Gardner Denver

13-17-613
Version: 01
March 1, 2017

AirSmart™ CONTROLLER
2nd GENERATION

USER'S MANUAL

(Compressor Application)

WARNING – PROHIBITION – MANDATORY LABEL INFORMATION

Gardner Denver Rotary Screw compressors 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 compressor 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, COULD result in death or serious injury.

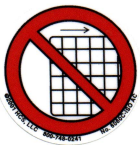
Asphyxiation Hazard – Poisonous Fumes or Toxic Gas in Compressed Air

⚠ CAUTION

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

Burn Hazard – Hot Surface

PROHIBITION - MANDATORY ACTION REQUIREMENTS



Do Not Operate Compressor 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

The following text presents common safety issues of which the user should be aware. Though the list below includes unit and supporting equipment dangers present, the user must also be vigilant to other hazards introduced in an industrial environment, and ensure they have received the necessary safety training.

⚠ DANGER

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

- **Keep fingers and clothing away from rotating fan, drive coupling, etc.**
- **Disconnect the compressor 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 compressor 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.**

⚠ WARNING

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

- **Stop the unit if any repairs or adjustments on or around the compressor 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.**

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Revision History and Software Compatibility

Version	Date	Notes	Current AirSmart G2 Firmware Version
00	January 27, 2014	First release. Supports fixed speed packages.	1.0.2
01	February 20, 2017	Supports VS and variable capacity packages	2.32.0

1 General Information

The AirSmart™ Generation 2 (G2) controller was designed specifically for use in Gardner Denver rotary screw air compressors and is capable of controlling fixed speed air compressors which use traditional motor starters as well as variable speed and modulating compressors. The microprocessor-based unit monitors all necessary temperature and pressure points within the compressor in order to safely operate the machine and satisfy user air demand. The Control Panel displays a comprehensive overview of the compressor status and allows easy access to operational parameters such as pressure set points, alarm set points and language selection.

1.1 AirSmart™ G2 Controller Features

- ✓ Microprocessor controlled
- ✓ Low voltage 24 VDC operation
- ✓ 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 compressor packages
- ✓ Three 4-20 mA analog inputs in support of analog pressure transducers
- ✓ Up to five additional 4-20 mA inputs available on I/O expansion
- ✓ Three analog RTD inputs in support of PT1000 temperature transducers
- ✓ Up to five additional analog RTD inputs available on I/O expansion
- ✓ Up to six contact closure sensing discrete inputs for user control
- ✓ Up to six additional discrete inputs available on I/O expansion
- ✓ Up to six 24VDC discrete outputs for user status (800mA per channel)
- ✓ Up to six additional discrete outputs available on I/O expansion
- ✓ Up to two normally-open SPST Relay outputs
- ✓ Up to one additional SPST Relay output available on I/O expansion
- ✓ Up to two 4-20 mA analog outputs available for feedback and control on I/O expansion
- ✓ SD Card slot (32 Gigabyte max) for data logging

1.2 Control Panel Features

- ✓ 320x240 color pixel display with LED back lighting is easy to read in all lighting conditions.
- ✓ 7 navigational Buttons for easy compressor control and menu navigation
- ✓ 2 status LEDs for `at-a-glance_ compressor status
- ✓ Password protection of setup parameter menus
- ✓ Multiple language support

2 Controller Operation

2.1 Compressor Front Panel

2.1.1 AirSmart Controller Control Panel

The Control Panel is mounted on the front panel of the compressor and is used to operate the compressor and observe system status using its 320x240 color pixel display, two status LED indicators, seven navigational buttons, and two control buttons.

2.1.2 Emergency Stop Button

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

2.2 Control Panel Indicator and General Navigation Button Functions

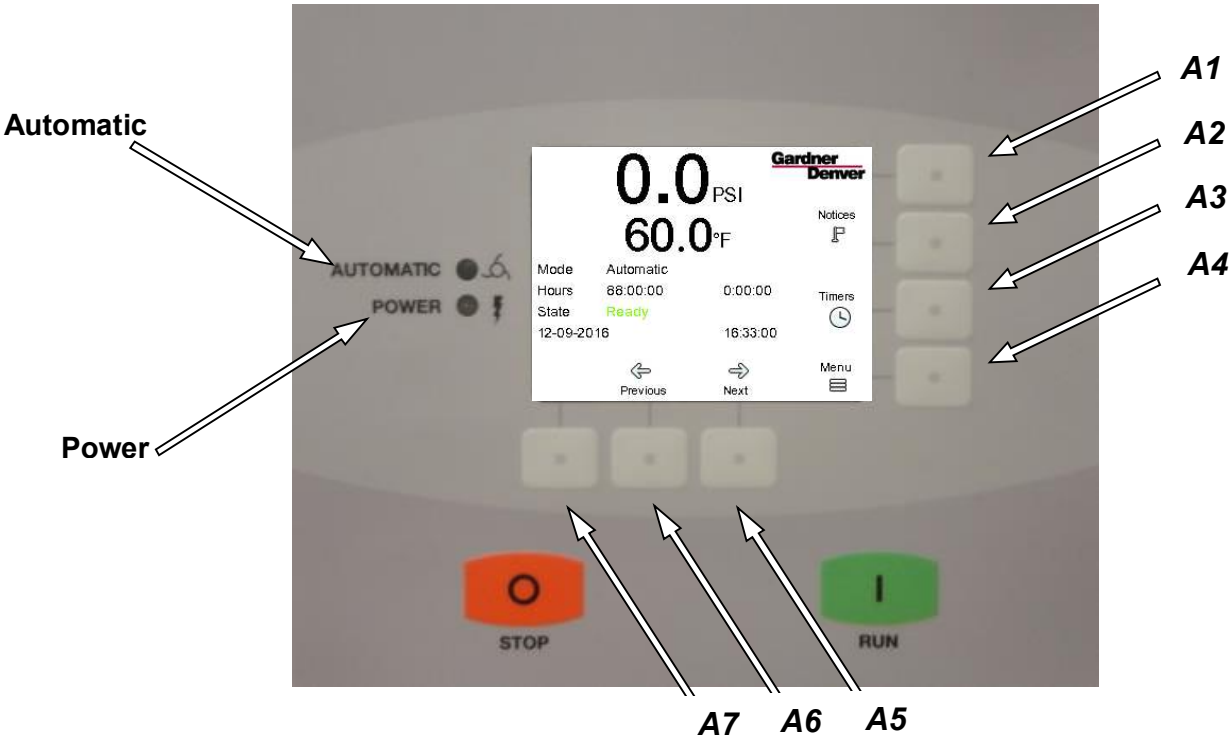


Figure 2-1: Control Panel Indicator and General Navigation Button Functions

2.2.1 LED Indicators and Stop Button

The Automatic LED (green) indicates that the compressor is capable of starting automatically, while the Power LED (white) indicates that power has been applied to the compressor. The STOP button clears a fault condition if the fault is not still active.

2.2.2 Button Navigation Functions

The display is controlled by seven navigation buttons. Four of these buttons are located to the right of the display and three are located beneath it. The navigational buttons correspond to the functions closest to them. For the example shown in Figure 2-1, Button A1 will navigate to the Distributor Information screen, Button *A2* will navigate the user to the Notices screen, Button *A3* will navigate the user to the Maintenance screen, and Button *A4* will navigate the user to the Menu screen. The buttons below the display (*A5* and *A6* for the example) will navigate to the Previous and Next pages, respectively. Each screen will have unique navigational controls as labeled by the display text.

Figure 2-1 shows an example of the Home screen display.

2.3 Operating Screens

The AirSmart G2 controller features a set of easily-accessible screens providing run-time information about the machine's operating state and condition. These are available from the home screen without logging in to the system and include sensor readings, gauges, notice history, and maintenance timer information. This section describes the operating screens in detail.

2.3.1 Home Screen

The home screen is the primary source of basic system status and operation. It includes plant delivery pressure and discharge temperature readings, a status indicator icon, operating mode, total and loaded hours, control state, and other dynamic information. Navigational links are provided to allow the user to access other operating screens and system menus. An annotated image of the home screen is shown in Figure 2-2.

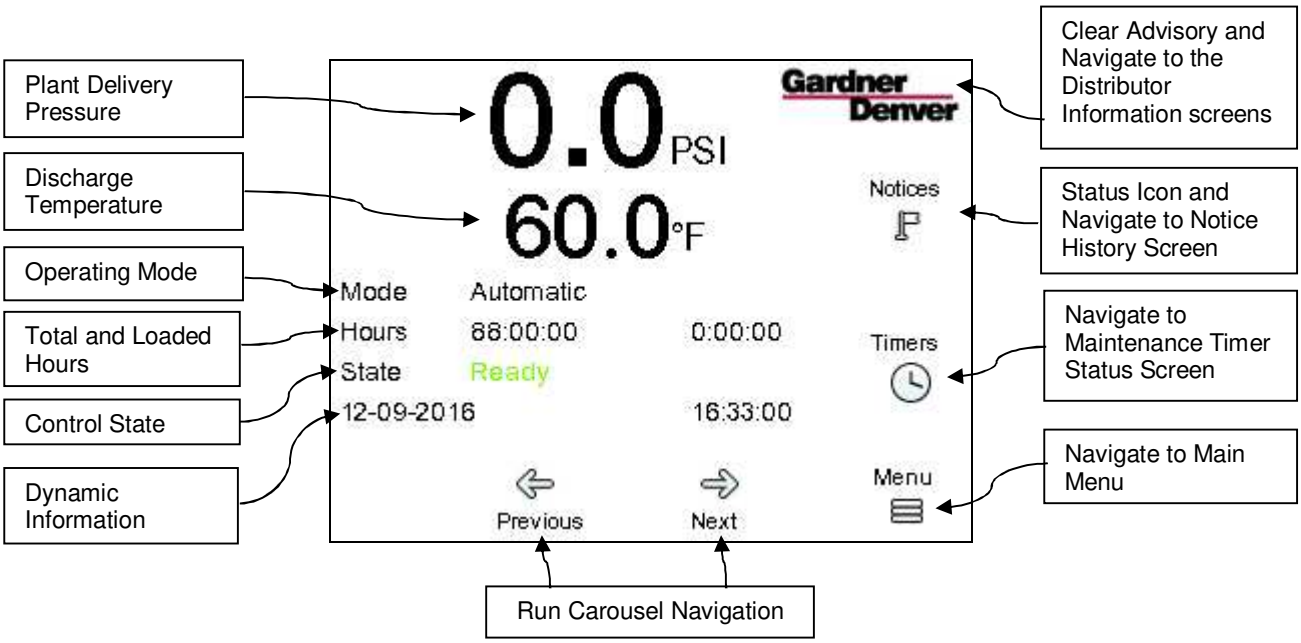


Figure 2-2: Home Screen at a Glance

The items labeled in Figure 2-2 are described in more detail below:

- **Plant Delivery Pressure** is the largest piece of information on the home screen. This value reflects the current air pressure at the compressor discharge port and is used to control compressor loading and unloading.
- **Discharge Temperature** indicates the airend discharge temperature of the compressor and is used as the control reference for cooling control and some temperature-based safety actions.
- **Operating mode** reflects the current operating mode setting of the controller. This will be one of Automatic, Low Demand, Constant, Sequence, or Connect 12.
- The **Hours** line on the display shows the current Total (left of screen) and Loaded (right of screen) hours on the package. These values are updated in real-time. The **Total Hours** will increment any time the main motor is being driven. The **Loaded Hours** value will increment any time that the compressor is producing air.
- **Control State** indicates the current state of the controller state machine and can be useful for quick reference as well as diagnostics. A definition of the available control states that may be displayed is provided in Table 2-1.

Table 2-1: Control State Definitions

Control State	Definition
Reset	The controller is resetting
Auto Restart	Auto Restart is enabled and active. The compressor will transition states at the expiration of the **Auto Restart Timer**.
Shutdown	A shutdown fault is active.
Ready	The compressor is healthy and ready to be enabled.
Remote Halt	The compressor has been halted by a remote signal.
Ask to Start	The compressor is attempting to start. Prolonged time in this state indicates that a precondition to starting the compressor has not been met.
Enabled	The compressor is enabled and may start automatically when all starting conditions, such as pressure setpoints, have been met.
Ask to Load	The compressor is attempting to load.
Pre-Wye	Initiating wye-delta start
Wye	Motor contactors have been engaged in the Wye (Start) connection.
Delta	Motor contactors have transitioned to delta connection.
Start	The motor has been started and the compressor is beginning the loading process
Pause	The motor has been started and the inlet valve has been opened but the controller is waiting on a condition to be met before transitioning to the loaded state. Dwelling in this state may be due to low reservoir pressure or the start timer.
Loaded	The compressor is loaded and operating, and will unload once the **Unload Pressure** has been reached.
Unload	The compressor is in the unloaded state. Transition into this state triggers the blowdown timer to start. The compressor will transition to loaded if delivery pressure falls below the **Load Pressure** setting or to blowdown state if the blowdown timer expires.
Blowdown	The compressor is in the blowdown state. Pressure will be relieved from the air/oil reservoir. Transition into this state triggers the auto timer to start. The compressor will transition to loaded if delivery pressure falls below the **Load Pressure** setting, or to enabled if the auto timer expires.
Normal Stop	The controller is executing the normal stop sequence. The motor will continue to run during this state until all conditions for stopping have been met, including the stop timer.

- The **Dynamic information** line on the home screen is used for various informational messages depending on the state and condition of the compressor. If no other information is being displayed, this line will show the current date and time setting on the controller. Table 2-2 describes the various information that will be displayed here:

Table 2-2: Dynamic Information

Condition	Text Description (Left)	Value (Right)
Auto Restart in progress	Auto Restart Timer	Timer value (hh:mm:ss)
Waiting on AutoRun schedule	Start Time	Absolute start time (hh:mm:ss)
Waiting for blowdown to complete	Not Blown Down	Reservoir pressure value
Waiting for reservoir pressure to exceed control pressure setting	Building Control Pressure	Reservoir pressure value
Start Timer active	Start Timer	Timer value (hh:mm:ss)
Blowdown timer active	Blowdown Timer	Timer value (hh:mm:ss)
Auto timer active	Auto Timer	Timer value (hh:mm:ss)
Stop timer active	Stop Timer	Timer value (hh:mm:ss)

- The **Run Carousel Navigation** buttons are labeled *Previous* and *Next*. These are used to navigate through the run screens carousel. See section 2.3.2 for more information.
- **Main Menu Navigation** is triggered by the button labeled Menu. The menu structure and operation are described in the subsequent sections.
- **Maintenance Timer Summary Navigation** is triggered by the button labeled Timers and will take the user to the maintenance timer summary screens which provide a graphical overview of the maintenance timers. See section 2.3.4 for more detail.
- The **Status Icon** provides a graphical indication of the status of the machine by displaying a different icon if any faults or advisories are active on the system. The button next to this icon is used to navigate to the notice history screen. See section 2.3.3 for more detail.

2.3.2 Run Screens Carousel

The run screens carousel is a set of informational screens set up in a loop that may be accessed in any direction from the home screen using the *Previous* and *Next* buttons. This set of screens includes graphical gauges displaying sensor readings as well as sensor and drivetrain summary screens. Trend logging for each sensor may be accessed from the respective gauge.

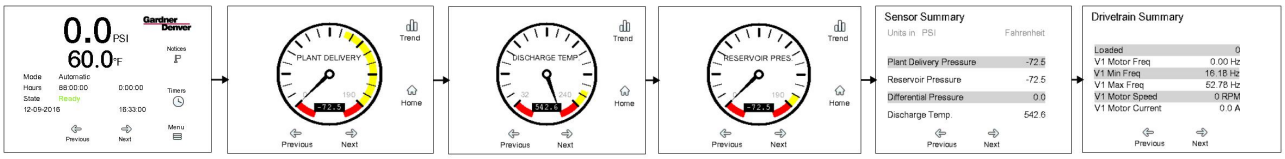


Figure 2-3: Run Screens Carousel

2.3.2.1 Gauges

Pressing the *Next* button from the home screen will take the user to the *Plant Delivery Pressure* gauge. This screen is show in Figure 2-4.

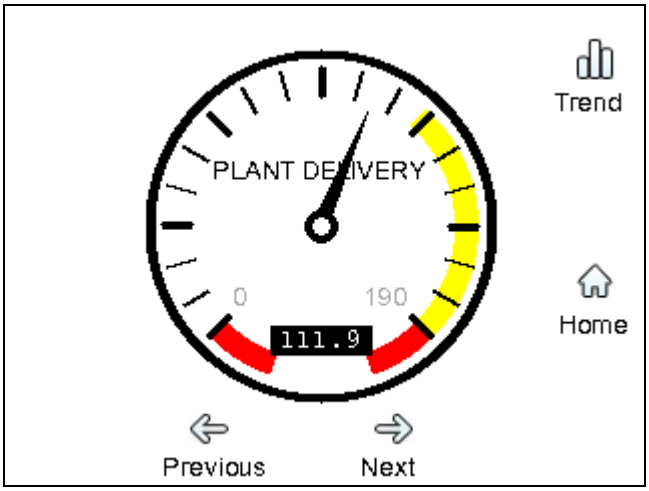


Figure 2-4: Plant Delivery Pressure Gauge

The position of the needle on the gauge indicates the current pressure reading as displayed in the digital value in the center of the gauge. The yellow region on the right of the gauge begins at the current setting for the **Unload Pressure** and the red region on the right of the gauge begins at the **Pressure Fault** setting. The scale of the gauge and location of the yellow and red zones will change dynamically according to the configuration of the system.

The *Discharge Temperature* and *Reservoir Pressure* gauges are formatted in a very similar fashion to the *Plant Delivery Pressure* gauge, with yellow and red zones configured as noted in Table 2-3.

Table 2-3: Gauge Classifications

Gauge	Lower (left) Red Zone	Upper (right) Yellow Zone	Upper (right) Red Zone
Plant Delivery Pressure	0 PSI	**Unload Pressure**	**Plant Pressure Fault**
Discharge Temperature	0 °C	**Discharge Temperature Advisory**	**Discharge Temperature Fault**
Reservoir Pressure	0 PSI	**Plant Pressure Advisory**	**Plant Pressure Fault**

From each gauge screen, pressing the button next to the *Home* icon will navigate back to the home screen. Pressing the button next to the *Trend* button will navigate to the trend history of this sensor reading recorded over time as described in section 2.3.2.2.

2.3.2.2 Trend Graphs

The readings from the primary sensors on the system are logged at a fixed interval during compressor operation and may be displayed on the screen by navigating to the *Trend* screen from the respective gauge. An image of the *Discharge Temperature Trend* screen is shown in Figure 2-5.

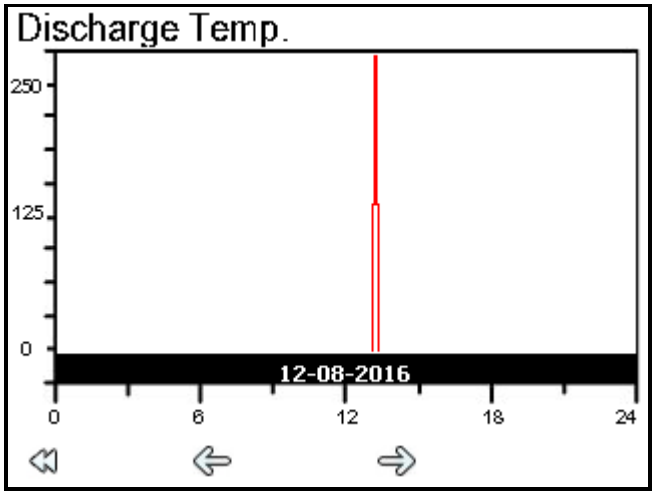


Figure 2-5: Discharge Temperature Trend

Trend data files are loaded one date at a time. The x-axis across the bottom of the screen indicates the hours in the day based on the current date and time setting of the controller. The current date loaded is shown in the bar at the bottom of the screen, and the data scale is indicated on the y-axis.

Pressing the right arrow ⇨ will load the next day in the log history, the left arrow ⇦ will load the previous day in the history. If a log is requested for a date when the compressor was not powered, either in the past or in the future, a message will be displayed indicating that no log is available.

Pressing the double left arrow ⇦ will navigate back to the respective gauge screen regardless of what date has been loaded.

2.3.2.3 Sensor Summary Screen

The final two screens in the carousel are the sensor summary and drivetrain summary screens. These screens provide a convenient display of all the sensor readings and drivetrain readings in one location. These screens can be accessed immediately from the home screen by pressing the *Previous* button. An example of the sensor summary screen is shown in Figure 2-6 and an example of the drivetrain summary is shown in Figure 2-7. Note that the Drivetrain Summary screen is only visible on units equipped with a variable speed drive.

