

USER MANUAL

WS CONTROLLER USER INTERFACE MANUAL

WARRANTY NOTICE

Failure to follow the instructions and procedures in this manual or, misuse of this equipment will VOID its warranty! PART NUMBER: 02250202-046 R02

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Section 1 SAFETY



1.1 GENERAL

Sullair and its subsidiaries design and manufacture all of their products so they can be operated safely. However, the responsibility for safe operation rests with those who use and maintain these products. The following safety precautions are offered as a guide which, if conscientiously followed, will minimize the possibility of accidents throughout the useful life of this equipment.

The compressor should be operated only by those who have been trained and delegated to do so, and who have read and understood this Operator's Manual. Failure to follow the instructions, procedures and safety precautions in this manual may result in accidents and injuries. **NEVER** start the compressor unless it is safe to do so. **DO NOT** attempt to operate the compressor with a known unsafe condition. Tag the compressor and render it inoperative by disconnecting and locking out all power at source or otherwise disabling its prime mover so others who may not know of the unsafe condition cannot attempt to operate it until the condition is corrected.

Install, use and operate the compressor only in full compliance with all pertinent OSHA regulations and/ or any applicable Federal, State, and Local codes, standards and regulations. **DO NOT** modify the compressor and/or controls in any way except with written factory approval.

While not specifically applicable to all types of compressors with all types of prime movers, most of

the precautionary statements contained herein are applicable to most compressors and the concepts behind these statements are generally applicable to all compressors.

1.2 PERSONAL PROTECTIVE EQUIPMENT

A. Prior to installing or operating the compressor, owners, employers and users should become familiar with, and comply with, all applicable OSHA regulations and/or any applicable Federal, State and Local codes, standards, and regulations relative to personal protective equipment, such as eye and face protective equipment, respiratory protective equipment, equipment intended to protect the extremities, protective clothing, protective shields and barriers and electrical protective equipment, as well as noise exposure administrative and/or engineering controls and/or personal hearing protective equipment.

1.3 PRESSURE RELEASE

- A. Install an appropriate flow-limiting valve between the service air outlet and the shut-off (throttle) valve, either at the compressor or at any other point along the air line, when an air hose exceeding 1/2" (13mm) inside diameter is to be connected to the shut-off (throttle) valve, to reduce pressure in case of hose failure, per OSHA Standard 29 CFR 1926.302(b)(7) and/or any applicable Federal, State and Local codes, standards and regulations.
- **B.** When the hose is to be used to supply a manifold, install an additional appropriate flow-limiting valve between the manifold and each air hose exceeding 1/2" (13mm) inside diameter that is to be connected to the manifold to reduce pressure in case of hose failure.
- **C.** Provide an appropriate flow-limiting valve at the beginning of each additional 75 feet (23m) of hose in runs of air hose exceeding 1/2" (13mm)



inside diameter to reduce pressure in case of hose failure.

- **D.** Flow-limiting valves are listed by pipe size and flow-rated. Select appropriate valves accordingly, in accordance with their manufacturer's recommendations.
- E. DO NOT use air tools that are rated below the maximum rating of the compressor. Select air tools, air hoses, pipes, valves, filters and other fittings accordingly. DO NOT exceed manufacturer's rated safe operating pressures for these items.
- **F.** Secure all hose connections by wire, chain or other suitable retaining device to prevent tools or hose ends from being accidentally disconnected and expelled.
- **G.** Open fluid filler cap only when compressor is not running and is not pressurized. Shut down the compressor and bleed the receiver tank to zero internal pressure before removing the cap.
- H. Vent all internal pressure prior to opening any line, fitting, hose, valve, drain plug, connection or other component, such as filters and line oilers, and before attempting to refill optional air line anti-icer systems with antifreeze compound.
- I. Keep personnel out of line with and away from the discharge opening of hoses or tools or other points of compressed air discharge.
- J. DO NOT use air at pressures higher than 2.1 bar for cleaning purposes, and then only with effective chip guarding and personal protective equipment per OSHA Standard 29 CFR 1910.242 (b) and/or any applicable Federal, State, and Local codes, standards and regulations.
- **K. DO NOT** engage in horseplay with air hoses as death or serious injury may result.

1.4 FIRE AND EXPLOSION

- A. Clean up spills of lubricant or other combustible substances immediately, if such spills occur.
- B. Shut off the compressor and allow it to cool. Then keep sparks, flames and other sources of ignition away and DO NOT permit smoking in the vicinity when checking or adding lubricant or when refilling air line anti-icer systems with antifreeze compound.
- C. DO NOT permit fluids, including air line anti-icer system antifreeze compound or fluid film, to

accumulate on, under or around acoustical material, or on any external surfaces of the air compressor. Wipe down using an aqueous industrial cleaner or steam clean as required. If necessary, remove acoustical material, clean all surfaces and then replace acoustical material. Any acoustical material with a protective covering that has been torn or punctured should be replaced immediately to prevent accumulation of liquids or fluid film within the material. **DO NOT** use flammable solvents for cleaning purposes.

- D. Disconnect and lock out all power at source prior to attempting any repairs or cleaning of the compressor or of the inside of the enclosure, if any.
- E. Keep electrical wiring, including all terminals and pressure connectors in good condition. Replace any wiring that has cracked, cut, abraded or otherwise degraded insulation, or terminals that are worn, discolored or corroded. Keep all terminals and pressure connectors clean and tight.
- **F.** Keep grounded and/or conductive objects such as tools away from exposed live electrical parts such as terminals to avoid arcing which might serve as a source of ignition.
- **G.** Remove any acoustical material or other material that may be damaged by heat or that may support combustion and is in close proximity, prior to attempting weld repairs.
- **H.** Keep suitable fully charged Class BC or ABC fire extinguisher or extinguishers nearby when servicing and operating the compressor.
- I. Keep oily rags, trash, leaves, litter or other combustibles out of and away from the compressor.
- J. DO NOT operate the compressor without proper flow of cooling air or water or with inadequate flow of lubricant or with degraded lubricant.
- K. DO NOT attempt to operate the compressor in any classification of hazardous environment unless the compressor has been specially designed and manufactured for that duty.

1.5 MOVING PARTS

- **A.** Keep hands, arms and other parts of the body and clothing away from couplings, belts, pulleys, fans and other moving parts.
- **B. DO NOT** attempt to operate the compressor with the fan, coupling or other guards removed.



- **C.** Wear snug-fitting clothing and confine long hair when working around this compressor, especially when exposed to hot or moving parts.
- **D.** Keep access doors, if any, closed except when making repairs or adjustments.
- E. Make sure all personnel are out of and/or clear of the compressor prior to attempting to start or operate it.
- F. Disconnect and lock out all power at source and verify at the compressor that all circuits are deenergized to minimize the possibility of accidental start-up, or operation, prior to attempting repairs or adjustments. This is especially important when compressors are remotely controlled.
- **G.** Keep hands, feet, floors, controls and walking surfaces clean and free of fluid, water or other liquids to minimize the possibility of slips and falls.

1.6 HOT SURFACES, SHARP EDGES AND SHARP CORNERS

- **A.** Avoid bodily contact with hot fluid, hot coolant, hot surfaces and sharp edges and corners.
- **B.** Keep all parts of the body away from all points of air discharge.
- **C.** Wear personal protective equipment including gloves and head covering when working in, on or around the compressor.
- D. Keep a first aid kit handy. Seek medical assistance promptly in case of injury. DO NOT ignore small cuts and burns as they may lead to infection

1.7 TOXIC AND IRRITATING SUBSTANCES

A. DO NOT use air from this compressor for respiration (breathing) except in full compliance with OSHA Standards 29 CFR 1910 and/or any applicable Federal, State or Local codes or regulations.

DANGER DANGER Death or serious injury can result from inhaling compressed air without using proper safety equipment. See OSHA standards and/or any applicable Federal, State, and Local codes, standards and regulations

B. DO NOT use air line anti-icer systems in air lines supplying respirators or other breathing air utilization equipment and **DO NOT** discharge air from these systems into unventilated or other confined areas.

on safety equipment.

