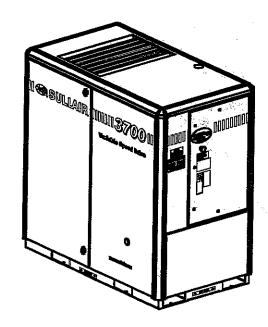


Industrial Air Compressor 3000, 3000P, 3700, 4500, 3000V, 3000PV, 3700V, 4500V 30, 37 & 45 kw/40, 50 & 60HP

Air-Cooled and Water-Cooled Standard & 24 KT



PART NUMBER: 02250155-601

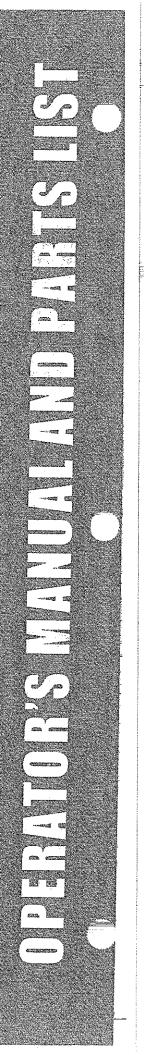
KEEP FOR FUTURE REFERENCE

SULLAIR CORPORATION

The information in this document is correct at the time of printing for utility compressor serial number

20060701XXXX

and all subsequent serial numbers.





AIR CARE SEMINAR TRAINING

Sullair Air Care Seminars are courses that provide hands-on instruction in the proper operation, maintenance and service of Sullair equipment. Individual seminars on Industrial compressors and compressor electrical systems are presented at regular intervals throughout the year at a dedicated training facility at Sullair's corporate headquarters in Michigan City, Indiana.

Instruction includes discussion of the function and installation of Sullair service parts, troubleshooting of the most common problems, and actual equipment operation. The seminars are recommended for Maintenance and 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 Bivd. Michigan City, IN 46360 Attn: Service Training Department

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Section 1

SAFETY

NOTE



OPERATOR IS REQUIRED TO READ ENTIRE INSTRUCTION MANUAL.

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

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, a 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 runs of air hose exceeding 1/2" (13mm) inside diameter to reduce pressure in case of hose failure.



SECTION 1

- **D.** Flow-limiting valves are listed by pipe size and flowrated. 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 quarding 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 Jubricant 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 also clothing away from couplings, fans and other moving
- 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 de-energized 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.

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SAFETY

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.



INHALATION HAZARD!

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 fifte 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.



SECTION 1

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.

AND ANGER

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.
- Keep lift operator in constant attendance whenever compressor is suspended.

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.
- 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
- B. Make sure all personnel are out of compressor before closing and latching enclosure doors.







Section 2

DESCRIPTION

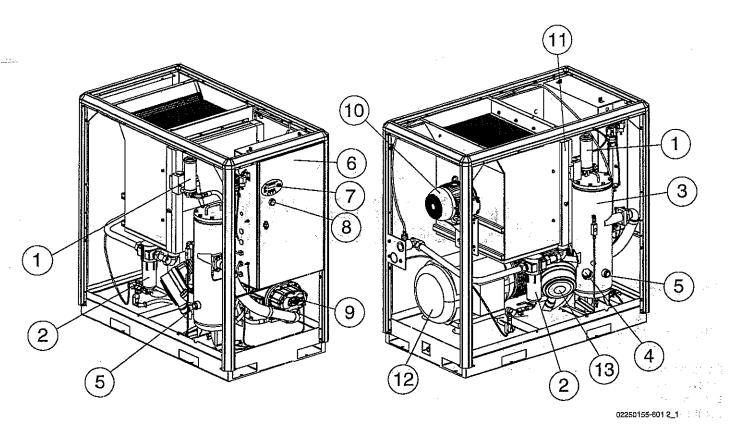
2.1 INTRODUCTION

Your new Sullair flood-lubricated rotary screw air compressor will provide you with a unique experience in improved reliability and simplified maintenance.

Compared to other types of compressors, the Sullair rotary screw is unique in mechanical reliability, with "no wear" and "no inspection" required of the working parts within the compressor unit.

Read *MAINTENANCE* on page 61 to see how surprisingly easy it is to keep your air compressor in top operating condition





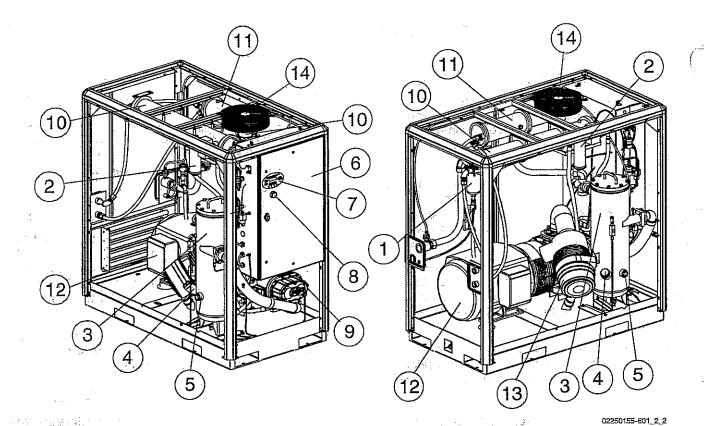
- Fluid Filter
 Moisture Separator
 Receiver Tank
 Fluid Fill
 Fluid Fill Sight Glass
 Starter Box
 WS Controller

- E-Stop Button
 Compressor Unit
 Cooler Fan Motor
 Cooler
 Motor
 Air Inlet Filter

Figure 2-1: Overall Component Layout, Air-Cooled Model

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	OOOO_FOOO CODSTCTOT OF TOTAL CONTROL CONT	- W

DESCRIPTION



- Moisture Separator
 Fluid Filter
 Receiver Tank
 Fluid Fill
 Fluid Fill Sight Glass
 Starter Box
 WS Controller

- E-Stop Button
 Compressor Unit
 Oil Cooler
 Aftercooler
 Motor

- 13. Air Inlet Filter14. Canopy Vent Fan

Figure 2-2: Overall Component Layout, Water-Cooled Model

2.2 DESCRIPTION OF COMPONENTS

efer to Figure 2-1 and Figure 2-2. The components and semblies of the air compressor are clearly shown. The complete package includes compressor, electric motor, starter, compressor inlet system, compressor discharge system, compressor lubrication and cooling system, capacity control system, WS Controller, aftercooler, a combination separator and trap, all mounted on a heavy gauge steel frame.

On air-cooled models, a fan draws air into the enclosure over the fan and main motors through the combined aftercooler and fluid cooler thereby removing the compression heat from the compressed air and the cooling fluid, and forces it out the top of the machine.

On water-cooled models, a shell and tube heat exchanger is mounted on the compressor frame. Fluid is piped into the heat exchanger where compression heat is removed from the fluid. Another similar heat exchanger cools the compressed air.

Both air-cooled and water-cooled versions have easily accessible items such as the fluid filter air/oil separator and control valves. The inlet air filter is also easily accessible for servicing.

2.3 SULLAIR COMPRESSOR UNIT, FUNCTIONAL DESCRIPTION

Illair air compressors feature the Sullair compressor unit, a single-stage, positive displacement, flood lubricated-type compressor. This unit provides continuous compression to meet your needs.

NOTE

With a Sullair compressor, there is no maintenance or inspection of the internal parts of the compressor unit permitted in accordance with the terms of the warranty.

The 3000-4500 Series compressors are factory-filled with Sullube lubricant. For more information on fluid fill, consult SPECIFICATIONS on page 17.

Sullair 24KT compressors are filled with a fluid that rarely needs to be changed. Use only Sullair 24KT fluid in the event that a fluid change is required.

CAUTION

Mixing of other lubricants within the compressor unit will void all warranties.

Sulfair recommends that a 24KT sample be taken at the first filter change and sent to the factory for analysis. This is a free service. The sample kit with instructions and self-addressed container is to be supplied by your Sulfair dealer at start-up. The user will receive an analysis report with recommendations.

Fluid is injected into the compressor unit hoses and mixes directly with the air as the rotors turn, compressing the air. The fluid flow has three basic functions:

- 1. As coolant, it controls the rise of air temperature normally associated with the heat of compression.
- Seals the clearance paths between the rotors and the stator and also between the rotors themselves.
- 3. Acts as a lubricating film between the rotors allowing one rotor to directly drive the other, which is an idler.

After the air/fluid mixture is discharged from the compressor unit, the fluid is separated from the air. At this time, the air flows through an aftercooler and separator then to your service line while the fluid is being cooled in preparation for reinjection.

@sullar.

3000-4500 Operator's Manual and Parts List

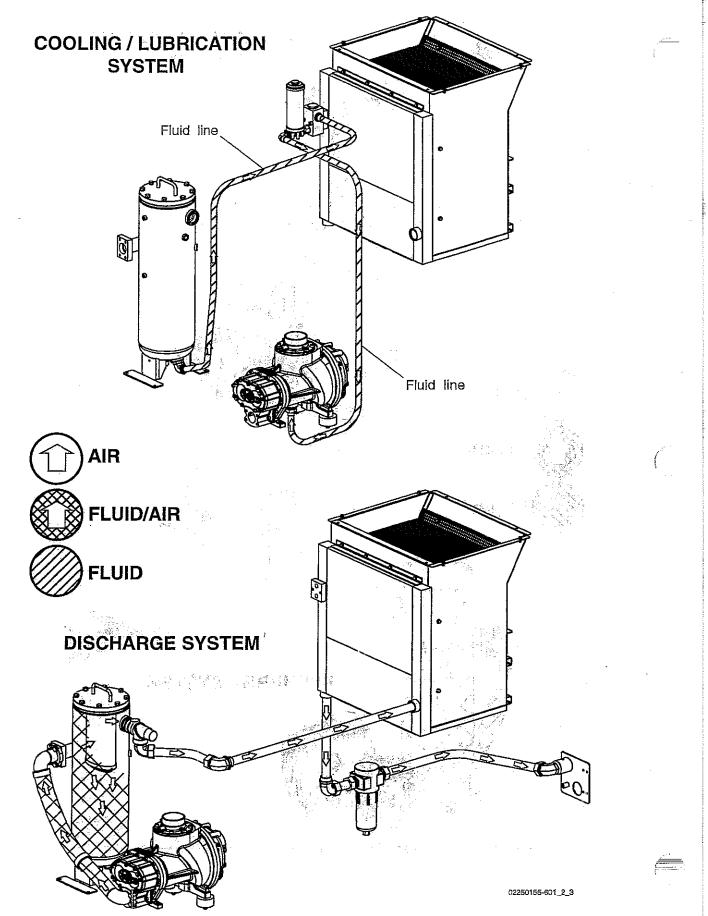


Figure 2-3: Air-Cooled, Cooling / Lubrication and Discharge System

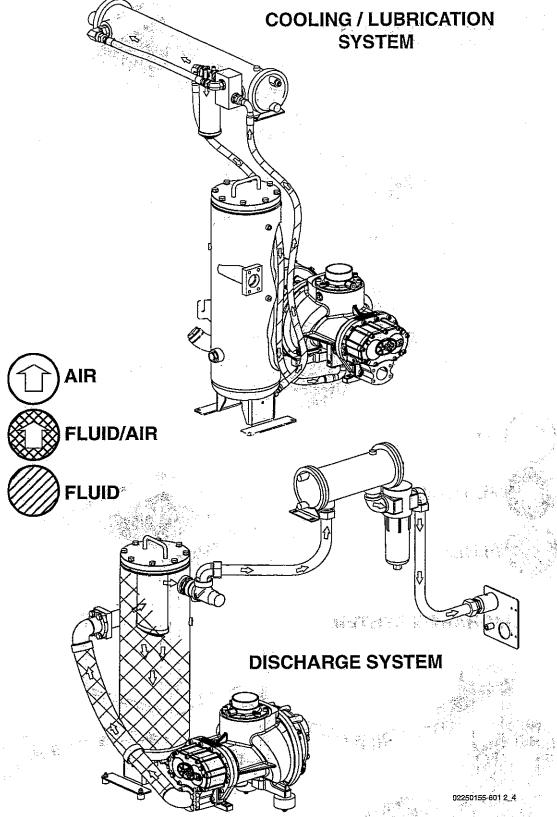


Figure 2-4: Water-Cooled, Cooling / Lubrication and Discharge System

DESCRIPTION

2.4 COMPRESSOR COOLING AND LUBRICATION SYSTEM, FUNCTIONAL DESCRIPTION

Refer to Figure 2-3 or Figure 2-4. The Cooling and Lubrication System (air-cooled version) consists of a fan, fan motor, radiator-type aftercooler/fluid cooler, full flow fluid filter, thermal valve, and interconnecting hoses. For water-cooled models, two shell and tube heat exchangers are substituted for the radiator-type cooler listed above. The pressure in the receiver tank causes fluid flow by forcing the fluid from the high pressure area of the receiver tank to an area of lower pressure in the compressor unit.

Fluid flows from the bottom of the receiver tank to the thermal valve. The thermal valve is fully open when the fluid temperature is below 185°F (85°C) [200°F (93°C) for 24KT] and pressures are rated above 150 psig. The fluid passes through the thermal valve, the main filter and directly to the compressor unit where it lubricates, cools and seals the rotors and the compression chamber.

As the discharge temperature rises above 185°F (85°C), due to the heat of compression, the thermal valve begins to close and a portion of the fluid then flows through the cooler. From the cooler the fluid flows to the fluid filter and then on to the compressor unit.

A portion of the fluid flowing to the compressor is routed to the anti-friction bearings which support the rotors inside the compressor unit.

The fluid filter has a replacement element and an integral pressure bypass valve. Refer to Lubrication Change Recommendations and Maintenance, Fluid Filter and Separator on page 21

Water-cooled models have a water pressure switch to prevent operation with inadequate water pressure.

2.5 COMPRESSOR DISCHARGE SYSTEM, FUNCTIONAL DESCRIPTION

Refer to Figure 2-3 or Figure 2-4. The compressor unit discharges the compressed air/fluid mixture into the combination receiver tank.

The receiver has three basic functions:

- It acts as a primary fluid separator.
- 2. Serves as the compressor fluid sump.
- 3. Houses the final fluid separator.

The compressed air/fluid mixture enters the receiver tank and flows through an internal baffle system. The direction of movement is changed and its velocity significantly reduced, thus causing large droplets of fluid to form and fall to the bottom of the receiver tank. The fractional percentage of fluid remaining in the compressed air collects on the surface of the separator element as the compressed air flows through the separator. A return line (or scavenge tube) leads from the bottom of the separator element to a medium pressure region of the compressor unit. Fluid collecting on the bottom of the separator is returned to the compressor by a pressure differential between the receiver and the compressor. A visual sight glass is located on the return line to observe this fluid flow. There is also an orifice in this return line (protected by a strainer) to assure proper flow. The separator system reduces the fluid carry-over to less than 1 ppm (parts per million). A message on the WS Controller indicates if abnormal pressure drop through the separator develops. Refer to

Lubrication Change Recommendations and Maintenance, Fluid Filter and Separator on page 21.

A minimum pressure/check valve, located downstream from the separator, assures a minimum receiver pressure of 50 psig (3.4 bar) during loaded conditions. This pressure is necessary for proper air/fluid separation and proper fluid circulation.

A terminal check valve is incorporated into the minimum pressure/check valve to prevent compressed air in the service line from bleeding back into the receiver on shutdown and during operation of the compressor in an unloaded condition.

A pressure relief valve (located on the wet side of the separator) is set to open if the receiver tank pressure exceeds the receiver tank rating. The WS Controller will shut down the compressor if the discharge temperature reaches 235°F (113°C).

A WARNING

DO NOT remove caps, plugs, and/or other components when compressor is running or pressurized.

Stop compressor and relieve all internal pressure before doing so.

Fluid is added to the receiver tank via a capped fluid filler opening, placed low on the tank to prevent overfilling of the receiver tank. A sight glass enables the operator to visually monitor the receiver tank fluid level.



3000-4500 Operator's Manual and Parts List

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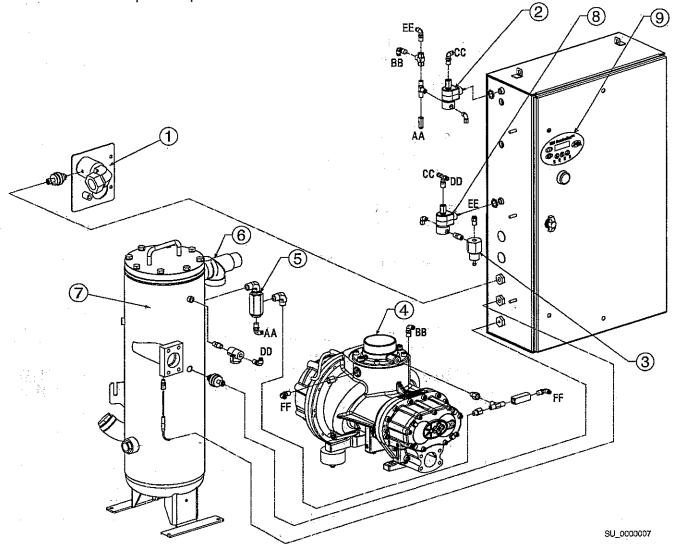


2.6 CONTROL SYSTEM, **FUNCTIONAL DESCRIPTION**

Hefer to Figure 2-5 and Figure 2-6. The purpose of the compressor control system is to regulate the amount of air being compressed to match the amount of compressed air being used. The capacity control system consists of a solenoid valve, regulator valve and an inlet valve. The functional description of the control system is described below in four distinct phases of operation. For explanatory purposes, this description will apply to a compressor with an operating range of 100 to 110 psig (6.9 to 7.6 bar). A compressor with any other pressure range would operate in the same manner except stated pressures.

Start Mode - 0 to 50 PSIG (0 to 3.5 Bar)

When the compressor "(START) pad is depressed, the receiver tank pressure will quickly rise from 0 to 50 psig (0 - 3.4 bar). The compressor initially starts unloaded with the solenoid valve open and the inlet valve closed. It then switches to full load when full rpm has been achieved. During this period, both the pressure regulator and the solenoid valve are closed, the inlet valve is fully open and the compressor pumps at full rated capacity. The rising compressor air pressure is isolated from the service line in this phase by the minimum pressure valve set at approximately 50 psig (3.4 bar).



- 1. Air Outlet
- Unload Solenoid Valve Pressure Regulator
- Air Inlet Blowdown Valve

- Minimum Pressure/Check Valve
- Receiver Tank
- Sequencing Solenoid Valve
- WS Controller

Figure 2-5: Standard Sequencing Control System

DESCRIPTION

Full Load Mode - 50 to 100 PSIG (3.4 to 6.9 BAR)

When the compressed air pressure rises above 50 psig (3.4 bar), the minimum pressure valve opens allowing compressed air to flow into the service line. From this point on, the line air pressure is continually monitored by the WS Controller. The pressure regulator and the solenoid valve remain closed during this phase. The inlet valve is in the fully open position as long as the compressor is running at 100 psig (6.9 bar) or below.

Modulating Mode - 100 to 110 PSIG (6.9 to 7.6 BAR)

If less than the rated capacity of compressed air is being used, the service line pressure will rise above 100 psig (6.9 bar). The pressure regulator valve gradually opens, directing air pressure to the inlet control valve, reducing air entering the compressor until it matches the amount of air being used. The control system functions continually in this manner between the limits of 100 to 110 psig (6.9 to 7.6 bar) in response to varying demands from the service line.

The integrated inlet valve has an orifice which vents a small amount of air to the compressor inlet when the pressure regulator controls the inlet control valve. The orifice also bleeds any accumulated moisture from the control lines.

Unload Mode- In Excess of 110 PSIG (7.6 BAR)

When a relatively small amount or no air is being used, the service line pressure continues to rise. When it exceeds 110 psig (7.6 bar), the WS Controller control system deenergizes the solenoid valve allowing receiver tank air pressure to be supplied directly to close the inlet valve. Simultaneously, the solenoid valve sends a pneumatic signal to the blowdown valve. The blowdown valve opens

to the atmosphere, located in the compressor receiver tank, reducing the receiver tank pressure to approximately 17 psig (1.2 bar). The check valve in the air service line prevents line pressure from returning to the receiver t

When the line pressure drops to the low setting (cut-in pressure; usually 100 psig (6.9 bar) on low pressure (7 bar) compressors and 125 psig (8.6 bar) on high pressure (9 bar) compressors, 150 psig (10.3 bar) on (10 bar) compressors, 175 psig (12.0 bar) on (12 bar) compressors), the WS Controller energizes the solenoid valve and allows the blowdown valve to close. The reenergized solenoid valve again prevents line pressure from reaching the inlet control valve. Should the pressure begin to rise, the pressure regulator will resume its normal function as previously described.

Load / No Load Control

If desired by the customer, the compressor can be set to operate load/no load without modulating control. This control mode is often selected when a large amount of compressed air storage (air tank) is available. Using the WS Controller keypad, select "load/no load control" from the menu. On a machine rated for 100 psig (7 bar) the compressor will run in the full load mode up to 100 psig (7 bar). If less than the rated capacity is required, pressure will rise above 100 psig and the WS Controller will deenergize the solenoid valve, causing the compressor to run in the unload mode. When the system pressure falls to 90 psig (6.3 bar), the WS Controller energizes the solenoid valve, causing the compressor to return to the full load mode. The compressor will thus operate to keep the system pressure in the range of 90-100 psig (6.3 - 6.9 bar).

Automatic Operation

For applications with varied periods of time when there are no air requirements, the WS Controller's AUTOMATIC mode allows the compressor to shutdown (time delayed) when no compressed air requirement is present and restart as compressed air is needed.



2.7 AIR INLET SYSTEM, FUNCTIONAL DESCRIPTION

Refer to Figure 2-6. The compressor inlet system consists of a dry-type air filter, a restriction gauge and an air inlet valve.

The restriction gauge (located on the air filter) indicates the condition of the air filter by showing red when filter maintenance is required

The poppet-type modulating air inlet valve directly controls the amount of air intake to the compressor in response to the operation of the pressure regulator. Refer to Full Load Mode - 50 to 100 PSIG (3.4 to 6.9 BAR) on page 13. The inlet valve also acts as a check valve, thus preventing reverse rotation when the compressor is shut down.

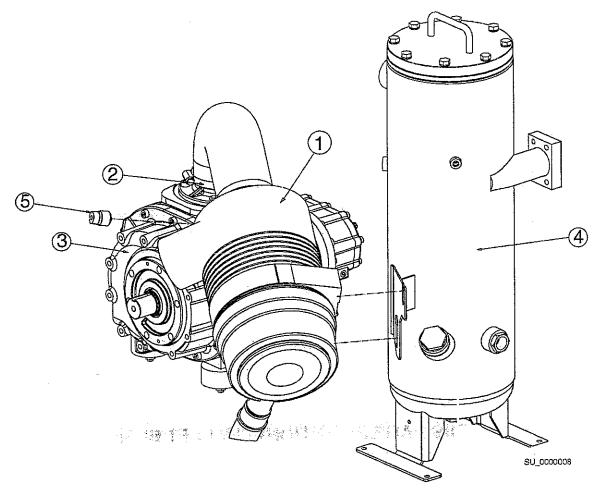
A WARNING

"The Plastic Pipe Institute recommends against the use of thermoplastic pipe to transport compressed air or other compressed gases in exposed above ground locations, e.g. in exposed plant piping." (I)

Sullube should not be used with PVC piping systems. It may affect the bond at cemented joints. Certain other plastic materials may also be affected.

(I) Plastic Pipe Institute, Recommendation B, Adopted January 19, 1972.

DESCRIPTION



- Air Inlet Filter
 Air Inlet
 Compressor Unit

- 4. Receiver Tank5. Restriction Indicator

Figure 2-6: Air Inlet System

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Section 3

SPECIFICATIONS

3.1 TABLE OF SPECIFICATIONS - 3000, 3000P, 3700 AND 4500 SERIES MODELS

	HP					DIMEN	SIONS				14.75
		Len	gth	Wic	lth	He	ight	Wei	ght	Wei	ght
MODEL (I)								lbs		kg ,	
		in	mm	in in	mm	in	mm	ODP	TEFC	ODP	TEFC
					3000 S	ERIES					
3007	40	62.0	1575	34.5	876	61.5	1562	1818	1884	825	855
3009	40	62.0	1575	34.5	876	61.5	1562	1818	1884	825	855
4 3010	40	62.0	1575	34.5	876	61.5	1562	1818	1884	825	855 /=
					3000P	SERIES	10000				1
3007P	40 -	62.0	1575	34.5	876	61.5	1562	1993	2059	904	934
3009P	40	62.0	1575	34.5	876	61.5	1562	1993	2059	904	934
3010P	40	62.0	1575	34.5	876	61.5	1562	1993	2059	904	934
					3700 5	ERIES		100			
3707	50	62.0	1575	34.5	876	61.5	1562	2043	2127	927	965
/3709	50	62.0	1575	34,5	876	61.5	1562	2043	2127	927	965
3710	50	62.0	1575	34.5	876	61.5	1562	2043	2127	927	965
3712	50	62.0	1575	34.5	876	61.5	1562	2043	2127	927	965
	1				4500 5	SERIES					
4509	60	62.0	1575	34.5	876	61.5	1562	2193	2270	995	1030
4510	60	62.0	1575	34,5	876	61.5	1562	2193	2270	995	1030
4512	60	62.0	1575	34.5	876	61.5	1562	2193	2270	995	1030
	<u> </u>				ar _e					े जैसे : # 	
(I) includes s	tandard an	d 24KT. Rate	ed pressure o	designations	appearing a	after model r	number are a	s follows:	<u> </u>		.) 도 호텔 (
07 - 10 0 psig						1	sig (10.3 bar)			·	
09 - 125 psig						12 - 175 ps	sig (12 bar)			·	
Maximum pr		ted pressure	plus 10 psig	ı (0.7 bar).				· _			





3.2 TABLE OF SPECIFICATIONS - VARIABLE SPEED DRIVE MODELS

DRIVE AMP RATING WEIGHT (lbs / kg) LENGTH (in / mm) WIDTH (in / mm) HEIGHT (in / mm) MOTOR HZ / VOLTAGE DRIVE AMP RATING 7	1575 6 / 876 1562 6 VSD SERIES /60 2 / 938 2 1575 6 / 876 3 1562 6 VSD SERIE	ODP 575/60 52 2069 / 938 32.0 / 1575 34.5 / 876 61.5 / 1562	400/50 87 1894 / 859 62.0 / 1575 34.5 / 876 61.5 / 1562 400/50 87 2069 / 938 62.0 / 1575 34.5 / 876 61.5 / 1562 ODELS 3707 THE	460/60 72 2135 / 968 62.0 / 1575 34.5 / 876 61.5 / 1562	TEFC 575/60 52 1960 / 889 62.0 / 1575 34.5 / 876 61.5 / 1562 TEFC 575/60 52 2135 / 968 62.0 / 1575 34.5 / 876 61.5 / 1562	400/50 87 1960 / 889 62.0 / 1575 34.5 / 876 61.5 / 1562 400/50 87 2135 / 968 62.0 / 1575 34.5 / 876 61.5 / 1562
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WEIGHT (lbs / kg) 2119 LENGTH (in / mm) 62.0 / WIDTH (in / mm) 34.5 / HEIGHT (in / mm) 61.5 /	/60	575/60	400/50	460/60	575/60	400/50
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WIDTH (in / mm) 34.5. HEIGHT (in / mm) 61.5/	/961 2	2171 / 984	2119/961	2203 / 999	2255 / 1023	2203/999
WIDTH (in / mm) 34.5 HEIGHT (in / mm) 61.5 /	1575 6	82.0 / 1575	62.0 / 1575	62.0 / 1575	62.0 / 1575	62.0 / 1575
Edition of the second	876	34.5 / 876	34.5 / 876	34.5 / 876	34.5 / 876	34.5 / 876
MOTOR	1562 6	31.5 / 1562	61.5 / 1562	61.5 / 1562	61.5 / 1562	61.5 / 1562
IMOTOR	VSD SERIES	S (I) = 4500 (M	ODELS 4509 THRO	DUGH 4510)		
<i></i>	<u></u>	ODP			TEFC	£3
HZ/VOLTAGE 460	60	575/60	400/50	460/60	575/60	400/50
DRIVE AMP RATING 75		52	87	72	52	87
WEIGHT (lbs / kg) 2361 /	1071 22	244 / 1018	2361 / 1071	2438 / 1106	2296 / 1041	2438/1106
LENGTH (in / mm) 62.0 /	1575 6	2.0 / 1575	62.0 / 1575	62.0 / 1575	62.0 / 1575	62.0 / 1575
WIDTH (in / mm) 34.5 /	876 3	34.5 / 876	34.5 / 876	34.5 / 876	34.5 / 876	34.5 / 876
HEIGHT (in / mm) 61.5 /	1562 6	1.5 / 1562	61.5 / 1562	61.5 / 1562	61.5 / 1562	61.5 / 1562
September Section (Section Company)	<u></u>					
(l) Includes standard and 24KT. Rated pre-	sure designat	tions appearing	g after model numb	er are as follows:		
07 - 100 psig (6.9 bar)			10 - 150 psig (10.3	bar)		
09 - 125 psig (8.6 bar)			12 - 175 psig (12 b	ar)		
Maximum pressure is rated pressure plus	7.7. · · · · · · · · · · · · · · · · · ·	-				



SPECIFICATIONS

3.3 COMPRESSOR SPECIFICATIONS

COMPRESSOR: STANDARD MODELS:			
Type:	Rotary Screw		
Standard Operating Pressure:	100 psig (7 bar) 125 psig (9 bar) 150 psig (10 bar) 175 psig (12 bar)		
Bearing Type:	Anti-friction		
Ambient Temperature (Max.) (II):	104°F (40°C)		
Cooling:	Pressurized fluid		
Compressor Fluid:	Sullair Sullube; 24KT is optional		
Receiver Capacity:	3.0 gallons (11.4 liters)		
Control:	WS Controller		

⁽ii) Special compressors are available for operation in higher ambient temperature.

MOTOR (III):	STANDARD MODELS:
Size:	40, 50, 60 HP / 30, 37, 45 KW
Туре:	C-Flanged, Open Drip-proof, Epact Efficiency, Three Phase, 230/460 60Hz, 380-415 (400) 50 Hz
VSD Type:	C-Flanged, Open Drip-proof, Premium Efficiency, Three Phase, 460V 60Hz, 380-415V (400V) 50Hz
Maximum Ambient Temperature	104°F (40°C)
Options Available:	200V and 575V 60 Hz, 220 50 Hz TEFC also available: CE Approved
Starter:	Full Voltage Magnetic, Wye-Delta or VSD
Speed - 40, 50, 60 HP:	1780 RPM (60 Hz) or 1475 RPM (50 Hz)

⁽III) Multi-frequency and voltage motors are used. The compressors must be used only with the specified electrical frequency and voltage.



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3.4 LUBRICATION GUIDE

Refer to Figure 3-1 for location of fluid fill port. For best value and longest uninterrupted service, the 3000-4500 Series compressors are factory filled and tested with Sullube lubricant.

CAUTION

Mixing of other lubricants within the compressor unit will void all warranties.

If fluid change is required, follow Section 3.6, Lubrication Change Recommendations and Maintenance, Fluid Filter and Separator on page 21

A WARNING

"The Plastic Pipe Institute recommends against the use of thermoplastic pipe to transport compressed air or other compressed gases in exposed above ground locations, e.g. in exposed plant piping." (I)

Sullube should not be used with PVC piping systems. It may affect the bond at cemented joints. Certain other plastic materials may also be affected. (I) Plastic Pipe Institute, Recommendation B, Adopted January 19, 1972.

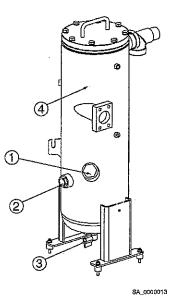
Maintenance of all other components is still recommended as indicated in the Operator's Manual

DO NOT MIX DIFFERENT TYPES OF FLUIDS. Contamination of compressor fluid with mineral oil or other fluids may lead to operational problems such as foaming, filter plugging, orifice or line plugging.

NOTE

Flush system when switching lubricant brands

When ambient conditions exceed those noted or if conditions warrant use of "extended" life lubricants contact Sullair for recommendation.



- 1. Fluid Fill Port
- Sight Glass
- 3. Fluid Drain Valve
- 4. Receiver Tank

Figure 3-1: Fluid Fill Location

3.5 APPLICATION GUIDE

Sullair encourages the user to participate in a fluid analysis program with the fluid suppliers. This could result in a fluid change interval differing from that stated in the manual. Contact your Sullair dealer for details.



