GARDNER DENVER

Experience Proven Results™

13-17-600
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AIRSMART™ CONTROLLER

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, <u>WILL</u> result in death or serious injury.

Equipment Starts Automatically

Health Hazard – Explosive Release of Pressure

Cutting of Finger or Hand Hazard – Rotating Impeller Blade

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

Cutting of Finger or Hand Hazard – Rotating Fan Blade

Entanglement of Fingers or Hand – Rotating Shaft

⚠WARNING

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

Asphyxiation Hazard – Poisonous Fumes or Toxic Gas in Compressed Air

⚠CAUTION

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

Burn Hazard – Hot Surface

PROHIBITION - MANDATORY ACTION REQUIREMENTS

Do Not Operate 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

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

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

- **Keep fingers and clothing away from rotating fan, 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.**

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.**

Table of Contents

1 General Information

The AirSmart™ Controller was designed specifically for use in the Gardner Denver Global Line of variable speed, rotary screw air compressors. The AirSmart™ Controller is also capable of controlling fixed speed air compressors which use traditional motor starters. The microprocessor-based unit can control up to three Variable Frequency motor Drives (VFDs) while monitoring 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 Controller Features

- ✓ Microprocessor controlled
- ✓ Low voltage 24 VDC operation
- ✓ Supports up to thee VFDs via Modbus link
- ✓ Compressor air regulation via PID control
- ✓ Can control variable speed or fixed speed compressors.
- ✓ 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
- ✓ Up to five pressure transducer inputs
- ✓ Up to five temperature transducer inputs
- ✓ Up to three discrete inputs for user control
- ✓ Up to two discrete outputs for user status
- ✓ Sequence capability for control of up to eight compressors (w/ opt. Communications Module)
- ✓ RS-232 Serial communications for local monitoring (w/ opt. Communication Module)
- ✓ Ethernet communications for remote monitoring (w/ opt. Communications Module)

1.2 Control Panel Features

- ✓ 4 x 20 Character LCD display with LED back lighting is easy to read in all lighting conditions.
- ✓ 9 Buttons for easy compressor control and menu navigation
- ✓ 4 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

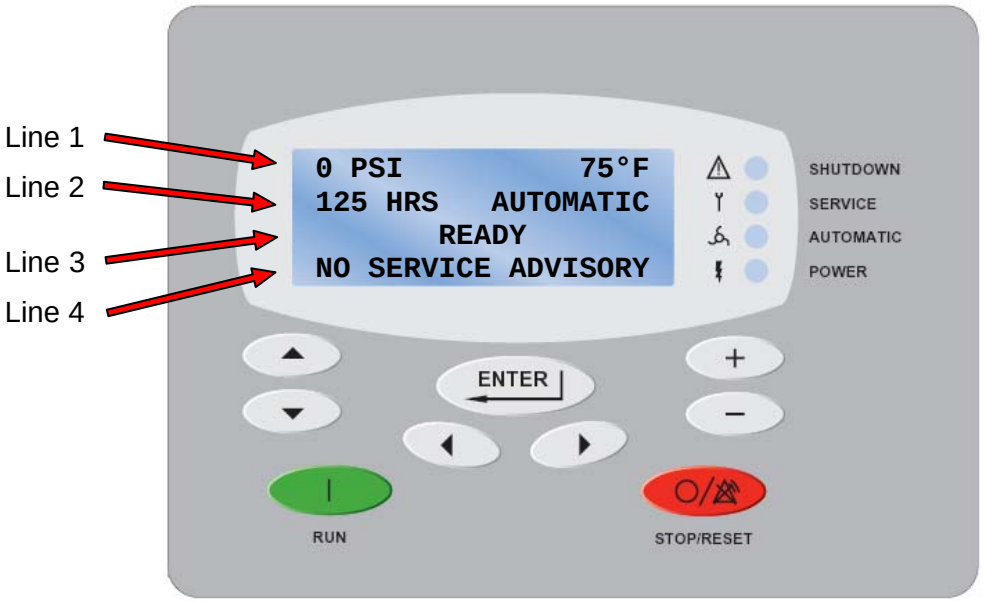
1. AirSmart Controller Control Panel

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 four-line LCD display, four status LED indicators and nine buttons.

2. Emergency Stop Button

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

2.2 Control Panel Four-Line Display



1. **Line 1**

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

2. **Line 2**

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

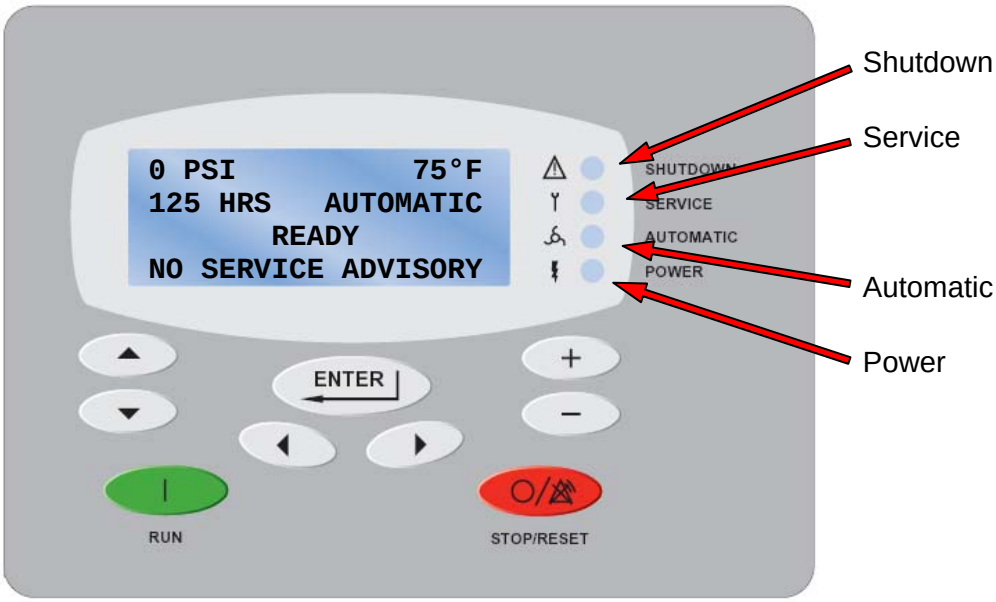
3. **Line 3**

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

4. **Line 4**

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

2.3 Control Panel Indicator Functions



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

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

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

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

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

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

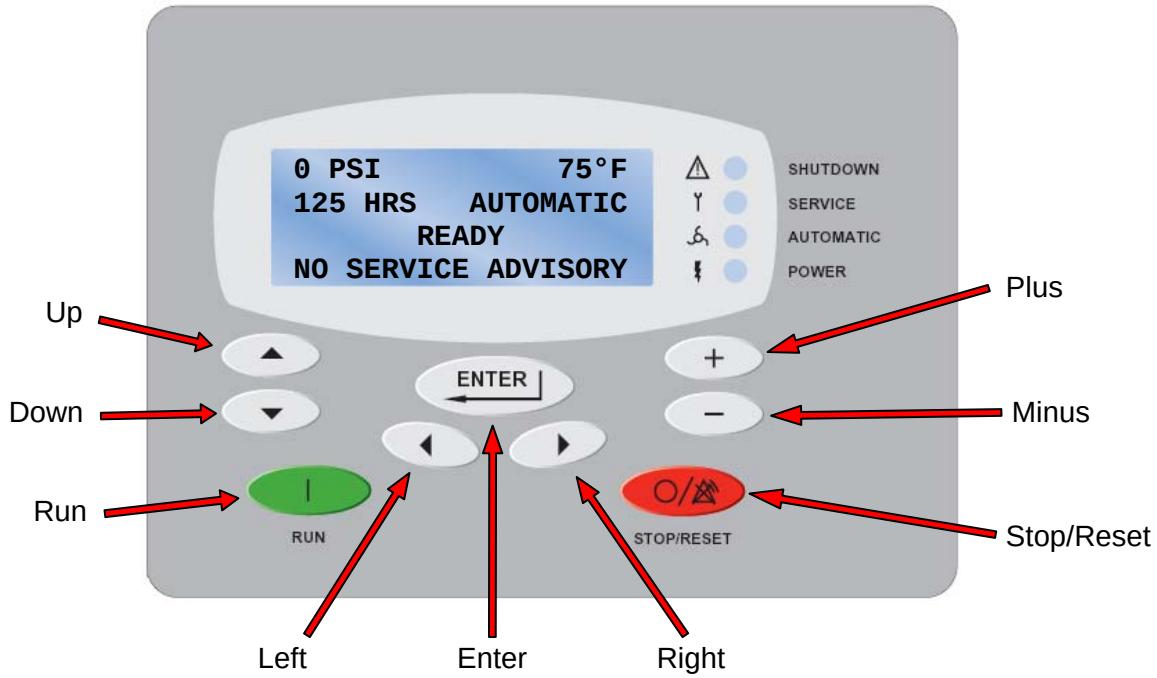
3. **Automatic LED Indicator (green)**

   The Automatic LED indicates that the compressor capable of starting automatically.

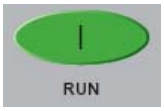
4. **Power LED Indicator (white)**

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

2.4 Control Panel Button Functions



1. **RUN Button**



The RUN button is used to start the compressor.

2. **STOP/RESET Button**

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

3. **ENTER Button**

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

4. **Left Arrow Button**

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

5. **Right Arrow Button**

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

6. **Up Arrow Button**

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

7. **Down Arrow Button**

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

8. **Plus Button**

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

9. **Minus Button**

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

3 Quick Start Guide

Operation of the AirSmart controller is easy. Simply select a Target Pressure and then press the Run 

button to start the compressor, no other settings are required. The Target Pressure comes preset to 100 PSI from the factory. The Unload Pressure is preset to 110 PSI. If a different pressure setting is desired, the following steps can be used as a guide.

3.1 Setting the Target Pressure

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

button. The front panel display should read “READY” on line 3.

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

Next, press the Enter 

button to access the Adjustment Menu tree

```
   ADJUSTMENT MENU
OPERATION ADJUSTMENT

  (SELECT SUB MENU)
```

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

again to access that sub-menu

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

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

```
OPERATION ADJUSTMENT
  TARGET PRESSURE
      100 PSI
 (SELECT PARAMETER)
```

To change the Target Pressure, press the Enter button to edit the value.

```
OPERATION ADJUSTMENT
  TARGET PRESSURE
      100 PSI
  (EDIT PARAMETER)
```

A flashing cursor will appear covering the least significant digit in the Target Pressure value, use the Plus and Minus buttons to change its value. Use the Right and Left buttons to move the cursor to other digits in the Target Pressure value. When the desired Target Pressure value is displayed, press the Enter button to save the new value. Pressing the Stop/Reset button will abort the change and restore the previous value.

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

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

To permanently save the changes that were made, press the Enter button. If the Stop/Reset button is pressed, the parameter changes will be lost the next time the compressor power is turned off.

3.2 Setting the Load and Unload Pressure

After setting the Target Pressure, set the Unload and Load Pressures values in a similar fashion. The Unload pressure is the third item in the Operation Adjustment sub-menu so press the Down button to navigate to the Unload Pressure setting. The Unload Pressure will control at which pressure the compressor unload and stops.

```
OPERATION ADJUSTMENT
  UNLOAD PRESSURE
      110 PSI
  (SELECT PARAMETER)
```

The Load pressure is the fourth item in the Operation Adjustment sub-menu so press the Down button to navigate to the Load Pressure setting. The Load Pressure will control at which pressure the compressor will startup again after unloading.

```
OPERATION ADJUSTMENT
  LOAD PRESSURE
      100 PSI
  (SELECT PARAMETER)
```

4 Air Compressor Control

The AirSmart Controller has been successfully implemented in a wide variety of compressor types within the Gardner 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 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 with the optional communications module that are run in Sequence mode of operation. The error value is fed into a PID (Proportional, Integral and Derivative) algorithm in the AirSmart 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 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 the 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 Controller at which 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, that is, PLANT PRESSURE is compared to TARGET PRESSUE. 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 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 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 Controller will begin to close the inlet valve to further decrease the air flow after PLANT PRESSURE has risen to 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 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. The Integra compressor series offered by Gardner Denver are representative of this type of machine. In a simple fixed speed compressor, the TARGET PRESSURE setting in the AirSmart 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 receiver or SYSTEM PRESSURE signal on units with the optional communications module that are run in Sequence mode of operation.

