

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: 02250165-411 R01

KEEP FOR FUTURE REFERENCE

SULLAIR CORPORATION

The information in this manual is current as of its publication date, and applies to compressor **serial number**:

20080301000

and all subsequent serial numbers.



AIR CARE SEMINAR TRAINING

Sullair Air Care Seminars are courses that provide hands-on instruction for the proper operation, maintenance, and servicing of Sullair products. Individual seminars on Industrial compressors and compressor electrical systems are offered at regular intervals throughout the year at Sullair's corporate headquarters training facility located at Michigan City, Indiana.

Instruction includes training on the function and installation of Sullair service parts, troubleshooting common faults and malfunctions, and actual equipment operation. These seminars are recommended for maintenance, contractor maintenance, and service personnel.

For detailed course outlines, schedule, and cost information contact:

SULLAIR CUSTOMER CARE TRAINING DEPARTMENT

1-888-SULLAIR or 219-879-5451 (ext. 5623) www.sullair.com

- Or Write -

Sullair Corporation

3700 E. Michigan Blvd. Michigan City, IN 46360 Attn: Service Training Department.



TABLE OF CONTENTS

SECTION 1—SAFETY

- 5 1.1 GENERAL
- 5 1.2 PERSONAL PROTECTIVE EQUIPMENT
- 5 1.3 PRESSURE RELEASE
- 6 1.4 FIRE AND EXPLOSION
- 6 1.5 MOVING PARTS
- 7 1.6 HOT SURFACES, SHARP EDGES AND SHARP CORNERS
- 7 1.7 TOXIC AND IRRITATING SUBSTANCES
- 8 1.8 ELECTRICAL SHOCK
- 8 1.9 LIFTING
- 9 1.10 ENTRAPMENT

SECTION 2—STARTUP PROCEDURES

- 11 2.1 INTRODUCTION
- 11 2.2 WS CONTROLLER PANEL LAYOUT
- 12 2.3 WS START UP PROCEDURES
- 13 2.4 SHUTDOWN PROCEDURE

SECTION 3—ADJUSTMENTS

- 15 3.1 INTRODUCTION
- 15 3.2 COMPRESSOR ADJUSTMENT PROCEDURES
- 16 3.3 USER ADJUSTABLE CONTROL PARAMETERS
- 18 3.4 CALIBRATION OF P2 PRESSURE TRANSDUCERS
- 18 3.5 REMOTE UNLOAD

SECTION 4—DESCRIPTION

- 19 4.1 INTRODUCTION
- 19 4.2 TOUCH PAD BUTTON DESCRIPTION
- 19 4.3 INDICATOR LED DESCRIPTION
- 20 4.4 DISPLAY SCREEN
- 21 4.5 OPERATING MODES
- 21 4.6 OPERATING STATES

TABLE OF CONTENTS

22	4.7	NORMAL VIEW SERVICE REMINDERS
23	4.8	WARNING MESSAGES
24	4.9	FAULT MESSAGES

SECTION 5—TROUBLESHOOTING

27	5.1	TROUBLESHOOTING INTRODUCTION
27	5.2	TROUBLESHOOTING GUIDE
31	5.3	WS CONTROLLER FAULTS AND WARNINGS
31	5.4	MACHINE BEHAVIOR AFTER A POWER INTERRUPTION
31	5.5	INTERNAL BATTERY
33	5.6	REPLACEMENT CONNECTOR PLUGS

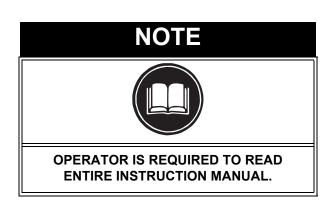
SECTION 6—VARIABLE SPEED DRIVE

35	6.1	SAFETY
36	6.2	OVERVIEW
39	6.3	INSTALLATION
39	6.4	WS CONTROLLER DISPLAY AND MENUS
42	6.5	STARTUP OF NEW VSD COMPRESSOR PACKAGE
42	6.6	VSD COMPRESSOR TROUBLESHOOTING



Section 1

SAFETY



1.1 GENERAL

Sullair Corporation 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.
- 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.
- 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 also clothing away from couplings, fans and other moving parts.
- **B. DO NOT** attempt to operate the compressor with the fan, coupling or other guards removed.



SECTION 1

- **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.

A 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 on safety equipment.

- 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.
- **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.
- 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.

A DANGER

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.



BLANK PAGE



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.