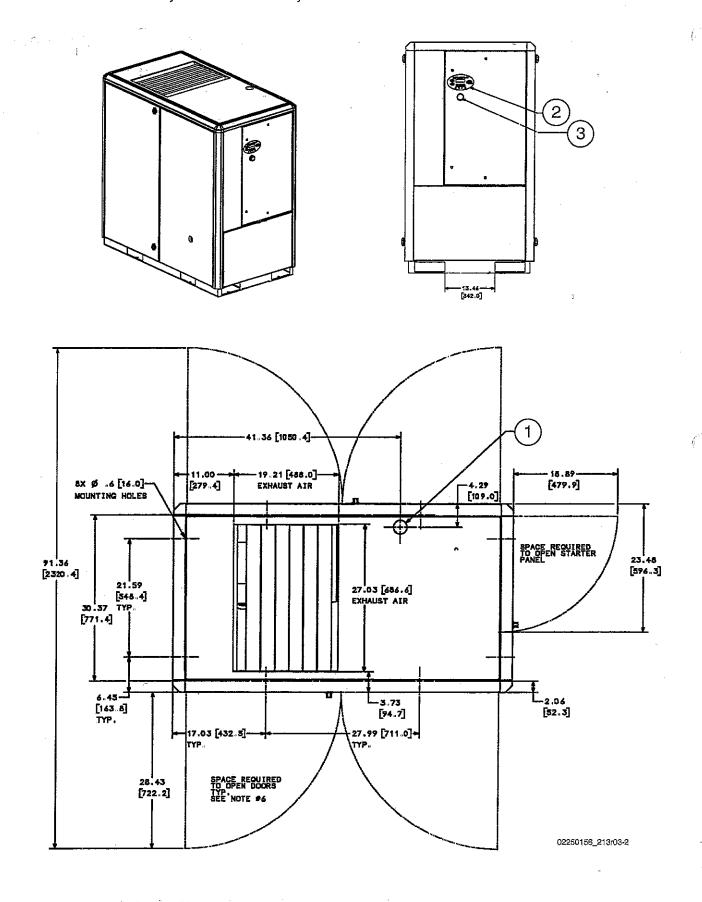
3.6 LUBRICATION CHANGE RECOMMENDATIONS AND MAINTENANCE, FLUID **FILTER AND SEPARATOR**

LUBRICANT	FLUID CHANGE	FLUID FILTER CHANGE SE	PARATOR CHANGE
Sullube	A, E	G, C	A, D
SRF 1/4000	B, E	Ġ, C	В, D
24KT	F, E	G, C	A, D
CP-4600-32-F	B, E	G, C	B, D

- A 8,000 hours or once a year
 B 4,000 hours or more frequently if conditions so require.
 C When measured pressure loss exceeds 20 psig (1.3 bar).
 D When measured pressure loss exceeds 10 psig (0.7 bar).
 E When required by fluid analysis or known contamination.
 F Does not require replacement during normal service conditions.
 G Every 2,000 hours.

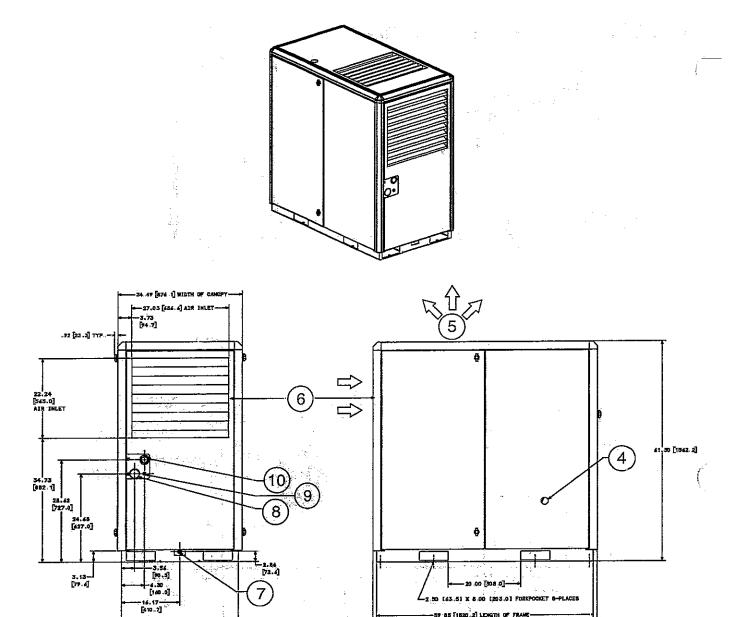


3.7 IDENTIFICATION, AIR-COOLED, STANDARD AND VSD





SPECIFICATIONS



- Alternate Incoming Power Supply Location Dia 2.5 in. (63.5mm)
 WS Controller
 E-Stop
 Oil Level Sight Glass

- 5. Air Exhaust

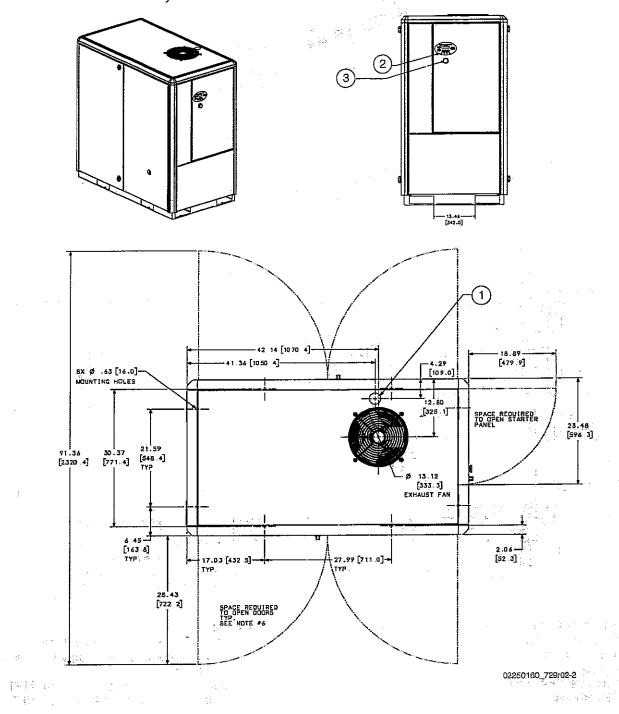
- 6. Air Inlet
- Air Intel
 Containment Pan Drain 1/2"-1/4" NPT
 Incoming Customer Power Supply Location 2.5 in. (63.5mm)
 Moisture Drain Connection 1/2"-1/4" NPT
 Air Outlet Connection 1 1/2"-11 1/2" NPT

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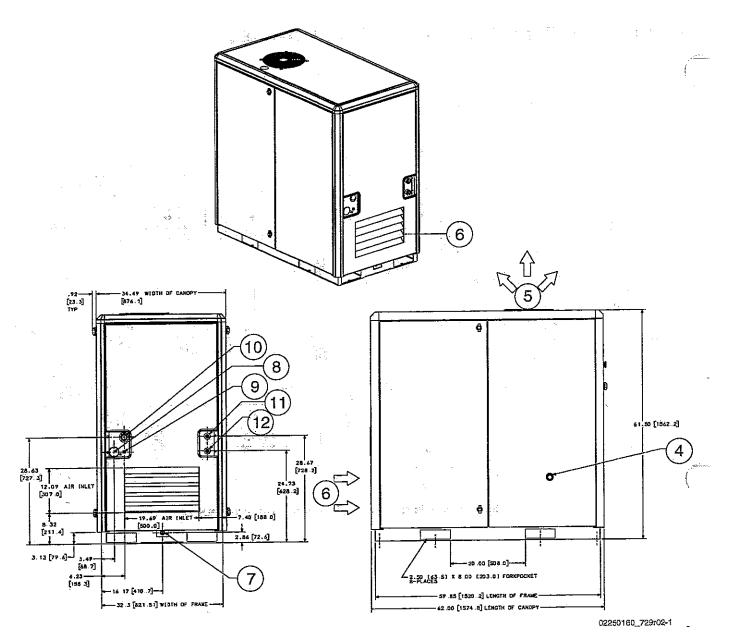
Figure 3-2: Identification, Air-Cooled, Standard and VSD



3.8 IDENTIFICATION, WATER-COOLED



SPECIFICATIONS



- 1. Alternate Incoming Power Supply Location Dia. 2.5 in. (63.5mm)

- WS Controller
 E-Stop
 Oil Level Sight Glass
 Air Exhaust
 Air Inlet

- Containment Pan Drain 1/2"-1/4" NPT
 Incoming Customer Power Supply Location 2.5 in. (63.5mm)
 Moisture Drain Connection 1/2"-1/4" NPT
 Air Outlet Connection 1 1/2"-11 1/2" NPT
 Cooling Water Out 3/4"-14 NPT
 Cooling Water in 3/4"-14 NPT

Figure 3-3: Identification, Water-Cooled



3.9 PIPING AND INSTRUMENTATION, AIR-COOLED

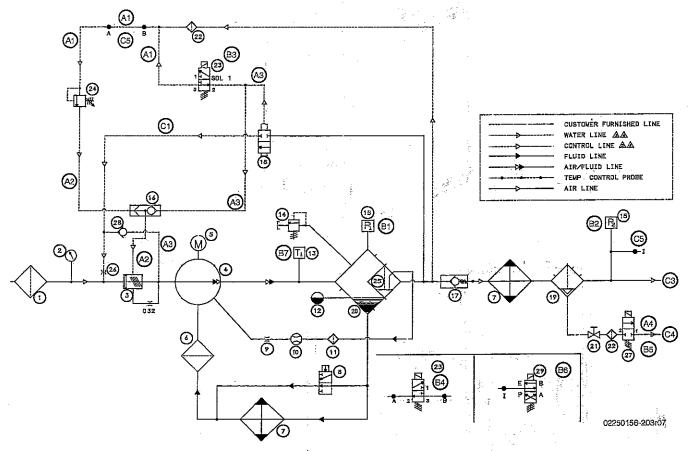


Figure 3-4: Piping and Instrumentation, Air-Cooled



SPECIFICATIONS

Key	Description	Part Number	Note (Quantity
1	filter, air 9" plastic	02250127-683	And the second s	1
2	indicator, restriction	02250003-869		1 /
3	inlet	_	(I)	1 '
4	compressor unit	. -	(I)	1
5	motor	<u>-</u>	(1)	1
6	filter, coreless 1-1/16 sae	02250155-708		1
7	cooler, air/oil 50 hp	02250151-493	(I)	1
	cooler, air/oil 60hp	02250152-862	(1)	1
8	valve, thermal 195 deg 1-1/2"-18	02250092-081	(1)	1
*	valve, thermal 210 deg 1-1/2"-18	0250148-796	(I)	1
9	orifice, 1/8 x 1/32	02250125-774		1
10	gls, sight/orf sae	02250126-129		1
11	filter, assy genisis	02250117-782		1
12	plug, sightglass 1-5/16" sae	02250097-610	1	1
13	probe, thermister 3000 ohm	02250155-175		1
14	valve, relief 1/2"	250006-938	•	1
15	xducr, 1-250# radiometric	02250155-174		2
16	valve, shuttle 1/4" double chk	408893		1
17	vlv, min pressure 1-7/8 sae	02250097-598		1
18	valve, blowdown 1/2" 1 8;1	02250100-042		1
19	sep, wtr scws-235n 1-1/2" l/ad	02250166-734		1
20	elem, sep round 5.5d x 14.3lng	02250160-774		1
21	vaive, ball 1/4"	47115		1 (
22	strainer, v-type 300psi x 1/4	241771		2
23	vlv, soi 3wno 1/4 250# 24vdc	02250155-714	(III)	1
24	valve, pressure reg	250017-280		1
25	tank, separator	02250149-624		1
26	orifice, .140 x 1/4m x 1/4f	02250161-433		1
27	vlv, soi 2wnc 1/4 200# 24vdc	02250155-715		1
28	vlv, chk 1/4" nptf brass viton	02250115-272		1
29	viv, sol ees	02250125-673	(II)	1



3.9 PIPING AND INSTRUMENTATION, AIR-COOLED (CONTINUED)

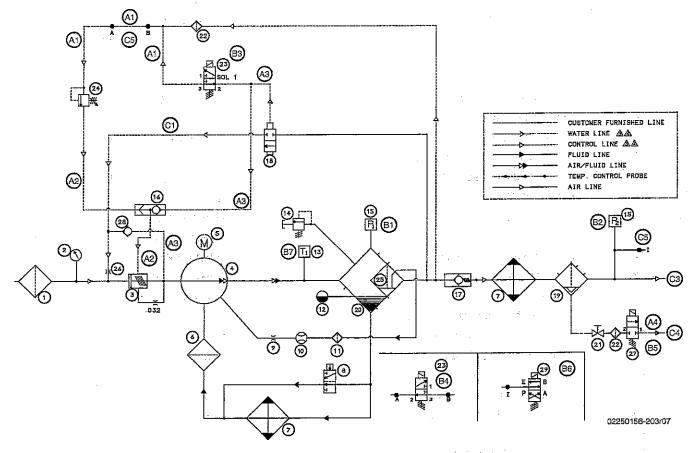


Figure 3-5: Piping and Instrumentation, Air-Cooled

SPECIFICATIONS

	Description Part Number Note Quantity
Key	
(1)	Part varies by model.
(II)	Used with EES option
(111)	Two solenoid valves are required with Sequencing option. Refer to B4
A 1	Tank pressure - blue color
A2	Reg pressure - yellow color
A3	Unload pressure - red color
A 4	Water drain - clear color
B1	P1 - Wet sump pressure
B2	P2 - Line pressure
B3	SOL 1 Load/unload solenoid valve
B4	SOL 4 - MEC/sequencing/full load solenoid valve
B5	SOL 5 - Electric drain/scd drain solenoid valve
B6	SOL 7 - EES solenoid valve (optional)
	A to open inside EES damper (winter)
	B to open outside EES damper (summer)
B7	T1 - Wet discharge temperature
C1	1/2" Hose
C2	Control moisture drain lines are 1/4" tubing except as noted
C3	1 1/2" - 11 1/2 npt air outlet
C4	1/4"-18 npt moisture drain connection.
C5	Section between lettered points (A) and (B) are to be replaced with corresponding option pictured below, as required by face of order. Refer to B4
C6	Optional heat trace is applied only to control and moisture drain lines and used only with stainless steel tubing. Refer to face of order for heat trace requirements.



3.10 PIPING AND INSTRUMENTATION, WATER-COOLED

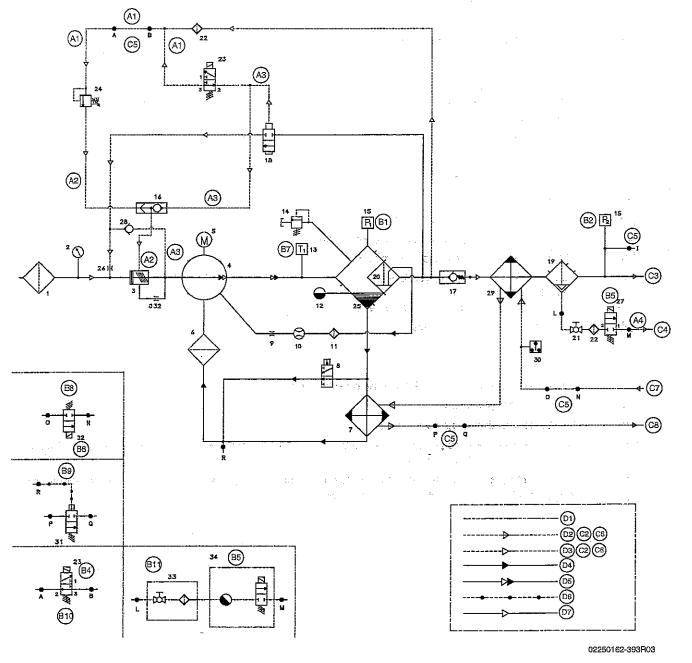


Figure 3-6: Piping and Instrumentation, Water-Cooled

3000-4500 Operator's Manual and Parts List	CO SINIA

Key	Description	Part Number	Note 0	uanti	l y
1	filter, air 9" plastic	02250127-683		1	
2	indicator, restriction	250003-869	•	1	(
. 3	inlet	-	(1)	1	
4	compressor unit	-	(i)	1	
5	motor	-	(1)	1	
6	filter, coreless 1-1/16" sae	02250155-708		1	
7	clr, oil/water 5x36 1-5/16" sae	02250094-744		1	
8	valve, thermal 210deg 1-1/2"-18 (24kt or 175 psig)	02250148-796		1	
8	valve, thermal 195deg 1-1/2"-18 (sullube)	02250092-081		1	
9	orifice, 1/8 x 1/32	02250125-774		1	
10	gls, sight/orf sae	02250126-129		1	
11	filter, assy genisis	02250117-782		1	
12	plug, sightglass 1-5/16" sae	02250097-610		1	
13	probe, thermister 3000 ohm	02250155-175	-	1	
14	valve, relief 1/2"	250006-938		1	
15	xducr, 1-250# radiometric	02250155-174		2	
16	valve, shuttle 1/4" double chk	408893		1	
17	vlv, min pressure 1-7/8" sae	02250097-598		1	
18	valve, blowdown 1/2" 1.8:1	02250100-042		1	
19	sep, wtr scws-235n 1 1/2" l/ad	02250166-734		1	
20	elem, sep round 5.5d x 14.3lng	02250160-774	-	1	
21	valve, ball 1/4"	47115		1	1
22	strainer, v-type 300psi x 1/4	241771	•	2	\
23	viv, sol 3wno 1/4 250# 24vdc	02250155-714		2	
24	valve, pressure reg	250017-280		1	
25	tank, separator	02250149-624	. 1.	1	
26	orf, 140" .25 fnpt x .25	02250161-433		1	
27	viv, sol 2wnc 1/4 200# 24vdc	02250155-715	\$4. y	1	
28	vlv, chk 1/4" nptf brass viton	02250115-272		1	
29	ht exch	250017-527	1	1	-
30	switch, press no 10 psi	250017-992	:	1	
31	valve, water reg 3/4" 160-230f	47398		1	
32	viv, sol 2wnc 3/4 250# n4	02250125-668		1	
33	vlv, ball/stnr comb 1/2f x 1/2m	02250144-842		1	
34	drn, electric condensate-scd400	02250130-866		1	
(I)	Part varies by model.				





3.10 PIPING AND INSTRUMENTATION, WATER-COOLED (CONTINUED)

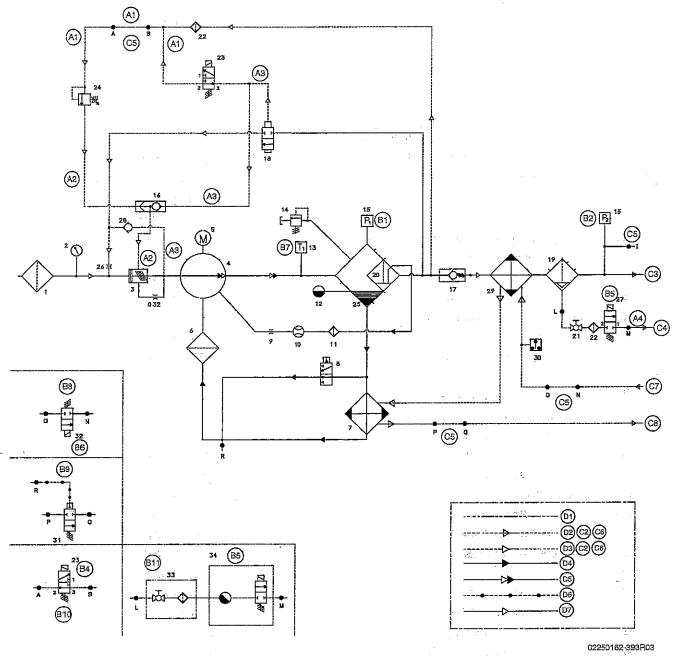


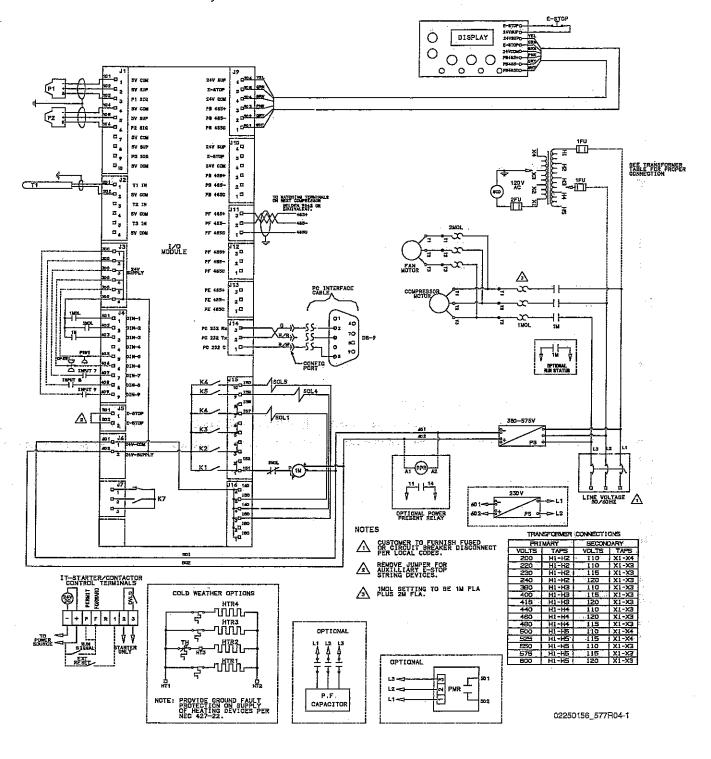
Figure 3-7: Piping and Instrumentation, Water Cooled

3000-4500 Operator's Manual and Parts Lis	ED SULLAIR.

	•			Part Number	Note	Qua	ntity
	Key A1	Description Teal areas we have color		: L Bictionib Ci			
		Tank pressure — blue color					1 200
	A2	Regulator pressure – yellow color					ì
	A3	Unload pressure – red color					
	A4	Water drain - clear color					٠
	5.4	Page 1					
	B1	P1 – wet sump pressure				-	
	B2	P2 – line pressure					
	B3	SOL 1 – load/unload solenoid valve					
S. Ash	B4	SOL 4 - MEC/sequencing/full load solenoid valve				45	
	B5	SOL 5 – electric drain/SCD drain solenoid valve	Salah Salah			4.7	
	B6	SOL 6 - water solenoid valve	files Programmer				
	B7	T1 – wet discharge temperature				-	
	B8	Water solenoid valve option					
	B9	Water regulating valve option			1.1		
	B10	Sequencing solenoid option					
	B11	SCD drain option				-	
			* . * *			7	
	C1	½" hose				4	
	C2	Control/moisture drain lines are ¼" tubing except	as noted				
	C3	1 ½" – 11 ½" npt air outlet		•			
	C4	1/4"-18 npt moisture drain connection					
	C5	Sections between lettered points are to be replace	ed with correspo	naing option pictul	rea pelow	ana ataol	l tuble
	C6	Optional head trace is applied only to control and	moisture drain lu	nes, and used only	/ with stain	ess stee	tribité
	C7	Water inlet ¾"-14 npt		į.			
	C8	Water outlet ¾"-14 npt	t.				
	D1	Customer furnished line					: i
	D2	Water line					
	D3	Control line			4.5	mag .	
	D4	Fluid line					
	D5 👫 🚉	Air/fluid line				5 8. L	
	D6	Temperature control probe		1. The second of	•		
	D7	Air line				54 - C- 1	i. :



3.11 WIRING DIAGRAM, MFV AIR-COOLED



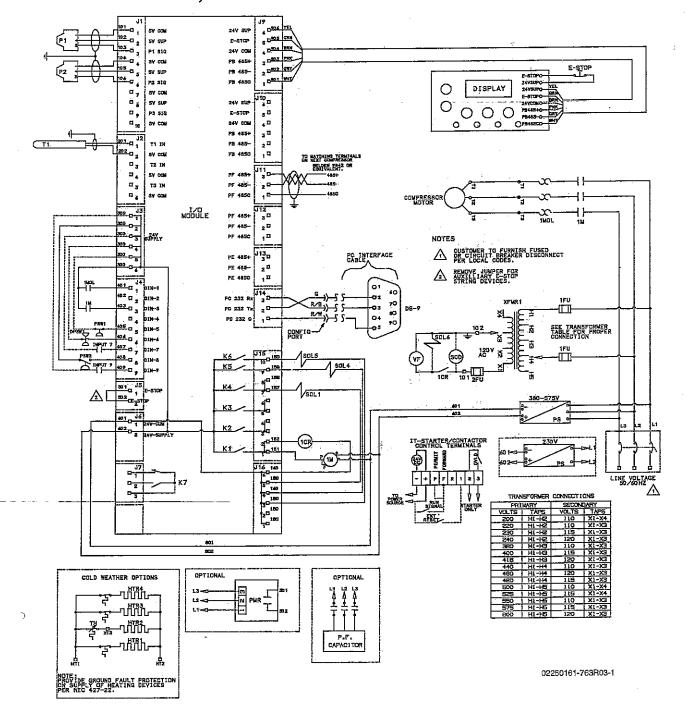
COMP	DESCRIPTION
1MOL	COMPRESSOR OVERLOAD
1M	COMPRESSOR STARTER
2MOL	FAN MOTOR OVERLOAD
P1	WET SUMP PRESSURE SENSOR
P2	PACKAGE DISCHARGE PRESSURE SENSOR
T1	UNIT DISCHAGE TEMPERATURE PROBE
PSW1	(OPT'L)INLET AIR FILTER SWITCH 558.9 MM WC - 22 IN WC
DPSW1	(OPT'L)OIL FILTER DIFF PRESS SWITCH 20PSID
	REMOTE RUN/UNLOAD
	CUSTOMER FURNISHED FAULT
	CUSTOMER FURNISHED WARNING
	LOAD CONTROL SOLENOID VALVE
SOL4	SEQUENCEING SOLENOID VALVE
SOL5	ELECTRIC CONDENSATE DRAIN VALVE
PS_	24VDC POWER SUPPLY
K1	INTERNAL RUN RELAY CONTACT
K2	INTERNAL Y-DELTA START RELAY
K3	INTERNAL WYE-DELTA RUN RELAY
K4	INTERNAL LOAD CONTROL RELAY
K5	INTERNAL SEQUENCE RELAY
K6	INTERNAL ELECTRIC DRAIN RELAY INTERNAL COMMON FAULT RELAY
K7	INTERNAL COMMON FAULT RELAY OPT'L POWER MONITOR RELAY
PMR PF CAP	POWER FACTOR CORRECTION CAPACITOR (OPT'L)
HTR1	(OPT'L) SUMP HEATER 800W
	(OPT'L) HEAT TRACE
HTR3	(OPT'L) TRAP HEATER 70WATTS
HTR4	(OPT'L) CONTROL PANEL HEATER 50 WATTS
TH	THERMOSTAT FOR HEAT TRACE OPTION
1FU	SCD TRANSFORMER PRIMARY FUSES
2FU	SCD TRANSFORMER SECONDARY FUSE
SCD	SCD DRAIN OPTION
PPR	POWER PRESENT RELAY OPTION
1 1 1 1 1 1 1 1	1

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Figure 3-8: Wiring Diagram, MFV Air-Cooled



3.12 WIRING DIAGRAM, MFV WATER-COOLED



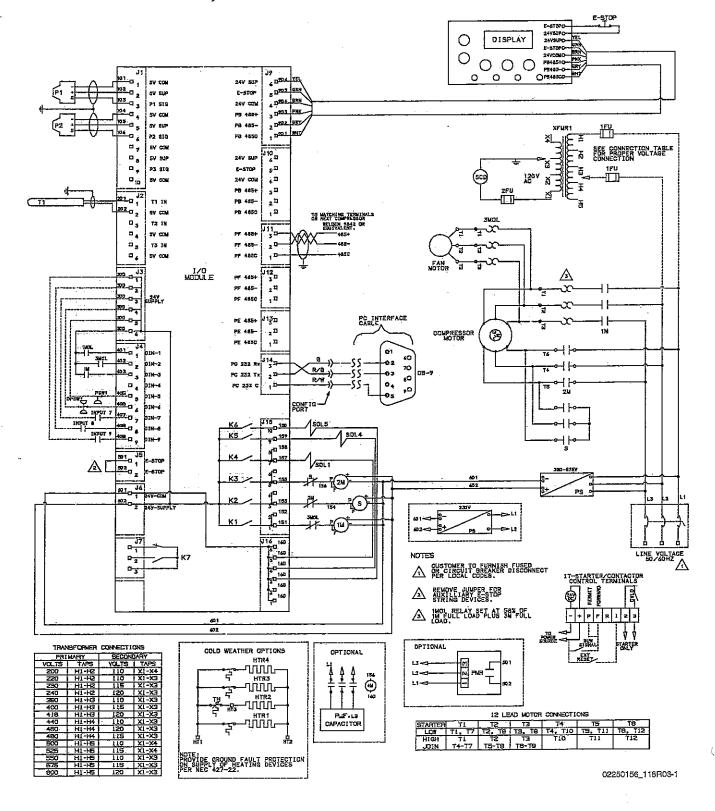
COMP	DESCRIPTION
1MOL	COMPRESSOR OVERLOAD
1 M	COMPRESSOR STARTER
P1	WET SUMP PRESSURE SENSOR
P2	PACKAGE DISCHARGE PRESSURE SENSOR
T1	UNIT DISCHAGE TEMPERATURE PROBE
PSW1	(OPT'L) INLET AIR FILTER SWITCH 558.9 MM WC - 22 IN WC
PSW2	LOW WATER PRESS SWITCH N.O. CLOSES @ 10 PSI
DPSW1	(OPT'L)OIL FILTER DIFF PRESS SWITCH 20PSID
INPUT 7	REMOTE RUN/UNLOAD
INPUT 9	
SOL 1	LOAD CONTROL SOLENOID VALVE
SOL4	SEQUENCEING SOLENOID VALVE
SOL5	ELECTRIC CONDENSATE DRAIN VALVE
SOL6_	(OPT'L) WATER SOLENOID VALVE
PS PS	24VDC POWER SUPPLY
K1	INTERNAL RUN RELAY CONTACT
K2	INTERNAL Y-DELTA START RELAY
K3	INTERNAL WYE-DELTA RUN RELAY
K4	INTERNAL LOAD CONTROL RELAY
K5	INTERNAL SEQUENCE RELAY
K6	INTERNAL ELECTRIC DRAIN RELAY
K7	INTERNAL COMMON FAULT RELAY
PMR	OPT'L POWER MONITOR RELAY
PF CAP	POWER FACTOR CORRECTION CAPACITOR (OPT'L)
HTR1	(OPT'L) SUMP HEATER 800W
HTR2	(OPT'L) HEAT TRACE
HTR3	(OPT'L) TRAP HEATER 70 WATTS
HTR4	(OPT'L) CONTROL PANEL HEATER 50 WATTS
TH	THERMOSTAT FOR HEAT TRACE OPTION
1FU	CONTROL TRANSFORMER PRIMARY FUSES
2FU	CONTROL TRANSFORMER SECONDARY FUSE
VF	CANOPY VENTILATION FAN MOTOR
1CR	CANOPY FAN CONTROL RELAY
SCD	(OPT'L) SCD DRAIN
XFMR1	CONTROL TRANSFORMER FOR 120 V OPTIONS

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Figure 3-9: Wiring Diagram, MFV Water-Cooled



