Xe-M
CONTROL SYSTEM

Technicians Guide

Contents

XE-M INTELLISYS CONTROLLER INTRODUCTION

The Intellisys control system is an exclusive Ingersoll Rand design developed for reliable compressor operation. The controller can be programmed in thirty languages and various unit of measure for the pressure and temperature readings.

The microprocessor based controller uses a finger touch membrane for operation of the compressor and setting control parameters.

Information about the programming and operating status is available on a Liquid Crystal Display (LCD) from a system of Folders and Pages.

The Intellisys monitors the compressor and should any pre-programmed limit be exceeded the controller automatically displays a warning or issues an alarm to shut the compressor down.

The major components of the control system include the Intellisys, the Power Supply

Board and a Stepper Motor to position the compressor's inlet valve.

A group of pressure and temperature sensors, relays and switches are all part of the process that provides feedback to the controller.

Operation of the control system will be easy after the following explanation of the control system components is read and understood. The explanation follows a logical path and begins at the primary side of the control voltage transformer. Use the electrical schematics provided in the Operator's Manual as a guide.

COMPONENT REVIEW

MCB1 – Main Circuit Breaker

MCB1 is the schematic designation for the Main Circuit Breaker. MCB1 protects the control power transformer should a short circuit develop in the transformer.

There is a time-delay feature to handle the short duration, but very high, inrush current when power is first applied to the transformer. For an instant, the inrush current drawn by the transformer can be several times greater than the full-load rating.

The circuit breaker are current limiting to protect downstream components from damage and the magnetic effects of short-circuit currents. Current limiting is defined as being able to cut off a short-circuit current in less than one-half cycle (0.008 second, 60Hz). Generally speaking this is long before damaging current levels are reached.

The current rating of the circuit breaker depends on the size of the control voltage transformer applied to the starter of the compressor.

T1 – Control Transformer

A step-down transformer (T1) reduces the incoming line voltage to levels suitable for use with the Intellisys control system.

The reduced voltage levels are called secondary circuits. There are two of these secondary circuits in the control system.

The secondary circuit is rated at 120Vac, 1 phase, 60Hz (110Vac,1,50Hz) and is basically used to energize solenoid valves and starter coils. The “hot” connection is X2 and the neutral connection X1 is grounded to the starter chassis.

120/110 VAC Circuit – Transformer (T1) to Intellisys

The Intellisys controller receives 120/110VAC power from T12 depending on operating conditions, sends the voltage onward to specific areas at times. Examples: energizing a starter coil at start-up or energizing a solenoid valve when the compressor loads. The circuit begins at X2 and connects to the Intellisys in the following sequence.

MCB3 – Ciruit Breaker

MCB3 is a circuit breaker in the 120/110 VAC secondary side of the control voltage

transformer circuit to provide a degree of protection for the Intellisys controller.

PSU – 24V Power Supply

A 24V Power Supply is provided to supply 24V to P10 on the Xe-M controller. The 24V powers the logic and display electronics in the Xe-M controller.

RFI Filter

A device in the 120/110Vac circuit used to filter Radio Frequency Interference (RFI) and prevent undesirable electrical disturbances from affecting the Intellisys.

In extreme instances, RFI can cause erratic control problems because the power supply is not steady.

Emergency Stop Switch

Located next to the Intellisys controller in the starter door and intended to stop the compressor in an emergency.

The switch has two sets of normally closed contacts that open when the red button is pressed. Refer to the electrical schematics,

one contact is in the 120/110Vac circuit (ES-1) and the other contact is in the 12Vdc logic circuit (ES-2) at P3 terminals 17 and 18.

These parallel contacts ensure power is removed from the starter coils and solenoids to cause the compressor to stop immediately.
The switch remains in the open position until manually reset by rotating the red button clockwise.

1TB – Terminal Block

A double row terminal block having 14 poles that serve as common connection points for wires within the control system. A decal identifies the terminal block (1TB) and each pole is numbered 1 through 14 reading from left to right.

When reading an electrical schematic, wires connecting to 1TB indicate which pole that the wire connects. Examples: 1TB-1 is the first pole and 1TB-7 is the seventh position.

1ATS – High Air Temperature Switch

A normally closed switch installed in the discharge port of the airend that opens when the discharge temperature rises above 245°F (118°C). The mechanical switch serves as a back-up for the usual Intellisys temperature shutdown at 228°F (109°C).

1ATS is connected in the 120/110 Vac circuit and should it open, the Intellisys shuts the compressor down in a TRIP condition.

1PS – Interstage Pressure Switch (2-Stage Units/250-450 horsepower

A normally closed switch monitoring interstage pressure on 2-stages airends and opens should pressure exceed approximately 100 psi when the switch opens, the Intellisys stops the compressor in a Trip condition and a message is displayed on the Trip page.

P1 - P10 Quick Connect/Disconnect Plugs

A group of different sized plug-type connectors and mating receptacles are identified on the electrical schematic and back of the

Xe-M controller. The plugs are designed to be inserted in one direction only.

The 120/110 VAC circuit passes through a circuit breaker and Emergency Stop switch with wire 102 the “hot” wire connecting to P1-1 and the Neutral wire connects at P1-10.

Emergency Stop – Logic Circuit ES-2

A normally closed (N.C.) contact connected to P3-7 and P3-8 which opens when the Emergency Stop switch is pressed.

Starter Fault Contacts (K2-1) and Motor Thermistors (PTC1, PTC2, PTC3)

The Motor Starter Fault relay contacts are normally closed (N.C.) contacts wired to P3-11 and P3-12. Motor Thermistor switches are also normally closed thermal switches located on each motor. These normally closed contacts are to be connected in series with the Starter Fault Contacts.

FMP – Fan Motor Starter Protector

The Fan Motor Starter protector contact is a contact that closes when the Fan Motor

Starter protector is on and opens when the protector opens. The contact is connected to P3-13 and P3-14.

RSP - Remote Stop button (Optional)

The remote stop button is intended be installed remotely from the controller in order to stop the compressor remotely. The normally closed contact of the switch is connected to P3-19 and P3-20.

RST - Remote Start button (Optional)

The remote start button is intended be installed remotely from the controller in order to start the compressor remotely. The normally open contact of the switch is connected to P3-21 and P3-22.

RLL – Remote Lead/Lag Switch (Optional)

The remote Lead/Lag switch is a normally open switch to control the Lead/Lag compressors from a remote location. The normally open contact is connected to P3-23 and P3-24.

RLE – Remote Load Enable Sw (Optional)

The remote Load Enable switch is a normally closed switch to control the Load Enable

function for the compressors from a remote location. The normally closed contact is connected to P3-25 and P3-26.

RLE – Remote Load/Unload (Optional)
The remote Load/Unload switch is a normally open switch to control the Load/Unload function for the compressors from a remote location. The normally closed contact is connected to P3-27 and P3-28.

Auxiliary Warning Inputs (AW1 & AW2)
Inputs for normally open contacts to indicated warning conditions. The connections for AW1 are P3-29 and P3-30; AW2 is connected at P3-31 and P3-32.

CTO – Common Trip Outputs
Common Trip Outputs (CTO) (N.O.) is connected at P2-1. CTO (Com) – P2-2 and CTO (N.C.) is connected at P2-3.

CWO – Common Warning Outputs
Common Warning Outputs (CWO) (N.O.) is connected at P2-4. CWO (Com) – P2-5 and CWO (N.C.) is connected at P2-6.

Pressure Sensors – 1AVPT, 3APT, 4APT, 5CPT, 6CPT, 10APT, 7APT

Pressure transducers used to convert air pressure signals to a voltage signal between 0.5 and 4.5 Volts DC.

The transducer contains a metal diaphragm connected to a small piece of steel called the beam which in turn has a strain gauge attached. As pressure pushes the diaphragm the beam flexes and bends the beam and the strain gauge.

A continuous voltage is applied to the strain gauge assembly. As the strain gauge bends due to the changing pressure on the diaphragm the resistance value through the strain gauge changes a corresponding amount the result is a variable output signal that ranges from 0.5-4.5 volts.

The output signal is processed by an analog to digital converter within the Intellisys controller. Depending on the voltage level, decisions are made by the controller that may cause a change in the pressure reading in the display, unload the compressor or pos-

sibly shut the compressor down if conditions dictate.

If a pressure sensor is replaced it is important to calibrate the new sensor. Basically, calibration allows the controller to read the sensor's output signal with the diaphragm in a totally relaxed state and then correct for any minor deviations from .5 VDC. Calibration directions are included in the Operator's Manual.

There are no adjustments to the pressure sensors.

1AVPT – Inlet Vacuum

A pressure sensor having a range between 0 and 15 psi vacuum connected to the airend inlet to provide vacuum information for the controller. The output voltage is 0.5 volts DC at 0 psi vacuum and 4.5V DC at 15 psi vacuum.

The controller uses inlet vacuum information to confirm the drive motor is rotating in the correct direction, to indicate the condition of the inlet air filter and to provide

logic for positioning the inlet valve during modulation or unloaded operation.

3APT – Separator Tank Pressure

3APT is a pressure sensor having a range between 0 and 225 psi used to provide information about pressure within the compressor's receiver-separator tank. The connection point in the receiver-separator tank is referred to as sump pressure. The sump pressure is taken on the wet side (before air enters) the separator element.

The sump pressure is monitored for several reasons to include comparison to the line pressure during the separator element differential check and provide logic for the controller to position the inlet valve during unloaded operation.

The normal unloaded sump pressure is maintained within a range of 24 to 33 psi to ensure adequate coolant flow and allow the unloaded compressor to operate at a low horsepower condition.

4APT – Package Discharge Pressure

4APT is a pressure sensor having a range between 0 and 225 psi used to provide information about the discharge pressure just prior to the compressed air leaving the package. The connection is downstream of the aftercooler and in the top of the moisture separator.

Package discharge pressure provides logic to load or unload the compressor and is compared with the sump pressure during the separator element differential check.

5CPT – Injected Coolant Pressure (2 Stage Compressors Only)

5CPT is a pressure sensor having a range between 0 and 225 psi phased into production approximately mid-May 2000 and is used to provide information about the coolant/lubricant pressure at the injection port on 2 stage compressors

5CPT will cause a “Low Coolant Pressure” alarm if the compressor is running and the coolant pressure falls below 1 psi and either

the sump pressure is greater than 10 psi or the inlet vacuum is less than 12psi.

6CPT – Coolant Filter Out Pressure

6CPT is a pressure sensor having a range between 0 and 225 psi.

10APT – Remote System Pressure

10APT is a pressure sensor having a range between 0 and 225 psi.

Temperature Sensors - 2CTT, 2ATT and 4ATT

Temperature sensitive resistors called thermistors used to monitor temperature changes at various points within the compressor package. They operate on a 5 volt DC circuit. As the temperature of the sensor changes, either higher or lower, the resistance through the sensor changes a corresponding amount. As the output voltage varies due to the temperature changes, the voltage strength is processed by an analog to digital converter within the controller. Depending on the output voltage from the various sensors, the controller makes decisions that may change a number on the

panel display, delay a differential pressure reading until the compressor warms up, re-position the inlet valve slightly during cold unloaded operation, provide a Warning about rising temperature or could possibly shut the compressor down with an Alarm if operating conditions dictate.

2CTT - Injected Coolant Temperature Sensor

2CTT is a temperature sensor monitoring the injected coolant flow into the airend. The injected coolant absorbs heat generated during the air compression, lubricates moving parts and seals clearances between the rotors and the housing.

When Injected Temperature has been selected on the Current Status display, 2CTT provides the information to the controller.

When a compressor is operating unloaded and the injected coolant temperature is below 120°F (49°C), 2CTT provides information to the controller which automatically opens the inlet valve a small amount. Opening the inlet valve a small amount raises the

unloaded sump pressure approximately 20 psi to promote flow of the cold coolant.

As the injected coolant temperature rises above 120°F (49°C), the controller recloses the inlet valve the small amount to return the unloaded sump pressure to the 24 to 33 psi range.

2CTT also provides information to the controller during checks of the Coolant Filter condition on the Current Status display.

When the injected coolant temperature is below 120°F (49°C) during the Coolant Filter check on a running unit, the controller assumes the cold coolant will be more viscous and the pressure differential across the filter will be higher than normal. As a result, the controller will advise “Unit Too Cold” in the display until the injected coolant temperature rises above 120°F (49°C).

2ATT - Airend Discharge Temperature Sensor

A temperature sensor monitoring the temperature of the air/coolant mixture as the flow leaves the airend discharge port. Typically, this sensor is located adjacent to the flange area of the discharge housing and just before the air/coolant mixture enters the airend discharge check valve.

When Airend Discharge Temperature has been selected on the Current Status display, 2ATT provides the information to the controller.

Should 2ATT observe the airend temperature exceed 97% of the 228°F (109°C) High Airend Discharge Temperature alarm, the controller will place the symbol (?) and the airend discharge temperature in the Current Status display. The compressor continues to run during the temperature Warning.

If the airend discharge temperature continues to rise, 2ATT advises the controller of the condition
and when the temperature exceeds 228°F (109°C), the controller shuts the compressor down. The Current Status display will

show the symbol (!) followed by the words High Airend Discharge Temperature and the shutdown temperature.

4ATT - Package Discharge Temperature Sensor

The 4ATT sensor Monitors the temperature of the compressed air downstream of the compressor's aftercooler. Typically, this sensor is located in the top of the moisture separator.

When Package Discharge Temperature has been selected on the Current Status display, 4ATT provides the information to the controller.

This sensor is for temperature information only and has no Warning or Alarm feature.

3CTT – Coolant Cooler Out Temperature Sensor

The 3CTT sensor monitors the temperature of the coolant temperature at the Cooler output.