- **C.** Operate the compressor only in open or adequately ventilated areas.
- **D.** Locate the compressor or provide a remote inlet so that it is not likely to ingest exhaust fumes or other toxic, noxious or corrosive fumes or substances.
- E. Coolants and lubricants used in this compressor are typical of the industry. Care should be taken to avoid accidental ingestion and/or skin contact. In the event of ingestion, seek medical treatment promptly. Wash with soap and water in the event of skin contact. Consult Material Safety Data Sheet for information pertaining to fluid of fill.
- **F.** Wear goggles or a full face shield when adding antifreeze compound to air line anti-icer systems.
- **G.** If air line anti-icer system antifreeze compound enters the eyes or if fumes irritate the eyes, they should be washed with large quantities of clean water for fifteen minutes. A physician, preferably an eye specialist, should be contacted immediately.
- **H. DO NOT** store air line anti-icer system antifreeze compound in confined areas.
- I. The antifreeze compound used in air line antifreeze systems contains methanol and is toxic, harmful or fatal if swallowed. Avoid contact with the skin or eyes and avoid breathing the fumes. If



swallowed, induce vomiting by administering a tablespoon of salt, in each glass of clean, warm water until vomit is clear, then administer two teaspoons of baking soda in a glass of clean water. Have patient lay down and cover eyes to exclude light. Call a physician immediately.

1.8 ELECTRICAL SHOCK

- A. This compressor should be installed and maintained in full compliance with all applicable Federal, State and Local codes, standards and regulations, including those of the National Electrical Code, and also including those relative to equipment grounding conductors, and only by personnel that are trained, qualified and delegated to do so.
- B. Keep all parts of the body and any hand-held tools or other conductive objects away from exposed live parts of electrical system. Maintain dry footing, stand on insulating surfaces and DO NOT contact any other portion of the compressor when making adjustments or repairs to exposed live parts of the electrical system. Make all such adjustments or repairs with one hand only, so as to minimize the possibility of creating a current path through the heart.
- **C.** Attempt repairs in clean, dry and well lighted and ventilated areas only.
- **D. DO NOT** leave the compressor unattended with open electrical enclosures. If necessary to do so, then disconnect, lock out and tag all power at source so others will not inadvertently restore power.
- E. Disconnect, lock out, and tag all power at source prior to attempting repairs or adjustments to rotating machinery and prior to handling any ungrounded conductors.

All field equipment must be tested for electrostatic fields prior to servicing or making contact with the machine using the following or equivalent test equipment:

- 90-600 VAC: Volt detector such as Fluke Model 1AC-A
- 600-7000 VAC: Voltage detector such as Fluke Networks Model C9970

It is the responsibility of each organization to provide/arrange training for all their associates expected to test for electrostatic fields.

1.9 LIFTING

- A. If the compressor is provided with a lifting bail, then lift by the bail provided. If no bail is provided, then lift by sling. Compressors to be air-lifted by helicopter must not be supported by the lifting bail but by slings instead. In any event, lift and/or handle only in full compliance with OSHA standards 29 CFR 1910 subpart N and/or any applicable Federal, State, and Local codes, standards and regulations.
- **B.** Inspect points of attachment for cracked welds and for cracked, bent, corroded or otherwise degraded members and for loose bolts or nuts prior to lifting.
- **C.** Make sure entire lifting, rigging and supporting structure has been inspected, is in good condition and has a rated capacity of at least the weight of the compressor. If you are unsure of the weight, then weigh compressor before lifting.
- **D.** Make sure lifting hook has a functional safety latch or equivalent, and is fully engaged and latched on the bail or slings.
- E. Use guide ropes or equivalent to prevent twisting or swinging of the compressor once it has been lifted clear of the ground.
- F. DO NOT attempt to lift in high winds.
- **G.** Keep all personnel out from under and away from the compressor whenever it is suspended.
- H. Lift compressor no higher than necessary.



SECTION 1

- I. Keep lift operator in constant attendance whenever compressor is suspended.
- J. Set compressor down only on a level surface capable of safely supporting at least its weight and its loading unit.
- **K.** When moving the compressor by forklift truck, utilize fork pockets if provided. Otherwise, utilize pallet if provided. If neither fork pockets or pallet are provided, then make sure compressor is secure and well balanced on forks before attempting to raise or transport it any significant distance.
- L. Make sure forklift truck forks are fully engaged and tipped back prior to lifting or transporting the compressor.
- **M.** Forklift no higher than necessary to clear obstacles at floor level and transport and corner at minimum practical speeds.
- N. Make sure pallet-mounted compressors are firmly bolted or otherwise secured to the pallet prior to attempting to forklift or transport them. NEVER attempt to forklift a compressor that is not secured to its pallet, as uneven floors or sudden stops may cause the compressor to tumble off, possibly causing serious injury or property damage in the process.

1.10 ENTRAPMENT

- A. If the compressor enclosure, if any, is large enough to hold a man and if it is necessary to enter it to perform service adjustments, inform other personnel before doing so, or else secure and tag the access door in the open position to avoid the possibility of others closing and possibly latching the door with personnel inside.
- **B.** Make sure all personnel are out of compressor before closing and latching enclosure doors.

1.11 SAFETY WARNINGS

The following special instructions apply to VSD packages provided with electronic adjustable speed motor drives. These cautions that apply to VSD operation.

Ground the unit following the instructions in this manual. Ungrounded units may cause electric shock and/or fire. The variable speed drive has a large capacitive leakage current during operation, which can cause enclosure parts to be above ground potential. Proper grounding, as described in this manual, is required. Failure to observe this precaution could result in death or severe injury.

WARNING

Before applying power to the variable speed drive, make sure that the front and cable covers are closed and fastened to prevent exposure to potential electrical fault conditions. Failure to observe this precaution could result in death or severe injury.

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🚯 WARNING

Refer all drive service to trained technicians. This equipment should be installed, adjusted, and serviced by qualified electrical maintenance personnel familiar with the construction and operation of this type of equipment and the hazards involved and in accordance with published service manuals. Failure to observe this precaution could result in death or severe injury.

Line terminals (L1, L2, L3), motor terminals (U, V, W) and the DC link/brake resistor terminals (-/+) are live when the drive is connected to power, even if the motor is not running. Contact with this voltage is extremely dangerous and may cause death or severe injury.



Before opening the variable speed drive covers:

Disconnect all power to the variable speed drive.
Wait a minimum of 5 (five) minutes after all the lights on the keypad are off. This allows time for the DC bus capacitors to discharge.

• A hazard voltage may still remain in the DC bus capacitors even if the power has been turned off. Confirm that the capacitors have fully discharged by measuring their voltage using a multimeter set to measure DC voltage. Failure to follow the above precautions may cause death or severe injury.

Do not perform any Meggar or voltage withstand tests on any part of the variable speed drive or its components. Improper testing may result in damage. Prior to any tests or measurements of the motor or the motor cable, disconnect the motor cable at the variable speed drive output terminals (U, VW) to avoid damaging the variable speed drive during motor or cable testing.

Do not touch any components on the circuit boards. Static voltage discharge may damage the components.

Install the variable speed drive in a well ventilated room that is not subject to temperature extremes, high humidity, or condensation, and avoid locations that are directly exposed to sunlight, or have high concentrations of dust, corrosive gas, explosive gas, inflammable gas, grinding fluid mist, etc. Improper installation may result in a fire hazard.

Make sure that no power correction capacitors are connected to the variable speed drive output or the motor terminals to prevent variable speed drive malfunction and potential damage.

Make sure that the variable speed drive output terminals (U, V, W) are not connected to the utility line power as severe damage to the VSD may occur.