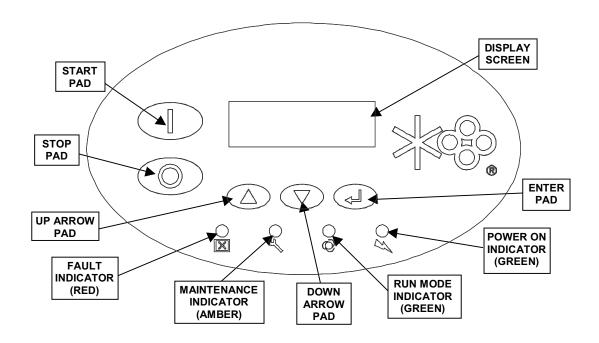


Figure 2-1: WS Controller Panel



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 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.
- 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/tagout procedure.
- 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 sincethe 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:

- With the compressor running, visually check that the fan rotation is correct.
- If it is incorrect, change the direction of the fan motor by disconnecting power from the compressor.
- Disconnect and lockout power according to lockout/tagout 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.

- 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.
- Slowly open the shut-off valve to the service line.
- Press the START pad to start the compressor. Compressor will begin operating in the default mode (Automatic) set at the factory.
- Check for possible leaks in piping.
- 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.



SECTION 2

WS CONTROLLER USER INTERFACE MANUAL

- 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

- 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.

4. 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 pad on the WS Controller panel.

NOTE

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

A WARNING

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



BLANK PAGE



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 Settings-----". 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.
- 2. 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 current 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 Pressure - (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. Refer to *Section* 6 for additional details.

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".

Language - The choice of language for text that will appear on the display screen (English, French, Spanish, German, Italian, Chinese).

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.



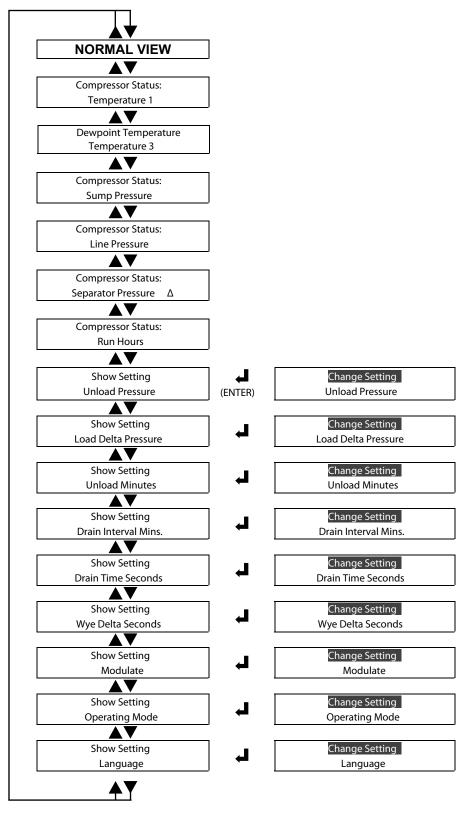


Figure 3-1: Controller Display Flow Diagram



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 27 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 Views, Compressor Adjustment Views.

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.

118 psi 70°F AUTOMATIC

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.

Compressor Status:
Line Pressure
118 psi

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.

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 \Delta—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.

NOTE

See Section 6: Variable Speed Drive on page 35 for additional VSD parameters.

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 - -----" 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.





Figure 4-3: Adjustment View— Show Setting Example



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:

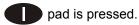
Automatic mode—Indicated by the word AUTOMATIC appearing in the lower line of the display window. This is a user selected mode that sets the compressor motor to automatically start when conditions necessitate and stop when motor operation is not required.

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

parameters function the same in both Manual and Automatic modes.

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.



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



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 and 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.

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.



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—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 27, for additional instructions on actions to be taken when warning conditions exists.



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.

Dryer High DP—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.

Dryer Low DP—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.

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 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.

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.

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

WARNING

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



4.9 FAULT MESSAGES

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*.



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 27, 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.

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 Package Pressure—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 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 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 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 Voltage Sensor—Indicates the system low voltage sensor has failed.

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

Low Water Pressure Switch—The water pressure switch is faulty.

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

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

Option Input—User option error.

Option Input Run —User option error.

Phase Relay (User option)—Indicates external phase protection relay has tripped.



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

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

Starter Aux. Contact—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.

VSD1 ... **VSD2** 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.



BLANK PAGE



Section 5

TROUBLESHOOTING

5.1 TROUBLESHOOTING 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 Corporation 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 Trouble-shooting 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.