5DTT – Dryer Dew Point Sensor

The 5DTT sensor monitors the dew point of the dryer.

6DTT – Refridgerant Temperature Sensor

The 6DTT sensor monitors the refrigerant temperature.

1ATT – Package Inlet Temperature Sensor

1ATT is a temperature sensor monitoring the temperature of the air at the package inlet.

XE-M INTELLISYS CONTROLLER INPUT/OUTPUT INFORMATION

Analog Inputs (P5)

Inlet Vacuum Pressure	1AVPT
Wet Sump Pressure	3APT
Package Discharge Pressure	4APT
Coolant Filter In Pressure	5CPT
Coolant Filter Out Pressure	6CPT
Remote Pressure	10APT
Package A/C Pressure*	7APT

Analog Inputs (P6)

Injected Coolant Temperature	2CTT
Airend Discharge Temperature	2ATT
Package Discharge Temperature	4ATT
Coolant Cooler Out Temp.**	3CTT
Dryer Dew Point*	5DTT
Refrigerant Temperature*	6DTT
Package Inlet Temperature**	1ATT

*Only used on units with integrated dryers.

**Only used when Smart Thermal Valve is installed.

Digital (Switched) Inputs (P3)

Emergency Stop - ES-2 (N.C.)

Starter Interlocks/Motor Thermistors -

K2-1, PTC1, PTC2, PTC3 (N.C.)
Fan Motor Protector - FMP - (N.O.)
Dryer High Pressure - DHP - (N.C.)
Condensate Drain Error – CDE - (N.C.)
(*Multiple CDE Contacts should be wired in parallel)*
Remote Stop – RSP – (N.C.)
Remote Start – RST – (N.O.)
Remote Lead-Lag – RLL – (N.O.)
Remote Load Enable – RLE – (N.C.)
Remote Load/Unload – RLU – (N.O.)
Auxiliary Warning 1 – AW1 – (N.O.)
Auxiliary Warning 2 – AW2 – (N.O.)

Digital Outputs (P1)

TX1(P1-2) – Starter Relay Coil – K1
Starter Fault Relay – K2
TX2(P1-3) – Isolation Contactor – KM1
TX3(P1-4) – Fan Motor Contactor – KM4
TX4(P1-5) – Load Valve – 1SV
TX5(P1-6) – Modulation Valve – 5SV
TX6(P1-7) – Moisture Separator Valve – 9SV
Dryer Filter Drain Valve – 10SV*
Dryer Drain Valve – 11SV*

Digital Outputs (P1) (cont.)

TX7(P1-8) – Dryer/Blower Drive Relay – K3*
TX8(P1-9) – Power Outage Reset Opt - PORO

(P1-1) – 115VAC
(P1-10) - Gnd

*Only used on units with integrated dryers.

Digital Outputs (CTO/CWO) - (P2)

(P2-1) Common Trip Output (N.O.)
(P2-2) Common Trip Output (Com)
(P2-3) Common Trip Output (N.C.)
(P2-4) Common Warning Output (N.O.)
(P2-5) Common Warning Output (Com)
(P2-6) Common Warning Output (N.C.)

XE-M INTELLISYS CONTROLLER INTERFACE AND OPERATION

The standard user interface configuration of the controller consists of the membrane and the LCD display. The membrane consists of five command keys (Start, Stop, Load, Unload, and Reset), four navigation keys (Up, Right, Left and Down), and an Edit mode selection key (Enter). These keys, in conjunction with the color graphics display and the LED icons, make up the user interface to the compressor.

X^e-90 M Interface

LED STATUS ICONS

Three LED icons are used to indicate the current status of the control system from a distance and are located on the upper left side of the user interface.

Icon	Name	Function
	**OK**	Green Indicator, Illuminates when no Warnings or Trips are sensed. Can be in a Ready or Not Ready state. This icon will flash when the machine is Running Un-loaded
	**Alert**	Red Indicator, Illuminates when an Warning (flashes) or Trip (constant on) is sensed. Can be in a Ready (Warning) or Tripped state.
	**Auto**	Blue Indicator, Illuminates when the compressor stops in auto restart.

Command Keys

These keys command the controller to perform actions as specified in the following table. When any of these keys are pressed the action below will be initiated and logged in the event log.

Key	Name	Function
	---	None
	**Load**	Puts the compressor into the selected mode of operation. Unit will load if the pressure conditions are right.
	**Unload**	Puts the compressor into an unloaded state. Unit will run unloaded indefinitely**.**
	**Reset**	Clears Warnings and Trips once the condition is corrected.

	**Start**	Starts the compressor.
	**Stop**	Stops the compressor. This button should be pressed instead of the Emergency Stop for normal stopping operation.
	**Enter**	Toggles the display between the Navigation mode and the Edit mode.

 The Load and Unload keys are not used on the variable speed compressors.

Navigation Keys

There are four navigation keys (UP, RIGHT, DOWN and LEFT). While the ENTER key is not considered a navigation key, it is used in conjunction with the navigation keys to make or confirm a selection.

Figure : X^{e}-90M's Navigation Keys

The navigation keys roll over. Pressing one of the navigation keys will lead the user down a navigation path. Each time the key is pressed, another step in the path is taken. Once the end of a navigation path is reached, pressing the key one more time will bring the user back to the beginning of the path. Pressing the opposite key will

move the user through the navigation path in the opposite direction. Once the beginning is reached, pressing the opposite key will take the user to the end of the path.

Display Layout

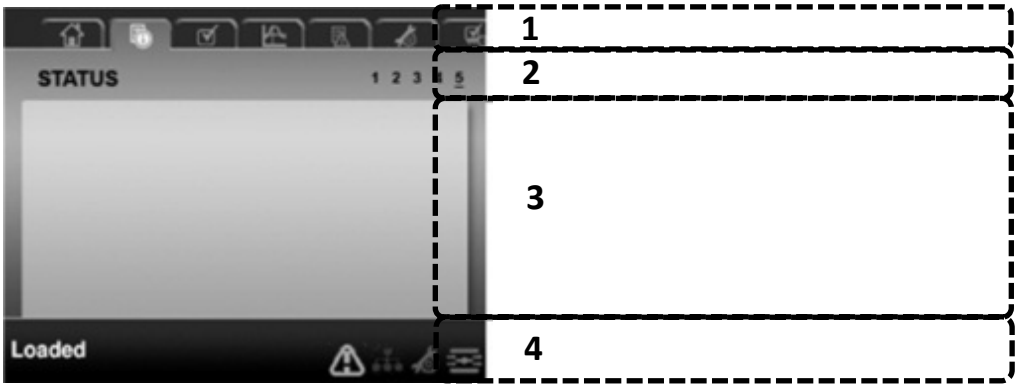


Figure : Xe-90M's Display Layout

1	**Folder Bar**	***Uses tabs to graphically identify each folder.***
2	**Title Bar**	***Identifies current folder and page (underlined).***
3	**Page Content**	***Content of the current page.***
4	**Dashboard**	***Displays system status.***

Folder Navigation & Icons

To move among the tabbed folders shown on the LCD display, press the RIGHT and LEFT keys. The navigation rolls over from the last to the first folder and vice-versa.

Folder Name	Icon	Description
Home		System performance and status main information. The first page of this folder is the default page at power up.
Operator Settings		System options and configuration settings.
Events		System events log.
Trip History		Details on the most recent trips.
Graphing		On-board graphing of system data. (Xe-145M Only)
Maintenance		Status and notification setup for compressor maintenance items.
General Settings		General settings such as Language, Time, and Units of Measure.

Folder Navigation & Icons (Cont.)

Folder Name	Icon	Description
Integral Sequencing		Intergral Sequencing communication status and configuration.
Status		Measurements or status from/of all analog and digital I/O.
Factory Settings		Compressor tuning parameters. Also displays hardware and software versions.

Page Navigation

Once the desired folder is selected, press the DOWN key to move to the page selection area and then use the RIGHT and LEFT keys to select the desired page. Use the UP key to get back to the folder tabs.

	Start of the page selection area.
	Indicates that there are more pages available by navigating right.
	Indicates that there are more pages available by navigating left.

Accessing Parameters

After the desired page is selected, the page's parameters can be selected by using the DOWN key. The cursor will move to the next parameter each time the DOWN key is pressed. Use the UP key to go back to the previous one.

The cursor rolls over, so once the last parameter is selected, pressing the DOWN key will navigate the cursor to the Folder Bar. If the first parameter is selected, pressing the UP key will move the cursor to the page selection area.

Once selected, access parameters by pressing the ENTER key. Make changes using the NAVIGATION keys and then enter the setting by pressing the ENTER key again. After a parameter is accessed, pressing the ENTER key will enter the current setting into the control program and navigate the cursor back to the selected parameter on the page.

When the cursor is on a parameter that has an enabled/disabled box, pressing the ENTER key will cause the setting to toggle.

This icon appears on numeric entry windows (see Figure below) indicating the cursor on it and then pressing the ENTER key will cancel the entry and any changes that were made.

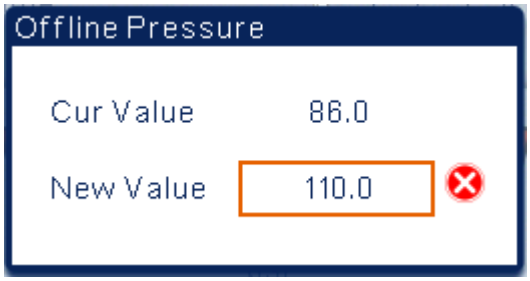


Figure : Numeric Entry Window

Not all pages have adjustable parameters. Some just have read-only information.

Dashboard Icons

The dashboard is intended to be a quick at-a-glance view of system status. The following table lists standard dashboard icons and their definition. Note that the color of these icons changes based on the state set by the application while running.

Name	Icon	Description
Remote Control		Intergral Sequencing communication status and configuration.
Service Required		Measurements or status from/of all analog and digital I/O.
Unloaded or Loaded	 	Compressor tuning parameters. Also displays hardware and software versions.

dashboard status messages

The dashboard also displays the current operating state of the compressor. The following states can be encountered during machine operation:

- **Ready to Start –** The compressor currently has no trip or start inhibit conditions present. The machine can be started by pressing the start button at any time
- **Starting –** A start command has been given to the compressor and the start sequence is being performed. The time

period for this state can vary depending on the starter type of the machine.

- **Load Delay –** The compressor is waiting for a small period of time after starting before allowing the machine to load. This ensures the machine is at operating conditions before loading
- **Running Loaded –** The compressor is operating and producing air. The inlet valve is open and the blowoff valve is closed.
- **Running Unloaded –** The compressor is operating, but not producing air. The inlet valve is closed and the blowoff valve is open.
- **Reload Delay –** This is a brief period of time after the compressor has unloaded before it is allowed to load again. This gives the inlet and bypass valves time to reach their proper positions.
- **Auto-Restart –** The compressor has stopped due to pressure rising above the offline or auto-stop setpoints and auto-restart being enabled. The compressor will automatically restart when pressure falls to the online or target pressure setpoint.
- **Stopping –** The compressor has received a stop command and the stop sequence is being performed
- **Blowdown –** The compressor must wait for a brief period of time after stopping its motor before it is allowed to start again. The compressor will restart at

the end of the blowdown period if a start command is receved during blowdown.

- **Not Ready –** The compressor has detected a condition that will not allow the compressor to start. The condition must be cleared before a start is allowed, but does not need to be acknowledged.
- **Tripped –** The compressor has detected an abnormal operational condition that has stopped the machine. A trip must be acknowledged by hitting the reset button before the compressor can start.
- **Processor Init –** The controller is being initialized.

Fixed Speed Compressor

Home Folder

Page 1 – System Overview

This is the factory default display after powering up the system.

Online Pressure Setpoint - indicated in the white box and by the white arrow, which is always left of center on the gauge. The compressor will load when package discharge pressure falls below this value.

Offline Pressure Setpoint - indicated in the white box and by the white arrow, which is always right of center on the gauge. The compressor will unload when package discharge pressure rises above this value.

Package Discharge Pressure - indicated by the large numbers centred below the gauge and by the red arrow. This is the air pressure that the compressor is supplying to the plant.

Pressure Unit of Measure - indicated below the Package Discharge Pressure. This is selectable from the GENERAL SETTINGS folder.

Airend Discharge Temperature - indicated by the numbers in the lower left of the display. This is the temperature of the air/oil mixture at the discharge of the compression module.

Temperature Unit of Measure - indicated to the right of the Airend Discharge Temperature. This is selectable from the GENERAL SETTINGS folder.

Run Hours - indicate the number of hours the compressor has been running.

The online and offline set points can be selected and modified on this page. All other information on this page is read only.

Page 2 – Counters

Hour Meters - Indicates the hours that: the controller has been powered up, the compressor has been running, and the compressor has running loaded.

Starts - Indicates the number of times a start is attempted on the compressor.

Date & Time – Indicates the current date and time. This is adjustable and configurable in the GENERAL SETTINGS folder.

All information on this page is read only.

Pages 3 thru 4 – Analog Inputs

Pressure is indicated by this icon.

Temperature is indicated by this icon.

Any sensor that is not installed or is reporting a failure will show an X symbol.

All information on these pages is read only.

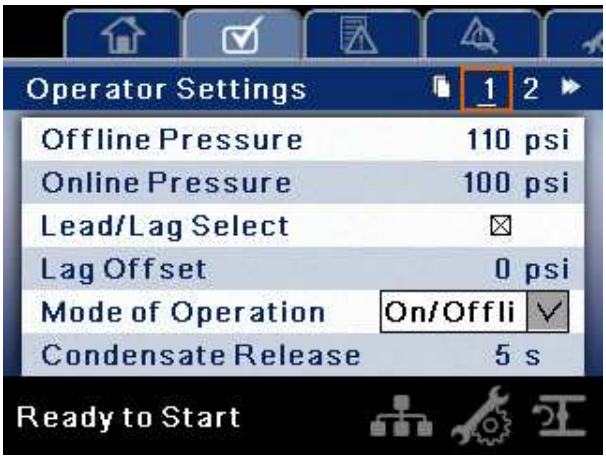
The following analog inputs are displayed in this section.