NOTE

Interior electrical wiring is performed at the factory. Required customer wiring is minimal, but should be done by a qualified electrician in compliance with OSHA, National Electrical Code, and/or any other applicable State, Federal, and local electrical codes concerning isolation switches, fused disconnects, etc. Sullair provides a wiring diagram for use by the installer.

NOTE

Customer must provide electrical supply power disconnect within sight of machine.



Section 2 STARTUP PROCEDURES

2.1 INTRODUCTION

This compressor is equipped with an WS Controller for controlling the compressor system operation, setting the machine parameters and performing maintenance operations. The WS Controller is designed for the safe operation and protection of the compressor system. When fault conditions occur, the controller automatically shuts down the machine before the conditions can cause damage to the equipment. The WS Controller also contains features that enable sequential interface with other machines.

2.2 WS CONTROLLER PANEL LAYOUT

The WS Controller panel is shown in *Figure 2-1*. The controller panel consists of:

- Display Screen for displaying machine status
- START
 pad for machine startup
- **STOP** pad for stopping machine operation and for clearing fault messages while the machine is stopped
- UP arrow and DOWN arrow pads for navigation through the various panel displays and for changing parameter values
- ENTER pad for selecting and accessing various screen displays and for entering values
- • Machine status indicator lights for identifying the current machine operational status.

Each of the controller components and functions is described in detail in *Section 4*.



Figure 2-1: WS Controller Panel



2.3 WS START UP PROCEDURES

COMPRESSOR MOTOR ROTATION DIRECTION CHECK (AT INSTALLATION)

After the compressor has been installed and the electrical wiring is completed, perform following steps to verify the direction of the compressor motor rotation.

1. If the display screen shows AUTOMATIC,

press the UP arrow pad twice to navigate to the Mode parameter. Press the

ENTER pad. The screen will display reverse characters indicating change mode

is active. Press the **DOWN** arrow **v** pad to highlight the **MANUAL** selection (it will appear in reverse text in the display). Press the **ENTER** pad to accept the change and place the machine in the Manual operating mode.

- 2. Press the **START** and **STOP** pads in succession to "bump start" the compressor.
- 3. Observe the direction of rotation of the compressor motor shaft. Verify with Operators Manual for correct rotation.
- 4. Disconnect and lockout power according to lockout/tag out procedure.
- 5. If the motor shaft is not turning in the proper direction, disconnect the power to the starter and exchange any two of the three power input leads. Refer to the Compressor Operator's Manual.
- 6. Perform above steps 1 3 again to confirm proper motor/compressor rotation.

NOTE

Variable speed drive (VSD) packages do not require a main motor direction check since the variable speed motor is set at the time of manufacture.

FAN MOTOR ROTATION CHECK (AT INSTALLATION)

The VSD fan direction is affected by installation. Verify the correct fan rotation using the following steps:

- 1. With the compressor running, visually check that the fan rotation is correct.
- 2. If incorrect, change the direction of the fan motor by disconnecting power from the compressor.
- 3. Disconnect and lockout power according to lockout/tag out procedure.
- Exchange any two of the three fan motor leads at the fan motor starter. Refer to the compressor Operator's Manual.
- 5. Recheck the direction of the fan motor.

INITIAL START-UP AFTER INSTALLATION

Perform the following procedure at the initial **START**up of the compressor following installation.

- 1. Verify that all preparations and checks necessary for proper installation have been made. Refer to the compressor Operator's Manual.
- 2. Read the preceding pages of this manual thoroughly.
- 3. Slowly open the shut-off valve to the service line.
- 4. Press the **START** pad to Start the compressor. Compressor will begin operating in the default mode (Automatic) set at the factory.
- 5. Check for possible leaks in piping.
- 6. Slowly close the service line shut-off valve to verify nameplate pressure unload setting is correct. The compressor should unload when nameplate pressure is achieved. If adjustments are necessary, see *Compressor Adjustment Procedures* on page 15.
- Observe the operating temperature. Refer to compressor Operator's Manual for acceptable operating range. If temperature exceeds this range, check the cooling system and installation environment.
- 8. Open the shut-off valve to the service line.
- 9. After operating the machine for 24 hours, inspect the compressor for fluid leaks and proper operating temperature.



SUBSEQUENT START-UP PROCEDURE

- 1. On subsequent start-ups, check the fluid sight glass for proper fluid level. Service if necessary. See compressor Operator's Manual.
- 2. Press the **START** pad on the display screen. The machine will prepare to start up in the last operating mode existing at shutdown. The current machine mode will appear on the display screen.
- 3. If a different operating mode is desired, use the arrow pads to navigate to the Mode

parameter. Press the **ENTER** pad to **ENTER** the Change Mode. Navigate to the desired mode (Automatic or Manual). Press

the **ENTER** pad to accept and save the mode setting.

 When the compressor is running, observe the display panel and maintenance indicators to ensure the values displayed are within the proper ranges.

2.4 SHUTDOWN PROCEDURE

Shut down the compressor by pressing the STOP



o pad on the WS Controller panel.

NOTE

The system may require sump blowdown (typically below 10 psi) to be completed prior to restarting.

The compressor may restart automatically after a power failure or after the E-Stop button has been reset.



NOTES



Section 3 **ADJUSTMENTS**

3.1 INTRODUCTION

This section describes steps for using the WS Controller to modify specific parameters that control the machine operation.

NOTE

Control parameters described in this manual are those which can be adjusted via the WS controller. Additional parameters that control the operation of the compressor and sequencing of multiple machines can be viewed and edited using the WSPC Software program. See the WSPC User Interface Manual for more details.

Typically, the top line of the Controller Display Screen will display the line pressure and compressor temperature; the bottom line will display the current operating mode. As the user presses the down navigation arrow, the screen will display various machine statistics appearing under the heading Compressor Status: These values are not adjustable at the WS Controller. Navigating past these screens, the first line of the screen will display the words Show Setting ------. This indicates that the controller is in the Adjustment mode. When in Adjustment mode, control parameters will be described in the second line of the display screen. These control parameters can be modified by the user. The bottom line of the display will show the current value or setting of the control parameter.

Section 3.2 provides general steps to modifying the compressor control parameters. A description of each user modifiable parameter is provided in *Section 3.3*.

3.2 COMPRESSOR ADJUSTMENT PROCEDURES

The following steps apply while **Show Setting** -----is indicated in the display. The control parameter described in the display can be modified by the user. Use these steps to modify a parameter value:

- 1. Press the **UP** arrow or **DOWN** arrow pad on the controller panel to navigate to the parameter to be change.
- Press the ENTER pad to select the parameter and access the CHANGE mode. The change mode is indicated by the text Change Setting ----- appearing in reverse (negative) characters on the top line of the display. The parameter name will appear on the second line and the cur-

rent parameter value or setting will appear in reverse characters on the bottom line.

- 3. Use the **UP** arrow or **DOWN** arrow pad to change the value or mode of the parameter.
- 4. When the desired value or mode name

appears on the display, Press **ENTER** to Accept and Save this new value for the selected parameter. The display will return to the **ADJUSTMENT** view and the new value or mode will be displayed.



5. Press the **START** pad when running

or **STOP** pad when stopped to return the display to the **NORMAL** view.

NOTE

If during the adjustment process, the

START or STOP pad is pressed prior to pressing the

ENTER pad, the display will return to the NORMAL view and the parameter value will not be changed.

3.3 USER ADJUSTABLE CONTROL PARAMETERS

Listed below are descriptions of the parameter that can be adjusted at the WS Controller:

Unload Pressure - Set point (psi, bar, or kpa) at which the system pressure will begin unloading. For example if this parameter is set to 110 psi (7.6 bar) the machine will unload when the line pressure is above 110 psi (7.6 bar).

Load Delta Pressure - The pressure differential (psi, bar, or kpa) below the unload pressure at which the machine will begin loading. For example if the unload pressure is set to 110 psi (7.6 bar) and the load differential is set to 10 psid (0.7 bar), the machine will load when the line pressure goes below 100 psi (6.9 bar).