3.13 WIRING DIAGRAM, WYE-DELTA AIR-COOLED



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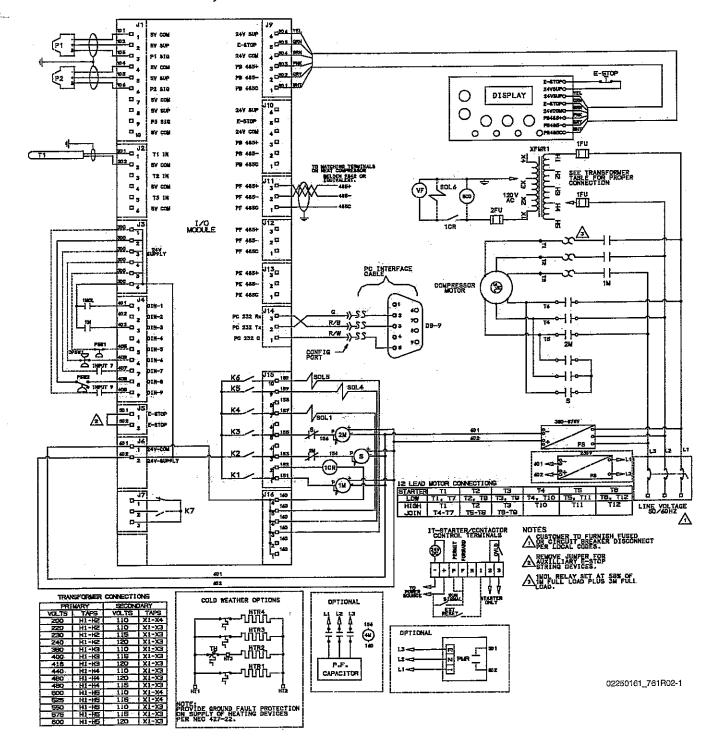
COMP	DESCRIPTION
1MOL	COMPRESSOR OVERLOAD
1 M	WYE-DELTA STARTER
2M	WYE-DELTA RUN CONTACTOR
S	WYE-DELTYA START CONTACTOR
3MOL	FAN MOTOR OVERLOAD
4 M	CONTACTOR FOR POWER FACTOR CAPACITOR OPT.
P 1	WET SUMP PRESSURE SENSOR
P2	PACKAGE DISCHARGE PRESSURE SENSOR
T1	UNIT DISCHAGE TEMPERATURE PROBE
PSW1	(OPT'L) INLET AIR FILTER SWITCH 558.9 MM WC - 22 IN WC
	(OPT'L)OIL FILTER DIFF PRESS SWITCH 20 PSID
	REMOTE RUN/UNLOAD
	CUSTOMER FURNISHED FAULT
INPUT 9	CUSTOMER FURNISHED WARNING
	LOAD CONTROL SOLENOID VALVE
SOL4	SEQUENCEING SOLENOID VALVE
	ELECTRIC CONDENSATE DRAIN VALVE
	24VDC POWER SUPPLY
K 1	INTERNAL RUN RELAY CONTACT
K2.	INTERNAL Y-DELTA START RELAY
К3	INTERNAL WYE-DELTA RUN RELAY
K4	INTERNAL LOAD CONTROL RELAY
K5	INTERNAL SEQUENCE RELAY
K6	INTERNAL ELECTRIC DRAIN RELAY
K7.	INTERNAL COMMON FAULT RELAY OPT'L POWER MONITOR RELAY
PMR	POWER FACTOR CORRECTION CAPACITOR (OPT'L)
PF CAP	(OPT'L) SUMP HEATER 800W
HTR1	(OPT'L) HEAT TRACE
	(OPT'L) TRAP HEATER 70WATTS
HTR3	(OPT'L) CONTROL PANEL HEATER 50WATTS
TH	THERMOSTAT FOR HEAT TRACE OPTION
1FU	(OPT'L) TRANSFORMER PRIMARY FUSES
2FU	(OPT'L) TRANSFORMER SECONDARY FUSE
SCD:	(OPT'L) SCD DRAIN
XFMR1	CONTROL TRANSFORMER FOR OPTIONAL SCD DRAIN
VI. IAU Z. F	CONTROL TRANSPORTER TOR OF TORNE SO STATE OF TRANSPORTER

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Figure 3-10: Wiring Diagram, Wye-Delta Air-Cooled



3.14 WIRING DIAGRAM, WYE-DELTA WATER-COOLED



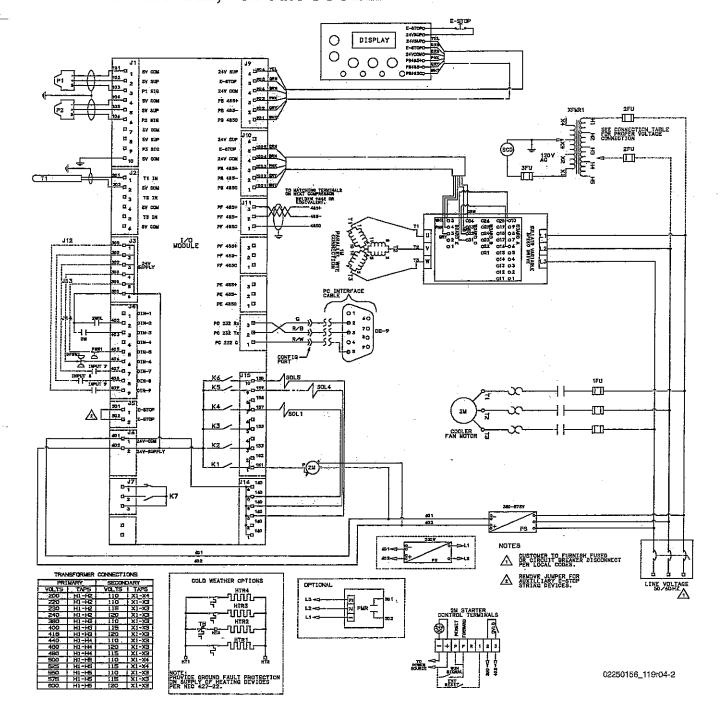
COMP	DESCRIPTION
1MOL	COMPRESSOR OVERLOAD
1M	WYE-DELTA STARTER
2M	WYE-DELTA RUN CONTACTOR
S	WYE-DELTYA START CONTACTOR
4M	CONTACTOR FOR POWER FACTOR CAPACITOR OPT.
P1	WET SUMP PRESSURE SENSOR
P2	PACKAGE DISCHARGE PRESSURE SENSOR
T1	UNIT DISCHAGE TEMPERATURE PROBE
PSW1	(OPT'L) INLET AIR FILTER SWITCH 558.9 MM WC - 22 IN WC
PSW2	LOW WATER PRESS SWITCH N.O. CLOSES @10PSI
DPSW1	(OPT'L)OIL FILTER DIFF PRESS SWITCH 20PSID
	REMOTE RUN/UNLOAD
	CUSTOMER FURNISHED WARNING
50L1	LOAD CONTROL SOLENOID VALVE
SOL4	SEQUENCEING SOLENOID VALVE
SOL5	ELECTRIC CONDENSATE DRAIN VALVE
SOL6	(OPT'L) WATER SOLENOID VALVE
PS	24VDC POWER SUPPLY
K1	INTERNAL RUN RELAY CONTACT
K2	INTERNAL Y-DELTA START RELAY
K3	INTERNAL WYE-DELTA RUN RELAY
K4	INTERNAL LOAD CONTROL RELAY
K5	INTERNAL SEQUENCE RELAY
K6	INTERNAL ELECTRIC DRAIN RELAY
K7	INTERNAL COMMON FAULT RELAY
PMR	OPT'L POWER MONITOR RELAY
PF CAP	POWER FACTOR CORRECTION CAPACITOR (OPT'L)
HTR1	(OPT'L) SUMP HEATER 800W
HTR2	(OPT'L) HEAT TRACE
HTR3	(OPT'L) TRAP HEATER 70 WATTS
HTR4	(OPT'L) CONTROL PANEL HEATER 50 WATTS
TH	THERMOSTAT FOR HEAT TRACE OPTION
1FU	CONTROL TRANSFORMER PRIMARY FUSES
2FU	CONTROL TRANSFORMER SECONDARY FUSE
VF	CANOPY VENTILATION FAN MOTOR
1CR	CANOPY FAN CONTROL RELAY
SCD	(OPT'L) SCD DRAIN
XFMR1	CONTROL TRANSFORMER FOR 120 V OPTIONS

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Figure 3-11: Wiring Diagram, Wye-Delta Water-Cooled



3.15 WIRING DIAGRAM, VSD AIR-COOLED



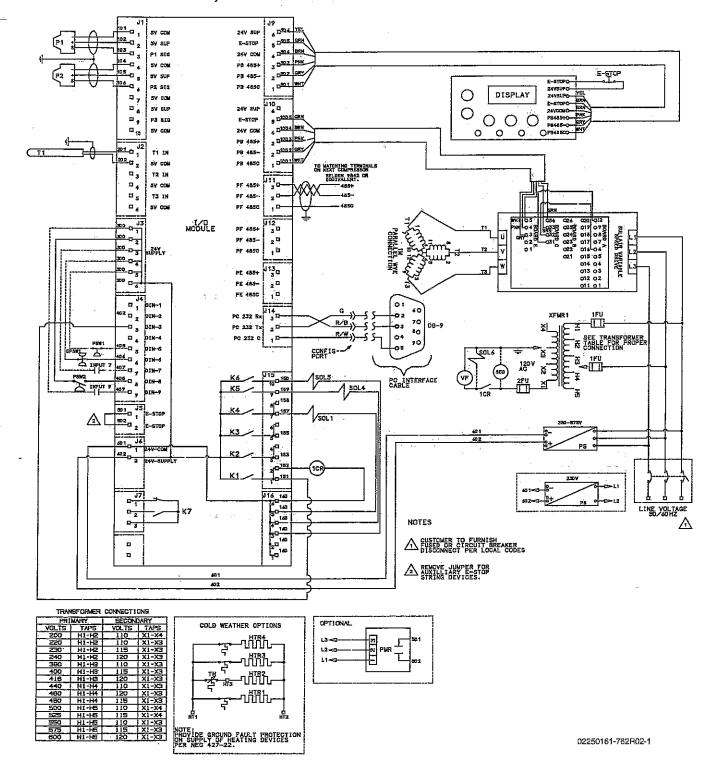
COMP	DESCRIPTION
1.M	COMPRESSOR MOTOR
2M	COOLER FAN MOTOR STARTER
2MOL	FAN MOTOR OVERLOAD
1FU	FAN MOTOR BRANCH CIRCUIT FUSES
2FU	SCD TRANSFORMER PRIMARY FUSES
3FU	SCD TRANSFORMER SCONDARY FUSE
P1	WET SUMP PRESSURE SENSOR
P2	PACKAGE DISCHARGE PRESSURE SENSOR
T1	UNIT DISCHAGE TEMPERATURE PROBE
PSW1	(OPT'L)INLET AIR FILTER SWITCH 558.9 MM WC - 22 IN WC
DPSW1	(OPT'L)OIL FILTER DIFF PRESS SWITCH 20PSID
	REMOTE RUN/UNLOAD
	CUSTOMER FURNISHED FAULT
	CUSTOMER FURNISHED WARNING
	LOAD CONTROL SOLENOID VALVE
	SEQUENCEING SOLENOID VALVE
SOL5	ELECTRIC CONDENSATE DRAIN VALVE
PS	24VDC POWER SUPPLY
K1	INTERNAL FAN RELAY CONTACT TEMP (T1) CONTROLLED
K2	INTERNAL Y-DELTA START RELAY COMPRESSOR RUNNING
K3	INTERNAL WYE-DELTA RUN RELAY COMPRESSOR ENABLED
K4	INTERNAL LOAD CONTROL RELAY
K5	INTERNAL SEQUENCE RELAY
K6 .	INTERNAL ELECTRIC DRAIN RELAY
	INTERNAL COMMON FAULT RELAY
	OPT'L POWER MONITOR RELAY
	(OPT'L) SUMP HEATER 800W
HTR2	(OPT'L) HEAT TRACE
HTR3	(OPT'L) TRAP HEATER 70 WATTS (OPT'L) CONTROL PANEL HEATER 50 WATTS
HTR4	10(11:21 100)11/102 1////
TH XFMR1	THERMOSTAT FOR HEAT TRACE OPTION CONTROL TRANSFORMER FOR SCD DRAIN
SCD	(OPT'L) SCD DRAIN
	TUPT LI SCU DRAIN

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Figure 3-12: Wiring Diagram, VSD Air-Cooled



3.16 WIRING DIAGRAM, VSD WATER-COOLED



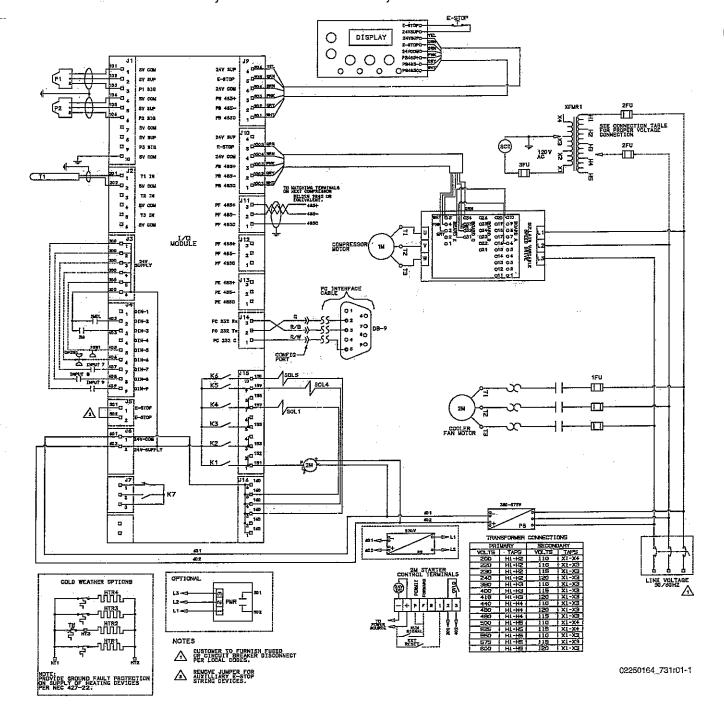
COMP	DESCRIPTION
1 M	COMPRESSOR MOTOR
. P1	WET SUMP PRESSURE SENSOR
P2	PACKAGE DISCHARGE PRESSURE SENSOR
T1	UNIT DISCHAGE TEMPERATURE PROBE
PSW1	(OPT'L) INLET AIR FILTER SWITCH 558.9 MM WC - 22 IN WC
PSW2	LOW WATER PRESS SWITCH N.O. CLOSES @ 10 PSI
DPSW1	(OPTIONAL)OIL FILTER DIFF PRESS SWITCH 20PSID
INPUT 7	REMOTE RUN/UNLOAD
INPUT 9	CUSTOMER FURNISHED WARNING
SOL 1	LOAD CONTROL SOLENOID VALVE
SOL4	FULL LOAD SOLENOID VALVE
SOL5	ELECTRIC CONDENSATE DRAIN VALVE
SOL6	(OPTIONAL) WATER SOLENOID VALVE
P\$	24VDC POWER SUPPLY
K1	INTERNAL RUN RELAY CONTACT
K2	INTERNAL COMPRESSOR RUNNING
K3	INTERNAL COMPRESSOR ENABLED
K4	INTERNAL LOAD CONTROL RELAY
K5	INTERNAL FULL LOAD RELAY
K6	INTERNAL ELECTRIC DRAIN RELAY
K7	INTERNAL COMMON FAULT RELAY
PMR	(OPTIONAL) POWER MONITOR RELAY
HTR1	(OPTIONAL) SUMP HEATER 800W
HTR2	(OPTIONAL) HEAT TRACE
HTR3	(OPTIONAL) TRAP HEATER 70WATTS
HTR4	(OPTIONAL) CONTROL PANEL HEATER 50 WATTS
TH	THERMOSTAT FOR HEAT TRACE OPTION
- 1FU	CONTROL TRANSFOMER PRIMARY FUSES
2FU	CONTROL TRANSFOMER SECONDARY FUSE
VF	CANOPY VENTILATION FAN MOTOR
1CR	CANOPY FAN CONTROL RELAY
SCD	(OPTIONAL) SCD DRAIN
XFMR1	CONTROL TRANSFORMER FOR 120 V OPTIONS

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Figure 3-13: Wiring Diagram, VSD Water-Cooled



3.17 WIRING DIAGRAM, VSD AIR-COOLED, 575V SERIES DELTA



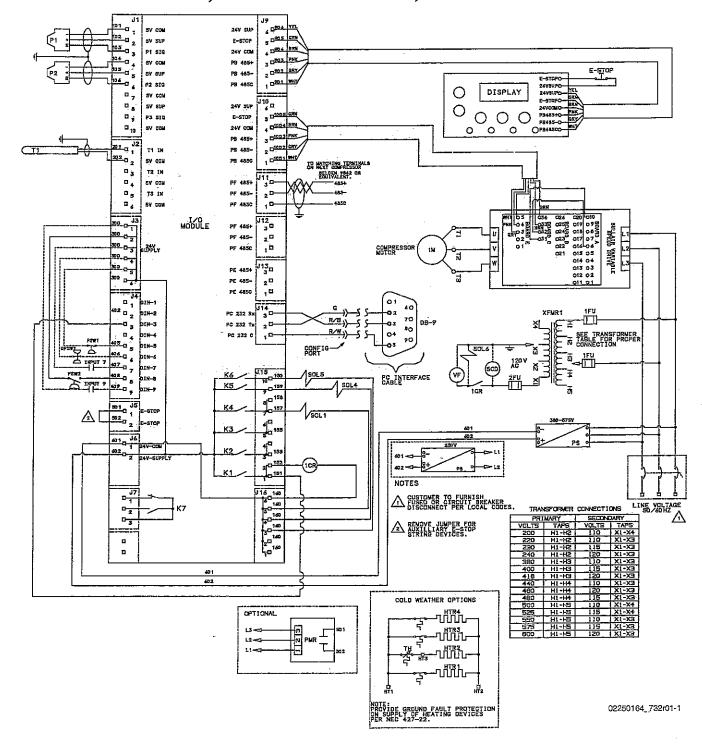
COMP	DESCRIPTION
1M	COMPRESSOR MOTOR
2M	COOLER FAN MOTOR STARTER
2MOL	FAN MOTOR OVERLOAD
1FU	FAN MOTOR BRANCH CIRCUIT FUSES
2FU	SCD TRANSFORMER PRIMARY FUSES
3FU	SCD TRANSFORMER SCONDARY FUSE
P1	WET SUMP PRESSURE SENSOR
P2	PACKAGE DISCHARGE PRESSURE SENSOR
T1	UNIT DISCHAGE TEMPERATURE PROBE
	(OPT'L)INLET AIR FILTER SWITCH 558.9 MM WC - 22 IN WC
	(OPT'L)OIL FILTER DIFF PRESS SWITCH 20PSID
	REMOTE RUN/UNLOAD
	CUSTOMER FURNISHED FAULT
	CUSTOMER FURNISHED WARNING
SOL 1	LOAD CONTROL SOLENGID VALVE
SOL4	SEQUENCEING SOLENOID VALVE
SOL5	ELECTRIC CONDENSATE DRAIN VALVE
PS	24VDC POWER SUPPLY
. 14 1	INTERNAL FAN RELAY CONTACT TEMP (T1) CONTROLLED
K2	INTERNAL Y-DELTA START RELAY COMPRESSOR RUNNING
<u>K3</u>	INTERNAL WYE-DELTA RUN RELAY COMPRESSOR ENABLED
K4	INTERNAL LOAD CONTROL RELAY
K5	INTERNAL SEQUENCE RELAY
K6	INTERNAL ELECTRIC DRAIN RELAY
K7	INTERNAL COMMON FAULT RELAY OPT'L POWER MONITOR RELAY
PMR	The state of the s
HTR1	101 1 2 7 0 0 mm 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
HTR2	(OPT'L) HEAT TRACE
HTR3	(OPT'L) TRAP HEATER 70WATTS (OPT'L) CONTROL PANEL HEATER 50WATTS
HTR4	()
TH VCMD1	
XFMR1	CONTROL TRANSFORMER FOR OPTIONAL SCD DRAIN [OPTIL] SCD DRAIN
SCD	[(OFI-E) SCD DRAIN

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Figure 3-14: Wiring Diagram, VSD Air-Cooled, 575V Series Delta



3.18 WIRING DIAGRAM, VSD WATER-COOLED, SERIES DELTA 575V



COMP	DESCRIPTION
1M	COMPRESSOR MOTOR
P1	WET SUMP PRESSURE SENSOR
P2	PACKAGE DISCHARGE PRESSURE SENSOR
T1	UNIT DISCHAGE TEMPERATURE PROBE
PSW1	(OPT'L) INLET AIR FILTER SWITCH 558.9 MM WC - 22 IN WC
PSW2	LOW WATER PRESS SWITCH N.O. CLOSES @ 10 PSI
DPSW1	(OPTIONAL)OIL FILTER DIFF PRESS SWITCH 20 PSID
INPUT 7	REMOTE RUN/UNLOAD
INPUT 9	CUSTOMER FURNISHED WARNING
SOL 1	LOAD CONTROL SOLENOID VALVE
SOL4	FULL LOAD SOLENOID VALVE
SOL5	ELECTRIC CONDENSATE DRAIN VALVE
SOL 6	(OPTIONAL) WATER SOLENOID VALVE
PS	24VDC POWER SUPPLY
K1	INTERNAL RUN RELAY CONTACT
K2	INTERNAL COMPRESSOR RUNNING
K3	INTERNAL COMPRESSOR ENABLED
K4	INTERNAL LOAD CONTROL RELAY
K5	INTERNAL FULL LOAD RELAY
K6	INTERNAL ELECTRIC DRAIN RELAY
K7	INTERNAL COMMON FAULT RELAY
PMR	(OPTIONAL) POWER MONITOR RELAY
HTR1	(OPTIONAL) SUMP HEATER 800W
HTR2	(OPTIONAL) HEAT TRACE
HTR3	(OPTIONAL) TRAP HEATER 70WATTS
HTR4	(OPTIONAL) CONTROL PANEL HEATER 50 WATTS
TH	THERMOSTAT FOR HEAT TRACE OPTION
1FU	CONTROL TRANSFOMER PRIMARY FUSES
2FU	CONTROL TRANSFOMER SECONDARY FUSE
VF	CANOPY VENTILATION FAN MOTOR
1CR	CANOPY FAN CONTROL RELAY
SCD	(OPTIONAL) SCD DRAIN
XFMR1	CONTROL TRANSFORMER FOR 120 V OPTIONS

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Figure 3-15: Wiring Diagram, VSD Water-Cooled, Series Delta 575V



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Section 4 INSTALLATION

4.1 MOUNTING OF COMPRESSOR

A suitable foundation or fabricated support must be established to support the compressor. It should be rigid enough to keep the compressor frame level and maintain alignment of the compressor and motor. Tie-down bolts of sufficient size must be used to provide uniform contact between the foundation and the compressor frame. Materials such as rubber or cork can be used to provide uniform contact between the foundation and compressor frame.

- Piping loads must be eliminated through the use of flex connectors or other systems which prevent piping loads from being transmitted to the compressor.
- Special consideration should be made to meet national and local electrical codes for the required space around and in front of the electrical panel. Lighting should be provided for future service requirements.
- Accessibility for fork lift trucks, overhead cranes and maintenance vehicles should be given careful consideration in order to provide any maintenance that may be required. Adequate space around the unit should be provided for access to all components of the compressor.
- Softer surfaces in walls or ceilings will absorb sound and minimize ambient noise levels. Harder, reflective surfaces will increase ambient noise levels.
- Water-cooled compressors must have provisions for cooling water supply and drainage available.

NOTE

Ambient temperatures above 104°F (40°C) require that the high ambient option is specified for the compressor.

4.2 VENTILATION AND COOLING

Air-Cooled Compressors

- An area with adequate space must be provided for the compressor and its components. Air-cooled compressors require a minimum of 3 feet (1 meter) around the perimeter of the compressor.
- The location should be free from standing water and allow access to clean air that is free from exhaust and paint fumes, dust, metal filings or caustic chemicals.
- Cooling air should be removed from the area in order to prevent the re-introduction of heated exhaust air back into the compressor's cooling system.
- Reduced headroom above the compressor will require that cooling air be either ducted or in some way deflected away from the compressor. Inadequate ventilation will result in higher ambient operating temperatures.

NOTE

Systems that employ both a conventional reciprocating compressor and a screw-type axial compressor must be isolated from each other by use of a common receiver tank. Individual airlines from each compressor should be piped to the common receiver tank.

NOTE

Shipping straps are painted red in order to help identify them for removal. Be sure to remove them prior to operation of the drive assembly.



Water-Cooled Compressors

Adequate cooling water flow must be supplied to watercooled compressors. Water delivery must be verified to assure constant delivery of the volumes outlined in Table 4-1 Water Flow Requirements on page 52. The figures shown are for full-load operation utilizing an aftercooler. Cooler water will reduce water-flow requirements and warmer water will increase water-flow requirements.

Water piping to and from the compressor unit must be a minimum of 1 inch diameter. Isolation valves with side drains should be installed on both input and return lines. Input water should have a 2 mm strainer installed in-line. A normally closed solenoid valve should be connected to the water outlet of the compressor. The compressor control circuit switches this circuit. Consult the Sullair Service Department for assistance in these setups.

Water quality is critical to proper cooling of the compressor. Excessive build-up of lime, scale or other deposits can restrict the flow of water to the compressor. These deposits act as a thermal insulator and reduce the efficiency of the water cooler.

The cleaning of piping and water coolers is the customer's responsibility. Inspect all piping for deposits and clean as necessary. Refer to

Water Quality Recommendations on page 53.

TABLE 4.1 WATER ELOW REQUIREMENTS

TABLE 4-1 WATER FLOW REQUIREMENTS				
Water Temp	Water Flow Gallons Per Minute /Liters Per Minute (I)			
°F/'C	40HP/30kW	50HP/37kW	60HP/45kW	
70/21	5.6	7.0 (26.5)	9.0 (31.6)	
80/27	8.4	10.5 (35.7)	11.5 (41.6)	

(I) Water pressure should be maintained between 25 and 75 psig (1.7 and 5.2 bar), but not to exceed 145 psig (10 bar)

> 1.1 11. 3

Table 4-2 Ventilation Requirements on page 53 indicates the minimum ventilation requirements necessary to keep the compressor running at its normal operating temperature. The fan air requirement is the amount of air, which must flow through the compressor for proper ventilation. The heat rejection requirement is the amount of heat that is radiated by the compressor. This heat must be removed to assure a normal operating temperature. With air-cooled compressors it is possible to use this heat for space heating, providing additional pressure drop across the fan does not exceed 0.2 in H₂O. Consult a Sullair office for assistance in utilizing this heat. If ductwork is added, the high static fan option is required.

DO NOT install a water-cooled or an air-cooled/aftercooled compressor where it will be exposed to temperatures less than 32°F (0°C). Consult factory for machine operation in ambient temperature less than 32°F

If machine is equipped with water regulating valve, use the water regulating valve to adjust compressor temperature to maintain a minimum of 180°F (82.2°C); 190°F (87.8°C) for 24KT

Temperature and pressure gauges should be installed in the water piping for use in troubleshooting of the water system. Water pressure should ideally be between 25 and 75 psig (1.7 and 5.2 bar) but must not be above 145 psi (10 bar).



TARLE 4-2 VENTIL	ATION REQUIREMENTS
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Cooling Type	Air-Cooled with Aftercooler			Water-Cooled		
Motor HP/kW	40/30	50 / 37	60 / 45	40/30	50/37	60 / 45 {
Fan Air cfm/m³/hr	5,000 / 8,500	5,000 / 8,500	6,000 / 10,200	700 / 1,200	700 / 1,200	700 / 1,200
Ventilating Air/Heat Rejection BTU/Hour	114,500	142,000	171,100	10,600	13,300	15,800
KCal/Hour	28,800	35,700	46,216	2,670	3,350	4,000
Cooling Water/Heat Rejection BTU/Hour				114,500	142.000	171,100
KCal/Hour				28,800	35,700	43,040

Water System Venting

Vent the system upon installation or after draining the system on start-up:

- 1. Open the water valve(s) allowing water to flow to the system.
- Open the vent cocks (located on top of the aftercooler and the lubricant cooler) and allow all air to escape from the system. When water is observed at the vent cocks, close them.

The system is now vented.

Draining The Water System

If the system needs to drained completely, follow the steps outlined below:

- 1. At the rear of the unit. Disconnect both the inlets and discharge water lines.
- 2. Remove the drain plugs located at the bottom of the aftercooler and lubricant cooler.
- 3. Allow the system to drain completely.

Water Quality Recommendations

Water quality considerations are crucial to the effective operation of a water-cooled compressor and yet are the most often ignored. Premature failure of components can often be traced to a reduction in heat-transfer rate that has resulted from a reduced flow rate due to scale build-up in water-cooling lines or the coolers themselves.

Scale

Scale is formed from calcium carbonate, which precipitates out of water. Calcium content tends to be higher in water taken from wells than water taken from the

surface of lakes. A higher pH value will also assist in the formation of lime scale. In all cases calcium will form scale when water that has dissolved calcium is heated. It then forms lime-scale on surfaces such as the inside of pipes and the tubing that comprises water coolers. Scale formation on the inside of pipes and inside of heat exchangers acts as a thermal insulator. This causes coolers to be less effective, and piping to have reduced water flow, making them less effective. Over time lime scale build-up can reduce water flow by 80% or greater. This renders the cooling system ineffective and will damage the system. Scale can be controlled with water treatment.

Corrosion

As contrasted to lime scale build-up, corrosion eventually causes a reduction in the wall thickness of pipes. High levels of dissolved oxygen and low pH levels assist in the creation of corrosive scale. A thin coating of lime scale is often beneficial in helping to prevent corrosion from forming.

Biological And Organic Fouling (Slime)

The heightened temperatures of compressor cooling operations help to reduce the likelihood that organic fouling will become a major concern. In the event of an infestation, commercial chemical shock treatments are available to control any outbreaks.

To ensure maximum life expectancy and best performance of the compressor cooling system, refer to Table 4-3 Water Tests on page 54.



TABLE 4-3 WATER TESTS

Substances	Test Interval	Acceptable Concentration
Corrosivity Hardness, pH, Total Dissolved Solids, Temperature at inlet, Alkalinity	Monthly - if stable for 3 to 4 months, analyze quarterly.	Langelier Index 0 to 1
fron	Monthly	< 2 ppm
Sulphate	Monthly	< 50 ppm
Chloride	Monthly	< 50 ppm
Nitrate	Monthly	< 2 ppm
Silica	Monthly	< 100 ppm
Desolated Oxygen	Daily - if stable, analyze weekly	0 ppm (as low as possible)
Oil & Grease	Monthly	< 5 ppm
Ammonia	Monthly	< 1 ppm

Seawater-Cooled Units

NOTE

If seawater is to be used for cooling, optional copper-nickel coolers must be selected.

Water cleanliness is critical for operation of the compressor. A strainer must be installed in the inlet piping of the water system. It is also recommended that a solenoid valve (normally closed) be installed into the water outlet side of the compressor system. Consult the Sullair Service Department for assistance in setting up these recommended precautionary functions. In addition, be aware that cleaning of coolers as a result of fouling is a customer responsibility.

Isolation valves with side drains should be installed on both the inlet and outlet lines.

The recommended flow rate cannot be exceeded. An orifice plate must be installed in the pipe-work at least 3.3 ft (1 m) before the cooler. The orifice size must be calculated to ensure that the maximum seawater flow rate cannot be exceeded. Without these precautions, the seawater flow rate through the cooler may be several times the recommended maximum, which will lead to rapid system failure.

Seawater pressure psi (Bar)	Orifice diameter in inch (mm) to give a maximum seawater flow or 40 US gal/ min (152 l/min)
25 (1.7)	0.675 (17)
35 (2.4)	0.62 (16)
45 <u>(</u> 3.1)	0.58 (15)
55 (3.8)	0.55 (14)
65 (4.5)	0.53 (13.5)
75 (5.2)	0.51 (13)

No oil cooler manufacturer can guarantee that its products will have an indefinite life and for this reason, we suggest that the cooling system be designed to minimize any damage caused by oil cooler leaking. This can be achieved as follows:

- The oil pressure should be maintained at a pressure higher than the seawater pressure. In the event of a leak occurring, the oil will be prevented from becoming contaminated.
- 2. When the hydraulic system is not in use, the coolers should be isolated from incoming seawater under pressure.
- 3 The seawater outlet pipe from the cooler should have an open run to waste piping.

Outdoor Installation (Sheltered)

Many times a compressor must be installed outside due to available space or other jobsite conditions. When this is necessary, there are certain items that should be incorporated into the system to help ensure trouble-free operation. The unit must be purchased with a TEFC motor. The standard machine has NEMA4 rated controls, which are watertight.

NOTE

Variable speed drive compressors are NEMA 12 rated and must not be installed outside or exposed to the elements.

The compressor should be on a concrete pad, which is designed to drain water away from it. If the concrete pad is sloped, then the compressor must be mounted so that it is level. The base or skid must be fully supported where it contacts the concrete pad.

A weatherhood option should be selected to prevent direct rain and snow from falling on the unit. If local weather conditions can be extreme such that direct rain or snow may fall on the unit, it should be in a fully enclosed room or building.

3000-4500 Operator's Manual and Parts List



INSTALLATION

If installed under a shelter, air-cooled machines must be positioned in a way that prevents air recirculation (i.e., hot exhaust being allowed back to the system air inlet).

In installations that include more than one compressor, hot air exhaust should not be directed toward the fresh air intake of the second unit or an air dryer.

A standard machine installed outside must not be started or run if the ambient temperature in and around the compressor drops or may drop below 35°F (1.7°C).

For installation in a below freezing climate, a low ambient option with heat tracing and a receiver tank heater must be installed.

4.3 SERVICE AIR PIPING

Review carefully the total air system before installing a new compressor. Items to consider for the total air system include liquid carryover, pipe sizing, and the use of an auxiliary receiver. The installation of a drip leg or multiple drip legs, installation of a line filter(s) and the installation of isolation valve or valves. These considerations are important to ensure a safe and effective system.

NOTE

Discharged air contains a very small amount of compressor lubricating oil, and care should be taken to ensure that this oil would not interfere with downstream equipment. Downstream filters and an air dryer can remove any carryover.

Pipe Sizing

Pipe should be sized at least as large as the discharge connection of the compressor. Piping and fittings should all be suitably rated for the discharge pressure.

Use of Auxiliary Receiver Tank

An auxiliary receiver tank should be used in cases where large demand swings are expected.

Isolation Valve(s)

If isolation of the compressor from the service lines is required, isolation valves should be installed close to the discharge of the compressor. They should be installed with drip legs that drain sloping downward from the base in order to drain properly. Install a vent to the piping downstream of the compressor outlet connection.

