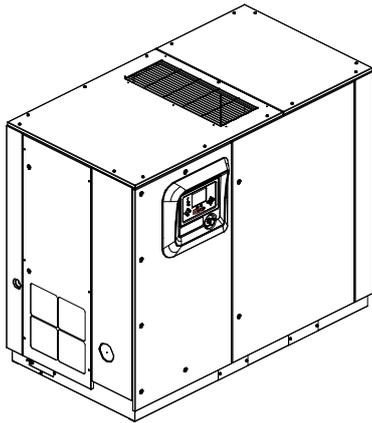




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Revision B
June 2014

Contact-Cooled Rotary Screw Air Compressor

R30, R37, R45, R55, R75, R90, R110, R132, R160



Product Information

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Save These Instructions

NET Power Project | Seller: Ingersoll Rand | Owner: NET Power
Drawing Title/Description: Installation, Operations and
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ABOUT THIS MANUAL

The purpose of this manual is to provide site planning, installation and operation guidelines for the compressor.

For supporting documentation refer to Table 1.

Table 1 : Product Manuals

Publication	Product	Part/Document Number by Region		
		Americas	EMEIA *	Asia Pacific
Product Safety Information Manual	All	80446313	80446156	80446321
Product Maintenance Manual	All	80447170	80447196	80447212
Product Parts Information Manual	R30-37	24342156		
	R37-45	80448095		
	R55-75	80447592		
	R90-160 kW Single-Stage	80446057		
	R90-160 kW Two-Stage	80446065		

* Europe, Middle East, India and Africa

Product specification sheets and reference drawings are also available.

SAFETY

- Locate, read, understand and follow all Danger, Warning, Caution, and Operating Instructions on the product and in all Manuals. Failure to comply with safety precautions described in the manuals supplied with the product, this manual or any of the labels and tags attached to the product may result in death, serious injury or property damage.
- Check that all labels, tags and data (name) plates are in place and legible.
- It is your responsibility to make this information available to others.
- If you have any questions about safety or procedures not included in this manual, ask your supervisor or contact any **Ingersoll Rand** office or qualified **Ingersoll Rand** distributor.

TRANSPORTATION/RECEIPT/HANDLING

■ Transportation

Ensure machine is secured against movement during transportation.

■ Receipt

Before signing the delivery receipt, inspect for damage and missing parts. If damage or missing parts are apparent, make the appropriate notation on the delivery receipt, then sign the receipt. Immediately contact the carrier for an inspection.

All material shall be held in the receiving location for the carrier's inspection.

Delivery receipts that have been signed without a notation of damage or missing parts are considered to be delivered "clear." Subsequent claims are then considered to be concealed damage claims. Settle damage claims directly with the transportation company.

If you discover damage after receiving the compressor (concealed damage), the carrier shall be notified within 15 days of receipt and an inspection shall be requested by telephone with confirmation in writing. On concealed damage claims, the burden of establishing that the compressor was damaged in transit reverts back to the claimant.

Read the compressor nameplate to verify it is the model ordered, and read the motor nameplate to verify it is compatible with your electrical conditions.

Make sure electrical enclosures and components are appropriate for the installation environment.

■ Unpacking and Handling

The compressor will normally be delivered with a polyethylene or other cover. If a knife has to be used to remove this cover, ensure that the exterior paintwork of the compressor is not damaged.

Incorporated within the base of the compressor are slots to enable a fork lift truck to move the compressor. Ensure truck forks are fully engaged on both sides. Alternatively a special lifting frame can be used to enable a crane or hoist to move the compressor. Use only marked lifting points.

Once the packaging and pallet are discarded and the compressor is in its final position, remove the yellow painted transit brackets from the resilient mounts and store for future use or discard.

For Variable Speed and Fixed Speed (R30-37 kW)

- (2) brackets from the Airend and separator tank support.
- (1) bracket from the motor mounting bracket.

For Variable Speed Drive (VSD) (R37e-160 kW)

- (3) brackets at the separator tank
- (1) bracket from the air end discharge elbow.
- (1) bracket from the air end support.

For Fixed Speed (FS) (R37e-160 kW)

- (3) brackets at the separator tank
- (1) bracket from the air end support.
- (1) bracket from the motor mounting bracket.

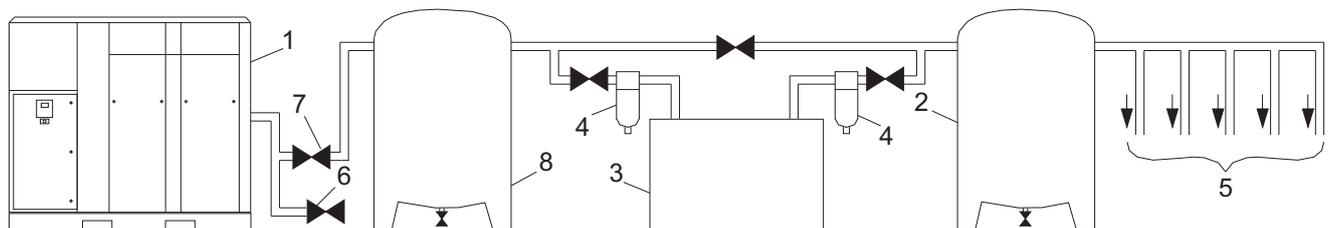
■ Long Term Storage

If the product will not be commissioned within six months of receipt, it should be prepared for long term storage. Please contact **Ingersoll Rand** for details.

INSTALLATION

■ Location in Plant

Figure 1 : Typical Air System



Key

1. Compressor
 2. Air Receiver Dry Tank
 3. Air Dryer
 4. Compressed Air Filters
 5. System Demand Points
 6. Vent/Drain Trap
 7. Isolation Valve
 8. Air Receiver ("Wet Tank")
- Customer can install flexible element between machine and pressure system to avoid vibration transmission.
 - The compressor can be installed on any level floor capable of supporting it. A dry, well ventilated area where the atmosphere is as clean as possible is recommended.
 - The area selected for the location of the compressor should be free of dust, chemicals, metal filings, paint fumes and overspray.
 - Hard surfaces may reflect noise with an apparent increase in the decibel level. When sound transmission is important, a sheet of rubber or cork can be installed beneath the compressor to reduce noise. Flexible piping may be required.
 - See the general arrangement drawing for minimum space requirements for normal operation and maintenance.
 - Minimum space in front of the control panel door as required by national or local codes shall be maintained.
 - Ambient temperatures higher than 46 °C (115 °F) shall be avoided, as well as areas of high humidity.

NOTICE

A minimum of 1 m (3.3 ft) all around the compressor is recommended. If headroom is restricted, then the exhaust should be ducted or deflected away from the compressor.

Screw type compressors should not be installed in air systems with reciprocating compressors without means of isolation such as a common receiver tank. It is recommended that both types of compressor be piped to a common receiver tank using individual air lines.

The compressor is shipped with the shipping restraints in place. Ensure that these are removed to allow free movement of the drive assembly during operation. Each restraint is painted yellow.

■ Discharge and Condensate Piping

See Figure 1.

It is essential when installing a new compressor (1) to review the total air system. This is to ensure a safe and effective total system.

One item which should be considered is liquid carryover. Installation of air dryers (3) is always good practice since, when properly selected and installed, they can reduce any liquid carryover to zero.

An air receiver tank (2) is recommended to ensure that the total system volume is sufficient.

Discharge piping should be at least as large as the discharge connection of the compressor. All piping and fittings should be suitably rated for the discharge pressure. Discharge piping should not exert any unresolved moments or force on the compressor.

It is good practice to install line filters (4).

Include a vent or drain trap (6) to vent the discharge pipework downstream from the minimum pressure check valve located on the separator tank and upstream of the first system isolation valve (7).

This compressor has an internal discharge check valve. An external check valve is not required. An isolation valve (7) is required within 1 m (36 in) of the compressor discharge.

NOTICE

There should be no plastic or PVC piping attached to this compressor or used for any lines down stream with exception of condensate removal lines.

NOTICE

The discharged air contains a very small percentage of compressor coolant and care should be taken to ensure that downstream equipment is compatible.

When two rotary compressors are operated in parallel, provide an isolation valve (7) and drain trap (6) for each compressor before the common receiver. Ensure the discharge piping is arranged to prevent water from being forced into the non-operating compressor.

A wet tank (8) is recommended in cases where the air dryer is a regenerative desiccant type to prevent short cycling the compressor during the purging cycle when plant air demand is slow.

The built-in after-cooler reduces the discharge air temperature below the dew point (for most ambient conditions). Therefore, considerable water vapor is condensed. To remove this condensation, each compressor with a built-in after-cooler is furnished with a combination condensate separator/trap.

A dripleg assembly and isolation valve should be mounted near the compressor discharge. A drain line should be connected to the condensate drain in the base.

NOTICE

The drain line shall slope downward from the base to work properly. For ease of inspection of the automatic drain trap operation, the drain piping should include an open funnel. The drain line must have a minimum inside diameter of 8 mm (5/16 in)

NOTICE

For low volume systems that may not include an air receiver tank (2), compressor response time may need adjusting. Contact your local Ingersoll Rand service provider.

NOTICE

Do not use the compressor to support the discharge pipe.

■ General Electrical

A qualified electrician shall perform all electrical installations and service.

The compressor shall be properly grounded / earthed in compliance with all applicable standards and regulations (local, state, country, federal, etc.).

Installation of this compressor shall be in compliance with all applicable standards and regulations (local, state, country, federal, etc.).

The compressor shall have its own isolator situated adjacent to it. The fuse protecting the circuit and the compressor shall be selected in accordance with recognized code requirements on the basis of the data provided in the specification sheet.

Feeder cables shall be sized to ensure that the circuit is balanced and not overloaded by other electrical equipment. The length of wiring from a suitable electrical feed point is critical as voltage drops may impair the performance of the compressor.

NOTICE

For VSD, cable sizes may vary considerably so the line reactor is equipped with copper bus connections. These connections can accept bolts between 6 mm and 12 mm.

Feeder cable connections to incoming terminals L1-L2-L3 shall be tight and clean.

The applied voltage shall be compatible with the compressor data plate ratings.

The control circuit transformer has different voltage tapings. Ensure that these are set for the specific applied voltage prior to starting.

Remove the blind plate to cut a hole for incoming power connection. If it is necessary to make a hole in the control box in a different location, care should be taken to not allow metal shavings to enter the starter and other electrical components within the box. If another hole is used, the original hole shall be blocked off.

The feeder cable shall be suitably glanded in to the starter box to maintain proper ingress protection. Fixed speed starter boxes are rated for NEMA 4 /IP65, and variable speed drive starter boxes are rated for NEMA 12/IP54. For variable speed drive starter boxes, the feeder cable shall be glanded to ensure that dirty air does not by-pass the filters.

On completion of electrical installation, check that the blower or fan motor rotation is correct.

Variable speed drive compressors are designed for use, where the electricity supply is separated from nearby residential and commercial areas. If the compressor is to be used in a light industrial, residential or commercial environment where the local supply network is shared, further Radio Frequency (RF) screening measures may be required. Consult your local distributor/supplier for details of the optional RF filter.

Variable speed drive compressors have an anti-condensation heater and thermostat in the electrical box. This circuit can be connected to an independent electrical supply of either 110 V or 230 V single phase, dependent on the country of installation. The supply shall be suitably fused and an independent isolator installed adjacent to the compressor. Verify that the thermostat is adjusted to 29 °C (85 °F). This shall be done in accordance with recognized codes. It is good practice, and sometimes mandatory, to display suitable signs warning that the compressor has two separate electrical supplies which both shall be isolated before any work is attempted.

For Variable speed drive compressors, the heater circuit can also be supplied from the 110 V tapping of the control transformer and connected as shown on the schematic wiring diagram furnished separately from this manual.

NOTICE

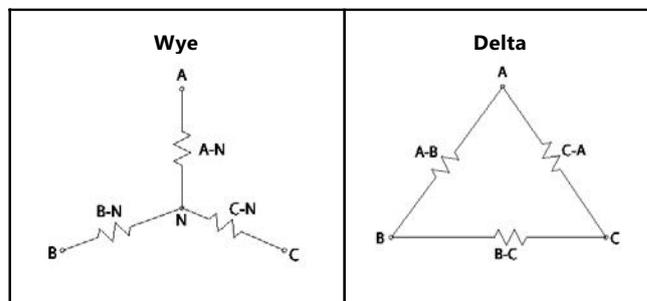
Main and fan motor insulation shall be tested by a qualified electrician prior to initial start-up or following an extended shutdown period in cold and damp conditions.

■ Special Electrical Considerations for Variable Speed Drive (VSD) Compressors

■ Primary Input Power Supply

The primary input power for the compressor can come from different transformer sources and configurations. The most typical sources and configurations are a wye secondary and a delta secondary.

Figure 2 : Wye and Delta Configurations

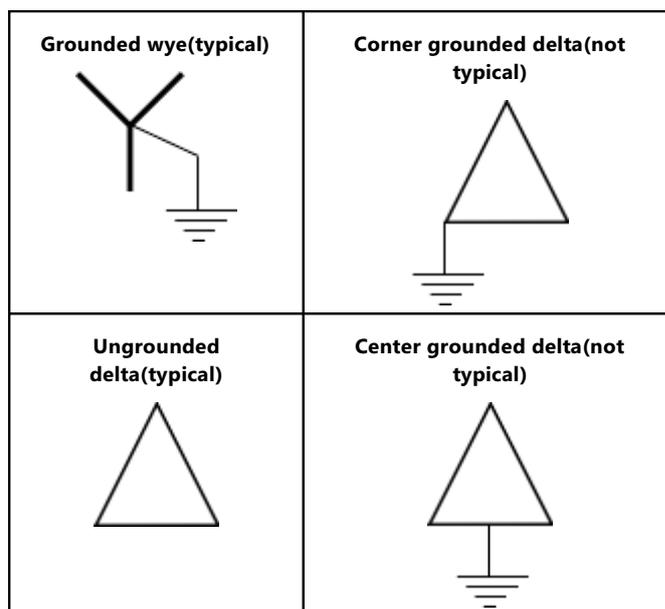


■ How to Ground

In most conditions, you must ground a wye system. Refer to local electrical codes. When you ground a wye system, the voltage to ground becomes stable and controlled. This prevents a system from damage by conditions that cause high voltage to ground. It is typical to ground the neutral (center) point of a wye source.

It is not necessary to ground a delta system. If you ground a delta system, ground it to one phase. You can also ground it to a center tap on one phase.

Figure 3 : Wye and Delta Grounding



Refer to electrical codes to ground the compressor to a permanent protective ground connection. The compressor electrical enclosure contains an electrical power ground terminal that has the identification of "PE". The typical primary input power is a four-wire connection with three power wires and a ground wire. Connect the ground wire to the ground terminal.

NOTICE

If there are only three power wires and no ground wire, connect the ground terminal to a correct building ground. Do not let the enclosure frame float without an electrical connection to a power ground source.

■ How to Find Which System Is Used

NOTICE

Use a multimeter to measure the voltage. All voltage indications can change plus or minus 10%.

In a grounded wye connected 480-volt network:

- Each phase to ground (neutral) voltage is approximately 277 volts (480/sqrt3).
- 277 volts is a nominal indication for 480 volt systems.
- Other voltage indications are possible for 380, 415, 440 and 575 volt systems. See Table 2.
- The phase-to-phase voltage is the same as the primary supply voltage (575, 480, 460, 440, 415, or 380 volts).

NOTICE

You must disconnect the two Electro-Magnetic Compatibility (EMC) filters in a wye network that has a high resistance neutral connection more than 30 ohms. See "Disconnecting the Electro-Magnetic Compatibility (EMC) Filters".

In an ungrounded delta connected network:

- The network is capacitively grounded.
- Stray capacitances are connected between each phase conductor to ground.
- All phase voltages to ground are approximately 277 volts for a 480-volt network.
- There can be many different indications because of the capacitive ground.
- The phase-to-phase voltage is the same as the primary supply voltage (575, 480, 440, or 380 volts).

The primary function of an ungrounded delta network is to let uninterrupted power occur during a ground fault. At this time, the ungrounded network is referenced to ground. The primary circuit breaker opens only when two phases are connected to ground. Thus, it is possible to have one of the three phases of an ungrounded delta network connected to ground or the network be ungrounded at the time of compressor installation, but have a grounded phase at a future time.

NOTICE

You must disconnect the two Electro-Magnetic Compatibility (EMC) filters in a delta network that is not grounded. If you do not do this, damage will occur to the filter and to the VSD. This voids the factory warranties. See "Disconnecting the Electro-Magnetic Compatibility (EMC) Filters".

In a delta connected network:

- Only two phases to ground have a voltage, while the third phase has zero volts. The phase with zero volts is grounded.
- The two ungrounded phase voltages are the same as the primary supply (480 volts to ground for a 480-volt system).
- The phase-to-phase voltage is the same as the primary supply voltage (480, 440, or 380 volts).

NOTICE

With all compressors that have a variable speed drive for the primary drive, connect the ground to the L2 input of the compressor. If you do not obey this procedure, the compressor does not operate.

NOTICE

If you find a grounded phase during installation, it is important to know if the grounded phase is intentional (grounded) or accidental (ungrounded with a ground fault condition present).

Table 2 : Input Voltage Rating

Nominal Voltage Rating (VAC)	380-460
Phase	3
Hertz	50/60
Min./Max. Voltage Tolerance (%) 400-460 V	± 10
380 V	+10, -6
Min. /Max. Voltage Imbalance Between Phases (%)	3
Min./Max. Frequency Tolerance (%)	± 5

NOTICE

Ratings that do not fall in these limits can cause damage to the compressor and make all factory warranties void.

■ High Voltage Conditions and Secondary Protection

A compressor with a variable speed drive contains Metal Oxide Varistors (MOV). The MOV prevent damage to the VSD from typical voltage conditions. Very high voltage conditions can cause damage to the MOV and the VSD. These are examples of very high voltage conditions:

- lightning storms
- switching of power factor capacitors
- welders
- thyristors

If there are very high voltage conditions, you must add secondary protection to prevent damage to the compressor.

NOTICE

Damage to the MOV shows that the compressor was exposed to very high voltage conditions. Damage to the MOV because of very high voltage makes the factory warranty and the extended contract warranty void.

■ Power Factor Compensation Capacitors

Power factor compensation is not necessary for a compressor that contains a variable speed drive. Nevertheless, if you connect the compressor to a system that includes compensation capacitors, obey these instructions:

- Do not connect a high-power capacitor to the power line while the compressor is connected to the primary power. High voltage conditions can open the compressor protection circuits or they can cause damage to the compressor.
- If you increase or decrease the capacitor load gradually when the compressor is connected to the power line, make sure the connection steps are sufficiently low not to cause voltage transients that can open the compressor protection circuits or cause damage to the compressor.
- Check that the power factor compensation unit is correct for use in systems with AC drives. The compensation unit must typically have a blocking reactor or harmonic filter.
- Do not connect any devices to the output of the AC drive in the compressor.

NOTICE

If you do not obey the electrical installation instructions, the factory warranty and any extended contract warranty is void.

■ Disconnecting the Electro-Magnetic Compatibility (EMC) Filters

On some types of electrical power systems, you must disconnect the internal Electro-Magnetic Compatibility (EMC) filters. If you do not do this, the electrical power system is connected to ground potential through the EMC filter capacitors. This can cause a dangerous situation and it can cause damage to the variable speed drive.