VSD Setpoint Press. - (VSD packages only) The targeted pressure (psi, bar, or kpa) for the variable speed controls. This is normally adjusted near the bottom of the load/unload delta. The speed will be adjusted to maintain this pressure.

Unload Minutes - Set time that the machine will run unloaded in Automatic mode before shutting off. If the time is set less than 15 minutes (for example 5), there may be times when the machine will run unloaded for more than 15 minutes. This is because there is another timer that keeps the machine from being started more than four times an hour. This secondary timer is disabled when a machine is configured for VSD motor control.

Drain Interval Mins. - Set interval in minutes between activation of the drain cycle for machines equipped with an electric solenoid drain. This does

not apply to the Sullair SCD zero loss drain, which is not controlled or monitored by the WS Controller.

Drain Time Seconds - Set time in seconds that the drain remains energized.

Wye Delta Seconds - Set time for wye to delta starter transition. Also used to control the closed inlet start valve. Disable by setting to zero (0), standard for full voltage start. Requires approximately 4-6 seconds for wye-delta or solid state starting.

Modulate - Manner in which the machine is set to regulate compressor flow. Default state is "**YES**" for proportional control. Select "**NO**" for Load/No Load operation.

Operating Mode - The mode set for controlling the compressor motor operation (Manual / Automatic). Manual mode runs continuously. Automatic mode refer to "Unload Minutes".

Ethernet Address - (Models with Ethernet only) This selects the address for the service Ethernet connector of the control box. The default is "LAN" which is used for a local area network. The factory default address is 192.168.1.3, but may be modified as desired. The other selection is "Link Local" which may be used for simple connection to a PC. This puts the controller at address 169.254.250.249, port 502.

Setup - Change the time left for editing the factory Setup Adjustments. When time is present these adjustments will be visible and editable. For "Setup" editing when time has expired a "Password" adjustment display will appear first. Please consult the factory regarding password authorization.

Rental Horsepower - Adjust the maximum horsepower limit for the rental unit. This is a Setup Adjustment and is only available if the Setup time is not expired for a rental machine.

Rental Pressure - Adjust the maximum operating pressure for the rental unit. This is a Setup Adjustment and is only available if the Setup time is not expired for a rental machine.

Forced Unload - Set to "Yes" to force the unit to not load during operation. This is a Setup Adjustment and is only available if the Setup time is not expired. This will revert to "No" within half an hour if left unattended. If the Setup time expires the value will revert to "No".

Language - The choice of language for text that will appear on the display screen.



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The Diagram of *Figure 3-1* shows the flow of the screens that appear on the WS Controller display screen for a typical standard compressor package. This diagram illustrates how adjustment parameters are accessed.



Figure 3-1: Controller Display Flow Diagram

3.4 CALIBRATION OF P2 PRESSURE TRANSDUCERS

The compressor is equipped with a pressure transducer that measures the output line (P2) pressure. Over time, the pressure transducer may vary slightly producing an inaccurate reading at the controller. Periodically and prior to operating multiple controllers in a sequence, the controller should be recalibrated to reflect the same measurement of P2 pressure through out the system. The re-calibration is best done when the system is at a stable pressure.

Calibration of the WS Controller P2 pressure reading is accomplished using the WSPC User Interface Software Program. Refer to the WSPC User Interface Manual for details on calibrating the P2 system pressure measurement.

3.5 REMOTE UNLOAD

As a default configuration, the compressor is provided with one input to allow user-furnished external remote control. This may be wired to a remote switch, timer, or other controls to halt operation of the compressor as desired. To enable remote control of the compressor:

- 1. Wire the remote contact to junction J4-7 and any vacant J3 terminal.
- Access the PC User Interface software. At the User Adjustments display screen, select one of the following sequencing modes: **Remote**, **Hours**, or **Com Number**. Remote operation is disabled if the sequencing mode is **Disabled** or **Slave**.
- 3. Once enabled, the controller will respond to the wired input.
- If the contact is closed, the compressor unloads and stops delivering air to the system. If the operating mode is AUTOMATIC, the compressor will stop after running unloaded for the period set in the Unload Minutes setting. When operating in a group of sequenced compressors, this removes only this compressor for service.
- If the contact is open, the compressor operates normally.

The WS Controller is field configurable for other remote functions with additional contacts or **fieldbus** commands. Refer to the WSPC manual for details.



Section 4 **DESCRIPTION**

4.1 INTRODUCTION

This section describes the components of the WS Controller, the function of each component, and the various types of displays that may appear on the display screen. Descriptive lists of all messages appearing in the display are also provided.

4.2 TOUCH PAD BUTTON DESCRIPTION

The WS Controller Panel has five touch pads that allow the operator control of the compressor and enable adjustment of the machine operating parameters. Each touch pad and its functions are described below:

Start Pad —Large GREEN pad button used to Start the compressor operation. The pad is also pressed to reset warnings while the machine is running and to return the display to the Normal View.

Stop Pad —Large RED key pad used to stop the compressor operation. The **Stop Pad** is also pressed to clear fault messages when the machine is stopped and to return the display to the Normal View.

Up Arrow Pad —Used to navigate "Up" the list of display messages and to increase or change parameter values for adjustments.

Down Arrow Pad —Used to navigate "Down" the list of display messages and to decrease or change parameter values for adjustments.

Enter Pad Angled arrow key pad used to select the parameter that is displayed on the screen. After adjusting the desired parameter value using the UP or DOWN arrow pads, the ENTER pad selects the parameter value displayed on the screen and saves it as the new value.

4.3 INDICATOR LED DESCRIPTION

Four LED's on the WS Controller Panel provide indication of the general state of the machine.

Power On Indicator (Green LED) — Lights whenever power is applied to the controller. This LED will blink very slowly if the compressor is set to automatically restart after power failure.

Automatic or Manual Run Mode Indicator (Green LED) — Lights when the compressor operation is set to Start and Run automatically. This LED lights steadily when the motor is running. The LED will blink slowly if the compressor motor is stopped while in Automatic mode as a warning that the machine may restart at any time. The display screen will periodically indicate **The compressor is Standing by**. The Automatic Mode LED will blink rapidly if machine restart is imminent. The display screen will periodically display a message to indicate the state of the machine prior to restart (e.g., **Waiting for Blowdown**).

Maintenance/Warning Indicator

(AMBER

LED)—Lights when recommended maintenance or service warning is issued. In most cases the machine will continue to operate normally. The display screen will periodically display the recommended maintenance actions or the cause of the warning. Refer to *Section 5: Troubleshooting* on page 29 to resolve maintenance conditions.

Fault Warning Indicator (Red LED) — Lights when a compressor fault has occurred. The indicator will remain lit and the compressor will remain inoperative until the fault condition is remedied. The controller display screen will indicate **FAULTED** and periodically a brief description of the cause of the fault. Refer to *Section 5: Troubleshooting* on page 27 to resolve fault conditions.



4.4 DISPLAY SCREEN

Information relevant to the compressor operation is presented in three views on the controller display screen: **Normal View**, **Compressor Status:** and **Compressor Adjustment:** or **Show Setting** ------.

NORMAL VIEW

The **Normal View** is the default view for the display screen. When in Normal View, information regarding the compressor current operating conditions appears on the display screen. See *Figure 4-1*. The top line of the display screen in Normal View shows the discharge pressure and the internal temperature of the compressor package. The lower line of the Display Screen displays the current compressor operating mode.



Figure 4-1: Display Screen Normal View Example

Under normal operating conditions, the lower line of the **Controller Display Screen** will alternately display the compressor operating state, warning messages, service reminders, and fault conditions when they occur.

COMPRESSOR STATUS VIEW

The **Compressor Status**: View shows real-time machine measurement information.

This information is quickly accessed using the Down navigational arrow. The top line of the display screen will indicate **Compressor Status:**. See *Figure 4-2*. The second line will show the name of the measurement (e.g., **Line Pressure**). The bottom line will display the current value of the measurement being viewed.