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 on Cooling Fan, Fluid Pump or Other 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.



Table 5-1: WS Controller Trou		DEMEDY	
MESSAGE	PROBABLE CAUSE	REMEDY	
Change Air Filter	Service interval has expired.	Perform recommended maintenance and reset the reminder using WSPC.	
Change Fluid	Maintenance due.		
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.	
Dryer High DP	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.	
Dryer Low DP	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.	
High Air Filter ΔP	Differential Pressure Across Inlet	Replace filter.	
	Filter High.	Check inlet filter pressure switch.	
High analog input AN0 through	Sensor (Pressure Transducer,	Check sensor wiring.	
AN9	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 Fluid Filter ΔP	Pressure across fluid filter above 20 psi (1.4 bar) while running.	Replace fluid filter.	
	Fluid filter clogged.	Sump heater may be required in ambien	
	Low ambient temperature.	below 40°F (4°C).	
	Sensor failure.	Check sensor, wiring and tubing.	
High Package Pressure	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 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 wirir	
	Faulty pressure regulator.	Check pressure regulator adjustment an operation.	
		Check minimum pressure check valve (napplicable to Fluid Free compressors).	



Table 5-1: WS Controller Trou	ubleshooting Guide	
MESSAGE	PROBABLE CAUSE	REMEDY
High Temperature 1 High Temperature 2	High Temp Fault.	Ambient above 105°F (41°C), improve local ventilation.
High Temperature 3	Fluid level low.	Replenish fluid to proper level.
Trigit temperature o	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.
Illegal State	Controller fault.	Contact Sullair Factory Service.
Internal Com Error	Module Network Error; Communication has failed between the Display Module, I/O Module and other modules. Check wiring.	
Low analog input AN0 through	Sensor (Pressure Transducer,	Check sensor wiring.
AN9	Temp Probe, etc.) or Wiring Failure.	Check sensor.
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	Switch is shorted or open.	Replace switch. Check wiring for shorts, arcing or loose connections.



Table 5-1: WS Controller Tro	-		
MESSAGE	PROBABLE CAUSE	REMEDY	
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	Service interval has expired.	Perform recommended maintenance and	
	Maintenance due.	reset the reminder using WSPC.	
Memory Fault	The controller I/O board has failed.	Board replacement required. Contact Sullair Factory Service.	
Option Input Option Input Run	User furnished switch has operated.	Check operation of optional device.	
Phase Relay	User furnished external phase relay protection relay has tripped.	Check operation of optional device. Refer to user supplied phase relay documentation and troubleshooting steps.	
Power Interruption	Intermittent Control Power.	Check line voltage and connections.	
Replace Battery	Controller I/O backup battery is low.	Replace battery.	
Separator dP High (fault) High Separator dP (warning)	Pressure Differential Across Separator High.	Replace separator.	
	Plugged separator elements. Pressure sensor failure.	Check sensor wiring.	
Sequence Comm Error	Cable or connection fault between compressors.	Check wiring.	
	Improper sequence adjustments.	Check sequence settings of all compressors in the sequence.	
Starter Aux. Contact	Starter failed to operate.	Check starter and control wiring.	
	Faulty auxiliary contact.	Check contact and contact wiring.	
UI Voltage too High	Controller fault.	Contact Sullair Factory Service.	
UI Voltage too Low	Controller fault.	Contact Sullair Factory Service.	
User Option Switch	User furnished switch has operated.	Check function of optional device.	
Voltage Sensor failed High	Controller fault.	Contact Sullair Factory Service.	
Voltage Sensor failed Low	Controller fault.	Contact Sullair Factory Service.	
	•		



5.3 WS CONTROLLER FAULTS AND WARNINGS

Parameter	Туре	Sensor	High Limit	Low Limit	Comment
Separator dP	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
System 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
Power Supply voltage	Fault	internal	28 V	20 V	
VSD Temperature	Warning		158 F		

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.

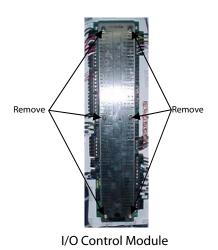
5.5 INTERNAL BATTERY

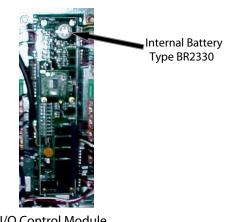
The WS Controller employs an internal battery that maintains the real-time clock and maintains the integrity of the controller memory records when power is disconnected from the controller. For best performance, ensure that the battery is functioning. If the controller is operated with a drained or dead 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 opad to stop the compressor.
- 2. Disconnect and lockout power according to lockout/tagout procedure.
- 3. Open the controller enclosure and locate the I/O Control Module.
- 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.