Disconnect the two EMC filters if the electrical power system is:

- ungrounded (floating)
- a high-resistance ground system (greater than 30 ohms)
- a corner-grounded delta system.

WARNING

Do not try to install or remove the EMC filters and jumpers while power is applied to the compressors input terminals.

NOTICE

If you disconnect the internal EMC filters, the variable speed drive does not agree to the European requirements for Electro-Magnetic Compatibility. If you operate the compressor without the EMC filters, the compressor can cause unwanted interference with electronic devices. You can continue to operate the compressor without the EMC filters only if Electro-Magnetic Compatibility is not necessary in your area.

NOTICE

You must remove the two jumpers (For R37e-160 kW only). One jumper is in the MOV/EMC metal box at the bottom of the compressor. The other jumper is on the Printed Circuit Board (PCB) found on the input buss bars to the drive.

Figure 4 : Location of First Jumper

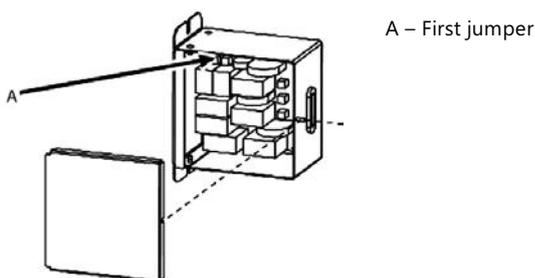
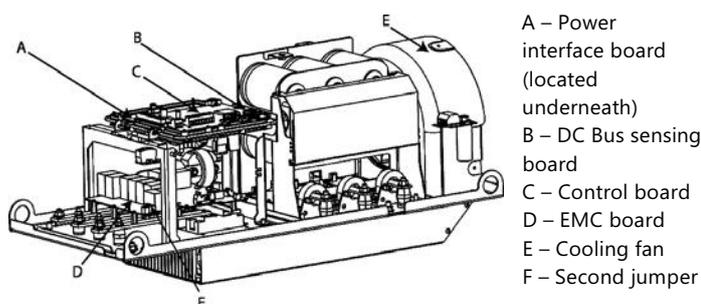


Figure 5 : Location of Second Jumper



NOTICE

The machine may not meet EMC requirement for connecting to a mains network that is shared with domestic premises. If connection to mains that are shared by other buildings for domestic use is required, an additional EMC filter may be required.

■ Power Supplied By Dedicated Transformer or Generator

High Impedance Power Source

The compressor can operate in industrial electrical networks that have a short-circuit power 15 times greater than the rated power of the drive (line impedance less than seven percent). Make sure that the network is correct if you operate the compressor on a generator set or on a dedicated transformer.

We recommend that you open the link that connects the Electro-Magnetic Compatibility filter capacitors to the ground point if the installation has the following characteristics:

- the distribution power network has no connection to ground and
- the short-circuit current at the drive connection point and its rated current has a ratio lower than 30.

Low Impedance Power Source

The variable speed drive can experience low impedance if the installation has the following characteristics:

- the compressor is installed near to the medium voltage/low voltage (MV/LV) power supply transformer, and
- a bank of power factor correction capacitors are connected in parallel at the secondary side of the transformer.

The risk of a high voltage surge at the equipment terminals is high in the condition that the voltage decrease > at the primary side of the transformer.

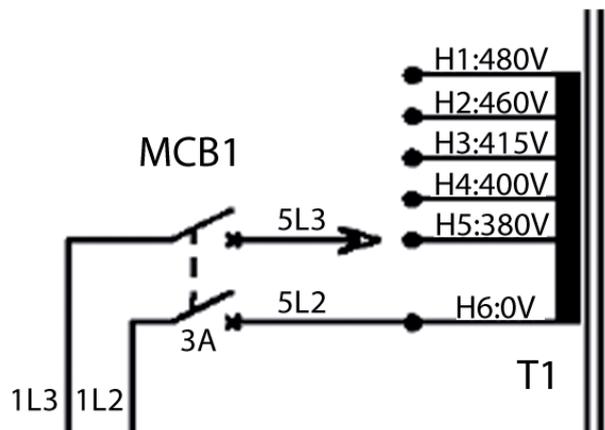
Example of line impedance calculation in percent

For a compressor with a rated input current of 100 amps and a line power supply with short-circuit current capacity of 5000 amps, the line impedance is two percent (100 A/5000 A).

■ Control Power Transformer Connections

The control circuit transformer has different voltage primary taps for different power line voltage levels. Make sure that the taps are set for the correct applied voltage before you start the compressor.

Figure 6 : Control Power Transformer Connections



■ Water-cooled

■ Cooling Water Piping

NOTICE

Water piping to and from the compressor package shall be at least as large as the package connection size. Do not undersize the water piping.

Isolation valves with side drains should be installed on both the inlet and outlet lines. To maintain cooler cleanliness and reliability, it is important to install a strainer of 2 mm mesh size on the inlet line. Strainers are available from **Ingersoll Rand**.

For sea water applications (sea water option only) a zinc anode is not recommended as it will deteriorate the copper oxide film on the 70/30 copper-nickel alloy tubes in contact with sea water. To minimize galvanic corrosion and provide the greatest corrosion protection to the coolers, it is strongly recommended that a section of iron pipe (>00 mm length) be connected as close as possible to the air compressor package water inlet connection. The iron pipe will act as the sacrificial anode for the copper-nickel tubes and therefore shall be considered a regular maintenance and replacement item. For this reason, the section of iron pipe should be installed so that it can be easily replaced (e.g. with a union joint.).

The air compressor has a normally closed solenoid valve that is fitted to the water outlet side within the package. The valve is wired into the air compressor control circuit and closes when the compressor stops.

Carefully inspect the water system before installing the air compressor package. Ensure that the piping is free of scale and deposits that may restrict water flow to the air compressor package. If water cleanliness is poor, filtration installed on the water inlet pipe line is recommended.

Proper operation of the compressor requires that the cooling water flow be provided at a maximum supply temperature of 46 °C (115 °F). See the compressor engineering data sheets for cooling water flow rates.

Water temperature and pressure gauges should be installed in the water piping for use in any fault finding of the water system. Water pressure should ideally be between and 5 bar (43.5 and 72.5 psi) but shall not be above 10 bar (145 psi).

Water cleanliness is also extremely important. Cleaning of coolers as a result of fouling is a customer responsibility. Therefore, it is highly recommended that proper water quality shall meet the requirements listed in WATER QUALITY RECOMMENDATIONS later in this section.

■ Venting the water system

Air should be vented from the water side of the system to avoid poor performance and water hammer. Since the air compressor uses different type heat exchangers depending on your selection of "fresh water cooled" or "harsh water cooled" system, the venting procedure is different. Be sure to use the correct procedure below:

Fresh water coolers (brazed plate heat exchangers):

1. Disconnect the water stop valve in the water outlet line of the compressor.
2. Open the inlet water valve(s) to allow the water to flow to the compressor.
3. Allow all the air to escape from the system and observe water at the water outlet port.
4. Connect the water stop valve.

Harsh water coolers (shell and tube heat exchangers):

1. Locate the water system vent cocks on top of the after-cooler and oil cooler.
2. Open the water valve(s) allowing water to flow to the package.
3. Open the vent cocks and allow all air to escape from the system. When water is observed at the vent cocks, close them.

■ Draining the water system

Should it become necessary to completely drain the water system, use the following procedures specific to the water cooled option you have.

Fresh water coolers (brazed plate heat exchangers):

1. Disconnect the inlet water line from the connection located at the rear of the compressor.
2. Disconnect the water stop valve in the water outlet line of the compressor.
3. Allow the system to completely drain.

Harsh water coolers (shell & tube heat exchangers):

1. Disconnect the inlet and discharge water lines from the connections located at the rear of the compressor.
2. Locate the after-cooler and oil cooler. Remove the drain plugs located at the bottom of the coolers.
3. Open the vent ports in the top of the after-cooler and oil cooler.
4. Allow the system to completely drain.

Adjusting the after-cooler trim valve

See the piping and instrumentation diagram provided separately from this manual. The coolers are piped in a "parallel" water flow arrangement with a manual trim valve controlling the flow through the after-cooler. The after-cooler trim valve is factory set and should not need adjusting but if disturbed use following procedure.

1. Close valve fully clockwise and then open two full turns.
2. With the compressor running loaded observe the package discharge temperature on the controller display. It should be approximately 8 °C (15 °F) above the water inlet temperature.
3. If the temperature is too high, open the valve ¼ turn and wait one minute. If the temperature is too low, close the valve ¼ turn and wait one minute. Repeat the incremental movements until the desired temperature is reached.
4. Put a "Warning – Do Not Adjust" label on the valve or fit a lock.

■ Water quality recommendations

Water quality is often overlooked when the cooling system of a water-cooled air compressor is examined. Water quality determines how effective the heat transfer rate, as well as the flow rate, will remain during the life of the compressor. It should be noted that the quality of water used in any cooling system does not remain constant during the operation of the system. Evaporation, corrosion, chemical and temperature changes, aeration, scale and biological formations affect the water makeup. Most problems in a cooling system first appear as a reduction in the heat transfer rate, then in a reduced flow rate or increased pressure drop, and finally with damage to the system.

Scale: Scale formation inhibits effective heat transfer, yet it does help prevent corrosion. Therefore, a thin uniform coating of calcium carbonate is acceptable on the inner surface. Perhaps the largest contributor to scale formation is the precipitation of calcium carbonate out of the water. This is dependent on temperature and pH level. The higher the pH value, the greater the chance of scale formation. Scale can be controlled with water treatment.

Corrosion: In contrast to scale formation is the problem of corrosion. Chlorides cause problems because of their size and conductivity. Low pH levels promote corrosion, as well as high levels of dissolved oxygen.

Fouling: Biological and organic substances (slime) can also cause problems, but in elevated temperature environments such as cooling processes they are not a major concern. If they create problems with clogging, commercial shock treatments are available.

To ensure good operation life and performance of the compressor cooling system, the recommended acceptable ranges for different water constituents are included below:

Table 3 : Acceptable Limits for Cooling Water Constituents

Substance	Test Interval	ACCEPTABLE MAXIMUM LIMITS	
		Fresh Water (Braze Plate Heat Exchanger)	Dirty Water / Sea Water (Shell & Tube Heat Exchanger)
Langelier Index (LI)	Monthly	0 to 1	-0.5 to 2.5
Ammonia [NH ₃], ppm	Monthly	<1	<2
Ammonium [NH ₄ -1], ppm	Monthly	<2	<5
Chlorides [Cl-], ppm	Monthly	<80	<1000
Copper [Cu], ppm	Weekly	<0.01	<0.5
Dissolved Oxygen (DO) [O ₂], ppm	Monthly	<0.1	<3
Iron + Manganese [Fe + Mn], ppm	Monthly	<0.3	<2
Nitrate [NO ₃ -], ppm	Monthly	<100	<125
Oil & Grease, ppm	Monthly	<5	<5
Silicon Dioxide (silica) [SiO ₂], ppm	Monthly	<30	<100
Sulfates [SO ₄ -2], ppm	Monthly	<70	<250

■ Integrated Dryer

Do not connect condensate drains common to other pressurized drain lines in a closed circuit. Make sure the outflow from the condensate drains is unimpeded. Connect the condensate piping in such a way to ensure that sound levels are kept to a minimum during drainage.

Ensure that all condensate is disposed of in a responsible manner, in compliance with all applicable standards and regulations (local, state, country, federal, etc.).

The ambient air around the dryer and compressor shall not contain solid or gaseous contaminants. All compressed and condensed gases can generate acids or chemical products which may damage the compressor or components inside the dryer. Take particular care with sulphur, ammonia, chlorine and installations in marine environments.

■ Environmental Limits

The standard compressor package is designed for the following conditions:

- Indoors only
- Area not considered to be a high dust area.
- Ambient temperature range 2 to 46 °C (5-115 °F)

Ingersoll Rand offers the following options for fixed speed compressors that extend the environmental limits:

- Outdoor modification
- Low ambient option (-23 to 46 °C / -15 to 115 °F) at sea level
- High ambient option (2 to 55 °C / 5 to 131 °F) at sea level
- High dust air filter
- High dust package filter

GENERAL INFORMATION

The compressor is an electric motor driven, contact cooled screw compressor, complete with all necessary components piped, wired and baseplate mounted. It is a totally self contained air compressor package.

The standard compressor is designed to operate in an ambient range of 2 °C to 46 °C (35 °F to 115 °F). The standard maximum temperature of 46 °C (115 °F) is applicable up to an elevation of 1000 m (3280 ft) above sea level. Above this altitude, significant reductions in ambient temperature are required if a standard motor is to be used.

The compressor is managed by the onboard electronic controller. The controller and drive system operate together to vary the speed of the compressor to deliver compressed air at the target pressure.

For fixed speed (FS) models, the capacity is automatically controlled via 'ON-OFF LINE'. The compressor will operate to maintain a set discharge line pressure and is provided with an auto restart system for use in plants where air demand varies widely.

Panel instrumentation is provided to indicate the compressor operating conditions and general status.

The air/coolant mixture discharges from the compressor into the separation system. This system removes all but a few ppm of the coolant from the discharge air. The coolant is returned to the cooling system and the air passes to the after-cooler and out of the compressor through the moisture separator.

Air is pulled into the compressor by the cooling blower and through the coolant cooler and after-cooler.

By cooling the discharge air, much of the water vapor naturally contained in the air is condensed and is drained from the built-in moisture separator and drain.

The coolant system consists of a sump, cooler, thermostatic valve and a filter. When the compressor is operating, coolant is forced by air pressure from the separator tank to the thermostatic element. The position of the element (a direct result of coolant temperature) will determine whether the coolant circulates through the cooler, bypasses the cooler, or mixes the two paths together to maintain an optimum compressor discharge temperature. This temperature is controlled to preclude the possibility of water vapor condensing. By injecting coolant at a sufficiently high temperature, the discharge air coolant mixture temperature will be kept above the dew point.

For variable speed drive models, the system is enhanced by a control logic that varies the cooling blower speed dependent on the intake and discharge temperatures and hence controls the injection temperature even closer while saving blower motor energy.

The compressor is provided with a temperature sensor which will shut the compressor down in case of excessive temperature. This setting is typically 109 °C (228 °F).

Effective coolant filtration is provided by the use of a screw on, heavy duty coolant filter.

NOTICE

Fixed speed compressors should not be connected to variable speed drives. Please contact your local Ingersoll Rand representative before inverter duty conversion.

CAUTION

For fixed speed models, the compressor may not reach its normal operating temperature during periods of low demand. Sustained operation at low demand can result in the buildup of condensate in the coolant. If this situation occurs, the lubricating characteristics of the coolant can be impaired, which may lead to damage of the compressor.

The compressor should be allowed ample loading time.

■ Integrated Dryer Operation

In the default mode, the dryer is non-cycling. The stop button must be pressed to shut-off the dryer.

In the energy efficient mode, the dryer may run up to 6 minutes before it shuts off automatically during the Start/Stop mode of the compressor package. Note the dryer could be off for an extended period if the compressor needs to come back on right away.

NOTICE

If ISO Class 4 dew point standards are critical to your application, run the compressor in unload mode (fixed speed) or idle mode (variable speed) for one minute at startup to allow the dryer to reach the required dew point before the compressor begins providing compressed air.

OPERATING INSTRUCTIONS FOR VARIABLE SPEED DRIVE (VSD)

■ Basic Operation

NOTICE

The language and compressors of measure displayed on the controller will be preset before leaving the factory. If these are required to be changed, contact your local Ingersoll Rand service provider.

■ Prior to starting

Check that the coolant level is at least visible in the center of the sight glass and add coolant if necessary. Refer to the maintenance procedures for setting the correct level.

Ensure that the discharge air isolation valve is open. Switch ON the main electrical isolation switch. The control panel will illuminate, indicating that the line and control voltages are available.

The contrast of the SG controller display may be adjusted by turning the small screw which is on the right hand side of the controller when accessed through the starter cabinet door.

■ Initial check sequence

The controller will perform an initial check sequence if the compressor receives initial power to the controller or has experienced a trip reset. While the initial check sequence occurs, the controller will display a "Checking Machine" message.

During the initial check sequence, the controller will check the control system for proper operation. During this time, if any items are found inoperative, a trip will occur and the compressor will not start.

After completion of the initial check sequence, the controller will then display "READY TO START". This process should be completed within 10 seconds.

■ Start sequence

The compressor will initially start by the operator pressing the local start button or receiving a remote start command. The compressor will start loaded and will ramp up the motor speed to its minimum speed. Once the minimum speed has been achieved, the compressor will begin to control pressure by using its speed regulation. When the system pressure reaches the target pressure, the compressor will start to slow. If the system pressure rises to the immediate stop pressure setpoint the compressor will stop. If the system pressure rises to the auto stop setpoint and the compressor is at minimum speed, the compressor will stop.

NOTICE

During the first startup of the compressor, check for the proper direction of rotation of the dryer condenser fan. If the fan is not rotating in the direction indicated by the rotation arrow decal, reverse two of the wires at the main power supply or at the contactor in the package starter box. Perform the proper stop sequence and lockout/tagout the main electrical supply before making changes to the wiring.

■ Stop sequence

The compressor can be stopped by a local or remote stop, a shutdown due to a trip, or an emergency stop. All of the above conditions will cause the compressor to stop immediately, except the local or remote stop. A local or remote stop will open the blowdown valve and the compressor will run for up to 10 seconds or until the pressure in the separator tank falls to 2.4 bar (35 psi) before stopping. The compressor will stop if the system pressure reaches the automatic stop or immediate stop pressure setpoints. However, if the compressor stops for this reason, it will automatically restart when the system pressure falls below the target pressure.

NOTICE

If the compressor has to be stopped in an emergency depress the emergency stop button located underneath the instrument panel.

■ Warm up mode

A warm up cycle occurs when the compressor's aird discharge temperature doesn't reach the required warm up temperature (82°C/180°F) for two consecutive operational cycles. On a warm up cycle, instead of stopping, the compressor will continue to run with the blowdown valve open. The compressor will run in a fixed speed mode, at minimum speed. The blower will operate at minimum speed. The compressor will run like this for approximately five minutes. During a warm up cycle, the controller will display the message "Warm Up Mode". If the pressure falls during this time period, the compressor will return to normal operation.

■ Blower control

The blower speed varies in some conditions to assist in controlling the after-cooler approach temperature and the coolant injection temperature. The blower motor has its own variable speed drive and will ramp up and down as the compressor starts and stops.

■ Emergency stopping

If the compressor has to be stopped in an emergency **press the emergency stop button located underneath the instrument panel.**

This will over-ride the normal unload/stop button and will immediately stop the compressor.

NOTICE

It is a normal situation that drive cooling fan continues to run even when the drive is stopped. And the fan can run even under an E-stop.

■ Restarting after emergency stopping

If the compressor has been switched OFF because of a compressor malfunction, identify and correct the fault before attempting to restart.

If the compressor has been switched OFF for reasons of safety, ensure that the compressor can be operated safely before restarting.

Refer to the *PRIOR TO STARTING* and *START SEQUENCE* instructions earlier in this section before restarting the compressor.

OPERATING INSTRUCTIONS (XE-90M CONTROLLER)

■ User Interface

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, the color graphics display and the LED icons make up the user interface to the compressor.

Figure 7 : Xe-90M



■ 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.