Figure 4-2: Display Screen Compressor Status View Example

Listed below are compressor attributes that may be viewed in the Compressor Status View. This list will vary based on specific machine configurations.

Temperature 1 — Displays the current compressor temperature at temperature probe 1.

Temperature 2 — Displays the current compressor temperature at temperature probe 2.

Temperature 3 — Displays the current compressor temperature at temperature probe 3.

Dewpoint Temperature — Displays the current dryer temperature at temperature probe 3.

Package Outlet RH — Displays the current relative humidity of the line outlet air.

Sump Pressure — Displays the current sump pressure (P1).

Line Pressure — Displays the current line output pressure (P2).

Pressure 3 — Displays the pressure (P3) at the specified transducer location.

Separator Pressure Δ — Displays the current separator pressure differential.

Run Hours—Displays the total time the compressor has been running loaded or unloaded.

Spiral Valve — Approximate percent of full capacity controlled by the compressor's spiral valve

VSD Capacity — This is displayed as an approximate percentage (%) of the maximum capacity for the package.

VSD Temperature — High temperatures usually indicate a need for cleaning of the VSD fan or heat sink by a trained service technician.

COMPRESSOR ADJUSTMENT VIEW – CONTROL PARAMETERS

The **Compressor Adjustment View** shows current machine parameters which are conditions and limits that can be modified by the operator. This view is accessed using the navigational arrows and is indicated by the text **Show Setting** ------ appearing on the first line of the display screen. See *Figure 4-3*.

Pressing ENTER at the Show Setting screen accesses the Change Mode. This mode is indicated by the text Change Setting----- appearing as reverse characters on the first line of the display screen and the change parameter appearing on the second line. See Figure 4-4. The value of the parameter is displayed as reverse characters on the bottom line. Refer to Section 3: Adjustments on page 15, for instructions on changing the compressor



control parameters and a list of the control parameters that can be modified by the user.

Show Setting - - - - -

Unload Pressure

110 PSI

Figure 4-3: Adjustment View— Show Setting Example

Change Setting ------

Unload Pressure

110 PSI

Figure 4-4: Adjustment View— Change Setting Example

4.5 **OPERATING MODES**

The Operating Mode is the manner in which the machine operation is being controlled. There are five Operating Modes: **AUTOMATIC**, **MANUAL**, **OFF**, **FAULT** and **UI COMM**.

The active operating mode of the compressor appears on the lower line of the display screen's Normal View. See *Figure 4-5*.



Figure 4-5: Compressor Operating Mode Display

The compressor operating modes are described below:

Automatic mode — Indicated by the word AUTOMATIC appearing in the lower line of the display window. This is a user selected mode that sets the compressor motor to automatically start when conditions necessitate and stop when motor operation is not required.

Manual Mode—Indicated by the word **MANUAL** appearing in the lower line of the display window. This is a user selected mode that allows the operator to manually control the compressor motor operation.

When the **START** pad is pressed while in Manual Mode the compressor motor will run continuously until the **STOP** pad is pressed. The compressor pump and all other machine



Off mode — Indicated by the word **OFF** appearing in the lower line of the display window. This mode indicates that the compressor and motor have been turned off under normal conditions. When in this mode the machine will not operate until the **START**



Fault mode — Indicated by the word **FAULTED** appearing in the lower line of the display window. This mode indicates that a machine problem has occurred causing the controller to shut down the machine until the condition is cleared. After a fault condition has been resolved, the fault indication can be cleared from the controller by pressing the **STOP**

pad. Refer to *Section 5: Troubleshooting* on page 27, for information on resolving fault conditions.

UI Comm mode—Indicated by the word **UI COMM** appearing in the lower line of the display window. This mode indicates that the User Interface has lost communication and, as a result, the machine operating mode or status is unknown.

4.6 **OPERATING STATES**

Operating States describe the state of the compressor operation in response to the current mode and current conditions. Essentially, the operating state is what the machine is doing at a particular moment. Most operating states occur automatically as normal functions of the compressor and require no direct action from the operator.

NOTE

Machine operating states may vary depending on compressor model.

Text descriptions of operating states appear periodically on the lower line of the display screen while in Normal View. See *Figure 4-6*. The leading line will read **The compressor is** below which the operating state description will be displayed.

118 psi 70 °F The Compressor is Standing by

Figure 4-6: Controller Display Normal View: Operating State



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The list below provides an explanation of each **Operating State** message that may appear in the **Normal View** display. Some operating states occur instantaneously and may not be seen by the operator.

Initializing — Displayed as the compressor is powered up.

Stopping — May be briefly displayed as the compressor is being stopped via the Controller Panel.

Manually Stopped — Displayed when the compressor operation is stopped.

Remote Stopping — May be briefly displayed as the compressor is being stopped remotely.

Remote Stopped — Displayed when the compressor operation is stopped but is armed to restart. The machine will start when the remote start contact is close. NOTE: The machine may start at any time when conditions are met.

Standing by — Displayed when the compressor is stopped and waiting for proper conditions before restarting.

Faulting — Displayed as a fault condition is occurring.

Faulted — Displayed after a fault condition has occurred.

Waiting for Blowdown — Displayed when the compressor is waiting for the sump to reach a set minimum pressure prior to starting. After the pressure has reduced to the set level, the compressor will start automatically.

Starting 1 — Displayed as compressor initiates stage 1 startup processes.

Starting 2 — Displayed as compressor initiates stage 2 startup processes.

Starting 3 — Displayed as compressor initiates stage 3 startup processes.

Precooling the Dryer — Displayed while initially cooling an integrated dryer with the compressor unloaded

Loading — Displayed as the compressor begins delivering air.

Loaded & Modulating — Displayed when the compressor is delivering air.

Fully Loaded — Displayed when the compressor is delivering air at full rated capacity.

Unloading — Displayed as the compressor is being unloaded automatically.

Remote Unloading — Displayed as the compressor is being unloaded remotely.

Running Unloaded — Displayed when the system is running with the compressor unloaded.

Remote Unloaded — Displayed when the compressor has been unloaded remotely.

Restarting — Displayed during the restart waiting period after the starter has dropped out unexpectedly.

4.7 NORMAL VIEW SERVICE REMINDERS

Service reminders may alternately appear in the Normal View display. See *Figure 4-7*. The Service Reminder screen is indicated by the words **Recommended Service:** appearing on the second line of the display. The bottom line displays a brief description of the recommended service required. When a service reminder appears, the machine will continue to operate normally, however, the appropriate service should be scheduled and accomplished within a short period of time.

118 psi **70°F** Recommended Service: Change Fluid Filter

Figure 4-7: Controller Display Normal View: Service Reminder

The list below provides an explanation of the Service Reminders that may appear in the **Normal View** display. Refer to *Section 5: Troubleshooting* on page 27, for additional instructions on actions to be taken when a service reminder appears.

Change Fluid Filter — The compressor fluid filter should be changed within the time frame noted in the machine operation specifications.

Change Separator — The compressor fluid separator should be changed within the time frame noted in the machine operation specifications.

Change Air Filter — The compressor air filter should be changed within the time frame noted in the machine operation specifications.

Analyze Fluid — A fluid analysis should be scheduled per machine operation specifications.

Change Fluid — The compressor fluid should be changed within the time frame noted in the machine operation specifications.

Maintenance A — Periodic maintenance should be scheduled per machine operation specifications.



4.8 WARNING MESSAGES

When a **Warning:** condition occurs a warning message will alternately appear on the lower line of the Normal View display. See *Figure 4-8*. Under a Warning condition, the machine will continue to operate normally, however, appropriate maintenance action must be taken to remedy the warning condition. Refer to *Section 5: Troubleshooting* on page 29, for additional instructions on actions to be taken when warning conditions exists.

118 psi 70°F Warning: High Separator dP

Figure 4-8: Controller Display Normal View: Warning Message

The list below provides an explanation of the **Warning Messages** that may appear in the display when an error occurs.