5 AirSmart Controller Menus

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

5.1 Operational Menus

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

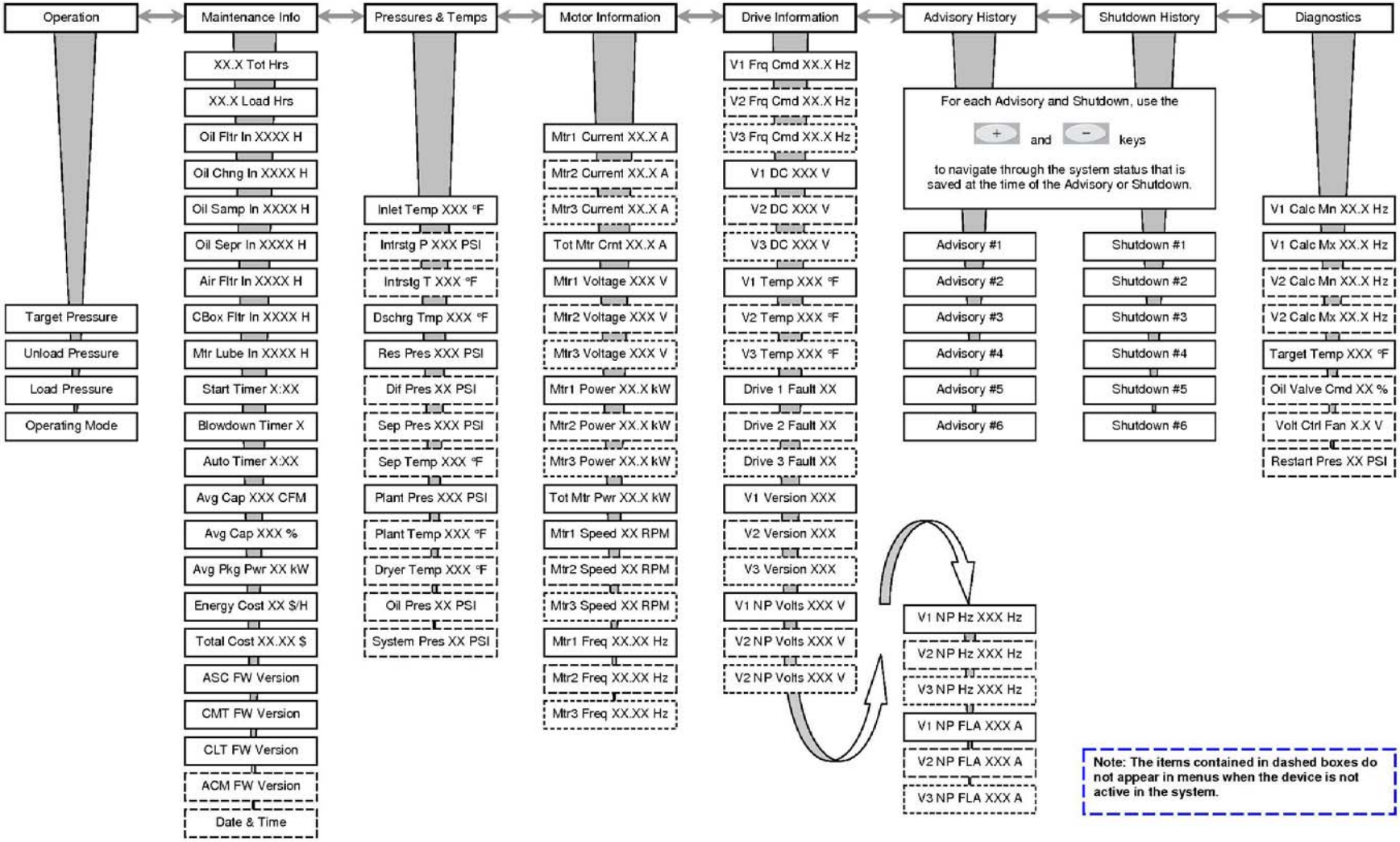
It is not necessary to navigate back to the top of a particular menu in order to enter another menu. Simply press the Right  or Left  buttons to go back to the heading of the current menu and then use the Right or Left buttons again to find the desired menu heading as described above.

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

AirSmart Controller Operational Menus (Compressor Application)

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

Use the ▲ ▼ keys to navigate through the vertical menu items.



4.1.1 Operation Menu

The Operation Menu gives the user the ability to change the pressure set points and the operating mode while the compressor is running or stopped. While in the Operation menu, small incremental changes can be made to the parameter values using the Plus + and Minus − buttons. When changing parameters, the "**=**" character will change to "**->**" to show that the value has been changed. Pressing the Enter ENTER button will apply the change.

```
0 PSI          75°F
125 HRS   AUTOMATIC
       READY
     OPERATION
```

1. Target Pressure

The first item in the Operation menu is the Target Pressure. This value is the pressure set point of the compressor. When the Target Pressure is changed, the Unload Pressure and the Load Pressure values are also changed by the same amount as the Target Pressure. If this action is not desired, the Unload and Load Pressure values may be changed individually. The Target Pressure can also be changed inside the Operation Adjustment menu.

```
0 PSI          75°F
125 HRS   AUTOMATIC
       READY
 TARGT PRES=100PSI
```

Min Value: Min Target Pressure in Unit Setup Adjustment menu
Max Value: 181 PSI (12.5 bar)
Default Value: 100 PSI (7 bar)

2. Unload Pressure

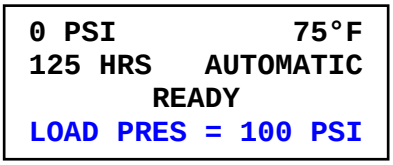
The next item in the Operation menu is the Unload Pressure. This pressure value is where the compressor will unload and begin the unload/stop sequence. The Unload Pressure value cannot be set any lower than [Target Pressure + 5 PSI].

```
0 PSI          75°F
125 HRS   AUTOMATIC
       READY
UNLOD PRES = 110 PSI
```

Min Value: Target Pressure + 5 PSI (0.3 bar)
Max Value: 185 PSI (12.8 bar)
Default Value: 110 PSI (7.5 bar)

3. Load Pressure

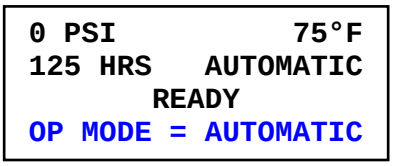
The next item in the Operation menu is the Load Pressure. This pressure value is where the compressor will load again after an unload/stop sequence. The Load Pressure value cannot be set any higher than Target Pressure.



Min Value: 30 PSI (2 bar)
Max Value: Target Pressure
Default Value: 100 PSI (7 bar)

4. Operating Mode

The next item in the Operation menu is the Operating Mode. The controller can be set to one of four operational modes; Automatic, Sequence, Low Demand and Constant.



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.

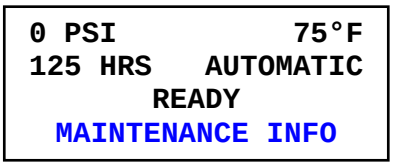
SEQUENCE: The compressor is part of a sequenced group of machines. Refer to Gardner Denver document 13-17-604 for further details about sequencing with the AirSmart Controller.

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.

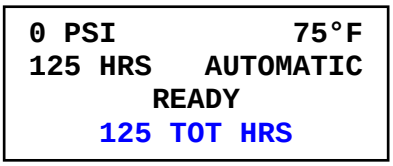
4.1.2 Maintenance Info Menu

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



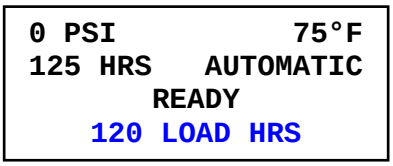
1. Total Hours

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



2. Loaded Hours

The next item in the Maintenance Info menu is the number of hours the compressor has been loaded.

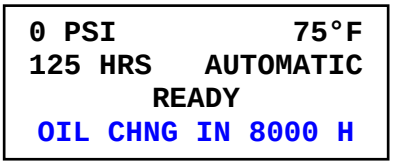


3. Time To Next Oil Filter Change

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

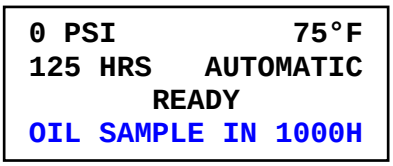
4. Time To Next Oil Change

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



5. Time To Next Oil Sample

The next item in the Maintenance Info menu is the number of hours before the next oil sample should be taken. The Oil Sample Interval Timer can be reset under the Maintenance Adjust menu. The Oil Sample Interval Time can be changed under the Unit Setup Adjust menu.



6. Time To Next Separator Element Change

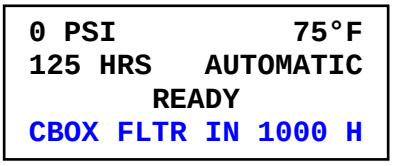
The next item in the Maintenance Info menu is the number of hours before the next separator element change is needed. The Separator Element Change Interval Timer can be reset under the Maintenance Adjust menu. The Separator Element Change Interval Time can be changed under the Unit Setup Adjust menu.

7. Time To Next Air Filter Change

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

8. Time To Control Box Filter Change

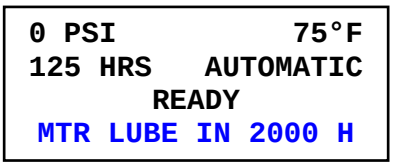
The next item in the Maintenance Info menu is the number of hours before the next control box filter change is needed. The Control Box Filter Change Interval Timer can be reset under the Maintenance Adjust menu. The Control Box Filter Change Interval Time can be changed under the Unit Setup Adjust menu.



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

9. Time To Next Motor Lubrication

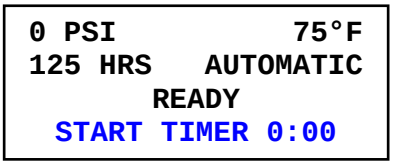
The next item in the Maintenance Info menu is the number of hours before motor lubrication is needed. The Motor Lubrication Interval Timer can be reset under the Maintenance Adjust menu. The Motor Lubrication Interval Time can be changed under the Unit Setup Adjust menu.



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

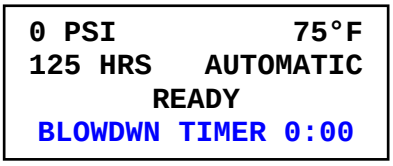
10. Start Timer

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



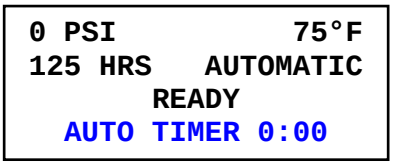
11. Blowdown Timer

The next item in the Maintenance Info menu is the current value of the Blowdown Timer. The Blowdown Timer is used to control the amount of time the compressor will run unloaded before starting the blowdown process. The Blowdown Timer Interval is set under the Operation Adjust menu in the Adjustment menu tree.



12. Auto Timer

The next item in the Maintenance Info menu is the current value of the Auto Timer. The Auto Timer is used to control the amount of time the compressor will run during the blowdown process. The Auto Timer interval is set under the Operation Adjust menu in the Adjustment Menu tree.



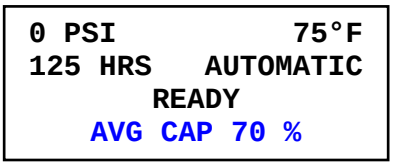
13. Average Capacity

The next item in the Maintenance Info menu shows the Average Capacity of the compressor based on a moving window average function which samples the compressor speed every five minutes and calculates the capacity using the last twelve samples (1 hour of data).

- **Note: This parameter is only available in variable speed compressor packages.**

14. Average Percent Capacity

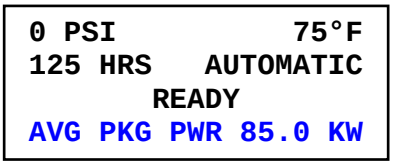
The next item in the Maintenance Info menu shows the Average Percent of Full Capacity of the compressor based on a moving window average function which samples the compressor speed every five minutes and calculates the average percent capacity using the last twelve samples (1 hour of data).



- **Note: This parameter is only available in variable speed compressor packages.**

15. Average Package Power

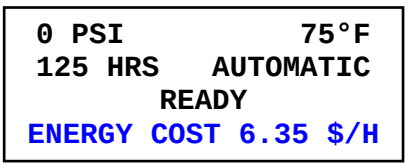
The next item in the Maintenance Info menu shows the Average Package Power of the compressor based on a moving window average function which samples the drive power output every five minutes and calculates the average power using the last twelve samples (1 hour of data).



- **Note: This parameter is only available in variable speed compressor packages.**

16. Current Energy Cost

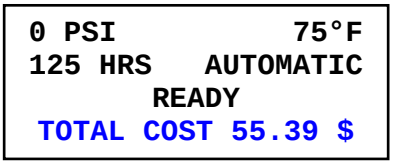
The next item in the Maintenance Info menu shows the cost of operating the compressor at the current power level. This number is based on the current package power output and the Energy Cost value that is entered under the Configuration Adjust menu.



- **Note: This parameter is only available in variable speed compressor packages.**

17. Cumulative Energy Cost

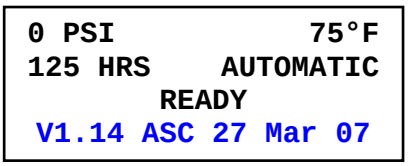
The next item in the Maintenance Info menu is the Cumulative Energy Cost of operating the compressor. This value is based on Average Package Power and the Energy Cost value under the Configuration Adjust menu. The user may reset the cumulative energy cost value under the Maintenance Adjust menu.

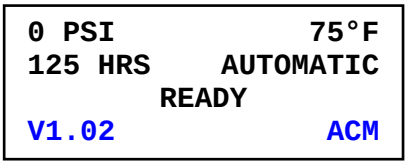


- **Note: This parameter is only available in variable speed compressor packages.**

18. Firmware Version

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

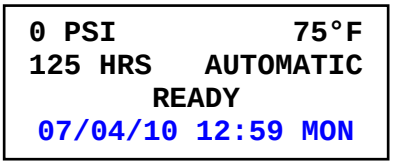




- **Note: This parameter is only available when Communications Module is installed.**

19. Time and Date

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



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

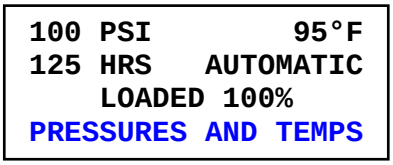
The date & time format reads as follows:

YY/MM/DD HH:MM DOW

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

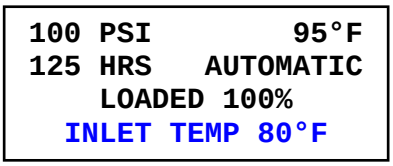
4.1.3 Pressures and Temps Menu

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



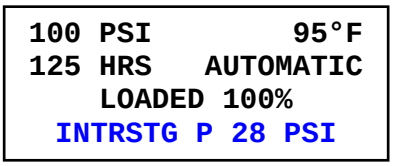
1. Inlet Temperature

The first item in the Pressures and Temps menu is the Inlet Temperature, which reflects the current ambient temperature outside the compressor package.



2. Interstage Pressure

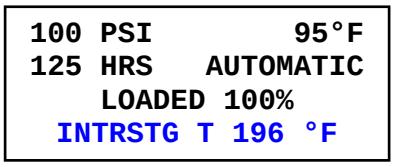
The next item in the Pressures and Temps menu is the Interstage Pressure, which reflects the current air pressure inside the interstage pipe of a two-stage compressor package.



- **Note: This parameter is only available in two-stage compressor packages.**

3. Interstage Temperature

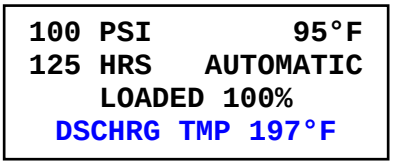
The next item in the Pressures and Temps menu is the Interstage Temperature, which reflects the current temperature inside the interstage pipe of a two-stage compressor package.