Table 4 : LED Status Icons

Icon	Name	Function
	OK	Illuminates when no Warnings or Trips are sensed. Can be in a Ready or Not Ready state.
	Alert	Illuminates when an Warning (flashes) or Trip (constant ON) is sensed. Can be in a Ready (Warning) or Not Ready (Trip) state.
	Auto	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.

Table 5 : Command Keys

Icon	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.
	Reset	Clears Warnings and Trips once the condition is corrected.

Icon	Name	Function
	Start	Starts the compressor.
	Stop	Stops the compressor. This button should be pressed instead of the E-Stop for normal stopping operation.
	Enter	Toggles the display between the Navigation mode and the Edit mode.

NOTICE

The LOAD and UNLOAD keys are not used on 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 8 : Navigation Keys



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 9 : Display Layout



Table 6 : Display Layout

Key	Name	Description
A	Folder Bar	Uses tabs to graphically identify each folder.
B	Title Bar	Identifies current folder and page (underlined).
C	Page Content	Content of the current page.
D	Dashboard	Displays system status.

Folder navigation and 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.

Table 7 : Folder Bar Icons

Folder Name	Icon	Description
Home		System performance and status main information. The first page of this folder is the default page when the controller first powers 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. (Optional for some controllers)
Maintenance		Status and notification setup for compressor maintenance items.
General Settings		General settings such as Language, Time, and Units of Measure.
Integral Sequencing		Inter Module 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.

Table 8 : Title Bar Page Icons

Icon	Description
	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.

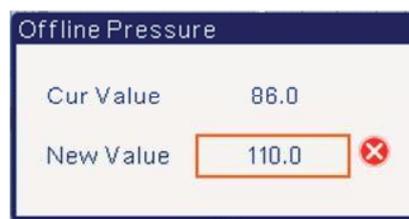
The cursor rolls over, so once the last parameter is selected, pressing the DOWN key will navigate the cursor to the folder bar. If the first parameter is selected, pressing the UP key will move the cursor to the page selection area.

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 "X" icon appears on numeric entry windows as shown below. Placing the cursor on it and then pressing the ENTER key will cancel the entry and any changes that were made.

Figure 10 : Numeric Entry Window



NOTICE

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.

Table 9 : Dashboard Icons

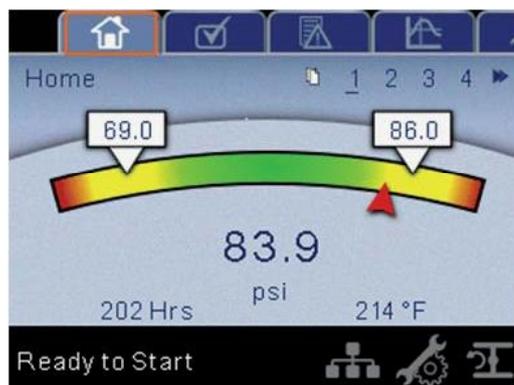
Name	Icon	Description
Network Control		Network control is enabled.
Service Required		A service reminder is nearing or has expired (i.e.: an air or oil filter needs to be changed).
Unloaded or Loaded	 	Compressor is in the unloaded state. Compressor is in the loaded state.

Folder Options (Fixed Speed)

Home folder

Page 1: System Overview

Figure 11 : Home Folder



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

- **Online Pressure Setpoint** is indicated in the white box and by the white arrow, which is always left of center on the gauge.
- **Offline Pressure Setpoint** is indicated in the white box and by the white arrow, which is always right of center on the gauge.
- **Package Discharge Pressure** is indicated by the large numbers centered below the gauge and by the red arrow.
- **Pressure Unit of Measure** is indicated below the Package Discharge Pressure. This is selectable from the General Settings folder.
- **Airend Discharge Temperature** is indicated by the numbers in the lower left of the display.
- **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.

NOTICE

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

Figure 12 : Counters



- **Hour Meters** indicate the hours that: the controller has been powered up, the compressor has been running, and the compressor has running loaded.
- **Starts** indicate the number of times a start is attempted on the compressor.
- **Date & Time** is adjustable and configurable in the General Settings folder.

Pages 3-4: Analog Inputs

Figure 13 : Analog Inputs



Icon	Meaning
	Pressure
	Temperature

NOTICE

All information on these pages is read only.

The following inputs are displayed in this section:

- Package Discharge Pressure
- Sump Pressure
- Airend Discharge Temperature
- Injected Coolant Temperature
- After-cooler Discharge Temperature
- Separator Pressure Drop

- Coolant Filter Pressure Drop
- Inlet Vacuum
- After-cooler Discharge Pressure (integrated dryer compressors only)
- Remote Pressure (optional)



Operator settings folder

Pages 1-2: Operator Settings

Figure 14 : Operator Settings



Table 10 : Operator Settings

Operator Settings	Selection	Min.	Max.	Default	Step	Unit
Offline Pressure	---	75	Rated+10	Rated+10	1	psi
Online Pressure	---	65	Offline-10	Offline-10	1	psi
Lead/Lag	Lead/Lag	---	---	Lead	---	---
Lag Offset	---	0	45	0	1	psi
Mode of Operation	Mode	---	---	ON/OFF line	---	---
Condensate Release	---	2	20	5	1	sec
Condensate Interval	---	90	270	180	1	sec
Stop Delay Time	---	10	30	10	1	sec
Star-Delta Time / Start Time	---	5	30	10	1	sec

Pages 3-5: Operator Options

Figure 15 : Operator Options



Table 11 : Operator Options

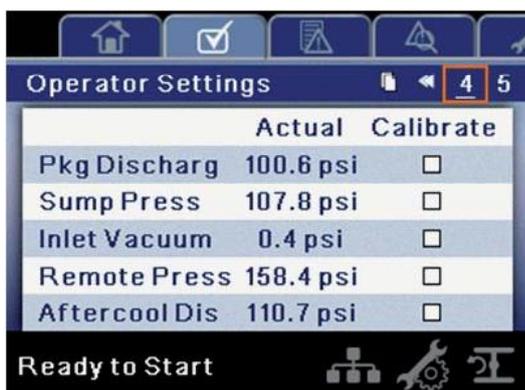
Operator Options	Selection	Min.	Max.	Def.	Step	Unit	Installed option required?
Enable Auto Restart	ON/OFF	---	---	OFF	---	---	No
Auto Restart Time	---	2	60	10	1	Min	No
Auto Restart Delay	---	0	60	0	1	Sec	No
Comm Control	ON/OFF	---	---	OFF	---	---	No
Remote Start/Stop	ON/OFF	---	---	OFF	---	---	No
Power Out Restart	ON/OFF	---	---	OFF	---	---	Yes
Power Out Restart Time	---	10	600	10	1	Sec	Yes
Low Ambient Temp*	---	30	60	35	1	Deg F	No
Lead/Lag Cycle Time**	---	0	750	0	1	Hours	No
Scheduled Start - Day	---	Day	Day	Sun	1	Day	Yes
Scheduled Start	---	00:00	23:59	00:00	1	Time	Yes
Scheduled Stop - Day	---	Day	Day	Sun	1	Day	Yes
Scheduled Stop	---	00:00	23:59	00:00	1	Time	Yes
High Dust Filter	ON/OFF	---	---	OFF	---	---	Yes
Remote Sensor	ON/OFF	---	---	OFF	---	---	Yes

* The low ambient temperature is only adjustable if the low ambient factory set point is on.

** A value of 0 will disable the lead/lag cycle time feature.

Pages 6-7: Sensor Calibration

Figure 16 : Sensor Calibration



Sensor calibration can only take place when the compressor is stopped. There should be no pressure on a sensor when it is calibrated. Calibration only needs to take place after a sensor is replaced, the controller is replaced, 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 compressors with the remote sensor option
- Interstage Pressure (2APT) – Only on 2-stage compressors
- After-cooler Discharge Pressure (7APT) – Only on compressors 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. Please make sure the sensor is being exposed to atmosphere before attempting calibration.

Events folder

Pages 1-42 (max.)

Figure 17 : Events Folder



The pages in the Events folder document up to the last 250 events that the controller has experienced, and time stamps each. The events are recorded in sequence, with number one being the newest and 250 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 six, page two displays seven through twelve, 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
- Warning
- Trip
- Start Inhibit

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

Active Trips will be highlighted in red while cleared 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.

See the following lists for details about messages in each type of event.

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 compressor has been loaded for at least 8 seconds. This condition must exist for 3 seconds before the warning is issued.

Change Coolant Filter

This will occur if the compressor 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.

Sensor Failure

This will occur whenever sensors 4ATT, 5DTT, 6DTT, and 7APT are recognized as missing or broken. The sensor failure message shall follow the following format: SENSOR FAILURE 4ATT. The 5DTT, 6DTT, and 7APT 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 compressor is loaded, the compressor is warmed up (the injected coolant temperature is at least 120 °F), the package discharge pressure is at least 90 psi, 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 compressor is running and 2ATT is greater than 221 °F (97% of 228) and the compressor is running. This condition must exist for 3 seconds before the warning is issued.

High Sump Pressure

If the compressor 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 compressor 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 compressor, a "SERVICE REQUIRED" warning will be issued on hour intervals equal to the service time period set point. This warning can be reset the same as any other warning.

Service Level 2

If service level 2 has been selected for the compressor, 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 been 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 compressor is the lead compressor in integral sequencing and is unable to communicate with another compressor.

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 compressor 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 compressor is using a remote sensor or is under the control of an external device, such as an 8XI, 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 compressor 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 687 (about 0.5 C) or below (low temp) while the dryer is running, on compressors 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). However the warning will still be displayed.

Dryer High Pressure

On compressors 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 switch must be reset before the dryer can run. Resetting the warning on the display does not reset the switch.

Condenser Temperature High

This will occur if the condenser sensor has a value above high temperature threshold while the dryer is running, on compressors 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 compressors 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 after-cooler discharge and the inlet to the dryer and is only on compressors with an integrated dryer. The drop

across the HE filter is measured by subtracting the package discharge pressure from the after-cooler discharge pressure. If the compressor is running, the measured drop across the HE filter is at or above 10 psi (0.7 bar), the compressor is hot (injected coolant temp above 120 °F), 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.

Trip Events List

Low Sump Pressure

Will occur if the compressor 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 °F and the compressor is running.

Check Motor Rotation

This will occur if 3APT is less than 1 psi on a compressor, 3 seconds after starting (6 seconds if the compressor is equipped with a soft starter or airend discharge temperature is less than 50 °F). 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.

Main Motor Overload

This will occur if the motor overload relay contact 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 compressor is started by the remote start button, and the button stays closed for 7 seconds after the compressor 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 compressor), 2CTT, and 2ATT. The sensor should be displayed along with the sensor failure message. The sensor failure message shall follow the following format: SENSOR FAILURE 1AVPT.

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 compressor 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 compressor is running loaded and the inlet vacuum is greater than 1.8 psi. If the compressor has a high dust filter, the trip threshold for inlet vacuum is 2.4 psi.

Unit Too Cold To Start

This will occur if the compressor does not have the low ambient option, the airend discharge temperature (2ATT) is less than 35 °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 compressor is being started in low ambient conditions.

High Interstage Pressure

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

Invalid Calibration

Will occur if the sensor zero value is +/- 10% of its scale. This will only occur when a sensor is calibrated.

Start Inhibit List

High Airend Discharge Temperature

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

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 1-4 (max.)

Figure 18 : Trip History



#	Description	Time	Date
1.	VSD Comms Los	07:54:31	12/29
2.	VSD Comms Los	21:05:56	12/28
3.	VSD Fault	20:47:39	12/28
4.	Emergency Stop	13:48:22	12/28
5.	VSD Comms Los	13:48:11	12/28

The pages in the Trip 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 event.

- Power ON
- Power OFF
- Press the Start Key
- Press the Stop Key
- Press the Load Key
- Press the Unload Key
- Warning
- Trip
- Start Inhibit

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.

Figure 19 : Trip History Dialog

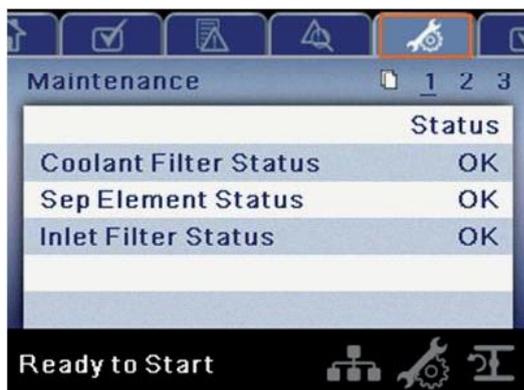


While the dialog box is active, press the left and right keys in order to scroll through the displayed data. The name of the trip will always be shown in the title bar of the dialog box. Press enter when finished viewing the data to return to the trip history screen.

■ Maintenance folder

Page 1: Filter Status

Figure 20 : Filter Status



This page displays the following:

- Coolant Filter Status
- Separator Element Status
- Inlet Filter Status

Page 2: Maintenance Status

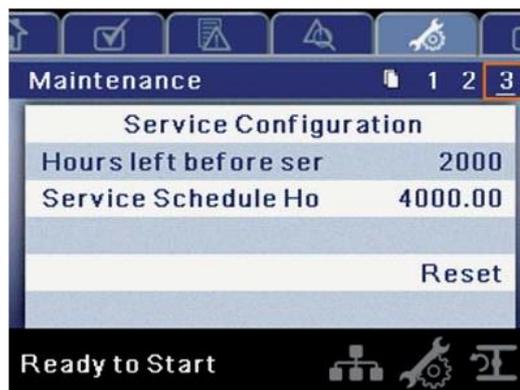
Figure 21 : Maintenance Status



This page displays the time until the compressor should be serviced.

Page 3: Maintenance Configuration

Figure 22 : Maintenance Configuration



This page allows the user to set the service interval and to reset the counter after the service has been performed.

■ General settings folder

NOTICE

All parameters in this folder are adjustable.

Page 1: Language Selection

Figure 23 : Language Selection



Language is selectable from the following 30 choices:

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

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 1: Units of Measure Settings

Figure 24 : Units of Measure Settings



The following compressors of measure settings are displayed in this section.

Table 12 : Units of Measure Settings

Display Text	Description
Temperature	Selectable between °F and °C.
Pressure	Selectable among psi, kpa, bar, kg/cm ² .
Power	Selectable between kW and HP.

Page 3: Home Page Selection

Figure 25 : Home Page Selection



Table 13 : Home Page Selection

Display Text	Description
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	Used to select the Home folder.
Select Home Page	Used to select the Home Page within the selected Home folder.

Pages 4-5: Time & Date Settings

Figure 26 : Time & Date Settings



All items are adjustable.

The following settings are displayed in this section:

Table 14 : Time & Date Settings

Display Text	Description
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	Selectable between dd/mm/yyyy (default) and mm/dd/yyyy.
Confirm New Time and Date	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.

NOTICE

The controller does not support Daylight Savings Time.

Page 6: Backlight Settings

Figure 27 : Backlight Settings



The following settings are displayed in this section:

Table 15 : Backlight Settings

Display Text	Description
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.

NOTICE

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.

Pages 7-8: Ethernet Settings

Figure 28 : Ethernet Settings

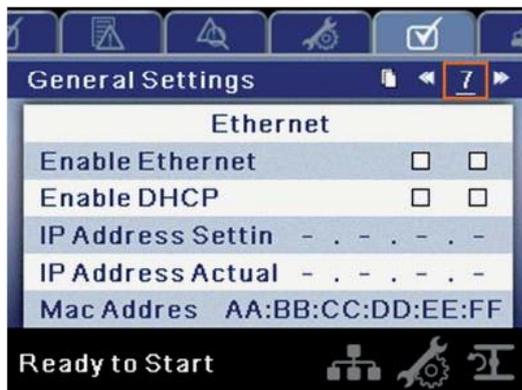


Table 16 : Ethernet Settings

Display Text	Description
Enable Ethernet	Allow connection by users to utilize the network enabled functionality of the controller
Enable DHCP	Allow the controller to automatically receive an IP address from the Local Area Network (LAN)
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.
MAC Address	This is the unique hardware MAC address for the controller. This can not be changed.
Subnet Mask Setting	Setpoint for the subnet mask
Subnet Mask Actual	Current reading/setting for the subnet mask
Default Gateway Setting	Setpoint for the default gateway.
Default Gateway Actual	Current reading/setting for the default gateway.
Accept	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.

 **Status folder**
NOTICE

All information on these pages is read only.

Pages 1-3: Analog Inputs

Figure 29 : Analog Inputs



The following inputs are displayed in this section:

- Package Discharge Pressure
- Sump Pressure
- Airend Discharge Temperature
- Injected Coolant Temperature
- After-cooler Discharge Temperature
- Separator Pressure Drop
- Coolant Filter Pressure Drop
- Inlet Vacuum
- After-cooler Discharge Pressure (integrated dryer compressors only)
- Remote Pressure (optional)
- Coolant Filter Inlet Pressure
- Coolant Filter Outlet Pressure
- Interstage Pressure (2-stage compressors only)
- Evaporator
- Condenser

Page 4: Compressor Data

Figure 30 : Compressor Data



The following data are displayed in this section:

- Power ON Hours
- Running Hours
- Loaded Hours
- Real Time Clock

Pages 5-6: Digital Inputs

Figure 31 : Digital Inputs



A marked 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, whereas, E-Stop is TRUE when its input is at 0Vdc.

- 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

Figure 32 : Digital Outputs



A marked checkbox beside a digital output indicates that it is energized.

- Starter Contact 1
- Starter Contact 2
- Fan Starter Contact
- Blowdown Solenoid
- Modulation Solenoid
- Condensate Drain
- Dryer Run / Fan Run
- PORO Horn
- Trip Relay
- Warning Relay
- Low Voltage Output 1
- Low Voltage Output 2
- Low Voltage Output 3
- Low Voltage Output 4

NOTICE

(RO) indicates read-only values.

Page 9: Analog Outputs

Figure 33 : Analog Outputs



The value for the analog outputs will be in mA.

- VSD Blower Output
- Analog Output 2

NOTICE

(RO) indicates read-only values.

 **Factory settings folder**

This folder is for 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

Figure 34 : Password



Table 17 : Password

Display Text	Description
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.

Pages 2-3: Factory Settings

Figure 35 : 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)
- Enable Two Stage (ON/OFF)
- Starter Type (Star-delta, Remote Starter, Soft Starter)
- Service Level (0, 1, or 2)
- Service Time Period (1000 – 8000, in increments of 1000 hours)
- Enable Modulation (ON/OFF)
- Enable PAC (ON/OFF)
- Enable Dryer (ON/OFF)
- Running Hours (adjustable)
- Loaded Hours (adjustable)
- VSD Blower (ON/OFF)
- Enable Low Ambient (ON/OFF)

Pages 4-5: Factory Settings

Figure 36 : Factory Settings



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

Folder Options (Variable Speed)

-  Home folder

Page 1: System Overview

Figure 37 : Systems 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.
- **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 compressor will unload and stop.
- **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.
- **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.

NOTICE

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

Figure 38 : 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.

NOTICE

All information on this page is read only.

Pages 3-5: Analog Inputs & Compressor Information**Figure 39 : Analog Inputs & Compressor Information**

Icon	Meaning
	Pressure
	Temperature

NOTICE

All information on these pages is read only.