High Dryer Dewpoint — Indicates that the integrated dryer is running with high dewpoint temperature. Consult the dryer manual and/or dryer manufacturer.

Dryer High dP Fault — Indicates that the integrated dryer has stopped operation due to high dewpoint temperature. Consult the dryer manual and/or dryer manufacturer.

Low Dryer Dewpoint — Indicates that the integrated dryer is running with low dewpoint temperature. Consult the dryer manual and/or dryer manufacturer.

Dryer Low dP Fault — Indicates that the integrated dryer has stopped operation due to low dewpoint temperature. Consult the dryer manual and/or dryer manufacturer.

Dryer Overload Fault — Indicates that the integrated dryer has stopped operation due to a compressor motor overload. Consult the dryer manual and/or dryer manufacturer.

Dryer Relay Fault — Indicates that the integrated dryer has stopped operation due to internal problems. Consult the dryer manual and/or dryer manufacturer.

Dryer Service — Indicates a dryer is running while a malfunction is occurring. Consult the dryer manual and/or dryer manufacturer.

Ethernet disabled — Ethernet was turned off due to excessive network traffic.

High Air Filter dP — Indicates the air filter pressure differential is high. The air filter unit needs to be checked or changed.

High Fluid Filter dP — Indicates the fluid filter pressure differential is high. The fluid filter needs to be checked or changed.

High Moisture — Indicates package outlet RH is high and is approaching the fault limit. Proper operation of the moisture drain needs to be verified.

High Separator dP — Indicates the fluid separator pressure differential is high. The separator unit needs to be checked or changed.

High Temperature 1 — Indicates that the compressor Temperature at temp probe location 1 is approaching the set high limit.

High Temperature 2 — Indicates that the compressor Temperature at temp probe location 2 is approaching the set high limit.

High Temperature 3 — Indicates that the compressor Temperature at temp probe location 3 is approaching the set high limit.

Low Temperature 1 — Indicates that the compressor Temperature at temp probe location 1 is approaching the set low limit.

Low Temperature 2 — Indicates that the compressor Temperature at temp probe location 2 is approaching the set low limit.

Low Temperature 3 — Indicates that the compressor Temperature at temp probe location 3 is approaching the set low limit.

Not Commissioned — A controller was replaced but has not been commissioned for a specific compressor model.

Power Interruption — Indicates that a power interruption has occurred.

Replace Battery — Indicates the I/O backup battery is low.

Sequence Comm Error — Indicates a communication problem exists between the compressor controllers set up for sequential operation.

Starter — The main motor starter failed to operate, and was restarted.

User Option Warning — Indicates a user furnished switch has been activated.

VFD Overtemp — Operating temperatures are approaching the VSD limits.



4.9 FAULT MESSAGES

The compressor may restart automatically after power has been restored following a power failure.

When a **Fault** condition occurs, the machine will shut down and the display will indicate **FAULTED** on the lower line of the display window. A **Fault Message** will alternately appear in the lower line of the Normal View display briefly describing the nature of the fault. See *Figure 4-9*.

118 psi**70°F**The fault cause is:

E-Stop Push Button

Figure 4-9: Controller Display Normal View: Fault Message

The list below provides an explanation of the Fault Messages that may appear when problems occur. Refer to *Section 5: Troubleshooting* on page 29, for instructions on actions to be taken when a **FAULT** condition occurs.

Aux Motor Overload — The auxiliary motor overload relay has been tripped due to a power overload in the auxiliary motor.

CE Voltage too high / Low — The internal 24 volt supply is out of range.

Controller Watchdog — Controller watchdog timer error.

Dryer Fault — Indicates a dryer malfunction has occurred. Consult the dryer manual and/or dryer manufacturer.

Dryer Overload — Indicates a dryer overload has occurred. Consult the dryer manual and/or dryer manufacturer.

E-Stop Push Button — Emergency Stop button has been pressed.

HIGH AN0 SENSOR (AN0 - AN9) — Device assigned to sensor input AN0 through AN9 (temp probe, transducer unit, etc.) or wiring between the device and the controller module has resulted in an open circuit.

High Dryer Dewpoint — Indicates that the integrated dryer has stopped all package operation due to high dewpoint temperature. Consult the dryer manual and/or dryer manufacturer.

High Interstage Pres — Interstage pressure is above the unit limits.

High Moisture Fault — Indicates excessive moisture in compressor. Proper operation of the moisture drain needs to be verified.

High Package Press — Package Discharge pressure has exceeded the set high limit.

High Plant Pressure — Plant line pressure has exceeded the set high limit.

High Pressure A...B — Pressure at specified transducer (A or B) has exceeded the set high limit.

High Separator dP — Separator pressure differential has exceeded the set high limit.

High Spiral Valve Pr — Excessive pressure was applied to the spiral valve actuator.

High Sump Pressure — Compressor sump pressure has risen above the set limits.

High Temperature 1...3 — The temperature at specified temp probe (1 through 3) has risen above the set high limit.

High Voltage Failed — No voltage is available at the high voltage motor starter.

HIGH VOLT SENSOR — Indicates the system high voltage sensor has failed.

Illegal State — Controller operating error.

Internal Com Error — An error in communication between the controller and the compressor has occurred.

LOW AN0 SENSOR (AN0 - AN9) — Device assigned to sensor input AN0 through AN9 (temp probe, transducer unit, etc.) or wiring between the device and the controller module has resulted in a short circuit.

Low Dryer Dewpoint — Indicates that the integrated dryer has stopped all package operation due to low dewpoint temperature. Consult the dryer manual and/or dryer manufacturer.

Low Line Pressure — The line pressure has fallen below the Low Fluid Pressure set low limit.

Low Fluid Pressure — Compressor fluid pressure has fallen below the set low limit.



Low Sump Pressure — Compressor sump pressure has fallen below the set limits.

Low Temperature 1 ... **3** — Temperature at the specified temp probe (1 through 3) has fallen below the set low limit.

LOW VOLT SENSOR — Indicates the system low voltage sensor has failed.

Low Water Pressure — The water pressure switch has been tripped due to low water pressure.

Main Motor Overload — The main motor overload relay has been tripped due to a power overload in the main motor.

Memory Error — The controller I/O board has failed.

OPTION INPUT — User option error.

OPTION INPUT RUN — User option error.

Phase Protection — Indicates external phase protection relay has tripped.

Ethernet Comm Error — Communications have failed to a keypad.

Power Interruption — A power interruption has occurred at the controller.

Pump Motor Overload — The pump motor's overload relay has tripped.

Pump Starter Contact — The pump starter did not operate as expected.

Starter — Starter auxiliary contact failed to connect power to the starter.

UI Voltage too high — The voltage to the User Interface has risen above the set limit.

UI Voltage too low — The voltage to the User Interface has fallen below the set limit.

High Plant Pressure — The inlet valve failed to close as expected

VSD1 Response — The A1000 drive is not responding to run commands

VSD1 Comm Fault — An error in communication between the controller and the specified VSD compressor has occurred.

VSD1 parameter error — An error has occurred during setup of the VSD adjustments.

4.10 DIAGNOSTIC VIEWS

While in the Normal View use the **ENTER** Pad to access the **Diagnostic View**.

Use the **UP**▲ or **DOWN**▼ arrow pads to access the next Diagnostic view.

Use the ENTER Pad to return to the Normal View.

Figure 4-13 Illustrates how to navigate between the Normal View and the Diagnostic Views.

DIAGNOSTIC: ANALOG INPUT VIEW

The analog inputs are displayed in their order on the analog input terminal block in a left to right, top to bottom order. Inputs not used by the machine are not shown.

T1 T2 88 78	
PĨ PŽ	
119 109	

Figure 4-10: Typical Analog Input Status

The analog values are typically displayed in the selected units of measure.

The input labels typically refer to the pressure and temperature sensor references in the Piping and Instrumentation drawing.