- **Note: This parameter is only available in two-stage compressor packages.**

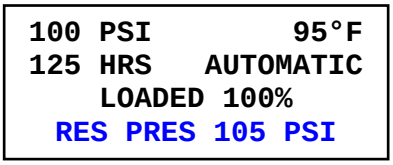
4. Discharge Temperature

The next item in the Pressures and Temps menu is the Discharge Temperature, which reflects the current temperature at the discharge of the airend but before the air-oil separator. The Discharge Temperature value is seen in the first line of the display if there is no Plant Temperature sensor in the system.



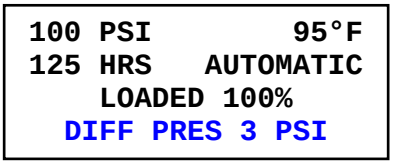
5. Reservoir Pressure

The next item in the Pressures and Temps menu is the Reservoir Pressure, which reflects the current air pressure at the “wet side” of the air-oil separator.



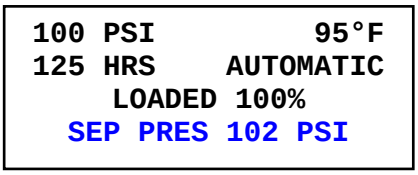
6. Differential Pressure

The next item in the Pressures and Temps menu is the Differential Pressure, which reflects the current air pressure differential across the air-oil separator. Differential Pressure is calculated as [Reservoir Pressure – Separator Pressure] when the compressor package contains s Separator Pressure transducer. Differential Pressure is calculated as [Reservoir Pressure – (Plant Pressure + Aftercooler Offset)] in systems that do not have a Separator Pressure transducer. The Aftercooler Offset is a fixed value that represents the pressure drop across the aftercooler.



7. Separator Pressure

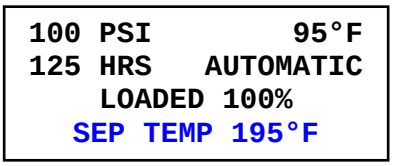
The next item in the Pressures and Temps menu is the Separator Pressure, which reflects the current air pressure at the “dry side” of the air-oil separator.



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

8. Separator Temperature

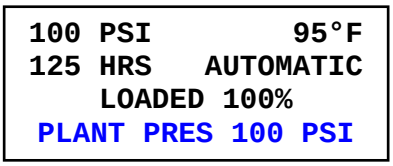
The next item in the Pressures and Temps menu is the Separator Temperature, which reflects the current temperature at the “dry side” of the air-oil separator.



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

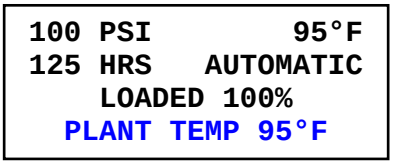
9. Plant Pressure

The next item in the Pressures and Temps menu is the Plant Pressure, which reflects the current air pressure at the package discharge port. The Plant Pressure value is also always seen in the first line of the display. The Plant Pressure value is used to control compressor modulation.



10. Plant Temperature

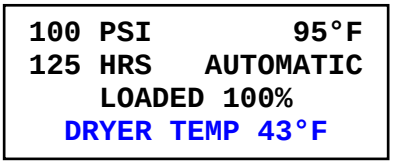
The next item in the Pressures and Temps menu is the Plant Temperature, which reflects the current temperature at the compressor package discharge port. The Plant Temperature value is also always seen in the first line of the display. The Discharge Temperature value is seen in the first line of the display if there is no Plant Temperature sensor in the system.



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

11. Dryer Temperature

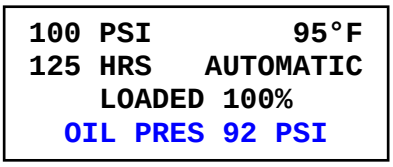
The next item in the Pressures and Temps menu is the Dryer Temperature, which reflects the current refrigerant temperature of the integrated dyer if present in the system.



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

12. Oil Pressure

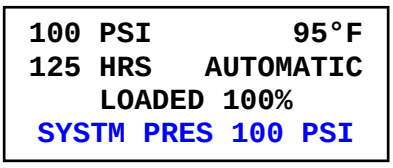
The next item in the Pressures and Temps menu is the Oil Pressure, which reflects the current oil pressure at the oil manifold, which is the main distribution point for the oil injection system.



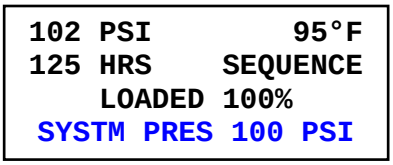
- **Note: This parameter is not available in all compressor packages.**

13. System Pressure

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

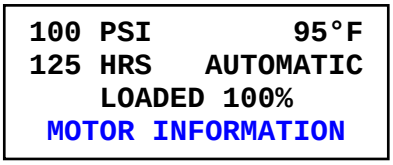


- **Note: This parameter is not available in all compressor packages.**



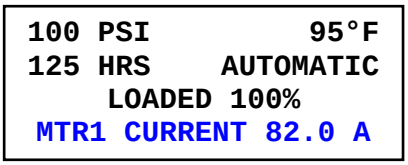
4.1.4 Motor Information Menu

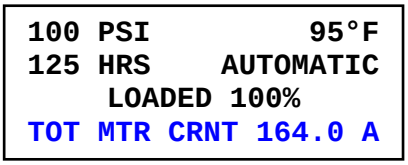
The Motor Information menu gives the user access to the current status of all the Variable Frequency Drive (VFD) controlled motors (up to three) that are installed in the compressor. The Motor Information menu is not visible if no VFDs are installed with the exception of Motor Current which is visible if the current sensor option is installed in a fixed speed compressor.



1. Motor Current

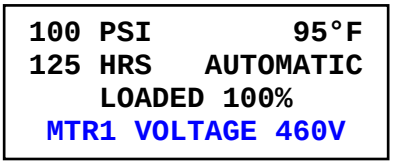
The first item(s) in the Motor Information menu is the Motor Current consumption value of each individual motor in the system followed by the total current consumption of all the motors. In the first display below, “MTR1” is followed by “MTR2” and “MTR3” depending on which motor is being observed.





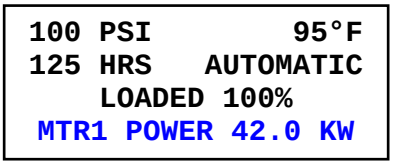
2. Motor Voltage

The next item(s) in the Motor Information menu is the AC Voltage level being delivered by the VFD to each individual motor in the system. In the display below, “MTR1” is followed by “MRT2” and “MTR3” depending on which motor is being observed.



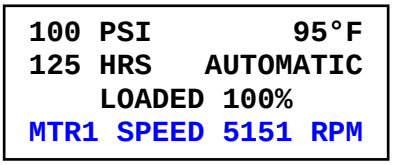
3. Motor Power

The next item(s) in the Motor Information menu is the Motor Power consumption value of each individual motor in the system followed by the total power consumption of all the motors. In the first display below, “MTR1” is followed by “MTR2” and “MTR3” depending on which motor is being observed.



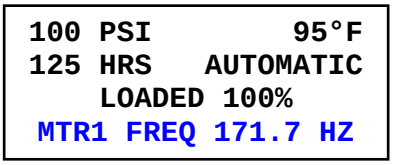
4. Motor Speed

The next item(s) in the Motor Information menu is the Motor Speed value of each individual motor in the system. In the display below, “MTR1” is followed by “MTR2” and “MTR3” depending on which motor is being observed.



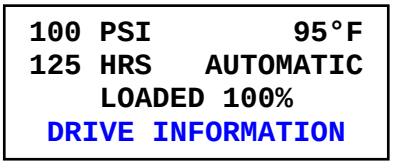
5. Motor Frequency

The next item(s) in the Motor Information menu is the Motor operating Frequency value of each individual motor in the system. In the display below, “MTR1” is followed by “MTR2” and “MTR3” depending on which motor is being observed.



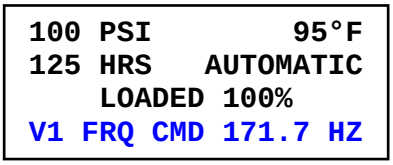
4.1.5 Drive Information Menu

The Drive Information menu gives the user access to the current status of all the Variable Frequency motor Drives (up to three) that are installed in the compressor. The Drive Information menu is not visible if no VFDs are installed.



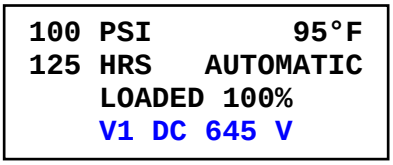
1. Commanded Motor Frequency

The first item(s) in the Drive Information menu is the Commanded Motor Frequency value of each individual drive in the system. This value indicates the speed at which each VFD has been commanded to run by the AirSmart controller. In the display below, “V1” is followed by “V2” and “V3” depending on which drive is being observed.



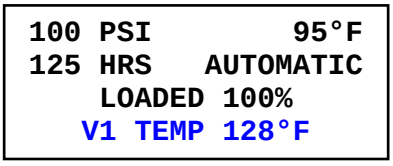
2. Drive DC Bus Voltage

The next item(s) in the Drive Information menu is the DC Bus Voltage value of each individual drive in the system. In the display below, “V1” is followed by “V2” and “V3” depending on which drive is being observed.



3. Drive Temperature

The next item(s) in the Drive Information menu is the VFD Heat Sink Temperature value of each individual drive in the system. In the display below, “V1” is followed by “V2” and “V3” depending on which drive is being observed.



4. Drive Fault

The next item(s) in the Drive Information menu is the fault value of each individual drive in the system. In the display below, “DRIVE1” is followed by “DRIVE2” and “DRIVE3” depending on which drive is being observed.

```
100 PSI        95°F
125 HRS   AUTOMATIC
    LOADED 100%
  DRIVE 1 FAULT 0
```

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

5. Firmware Version

The next item(s) in the Drive Information menu is the Firmware Version of each individual drive in the system. In the display below, “V1” is followed by “V2” and “V3” depending on which drive is being observed.

```
100 PSI        95°F
125 HRS   AUTOMATIC
    LOADED 100%
  V1 VERSION 5.01
```

6. Motor Nameplate Volts

The next item(s) in the Drive Information menu is the Motor Nameplate Volts value of each individual motor in the system. In the display below, “V1” is followed by “V2” and “V3” depending on which drive is being observed.

```
100 PSI        95°F
125 HRS   AUTOMATIC
    LOADED 100%
 V1 NP VOLTS 460 V
```

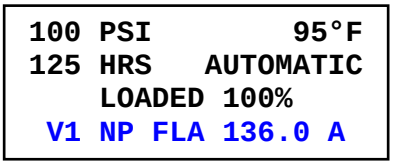
7. Motor Nameplate Frequency

The next item(s) in the Drive Information menu is the Motor Nameplate Frequency value of each individual motor in the system. In the display below, “V1” is followed by “V2” and “V3” depending on which drive is being observed.

```
100 PSI        95°F
125 HRS   AUTOMATIC
    LOADED 100%
  V1 NP HZ 126 HZ
```

8. Motor Nameplate Full Load Amps

The next item(s) in the Drive Information menu is the Motor Nameplate Full Load Amps (FLA) value of each individual motor in the system. In the display below, “V1” is followed by “V2” and “V3” depending on which drive is being observed.



4.1.6 Advisory History Menu

The Advisory History menu gives the user immediate access to the system status during the last six advisory faults in the compressor.

```
0 PSI          75°F
125 HRS   AUTOMATIC
       READY
  ADVISORY HISTORY
```

1. Advisory #1 through #6

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

```
0 PSI          75°F
125 HRS   AUTOMATIC
       READY
1 = HIGH DISCH TEMP
```

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

```
0 PSI          75°F
125 HRS   AUTOMATIC
       READY
  NO MORE HISTORY
```

2. System Status

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

```
0 PSI          75°F
125 HRS   AUTOMATIC
       READY
    ADVISORY # 3
```

3. System Status List

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

- Advisory/Shutdown count since last EEPROM reset
- Total machine hours
- Date and time*
- Inlet temperature
- Interstage pressure*
- Interstage temperature*
- Discharge temperature
- Reservoir pressure
- Separator pressure*
- Separator temperature*
- Plant pressure
- Plant temperature*
- Most recent Drive 1 fault value*
- Motor 1 frequency*
- Motor 1 speed*
- Motor 1 current*
- Drive 1 temperature*
- Drive 1 DC bus voltage*
- Most recent Drive 2 fault value*
- Motor 2 frequency*
- Motor 2 speed*
- Motor 2 current*
- Drive 2 temperature*
- Drive 2 DC bus voltage*

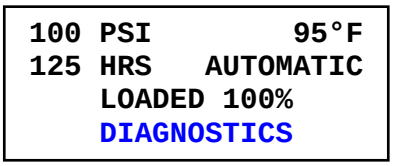
Note: * Appears only if parameter is available in compressor package

4.1.7 Shutdown History Menu

The Shutdown History menu gives the user immediate access to the system status during the last six shutdown faults in the compressor. Navigating through the system status information in the Shutdown History menu is identical to navigating through the Advisory History menu.

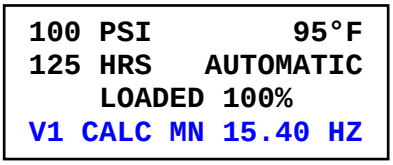
4.1.8 Diagnostics Menu

The Diagnostics menu gives the user access the current value of a number of calculated parameters that are used in controlling the compressor.



1. Drive Calculated Frequency Limits

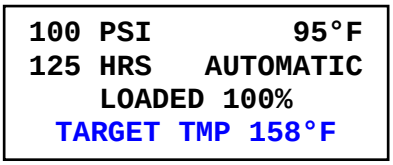
The first two or four items in the Diagnostics menu are the Calculated VFD Frequency Limits for each main motor drive in the system. These values indicate the minimum and maximum speed at which each VFD can be commanded to run by the AirSmart Controller. In the display below, "V1 CALC MN" is followed by "V1 CALC MX", "V2 CALC MN" and "V2 CALC MX" depending on which drive is being observed and is present in the system.



- **Note: These parameters are only available in variable speed compressor packages.**

2. Target Temperature

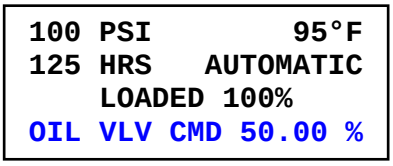
The next item in the Diagnostics menu is the Target Discharge Temperature that is being calculated by the oil flow algorithm. The discharge temperature of the compressor is automatically kept greater than the displayed value to avoid water condensation inside the compressor.