I/O Control Module Circuit Board

5.6 REPLACEMENT CONNECTOR PLUGS

		_			
0	< 5V Com			24V Sup >	0
0	< 5V Sup			E Stop >	0
0	< Input P1		J9	24V Com >	0
0	< 5V Com	J1		PB 485+ >	0
0	< 5V Sup	131		PB 485- >	0
0	< Input P2			PB 485C	0
0	< 5V Com		Ī	Rx O Tx O	
0	< 5V Sup			24V Sup >	0
0	< Input P3		J10	E Stop >	0
0	< 5V Com	_		24V Com >	0
	a lancet T4	_		PB 485+ >	0
0	< Input T1			PB 485- >	0
0	< 5V Com	J2	ļ	PB 485C	0
0	< Input T2 < 5V Com		ĺ	PF 485+ >	0
0	< Input T3		J11	PF 485- >	0
0	< 5V Com	1		PF 485C >	0
	- 0 0 00111	_		Rx 0 Tx 0	
0	< 24V Sup	7		PF 485+ >	0
0	< 24V Sup	1	J12	PF 485- >	0
0	< 24V Sup	J3		PF 485C >	0
0	< 24V Sup		Į.		
0	< 24V Sup				
0	< 24V Sup				
				Rx 🚺 Tx 🔾	
		_		PE 485+ >	0
0	< Din 1		J13	PE 485- >	0
0	< Din 2	1		PE 485C >	0
0	< Din 3	J4	ı	Rx 🚺 Tx 🚺	
0	< Din 4		J14	PC RS232 Rx >	0
0	< Din 5		314	PC RS232 Tx >	0
0	< Din 6			PC RS232 C >	0
0	< Din 7				
0	< Din 8				
0	< Din 9				
1			į	Don't C's	_
	< Net ES	٦		Dout 6 > Dout 5 >	0
0	< E Stop	J5		Dout 5 >	0
	- L 010p			Dout 4 >	0
			145		
0	< 24V Com		J15		
0	< 24V Com < 24V Sup	J6	J15	Dout 3 >	0
0	< 24V Sup	J6	J15	Dout 3 > Dout 3 >	
		J6	J15	Dout 3 >	0
	< 24V Sup	J6	J15	Dout 3 > Dout 3 > Dout 2 >	0
	< 24V Sup	J6	J15	Dout 3 > Dout 3 > Dout 2 > Dout 2 >	0 0 0
	< 24V Sup	J6	J15	Dout 3 > Dout 2 > Dout 2 > Dout 2 >	0 0 0 0
	< 24V Sup]	J15	Dout 3 > Dout 2 > Dout 2 > Dout 2 >	0 0 0 0
0	< 24V Sup < 24 VAC Opt] J6	J15	Dout 3 > Dout 3 > Dout 2 > Dout 2 > Dout 1 >	0 0 0 0 0
0	< 24V Sup < 24 VAC Opt < Dout 7 (NC)]		Dout 3 > Dout 3 > Dout 2 > Dout 2 > Dout 1 > Dout 1 > Dout 1 >	0 0 0 0 0
0 0	< 24V Sup < 24 VAC Opt < Dout 7 (NC) < Dout 7 (NO)]	J15	Dout 3 > Dout 2 > Dout 2 > Dout 1 > Dout 1 > Dout 1 > Dout Com > Dout Com > Dout Com > Dout Com >	0 0 0 0 0
0 0	< 24V Sup < 24 VAC Opt < Dout 7 (NC) < Dout 7 (NO) < Dout 7 (C)			Dout 3 > Dout 3 > Dout 2 > Dout 2 > Dout 1 > Dout 1 > Dout 1 > Dout Com > Dout Com > Dout Com > Dout Com > Dout Com > Dout Com >	0 0 0 0 0 0
0 0	< 24V Sup < 24 VAC Opt < Dout 7 (NC) < Dout 7 (NO) < Dout 7 (C)]		Dout 3 > Dout 2 > Dout 2 > Dout 1 > Dout 1 > Dout 1 > Dout Com > Dout Com > Dout Com > Dout Com >	0 0 0 0 0 0
0 0	< 24V Sup < 24 VAC Opt < Dout 7 (NC) < Dout 7 (NO) < Dout 7 (C)			Dout 3 > Dout 3 > Dout 2 > Dout 2 > Dout 1 > Dout 1 > Dout 1 > Dout Com > Dout Com > Dout Com > Dout Com > Dout Com > Dout Com >	0 0 0 0 0 0
0 0	< 24V Sup < 24 VAC Opt < Dout 7 (NC) < Dout 7 (NO) < Dout 7 (C)			Dout 3 > Dout 3 > Dout 2 > Dout 2 > Dout 1 > Dout 1 > Dout 1 > Dout Com > Dout Com > Dout Com > Dout Com > Dout Com > Dout Com >	0 0 0 0 0 0