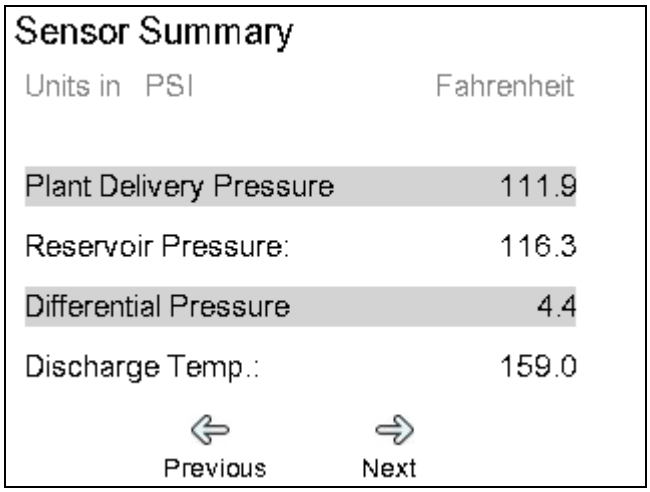


Figure 2-6: Sensor Summary Screen

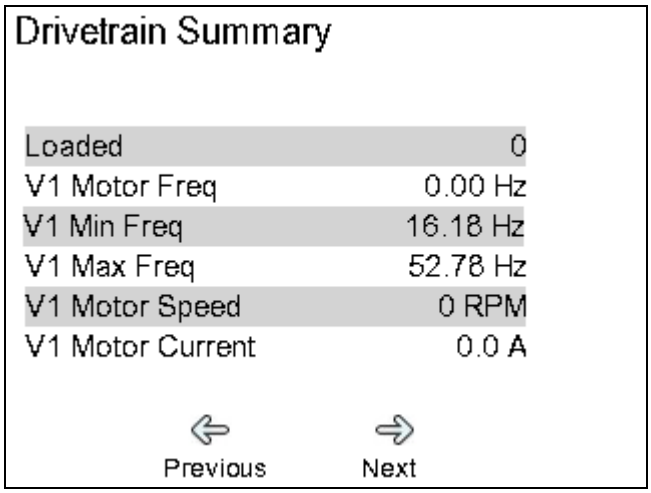


Figure 2-7: Drivetrain Summary Screen

2.3.3 Notice History and Status Icon

The status icon on the home screen provides a clear indication of the status of the machine. The icon will change according to the conditions described below:

- If no advisories or faults are currently active, a flag image will be displayed under the *Notices* label.
- If a fault has occurred and is currently active, the status icon will change to a flashing red triangle: .
- Once the fault condition has been resolved, for example a sensor reading has been lowered below the fault level or a digital input trigger has been cleared, the fault icon will change from flashing to solid. This indicates that the fault may be cleared by pressing the STOP button.
- If an advisory condition is currently active, a yellow triangle will be displayed: . To clear an advisory, press the button to the right of the Gardner Denver logo . Note that this will also navigate to the Distributor information screens to display distributor contact information and consumable part numbers.

Regardless of the state of the machine, pressing the button to the right of the status icon will navigate to the *Notice History* screen. This screen displays information about all faults and advisories logged on the system. For example, Figure 2-8 illustrates the *Notice History* display for an Emergency Stop fault.

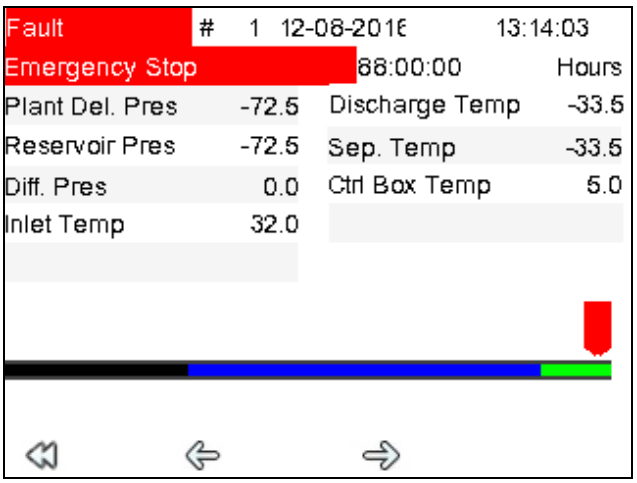


Figure 2-8: Notice History Fault Display

As shown in Figure 2-8, the following information is displayed for each event in the log:

- Type of notice (Fault / Advisory)
- Notice number (since commissioning)
- Date and Time of notice
- Notice description ("Emergency Stop" for example)
- Total hours at time of notice
- Sensor readings at time of the event
- Timeline of notices when they have occurred (Green section = last 24hr period, Blue section = previous seven days, Black section = older than seven days). The yellow and red flags represent either an advisory (yellow) or fault (red) condition and the location on the timeline indicates when they occurred. The flag corresponding to the currently displayed event will flash slowly.

Pressing the *Next* button will load the next notice in the log (if one exists). Pressing the *Previous* button will load the previous entry in the log (if one exists). The *Back* button will return to the home screen.

The display is very similar for advisory conditions, as shown in Figure 2-9.

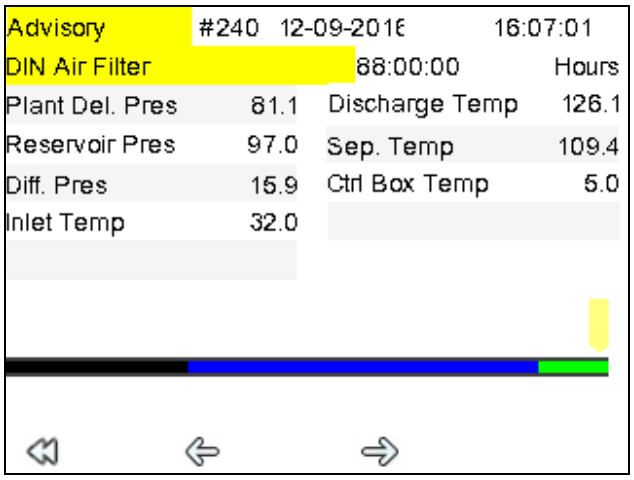


Figure 2-9: Notice History Advisory Display

2.3.4 Maintenance Timers Summary

The *Maintenance Timers Summary* screens can be accessed by pressing the button labeled *Timers* on the home screen. These screens provide bar graphs for a graphical representation of the maintenance status of the package. For each bar in the graph, the height of the bar indicates the percentage of life remaining on the timer. For example, a maintenance timer with a 1000 hour interval and 500 running hours since the last change would display at 50% life, indicated by the *Half* label on the graph. At 10% life remaining, the bar will turn yellow, followed by red at 5% and below. Once the timer has reached 0% remaining at the *Expired* label on the graph, it will begin counting in the opposite direction towards the *Critical* label, which will be reached at 50% past the expiration point.

Note*:* Although the graph displays *Critical* at the -50% point, maintenance should be performed at or before the timer reaches *Expired*.

The first screen in this set is shown in Figure 2-10 and shows the following timers:

- Air Filter change timer
- Control Box Filter change timer
- Oil Filter change timer
- Oil Separator change timer

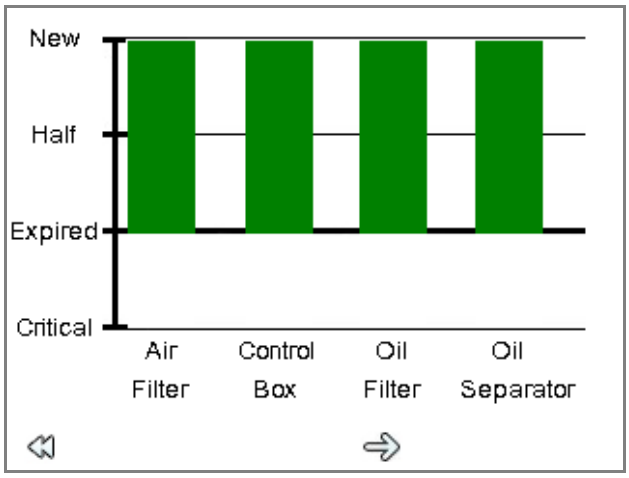


Figure 2-10: Maintenance Timer Summary`

From the first timer summary screen, pressing the *right arrow* will navigate to the second screen as shown in Figure 2-11, which includes the following timers:

- Oil Sample timer
- Oil Change timer
- Motor Lube timer

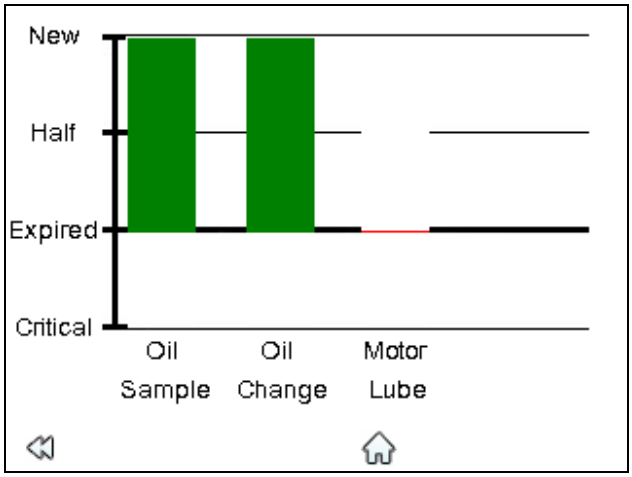


Figure 2-11: Maintenance Timer Summary

Notice on Figure 2-11 that the Motor Lube timer is displayed at the *Expired* level. In this case, this is due to the timer being disabled on this package by setting the **Motor Lube Timer Interval** to 0 hours. If an interval is set to 0 hours, no maintenance advisory will be triggered based on this timer.

2.4 Login and Accessibility

The **Login** operation for menu access is found under the *Main Menu*. Logging in is required to access any screens other than those described in the Operating Screens under section 2.3.

To access and operate the **Login** function*:*

1. From the Home screen, select the *Menu* button  as shown in Figure 2-12.

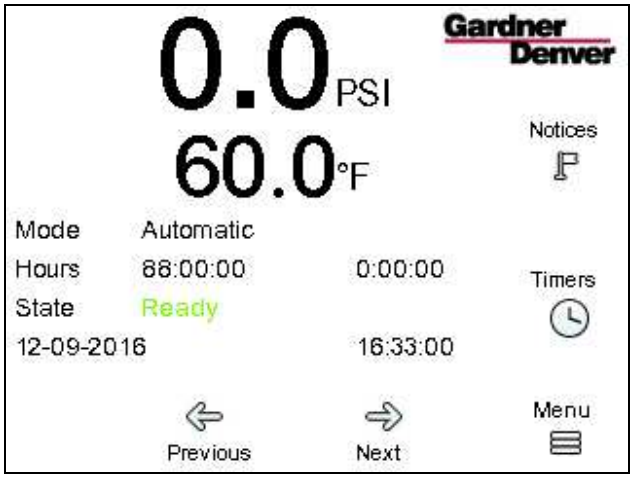


Figure 2-12: Home Screen

2. From the *Main Menu*, select the *Login* button  as shown in Figure 2-13. The *Select User* menu will appear as shown in Figure 2-14.

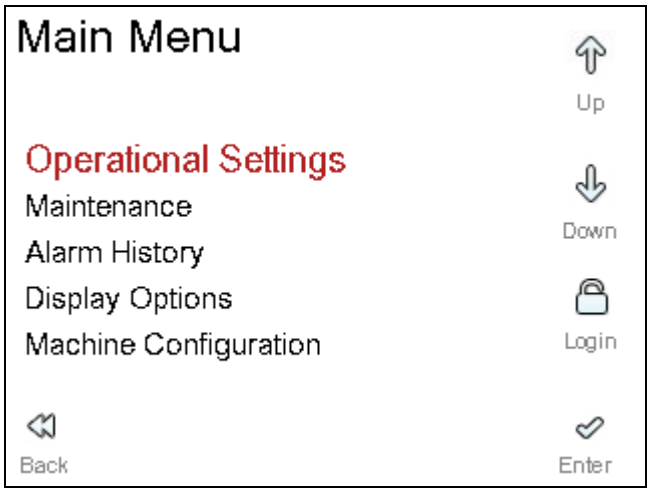


Figure 2-13: Main Menu

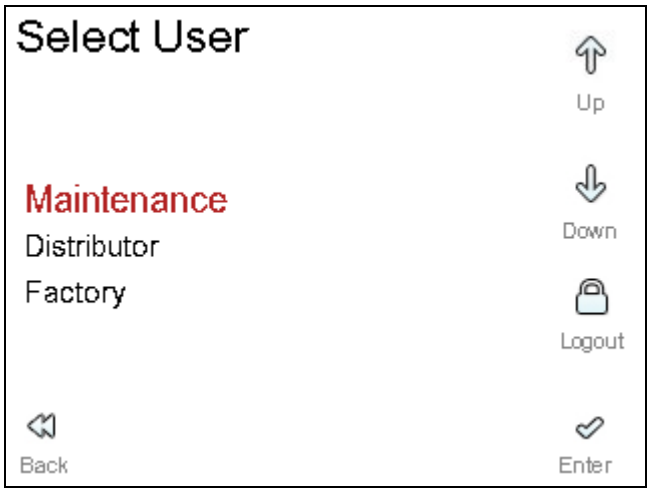


Figure 2-14: Select User Screen

3. Use the navigational buttons  to choose the appropriate user level: **Maintenance, Distributor,** or **Factory.** Press the *Enter* button  . The **Enter Passcode** screen will appear.

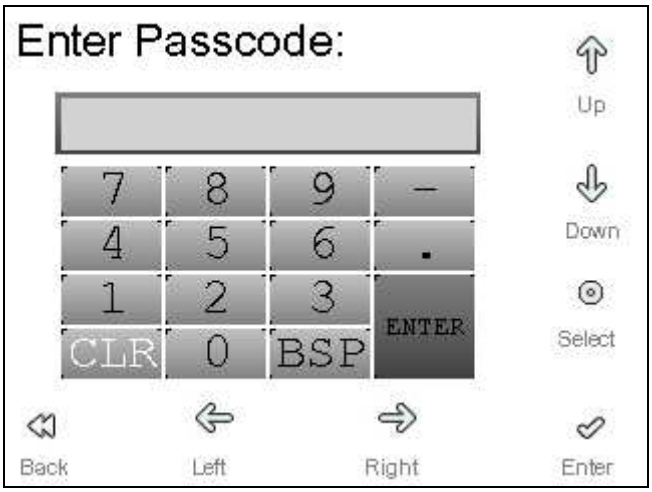


Figure 2-15: Passcode Entry Screen

4. Enter the passcode for the requested access using the navigational buttons to choose the appropriate number. The *Select* button is used to enter the number. Navigate to and select ENTER when complete, or simply press the *Enter* button to apply the code.

5. The interface will automatically navigate to the *Select User* screen if the code is accepted. If the code is not accepted, the user interface will remain at the **Enter Passcode** keypad.

Note: The timeout for any active user is approximately six minutes from the last screen navigation. When the timeout occurs, the user will be logged out and the unit will be reset to the *Home* page

3 Quick Start Guide

Quick start operation of the compressor using the AirSmart G2 can be achieved by setting the **Target Pressure**, setting the **Load/Unload Pressures**, setting the unit to **Automatic Mode**, and commencing run. The following steps are provided as a guide to quick starting the unit.

3.1 Applying Machine Power

1. Apply power to the compressor.

2. The AirSmart G2 controller will automatically boot to the default *Home* screen as shown in Figure 3-1. Boot time is approximately 20 seconds. A Gardner Denver logo will be displayed on the screen during the boot process.

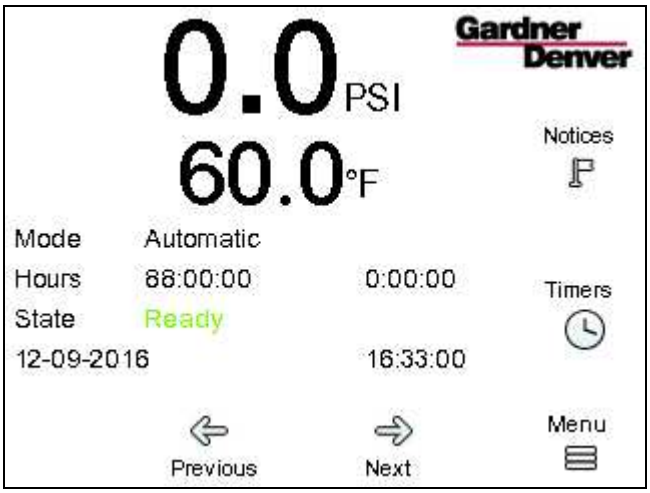


Figure 3-1: Home Screen

3.2 Setting Target Pressure

1. From the *Home* screen, select the *Menu* button. The *Main Menu* will appear as in Figure 3-2.

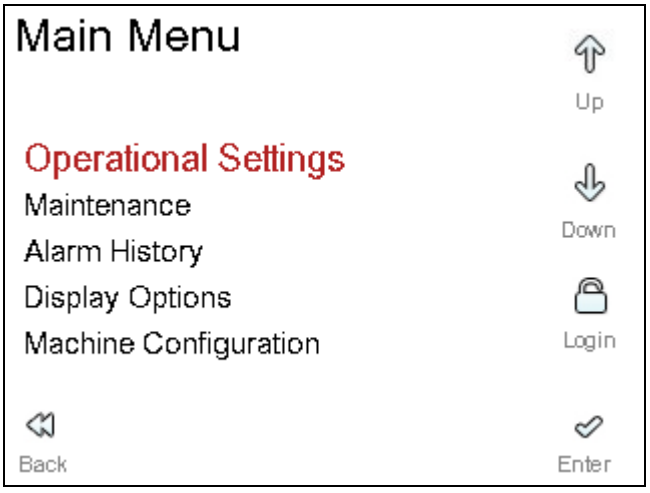


Figure 3-2: Main Menu

2. Follow the instructions in section 2.4 to log in with distributor access.

3. From the *Main Menu,* use the navigational buttons and select *Operational Settings*.

4. Press the *Enter* button. The *Operational Settings* menu will appear as illustrated by Figure 3-3.

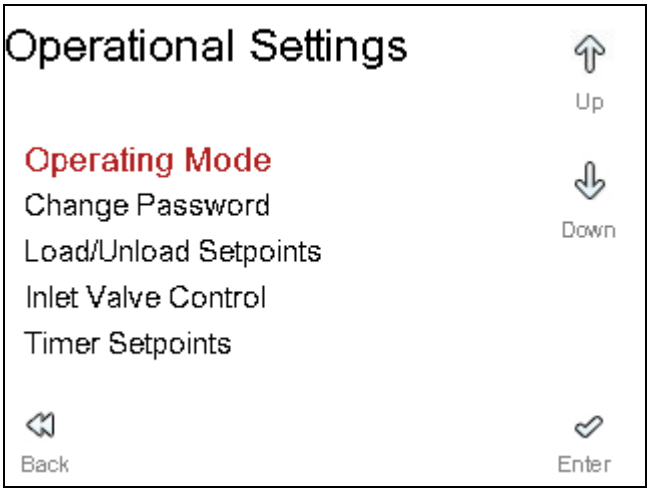


Figure 3-3: Operational Settings Menu

5. From the *Operational Settings* menu, use the navigational buttons and select *Load/Unload Setpoints*.

6. Press the *Enter* button. The *Load/Unload Setpoints* menu will appear as in Figure 3-4.

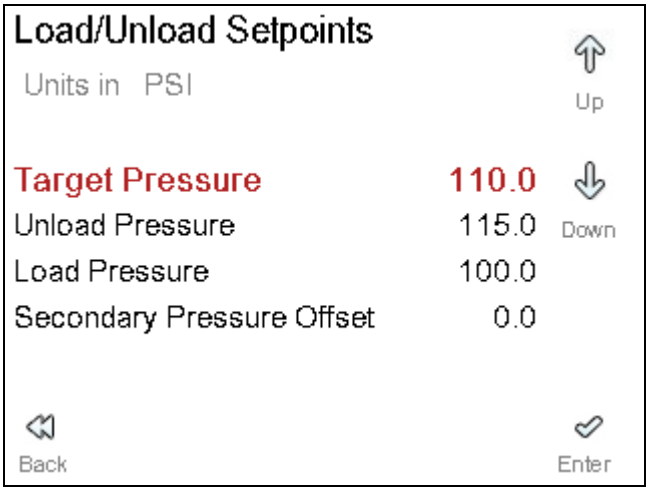


Figure 3-4: Load/Unload Setpoints Menu

7. From the *Load/Unload Setpoints* menu, use the navigational buttons and select **Target Pressure**.

8. Press the *Enter* button. The **Target Pressure** numeric keypad will appear as illustrated by Figure 3-5.

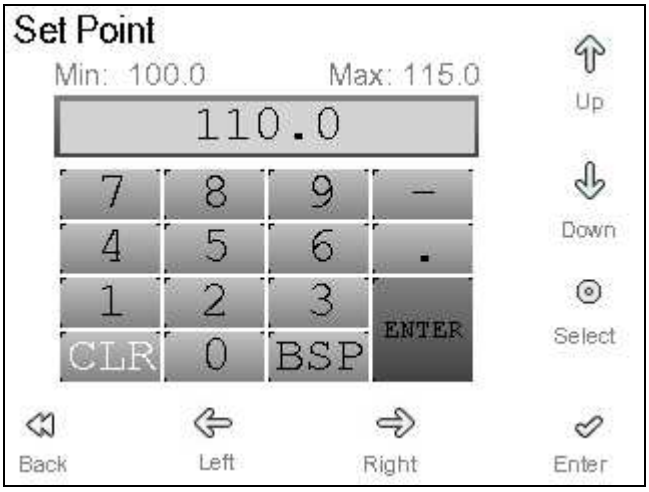


Figure 3-5: Target Pressure Menu

9. Enter the **Target Pressure** to the first decimal by using the navigational buttons to choose the appropriate numeric value as indicated by the white highlight (CLR in Figure 3-5). The *Select* button is used to enter the number or function currently highlighted. When the target pressure has been entered, navigate to and select ENTER when complete, or simply press the *Enter* button to apply the target pressure. If the value entered is within the valid range, the number will turn green in the entry pad to show its acceptance. If the value is not accepted, the number will turn red momentarily and the value displayed on the keypad will revert back to the current setting. If this occurs, check the value entered against the *Min* and *Max* values above the keypad.