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

3. Oil Valve Command

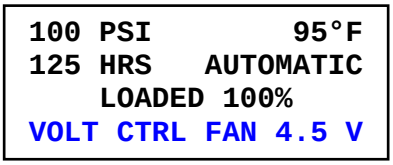
The next item in the Diagnostics menu shows the current position of the Precision Oil Mixing Valve. A value of 50% indicates that equal amounts of oil are flowing through the oil cooler and the oil cooler bypass line. A value is less than 50% indicates that more oil is being routed to the oil cooler while a value greater than 50% indicates that more oil is bypassing the oil cooler.



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

4. Fan Control Voltage

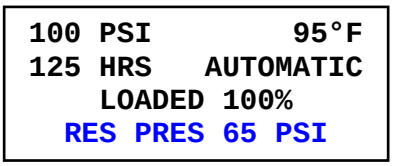
The next item in the Diagnostics menu shows the current value of the Fan Control Voltage for machines with voltage controlled variable speed cooler fans. The voltage value will increase with increasing compressor output power.



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

5. Restart Pressure

The next item in the Diagnostics menu shows the current value of the Restart Pressure setting which reflects the maximum pressure allowed in the oil reservoir before the compressor can start or restart.



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

5.2 Adjustment Menus

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

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

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

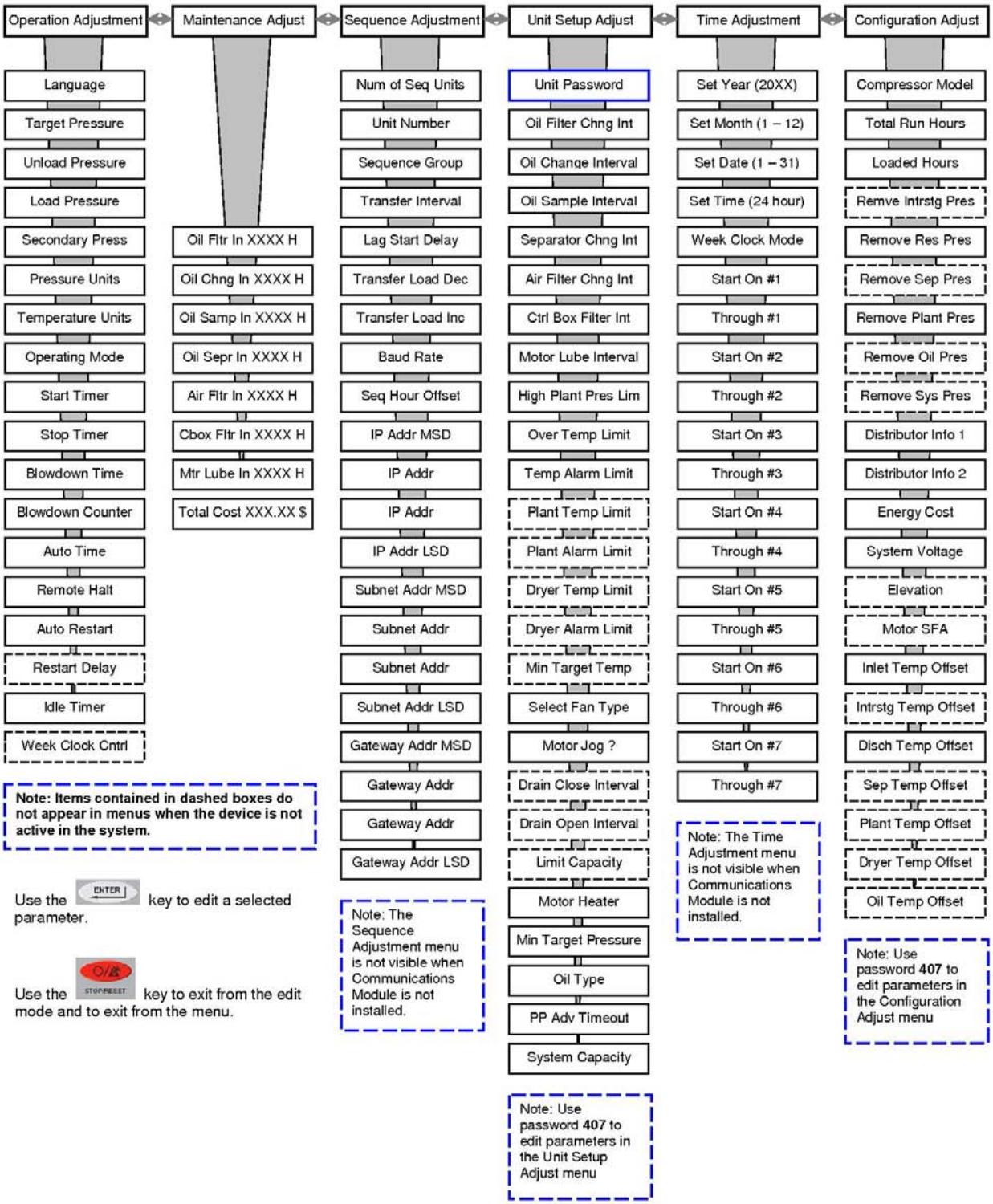
```
STORE MODIFIED
PARAMETERS?
 STOP = NO
ENTER = YES
```

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

AirSmart Controller Adjustment Menus (Compressor Application)

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

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



4.2.1 Operation Adjustment Menu

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

```
ADJUSTMENT MENU
OPERATION ADJUSTMENT

(SELECT SUB MENU)
```

1. Language

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

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

2. Target Pressure

The next item in the Operation Adjustment menu is the Target Pressure. This value is the pressure set point of the compressor. The Target Pressure parameter is ignored in fixed speed compressors.

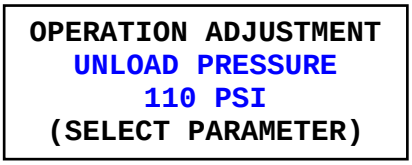
```
OPERATION ADJUSTMENT
TARGET PRESSURE
100 PSI
(SELECT PARAMETER)
```

Min Value: Min Target Pressure in Unit Setup Adjust menu
Max Value: 181 PSI (12.5 bar)
Default Value: 100 PSI (7 bar)

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

3. Unload Pressure

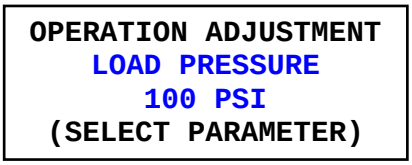
The next item in the Operation Adjustment menu is the Unload Pressure. This pressure value is where the compressor will unload and begin the unload/stop sequence. The Unload Pressure value cannot be set any lower than [Target Pressure + 5 PSI]. If the Target Pressure setting is changed, the Unload Pressure setting will be automatically changed by the same amount as the Target Pressure setting.



Min Value: Target Pressure + 5 PSI (0.3 bar)
Max Value: 185 PSI (12.8 bar)
Default Value: 110 PSI (7.5 bar)

4. Load Pressure

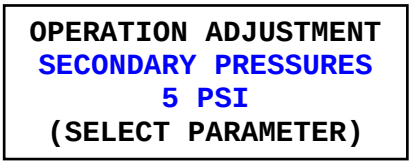
The next item in the Operation Adjustment menu is the Load Pressure. This pressure value is where the compressor will load again after an unload/stop sequence. The Load Pressure value cannot be set any higher than Target Pressure. If the Target Pressure setting is changed, the Load Pressure setting will be automatically changed by the same amount as the Target Pressure setting.



Min Value: 30 PSI (2 bar)
Max Value: Target Pressure
Default Value: 100 PSI (7 bar)

5. Secondary Pressures

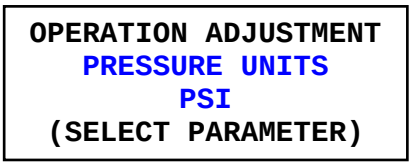
The next item in the Operation Adjustment menu is the Secondary Pressures. This parameter is used to add a positive or negative offset to the Target, Load and Unload Pressure set points when a digital input programmed to the Secondary Pressures function becomes active. The Target, Load and Unload set points are still subject to system limits when the Secondary Pressures feature is used. Secondary Pressures can also be triggered using the timer function of the optional Communications Module when installed.



Min Value: -60 PSI (-4 bar)
Max Value: 30 PSI (2 Bar)
Default Value: 0 PSI

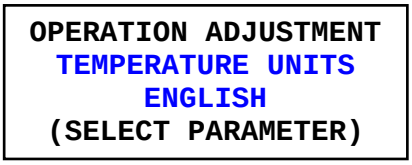
6. Pressure Units

The next item in the Operation Adjustment menu is the Pressure Units, which will determine how all pressure values will be displayed on the control panel. Pressure can be displayed in pounds per square inch (PSI), Bar (BAR), kilopascals (KPA) or kilograms per square centimeter (KGC).



7. Temperature Units

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



8. Operating Mode

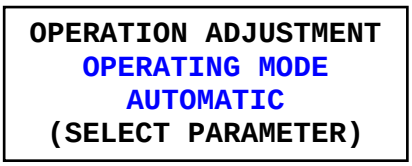
The next item in the Operation Adjustment menu is the operating mode. The controller can be set to one of four operational modes.

AUTOMATIC: (Default mode) the 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.

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

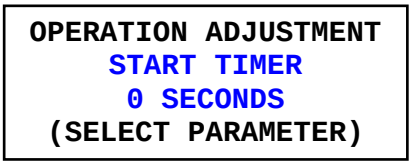
LOW DEMAND: The compressor uses its internal modulation algorithms but motor(s) will NOT stop after it goes through the timed unload/blowdown sequence. The Blowdown Timer is used, however, the Auto Timer is ignored in Low Demand mode.

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.



9. Start Timer

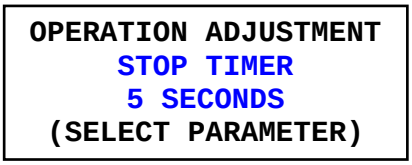
The next item in the Operation Adjustment menu is the Start Timer. The Start Timer is used to extend how long the compressor will run in the "Pause" state before it is allowed to start modulating.



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

10. Stop Timer

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

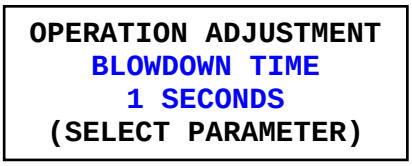


Min Value: 0 seconds
Max Value: 120 seconds
Default Value: 5 seconds

11. Blowdown Timer

The next item in the Operation Adjustment 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 Modulation state.

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

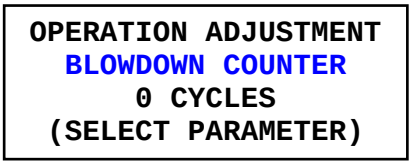


Min Value: 1 second
Max Value: 1200 seconds
Default Value: 1 second (variable speed units), 600 seconds (fixed speed units)

12. Blowdown Counter

The next item in the Operation Adjust 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 Modulation State from either the Unload or Blowdown State.

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

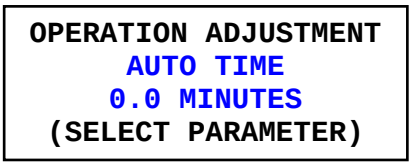


Min Value: 0 cycles
Max Value: 10 cycles
Default Value: 0 cycles (variable speed units), 5 cycles (fixed speed units)

13. Auto Timer

The next item in the Operation Adjustment menu is the Auto Timer. The Auto Timer is used to control the amount of time the compressor will run during the blowdown process. When the Auto Timer expires, the compressor will stop provided the Operation Mode is set to Automatic. The Auto Timer is reset to the programmed value when the compressor is in the Modulation state.

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



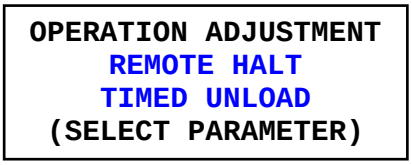
Min Value: 0.0 minutes
Max Value: 20.0 minutes
Default Value: 0.0 minutes (variable speed units), 10.0 minutes (fixed speed units)

14. Remote Halt

The next item in the Operation Adjustment menu is the Remote Halt function, which controls how the compressor will stop if a Remote Halt signal is detected on one of the controller's digital inputs. 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.



15. Auto Restart

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

OPERATION ADJUSTMENT
AUTO RESTART
ON
(SELECT PARAMETER)

Default Value: OFF

Automatic restarting of the compressor can cause injury or death

16. Restart Delay

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

OPERATION ADJUSTMENT
RESTART DELAY
10 SECONDS
(SELECT PARAMETER)

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

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

17. Idle Timer

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

```
OPERATION ADJUSTMENT
     IDLE TIMER
    90.0 MINUTES
 (SELECT PARAMETER)
```

Min Value: 0.0 minutes (feature is disabled when set to 0)
Max Value: 120.0 minutes
Default Value: 90.0 minutes (variable speed units), 0.1 minutes (fixed speed units)

18. Week Clock Control

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

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

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

Default Value: OFF

Automatic starting of the compressor can cause injury or death

4.2.2 Maintenance Adjust Menu

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

```
ADJUSTMENT MENU
MAINTENANCE ADJUST

(SELECT SUB MENU)
```

1. Maintenance Timers

The six timers under the Maintenance Adjust menu are:

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

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

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

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

Pressing the Enter 

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

button will abort the timer reset.

```
MAINTENANCE ADJUST
   OIL CHNG IN
    8000 HRS
(ACCEPT OR REJECT)
```

2. Total Cost

The next item in the Maintenance Adjust menu after the maintenance timers is the total operating cost reset screen. The value is reset to 0 by pressing the Enter 

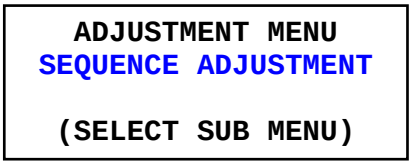
button twice.

```
MAINTENANCE ADJUST
   TOTAL COST
    55.383 $
(SELECT PARAMETER)
```

- **Note: This parameter is not visible in packages without a Variable Frequency Drive (VFD) installed.**

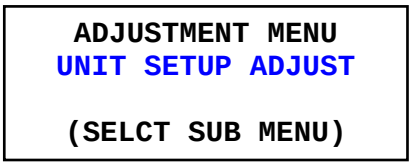
4.2.3 Sequence Adjustment Menu

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



4.2.4 Unit Setup Adjust Menu

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

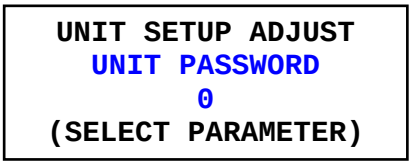


1. Unit Password

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

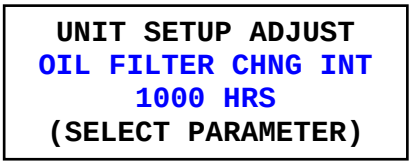
The Following passwords unlock the listed menus for visibility and editing:

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



2. Oil Filter Change Interval

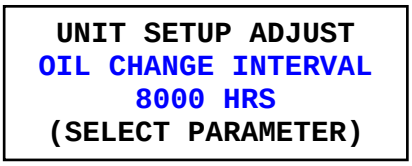
The next item in the Unit Setup Adjust menu is the Oil Filter Change Interval. This value sets the default oil filter change countdown timer value that gets set under the Maintenance Adjust menu. Setting this parameter to zero will disable the timer and its associated alarms.