Replacement connector plugs				
ID	Terminal	Part Number		
J1	10	02250161-737		
J2	6	02250161-735		
J3	6	02250161-735		
J4	9	02250161-736		
J5	2	02250161-733		
J6	2	02250161-733		
J7	3	02250161-734		
J8		(not used)		
J9	6	02250161-735		
J10	6	02250161-735		
J11	3	02250161-734		
J12	3	02250161-734		
J13	3	02250161-734		
J14	3	02250161-734		
J15	10	02250161-737		
J16	6	02250161-735		



BLANK PAGE



Section 6

VARIABLE SPEED DRIVE

6.1 SAFETY

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

WARNING

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.

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.

WARNING

Line terminals (L1, L2, L3), motor terminals (U, V, W) and the DClink/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.



WARNING

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.

A CAUTION

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.

A CAUTION

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

A CAUTION

Install the variable speed drive in a wellventilated 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.

A CAUTION

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.

A CAUTION

Make sure that the variable speed drive output terminals (U, V, W) are not connected to thedrive may occur.

6.2 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.



NOTE

ELECTRICAL PREPARATION

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.



Table 6-1: Cable and Fuse Sizes—460V Ratings

_ UL recognized type RK Based on a maximum environment of 104°F (40°C)

hp	Size (A)	Fuse (A)	Wire Size Power	Wire Size Ground
15	23	30	10	10
20	31	35	8	8
25	38	50	6	8
30	46	60	4	8
40	61	80	2	6
50	72	100	2	6
60	87	110	1	6
75	105	125	1/0	4
100	140	175	3/0	2
125	168	200	4/0	1/0
150	205	250	300MCM	2/0
200	261	350	2 x 4/0	3/0
250	300	400	2 x 250MCM	300MCM
300	385	700	2 x 300MCM	300MCM
350	460	1250	2 x 400MCM	400MCM

Table 6-2: Cable and Fuse Sizes—575V Ratings

_ UL recognized type RK Based on a maximum environment of 104°F (40°C)

		Wire Size	Wire Size
Size (A)	Fuse (A)	Power	Ground
18	30	10	10
22	35	8	8
27	40	8	8
34	45	6	8
41	50	2	6
52	70	4	6
62	80	2	6
80	125	1/0	6
100	150	2/0	6
125	175	3/0	6
144	250	300MCM	1/0
208	275	350MCM	2/0
261	700	2 x 3/0	3/0
325	700	2 x 4/0	4/0
	18 22 27 34 41 52 62 80 100 125 144 208 261	18 30 22 35 27 40 34 45 41 50 52 70 62 80 80 125 100 150 125 175 144 250 208 275 261 700	18 30 10 22 35 8 27 40 8 34 45 6 41 50 2 52 70 4 62 80 2 80 125 1/0 100 150 2/0 125 175 3/0 144 250 300MCM 208 275 350MCM 261 700 2 x 3/0



6.3 INSTALLATION

The variable speed AC drive has been properly mounted, adjusted, and tested prior to shipment of the compressor package. Inspect the unit to ensure it was not damaged during shipment. The package provides a terminal block for connection of three-phase power and ground. Refer to the package wiring diagram for specific connection information.

All internal wiring to the drive and motors has been provided by the factory, in accordance with the drive's requirements. Do not alter factory wiring. To ensure proper wiring to the package, use the following guidelines:

- Use heat-resistant copper cables only, +75°C or higher.
- The minimum input line cable and line fuses must be sized in accordance with the rated input current of the unit. See Table 6-1 and 6-2.

Consistent with UL listing requirements, for maximum protection of the variable speed drive, use UL recognized fuses, type RK, suitable for circuits delivering fault currents up to 100,000A.

