an Advisory or Shutdown fault.

- Advisory/Shutdown code
- Inlet pressure
- Discharge pressure
- Inlet temperature
- Discharge temperature
- Total Hours
- Time and date*
- Drive status*
- Drive commanded frequency*
- Motor frequency*
- Motor current*
- Drive temperature*
- Drive 1 DC bus voltage*

Note: * Appears only if parameter is available in blower package

5.2 Adjustment Menus

The Adjustment Menus are only available when the blower is stopped. To enter the Adjustment Menu tree, press the Enter  button and then press the Right  or Left  buttons to access one of four different menus. Once the desired menu heading is shown in the second line of the display, press the Enter  button again to access that menu. Use the Up  and Down  buttons to access the individual items in the selected menu, which are also shown in the second line of the display.

It is not necessary to navigate back to the top of a particular menu in order to enter another menu. Simply press the Stop/Reset  button to go back to the heading of the current menu and then use the Right  or Left  buttons again to find the desired menu heading as described above.

To completely exit from the Adjustment menus, press the Stop/Reset  button again. If parameter changes have been made, the following screen will appear.

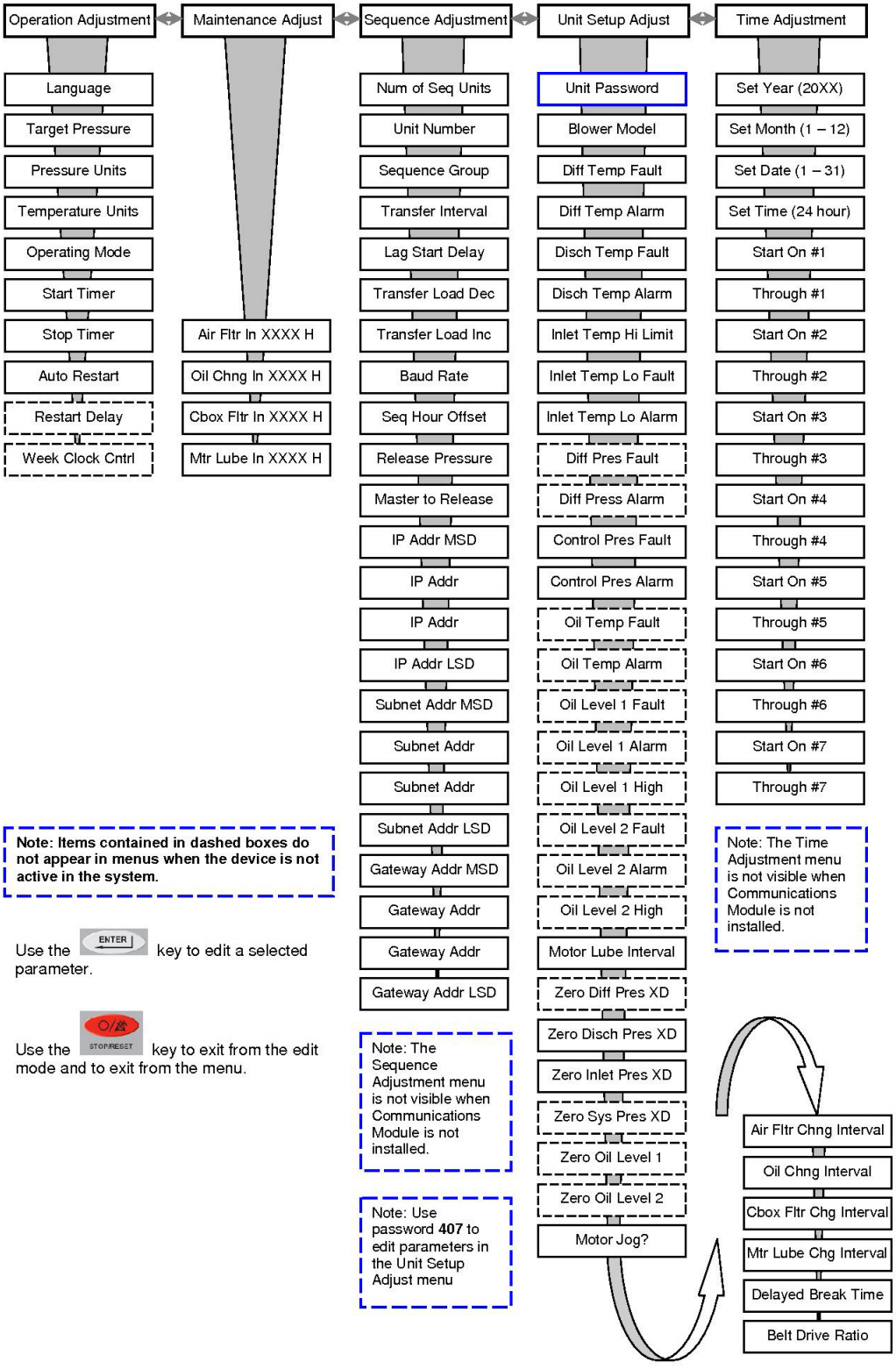
```
STORE MODIFIED
PARAMETERS?
STOP = NO
ENTER = YES
```

To permanently save the changes that were made, press the Enter  button. If the Stop/Reset  button is pressed, the parameter changes that have been made are still valid but will be lost the next time the blower is disconnected from main power.

AirSmart Controller Adjustment Menus (Blower Application)

Use the ENTER key to enter the Adjustment menus (compressor must be stopped). Use the ◄ ► keys to navigate through the horizontal main menus.

Use the ENTER key again to select the horizontal menu item. Use the ▲ ▼ keys to navigate through the vertical menu items.



4.2.1 Operation Adjustment Menu

The Operation Adjustment menu provides access to the parameters that control the basic operation of the blower

```
ADJUSTMENT MENU
OPERATION ADJUSTMENT

(SELECT SUB MENU)
```

1. Language

The first item in the Operation Adjustment menu is language selection. The language selection can also be entered directly by holding down the Stop/Reset button for five seconds when the blower is stopped. The AirSmart Controller can have up to eight different language translations available at one time in the Controller Language Table, which is stored in the controller's memory.

```
OPERATION ADJUSTMENT
  LANGUAGE-LANGUAGE
    ENGLISH (US)
(SELECT PARAMETER)
```

2. Target Pressure/Vacuum

The next item in the Operation Adjustment menu is the Target Pressure/Vacuum. This value is the control set point of the blower. The Target Pressure/Vacuum parameter is ignored in fixed speed blowers.

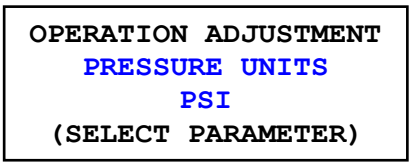
```
OPERATION ADJUSTMENT
  TARGET PRES/VAC
      9.0 PSI
(SELECT PARAMETER)
```

Min Value: 0.0 PSI (0.0 bar)
Max Value: 20.0 PSI (1.4 bar) for pressure and 20.0 inHgV (508 mmHgV) for vacuum.
Default Value: Set at factory.

Operation at excessive discharge air pressure can cause personal injury or damage to equipment. Do not adjust the discharge air pressure above the maximum pressure stamped on the unit nameplate.

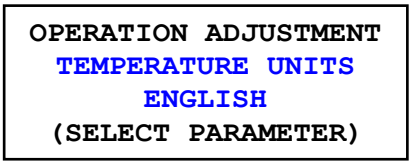
3. Pressure Units

The next item in the Operation Adjustment menu is the Pressure Units, which will determine how all pressure values will be displayed on the control panel. For a pressure machine, the pressure can be displayed in pounds per square inch (PSI), Bar (BAR), kilopascals (KPA) or kilograms per square centimeter (KGC). For a vacuum machine, the pressure can be displayed in inches of mercury (inHgV), inches of water (inH2OV), millimeters of mercury (mmHgV) or millimeters of water (mmH2OV)



4. Temperature Units

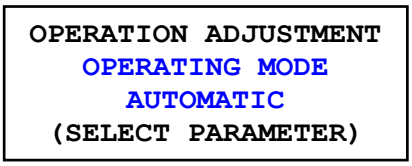
The next item in the Operation Adjustment menu is the Temperature Units, which will determine how all temperature values will be displayed on the control panel. Temperature can be displayed in English/Fahrenheit (°F) or Metric/Celsius (°C).