- **Package Discharge Pressure –** The pressure the compressor is delivering to the plant

- **Sump Pressure –** The compressor's internal pressure at the sump tank.
- **Airend Discharge Temperature –** The temperature of the air/oil mixture at the discharge of the compression module.
- **Injected Coolant Temperature –** The temperature of the oil as it is injected into the compression module
- **Aftercooler Discharge Temperature –** The temperature of the air after passing through the Aftercooler
- **Separator Pressure Drop –** The pressure drop across the separator element
- **Coolant Filter Pressure Drop –** The pressure drop across the coolant filter
- **Inlet Vacuum** – Vacuum reading at the inlet valve.
- **Aftercooler Discharge Pressure (integrated dryer units only) –** Pressure the compressor is delivering before the dryer
- **Remote Pressure (optional) –** An optional pressure sensor that reads pressure at a point outside of the compressor package. Usually this would be on a common tank.
- **Dryer Run Status (Integrated dryer units only) –** Checkbox that shows whether the dryer is currently running (checked) or not (blank)

Operator Settings Folder

Pages 1-2 Operator settings



Below are all setpoints

Offline Pressure – The compressor will unload when package discharge pressure falls below this value.

Online Pressure – The compressor will load when the package discharge pressure rises above this value

Lead/Lag – When this box is checked the compressor is operating as a lead machine. Unchecking the box causes the machine to run as a lag machine.

Lag Offset – If the machine is running as a lag compressor, the lag offset will be subtracted from the online and offline setpoints.
Mode of Operation – Selections are On-line/Offline, Modulation/ACS, and Modulation only – determines how the compressor will try to maintain a specific pressure.

- **Online/Offline –** The compressor will load the machine by energizing a solenoid that opens the inlet valve and closes the blowdown valve when package discharge pressure falls below the online pressure setpoint. The compressor will unload the machine by de-energizing the solenoid when pressure rises above the offline pressure setpoint.
- **Modulation –** The compressor will still load and unload as in online/offline, but will energize a different solenoid valve for modulation. When the package discharge pressure is between the online and offline setpoints the compressor will adjust the inlet valve in order to achieve a stable output pressure. The output pressure target needs to be set by a technician at the inlet valve in order to provide effective modulation control. Modulation can only work when the package discharge pressure is above 60 psi. Modulation is an option and must be enabled in the factory settings tab.
- **Mod/ACS –** The compressor will initially

start out in online offline mode. If the compressor goes through 3 load/unload cycles within 3 minutes, it will switch over into Modulation mode. It will remain in modulation until the stop button is pressed or 3 minutes pass between an unload and load command. Mod/ACS is an option and must be enabled in the factory settings tab.

Condensate Release – Time period that determines how long the condensate drain valve will remain open every cycle.
Condensate Interval – Time period that determines how often the condensate drain valve will open.
Unloaded Stop Time – Time period that the machine must run unloaded before the motor is allowed to stop after a stop command is received.
Starter Time – Time period that the compressor needs in order to come up to operating speed after a start command before being able to produce air.

The parameters on these pages are adjustable any time. The table below shows the range and default values for the setoints on these screens.

SELECTION	MIN.	MAX.
---	75	Rated+10
---	65	Offline-10
---	---	---
---	2	20
---	90	270

*Please note that Mode of Operation can only be adjusted if the modulation option has been purchased for the compressor and the Enable Modulation factory setting has been turned

Pages 3-5 OPERATOR Options

The below values are all setpoints

Enable Auto-Restart – Enabling this will allow the compressor to stop if it has been running unloaded for a period of time, and the motor has exceeded its minimum running time (10 minute in most cases).

Auto-Restart Time – The time period the compressor must run unloaded before stopping in auto-restart. This time period begins the moment that package discharge pressure rises above the offline setpoint. Both this time period and the minimum motor run timer (10 minutes) must be satisfied before the compressor will stop in auto restart.

Auto-Restart Delay – The time period after the package discharge pressure has fallen below the online setpoint before the compressor can automatically restart.

COM Control – Enabling this setpoint allows the compressor to be controlled by a serial or Ethernet device, such as an X8I. This is equivalent to the "Sequencer" option on older Intellisys controllers.

Remote Start/Stop – Enabling this setpoint allows the compressor to be started and stopped using the digital inputs on the controller.

Enable PORO – Enabling this setpoint will allow the compressor to automatically restart after a power outage has been restored if the com-

pressor was running loaded at the time of the outage. PORO is an option and the option module must be purchased and installed before this feature can be turned on.

PORO Time – Time after the controller power has been restored and controller has finished booting before the compressor will perform a PORO start. During this time.

Low Ambient Temp – Temperature below which the low ambient option will come into effect.

Lead/Lag Cycle Time - Time interval after which the compressor will switch from lead to lag mode or vice versa.

Scheduled Start Day – Day (or days) of the week for which a scheduled start will be performed. The compressor will start when its on-board clock matches the day, hour, and minute of the scheduled start setpoints. Scheduled Start/Stop is an option and the option module must be purchased and installed before this feature can be turned on.

Scheduled Start Hour – Hour of the day for which a scheduled start will be performed. Scheduled Start/Stop is an option and the option module must be purchased and installed before this feature can be turned on.

Scheduled Start Minute – Minute of the hour for which a scheduled start will be performed. Scheduled Start/Stop is an option and the op-

tion module must be purchased and installed before this feature can be turned on.

Scheduled Stop Day – Day (or days) of the week for which a scheduled stop will be performed. The compressor will stop when its onboard clock matches the day, hour, and minute of the scheduled stop setpoints. Scheduled Start/Stop is an option and the option module must be purchased and installed before this feature can be turned on.

Scheduled Stop Hour – Hour of the day for which a scheduled stop will be performed. Scheduled Start/Stop is an option and the option module must be purchased and installed before this feature can be turned on.

Scheduled Stop Minute – Minute of the hour for which a scheduled stop will be performed. Scheduled Start/Stop is an option and the option module must be purchased and installed before this feature can be turned on.

Enable High Dust Filter – Enabling this when a high dust filter is installed will adjust the change inlet filter warning and high inlet vacuum trip thresholds to a higher value.

Enable Remote Sensor – Enabling this allows the compressor to load and unload based off a sensor reading installed in a remote location.

Please note that in order to disable Scheduled Start/Stop, the Scheduled Start and Stop days, hours, and minutes must match exactly.

The parameters on the facing page are only adjustable when the compressor is stopped. The table below shows the range and default values for the setoints on these screens.

OPERATOR OPTIONS	SELECTION	MIN.	MAX.	DIFF.	STEP	UNIT	Installed Option Required
Enable Auto Restart	ON/OFF	---	---	Off	---	---	No
Auto Restart Time	---	2	60	10	1	min	No
Auto Restart Delay	---	0	60	0	1	sec	No
Comm Control	ON/OFF	---	---	Off	---	---	No
Remote Start/Stop	ON/OFF	---	---	Off	---	---	No
Enable PORO	ON/OFF	---	---	Off	---	---	Yes
PORO Time	---	10	600	10	1	sec	Yes
Scheduled Start – Hour	---	0	23	0	1	Hour	Yes
Scheduled Start – Minute	-	0	59	0	1	Min	Yes
Scheduled Stop - Day	---	Day	Day	Sun	1	day	Yes
Scheduled Stop – Hour	---	0	23	0	1	Hour	Yes
Scheduled Stop – Minute	-	0	59	0	1	Min	Yes
High Dust Filter	ON/OFF	---	---	Off	---	---	No
Remote Sensor	ON/OFF	---	---	Off	---	---	No

* The low ambient temperature is only adjustable if the low ambient factory set point is on.
** A value of 0 will disable the

Pages 6-7 CALIBRATE SENSORS

Sensor calibration can only take place when the machine is stopped and there is no pressure on the sensor.. Calibration only needs to take

place after a sensor is replaced, the controller is replaced, the controller software is upgraded, or the operator suspects the sensor reading is in error. Calibrate a sensor by selecting the checkbox beside the sensor name.
Each of the sensors listed below can be calibrated.

- Inlet Vacuum (1AVPT)
- Sump Pressure (3APT)
- Package Discharge Pressure (4APT)
- Coolant Filter Inlet Pressure (5CPT)
- Coolant Filter Outlet Pressure (6CPT)
- Remote Pressure (10APT) – Only on units with the remote sensor option
- Interstage Pressure (2APT) – Only on 2-stage units
- Aftercooler Discharge Pressure (7APT) – Only on units with integrated dryer

Please note that if a sensor is currently reading a value that is +/- 10% of its range from zero, the sensor will not be able to be calibrated and an warning will be logged in the event log. Please make sure the sensor is being exposed to atmosphere before attempting calibration.

Events folder

Pages 1 to a max of 42

The pages in the Events folder document up to the last 200 events that the controller has experienced, with the time and date of the occurrence. The events are recorded in sequence, with number one being the newest and 200 being the oldest. When a new event occurs, it becomes number one and all others are shifted up in number.

The page numbers in the Title Bar are used to scroll through the events, with each page displaying up to seven. Page one displays events

one through five, page two displays six through ten, and so on.

The following items will generate an event.

- Power On
- Power Off
- Press the Start Key
- Press the Stop Key
- Press the Load Key
- Press the Unload Key
- Starting the compressor remotely
- Stopping the compressor remotely
- Loading the compressor remotely
- Unloading the compressor remotely
- Warning
- Trip
- Start Inhibit

Active Warnings will be highlighted in amber while acknowledged Warnings will have amber text.

Active Trips will be highlighted in red while acknowledged Trips will have red text.

Active Start Inhibits will be listed in the Event log, but not highlighted. The display will indicate the compressor is not ready to start if a start inhibit is active.

Warning Events List

Change Inlet Filter

Will occur if 1AVPT is greater than 0.7 psi vacuum (or 1.3 psi vacuum if the high dust filter option is enabled) and the unit has been loaded for at least 8 seconds. This condition must exist for 3 seconds before the warning is issued. This warning should only be checked if the compressor is running as an online/offline compressor.

Change Coolant Filter

This will occur if the unit has been running loaded for at least 8 seconds, is warmed up, and the coolant filter pressure drop (5CPT - 6CPT) is greater than 25 psi. This condition must exist for 3 seconds before the warning is issued. A unit is considered warmed up if the Injected Coolant Temperature is above 120 degF

Sensor Failure

This will occur whenever sensors 4ATT, 5DTT, or 6DTT are recognized as missing or broken. The sensor failure message shall follow the following format: 4ATT FAILURE. The 5DTT and 6DTT sensor failures will be

shown only when the integrated dryer is installed (accessed in the factory settings menu). This condition must exist for 3 seconds before the warning is issued.

Change Separator Element

Will occur if the unit is loaded, the package discharge pressure (4APT) is at least 90 psi, is warmed up, and the separator pressure drop is greater than 12 psi. This condition must exist for 3 seconds before the warning is issued.

High Airend Discharge Temperature

Will occur if the unit is running and 2ATT is greater than 221 degF (97% of 228) and the unit is running. This condition must exist for 3 seconds before the warning is issued.

High Sump Pressure

If the unit is running loaded, has been loaded for at least 8 seconds and the sump pressure is more than 25 psi above the rated pressure for the compressor. If this warning occurs, the online and offline pressures will be reduced. For example, a rated pressure of 100 psi would have a maximum offline pressure of 110 psi. This warning

would occur if the sump pressure goes above 125 psi in this example. This condition must exist for 3 seconds before the warning is issued.

Auxiliary 1

This will occur if auxiliary input 1 closes. The contact must be closed for at least 3 seconds before the warning will occur.

Auxiliary 2

This will occur if auxiliary input 2 closes. The contact must be closed for at least 3 seconds before the warning will occur.

Service

Service warnings occur when the unit has operated a certain number of hours, based on the total hours. Service warnings can have multiple levels, depending on the service level selection. A service level selection of 0 disables service warnings.

Service Level 1

If service level 1 has been selected for the unit, a “SERVICE REQUIRED” warning will be issued on hour intervals equal to the service time period set point. This warn-

ing can be reset the same as any other warning.

Service Level 2

If service level 2 has been selected for the unit, the service complete factory set point will be used to clear a level 2 service warning and reset the service time or date. The service complete can be reset before a service warning occurs.

The initial "SERVICE REQUIRED" warning will occur at total hour intervals equal to the service time period set point. However, 100 hours before this a "100 HOURS TO SERVICE" warning will occur. This warning can be reset the same as any other warning. One hundred hours later the "SERVICE REQUIRED" warning will occur. This warning can be reset the same as any other warning, however this warning will return in 24 hours if the service complete factory set point has not be set. If the service complete has not been set, 100 hours later, the "ALARM – SERVICE REQUIRED" warning will be issued. This warning can only be cleared by the service

complete factory set point. Once the service complete factory set point is set, indicating the service is completed, the time for the next "SERVICE REQUIRED" warning will be calculated by adding the service time period to the total hours value, with the "100 HOURS TO SERVICE" warning occurring 100 hours before and the "ALARM – SERVICE REQUIRED" warning occurring 100 hours after that time.

Communication Failure

This will occur if the unit is the lead compressor in integral sequencing and is unable to communicate with another unit.