The following analog inputs are displayed in this section:

- Package Discharge Pressure
- Sump Pressure
- Airend Discharge Temperature
- Injected Coolant Temperature
- After-cooler Discharge Temperature
- Separator Pressure Drop
- Coolant Filter Pressure Drop
- Inlet Vacuum
- Remote Pressure (optional)
- After-cooler Discharge Pressure (integrated dryer compressors only)

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

- Motor Speed
- Package kW
- Average Package kW/hour
- Average % Capacity
- Average Capacity
- Energy Cost
- Energy Savings
- Lifetime Energy Savings

**Operator settings folder****Pages 1-2: Operator Settings****Figure 40 : Operator Settings**

The parameters below are adjustable at any time:

Table 18 : Operator Settings

Operator Settings	Default	Min.	Max.	Step	Unit
Target Pressure	100	65	145	1	psi
Automatic Stop Pressure	110	Target+1	Target+10	1	psi
Immediate Stop Pressure	120	Auto	Auto+10	1	psi
% Savings Compared To	Modulation	---	---	---	---
Energy Rate	0.000	0.000	9999.999	---	---
Reset Averaging	--/--/--	-	-	-	Date

Pages 3-5: Operator Options**Figure 41 : Operator Options**

The parameters immediately below are only adjustable when the compressor is stopped.

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

Table 19 : Operator Options

Option Items	Selection	Min.	Max.	Step	Unit	Installed option required?
Remote Sensor	ON/OFF	---	---	---	---	No
Comm Control	ON/OFF	---	---	---	---	No

Option Items	Selection	Min.	Max.	Step	Unit	Installed option required?
Remote Start-Stop	ON/OFF	---	---	---	---	No
Enable PORO	ON/OFF	---	---	---	---	Yes
PORO Time	---	10	600	1	Sec	Yes
	---	Day	Day	1	Day	Yes
	---	00:00	23:59	1	Time	Yes
	---	Day	Day	1	Day	Yes
	---	00:00	23:59	1	Time	Yes
Modbus Protocol	ON/OFF/ICU	---	---	---	---	No
Modbus Address	---	1	247	1	---	No

If an option has not been purchased and installed in the compressor, the message "Not Installed" will be shown on the selection display screen. Installation of options will be done using the **Ingersoll Rand** service tool.

*The low ambient temperature is only adjustable if the low ambient factory set point is ON.

** A value of 0 will disable the lead/lag cycle time feature.

Pages 6-7: Sensor Calibration

Figure 42 : Sensor Calibration



Sensor calibration can only take place when the compressor is stopped. There should be no pressure on a sensor when it is calibrated. Calibration only needs to take place after a sensor is replaced, the controller is replaced, 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 compressors with the remote sensor option
- Interstage Pressure (2APT) – Only on 2-stage compressors
- After-cooler Discharge Pressure (7APT) – Only on compressors 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. Please make sure the sensor is being exposed to atmosphere before attempting calibration.

Events folder

Pages 1-42 (max.)

Figure 43 : Events Folder



The pages in the Events folder document up to the last 250 events that the controller has experienced, and time stamps each. The events are recorded in sequence, with number one being the newest and 250 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 six, page two displays seven through twelve, and so on.

The following actions will generate an event:

- Power ON
- Power OFF
- Press the Start Key
- Press the Stop Key
- Press the Load Key
- Press the Unload Key
- Warning
- Trip
- Start Inhibit

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

Active Trips will be highlighted in red while cleared 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.

See the following lists for details about messages in each type of event.

Warning Events List

Change Inlet Filter

This will occur if the compressor 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.

Change Coolant Filter

This will occur if the compressor has been running for at least 7 seconds, the injected coolant temperature is at least 140 °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.

Sensor Failure (Units without Integrated Dryer)

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

Sensor Failure (Units with Integrated Dryer)

Will occur whenever a sensor is recognized as missing or broken and the compressor has an integrated dryer (3.3.1.6). The sensors affected by this

warning are 7APT, 5DTT, and 6DTT. The sensor failure message shall follow the following format: SENSOR FAILURE 7APT.

Change Separator Element

This will occur if the compressor has been running for at least 7 seconds, the injected coolant temperature is at least 120 °F, 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.

High Airend Disch Temp

Will occur if the compressor is running and 2ATT is greater than 221 °F (97% of 228) or the compressor is in idle mode (3.3.7.1) and 2ATT is greater than 184 °F. 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 compressor is under the control of an external device, such as an X-series, 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 could change significantly once the predictive maintenance warnings have been determined.

Service warnings occur when the compressor 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 compressor, 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 compressor, 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 been 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 °F).

Freeze Warning

This will occur if the evaporator sensor has a value of 687 (about 0.5 °C) or below (low temp) while the dryer is running, on compressors 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). However the warning will still be displayed.

Dryer High Pressure

On compressors with an 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 three 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 switch must be reset before the dryer can run. Resetting the warning on the display does not reset the switch.

Sensor Failure Remote

This will occur whenever the remote sensor is recognized as missing or broken. The sensor failure message shall follow the following format: SENSOR FAILURE REMOTE. If this warning occurs, the compressor will automatically switch to the package discharge pressure sensor for control.

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 (see 4.11).

Condenser Temperature High

This will occur if the condenser sensor has a value of 1019 (about 65 °C) or above (high temp) while the dryer is running, on compressors 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 compressors 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 after-cooler discharge and the inlet to the dryer and is only on compressors with an integrated dryer. The drop across the HE filter is measured by subtracting the package discharge pressure from the after-cooler discharge pressure. If the compressor is running at a minimum of 75% capacity, the measured drop across the HE filter is at or above 10 psi (0.7 bar), the compressor is hot (injected coolant temp above 120 °F), 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.

Trip Events List

High Airend Disch Temp

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

Blower Fault

Will occur if the fault contact opens for 3 seconds on the blower VSD.

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 compressor is started by the remote start button and the button stays closed for 7 seconds after the compressor 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, and 2ATT. The

sensor should be displayed along with the sensor failure message. The sensor failure message shall follow the following format: SENSOR FAILURE 4APT. 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

For R30-37 kW, the VSD fault is read from drive, controller only shows VSD FAULT. Once fault is eliminated from drive, VSD fault can be cleared by pressing the reset button and machine can be restarted.

For R37e-160 kW, 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 cannot 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. Due to false trips 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. After two minutes, 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 force itself into a reset. Upon completing the reset, the controller will monitor the VSD for completion of the power module 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 five automatic restarts of VSD Fault 39 – 41 within a 24 hour period. The controller will also not allow two 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 must cycle power. Another exception 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 reset and then restart the compressor. If the compressor is equipped with a power outage restart option (PORO), the controller will execute a PORO restart. If the compressor does not have PORO, the controller will restart the compressor 10 seconds after the controller has reset. A compressor will be allowed to do this up to five times in a one hour period. If the compressor exceeds five occurrences within a one hour period, the sixth occurrence will be treated like a regular VSD fault.

Low Sump Pressure

This 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.

VSD Initialization Fault

This will occur if the controller is unable to establish communications with the VSD after a power up.

Replace Coolant Filter

This will occur if the idle mode is set to on. This trip is used as a reminder to **Ingersoll Rand** service to only use idle mode if a new coolant filter is installed.

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 running and the AC input voltage, as read from the VSD, falls below 100 VAC. There is a delay of 2 seconds on this trip in case the power quickly returns. A phase monitor is something that can cause this trip.

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.

High Interstage Pressure

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

High Coolant Filter Pressure Drop

This will occur if the compressor has been running for at least seven seconds, the injected coolant temperature is at least 140 °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 three 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.

Start Inhibit List

High Airend Discharge Temperature

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

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.

■ Trip history

Pages 1-4 (max.)

Figure 44 : Trip History



#	Description	Time	Date
1.	VSD Comms Los	07:54:31	12/29
2.	VSD Comms Los	21:05:56	12/28
3.	VSD Fault	20:47:39	12/28
4.	Emergency Stop	13:48:22	12/28
5.	VSD Comms Los	13:48:11	12/28

Ready to Start

The pages in the Trip 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 actions will generate an event:

- Power ON
- Power OFF
- Press the Start Key
- Press the Stop Key
- Press the Load Key
- Press the Unload Key
- Warning
- Trip
- Start Inhibit

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 pressing the enter button will activate the trip history dialog box.

Figure 45 : Trip History Dialog



While the dialog box is active, press the left and right keys 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

Figure 46 : Filter Status



This page displays the following:

- Coolant Filter Status
- Separator Element Status
- Inlet Filter Status

Page 2: Maintenance Status

Figure 47 : Maintenance Status



This page displays the time until the compressor should be serviced.

Page 3: Maintenance Configuration

Figure 48 : Maintenance Configuration



This page allows the user to set the service interval and to reset the counter after the service has been performed.

■ General settings folder

NOTICE

All parameters in this folder are adjustable.

Page 1: Language Selection

Figure 49 : Language Selection



Language is selectable from the following 30 choices:

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

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 1: Units of Measure Settings

Figure 50 : Units of Measure Settings



The following compressors of measure settings are displayed in this section:

Table 20 : Units of Measure Settings

Display Text	Description
Temperature	Selectable between °F and °C.
Pressure	Selectable among psi, kpa, bar, kg/cm ² .
Power	Selectable between kW and HP.

Page 3: Home Page Selection

Figure 51 : Home Page Selection



The following settings are displayed in this section:

Table 21 : Home Page Selection

Display Text	Description
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	Used to select the Home folder.
Select Home Page	Used to select the Home Page within the selected Home folder.

Page 4-5: Time & Date Settings

Figure 52 : Time & Date Settings



All items are adjustable.

The following settings are displayed in this section:

Table 22 : Time & Date Settings

Display Text	Description
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	Selectable between dd/mm/yyyy (default) and mm/dd/yyyy.
Confirm New Time and Date	Used to verify that changes to selections are desired. An "x" must appear in the checkbox before any changes will take effect.

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.

NOTICE

The controller does not support Daylight Savings Time.

Page 6 : Backlight Settings

Figure 53 : Backlight Settings



The following settings are displayed in this section:

Table 23 : Backlight Settings

Display Text	Description
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.

NOTICE

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.

Pages 7-8: Ethernet Settings

Figure 54 : Ethernet Settings



The following settings are displayed in this section:

Table 24 : Ethernet Settings

Display Text	Description
Enable Ethernet	Allow connection by users to utilize the network enabled functionality of the controller.
Enable DHCP	Allow the controller to automatically receive an IP address from the Local Area Network (LAN).
IP Address Setting	When DHCP is not enabled, this setpoint sets the IP address of the controller.

Display Text	Description
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.
MAC Address	This is the unique hardware MAC address for the controller. This can not be changed.
Subnet Mask Setting	Setpoint for the subnet mask.
Subnet Mask Actual	Current reading/setting for the subnet mask.
Default Gateway Setting	Setpoint for the default gateway.
Default Gateway Actual	Current reading/setting for the default gateway.
Accept	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.

■  **Status folder**

NOTICE

All information on these pages is read only.

Pages 1 -2: Analog Inputs

Figure 55 : Analog Inputs



The following inputs are displayed in this section:

- Package Discharge Pressure
- Sump Pressure
- Airend Discharge Temperature
- Injected Coolant Temperature
- After-cooler Discharge Temperature
- Separator Pressure Drop
- Coolant Filter Pressure Drop
- Inlet Vacuum
- After-cooler Discharge Pressure (integrated dryer compressors only)
- Remote Pressure (optional)
- Coolant Filter Inlet Pressure
- Coolant Filter Outlet Pressure
- Interstage Pressure (2-stage compressors only)
- Evaporator
- Condenser

Page 4: Compressor Data

Figure 56 : Compressor Data

Status	
% Energy Savings	-
% Capacity	54.1 %
Package Power	-
Power On Hours	138 Hr
Running Hours	10 Hr
Motor Speed	0

Ready to Start

The following are displayed in this section:

- % Energy Savings
- % Capacity
- Package Power
- Power ON Hours
- Running Hours
- Motor Speed
- Time
- Motor Current
- Motor Voltage
- AC Input Voltage
- DC Bus Voltage
- IGBT U Temperature
- IGBT V Temperature
- IGBT W Temperature
- Input Rectifier Temperature
- VSD Ambient Temperature
- Remote Maximum Speed
- Remote Maximum Pressure
- Target Pressure

Pages 7-8: Digital Inputs

Figure 57 : Digital Inputs

Status	
Emergency Stop	<input type="checkbox"/>
Main Motor Overload	<input type="checkbox"/>
Fan Motor Overload	<input type="checkbox"/>
Condensate Error	<input type="checkbox"/>
Remote Stop	<input type="checkbox"/>
Remote Start	<input type="checkbox"/>

Ready to Start

A marked 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.

The following are displayed in this section:

- 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 9-10: Digital Outputs

Figure 58 : Digital Outputs

Status	
Starter Contact 1	<input type="checkbox"/>
Starter Contact 2	<input type="checkbox"/>
Fan Starter Contact	<input type="checkbox"/>
Blowdown Solenoid	<input type="checkbox"/>
Condensate Drain	<input checked="" type="checkbox"/>
Remote Start-Stop	<input type="checkbox"/>

Ready to Start

A marked checkbox beside a digital output indicates that it is energized.

- Starter Contact 1
- Starter Contact 2
- Fan Starter Contact
- Blowdown Solenoid
- Modulation Solenoid
- Condensate Drain
- Dryer Run / Fan Run
- PORO Horn
- Trip Relay
- Warning Relay
- Low Voltage Output 1
- Low Voltage Output 2
- Low Voltage Output 3
- Low Voltage Output 4

NOTICE

(RO) indicates read-only values.

Page 11: Analog Outputs

Figure 59 : Analog Outputs



The value for the analog outputs will be in mA.

- VSD Blower Output
- Analog Output 2

Factory settings folder

This folder is for **Ingersoll Rand** 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

Figure 60 : Password

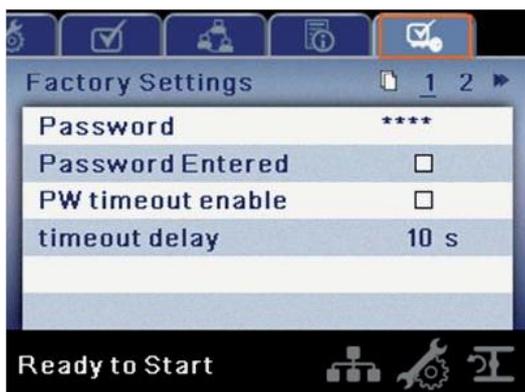


Table 25 : Password

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.
Timeout Delay:	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.

Pages 2-3: Factory Settings

Figure 61 : 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 will be selected here. The choices are listed below:

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

Water Cooled (ON/OFF)

Hot Side Thermal Valve (ON/OFF)

Enable PAC (ON/OFF)

Enable Dryer (ON/OFF)

Constant Running Dryer (ON/OFF)

Running Hours (adjustable)

Loaded Hours (adjustable)

Pages 4-5: Software Information

Figure 62 : Software Information



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

Pages 13 -16: VSD Service Menus

Figure 65 : VSD Service Menus



The VSD service menus contain parameters used to set up the compressor for optimal operation.

Pages 6-10: Maximum Values

Figure 63 : 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 11-12: VSD Diagnostics

Figure 64 : VSD Diagnostics



The VSD Diagnostics screens are used to troubleshoot any drive problems.

NOTICE

These screens must only be used by authorized service technicians. The password must be entered in order to activate these diagnostic tests.

NOTICE

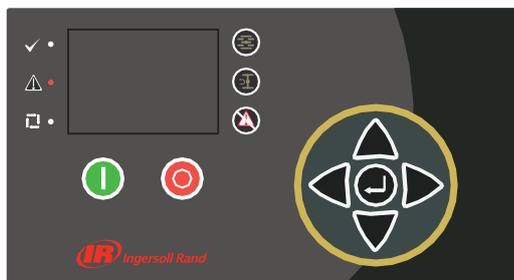
These screens must only be used by authorized service technicians. The password must be entered in order to modify these parameters.

OPERATING INSTRUCTIONS (XE-70M CONTROLLER)

User Interface

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 graphics display and the LED icons, make up the user interface to the compressor.

Figure 66: Xe-70M



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.

Table 26: Xe-70M LED Status Icons

Icon	Name	Function
	OK	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 Unloaded.
	Alert	Illuminates when a Warning (flashes) or Trip (constant ON) is sensed. Can be in a Ready (Warning) or Tripped state.
	Auto	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.

Table 27: Xe-70M Command Keys

Icon	Name	Function
	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 fault 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.

Icon	Name	Function
	Enter	Toggles the display between the Navigation mode and the Edit mode.

NOTICE

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 67 : 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 68 : Display Layout

	A
Home	B
	C
Ready to Start	D

Table 28 : Display Layout

Key	Name	Description
A	Folder Bar	Uses tabs to graphically identify each folder.
B	Title Bar	Identifies current folder and page (underlined).
C	Page Content	Content of the current page.
D	Dashboard	Displays system status.

Folder navigation and 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.

Table 29 : Folder Bar Icons

Folder Name	Icon	Description
Home		System performance and status main information. The first page of this folder is the default page when the controller first powers up.
Operator Settings		System options and configuration settings.
Events		System events log.
Trip History		Details on the most recent trips.
Maintenance		Status and notification setup for compressor maintenance items.
General Settings		General settings such as Language, Time, and Units of Measure.
Integral Sequencing		Integral 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.

Table 30 : Title Bar Page Icons

Icon	Description
	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.

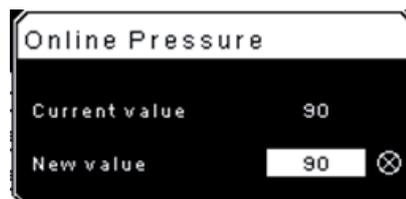
The cursor rolls over, so once the last parameter is selected, pressing the DOWN key will navigate the cursor to the Folder Bar. If the first parameter is selected, pressing the UP key will move the cursor to the page selection area.

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 69). Placing the cursor on it and then pressing the ENTER key will cancel the entry and any changes that were made.

Figure 69 : Numeric Entry Window



NOTICE

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.

Table 31 : Dashboard Icons

Name	Icon	Description
Remote Control		Remote control is enabled. This can be Remote Start/Stop, COM Control, Integral Sequencing or Web Control.
Service Required		A service reminder is nearing or has expired (i.e.: an air or oil filter needs to be changed).
Unloaded or Loaded	 	Compressor is in the unloaded state. Compressor is in the loaded state.

Dashboard Status Messages

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

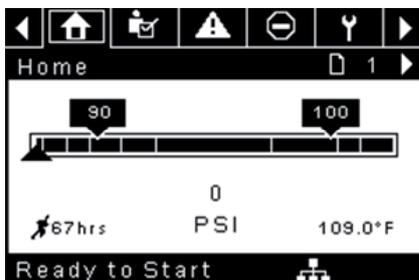
- **Ready to Start** – The compressor currently has no trip or start inhibit conditions present. The machine can be started by pressing the start button at any time.
- **Starting** – A start command has been given to the compressor and the start sequence is being performed. The time period for this state 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 blow-off valve is closed.
- **Running Unloaded** – The compressor is operating, but not producing air. The inlet valve is closed and the blow-off 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 received 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

Figure 70 : Home Folder



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

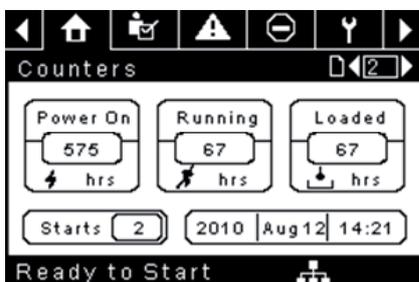
- **Online Pressure Setpoint** - indicated in the black box and arrow, which is always left of center on the gauge. The compressor will load when package discharge pressure falls below this value.
- **Offline Pressure Setpoint** - indicated in the black box and arrow, which is always right of center on the gauge. The compressor will unload when package discharge pressure rises above this value.
- **Package Discharge Pressure** - indicated by the large numbers centered below the gauge and by the black arrow below the gauge. 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 right 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** – indicated by the numbers in the lower left of the display. The number of hours the compressor motor has been running.