Min Value: 100 hours
Max Value: 4000 hours
Default Value: 1000 hours

3. Oil Change Interval

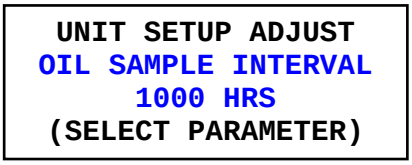
The next item in the Unit Setup Adjust menu is the Oil Change Interval. This value sets the default oil change countdown timer value that gets set under the Maintenance Adjust menu. Setting this parameter to zero will disable the timer and its associated alarms.



Min Value: 1000 hours
Max Value: 12000 hours
Default Value: 8000 hours

4. Oil Sample Interval

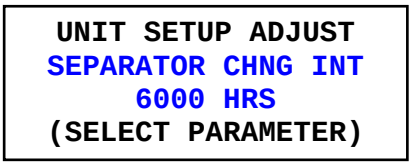
The next item in the Unit Setup Adjust menu is the Oil Sample Interval. This value sets the default oil sample countdown timer value that gets set under the Maintenance Adjust menu. Setting this parameter to zero will disable the timer and its associated alarms.



Min Value: 100 hours
Max Value: 4000 hours
Default Value: 1000 hours

5. Separator Element Change Interval

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



Min Value: 1000 hours
Max Value: 9000 hours
Default Value: 6000 hours

6. Air Filter Change Interval

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

Min Value: 100 hours
Max Value: 4000 hours
Default Value: 3000 hours

7. Control Box Filter Change Interval

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

Min Value: 100 hours
Max Value: 4000 hours
Default Value: 1000 hours (variable speed units), 0 (fixed speed units)

8. Motor Lubrication Interval

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

```
UNIT SETUP ADJUST
MOTOR LUBE INTERVAL
     8000 HRS
(SELECT PARAMETER)
```

Min Value: 500 hours
Max Value: 10000 hours
Default Value: 8000 hours (variable speed units), 0 (fixed speed units)

9. High Plant Pressure Limit

The next item in the Unit Setup Adjust menu is the High Plant Pressure Limit. This value sets the maximum internal pressure limit where the compressor will shut down.

```
UNIT SETUP ADJUST
HIGH PLANT PRES LIM
     190 PSI
(SELECT PARAMETER)
```

Min Value: 70 PSI (4.8 bar)
Max Value: 200 PSI (13.8 bar)
Default Value: 190 PSI (13 bar)

Operation of the compressor with improper High Plant Pressure Limit setting can cause personal injury or damage to equipment. Do not adjust the High Plant Pressure Limit above the level of the pressure relief valve or 200 PSI (13.8 bar).

10. Over Temperature Shutdown Limit

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

```
UNIT SETUP ADJUST
OVER TEMP LIMIT
240°F
(SELECT PARAMETER)
```

Min Value: 175°F (79°C)
Max Value: 240°F (115°C)
Default Value: 240°F (115°C) for variable speed units, 225°F (107°C) for fixed speed units

Operation of the unit at excessive high temperatures can cause personal injury or damage to equipment. Do no adjust the Over Temperature Shutdown Limit above 240°F (115°C).

11. Temperature Alarm Limit

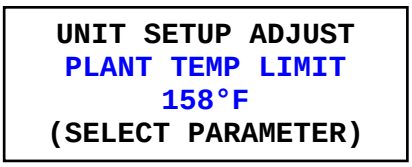
The next item in the Unit Setup Adjust menu is the Temperature Alarm Limit. This value sets the internal temperature limit at which the compressor will give and advisory alarm.

```
UNIT SETUP ADJUST
TEMP ALARM LIMIT
225°F
(SELECT PARAMETER)
```

Min Value: 175°F (79°C)
Max Value: 240°F (115°C)
Default Value: 225°F (107°C) for variable speed units, 210°F (99°C) for fixed speed units

12. Plant Temperature Shutdown Limit

The next item in the Unit Setup Adjust menu is the Plant Temperature Shutdown Limit. This value sets the maximum package discharge temperature limit where the compressor will shut down. This menu item is not visible if there is no plant temperature sensor installed in the system.

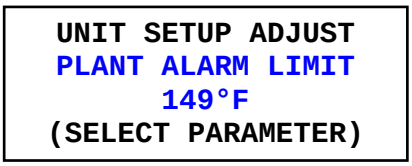


- **Note: This parameter is not visible in all compressor packages.**

Min Value: 122°F (50°C)
Max Value: 176°F (80°C)
Default Value: 158°F (70°C)

13. Plant Temperature Alarm Limit

The next item in the Unit Setup Adjust menu is the Plant Temperature Alarm Limit. This value sets the package discharge temperature limit at which the compressor will give and advisory alarm. This menu item is not visible if there is no plant temperature sensor installed in the system.

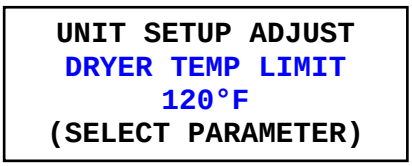


- **Note: This parameter is not visible in all compressor packages.**

Min Value: 104°F (40°C)
Max Value: 176°F (80°C)
Default Value: 149°F (65°C)

14. Dryer Temperature Shutdown Limit

The next item in the Unit Setup Adjust menu is the Dryer Temperature Shutdown Limit. This value sets the maximum dryer temperature limit where the compressor will shut down. This menu item is not visible if there is no integrated dryer installed in the system.

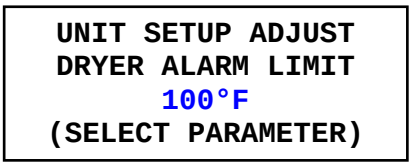


- **Note: This parameter is not visible in packages without an integrated dryer.**

Min Value: 50°F (10°C)
Max Value: 250°F (121°C)
Default Value: 120°F (49°C)

15. Dryer Temperature Alarm Limit

The next item in the Unit Setup Adjust menu is the Dryer Temperature Alarm Limit. This value sets the dryer temperature limit at which the compressor will give and advisory alarm. This menu item is not visible if there is no integrated dryer installed in the system.

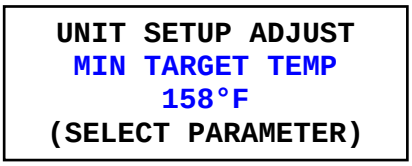


- **Note: This parameter is not visible in packages without an integrated dryer.**

Min Value: 50°F (10°C)
Max Value: 250°F (121°C)
Default Value: 100°F (38°C)

16. Minimum Target Temperature

The next item in the Unit Setup Adjust menu is the Minimum Target Temperature. This value sets the lower temperature limit of the oil temperature control system on compressor packages with a Precision Mixing Valve installed.



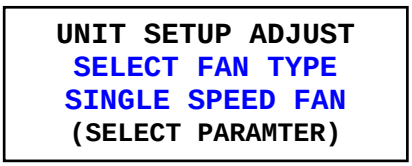
- **Note: This parameter is not visible in packages without a Precision Oil Mixing valve.**

Min Value: 158°F (70°C)
Max Value: 203°F (95°C)
Default Value: 158°F (70°C)

17. Select Fan Type

The next item in the Unit Setup Adjust menu is the Fan Type Selection, which alerts the controller as to which type of fan is being used with the air/oil cooler. Five different fan types are available.

SINGLE SPEED FAN: Air/oil cooler fan uses standard fixed speed motor.
TWO SPEED FAN: Air/oil cooler fan uses a dual winding motor.
VARIABLE SPEED FAN: Air/oil cooler uses a VFD to control fan speed based on the discharge temperature of the compressor.
WATER COOLED: Used if compressor is a water-cooled package.
VS FAN (V1 PWR): Air/oil cooler uses a VFD to control fan speed based on the output power from the main motor VFD.



18. Motor Jog

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

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

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

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

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

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

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

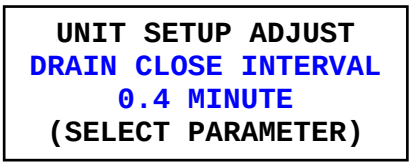
19. Drain Close/Open Intervals

The next two items in the Unit Setup Adjust menu are the Water Drain Close/Open Intervals, which are used to control a solenoid operated drain valve in a water separator unit, integrated dryer unit or oil scavenge system. The Drain Close Interval is variable and dependent upon the speed of the main motor using the following formula: Actual Drain Close Time = Drain Close Interval / (% of Full Speed / 100). For fixed speed compressors, % of full speed will always be 100%. See example calculation below.

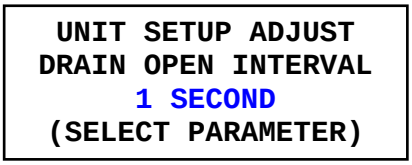
Note: Setting the Drain Open Interval to zero seconds will disable the water drain function.

Example Drain Close Interval Calculation:

Speed of main motor: 80%
Drain Close Interval setting: 0.4 minutes (24 seconds)
Actual Drain Close Time = 24 / (80 / 100) = 30 seconds



Min Value: 0.1 minute
Max Value: 30.0 minutes
Default Value: 0.4 min. (units with integrated dryer), 15.0 min. (units with oil scavenge)

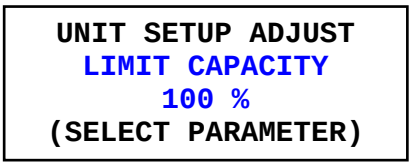


- **Note: These parameters are not visible in packages without a drain valve solenoid installed.**

Min Value: 0 seconds
Max Value: 10 seconds
Default Value: 1 second

20. Limit Capacity

The next item in the Unit Setup Adjust menu is the Capacity Limit value, which controls the maximum speed of a variable speed compressor.



- **Note: This parameter is not visible in packages without a Variable Frequency Drive (VFD) installed.**

Min Value: 50%
Max Value: 100%
Default Value: 100%

21. Motor Heater

The next item in the Unit Setup Adjust menu is the Motor Heater function. The Motor Heater provides a DC signal to warm the motor windings of the main motor(s) for starting in cold environments.

```
UNIT SETUP ADJUST
MOTOR HEATER
OFF
(SELECT PARAMETER)
```

- **Note: This parameter is not visible in packages without a Variable Frequency Drive (VFD) installed.**

Default Value: OFF

22. Minimum Target Pressure

The next item in the Unit Setup Adjust menu is the Minimum Target Pressure setting, which sets the lower limit for the Target Pressure parameter in the Operation Adjustment menu. This parameter should be set equal to or greater than the compressor's minimum pressure valve setting.

```
UNIT SETUP ADJUST
MIN TARGET PRESSURE
80 SI
(SELECT PARAMETER)
```

Min Value: 40 PSI (3 bar)
Max Value: 150 PSI (10 bar)
Default Value: Compressor model dependent

23. Oil Type

The next item in the Unit Setup Adjust 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.

```
UNIT SETUP ADJUST
OIL TYPE
HIGH TEMP
(SELECT PARAMETER)
```

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.

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)	

24. Plant Pressure Advisory Timeout

The next item in the Unit Setup Adjust menu is the Plant Pressure Advisory Timeout setting, which controls the length of time the Plant Pressure value may remain under the Target Pressure setting before generating an advisory fault.

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

```
UNIT SETUP ADJUST
PP ADV TIMEOUT
3.0 MINUTES
(SELECT PARAMETER)
```

Min Value: 0.0 minutes
Max Value: 30.0 minutes
Default Value: 3.0 minutes

25. System Capacity

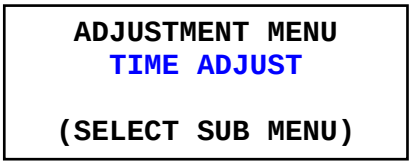
The last item in the Unit Setup Adjust menu is the System Capacity setting. This parameter is used by the lead machine in a sequencing group to determine running speeds and other sequencing related operations. Refer to Gardner Denver document 13-17-604 for operation of the compressor in Sequence Mode.

```
UNIT SETUP ADJUST
SYSTEM CAPACITY
436 CFM
(SELECT PARAMETER)
```

Min Value: 0 CFM
Max Value: 5000 CFM
Default Value: Compressor package dependant.

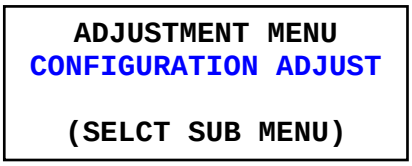
4.2.5 Time Adjustment Menu

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



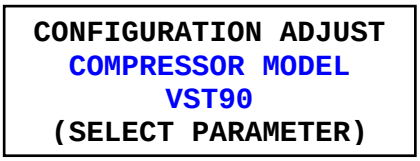
4.2.6 Configuration Adjust Menu

The Configuration Adjust menu also provides access to the parameters that control advanced operation of the compressor. The parameters in the Configuration Adjust menu are not visible unless the correct value has been entered into the Unit Password menu item in the Unit Setup Adjust menu.