   Note: The *Min* and *Max* values displayed on the keypads throughout the system will be dynamically updated to the current limits based on the configuration of the machine.

3.3 Setting Unload Pressure

1. Press the *Back* button to return to the previous screen. The *Load/Unload Setpoints* menu will be displayed.

2. From the *Load/Unload Setpoints* menu, use the navigational buttons and select **Unload Pressure**.

3. Press the *Enter* button. The **Unload Pressure** numeric keypad will appear as illustrated by Figure 3-6.

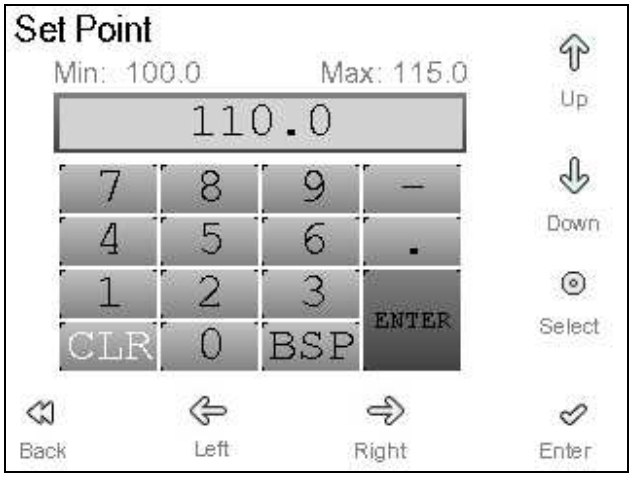


Figure 3-6: Unload Pressure Numeric Key Pad

4. Enter the **Unload Pressure** to the first decimal by using the navigational buttons to choose the appropriate numeric value as indicated by the white highlight (CLR in Figure 3-6). The *Select* button is used to enter the number or function currently highlighted. When the unload pressure has been entered, navigate to and select ENTER when complete, or simply press the *Enter* button to apply the value. If the value entered is within the valid range, the number will turn green in the entry pad to show its acceptance. If the value is not accepted, the number will turn red momentarily and the value displayed on the keypad will revert back to the current setting. If this occurs, check the value entered against the *Min* and *Max* values above the keypad. The **Unload Pressure** will control at which pressure the compressor unload and stops.

3.4 Setting Load Pressure

1. Press the back button to return to the previous screen. The *Load/Unload Setpoints* menu will be displayed.

2. From the *Load/Unload Setpoints,* use the navigational buttons and select **Load Pressure**.

3. Press the **Enter** button. The **Load Pressure** numeric keypad will appear as illustrated by Figure 3-7.

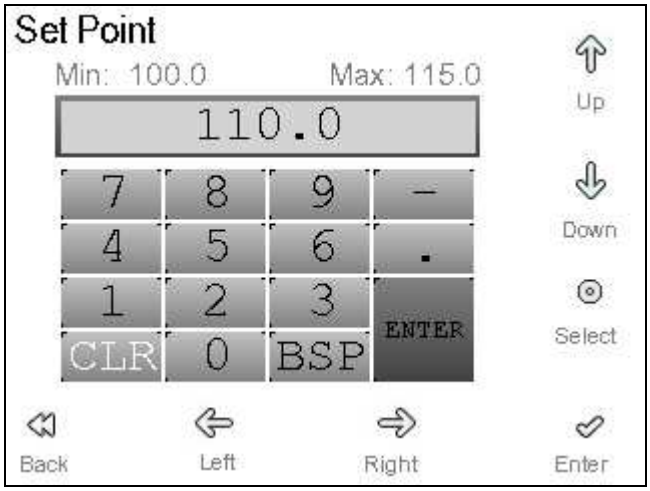


Figure 3-7: Load Pressure Numeric Key Pad

4. Enter the **Load Pressure** to the first decimal by using the navigational buttons to choose the appropriate numeric value as indicated by the white highlight (CLR in Figure 3-6). The *Select* button is used to enter the number or function currently highlighted. When the load pressure has been entered, navigate to and select ENTER when complete, or simply press the *Enter* button to apply the value. If the value entered is within the valid range, the number will turn green in the entry pad to show its acceptance. If the value is not accepted, the number will turn red momentarily and the value displayed on the keypad will revert back to the current setting. If this occurs, check the value entered against the *Min* and *Max* values above the keypad. The **Load Pressure** is the pressure that the compressor will startup again after unloading.

3.5 Setting to Automatic Mode

1. Press the back button to return to the previous screen. The *Load/Unload Setpoints* menu will be displayed.

2. From the *Load/Unload Setpoints* menu, use the navigational buttons and select *Operating Mode*.

3. Press the *Enter* button. The *Operating Mode* menu will appear as illustrated by Figure 3-8.

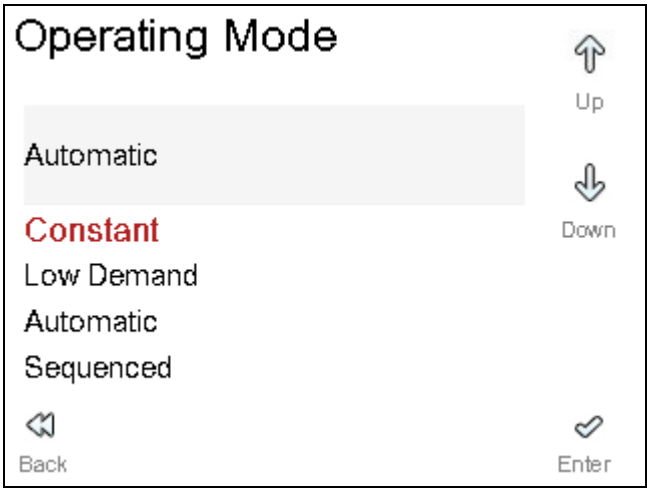


Figure 3-8: Operating Mode Menu

4. Set the Operating Mode to **Automatic** by using the navigational buttons to choose the appropriate setting. Press the *Enter* button to apply **Automatic Mode. Automatic** will now be displayed in the gray area at the top of the screen.

5. Press the *Back* button until the *Home* Screen is reached.

6. Press the RUN button to commence operation of the compressor.

3.6 Menu Structure at a Glance

The following menu structure provides an at-a-glance overview of the functions and their relative location on a menu map. The AirSmart G2 controller features are organized by common functional groupings and unit settings.

Chapter 5 discusses the functions of these items in detail.

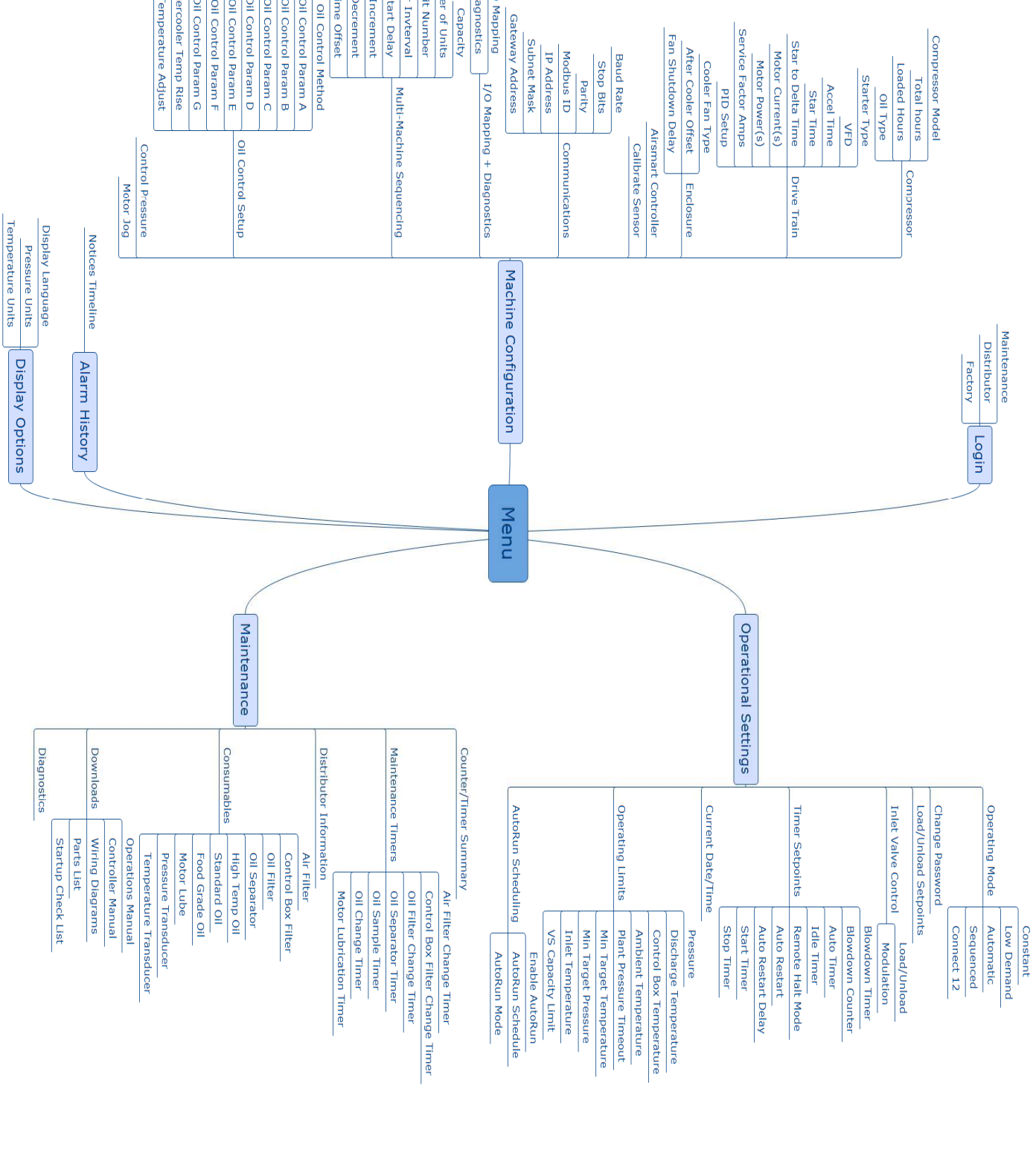


Figure 3-9: Overall Menu Structure

4 Air Compressor Control

The AirSmart G2 Controller has been successfully implemented in a wide variety of compressor types within the Gardener Denver product line from large variable speed, multi-stage, rotary screw compressors to small fixed speed models. Each type of machine requires a certain amount of complexity for control and the AirSmart Controller can employ everything from PID control loops with specialized I/O down to simple binary (on/off) control. The following paragraphs present a brief description of how the AirSmart G2 Controller regulates pressure depending on machine type.

4.1 Variable Speed Compressors

A variable speed compressor employs a Variable Frequency Drive (VFD) to regulate the airflow by speeding up or slowing down the main motor which is directly connected to the airend. The Gardner Denver VS and VST line of compressors are variable speed machines. The **Target Pressure** setting is used to generate a difference value (error value) when compared to the package discharge or **Plant Pressure** signal. The **Target Pressure** setting is compared to the air storage receiver or **System Pressure** signal on units that are being run in Sequence mode of operation. The error value is fed into a PID (Proportional, Integral and Derivative) algorithm in the AirSmart G2 Controller which produces an appropriate command for the VFD to change the speed of the main motor thereby increasing or decreasing the pressure so that the **Plant Pressure** value will match the **Target Pressure** value. In a two-stage, variable speed compressor, a second PID algorithm is used to match the power output from the second stage VFD to that of the first stage VFD. PID control algorithms require tuning in order to function correctly without losing control of the machine. The PID algorithms in the AirSmart G2 Controller were carefully tuned for each compressor model during the product development process and do not require any further adjustment by the end user.

During normal operation, as the demand for air increases, the speed of the compressor will also increase to meet the demand. When the speed of the compressor reaches the set maximum value for the given **Target Pressure** setting, it will not increase any further. As the demand for air decreases, the speed of the compressor will decrease down to the set minimum value for the given **Target Pressure** setting. If the demand for air continues to decrease, the **Plant Pressure** value will increase until it reaches the **Unload Pressure** value programmed into the AirSmart G2 Controller, at this time the compressor will unload and the main motor will stop. The compressor will start again when **Plant Pressure** falls below the **Load Pressure** setting. The minimum and maximum motor speeds are fixed in the controller for each compressor model to ensure that the motor and VFD current limits are not exceeded at any given **Target Pressure** setting.

4.2 Variable Flow Compressors

A variable flow compressor can be defined as a machine which uses a fixed speed motor (with a traditional full voltage or wye-delta starter) but can regulate the air flow by using mechanical devices such as a turn valve to change the size of the compression chamber in the airend or a variable inlet valve to restrict the intake of air. The Gardner Denver Electra-Saver line of compressors are an example of variable flow machines. In the case of a compressor with an inlet valve and a turn valve, two separate PID algorithms are used which control each device based on the package discharge pressure, in other words, the **Plant Pressure** is compared to the **Target Pressure**. So that the two independent algorithms do not attempt to cancel or fight each other, each is used in succession while the compressor is operating in different flow regions. The **Target Pressure** setting is compared to the air storage receiver or **System Pressure** signal on units with the optional communications module that are run in Sequence mode of operation. In a typical Gardner Denver machine, the turn valve is used to control the flow between 100% and typically 40% of full capacity while the inlet valve is used to control the flow at even lower capacity levels. The AirSmart G2 Controller can also be programmed to use only the inlet valve for flow control over the full capacity range of the machine.

At full capacity, the inlet valve is fully open and the turn valve is in the fully closed state. As the air demand decreases, The AirSmart G2 Controller will open the turn valve to decrease the capacity of the airend to match the demand and keep the **Plant Pressure** value at the **Target Pressure** setting. When the turn valve is fully open and as the demand continues to decrease, the AirSmart G2 Controller will begin to close the inlet valve to further decrease the air flow after the **Plant Pressure** has risen to the **Target Pressure** + 3 PSI. The 3 PSI offset helps keep the two PID controllers from interfering with each other. Decreasing the demand for air from this point will cause either the inlet valve to fully close or the pressure to rise to the **Unload Pressure** setting both of which will cause the compressor to unload. If the demand increases the inlet valve will open followed by the closing of the turn valve to meet the new demand. If the demand does not increase, the compressor package will eventually unload and stop. The compressor will start again when the **Plant Pressure** value falls below the **Load Pressure** setting.

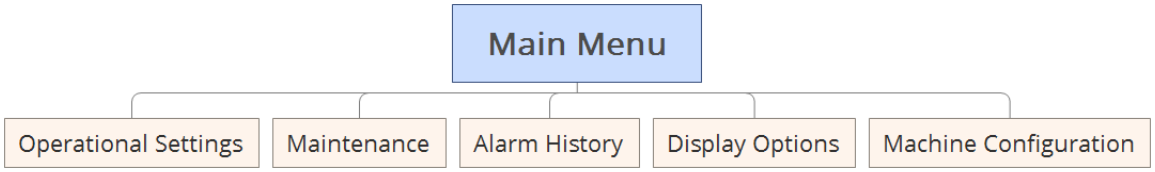
4.3 Fixed Speed Compressors

A fixed speed compressor is the simplest type of machine in the Gardner Denver product line and uses a fixed speed motor along with a binary inlet valve (open or closed) for flow control. In a simple fixed speed compressor, the **Target Pressure** setting in the AirSmart G2 Controller is ignored due to the fact that there is no way to partially restrict the air flow. The controller loads (starts) and unloads (stops) the compressor based only on the **Load Pressure** and **Unload Pressure** settings. The **Load Pressure** and **Unload Pressure** settings are compared to the air storage signal.

5 AirSmart Controller Menus

The AirSmart G2 Controller *Main Menu* is broken down into six areas of control, display, and configuration. These sub-menus are: Operational Settings, Maintenance, Alarm History, Display Options, and Machine Configuration.

The *Main Menu* structure is organized as follows:



The default values for the adjustable parameters are determined by the compressor model configuration stored in the controller's memory. Most of these parameters can then be reconfigured if necessary by accessing the appropriate submenu within the *Main Menu*. Section 5.1 details the functions and parameter settings found within this top level menu.

The AirSmart G2 menus and functions are password protected, and availability is setup through a three tiered accessibility structure: MAINTENANCE, DISTRIBUTOR, and FACTORY. Before the description of each of the screens in the following section, there is an accessibility chart that shows the read/write access of each of the users. Green represents read and write access, yellow represents read only access, and red represents no access. For example, the following accessibility chart:

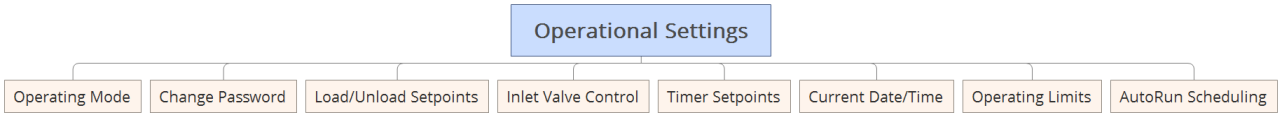
Accessibility	Maintenance	Distributor	Factory

This chart can be interpreted as: Maintenance has no access; Distributor has read only access; and Factory has full read and write access.

5.1 Operational Settings

The *Operational Settings* menu allows the user to: 1) access operating modes, 2) change passwords, 3) view and adjust load and unload setpoints, 4) change inlet valve control, 5) view and adjust timer setpoints, 6) change the current date/time, 7) view and adjust operating limits, and 8) configure the AutoRun schedule function. The *Operational Settings* menu is the primary location for most of the compressor limits and unit settings.

The *Operational Settings* menu structure is organized as follows:



Most of the parameter settings stored in the Controller configuration that are available to be modified through the user interface can be accessed in the *Operational Settings* sub-menu.

To enter the Operational Settings menu:

1. From the *Home* screen, press the *Menu* button.

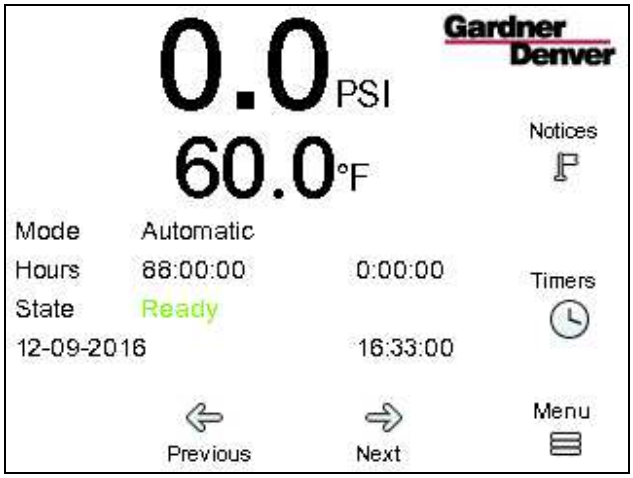


Figure 5-1: Home Screen

2. Log in to the system using the steps below. See section 2.4 for more detail:
    a. Press the *Login* button to load the *Select User* screen. Use the navigational buttons to choose the appropriate user level: **Maintenance**, **Distributor**, or **Factory**.
    b. Press the *Enter* button. The **Enter Passcode** screen will appear.
    c. Enter the correct passcode for the system and navigate back to the *Main Menu*.