NOTICE

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

Figure 71 : Counters



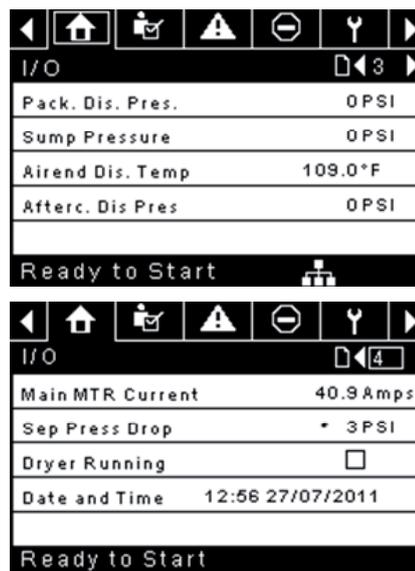
- **Hour Meters** - Indicates the hours that: the controller has been powered up, the compressor motor has been running, and the compressor has running loaded.
- **Starts** - Indicates the number of times a start is attempted on the compressor.
- **Date & Time** – Indicates the current date and time. This is adjustable and configurable in the GENERAL SETTINGS folder.

NOTICE

All information on this page is read only.

Pages 3 & 4 – Analog Inputs and Compressor Information

Figure 72 : Analog Inputs and Compressor Information



Any sensor that is not installed or is reporting a failure will show a [- -] symbol.

NOTICE

All information on this page 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.
- **After-cooler Discharge Temperature** – The temperature of the air after passing through the after-cooler. Note – Only shown when the Low Ambient option is purchased and installed.
- **After-cooler Discharge Pressure** – Pressure the compressor is delivering before the dryer. Note – Only shown when the TAS option is purchased and installed.
- **Separator Pressure Drop** – The pressure drop across the separator element.
- **Dryer Run Status (Integrated dryer units only)** – Checkbox that shows whether the dryer is currently running (checked) or not (blank).
- **Time and Date**
- **Main Motor Current** – Current flowing through the main motor as measured by the installed current transducers.



Operator Settings folder

Pages 1-2: Operator Settings

Figure 73 : Operator Settings

Setpoints	
Online Pressure	93 PSI
Offline Pressure	103 PSI
Lead/Lag Select	<input checked="" type="checkbox"/>
Lag Offset	2 PSI
Lead/Lag Cycle	0 hrs
Ready to Start	

Setpoints	
Operation Mode	On/Offline
Unload Stop Time	10 SEC
Starter Time	10 SEC
Ready to Start	

The below values are all setpoints

Online Pressure – The compressor will load when the package discharge pressure falls below this value.

Range (in PSI): 65 to Offline Pressure - 10

Offline Pressure – The compressor will unload when package discharge pressure rises above this value.

Range (in PSI): 75 to Rated Pressure + 10. Please note that the range will be reduced by 7 psi when operating a TAS machine.

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.

Range (in PSI): 0 – 45, depending on the online and offline setpoints. The Lag Offset will never allow you to exceed the minimum or maximum values of the online and offline setpoints.

Mode of Operation – Selections are Online/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.

Unloaded Stop Time – Time period that the machine must run unloaded before the motor is allowed to stop after a stop command is received.

Range (in seconds): 10 - 30

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. Range (in seconds): 5 - 30

The parameters on these pages are adjustable any time.

*Note that Mode of Operation can only be adjusted if the modulation option has been purchased for the compressor and the Enable Modulation factory setpoint has been turned ON.

Pages 3-6: Operator Options

Figure 74 : Operator Options

Options	
En Auto-Restart	<input type="checkbox"/>
AutoRestart Time	120 SEC
AutoRestart Dly	0 SEC
COM Control	<input type="checkbox"/>
Ready to Start	

Options	
Rem Start/Stop	<input type="checkbox"/>
Enable PORO	<input type="checkbox"/>
PORO Time	10 SEC
Low Ambient Temp	35°F
Ready to Start	

Options	
Sched Stop Day	Sunday
Sched Stop Hour	0
Sched Stop Min	0
Ready to Start	

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.

Range (in seconds) 2 - 60

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

Range (in seconds): 0 - 60

COM Control – Enabling this setpoint allows the compressor to be controlled by a serial or Ethernet device, such as an X81. 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 which 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 the PORO Horn will sound.

Range (in seconds): 10 - 600

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

Range (in deg F): 30 - 60

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 which 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 which 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 which 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 which 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 which 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 which must be purchased and installed before this feature can be turned ON.

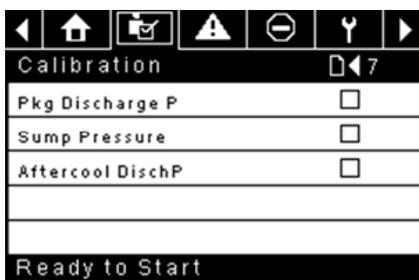
Note that in order to disable Scheduled Start/Stop, the Scheduled Start and Stop days, hours, and minutes must match exactly.

* The low ambient temperature is only adjustable if the low ambient factory set point is ON.

** A value of 0 will disable the lead/lag cycle time feature.

Page 7 Calibrate Sensors

Figure 75 : 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. Note that the checkbox may appear too quickly to be visible. Calibration can be confirmed by verifying that the sensor value now reads zero.

Each of the sensors listed below can be calibrated.

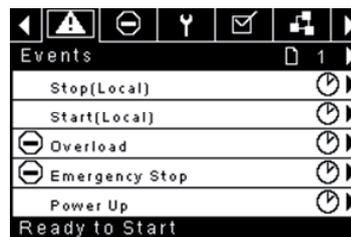
- Sump Pressure (3APT) – Only on units with the Enable 3APT factory setpoint ON. The R4 – 11 units typically do not have 3APT installed
- Package Discharge Pressure (4APT)
- After-cooler Discharge Pressure (7APT) – Only on units with integrated dryer

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. Make sure the sensor is being exposed to atmosphere before attempting calibration.

Events folder

Pages 1 to a Max of 50

Figure 76 : Events folder



The pages in the Events folder document up to the last 250 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 250 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 five. Page one displays events one through five, page two displays six through ten, and so on.

The time and date of the event can be viewed by navigating to an event and pressing the right arrow navigation key. The time and date window can then be exited by pressing the enter key.

Figure 77 : Events folder



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 show a flashing caution icon  while acknowledged Warnings will have a solid icon.

Active Trips will show a flashing trip icon  while acknowledged Trips will have a solid icon.

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

Warning Events List

Sensor Failure

Xe-70M On-Screen Text: 7ATT Failure

This will occur whenever sensor 7ATT is recognized as missing or broken. The sensor failure message shall follow the following format: 7ATT FAILURE. The 7ATT sensor failure 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

Xe-70M On-Screen Text: Chg Sep Elem

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

Note that the Enable 3APT setpoint must be turned ON for this warning to occur

High Airend Discharge Temperature

Xe-70M On-Screen Text: High A/E Disch T

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

High Sump Pressure

Xe-70M On-Screen Text: High Sump Pres

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.

Note that the Enable 3APT setpoint must be turned ON for this warning to 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

Xe-70M On-Screen Text: SVC Required

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 warning can be reset the same as any other warning.

Service Level 2

Xe-70M On-Screen Text: 100 hours to SVC, SVC Required, Service Alarm

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 been 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.

High Discharge Pressure

Xe-70M On-Screen Text: High Disch Pres

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.

Dryer Temp Warning

Xe-70M On-Screen Text: Dryer Temp

For R30 – 37 kW compressors this will occur if the dryer condenser or evaporator temperature switches close. The condenser switch is locking and must be manually reset before performing a reset on the controller. The evaporator switch does not latch and can be reset as soon as the signal opens. If this warning is reset while the conditions for running the dryer exist, the dryer can restart.

Note that for R4 – 11 kW compressors equipped with a TAS dryer, the dryer temp warning is triggered when the dewpoint temperature exceeds 14.5 deg C for 6 minutes or longer. This warning can also be triggered if the temperature probe in the dryer fails.

Dryer High Pressure

Xe-70M On-Screen Text: Dryer High Pres

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.

Change HE Filter

Xe-70M On-Screen Text: Change HE Filt

The HE filter is located between the after-cooler 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 after-cooler discharge pressure. If the compressor is running, the measured drop across the HE filter is at or above 14 psi (0.7 bar) 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.

Note that the Enable 7APT setpoint must be turned ON for this warning to occur.

Invalid Calibration

Xe-70M On-Screen Text: Invalid Cal

Will occur if the sensor zero value is $\pm 10\%$ of its scale. See Sensor Calibration.

Trip Events List

Low Sump Pressure

Xe-70M On-Screen Text: Low Sump Press

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

Note that the Enable 3APT setpoint must be turned ON for this warning to occur

High Airend Discharge Temperature

Xe-70M On-Screen Text: High A/E Disch T

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

Check Motor Rotation

Xe-70M On-Screen Text: Ck Motor Rot

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 deg F). 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.

Note that the Enable 3APT setpoint must be turned ON for this warning to occur

Overload

Xe-70M On-Screen Text: Overload

This will occur if the fan or motor overload relays opens. The contact must be open for at least 3 seconds before the trip will occur.

Xe-70M On-Screen Text: Main Motor OL

This will occur if the current transducers indicate that the motor amp draw is excessive. This overload is the equivalent of a class 10A trip level.

Remote Stop Failure

Xe-70M On-Screen Text: Rem Stop Fail

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

Xe-70M On-Screen Text: Rem Start Fail

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

Xe-70M On-Screen Text: 3APT Failure, 4APT Failure, 7APT Failure, 2ATT Failure, Main Motor CT Failure

This will occur when a sensor is recognized as missing or broken. The sensors affected by this trip are CT1, CT2, CT3, 3APT, 4APT, 7APT, and 2ATT. The sensor should be displayed along with the sensor failure message. The sensor failure message shall follow the following format: 3APT Failure.

Emergency Stop

Xe-70M On-Screen Text: Emergency Stop

This will occur when the EMERGENCY STOP button is engaged.

High Sump Pressure

Xe-70M On-Screen Text: High Sump Pres

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.

Note that the Enable 3APT setpoint must be turned ON for this warning to occur.

Unit Too Cold To Start

Xe-70M On-Screen Text: Unit Too Cold

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.

Start Inhibit List

High Airend Discharge Temperature

Xe-70M On-Screen Text: High A/E Disch T

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

High Sump Pressure

Xe-70M On-Screen Text: High Sump Pres

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

Figure 78 : Trip History



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 show a flashing trip icon  while acknowledged Trips will have a solid icon.

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 right navigation button will bring up the trip history dialog box.

Figure 79 : Trip History



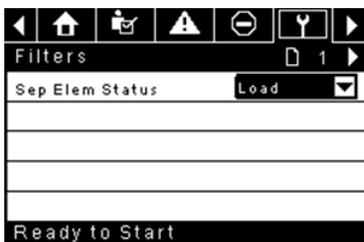
While the dialog box is active, press the left and right keys in order to scroll through the displayed data. The name of the trip will always be shown in the title bar of the dialog box. Press enter when finished viewing the data to return to the trip history screen.



Maintenance folder

Page 1 – Filter Status

Figure 80 : Filter Status



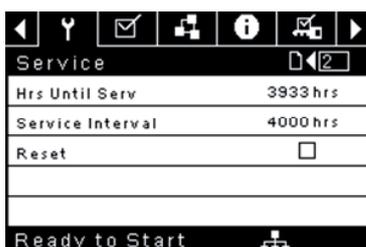
This page displays the status of the filters. The filter status will either be “OK” or “Change” depending on the compressor’s diagnostic readings. If a filter reaches the “change” status, a warning will be issued and the service indicator will light up to notify the user. Please note that the compressor 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:

- Separator Element

Page 2 - Maintenance Configuration

Figure 81 : 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. Note that after changing the Service Interval a Reset must be performed to set the Hours Until Service to the proper value.

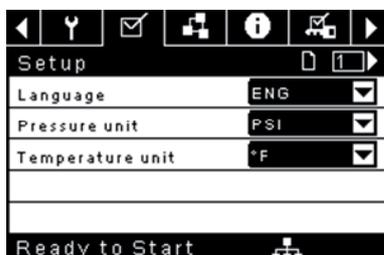


General Settings folder

All parameters in the general settings folder are adjustable.

Page 1 – Language and Units Selection

Figure 82 : Language and Units Selection



Language is selectable from the following 30 choices:

- English (default)
- Bulgarian
- Chinese, simplified
- Croatian
- Czech
- Korean
- Latvian
- Lithuanian
- Maltese
- Norwegian

- Danish
- Dutch
- Estonian
- Finnish
- French
- German
- Greek
- Hungarian
- Italian
- Indonesian
- Polish
- Portuguese
- Romanian
- Russian
- Slovak
- Slovenian
- Spanish
- Swedish
- Thai
- Turkish

The controller will display all screens in the selected language and only one language can be selected at a time.

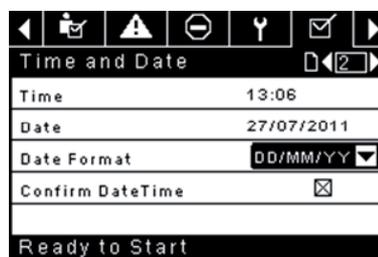
Each language appears in its native translation.

Temperature is selectable between °F and °C.

Pressure is selectable between psi, kpa, bar, kg/cm².

Page 2 – Time & Date Settings

Figure 83 : Time & Date Settings



All items are adjustable.

Time allows the current time to be set in a 24 hour format

Date allows the current month, day, and year to be set

Date Format is selectable between dd/mm/yyyy (default), mm/dd/yyyy, and YYYY/MM/DD

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.

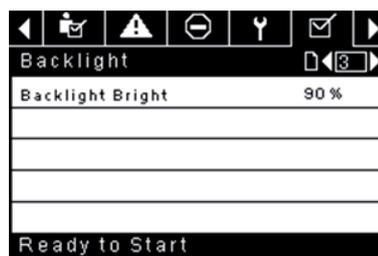
The controller will continue to display any changes, even when the selections have not been confirmed and the user exits the page, then returns. Cycling of the power returns all selections to their current settings.

NOTICE

The controller does not support Daylight Savings Time.

Page 3 – Backlight Settings

Figure 84 : Backlight Settings



Backlight Brightness adjusts the brightness of the display.

NOTICE

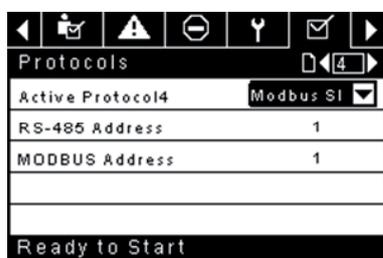
The backlight will be switched ON whenever any of the controller’s keys are pressed.

WARNING

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 4 - Serial Port Address Settings

Figure 85 : 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.

Active Protocol – Allows the serial port to be configured to Airbus (used for X-Series system controllers and integral sequencing) or Modbus protocols.

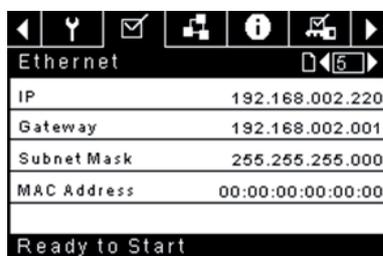
MODBUS Address – Sets the modbus node ID for the controller to communicate with a Modbus capable device, this can be any value between 1 and 254.

RS-485 Address – Sets the airbus address that allows the controller to communicate over Integral Sequencing or an X-Series system controller network.

Pages 5 & 6 – Ethernet Settings (ECO Module Only)

Please note that these pages will have no effect unless the ECO module option has been purchased.

Figure 86 : Ethernet Settings (ECO Module Only)



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.

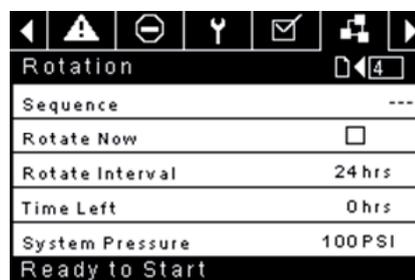
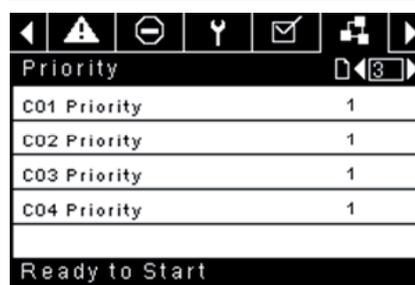
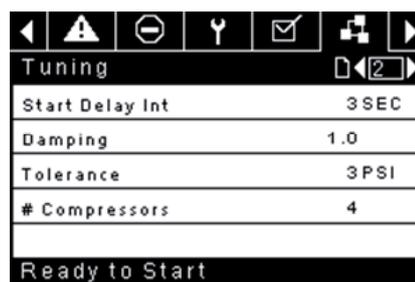
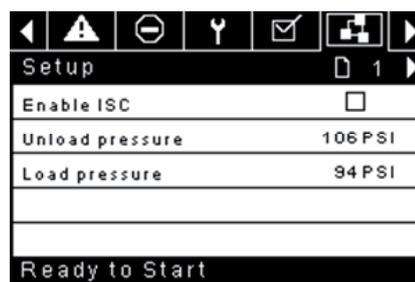
Enable DHCP – Allow the controller to automatically receive an IP address from the Local Area Network (LAN)

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

Integral Sequencing folder

Figure 87 : 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, connected to port X04 on the controller.

For a compressor to be a member of the integral sequencing system, the COM control setpoint in the operator settings tab must be enabled and the compressor must be started via the local start button. Additionally, it is recommended that the Auto-Restart function be enabled as the integral sequencing system will never start and stop machines, only load and unload them. Integral sequencing relies on Auto-Restart to turn OFF the compressor motor when not needed.

Please note that the compressor's address in the integral sequencing system is defined by the RS-485 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 assigned as the integral sequencing master. Lastly, note that the Active Protocol on the general settings tab must be set to Airbus485 for integral sequencing to operate properly.

Certain functions may interfere with compressors loading and unloading:

- Verify that the Remote Load Enable switch is in the open position. Having this closed will allow the remote load/unload switch to define the load command.

- The master controller **MUST** be started and running in the sequence. Otherwise, compressors will revert to their local setpoints.
- If the master controller is telling a slave controller to load and the slave's local pressure is above its maximum offline setpoint, or its immediate stop setpoint, the slave will unload locally, and remain unloaded until pressure falls below online or target setpoints.

Integral Sequencing – Enabling Integral Sequencing chooses this compressor to be the sequence Master. The master's package discharge pressure sensor will be the pressure signal used for the system. The default is disabled. Please make sure all compressors are set up for integral sequencing before enabling this function. It is important that only one compressor in the system have this setpoint enabled, otherwise system behaviour could be impacted. This setpoint should also only be modified while the compressor is stopped. Note that the Integral Sequencing master does not have to be the compressor assigned RS-485 address 1.