1. Compressor Model

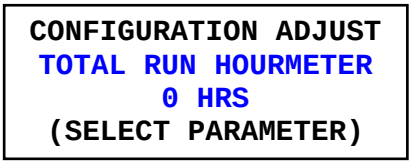
The first item in the Configuration Adjust menu is the Compressor Model selection. Up to 25 different compressor models are available from the Controller Model Table that is stored in the controller's memory. Selecting a compressor model from the Model Table will configure the controller for the chosen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



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

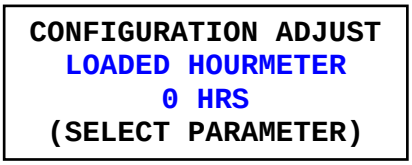
2. Total Run Hour Meter

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



3. Loaded Hour Meter

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



4. Pressure Transducer Zero Set

The next items in the Configuration Adjust menu are used for setting the zero point of the pressure transducers in the compressor. The following is a list of possible pressure transducers. Not all compressor models will have all six transducers.

1. Interstage pressure transducer
2. Reservoir pressure transducer
3. Oil separator pressure transducer
4. Plant pressure (package discharge) transducer
5. Oil pressure transducer
6. System pressure transducer

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

button to select the zero pressure point. With zero pressure, the display should read 0.50 Volts +/- 0.05 Volts.

```
CONFIGURATION ADJUST
  REMOVE RES PRES
     0.51 VOLT
(SELECT PARAMETER)
```

Pressing the Enter 

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

button will abort the set point process.

```
CONFIGURATION ADJUST
  REMOVE RES PRES
     0.51 VOLT
(ACCEPT OR REJECT)
```

5. Distributor Information #1

The next item in the Configuration Adjust menu after the Pressure Transducer Zero Set is the first Distributor Information screen. This parameter is used to set up a contact name, which appears in the display when a service item such as an air filter or oil change is needed.

```
CONFIGURATION ADJUST
 DISTRIBUTOR INFO 1
   GARDNER DENVER
 (SELECT PARAMETER)
```

6. Distributor Information #2

The next item in the Configuration Adjust is the second Distributor Information screen. This parameter is used to set up a contact number, which appears in the display when a service item such as an air filter or oil change is needed.

```
CONFIGURATION ADJUST
 DISTRIBUTOR INFO 2
   (217) 222-5400
 (SELECT PARAMETER)
```

7. Energy Cost

The next item in the Configuration Adjust is the Energy Cost value. This parameter should be set equal to the cost of each kWH that appears in the power bill and is used to calculate the Energy Cost and Total Cost values under the Maintenance Info menu.

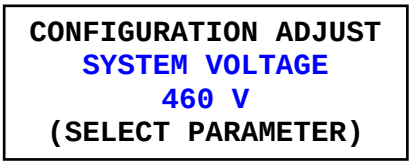
```
CONFIGURATION ADJUST
     ENERGY COST
     0.060 $/KWH
 (SELECT PARAMETER)
```

- **Note: This parameter is not visible in packages without a Variable Frequency Drive (VFD) installed.**

Min Value: 0.001
Max Value: 65.000

8. System Voltage

The next item in the Configuration Adjust is the System Voltage, which should be set to line voltage value connected to the compressor. This parameter controls the maximum speed limits used in variable speed compressor applications. Failure to set this parameter to the correct value may limit the maximum running speed of the unit.

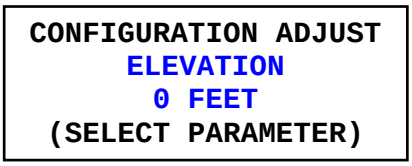


- **Note: This parameter is not visible in packages without a Variable Frequency Drive (VFD) installed.**

Min Value: 115 Volts
Max Value: 1000 Volts
Default Value: 460 Volts

9. Elevation

The next item in the Configuration Adjust is the elevation setting. This parameter 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).



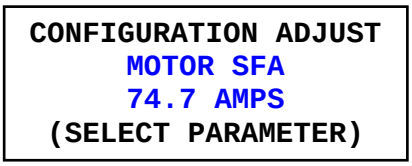
- **Note: This parameter is not visible in packages without a Variable Frequency Drive (VFD) installed.**

Min Value: 0 feet (0 meters)
Max Value: 30,000 feet (9144 meters)
Default Value: 0 feet (0 meters)

10. Motor SFA

The next item in the Configuration Adjust is the Motor SFA value. 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 installed, set this parameter to zero to disable current monitoring.

Note: The Motor SFA is used primarily in fixed speed compressor operations.



- **Note: This parameter is not visible in packages without a current transducer installed.**

Min Value: 0.0 Amps
Max Value: 1500.0 Amps
Default Value: Compressor package dependant.

11. Temperature Transducer Offsets

The next items in the Configuration Adjust menu are used for adding a fixed offset value to the temperature transducers in the compressor. The following is a list of possible temperature transducers. Not all compressor models will have all seven transducers.

1. Inlet temperature transducer
2. Interstage temperature transducer
3. Discharge temperature transducer
4. Separator temperature transducer
5. Plant temperature transducer
6. Dryer temperature transducer
7. Oil temperature transducer

Navigate to the appropriate temperature transducer offset and press the Enter 

button to select and edit the temperature offset value.

```
CONFIGURATION ADJUST
  INLET TEMP OFFSET
        0 °F
 (SELECT PARAMETER)
```

Min Value: -9 °
Max Value: 9 °

6 Error Management

The AirSmart Controller, developed by Gardner Denver, represents the most current development in air compressor control systems. The AirSmart Controller has the ability to control up to three variable speed motor drives, read more than ten analog inputs (with expansion board) 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 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 VS Limiters

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

1. Current Limiter

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

```
100 PSI        85°F
125 HRS   AUTOMATIC
  AMPS LIM SET nn%
NO SERVICE ADVISORY
```

2. VFD Heatsink Temperature Limiter

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

```
100 PSI        85°F
125 HRS   AUTOMATIC
DRV TMP LIM SET nn%
NO SERVICE ADVISORY
```

3. Ambient Temperature Limiter

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

```
100 PSI        85°F
125 HRS   AUTOMATIC
  AMB LIM SET nn%
NO SERVICE ADVISORY
```

4. Voltage Limiter

The fourth limiter function is the Voltage Limiter which becomes active if the incoming line voltage drops lower than the line System Voltage setting under the Configuration Adjust menu. When the Voltage Limiter is active, the display will read as shown below.

```
100 PSI        85°F
125 HRS   AUTOMATIC
    VOLT LIM nn%
NO SERVICE ADVISORY
```

5. Manual Limiter

The fifth limiter function is the Manual Limiter which becomes active if the Limit Capacity parameter under the Unit Setup Adjust menu is set lower than 100%. When the Manual Limiter is active, the display will read as shown below.

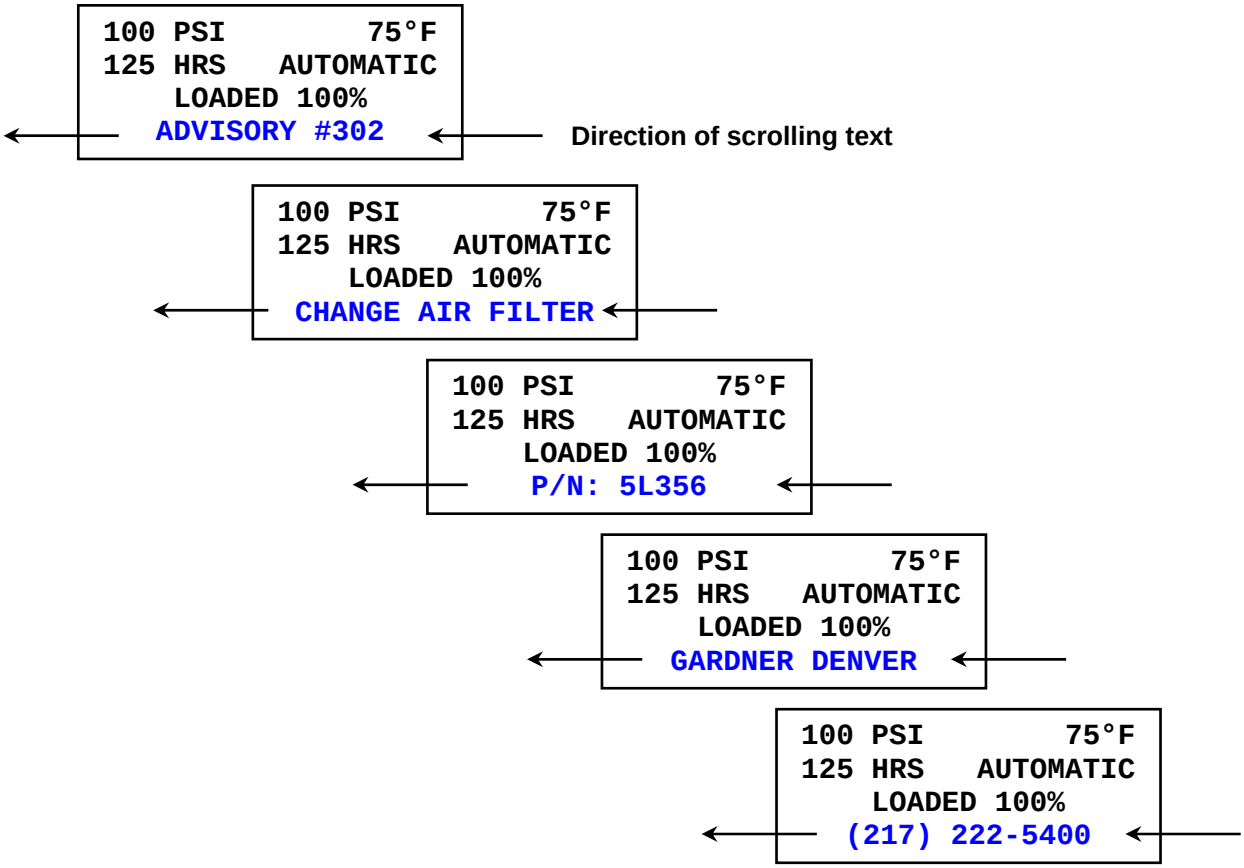
```
100 PSI        85°F
125 HRS   AUTOMATIC
    CAP LIM nn%
NO SERVICE ADVISORY
```

6.2 Advisory Faults

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

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

Advisory fault information is shown in the fourth line of the control panel display in a scrolling fashion. The advisory number is shown first followed by a short description of the fault. If the advisory indicates that service is necessary, the scrolling information will also include the Gardner Denver part number of the service item and contact information to obtain the service item.



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

Advisory	Advisory Text	Description	Action
#301	CHANGE SEPARATOR	Differential pressure > 8 PSIG	Change separator element
#302	CHANGE AIR FILTER	Vacuum switch after inlet air filter has tripped	Change air filter
#303	CHANGE AIR FILTER	Maintenance timer for air filter change has expired	Change air filter and reset timer
#304	CHANGE OIL FILTER	Maintenance timer for oil filter change has expired	Change oil filter and reset timer
#305	CHANGE OIL	Maintenance timer for oil change has expired	Change oil and reset timer
#306	LOW AMB TEMP A	Package discharge (Plant) temperature < 40°F (4°C)	Locate compressor to area where ambient temperature > 32°F (0°C)
#307	LOW AMB TEMP B	Separator temperature < 40°F (4°C)	Locate compressor to area where ambient temperature > 32°F (0°C)
#308	HIGH SEP TEMP	Temperature in separator > 225°F (107°C)	Check oil cooler system functionality or reduce package power
#309	HIGH PLANT TEMP	Temperature at package discharge > 149°F (65°C)	Check air cooler functionality or reduce package power
#310	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
#315	CHANGE SEPARATOR	Maintenance timer for separator element change has expired	Change separator element and reset timer
#316	HIGH DISCH TEMP	Temperature at airend discharge > 225°F (107°C)	Check oil cooler system functionality or reduce package power
#317	HIGH INTERSTG TEMP	Temperature in interstage pipe > 225°F (two-stage package only) (107°C)	Check oil cooler system functionality or reduce package power
#318	OPTIONAL ALARM	Digital input programmed for Optional Alarm has tripped	Check device connected to input

Advisory	Advisory Text	Description	Action
#320	CHANGE OIL FILTER	Pressure switch in oil filter assembly has tripped	Change oil filter
#321	LOW VOLTAGE	Digital input programmed for Low Voltage has tripped	Check line voltage
#322	MOTOR OVERTEMP	Digital input programmed for Motor Over Temperature has tripped	Check main motor(s) temperature or reduce package power
#323	WATER PRESSURE	Digital input programmed for Water Pressure has tripped	Check water pressure
#324	HIGH VIBRATION	Digital input programmed for High Vibration has tripped	Check for source of vibration
#325	LOW DISCH TEMP	Temperature at airend discharge < 185°F (85°C) (two-stage package only)	Check oil cooler system functionality
#326	HIGH DRYER TEMP	Temperature at dryer > 100°F (38°C)	Integrated dryer may have shut down, check dryer functionality
#327	CHANGE MOTOR LUBE	Motor lubrication interval timer has expired	Lubricate motor(s) and reset timer
#328	PLANT PRESSURE	Compressor is unable to maintain target pressure setting	Reduce demand on compressor
#329	LOW OIL PRESSURE	Oil pressure has dropped below (Interstage Pressure + 5 PSI) in two-stage compressor	Change oil filter or check for oil system leaks or plugs
#330	V1 MAX SINK TEMP	Main motor drive heat sink temperature > 175°F (79°C)	Check if control box air has become clogged or ambient temperature too high
#331	V2 MAX SINK TEMP	Second stage motor drive heat sink temperature > 175°F (79°C)	Check if control box air has become clogged or ambient temperature too high
#332	CHNG CTRL BOX FILTER	Control box filter change interval timer has expired	Change or clean control box air filter element
#333	DRYER ALARM	Integrated dryer has shut down	Check dryer functionality
#334	TAKE OIL SAMPLE	The maintenance timer for taking an oil sample has expired	Take an oil sample and reset the timer