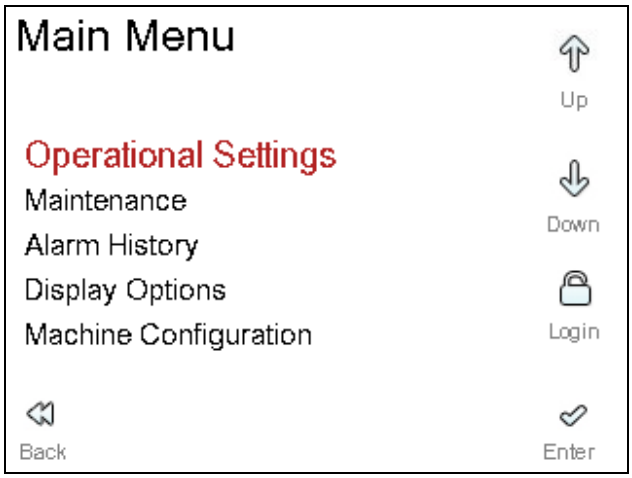


Figure 5-2: Main Menu

3. From the *Main Menu*, use the navigational buttons and select *Operational Settings*.
4. Press the *Enter* button.

5. Operating Mode

Accessibility	Maintenance	Distributor	Factory

The first item in the *Operational Settings* menu is the **Operating Mode**. The controller can be set to one of five operational modes: Automatic, Low Demand, Constant, Sequenced, and Connect 12.

The **Operating Mode** of the compressor sets the running / process of the unit as follows:

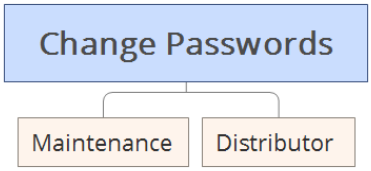
- **Automatic**: (Default mode) the compressor uses its internal modulation algorithms and the motor(s) will stop after it goes through the timed unload / blowdown sequence using the Blowdown and Auto Timers.
- **Low Demand**: The compressor uses its internal modulation algorithms but motor(s) will not stop after it goes through the timed unload / blowdown sequence. The Blowdown Timer is used, however, the Auto Timer is ignored in *Low Demand* mode.
- **Constant**: The compressor uses its internal modulation algorithms but motor(s) will not stop and the compressor will not blowdown after it unloads. The Blowdown and Auto Timers are both ignored in *Constant mode*.
- **Sequenced**: The *sequenced* operation of the compressor is similar to *Automatic* mode but the compressor is part of a sequenced group of machines. Refer to the *AirSmart G2 Sequencing Manual* (13-17-615) for information on operation in *Sequenced* mode.
- **Connect 12**: The *connect 12* operation of the compressor is similar to *Sequenced* mode. Refer to the *AirSmart G2 Sequencing Manual* (13-17-615) for information on operation in *Connect 12* mode. The compressor will be controlled by an external Gardner Denver *Connect 12* system controller.

5.1.1 Change Passwords

Accessibility	Maintenance	Distributor	Factory

The *Change Passwords* menu under the *Operational Settings* menu allows the user to change the password of his/her current accessibility level, and the password of lower level users. For example, the Distributor may change the access code of Distributor or Maintenance, but may not change the Factory Code. Valid passcodes may be up to 12 digits in length. Gardner Denver recommends changing the passcodes if you wish to restrict access to the settings on the machine from individuals who may have access to the default values.

The *Change Passwords* menu structure is organized as follows:



By default:

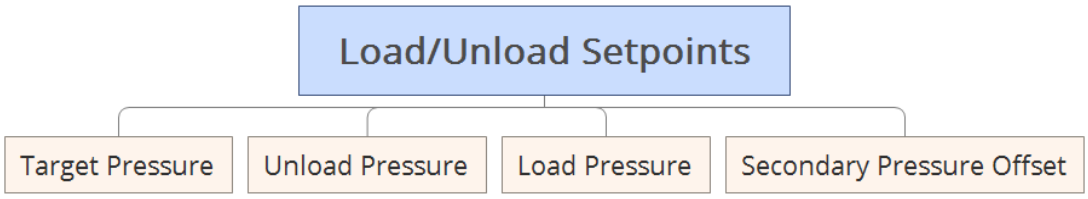
- The **Maintenance** passcode is set to: 407
- Contact Gardner Denver for the default **Distributor** passcode.
- The **Factory** passcode is a dynamic code which changes based on the total hours of the machine. If required, it must be attained from Gardner Denver and may not be modified.

5.1.2 Load/Unload Setpoints

Accessibility	Maintenance	Distributor	Factory

The *Load/Unload Setpoints* menu is the next category under the *Operational Settings* menu. These setpoints establish target and loading pressures for changing the baseline configuration of the unit. This menu gives the user the ability to change the pressure set points and the operating mode while the compressor is running or stopped.

The *Load/Unload Setpoints* menu structure is organized as follows:



5.1.2.1 Target Pressure

Accessibility	Maintenance	Distributor	Factory

The first item in the *Load/Unload Setpoints* menu is the **Target Pressure**. This value is the pressure set point of the compressor.

Min Value: Load Pressure setting
Max Value: Unload Pressure setting - 5 PSI (0.3 bar)
Default Value: Package-dependent

5.1.2.2 Unload Pressure

Accessibility	Maintenance	Distributor	Factory

The next item in the *Load/Unload Setpoints* is the **Unload Pressure**. This pressure value is where the compressor will unload and begin the unload/blowdown sequence.

Min Value: Target Pressure + 5 PSI (0.3 bar)
Max Value: Advisory Pressure Setting - 5 PSI (0.3 bar)
Default Value: Package-dependent

5.1.2.3 Load Pressure

Accessibility	Maintenance	Distributor	Factory

The next item in the *Load/Unload Setpoints* menu is the **Load Pressure**. This pressure value is where the compressor will load again after an unload/blowdown sequence.

Min Value: Min Target Pressure setting
Max Value: Target Pressure
Default Value: Package-dependent

5.1.2.4 Secondary Pressure Offset

Accessibility	Maintenance	Distributor	Factory

The next item in the *Load/Unload Setpoints* menu is the **Secondary Pressure Offset**. This parameter is used to add a positive or negative offset to the Target, Load and Unload Pressure set points when a digital input programmed to the Secondary Pressures function becomes active. The Target, Load and Unload set points are still subject to system limits when the Secondary Pressures feature is used. Secondary Pressures can also be triggered using the AutoRun Scheduling feature when the *AutoRun Mode* is set to secondary pressures.

Min Value: -60 PSI (-4 bar)
Max Value: 80 PSI (5.5 Bar)
Default Value: 0 PSI

5.1.3 Inlet Valve Control

Accessibility	Maintenance	Distributor	Factory

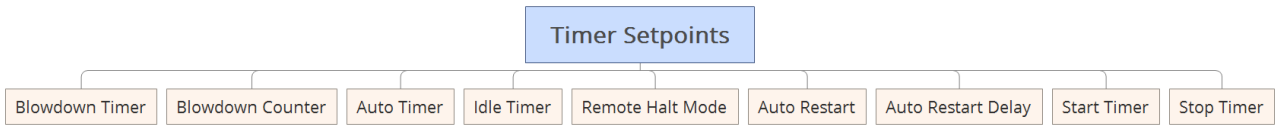
The *Inlet Valve Control* menu is the next menu under the *Operational Settings.* This menu item is only available on machines that have inlet modulation capability. It allows the user to change the control of the inlet valve on the compressor to either Load/Unload or Modulation. When set to load / unload, the inlet valve will open at the load setpoint and close at the unload setpoint, but will not modulate to the target pressure setpoint.

5.1.4 Timer Setpoints

The *Timer Setpoints* menu is the next menu under the *Operational Settings*. This menu addresses settings for the blowdown, auto, idle, start, and stop timers, as well as remote halt behavior, and auto restart settings.

Accessibility	Maintenance	Distributor	Factory

The *Timer Setpoints* menu structure is organized as follows:



5.1.4.1 Blowdown Timer

Accessibility	Maintenance	Distributor	Factory

The first item under the *Timer Setpoints* menu is the **Blowdown Timer**. The **Blowdown Timer** is used to control the amount of time the compressor will run unloaded before starting the timed blowdown process. The **Blowdown Timer** is reset to the programmed value when the compressor is in the Loaded state.

Note: The **Blowdown Timer** is used primarily in fixed speed compressor operations.

Min Value: 1 second
Max Value: 1200 seconds
Default Value: 600 seconds (fixed speed units with blowdown valve)

5.1.4.2 Blowdown Counter

Accessibility	Maintenance	Distributor	Factory

The next item in the *Timer Setpoints* menu is the **Blowdown Counter**, which is used to control the number of complete unload/blowdown cycles the compressor will execute. When the **Blowdown Counter** reaches zero, the compressor will skip the unload state and go directly to the blowdown state. The **Blowdown Counter** is reset to the programmed value if the compressor returns to the loaded state from either the unload or blowdown states.

Note: The **Blowdown Counter** is used primarily in fixed speed compressor operations.

5.1.4.3 Auto Timer

Accessibility	Maintenance	Distributor	Factory

The **Auto Timer** under the *Timer Setpoints* Menu is used to control the amount of time the compressor will run during the blowdown process.

Min Value: 0 seconds
Max Value: 1800 seconds
Default Value: 600 seconds (fixed speed units)

5.1.4.4 Idle Timer

Accessibility	Maintenance	Distributor	Factory

The next item in the *Timer Setpoints* menu is the **Idle Timer,** which is used to control the blow down of the air/oil reservoir during long periods of compressor inactivity. If the **Idle Timer** is set to zero, this feature is disabled.

Min Value: 0 seconds (feature is disabled when set to 0)
Max Value: 7200 seconds
Default Value: 10 seconds (fixed speed units)

5.1.4.5 Remote Halt Mode

Accessibility	Maintenance	Distributor	Factory

The **Remote Halt Mode** function is the next menu item, which controls how the compressor will stop if a Remote Halt signal is detected on one of the controller's digital inputs programmed for this function. Refer to the appropriate compressor electrical wiring diagram for connection of an external Remote Halt signal.

- **Timed Unload:** The compressor will stop after the Blowdown and Auto Timers have expired.
- **Immediate:** The compressor will unload and stop immediately just as if the Blowdown and Auto Timers were set to zero.

5.1.4.6 Auto Restart

Accessibility	Maintenance	Distributor	Factory

The next item in the *Timer Setpoints* menu is the **Auto Restart** function. If **Auto Restart** is enabled, the compressor will resume operation in the mode it was in prior to the power interruption when power is restored. The default value for **Auto Restart** is disabled.

Automatic restarting of the compressor can cause injury or death

5.1.4.7 Auto Restart Delay

Accessibility	Maintenance	Distributor	Factory

The next item in the *Timer Setpoints* menu is the **Auto Restart Delay** value, which controls how long the compressor will wait to start after power has been restored. This parameter is only available if the **Auto Restart** feature is enabled.

Min Value: 5 seconds
Max Value: 300 seconds
Default Value: 10 seconds

5.1.4.8 Start Timer

Accessibility	Maintenance	Distributor	Factory

The following item in the *Timer Setpoints* menu is the **Start Timer**. The **Start Timer** is used to extend how long the compressor will run in the pause state before it is allowed to start modulating.

Min Value: 0 seconds
Max Value: 600 seconds
Default Value: 0 seconds

5.1.4.9 Stop Timer

Accessibility	Maintenance	Distributor	Factory

The **Stop Timer** is the next item in the *Timer Setpoints* menu. When the STOP button is pressed or a remote stop is activated, the compressor will blow down and the motor(s) will continue to run until this timer expires.

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

5.1.5 Current Date/Time

Accessibility	Maintenance	Distributor	Factory

The **Current Date/Time** category under the *Operational Settings* menu allows the user to change the Date and Time settings, which are kept by the battery-backed real time clock on the AirSmart G2 Controller. This clock is used for timestamps on logging data such as notices and trend data, as well as for AutoRun scheduling. The current date and time is displayed on the home screen and should be adjusted if not correct.

The date and time format reads as follows:

hh:mm:ss
MM-DD-YYYY

Where:
MM = Month
DD = Day of Month
YYYY =Four-digit Year)
hh = Hour (using 24 hour clock)
mm = Minute

To set the current date and time:

1. Select the *Current Date/Time* option under the *Operational Settings* screen. Then select *Edit Time* or *Edit Date.* This will trigger a numeric keypad set to enter a value in date or time format.

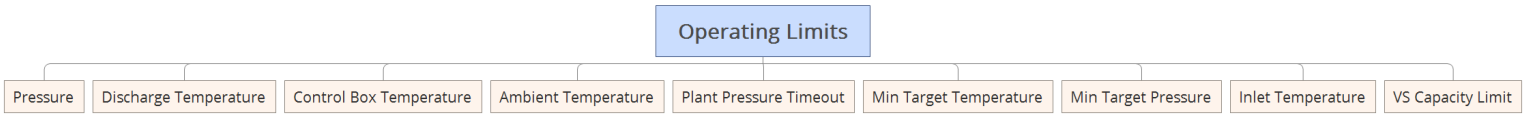
2. Select *CLR* to clear the current value, and begin entering the desired setting in the format *MMDDYY* for date and *hhmmss* for time without punctuation. For example, 1-19-2014 would be entered as 011914 and 15:11:00 would be entered as 151100.

3. Press *Enter* to commit the value and return to the *Current Date/Time* screen and verify that the date and time are accurate.

5.1.6 Operating Limits

The *Operating Limits* menu allows the user to set Advisory and Shutdown conditions when specified pressure and temperature thresholds are met. There are nine categories that can be set that include plant pressure, discharge temperature, control box temperature, ambient temperature, plant pressure timeout, min target temperature, min target pressure, inlet temperature, and VS capacity limit.

The *Operating Limits* menu structure is organized as follows:



5.1.6.1 Pressure

Accessibility	Maintenance	Distributor	Factory

The **Pressure** option under the *Operating Limits* menu allows the user to set an advisory and shut down condition for the discharge pressure of the compressor. The maximum pressure that any compressor can achieve is set in the configuration file. If the user attempts to program a value greater than this number, the entry will be rejected and the proposed value will turn red on the numeric entry pad. The minimum and maximum value that it can be set at is also shown above the keypad when a limit option is selected.

5.1.6.2 Discharge Temperature

Accessibility	Maintenance	Distributor	Factory

The **Discharge Temperature** option under the *Operating Limits* menu allows the user to set an advisory and shut down condition for the discharge temperature of the compressor. The maximum discharge temperature that any compressor can achieve is set in the configuration file. If the user attempts to program a value greater than this number, the entry will be rejected and the proposed value will turn red on the numeric entry pad. The minimum and maximum value that it can be set at is also shown above the keypad when a limit option is selected.

5.1.6.3 Control Box Temperature

Accessibility	Maintenance	Distributor	Factory

The **Control Box Temperature** option under the *Operating Limits* menu allows the user to set an advisory and shut down condition for the control box temperature of the compressor. The maximum control box temperature that any compressor control box can achieve is set in the configuration file. If the user attempts to program a value greater than this number, the entry will be rejected and the proposed value will turn red on the numeric entry pad. The minimum and maximum value that it can be set at is also shown above the keypad when a limit option is selected.

5.1.6.4 Ambient Temperature

Accessibility	Maintenance	Distributor	Factory

The **Ambient Temperature** option under the *Operating Limits* menu allows the user to set an upper and lower limits for the advisory and shut down ambient temperatures of the compressor. The maximum and minimum ambient temperature that any compressor can achieve is set in the configuration file. If the user attempts to program a value less than or greater than these numbers, the entry will be rejected and the proposed value will turn red on the numeric entry pad. The minimum and maximum value that it can be set at is also shown above the keypad when a limit option is selected.

5.1.6.5 Plant Pressure Timeout

Accessibility	Maintenance	Distributor	Factory

The next item in the *Operating Limits* menu is the **Plant Pressure Timeout** setting, which controls the length of time the plant delivery pressure value may remain under the **Target Pressure** setting before generating an advisory.

Note: Setting this parameter to zero will disable the Plant Pressure Advisory.

Min Value: 0 seconds
Max Value: 600 seconds
Default Value: 180 seconds

5.1.6.6 Minimum Target Temperature

Accessibility	Maintenance	Distributor	Factory

The **Minimum Target Temperature** setting under the *Operational Limits* menu establishes the lower temperature limit of the oil temperature control system on compressor packages with a Precision Mixing Valve installed.

Note: This parameter has no effect on packages that do not utilize a Precision Oil Mixing Valve.

5.1.6.1 Minimum Target Pressure

Accessibility	Maintenance	Distributor	Factory

The **Minimum Target Pressure** setting under the *Operational Limits* menu sets the lowest value that the controller will allow the **Target Pressure** to be set to.

5.1.6.2 Inlet Temperature

Accessibility	Maintenance	Distributor	Factory

The **Inlet Temperature** setting is the next item under the *Operational Limits* menu. The **Inlet Temperature** setting is used when there is an inlet temperature sensor on the package. When the inlet temperature exceeds the set point of the inlet temperature limit, it will engage the inlet temperature speed limiter.

5.1.6.3 VS Capacity Limit

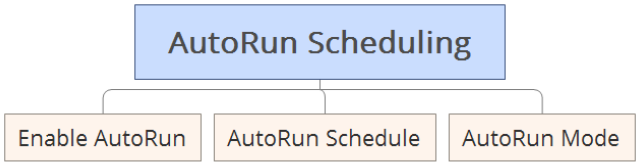
Accessibility	Maintenance	Distributor	Factory

The **VS Capacity Limit** setting under the *Operational Limits* menu sets the percentage that the controller will allow a variable speed machine to run at. For example, if the VS capacity limit is set at 90%, then the compressor will allow the VFD to run up to 90% of full speed.

5.1.7 AutoRun Scheduling

The **AutoRun Scheduling** feature allows the user to manage the compressors run cycle via a predefined schedule. The compressor may be started and stopped based on the time settings, or a secondary pressure offset may be applied during the specified time period. The **AutoRun Scheduling** can be accessed through the *Operational Settings* menu.

The **AutoRun Scheduling** menu structure is organized as follows:



5.1.7.1 Enable AutoRun

Accessibility	Maintenance	Distributor	Factory

The *Enable AutoRun* menu allows the user to enable or disable the **AutoRun** functionality. When **AutoRun** is enabled, each timer in the **AutoRun Schedule** will be evaluated, and the operation of the compressor will be controlled based on these timers.

5.1.7.2 AutoRun Schedule

Accessibility	Maintenance	Distributor	Factory

The **AutoRun Schedule** menu allows access to the configuration for the system's seven available timers. After selecting a timer, the start and stop time as well as mode can be adjusted as shown in Figure 5-3.

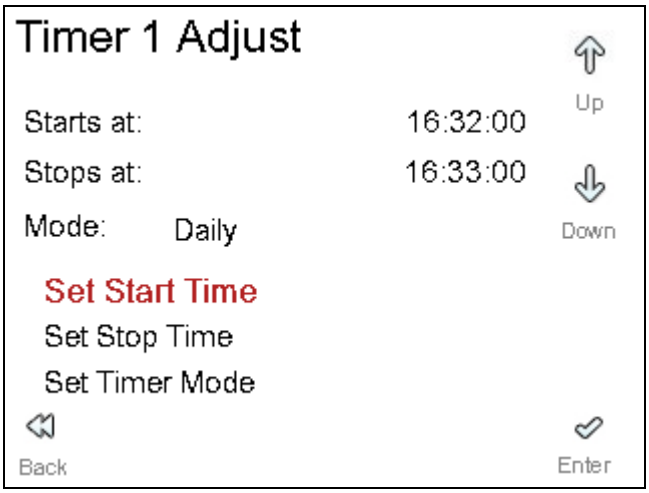


Figure 5-3: Timer Adjust Screen

The available modes for each timer are: Daily, Monday - Friday, or Saturday - Sunday.

5.1.7.3 AutoRun Mode

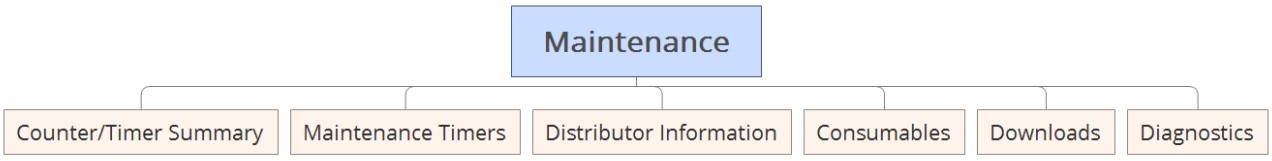
Accessibility	Maintenance	Distributor	Factory

The **AutoRun Mode** menu allows the user to configure the behavior of the AutoRun mode, which can be set to Start/Stop mode or Secondary Pressure mode. When Start/Stop mode is selected, the compressor will be started and stopped based on the **AutoRun Schedule** once the user has enabled the compressor using the RUN button. If Secondary Pressures is selected, the **Secondary Pressure Offset** setting will be applied according to the **AutoRun Schedule**, as long as the compressor is running.

5.2 Maintenance

The *Maintenance* menu allows the user to change the timer settings related to oil, oil filter, and air filters, as well as access the distributor contact information and document numbers pertaining to the unit. Diagnostics screens are also provided for access to machine sensor readings and setpoints.

The *Maintenance* menu structure is organized as follows:



To enter the Maintenance menu:

1. From the *Home* screen, press the *Menu* button.
2. From the *Main Menu,* use the navigational buttons and select *Maintenance*.
3. Press the *Enter* button.