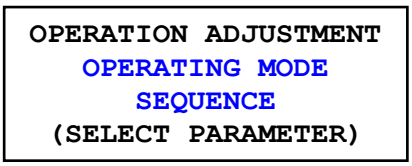
5. Operating Mode

The next item in the Operation Adjustment menu is the operating mode. The controller can be set to one of four operational modes.

AUTOMATIC: (Default mode) the blower uses its internal modulation algorithms and will regulate motor speed in the case of a variable speed machine.



SEQUENCE: The blower is part of a sequenced group of machines. Refer to Gardner Denver document 13-17-604 for further details about sequencing with the AirSmart Controller.



MANUAL: This mode of operation is only available in variable speed blower models. The manual mode allows the user to adjust the speed of the blower manually from the keypad. Use the Plus (+) and Minus (−) buttons to adjust the blower speed between minimum speed (0%) and maximum speed (100%). The last speed setting is preserved when the Stop/Reset is pressed or if there is a loss of power to the blower.

Note: The minimum and maximum speed settings of the blower are model dependant.
Note: The fourth line of the display must read **NO SERVICE ADVISORY** for the speed control buttons to function.

```
OPERATION ADJUSTMENT
   OPERATING MODE
        MANUAL
  (SELECT PARAMETER)
```

When running in the MANUAL mode, the display will appear as shown below.

```
9.00 PSI       185°F
125 HRS       MANUAL
RUNNING          57%
NO SERVICE ADVISORY
```

REMOTE: This mode of operation is only available in variable speed blower model. In the remote mode, the speed of the blower is determined by an analog input signal from an external source such as a Dissolved Oxygen Controller. See Section 7.5 of this manual for information about connecting an external signal for remote operation.

```
OPERATION ADJUSTMENT
   OPERATING MODE
        REMOTE
  (SELECT PARAMETER)
```

When running in the REMOTE mode, the display will appear as shown below.

```
9.00 PSI       185°F
125 HRS       REMOTE
RUNNING          45%
NO SERVICE ADVISORY
```

6. Start Timer

The next item in the Operation Adjustment menu is the Start Timer. The Start Timer is used to extend how long the blower will run in the "Pause" state before it is allowed to start modulating.

```
OPERATION ADJUSTMENT
     START TIMER
      0 SECONDS
  (SELECT PARAMETER)
```

Min Value: 0 seconds
Max Value: 600 seconds
Default Value: 0 seconds (variable speed units), 5 seconds (fixed speed units)

7. Stop Timer

The next item in the Operation Adjustment menu is the Stop Timer. When the Stop/Reset button is pressed or a remote stop is activated, the blower will continue to run until this timer expires.

```
OPERATION ADJUSTMENT
     STOP TIMER
      5 SECONDS
  (SELECT PARAMETER)
```

Min Value: 0 seconds
Max Value: 120 seconds
Default Value: 5 seconds

8. Auto Restart

The next item in the Operation Adjustment menu is the Auto Restart function. If Auto Restart is turned on, the blower will resume operation in the mode it was in prior to the power interruption when power is restored.

```
OPERATION ADJUSTMENT
     AUTO RESTART
          ON
  (SELECT PARAMETER)
```

Default Value: OFF

DANGER

Automatic restarting of the blower can cause injury or death

9. Restart Delay

The next item in the Operation Adjustment menu is the Restart Delay Timer, which controls how long the blower will wait to start after power has been restored.

```
OPERATION ADJUSTMENT
   RESTART DELAY
     10 SECONDS
(SELECT PARAMETER)
```

- **Note: This parameter is only visible if Auto Restart is ON.**

Min Value: 5 seconds
Max Value: 30 seconds
Default Value: 10 seconds

10. Week Clock Control

The last item in the Operation Adjustment menu is the Week Clock Control function. When the Week Clock Control is turned on, the blower can be started and stopped using the seven programmable timers under the Time Adjust menu. This menu item is not displayed if the optional Communications Module is not installed. Consult Gardner Denver document 13-17-604 for more information about timed start/stop or secondary pressures operation.

```
OPERATION ADJUSTMENT
  WEEK CLOCK CONTROL
          ON
(SELECT PARAMETER)
```

- **Note: This parameter is only available when Communications Module is installed.**

Default Value: OFF

Automatic starting of the blower can cause injury or death

4.2.2 Maintenance Adjust Menu

The Maintenance Adjust menu provides a means for resetting the maintenance timers after servicing the blower.

```
ADJUSTMENT MENU
MAINTENANCE ADJUST

(SELECT SUB MENU)
```

1. Maintenance Timers

The four timers under the Maintenance Adjust menu are:

Air Filter Change Timer
Oil Change Timer
Control Box Filter Change Timer (only on variable speed units)
Motor Lubrication Timer

After service has been performed, navigate to the appropriate timer and press the Enter 

button to select timer reset. The default timer intervals can be set in the Unit Setup Adjust menu.

```
MAINTENANCE ADJUST
   OIL CHNG IN
     230 HRS
(SELECT PARAMETER)
```

Pressing the Enter 

button again will reset the timer to the default value. The Stop/Reset 

button will abort the timer reset.

```
MAINTENANCE ADJUST
   OIL CHNG IN
     6000 HRS
(ACCEPT OR REJECT)
```

4.2.3 Sequence Adjustment Menu

The Sequence Adjustment menu provides access to the parameters that control the sequencing operation of the blower. This menu is only visible if the optional AirSmart Communications Module, Gardner Denver P/N 301ETK1173, is installed. Refer to Gardner Denver document 13-17-604 (AirSmart Communications Module User's Manual) for operation of the blower in Sequence Mode.

```
ADJUSTMENT MENU
SEQUENCE ADJUSTMENT

(SELECT SUB MENU)
```

4.2.4 Unit Setup Adjust Menu

The Unit Setup Adjust menu provides access to the parameters that control advanced operation of the blower. The parameters in the Unit Setup adjust menu can only be changed if the correct value has been entered into the Unit Password menu item.

```
ADJUSTMENT MENU
UNIT SETUP ADJUST

(SELCT SUB MENU)
```

1. Unit Password

The first item in the Unit Setup Adjust menu is the Unit Password. The correct value entered here will allow the items in Unit Setup Adjust menu and the I/O Adjust menu to be changed.

The Following passwords unlock the listed menus for visibility and editing:

407: Unit Setup Adjust menu
8412: Programmable I/O Adjust menu

```
UNIT SETUP ADJUST
  UNIT PASSWORD
        0
(SELECT PARAMETER)
```

2. Blower Model

The next item in the Unit Setup Adjust menu is the Blower Model selection. Up to 25 different blower models are available from the Controller Model Table that is stored in the controller's memory. Selecting a Blower model from the Model Table will configure the controller for the chosen machine and reset all of the adjustable parameters to their factory default value.

```
CONFIGURATION ADJUST
    BLOWER MODEL
VSP40 460 1.9 HF408
 (SELECT PARAMETER)
```

⚠WARNING

Selection of a Model Type different from the installed unit could cause personal injury or damage to equipment.

3. Total Run Hour Meter

The next item in the Configuration Adjust menu is the Total Run Hour Meter, which records the number of hours that the blower main motor has been running. The value of this hour meter is shown in line 2 of the normal display and in the Maintenance Info menu. This parameter can not be changed and will not appear in the menu tree unless the current value is zero. On a replacement controller, this value must be preset with the value from the replaced controller before the unit is started.

```
CONFIGURATION ADJUST
TOTAL RUN HOURMETER
      0 HOURS
(SELECT PARAMETER)
```

4. Differential Temperature Shutdown Limit

The next item in the Unit Setup Adjust menu is the Differential Temperature Shutdown Limit. This value sets the maximum differential temperature limit where the blower will shut down

```
UNIT SETUP ADJUST
DIFF TEMP FAULT LIM
      240°F
(SELECT PARAMETER)
```

Min Value: 0°F (0°C)
Max Value: 250°F (121°C)
Default Value: Airend or package dependant

⚠ DANGER

Operation of the unit at excessive high temperatures can cause personal injury or damage to equipment. Do not adjust the Differential Temperature Shutdown Limit above 250°F (121°C).