When two compressors are operated in parallel, provide an isolation valve and a drain trap for each compressor before the common receiver. A built-in aftercooler reduces the discharge air temperature below the dew point. For most ambient conditions, considerable water vapor is condensed. To remove the condensation, each compressor with built aftercooler is supplied with a combination condensate separator/trap. A drain line should be installed on the condensate drain.

NOTE

For low-volume systems that do not require an auxiliary receiver, compressor response time may need to be adjusted. Consult the Sullair Service Department for assistance.

Fluid Containment

Compressors are equipped with a fluid containment pan to catch any fluid in the event of a leak or spill. The drain for the pan is located on the air intake end of the machine. For indoor installations, the drain should be plugged to contain fluids. For outdoor applications, the drain must be connected to a separate, customer supplied system to allow rainwater or any accumulated compressor fluid to drain out.

A CAUTION

The use of plastic bowls on line filters and other plastic airline components without metal guards can be hazardous. Synthetic coolants or the additives used in mineral oils can alter their structural integrity and create hazardous conditions. Metal bowls should be used on any pressurized system for safety concerns.

"The Plastic Pipe Institute recommends against the use of thermoplastic pipe to transport compressed air or other compressed gases in exposed above ground locations, e.g. in exposed plant piping." (I)

Sullube should not be used with PVC piping systems. It may affect the bond at cemented joints. Certain other plastic materials may also be affected.

(I) Plastic Pipe Institute, Recommendation B, Adopted January 19, 1972.



4.4 COUPLING ALIGNMENT CHECK

No coupling alignment is required.

4.5 FLUID LEVEL CHECK

The air compressor is shipped with the proper amount of fluid installed. However, it is necessary to check the fluid level at the time of installation and during continued operation of the compressor. The fluid level is to be checked when the compressor is in the SHUT DOWN MODE (fluid level may not be visible when operating), and by looking at the sight glass on the receiver tank. To be able to see the fluid level it may be necessary to start the machine and build the receiver tank pressure up to 10/20 psi and then shut down. If no fluid level is seen in the sight glass add fluid to the center of the glass. Do not overfill in any case. When a complete fluid change is performed, fill the receiver tank to the maximum allowable fluid level, which is center of the sight glass.

4.6 ELECTRICAL PREPARATION

Interior electrical wiring is performed at the factory. Required customer wiring should be done by a qualified electrician in compliance with OSHA, National Electric Code and/or any applicable local electrical code concerning isolation switches, fused disconnects, etc. Sullair provides a wiring diagram for use by the installer. An electrical check should be made to help assure that the first start-up will be trouble-free. The compressor and drive should be properly grounded/earthed in accordance with Local and National Code requirements.

Installation of this compressor must be in accordance with recognized electrical codes and any local Health and Safety Codes

Feeder cables should be sized by the customer/electrical contractor to ensure that the circuit is balanced and not overloaded by other electrical equipment. The length of wiring from a suitable electrical feed point is critical as voltage drops may impair the performance of the compressor. Cable sizes may vary considerably so the mains terminals will accept up to 50 mm² (1 awg) (37/4 Sk & 50/60 H) and up to 90 mm² (3/0 awg) (55/75 k & 75/100 H) cable.

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

The applied voltage must be compatible with the motor and compressor data plate ratings.

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

A DANGER

Lethal shock hazard inside.

Disconnect all power at source before opening or servicing.

- Check incoming voltage. Be sure that the incoming voltage is the same voltage that the compressor was wired for.
- 2. Check motor starter and overload heater sizes.
- Check all electrical connections for tightness.
- 4. "DRY RUN" the electrical controls by disconnecting the three (3) motor leads from the starter. Energize the control circuits by pushing the "①" (START) pad and check all protective devices to be sure that they will de-energize the starter coil when tripped.
- 5. Reconnect the three (3) motor leads and jog the motor for a direction of rotation check, as explained in *Motor Rotation Direction Check on page 56*.

4.7 MOTOR ROTATION DIRECTION CHECK

Motor rotation check must be made at compressor startup. The compressor can be damaged if it runs in the wrong direction for more than a few seconds. Motor rotation can be viewed through the opening in the drive adapter housing. After the electrical wiring has been done, it is necessary to check the direction of the motor rotation. Pull out the EMERGENCY STOP button and press once, quickly and in succession, the "O" (START) and "O" (STOP) pads. This action will bump start the motor for a very short time. When looking at the motor from the end opposite the compressor unit, the shaft should be turning clockwise. If the reversed rotation is noted. disconnect the power to the starter and exchange any two of the three power input leads, then re-check rotation. A "Direction of Rotation" decal is located on the motor drive housing to show proper motor/compressor rotation. An alternative to this procedure is to set the WS Controller to display P1 receiver tank pressure. Pull out the EMERGENCY STOP button and press once, quickly and in succession, the "O" (START) and "O" (STOP) pads. This action will bump start the motor for a very short time. If motor rotation is correct there will be immediate pressure shown. If no pressure is present, reverse rotation is occurring. Disconnect the power to the starter and exchange any two of the three power input leads. Recheck rotation as outlined above.

Fan motor rotation should also be checked. It should rotate counter-clockwise when viewing the fan motor from the backside of the motor.

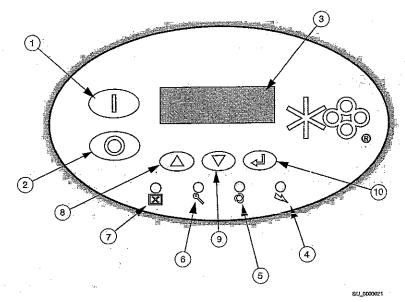
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Section 5

WS CONTROLLER

5.1 CONTROLLER LAYOUT



- ON
 OFF
- 3. LCD Display
- 4. Power Indicator
- 5. Run Mode Indicator

- 6. Maintenance Indicator7. Fault Indicator

- 8. Up Key
 9. Down Key
 10. Enter Key

Figure 5-1: WS Controller

5.2 CONTROLLER KEYPAD

The WS Controller keypad has two main pads for compressor control.

- To start the compressor operation, press the green Start pad "①".
- To stop compressor operation, press the red Stop pad
- The Run mode indicator "Q" lights up whenever the control is in an operating mode.

5.3 LCD DISPLAY

The display's normal view shows the compressor package's discharge pressure, internal temperature, and the operating mode. The modes are MANUAL, OFF, AUTOMATIC, or FAULTED.



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Figure 5-2:

Refer to Figure 5-2 and Figure 5-3. The lower line is occasionally interrupted to describe the compressor package's operating state.



SA_0000004R01

Figure 5-3:

Refer to Figure 5-4. If a machine fault occurs, the red fault "X" indicator will light up, and the display will indicate that a fault has occurred.



SA_0000001R01

Figure 5-4:

Refer to Figure 5-5. The lower line periodically will display the cause of the fault. Refer to service instructions to correct the cause. Press the Stop pad "O" to reset the controller.



SA_0000002R01

Figure 5-5:

Refer to Figure 5-6. Press the Down arrow "O" to display additional information about the compressor. The upper line will indicate "Compressor Status" and the name of the temperature, pressure, or other measurement. The lower line indicates the present reading.

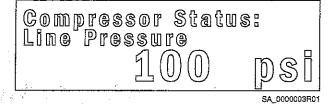


Figure 5-6:

Refer to Figure 5-7. When you continue beyond the status information, the display will show a list of control settings. The upper line will indicate "Show Setting" and the name of the setting. The lower line shows the present value.

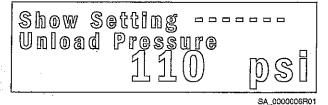


Figure 5-7:

Refer to Figure 5-8. To change the setting, press the Enter pad "-". The display indicates that you are in a change mode with reverse characters. Use the Up "-" or Down "-" arrow keys to change the setting, and press Enter again to save the new setting.

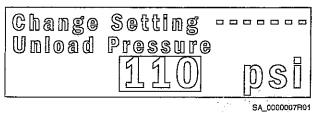


Figure 5-8:

Refer to Figure 5-8. If there is no keypad activity, the display will return to normal view in about one minute. If the Start or Stop buttons are pressed, the display also returns to normal view. If either of these occur, the setting will not be altered.

If there are any warnings or recommended service instructions, these will be periodically displayed on the normal view.

The list of displays may be navigated from either direction by using the Up "" or Down "" arrow keys. For example, to change language from normal view, press the Up arrow pad once, press the Enter key "", select your language, and press Enter again. The number of displays varies with compressor model, but will follow this pattern.

€® SULLAIR

WS CONTROLLER

The large Emergency Stop button located near the controller overrides all electronic functions to turn off the control devices. The controller senses this, and will display E-stop. To reset, twist and pull out the Emergency Stop button, then press the Stop pad to reset the WS Controller.

5.4 LED LIGHTS

The four LED lights indicate the general condition of the machine

The green Power indicator "" simply indicates that power is applied to the controller. It will blink very slowly if the WS Controller is set up to automatically restart after power failure.

The green Run mode indicator "O" indicates compressor operation is enabled. It lights steadily if the motor is running. If the motor stops while in Automatic mode, this LED will blink to indicate that the motor may restart.

The yellow Maintenance indicator " comes on whenever there is recommended maintenance or a warning. The text display will periodically indicate the recommended actions or the cause of the warning.

The red Fault indicator " indicates that a compressor fault has occurred and needs to be repaired before further operation. The text display will indicate the cause of the fault.

The PC support program for the WS controller provides additional information about compressor operation and advanced setup adjustments to optimize operation.

Software part numbers are shown in the display following a power interruption or other interruption of communication with the controller. The P/N remains on the display until satisfactory communications are established with the input/Output module.



SECTION 5

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Section 6

MAINTENANCE

6.1 GENERAL

As you proceed in reading this section, it will be easy to see that the Maintenance Program for the air compressor is quite simple. The use of the service indicators provided for the fluid filter, air filter and fluid separator will alert you when service maintenance is required. When the WS Controller display indicates service, maintenance for that specific item is required. See instructions for each item in Filter Maintenance, on page 62.

6.2 DAILY OPERATION

Prior to starting the compressor, it is necessary to check the fluid level in the receiver tank. Should the level be low, simply add the necessary amount. If the addition of fluid becomes too frequent, a simple problem has developed which is causing this excessive loss. See the Troubleshooting Guide Section under EXCESSIVE COMPRESSOR FLUID CONSUMPTION for a probable cause and remedy.

A WARNING



HIGH-PRESSURE HAZARD!

- DO NOT remove caps, plugs, and/or other components when compressor is running or pressurized. Stop compressor and relieve all internal pressure before doing so.
- · Failure to comply could result in death or serious injury.

After a routine start has been made, observe the controller display and be sure it monitors the correct readings for their particular phase of operation. After the compressor has warmed up, it is recommended that a general check on the overall compressor be made to assure that the compressor is running properly.

6.3 MAINTENANCE AFTER INITIAL **50 HOURS OF OPERATION**

After the initial 50 hours of operation, a few maintenance requirements are needed to clean the system of any foreign materials. Perform the following maintenance operations to prevent unnecessary problems:

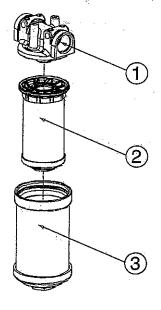
- 1. Clean the return line strainer. Refer to Maintenance Every 2000 Hours on page 62 for location.
- 2. Clean the return line orifice.



6.4 MAINTENANCE EVERY 2000 HOURS

After 2000 hours of operation, it will be necessary to perform the following:

- 1. Clean the return line strainer. Refer to *Discharge*, *Receiver and Piping System*, 3000P, 3700 and 4500 on page 96.
- 2. Replace the fluid filter element.



SA_0000017

- 1. Filter Head
- 2. Element*
- 3. Body

Fluid Filter Assembly:

P/N 02250155-708

*Fluid Filter

P/N 02250155-709

Replacement Kit:

Figure 6-1: Fluid Filter Assembly

6.5 FLUID MAINTENANCE

Drain the receiver tank and change the compressor fluid using instructions shown in Lubrication Guide on page 20.

6.6 FILTER MAINTENANCE

Refer to Figure 6-1. Replace your fluid filter element under any of the following conditions, whichever occurs first:

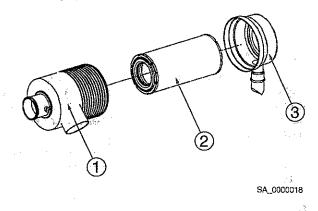
- 1. As indicated by the WS Controller.
- 2. Every fluid change.

-luid Filter Element Replacement

Refer to Figure 6-1

- 1. Using a wrench, remove the filter canister.
- 2. Remove and dispose of filter element. Observe all laws and regulations for filter disposal.
- 3. Clean gasket seating surface.
- 4. Apply a light film of fluid to the element seal.
- 5. Install the element into the filter canister.
- 6. Screw the canister to the filter head. Tighten to 10 to 12 ft-lb (13.5 to 16.0 N·m).
- 7. Restart compressor and check for leaks.

6.7 AIR FILTER MAINTENANCE



- 1. Housing
- 2. Element*
- 3. Cover

Air Filter Assembly:

P/N 02250127-683

* Replacement Air

P/N 02250127-684

Filter Element Kit:

· . · · · · · ·

Figure 6-2: Air Filter Assembly

Refer to Figure 6-2. Air filter maintenance should be performed when the maintenance gauge shows red with the compressor running full load, or once a year, whichever comes first. If the filter needs to be replaced, order a replacement element. Below you will find procedures on how to replace the air filter element.



MAINTENANCE

Air Filter Element Replacement

- 1. Clean exterior of air filter housing.
- 2. Rotate end cover counterclockwise and remove
- Remove air filter element by pulling it out of the housing.
- 4. Clean interior of housing using a damp cloth. DO NOT blow dirt out with compressed air.
- 5 At this time replace the element.
- 6. Reassemble in the reverse order of the disassembly.

6.8 SEPARATOR MAINTENANCE

Replace the separator element when indicated by the Wig Controller or after one (1) year, whichever comes first. separator element must be replaced. DO NOT attempt w clean the separator element.

Separator Element Replacement

Refer to Figure 6-3. The separator element must be changed when indicated by the WS Controller, or once a year, whichever occurs first. Follow the procedure explained below for separator element replacement:

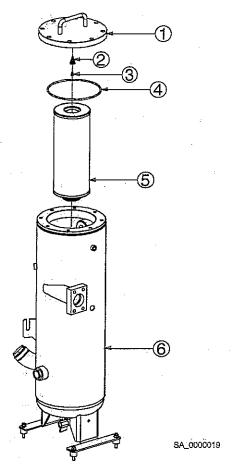
NOTE

Relieve all pressure from the receiver tank and all compressor lines.

- 1. Loosen and remove the eight (8) hex head capscrews (M12 x 40mm) from the cover plate.
- 2. Lift the cover plate from the receiver tank.
- 3. Remove the separator element.
- 4. Inspect the receiver tank for rust, dirt, etc.
- 5. Reinsert the separator element into the receiver tank taking care not to dent the element against the tank opening.
- 6 Install a new lubricated O-ring in the O-ring groove on the underside of the receiver tank cover-
- 7. Replace the cover plate, washers and capscrews: Torque to 89 ft lbs. (121 N m).
- 8. Clean the return line strainer before restarting the compressor.



63	



- 1. Cover
- 2. Ground Spring*
- Spring Fastener*
 Cover Gasket*
- 5. Element*
- 6. Receiver Tank

Separator Element:

P/N 02250160-774

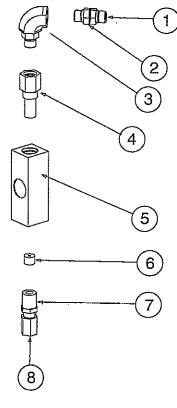
*Separator Element Replacement Kit:

P/N 02250160-776

Figure 6-3: Separator Element Assembly

Oil Return/Sight Glass Maintenance

Refer to Figure 6-4. The oil return/sight glass subassembly is attached to the side of the separator tank. Oil return/sight glass maintenance should be performed on a routine basis parallel to that of the fluid filter, or as indicated in the troubleshooting section of this manual. The maintenance on an oil return/sight glass is mainly concerned with the condition of the filter assembly. Order filter assembly No. 02250117-782, and use the following instructions as a guide:



SU_0000032

- 1. To Receiver Tank
- Male Tube Connector
- 3. 90° Pipe Elbow
- 4. Filter Assembly*
- Sight Glass/Orifice Block
- 6. Brass Plug Orifice
- 7. Female Tube Connector
- 8. To Unit

* Oil Return Filter Replacment Kit:

P/N 02250117-782

Figure 6-4: Oil Return/Sight Glass

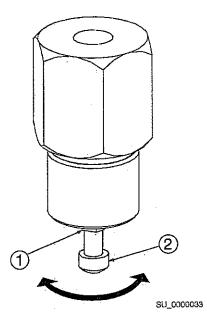
- 1. Disconnect the tube at bottom of sight glass.
- 2. Unscrew the sight glass assembly where the elbow fitting joins the strainer/filter.
- 3. Remove used filter assembly, and replace with new assembly...



- Inspect and clean the orifice inside the sight glass blocks. The orifice must be removed with an allen wrench.
- 5. Coat/lubricate the O-rings with silicone grease.
- Reattach the connectors to the sight glass/orifice blocks.

Pressure Regulator Adjustment

Refer to Figure 6-5. Start the compressor and adjust the service valve to maintain service air pressure approximately at 1 psi over rated pressure. Turn the inlet valve regulator adjusting screw until air just begins to escape from the control air orifice, located at the bottom of the regulator. Lock the adjusting screw in place with the locknut. The regulator is now properly set.



- 1. Locking Nut
- 2. Adjustment Screw

Figure 6-5: Regulator Adjustment

Water Condensate Drain Maintenance

If your compressor is fitted with the standard solenoid condensate drain valve, it is necessary to periodically clean the strainer. Remove the hex cap from the strainer and remove the strainer screen. Clean the screen and reinstall. If the screen is damaged, the strainer assembly must be replaced (P/N 241772).

Control Line Strainer

The regulator and solenoid valve(s), which control the compressor, are protected by a strainer. Every 12 months it is necessary to clean the strainer. Remove the hex cap

from the strainer and remove the strainer screen. Clean the screen and reinstall. If the screen is damaged, the strainer assembly must be replaced (P/N 241772).

Shaft Coupling Maintenance

The compressor unit and motor are rigidly connected via a mounting adapter housing. This arrangement makes coupling alignment unnecessary. The coupling is a jaw type in shear. If the elastomeric element requires replacement due to wear or breakage, order replacement element no. 02250152-670, and follow the following steps:

- 1. Remove the protective grill from the adapter housing.
- Loosen the retaining screw located on the outer sleeve. Slide the sleeve to one side, exposing the coupling element.
- 3. Unwrap the coupling element from the coupling jaws.
- 4. Install the new element by wrapping it around the jaws, engaging the cogs on the element into the jaws.
- 5. Reinstall the outer sleeve and the protective grill. Secure the outer sleeve by tightening the two screws to 45 in lbs (5 N-m).

6.9 TROUBLESHOOTING - INTRODUCTION

The information contained in the Troubleshooting Guide has been compiled from field report data and factory experience. It contains symptoms and usual causes for the described problems. However, **DO NOT** assume that these are the only problems that may occur. All available data concerning a problem should be systematically analyzed before undertaking any repairs or component replacement procedures.

A detailed visual inspection is worth performing for almost all problems and may avoid unnecessary additional damage to the compressor. Always remember to:

- 1. Check for loose wiring.
- 2. Check for damaged piping.
- 3. 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 representative.



SECTION 6

6.10 TROUBLESHOOTING GUIDE

SYMPTOM	PROBABLE CAUSE	REMEDY
Compressor Will Not Start	Main Disconnect Switch Open	Close switch.
	Line Fuse Blown	Replace fuse.
	Motor Starter Overload Tripped	Reset. Should trouble persist, check whether motor starter contacts are functioning properly.
	Low Incoming Line Voltage	Check voltage Should voltage check low, consult power company.
Compressor Shuts Down With Air Demand Present	Loss of Control Voltage	Check power supply for 24V DC output Replace power supply if necessary.
	Low Incoming Voltage	Consult power company.
	Excessive Operating Pressure	Reset. If trouble persists, check that line pressure does not exceed maximum operating pressure of the compressor (specified on nameplate).
	Separator Requires Maintenance Indicated by WS Controller	Replace separator.
	Machine Programmed for Wrong Pressure Setting	Reprogram with WSPC equipped laptop
	Defective Regulator Valve	Regulator valve should cause inlet valve to close when the pressure switch contacts open. Repair if defective.
	Defective Blowdown Valve	Blowdown valve should exhaust receiver tank pressure to 18 psig (1.2 bar) when maximum operating pressure is reached. Repair if defective.
	Cooling Water Temperature Too High	Reduce water temperature to 85°F (29.4°C) or less. Water-cooled only.
)	Cooling Water Flow Insufficient	Check water lines and valves (water-cooled only).
	Cooler Plugged	Clean tubes. If plugging persists, install water conditioner (water-cooled only).
	Cooling Air Flow Restricted	Clean cooler and check for proper ventilation.
	Ambient Temperature Is Too High	Provide sufficient ventilation.
. <u>[</u> 1	_ow Fluid Level	Add fluid.
<u>[</u>	Clogged Filter	Change the fluid filter element.
	Thermal Valve Not Functioning Properly	Replace element.
	Nater Flow Regulating Valve Not Functioning Properly	Change (water-cooled only).



MAINTENANCE

6.10 TROUBLESHOOTING GUIDE (CONTINUED)

SYMPTOM	PROBABLE CAUSE	REMEDY
Compressor Will Not Build Full Discharge	Air Demand is Too Great	Check service lines for leaks or open valv
Pressure	Dirty Air Filter	Check the filter indicator and inspect and/or change element if required.
	Inlet Valve Bleed Orifice Plugged	Ensure control line bleed orifice located inside inlet valve is not plugged.
	Pressure Regulator Out of Adjustment	Adjust regulator according to control adjustment instructions in the Maintenance section.
	Defective Pressure Regulator	Replace regulator.
	Defective Unload Solenoid Valve	Check that the valve closes when energized. Replace the coil or the complete valve if defective.
Line Pressure Rises Above Unload Pressure Set-Point	Leak in Control System Causing Loss of Pressure Signals	Check for leaks
	Inlet Valve Stuck Open	Remove the intake hose and check for inlet valve operation.
·	Defective Unload Solenoid Valve	Check that the valve is open when de- energized. Replace if necessary.
	Plugged Control Line Strainer	Clean strainer (screen and O-ring replacement kit available).
	Defective Blowdown Valve	Check that receiver tank pressure is exhausted to the atmosphere when the solenoid valve opens. Repair or replace if necessary (kit available).
Excessive Compressor Fluid Consumption	Clogged Return Line or Orifice	Clean strainer (screen and O-ring replacement kit available).
		Clean orifice.
	Separator Element Damaged or Not Functioning Properly	Change separator
•	Leak in the Lubrication System	Check all pipes, connections and components.
	Excess Fluid Foaming	Drain and change.
	Fluid Level Too High	Drain and change. Check that the compressor temperature has not dropped below 170°F (76.7°C).
Pressure Relief Valve Opens Repeatedly	Defective Pressure Relief Valve	Replace.
	Plugged Separator	Check separator differential.



SECTION 6

6.10 TROUBLESHOOTING GUIDE (CONTINUED)

SYMPTOM	PROBABLE CAUSE	REMEDY
Liquid Water In Compressed Air Lines	Plugged Strainer in Moisture Drain Line	Clean and service strainer located in the line off the bottom of the water separator.
	Water Vapor Condensation from Cooling and Compression Occurs Naturally	Remove the water vapor from compressed air prior to distribution through the air system. Check operation of aftercooler and moisture separator. Install a compressed air dryer sized for the flow and dryness level required (Note: Filters may also be required to remove particulates, liquid oil aerosols or for oil vapor removal. Change cartridges as recommended by the filter manufacturer) Check all drain traps routinely to insure their proper operation. Maintain them regularly.
	Defective Drain Solenoid Valve	Ensure valve opens and closes as signaled by the WS Controller.
	Inadequate Drain Timer Settings	Check WS Controller control drain interval and drain time, and adjust accordingly. High humidity conditions require longer drain times or more frequent openings.



68.	3000-4500 Operator's Manual and Parts List	€Ð.SULL4
		



Section 7

VSD CONTROL OPERATION

7.1 DESCRIPTION OF COMPONENTS

The variable speed drive unit is located in the machine electrical enclosure. The heat sink for the drive extends through the back of the enclosure, and is cooled by airflow through the compressor enclosure.

7.2 CONTROL SYSTEM, **FUNCTIONAL DESCRIPTION**

Refer to Figure 2-5. The purpose of the compressor control system is to regulate the amount of the air being compressed to match the amount of compressed air being used. The Capacity Control System consist of variable speed drive, solenoid valve, regulating valve, and the inlet valve. The functional description of the control system is described below in six distinct phases of operation. The following description text applies to 3000V, 3000PV, 3700V and 4500V series variable speed drive compressors with WS Controller. Depending on the model, the compressor can be operated at a setpoint pressure from 60 to 175 psig (4.1 to 12.1 bar). Refer to the nameplate for operating pressure range. The WS Controller will automatically set the frequency range based on the selected pressure. For explanatory purposes, this description will apply to a compressor with an operating pressure of 100 psig (6.9 bar), and load delta setting of 6 psi (0.4 bar). The load delta has a default setting of 10 psi (0.7 bar), but is recommended to set at 6 psi (0.4 bar) for most efficient operation. A compressor with any other pressure range would operate in the same manner except stated pressures.

Start Mode- 0 to 50 PSIG (0 to 3.5 Bar)

When the WS Controller "1" (START) button is depressed, the VSD ramps the motor to full speed and the receiver tank pressure will quickly rise from 0 to 50 psig (0-3.4 bar). During this period, both the regulator and solenoid valves are closed, the inlet valve is fully open and the air-end delivers full capacity to the receiver tank. The rising compressor air pressure is isolated from the service line in this phase by the minimum pressure valve set at approximately 50 psig (3.4 bar).

Full Load Mode- 50 to 100 **PSIG (3.4 to 6.9 Bar)**

When the compressed air pressure rises over 50 psia (3.4 bar) the minimum pressure valve opens allowing compressed air to flow into the service line. From this point on the line pressure is continually monitored by the WS Controller, which controls the variable speed drive. The pressure regulator and solenoid valve remain closed with the inlet valve fully open running at 100 psig (6.9 bar) or

Variable Speed Drive Part Load Control

If less than rated capacity of compressed air is being us the service line pressure will rise above 100 psig (6.9 bar). Consequently, the Variable Speed Drive will begin to decelerate the motor, thereby reducing the output capacity to match demand. The drive will continuously adjust the motor speed (accelerate or decelerate) to maintain a line pressure of 100 psig (6.9 bar). In this mode the VSD will operate within the appropriate frequency range determined by the WS Controller.

Modulating Mode- 100 to 106 **PSIG** (7.3 to 6.9 Bar)

During low demand periods and with the Variable Speed Drive at minimum speed, the line pressure can continue to rise. When the line pressure reaches 101-102 psig (approximately 7 bar), the regulator valve (Figure 7-7) gradually opens, directing air pressure to the inlet control valve piston. This action causes the inlet valve to partially close, thereby reducing the air entering the compressor until it matches the amount of air being used. The control system functions continually in this manner between the limits of > 101 psig (7.0 bar) to 106 psig (7.3 bar), in response to varying flow demand. The pressure regulator has an orifice which vents a small amount of air to the atmosphere when the pressure regulator controls the inlet valve. The orifice also bleeds any accumulated moisture from the control line. When the discharge pressure rises above 106 psig (7.3 bar), or alternatively set unload pressure the compressor unloads.



NOTE

With a Sullair compressor, there is no maintenance or inspection of the internal parts of the compressor unit permitted in accordance with the terms of the warranty.

Unload Mode- In Excess of 106 PSIG (7.3 Bar)

When a relatively small amount or no air is being used, the service line pressure continues to rise. When it exceeds 106 psig (7.3 bar), or alternatively set unload pressure, the WS control system de-energizes the solenoid valve allowing receiver tank air pressure to be supplied directly to close the inlet valve. Simultaneously, the solenoid valve sends a pneumatic signal to the blow down valve. The blowdown valve opens to the atmosphere, reducing the receiver tank pressure. The check valve in the air service line prevents line pressure from returning to the receiver tank. The compressor will shut down after the unload time setting expires if programmed (the default setting is zero [0] seconds for an immediate shutdown upon unload). When the line pressure drops to the low setting pressure of 100 psig (6.9 bar) The WS Controller starts the motor and energizes the solenoid valve which closes the blow down valve. The re-energized solenoid valve prevents line pressure from reaching the inlet control valve, thereby allowing it to fully open, and the compressor again delivers compressed air to the system



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Section 8

PARTS LISTS

8.1 PROCEDURE FOR ORDERING PARTS

When ordering parts always indicate the Serial Number of the compressor. This can be obtained from the Bill of Lading for the compressor or from the Serial Number Plate located on the compressor. Refer to Figure 8-1.

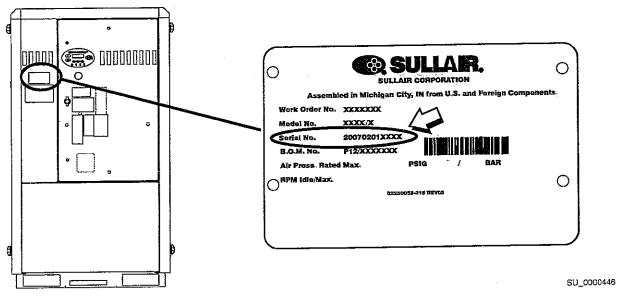


Figure 8-1: Serial Plate, Serial Number Location



Parts should be ordered from the nearest Sullair Representative or the Representative from whom the compressor was purchased. If for any reason parts cannot be obtained in this manner, contact the factory directly at the addresses, phone and fax numbers listed below.

SULLAIR ASIA, LTD.

Sullair Road, No. 1 Chiwan, Shekou Shenzhen, Guangdong 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) or 1-219-879-5451 Fax: (219) 874-1273

CUSTOMER CARE for PARTS and SERVICE

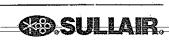
1-888-SULLAIR (7855247) 219-874-1835

CHAMPION COMPRESSORS, LTD.

Princess Highway
Hallam, Victoria 3803
Austrailia
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 Cedex, France Telephone: 33-477968470 Fax: 33-477968499 www.sullaireurope.com



8.2 RECOMMENDED SPARE PARTS LIST

U.E 1			
Key	Description	Part Number	Note Quantity
***************************************	ELEMENTS		
1	element, compressor fluid filter 02250155-708	02250155-709	1
2	element, heavy duty air filter (3000P, 3700, 4500) 02250127-683	02250127-684	1
3	element, heavy duty air filter (3000) 02250125-369	02250125-372	1
4	element, replacement for separator 02250160-774	02250160-776	1
	KITS		
5	kit, repair for minimum pressure / check valve 02250097-598	02250110-727	1
6	kit, cap for minimum pressure check valve 02250097-598	02250046-396	1
7	kit, O-ring for minimum pressure check valve 02250097-598	02250048-363	1
8	kit, piston for minimum pressure check valve 02250097-598	02250051-337	1
9	kit, repair for thermal valve (Sullube) 02250092-081	02250144-327	1
10	kit, repair for thermal valve (24KT or 175 psig) 02250148-796	02250148-827	1
11	kit, repair for pressure regulator 250017-280	250019-453	1
12	kit, repair for blowdown valve 02250100-042	02250100-042	1
13	kit, repair for control solenoid valve 02250155-714	02250157-500	1
14	kit, coil replacement for control solenoid valve coil 02250155-714	02250157-502	1
15	kit, repair for condensate drain solenoid valve coil 02250155-715	02250157-501	1
16	kit, coil replacement for condensate drain solenoid valve coil 02250155-715	02250157-502	1
17	kit, repair inlet valve (integrated with compressor unit)	02250155-971	, i de 1
18	kit, rebuild inlet valve	02250155-970	1
19	kit, repair for v-type strainer 241771	241772	4
20	kit, repair for shaft seal (12 series)	02250050-363	· 1
21	kit, repair for shaft seal (10 series)	02250155-594	1
22	kit, tool for shaft seal installation (12 series)	602542-001	1
23	kit, repair for shaft seal installation (10 series)	001932-005	1
24	filter, scavenge line 02250117-782	02250117-782	2
25	kit, seal replacement for separator trap 02250144-635	02250144-735	1
	LUBRICATION		-
26	fluid, SRF 1/4000 (5 gal/19 liter)	250019-662	(l)
27	lubricant, Sullube (Std.) (5 gal/19 liter)	250022-669	(I)
28	lubricant, 24 KT (5 gal/19 liter)	02250051-153	(I)
29	lubricant, Food Grade (5 gal/19 liter)	250029-008	(I)

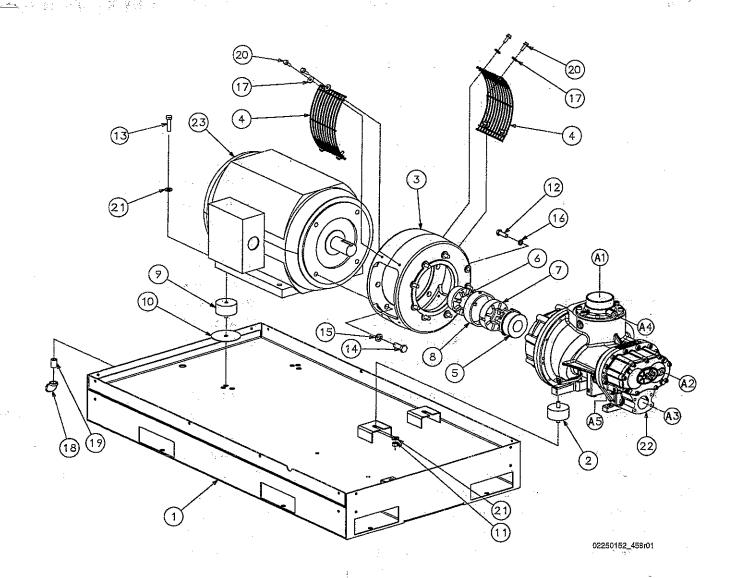
(I) For proper amount of fluid fill, please consult Lubrication Guide in Section 3, Specifications

CAUTION

Mixing of other lubricants within the compressor unit will void all warranties.