5.2.1 Counter/Timer Summary

Accessibility	Maintenance	Distributor	Factory

The first item in the *Maintenance* menu is the **Counter/Timer Summary**. This summary consists of a bar chart that illustrates the seven system variables which are displayed on two timer summary screens. These are the same screens that are accessible from the *Timers* link on the *Home* screen and are described in detail in section 2.3.4. Figure 5-4 illustrates the first screen in the set.

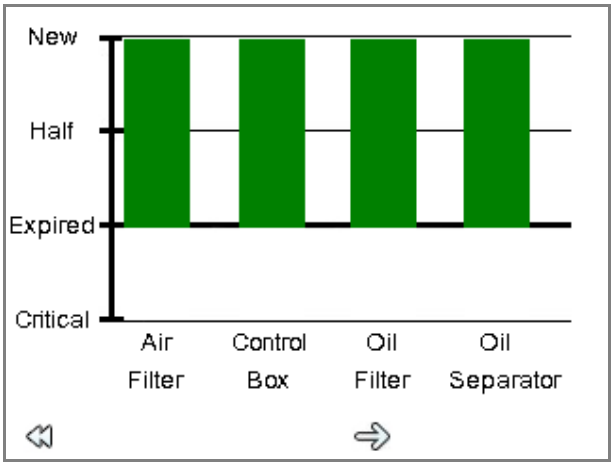
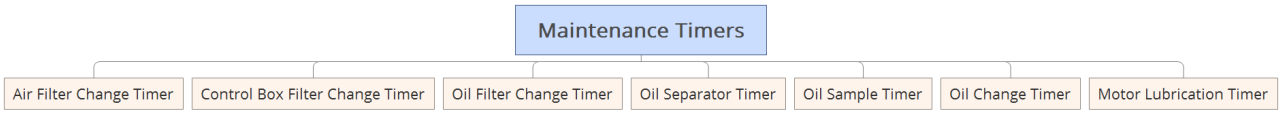


Figure 5-4: Counter / Timer Summary Screen

5.2.2 Maintenance Timers

The next item in the *Maintenance* menu is the **Maintenance Timers**. The timer settings which can be adjusted in the controller can be found in this menu.

The **Maintenance Timers** menu structure is organized as follows:



Under each sub-menu, the timer interval is displayed as well as the number of hours remaining on the timer since the last maintenance was performed. The distributor and factory level users may modify the default interval for each timer, while the maintenance level user may reset the timer after performing required maintenance.

5.2.2.1 Air Filter Change Timer

Accessibility	Maintenance	Distributor	Factory

The first item in the *Maintenance Timers* menu is the **Air Filter Change Timer**. This value sets the default air filter change countdown interval. Setting this parameter to zero will disable the timer and its associated alarms.

An image of the *Air Filter Change Timer* screen is shown in Figure 5-5.

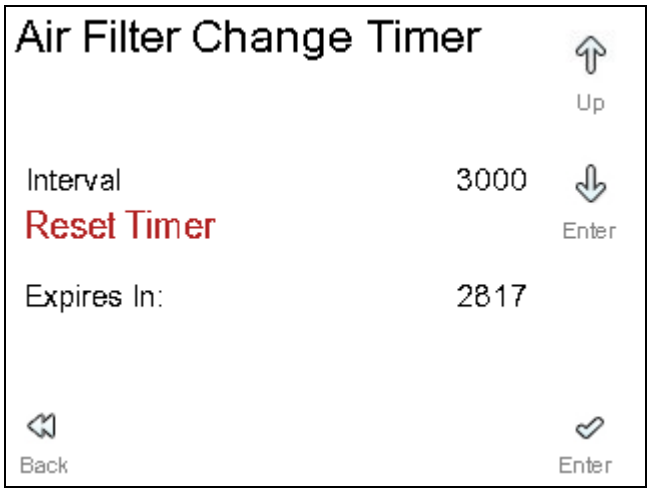


Figure 5-5: Air Filter Change Timer Screen

Pressing *Enter* on *Reset Timer* on this screen will reset the timer to expire in the full interval. Then the screen in Figure 5-6 will appear indicating that the timer has been reset and showing the number of hours on the machine at the time of reset.

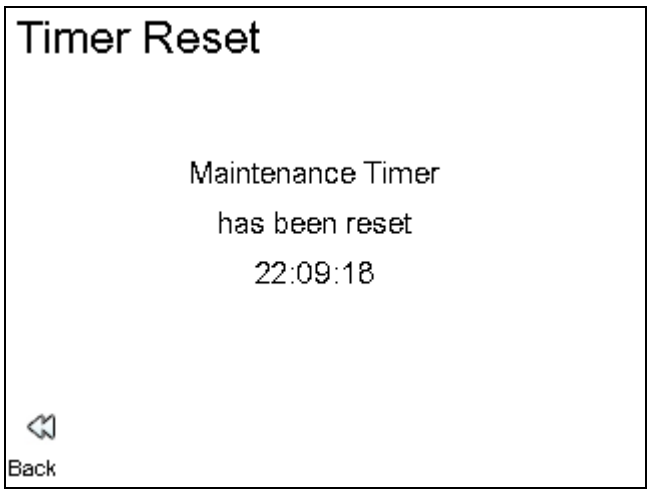


Figure 5-6: Timer Reset Confirmation Screen

5.2.2.2 Control Box Filter Change Timer

Accessibility	Maintenance	Distributor	Factory

The next item in the *Maintenance Timers* menu is the **Control Box Filter Change Timer**. This value sets the default control box filter change countdown timer. Setting this parameter to zero will disable the timer and its associated alarms.

The **Control Box Filter Change Timer** may be reset according to the same procedure described in section 5.2.2.1 for the **Air Filter Change Timer**.

5.2.2.3 Oil Filter Change Timer

Accessibility	Maintenance	Distributor	Factory

The next item in the *Maintenance Timers* menu is the **Oil Filter Change Timer.** This value sets the default oil filter change countdown timer value. Setting this parameter to zero will disable the timer and its associated alarms.

The **Oil Filter Change Timer** may be reset according to the same procedure described in section 5.2.2.1 for the **Air Filter Change Timer**.

5.2.2.1 Oil Separator Element Timer

Accessibility	Maintenance	Distributor	Factory

The next item in the *Maintenance Timers* menu is the **Oil Separator Element Timer**. This value sets the number of hours before the next oil separator element change is needed. Setting this parameter to zero will disable the timer and its associated alarms.

The **Oil Separator Element Timer** may be reset according to the same procedure described in section 5.2.2.1 for the **Air Filter Change Timer**.

5.2.2.1 Oil Sample Timer

Accessibility	Maintenance	Distributor	Factory

The next item in the *Maintenance Timers* menu is the **Oil Sample Timer**. This value sets the default oil sample countdown timer value. Setting this parameter to zero will disable the timer and its associated alarms.

The **Oil Sample Timer** may be reset according to the same procedure described in section 5.2.2.1 for the **Air Filter Change Timer**.

5.2.2.2 Oil Change Timer

Accessibility	Maintenance	Distributor	Factory

The next item in the *Maintenance Timers* menu is the **Oil Change Timer**. This value sets the default oil change countdown timer value. Setting this parameter to zero will disable the timer and its associated alarms.

The **Oil Change Timer** may be reset according to the same procedure described in section 5.2.2.1 for the **Air Filter Change Timer**.

5.2.2.3 Motor Lubrication Timer

Accessibility	Maintenance	Distributor	Factory

The next item in the *Maintenance Timers* menu is the **Motor Lubrication Timer**. This value sets the default motor lubrication countdown timer. Setting this parameter to zero will disable the timer and its associated alarms.

The **Motor Lubrication Timer** may be reset according to the same procedure described in section 5.2.2.1 for the **Air Filter Change Timer**.

5.2.3 Distributor Information

Accessibility	Maintenance	Distributor	Factory

The next item in the *Maintenance* menu is the **Distributor Information** screen. This pre-programmed screen displays the distributor name and contact information for end-user access. An example is below.

Figure 5-7: Distributor Information Screen

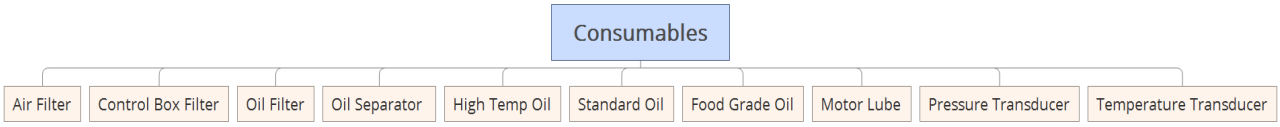
The information may be updated by the **Distributor** or **Factory**, but not the end user (**Maintenance**).

5.2.4 Consumables

Accessibility	Maintenance	Distributor	Factory

The **Consumables** screen is the next item under the *Maintenance* menu. This screen provides an easy reference to the Gardner Denver part numbers for consumable items specific to the package, such as filters, oil, and transducers. These entries may be modified as required by **Distributor** and **Factory** level users.

The **Consumables** menu structure is organized as follows:



5.2.5 Downloads

Accessibility	Maintenance	Distributor	Factory

The **Downloads** screen is the next item under the *Maintenance* menu. This submenu provides Gardner Denver document numbers for the reference documentation corresponding to the package.

The downloadable documents that may be available include the operations manual, controller manual, wiring diagrams, parts lists, and the startup checklist.

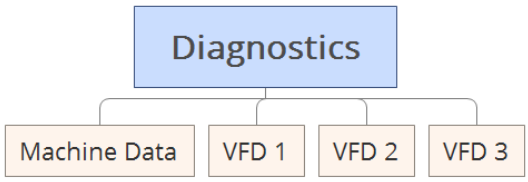
Note: Downloadable content is machine specific and may differ based on order request.

5.2.6 Diagnostics

Accessibility	Maintenance	Distributor	Factory

The next item under the *Maintenance* menu is the **Diagnostics** screen. Under the **Diagnostics** screen is *Machine Data*, *VFD 1*, *VFD 2*, and *VFD 3*.

The **Diagnostics** menu structure is organized as follows:



Selecting *Machine Data* will yield three pages. The first page shows compressor temperature readings, such as high temp fault, high temp alarm, discharge temp, inlet temp, oil temp, etc. The second page shows compressor pressure readings, such as high pressure fault, high pressure alarm, unload pressure, load pressure, etc. The third page shows plant delivery pressure, reservoir pressure, differential pressure, and separator pressure.

An example of the first page is shown in Figure 5-8 below.

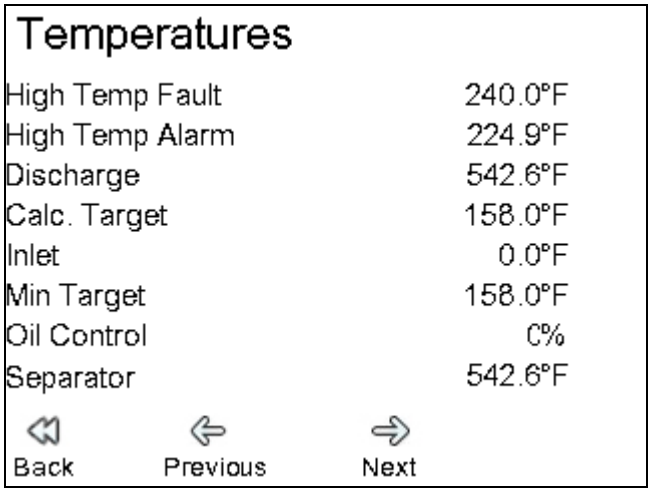


Figure 5-8: Temperatures Screen

Selecting *VFD 1, VFD 2,* or *VFD 3* will yield three pages that display drivetrain data of the compressor. The first page shows the min and max frequencies of the drivetrain, motor frequency, motor speed, etc. The second page shows the voltage, current, power, etc. of the motor. The third page shows other various information of the compressor motor. All three of the different VFD selections show similar information on the three separate pages of drivetrain data.

An example of the first page for *VFD 1* is shown below in Figure 5-9.

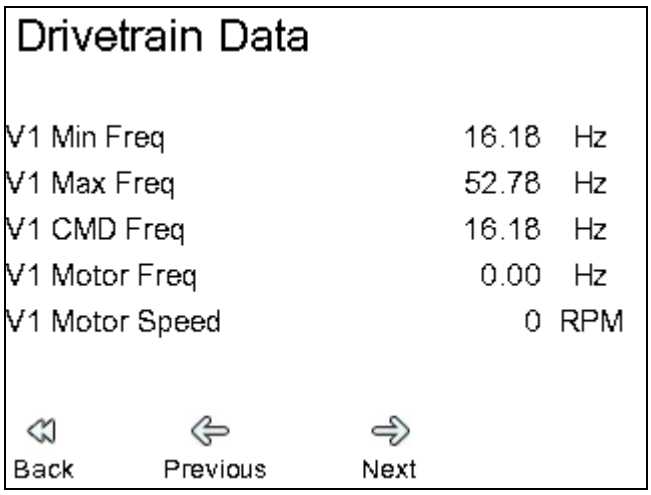
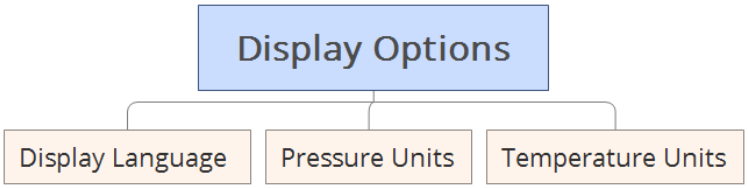


Figure 5-9: Drivetrain Data Screen

5.3 Display Options

The *Display Options* menu allows the user to review options related to the display of the controller.

The *Display Options* menu structure is organized as follows:



To enter the Display Options menu:

1. From the *Home* screen, press the *Menu* button.
2. From the *Main Menu,* use the navigational buttons and select *Display Options*.
3. Press the *Enter* button.

5.3.1 Display Language

Accessibility	Maintenance	Distributor	Factory

The first item in the *Display Options* menu is **Display Language.** This menu allows the user to set the controller to the desired language. This change will take place immediately after the desired language is selected.

5.3.2 Pressure Units

Accessibility	Maintenance	Distributor	Factory

The next item in the *Display Options* menu is the **Pressure Units**, which will determine how all pressure values will be displayed on the controller. Pressure can be displayed in pounds per square inch (PSI), Bar (BAR), kilopascals (KPA), kilo pounds per square centimeter (kp/cm2), inches of mercury (in. Hg), millimeters of mercury (mm Hg), inches of water (in. H2O), or millimeters of water (mm H2O).

5.3.3 Temperature Units

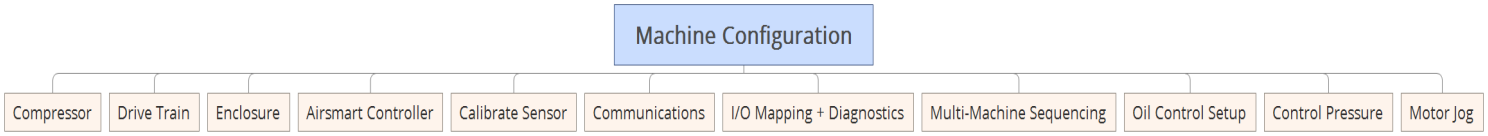
Accessibility	Maintenance	Distributor	Factory

The next item in the *Display Options* 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).

5.4 Machine Configuration

The *Machine Configuration* menu allows the user review and configure details about the compressor related to model, hours run, motor power and other similar functions.

The *Machine Configuration* menu structure is organized as follows:



To enter the *Machine Configuration* menu:

1. From the *Home* screen, press the *Menu* button.
2. From the *Main Menu*, use the navigational buttons and select *Machine Configuration*.
3. Press the *Enter* button.

5.4.1 Compressor

The *Compressor* menu provides data related to the compressor model and hours of usage. The screens available for this submenu are detailed below.

5.4.1.1 Compressor Model

Accessibility	Maintenance	Distributor	Factory

Compressor Model informs user of the compressor model number derived from the configuration file.

5.4.1.2 Total Hours

Accessibility	Maintenance	Distributor	Factory

The next item under the *Compressor Menu* is the **total number of hours** the compressor has been in operation. It begins counting upon initial machine startup at the factory and increments whenever the main motor is being driven.

5.4.1.3 Loaded Hours

Accessibility	Maintenance	Distributor	Factory

Loaded hours are the number of hours the compressor has been loaded. It begins counting upon initial machine operation and increments when the compressor is producing air.

5.4.1.4 Oil Type

Accessibility	Maintenance	Distributor	Factory

The next item in the *Compressor Menu* selects the **Oil Type**. The **Oil Type** setting determines how fast the **Oil Change Timer** will count down as the compressor discharge temperature rises as shown in the table below. The **Oil Type** selections are as follows.

Default Value: Compressor model dependent

- ***Standard***: Oil Change Timer counts down normally at high temperature. Use with AEON 9000SP or similar lubricant.
- ***High Temp***: Oil Change Timer counts down more slowly at high temperature. Use with AEON 9000TH or similar lubricant.
- ***Food Grade***: Oil Change Timer counts down at same rate as Standard Oil. Use with AEON 6000FG or similar lubricant.

Table 5-1: Oil Change Multipliers

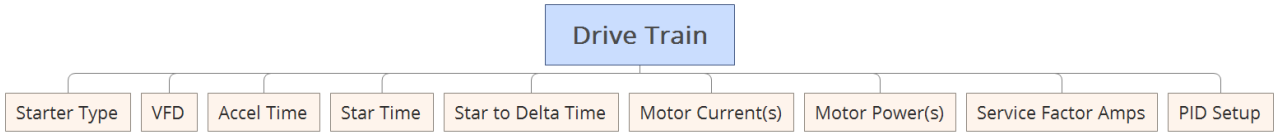
Oil Aging Clock Multiplier	Standard/Food Grade Oil Temperature Break Points	High Temp Oil Temperature Break Points
X 1	< 180°F (82°C)	< 210°F (99°C)
X 1.3	180°F - 189°F (82°C - 87°C)	210°F - 219°F (99°C - 104°C)
X 2	190°F - 198°F (88°C - 92°C)	220°F - 228°F (104°C - 109°C)
X 4	199°F - 216°F (93°C - 102°C)	> 229°F (109°C)
X 8	217°F - 234°F (103°C - 112°C)	
X 16	> 234°F (112°C)	

5.4.2 Drive Train

The *Drive Train* menu gives the user access to the configuration of the motor drive configuration on the system. This includes the starter type and timings as well as motor currents and related information.

Note: Motor information such as voltage, currents, power, and service factor amps are not utilized and should be ignored for fixed speed machines which do not include a current transducer.

The *Drive Train* menu structure is organized as follows:



5.4.2.1 Starter Type

Accessibility:	Maintenance	Distributor	Factory

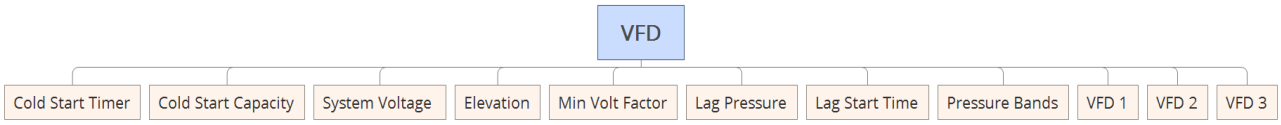
The **Starter Type** menu displays what starter unit variation is implemented in the current machine. The starter type will be one of full voltage, wye delta, or none.

5.4.2.2 VFD

Accessibility	Maintenance	Distributor	Factory

The next item in the *Drive Train* menu is the **VFD** menu. The **VFD** menu allows the user to configure the settings for the VFDs in variable speed compressor packages.

The **VFD** menu structure is organized as follows:



5.4.2.2.1 Cold Start Timer

Accessibility	Maintenance	Distributor	Factory

The first item in the **VFD** menu is the ***Cold Start Timer***. The ***Cold Start Timer*** parameter sets the time the compressor will run at a specified capacity when the inlet temp of the compressor reads a value that is less than 50 degrees Fahrenheit.

5.4.2.2.2 Cold Start Capacity

Accessibility	Maintenance	Distributor	Factory

The next item in the **VFD** menu is the ***Cold Start Capacity***. The ***Cold Start Capacity*** parameter sets the capacity limit the compressor will run at for a specified time when the inlet temp of the compressor reads a value that is less than 50 degrees Fahrenheit. For example, when the compressors inlet temp reads a value less than 50 degrees Fahrenheit and the ***cold start capacity*** is set at 90%, the compressor will run at 90% of full speed for the duration of the ***cold start timer***.

5.4.2.2.3 System Voltage

Accessibility	Maintenance	Distributor	Factory

The next item in the **VFD** menu is the ***System Voltage***. The ***System Voltage*** parameter sets the voltage of the VFD. This voltage will depend on the system configuration of the machine.