5. Differential Temperature Alarm Limit

The next item in the Unit Setup Adjust menu is the Differential Temperature Alarm Limit. This value sets the differential temperature limit at which the blower will give an advisory alarm.

```
UNIT SETUP ADJUST
DIFF TEMP ALARM LIM
      210°F
(SELECT PARAMETER)
```

Min Value: 0°F (0°C)
Max Value: 250°F (121°C)
Default Value: Airend or package dependant

6. Discharge Temperature Shutdown Limit

The next item in the Unit Setup Adjust menu is the Discharge Temperature Shutdown Limit. This value sets the maximum airend discharge temperature limit where the blower will shut down

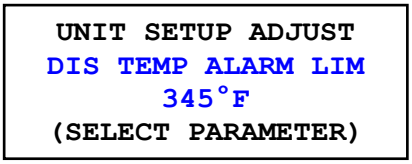
```
UNIT SETUP ADJUST
DIS TEMP FAULT LIM
      350°F
(SELECT PARAMETER)
```

Min Value: 0°F (-18°C)
Max Value: 350°F (177°C)
Default Value: Airend or package dependant

Operation of the unit at excessive high temperatures can cause personal injury or damage to equipment. Do not adjust the Discharge Temperature Shutdown Limit above 350°F (177°C).

7. Discharge Temperature Alarm Limit

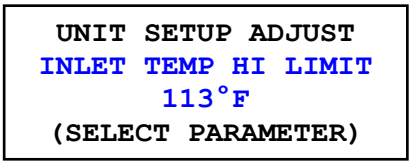
The next item in the Unit Setup Adjust menu is the Discharge Temperature Alarm Limit. This value sets the airend discharge temperature limit at which the blower will give an advisory alarm.



Min Value: 0°F (-18°C)
Max Value: 350°F (177°C)
Default Value: Airend or package dependant

8. Inlet Temperature High Limit

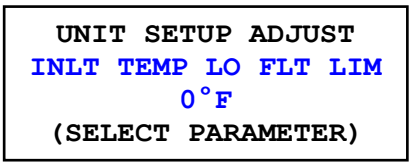
The next item in the Unit Setup Adjust menu is the Inlet Temperature High Limit. This value sets the maximum airend inlet temperature limit at which the blower will activate the speed limiter function.



Min Value: 15°F (-9°C)
Max Value: 150°F (66°C)
Default Value: 113°F (45°C)

9. Inlet Temperature Low Shutdown Limit

The next item in the Unit Setup Adjust menu is the Inlet Temperature Low Shutdown Limit. This value sets the minimum airend inlet temperature limit at which the blower will shut down.



Min Value: 0°F (-18°C)
Max Value: 50°F (10°C)
Default Value: 0°F (-18°C)

10. Inlet Temperature Low Alarm Limit

The next item in the Unit Setup Adjust menu is the Inlet Temperature Low Alarm Limit. This value sets the airend inlet temperature limit at which the blower will give an advisory alarm.

```
UNIT SETUP ADJUST
INLT TEMP LO ALM LIM
      113°F
(SELECT PARAMETER)
```

Min Value: 0°F (-18°C)
Max Value: 50°F (10°C)
Default Value: 10°F (-12°C)

11. Control Pressure Shutdown Limit

The next item in the Unit Setup Adjust menu is the Control Pressure Shutdown Limit. This value sets the maximum control pressure limit where the blower will shut down. In a pressure machine, the control pressure is equivalent to the package discharge. In a vacuum machine, the control pressure is equivalent to the package inlet.

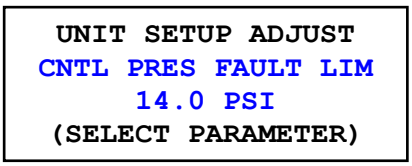
```
UNIT SETUP ADJUST
CNTL PRES FAULT LIM
      15.0 PSI
(SELECT PARAMETER)
```

Min Value: 0 PSI (0.0 bar)
Max Value: 20 PSI (1.4 bar) for pressure and 20.0 inHgV (508 mmHgV) for vacuum
Default Value: Set at factory.

Operation of the blower with improper Control Pressure Shutdown Limit setting can cause personal injury or damage to equipment. Do not adjust the Control Pressure Shutdown Limit above the level of the pressure relief valve or 15 PSI (1.0 bar).

12. Control Pressure Alarm Limit

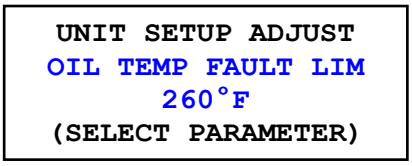
The next item in the Unit Setup Adjust menu is the Control Pressure Alarm Limit. This value sets the maximum control pressure limit where the blower will give an advisory alarm. In a pressure machine, the control pressure is equivalent to the package discharge. In a vacuum machine, the control pressure is equivalent to the package inlet.



Min Value: 0 PSI (0.0 bar)
Max Value: 20 PSI (1.4 bar) for pressure and 20.0 inHgV (508 mmHgV) for vacuum
Default Value: Set at factory

13. Oil Temperature Shutdown Limit

The next item in the Unit Setup Adjust menu is the Oil Temperature Shutdown Limit. This value sets the maximum oil sump temperature limit where the blower will shut down. This menu item is not visible if there is no oil temperature sensor installed in the system.

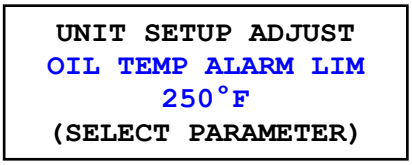


- **Note: This parameter is not visible in all blower packages.**

Min Value: 15°F (-9°C)
Max Value: 350°F (177°C)
Default Value: Airend or package dependant

14. Oil Temperature Alarm Limit

The next item in the Unit Setup Adjust menu is the Oil Temperature Alarm Limit. This value sets the package oil sump temperature limit at which the blower will give an advisory alarm. This menu item is not visible if there is no oil temperature sensor installed in the system.



- **Note: This parameter is not visible in all blower packages.**

Min Value: 15°F (-9°C)
Max Value: 350°F (177°C)
Default Value: Airend or package dependant

15. Oil Level Low Shutdown Limit

The next item in the Unit Setup Adjust menu is the Oil Level Low Shutdown Limit. This value sets the minimum oil sensor voltage differential limit where the blower will shut down. This menu item is not visible if there is no oil level sensor installed in the system. As shown in the display below OIL LEVEL 1 (drive end) is followed by OIL LEVEL 2 (gear end) depending on the number of oil level sensors installed in the package.

```
UNIT SETUP ADJUST
OIL LEVEL 1 FLT DIF
     1.00 VOLT
(SELECT PARAMETER)
```

- **Note: This parameter is not visible in all blower packages.**

Min Value: 0.00 Volt
Max Value: 5.00 Volt
Default Value: Airend dependant

16. Oil Level Low Alarm Limit

The next item in the Unit Setup Adjust menu is the Oil Level Low Alarm Limit. This value sets the minimum oil sensor voltage differential limit where the blower will give an advisory alarm. This menu item is not visible if there is no oil level sensor installed in the system. As shown in the display below OIL LEVEL 1 (drive end) is followed by OIL LEVEL 2 (gear end) depending on the number of oil level sensors installed in the package.

```
UNIT SETUP ADJUST
OIL LVL 1 LO ALM DIF
     1.00 VOLT
(SELECT PARAMETER)
```

- **Note: This parameter is not visible in all blower packages.**

Min Value: 0.00 Volt
Max Value: 5.00 Volt
Default Value: Airend dependant

17. Oil Level High Alarm Limit

The next item in the Unit Setup Adjust menu is the Oil Level High Alarm Limit. This value sets the maximum oil sensor voltage differential limit where the blower will give an advisory alarm. This menu item is not visible if there is no oil level sensor installed in the system. As shown in the display below OIL LEVEL 1 (drive end) is followed by OIL LEVEL 2 (gear end) depending on the number of oil level sensors installed in the package.

```
UNIT SETUP ADJUST
OIL LVL 1 HI ALM DIF
     0.50 VOLT
(SELECT PARAMETER)
```

- **Note: This parameter is not visible in all blower packages.**

Min Value: 0.00 Volt
Max Value: 5.00 Volt
Default Value: Airend dependant

18. Pressure Transducer Zero Set

The next items in the Unit Setup Adjust menu are used for setting the zero point of the absolute pressure transducers in the blower. The following is a list of possible pressure transducers. Not all blower models will have all three transducers.