6.3 Shutdown Faults

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

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

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

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

Shutdown	Shutdown Text	Description	Action
#101	FAN FAULT	Cooler or vent fan over temp fault	Check fan motor and associated fuses and wiring
#102	DRIVE 1 FAULT	Main motor VFD has shut down	Check main motor VFD operation
#103	DRIVE 2 FAULT	Main motor VFD #2 has shut down (two-stage package only)	Check main motor VFD #2 operation
#104	DRIVE 3 FAULT	Cooler fan motor VFD has shut down (when equipped)	Check cooler fan motor VFD operation
#105	EMERGENCY STOP	Compressor stopped using Emergency Stop button	Pull out Emergency Stop button to its normal position
#106	OPEN XDUCER XD5	Connection to pressure transducer PT5 is open	Check wiring between pressure transducer PT5 and controller
#107	HIGH PLANT PRES	Pressure at package discharge > 190 PSIG (13 bar)	Check for sources of high system pressure
#108	SHORTED XDUCER XD5	Connection to pressure transducer PT5 is shorted	Check wiring between pressure transducer PT5 and controller
#109	OPEN XDUCER XD4	Connection to pressure transducer PT4 is open	Check wiring between pressure transducer PT4 and controller
#110	HIGH SEP PRES	Pressure in separator tank > 190 PSIG (13 bar)	Check for sources of high system pressure
#111	SHORTED XDUCER XD4	Connection to pressure transducer PT4 is shorted	Check wiring between pressure transducer PT4 and controller
#112	OPEN XDUCER XD3	Connection to pressure transducer PT3 is open	Check wiring between pressure transducer PT3 and controller
#113	HIGH RESVR PRES	Pressure at airend discharge > 190 PSIG (13 bar)	Check for sources of high system pressure
#114	SHORTED XDUCER XD3	Connection to pressure transducer PT3 is shorted	Check wiring between pressure transducer PT3 and controller
#115	OPEN XDUCER XD2	Connection to pressure transducer PT2 is open	Check wiring between pressure transducer PT2 and controller

Shutdown	Shutdown Text	Description	Action
#116	HIGH INT PRES	Pressure in interstage pipe > 190 PSIG (13 bar)	Check for sources of high system pressure
#117	SHORTED XDUCER XD2	Connection to pressure transducer PT2 is shorted	Check wiring between pressure transducer PT2 and controller
#118	OPEN XDUCER XD1	Connection to pressure transducer PT1 is open	Check wiring between pressure transducer PT1 and controller
#120	SHORTED XDUCER XD1	Connection to pressure transducer PT1 is shorted	Check wiring between pressure transducer PT1 and controller
#121	OPEN THERM T5	Connection to thermistor TT5 is open	Check wiring between thermistor TT5 and controller
#122	HIGH PKG DISCH TMP	Temperature at package discharge > 158°F (70°C)	Check air cooler functionality or reduce package power
#123	SHORTED THERM T5	Connection to thermistor TT5 is shorted	Check wiring between thermistor TT5 and controller
#124	OPEN THERM T4	Connection to thermistor TT4 is open	Check wiring between thermistor TT4 and controller
#125	HIGH SEP TEMP	Temperature in separator > 240°F (116°C)	Check oil cooler system functionality or reduce package power
#126	SHORTED THERM T4	Connection to thermistor TT4 is shorted	Check wiring between thermistor TT4 and controller
#127	OPEN THERM T3	Connection to thermistor TT3 is open	Check wiring between thermistor TT3 and controller
#128	HIGH DISCH TEMP	Temperature at airend discharge > 240°F (116°C)	Check oil cooler system functionality or reduce package power
#129	SHORTED THERM T3	Connection to thermistor TT3 is shorted	Check wiring between thermistor TT3 and controller
#130	OPEN THERM T2	Connection to thermistor TT2 is open	Check wiring between thermistor TT2 and controller
#131	HIGH INTERSTG TMP	Temperature in interstage pipe > 240°F (116°C) (two-stage package only)	Check oil cooler system functionality or reduce package power

Shutdown	Shutdown Text	Description	Action
#132	SHORTED THERM T2	Connection to thermistor TT2 is shorted	Check wiring between thermistor TT2 and controller
#133	OPEN THERM T1	Connection to thermistor TT1 is open	Check wiring between thermistor TT1 and controller
#134	HIGH INLET TEMP	Temperature at package inlet > 113°F (45°C)	Ambient temperature too high for safe compressor operation
#135	SHORTED THERM T1	Connection to thermistor TT1 is shorted	Check wiring between thermistor TT1 and controller
#136	HIGH SEPRATR RATE	Rapid temperature rise in air/oil separator tank detected	Check separator element or oil cooler system functionality
#137	HIGH DISCH RATE	Rapid temperature rise at airend discharge detected	Check airend oil injection or oil cooler system functionality
#138	FAN STARTER	Fan Aux input does not match Cooler Start digital output	Check fan contactor operation
#139	DRIVE 1 STARTER	Main motor VFD start failure	Check main motor VFD operation
#140	DRIVE 2 STARTER	Main motor VFD #2 start failure (two-stage package only)	Check main motor VFD #2 operation
#141	DRIVE 3 STARTER	Cooler fan motor VDF start failure	Check cooler fan motor VFD operation
#142	POWER FAILURE	Loss of power to compressor package	Check line voltage
#143	XB1 COMM ERROR	Controller internal communications failure	Replace controller
#144	DRIVE 1 COMM ERROR	Communications failure between controller and main motor VFD #1	Check wiring or communications parameters in main motor VFD
#145	DRIVE 2 COMM ERROR	Communications failure between controller and main motor VFD #2 (two-stage package only)	Check wiring or communications parameters in main motor VFD #2
#146	DRIVE 3 COMM ERROR	Communications failure between controller and cooler fan motor VFD (when equipped)	Check wiring or communications parameters in cooler fan motor VFD

Shutdown	Shutdown Text	Description	Action
#147	OPTIONAL SHUTDOWN	Digital input programmed for Optional Shutdown has tripped	Check device connected to input
#148	LOW VOLTAGE	Digital input programmed for Low Voltage has tripped	Check voltage relay
#149	PHASE SEQUENCE	Digital input programmed for Phase Sequence has tripped	Check phase relay
#150	MOTOR OVERTEMP	Digital input programmed for Motor Over Temperature has tripped	Check main motor(s), motor overload relay or reduce package power
#151	WATER PRESSURE	Digital input programmed for Water Pressure has tripped	Check water pressure
#152	HIGH VIBRATION	Digital input programmed for High Vibration has tripped	Check for source of vibration
#153	ZERO XDUCER XD5	Pressure transducer PT5 not properly zeroed or vacuum present in system	Zero pressure transducer PT5 or remove vacuum
#154	ZERO XDUCER XD4	Pressure transducer PT4 not properly zeroed or vacuum present in system	Zero pressure transducer PT4 or remove vacuum
#155	ZERO XDUCER XD3	Pressure transducer PT3 not properly zeroed or vacuum present in system	Zero pressure transducer PT3 or remove vacuum
#156	ZERO XDUCER XD2	Pressure transducer PT2 not properly zeroed or vacuum present in system	Zero pressure transducer PT2 or remove vacuum
#157	ZERO XDUCER XD1	Pressure transducer PT1 not properly zeroed or vacuum present in system	Zero pressure transducer PT1 or remove vacuum
#160	CONTROLLER ERROR	Controller internal failure	Replace controller
#161	EEPROM RESTORED	Main parameter set in non-volatile memory restored with backup set	No action required

Shutdown	Shutdown Text	Description	Action
#164	INVALID MODEL	Valid compressor model not selected during factory setup or controller replacement	Select valid compressor model Configuration Adjust menu
#165	DC POWER LOW	24 VDC input to controller < 18.5 VDC +/- 1.5 VDC	Check 24 VDC power supply
#166	HIGH DRYER TEMP	Temperature at dryer > 120°F (49°C)	Integrated dryer may have shut down. Check dryer functionality
#167	OPEN THERM T6	Connection to thermistor TT6 is open	Check wiring between thermistor TT6 and controller
#168	SHORTED THERM T6	Connection to thermistor TT6 is shorted	Check wiring between thermistor TT6 and controller
#169	CM TABLE INVALID	Model Table in memory has been corrupted	Load new Model Table values
#170	ACTUATOR COMM ERROR	Communications failure between controller and precision mixing valve	Check wiring or mixing valve operation
#171	LOW OIL PRESSURE	Oil pressure has dropped below (Interstage Pressure + 2.5 PSI) in two-stage compressor	Change oil filter or check for oil system leaks or plugs.
#172	SEQUENCER COMM ERR	Communications failure between controller and communications module	Remove and reconnect or replace communications module
#173	OPEN XDUCER XD6	Connection to pressure transducer PT6 is shorted	Check wiring between pressure transducer PT6 and communications module
#174	SHORTED XDUCER XD6	Connection to pressure transducer PT6 is open	Check wiring between pressure transducer PT6 and communications module
#175	ZERO XDUCER XD6	Pressure transducer PT6 not properly zeroed or vacuum present in system	Zero pressure transducer PT6 or remove vacuum

Shutdown	Shutdown Text	Description	Action
#176	OPEN XDUCER XD7	Connection to pressure transducer PT7 is shorted	Check wiring between pressure transducer PT7 and communications module
#177	SHORTED XDUCER XD7	Connection to pressure transducer PT7 is open	Check wiring between pressure transducer PT7 and communications module
#178	ZERO XDUCER XD7	Pressure transducer PT7 not properly zeroed or vacuum present in system	Zero pressure transducer PT7 or remove vacuum
#179	MAIN STARTER	Motor Aux digital input does not match Main Contactor digital output	Check main motor contactor operation
#201	LOW SUMP PRES	Pressure in reservoir < 15 PSIG (1 bar) after one minute of compressor operation	Check inlet valve or minimum pressure valve operation
#202	CHANGE SEPARATOR	Differential pressure over separator element > 15 PSIG (1 bar)	Change separator element

6.4 Transducer Locations

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

Transducer Reference	AirSmart Controller P/N: 89864799	AirSmart Controller with Expansion Board P/N: 300ETK1173	AirSmart Controller Communications Module P/N: 301ETK1173
TT1	Inlet Temperature	Inlet Temperature	
TT2	Airend Discharge Temperature	Interstage Temperature (two-stage only)	
TT3		Airend Discharge Temperature	
TT4		Separator Temperature (dry side)	
TT5		Package Discharge (Plant) Temperature	
TT6	Dryer Temperature (connected to VFD analog input)		
PT1	Reservoir Pressure	Oil Pressure	
PT2	Package Discharge (Plant) Pressure	Interstage Pressure (two-stage only)	
PT3		Reservoir Pressure (wet side)	
PT4		Separator Pressure (dry side)	
PT5		Package Discharge (Plant) Pressure	
PT6			System Pressure (sequencing)
PT7			Package Discharge (Plant) Pressure

7 Auxiliary Inputs and Outputs

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

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

7.1 Operating Device Addresses

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

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

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

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

7.2 Digital Input/Output Functions

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

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

Digital Input Function	Description
Fan Fault	Input used to signal a fan motor over temperature fault.
Fan Auxiliary	Used to signal the failure of the fan motor starter.
Remote Halt	Used to remote start/stop compressor.
Remote Halt Enable	Used to enable/disable Remote Halt input.
Advisory Alarm	Used to trigger a generic advisory alarm.
Shutdown Fault	Used to trigger a generic shutdown fault.
Air Filter	Used to signal a dirty air filter.
Oil Filter	Used to signal a dirty oil filter.
Low Voltage Relay Alarm	Used to signal low line voltage detected by external device.
Low Voltage Relay Shutdown	
Phase Sequence	Used to signal incorrect connection of three phase power input detected by external device.
Motor Overtemp Alarm	Used to signal motor over temperature or motor overload relay trip.
Motor Overtemp Shutdown	
Water Pressure Alarm	Used to signal high water pressure in water cooled systems.
Water Pressure Shutdown	
High Vibration Alarm	Used to signal high vibration detected by external device.
High Vibration Shutdown	
Clock Override	Used to disable clock controlled functions.
Reset Alarm	Used to control remote rest of alarms.
Heavy Consumer Start	Used to control staggered starting of multiple compressors.
Heavy Consumer Load	Used to control staggered loading of multiple compressors.
Remote Load	Used to remotely load the compressor
Remote Load Enable	Used to enable/disable Remote Load input.
Dryer Alarm	Used to signal a dryer alarm
Secondary Pressures	Used to switch control to secondary pressure offset.
Motor Auxiliary	Used to signal the failure of the main motor starter.
Unload	Used to remotely unload the compressor.

Digital Output Function	Description
Advisory Alarm	Used to indicate an active advisory alarm.
Shutdown Fault	Used to indicate an active shutdown alarm.
Inlet Valve	Used to control the inlet valve of the compressor.
Blowdown Valve	Used to control the blowdown valve of the compressor.
Oil Flow A	Used to control the airend coolant oil injection in some compressor models.
Oil Flow B	Used to control the airend coolant oil injection in some compressor models.
Oil Flow C	Used to control the airend coolant oil injection in some compressor models.
Cooler Start	Used to control the cooler fan or water source in some compressor models.
Auto Operation	Used to indicate a compressor is operating in the Automatic Mode.
Run	Used to indicate the compressor's main motor is running.
Delayed Break Run	Used to indicate the compressor's main motor is running but stays active for ten minutes after the motor stops.
Standby	Used to indicate the compressor is waiting to run.
Dryer Start	Used to control an integrated dryer in some compressor models.
Heater Start	Used to control integrated heater in some compressor models.
Water Drain	Used to control a timed water drain or oil scavenge system in some compressor models.
Heavy Consumer	Used to control staggered starting of multiple compressors.
Maintenance Alarm	Used to indicate an active advisory alarm.
Any Alarm	Used to indicate an active advisory or shutdown alarm.
Good To Go	Used to indicate compressor is started or running.
Main Contactor	Used to control the main motor starter in fixed speed compressor models.
Start Contactor	Used to control the start contactor in a Wye-Delta motor starter in fixed speed compressor models.
IVO - Inlet Valve Open	Used to modulate the inlet valve in some compressor models.
IVC - Inlet Valve Close	Used to modulate the inlet valve in some compressor models.
TVO - Turn Valve Open	Used to modulate the turn valve in some compressor models.
TVC - Turn Valve Close	Used to modulate the turn valve in some compressor models.