Unload Pressure – Determines the pressure at which a compressor will be unloaded by the system. The system unload pressure should always be set lower than the local offline setpoint of compressors in the system. Note that when under system control, the compressor will ignore the local pressure setpoints except for protective functions.

Load Pressure – Determines the pressure at which a compressor will be loaded by the system. The system unload pressure should always be set lower than the local offline setpoint of compressors in the system. The system unload pressure should always be set lower than the local offline setpoint of compressors in the system. Note that when under system control, the compressor will ignore the local pressure setpoints except for protective functions.

Start Delay Interval – Determines the amount of time between loading compressors. This prevents all compressors from loading at once. This setpoint should be set to the longest starting time of any compressor in the system. In general, this will be equivalent to the star/delta transition time for a fixed speed machine, or ramp time for a VSD machine.

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. There is a maximum of 4.

Priority – Each compressor can be assigned a priority level. Setting a priority for a compressor affects how the rotation will occur. Compressors with priority 1 will always be in the lead position(s), followed by priority 2 compressors, and so on. Compressors will only rotate positions with other compressors of the same priority level.

Sequence – Displays the current load/unload order of the system. Each compressor in the system is assigned a letter. The letter indicates whether the machine with the assigned Airbus address is a lead machine (loads first, unloads last) or one of the trim machines. Letter A is assigned to the lead machine, B to the next machine to load, C to the third machine to load, and D to the final machine to load. Machines will unload in the reverse order, such that A will be the last machine running.

The first position in the - - - sequence on Integral Sequencing tab, page 3 always refers to the compressor that is assigned Airbus Address 1. The second position to Airbus Address 2, and so on. Note that the letter sequence may change due to rotation.

Note that the sequence will only be displayed on the master controller.

Rotate Now – Selecting this setpoint will cause the sequence to shift according to the priorities, regardless of the rotation interval setpoint.

Rotation Interval – Determines the time period between automatic 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 will only be shown on the sequence Master controller.



Status folder

NOTICE

All information on these pages is read only.

NOTICE

Some values may only be visible when the factory settings password is entered.

Page 1 – Analog Inputs

Figure 88 : Analog Inputs

Analog Inputs	
Pkg Discharge P	100 PSI
Sump Press	7 PSI
Airend Disch T	184°F
Aftercool DischP	36 PSI

Ready to Start

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.
- **After-cooler Discharge Temperature** – The temperature of the air after passing through the After-cooler. Note that this will only be shown if the Low Ambient option has been purchased and installed.
- **After-cooler Discharge Pressure (integrated dryer units only)** – Pressure the compressor is delivering before the dryer.

Page 2 – Compressor Data

Figure 89 : Compressor data

Timers	
Running	67 hrs
Loaded	67 hrs
Power On	575 hrs
Time	14:40

Ready to Start

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 3 and 4 – Digital Inputs

Figure 90 : Digital inputs



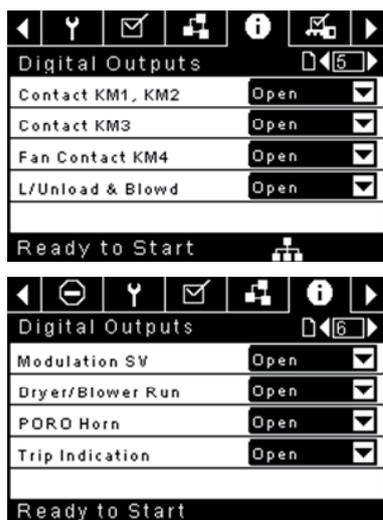
Digital Inputs:

Each digital input will have an indication showing whether the input is in an "OPEN" or "CLOSED" state. This is the physical state of the input and may not necessarily line up with the logical condition. The normal state is shown below.

- **Emergency Stop** – Normally Closed
- **Main/Fan Motor Overload** – Normally Closed
- **Remote Load Enable** – Normally Open
- **Remote Load/Unload** – Normally Open
- **Remote Start** - Normally Open
- **Remote Stop** – Normally Closed
- **Dryer Temperature Fault** – Normally Open
- **Dryer High Pressure** – Normally Closed

Pages 5 & 6 – Digital Outputs

Figure 91 : Digital inputs



Digital Outputs:

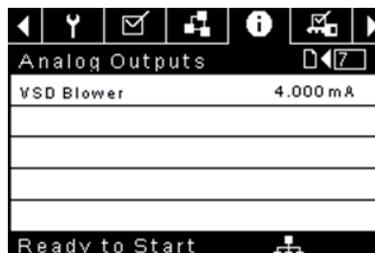
Each digital output will have an indication showing whether the output is in an "OPEN" or "CLOSED" state. This is the physical state of the input and may not necessarily line up with the logical condition. The normal state is shown below.

- **Starter Contact KM1, KM2** – Normally Open
- **Starter Contact KM3** – Normally Open
- **Fan Starter Contact KM4** – Normally Open

- **Load Solenoid 15V** – Normally Open
- **Modulation Solenoid 35V** – Normally Open
- **Dryer Run / Fan Run** – Normally Open
- **PORO Horn** – Normally Open
- **Trip Indication** – Normally Open

Page 7 – Analog Outputs

Figure 92 : Analog inputs



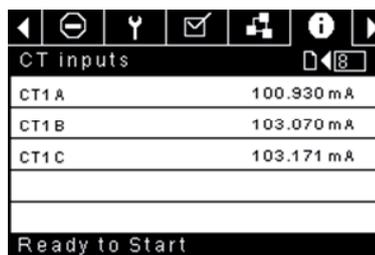
Analog Outputs:

The value for the analog outputs will be in mA.

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

Page 8 – CT Inputs

Figure 93 : CT Inputs



CT Inputs

Displays the mA value of the current transformers installed on each leg of the motor incoming power

- CT1
- CT2
- CT3

Factory Settings folder

This folder is for **Ingersoll Rand** 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

Figure 84 : 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 timeout counter is reset after any button press.

Pages 2 Thru 6 – Factory Settings**Figure 95 : Factory settings**

Factory Setpoint	
Rated Pressure	100 PSI
Starter Type	Star-Delta
Service Level	1
Ready to Start	

Factory Setpoint	
Main MTR Protect	ON
Nominal Current	80.0 Amps
Main MTR CT RNG	40.0 Amps
CT Windings	1
Ready to Start	

Enable Modulate	
Enable Modulate	<input type="checkbox"/>
Enable PAC	<input checked="" type="checkbox"/>
Enable Dryer	<input checked="" type="checkbox"/>
Const Run Dryer	<input checked="" type="checkbox"/>
Ready to Start	

Factory Options	
En VSD Blower	<input type="checkbox"/>
Limit VSD Blower	<input checked="" type="checkbox"/>
Blower Override	101 %
Enable Low Amb	<input type="checkbox"/>
Ready to Start	

Hours Adjustment	
Running	0 hrs
Loaded	0 hrs
Power On	1 hrs
Ready to Start	

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.

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).

Motor Protection – Used to enable current transformer based overload and locked rotor protection. This must be set to ON unless a thermal overload is installed in the compressor starter panel.

Nominal Current – Used to set up the motor overload protection. This value is set at the factory and must not be changed.

Main Motor CT Range – Must match the range of the installed current transformers. All current transformers must have the same range.

CT Windings – Must match the number of windings of the installed current transformers. All current transformers must have the same winding number

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.

Blower Override – Sets the blower on VSD blower equipped units to run at a set percentage of full speed. Setting this to 101% enables automatic control

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 aird discharge temperature reaches the low ambient temperature set point.

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 7 & 8 – Factory Settings**Figure 96 : Factory Settings**

Software Version	
Software CCN	24236028
Software Version	E19
QL Software Name	QLCMCWAI
QL Software Ver	E01
Ready to Start	

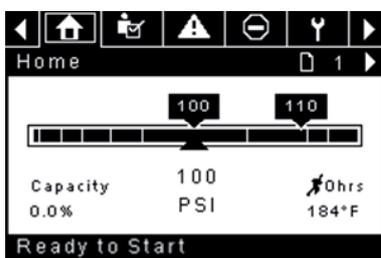
These pages are used for displaying software information for the controller. All items are read only.

Variable Speed Compressor

Home folder

Page 1 – System Overview

Figure 97 : System overview



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

Target Pressure Setpoint is indicated in the black box, 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 black box which is always right of center on the gauge. When the compressor reaches this setpoint the compressor will unload and stop once the motor reaches minimum speed and the compressor motor has been running for at least 2 minutes.

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.

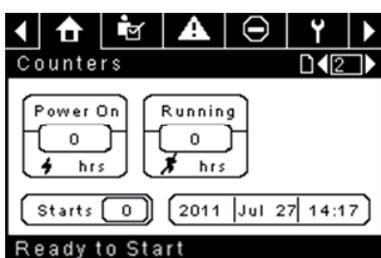
Run Hours indicate the number of hours the compressor has been running.

NOTICE

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

Figure 98 : 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.

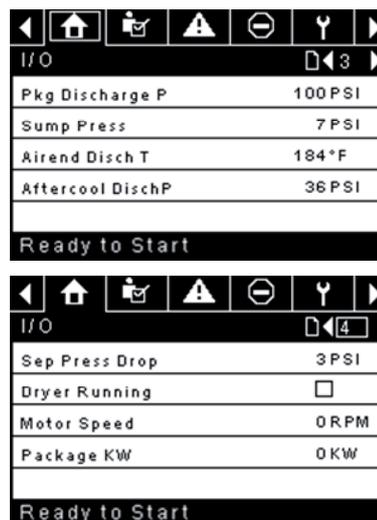
Date & Time is adjustable and configurable in the GENERAL SETTINGS folder.

NOTICE

All information on this page is read only.

Pages 3 & 4 – Analog Inputs and Compressor Information

Figure 99 : Analog Inputs and Compressor Information



Any sensor that is not installed or is reporting a failure will show a [-] symbol.

NOTICE

All information on this page 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.
- **After-cooler Discharge Pressure (integrated dryer units only)** – Pressure the compressor is delivering before upstream of the dryer
- **Separator Pressure Drop** – The pressure drop across the separator element
- **Dryer Run Status (Integrated dryer units only)** – Checkbox that shows whether the dryer is currently running (checked) or not (blank)

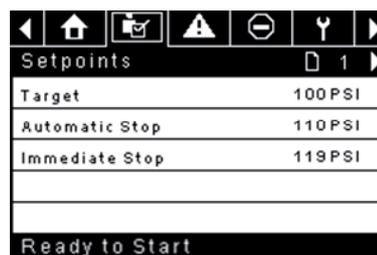
Additionally, the following compressor status readings are included in this section:

- **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

Operator Settings folder

Pages 1 and 2 Operator Settings

Figure 100 : 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.
Range (in psi): 65 - 145 (non-TAS compressors)
: 65 - 138 (TAS Equipped Compressors)

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

Range (in psi): Target +1 to Target +10

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

Range (in psi): Auto Stop Pressure to Auto Stop Pressure +10

Pages 2 Thru 4 Operator Options

Figure 101 : Operator Settings



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 which 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.

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 which 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 which 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 which 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 which must be purchased and installed before this feature can be turned ON.

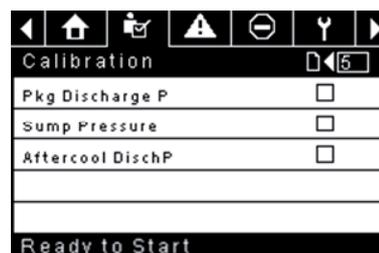
Scheduled Stop Hour – Hour of the day for which a scheduled stop will be performed. Scheduled Start/Stop is an option which must be purchased and installed before this feature can be turned ON.

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

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

Page 5 Calibrate Sensors

Figure 102 : 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. Note that the checkbox may appear too quickly to be visible. Calibration can be confirmed by verifying that the sensor value now reads zero.

Each of the sensors listed below can be calibrated.

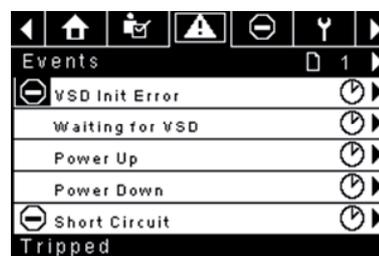
- Package Discharge Pressure (4APT)
- Sump Pressure (3APT)
- After-cooler Discharge Pressure (7APT) – Only on units with integrated dryer (TAS)

Note that if a sensor is currently reading a value that is $\pm 10\%$ 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 50

Figure 103 : Events folder

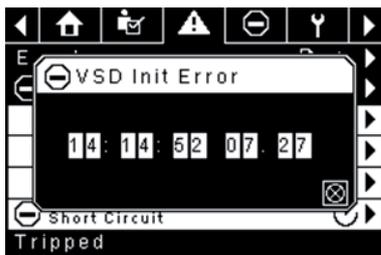


The pages in the Events folder document up to the last 200 events that the controller has experienced, with the time and date of the occurrence. The events are recorded in sequence, with number one being the newest and 200 being the oldest. When a new event occurs, it becomes number one and all others 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 time and date of the event can be viewed by navigating to an event and pressing the right arrow navigation key. The time and date window can then be exited by pressing the enter key.

Figure 104 : Events folder



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 show a flashing caution icon  while acknowledged Warnings will have a solid icon.

Active Trips will show a flashing trip icon  while acknowledged Trips will have a solid icon.

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 Separator Element

Xe-70M On-Screen Text: Chg Sep Elem

This will occur if the unit has been running for at least 15 seconds, 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.

Note that the Enable 3APT setpoint must be turned ON for this warning to occur.

High Aired Disch Temp

Xe-70M On-Screen Text: High A/E Disch T

Will occur if the unit is running and 2ATT is greater than 221 deg F (97% of 228) or the unit is in idle mode (3.3.7.1) and 2ATT is greater than 184 deg F. This warning will have a 90 second delay.

High Discharge Press

Xe-70M On-Screen Text: High Disch 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 for a time period of 3 seconds. At this point, the controller will unload the compressor until package discharge pressure falls back below the target pressure setpoint.

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

Xe-70M On-Screen Text: SVC Required

If service level 1 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. This warning can be reset the same as any other warning.

Service Level 2

Xe-70M On-Screen Text: 100 Hrs to SVC, SVC Required, Service Alarm

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 first "SERVICE REQUIRED" warning will occur at the total hours value of 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, 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 been 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.

High VSD Ambient Temperature

Xe-70M On-Screen Text: High VSD Amb T

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

Dryer Temp Warning

Xe-70M On-Screen Text: Dryer Temp

For R30 – 37 kW compressors this will occur if the dryer condenser or evaporator temperature switches close. The condenser switch is locking and must be manually reset before performing a reset on the controller. The evaporator switch does not latch and can be reset as soon as the signal opens. If this warning is reset while the conditions for running the dryer exist, the dryer can restart.

Note that for R4 – 11 kW compressors equipped with a TAS dryer, the dryer temp warning is triggered when the dewpoint temperature exceeds 14.5 deg C for 6 minutes or longer. This warning can also be triggered if the temperature probe in the dryer fails.

Dryer High Pressure

Xe-70M On-Screen Text: Dryer High Pres

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

Xe-70M On-Screen Text: High Sump Pres

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.

Note that the Enable 3APT setpoint must be turned ON for this warning to occur

Change HE Filter

Xe-70M On-Screen Text: Change HE Filt

The HE filter is located between the after-cooler 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 after-cooler 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), 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.

Note that the Enable 7APT setpoint must be turned ON for this warning to occur

Replace Coolant Filter

Xe-70M On-Screen Text: Chg Rplc Coolant Filt

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

Invalid Calibration

Xe-70M On-Screen Text: Invalid Cal

This will occur if the sensor zero value is $\pm 10\%$ of its scale.

Trip Events List

High Airend Disch Temp

Xe-70M On-Screen Text: High A/E Disch T

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

Overload

Xe-70M On-Screen Text: Overload

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

Remote Stop Failure

Xe-70M On-Screen Text: Rem Stop Fail

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

Xe-70M On-Screen Text: Rem Start Fail

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

Xe-70M On-Screen Text: 3APT Failure, 4APT Failure, 7APT Failure, 2ATT Failure, Main Motor CT Failure

This will occur when a sensor is recognized as missing or broken. The sensors affected by this trip are CT1, CT2, CT3, 3APT, 4APT, 7APT, and 2ATT. The sensor should be displayed along with the sensor failure message. The sensor failure message shall follow the following format: 3APT Failure.

Emergency Stop

Xe-70M On-Screen Text: Emergency Stop

This will occur when the EMERGENCY STOP button is engaged.

VSD Fault X

Xe-70M On-Screen Text:

The compressors variable speed drive is reporting a fault. Please refer to the troubleshooting guide for further information.

Low Sump Pressure

Xe-70M On-Screen Text: Low Sump Press

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

Note that the Enable 3APT setpoint must be turned ON for this warning to occur.

Check Motor Rotation

Xe-70M On-Screen Text: Ck Motor Rot

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

VSD Communication Failure

Xe-70M On-Screen Text: VSD Comm Fail

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

Xe-70M On-Screen Text: Wrong 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.

Stop Failure

Xe-70M On-Screen Text: 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 Sump Pressure

Xe-70M On-Screen Text: High Sump Pres

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 (32 PSI if the dryer is enabled). (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 for a machine with rated pressure of 145 psi.

Note that the Enable 3APT setpoint must be turned ON for this warning to occur

VSD Initialization Fault

Xe-70M On-Screen Text: Drive Init Error

This will occur if the controller is unable to properly set-up the drive after boot or after a reset. The controller will attempt to write a parameter 10 times to the drive, after these 10 attempts have failed this trip will be registered.

Xe-70M On-Screen Text: VSD Comm Except

This will occur if the controller receives invalid communications from the VSD. Please refer to the troubleshooting guide for further information.

Start Inhibit List

High Airend Discharge Temperature

Xe-70M On-Screen Text: High A/E Disch T

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

High Sump Pressure

Xe-70M On-Screen Text: High Sump Pres

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

Please note that the Enable 3APT setpoint must be turned ON for this warning to occur

VSD Initialization

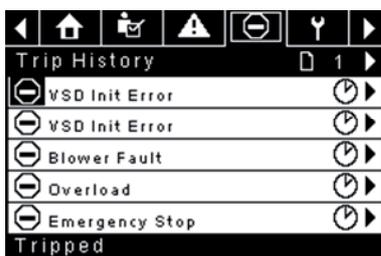
Xe-70M On-Screen Text: VSD Initializing

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

■ Trip History

Pages 1 to A Max of 3

Figure 105 : Trip History



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 show a flashing trip icon  while acknowledged Trips will have a solid icon.

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.

Figure 106 : Trip History

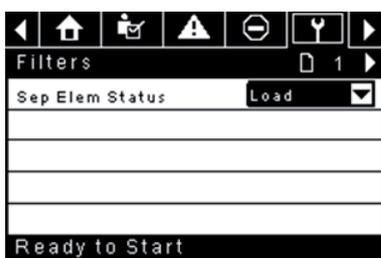


While the dialog box is active, press the left and right keys in order to scroll through the displayed data. The name of the trip will always be shown in the title bar of the dialog box. Press enter when finished viewing the data to return to the trip history screen.