8.3 COMPRESSOR, FRAME AND DRIVE, 3000P AND 3700 MODELS



PARTS LISTS

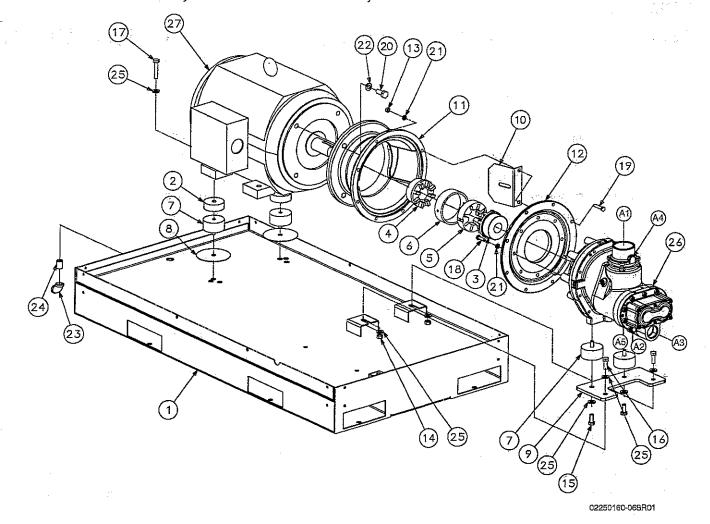
8.3 COMPRESSOR, FRAME AND DRIVE, 3000P AND 3700 MODELS (CONTINUED)

CON	INVED)				
Key	Description	Part Number	Note Q	uantity	
1	frame, 37kw	02250151-176		1	
2	isolator, vibration air end 50hp	02250151-500		2	
3	adapter, compr/motor 50hp ma	02250151-630		1	
4	grille, coupling guard 50hp	02250152-346		2	
5	hub, coupling 1.75 bore falk 20r	02250152-624		1	
	hub, coupling 1.50 bore (3000)	02250152-662			
6	hub, coupling 1 875 bore falk 20r	02250152-625		1	
7	element, cplg falk 20r	02250152-670		1	
8	cover, cplg element falk 20r	02250152-678		1	
9	isolator, vibration motor 37kw	02250155-285		2	
10	plate, motor seal 3000/3700/4500	02250156-393		2	
11	nut, hex metric m12 x 1.75	825912-175	**	2	
12	capscrew, hex 8.8 m12 x 40mm	828012-040	er ^{er e}	8	
13	capscrew, hex 8.8 m12 x 50mm	828012-050		2	
14	capscrew, hex gr5 5/8-11 x 1 3/4	829110-175		4	
15	washer, spr lock reg pltd 5/8	837810-156		4	
16	washer, spr lock-metric pltd m12	838812-250		8	
17	washer, iso 7093-8-140hv	865708-240		8	
18	elbow, pipe 90 deg plt 1/2"	866215-020		1	
19	nipple, pipe-xs plt 1/2 x cl	866408-000		1	1
20	screw, hex serr washer m8 x 25	882608-025		8	
21	washer, nord-lock pl m12 sp	883212-254		4	
22	compressor	_	(I) (II)	1	
23	motor	_	(l)	1	

- A1 From Air Inlet Filter
- A2 Oil Return From Sightglass on Receiver Tank
- A3 To Receiver Tank
- A4 From Blowdown Valve
- A5 Main Oil Connection
- (I) This part may vary per machine design. Consult factory with machine serial number to determine the proper part number.
- (ii) Sullair offers an exchange program whereby a remanufactured compressor unit can be obtained from Sullair distributors or the factory at a lower cost than it would cost for the owner to repair the unit. For information regarding the unit exchange program, contact your nearest Sullair representative or the Sullair Corporation. The shaft seal is not considered part of the compressor unit in regard to the two year warranty, but the normal Sullair parts warranty does apply. For shaft seal repairs, order repair kit no. 02250050-363, and installation kit no. 602542-001.



8.4 COMPRESSOR, FRAME AND DRIVE, 3000 MODEL WITH 10 SERIES UNIT



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3000-4500 Operator's Manual and Parts List	
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8.4 COMPRESSOR, FRAME AND DRIVE, 3000 MODEL WITH 10 SERIES UNIT (CONTINUED)

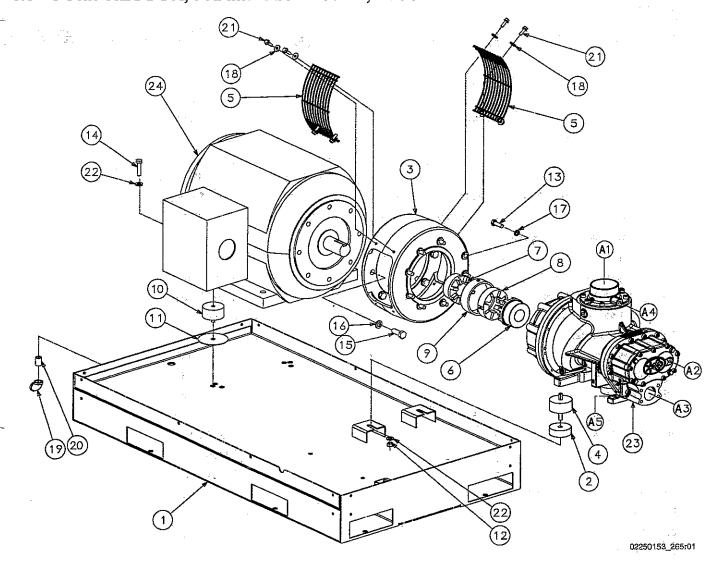
CON	TINOLD)			
Key	Description	Part Number	Note	Quantity
1	frame, 37kw	02250151-176		1
2	spacer,air end shaft height 60hp	02250151-499		2
3	hub, coupling 1.50 bore falk 20r	02250152-622		1
4	hub, coupling 1.875 bore falk 20r	02250152-625		1
5	element,cplg falk 20r	02250152-670		1
6	cover,cplg element falk 20r	02250152-678		1
7	isolator, vibration motor 37kw	02250155-285		4
8	plate, motor seal 3000/3700/4500	02250156-393		2
9	adapter, compressor 3700x w/10series	02250160-067		1
10	plate, motor/compr adapt cover 03	225980		1
11	adapter, motor compr 10/40 -	231977		1
12	adapter, sae 5 dxx10 gi ma -	250009-542		1
13	nut hex pltd 3/8-16	825206-337		8
14	nut hex metric m12 x 1 75	825912-175		2
15	capscrew,hex 8.8 m12 x 30mm	828012-030		2
16	capscrew,hex 8.8 m12 x 35mm	828012-035		2
17	capscrew,hex 8.8 m12 x 65mm	828012-065	•	2
18*	capscrew,hex gr5 3/8-16 x 1 1/4	829106-125		7
19	capscrew,hex gr5 3/8-16 x 1 3/4	829106-175		8
20	capscrew,hex gr5 5/8-11 x 1 1/2	829110-150		4 (
21	washer, spr lock reg pltd 3/8	837806-094		15
22	washer, spr lock reg pltd 5/8	837810-156		4
23	elbow, pipe 90 deg plt 1/2"	866215-020		1
24	nipple,pipe-xs plt 1/2 x cl	866408-000		1
25	washer, nord-lock pl m12 sp	883212-254		8
26	compressor	-	(I) (II)	1
27	motor 40hp	_	(I)	1
A1	From Air Inlet Filter			
A2	Oil Return From Sightglass on Receiver Tank			

- A2 Oil Return From Sightglass on Receiver Tank
- A3 To Receiver Tank
- A4 From Blowdown Valve
- A5 Main Oil Connection
- (l) This part may vary per machine design. Consult factory with machine serial number to determine the proper part number.
- (II) Sullair offers an exchange program whereby a remanufactured compressor unit can be obtained from Sullair distributors or the factory at a lower cost than it would cost for the owner to repair the unit. For information regarding the unit exchange program, contact your nearest Sullair representative or the Sullair Corporation.

The shaft seal is not considered part of the compressor unit in regard to the two year warranty, but the normal Sullair parts warranty does apply. For shaft seal repairs, order repair kit no. 02250155-594, and installation kit no. 001932-005



8.5 COMPRESSOR, FRAME AND DRIVE, 4500 MODEL



PARTS LISTS

8.5 COMPRESSOR, FRAME AND DRIVE, 4500 MODEL (CONTINUED)

			4.320.42
Key	Description	Part Number	Note Quantity
1	frame, 37kw	02250151-176	1 .
2	isolator, vibration air end 50hp	02250151-499	2
3	adapter, compr/motor 50hp ma	02250151-630	. 1
4	isolator, vibration motor/airend 50/60hp	02250151-941	2
5	grille, coupling guard 50hp	02250152-346	2
6	hub, coupling 1.75 bore falk 20r	02250152-624	1
7	hub, coupling 1.875 bore falk 20r	02250152-625	1
8	element, cplg falk 20r	02250152-670	1
9	cover, cpig element falk 20r	02250152-678	1
10	isolator, vibration motor 37kw	02250155-285	2
11	plate, motor seal 3000/3700/4500	02250156-393	2
12	nut, hex metric m12 x 1.75	825912-175	2
13	capscrew, hex 8.8 m12 x 40mm	828012-040	8
14	capscrew, hex 8.8 m12 x 50mm	828012-050	2
15	capscrew, hex gr5 5/8-11 x 1 3/4	829110-175	8
16	washer, spr lock reg pltd 5/8	837810-156	8
17	washer, spr lock-metric pltd m12	838812-250	8
18	washer, iso 7093-8-140hv	865708-240	8
19	elbow, pipe 90 deg plt 1/2"	866215-020	1
20	nipple, pipe-xs plt 1/2 x cl	866408-000	1
21	screw, hex serr washer m8 x 25	882608-025	8
22	washer, nord-lock pl m12 sp	883212-254	4
23	compressor	-	(I) (II) 1
24	motor	· <u>-</u>	(i) 1

- A1 From Air Inlet Filter
- A2 Oil Return From Sightglass on Receiver Tank
- A3 To Receiver Tank
- A4 From Blowdown Valve
- A5 Main Oil Connection
- (I) This part may vary per machine design. Consult factory with machine serial number to determine the proper part number.
- Sullair offers an exchange program whereby a remanufactured compressor unit can be obtained from Sullair distributors or the factory at a lower cost than it would cost for the owner to repair the unit. For information regarding the unit exchange program, contact your nearest Sullair representative or the Sullair Corporation.

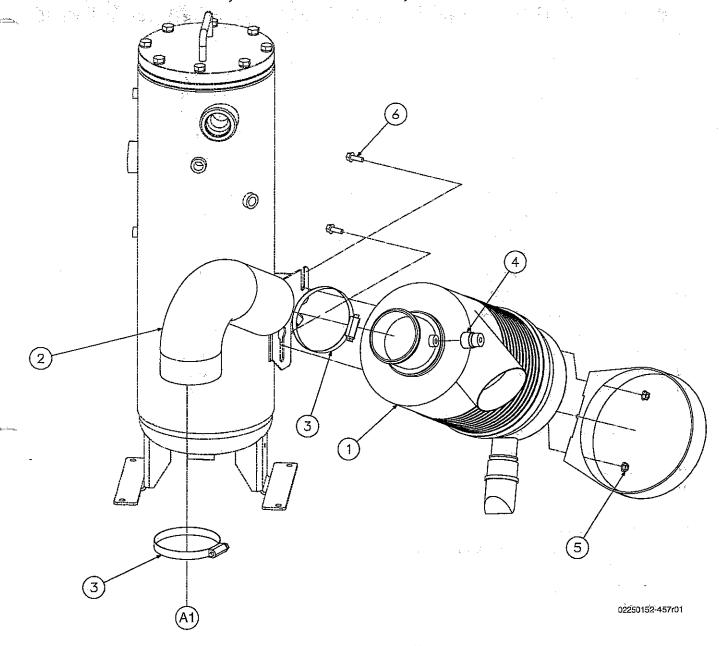
The shaft seal is not considered part of the compressor unit in regard to the two year warranty, but the normal Sullair parts warranty does apply. For shaft seal repairs, order repair kit no. 02250050-363, and installation kit no. 602542-001



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8.6 AIR INLET SYSTEM, STANDARD 3000P, 3700 AND 4500 SERIES



8.6 AIR INLET SYSTEM, STANDARD 3000P, 3700 AND 4500 SERIES (CONTINUED)

Key	Description - Francisco de la companya de la compan	Part Number	Note	Quantity
1	filter, air 9"	02250127-683	(1)	1
2	hose, rubber ei 120deg 4"ini ws37	02250156-927		1
3	clamp, hose 4.25" — 5.12" i.d.	02250164-153		2
4	indicator, restriction 20" h20	250003-869		1
5	nut, serr fing m8x1.25	882508-125		2
6	screw, hex serr washer m8 x 25	882608-025		2

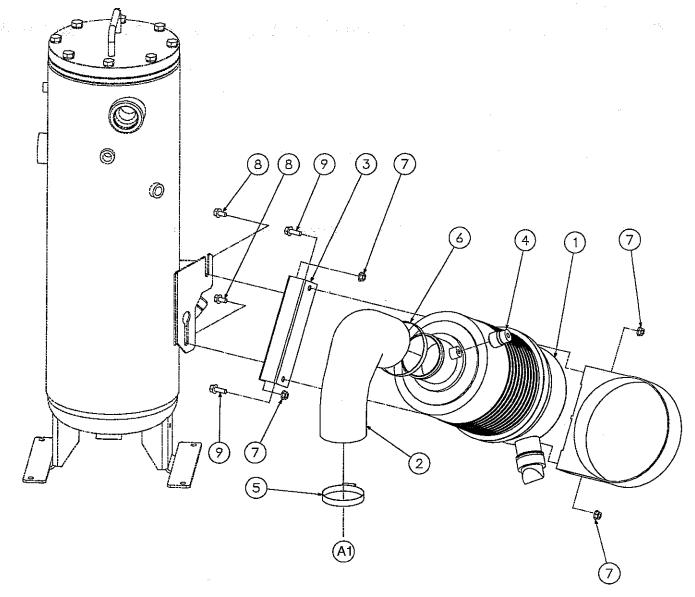
⁽I) For maintenance on air filter No. 02250127-683, order replacement element No. 02250127-684.

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A1 To Air Inlet on Compressor Unit



8.7 AIR INLET SYSTEM, 10 SERIES 3000



02250160-069R02

8.7 AIR INLET SYSTEM, 10 SERIES 3000 (CONTINUED)

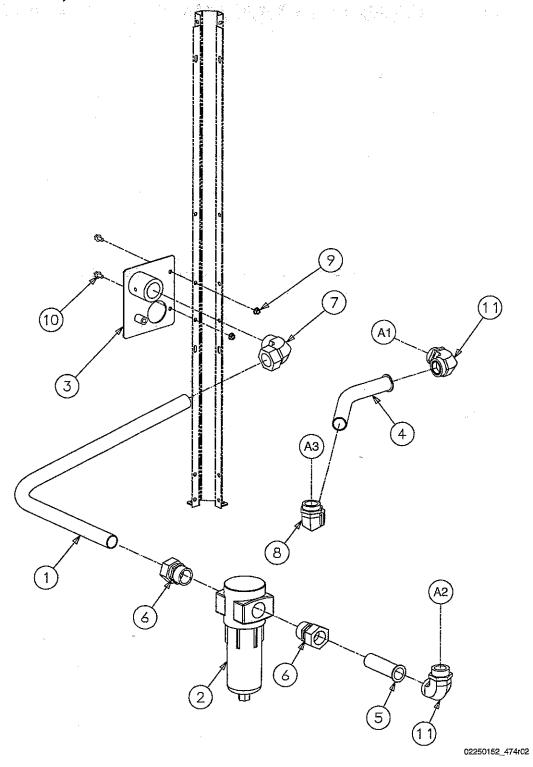
Key	Description	Part Number	Note	Quantity
1	filter, air 8"(plastic) w/mtg & +	02250125-369	(1)	1
2	hose, rubber el 3-1/2"-3" 3000 w/+	02250160-073		1
3	support, air filter 3000 w/10series	02250160-72 1		1
4	indicator, restriction 20" h20	250003-869		1
5	clamp, hose 2-13/16 to 3-3/4"	250018-550		1
6	clamp, hose 4.25/3.31	250031-415		1
7	nut,serr fing m8 x 1.25	882508-125		4
8	screw, hex serr washer m8 x 16	882608-016		2
9	screw, hex serr washer m8 x 25	882608-025		2

A1 To Air Inlet on Compressor Unit



⁽I) For maintenance on air filter No 02250125-369, order replacement element No 02250125-372

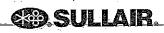
8.8 AIR PIPING, AIR-COOLED



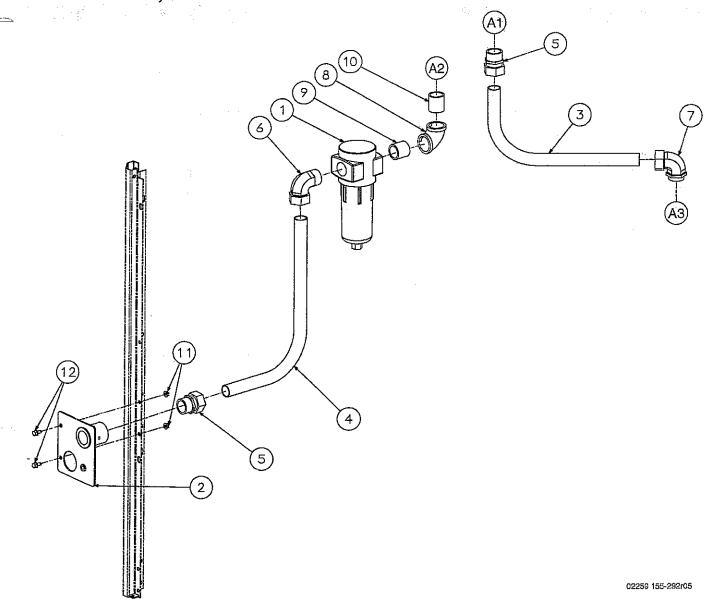
8.8 AIR PIPING, AIR-COOLED (CONTINUED)

(■ Provide Advisory at the second control of the second contro	-1 4	
Description	Part Number	Note	Quantity
tube, mpv/clr/moist sep ls12	02250121-707		1 (
separator, water 1-1/2" fnpt 1/4" drn	02250144-635	(I)	1
support, outlet conn 1-1/2npt	02250152-215		1
tube, mpv to a/c 1.5" orfs 3700	02250157-836		1
tube, a/c to trap 1.5" orfs 3700	02250157-837		1
connector, tube-m 1 1/2 x 1 1/2	810224-150		2
elbow, tube 90 deg m 1 1/2 x 1 1/2	810524-150		1
elbow, tube str thrd 1 1/2 x 1 7/8	811624-188		1
nut, serr fing m8 x 1.25	882508-125		2
screw, hex serr washer m8 x 16	883008-016		2
elbow, met st thd/orfs m48 x 1 ² 1/2	883648-024		2
To Aftercooler			
From Aftercooler			
From Minimum Pressure Valve		:	
	separator, water 1-1/2" fnpt 1/4" drn support, outlet conn 1-1/2npt tube, mpv to a/c 1.5" orfs 3700 tube, a/c to trap 1.5" orfs 3700 connector, tube-m 1 1/2 x 1 1/2 elbow, tube 90 deg m 1 1/2 x 1 1/2 elbow, tube str thrd 1 1/2 x 1 7/8 nut, serr fing m8 x 1.25 screw, hex serr washer m8 x 16 elbow, met st thd/orfs m48 x 1/1/2 To Aftercooler From Aftercooler	Description Part Number tube, mpv/clr/moist sep ls12 02250121-707 separator, water 1-1/2" fnpt 1/4" drn 02250144-635 support, outlet conn 1-1/2npt 02250152-215 tube, mpv to a/c 1.5" orfs 3700 02250157-836 tube, a/c to trap 1.5" orfs 3700 02250157-837 connector, tube-m 1 1/2 x 1 1/2 810224-150 elbow, tube 90 deg m 1 1/2 x 1 1/2 810524-150 elbow, tube str thrd 1 1/2 x 1 7/8 811624-188 nut, serr flng m8 x 1.25 882508-125 screw, hex serr washer m8 x 16 883008-016 elbow, met st thd/orfs m48 x 1 1/2 883648-024 To Aftercooler From Aftercooler	tube, mpv/clr/moist sep ls12 separator, water 1-1/2" fnpt 1/4" drn support, outlet conn 1-1/2npt tube, mpv to a/c 1.5" orfs 3700 tube, a/c to trap 1.5" orfs 3700 connector, tube-m 1 1/2 x 1 1/2 elbow, tube 90 deg m 1 1/2 x 1 1/2 elbow, tube str thrd 1 1/2 x 1 7/8 nut, serr flng m8 x 1.25 screw, hex serr washer m8 x 16 elbow, met st thd/orfs m48 x 1 1/2 To Aftercooler From Aftercooler

⁽I) For maintenance on water separator No. 02250144-635, order seal replacement element No. 02250144-735.



8.9 AIR PIPING, WATER-COOLED



PARTS LISTS

8.9 AIR PIPING, WATER-COOLED (CONTINUED)

Kev	Description	Part Number	Note Quantity
1	separator, water d-h 1-1/2" fnpt 1/4" drn	02250144-635	(i) 1
2	support, outlet conn 1-1/2npt	02250152-215	1
3	tube, mpv to aftrcir 3700 wc	02250155-282	-1
4	tube, aftreir to outlet 3700 wc	02250155-283	1
.5	connector, tube-m 1 1/2 x 1 1/2	810224-150	2
6	elbow, tube 90 deg m 1 1/2 x 1 1/2	810524-150	1
7	connector, tube str thd 1 1/2 x 1 7/8	811624-188	1
8	elbow, pipe 90 deg plt 1 1/2"	866215-060	1
9	nipple, pipe-xs plt 1 1/2 x cl	866424-000	1
10	nipple, pipe-xs plt 1 1/2 x 2	866424-020	. 1
11	nut, serr flng m8 x 1.25	882508-125	2
12	screw, tf-hex m8 x 16 blk zinc	883008-016	2

A1 To Aftercooler



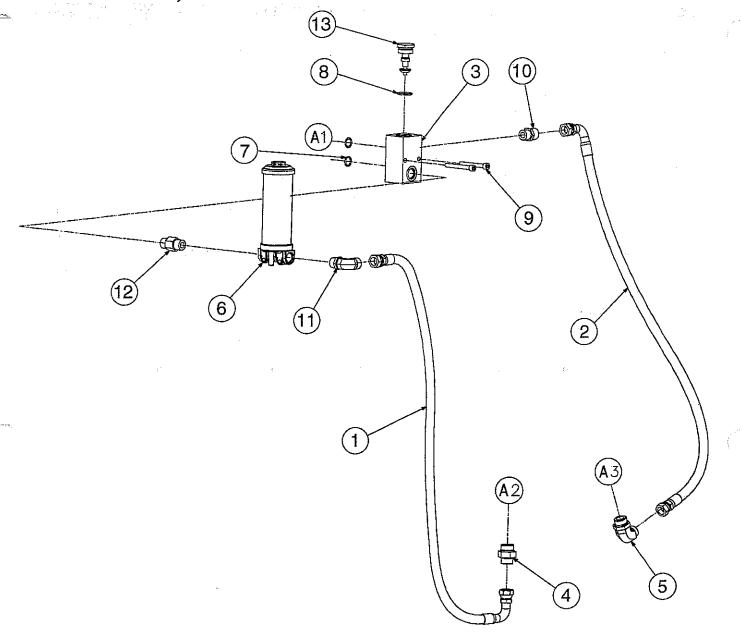
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A2 From Aftercooler

A3 From Minimum Pressure Valve

⁽I) For maintenance on water separator no. 02250144-635, order replacement seal kit no. 02250144-735.

8.10 FLUID PIPING, AIR-COOLED



02250152-488r00

PARTS LISTS

8.10 FLUID PIPING, AIR-COOLED (CONTINUED)

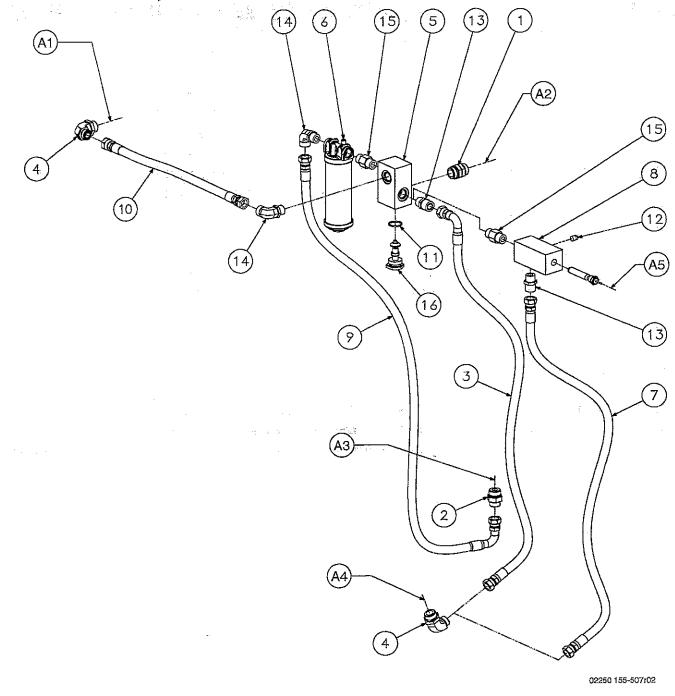
Key	Description	Part Number	Note	Quantity
1	hose, medium pressure orfs f-swvl 1" x 53"	02250141-104		. 1
2	hose, medium pressure orfs f-swvl 1" x 48"	02250143-476		1
3	block, thermal valve 50HP	02250151-498		1
4	connector, orfs x metr oring 3/4" 50HP	02250152-223		1
5	elbow, 90 1" sae x 3/4" orfs	02250152-544		1
6	filter, coreless m27 6"	 02250155-708	(I) :	1
7	o-ring, viton 13/16 x 1/8	826502-211		2
8	o-ring, viton 1 5/16 x 1/8	826502-219		1
9	screw, socket iso m10 x 85mm pc 12.9	874510-085		2
10	connector, metr str thd/orfs m27 x 3/4	883527-012		1
11	elbow, met st thd/orfs m27 x 3/4	883627-012		1
12	union, str thd iso 6149 m27 x 2	883727-012		1
13	element, thermal valve (Sullube)	02250092-081	(II)	1
	element, thermal valve (24KT or 175 psig)	02250148-796	(III)	1

- A1 To Cooler
- A2 To Compressor Unit
- A3 From Receiver Tank
- (I) For maintenance on coreless filter No. 02250155-708, order replacement element No. 02250155-709
- (II) For maintenance on thermal valves on machines using Sullube, order repair kit no. 02250144-327
- (III) For maintenance on thermal valves on machines using 24KT fluid, or rated 175 psig, order repair kit no. 02250148-827.



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8.11 FLUID PIPING, WATER-COOLED



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8.11 FLUID PIPING, WATER-COOLED (CONTINUED)

- *			
Key	Description	Part Number Note (Quantity
1	adapter, sae 1 5/16 x 1 5/16-12	02250086-022	. 1
2	connector, sae x orfs .75"	02250135-568	1
3	hose, medium pressure orfs f-swvl 3/4"x 53"	02250141-104	1
4	elbow, 90 1"sae x 3/4"orfs	02250152-544	2
5	housing, thermal valve 50hp w/c	02250155-141	1
6	filter, coreless m27 6"I	02250155-708	1
7	hose, medium pressure orfs f-swvl 3/4" x 54"	02250156-913	1
8	tee, iso-6149/npt oil ret 3700	02250160-059	. 1
9	hose, medium pressure orfs f-swvl 3/4" x 60"	02250160-242	1
10	hose, medium pressure orfs f-swvl 3/4" x 29"	02250164-115	1
11	o-ring, viton 1 5/16 x 1/8"	826502-219	1
12	plug, pipe 1/4" 3000# stl plt	866900-010	1
13	connector, metr str thd/orfs m27 x 3/4	883527-012	2
14	elbow, met st thd/orfs m27 x 3/4	883627-012	2
15	union, str thd iso 6149 m27 x 2	883727-012	2
16	valve, thermal 195f 1 1/2-18 (Sullube)	02250092-081 (I)	1
	element, thermal 210f (24kt, 175 psig)	02250148-796 (I)	1

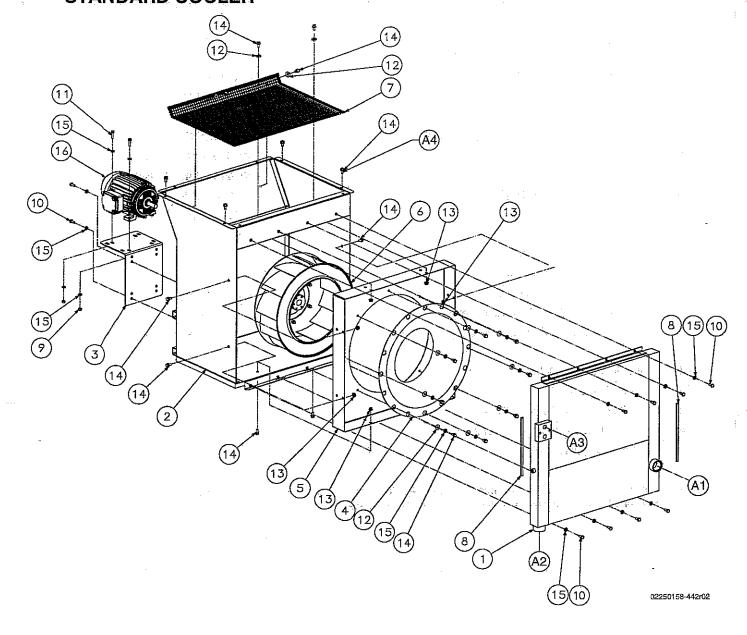
- A1 From Fluid Cooler Outlet
- A2 To Fluid Cooler Inlet
- A3 Fluid Return From Receiver Tank
- A4 Fluid Injection To Compressor Unit
- A5 To Water Regulator Valve
- For maintenance on thermal valve no 02250092-081, order repair kit No. 02250144-327. For maintenance on thermal valve no 02250148-796, order repair kit No. 02250148-827.