6.4 WS CONTROLLER DISPLAY AND MENUS

The flow diagram of *Figure 6-1* shows the order in which the display messages appear on the WS Controller screen when connected to a VSD machine. As illustrated in the diagram, a press of the ENTER pad when viewing a parameter setting, enables access to change the control parameter value.

Refer to Section 4: Description on page 19 for a general description of the WS Controller displays. This section addresses special functions applicable to VSD packages.



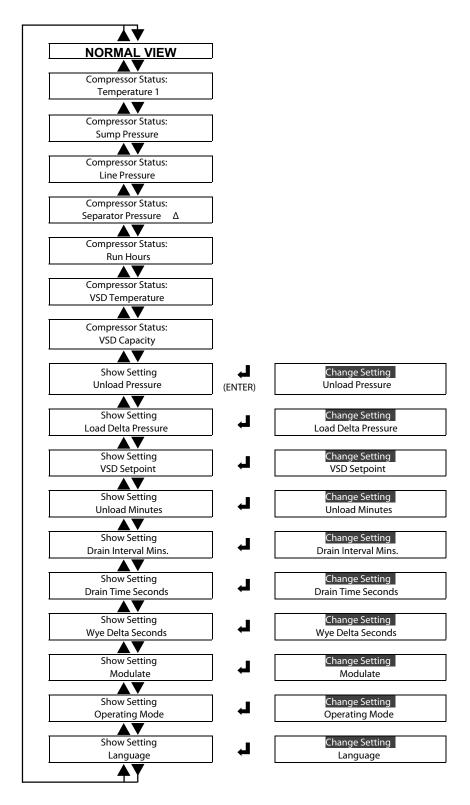


Figure 6-1: Controller Display Flow Diagram—VSD Compressor



VSD STATUS

In addition to the general status messages displayed on the WS Controller, two status messages will display to indicate, a) the temperature variable speed drive, and b) the delivery capacity of the variable speed package. The display indications are shown as:

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

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

VSD CONTROL PARAMETERS

In addition to the general control parameters described in *Section 4: Description* on page 19, a VSD specific parameter can be adjusted at the WS Controller keypad to control VSD operation. The VSD control parameter is shown as:

VSD Setpoint Pressure – This is the targeted pressure (psi, bar, or kpa) for the variable speed controls. The setpoint pressure is normally adjusted near the bottom of the load/unload delta. The

compressor speed will be adjusted to maintain this pressure. Most packages will allow adjustment of this parameter over a wide range, to allow tailoring to the needs of the application. Adjustments will be automatically made as the maximum speed to operate the motor at its full capacity at any pressure.

WSPC Interface Application - VSD

The WSPC Interface is a PC application that allows the user to monitor, control, and modify the compressor operation. It provides functionality not available via the WS Controller panel. Refer to the WSPC User Interface manual for details on controlling and modifying the VSD package performance using the WSPC application.

An additional warning message is provided when monitoring indicates a need for drive service:

VFD OVERTEMP

The internal temperature of the drive exceeds normal operating temperatures. Check for the correct volume and unrestricted flow of cooling air. Check the heatsink for dust or dirt buildup. Check the highest ambient temperature level.



6.5 STARTUP OF NEW VSD COMPRESSOR PACKAGE

Read and follow all safety warnings and cautions in this manual.

- 1. At installation ensure:
 - That the incoming power and ground wires are properly connected to terminal blocks in the electrical control box.
 - Visually check all power and controls connections to the drive to ensure that no damage has occurred.
- 2. Check that moisture has not condensed inside the variable speed drive.
- Connect to the utility and switch the power on. The WS Controller will establish communications and report errors if correct conditions are not found. If replacing a drive, communication faults will be indicated for either improper communication wiring or improper application or communication software in the drive.

Check the direction of the fan rotation. To observe the rotation, quickly press START

then the STOP on the WS Controller. If the fan rotates incorrectly, disconnect power and interchange two of the fan motor leads at the fan starter. Compressor motor rotation is factory set.

6.6 VSD COMPRESSOR TROUBLESHOOTING

The WS Controller continuously monitors VSD drive performance through the serial channel. Table 6-3 shows Fault messages that are displayed by the WS Controller in the event of problems along with possible causes and some likely solutions. The controller monitors communications with the inverter and will display a fault message if these communications are broken. The WS Controller will display a VSD drive fault with a code number of the form V—accompanied by a text description. If a keypad service tool is plugged into the drive, it will display the fault code and the fault name.