Sensor Failure 10APT – Remote Sensor

This will occur if the remote sensor option is on and the remote sensor is recognized as missing or broken. If this occurs, the unit will automatically start using 4APT for loading and unloading the compressor. Units equipped with an integrated dryer cannot have a remote pressure sensor. This condition must exist for 3 seconds before the warning is issued.

High Discharge Pressure

Will occur if the unit is using a remote sensor or is under the control of an external device, such as an X8I, is loaded, and the discharge pressure (4APT) is greater than the maximum offline pressure. This condition must exist for 3 seconds before the warning is issued. If this condition occurs, the compressor will automatically unload. The unit will be available to reload once the discharge pressure falls to the rated pressure value.

Condensate Drain Error

This will occur if the compressor is running, the package discharge pressure is over 50 psi, and the condensate drain error contact closes for at least 240 seconds. This warning will be ignored for 4.5 minutes after starting.

Freeze Warning

This will occur if the evaporator sensor has a value of 675 (about 0.5 C) or below (low temp) while the dryer is running, on units with the integrated dryer. This is a dryer fault. If this happens, the compres-

sor will continue to run, but the dryer will stop. The condition must exist for at least 180 seconds before the warning will occur. NOTE: If this warning is reset while the conditions for running the dryer exist, the dryer can restart. Also the dryer can restart if the evaporator value rises to 709 (about 5 C). However the warning will still be displayed.

Dryer High Pressure

On units with the integrated dryer, this will occur if the dryer high pressure switch opens while the dryer is running. This is a dryer fault. If this happens, the compressor will continue to run, but the dryer will stop. The contact must be open for at least 3 seconds before the warning will occur. However, this switch is a locking switch. The dryer high pressure switch must be reset (contact closed) before this warning can be reset. If this warning is reset while the conditions for running the dryer exist, the dryer can restart.

Condenser Temperature High

This will occur if the condenser sensor has a value above high temperature threshold while the dryer is running, on units with the integrated dryer. This is not a dryer fault. If this happens, the compressor and dryer will continue to run. The condition must exist for at least 180 seconds before the warning will occur.

Condenser Temperature Low

This will occur if the condenser sensor has a value below the low temperature threshold while the dryer is running, on units with the integrated dryer. This is not a dryer fault. If this happens, the compressor and dryer will continue to run. The condition must exist for at least 180 seconds before the warning will occur.

Change HE Filter

The HE filter is located between the aftercooler discharge and the inlet to the dryer and is only on units with an integrated dryer. The drop across the HE filter is measured by subtracting the package discharge pressure from the aftercooler discharge pressure. If the compressor is

running, the measured drop across the HE filter is at or above 10 psi (0.7 bar), the unit is hot (injected coolant temp above 120 degF), and the package discharge pressure (4APT) is above 90 psi, this warning can occur. The condition must exist for at least 3 seconds before the warning will occur. This is not a dryer fault. If this happens, the warning will be displayed, but the dryer will continue to run.

Invalid Calibration

Will occur if the sensor zero value is +/- 10% of its scale. See Sensor Calibration.

Trip Events List

Low Sump Pressure

Will occur if the unit is running unloaded or loaded and 3APT is less than 13 psi for 15 seconds.

High Airend Discharge Temperature

This will occur if 2ATT is greater than 228 degF and the unit is running.

Check Motor Rotation

This will occur if 3APT is less than 1 psi on a unit, 3 seconds after starting (6 seconds if the unit is equipped with a soft starter or airend discharge temperature is less than 50 degF). This condition can be caused by the motor running in reverse. Once correct motor rotation is established, this trip will not be checked again unless power is removed from the controller. However, if correct motor rotation is not established, this fault will be checked after each start until correct motor rotation is established. Correct motor rotation is established when the controller reads a sump pressure of 1 psi or more within 3 seconds of starting.

Main Motor Overload

This will occur if the motor overload relay or the phase monitor contact (optional) opens. The contact must be open for at least 3 seconds before the trip will occur.

Fan Motor Overload

Will occur if a fan motor overload relay contact opens. The contact must be open for at least 3 seconds before the trip will occur.

Remote Stop Failure

Will occur if the remote start/stop option is enabled, the remote stop button remains open and either start button is pressed.

Remote Start Failure

Will occur if the remote start/stop option is enabled, the unit is started by the remote start button, and the button stays closed for 7 seconds after the unit starts.

Sensor Failure

This will occur when a sensor is recognized as missing or broken. The sensors affected by this trip are 1AVPT, 3APT, 4APT, 5CPT, 6CPT, 2APT (if 2 stage unit), 7APT, 2CTT, and 2ATT. The sensor should be displayed along with the sensor failure message. The sensor failure message

shall follow the following format: 1AVPT Failure.

Emergency Stop

This will occur when the EMERGENCY STOP button is engaged.

High Sump Pressure

This will occur if the compressor is running loaded for at least 8 seconds, and any one of the 3 following conditions exist. (1) The sump pressure is above the rated pressure by 35 psi. (2) The separator pressure drop is measured to be more than 25 psi and the package discharge pressure at least equal to the minimum online set point value. (3) The sump pressure is above 165 psi if the rated pressure is less than 190 psi or the sump pressure is above 220 if the rated pressure is 190 psi.

High Coolant Filter Pressure Drop

This will occur if the unit has been running loaded for at least 8 seconds, is warmed up, already has a change coolant filter

warning, and the coolant filter pressure drop (5CPT - 6CPT) is greater than 35 psi.

High Inlet Vacuum

This will occur if the unit has running loaded for at least 8 seconds and the inlet vacuum is greater than 1.8 psi. If the unit has a high dust filter, the trip threshold for inlet vacuum is 2.4 psi. This trip should only be checked if the compressor is running as an online/offline compressor. This is not checked if the modulation solenoid valve output is energized.

Unit Too Cold To Start

This will occur if the unit does not have the low ambient option, the airend discharge temperature (2ATT) is less than 35 deg F, and the operator attempts to start the compressor. This fault can only occur once a day. Once this fault occurs, the operator can reset it and start the compressor. This fault will be logged in the trip history to indicate that the unit is being started in low ambient conditions.

High Interstage Pressure

This will occur if the unit is running and the interstage pressure (2APT) is greater than 75 psi. This trip will only occur in 2 stage units.

Start Inhibit List

High Airend Discharge Temperature

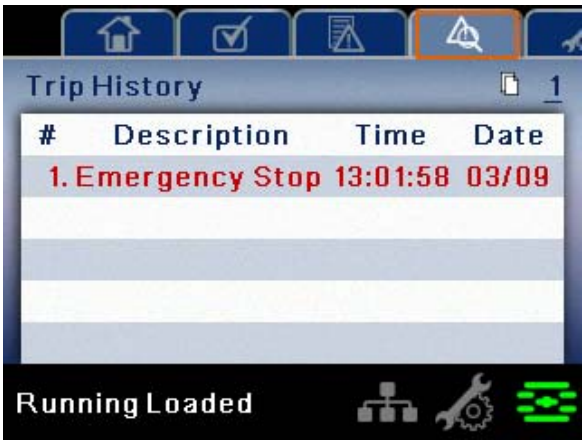
This will occur if 2ATT is greater than 95% of 228 degF.

High Sump Pressure

This will occur if the sump pressure (3APT) is 25 psi or higher than the rated pressure of the compressor.

Trip History

PAGES 1 TO A MAX OF 3



The pages in the Trips History folder document up to the last 15 trips that the controller has experienced, and time stamps each. The trips are recorded in sequence, with number one being the newest and 15 being the oldest. When a new trip occurs, it becomes number one and all others are shifted up in number.

The page numbers in the Title Bar are used to scroll through the events, with each page displaying up to seven. Page one displays events one through five, page two displays six through ten, and so on.

The following items will generate an entry in the trip history.

- Trips

Active Trips will be highlighted in red while cleared Trips will have red text.

The trip history also records compressor data at the time of the trip to assist in diagnostics and troubleshooting. Navigating to the trip entry and hitting the enter button will bring up the trip history dialog box.

While the dialog box is active, press the left and right keys in order to scroll through the displayed data. The name of the trip will always be shown in the title bar of the dialog box. Press enter when finished viewing the data to return to the trip history screen.

Maintenance Folder

PAGE 1 – FILTER STATUS

This page displays the status of the filters. The filter status will either be “OK” or “Change” depending on the compressor’s diagnostic readings. If a filter reaches the “change’ status, a

warning will be issued and the service indicator will light up yellow to notify the user. Please note that the compressor must be in a "Running Loaded" state to check these maintenance items. If the compressor is not in a running state – the status will display "Load," unless a maintenance indicator has been issued when the machine was running and has not yet been reset.

The following filters are displayed:

- Coolant Filter
- Separator Element
- Inlet Filter

PAGE 2 – MAINTENANCE STATUS

This page displays the time until the unit should be serviced. The service meter will deplete as the hours count down closer to a service appointment. Once the counter reaches the yellow zone, the service indicator will light up yellow. Once the counter reaches the red zone the service indicator will light up red and maintenance must be performed.

PAGE 3 MAINTENANCE CONFIGURATION

This page allows the user to set the service interval and to reset the counter after the service has been performed. The service interval may be set to any value between 1000 and 8000

hours, but must be set in accordance with the factory maintenance schedule. After maintenance has been performed, the user can reset the counter by navigating to the Reset button and pressing the enter key.

General Settings Folder

All parameters in the general settings folder are adjustable.

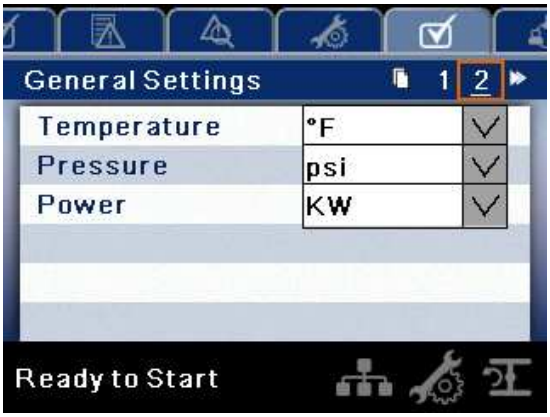
Page 1 – Language Selection

Language is selectable from the following:

English (default)	Finish	Latvian
Bulgarian	Slovak	French
Lithuanian	German	Maltese
Slovenian	Spanish	Greek
Chinese(Simplified)	Croatian	Swedish
Norwegian	Polish	Czech
Hungarian	Thai	Danish
Portuguese	Italian	Turkish
Indonesian	Dutch	Korean
Romanian	Estonian	Russian

The controller will display all screens in the selected language and only one language can be selected at a time.
Each language appears in its native translation.

Page 2– Units of Measure Settings



Temperature is selectable between ^{o}F and ^{o}C.

Pressure is selectable between psi, kpa, bar, kg/cm^{2}.

Power is selectable between kW and HP

Page 3 – Home Page Selection

Auto Return to Home enables the controller to return the display back to the selected Home Page if there is no user activity for the Delay Time shown. This is only enabled when an "x" appears in the checkbox.

Delay Time determines how many seconds of inactivity it will take before the controller will return to the Home Page.

Select Home Folder is used to select the Home Folder.

Select Home Page is used to select the Home Page within the selected Home Folder.

Page 4 and 5 – Time & Date Settings

All items are adjustable.

Hours allows the current hour to be set. The hours format is fixed on 24-hour.
Minutes allows current minutes to be set.
Seconds allows current seconds to be set.
Year allows current year to be set.
Month allows current month to be set.
Day allows current day to be set.
Date Format is selectable between dd/mm/yyyy (default) and mm/dd/yyyy.

Confirm New Time and Date is used to verify that changes to selections are desired. An "x" must appear in the checkbox before any changes will take affect.

The controller will continue to display any changes, even when the selections have not been confirmed and the user exits the page, then returns. Cycling of the power returns all selections to their current settings.

The controller does not support Daylight Savings Time.

Page 6 – Backlight Settings

Backlight Brightness adjusts the brightness of the display.
Enable Backlight Auto-Off enables the controller to shut-off the backlight if there is no user activity for the delay time shown.

Backlight Auto-Off Delay Time determines how many seconds of inactivity it will take before the controller will shut-off the backlight.

The backlight will be switched on whenever any of the controller's keys are pressed.

THE START, STOP, LOAD, UNLOAD, RESET, AND ACKNOWLEDGE KEYS ON THE CONTROLLER REMAIN FUNCTIONAL WHILE THE BACKLIGHT IS SWITCHED OFF. IT IS RECOMMENDED TO PRESS THE ENTER KEY OR ONE OF THE NAVIGATION KEYS IN ORDER TO SWITCH THE BACKLIGHT ON.

page 7 - Serial port address settings

This page allows the user to set up the network addresses for the RS-485 networks the controller is capable of communicating with.

MODBUS Address – Sets the modbus node ID for the controller to communicate with a Modbus capable device, this can be any value between 1 and 254.

Airbus Address – Sets the airbus address that allows the controller to communicate over Integral Sequencing or an X-Series system controller network.

pages 8, 9, and 10 – ethernet settings

IP Address Setting – When DHCP is not enabled, this setpoint sets the IP address of the controller.
IP Address Actual – This will match the IP address setting when DHCP is not enabled. If DHCP is enabled this will display the address assigned to the controller by the DHCP server.
Default Gateway Setting – Setpoint for the default gateway.
Default Gateway Actual – Current reading/setting for the default gateway.
Subnet Mask Setting – Setpoint for the subnet mask
Subnet Mask Actual – Current reading/setting for the subnet mask

MAC Address – This is the unique hardware MAC address for the controller. This can not be changed.

Enable DHCP – Allow the controller to automatically receive an IP address from the Local Area Network (LAN)

Apply– After editing the desired setpoint navigate to the accept setting and press enter in order for the values in the setting variables to be confirmed by the controller.