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8.12 COOLING AND LUBRICATION SYSTEM, AIR-COOLED 18"/60HZ FAN, STANDARD COOLER



PARTS LISTS

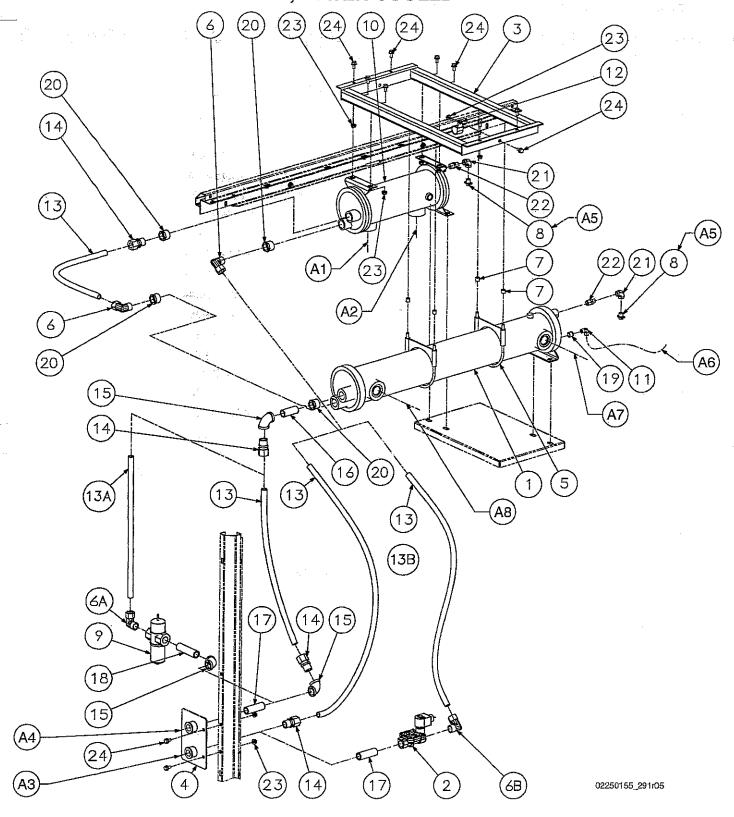
8.12 COOLING AND LUBRICATION SYSTEM, AIR-COOLED 18"/60HZ FAN, STANDARD COOLER (CONTINUED)

Key 1			The same of the sa	Quantity
	Description cooler, air/oil 50hp	02250151-493		1
2	duct, centrifugal fan 3700	02250151-496		1
3	support, fan motor 3700	02250151-501		1
4	panel, venturi 3700 18" fan	02250155-681		1
4	panel, venturi 4500 20" fan	02250155-680		. 1
5	adapter, venturi 3700 18" fan	02250155-682		. 1
)	adapter, venturi 4500 20" fan	02250155–683		1
•	fan, centrifugal hs 60hz 18"dia	02250155-684		1
6	fan, centrifugal 20" 50HP std	02250151-494		1
	fan, centrifugal 18" 60HP hi static/60HP std	02250155-684	V+	1
	fan, centrifugal 20" 60HP hi static/50HZ	02250155-685		1
	fan, centrifugal 18" 50HP 50HZ	02250151-495		1
7	guard, fan discharge 3700	02250158-544		1
8	weatherstrip, 3/16 x 3/8 ft	250022-436		6
9	nut, hex metric m8 x 1.25	825908-125		4
10	capscrew, hex 8.8 m8 x 20mm	828008-020		12
11	capscrew, hex 8.8 m8 x 30mm	828008-030		4
12	washer, iso 7093-8-140hv	865708-240		12
13	nut, serr fing m8 x 1 25	882508-125		8
14	screw, tf-hex m8 x 16 blk zinc	883008-016	\$	22
15	washer, nord-lock pl m8 sp	883208-166		28
16	motor	-	(1)	1
10	riotoi			
A1	In From MPV		-	

- A2 Out To Water Separator
- A3 Thermal Bypass Valve
- A4 Cooler Pack Assembly Rest on Top Rails of Canopy. Thread Forming Screws Attach Cooler Pack To Rails.
- (I) This part will vary by model.



8.13 FLUID COOLING SYSTEM, WATER-COOLED



8.13 FLUID COOLING SYSTEM, WATER-COOLED (CONTINUED)

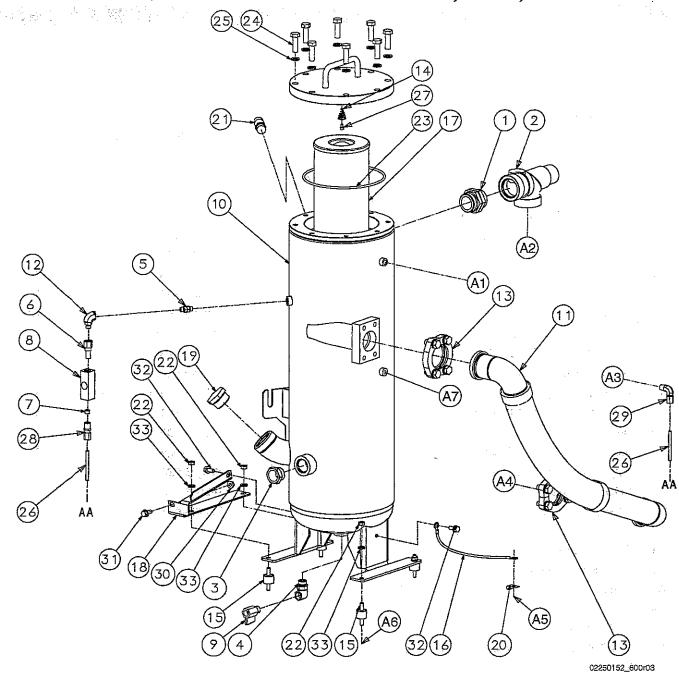
еу	Description	Part Number	Note	Quantity
1	cooler, Is12v oil/wtr 5 x 36	02250094-744		1
2	valve, solenoid 2wnc 3/4 250# n4 +	02250125-668	(I) (III)	1
3	support, heat exchanger w/c 50hp	02250155-140		1
4	support, water conn 3/4" 3700 w/c	02250155-142		1
5	u-bolt, w/saddle 5.50"	02250155-250		2
6	elbow, tube 3/4"-plstc x 3/4"-npt	02250155-257	(II) (III)	4
7	spacer, sti tube 50 o.d. x 49	02250164-034		4
8	drainlock, 1/4 ^u	40061		2
9	valve, water reg 3/4"160-230f	47398	(II)	1
10	oir, aftroir 1-1/2" npt air/1" npt wtr port	250017-527	(IV)	1
, ,	cir, aftrcir 1-1/2" npt air/1" npt wtr port	250040-680	(V)	1
11	elbow, 90 1/4t pls x 1/4 npt m	250018-430		1.
12	clamp, tubing 1-1/8" dia	250025-636		1
13	tubing, thermoplastic 3/4"(ft)	250039-353		7
14	connector, male plastic tubing 3/4x3/4	250039-357		4
15	elbow, pipe 90 deg plt 3/4"	866215-030	4.1	3
16	nipple, pipe pltd 3/4 x 2 1/2	866312-025		1
17	nipple, pipe-xs plt 3/4 x 3	866412-030		2
18	nipple, pipe-xs plt 3/4 x 4	866412-040	(II)	1
19	bushing, red hex pltd 3/8 x 1/4	868901-010		1
20	bushing, red hex pltd 1 x 3/4	868904-030		4
21	elbow, pipe 90f 1/4 x 1/4 brass	881104-025		2
22	nipple, pipe-hx brass 3/8 x 1/4	881306-025		2
23	nut, serr fing m8 x 1.25	882508-125		9
24	screw, hex serr washer m8 x 16	882608-016		11

- A1 To Water Separator
- A2 To Minimum Pressure Valve
- A3 Water In
- A4 Water Out
- A5 Air Bleed Valve
- A6 To PSW2 low Water Pressure Switch in Electrical Control Box
- A7 To Fluid Cooler
- A8 From Fluid Cooler
- (I) For maintenance on solenoid valve No. 02250125-668, order repair kit No. 02250160-751, and replacement coil No. 02250125-855.
- (II) Used on machines requiring water regulating valve option
- (III) Used on machines requiring water solenoid valve option.
- (IV) 3000, 3700 models only
- (V) 4500 model only.



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8.14 DISCHARGE, RECEIVER AND PIPING SYSTEM, 3000P, 3700 AND 4500

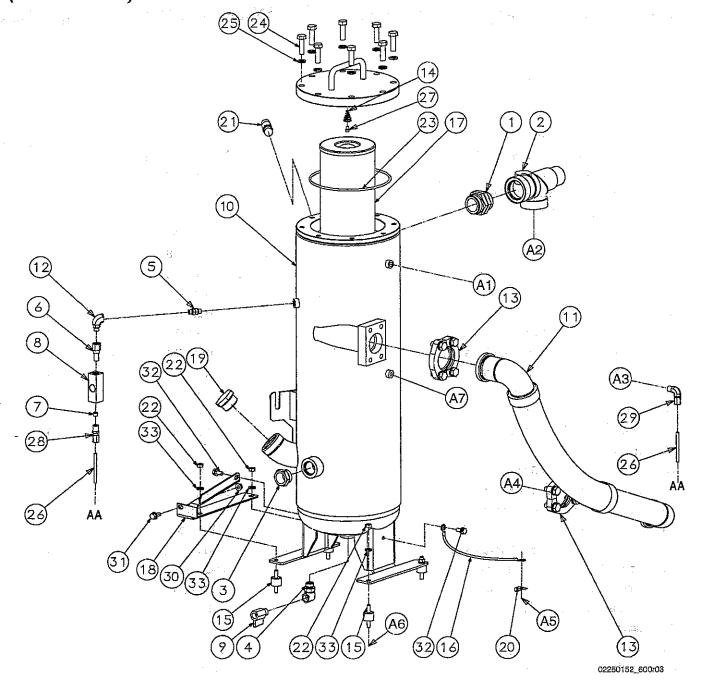


8.14 DISCHARGE, RECEIVER AND PIPING SYSTEM, 3000P, 3700 AND 4500 (CONTINUED)

		Part Number N	ote Qu	antity
Key	Description adapter, sae 1 7/8-12 x 1 7/8-12	02250055-014		1
1	vlv. min press chk 1-7/8 sae 0-ring		(1)	2
2	plug, sight glass 1 5/16" sae	02250097-610		1
3	elb, 90 deg 3/4 sae x 3/8 nptf	02250100-093		1
4	adapter, sae 7/16 x 7/16-20	02250101-783		1
5 6	filter, assembly screen filter	02250117-782	(II)	1
7	orifice, plug brass 1/8"npt x 1/32"	02250125-774		1
8	sightglass, orf block sae	02250126-129		1
9	valve, ball mini m x f 3/8"viton	02250146-870		1
10	tank, separator 3700	02250149-624		1
11	joint, expansion air end-separator	02250151-492		1
12	elbow, sae 1/4" (7/16-20) m x f	02250152-798		1
13	flange, kit sae split 2" m12 bolt	02250152-810		2
14	spring, conical oil sep ground	02250155-720		1
15	isolator, vibration 3700	02250156-379		4
16	wire,10 gage ground bond 12" m8	02250157-450		1
17	element, sep round 5.5d x 14.3lng	02250160-774	(III)	1
18	support, receiver 3700 shipping	02250162-937	* . *	1
19	plug, o-ring boss sae 1 1/4	40029	**	1
20	clamp, speed tube 1/4"	43357		1. (
21	valve, pressure relief 200 psig	250006-938		. 1
22	nut, hex metric m8 x 1.25	825908-125		4
23	o-ring, viton 7 3/4 x 3/16"	826502-368		1
24	capscrew, hex 8.8 m12 x 40mm	828012-040		8
25	washer, spr lock-metric pltd m12	838812-250	9	8
26	tubing, stnls stl 1/4 20ga ft	841215-004		4
27	screw, socket iso m5 x 8mm pc 12.9	874505-008	1 y"	1
28	connector, tube-m 1/4 x 1/4 ss	876804-025		1
29	elbow, tube 90 deg m 1/4 x 1/4 ss	877004-025		1
30	nut,serr flng m8 x 1.25	882508-125		1
31	screw, hex serr washer m8 x 20	882608-020		1
32	screw, tf-hex m8 x 16 blk zinc	883008-016		2
33	washer, nord-lock pl m8 sp	883208-166		4



8.14 DISCHARGE, RECEIVER AND PIPING SYSTEM, 3000P, 3700 AND 4500 (CONTINUED)

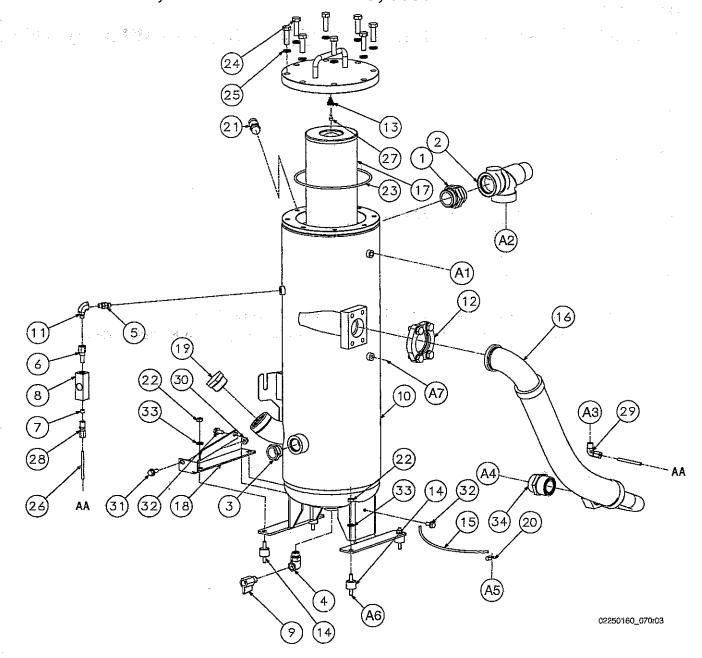


8.14 DISCHARGE, RECEIVER AND PIPING SYSTEM, 3000P, 3700 AND 4500 (CONTINUED)

ι .	
Key	Description Part Number Note Quantity
A1	To Strainer on Solenoid Valve Assembly
A2	To Aftercooler in
АЗ	To Unit Oil Return Port
A 4	From Unit Discharge
A5	To Grounding Location on Frame
A6	To Frame
A7 -	Sump Pressure
(1)	For maintenance on minimum pressure valve no. 02250097-598, order:
	kit, repair, No. 02250110-727
	kit, cap, No. 02250046-396
	kit, O-ring, No. 02250048-363
	kit, piston, No. 02250051-337
(11)	For maintenance on return line strainer, order replacement strainer No. 02250117-782.
(111)	For maintenance on separator element No. 02250160-774, order replacement element No. 02250160-776.



8.15 DISCHARGE, RECEIVER AND PIPING, 3000 WITH 10 SERIES UNIT



PARTS LISTS

8.15 DISCHARGE, RECEIVER AND PIPING, 3000 WITH 10 SERIES UNIT (CONTINUED)

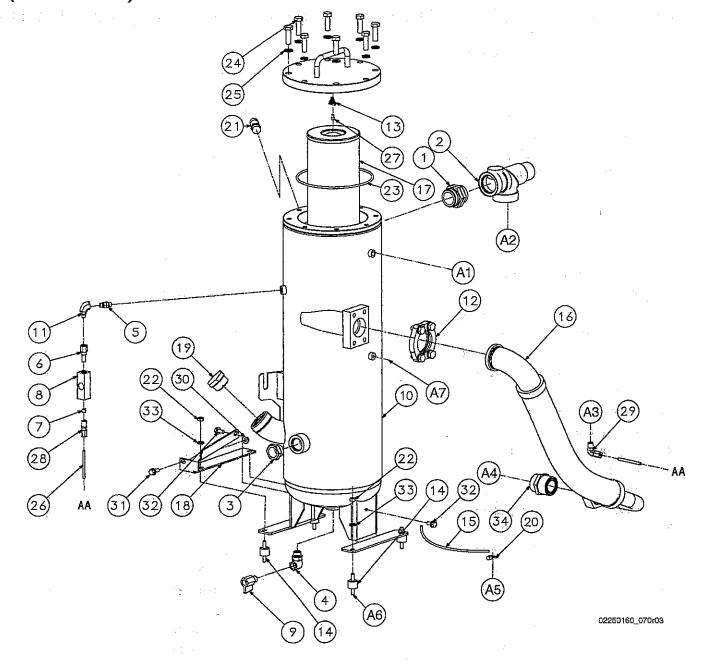
Key	Description	Part Number	Note	Quantity	
1	adapter, sae 1 7/8-12 x 1 7/8-12	02250055-014		1	
2	vlv. min press chk 1-7/8 sae 0-ring por	02250097-598	(1)	1	
3	plug, sight glass 1 5/16" sae	02250097-610		1	
4	elb, 90 deg 3/4 sae x 3/8 np	02250100-093		1	
5	adapter, sae 7/16 x 7/16-20	02250101-783		1	
6	filter, assembly screen filter	02250117-782	(II)	, 1	
7	orifice, plug brass 1/8"npt x 1/32"	02250125-774		1	
8	sightglass, orf block sae	02250126-129		1	
9	valve, ball mini m x f 3/8"viton	02250146-870		1	
10	tank, separator ws37	02250149-624		1	
11	elbow, sae 1/4" (7/16-20) m x f	02250152-798		1	
12	flange, kit sae split 2" m12 bolt	02250152-810		1	
13	spring, conical oil sep ground ws	02250155-720		1	
14	isolator, vibration ws 30/37/45 rec tnk	02250156-379		. 4	
15	wire, 10 gage ground bond 12" m8	02250157-450		1	
16	joint, expansion 3700 w/10series unit	02250159-974		†	
17	element, sep round 5.5d x 14.3ing+	02250160-774	(111)	.1	
18	support, receiver 3700 shipping	02250162-937		1	
19	plug, o-ring boss sae 1 1/4	40029		1	, ···
20	clamp, speed tube 1/4"	43357		1	al .
21	valve, pressure relief 200 psig	250006-938		* 1	
22	nut, hex metric m8 x 1.25	825908-125		4	
23	o-ring, viton 7 3/4 x 3/16°	826502-368		1	
24	capscrew, hex 8.8 m12 x 40mm	828012-040		8	
25	washer, spr lock-metric pltd m12	838812-250		8	
26	tubing, stnls stl 1/4 20ga ft	841215-004		4	
27	screw, socket iso m5 x 8mm pc 12.9	874505-008		1	
28	connector, tube-m 1/4 x 1/4 ss	876804-025		1	
29	elbow, tube 90 deg m 1/4 x 1/4 ss	877004-025		_	
30	nut, serr fing m8 x 1.25	882508-125		1	
31	screw, hex serr washer m8 x 20	882608-020			
32	screw, tf-hex m8 x 16 blk zinc	883008-016		2	
33	washer, nord-lock pl m8 sp	883208-166		4	
34	connector, straight thd/orfs 1 7/8 x 1 1/2	884424-188		1	

3000-4500 Operator's Manual and Parts List



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8.15 DISCHARGE, RECEIVER AND PIPING, 3000 WITH 10 SERIES UNIT (CONTINUED)

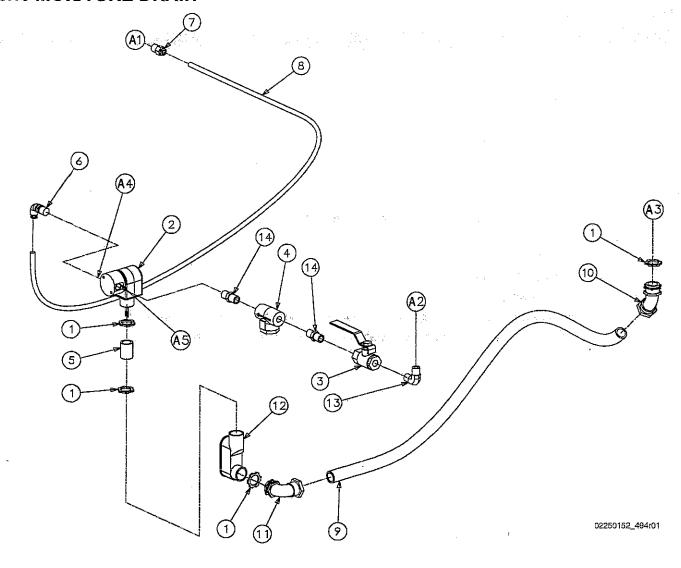


8.15 DISCHARGE, RECEIVER AND PIPING, 3000 WITH 10 SERIES UNIT (CONTINUED)

*	
Key	Description Part Number Note Quantity
A1	To Strainer on Solenoid Valve Assembly
A2	To Aftercooler in
АЗ	To Unit Oil Return Port
A4	From Unit Discharge
A5	To Grounding Location on Frame
A6	To Frame
A7	Sump Pressure
(I)	For maintenance on minimum pressure valve no 02250097-598, order:
``	kit, repair, No 02250110-727
	kit, cap, No. 02250046-396
	kit, O-ring, No. 02250048-363
	kit, piston, No. 02250051-337
(II)	For maintenance on return line strainer, order: strainer No. 02250117-782, (qty of 2 needed).
7101	For meintenance on congretor element No. 02250160-774, order: element No. 02250160-776

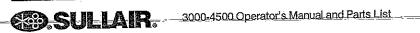


8.16 MOISTURE DRAIN

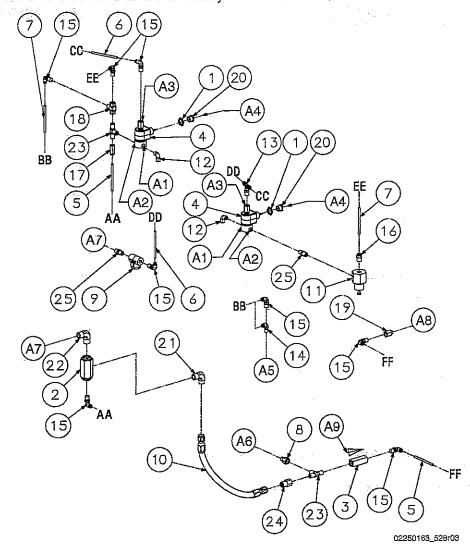


	MOISTURE DRAIN <i>(CONTINUE</i>		Part Number	Note	Quantit
еy	Description locknut, n4 conduit sealing		02250071-362	· .	4
1	valve, solenoid 2wnc 1/4 200# 24vdc		02250155-715	(1)	1
2			047115		1
3	valve, ball 1/4" npt	•	241771	(11)	1
4	strainer, v-type 300psix1/4		250007-168		1
5	nipple, conduit 1/2 x 1.125"		250025-850		1
6	elbow, 90deg m swvl 1/4t x 1/4 npt		250025-859		1
7	connector, male1/4tube x 1/4		842215-004		5
8	hose,nylon 1/4(ft)		846315-050		4
9	conduit		846500-050		1
10	elbow, 45deg lq-tite 1/2		846600-050		1
11	elbow, 90deg lq-tite 1/2		847715-050		1
12	elbow, entrance 1/2	•	881004-025		1
13 14	elbow, pipe-90m 1/4 x 1/4 brass nipple, pipe-hx brass 1/4 x 1/4		881304-025		2
A1	To Air Bracket Out				
A2	To Water Seperator	6 ×			
АЗ	To Bottom of Starter Box	Ĭ.			
Α4	Port 1				
A5	Port 2				

- For maintenance on solenoid valve no 02250155-715, order repair kit no 02250157-501, and replacement coil no 02250157-502
- For maintenance on return line strainer no. 241771, order repair kit no. 241772.



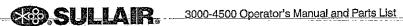
8.17 PNEUMATIC CONTROL SYSTEM, WITH STANDARD SEQUENCING



8.17 PNEUMATIC CONTROL SYSTEM, WITH STANDARD SEQUENCING (CONTINUED)

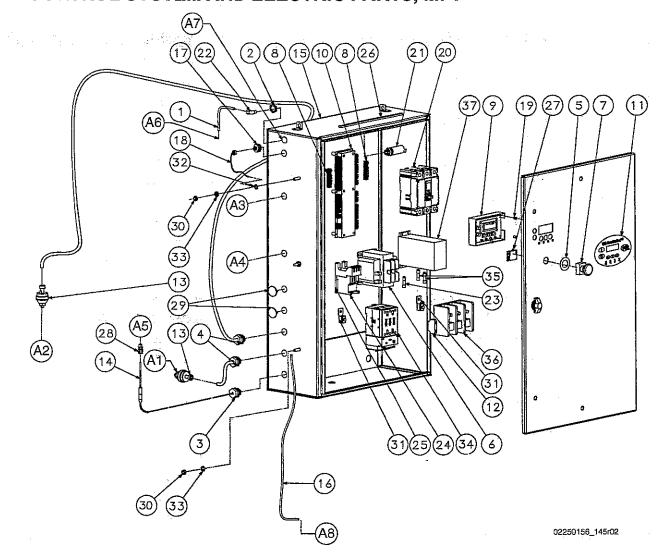
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Key	Description	Part Number	Note	Quantity 🔍
1	locknut, n4 conduit sealing	02250071-362		2
2	valve, 1/2 bldwn 1.8:1 250 psig	02250100-042	· (Ì)	1
3	valve, check 1/4" poppet style	02250115-272		1
4	valve, solenoid 3wno 1/4 250# 24vdc	02250155-714	(II)	2
5	tbg, nylon 1/4"-od red	02250155-961		3
6	tbg, nylon 1/4"-od blue	02250155-962		2
7	tbg, nylon 1/4"-od yellow	02250155-963		5
8	orifice, 140" 25 fnpt x 25	02250161-433		1
9	strainer, v-type 300psix1/4	241771	(III)	1
10	hose, med press 0.50 x 015"	249608-019		1
11	valve, pressure regulator	250017-280	(IV)	1
12	elbow, 1/4" tube x 1/4" npt	250018-430		2
13	tee, male branch swiv 1/4 tube x 1/4 npt	250025-835		ः" 1
14	elbow, 90deg m swvi 1/4t x 1/8npt	250025-849	(V)	1
15	elbow, 90deg m swvl 1/4t x 1/4 npt	250025-850		8
16	connector, male1/4tube x 1/4	250025-859		1
17	connector, fem tube 1/4 x 1/4 nptf	250025-923		1
18	valve, shuttle 1/4" npt (dbl chk)	408893		1
19	adapter, fem pipe 1/4 x 7/16-20	811502-025	(V)	1
20	nipple, chase cond 1/2	847815-050		2 (
21	elbow, 37fl 90m 1/2 x 1/2	860208-050		1
22	elbow, pipe-90m 1/2 x 1/2	860508-050		1
23	tee, male pipe brass 1/4	869825-025		2
24	connector,37 fl 1/2 x 1/4" npt	873704-075		1
25	nipple, pipe-hx brass 1/4 x 1/4	881304-025		2

- A1 Port 1
- Port 2 A2
- Port 3 АЗ
- To Starter Box
- To Inlet Valve Α5
- To Inlet Adapter
- To Reciever Tank
- To Starter Below Inlet 8A
- Flow Direction
- For maintenance on blowdown valve no. 02250100-042, order: repair kit no. 02250100-042.
- For maintenance on solenoid valve no. 02250155-714, order: repair kit no. 02250155-500, and replacement coil no. 02250157-502
- For maintenance on strainer no. 241771, order: repair kit no. 241772.
- For maintenance on pressure regulator valve no. 250017-280, order: repair kit no. 250019-453.
- Use with 3000 machine only.



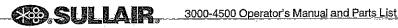
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8.18 CONTROL SYSTEM AND ELECTRIC PARTS, MFV



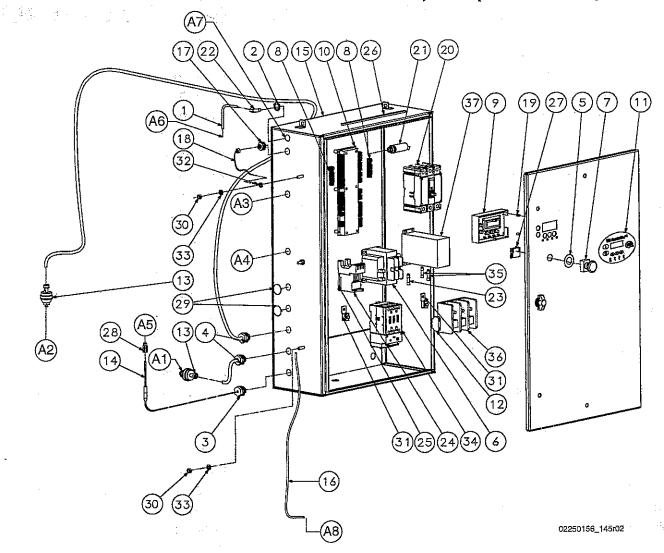
8.18 CONTROL SYSTEM AND ELECTRIC PARTS, MFV (CONTINUED)

Key	Description	Part Number	Note	Quantity
1	tube, nyl .25 x 040w blk (ft)	02250054-861	(1)	2
2	locknut, n4 conduit sealing	02250071-362	(1)	1
3	grip, cord n4 .125187 x 1/2"	02250071-379		1
4	grip, cord n4 .250375 x 1/2"	02250071-381		2
5	nameplate, e-stop 45mm yellow	02250081-473		1
6	transformer, control 150va univ w.pri fh	02250083-186		1
7	switch, push-button operator e22 40mm	02250085-504		1
8	bar, ground 5 post cutler hammer	02250101-721		2
9	control, display s4	02250154-051		1
10	control, I/o mod ws 24vdc supply	02250154-052		1
11	decal, microprocessor overlay	02250154-359		1
12	block, contact aux 1nc ch-it a-e	02250154-608		1
13	transducer, pressure 0-250# ratiometric	02250155-174		2
14	probe, rtd 100 ohm plat 3.5"x 6ft	02250155-175		- 1
15	specification, encl 3700 22"x36"x10"	02250155-936		1
16	wire, 10 gage ground bond 33" m8	02250157-449		1
17	receptacle,s4 program port nema 6p	02250159-547		1
18	cap, s4 program port nema 6p	02250159-549		1
19	spacer, p8/p12 ws mtg to encl	02250161-759		4
20	breaker, cir100a hmcp	250014-827		1
21	switch, pressure n.o. 10 psi	250017-992	(1)	1 (
22	elbow, 90 1/4"tube x 1/8"npt	250018-429	(l)	1
23	fuse, limitron ktk-r 2 00	250019-756	(l)	1
24	relay, overload 32a	250021-692	(II)	1
25	adapter, o.l.r. base mnt ch1	250021-694	(II)	1
26	weatherstrip, 3/16 x 3/8 ft	250022-436		1
27	block, contact 1nc	250027-125		1
28	fitting, compress adj	250028-635		1
29	plug, hole n4 1/2" cond	409918-002		2
30	nut, hex metric m8 x 1.25	825908-125		6
31	lug, scrulug kpa-25 4-1/0	849215-025		2
32	terminal, ring tng 3/8 x 8ga	849306-008		1
33	washer, nord-lock pl m8 sp	883208-166	437)	6
34	starter, ac fan	-	(II) (III)	1
35	fuse	-	(1) (111)	2
36	block, power	-	(III)	1
37	supply, power	-	(III)	1



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8.18 CONTROL SYSTEM AND ELECTRIC PARTS, MFV (CONTINUED)

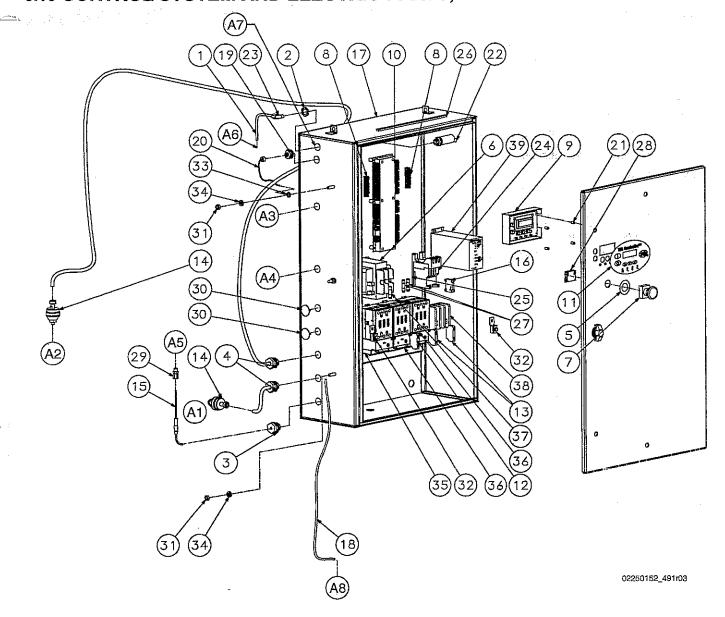


8.18 CONTROL SYSTEM AND ELECTRIC PARTS, MFV (CONTINUED)

Key Description A1 P1 - Wet Receiver Pressure A2 P2 - Line Pressure A3 Solenoid 1 A4 Solenoid 4 A5 T1 - Wet Discharge Temp A6 PSW2 - Low Water Pressure Switch A7 Drill Hole for WC Machine	Part Number Note Quantity
A2 P2 - Line Pressure A3 Solenoid 1 A4 Solenoid 4 A5 T1 - Wet Discharge Temp A6 PSW2 - Low Water Pressure Switch	
A3 Solenoid 1 A4 Solenoid 4 A5 T1 - Wet Discharge Temp A6 PSW2 - Low Water Pressure Switch	
A4 Solenoid 4A5 T1 - Wet Discharge TempA6 PSW2 - Low Water Pressure Switch	
A5 T1 - Wet Discharge Temp A6 PSW2 - Low Water Pressure Switch	
A6 PSW2 - Low Water Pressure Switch	
A7 Drill Hole for WC Machine	
10 Dillinois is it is massimize	
A8 To Frame	
(I) Denotes water-cooled machines only	
(II) Denotes air-cooled machines only	
(III) This part may vary per machine specification. Const	ult the Sullair factory for details