■ Maintenance folder

Page 1 – Filter Status

Figure 107 : Filter Status



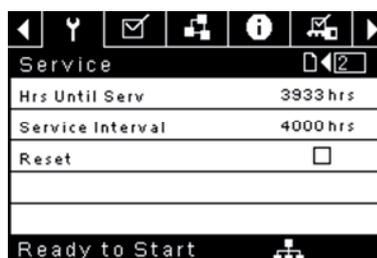
This page displays the status of the filters. The filter status will either be “OK” or “Change” depending on the compressor’s diagnostic readings. If a filter reaches the “change” status, a warning will be issued and the service indicator will light up to notify the user. Please note that the compressor 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:

- Separator Element

Page 2 - Maintenance Configuration

Figure 108 : Maintenance Configuration



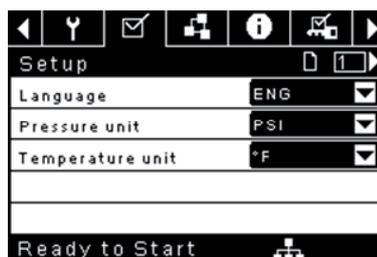
This page allows the user to set the service interval and to reset the counter after the service has been performed. The service interval may be set to any value between 1000 and 8000 hours, but must be set in accordance with the factory maintenance schedule. After maintenance has been performed, the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

■ General Settings folder

All parameters in the general settings folder are adjustable.

Page 1 – Language & Units Selection

Figure 109 : Language & Units Selection



Language is selectable from the following 30 selections:

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

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.

Temperature is selectable between °F and °C.

Pressure is selectable between psi, kpa, bar, kg/cm².

Page 2 – Time & Date Settings

Figure 110 : Time & Date Settings

Time and Date	
Time	13:06
Date	27/07/2011
Date Format	DD/MM/YY
Confirm DateTime	<input checked="" type="checkbox"/>
Ready to Start	

All items are adjustable.

Time allows the current time to be set in a 24 hour format

Date allows the current month, day, and year to be set

Date Format is selectable between dd/mm/yyyy (default), mm/dd/yyyy, and YYYY/MM/DD

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.

NOTICE

The controller does not support Daylight Savings Time.

Page 3 – Backlight Settings

Figure 111 : Backlight Settings

Backlight	
Backlight Bright	90 %
Ready to Start	

Backlight Brightness adjusts the brightness of the display.

NOTICE

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

WARNING

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 4 - Serial Port Address Settings

Figure 112 : Serial Port Address Settings

Protocols	
Active Protocol4	Modbus SI
RS-485 Address	1
MODBUS Address	1
Ready to Start	

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

Active Protocol – Allows the serial port to be configured to Airbus (used for X-Series system controllers and integral sequencing) or Modbus protocols

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.

RS-485 Address – Sets the airbus address that allows the controller to communicate over Integral Sequencing or an X-Series system controller network.

Pages 5 & 6 – Ethernet Settings (ECO Module Only)

Note that these pages will have no effect unless the ECO module option has been purchased.

Figure 113 : Ethernet Settings (ECO Module Only)

Ethernet	
IP	192.168.002.220
Gateway	192.168.002.001
Subnet Mask	255.255.255.000
MAC Address	00:00:00:00:00:00
Ready to Start	

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.

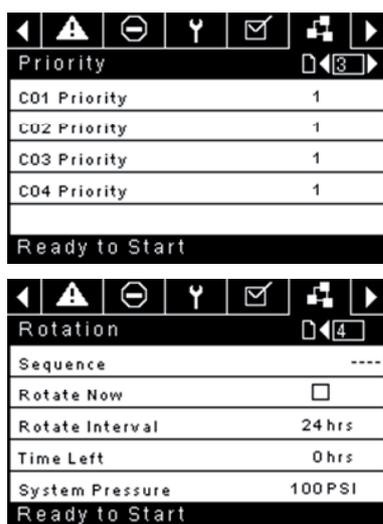
Cancel – Discard any changes made to the Ethernet settings.

■ Integral Sequencing folder

Figure 114 : Integral Sequencing

Setup	
Enable ISC	<input type="checkbox"/>
Unload pressure	106 PSI
Load pressure	94 PSI
Ready to Start	

Tuning	
Start Delay Int	3 SEC
Damping	1.0
Tolerance	3 PSI
# Compressors	4
Ready to Start	



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, connected to port X04 on the controller.

For a compressor to be a member of the integral sequencing system, the COM control setpoint in the operator settings tab must be enabled and the compressor must be started via the local start button. Additionally, it is recommended that the Auto-Restart function be enabled as the integral sequencing system will never start and stop machines, only load and unload them. Integral sequencing relies on Auto-Restart to turn OFF the compressor motor when not needed.

Please note that the compressor's address in the integral sequencing system is defined by the RS-485 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 assigned as the integral sequencing master. Lastly, note that the Active Protocol on the general settings tab must be set to Airbus485 for integral sequencing to operate properly.

Certain functions may interfere with compressors loading and unloading:

- Verify that the Remote Load Enable switch is in the open position. Having this closed will allow the remote load/unload switch to define the load command.
- The master controller MUST be started and running in the sequence. Otherwise, compressors will revert to their local setpoints.
- If the master controller is telling a slave controller to load and the slave's local pressure is above its maximum offline setpoint, or its immediate stop setpoint, the slave will unload locally, and remain unloaded until pressure falls below online or target setpoints.

Integral Sequencing – Enabling Integral Sequencing chooses this compressor to be the sequence Master. The master's package discharge pressure sensor will be the pressure signal used for the system. The default is disabled. Please make sure all compressors are set up for integral sequencing before enabling this function. It is important that only one compressor in the system have this setpoint enabled, otherwise system behaviour could be impacted. This setpoint should also only be modified while the compressor is stopped. Note that the Integral Sequencing master does not have to be the compressor assigned RS-485 address 1.

Unload Pressure – Determines the pressure at which a compressor will be unloaded by the system. The system unload pressure should always be set lower than the local offline setpoint of compressors in the system. Note that when under system control, the compressor will ignore the local pressure setpoints except for protective functions.

Load Pressure – Determines the pressure at which a compressor will be loaded by the system. The system unload pressure should always be set lower than the local offline setpoint of compressors in the system. The system unload pressure should always be set lower than the local offline setpoint of compressors in the system. Note that when under system control, the compressor will ignore the local pressure setpoints except for protective functions.

Start Delay Interval – Determines the amount of time between loading compressors. This prevents all compressors from loading at once. This setpoint should be set to the longest starting time of any compressor in the system. In general, this will be equivalent to the star/delta transition time for a fixed speed machine, or ramp time for a VSD machine.

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. There is a maximum of 4.

Priority – Each compressor can be assigned a priority level. Setting a priority for a compressor affects how the rotation will occur. Compressors with priority 1 will always be in the lead position(s), followed by priority 2 compressors, and so on. Compressors will only rotate positions with other compressors of the same priority level.

Sequence – Displays the current load/unload order of the system. Each compressor in the system is assigned a letter. The letter indicates whether the machine with the assigned Airbus address is a lead machine (loads first, unloads last) or one of the trim machines. Letter A is assigned to the lead machine, B to the next machine to load, C to the third machine to load, and D to the final machine to load. Machines will unload in the reverse order, such that A will be the last machine running.

The first position in the - - - - sequence on Integral Sequencing tab, page 3 always refers to the compressor that is assigned Airbus Address 1. The second position to Airbus Address 2, and so on.

Note that the letter sequence may change due to rotation.

Note that the sequence will only be displayed on the master controller.

Rotate Now – Selecting this setpoint will cause the sequence to shift according to the priorities, regardless of the rotation interval setpoint.

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 will only be shown on the sequence Master controller.

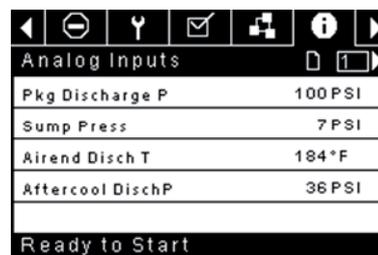
Status folder

NOTICE

All information on these pages is read only. Page numbers are valid for when the password is entered. When the password is not entered the pages may be arranged slightly differently.

Page 1- Analog Inputs

Figure 115 : 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.

- **After-cooler Discharge Pressure (TAS units only)** – Pressure the compressor is delivering before the dryer.

Pages 2 Thru 4 – Compressor Data

Figure 116 : Compressor Data

Timers	
Running	67 hrs
Loaded	67 hrs
Power On	575 hrs
Time	14:40
Ready to Start	

VSD	
Motor Speed	0 RPM
Motor Current	0 Amps
Motor Voltage	0 V
DC Link Voltage	0 V
Tripped	

VSD	
Package KW	0 KW
Heatsink Temp	32.0°F
Contr. Card Temp	32.0°F
Tripped	

Compressor Data:

- **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 currently being drawn by the motor.
- **Motor Voltage** – Electrical voltage at the motor.
- **DC Link Voltage** – DC Bus Voltage on the VSD
- **Package kW** – Instantaneous power consumption of the compressor
- **Heatsink Temperature** – Temperature of the VSD at the heatsink
- **Control Card Temperature** – Temperature of the VSD at the control card

Pages 5 & 6 – Digital Inputs

Figure 117 : Digital Inputs

Digital Inputs	
Emergency Stop	Closed
Fan Motor OL	Closed
Unused	Open
Unused	Open
Ready to Start	

Digital Inputs	
Remote Start	Open
Remote Stop	Closed
Dryer Temp	Open
Dryer High Press	Closed
Ready to Start	

Digital Inputs: (Password Required)

Each digital input will have an indication showing whether the input is in an "OPEN" or "CLOSED" state. This is the physical state of the input and may not necessarily line up with the logical condition. The normal state is shown below.

- **Emergency Stop** – Normally Closed
- **Main/Fan Motor Overload** – Normally Closed
- **Remote Start** - Normally Open
- **Remote Stop** – Normally Closed
- **Dryer Temperature Fault** – Normally Open
- **Dryer High Pressure** – Normally Closed

Pages 7 & 8 – Digital Outputs

Figure 118 : Digital Outputs

Digital Outputs	
VSD Run	Open
Unused	Open
Fan Contact KM4	Open
Blowdown solenoid	Open
Tripped	

Digital Outputs	
Unused	Open
Dryer Run	Open
PORO Horn	Open
Trip Indication	Closed
Tripped	

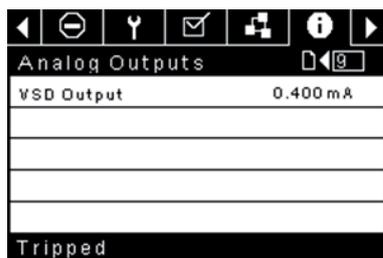
Digital Outputs (Password Required):

Each digital output will have an indication showing whether the output is in an "OPEN" or "CLOSED" state. This is the physical state of the input and may not necessarily line up with the logical condition. The normal state is shown below.

- **VSD Run K1 Contact** – Normally Open
- **Fan Starter Contact KM4** – Normally Open
- **Blowdown Solenoid 1SV** – Normally Open
- **Dryer Run / Fan Run** – Normally Open
- **PORO Horn** – Normally Open
- **Trip Indication** – Normally Open

Page 9 – Analog Outputs

Figure 119 : Analog Inputs

**Analog Outputs:**

The value for the analog outputs will be in mA.

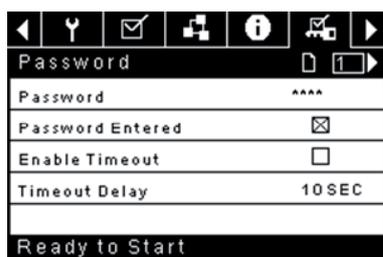
- VSD Output

■ Factory settings folder

This folder is for **Ingersoll Rand** 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

Figure 120 : 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:

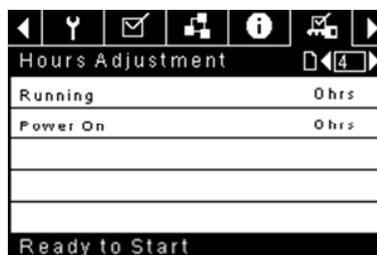
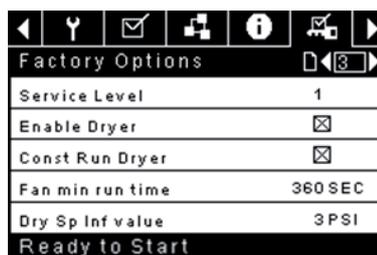
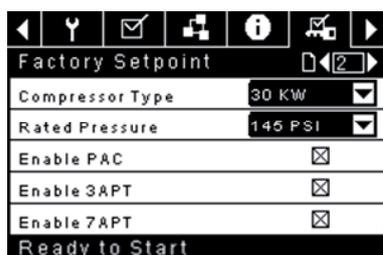
Checking this box will enable the password time feature.

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 timeout counter is reset after any button press.

Pages 2 Thru 4 – Factory Settings

Figure 121 : 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 and must only be changed by authorize factory technicians.

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

- 5.5 kW
- 7.5 kW
- 11 kW
- 30 kW
- 37 kW
- 7.5 hp
- 10 hp
- 15 hp
- 40 hp
- 50 hp

Rated Pressure (psi – 145, 200) – This is the maximum target pressure that the compressor can provide.

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 3APT (ON/OFF) – Enables the sump pressure sensor. This is set at the factory and should not be changed.

Enable 7APT (ON/OFF) – Enables the after-cooler discharge pressure sensor. This is set at the factory and should not be changed.

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).

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.

Fan Minimum Run Time – Sets the amount of time the fan will have to stay running before being allowed to shut-off if the compressor stops. Note that this means the fan may continue to run after the compressor main motor has stopped.

PORO Installed (ON/OFF) – Allows the PORO and Scheduled Start/Stop functions to be turned ON. This can only be turned ON if the PORO kit has been purchased and installed.

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 5 Through 8 – Maximum Values

Figure 122 : Factory Settings (Maximum Values)

Max Values	
Motor Speed	0 RPM
00:00:00	00/00/0000
Motor Current	0 Amps
00:00:00	00/00/0000
Tripped	

Max Values	
Package KW	0 KW
00:00:00	00/00/0000
DC Link Voltage	0 V
00:00:00	00/00/0000
Tripped	

Max Values	
Motor Voltage	0 V
00:00:00	00/00/0000
Heatsink Temp	32.0°F
00:00:00	00/00/0000
Tripped	

Max Values	
Contr. Card Temp	32.0°F
00:00:00	00/00/0000
Reset Values	<input type="checkbox"/>
Tripped	

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 & 10 – VSD Diagnostics

Figure 123 : Factory Settings (VSD Diagnostics)

VSD Diagnostics	
Max Motor Speed	3386 RPM
Min Motor Speed	1200 RPM
Proportion. Gain	40
Integral Gain	10
Derivative Gain	0
Tripped	

PID Setup	
Ramp Rate	100.0%
Skip Speed Point	0 RPM
Skip Speed Band	0 RPM
Tripped	

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

Figure 124 : Factory Settings (VSD Service Menus)

VSD Setup	
Idle Mode	<input type="checkbox"/>
Warm Up Temp	179°F
Warm Up Time	5 MIN
VSD Delay	0 SEC
Enable RFI Filt	<input checked="" type="checkbox"/>
Tripped	

Fixed Speed	
Fixed Speed Ctrl	<input type="checkbox"/>
Fixed Speed	1200 RPM
Max Motor Speed	3386 RPM
Min Motor Speed	1200 RPM
Tripped	

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 13 & 14 – Software Information

Figure 125 : Software Information

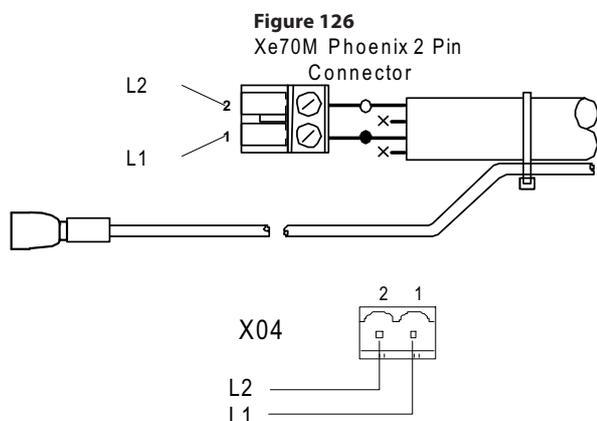
Software Version	
Software name	Q1MCMCVS
Software Rev	E05
VSD Software Rev	
Software name QL	QLCMCWAI
Software rev QL	E01
Tripped	

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

MODBUS CONNECTION AND CONTROL

■ Connection to the Modbus Network

The Xe-70M controller is designed to interface to any Modbus RTU master capable device using Belden 9841 or equivalent RS-485 cable. In order to connect to the network, the cable must be connected to port X04 on the controller as shown in the figure below:



■ RS-485 Network

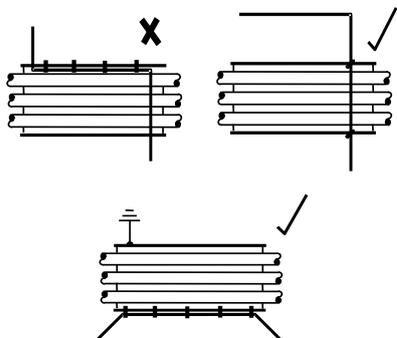


RS-485 data communications and other low voltage signals can be subject to electrical interference.

This potential can result in intermittent malfunction or anomaly that is difficult to diagnose. To avoid this possibility always use earth shielded cables, securely bonded to a known good earth at one end. In addition, give careful consideration to cable routing during installation.

1. Never route an RS-485 data communications or low voltage signal cable alongside a high voltage 3- phase power supply cable. If it is necessary to cross the path of a power supply cable(s), always cross at a right angle.
2. If it is necessary to follow the route of power supply cables for a short distance (for example: from a compressor unit to a wall along a suspended cable tray) attach the RS-485 or signal cable on the outside of an earthed cable tray such that the cable tray forms an earthed electrical interference shield.
3. Where possible, never route an RS-485 or signal cable near to equipment or devices that may be a source of electrical interference (for example: 3-phase power supply transformer, high voltage switchgear unit, frequency inverter drive module, radio communications antenna).

Figure 127



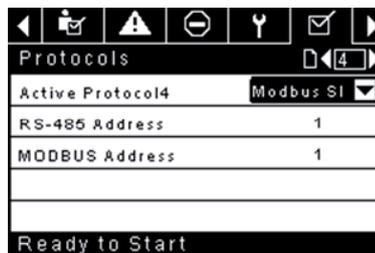
■ Modbus Address Selection

Each compressor connected to the MODBUS network will have a unique assigned address, starting at compressor 1 increasing sequentially to the number of compressors connected to the MODBUS network.

The Modbus address for each compressor is set on the General Settings Tab, Page 4. The controller's default Modbus Address setting is 1,

Additionally, the active protocol must be set to Modbus Slave.