DIAGNOSTIC: DIGITAL I/O VIEW

The status of the digital inputs and relay outputs are shown from left to right in the order in which they are found on the terminal blocks.



Figure 4-11: Typical Digital I/O Status

The values of one and zero refer to Active or Inactive states respectively.

The labels refer to the controller input and output naming on the wiring diagram.



DIAGNOSTIC: ALARM VIEWS

Any current fault, alarm or service reminder message will be available to view here. Multiple messages may be scrolled through using the **UP** \blacktriangle and **DOWN** \blacktriangledown arrow pads.

Recommended Service: Change Air Filter

Figure 4-12: Typical Alarm View



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Figure 4-13: Navigation between the Normal and Diagnostic view



NOTES



Section 5 TROUBLESHOOTING

TROUBLESHOOTING 5.1 INTRODUCTION

This Troubleshooting section is provided as a guide to aid in diagnosing and resolving compressor problems when they occur. The information contained in Table 5-1, Troubleshooting Guide, has been compiled from factory experience and contains symptoms and usual causes for the described problems. Each Service Reminder, Warning, or Fault Message is listed with conditions of when the problem may occur, a probable cause, and a suggested solution to the problem. DO NOT assume that these are the only problems that may occur.

This document cannot address every possible adverse condition that may occur nor does it provide every solution for the potential troubles listed. All available data concerning the trouble should be systematically analyzed before undertaking any repairs or component replacement procedures.

Always perform a detailed visual inspection when a machine problem occurs prior to attempting any repairs. Doing so may avoid unnecessary repair and/ or additional damage to the compressor.

Always remember to:

- a. Check for loose wiring.
- b. Check for damaged piping.

c. Check for parts damaged by heat or an electrical short circuit, usually apparent by discoloration or a burnt odor.

Should your problem persist after making the recommended check, consult your nearest Sullair Distributor or the Sullair factory Service Department.

NOTE

Section 5.2 and Section 5.4 portray common systematic problems that can occur during controller operation. For a more thoroughly in-depth coverage of machine operation troubles, consult the Troubleshooting Section in the machine's operator's manual.

5.2 TROUBLESHOOTING GUIDE

Table 5-1 contains symptoms and usual causes for the problems that may occur throughout the compressor system. Each warning or fault message that may appear is listed along with conditions for the problem, a probable cause, and a suggested solution to the problem. DO NOT assume that these are the only troubles that may occur.

Table 5-1: WS Controller Troubleshooting Guide				
MESSAGE	PROBABLE CAUSE	REMEDY		
Analyze Fluid	Service interval has expired. Maintenance due.	Select Maintenance from menu to see service due and part numbers.		
Aux Motor Overload Auxiliary Motor Tripped of Fan, Fluid Pump or Other		Reset auxiliary overload after element cools. Verify correct motor amps.		
		Check for loose connections.		
		Check motor starter contact for proper operation.		
		Check line voltage, if low consult power company.		
CE Voltage too high	Excessive voltage form power supply or transformer.	Check connections and adjustments.		





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Table 5-1: WS Controller Troubleshooting Guide					
MESSAGE	PROBABLE CAUSE	REMEDY			
CE Voltage too low	Inadequate voltage form power supply or transformer.	Check connections and adjustments.			
	Excessive load or short in 24v control devices.	Check wiring, coils, and solenoid valves.			
Change Air Filter	Service interval has expired.	Perform recommended maintenance and			
Change Fluid	Maintenance due.	reset the reminder using WSPC.			
Change Fluid Filter					
Change Separator					
Controller Watchdog	Controller fault.	Contact Sullair Factory Service.			
Dryer Fault	Indicates a general dryer malfunction has occurred.	Consult the dryer manual and/or Sullair Factory Service.			
High Dryer Dewpoint	The dryer is unable to cool below	Consult the dryer manual and/or			
Dryer High DP Fault	the high dewpoint temperature setting.	Sullair Factory Service.			
Low Dryer Dewpoint	The dryer is cooling below the low	Consult the dryer manual and/or			
Dryer Low DP Fault	dewpoint temperature setting.	Sullair Factory Service.			
Dryer Overload Dryer Overload Fault	Indicates a dryer overload has occurred.	Consult the dryer manual and/or Sullair Factory Service.			
Dryer Relay Fault	Indicates a general dryer malfunction has occurred	Consult the dryer manual and/or Sullair Factory Service.			
Dryer Service	Dryer malfunction is imminent.	Consult the dryer manual and/or Sullair Factory Service.			
E-Stop Push Button	E-Stop Button Active.	Release button.			
	Faulty E-Stop Button.	Check wiring.			
Ethernet disabled	Excessive Ethernet traffic	Install a router to reduce the traffic on the compressor's LAN.			
Failed to Unload	Compressor failed to unload	Check operation of the inlet valve and controls			
High Air Filter dP	Differential Pressure Across Inlet	Replace filter.			
	Filter High.	Check inlet filter pressure switch.			
HIGH AN_ SENSOR	Sensor (Pressure Transducer,	Check sensor wiring.			
	Temp Probe, etc.) or Wiring Failure.	Check sensor.			
High Dryer Dewpoint	The dryer is unable to cool below the high dewpoint temperature setting.	Consult the dryer manual and/or Sullair Factory Service.			
High Moisture	Moisture drain malfunction	Check wiring and operation of moisture drain, replace if necessary.			
	Improper moisture drain interval	Increase drain rate and/or open time.			
	Plugged moisture drain strainer	Clean strainer			
	Insufficient oil flow to absorber module. Plugged orifice and/or strainer.	Clean strainers and orifices.			

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Table 5-1: WS Controller Troubleshooting Guide				
MESSAGE	PROBABLE CAUSE	REMEDY		
High Oil Filter dP	Pressure across fluid filter above 20 psi (1.4 bar) while running.	Replace fluid filter.		
	Fluid filter clogged.	Sump heater may be required in ambients		
	Low ambient temperature.	below 40°F (4°C).		
	Sensor failure.	Check sensor, wiring and tubing.		
High Interstage Pres	Compressor Interstage Blockage or second stage failure	Inspect for: interstage flow restriction, or damaged air end and repair		
High Package Press	High pressure.	Check operation of valves and controls.		
High Pressure A	Faulty pressure sensor.	Check and replace pressure sensor if		
High Pressure B		defective.		
High Separator dP	High Separator pressure drop	Inspect separator and replace		
High Spiral Valve Pr	Misadjustment	Check setting of the pressure regulator for the spiral valve actuator.		
High Sump Pressure	Sump Pressure High (Poppet, Sullicon, Spiral, Blowdown or Pneumatic Valve Failed).	Check valves. Check Sullicon adjustment (see Control Adjustment section in the compressor operator's manual).		
	Faulty solenoid valves.	Check solenoid valve operation and wiring.		
	Faulty pressure regulator.	Check pressure regulator adjustment and operation.		
		Check minimum pressure check valve (not applicable to Fluid Free compressors).		
High Temperature 1	High Temp Fault.	Ambient above 105°F (41°C), improve local ventilation.		
High Temperature 3	Fluid level low.	Replenish fluid to proper level.		
	Thermal valve fault.	Check thermal valve operation.		
	Cooler fins dirty.	Clean Cooler fins and fan blades.		
	Low water flow.	Check for valve closed, pump off or broken pipe.		
	High water temperature.	Increase water flow or lower water temperature.		
	Cooler plugged.	Clean cooler tubes and shell. If plugging persists, use cleaner water.		
	Temp probe or sensor failure.	Check sensor and wiring.		
High Voltage Failed	No power to the high voltage starter	Close the disconnect switch Check main motor fuses or circuit breaker		
Illegal State	Controller fault.	Contact Sullair Factory Service.		
Ethernet Comm Error	Module Network Error; Communication has failed between the Display Module, I/O Module and other modules.	Check wiring.		
LOW AN_SENSOR Sensor (Pressure Transducer, Temp Probe, etc.) or Wiring Failure.		Check sensor wiring. Check sensor.		