Table 6-3: VSD Troubleshooting Guide—Drive Faults				
CODE	FAULT	POSSIBLE CAUSE	SOLUTION	
VSD1	Com Fault	Communications lost with the VSD	Check connections to the VSD.	
			Check VSD control power and check for board faults.	
VSD1	Parameter Error	An error has occurred during setup of	Check for proper drive size.	
		the VSD adjustments.	Check proper WS model commissioning.	
V01 Overcurrent	Overcurrent	The variable speed drive has detected a high current (>4xIn) in its output due to: • sudden heavy load increase • short in the motor • short in the cables to the motor • unsuitable motor	Check loading.	
			Check motor.	
			Check cables.	
V02	Overvoltage	The DC-link voltage has exceeded its high limit due to: • deceleration time too short • high voltage levels or surges in the utility supply	Make the deceleration time longer. Use a chopper and brake resistor. Correct utility supply voltage (level is too high). Add input impedance to limit surges.	
V03	Ground Fault (Earth Fault)	Current sensing indicates that the sum of motor phase currents is not zero. • insulation failure in motor or motor cables	Remove faults from ungrounded systems. Check the motor and motor cables.	



WS CONTROLLER USER INTERFACE MANUAL

Table 6	Table 6-3: VSD Troubleshooting Guide—Drive Faults				
CODE	FAULT	POSSIBLE CAUSE	SOLUTION		
V05	Charging Switch	The charging switch was open when the START command was given due to: • faulty operation • component failure	Reset the fault and restart. Should the fault re-occur, contact Sullair service.		
V06	Emergency Stop	An Emergency stop signal was received from one of the digital inputs	Determine the reason for the Emergency stop and remedy it.		
V07	Saturation Trip	defective component motor or motor cable short	Cannot be reset from the keypad. Switch off power. If this fault appears simultaneously with Fault 1, check the motor and motor cables.		
			MARNING		
			If the problem is not in the motor or its cables, do not re-connect power!		
			Contact Sullair service.		
V08	System Fault	 component failure faulty operation Note: Exceptional fault data record, see the Active Fault Menu and Fault Time Data Record for more information 	Reset the fault and restart. Should the fault reoccur, contact Sullair service.		
V09	Undervoltage	DC-link voltage is less than the minimum safe operating voltage limit. • most probable cause: supply voltage too low • variable speed drive internal fault	If there was a supply voltage loss or dip, reset the fault and restart the variable speed drive. Check the supply voltage. If it was within specification at the time of the fault, an internal failure has occurred. Contact Sullair service.		
V10	Input Line Supv	Input line phase is low or missing.	Check the utility supply voltage, cables and connections.		
V11	Output Phase Sv	Current sensing indicates that there is no current in one motor phase.	Check the motor cables, connections and motor.		
V12	Brake Chopper Sv	This fault is disabled. A display of this message indicates that the components or settings of the variable frequency drive have been changed.	Correct drive parameters need to be downloaded. Contact Sullair service.		
V13	VFD Undertemp	Heatsink temperature is under 14°F (-10°C)	Provide supplemental heating or relocate the variable speed drive to a warmer location.		



CODE	FAULT	POSSIBLE CAUSE	SOLUTION
V14	VFD Overtemp	Heatsink temperature is over 194°F(90°C).	Heatsink temperature is over 194°F(90°C). Note: the drive must be allowed to cool below 131°F(55°C) for reset. Check for the correct volume and unrestricted flow of cooling air.
			Check the heatsink for dust or dirt buildup. Check the highest ambient temperature level.
			Make sure that the switching frequency is not set too high in relation to ambient temperature and motor load.
V15	Motor Stalled	motor or load mechanical failure load is too high	Check motor, mechanical system and load level.
		stall parameter settings incorrect	Confirm the stall parameter settings.
V16	Motor Overtemp	motor is overloaded motor overheating has been detected by the variable speed drive motor temperature model	Decrease the motor load. If no motor overload exists, check the temperature model parameters.
V17	Motor Underload	This fault is disabled. A display of this message indicates that the components or settings of the variable frequency drive have been changed.	Correct drive parameters need to be downloaded. Contact Sullair service.
V22	EEPROM Checksum	Parameter save fault	Upon reset of this fault, the variable speed drive will automatically reload the parameter default settings. Check all parameter settings after reset.
			If the fault reoccurs, contact Sullair service.
V24	Counter Fault	Values displayed on the counters are incorrect	Reset counters.
V25	µprocessor Watchdog	faulty operation component failure	Reset the fault and restart. Should the fault reoccur, contact Sullair service.
V26	Startup Prevented	Startup of the drive has been prevented.	Check Start Enable/Interlock settings.
V29	Thermistor Fault	This fault is disabled. A display of this message indicates that the components or settings of the variable frequency drive have been changed.	Correct drive parameters need to be downloaded. Contact Sullair service.
V31	IGBT Temperature (hardware)	IGBT Inverter Bridge overtemperature protection has detected a high short-term overload current	Check loading. Check motor size.
V32	Fan Cooling	The variable speed drive cooling fan did not start when commanded	Contact Sullair service.
V34	CAN Bus Comm	This fault is disabled. A display of this message indicates that the components or settings of the variable frequency drive have been changed.	Correct drive parameters need to be downloaded. Contact Sullair service.
V36	Control Unit	The control unit cannot control the power unit and vice-versa	Change the control unit.