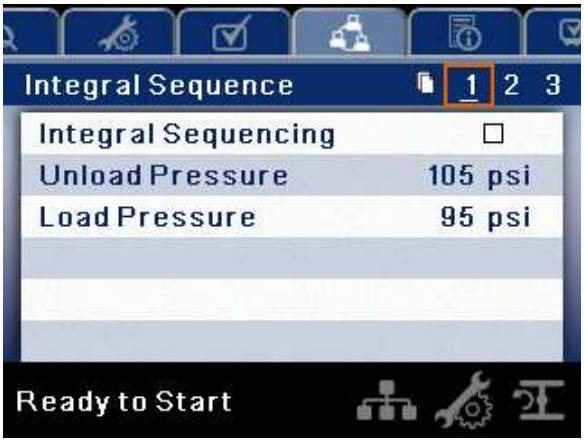
Cancel – Discard any changes made to the Ethernet settings.

pages 11 and 12 option module information

The option module information screen allows the user to see which software options have been installed in the controller. An option module that is installed will show up with an "X" in the appropriate box. The option part number is displayed with the option name.

If no options are installed, this screen will not appear on the controller.

Integral Sequencing folder



Integral Sequencing allows the compressor to be networked with up to three other compressors (fixed or variable speed) to maintain a stable system pressure by loading and unloading compressors as needed. Integral sequencing requires no additional hardware other than a serial two wire connection daisy chained between all compressors in the system.

Please note that the compressor's address in the integral sequencing system is defined by the airbus address that is set on the general settings folder. Also note that the pressure signal used to determine when to load or unload another

compressor is based on the pressure reading from the compressor at address 1 in the system.

Integral Sequencing – Enabling Integral Sequencing immediately places the compressor under integral sequence control. The default is disabled. Please make sure all compressors are set up for integral sequencing before enabling this function.

Unload Pressure – Determines the pressure at which a compressor will be unloaded by the system

Load Pressure – Determines the pressure at which a compressor will be loaded by the system.

Start Delay Interval – Determines the amount of time between loading compressors. This prevents all compressors from loading at once.

Damping – The pressure control "Damping" setting which is used to tune how quickly the system responds to pressure deviations. The default is 10 and should not normally be changed.

Tolerance - The pressure control "Tolerance" setting, which is used to tell the system how to respond to changes in pressure above and be-

low the load/unload pressures. The default is 3.0 psi and should not normally be changed.

Number of Compressors – Defines how many compressors are in the system. There is a maximum of 4.

Sequence – Displays the current load/unload order of the system. Each compressor in the system is assigned a letter, with “A” being the compressor to load first and unload last, and “D” being the compressor to load last and unload first.

Priority – Each compressor can be assigned a priority level. Compressors will only rotate positions with other compressors of the same priority level.

Rotation Interval – Determines the time period between sequence rotations.

Time Left – Counts down the time until the sequence rotation will occur.

System Pressure – Shows the current pressure reading that the system is using for control. This is typically compressor 1’s package discharge pressure reading.

Status Folder

All information on the following pages is read only. Additionally, Some values may only be visible when the factory settings password is entered.

Pages 1 thru 3 – Analog Inputs

Analog Inputs:
The following analog inputs are displayed in this section.

- **Package Discharge Pressure –** The pressure the compressor is delivering to the plant
- **Sump Pressure –** The compressor's internal pressure at the sump tank.
- **Airend Discharge Temperature –** The temperature of the air/oil mixture at the discharge of the compression module.

- **Injected Coolant Temperature –** The temperature of the oil as it is injected into the compression module
- **Aftercooler Discharge Temperature –** The temperature of the air after passing through the Aftercooler
- **Separator Pressure Drop –** The pressure drop across the separator element
- **Coolant Filter Pressure Drop –** The pressure drop across the coolant filter
- **Inlet Vacuum** – Vacuum reading at the inlet valve.
- **Aftercooler Discharge Pressure (integrated dryer units only) –** Pressure the compressor is delivering before the dryer
- **Remote Pressure (optional) –** An optional pressure sensor that reads pressure at a point outside of the compressor package. Usually this would be on a common tank.
- **Coolant Filter Inlet Pressure (Password Required) –** Pressure on the inlet side of the coolant filter.
- **Coolant Filter Outlet Pressure (Password Required) –** Pressure on the outlet side of the coolant filter
- **Interstage Pressure** (2-stage units only) **(Password Required) –** Pressure at the discharge of the first stage of the compression module on 2 stage units.
- **Evaporator (Password Required) –** Temperature reading on the evaporator of the dryer.

- **Condenser (Password Required) –** Temperature reading at the discharge of the dryer

Page 4 – Compressor Data

Compressor Data:

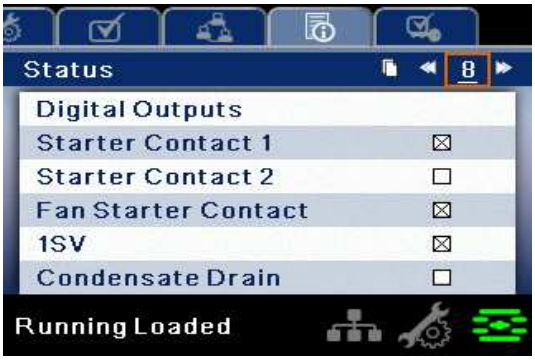
- **Power On Hours –** The number of hours the controller has been powered up
- **Running Hours** – The number of hours the compressor's motor has been running
- **Loaded Hours** - The number of hours the compressor has been producing air
- **Real Time Clock** - Current time of day

Pages 5 & 6 – Digital Inputs

Digital Inputs: An "x" in the checkbox beside a digital input indicates that the input is in its TRUE state. For example, Starter Feedback is TRUE when its input is in the high state, where as, Emergency Stop is TRUE when its input is at 0Vdc. A password is required to view these pages.

- **Emergency Stop**
- **Main Motor Overload**
- **Fan Motor Overload**
- **Condensate Drain Error**
- **Remote Stop**
- **Remote Start**
- **Remote Lead/Lag**
- **Remote Load Enable**
- **Remote Load/Unload**
- **Auxiliary Input 1**
- **Auxiliary Input 2**
- **Dryer High Pressure**

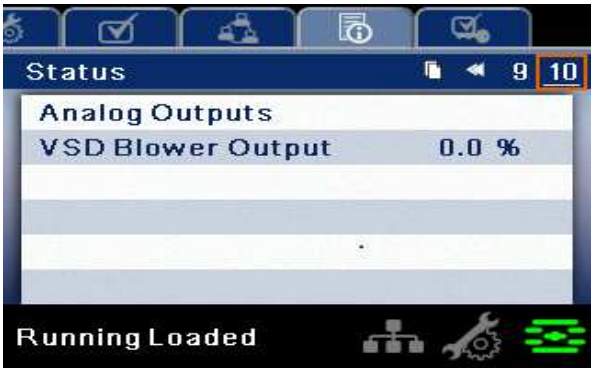
Pages 7 & 8 – Digital Outputs



Digital Outputs: An "x" in the checkbox beside a digital output indicates that it is energized. A password is required to view these pages.

- **Starter Contact 1**
- **Starter Contact 2**
- **Fan Starter Contact**
- **1SV**
- **Modulation Solenoid**
- **Condensate Drain**
- **Dryer Run / Fan Run**
- **PORO Horn**
- **Trip Relay**
- **Warning Relay**

Page 9 – Analog Outputs



Analog Outputs: The value for the analog outputs will be in %. A password is required to view this page.

- **VSD Blower Output** – Current speed of the VSD blower (if installed)

Factory Settings Folder

This folder is for IR factory and service personnel. A password must be entered on page one in order to adjust values in this folder. This folder is used for setting parameters that are specific to that compressor and displaying software information for the controller.

Page 1 – Password

Password: Provides access to enter a valid password to gain access to password protected parameters. The password is entered by scrolling down to the password value and pressing the return key.

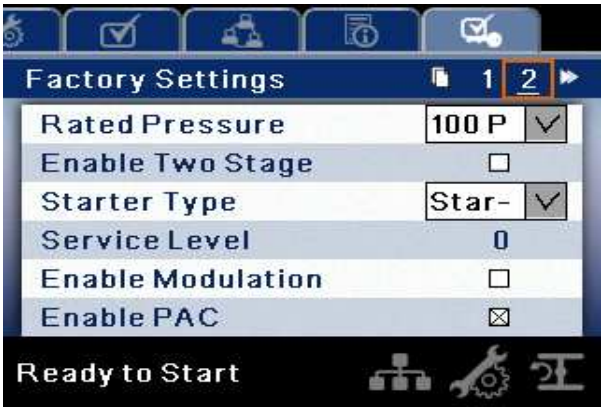
Password entered: This checkbox will indicate a valid password has been entered. If this check-

box is blank, a valid password has not been entered or it has timed out. This is read only.

Password timeout enable: Checking this box will enable the password time feature.

Password timeout: This timeout along with the password timeout enable allows the user to set an adjustable amount of time to require a valid password to be re-entered. Once this timeout is reached re-entry of a valid password is required. The timeout counter is reset after any button press.

Pages 2 thru 4 – Factory Settings



These pages are used for setting parameters that are specific to the compressor. All of the factory settings that are adjustable are listed below. All settings on these pages are password protected.

Rated Pressure (psi – 100, 115, 135, 190) – This is the nominal pressure that the compressor can provide.

Enable Two Stage (On/Off) – This setpoint is enabled on two stage machines to enable the additional two stage functionality. If this is enabled on a single-stage machine, the machine will trip due to missing sensors.

Starter Type (Star-delta, Remote Starter, Soft Starter) – Choose the starter type installed in the compressor. If this is not set correctly, the compressor may not start.

Service Level (0, 1, or 2) – Set the service level reminders for the compressor.

- **Service Level 0 –** Disables all service reminders
- **Service Level 1 –** A service warning will be issued when the service time period has been expired. This warning can be reset by any user.
- **Service Level 2 –** A service warning will be issued 100 hours prior to the service time period expiring. This 100 hour warning can be reset by any user. At the expiration of the service time interval the service warning will again occur. This warning can be reset by any user but will recur every 24 hours until the service complete factory setpoint has been set (Password Required).

Service Time Period (1000 – 8000) – The time interval that the service warnings are based on. This must be set according to the factory maintenance schedule.

Enable Modulation (On/Off) – This enables the modulation option in the controller, allowing Modulation or Mod/ACS modes of operations to be chosen from the operator settings. The modulation option must be installed on the compressor for this to work.

Enable PAC (On/Off) – Enables Progressive Adaptive Control – this will reduce operating pressure in the case of a Change HE Filter warning or High Sump Pressure warning in order to protect the compressor.

Enable Dryer (On/Off) – Enables dryer control from the controller. The dryer option must be installed in the compressor for this to work properly.

Constant Run Dryer (On/Off) – Enabling this function causes the dryer to run whenever the compressor is in a running state, including auto-restart. Disabling this will allow the dryer to stop if certain conditions are met, such as satisfying a minimum run timer. Certain dryer warnings will stop the dryer regardless of this setpoint. If the dryer stops for any reason it will not be allowed to restart for 90 seconds. When the compressor is being controlled by an external source, constant run dryer will be enabled regardless of this setpoint's state.

Enable VSD Blower (On/Off) – Enable this function if there is a VSD blower option installed in the compressor.

Limit Blower VSD (On/Off) – Enable this setpoint to limit the maximum speed of the blower to 39 Hz.

Enable Low Ambient (On/Off) – Enable this setpoint to activate low ambient control. Low ambient control uses temperature readings to determine the speed of the blower to allow the compressor to reach an optimal operating temperature. When low ambient is enabled, the compressor will always start, but will run unloaded until the airend discharge temperature reaches the low ambient temperature set point.

Max Inlet Vacuum (On/Off) – This is the inlet vacuum value at which the compressor will unload if running in Modulation or Mod/ACS mode.

Running Hours (adjustable) – Used to adjust the running hours counter on the compressor

Loaded Hours (adjustable) – Used to adjust the loaded hours on the compressor

Power On Hours (Read Only)

Pages 5 & 6 – Factory Settings

These pages are used for displaying software information for the controller. All items are read only.

Variable Speed Compressor

Home Folder

Page 1 – System Overview

This is the factory default display after powering up the system.

Target Pressure Setpoint is indicated in the white box and by the white arrow, which is always centered on the gauge. This is the pressure that the compressor is trying to maintain by adjusting the motor speed.

Automatic Stop Setpoint is indicated in the white box and by the white arrow, which is always right of center on the gauge. When the compressor reaches this setpoint the compres-

sor will unload and stop once the motor reaches minimum speed.

Package Discharge Pressure is indicated by the large numbers centered below the gauge and by the red arrow. This is the output pressure of the compressor.

Pressure Unit of Measure is indicated below the Package Discharge Pressure. This is selectable from the GENERAL SETTINGS folder.

Percent Capacity is indicated on the lower left side of the screen in numeric and bar graph form. This is how much air the compressor is producing as a percentage of its maximum capacity.

Airend Discharge Temperature is indicated by the numbers in the lower right of the display. This is the temperature of the air/oil mixture at the discharge of the compression module.

Temperature Unit of Measure is indicated to the right of the Airend Discharge Temperature. This is selectable from the GENERAL SETTINGS folder.

Run Hours indicate the number of hours the compressor has been running.

The target pressure and automatic stop set points can be selected and modified on this page. All other information on this page is read only.

Page 2 - Counters

Hour Meters Indicate the hours that: the controller has been powered up, and the compressor has been running.

Starts indicate the number of times a start is attempted on the compressor.

Date & Time is adjustable and configurable in the GENERAL SETTINGS folder.