5.4.2.2.4 Elevation

Accessibility	Maintenance	Distributor	Factory

The next item in the **VFD** menu is ***Elevation***. ***Elevation*** should be set equal to the elevation above sea level at the compressor site. This parameter is used to de-rate the compressor drive system at higher elevations where heat dissipation is less effective. There is no de-rating performed at elevations below 3300 feet (1000 m).

5.4.2.2.5 Min Volt Factor

Accessibility	Maintenance	Distributor	Factory

The next item in the **VFD** menu is the ***Min Volt Factor***. The ***Voltage Factor*** is a calculation of the DC bus voltage relative to the rated system voltage. If the drive is overloaded or the line voltage is below the threshold the voltage factor will fall below the minimum volt factor setting. This will engage the voltage factor limiter to reduce system load. This should be set to the default value of 87%.

5.4.2.2.6 Lag Pressure

Accessibility	Maintenance	Distributor	Factory

The next item in the **VFD** menu is the ***Lag Pressure***. The ***Lag Pressure*** is the maximum interstage pressure at which the first stage motor will be allowed to start in a two-stage compressor.

5.4.2.2.7 Lag Start Time

Accessibility	Maintenance	Distributor	Factory

The next item in the **VFD** menu is the ***Lag Start Time***. The ***Lag Start Time*** is the minimum time that the second stage motor will be run before starting the first stage motor in a two-stage compressor.

5.4.2.2.8 Pressure Bands

Accessibility	Maintenance	Distributor	Factory

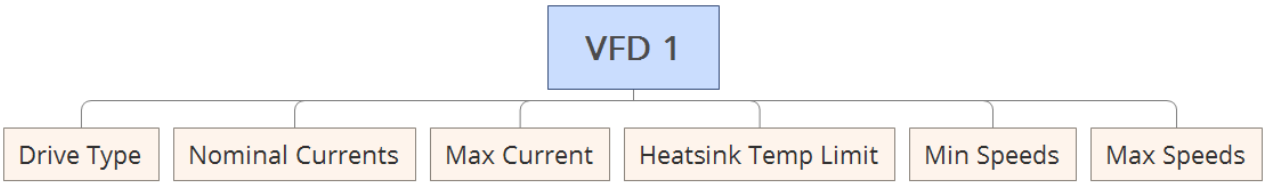
The next item in the **VFD** menu is ***Pressure Bands***. The ***Pressure Bands*** submenu allows the user to set the pressures P1 ¯ P5 on the VFD. These pressures settings are then used to define the min and max speeds of VFD 1 and VFD 2.

5.4.2.2.9 VFD 1

Accessibility	Maintenance	Distributor	Factory

The next item in the **VFD** menu is the ***VFD 1*** menu. The ***VFD 1*** menu allows the user to configure the settings of VFD 1.

The ***VFD 1*** menu structure is organized as follows:



5.4.2.2.9.1 Drive Type

Accessibility	Maintenance	Distributor	Factory

The first item in the ***VFD 1*** menu is **Drive Type**. The **Drive Type** allows the user to define the type of variable frequency drive that is in the compressor. The user may select one of the following, depending on the type of VFD that is in the machine: none, AB PF400, AB PF70, and AB PF700.

5.4.2.2.9.2 Nominal Current

Accessibility	Maintenance	Distributor	Factory

The next item in the ***VFD 1*** menu is **Nominal Current**. The **Nominal Current** setting allows the user to define the nominal current of the motor in the compressor.

5.4.2.2.9.3 Max Current

Accessibility	Maintenance	Distributor	Factory

The next item in the ***VFD*** 1 menu is **Max Current**. The **Max Current** parameter sets the maximum allowable current that the drive can achieve.

5.4.2.2.9.4 Heatsink Temp Limit

Accessibility	Maintenance	Distributor	Factory

The next item in the ***VFD 1*** menu is the **Heatsink Temp Limit**. The **Heatsink Temp Limit** is the temperature limit that the controller will allow the heatsink to achieve in the VFD.

5.4.2.2.9.5 Min & Max Speeds

Accessibility	Maintenance	Distributor	Factory

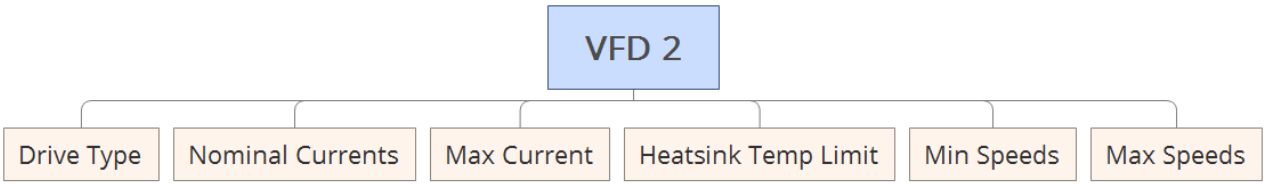
The last two items in the ***VFD 1*** menu is the **Min Speeds** and **Max Speeds**. The **Min** and **Max Speeds** relate to the preset pressures that are set in the **Pressure Bands** section previously. The minimum and maximum speed can be set for pressures P1 ¯ P5. The controller reads the pressure values and corresponding min and max speeds and then interpolates to find the speed limit that the VFD will run at for the predefined pressures and speeds set in the controller.

5.4.2.2.10 VFD 2

Accessibility	Maintenance	Distributor	Factory

The next item in the **VFD** menu is the ***VFD 2*** menu. The ***VFD 2*** menu allows the user to configure the settings of VFD 2. Refer to the previous section, ***VFD 1***, for details on how to configure the ***VFD 2*** settings.

The ***VFD 2*** menu structure is organized as follows:

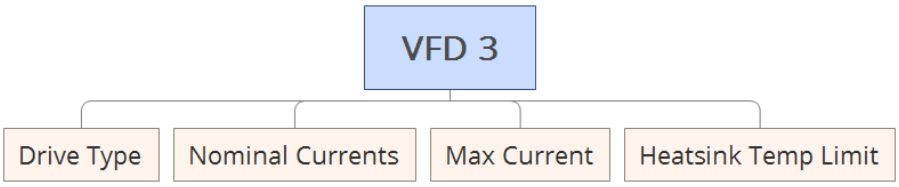


5.4.2.2.11 VFD 3

Accessibility	Maintenance	Distributor	Factory

The next item in the **VFD** menu is the ***VFD 3*** menu. The ***VFD 3*** menu allows the user to configure the settings of VFD 3. Refer to the ***VFD 1*** section above for details on how to configure the ***VFD 3*** settings. The ***VFD 3*** settings are the same as ***VFD 1*** and ***VFD 2*** but do not include the min and max speeds.

The ***VFD 3*** menu structure is organized as follows:



5.4.2.3 Accel Time

Accessibility	Maintenance	Distributor	Factory

The next item in the *Drive Train* menu is the **Accel Time**. The **Accel Time** setting sets a reference to the expected acceleration time of the motor.

5.4.2.4 Star Time

Accessibility	Maintenance	Distributor	Factory

The next item in the *Drive Train* menu is the current value of the **Star Time**. The **Star Time** is used to control the amount of time, in seconds, that the motor will run in the wye configuration for a wye-delta starter.

5.4.2.5 Star to Delta Time

Accessibility	Maintenance	Distributor	Factory

The **Star to Delta Time** setting controls dwell time between wye and delta connections. Do not change this setting without direct instruction from Gardner Denver Engineering.

5.4.2.6 Motor Current(s)

Accessibility	Maintenance	Distributor	Factory

The next item in the *Drive Train* menu is the **Motor Current** consumption value of each individual motor in the system.

Note: This information is not populated and should be ignored on systems that do not include a current transducer.

5.4.2.7 Motor Power(s)

Accessibility	Maintenance	Distributor	Factory

The next item in the *Drive Train menu* is the **Motor Power** consumption value of each individual motor in the system.

Note: This information is not populated and should be ignored on systems that do not include a current transducer.

5.4.2.8 Service Factor Amps

Accessibility	Maintenance	Distributor	Factory

The next item in the *Drive train* menu is the **Service Factor Amps**. This parameter should be set equal to the motor nameplate service factor amps (SFA, if given) or the motor nameplate full load amps (FLA) times the motor service factor (SF). It may be set lower if desired. If current monitoring is not supported, set this parameter to zero.

5.4.2.9 PID Setup

Accessibility	Maintenance	Distributor	Factory

The last item on the *Drive Train* menu is the **PID Setup**. PID1, PID2, and PID3 control different elements of the compressor depending on what the package is configured for. Table 5-2 below shows what each of the PID values control for variable speed and fixed speed compressors. Inside the PID1, PID2, and PID3 menus is another submenu that allows the user to define the gain, integral time, differential rate, and dead band of PID 1, PID 2, and PID 3 for each of the elements on the compressor that they control.

Table 5-2: PID Control

Variable Speed	
PID1	First Stage Drive
PID2	Second Stage Drive
PID3	Fan Drive
Fixed Speed	
PID1	Inlet Valve Modulation
PID2	Turn Valve Modulation
PID3	None

5.4.3 Enclosure

Accessibility	Maintenance	Distributor	Factory

The next item on the *Machine Configuration* menu is **Enclosure**. The **Enclosure** menu allows the user to select the cooler fan type, after cooler offset, and fan shutdown delay.

5.4.3.1 Cooler Fan Type

Accessibility	Maintenance	Distributor	Factory

The first item on the **Enclosure** menu is the *Cooler Fan Type*. The *Cooler Fan Type* allows the user to select the type of fan that is used in the package. The options are none, single speed fan, and water cooled.

5.4.3.2 After Cooler Offset

Accessibility	Maintenance	Distributor	Factory

The next item on the **Enclosure** menu is the *After Cooler Offset*. The *After Cooler Offset* allows the user to set the offset of the after cooler

5.4.3.3 Fan Shutdown Delay

Accessibility	Maintenance	Distributor	Factory

The last item on the **Enclosure** menu is the *Fan Shutdown Delay*. The *Fan Shutdown Delay* allows the user to define the delay of the fan when the machine is on shutdown.

5.4.4 AirSmart Controller

Accessibility	Maintenance	Distributor	Factory

The *AirSmart Controller* screen displays data relating to controller software versions.

5.4.4.1 Controller Firmware Version(s)

Accessibility	Maintenance	Distributor	Factory

The Controller Firmware Version screen allows the user to see the current AirSmart software version(s), and allows the distributor level user to update the controller with new software, firmware, and configuration files, if applicable. A sample screen of the AirSmart controller versions screen is shown in Figure 5-10.

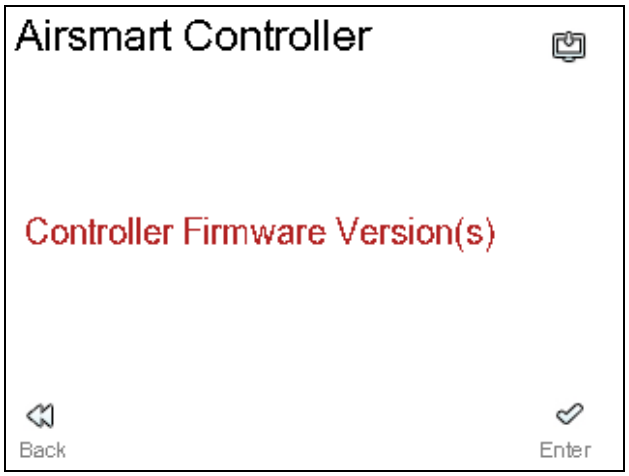


Figure 5-10: AirSmart Controller Versions Screen

The top right button on the *AirSmart Controller* screen allows the distributor level user to update the screens, configuration file, fonts, and firmware, if necessary. Software updates are loaded from the SD card and must be provided by Gardner Denver service or engineering. Refer to the *AirSmart G2 Software Update Manual (13-17-616)* for a complete procedure describing the software update process.

Caution: Loading invalid or improperly configured software or other files to the controller will render the controller unusable and require factory programming. Only update software under direction from Gardner Denver service or engineering.

Figure 5-11: System Update Screen

5.4.5 Calibrate Sensor

Accessibility	Maintenance	Distributor	Factory

The *Calibrate Sensor* screen allows fine tuning of the pressure sensors used with the system as shown in Figure 5-12. These values should only be adjusted if a sensor is consistently offset by a small amount when there is zero pressure in the system.

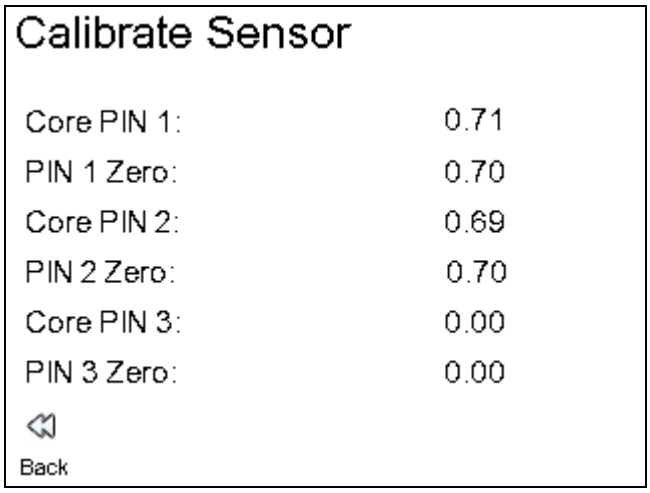


Figure 5-12: Calibrate Sensor Screen

The value to the right of the *Core PIN [n]* labels are the current reading on the respective sensor as seen by the analog to digital converter on the controller in a range of 0 to 3 VDC. The *PIN [n] Zero* values are the voltage levels set in the configuration for the zero pressure value of the corresponding sensor. For example, if the **PIN 1 Zero** value is set to 0.70 as shown in Figure 5-8, the controller will read 0 PSI on pressure input 1 when the controller sees a voltage level of 0.70 VDC.

Pressing the upper right button on the controller will cause the current value shown on **Core PIN 1** to be stored as the new **PIN 1 Zero** value. The second button down from the upper right on the controller will do the same for pressure sensor two, and the third button down for pressure sensor three.

Along with the first page of the *Core PIN [n]* labels, there are two other pages for the I/O expansion module. These labels are shown as *Exp PIN [n]*. These values may be stored in the same way as the *Core PIN [n]* values.

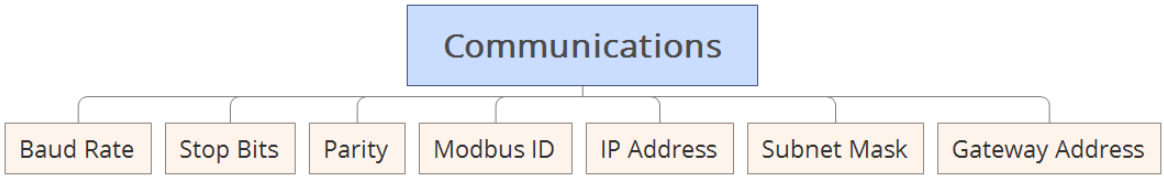
Note: The correct range for the zero value will vary depending on the sensor model installed on the system and should be set correctly during factory commissioning. Values off by more than 2 PSI most likely indicate a bad pressure transducer -- do not attempt to correct this by calibrating the sensor.

5.4.6 Communications

Accessibility	Maintenance	Distributor	Factory

The next item in the *Machine Configuration* menu is *Communications*. The *Communications* menu allows the distributor and factory users to change communication parameters such as baud rate, stop bits, parity, Modbus ID, IP address, subnet mask, and gateway address.

The *Communications* menu structure is organized as follows:

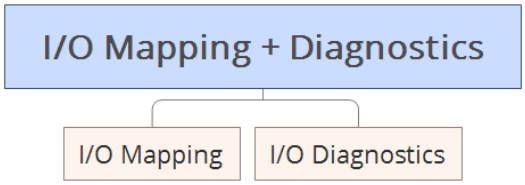


Refer to the *AirSmart G2 Modbus Manual (13-17-617)* for more information on communications and the required settings.

5.4.7 I/O Mapping & Diagnostics

The *I/O Mapping & Diagnostics* menu allows the user to review the hardware address locations of the various input and output devices for troubleshooting and diagnosing system problems.

The *I/O Mapping & Diagnostics* menu structure is organized as follows:



5.4.7.1 I/O Mapping

Accessibility	Maintenance	Distributor	Factory

The **I/O Mapping** screen allows the user to directly map the analog inputs (Ain), digital inputs (Din), analog outputs (Aout), and digital outputs (Dout) through this menu. The 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 the correlating menu, which becomes visible when the factory password is entered.

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 Table 5-3.

Table 5-3: Operating Device Numbers

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

To calculate the address corresponding to a particular port, multiply the Unit Number from the table above by 16, then add the number of the IO port function. For example the address for Digital input 3 on the expansion module is: (16 x 2) + 3 = 36. Note that for digital inputs and outputs, a negative number in the address corresponds to an active low signal, whereas a positive number in the address corresponds to an active high signal.

Figure 5-13 shows a sample screen with the first three analog inputs and analog output sub-menus, as well as the first Digital input. Due to the number of functions available for mapping most I/O types are divided into several menus, as seen by the three different *Ain Address* options below. To program or modify an I/O address assignment, navigate the sub-menus to find the desired function, and use the numeric keypad to assign the address corresponding to the hardware configuration.

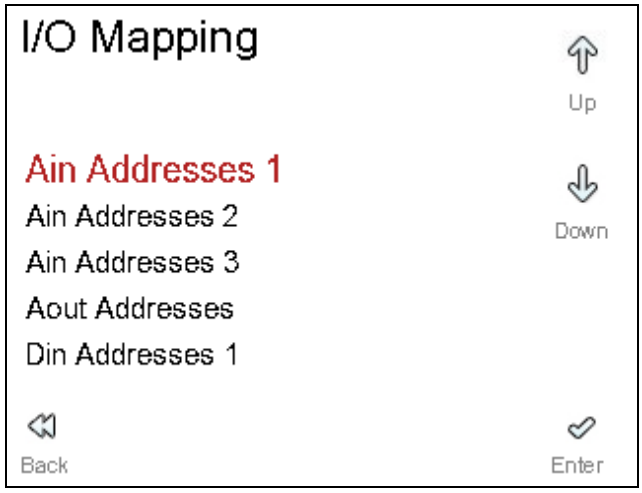


Figure 5-13: I/O Mapping Screen

5.4.7.2 I/O Diagnostics

Accessibility	Maintenance	Distributor	Factory

The **I/O Diagnostics** screen allows the user to review the status of the machine data, drivetrain data, or conduct hardware tests when validating the unit. An example screen shot is shown in Figure 5-14 below.

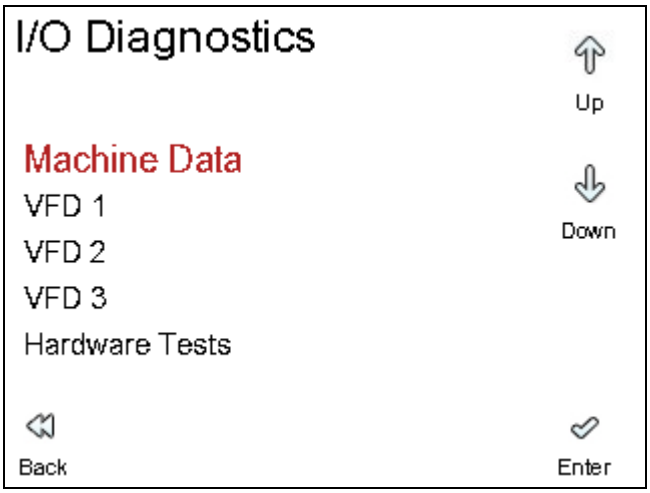


Figure 5-14: I/O Diagnostics

The machine data available for review is shown in Figure 5-15, 5-16, and 5-17 below.