CODE	FAULT	POSSIBLE CAUSE	SOLUTION
V37	Device Change	option board changed	Reset Controller.
	(same type)	different power rating of drive	Note : On reset, no Fault Time Data Record is made.
			Note : On reset, application parameter values are restored to default.
V38	Device Added (same	option board added	Reset Controller.
	type)	drive of different power rating added	Note : On reset, no Fault Time Data Record is made.
			Note : On reset, application parameter values are restored to default.
V39	Device Removed	option board removed	Reset Controller.
		drive removed	Note : On reset, no Fault Time Data Record is made.
			Note : On reset, application parameter values are restored to default.
V40	Device Unknown	Unknown option board or drive	Contact Sullair service.
V41	IGBT Temperature	IGBT Inverter Bridge overtemperature protection has detected a high short-term overload current	Check loading. Check motor size.
V42	Brake Overtemp	This fault is disabled. A display of this message indicates that the components or settings of the variable frequency drive have been changed.	Correct drive parameters need to be downloaded. Contact Sullair service.
V43	Encoder Fault	This fault is disabled. A display of this message indicates that the components or settings of the variable frequency drive have been changed.	Correct drive parameters need to be downloaded. Contact Sullair service.
V44	Device Change	option board changed	Reset Controller.
	(different type)	different power rating of drive	Note : On reset, no Fault Time Data Record is made.
			Note : On reset, application parameter values are restored to default.
V45	Device Added	option board added	Reset Controller.
	(different type)	drive of different power rating added	Note : On reset, no Fault Time Data Record is made.
			Note : On reset, application parameter values are restored to default.
V50	Analog Input	Current at the analog input is< 4 mA	Adjust analog input parameter to "None".
V51	External fault	Digital input set as an external fault input has been triggered	Clear the package emergency stop. Check E-stop wiring to the drive input.
V52	Keypad Comm	The variable frequency drive parts or settings have been changed.	Drive parameters need to be downloaded. Contact Sullair service.
V53	FieldBus	The data connection between the communication bus master and the communication bus board has failed	Check WS Controller bus cable. If installation is correct contact Sullair service.



Table 6-	Table 6-3: VSD Troubleshooting Guide—Drive Faults			
CODE	FAULT	POSSIBLE CAUSE	SOLUTION	
V54	Slot fault	Defective option board or slot	Check that the board is properly installed and seated in slot. If the installation is correct, contact Sullair service.	
V56	PT100 Board	This fault is disabled. A display of this message indicates that the components or settings of the variable frequency drive have been changed.	Correct drive parameters need to be downloaded. Contact Sullair service.	

BLANK PAGE



BLANK PAGE





WORLDWIDE SALES AND SERVICE

SULLAIR ASIA, LTD.

Sullair Road, No. 1 Chiwan, Shekuo Shenzen, Gunagdong PRV. PRC POST CODE 518068 Telephone: 755-6851686 Fax: 755-6853473 www.sullair-asia.com

SULLAIR CORPORATION

3700 East Michigan Boulevard Michigan City, Indiana, 46360 U.S.A. www.sullair.com Telephone: 1-800-SULLAIR (U.S.A. only) Fax: 219-874-1273

CUSTOMER CARE for PARTS and Service

1-888-SULLAIR (7855247) 219-874-1835

Champion Compressors, LTD.

Princess Highway
Hallam, Victoria 3803
Australia
Telephone: 61-3-9796-4000
Fax: 61-3-9703-8053
www.championcompressors.com.au

SULLAIR EUROPE, S.A.

Zone Des Granges BP 82 42602 Montbrison, France Telephone: 33-477968470 Fax: 33-477968499 www.sullaireurope.com