8.19 CONTROL SYSTEM AND ELECTRIC PARTS, WYE-DELTA

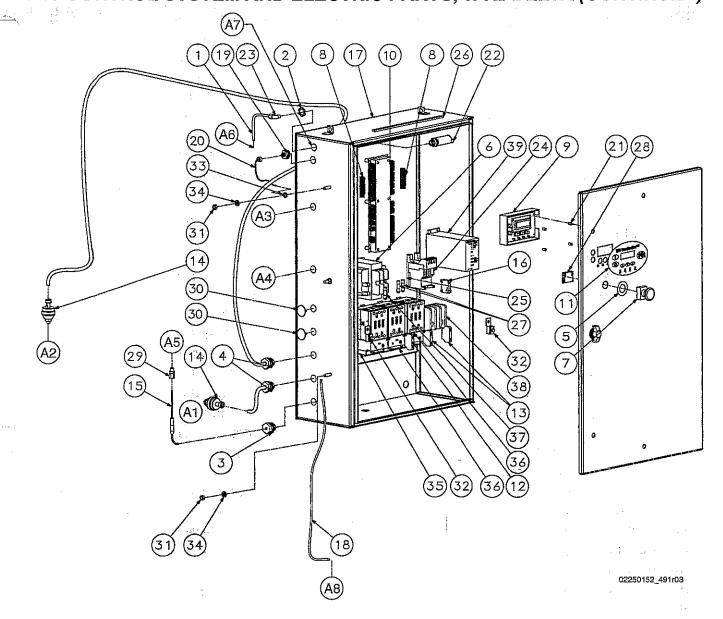


8.19 CONTROL SYSTEM AND ELECTRIC PARTS, WYE-DELTA (CONTINUED)

1 tube, nyl 25 x 040w blk (ft) 2 looknut, n4 condult sealing 3 grip, cord n4 125-187 x 1/2" 3 grip, cord n4 125-187 x 1/2" 4 grip, cord n4 125-187 x 1/2" 5 nameplate, e-stop 45mm yellow 6 transformer, control 150va univ w pri fin 7 switch, push-button operator e22 40mm 8 bar, ground 5 post cutiler hammer 9 control, library w pri fin 10 control, library w pri fin 10 control, library w pri fin 11 deat, microprocessor overlay 12 block, contact aux 1no ch-it a-e 13 block, contact aux 1no ch-it a-e 14 transducer, pressure 0-250 ir attionettic 15 probe, ltd 100 chm plat 3 5"x 6it 16 link, mech intrik ch it frm b-e 17 specification, end 3700 22"x36"x10" 18 wire, 10 gage ground bond 33" m8 19 caep, s4 program port nema 6p 20 cap, s4 program por	Key	Description	Part Number	Note	Quantity
Dockmat, not conduit sealing O2250071-362 (i) 1 3 grip, cord n4 126-187 x 1/2* O2250071-381 2 2 grip, cord n4 126-187 x 1/2* O2250071-381 2 2 2 2 2 2 2 2 2	MINISTER PROPERTY.		02250054-861	(l)	2
grip, cord n4 125-187 x 1/2*			02250071-362	(I)	1
grip, cord n4 .250 .375 x 1/2* 5 nameplate, e-stop 45mm yellow 02250081-473 1 transformer, control 150va unit v pri fi 7 switch, push-button operator e22 40mm 02250085-504 1 ber, ground 5 post cutler hammer 02250154-051 1 control, life play s4 02250154-051 1 decal, microprocessor overlay 1 decal, microprocessor overlay 1 block, contact aux 1no ch-it a-e 1 block, contact aux 1no ch-it a-e 1 block, contact aux 1no ch-it a-e 1 block, contact aux 1no th-it a-e 1 class and aux 1no th-it a-e 1 block, contact aux 1no th-it a-e 1 class and aux 1no th-it a-e 1 class aux 1no th-it a-e 1 class and aux 1no			02250071-379		1
5 nameplate, e-stop 45mm yellow 02250081-473 1 6 transformer, control 150va univ w pri fit 02250083-186 (I) 1 7 switch, push-button operator e22 40mm 02250085-504 1 8 ber, ground 5 post cutler hammer 02250164-051 1 9 control, kiplay s4 02250154-051 1 10 control, kiplay s4 02250154-052 1 11 decal, microprocessor overlay 02250154-052 1 12 block, contact aux 1no ch-it a-e 02250154-607 1 13 block, contact aux 1no ch-it a-e 02250154-608 2 14 transducer, pressure 0-250F ratiometric 02250154-608 2 15 probe, rtd 100 chm plat 35°x 6ft 02250155-174 2 15 probe, rtd 100 chm plat 35°x 6ft 02250155-174 2 16 link, mech lintrik ch it frm b-e 02250155-175 1 17 specification, end 3700 22°x36°x10° 02250155-476 1 18 wire, 10 gage ground bond 33° m8 02250157-449 <td></td> <td></td> <td>02250071-381</td> <td></td> <td>2</td>			02250071-381		2
transformer, control 150va univ w.prl fit 7 switch, push-button operator e22 40mm 8 ber, ground 5 post cutler hammer 92250185-504 1 control, display s4 92250164-051 1 control, j/o mod ws 24vdc supply 10 control, j/o mod ws 24vdc supply 11 decal, microprocessor overlay 12 block, contact aux 1 no ch-it a-e 13 block, contact aux 1 no ch-it a-e 14 transducer, pressure 0-250/r attometric 15 probe, rtd 100 ohm plat 3.5°x 6ft 16 link, mech intrik ch it frm b-e 17 specification, encl 3700 22°x36°x10° 18 wire, 10 gage ground bond 33° m8 19 receptacle, s4 program port nema 6p 10 cap, s4 program port nema 6p 21 spacer, p8/p12 ws mig to encl 22 switch, pressure n.o. 10 psi 22 switch, pressure n.o. 10 psi 23 elbow, 90 1/4°tube x 1/8°npt 24 relay, overload 32a 25 adapter, ol 1. base mnt ch1 26 weatherstrip, 3/16 x 3/6 ft 27 fuse, kldr 1.50 600v td 28 block, contact inc 19 fuse, kldr 1.50 600v td 29 starter, ac fan 10 (III) 20 contactor 10 (III) 20 contactor 11 control, display served 12 system 90 2250165-954 13 block, contact inc 14 system 90 2250165-954 90 2250169-547 90 2250169-549 90 2250169-547 90 2250169-549 90 2250169-547 90 225			02250081-473		1
7 switch, push-button operator e22 40mm 02250085-504 1 8 bar, ground 5 post cutler hammer 02250101-721 2 9 control, display s4 02250154-051 1 10 control, lyo mod ws 24vdc supply 02250154-052 1 11 decal, microprocessor overlay 02250154-359 1 12 block, contact aux 1no ch-it a-e 02250154-607 1 13 block, contact aux 1no ch-it a-e 02250154-608 2 14 transducer, pressure 0-250# ratiometric 02250155-175 1 15 probe, rtd 100 ohn plat 3.5"x 6it 02250155-175 1 16 link, mech intrik ch it frm b-e 02250155-175 1 17 specification, end 3700 22"x36"x10" 02250155-936 1 18 whre, 10 gage ground bond 33" m8 02250157-449 1 19 receptacle, s4 program port nema 6p 02250159-547 1 20 cap, s4 program port nema 6p 02250159-549 1 21 spacer, p8/p12 we mtg to encl 02250159-549 <td< td=""><td></td><td>•</td><td>02250083-186</td><td>(I)</td><td>1</td></td<>		•	02250083-186	(I)	1
bar, ground 5 post cutler hammer control, display s4 control, decal, microletal s5 control, display s4 control, decal, microletal s5 control, display s4 control, decal, microletal s5 control, decal, microletal s5 control, decal, microletal s5 control, decal, microletal s5 control, decal, microletal s6 control, decal, microletal s7 control, s6 con			02250085-504		1
9 control, display s4 10 control, l/o mod ws 24vdc supply 11 decal, microprocessor overlay 12 block, contact aux 1 no ch-it a-e 13 block, contact aux 1 no ch-it a-e 14 transducer, pressure 0-250# ratiometric 15 probe, rtd 100 ohm plat 3.5"x 6ft 16 link, mech intrlk ch it frm b-e 17 specification, encl 3700 22"x36"x10" 18 wire, 10 gage ground bond 33" m8 19 receptacle, s4 program port nema 6p 20 cap, s4 program port nema 6p 21 spacer, p8/p12 ws mtg to encl 22 switch, pressure n.o. 10 psi 23 elbow, 90 1/4"tube x 1/8"npt 24 relay, overload 32a 25 adapter, ollr, base mnt ch1 26 weatherstrip, 3/16 x 3/8 ft 27 fuse, kldr 1.50 600v td 28 block, contact Inc 30 contact or 31 the second se	: 8		02250101-721		2
10 control,			02250154-051		1
11 decal, microprocessor overlay 02250154-359 1 1 2250154-359 1 1 2250154-607 1 1 2250154-608 2 2 1 2 2 2 2 2 2 2			02250154-052		1
12 block, contact aux 1 no ch-it a-e 02250154-607 1 13 block, contact aux 1 no ch-it a-e 02250154-608 2 14 transducer, pressure 0-250if ratiometric 02250155-174 2 15 probe, rtd 100 ohm plat 3 5"x 6ft 02250155-175 1 16 link, mech intrik ch it frm b-e 02250155-676 1 17 specification, encl 3700 22"x36"x10" 02250155-936 1 18 wire, 10 gage ground bond 33" m8 02250157-449 1 19 receptacle, s4 program port nema 6p 02250159-547 1 20 cap, s4 program port nema 6p 02250159-549 1 21 spacer, p8/p12 ws mtg to encl 02250161-759 4 22 switch, pressure n.o. 10 psi 250017-992 (i) 1 23 elbow, 90 1/4"tube x 1/8"npt 250018-429 (i) 1 24 relay, overload 32a 250021-692 (ii) 1 25 adapter, o.lr. base mnt ch1 250021-694 (ii) 1 26 weatherstrip, 3/16 x 3/8 ft 250022-436 1 27 tuse, kldr 1.50 600v td 250026-643 (i) 2 28 block, contact 1 nc 250027-125 1 19 fitting, compress adj 250028-635 1 10 plug, hole n4 1/2" cond 409918-002 2 11 nut, hex metric m8 x 1.25 825908-125 6 12 tuse, scrulug kpa-25 4-1/0 849215-025 2 13 terminal, ring tng 3/8 x 8ga 849306-008 1 14 weather, nord-lock pl m8 sp 883208-166 6 15 starter, ac fan - (ii) (iii) 1 16 contactor - (iii) 1 17 tuse block, power - (iii) 1			02250154-359		1
13 block, contact aux 1 no ch-it a-e 02250154-608 2		and the second s	02250154-607		1
transducer, pressure 0-250# ratiometric probe, rtd 100 ohm plat 3 5"x 6ft link, mech intrlk ch it frm b-e psecification, encl 3700 22"x36"x10" probe, rtd 100 ohm plat 3 5"x 6ft link, mech intrlk ch it frm b-e psecification, encl 3700 22"x36"x10" probe, 10 gage ground bond 33" m8 preceptacle, s4 program port nema 6p page ground bond 32" m8 preceptacle, s4 program port nema 6p page ground bond 32" m8 preceptacle, s4 program port nema 6p page ground bond 32" m8 preceptacle, s4 program port nema 6p page ground bond 32" m8 preceptacle, s4 program port nema 6p page ground bond 32" m8 preceptacle, s4 program port nema 6p page ground bond 32" m8 preceptacle, s4 program port nema 6p page ground bond 32" m8 preceptacle, s4 program port nema 6p page ground bond 32" make ground season for sea			02250154-608		2
15 probe, rtd 100 ohm plat 3.5"x 6ft 16 link, mech intrik ch it frm b-e 17 specification, encl 3700 22"x36"x10" 18 wire, 10 gage ground bond 33" m8 19 receptacle, s4 program port nema 6p 2250155-47 20 cap, s4 program port nema 6p 21 spacer, p8/p12 ws mtg to encl 22 switch, pressure n.o. 10 psi 23 elbow, 90 1/4"tube x 1/8"npt 24 relay, overload 32a 250021-692 26 dill) 27 use, kldr 1.50 600v td 28 block, contact 1nc 29 fitting, compress adj 20 plug, hole n4 1/2" cond 30 yk x 8ga 30 yk y 90 yk x 8ga 30 yk y 90 yk y m8 sp 30 yk x 8ga 30 yk y 90 yk y m8 sp 30 yk x 8ga 30 yk y 90 yk y m8 yk yk y m8 yk			02250155-174		2
16 link, mech intrik ch it frm b-e 02250155-676 1 17 specification, encl 3700 22"x36"x10" 02250155-936 1 18 wire, 10 gage ground bond 33" m8 02250157-449 1 19 receptacle, s4 program port nema 6p 02250159-547 1 20 cap, s4 program port nema 6p 022501619-549 1 21 spacer, p8/p12 ws mtg to encl 02250161-759 4 22 switch, pressure n.o. 10 psi 250017-992 (I) 1 23 elbow, 90 1/4"tube x 1/8"npt 250018-429 (I) 1 24 relay, overload 32a 250021-692 (II) 1 25 adapter, ol r. base mnt ch1 250021-692 (II) 1 26 adapter, ol r. base mnt ch1 250021-692 (II) 1 26 adapter, ol r. base mnt ch1 250021-692 (II) 1 27 fuse, kldr 1.50 600 td 250024-36 1 28 block, contact 1nc 250027-125 1 29 fitting, compress adj 250028-635 1 30 plug, hole n4 1/2"			02250155-175		1
17 specification, encl 3700 22"x36"x10" 18 wire, 10 gage ground bond 33" m8 19 receptacle, s4 program port nema 6p 20 cap, s4 program port nema 6p 21 spacer, p8/p12 ws mtg to encl 22 switch, pressure n.o. 10 psi 23 elbow, 90 1/4"tube x 1/8"npt 25 adapter, ol.r. base mnt ch1 26 weatherstrip, 3/16 x 3/8 ft 27 fuse, kldr 1.50 600v td 28 block, contact 1nc 29 fitting, compress adj 20 plug, hole n4 1/2" cond 30 plug, serulug kpa-25 4-1/0 31 washer, nord-lock pl m8 sp 32 surver, as fan 33 contactor 4 contactor 5 contactor 6 contactor 7 (III) 1 cond 1 contactor 1 cond 1 contactor 1 cond 1 contactor 1 cond 2 contactor 2 cond 2 contactor 2 cond 2 contactor 2 cond 3 contactor 4 cond			02250155-676		1
18 wire, 10 gage ground bond 33" m8 02250157-4449 1 19 receptacle, s4 program port nema 6p 02250159-547 1 20 cap, s4 program port nema 6p 02250159-549 1 21 spacer, p8/p12 ws mtg to encl 02250161-759 4 22 switch, pressure n.o. 10 psi 250017-992 (I) 1 23 elbow, 90 1/4"tube x 1/8"npt 250018-429 (I) 1 24 relay, overload 32a 250021-692 (II) 1 25 adapter, o.l.r. base mnt ch1 250021-694 (II) 1 26 weatherstrip, 3/16 x 3/8 ft 250022-436 1 27 fuse, kldr 1.50 600v td 250022-436 1 28 block, contact 1nc 250027-125 1 29 fitting, compress adj 250028-635 1 30 plug, hole n4 1/2" cond 409918-002 2 31 nut, hex metric m8 x 1.25 825908-125 6 32 lug, scrulug kpa-25 4-1/0 849215-025 2 33 terminal, ring tng 3/8 x 8ga 849306-008 1			02250155-936		1
19 receptacle, s4 program port nema 6p 20 cap, s4 program port nema 6p 21 spacer, p8/p12 ws mtg to encl 22 switch, pressure n.o. 10 psi 23 elbow, 90 1/4"tube x 1/8"npt 24 relay, overload 32a 250021-692 (II) 25 adapter, o.l.r. base mnt ch1 26 weatherstrip, 3/16 x 3/8 ft 27 fuse, kldr 1.50 600v td 28 block, contact 1 nc 29 fitting, compress adj 30 plug, hole n4 1/2" cond 31 terminal, ring tng 3/8 x 8ga 34 washer, nord-lock pl m8 sp 35 starter, ac fan 36 contactor 37 fuse 4 (III) 31 contact 1 nc 3250021-694 31 contactor 32 desprice of the service of the serv			02250157-449		1
20 cap, s4 program port nema 6p 21 spacer, p8/p12 ws mtg to encl 22 switch, pressure n.o. 10 psi 23 elbow, 90 1/4"tube x 1/8"npt 24 relay, overload 32a 250017-992 (I) 25 adapter, o.l.r. base mnt ch1 26 weatherstrip, 3/16 x 3/8 ft 27 fuse, kldr 1.50 600v td 28 block, contact 1nc 29 fitting, compress adj 30 plug, hole n4 1/2" cond 31 nut, hex metric m8 x 1.25 32 lug, scrulug kpa-25 4-1/0 33 terminal, ring tng 3/8 x 8ga 34 washer, nord-lock pl m8 sp 35 starter, ac fan 36 contactor 37 fuse 38 block, power 39 log, hower 30 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		T.	02250159-547		1
21 spacer, p8/p12 ws mtg to encl 22 switch, pressure n.o. 10 psi 250017-992 (I) 23 elbow, 90 1/4"tube x 1/8"npt 250018-429 (I) 24 relay, overload 32a 250021-692 (II) 25 adapter, o.l.r. base mnt ch1 26 weatherstrip, 3/16 x 3/8 ft 27 fuse, kldr 1.50 600v td 28 block, contact 1 nc 29 fitting, compress adj 250028-635 1 30 plug, hole n4 1/2" cond 31 nut, hex metric m8 x 1.25 32 lug, scrulug kpa-25 4-1/0 33 terminal, ring tng 3/8 x 8ga 34 washer, nord-lock pl m8 sp 35 starter, ac fan 36 contactor 37 fuse 38 block, power 38 contactor 49 contactor 50 contactor 6 contactor 7 (III) 7 contactor 8 contactor 9 contactor 1 conta			02250159-549		1
22 switch, pressure n.o. 10 psi 23 elbow, 90 1/4"tube x 1/8"npt 24 relay, overload 32a 25 adapter, ollr. base mnt ch1 26 weatherstrip, 3/16 x 3/8 ft 27 fuse, kldr 1.50 600v td 28 block, contact 1nc 29 fitting, compress adj 20 plug, hole n4 1/2" cond 30 plug, scrulug kpa-25 4-1/0 31 terminal, ring ting 3/8 x 8ga 32 starter, ac fan 33 contactor 44 sylvan ac fan 55 contactor 56 contactor 77 fuse 66 contactor 78 sylvan 79 fuse 70 (III) 71 cond 71 cond 72 cond 73 sylvan 74 sylvan 75 contactor 75 contactor 76 contactor 77 fuse 78 contactor 79 (III) 70 (III) 71 cond 71 cond 72 cond 71 cond 72 cond 73 fuse 75 (III) 75 (III) 76 (III) 77 (III) 78 contactor 79 (III) 70 (III) 71 cond 71 cond 72 (III) 71 cond 72 (III) 73 fuse 74 (III) 75 (IIII) 75 (IIIII) 75 (IIII) 75 (IIIIII) 75 (IIII) 75 (IIIIII) 75 (IIIII) 75 (IIIII) 75 (IIIII) 75 (IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII			02250161-759		4
23 elbow, 90 1/4"tube x 1/8"npt 250018-429 (I) 1 24 relay, overload 32a 250021-692 (II) 1 25 adapter, o I.r. base mnt ch1 250022-694 (II) 1 26 weatherstrip, 3/16 x 3/8 ft 250022-436 1 27 fuse, kldr 1.50 600v td 250026-643 (I) 28 block, contact 1 nc 250027-125 1 29 fitting, compress adj 30 plug, hole n4 1/2" cond 409918-002 2 31 nut, hex metric m8 x 1.25 32 lug, scrulug kpa-25 4-1/0 34 washer, nord-lock pl m8 sp 35 starter, ac fan 36 contactor 37 fuse 38 block, power 31 lug, spower 32 lug, spower 33 lug, scrulug kpa-25 4-1/0 34 lug, scrulug kpa-25 4-1/0 35 lug, scrulug kpa-25 4-1/0 36 lug, scrulug kpa-25 4-1/0 37 fuse 38 lock, power 39 lug, lug, lug, lug, lug, lug, lug, lug,	22	• • • •	250017-992	(l)	1
24 relay, overload 32a 250021-692 (II) 1 25 adapter, o.l.r. base mnt ch1 250021-694 (II) 1 26 weatherstrip, 3/16 x 3/8 ft 250022-436 1 27 fuse, kldr 1.50 600v td 250026-643 (I) 2 28 block, contact 1nc 250027-125 1 29 fitting, compress adj 250028-635 1 30 plug, hole n4 1/2" cond 409918-002 2 31 nut, hex metric m8 x 1.25 825908-125 6 32 lug, scrulug kpa-25 4-1/0 849215-025 2 33 terminal, ring tng 3/8 x 8ga 849306-008 1 34 washer, nord-lock pl m8 sp 883208-166 6 35 starter, ac fan - (II) (III) 1 36 contactor - (II) (III) 1 37 fuse - (II) (III) 1 38 block, power - (III) 1			250018-429	(l)	1
25 adapter, o.l.r. base mnt ch1 26 weatherstrip, 3/16 x 3/8 ft 27 fuse, kldr 1.50 600v td 250022-436 1 28 block, contact 1nc 250027-125 1 29 fitting, compress adj 250028-635 1 30 plug, hole n4 1/2" cond 30 plug, hole n4 1/2" cond 31 nut, hex metric m8 x 1.25 32 lug, scrulug kpa-25 4-1/0 33 terminal, ring tng 3/8 x 8ga 34 washer, nord-lock pl m8 sp 35 starter, ac fan 36 contactor 37 fuse 38 block, power 41 250022-436 1 250023-643 (I) 2 2 2 2 250028-635 1 3 409918-002 2 3 825908-125 6 849215-025 2 3 849306-008 1 3 849306-008 1 3 883208-166 6 6 7 (II) (III) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			250021-692	(11)	1
26 weatherstrip, 3/16 x 3/8 ft 250026-643 (I) 2 27 fuse, kldr 1.50 600v td 250026-643 (I) 2 28 block, contact 1 nc 250027-125 1 29 fitting, compress adj 250028-635 1 30 plug, hole n4 1/2" cond 409918-002 2 31 nut, hex metric m8 x 1.25 825908-125 6 32 lug, scrulug kpa-25 4-1/0 849215-025 2 33 terminal, ring tng 3/8 x 8ga 1 34 washer, nord-lock pl m8 sp 883208-166 6 35 starter, ac fan - (II) (III) 1 36 contactor - (III) (III) 1 37 fuse - (I) (III) 1 38 block, power - (III) 1		•	250021-694	(II)	1
250027-125 1 250027-125 1 250028-635 1 250028-635 1 30 plug, hole n4 1/2" cond 409918-002 2 31 nut, hex metric m8 x 1.25 825908-125 6 32 lug, scrulug kpa-25 4-1/0 849215-025 2 33 terminal, ring tng 3/8 x 8ga 849306-008 1 34 washer, nord-lock pl m8 sp 883208-166 6 35 starter, ac fan -		•	250022-436		1
fitting, compress adj 250028-635 1 30 plug, hole n4 1/2" cond 409918-002 2 31 nut, hex metric m8 x 1.25 32 lug, scrulug kpa-25 4-1/0 34 terminal, ring tng 3/8 x 8ga 34 washer, nord-lock pl m8 sp 35 starter, ac fan 36 contactor 37 fuse 38 block, power 250028-635 1 409918-002 2 825908-125 6 849215-025 2 (II) (III) 1 1 36 lug, scrulug kpa-25 4-1/0 849215-025 2 (II) (III) 1 1 1 1 1 1 1 1 1 1 1 1 1	27	fuse, kldr 1.50 600v td	250026-643	· (l)	2
29 fitting, compress adj 250028-635 1 30 plug, hole n4 1/2" cond 31 nut, hex metric m8 x 1.25 825908-125 6 32 lug, scrulug kpa-25 4-1/0 849215-025 2 33 terminal, ring tng 3/8 x 8ga 849306-008 1 34 washer, nord-lock pl m8 sp 883208-166 6 35 starter, ac fan - (II) (III) 1 36 contactor - (III) 2 37 fuse - (III) 1 38 block, power	28	block, contact inc	250027-125		1
30 plug, hole n4 1/2" cond 409918-002 2 31 nut, hex metric m8 x 1.25 825908-125 6 32 lug, scrulug kpa-25 4-1/0 849215-025 2 33 terminal, ring tng 3/8 x 8ga 849306-008 1 34 washer, nord-lock pl m8 sp 883208-166 6 35 starter, ac fan - (II) (III) 1 36 contactor - (III) (III) 1 37 fuse - (I) (III) 1 38 block, power - (III) 1		575, \$1	250028-635		1
31 nut, hex metric m8 x 1.25 825908-125 6 32 lug, scrulug kpa-25 4-1/0 849215-025 2 33 terminal, ring tng 3/8 x 8ga 849306-008 1 34 washer, nord-lock pl m8 sp 883208-166 6 35 starter, ac fan - (II) (III) 1 36 contactor - (II) (III) 1 37 fuse - (II) (III) 1 38 block, power - (III) 1			409918-002		2
32 lug, scrulug kpa-25 4-1/0 849215-025 2 33 terminal, ring tng 3/8 x 8ga 849306-008 1 34 washer, nord-lock pl m8 sp 883208-166 6 35 starter, ac fan - (II) (III) 1 36 contactor - (II) (III) 1 37 fuse - (I) (III) 1 38 block, power - (III) 1		• -	825908-125		6
33 terminal, ring ting 3/8 x 8ga 34 washer, nord-lock pl m8 sp 35 starter, ac fan 36 contactor 37 fuse 38 block, power 38 starter, ac fan - (II) (III) 1 1 1 1 1 1 1 1 1 1 1 1 1		lug, scrulug kpa-25 4-1/0	849215-025		2
34 washer, nord-lock pl m8 sp 883208-166 6 35 starter, ac fan - (II) (III) 1 36 contactor - (III) 2 37 fuse - (I) (III) 1 38 block, power - (III) 1		terminal, ring tng 3/8 x 8ga	849306-008		1
35 starter, ac fan - (II) (III) 1 36 contactor - (III) 2 37 fuse - (I) (III) 1 38 block, power - (III) 1		·	883208-166		6
36 contactor - (III) 2 37 fuse - (I) (III) 1 38 block, power - (III) 1		•	-	(II) (III)	1
37 fuse - (I) (III) 1 38 block, power - (III) 1			-	(III)	2
38 block, power - (III) 1			-	(I) (III)	1
AID 1		block, power	-	(111)	1
	39	supply, power	~	(III)	1



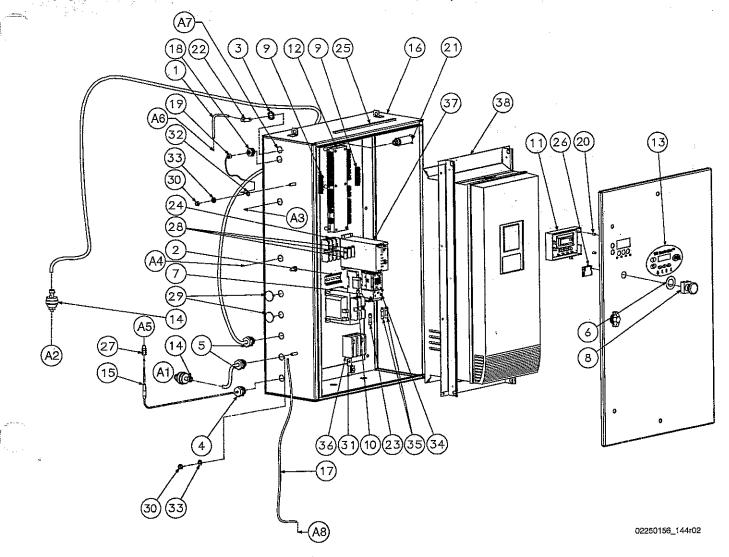
8.19 CONTROL SYSTEM AND ELECTRIC PARTS, WYE-DELTA (CONTINUED)



Cey	Description	Part Number Note Quantity
41	P1 - Wet Receiver Pressure	
42	P2 - Line Pressure	
43	Solenoid 1	
\4	Solenoid 4	
\ 5	T1 - Wet Discharge Temp	
46	PSW2 - Low Water Pressure Switch	
١7	Drill Hole for WC Machine	
8/	To Frame	
(1)	Denotes water-cooled machines only	
II)	Denotes air-cooled machines only	
III)	This part may vary per machine specification. Consu	It the Sullair factory for details



8.20 CONTROL SYSTEM AND ELECTRIC PARTS, VSD



8.20 CONTROL SYSTEM AND ELECTRIC PARTS, VSD (CONTINUED)

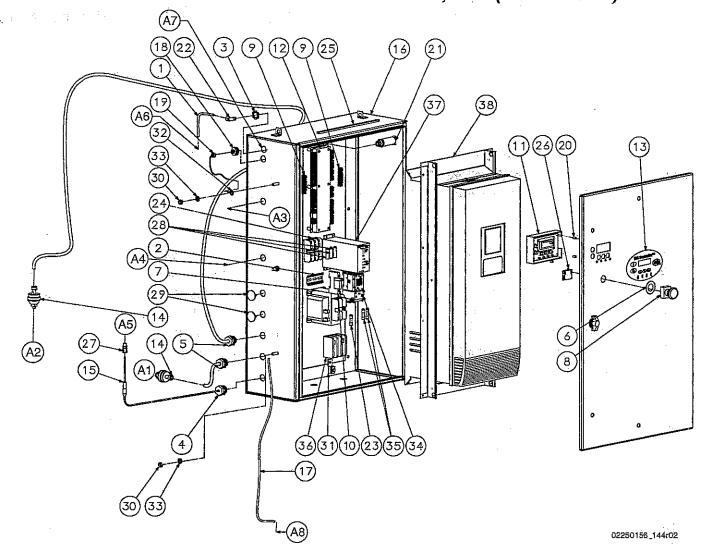
Key	Description	Part Number	Note	Quantity
1	tube, nyl 25 x 040w blk (ft)	02250054-861	(I)	2
2	rail, din 35mm (meters)	02250060-705	(1)	1
3	locknut, n4 conduit sealing	02250071-362	(1)	1
4	grip, cord n4 .125187 x 1/2"	02250071-379		1
5	grip, cord n4 250-375 x 1/2"	02250071-381		2
6	nameplate, e-stop 45mm yellow	02250081-473		1
7	transformer, control 150va univ w.pri fh	02250083-186	(I)	İ
8 .	switch, push-button operator e22 40mm	02250085-504		1
9	bar, ground 5 post cutler hammer	02250101-721		2
10	relay, sptd din 6a 24vdc coil	02250140-490	(l)	1
11	control, display s4	02250154-051		1
12	control, i/o mod ws 24vdc supply	02250154-052		· 1
13	decal, microprocessor overlay	02250154-359		1 1
14	transducer, pressure 0-250# ratiometric	02250155-174		2 = , ;
15	probe, rtd 100 ohm plat 3.5"x 6ft	02250155-175		1
16	specification, encl 3700v 22" x 36" x 10	02250155-937		1
17	wire, 10 gage ground bond 33" m8	02250157-449		1
18	receptacle, s4 program port nema 6p	02250159-547		1
19	cap, s4 program port nema 6p	02250159-549		1
20	spacer, p8/p12 ws mtg to encl	02250161-759		4
21	switch, pressure n.o. 10 psi	250017-992	(1)	1 /
22	elbow, 90 1/4"tube x 1/8"npt	250018-429	(1)	1
23	fuse, limitron ktk-r 2.00	250019-756	(I)	1
24	holder, fuse ktk-r 3 pole	250019-773	(H)	1 _
25	weatherstrip, 3/16 x 3/8 ft	250022-436		2
26	block, contact 1ne	250027-125		1
27	fitting, compress adj	250028-635		1
28	fu, cc td 10a 600vac	250041-618		3
29	plug, hole n4 1/2" cond	409918-002	(11)	2
30	nut, hex metric m8 x 1.25	825908-125		6
31	lug, scrulug kpa-25 4-1/0	849215-025		1 .
32	terminal, ring tng 3/8 x 8ga	849306-008		1
33	washer, nord-lock pl m8 sp	883208-166		6
34	starter, ac fan	-	(II) (III)	[′] 1
35	fuse	-	(I) (III)	2
36	block, power	•	(III)	1
37	supply, power	-	(III)	1
38	vsd	-	(III)	1



3000-4500 Operator's Manual and Parts List

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8.20 CONTROL SYSTEM AND ELECTRIC PARTS, VSD (CONTINUED)