1. Discharge pressure transducer
2. Inlet pressure transducer
3. System pressure transducer

After all pressure or vacuum has been removed from the system and the line to the transducer has been removed, navigate to the appropriate transducer and press the Enter 

button to select the zero pressure point. With atmospheric pressure, the display should read around 0.00 Volts.

```
CONFIGURATION ADJUST
  ZERO DIS PRES XD
      0.00 VOLT
 (SELECT PARAMETER)
```

Pressing the Enter 

button again will accept the displayed voltage as the zero pressure value. The Stop/Reset 

button will abort the set point process.

```
CONFIGURATION ADJUST
  ZERO DIS PRES XD
      0.00 VOLT
 (ACCEPT OR REJECT)
```

19. Oil Level Sensor Zero Set

The next items in the Unit Setup Adjust menu are used for setting the zero point of the oil sump level sensors in the blower. The following is a list of possible oil level sensors. Not all blower models will have both sensors.

1. Drive side oil level sensor
2. Gear side oil level sensor

After the oil sump has been filled to the middle of the sight glass and the main motor is at rest, navigate to the appropriate sensor and press the Enter 

button to select the zero level point.

```
CONFIGURATION ADJUST
  ZERO OIL LEVEL 1
      2.50 VOLT
 (SELECT PARAMETER)
```

Pressing the Enter 

button again will accept the displayed voltage as the normal oil level value. The Stop/Reset 

button will abort the set point process.

```
CONFIGURATION ADJUST
  ZERO OIL LEVEL 1
      2.50 VOLT
 (ACCEPT OR REJECT)
```

20. Motor Jog

The next item in the Unit Setup Adjust menu is the Motor Jog function, which will cause the main motor in the blower package to run for the programmed amount of time as soon as the Enter 

button is pressed. The Motor Jog function is used to check the rotation of the main motor after the power has been connected during installation of the blower package or the power cables between the motor and the VFD are reconnected.

```
UNIT SETUP ADJUST
   MOTOR JOG ?
   0.0 SECONDS
(SELECT PARAMETER)
```

Min Value: 0.1 seconds
Max Value: 2.0 seconds (variable speed units), 0.5 seconds (fixed speed units)

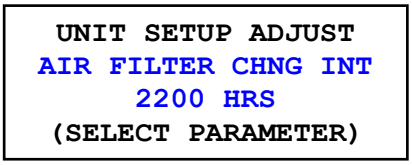
Do not operate the blower with the fan or coupling guard removed. Exposed fan and coupling may cause personal injury.

Operation with incorrect motor rotation can cause severe damage to the equipment. When checking motor rotation, induce minimum rotation (less than one revolution if possible). Never allow motor to reach full speed.

The blower unit's direction of rotation must be checked every time the blower is reconnected to the power supply.

21. Air Filter Change Interval

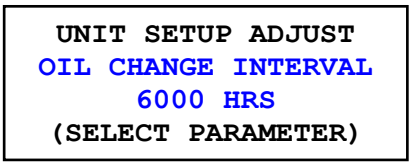
The next item in the Unit Setup Adjust menu is the Air Filter Change Interval. This value sets the default air filter change countdown timer value that gets set under the Maintenance Adjust menu. Setting this parameter to zero will disable the timer and its associated alarms.



Min Value: 0 hours
Max Value: 4000 hours
Default Value: 2200 hours

22. Oil Change Interval

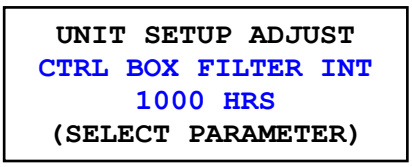
The next item in the Unit Setup Adjust menu is the Oil Change Interval. This value sets the default oil change countdown timer value that gets set under the Maintenance Adjust menu. Setting this parameter to zero will disable the timer and its associated alarms.



Min Value: 0 hours
Max Value: 12000 hours
Default Value: 6000 hours

23. Control Box Filter Change Interval

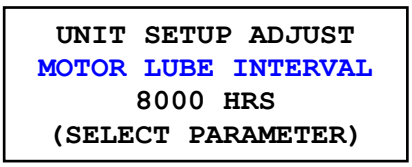
The next item in the Unit Setup Adjust menu is the Control Box Filter Change Interval. This value sets the default control box filter change countdown timer value that gets set under the Maintenance Adjust menu. Setting this parameter to zero will disable the timer and its associated alarms.



Min Value: 0 hours
Max Value: 4000 hours
Default Value: 1000 hours (variable speed units), 0 (fixed speed units)

24. Motor Lubrication Interval

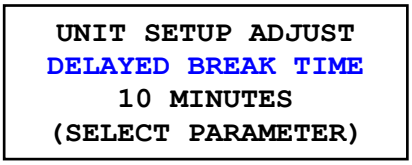
The next item in the Unit Setup Adjust menu is the Motor Lubrication Interval. This value sets the default motor lubrication countdown timer value that gets set under the Maintenance Adjust menu. Setting this parameter to zero will disable the timer and its associated alarms.



Min Value: 0 hours
Max Value: 10000 hours
Default Value: Dependant on main motor installed in package.

25. Delayed Break Time

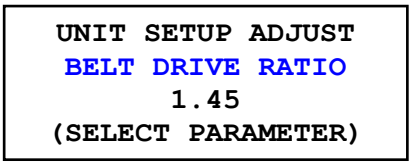
The next item in the Unit Setup Adjust menu is the Delayed Break Time. This parameter sets the countdown timer that gets used in conjunction with the digital output function DELAYED BREAK RUN which is active while the main motor is running plus the Delayed Break Time period after the motor has stopped.



Min Value: 0 minutes
Max Value: 30 minutes
Default Value: 10 minutes

26. Belt Drive Ratio

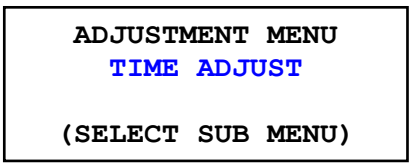
The next item in the Unit Setup Adjust menu is the Belt Drive Ratio. This parameter is used along with the Motor Speed to calculate the Blower Speed value shown in the Motor Information menu.



Min Value: 0.10
Max Value: 3.00
Default Value: Dependant on belt drive system installed in blower package.

4.2.5 Time Adjustment Menu

The Time Adjustment menu provides access to the parameters that control the real time clock operation of the blower. This menu is only visible if the optional AirSmart Communications Module, Gardner Denver P/N 301ETK1173, is installed. Refer to Gardner Denver document 13-17-604 (AirSmart Communications Module User's Manual) for operation of the blower real time clock functions.



6 Error Management

The AirSmart Controller, developed by Gardner Denver, represents the most current development in blower control systems. The AirSmart Controller has the ability to control a variable speed motor drive, read more than ten analog inputs (with expansion board) and a control a host of digital I/O in order to achieve system objectives. To that end, there are numerous tests that are performed every second by the AirSmart Controller in order to determine the state of the blower system. Many of those tests are designed to check if certain parameters have been exceeded so that action can be taken to protect the machine.