Table 5-1: WS Controller Troubleshooting Guide					
MESSAGE	PROBABLE CAUSE	REMEDY			
Low Dryer Dewpoint	The dryer is cooling below the low dewpoint temperature setting.	Consult the dryer manual and/or Sullair Factory Service.			
Low Line Pressure	Demand exceeds capacity.	Reduce demands.			
	Leaks in supply lines.	Increase capacity.			
		Check for leaks or open lines in air supply.			
		Repair as necessary.			
Low Fluid Pressure	Fluid filter clogged.	Replace fluid filter.			
	Sump fluid level low.	Replenish fluid to proper level.			
	Low ambient temperature.	Sump heater may be required in ambients below 40°F (4°C).			
		Fluid pump may be required for remote coolers.			
	Fluid pump failure.	Consult Sullair Factory Service.			
Low Sump Pressure	Bad sensor or connections. Machine may have failed to start.	Check pressure sensor, wiring and tubing. Check machine operation.			
Low Temperature 1	Low ambient air temperature	Sump heater may be required in ambients			
Low Temperature 2		below 40°F (4°C).			
Low Temperature 3					
Low Water Pressure	Cooling Water Pressure below 10 psi (0.7 bar).	Check for closed valves or broken pipes.			
Low Water Pressure	Switch is shorted or open.	Replace switch. Check wiring for shorts, arcing or loose connections.			
Main Motor Overload	Main Motor Overload Relay Tripped.	Reset overload after heater element cools down.			
		Check that compressor is properly configured.			
		Ensure load pressure is set below limit of compressor.			
		Check line voltage, if low consult power company.			
Maintenance A	Service interval has expired.	Perform recommended maintenance and			
	Maintenance due.	reset the reminder using WSPC.			
Memory Error	The controller I/O board has failed.	Board replacement required. Contact Sullair Factory Service.			
Not Commissioned	Controller replacement	Follow commissioning procedures to set up for the specific compressor package.			
Option Input Option Input Run	User furnished switch has operated.	Check operation of optional device.			
User Option Warning	User furnished external phase relay protection relay has tripped.	Check operation of optional device. Refer to user supplied phase relay documentation and troubleshooting steps.			
Port C Comm Error (C or E)	Wiring fault between the controller and keypad	Check the cable and connections			
Power Interruption	Intermittent Control Power.	Check line voltage and connections.			





Table 5-1: WS Controller Troubleshooting Guide				
MESSAGE	PROBABLE CAUSE	REMEDY		
Pump Motor Overload	Auxiliary Motor Tripped on Fluid Pump Motor	Reset auxiliary overload after element cools. Verify correct motor amps.		
		Check for loose connections.		
		Check motor starter contact for proper operation.		
		Check line voltage, if low consult power company.		
Pump Starter Contact	Pump starter failed to operate. Faulty auxiliary contact.	Check starter and control wiring. Check contact and contact wiring.		
Replace Battery	Controller I/O backup battery is low.	Replace battery.		
High Separator dP	Pressure Differential Across Separator High.	Replace separator.		
	Plugged separator elements.	Check sensor wiring.		
	Pressure sensor failure.			
Sequence Comm Error	Cable or connection fault between compressors.	Check wiring.		
	Improper sequence adjustments.	Check sequence settings of all compressors in the sequence.		
Starter	Main starter failed to operate. Faulty auxiliary contact. Momentary Line Power loss or brownout	Check starter and control wiring. Check contact and contact wiring. Check Line Power quality		
UI Voltage too high	Controller fault.	Contact Sullair Factory Service.		
UI Voltage too low	Controller fault.	Contact Sullair Factory Service.		
User Option Warning	User furnished switch has operated.	Check function of optional device.		
HIGH VOLT SENSOR	Controller fault.	Contact Sullair Factory Service.		
LOW VOLT SENSOR	Controller fault.	Contact Sullair Factory Service.		
VSD1 Comm Fault	Communications lost with the VSD	Check connections to the VSD.		
		Check VSD control power and check for board faults.		
VFD Overtemp	Warns that the variable frequency drive is too hot	Ensure adequate ventilation Schedule cleaning before a High Temp fau occurs		
VSD1 parameter error	Controller commissioned incorrectly.	Commission the controller per the machine nameplate		
	Incorrect VSD	Replace with proper drive rating		
VSD1 Response	The A1000 drive is not responding to WS control.	g Remove power for 1 minute Restore power for 1 minute Restart the machine		



5.3 WS CONTROLLER FAULTS AND WARNINGS

Parameter	Туре	Sensor	High Limit	Low Limit	Comment
Separator Pressure Δ	Warning	P2-P1+offset	10 psid		offset for aftercooler or dryer
Sump Pressure	Fault	P1	135 psig	5 psig	100 psig machine
			150 psig	5 psig	125 psig machine
			175 psig	5 psig	150 psig machine
			200 psig	5 psig	175 psig machine
			165 psig	5 psig	100-140 psig VSD machine
			200 psig	5 psig	150-175 psig VSD machine
Line Pressure	Fault	P2	125 psig	10 psig	100 psig machine
			150 psig	10 psig	125 psig machine
			175 psig	10 psig	150 psig machine
			200 psig	10 psig	175 psig machine
			155 psig	10 psig	100-140 psig VSD machine
			200 psig	10 psig	150-175 psig VSD machine
Air End Discharge Temperature	Warning	T1	225 F	0 F	
	Fault	T1	235/255F	0 F	Time delayed/immediate

5.4 MACHINE BEHAVIOR AFTER A POWER INTERRUPTION

If the compressor was faulted prior to the power interruption, the controller will resume the **FAULTED** condition and display the reason for the fault. Repair

the cause of the fault and press the **STOP** pad to reset the controller.

If the compressor was manually stopped prior to the power interruption, the controller will return to the manually stopped mode. Press the **START** button to manually restart operation.

If the restart timer is greater than Zero AND the controller was in **Automatic** or **Manual** mode prior to the interruption, the controller will resume that mode after the restart timer expires. No key press is necessary to restart the compressor.

5.5 INTERNAL BATTERY

The WS Controller employs an internal battery that maintains the real-time clock and maintains the

integrity of the controller memory records when power is disconnected from the controller. For best performance, ensure that the battery is functioning. If the controller is operated with a drained or dead battery, the time-of-day records will not work properly and loss of recent records could occur. If recent records are lost due to an inoperative battery (or other reason), the controller will revert to the last saved versions of settings and records.

The internal battery is located inside the controller I/ O module and will operate for several years without requiring maintenance. When the battery voltage gets low, the controller will issue a "Replace Battery" warning. Perform the following steps to replace the battery.

- 1. Press the **STOP** pad to Stop the compressor.
- 2. Disconnect and lockout power according to lockout/tag out procedure.
- 3. Open the controller enclosure and locate the I/O Control Module.



SECTION 5

WS CONTROLLER USER INTERFACE MANUAL

- 4. Remove six screws from I/O Control Module cover and remove cover.
- 5. Locate the internal battery. The battery is located near one end of the I/O circuit board (usually oriented towards the top).
- 6. Remove the battery and replace with a battery type BR2330.
- 7. Replace the cover, close the enclosure, follow normal startup procedures.





Small I/O Control Module Circuit Board



Large I/O Control Module Circuit Board



NOTES



Section 6 VARIABLE SPEED DRIVE

6.1 OVERVIEW

The Sullair VSD drive application is custom designed for operation of air compressors. All necessary control functions are performed through the WS Controller keypad and WSPC software. The drive functions as a module on the WS Controller communications bus. WSPC provides detailed information about relevant drive status data and compressor performance. Drive controls are coordinated with internal compressor controls, and with other Supervisor or WS controlled compressors in sequenced systems. The WS Controller monitors drive performance to provide motor thermal and other protections in an easy-to-use, robust design.

6.2 INSTALLATION

Refer to the VSD Installation and Service manual that came with the compressor for installation information.



NOTES



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