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

7.3 Analog Input/Output Functions

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

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

Analog Input Function	Description
Inlet Temperature	Used to indicate the compressor air inlet temperature.
Interstage Temperature	Used to indicate the interstage temperature in two-stage compressor models.
Discharge Temperature	Used to indicate the airend discharge temperature.
Separator Temperature	Used to indicate the dry side separator temperature.
Plant Temperature	Used to indicate the package discharge temperature.
Dryer Temperature	Used to indicate the internal temperature of an integrated dryer in some compressor models.
Oil Temperature	Used to indicate the oil temperature in some compressor models.
Inlet Pressure	Used to indicate the compressor inlet pressure.
Interstage Pressure	Used to indicate the interstage pressure in two-stage compressor models.
Reservoir Pressure	Used to indicate the wet side reservoir pressure.
Separator Pressure	Used to indicate the dry side reservoir pressure.
Plant Pressure	Used to indicate the package discharge pressure. Also used as control pressure reference to AirSmart Controller.
Oil Pressure	Used to indicate the oil pressure in some compressor models.
System Pressure	Used to indicate the control pressure in a sequenced group of compressors.
Current Sensor	Used to indicate the main motor current in some fixed speed compressor models.

Analog Output Function	Description
Oil Valve Command	Used to control the precision mixing valve in some compressor models.
Plant Pressure	Used to indicate the current plant pressure value.
Discharge Temperature	Used to indicate the current discharge temperature value.
Voltage Controlled Fan	Used to control the variable speed cooler fan in some compressor models.

7.4 Example “RUN” Digital Output Signal

The following example shows how to provide a "RUN" output signal on single-stage, variable speed VS20 through VS70 compressor. This procedure can also be used on other machines; however the I/O addresses will need to be changed. Provided the VS machine does not have an integrated dryer, there are two outputs that can be programmed to serve as a “RUN” signal. There is a 24 VDC output on terminal block A10 (ground reference on B6 thru B10) and there is also a N.O relay contact between terminal blocks A14 and B14. Either one of these contact points can be programmed to be active when the compressor is running.

1. Press the Enter ENTER key on the display to access the Adjustment menu tree.
2. Use Right ▶ or Left ◀ keys to navigate to the Unit Setup Adjust menu.
3. Press the Enter ENTER key to enter the Unit Setup Adjust menu.
4. The Unit Password parameter will be the first item in the Unit Setup Adjust menu. Press the Enter ENTER key to change the Password to **8412**.
5. Use the Plus + and Minus − keys the change the value of each digit.
6. Use the Right ▶ or Left ◀ keys to select individual password digits.
7. Press the Enter ENTER key to confirm the password value.
8. Press the Stop/Reset STOP/RESET key to return to the Adjustment menu tree.
9. Press the Right ▶ key twice to navigate to the Prog I/O Adjust menu.
10. Press the Enter ENTER key to access the Prog I/O Adjust menu.
11. To use terminals A14/B14 (N.O. relay contact) for the "RUN" signal, skip to step #19 below.
12. To use terminal A10 for the "RUN" signal, continue with step #13.
13. Press the Down ▼ key to navigate to the "RUN" Digital Output address. The controller display should read as below.

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

14. Press the Enter  key to edit the I/O address for the "RUN" signal. Use address **20** for terminal A10.

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

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

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

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

18. Skip now to step #28.

19. To use terminals A14/B14 (N.O. relay contact) for the "RUN" signal, continue with step #20 below.

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

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

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

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

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

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

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

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

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

27. Skip back to step #14 except that you need to use address **50** for the relay output instead of address 20 as stated in step #14.

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

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

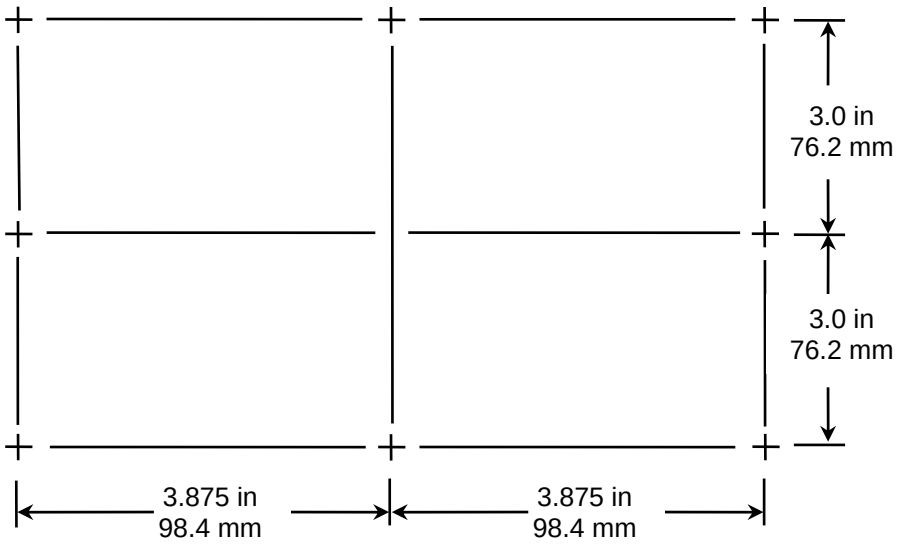
29. Press the Enter  key to permanently save to changed parameters in the controller's memory.

8 Technical Data

8.1 All-In-One AirSmart Controller

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

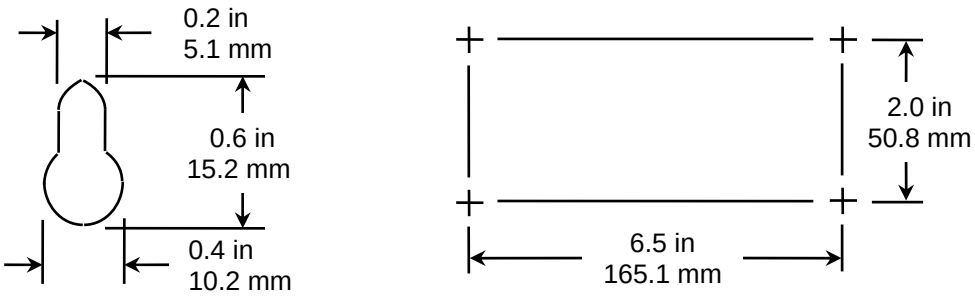
Mounting arrangement for the All-In-One AirSmart Controller and Display Unit:



8.2 Full-Sized AirSmart Controller

Outside dimensions for Full-Sized AirSmart Controller with connectors installed:
7.0 in x 5.1 in x 2.4 in
177.8 mm x 129.5 mm x 61.0 mm

Mounting arrangement for Full-Sized AirSmart Controller:



8.3 Agency Certifications

The AirSmart Controller is UL Recognized in the United States and Canada under File No.E150840

8.4 Environmental Ratings

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

8.5 Electrical Ratings

DC power input (P1 on Core board): 24 VDC +/- 10% @ 150 mA.

Digital Inputs (P2 on Core board):
Four 0 to 24 VDC inputs - Low = 0 to 4 VDC / High = 20 - 24 VDC.

Digital Inputs (P10 on Expansion board):
Four 0 to 24 VDC inputs - Low = 0 to 4 VDC / High = 20 to 24 VDC.

Digital Outputs (P3 on Core board):
Four 24 VDC outputs @ 2.6 A continuous.

Digital Outputs (P12 on Expansion board):
Five 24 VDC outputs @ 800 mA continuous.

Form-C relay output (P13 on Expansion board):
One relay contact - Rating: 125 mA @ 250 VAC, 2.0 A @ 30 VDC.

Analog Inputs (P4, P5 on Core Board): Four 0 – 5 VDC inputs.
Two configured for use with 2-wire, 3 kOhm, NTC, 150°C thermistors.
Two configured for use with 250 PSI, 0.5 – 4.5 VDC ratiometric output transducers.

Analog Inputs (P14, P15 on Expansion Board): Six 0 – 5 VDC inputs.
Three configured for use with 2-wire, 3 kOhm, NTC, 150°C thermistors.
Three configured for use with 250 PSI, 0.5 – 4.5 VDC ratiometric output transducers.

Appendix A - Remote Mounted Main Motor Starters

Connection of Remote Mounted Main Motor Starter to AirSmart Control System

The majority of our rotary screw compressor packages feature starters completely wired and tested at the factory. Some special applications and large units, however, do not have the main motor starter mounted on the package. The following information describes special requirements for applications with a remote mounted main starter.

1. Starter

Regardless of starter type or brand, the following are required:

- The starter must have its own fused control circuit (and control transformer, if required).
- The starter must have provision for connection to a two-wire control circuit.
- The starter must have an isolated (dry contact) normally-open auxiliary contact.

2. Installation and wiring

Refer to the package Operating and Service Manual for the Wire Diagram – Less Starter.

The starter should be mounted and wired in accordance with the National Electrical Code and the manufacturer's instructions. Wiring from the load terminals of the starter to the motor should include flexible conduit to the motor junction box to allow for normal movement of the motor in the package.

The compressor package control box must have its own disconnect and overcurrent protection. If the package has a fan, the wiring should be sized for the fan horsepower and voltage. If the package does not include a fan, the only package load is the control power supply.

Install a separate conduit from the starter to the package control box for control wiring. Label and pull four control wires through this conduit. Since two separate supplies are involved, run blue and white wires and one pair of yellow wires for identification.

3. Controls connections

Disconnect and remove any manual starter controls which may be mounted on the starter or elsewhere. The starter must be controlled by the compressor controls for proper operation. The following is general information; refer to the unit wiring diagram for detailed connection.

Connect the control relay contact in the control box to the starter terminals for two-wire control. The terminals are identified in the control box as 40 & 41 on standard packages. Refer to the starter instructions for identification of the control terminals for two-wire control. Use the pair of yellow wires to indicate that this circuit is from a different source.

Connect the starter auxiliary contact to the compressor control box. When connecting this contact, make sure that no other wires are connected to it in the starter - it has to be an isolated contact. These two wires connect to terminals 2 & 9 on standard packages. Use the blue and white wires; this is powered from the compressor control panel 24 VDC control power supply.

4. Controls checkout

Lock the disconnect switch for the starter in the open position. Energize the compressor package control panel. If the display indicates "SHUTDOWN #179 - MAIN STARTER", the starter auxiliary contact is mis-connected. Remove all power and correctly wire as indicated above.

Enter the UNIT SETUP ADJUST menu and perform a jog to check for proper fan rotation. If it is incorrect, disconnect power and switch two of the three wires to the fan motor. Restore power to the control box when done.

With the main motor power still disconnected, choose CONSTANT mode and press the [RUN] key. After a brief delay, the control should stop and display "SHUTDOWN #179 - MAIN STARTER". This properly indicates that the starter did not function because it is turned off by the disconnect switch.

Unlock and close the disconnect switch for the main motor. Enter the UNIT SETUP ADJUST menu to jog the compressor and check rotation. If it is incorrect, disconnect and lockout all power, reverse two of the three power phases at the starter. Restore power when done.

Choose CONSTANT mode and press the [RUN] key. If the controller displays "SHUTDOWN #179 - MAIN STARTER" and stops the unit, the starter auxiliary contact is misconnected. Remove all power and correctly wire as indicated above.

Press the [STOP/RESET] key to stop the compressor. The controller should perform an ordinary stop of the compressor unit and motor.

Appendix B - Remote Cooling Module Starters

Connection of Remote Cooling Module Starter to AirSmart Control System

The majority of our rotary screw compressor packages feature starters completely wired and tested at the factory. Some applications and large units, however, will have the air cooled cooling module mounted remotely from the compressor package. Standard practice is to provide a combination starter (with fused disconnect) for the cooling module. The following information describes connection requirements for these applications.

1. Starter

Regardless of starter type or brand, the following are required:

- The starter must have an isolated 24VDC coil.
- The starter must have an isolated (dry contact) normally closed overload relay contact.
- The starter must have an isolated (dry contact) normally-open auxiliary contact.

Standard starters are generally provided by the manufacturer with interconnecting wires between the coil, overload relay contact, and auxiliary contact. Remove all of these to isolate the three control components.

2. Installation and wiring

The starter should be mounted and wired in accordance with the National Electrical Code and the manufacturer's instructions. Wiring from the load terminals of the starter to the motor should include flexible conduit to the motor junction box to allow for normal movement of the motor in the package. Use time-delay fuses in the disconnect, to allow for motor starting. Follow instructions in the starter for proper sizing and application of overload heaters.

Install a separate conduit from the starter to the package control box for control wiring. Label five control wires: 9, 10, 22, 35, 36; pull through this conduit.

3. Controls connections

Disconnect and remove any manual starter controls or other control wires which may be mounted on the starter or elsewhere. The starter must be controller by the compressor controls for proper operation. The following is general information; refer to the unit wiring diagram for detailed connection.

Connect the five control wires to terminals 9, 10, 22, 35, 36 in the compressor control box.

At the cooling module starter, connect wire 10 to one terminal of the starter coil, wire 22 to the other coil terminal. Connect wire 9 to one terminal of the aux contact and to one terminal of the overload relay contact terminal. Connect wire 35 to the other aux relay contact. Connect wire 36 to the other overload relay contact terminal.

4. Controls checkout

After installation is complete, energize both the module and the compressor package. In the controller adjustments, select "WATER COOLED" fan type. This operates the fan whenever the compressor operates, and must be used with remote-cooled units as well as water cooled units. This ensures that the oil piping does not accumulate a large quantity of hot oil before the fan starts. This setting also starts the enclosure vent fan (if so equipped) whenever the compressor runs to cool the main drive motor. Check rotation of both the compressor and the cooling fan during the jog motor test.

Start the compressor unit by pressing the [RUN] key. The compressor and cooling module should both start. Run for approximately one minute. Stop the compressor by pressing [STOP/RESET]. The compressor and cooling module should both stop.

If the controller shuts down before a start is attempted and displays "SHUTDOWN #138 – FAN STARTER", check and correct wiring to the auxiliary contact.

If the cooling module fan does not start, and the controller shuts down and displays "SHUTDOWN #138 – FAN STARTER", check and correct the wiring to the starter coil.

If the cooling module fan does not start, check the fuses in the combination starter and ensure that the disconnect switch is closed.

If the cooling module fan starts, but the controller then shuts down and displays " SHUTDOWN #138 – FAN STARTER", check and correct the wiring to the auxiliary contact.

If the controller shuts down and displays "SHUTDOWN #101 – FAN FAULT", check both the cooling fan and the package fan (if applicable) motors for overload or misconnection.

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For additional information, contact your local representative or visit:
www.contactgd.com/compressors

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