6.1 Variable Speed Limiters

When the AirSmart Controller is installed in a variable speed blower, there are three limiting functions which will reduce the maximum speed of the blower by up to ten percent in order to prevent a nuisance shutdown during extreme environmental conditions.

1. Current Limiter

The first limiter function is the Current Limiter which becomes active if the main motor current becomes greater than the Motor NP Current for more than 30 seconds. When the Current Limiter is active, the display will read as shown below. The Current Limiter may become active when the blower is running at peak capacity, filling an empty system or the air demand exceeds the blower capacity. If running at less than maximum capacity, the Current Limiter can indicate a problem with the airend or main motor which is drawing excess current.

```
9.00 PSI      185°F
125 HRS   AUTOMATIC
    AMPS LIM SET
NO SERVICE ADVISORY
```

2. VFD Heatsink Temperature Limiter

The second limiter function is the VFD Heatsink Temperature Limiter which becomes active if the VFD heatsink temperature becomes greater than the prescribed value for that blower model. When the VFD Heatsink Temperature Limiter is active, the display will read as shown below. The VFD Heatsink Temperature Limiter may become active when the blower is running at peak capacity while the ambient temperature is elevated.

```
9.00 PSI      185°F
125 HRS   AUTOMATIC
  DRV TMP LIM SET
NO SERVICE ADVISORY
```

3. Ambient Temperature Limiter

The third limiter function is the Ambient Temperature Limiter which becomes active if the ambient (inlet) temperature becomes greater than 113 °F (45. °C) When the Ambient Temperature Limiter is active, the display will read as shown below.

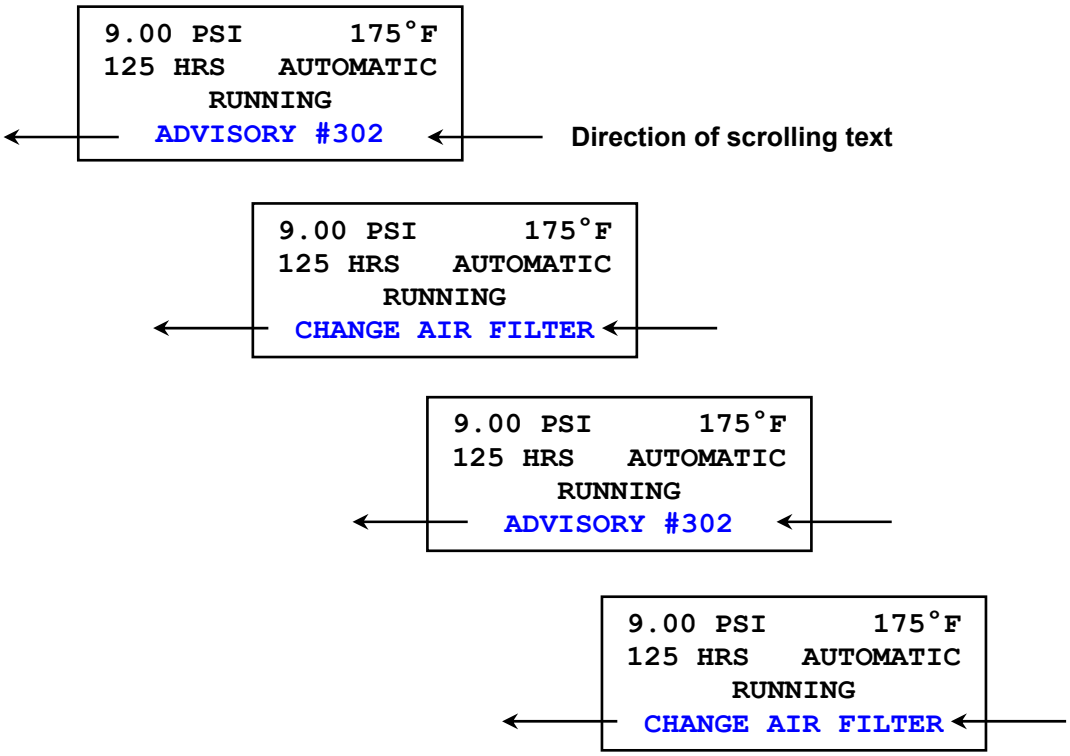
```
9.00 PSI      185°F
125 HRS   AUTOMATIC
    AMB LIM SET
NO SERVICE ADVISORY
```

6.2 Advisory Faults

The advisory faults in the AirSmart Controller are designed to alert the user of needed service or that or that certain parameters may be approaching their shutdown level. Advisory faults can be reset while the blower is running or stopped by pressing the Enter 

button. If the error condition still exists after resetting the advisory fault, the advisory fault will occur again. The status of the blower at the time of the last six advisories is stored in non-volatile memory, which can be accessed through the Advisory History menu.

Advisory fault information is shown in the fourth line of the control panel display in a scrolling fashion. The advisory number is shown first followed by a short description of the fault.



The following table is a list of advisory faults that can occur in the AirSmart Controller:

Advisory	Advisory Text	Description	Action
#301	OPTIONAL ALARM	Digital input programmed for Optional Alarm has tripped.	Check device connected to input.
#302	CHANGE AIR FILTER	Vacuum switch across inlet air filter has tripped.	Change air filter.
#303	CHNG CTRL BOX FLTR	Maintenance timer for control box filter change has expired.	Change control box filter and reset timer.
#304	CHANGE MOTOR LUBE	Maintenance timer for motor lube change has expired.	Change motor lube and reset timer.
#305	HIGH DISCH TEMP	Temperature at airend discharge > alarm set point.	Check system functionality or reduce package power.
#307	HIGH DIFF TEMP	Differential temperature across airend > alarm set point.	Check system functionality or reduce package power.
#308	HIGH ENCL TEMP	Enclosure temperature switch tripped at > 140°F (60°C).	Check enclosure ventilation fan for proper operation.
#309	HIGH DIFF PRES	Differential pressure > alarm set point.	Change air filter or check system functionality.
#310	HIGH CNTL PRES	Control pressure > alarm set point.	Check system functionality or reduce package power.
#311	INLET TEMP LOW	Inlet temperature < alarm set point	Operate package in warmer ambient temperature
#314	OIL LEVEL 1 LOW	Oil sump level 1 < alarm set point.	Oil level low; add oil to sump #1.
#315	OIL LEVEL 2 LOW	Oil sump level 2 < alarm set point.	Oil level low; add oil to sump #2.
#316	CHANGE OIL	Maintenance timer for oil change has expired.	Change oil and reset timer.
#317	OIL TEMP 1	Oil temperature #1 > alarm set point.	Check oil level or reduce package power.
#318	OIL TEMP 2	Oil temperature #2 > alarm set point.	Check oil level or reduce package power.
#319	CHK COMM PORT	Communications error in sequencing network.	Check sequencing network connections.

6.3 Shutdown Faults

The shutdown faults in the AirSmart Controller are designed to protect the blower from component failure or extreme environmental conditions. Shutdown faults can be reset after the blower has stopped by pressing the Stop/Reset 

button. If the error condition still exists as indicated by a blinking Shutdown LED on the control panel, the shutdown fault can not be reset. The status of the blower at the time of the last six shutdowns is stored in non-volatile memory, which can be accessed through the Advisory History menu.