All information on this page is read only.

Pages 3 thru 5 – Analog Inputs and Compressor information

Pressure is indicated by this icon.

Temperature is indicated by this icon.

All information on these pages is read only.

The following analog inputs are displayed in this section.

- **Package Discharge Pressure –** The pressure the compressor is delivering to the plant
- **Sump Pressure –** The compressor's internal pressure at the sump tank.
- **Airend Discharge Temperature –** The temperature of the air/oil mixture at the discharge of the compression module.

- **Injected Coolant Temperature –** The temperature of the oil as it is injected into the compression module
- **Aftercooler Discharge Temperature –** The temperature of the air after passing through the Aftercooler
- **Separator Pressure Drop –** The pressure drop across the separator element
- **Coolant Filter Pressure Drop –** The pressure drop across the coolant filter
- **Inlet Vacuum** – Vacuum reading at the inlet valve.
- **Aftercooler Discharge Pressure (integrated dryer units only) –** Pressure the compressor is delivering before the dryer
- **Remote Pressure (optional) –** An optional pressure sensor that reads pressure at a point outside of the compressor package. Usually this would be on a common tank.
- **Dryer Run Status (Integrated dryer units only) –** Checkbox that shows whether the dryer is currently running (checked) or not (blank)

Additionally, the following compressor status readings are included in this section:

- **Motor Speed –** The current speed of the motor in rpm
- **Package kW –** The current power being consumed by the package, including the main and blower VSDs

Page 6 Energy Savings Information

This page displays the calculated and estimated energy savings values as compared to a fixed speed compressor running a specific mode of operation.

- **Average Package kW/hour –** Calculated package kW/hour since the last reset averaging command.
- **Average % Capacity –** The calculated average % capacity of the compressor since the last reset averaging command.
- **Average Capacity –** The calculated average flow capacity of the compressor since the last reset averaging command.
- **Energy Cost –** Current cost of energy as input by the user
-

- **Energy Savings –** The estimated energy savings based on the energy cost and average power consumption of the compressor as compared to a fixed speed compressor running the selected "Savings compared to" setpoint, since the last reset averaging command.
- **Lifetime Energy Savings –** estimated energy savings based on the energy cost and average power consumption of the compressor as compared to a fixed speed compressor running the selected "Savings compared to" setpoint, since the controller has been installed.

Operator Settings Folder

Pages 1-2 Operator settings

Target Pressure – The compressor will vary its speed in order to maintain a package discharge pressure as close to this value as possible.

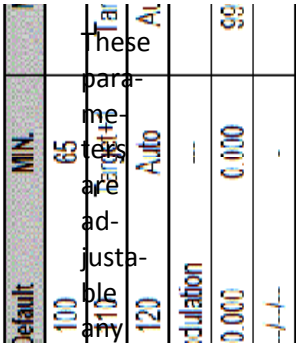
Automatic Stop Pressure – The compressor will stop if the package discharge pressure reaches this value and the compressor is running at minimum speed.

Immediate Stop Pressure – The compressor will stop if the package discharge pressure reaches this value, regardless of its speed.

Savings Compared – The energy savings calculation compares how much energy is saved by this compressor when compared to a compressor operating in the mode selected here. The options are Geometry, Online/Offline, or Modulation

Energy Rate - Setpoint to enter the current energy cost for this compressor in local currency. This is used for energy savings calculations

Reset Averaging – This setpoint is selected to reset the energy savings calculation and start anew.



These parameters are adjustable any time. The table shows the range and default values for the setpoints on screen 2.

Pages 2 and 3 Operator Options

The options set points are similar to the operator set points except these set points cannot be changed while the unit is running.

COM Control – Enabling this setpoint allows the compressor to be controlled by a serial or

Ethernet device, such as an X8I. This is equivalent to the “Sequencer” option on older Intellisys controllers.

Remote Start/Stop – Enabling this setpoint allows the compressor to be started and stopped using the digital inputs on the controller.

Enable PORO – Enabling this setpoint will allow the compressor to automatically restart after a power outage has been restored if the compressor was running loaded at the time of the outage. PORO is an option and the option module must be purchased and installed before this feature can be turned on.

PORO Time – Time after the controller power has been restored and controller has finished booting before the compressor will perform a PORO start. During this time

Scheduled Start Day – Day (or days) of the week for which a scheduled start will be performed. The compressor will start when its onboard clock matches the day, hour, and minute of the scheduled start setpoints. Scheduled Start/Stop is an option and the option module must be purchased and installed before this feature can be turned on.

Scheduled Start Hour – Hour of the day for which a scheduled start will be performed. Scheduled Start/Stop is an option and the option module must be purchased and installed before this feature can be turned on.

Scheduled Start Minute – Minute of the hour for which a scheduled start will be performed. Scheduled Start/Stop is an option and the option module must be purchased and installed before this feature can be turned on.

Scheduled Stop Day – Day (or days) of the week for which a scheduled stop will be performed. The compressor will stop when its onboard clock matches the day, hour, and minute of the scheduled stop setpoints. Scheduled Start/Stop is an option and the option module must be purchased and installed before this feature can be turned on.

Scheduled Stop Hour – Hour of the day for which a scheduled stop will be performed. Scheduled Start/Stop is an option and the option module must be purchased and installed before this feature can be turned on.

Scheduled Stop Minute – Minute of the hour for which a scheduled stop will be performed. Scheduled Start/Stop is an option and the op-

tion module must be purchased and installed before this feature can be turned on.

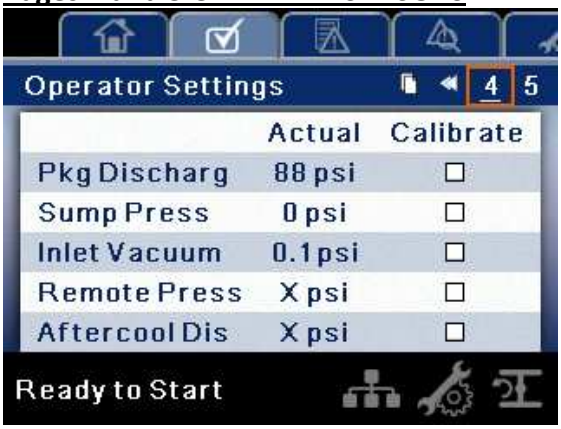
Enable Remote Sensor – Enabling this allows the compressor to load and unload based off a sensor reading installed in a remote location.

Please note that in order to disable Scheduled Start/Stop, the Scheduled Start and Stop days, hours, and minutes must match exactly.

These parameters are only adjustable when the compressor is stopped. The table shows the range and default values for the setoints on these

OPTION ITEMS	SELECTION	MIN.	MAX.	STEP	UNIT	Installed Option Required
Remote Sensor	ON/OFF	---	---	---	---	No
Comm Control	ON/OFF	---	---	---	---	No
Remote Star/Stop	ON/OFF	---	---	---	---	No
Power Cut Restart	ON/OFF	---	---	---	---	Yes

Pages 4 and 5 CALIBRATE SENSORS



Sensor calibration can only take place when the machine is stopped and there is no pressure on the sensor.. Calibration only needs to take place after a sensor is replaced, the controller is replaced, the controller software is upgraded, or the operator suspects the sensor reading is in

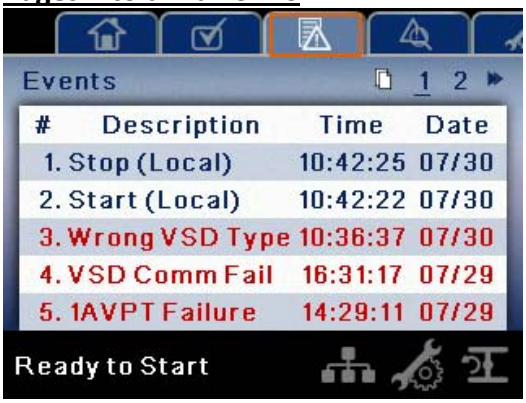
error. Calibrate a sensor by selecting the checkbox beside the sensor name.
Each of the sensors listed below can be calibrated.

- Inlet Vacuum (1AVPT)
- Sump Pressure (3APT)
- Package Discharge Pressure (4APT)
- Coolant Filter Inlet Pressure (5CPT)
- Coolant Filter Outlet Pressure (6CPT)
- Remote Pressure (10APT) – Only on units with the remote sensor option
- Interstage Pressure (2APT) – Only on 2-stage units
- Aftercooler Discharge Pressure (7APT) – Only on units with integrated dryer

Please note that if a sensor is currently reading a value that is +/- 10% of its range from zero, the sensor will not be able to be calibrated and an warning will be logged in the event log. Please make sure the sensor is being exposed to atmosphere before attempting calibration.

Events folder

Pages 1 to a max of 40



The pages in the Events folder document up to the last 200 events that the controller has experienced, with the time and date of the occurrence. The events are recorded in sequence, with number one being the newest and 200 being the oldest. When a new event occurs, it becomes number one and all others are shifted up in number.

The page numbers in the Title Bar are used to scroll through the events, with each page displaying up to seven. Page one displays events one through five, page two displays six through ten, and so on.

The following items will generate an event.

- Power On
- Power Off
- Press the Start Key
- Press the Stop Key
- Press the Load Key
- Press the Unload Key
- Starting the compressor remotely
- Stopping the compressor remotely
- Loading the compressor remotely
- Unloading the compressor remotely
- Warning
- Trip
- Start Inhibit

Active Warnings will be highlighted in amber while acknowledged Warnings will have amber text.
Active Trips will be highlighted in red while acknowledged Trips will have red text.
Active Start Inhibits will be listed in the Event log, but not highlighted. The display will indicate the compressor is not ready to start if a start inhibit is active.

Warning Events List

Change Inlet Filter

This will occur if the unit has been running for at least 7 seconds, the motor speed is equal to or greater than the minimum speed, and the inlet vacuum is greater than 0.7 psi. This condition must exist for 3 seconds before the warning is issued.

Change Coolant Filter

This will occur if the unit has been running for at least 7 seconds, the injected coolant temperature is at least 140 deg F, the motor speed is at least equal to the minimum speed, and the coolant filter pressure drop (5CPT - 6CPT) is greater than 25 psi. This condition must exist for 3 seconds before the warning is issued.

Sensor Failure (All Units)

Will occur whenever a sensor is recognized as missing or broken. The sensors affected by this warning are 10APT, 1ATT, 2ATT, 4ATT, and 3CTT. The sensor failure message shall follow the following format: 4ATT Failure.

Sensor Failure (Units with Integrated Dryer)

Will occur whenever a sensor is recognized as missing or broken and the unit has an integrated dryer (3.3.1.6). The sensors affected by this warning are 5DTT and 6DTT. The sensor failure message shall follow the following format: 5DTT Failure.

Change Separator Element

This will occur if the unit has been running for at least 7 seconds, the injected coolant temperature is at least 120 degF, the package discharge pressure is at least 65 psi, and the separator pressure drop is at least 12 psi. If the target pressure is less than 90 psi, the warning value will increase 1 psi per 5 psi in reduced target pressure. For example, if the target pressure is between 89 and 85 psi, the warning value will be 13 psi. This condition must exist for 3 seconds before the warning is issued.

High Airend Disch Temp

Will occur if the unit is running and 2ATT isgreater than 221 degF (97% of 228) or the unit is in idle mode (3.3.7.1) and 2ATT is greater than 184 degF. This warning will normally have a 5 second delay, however, if the hot side thermal valve (3.3.1.5) is set to ON, this warning will have a 90 second delay.

High Discharge Press

Will occur if the unit is under the control of an external device, such as an X-series system controller, and the discharge pressure is greater than the immediate stop pressure.

Auxiliary Warning 1 (2)

This will occur if the auxiliary warning input closes.

Service

Service warnings occur when the unit has operated a certain number of hours, based on the total hours. Service warnings can have multiple levels, depending on the service level selection. Selecting service level 0 disables service warnings.

Service Level 1

If service level 1 (3.3.1.9) has been selected for the unit, a "SERVICE REQUIRED" warning will be issued the amount of operating hours in the Service Time Period set point (3.3.1.10). This warning can be reset the same as any other warning.

Service Level 2

If service level 2 has been selected for the unit, the service complete factory set point (3.3.1.11) will be used to clear a level 2 service warning and reset the service time or date. The service complete can be reset before a service warning occurs.

The first "SERVICE REQUIRED" warning will occur at the total hours value of the service time period set point (3.3.1.10). However, 100 hours before this a "100 HOURS TO SERVICE" warning will occur. This warning can be reset the same as any other warning. One hundred hours later, at the total hours value of the service time period, the "SERVICE REQUIRED" warning will occur. This warning can be reset the same as any other warning, however this warning will return

in 24 hours if the service complete factory set point has not be set. If the service complete has not been set, 100 hours later (service time period + 100) the “ALARM – SERVICE REQUIRED” warning will be issued. This warning can only be cleared by the service complete factory set point. Once the service complete factory set point is set, indicating the service is completed, the time for the next “SERVICE REQUIRED” warning will be calculated by adding the service time period to the total hours value, with the “100 HOURS TO SERVICE” warning occurring 100 hours before and the “ALARM – SERVICE REQUIRED” warning occurring 100 hours after that time.

Condensate Drain Error

This will occur if the compressor is running, the package discharge pressure is over 50 psi, and the condensate drain error contact closes for at least 240 seconds. This warning will be ignored for 4.5 minutes after starting.

High VSD Ambient Temperature

This warning will occur if the VSD ambient temperature gets within 5% of the shutdown value (133 degF). This condition must exist for 3 seconds before the warning is issued.