Figure 128



■ Modbus Master Settings

In order to communicate properly with the Xe-70M controller, the Modbus master must be set to communicate with the following configuration:

Baud Rate – 9600

Data Bits – 8

Stop Bits – 1

Parity – None

The following polling parameters are recommended for optimal system operation:

Polling Rate: Not less than 500 ms

Timeout: 500 ms

Retries: 2

■ R4 to 37 kW Fixed Speed Modbus Table

Table 32: R4 To 37 kW Fixed Speed Modbus Table

Register (40XXX)	Variable	Read/Write	Range	Notes
1	Status/Control	R/W		See FIGURE 129
3	Package Discharge Pressure	R		
4	Sump Pressure	R		
7	Airend Discharge Temperature	R		
8	After-cooler Discharge Temperature	R		Low Ambient units only
10	Separator Pressure Drop	R		
16	After-cooler Discharge Pressure	R		Dryer units only
65	Running Hours MSB	R		
66	Running Hours LSB	R		
67	Loaded Hours MSB	R		
68	Loaded Hours LSB	R		
98	Rated Pressure	R		
100	Starter Type	R	1-3	See Figure 130
101	Modulation Enabled	R		0=Disabled
102	Service Level	R	0 - 2	0=Level 0, 1=Level 1, 2=Level 2
103	Service Time Period	R	1000 - 8000	Increments of 1000
104	Dryer Installed	R		0=OFF
112	Offline Pressure	R/W	75 - (rated+10)	rated = rated pressure
113	Online Pressure	R/W	65-(offline-10)	offline = offline pressure
114	Mode of Operation	R/W	0 - 2	See Figure 130
115	Starter Time (seconds)	R/W	5 - 30	
116	Auto Restart Time (seconds)	R/W	120 - 3600	
117	Auto Restart ON/OFF	R		0=OFF
118	Communication Control ON/OFF	R		0=OFF
119	Remote Start/Stop Enable	R		0=OFF
121	Power Out Restart Option (PORO) Enable	R		0=OFF
122	PORO Time (seconds)	R/W	10 - 600	
123	Auto Start/Stop Delay Time (seconds)	R/W	0 - 60	
124	Low Ambient Temperature	R/W	30 - 60	Degree F
125	Unloaded Stop Time	R/W	10 - 30	
128	Lead/Lag	R/W		0=Lag
129	Lag Offset	R/W	0 - 45	psi
131	Lead/Lag Cycle Length (Hours)	R/W	0 - 750	
132	Scheduled Start (Day)	R/W	0 - 9	See Figure 130
133	Scheduled Start (Hour)	R/W	0 - 23	
134	Scheduled Start (Minute)	R/W	0 - 59	
135	Scheduled Stop (Day)	R/W	0 - 9	See Figure 130
136	Scheduled Stop (Hour)	R/W	0 - 23	
137	Scheduled Stop (Minute)	R/W	0 - 59	
255	Warning Code	R		See Figure 131
256	Trip Code	R		See Figure 131
400	Reset Web Logins	R/W	0-1	Writing a 1 value will reset the web logins to factory defaults. After the reset is performed this value shall be set back to 0

Figure 129 : Manhattan Fixed Speed Controller Register 01-Status/Control

Bit 0: Host/Local (R/W) 0 = Local 1 = Host	Bit 6: Alarm (R) 0 = No Alarms 1 = Alarms
Bit 1: Run/Stop (R/W) 0 = Stop 1 = Run	Bit 7: Warning (R) 0 = No Warnings 1 = Warnings
Bit 2: Load/Unload (R/W) 0 = Unload 1 = Load	Bit 8: On/Off Line Mode (R) 0 = Not in On/Off Line Mode 1 = On/Off Line Mode
Bit 3: Modulating (R) 0 = Not Modulating 1 = Modulating	Bit 9: Mod/ACS or Mod Only (R) 0 = Not in Mod/ASC Mode 1 = Mod/ASC Mode
Bit 4: Unused	Bits 10-12: Unused
Bit 5: Stopped in Auto Restart (R) 0 = Not Stopped in Auto Restart 1 = Stopped in Auto Restart	Bits 13-15: Unit Type (R): Unused

Figure 130 : Manhattan Fixed Speed Controller Register Codes

Register 100: Starter Type 1 = Star-Delta 2 = Remote Starter 3 = Soft Starter	Register 114: Mode of Operation 0 = On/Off Line 1 = MOD/ACS 2 = Modulation Only
Registers 132, 135: Day 0 = Sunday 1 = Monday 2 = Tuesday 3 = Wednesday	4 = Thursday 5 = Friday 6 = Saturday 7 = Daily 8 = Weekdays 9 = Weekends

Figure 131 : Manhattan Fixed Speed Controller Trip & Warning Codes

Code	Description
02	Sensor Failure 3APT
03	Sensor Failure 4APT
08	Sensor Failure 7APT
10	Sensor Failure 2ATT
11	Sensor Failure 4ATT
18	Motor Overload (Main) – due to CTs
19	Overload – due to Thermal OL
22	Check Motor Rotation
25	Remote Stop Failure
26	Remote Start Failure
28	Low Sump Pressure
29	High Air Pressure
31	High Airend Discharge Temperature
32	Emergency Stop
34	Change Separator Element
36	Sensor Error (Calibration)
38	100 Hours To Service
39	Service Required
40	Alarm – Service Required
48	Unit Too Cold To Start
49	High Sump Pressure
51	Dryer High Pressure
52	Dryer Temperature Warning
55	Change HE Filter (Dryer)
56	Sensor Failure – Main Motor CT Inputs

■ R5.5 to 37 kW Variable Speed Modbus Table

Table 33 : R5.5 TO 37 kW Variable Speed Modbus Table

Register (40XXX)	Variable	Read/Write	Range	Notes
1	Status/Control	R/W		See Figure 132
3	Package Discharge Pressure	R		
4	Sump Pressure	R		
10	After-cooler Discharge Pressure	R		
12	Airend Temperature	R		
19	Separator Pressure Drop	R		
20	Percent Capacity	R		
25	Motor Speed	R		
26	Motor Current	R		
28	DC Link Voltage	R		
30	Motor Voltage	R		
31	Package kW	R		
32	kW Hours	R	0 - 999	Add to (mW hours * 1000)
65	Total Hours MSB	R		
66	Total Hours LSB	R		
98	Compressor Type	R		See FIGURE 133
99	Service Level	R	0 - 2	0=Level 0, 1=Level 1, 2=Level 2
100	Service Time Period	R	1000 - 8000	Increments of 1000
103	Dryer Installed	R		0 = no dryer
112	Target Pressure	R/W	65 - 145	
113	Auto Stop Pressure	R/W	(T+1)-(T+10)	T = target pressure
114	Immediate Stop Pressure	R/W	ASP-(ASP+10)	ASP = auto stop pressure
117	Compare Savings To	R/W	0 - 2	0=Geo, 1=Mod, 2=ON/OFF
121	Communication Control ON/OFF	R		0=OFF
122	Remote Start/Stop ON/OFF	R		0=OFF
123	Power Out Restart Option (PORO) ON/OFF	R		0=OFF
124	PORO Time (seconds)	R/W	10 - 600	See Figure 133
127	Scheduled Start - Day	R/W	0 - 9	See Figure 133
128	Scheduled Stop - Day	R/W	0 - 9	
129	Scheduled Start (Hour)	R/W	0 - 23	
130	Scheduled Start (Minute)	R/W	0 - 59	
131	Scheduled Stop (Hour)	R/W	0 - 23	
132	Scheduled Stop (Minute)	R/W	0 - 59	
133	Rated Pressure	R		
251	VSD Software Version Number	R		Divide by 100
255	Warning Code	R		See Figure 134
256	Alarm Code History	R		See Figure 134
400	Reset Web Logins	R/W	0-1	Writing a 1 value will reset the web logins to factory defaults. After the reset is performed this value shall be set back to 0

Figure 132 : Manhattan Variable Speed Controller Register 01-Status/Control

<p>Bit 0: Host/Local (R/W) 0 = Local 1 = Host</p> <p>Bit 1: Run/Stop (R/W) 0 = Stop 1 = Run</p> <p>Bit 2: Load/Unload (R/W) 0 = No Loaded Operation 1 = Loaded Operatoin</p> <p>Bit 3: Operating at Minimum Speed (R) 0 = Operating above Minimum Speed 1 = Operating at Minimum Speed</p> <p>Bit 4: Operating at Maximum Speed (R) 0 = Operating below Maximum Speed 1 = Operating at Maximum Speed</p> <p>Bit 5: Stopped in Auto Restart (R) 0 = Not Stopped in Auto Restart 1 = Stopped in Auto Restart</p>	<p>Bit 6: Alarm (R) 0 = No Alarms 1 = Alarms</p> <p>Bit 7: Warning (R) 0 = No Warnings 1 = Warnings</p> <p>Bits 8 - 9: Normal/Unload Operate (R) 00 = Unloaded Operation 11 = Normal Operation</p> <p>Bits 10 - 11: Unused</p> <p>Bit 12: Fixed/Variable Speed Compressor (R) 0 = Fixed Speed 1 = Variable Speed</p> <p>Bits 13-15: Unit Type (R): Unused</p>
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Figure 133 : Manhattan Variable Speed Controller Register Codes

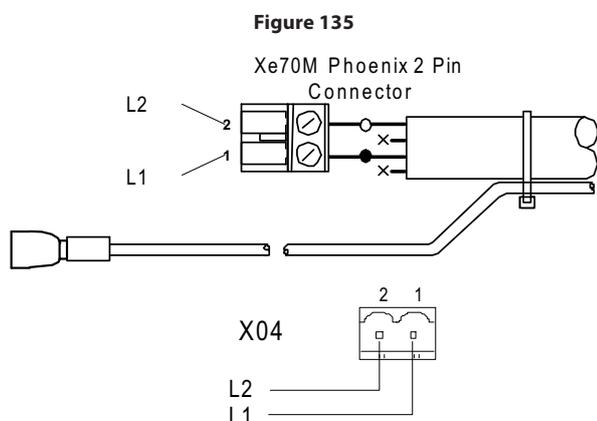
Register 98: Compressor Type		
55	=	5.5 kW
75	=	7.5 kW
80	=	7.5 hp
100	=	10 hp
110	=	11 kW
150	=	15 kW
200	=	20 hp
220	=	22 kW
290	=	30 hp
300	=	30 kW
400	=	40 hp
370	=	37 kW
500	=	50 hp
Register 127 & 128: Day		
0	=	Sunday
1	=	Monday
2	=	Tuesday
3	=	Wednesday
4	=	Thursday
5	=	Friday
6	=	Saturday
7	=	Daily
8	=	Weekdays
9	=	Weekends

Figure 134 : Manhattan Variable Speed Controller Alarm & Warning Codes

Code	Description	Code	Description
01	Sensor Failure 4APT	128	VSD Fault 28
02	Sensor Failure 3APT	129	VSD Fault 29
08	Sensor Failure 7APT (Dryer)	130	VSD Fault 30
10	Sensor Failure 2ATT	131	VSD Fault 31
18	High VSD Temperature	132	VSD Fault 32
19	Blower Fault	133	VSD Fault 33
20	VSD Communication Failure	134	VSD Fault 34
22	Check Motor Rotation	135	Unused
23	Stop Failure	136	VSD Fault 36
25	Remote Stop Failure	137	Unused
26	Remote Start Failure	138	VSD Fault 38
27	Incorrect VSD Type	139	Unused
28	Replace Coolant Filter (Idle Mode)	140	VSD Fault 40
29	High Air Pressure	141	VSD Fault 41
30	Low Sump Air Pressure	142	VSD Fault 42
31	High Airend Discharge Temperature	...	Unused
32	Emergency Stop	147	VSD Fault 47
34	Change Separator Element	148	VSD Fault 48
36	Invalid Calibration	149	VSD Fault 49
37	Check Set Points (Parameter Reset to Defaults)	150	AMA Not OK
38	100 Hours To Service	...	Unused
39	Service Required	159	VSD Fault 59
40	Alarm – Service Required	160	Unused
48	High Sump Pressure	161	VSD Fault 61
51	Dryer High Pressure	162	VSD Fault 62
52	Dryer Temperatures Warning	163	VSD Fault 63
55	Change HE Filter	164	VSD Fault 64
100	VSD Fault (generic)	165	VSD Fault 65
101	VSD Fault 1	166	VSD Fault 66
102	VSD Fault 2	167	VSD Fault 67
103	VSD Fault 3	168	VSD Fault 68
104	VSD Fault 4	169	Unused
105	VSD Fault 5	170	VSD Fault 70
106	VSD Fault 6	171	VSD Fault 71
107	VSD Fault 7	172	VSD Fault 72
108	VSD Fault 8	...	Unused
109	VSD Fault 9	180	VSD Fault 80
110	VSD Fault 10	...	Unused
111	VSD Fault 11	190	VSD Fault 90
112	VSD Fault 12	191	VSD Fault 91
113	VSD Fault 13	...	Unused
114	VSD Fault 14	210	KTY Error (VSD Fault)
115	VSD Fault 15	211	Fans Error (VSD Fault)
116	VSD Fault 16	212	ECB Error (VSD Fault)
117	VSD Fault 17	213	Broken Belt (VSD Fault)
...	Unused	214	Clock Failure (VSD Fault)
123	VSD Fault 23	215	End of Curve (VSD Fault)
124	VSD Fault 24		
125	VSD Fault 25		
126	VSD Fault 26		
127	VSD Fault 27		

X-SERIES SYSTEM CONTROLS CONNECTION

The Xe-70M controller is designed to interface to an **Ingersoll Rand X-Series System Controller** using Belden 9841 or equivalent RS-485 cable. In order to connect to the network, the cable must be connected to port X04 on the controller as shown in the diagrams below. Note that up to 8 (X8I) or 12 (X12I) devices can be daisy chained together in an X-Series network.:



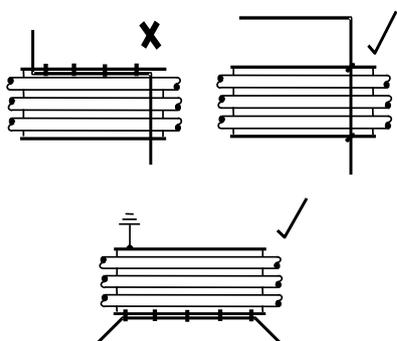
■ RS-485 Network

 RS-485 data communications and other low voltage signals can be subject to electrical interference.

This potential can result in intermittent malfunction or anomaly that is difficult to diagnose. To avoid this possibility always use earth shielded cables, securely bonded to a known good earth at one end. In addition, give careful consideration to cable routing during installation.

1. Never route an RS-485 data communications or low voltage signal cable alongside a high voltage 3- phase power supply cable. If it is necessary to cross the path of a power supply cable(s), always cross at a right angle.
2. If it is necessary to follow the route of power supply cables for a short distance (for example: from a compressor unit to a wall along a suspended cable tray) attach the RS-485 or signal cable on the outside of an earthed cable tray such that the cable tray forms an earthed electrical interference shield.
3. Where possible, never route an RS-485 or signal cable near to equipment or devices that may be a source of electrical interference (for example: 3-phase power supply transformer, high voltage switchgear unit, frequency inverter drive module, radio communications antenna).

Figure 136



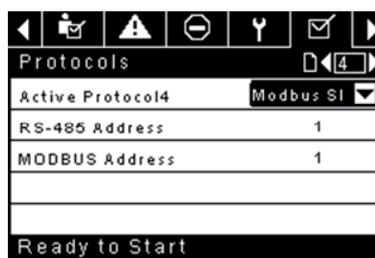
■ RS-485 Address Selection

Each compressor connected to the network will have a unique assigned address, starting at compressor 1 increasing sequentially to the number of compressors connected to the network.

The RS-485 address for each compressor is set on the General Settings Tab, Page 7. The controller's default RS-485 Address setting is 1

Additionally, the active protocol must be set to Airbus485.

Figure 137



■ Enabling System Control Capabilities

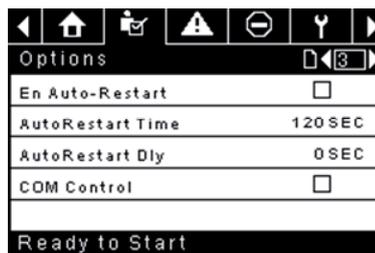
In order to communicate properly with the X-Series system controller, the Xe-70M must have the following setpoints correctly set.

On the Operator Settings tab, page 3 (Fixed Speed) or page 2 (Variable Speed).

Verify that the COM control setpoint is enabled (Checkbox is filled in) as shown below. If this setpoint is not selected, the system controller will be unable to load or unload the machine.

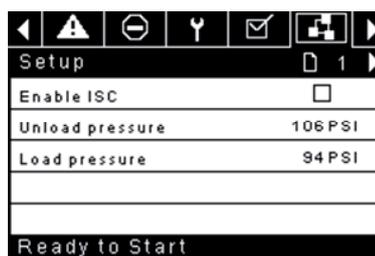
Additionally, for fixed speed machines, make sure that the Enable Auto-Restart setpoint is enabled (checkbox is filled in) or the compressor will continue to run when unloaded by the system controller.

Figure 138



After the address and COM control have been set, be sure that Integral Sequencing is disabled by navigating to Integral Sequencing, page 1 and verifying that the Integral sequencing setpoint is disabled (checkbox not filled in) as shown below:

Figure 139



Once these setpoints are correctly set and the machine is started locally, the system controller should see status information from the compressor and be able to take control.



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NOTICES AND DISCLAIMERS

Machine models represented in this manual may be used in various locations worldwide. Machines sold and shipped into European community countries shall display the EC Mark and conform to various directives. In such cases, the design specification of this compressor has been certified as complying with EC directives. Any modification to any part is absolutely prohibited and would result in the CE certification and marking being rendered invalid.

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Details of approved equipment are available from **Ingersoll Rand** Service departments.

The company accepts no responsibility for errors in translation of this manual from the original English version.

The design of this Compressor package and certain features within it are covered by patents held by Ingersoll Rand and patents pending.

WARRANTY

The Company warrants that the equipment manufactured by it and delivered hereunder will be free of defects in material and workmanship for a period of twelve months from the date of placing the Equipment in operation or eighteen months from the date of shipment from the factory, whichever shall first occur. The Purchaser shall be obligated to promptly report any failure to conform to this warranty, in writing to the Company in said period, whereupon the Company shall, at its option, correct such nonconformity, by suitable repair to such equipment or, furnish a replacement part F.O.B. point of shipment, provided the Purchaser has stored, installed, maintained and operated such Equipment in accordance with good industry practices and has complied with specific recommendations of the Company. Accessories or equipment furnished by the Company, but manufactured by others, shall carry whatever warranty the manufacturers have conveyed to the Company and which can be passed on to the Purchaser. The Company shall not be liable for any repairs, replacements, or adjustments to the Equipment or any costs of labor performed by the Purchaser or others without Company's prior written approval.

The effects of corrosion, erosion and normal wear and tear are specifically excluded. Performance warranties are limited to those specifically stated within the Company's proposal. Unless responsibility for meeting such performance warranties are limited to specified tests, the Company's obligation shall be to correct in the manner and for the period of time provided above.

THE COMPANY MAKES NO OTHER WARRANTY OR REPRESENTATION OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED.

Correction by the Company of nonconformities whether patent or latent, in the manner and for the period of time provided above, shall constitute fulfillment of all liabilities of the Company for such non conformities whether based on contract, warranty negligence, indemnity, strict liability or otherwise with respect to or arising out of such Equipment.

The purchaser shall not operate Equipment which is considered to be defective, without first notifying the Company in writing of its intention to do so. Any such use of Equipment will be at Purchaser's sole risk and liability.

Note that this is **Ingersoll Rand** standard warranty. Any warranty in force at the time of purchase of the compressor or negotiated as part of the purchase order may take precedence over this warranty.