Shutdown fault information is shown in the second and third lines of the control panel display. The shutdown number is shown in the second line followed by a short description of the fault in the third line.

```
0.00 PSI        75°F
   SHUTDOWN # 128
  HIGH DISCH TEMP
NO SERVICE ADVISORY
```

The following table is a list of shutdown faults that can occur in the AirSmart Controller:

Shutdown	Shutdown Text	Description	Action
#101	INVALID MODEL	Valid blower model not selected during factory setup or controller replacement.	Select valid blower model in Unit Setup Adjust menu.
#102	CNTL PRES FAULT	Control pressure > shutdown set point.	Check system functionality or reduce package power.
#103	CONTROLLER ERROR	Controller internal failure.	Replace controller.
#104	DC POWER LOW	24 VDC input to controller < 20 VDC.	Check 24 VDC power supply.
#106	DIFF TEMP FAULT	Differential temperature across airend > shutdown set point.	Check system functionality or reduce package power.
#107	DISCH TEMP FAULT	Temperature at airend discharge > shutdown set point.	Check system functionality or reduce package power.
#108	DRIVE 1 COMM ERROR	Communications failure between controller and main motor VFD.	Check wiring or communications parameters in main motor VFD.
#109	DRIVE 1 FAULT	Main motor VFD has shut down.	Check main motor VFD operation.
#110	EMERGENCY STOP	Blower stopped using Emergency Stop button.	Pull out Emergency Stop button to its normal position.
#111	ENC TEMP FAULT	Enclosure temperature switch has tripped.	Check enclosure fan and ventilation..
#112	FAN FAULT	Cooler or vent fan over temp fault	Check fan motor and associated fuses and wiring
#113	FAN STARTER	Fan Aux input does not match Fan Starter digital output	Check fan contactor operation
#115	LOW VOLTAGE	Digital input programmed for Low Voltage has tripped	Check voltage relay
#118	OIL LEVEL 1 LOW	Oil level 1 (drive end) < shutdown set point.	Oil level low; add oil to drive end sump.
#119	OIL LEVEL 2 LOW	Oil level 2 (gear end) < shutdown set point.	Oil level low; add oil to gear end sump.

Shutdown	Shutdown Text	Description	Action
#120	PHASE SEQUENCE	Digital input programmed for Phase Sequence has tripped.	Check phase relay.
#121	OPTIONAL SHUTDOWN	Digital input programmed for Optional Shutdown has tripped.	Check device connected to input.
#122	INLET TEMP LOW	Inlet temperature < shutdown set point	Operate package in warmer ambient temperature
#123	MAIN STARTER	Motor Aux input does not match Main Contactor digital output.	Check main motor contactor operation.
#124	OIL LEVEL 1 HIGH	Oil level 1 (drive end) > shutdown set point.	Oil level high; drain oil from drive end sump.
#125	OIL LEVEL 2 HIGH	Oil level 2 (gear end) > shutdown set point.	Oil level high; drain oil from gear end sump.
#126	OIL TEMP 1 FAULT	Drive end oil temperature > shutdown set point.	Check drive end oil level or reduce package power.
#127	OIL TEMP 2 FAULT	Gear end oil temperature > shutdown set point.	Check gear end oil level or reduce package power.
#128	OPEN THERM T1	Connection to thermistor TT1 is open.	Check wiring between thermistor TT1 and controller.
#129	OPEN THERM T2	Connection to thermistor TT2 is open.	Check wiring between thermistor TT2 and controller.
#130	OPEN THERM T3	Connection to thermistor TT3 is open.	Check wiring between thermistor TT3 and controller.
#131	OPEN THERM T4	Connection to thermistor TT4 is open.	Check wiring between thermistor TT4 and controller.
#132	OPEN THERM T5	Connection to thermistor TT5 is open.	Check wiring between thermistor TT5 and controller.
#133	OPEN XDUCER XD1	Connection to pressure transducer PT1 is open.	Check wiring between pressure transducer PT1 and controller.
#134	OPEN XDUCER XD2	Connection to pressure transducer PT2 is open.	Check wiring between pressure transducer PT2 and controller.

Shutdown	Shutdown Text	Description	Action
#135	OPEN XDUCER XD3	Connection to pressure transducer PT3 is open.	Check wiring between pressure transducer PT3 and controller.
#136	OPEN XDUCER XD4	Connection to pressure transducer PT4 is open.	Check wiring between pressure transducer PT4 and controller.
#137	OPEN XDUCER XD5	Connection to pressure transducer PT5 is open.	Check wiring between pressure transducer PT5 and controller.
#138	POWER FAILURE	Loss of power to blower package	Check line voltage
#139	SEQ COMM FAULT	Communications fault in sequencing network.	Check sequencing network connections.
#140	SHORTED THERM T1	Connection to thermistor TT1 is shorted.	Check wiring between thermistor TT1 and controller.
#141	SHORTED THERM T2	Connection to thermistor TT2 is shorted.	Check wiring between thermistor TT2 and controller.
#142	SHORTED THERM T3	Connection to thermistor TT3 is shorted.	Check wiring between thermistor TT3 and controller.
#143	SHORTED THERM T4	Connection to thermistor TT4 is shorted.	Check wiring between thermistor TT4 and controller.
#144	SHORTED THERM T5	Connection to thermistor TT5 is shorted.	Check wiring between thermistor TT5 and controller.
#145	SHORTED XDUCER XD1	Connection to pressure transducer PT1 is shorted.	Check wiring between pressure transducer PT1 and controller.
#146	SHORTED XDUCER XD2	Connection to pressure transducer PT2 is shorted.	Check wiring between pressure transducer PT2 and controller.
#147	SHORTED XDUCER XD3	Connection to pressure transducer PT3 is shorted.	Check wiring between pressure transducer PT3 and controller.
#148	SHORTED XDUCER XD4	Connection to pressure transducer PT4 is shorted.	Check wiring between pressure transducer PT4 and controller.
#149	SHORTED XDUCER XD5	Connection to pressure transducer PT5 is shorted.	Check wiring between pressure transducer PT5 and controller.
#150	XB1 COMM ERROR	Controller internal communications failure	Replace controller

6.4 Transducer Locations

Gardner Denver blowers are equipped with a number of temperature and pressure transducers to monitor status and control the machine. The following table is a list of the various locations where these transducers are typically used depending on the AirSmart Controller installed in the unit.

Transducer Reference	AirSmart Controller P/N: 89864799	AirSmart Controller with Expansion Board P/N: VP1017673	AirSmart Controller Communications Module P/N: 301ETK1173
TT1	Inlet Temperature	Inlet Temperature	
TT2	Discharge Temperature	Discharge Temperature	
TT3		Optional Enclosure Temperature	
TT4		Optional Drive End Oil Temperature	
TT5		Optional Gear End Oil Temperature	
XD1	Inlet Pressure	Inlet Pressure	
XD2	Discharge Pressure	Discharge Pressure	
XD3			
XD4		Optional Drive End Oil Level	
XD5		Optional Gear End Oil Level	
XD6			System Pressure (sequencing)

7 Auxiliary Inputs and Outputs

As mentioned earlier in this manual, the AirSmart Controller has the ability to control a variable speed motor drive, read more than ten analog inputs and a control a host of digital I/O in order to achieve system objectives. The digital and analog I/O connect to the AirSmart Controller through a highly flexible mapping system which enables each input and output to perform a wide variety of functions. The following sections describe how to choose and configure the AirSmart's I/O for the correct task.

Changing of inputs and outputs which have already been configured at the factory can cause personal injury or damage to equipment.

7.1 Operating Device Addresses

There are four defined function sets, one each for digital inputs, digital outputs, analog inputs and analog outputs. Each function in each set has an address, which directs the corresponding function to the desired input or output. The functions and addresses are located in "PROG I/O ADJUST" menu, which becomes visible when **8412** is entered as the password parameter under the "UNIT SETUP ADJUST" menu.

The controller can map input and output functions to unique input and output ports. System inputs and outputs are addressed numerically. Each operating device in the system has a unique number as shown in the following table.

Operating Device	Unit Number
AirSmart Controller Core Board	1
AirSmart Controller Expansion Board	2
Drive 1	3
Drive 2	4
Drive 3	5
Modbus Registers	6
AirSmart Communications Module	7

A unit's base address is formed by multiplying the unit number by sixteen (16). A corresponding unit port address is formed by adding the device's port number to the unit base address. For example, the address for the AirSmart Controller's Expansion Board digital input #2 would be 2 × 16 + 2 = 34. Same addressing principal applies with all inputs and outputs, digital or analog.

7.2 Digital Input/Output Functions

The following tables are a list of the various digital input and output functions that are avaialble in the AirSmart Controller. A digital input or output fuction is active only when a valid address is assigned to that function. Any function is disabled when the address is set to zero.