Freeze Warning

This will occur if the evaporator sensor has a value of 678 (about 0.5 C) or below (low temp) while the dryer is running, on units with the integrated

dryer. This is a dryer fault. If this happens, the compressor will continue to run, but the dryer will stop. The condition must exist for at least 180 seconds before the warning will occur. NOTE: If this warning is reset while the conditions for running the dryer exist, the dryer can restart. Also the dryer can restart if the evaporator value rises to 709 (about 5 C).

Dryer High Pressure

On units with the integrated dryer, this will occur if the dryer high pressure switch opens while the dryer is running. This is a dryer fault. If this happens, the compressor will continue to run, but the dryer will stop. The contact must be open for at least 3 seconds before the warning will occur. If this warning is reset while the conditions for running the dryer exist, the dryer can restart. However, this switch is a locking switch. The dryer high pressure switch must be reset (contact closed) before this warning can be reset. If this warning is reset while the conditions for running the dryer exist, the dryer can restart.

High Sump Pressure

This will occur if the compressor is running, the package discharge pressure is at least 65 psi, and the sump pressure is more than 15 psi above the target pressure. The occurrence of this warning will cause the controller to evaluate the need to lower the maximum speed. This condition must exist for 3 seconds before the warning is issued.

Condenser Temperature High

This will occur if the condenser sensor has a value of 1231 (about 104 C) or above (high temp) while the dryer is running, on units with the integrated dryer. This is not a dryer fault. If this happens, the compressor and dryer will continue to run. The condition must exist for at least 180 seconds before the warning will occur.

Condenser Temperature Low

This will occur if the condenser sensor has a value of 887 (about 40 C) or below (low temp) while the dryer is running, on units with the integrated dryer. This is not a dryer fault. If this happens, the compressor and dryer will continue to run. The condition must exist for at least 180 seconds before the warning will occur.

Change HE Filter

The HE filter is located between the aftercooler discharge and the inlet to the dryer and is only on units with an integrated dryer. The drop across the HE filter is measured by subtracting the package discharge pressure from the aftercooler discharge pressure. If the compressor is running at a minimum of 75% capacity, the measured drop across the HE filter is at or above 14 psi (1.0 bar), the unit is hot (injected coolant temp above 120 degF), and the package discharge pressure (4APT) is above 90 psi, this warning can occur. The condition must exist for at least 3 seconds before the warning will occur. This is not a dryer fault. If

this happens, the warning will be displayed, but the dryer will continue to run.

Replace Coolant Filter

Will occur if the idle mode is set to on. This trip is used as a reminder to IR service to only use idle mode if a new coolant filter is installed.

Invalid Calibration

This will occur if the sensor zero value is +/- 10% of its scale.

Trip Events List

High Airend Disch Temp

This will occur if 2ATT is greater than 228 degF during normal operation. This trip will occur at 200 degF if the unit is in idle mode.

Blower Fault

This Will occur if the fault contact opens for 3 seconds on the blower VSD and the compressor is running or is stopped in auto restart (the fan on a water cooled unit may run for a few minutes after the compressor stops because it is limited in the starts per hour). If the unit has a blower VSD, the isolation contact will de-energize on a blower fault. The isolation contact can be re-energized when the blower fault is reset.

Remote Stop Failure
Will occur if the REMOTE START/STOP option is enabled, the remote stop button remains open and either start button is pressed.

Remote Start Failure
Will occur if the unit is started by the remote start button and the button stays closed for 7 seconds after the unit starts.

Sensor Failure
This will occur when a sensor is recognized as missing or broken. The sensors affected by this trip are 4APT, 3APT, 2APT, 1AVPT, 5CPT, 6CPT, 7APT, and 2ATT. The sensor should be displayed along with the sensor failure message. The sensor failure message shall follow the following format: 4APT Failure. Sensor 4APT has the following additional logic. A sensor failure 4APT will be issued if the sump pressure is over 100 psi and the package discharge pressure (4APT) is 50 psi less than the sump pressure.

Emergency Stop
This will occur when the EMERGENCY STOP button is engaged.

VSD Fault
The VSD fault is read from the drive. The controller will read the status menu of the variable speed drive. If a fault condition is returned in the status information, the controller will issue a VSD

FAULT trip and display the number of the fault condition. VSD faults 39 – 42 and 44 can't be cleared by pressing the reset button. All other VSD faults can be cleared by pressing the reset button. The only way to clear a VSD fault 39 – 42 or 44 is by cycling the power on the compressor. Cycling the power causes the VSD to execute a power module test. The power module test must be passed before the compressor can be restarted after a VSD fault 39 – 42 or 44. VSD faults 39, 40, and 41 (IGBT failures) have additional logic associated with them. The logic was modified to allow an automatic restart. If the VSD fault 39, 40, or 41 occurs, the controller will trip and display the fault message. Next, the controller will issue a command to the VSD to run the power module test. While the VSD is running the power module test the controller will monitor the VSD for completion of the test. If the power module test is completed and all conditions have passed, the controller will automatically restart the compressor. If the power module test is failed, the controller will show the power module test failure message and the failure code. The controller will not allow more than 5 automatic restarts of VSD Fault 39 – 41 within a 24 hour period. The controller will also not allow 2 automatic restarts of VSD Fault 39 – 41 within a 10 minute period. If a VSD Fault 39 – 41 occurs and violates the time periods, the controller will not issue a power module test and restart. It will display the fault and not allow a reset from the controller. The operator will have to cycle power. Another ex-

ception on all drives are VSD faults 10, 12 – 14, and 16. If the compressor trips due to one of these faults, instead of shutting down on the VSD fault, the controller will restart the compressor. If the compressor is equipped with PORO, the controller will execute a PORO restart. If the unit does not have PORO, the controller will restart the compressor 10 seconds after the controller has reset. A unit will be allowed to do this up to 5 times in a 1 hour period. If the unit exceeds 5 occurrences within a 1 hour period, the 6th occurrence will be treated like a regular VSD fault.

Low Sump Pressure

Will occur if the compressor is operating and the sump pressure drops below 13 psi for 15 seconds.

Check Motor Rotation

This will occur if the controller reads a negative speed from the VSD when starting.

VSD Communication Failure

This will occur if the controller does not receive a response from the VSD when requesting information. This trip will take about 8 seconds to occur.

Incorrect VSD Type

This will occur at power up if the VSD type does not match the size of compressor. The controller will determine this by comparing the compressor type with the drive ID board.

Control Power Loss

This will occur if the compressor should be ready to start, running, or stopped in auto restart and the AC input voltage, as read from the VSD, falls below 300 VAC (480 VAC if the unit is 575 volt). There is a delay of 5 seconds on this trip in case the power quickly returns.

Stop Failure

This will occur if the compressor should be stopped, but the motor speed has not dropped below the minimum motor speed set point. The controller will wait 4 seconds for the compressor to stop before issuing this trip. This is normally an indication the run relay (K1) did not open when de-energized. Because of this, the isolation contact should open when this fault occurs. The isolation contact can close when this fault is cleared, if the unit is not water cooled.

High Interstage Pressure

This will occur if the compressor is running, it is a 2 stage unit, and the interstage pressure is above 75 psi.

High Coolant Filter Pressure Drop

This will occur if the unit has been running for at least 7 seconds, the injected coolant temperature is at least 140 deg F, already has a change coolant filter warning, the motor speed is at least equal to the minimum speed, and the coolant filter pressure drop (5CPT - 6CPT) is greater than 35 psi.

High Inlet Vacuum

This will occur if the compressor is running loaded, the motor speed is at least minimum speed, and the inlet vacuum is greater than 1.8 psi (vacuum).

High Sump Pressure

This will occur if the compressor is running and any one of the 3 following conditions exist. (1) The sump pressure is above the target pressure by 25 psi. (2) The separator pressure drop is measured to be more than 25 psi and the package discharge pressure is at least 65 psi. (3) The sump pressure is above 168 psi.

Power Module Timeout

This fault is checked at power up. The VSD will automatically do a power module test at power up. The controller will monitor the power module test result parameter. A value of 0 will indicate the power module test is running. If it does not complete within 20 seconds after power up, the controller will issue the power module timeout trip. A power module test result of 1 or higher will indicate the power module test is complete and the controller will not check for this fault until the next power cycle. This trip is not checked if the power module test is selected from the operator interface or if the power module test is caused by an IGBT fault (VSD faults 39 – 41). The controller will not show ready to start while it is checking for this fault. This fault cannot be cleared by pressing the reset button on

the operator interface. It can only be cleared by a power cycle.

Start Inhibit List

High Airend Discharge Temperature

This will occur if 2ATT is greater than 95% of 228 degF.

High Sump Pressure

This will occur if the sump pressure (3APT) is 25 psi or higher than the rated pressure of the compressor.

Waiting for VSD Comms

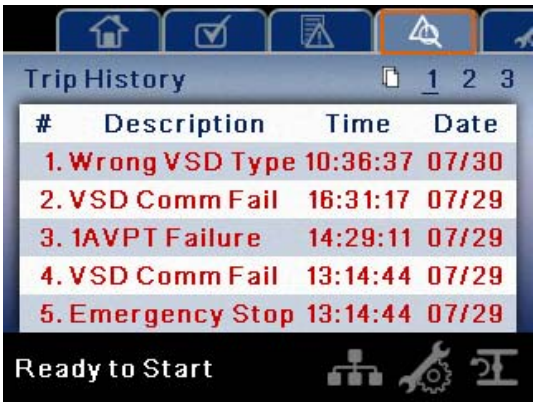
This will occur if the compressor VSD has not responded to the initial communications from the controller.

Power Module Test

This will occur if the VSD is running a power module test. When the VSD is running a power module test, the VSD parameter power module test result (22.11) will be set to a value of 0. Any value greater than 0 will indicate the power module test is complete.

Trip History

PAGES 1 TO A MAX OF 4

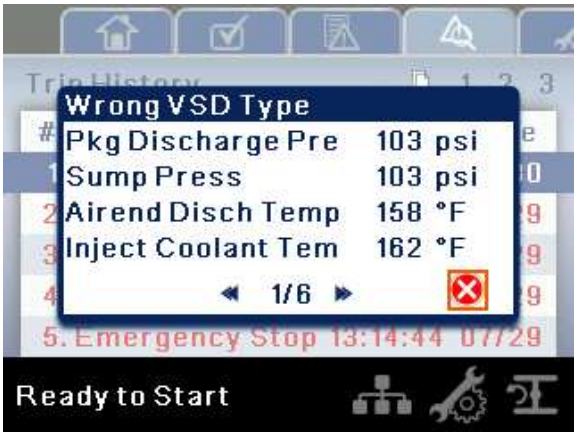


The pages in the Trips History folder document up to the last 15 trips that the controller has experienced, and time stamps each. The trips are recorded in sequence, with number one being the newest and 15 being the oldest. When a new trip occurs, it becomes number one and all others are shifted up in number.

The page numbers in the Title Bar are used to scroll through the events, with each page displaying up to seven. Page one displays events one through five, page two displays six through ten, and so on.

Active Trips will be highlighted in red while cleared Trips will have red text.

The trip history also records compressor data at the time of the trip to assist in diagnostics and troubleshooting. Navigating to the trip entry and hitting the enter button will bring up the trip history dialog box.



While the dialog box is active, press the left and right keys in order to scroll through the displayed data. The name of the trip will always be shown in the title bar of the dialog box. Press enter when finished viewing the data to return to the trip history screen.

Maintenance Folder

PAGE 1 – FILTER STATUS

This page displays the status of the filters. The filter status will either be “OK” or “Change” depending on the compressor’s diagnostic readings. If a filter reaches the “change’ status, a warning will be issued and the service indicator will light up yellow to notify the user. Please note that the compressor must be in a “Running Loaded” state to check these maintenance items. If the compressor is not in a running state – the status will display “Load,” unless a maintenance indicator has been issued when the machine was running and has not yet been reset.

The following filters are displayed:

- Coolant Filter
- Separator Element
- Inlet Filter

PAGE 2 – MAINTENANCE STATUS

This page displays the time until the unit should be serviced. The service meter will deplete as the hours count down closer to a service appointment. Once the counter reaches the yellow zone, the service indicator will light up yellow. Once the counter reaches the red zone the service indicator will light up red and maintenance must be performed.

PAGE 3 MAINTENANCE CONFIGURATION

This page allows the user to set the service interval and to reset the counter after the service has been performed. The service interval may be set to any value between 1000 and 8000 hours, but must be set in accordance with the factory maintenance schedule. After maintenance has been performed, the user can reset the counter by navigating to the Reset button and pressing the enter key.

General Settings Folder

All parameters in the general settings folder are adjustable.

Page 1 – Language Selection

Language is selectable from the following:

English (default)	Finish	Latvian
Bulgarian	Slovak	French
Lithuanian	German	Maltese
Slovenian	Spanish	Greek
Chinese(Simplified)	Croatian	Swedish
Norwegian	Polish	Czech
Hungarian	Thai	Danish
Portuguese	Italian	Turkish
Indonesian	Dutch	Korean
Romanian	Estonian	Russian

The controller will display all screens in the selected language and only one language can be selected at a time.
Each language appears in its native translation.

Page 2 – Units of Measure Settings

Temperature is selectable between ^{o}F and ^{o}C.

Pressure is selectable between psi, kpa, bar, kg/cm^2.

Power is selectable between kW and HP

Page 3 – Home Page Selection

Auto Return to Home enables the controller to return the display back to the selected Home Page if there is no user activity for the Delay Time shown. This is only enabled when an "x" appears in the checkbox.

Delay Time determines how many seconds of inactivity it will take before the controller will return to the Home Page.

Select Home Folder is used to select the Home Folder.

Select Home Page is used to select the Home Page within the selected Home Folder.

Page 4 and 5 – Time & Date Settings

All items are adjustable.

Hours allows the current hour to be set. The hours format is fixed on 24-hour.