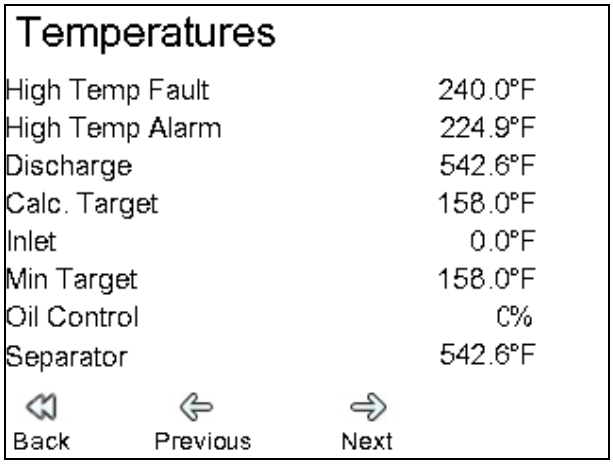


Figure 5-15: Machine Data Temperatures

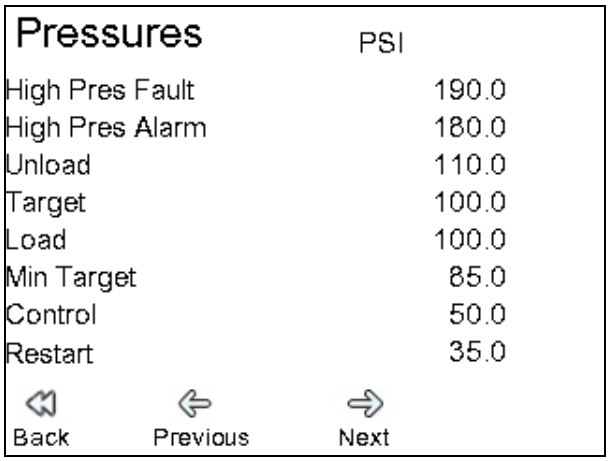


Figure 5-16: Machine Data Pressures

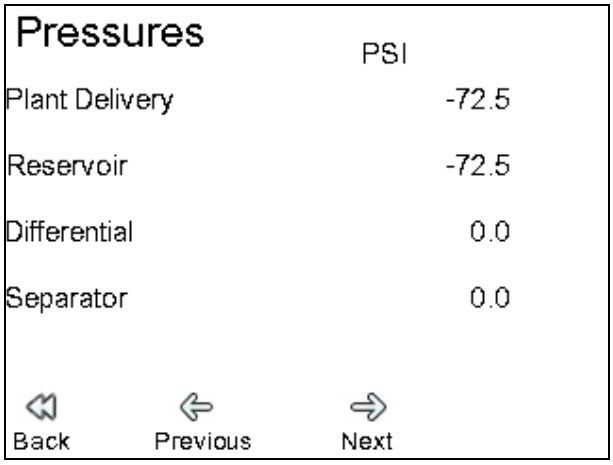


Figure 5-17: Machine Data Pressures Continued

The drivetrain data allows the user to review the minimum, maximum, command, and current motor frequency as well as the motor speed, along with motor current, voltage, power and other drivetrain data. An example of the drivetrain data screens is shown below in Figures 5-18, 5-19, and 5-20.

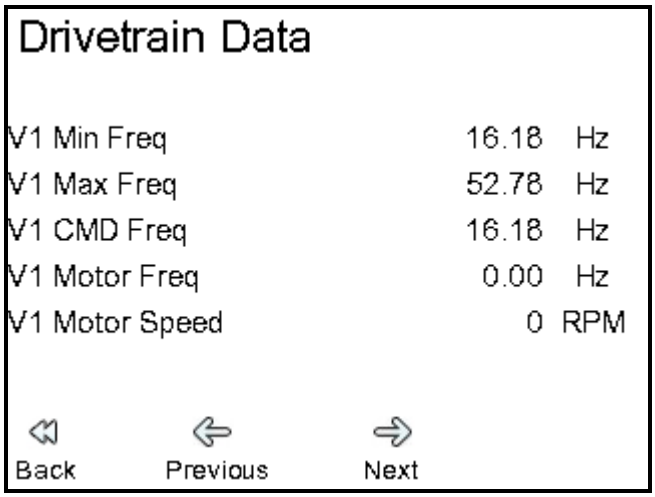


Figure 5-18: Drivetrain Data (Page 1)

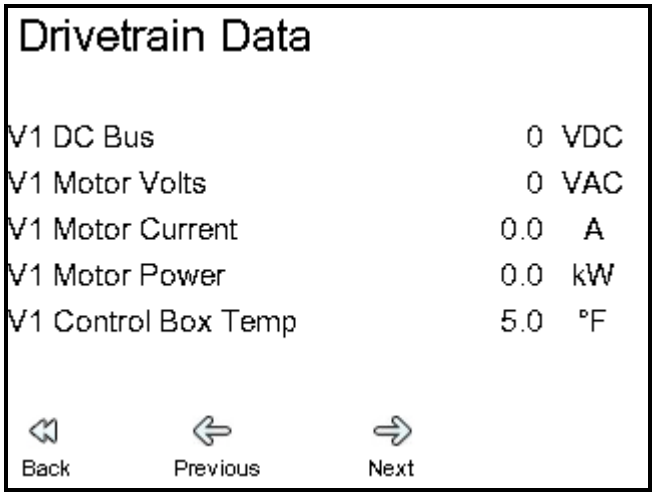


Figure 5-19: Drivetrain Data (Page 2)

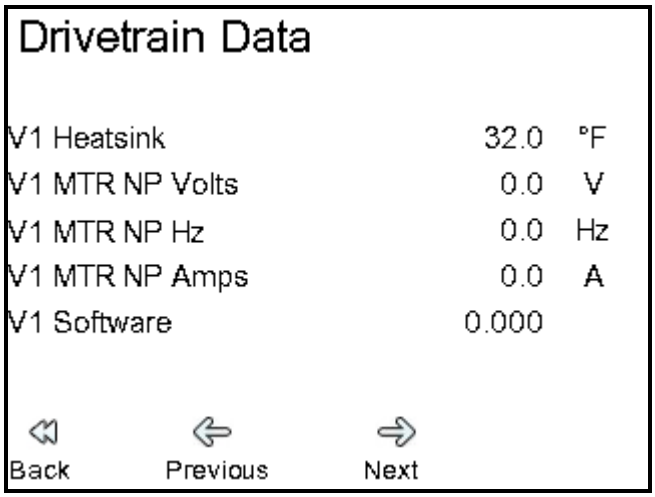


Figure 5-20: Drivetrain Data (Page 3)

Note: This feature is only available on machines with a variable speed drive.

The *Hardware Tests* that are available include:

- Button Test: validation of physical button depress functionality
- Core DIN Test: Display of digital value at each digital input
- Core DOUT Test: Send digital signals to available digital outputs
- Core AIN Test: Display signal value at each analog input

Figure 5-21 shows an example screen of the hardware tests described above.

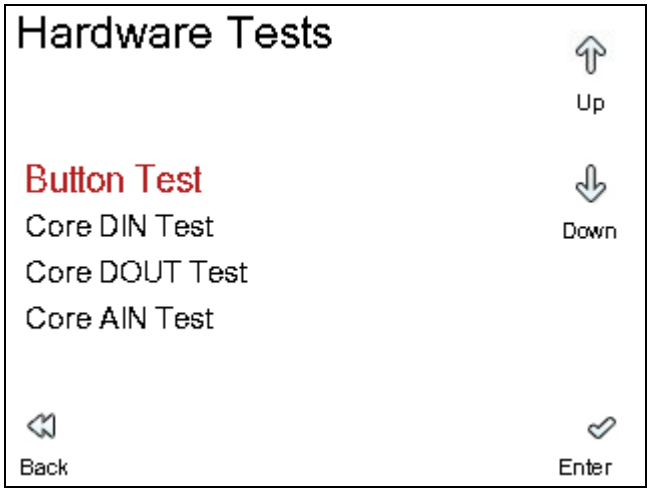


Figure 5-21: Hardware Tests

The Core DOUT tests are accomplished by pressing the perimeter buttons which correspond to the digital outputs 1-6, or the 2 available relay connections which are mapped to the STOP and RUN buttons. By pressing the appropriate button, the corresponding value will toggle to the opposite shown state at the output. The buttons are mapped starting with the top right button assigned to Core DOUT 1, and following the remaining values clockwise around the display. For the example shown in Figure 5-22, if the third button on the right is pressed, Core DOUT 3 would shift to 1 and a digital high signal would be present at the physical output.

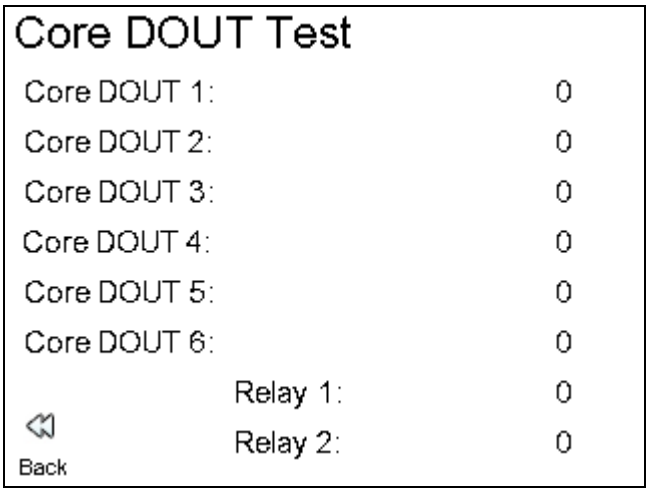


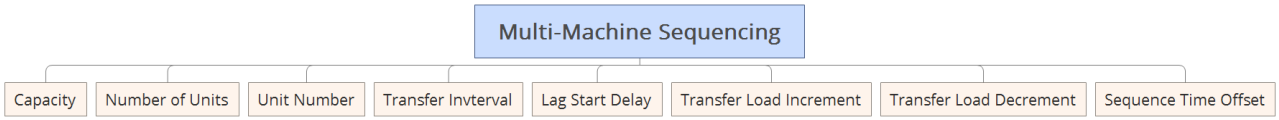
Figure 5-22: Core DOUT Test

5.4.8 Multi-Machine Sequencing

Accessibility	Maintenance	Distributor	Factory

The next item in the *Machine Configuration* menu is the *Multi-Machine Sequencing* menu. This menu allows the distributor and factory user to configure multiple machines so that they are sequenced together. The parameter that can be set in this menu are capacity, number of units, unit number, transfer interval, lag start delay, transfer load increment, transfer load decrement, and sequence time offset. See the *AirSmart G2 Sequencing Manual (13-17-615)* for detailed information on sequencing operation.

The *Multi-Machine Sequencing* menu structure is organized as follows:



5.4.8.1 Capacity

Accessibility	Maintenance	Distributor	Factory

Capacity is used to decide which compressor will become the Leader in the sequence. Normally the largest compressor will be the Leader unless multiple compressors of the same capacity are present in the network, in which the compressors will use total hours to calculate Leader control.

5.4.8.2 Number of Units

Accessibility	Maintenance	Distributor	Factory

The **Number of Units** is a value that should be set to the factory value.

5.4.8.3 Unit Number

Accessibility	Maintenance	Distributor	Factory

The **Unit Number** is a number between one and eight that is assigned to each compressor in the sequence. This value is used to identify compressors on the network. No two compressors can share the same unit number.

5.4.8.4 Transfer Interval

Accessibility	Maintenance	Distributor	Factory

The **Transfer Interval** is used to control how frequently the Leader role is transferred on the sequencing network. This value specifies how many more total hours a machine needs before it should release Leader control and become a Lag compressor. This parameter must be the same for all machines that are going to be sequenced together.

The transfer logic operates as follows. Machine A and Machine B are sequenced and both have 100 hours. They will use the unit number to decide who becomes the Leader. The transfer interval for both of these machines will be set to 1 hour. We will assume Machine A becomes the leader and begins running which will increase its total hours. Machine A will allow Machine B to become the leader only when it accumulates 101 hours of runtime, then Machine B will become the leader, and only allow Machine A to become leader when it has 1 more hour than Machine A, or 102 hours in this example.

5.4.8.5 Lag Start Delay

Accessibility	Maintenance	Distributor	Factory

The **Lag Start Delay** set the amount of time the Leader will wait before asking another compressor to come online. This takes into account the amount of time it takes a machine to startup and begin producing air after it is asked to start.

5.4.8.6 Transfer Load Increment

Accessibility	Maintenance	Distributor	Factory

Transfer Load Increment sets the maximum speed percentage a compressor will run at before asking another compressor to come online to meet plant demand. This value must be the same across all compressors in the sequence.

5.4.8.7 Transfer Load Decrement

Accessibility	Maintenance	Distributor	Factory

Transfer Load Decrement set the minimum speed percentage a compressor will run at before asking another compressor in the sequence to go offline to meet plant demand. This value must be the same across all compressors in the sequence.

5.4.8.8 Sequence Time Offset

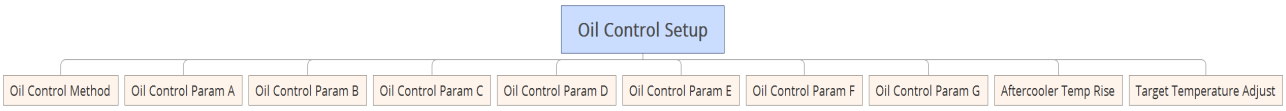
Accessibility	Maintenance	Distributor	Factory

Sequence Time Offset increases the number of hours a compressor will report it has to other compressors in the network. This can be used to synchronize maintenance schedules between multiple machines.

5.4.9 Oil Control Setup

The *Oil Control Setup* menu allows the user to set oil control method, oil control parameters, aftercooler temp rise, and target temperature adjust.

The *Oil Control Setup* menu structure is organized as follows:



Caution: These parameters are not available in all compressor packages and should not be adjusted unless directed by Gardner Denver unit control personnel.

5.4.9.1 Oil Control Method

Accessibility	Maintenance	Distributor	Factory

The **Oil Control Method** allows the distributor and factory user to define one of the following for the oil control method: none, injection, or delta T. Depending on which method is defined, there will be different parameters that can be changed corresponding to that oil control method.

5.4.9.2 Oil Control Parameters A-G

Accessibility	Maintenance	Distributor	Factory

The **Oil Control Parameters A-G** allows the distributor and factory user to define the value of the seven different oil control parameters. These oil control parameters are different depending on which **Oil Control Method** is selected. When selecting one of the oil control parameters, the parameter that is being changed will be labeled above the keypad that is shown. When the **Oil Control Method** selected is *none*, the oil control parameters can be ignored as their values will not be applicable for that method.

Table 5-4 below shows what each parameter controls when either the injection or delta T oil control method is selected.

Table 5-4: Oil Control Parameter Definitions

	Injection	Delta T
Parameter A	VC Low Oil Temp	Valve Max CMD
Parameter B	V1 High Oil Temp	Valve Min CMD
Parameter C	V2 Low Oil Temp	Valve PID Gain
Parameter D	V2 High Oil Temp	Valve PID Int Time
Parameter E	Full Flow Start Time	Valve PID Diff Rate
Parameter F	State Mach Step Period	Valve PID Dead Band
Parameter G	Not Used	Valve B Pressure

5.4.9.3 Aftercooler Temp Rise

Accessibility	Maintenance	Distributor	Factory

The **Aftercooler Temp Rise** defines the target temperature rise across the air aftercooler.

5.4.9.4 Target Temperature Adjust

Accessibility	Maintenance	Distributor	Factory

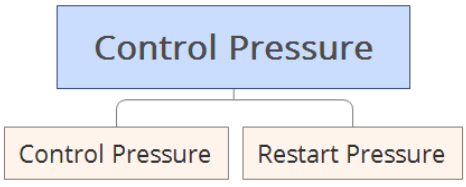
The **Target temperature Adjust** is a factory parameter used to change the scale for the target temperature calculation on machines using the delta T oil control method.

5.4.10 Control Pressure

The *Control Pressure* menu allows configuration of the control and restart pressure settings on the machine.

Note: These settings are machine-specific and should not be adjusted unless directed by Gardner Denver.

The *Control Pressure* menu structure is organized as follows:



5.4.10.1 Control Pressure

Accessibility	Maintenance	Distributor	Factory

The **Control Pressure** setting is the minimum pressure that must be achieved in the air/oil reservoir before the controller will switch from the starting sequence to the *loaded* state at which modulation occurs.

5.4.10.2 Restart Pressure

Accessibility	Maintenance	Distributor	Factory

The next item in the *Control Pressure* menu shows the current value of the **Restart Pressure** setting which reflects the maximum pressure allowed in the air/oil reservoir at which the compressor will be allowed to start or restart.

Note: This parameter is not available in all compressor packages.

5.4.11 Motor Jog

Accessibility	Maintenance	Distributor	Factory

The *Motor Jog* feature is a testing tool that will cause all of the motors in the compressor package to run for the programmed amount of time as soon as the RUN button is pressed. The Motor Jog function is used to check the rotation of the motor(s) after the main power has been connected during installation of the compressor package or the power cables between the motor and the starter are reconnected.

Note: For Wye-Delta starters, only the Wye connection is tested during the motor jog sequence.

Figure 5-23 shows a screen capture of the *Motor Jog* screen. Note that the compressor must be in the *Ready* state before motor jog will be allowed. The Power LED should turn off upon loading the *Motor Jog* screen if all preconditions have been met to allow the controller to enter the motor jog state.

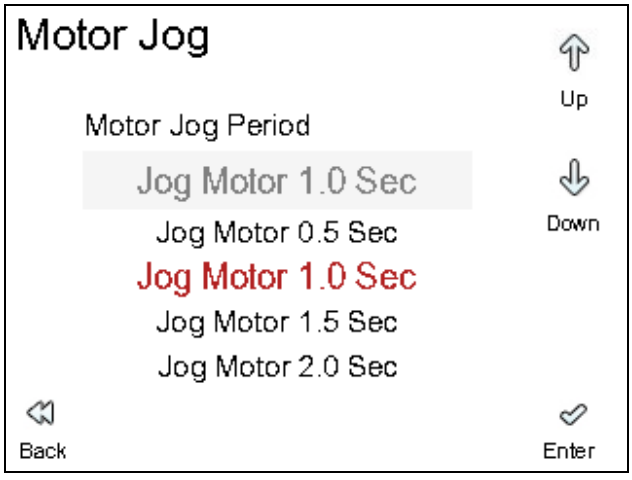


Figure 5-23: Motor Jog Screen

After the screen has loaded, select the desired jog period and press *Enter*. To start the jog function, press the RUN button and verify correct operation and rotation of the motors. If the STOP button is pressed at any point during the jog, all motors will be stopped immediately.

Note: There is a 10-second lockout timer between motor jogs such that the machine will not respond to a subsequent motor jog request until 10-seconds after the previous jog has completed.

Exit the *Motor Jog* screen using the *Back* button after testing has been completed.

5.5 Alarm History

Accessibility	Maintenance	Distributor	Factory

The *Alarm History* menu allows the user to review the faults and alarms that have occurred over a predefined period of time. The alarm history provides the same information available through the home screen navigation buttons, and can be referenced in section 2.3.3.

6 Error Management

The AirSmart G2 controller has the ability to read many analog inputs and 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 G2 controller in order to determine the state of the compressor 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 Advisory Faults

The advisory faults in the AirSmart G2 controller are designed to alert the user of needed service or that certain parameters may be approaching their shutdown level. Advisory faults can be reset while the compressor is running or stopped by pressing the upper right button corresponding to the Gardner Denver logo on the home screen. If the error condition still exists after resetting the advisory fault, the advisory fault will occur again. The status of the compressor at the time of each advisory is stored in the SD card, which can be accessed through the History menu.

Table 6-1: Advisory Fault Definitions

Advisory	Description	Action
Separator Change Timer	Differential pressure > 8 PSIG	Change separator element
DIN Air Filter	Vacuum switch after inlet air filter has tripped	Change air filter
Air Filter Timer	Maintenance timer for air filter change has expired	Change air filter and reset timer
Oil Filter Timer	Maintenance timer for oil filter change has expired	Change oil filter and reset timer
Oil Change Timer	Maintenance timer for oil change has expired	Change oil and reset timer
Low Ambient A	Package discharge (Plant) temperature < 40°F (4°C)	Locate compressor to area where ambient temperature > 32°F (0°C)
Low Ambient B	Separator temperature < 40°F (4°C)	Locate compressor to area where ambient temperature > 32°F (0°C)
High Separator Temp	Temperature in separator > 225°F (107°C)	Check oil cooler system functionality or reduce package power
High Plant Delivery Temp	Temperature at package discharge > 149°F (65°C)	Check air cooler functionality or reduce package power
High Inlet Temp	Temperature at package inlet > 113°F (45°C). On some models, this may trigger at 104°F (40°C)	Wait for ambient temperature to cool
Separator Change Timer	Maintenance timer for separator element change has expired	Change separator element and reset timer
High Discharge Temp	Temperature at airend discharge > 225°F (107°C)	Check oil cooler system functionality or reduce package power
DIN Advisory Alarm	Digital input programmed for Optional Alarm has tripped	Check device connected to input
DIN Oil Filter	Pressure switch in oil filter assembly has tripped	Change oil filter
DIN Low Volt Relay	Digital input programmed for Low Voltage has tripped	Check line voltage

Table 6-2: Advisory Fault Definitions Cont.