Note: Functions listed in **BOLD** print may be pre-programmed at the factory. **DO NOT** change the address of these I/O functions or the blower will not function correctly.

Digital Input Function	Description
Air Filter	Used to signal a dirty air filter.
Remote Halt	Used to remote start/stop blower.
Motor Auxiliary	Used to signal the failure of the main motor starter.
Motor Fault	Input used to signal a main motor fault.
Fan Auxiliary	Used to signal the failure of the fan motor starter.
Fan Fault	Input used to signal a fan motor over temperature fault.
Low Voltage Relay Alarm	Used to signal low line voltage detected by external device.
Low Voltage Relay Shutdown	
Phase Sequence	Used to signal incorrect connection of three phase power input detected by external device.
Enclosure Temp	Used to signal enclosure temperature switch trip.
Drive End Oil Level Alarm	Used to trigger low oil level from oil level sensor switch.
Drive End Oil Level Shutdown	
Gear End Oil Level Alarm	Used to trigger low oil level from oil level sensor switch.
Gear End Oil Level Shutdown	
Water Pressure Alarm	Used to signal high water pressure in water cooled systems.
Water Pressure Shutdown	
Reset Alarm	Used to control remote rest of alarms.
Advisory Alarm	Used to trigger a generic advisory alarm.
Shutdown Fault	Used to trigger a generic shutdown fault.

Digital Output Function	Description
Advisory Alarm	Used to indicate an active advisory alarm.
Shutdown Fault	Used to indicate an active shutdown alarm.
Any Alarm	Used to indicate an active advisory or shutdown alarm.
Main Contactor	Used to control the main motor starter in fixed speed blower models.
Start Contactor	Used to control the start contactor in a Wye-Delta motor starter in fixed speed blower models.
Fan Contactor	Used to control the enclose ventilation fan.
Unloader Valve	Used to control unloader valve on the package discharge.
Run	Used to indicate the blower's main motor is running.
Delayed Break Run	Used to indicate the blower's main motor is running but stays active for ten minutes after the motor stops.

Digital I/O functions can be programmed to be either active high or active low by using the Plus  and Minus  keys to change the polarity of the input. A positive address value corresponds to an active high function and a negative address value likewise corresponds to an active low function.

7.3 Analog Input/Output Functions

The following tables are a list of the various analog input and output functions that are availble in the AirSmart Controller. An analog input or output fuction is active only when a valid address is assigned to that function. Any function is disabled when the address is set to zero.

Note: Functions listed in **BOLD** print may be pre-programmed at the factory. **DO NOT** change the address of these I/O functions or the blower will not fuction correctly.

Analog Input Function	Description
Inlet Temperature	Used to indicate the blower air inlet temperature.
Discharge Temperature	Used to indicate the airend discharge temperature.
Discharge Pressure	Used to indicate the package discharge pressure. Also used as control pressure reference to AirSmart Controller in a pressure machine.
Inlet Pressure	Used to indicate the package inlet pressure. Also used as control pressure reference to AirSmart Controller in a vacuum machine.
System Pressure	Used to indicate the control pressure in a sequenced group of blowers.
Enclosure Temperature	Used to indicate the temperature inside the package enclosure.
Drive End Oil Temperature	Used to indicate the temperature in drive end oil sump.
Gear End Oil Temperature	Used to indicate the temperature in gear end oil sump.
Drive End Oil Level	Used to indicate the oil level in drive end oil sump.
Drive End Oil Level	Used to indicate the oil level in gear end oil sump.
Speed Control	Used to control the speed of a variable speed blower while operating in REMOTE mode.

Analog Output Function	Description
Discharge Temperature	Used to indicate the current discharge temperature value.
Discharge Pressure	Used to indicate the current discharge pressure value.
Inlet Pressure	Used to indicate the current inlet pressure value.

7.4 Example “RUN” Digital Output Signal

The following example shows how to provide a "RUN" output on a variable speed blower. This procedure can also be used on other machines; however the I/O addresses may need to be changed. There are as many as four outputs that can be programmed to serve as a “RUN” signal. There is a 24 VDC output on terminal blocks A9 or A10 (ground reference on B6 thru B10) and there are also two N.O relay contacts between terminal blocks A11 and B11 or A12 and B12. Any one of these contact points can be programmed to be active when the blower is running.

1. Press the Enter ENTER key on the display to access the Adjustment menu tree.
2. Use Right → or Left ← keys to navigate to the Unit Setup Adjust menu.
3. Press the Enter ENTER key to enter the Unit Setup Adjust menu.
4. The Unit Password parameter will be the first item in the Unit Setup Adjust menu. Press the Enter ENTER key to change the Password to **8412**.
5. Use the Plus + and Minus − keys the change the value of each digit.
6. Use the Right → or Left ← keys to select individual password digits.
7. Press the Enter ENTER key to confirm the password value.
8. Press the Stop/Reset STOP/RESET key to return to the Adjustment menu tree.
9. Press the Right → key twice to navigate to the Prog I/O Adjust menu.
10. Press the Enter ENTER key to access the Prog I/O Adjust menu.
11. To use terminals A11/B11 (N.O. relay contact) for the "RUN" signal, skip to step #19 below.
12. To use terminal A10 for the "RUN" signal, continue with step #13.
13. Press the Down ↓ key to navigate to the "RUN" Digital Output address. The controller display should read as below.

```
PROG I/O ADJUST
RUN
0 DIGTIAL OUT
(SELECT PARAMETER)
```

14. Press the Enter ENTER key to edit the I/O address for the "RUN" signal. Use address **20** for terminal A10.
15. Use the Plus + and Minus − keys the change the value of each digit.
16. Use the Right → or Left ← keys to select individual address digits.
17. Press the Enter ENTER key to confirm the address value. The controller display should read as below.

```
PROG I/O ADJUST
      RUN
  20 DIGTIAL OUT
(SELECT PARAMETER)
```

18. Skip now to step #28.

19. To use terminals A11/B11 (N.O. relay contact) for the "RUN" signal, continue with step #20 below.

20. Press the Down key to navigate to the "ANY ALARM" Digital Output address. The controller display should read as below.

```
PROG I/O ADJUST
   ANY ALARM
  50 DIGTIAL OUT
(SELECT PARAMETER)
```

21. We must first set this address to **0** in order to disable this function so that the relay output can be re-used for the "RUN" signal.

22. Press the Enter key to edit the I/O address for the "ANY ALARM" signal.

23. Use the Plus and Minus keys the change the value of each digit.

24. Use the Right or Left keys to select individual address digits.

25. Press the Enter key to confirm the address value. The controller display should read as below.

```
PROG I/O ADJUST
   ANY ALARM
  0 DIGTIAL OUT
(SELECT PARAMETER)
```

26. Press the Up key to navigate to the "RUN" Digital Output address.

27. Skip back to step #14 except that you need to use address **49** for the relay output instead of address 20 as stated in step #14.

28. Press the Stop/Reset key twice. The controller display will read as below.

```
STORE MODIFIED
  PARAMETERS?
   STOP = NO
  ENTER = YES
```

29. Press the Enter key to permanently save to changed parameters in the controller's memory.

7.5 Remote Mode Analog Input Signal

The following procedure explains how to program an analog input on a variable speed blower package for controlling the speed of the blower in REMOTE operating mode. Only an unused pressure transducer signal input can be used for this function. The pressure transducer connections are found on either connector P5 or P14 if the expansion I/O board is installed in the controller.

The analog signal range on the pressure transducer inputs is 0 – 5 VDC. If the available analog source is a 4 – 20 mA signal, an external 250 Ohm, 1 % resistor will need to be connected across the input. An example 4 – 20 mA connection is shown in the diagram below.