Minutes allows current minutes to be set.

Seconds allows current seconds to be set.

Year allows current year to be set.

Month allows current month to be set.

Day allows current day to be set.

Date Format is selectable between dd/mm/yyyy (default) and mm/dd/yyyy.

Confirm New Time and Date is used to verify that changes to selections are desired. An “x” must appear in the checkbox before any changes will take affect.

The controller will continue to display any changes, even when the selections have not been confirmed and the user exits the page, then returns. Cycling of the power returns all selections to their current settings.

The controller does not support Day-light Savings Time.

Page 6 – Backlight Settings

Backlight Brightness adjusts the brightness of the display.

Enable Backlight Auto-Off enables the controller to shut-off the backlight if there is no user activity for the delay time shown.

Backlight Auto-Off Delay Time determines how many seconds of inactivity it will take before the controller will shut-off the backlight.

The backlight will be switched on whenever any of the controller's keys are pressed.

THE START, STOP, LOAD, UNLOAD, RESET, AND ACKNOWLEDGE KEYS ON THE CONTROLLER REMAIN FUNCTIONAL WHILE THE BACKLIGHT IS SWITCHED OFF. IT IS RECOMMENDED TO PRESS THE ENTER KEY OR ONE OF THE NAVIGATION KEYS IN ORDER TO SWITCH THE BACKLIGHT ON.

page 7 - Serial port address settings

This page allows the user to set up the network addresses for the RS-485 networks the controller is capable of communicating with.

MODBUS Address – Sets the modbus node ID for the controller to communicate with a Modbus capable device, this can be any value between 1 and 254.

Airbus Address – Sets the airbus address that allows the controller to communicate over Integral Sequencing or an X-Series system controller network.

pages 8 thru 10 – ethernet settings

IP Address Setting – When DHCP is not enabled, this setpoint sets the IP address of the controller.
IP Address Actual – This will match the IP address setting when DHCP is not enabled. If DHCP is enabled this will display the address assigned to the controller by the DHCP server.
Default Gateway Setting – Setpoint for the default gateway.
Default Gateway Actual – Current reading/setting for the default gateway.
Subnet Mask Setting – Setpoint for the subnet mask
Subnet Mask Actual – Current reading/setting for the subnet mask

MAC Address – This is the unique hardware MAC address for the controller. This can not be changed.

Enable DHCP – Allow the controller to automatically receive an IP address from the Local Area Network (LAN)

Apply– After editing the desired setpoint navigate to the accept setting and press enter in order for the values in the setting variables to be confirmed by the controller.

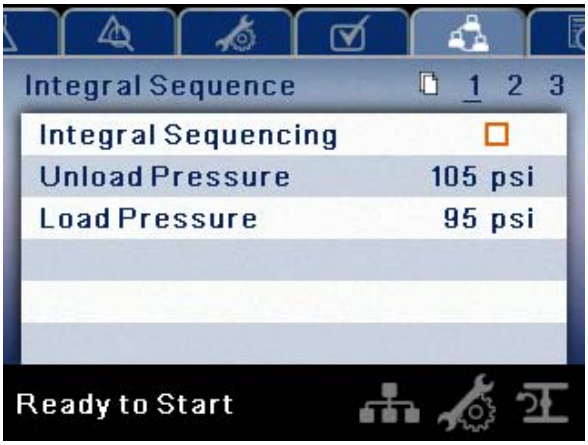
Cancel – Discard any changes made to the Ethernet settings.

pages 11 and 12 option module information

The option module information screen allows the user to see which software options have been installed in the controller. An option module that is installed will show up with an "X" in the appropriate box. The option part number is displayed with the option name.

If no options are installed, this screen will not appear on the controller.

Integral Sequencing folder



Integral Sequencing allows the compressor to be networked with up to three other compressors (fixed or variable speed) to maintain a stable system pressure by loading and unloading compressors as needed. Integral sequencing requires no additional hardware other than a serial two wire connection daisy chained between all compressors in the system.

Please note that the compressor's address in the integral sequencing system is defined by the airbus address that is set on the general settings folder. Also note that the pressure signal used to determine when to load or unload another

compressor is based on the pressure reading from the compressor at address 1 in the system.

Integral Sequencing – Enabling Integral Sequencing immediately places the compressor under integral sequence control. The default is disabled. Please make sure all compressors are set up for integral sequencing before enabling this function.

Unload Pressure – Determines the pressure at which a compressor will be unloaded by the system

Load Pressure – Determines the pressure at which a compressor will be loaded by the system.

Start Delay Interval – Determines the amount of time between loading compressors. This prevents all compressors from loading at once.

Damping – The pressure control "Damping" setting which is used to tune how quickly the system responds to pressure deviations. The default is 10 and should not normally be changed.

Tolerance - The pressure control "Tolerance" setting, which is used to tell the system how to

respond to changes in pressure above and below the load/unload pressures. The default is 3.0 psi and should not normally be changed.

Number of Compressors – Defines how many compressors are in the system.

Sequence – Displays the current load/unload order of the system. Each compressor in the system is assigned a letter, with "A" being the compressor to load first and unload last, and "D" being the compressor to load last and unload first.

Priority – Each compressor can be assigned a priority level. Compressors will only rotate positions with other compressors of the same priority level.

Rotation Interval – Determines the time period between sequence rotations.

Time Left – Counts down the time until the sequence rotation will occur.

System Pressure – Shows the current pressure reading that the system is using for control. This is typically compressor 1's package discharge pressure reading.

Status Folder

All information on the following pages is read only. Additionally, Some values may only be visible when the factory settings password is entered.

Pages 1 thru 3 – Analog Inputs

Analog Inputs:
The following analog inputs are displayed in this section.

- **Package Discharge Pressure –** The pressure the compressor is delivering to the plant
- **Sump Pressure –** The compressor's internal pressure at the sump tank.

- **Airend Discharge Temperature –** The temperature of the air/oil mixture at the discharge of the compression module.
- **Injected Coolant Temperature –** The temperature of the oil as it is injected into the compression module
- **Aftercooler Discharge Temperature –** The temperature of the air after passing through the Aftercooler
- **Separator Pressure Drop –** The pressure drop across the separator element
- **Coolant Filter Pressure Drop –** The pressure drop across the coolant filter
- **Inlet Vacuum** – Vacuum reading at the inlet valve.
- **Aftercooler Discharge Pressure (integrated dryer units only) –** Pressure the compressor is delivering before the dryer
- **Remote Pressure (optional) –** An optional pressure sensor that reads pressure at a point outside of the compressor package. Usually this would be on a common tank.
- **Coolant Filter Inlet Pressure (Password Required) –** Pressure on the inlet side of the coolant filter.
- **Coolant Filter Outlet Pressure (Password Required) –** Pressure on the outlet side of the coolant filter
- **Interstage Pressure** (2-stage units only) **(Password Required) –** Pressure at the discharge of the first stage of the compression module on 2 stage units.

- **Evaporator (Password Required) –** Temperature reading on the evaporator of the dryer.
- **Condenser (Password Required) –** Temperature reading at the discharge of the dryer
- **Cooler Outlet Temperature (Password Required) –** Temperature at the discharge of the oil cooler
- **Package Inlet Temperature (Password Required) –** Temperature at the air inlet of the compressor package.

Pages 4 thru 7 – Compressor Data

Compressor Data:

- **% Energy Savings –** Energy savings of the compressor compared to a fixed speed machine expressed in percent
- **% Capacity –** The current capacity the compressor is producing
- **Package Power –** Power in kW that the compressor is consuming at that instant
- **Power On Hours –** Number of hours that the controller has been powered up
- **Running Hours –** Number of hours the compressor's motor has been running
- **Motor Speed –** Current speed of the motor in RPM
- **Time –** Current time of day.
- **Motor Current –** Electrical current cur-

rently being drawn by the motor.

- **Motor Voltage –** Electrical voltage at the motor.
- **AC Input Voltage –** Input voltage to the VSD
- **DC Bus Voltage –** DC Bus Voltage on the VSD
- **IGBT U Temperature –** Temperature of the IGBT on Phase U of the VSD
- **IGBT V Temperature –** Temperature of the IGBT on Phase V of the VSD
- **IGBT W Temperature –** Temperature of the IGBT on Phase W of the VSD
- **Input Rectifier Temperature –** Temperature of the VSD at the Input Rectifier
- **VSD Ambient Temperature –** Ambient temperature of the VSD
- **Remote Maximum Speed -** Unused
- **Remote Maximum Pressure -** Unused
- **Target Pressure –** The current target pressure the compressor is attempting to maintain

Pages 8 and 9 – Digital Inputs

Digital Inputs: **(Password Required)**

An "x" in the checkbox beside a digital input indicates that the input is in its TRUE state. For example, Starter Feedback is TRUE when its input is in the high state, where as, E-Stop is TRUE when its input is at 0Vdc.

- Emergency Stop
- Blower Fault
- Condensate Drain Error
- Remote Stop
- Remote Start
- Auxiliary Input 1
- Auxiliary Input 2
- Dryer High Pressure

Pages 10 and 11 – Digital Outputs

Digital Outputs (Password Required):

An "x" in the checkbox beside a digital output indicates that it is energized.

- Isolation Contact
- K1 Contact
- PDM Fan Contact
- 1SV
- Condensate Drain
- Dryer Running
- PORO Horn
- Trip Relay
- Warning Relay

Page 11 – Analog Outputs

Analog Outputs:

The value for the analog outputs will be in mA.

- VSD Blower Output

Factory Settings Folder

This folder is for IR factory and service personnel. A password must be entered on page one in order to adjust values in this folder. This folder is used for setting parameters that are specific to that compressor and displaying software information for the controller.

Page 1 – Password

Password:
Provides access to enter a valid password to gain access to password protected parameters. The password is entered by scrolling down to the password value and pressing the return key.

Password entered:
This checkbox will indicate a valid password has been entered. If this checkbox is blank, a valid password has not been entered or it has timed out. This is read only.

Password timeout enable:
Checking this box will enable the password time feature.

Password timeout:
This timeout along with the password timeout enable allows the user to set an adjustable amount of time to require a valid password to be re-entered. Once this timeout is reached re-entry of a valid password is required. The time-out counter is reset after any button press.

PAGES 2 & 3 – FACTORY SETTINGS

These pages are used for setting parameters that are specific to the compressor. All of the factory settings that are adjustable are listed below. All settings on these pages are password protected.

Compressor Type - The type of compressor will be selected here. The choices are listed below.

Single Stage	2-Stage
37 kW/50 HP 1-S (46,47) (38,39)	
45 kW/60 HP 1-S (47) (39)	90 kW 2-S (50,51) (42,43)
55 kW/75 HP 1-S (48, 49) (40,41)	125 HP 2-S (50,51) (42,43)
75kW/100HP 1-S (49) (41)	110 kW 2-S (51) (43)
90 kW 1-S (50, 51) (42,43)	150 HP 2-S (51) (43)
125 HP 1-S (50, 51) (42,43)	132 kW 2-S (52,53) (44,45)
110 kW 1-S (51) (43)	200 HP 2-S (53) (45)
150 HP 1-S (51) (43)	160 kW 2-S (53) (45)
132 kW 1-S (52, 53) (44,45)	
200 HP 1-S (53) (45)	
160kW 1-S (53) (45)	

Enable Two Stage (On/Off) - This setpoint is enabled on two stage machines to enable the additional two stage functionality. If this is enabled on a single-stage machine, the machine will trip due to missing sensors.

Enable Water Cooled (On/Off) – This setpoint is enabled on water cooled machines to select the proper cooling algorithms in the controller.

Hot Side Thermal Valve (On/Off) – This setpoint is enabled on all machines that have hot side thermal valves installed, this includes all R-Series machines. This selects proper algorithms for cooling.

Enable PAC (On/Off) – Enables Progressive Adaptive Control – this will reduce maximum motor speeds in the case of a Change HE Filter warning or High Sump Pressure warning in order to protect the compressor.

Enable Dryer (On/Off) – Enables dryer control from the controller. The dryer option must be installed in the compressor for this to work properly.

Constant Run Dryer (On/Off) – Enabling this function causes the dryer to run whenever the compressor is in a running state, including auto-restart. Disabling this will allow the dryer to stop if certain conditions are met, such as satisfying a minimum run timer. Certain dryer warnings will stop the dryer regardless of this setpoint. If the dryer stops for any reason it will not be allowed to restart for 90 seconds. When the compressor is being controlled by an external source, constant run dryer will be enabled regardless of this setpoint's state.

Running Hours (adjustable) – Used to adjust the running hours counter on the compressor

Power On Hours (Read Only) – Displays the amount of time the controller has had power connected.

PAGES 4 THROUGH 8 – MAXIMUM VALUES

The maximum values pages are used to record the highest value the controller has seen since the last time the maximum values have been reset. Each maximum value entry displays the highest value recorded as well as the time and

date stamp of when these maximum values have occurred.

The final maximum value page has a reset setting at the bottom of the page, highlighting this button and hitting enter will cause the controller to clear all history of maximum values and begin recording them again. The password must be entered in order to use this reset functionality.

PAGES 9 AND 10 – VSD DIAGNOSTICS

The VSD Diagnostics screens are used to troubleshoot any drive problems. These screens must only be used by authorized service technicians. The password must be entered in order to activate these diagnostic tests.

PAGES 11 THROUGH 14 – VSD SERVICE MENUS

The VSD service menus contain parameters used to set up the compressor for optimal operation. The default selections have been set to work optimally for a majority of compressors. These screens must only be used by authorized service technicians. The password must be entered in order to modify these parameters.

PAGES 15 & 16 – SOFTWARE INFORMATION

These pages are used for displaying software information for the controller. All items are read only.