Advisory	Description	Action
DIN Motor Overtemp	Digital input programmed for Motor Over Temperature has tripped	Check main motor(s) temperature or reduce package power
DIN Water Pressure	Digital input programmed for Water Pressure has tripped	Check water pressure
DIN High Vibration	Digital input programmed for High Vibration has tripped	Check for source of vibration
Motor Lube Timer	Motor lubrication interval timer has expired	Lubricate motor(s) and reset timer
CBOX Filter Timer	Control box filter change interval timer has expired	Change or clean control box air filter element
Oil Sample Timer	The maintenance timer for taking an oil sample has expired	Take an oil sample and reset the timer
DIN User Alarm	Digital input programmed for User Alarm has tripped	Check User alarm
Low Oil Pressure	Oil pressure < alarm set point	Check oil pressure
High Interstage Temp	Interstage Temp > alarm set point	Check Interstage temp or reduce package power
High Plant Delivery Pres	Plant Delivery Pressure > alarm set point	Check air cooler functionality or reduce package power
High Control Box Temp	Control Box Temp > alarm set point	Check control box temp or reduce package power
High Oil Temperature	Oil injection temperature is > alarm set point	Check oil temperature or reduce package power
DIN Oil Level 1	Digital Input oil level 1 has tripped	Check oil level 1
DIN Oil Level 2	Digital input oil level 2 has tripped	Check oil level 2
High Differential Temp	Differential temp > alarm set point	Check differential temp or reduce package power
High Discharge Pressure	Discharge pressure > alarm set point	Check discharge pressure
High Inlet Pressure	Inlet pressure > alarm set point	Check inlet pressure
Low Oil Level 1	Oil sump level 1 < alarm set point	Oil level low; add oil to sump #1
Low Oil Level 2	Oil sump level 2 < alarm set point	Oil level low; add oil to sump #2
High Enclosure Temp	Enclosure temperature exceeded alarm set point	Check enclosure ventilation fan for proper operation
High Oil Temp 1	Oil temperature #1 > alarm set point	Check oil level or reduce package power
High Oil Temp 2	Oil temperature #2 > alarm set point	Check oil level or reduce package power

6.2 Shutdown Faults

The shutdown faults in the AirSmart G2 controller are designed to protect the compressor from component failure or extreme environmental conditions. Shutdown faults can be reset after the compressor has stopped by pressing the STOP button. If the error condition still exists, the shutdown fault cannot be reset. The status of the compressor at the time of each shutdown is stored in non-volatile memory, which can be accessed through the history menu.

Table 6-3: Shutdown Fault Definitions

Shutdown Condition	Description	Action
Actuator Comm Error	Communications failure between controller and precision mixing valve	Check wiring or mixing valve operation
Change Separator	Differential pressure over separator element > 15 PSIG (1 bar)	Change separator element
Cooler Aux	Cooler Aux input does not match Cooler Start digital output	Check fan contactor operation
DIN Fan Fault	Cooler or vent fan over temp or overload fault	Check fan motor and associated fuses and wiring
DIN High Vibration	Digital input programmed for High Vibration has tripped	Check for source of vibration
DIN Low Volt Relay	Digital input programmed for Low Voltage has tripped	Check voltage relay
DIN Motor Fault	Main motor overload or fault	Check main motor wiring and overloads
DIN Motor Overtemp	Digital input programmed for Motor Over Temperature has tripped	Check main motor(s), motor overload relay or reduce package power
DIN Phase Seq	Digital input programmed for Phase Sequence has tripped	Check phase relay
DIN Shutdown Fault	Digital input programmed for Optional Shutdown has tripped	Check device connected to input
DIN User Fault	Digital input programmed for Optional Shutdown has tripped	Check device connected to input
DIN Water Pressure	Digital input programmed for Water Pressure has tripped	Check water pressure
Emergency Stop	Compressor stopped using Emergency Stop button	Pull out Emergency Stop button to its normal position
High Discharge Temp	Temperature at airend discharge > 240°F (116°C)	Check oil cooler system functionality or reduce package power
High Discharge Temp Rate	Rapid temperature rise at airend discharge detected	Check airend oil injection or oil cooler system functionality
High Plant Delivery Pres	Pressure at package discharge > 190 PSIG (13 bar)	Check for sources of high system pressure
High Reservoir Pres	Pressure in air/oil reservoir > 190 PSIG (13 bar)	Check for sources of high system pressure
High Separator Pres	Pressure in separator tank > 190 PSIG (13 bar)	Check for sources of high system pressure
High Separator Temp	Temperature in separator > 240°F (116°C)	Check oil cooler system functionality or reduce package power
High Separator Temp Rate	Rapid temperature rise in air/oil separator tank detected	Check separator element or oil cooler system functionality
Low Sump Pressure	Pressure in reservoir < 15 PSIG (1 bar) after one minute of compressor operation	Check inlet valve or minimum pressure valve operation
Motor Aux	Motor Aux digital input does not match Main Contactor digital output	Check main motor contactor operation
Open TT1	Connection to thermistor TT1 is open	Check wiring between thermistor TT1 and controller
Open TT2	Connection to thermistor TT2 is open	Check wiring between thermistor TT2 and controller

Table 6-3: Shutdown Fault Definitions Cont.

Shutdown Condition	Description	Action
Open TT3	Connection to thermistor TT3 is open	Check wiring between thermistor TT3 and controller
Open XD1	Connection to pressure transducer PT1 is open	Check wiring between pressure transducer PT1 and controller
Open XD2	Connection to pressure transducer PT2 is open	Check wiring between pressure transducer PT2 and controller
Open XD3	Connection to pressure transducer PT3 is open	Check wiring between pressure transducer PT3 and controller
Power Failure	Low voltage on 24V input to controller	Check DC power supply and line voltage stability
Shorted TT1	Connection to thermistor TT1 is shorted	Check wiring between thermistor TT1 and controller
Shorted TT2	Connection to thermistor TT2 is shorted	Check wiring between thermistor TT2 and controller
Shorted TT3	Connection to thermistor TT3 is shorted	Check wiring between thermistor TT3 and controller
Shorted XD1	Connection to pressure transducer PT1 is shorted	Check wiring between pressure transducer PT1 and controller
Shorted XD2	Connection to pressure transducer PT2 is shorted	Check wiring between pressure transducer PT2 and controller
Shorted XD3	Connection to pressure transducer PT3 is shorted	Check wiring between pressure transducer PT3 and controller
Hardware Fault	Controller hardware failure detected.	Check controller for malfunction or damage.
SD Card Error	SD card failure	Check SD card is inserted into controller correctly
Configuration Error	Configuration failure	Reload configuration files into controller using SD card
Can Comm Error	Communications failure between control and IO module	Check all wire connections on controller and IO module
Seq Comm Error	Communications failure between sequenced machines	Check all wire connections on controllers
Drive 1 Comm Error	Communications failure between controller and drive 1	Check all wire connections between controller and drive 1
Drive 2 Comm Error	Communications failure between controller and drive 2	Check all wire connections between controller and drive 2
Drive 3 Comm Error	Communications failure between controller and drive 3	Check all wire connections between controller and drive 3
Drive 1 Fault	Drive 1 failure detected	Check drive 1 for malfunction or damage
Drive 2 Fault	Drive 2 failure detected	Check drive 2 for malfunction or damage
Drive 3 Fault	Drive 3 failure detected	Check drive 3 for malfunction or damage
DIN VFD Fault	Digital input for VFD has tripped	Check wires connected to input; check VFD
DIN MBC Fault	Digital input for MBC has tripped	Check wires connected to input; check MBC
DIN Safety Switch	Digital input for the safety switch has tripped	Check safety switch wiring
DIN Belt Break	Digital Input for a belt break has tripped	Check wires connected to input; check belt
High Interstage Pres	Interstage Pres > alarm set point	Check Interstage pressure and for sources of high pressure

Table 6-3: Shutdown Fault Definitions Cont.

Shutdown Condition	Description	Action
Low Oil Pressure	Oil pressure < alarm set point	Check oil pressure and for sources of high system pressure
High Plant Delivery Temp	Plant delivery temp > alarm set point	Check plant delivery temp or reduce package power
High Plant Temp Rate	Rapid temp rise of plant temp detected	Check plant temp or reduce package power
High Interstage Temp	Interstage Temp > alarm set point	Check Interstage temp or reduce package power
High Interstage Temp Rate	Rapid temp rise of Interstage temp detected	Check Interstage temp or reduce package power
High Control Box Temp	Control box temp > alarm set point	Check control box temp or reduce package power
High Oil Temperature	Oil injection temperature > alarm set point	Check oil temperature
DIN Low Oil Level 1	Digital input for Oil Level 1 has tripped	Check oil level 1
DIN Low Oil Level 2	Digital input for Oil Level 2 has tripped	Check oil level 2
Open EXP XD1	Connection to expansion module PIN1 is open	Check wiring between expansion module PIN1 and controller
Shorted EXP XD1	Connection to expansion module PIN1 is shorted	Check wiring between expansion module PIN1 and controller
Open EXP XD2	Connection to expansion module PIN2 is open	Check wiring between expansion module PIN2 and controller
Shorted EXP XD2	Connection to expansion module PIN2 is shorted	Check wiring between expansion module PIN2 and controller
Open EXP XD3	Connection to expansion module PIN3 is open	Check wiring between expansion module PIN3 and controller
Shorted EXP XD3	Connection to expansion module PIN3 is shorted	Check wiring between expansion module PIN3 and controller
Open EXP XD4	Connection to expansion module PIN4 is open	Check wiring between expansion module PIN4 and controller
Shorted EXP XD4	Connection to expansion module PIN4 is shorted	Check wiring between expansion module PIN4 and controller
Open EXP XD5	Connection to expansion module PIN5 is open	Check wiring between expansion module PIN5 and controller
Shorted EXP XD5	Connection to expansion module PIN5 is shorted	Check wiring between expansion module PIN5 and controller
Open EXP TT1	Connection to expansion module TIN1 is open	Check wiring between expansion module TIN1 and controller
Shorted EXP TT1	Connection to expansion module TIN1 is shorted	Check wiring between expansion module TIN1 and controller
Open EXP TT2	Connection to expansion module TIN2 is open	Check wiring between expansion module TIN2 and controller
Shorted EXP TT2	Connection to expansion module TIN2 is shorted	Check wiring between expansion module TIN2 and controller
Open EXP TT3	Connection to expansion module TIN3 is open	Check wiring between expansion module TIN3 and controller
Shorted EXP TT3	Connection to expansion module TIN3 is shorted	Check wiring between expansion module TIN3 and controller
Open EXP TT4	Connection to expansion module TIN4 is open	Check wiring between expansion module TIN4 and controller
Shorted EXP TT4	Connection to expansion module TIN4 is shorted	Check wiring between expansion module TIN4 and controller

Table 6-3: Shutdown Fault Definitions Cont.

Shutdown Condition	Description	Action
Open EXP TT5	Connection to expansion module TIN5 is open	Check wiring between expansion module TIN5 and controller
Shorted EXP TT5	Connection to expansion module TIN5 is shorted	Check wiring between expansion module TIN5 and controller
DIN Enclosure Temp	Digital input for enclosure temp has tripped	Check the enclosure temperature and associated wiring
High Discharge Pressure	Discharge pressure > alarm set point	Check discharge pressure or sources of high pressure
High Inlet Pressure	Inlet pressure > alarm set point	Check inlet pressure
Low Oil Level 1	Oil sump level 1 < alarm set point	Oil level low; add oil to sump #1
Low Oil Level 2	Oil sump level 2 < alarm set point	Oil level low; add oil to sump #2
High Oil Level 1	Oil sump level 1 > alarm set point	Oil level high; check oil in sump #1
High Oil Level 2	Oil sump level 2 > alarm set point	Oil level high; check oil in sump #2
Low Ambient Temp	Ambient temp < alarm set point	Locate blower to area with ambient temperature > 32°F (0°C)
High Differential Temp	Differential temp > alarm set point	Check differential temp or reduce package power
High Differential Temp Rate	Rapid temp rise of differential temp detected	Check differential temp or system functionality
High Enclosure Temp	Enclosure temp > alarm set point	Check enclosure temp or reduce package power
High Oil Temp 1	Oil temperature #1 > alarm set point	Check oil level or reduce package power
High Oil Temp 2	Oil temperature #2 > alarm set point	Check oil level or reduce package power
High Oil Temp Rate	Rapid temp rise of Oil temp	Check oil temp or system functionality

7 Data Logs

Data Logging is an automatic process on the AirSmart G2 controller. Data Logs provide an easy-to-read history of the machine operation that can be exported from the SD card for further analysis. There are different logging intervals depending on the current operation of the package. Data is logged every 1 second during the start phase of the machine, every 20 seconds during normal running, and every 10 minutes when the motor is stopped. There is also an added log entry every time the machine changes operating states.

7.1 Format

Data Logs can be found on the SD card in the memory card slot on the side of the AirSmart G2 controller. The log files are located in the *DataLogs* folder on the SD card, which can be accessed by temporarily removing the SD card from the controller and using an SD card reader to copy the files from the SD card to another device, such as a PC. Log files are organized into folders under the DataLogs folder by Year. The folder naming convention follows *Yearxxxx*. Where *:xxxx˘*is the year the log was recorded. Inside this folder are CSV files with naming convention as follows: *DataLog_xxxx_weekXX.csv*. The :xxxx˘is the year and :XX˘is the week. Each file contains one week of log data. The following is an example of how the file would be named: *DataLog_2017_week17.csv*, which would be the 17th week in the year 2017.

7.2 Information

The information that is included in the .csv file includes date, time, total hours, loaded hours, state, fault code, advisory code, operating mode, delivery pressure, reservoir pressure, separator pressure, system pressure, load pressure, target pressure, unload pressure, discharge temperature, separator temperature, percent load, drive 1 status, drive 1 frequency, drive 1 motor current, drive 1 power, drive 1 heatsink temp, and control box temp in a table format. Pressure readings are in units of PSI and temperature readings are in units of degrees Celsius. Figure 7-1 shows an example of what a data log may look like when opened in a spreadsheet application such as Microsoft Excel.

	A	B	C	D	E	F	G	H	I	J	K
1	Date	Time	Total Hours	Loaded Hours	State	Fault Code	Advisory Code	Operating Mode	Delivery Pressure	Reservoir Pressure	Separator Pressure
2	12/12/2016	0:08:56	316800	0	2	21	14	2	0.1	97.199997	0
3	12/12/2016	0:18:56	316800	0	2	21	14	2	0.1	97.199997	0
4	12/12/2016	0:28:56	316800	0	2	21	14	2	0.1	97.199997	0
5	12/12/2016	0:38:56	316800	0	2	21	14	2	0.1	97.199997	0
6	12/12/2016	0:48:56	316800	0	2	21	14	2	0.1	97.199997	0
7	12/12/2016	0:58:56	316800	0	2	21	14	2	0.1	97.199997	0
8	12/12/2016	1:08:56	316800	0	2	21	14	2	0.1	97.199997	0
9	12/12/2016	1:18:56	316800	0	2	21	14	2	0.1	97.199997	0

Figure 7-1: Data Log Example

The following tables below show the controller states and corresponding values for each state, operating modes and mode designations, and advisory and fault codes and values for each code that may be found in the data logs.

Table 7-1: Controller States

Value	State
0	Reset
1	Auto Restart
2	Shutdown
3	Ready
4	Remote Halt
5	Ask to Start
6	Enabled
7	Ask to Load
8	Pre-Wye

Value	State
9	Wye
10	Delta
11	Start
12	Pause
13	Loaded
14	Unload
15	Blowdown
16	Normal Stop

Table 7-2: Operating Modes

Operating Mode	Designation
Constant	0
Low Demand	1
Automatic	2
Sequenced	3
Connect 12	4

Table 7-3: Advisory Codes

Value	Advisory Code
0	System OK
1	Air Filter Timer
2	Oil Filter Timer
3	Oil Sample Timer
4	Oil Change Timer
5	Separator Change Timer
6	Motor Lube Timer
7	Control Box Filter Timer
8	Advisory Alarm
9	User Alarm
10	Motor Over Temperature
11	Low Voltage Relay
12	Water Pressure

Value	Advisory Code
13	High Vibration
14	Air Filter Timer
15	Oil Filter Timer
16	Change Separator
17	Low Oil Pressure
18	Low Ambient A
19	High Plant Delivery Temperature
20	Low Ambient B
21	High Separator Temperature
22	High Discharge Temperature
23	High Interstage Temperature
24	High Inlet Temperature
25	High Discharge Pressure

Value	Advisory Code
26	High Inlet Pressure
27	Low Oil Level 1
28	Low Oil Level 2
29	High Enclosure Temperature
30	High Oil Temperature 1
31	High Oil Temperature 2
32	High Plant Delivery Pressure
33	High Control Box Temperature
34	High Oil Temperature
35	DIN Oil Level 1
36	DIN Oil Level 2
37	High Differential Temperature

Table 7-4: Fault Codes

Value	Fault Code
0	System OK
1	Hardware Fault
2	SD Card Error
3	Configuration Error
4	Power Failure
5	Emergency Stop
6	Open XD1
7	Shorted XD1
8	Open XD2
9	Shorted XD2
10	Open XD3
11	Shorted XD3
12	Open TT1
13	Shorted TT1
14	Open TT2
15	Shorted TT2
16	Open TT3
17	Shorted TT3
18	CAN Communication Error
19	Sequencing Communication Error
20	Actuator Communication Error
21	Drive 1 Communication Error
22	Drive 2 Communication Error
23	Drive 3 Communication Error
24	Drive 1 Fault
25	Drive 2 Fault
26	Drive 3 Fault
27	Shutdown Fault
28	User Fault
29	VFD Fault
30	MBC Fault
31	Motor Fault

Value	Fault Code
32	Motor Over temperature
33	Fan Fault
34	Phase Sequence
35	Low Voltage Relay
36	Safety Switch
37	Belt Break
38	Water Pressure
39	High Vibration
40	Plant Delivery Pressure
41	High Separator Pressure
42	High reservoir Pressure
43	High Interstage Pressure
44	Low Oil Pressure
45	Change Separator
46	Low Sump Pressure
47	High Plant Delivery Temperature
48	High Plant Temperature Rate
49	High Separator Temperature
50	High Separator Temperature Rate
51	High Discharge Temperature
52	High Discharge Temperature Rate
53	High Interstage Temperature
54	High Interstage Temperature Rate
55	Motor Auxiliary
56	Cooler Auxiliary
57	Enclosure Temperature
58	High Discharge Pressure
59	High Inlet Pressure
60	Low Oil Level 1
61	Low Oil Level 2
62	High Oil Level 1
63	High Oil Level 2

Value	Fault Code
64	Low Ambient Temperature
65	High Differential Temperature
66	High Differential Temperature Rate
67	High Enclosure Temperature
68	High Enclosure Temperature Rate
69	High Oil Temperature 1
70	High Oil Temperature 2
71	High Oil Temperature Rate
72	High Control Box Temperature
73	High Oil Injection Temperature
74	DIN Low Oil Level 1
75	DIN Low Oil Level 2
76	Open Expansion XD1
77	Shorted Expansion XD1
78	Open Expansion XD2
79	Shorted Expansion XD2
80	Open Expansion XD3
81	Shorted Expansion XD3
82	Open Expansion XD4
83	Shorted Expansion XD4
84	Open Expansion XD5
85	Shorted Expansion XD5
86	Open Expansion TT1
87	Shorted Expansion TT1
88	Open Expansion TT2
89	Shorted Expansion TT2
90	Open Expansion TT3
91	Shorted Expansion TT3
92	Open Expansion TT4
93	Shorted Expansion TT4
94	Open Expansion TT5
95	Shorted Expansion TT5

8 Technical Data

8.1 AirSmart Controller Dimensions

The outside Dimensions for the AirSmart controller are:

9.0 in x 7.5 in x 1.8 in
228.6 mm x 190.5 mm x 45.7 mm

8.2 Agency Certifications

The AirSmart G2 controller is a UL Recognized component in the United States and Canada.

8.3 Environmental Ratings

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

8.4 Electrical Ratings

DC power input (P4 on Core board):
- 24 VDC +/- 10% (6 Watts).

Digital Inputs (P5 on Core board, P1 on I/O Expansion):
- Six 0 to 24 VDC inputs / Contact Closure Sensing
- Up to Six additional inputs on I/O Expansion

RTD Temperature Inputs (P3 on core board, P7 on I/O Expansion):
- Three 2-wire PT1000 inputs
- Up to five additional PT1000 inputs on I/O Expansion

Digital Outputs (P8 and P6 on core board, P2 and P4 on I/O Expansion):
- Six 0 to 24 VDC outputs @ 800mA per channel
- Up to six additional 24VDC outputs on I/O Expansion

SPST relay contacts (P6 on Core board, P4 on I/O Expansion):
- Two relay contacts - Rating: 125 mA @ 250 VAC, 2.0 A @ 30 VDC.
- Up to one additional relay contacts on I/O Expansion

Analog Inputs (P2 on core board, P3 and P5 on I/O Expansion):
- Three 4-20 mA analog inputs for pressure measurement
- Up to 5 additional 4-20 mA inputs on I/O Expansion

Analog Outputs (J6 on I/O Expansion):
- Up to two 4-20 mA outputs for feedback and control

Ports:
- RS485: 3 each, 1 each RJ45 connector (J6), 2 each terminal strip connection (P9).
- CANBUS: 1 each, terminal strip connection (P7).
- USB Host: 1 each, USB Type A connector.
- Ethernet: 1 each, RJ45 connector (P1).

On Board Memory:
- Flash: 32 MByte
- DRAM: 4 MByte

Memory Card:
- Secured Data (SD) Card slot, 32 GByte max

NOTES:

NOTES:

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