1. Press the Enter ENTER key on the display to access the Adjustment menu tree.
2. Use Right → or Left ← keys to navigate to the Unit Setup Adjust menu.
3. Press the Enter ENTER key to enter the Unit Setup Adjust menu.
4. The Unit Password parameter will be the first item in the Unit Setup Adjust menu. Press the Enter ENTER key to change the Password to **8412**.
5. Use the Plus + and Minus − keys the change the value of each digit.
6. Use the Right → or Left ← keys to select individual password digits.
7. Press the Enter ENTER key to confirm the password value.
8. Press the Stop/Reset STOP/RESET key to return to the Adjustment menu tree.
9. Press the Right → key twice to navigate to the Prog I/O Adjust menu.
10. Press the Enter ENTER key to access the Prog I/O Adjust menu.
11. Press the Down ↓ key to navigate to the "SPEED CONTROL" Analog Input address. The controller display should read as below.

```
PROG I/O ADJUST
SPEED CONTROL
0 ANALOG IN
(SELECT PARAMETER)
```

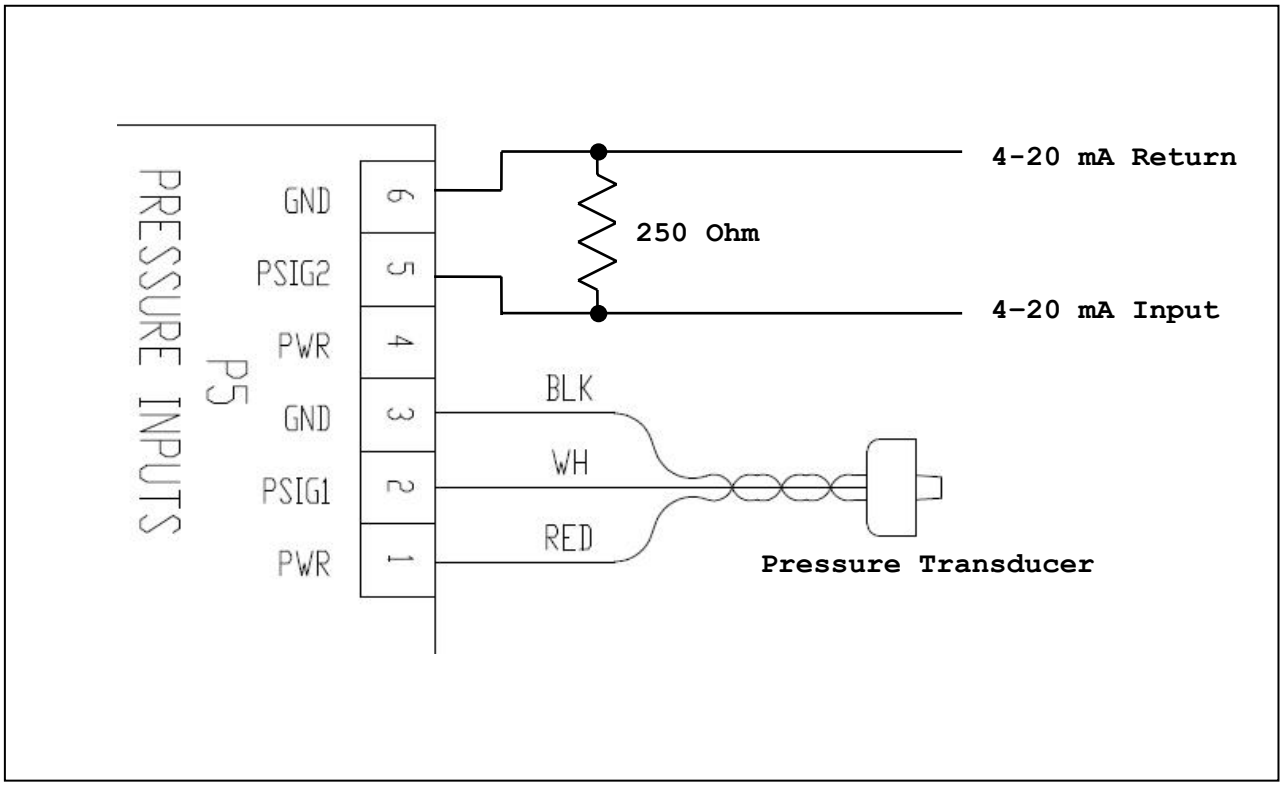
12. Press the Enter ENTER key to edit the I/O address for the "SPEED CONTROL" signal. Use address **19** for pins 2 and 3 on connector P5 or address **20** for pins 5 and 6 on connector P5.
13. Use the Plus + and Minus − keys the change the value of each digit.
14. Use the Right → or Left ← keys to select individual address digits.
15. Press the Enter ENTER key to confirm the address value. The controller display should read as below.

```
PROG I/O ADJUST
SPEED CONTROL
19 ANALOG IN
(SELECT PARAMETER)
```

16. Press the Stop/Reset  key twice. The controller display will read as below.


```
STORE MODIFIED
PARAMETERS?
STOP = NO
ENTER = YES
```

17. Press the Enter  key to permanently save to changed parameters in the controller's memory.

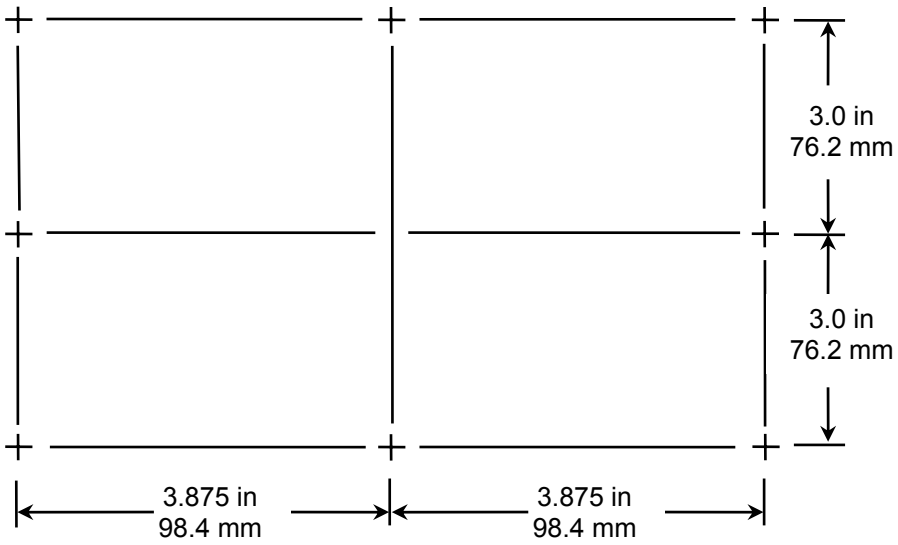


8 Technical Data

8.1 All-In-One AirSmart Controller

Outside dimensions for the All-In-One AirSmart Controller and Display Unit:
9.0 in x 7.5 in x 1.8 in
228.6 mm x 190.5 mm x 45.7 mm

Mounting arrangement for the All-In-One AirSmart Controller and Display Unit:



8.2 Environmental Ratings

Operating temperature range: -40°F to 185°F (-40°C to 85°C)
Storage temperature range: -67°F to 300°F (-55°C to 150°C)
Humidity: 0 to 95% non-condensing

8.3 Electrical Ratings

DC power input on P1: 24 VDC +/- 10% @ 150 mA

Digital Outputs (Core board):
24 VDC @ 2.6 A continuous

Digital Outputs (Expansion board):
24 VDC @ 800 mA continuous

Form-C relay output (Expansion board):
Relay contact rating: 125 mA @ 250 VAC, 2.0 A @ 30 VDC.

Digital Inputs (Core board): Four 0 - 24 VDC inputs -
Low = 0 to 4 VDC / High = 20 - 24 VDC.

Digital Inputs (Expansion board): Ten 0 to 24 VDC inputs -
Low = 0 to 4 VDC / High = 20 to 24 VDC.

Analog Inputs (Core Board): Four 0 – 5 VDC inputs.
Two configured for use with 3 kOhm NTC thermistors
Two configured for use with 0.5 – 4.5 VDC output pressure transducers.

Analog Inputs (Expansion Board): Six 0 – 5 VDC inputs.
Three configured for use with 3 kOhm NTC thermistors
Three configured for use with 0.5 – 4.5 VDC output pressure transducers.

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