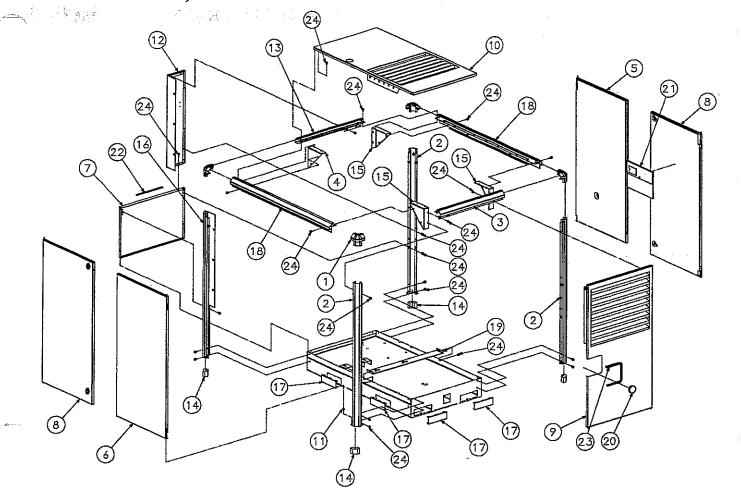


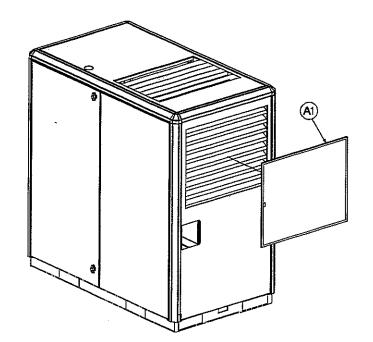
8.20 CONTROL SYSTEM AND ELECTRIC PARTS, VSD (CONTINUED)

Key	Description		Part Numl	oer Note Quanti	ty
A1	P1- Wet Receiver Pressure			·	1
A2	P2- Line Pressure				
АЗ	Solenoid 1				
A4	Solenoid 4				
A5	T1-Wet Discharge Temperature			u .	
A6	PSW2- Low Water Pressure				
.A7	Drill Hole for WC machines				
A8	To Frame				
	e de la companya de l				
(1)	Denotes water-cooled machines only				
(II)	Denotes air-cooled machines only.				
(111)	This part may vary per machine specification	on. Consult the Sullair factory	for details	•	



8.21 ENCLOSURE, AIR-COOLED





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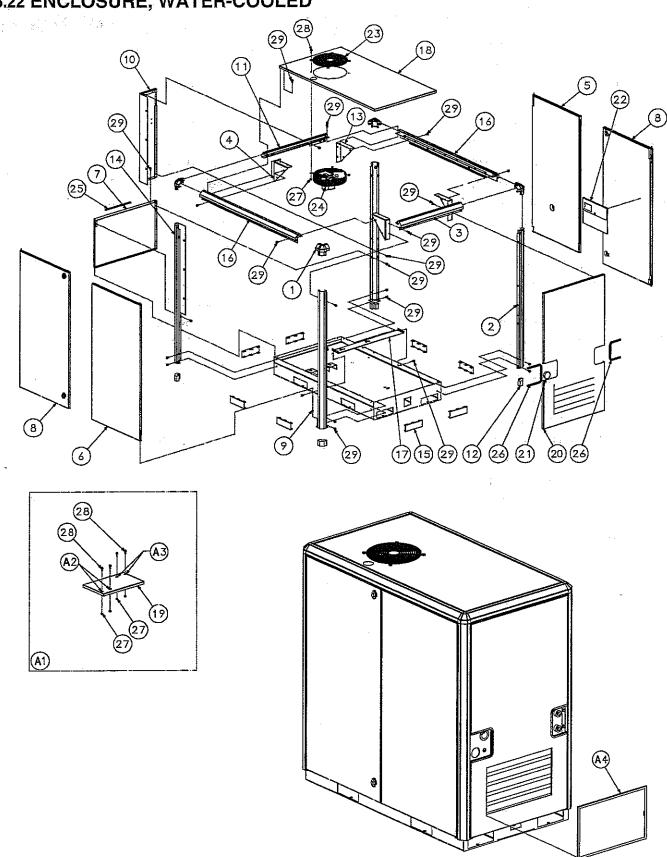
8.21 ENCLOSURE, AIR-COOLED (CONTINUED)

U.L.	LITOLOGOILL, AIII GOOLLD (GC			그는 일본 사람이 살 중에 가게 살을 때 다니
Key	/ Description		Part Number	Note Quantity
1	cap, molded canopy corner		02250150-893	4
2	rail, vertical 3000,3700,4500		02250150-910	3
3	rail, roof air out end 37kw		02250150-912	1
4	gusset, str crnr square 37kw		02250151-177	1
5	panel, canopy door flanged w/cutout		02250151-178	1
6	panel, canopy door flanged 37kw		02250151-179	1
7	panel, starter end bottom 3700		02250151-180	1
8	panel, canopy door locking 37kw		02250151-181	2
9	panel, canopy assy intake end 37kw		02250151-182	1
10	panel, roof canopy 37kw	7	02250151-183	. 1
11	bearing, flanged 5mm 50hp		02250151-635	4
12	panel, starter end I/h 37kw		02250152-031	ĺ
13	rail, roof starter end 37kw		02250152-040	1
14	insulation, foam 2" corner piece 50h		02250152-323	4
15	gusset, corner square 37kw		02250154-298	3
16	rail, vertical starter side 3700		02250154-393	1 .
17	cover, forkpocket 37kw		02250154-405	8
18	rail, side assy rh/lh 37kw		02250154-992	2
19	support, shipping mtr/unit 37kw		02250155-191	1
20	plug, hole 2 1/2" nylon black		02250155-284	
21	pocket, drawing holder 3700		02250158-039	1 (*
22	weatherstrip, 3/16 x 3/8 ft		250022-436	3
23	trim, canopy edge 7.5/10hp		250034-157	2
24	screw, tf-hex m8 x 16 blk zinc		883008-016	57
A1	Clean Air Inlet Filter 3700		02250161-137	1



-1	2	4

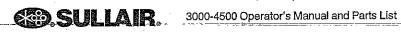
8.22 ENCLOSURE, WATER-COOLED



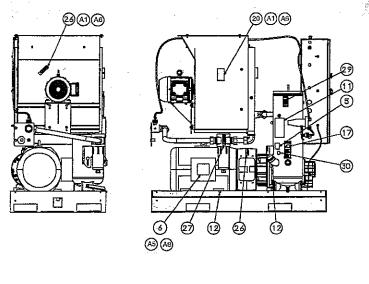
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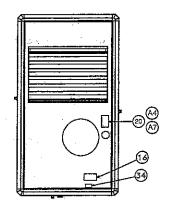
8.22 ENCLOSURE, WATER-COOLED (CONTINUED)

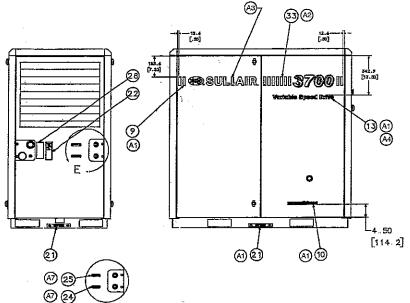
Key	Description	Part Number Note	Quantity	
1	cap, molded canopy corner	02250150-893	4	Taylor.
2	rail, vertical 3000,3700,4500	02250150-910	3	
3	rail, roof air out end 37kw	02250150-912	1	
4	gusset, str crnr square 37kw	02250151-177	1	
5	panel, canopy door flanged w/cutout	02250151-178	1	
6	panel, canopy door flanged 37kw	02250151-179	1	
7	panel, starter end bottom 3700	02250151-180	1	
8	panel, canopy door locking 37kw	02250151-181	2	
9	bearing, flanged 5mm 50hp	02250151-635	4	
10	panel, starter end I/h 37kw	02250152-031	1	
11	rail, roof starter end 37kw	02250152-040	1	
12	insulation, foam 2" corner piece 50h	02250152-323	4	
13	gusset, corner square 37kw	02250154-298	3	
14	rail, vertical starter side 3700	02250154-393	1	
15	cover, forkpocket 37kw	02250154-405	8	
16	rail, side assy rh/lh 37kw	02250154-992	2	
17	support, shipping mtr/unit 37kw	02250155-191	1 -	
18	panel, roof canopy w/c	02250155-204	1	
19	panel, baffle canopy w/c	02250155-205	1	
20	panel, canopy assy intake 37kw w/c	02250155-260	1	
21	plug, hole 2 1/2" nylon black	02250155-284	. 1	{
22	pocket, drawing holder 3700	02250158-039	1	•
23	guard, fan 13"dia	241579	1	
24	fan, enclosure 10s wc	241580	1	
25	weatherstrip, 3/16 x 3/8 ft	250022-436	3	
26	trim, canopy edge 7.5/10hp	250034-157	2	
27	nut, serr fing m8 x 1.25	882508-125	8	
28	screw, hex serr washer m8 x 25	882608-025	8	
29	screw, tf-hex m8 x 16 blk zinc	883008-016	62	
A1	Cooling Fan Baffle			
A2	Aftercooler Mounting Feet			
АЗ	Oil Cooler Mounting Feet			
A4	Clean Air Inlet Filter 3700	02250164-592	1	

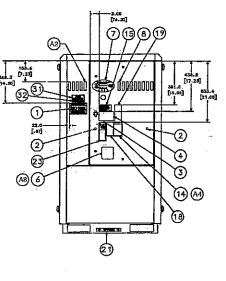


8.23 DECAL LOCATIONS, AIR-COOLED







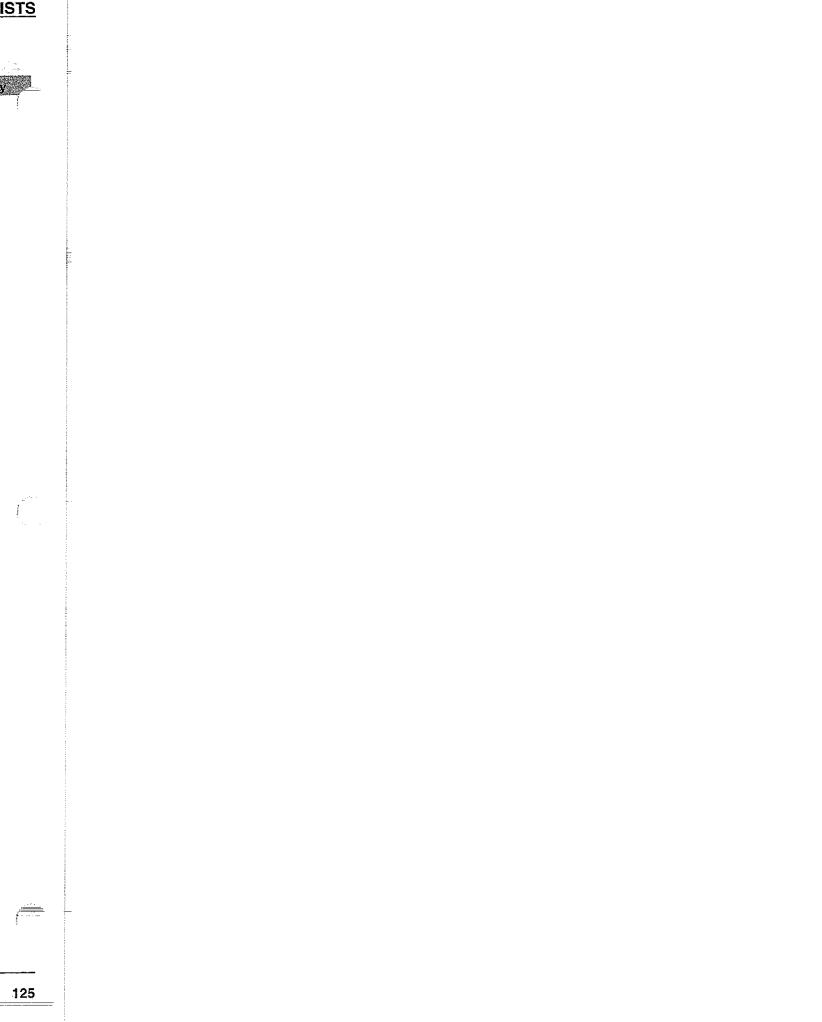


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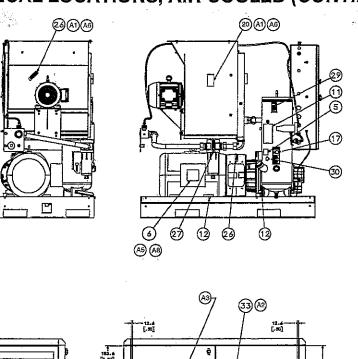
8.23 DECAL LOCATIONS, AIR-COOLED (CONTINUED)

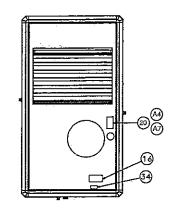
Key	Description	Part Number	Note	Quantity
1	decal, iso 9001 blk 3.44x5.75	02250057-624		1
2	decal, protective earth ground	02250075-045	(III)	2
3	decal, pe designation	02250075-540	(III)	1
4	decal, electrocution hazard international/global	02250077-472		1
5	decal, en-warning mixing fluids	02250110-891		1
6	decal, parallel wye motor conn	02250146-385	1.2	2
7	decal, microprocessor overlay	02250154-359		1
8	decal, sullair side graphic 50hp	02250154-360		1
9	decal, sullair side graph 50hp	02250154-361		2
10	decal, black www.sullair.com	02250155-495		2
11	decal, maint kit eng 3700	02250156-300		1
12	decal, remove before start-up	02250158-358	(IV)	2
13	decal, vsd black p8/p10/p12	02250162-215		2
14	decal, warning n12 elec enci proto	02250164-823		1
15	decal, warning auto start	41065		1
16	decal, danger hi voltagê	42218	(1)	1.
17	sign, warning-comp oil fil cap	49685		1
18	decal, danger electrocution	49850		1
19	decal, warning elect. shock-ground fault	49852	(II)	1
20	sign, warning-sever-fan-indus	49855		3
21	decal, fork lifting	241814	•	4 1
22	decal, warn "food grade" lube	250003-144		1
23	decal, warning-autostart	250017-903		1
24	decal, water in	250019-107		1
25	decal, water out	250019-108		1
26	decal, rotation 3.5" lg	250021-564		2
27	decal, water drain 3 3/4 x 1"	250022-810		1
28	decal, danger inhaling comp air	250027-935		1
29	sign, warning-hot surfaces	407408		1
30	decal, fluid	-	(V)	1
31	nameplate	-	(V)	1
32	rivet	-	(V)	4
33	decal, series	-	(V)	2
34	decal, voltage	-	(I) (V)	1

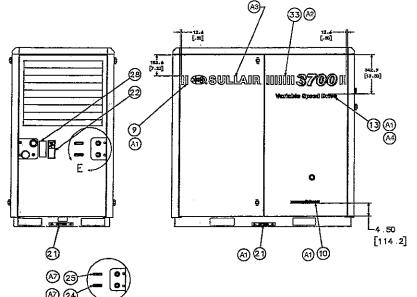


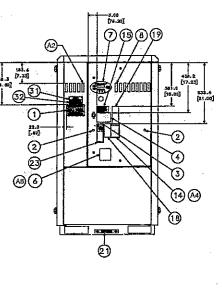


8.23 DECAL LOCATIONS, AIR-COOLED (CONTINUED)









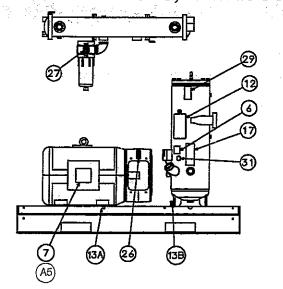
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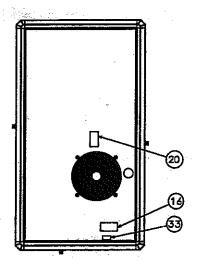
8.23 DECAL LOCATIONS, AIR-COOLED (CONTINUED)

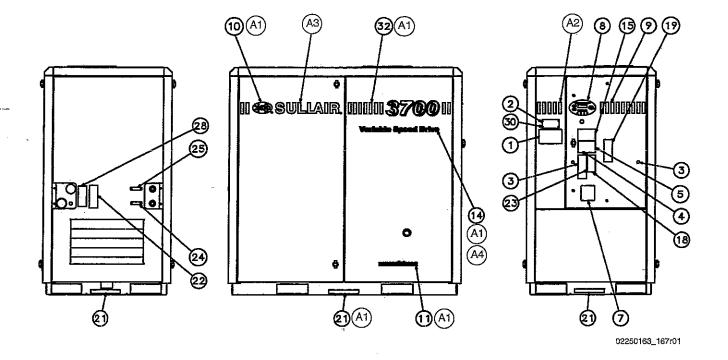
		Part Num	ber Note	Quantity
Key	Description.	FAILNUIN	ioci itoic	7
A1	Both Sides of Machine	-		ě ·
A2	Center Stripes Vertically Based on Location of WS Controller Decal			
А3	Locate Decals on both Sides of Machine by Using Location of End Stripe	e and WS Cor	ntroller Location	
A4	Used Only On VSD Machines			
A5	Used On Parallel Wye Machines Only			
A6	Air-cooled Only			
A7	Water-cooled Only	N.		
A8	Not used on 575V VSD machines			
(1)	Attach to the bottom on inside of starter box		r.	
(II)	Attach to inside of starter door.			
(III)	Attach to sub-panel inside starter box			
(IV)	Attach to top of shipping strap			
(V)	This part will vary by model. Consult factory with serial number.			



8.24 DECAL LOCATIONS, WATER-COOLED





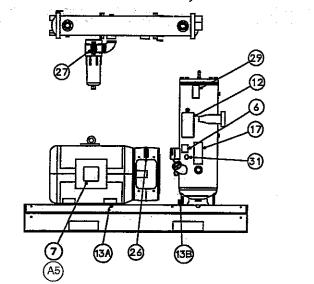


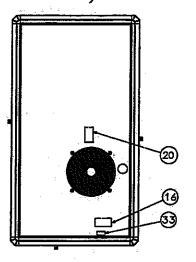
8.24 DECAL LOCATIONS, WATER-COOLED (CONTINUED)

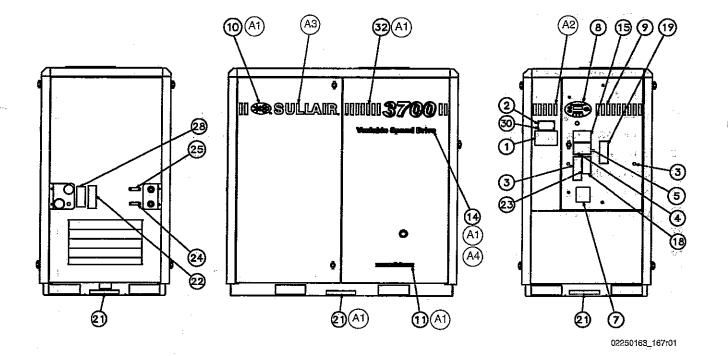
Key	Description	Part Number	Note	Quantity
1	decal, iso 9001 blk 3.44x5 75	02250057-624		1 .
2	npl, sullair serial number	02250059-318		1
3	decal, protective earth ground	02250075-045	(III)	2
4	decal, pe designation	02250075-540	(III)	1
5	decal, electrocution hazard international/glbl	02250077-472		1
6	decal, en-warning mixing fluids	02250110-891	+ \$.	1
7	decal, parallel wye motor conn	02250146-385		2
8	decal, microprocessor overlay	02250154-359		1
9	decal, sullair side graphic 50 hp	02250154-360		1
10	decal, sullair side graph 50hp	02250154-361		2
11	decal, black www.sullair.com	02250155-495		2
12	decal, maint kit eng 3700	02250156-300		1
13	decal, remove before start-up	02250158-358	(IV)	2
14	decal, vsd black p8/p10/p12	02250162-215		2
15	decal, warning auto start	41065		. 1
16	decal, danger hi voltage	42218	(l)	1
17	sign, warning-comp oil fil cap	49685		1
18	decal, danger electrocution	49850		1
19	decal, warning elect. shock-ground fault	49852	· (II)	· • • • • • • • • • • • • • • • • • • •
20	sign, warning-sever-fan-indus	49855		1
21	decal, fork lifting	241814		4
22	decal, warn "food grade" lube	250003-144		1
23	decal, warning-autostart	250017-903		1
24	decal, water in	250019-107		. 1
25	decal, water out	250019-108	j.a.	1
26	decal, rotation 3.5" lg	250021-564	· · ·	1
27	decal, water drain 3 3/4 x 1"	250022-810		1
28	decal, danger inhaling comp air	250027-935		1
29	sign, warning-hot surfaces	407408		. Springer omgredette eine de
30	rivet, pop 1/8 x 1/2	843102-050	-	4
31	decal, fluid	FLUID DECAL		1
3 <u>2</u>	decal, series	SERIES DECAL		2
33	decal, voltage	VOLTAGE DECAL	(1)	1



8.24 DECAL LOCATIONS, WATER-COOLED (CONTINUED)







8.24 DECAL LOCATIONS, WATER-COOLED (CONTINUED)

A1	Both Sides Of Machine			
A2	Center Stripes Vertically Based On Location Of WS C	Controller Decal		the state of the s
Å3 ⁻	Locate Decals On Both Sides Of Machine By Using L	ocation Of End Stripe And W	/S Controller Location	n 🤫
A4	Used On VSD Machines Only			
A5	Used On Parallel Wye Machines Only			
		44 - 5		
(ī)	Attached to the bottom on inside of starter box.		e e e e e e e e e e e e e e e e e e e	
(II)	Attached to inside of starter door			**************************************
(III)	Attached to sub-panel inside starter box		± .	
(IV)	Attached to top of shipping strap			



8.25 DECAL GROUP

(1)

AWARNING



Do not remove caps, plugs, or other components when compressor is running or pressurized. Stop compressor and relieve all internal pressure before doing so.



WARNING



Do not permit air from this equip-ment to contact food stuff except in full compi-ance with FDA Standard 21CFR178.3570, and all other applicable federal, state and local, codes, standards and regulations.







Use equipment grounding connector in accordance with the National Electric Code, and all Federal, State, and Local Codes, to help avoid possible ground fault shock hazard.

(4)



This Unit is Equipped With An Auto Start Sequence That Will Start The Unit In The Event Of A Power Failure Automatically After The Sump Pressure Drops To 10 PSIG And The Power IS Restored.

When Performing Maintenance Follow Your Company's Prescribed Safety Practices for Electrical Equipment.

MARNING

250017-903

A DANGER



Death or serious injury can occur from inhaling compressed air without using proper safety equipment. See OSHA standards on safety equipment.

250027-935

(5)



Lethal shock hazard inside. Disconnect all power at source. before opening or servicing.





Disconnect all power at source, before attempting maintenance or adjustments.

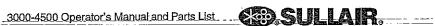
(7)



To avoid burns, keep hands and all parts of the body away.

(8)

02250155_601_Decal_1



8.25 DECAL GROUP (CONTINUED)

Key	Description		Part Number	Note	Quantity
1	sign, warning-comp oil fil cap		049685		1
2	decal, warn "food grade" lube		250003-144		1
3	sign, warning ground fault		049852		1
4	decal, warning-autostart		250017-903		1
5	decal, danger inhaling comp air		250027-935	-	1
6	sign, danger electrocution		049850	· .	1
7	sign, warning-sever-fan-indus	and about	049855		2
8	sign, warning-hot surfaces		407408	1	1



8.25 DECAL GROUP (CONTINUED)

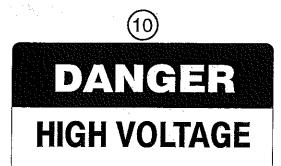
(9)

CAUTION: This machine is equipped with Automatic Stop / Start Control System.

DO NOT ATTEMPT to make any adjustment without disconnecting both main line and

control circuit electrical power.

41065



DANGERI
Lethal shock hazard. Disconnect all power at source before opening or servicing.

DANGERI

Danger mortel d'électrocution. Débranchez toute source d'alimentation avant toute ouyerture ou intervention de maintenance de la machine.

GEFAHRI

Tödlich Stromschlaggefahr. Vor jeder Öffnung oder jedem Eingriff am Anlasserrelais oder am Schaltachrank aamtliche Strom-

Pericolo montale di elettrocuzione. Disinserire tutte le fonti di alimentazione prima di qualsiasi apertura o di qualsiasi inter-vento di manutenzione della macchina.

¡PELIGRO!
Peligro mortal de electrocución. Desconectar todas las fuentes de alimentación antes de abrir o de realizar una intervención de

1危险

02250077-472

(12)

(15)

内有高层,小心能也。特却像是之前座的开解有电路。

WARNING

Mixing of other fluids will void warranty.

Fill cap has an o-ring seal. Do not use pipe dope.







GENUINE

SERVICE PARTS

MODEL: 3000/3700/4500

DESCRIPTION: ELEMENT, AIR FILTER ELEMENT, FLUID FILTER KIT, SEPARATOR FILTER, FLUID RETURN LINE

KIT, AIR INLET VALVE 0 2250 155-971 STD SULLUBE 24KT OR > 150 PSIG 0 2250 144-327 0 2250 148-827

**STD COMPRESSOR FLUID OPTIONS: SULLUBE FLUID (5 GAL) 250022-667 24KT FLUID (5 GAL) 02250051-153 CP-4600-32-F F00D GRADE (5 GAL) 250029-008 FF 1/4000 FLUID (5 GAL) 250019-662

** SEE COMPR. FILL DECAL FOR CORRECT FLUID

WATER **DRAIN**



NOITATOR ROTATION

(17)

stored to the higest quality standards in an ISO 9001 certified system.

ναστεί σύμφωνα με τις πλέον αυσπρές τι res de calidad en un aistana con la cerficación ISO 9001. 本產品是由取得最高品管水源 ISO 9001 資格之學達亦所生產

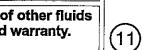
02250155_601_Decal_2

(18)

3000-4500 Operator's Manual and Parts List







02250110-891



8.25 DECAL GROUP (CONTINUED)

	· · · · · · · · · · · · · · · · ·				
Key	Description		Part Number	Note.	Quantity
9	decal, caution auto start		041065		1 .
10	decal, danger hi voltage		042218		1
11	decal, en-warning mixing fluids		02250110-891		1
12	decal, electrocution hazard international/globa		02250077-472		1
13	decal, protective earth ground		02250075-045		2
14	decal, fluid Sullube		02250069-389	(1)	1
15	decal, maint kit eng 3700		02250156-300		1
16	decal, water drain 3 3/4 x 1"		250022-810	•	1
17	decal, rotation 3.5" lg	% I.	250021-564		, j j 1
18	decal, ISO 9001 blk 3 44x5 75		02250057-624		1

(I) Although Sullube fluid decal is shown, initial fluid fill may vary by machine. For correct corresponding fluid decal part number, consult factory with serial numbers of your machine.

3000-4500 Operator's Manual and Parts List

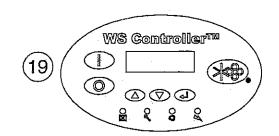
CAUTION

Mixing of other lubricants within the compressor unit will void all warranties.



135

8.25 DECAL GROUP (CONTINUED)





Remove shipping strap before start-up.

02250158-358

- 20 []]]]]]
- 2) [[] SULLA[R.
- 22 Www.sullair.com
- 23 - LIFTHERE -
- 24 Variable Speed Drive
- 25 [[[[]]]]]











△ CAUTION

The electrical enclosure for

The electrical enclosure for the Variable Speed Drive unit is rated NEMA 12 and is intended for indoor use primarily to provide a degree of protection against circulating dust falling dirt and dripping non-corrosive liquids. Do not mount outdoors or pressure wash.

The VSD unit must be periodically cleaned. Consult Sullair Service Dept. for cleaning procedure.

02250155_601_Decal_3

8.25 DECAL GROUP (CONTINUED)

-				
Key	Description	Part Number	Note	Quantity
19	decal, microprocessor overlay	02250154-359	ž Ž	1 1
20	decal, black graphic	02250157-732		1
21	decal, side graphics	02250157-703		1
22	decal, black www.sullair.com	02250155-495		2
23	decal, fork lifting	241814	;	4
24	decal, VSD (variable speed drive)	02250162-215		1
25	decal, 3000 with stripe	02250157-029		1
26	decal, 3000P with stripe	02250166-030		1
27	decal, 3700 with stripe	02250157-030		1
28	decal, 4500 with stripe	02250157-031		1
29	decal, remove before start up	02250158-358		1
30	decal, voltage 460/3/60 international	02250569-399	(I)	1
31	decal, voltage 380-415/3/50 international	02250069-403	(I)	1
32	decal, voltage 230/3/60 international	02250069-397	· (1)	1
33	decal, voltage 200/3/60 international	02250069-406	(1)	1
34	decal, voltage 575/3/60 international	02250069-400	(I)	1
35	nameplate, Sullair serial number	02250059-318	(11)	1
36	rivet, pop 1/8 x 1/2	843102-050	(III)	4
37	decal, warning n12 elec encl protection	02250164-823		1

- This decal may vary per machine specification. Consult the Sullair factory for details.
- See Figure 8-1 for features and location.
- This part not shown



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 $= \int_{0}^{\infty} \frac{1}{\sqrt{2\pi}} \frac{d^{2} dx}{dx} \qquad \qquad \qquad \frac{1}{\sqrt{2\pi}} \frac{1}{\sqrt{2\pi}} \frac{dx}{dx}$

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SUPERVISOR II INSTRUCTION MANUAL ALL MODELS

Part Number 02250071 - 398 eSullair Corporation,

AIR CARE SEMINAR TRAINING

Sullair Air Care Seminars are 3—day courses that provide hands—on instruction in the proper operation, maintenance and service of Sullair equipment. Individual seminars on Industrial compressors and compressor electrical systems are presented at regular intervals throughout the year at a dedicated training facility at Sullair's corporate headquarters in Michigan City, Indiana

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- Or Write -

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Michigan City, IN 46360 Attn: Service Training Department



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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. For safe machine operation it is vitally important to review all safety precautions noted in the Safety Section of your compressor's Operator's Manual. The precautions listed there, as well as those following, 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 their compressor's Operator's Manual. Failure to follow the instructions, procedures and safety precautions listed here and in the Operator's 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

Use and operate the air compressor only in full compliance with all pertinent OSHA requirements or any pertinent Federal, State, and Local codes or requirements.

DO NOT modify the compressor and/or controls in any way except with written factory approval.

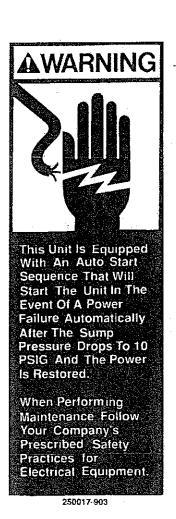
1.2 ELECTRICAL SHOCK

- A 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.
- **B.** Attempt repairs only in clean, dry and well lighted and ventilated areas.
- \mathbf{C}_{e} Stay clear of the compressor during electrical storms! It can attract lightning.

1.3 DECALS

See Figure 1—1. The Supervisor II control panel contains several decals which contain necessary information for safe performance. These decals should never be removed. If a decal becomes damaged, contact your nearest Sullair Distributor or the Sullair Corporation factory Service Department for replacement parts (Note: When ordering new decals, use part number printed on decal face)

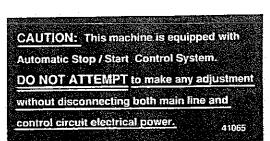
Figure 1-1 Decals





250027-935

on safety equipment



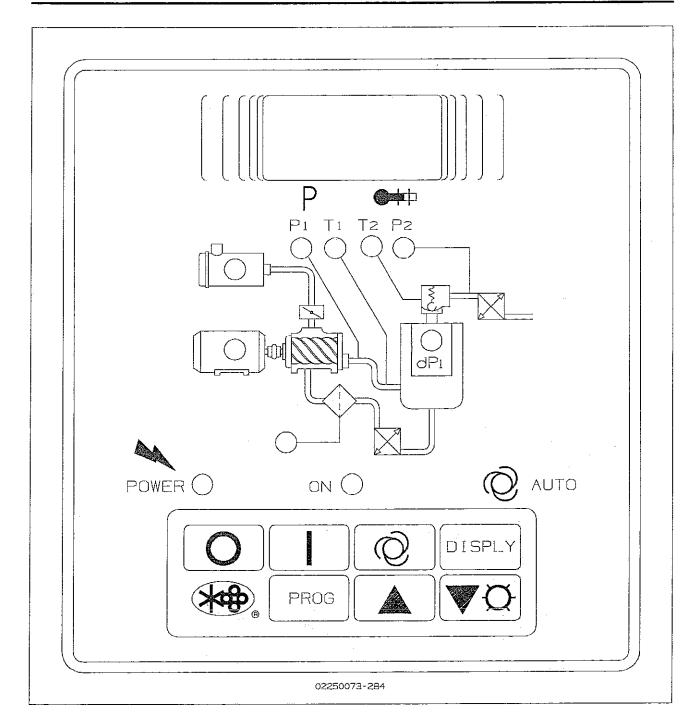
Do not permit air from this equipment to contact food stuff except in full compliance with FDA Standard 21CFR178.3570, and all other applicable federal, state and local, codes, standards and regulations.

AWARNING

* OSHA and FDA guidelines are superceded by any Federal, State or Local regulations whenever applicable

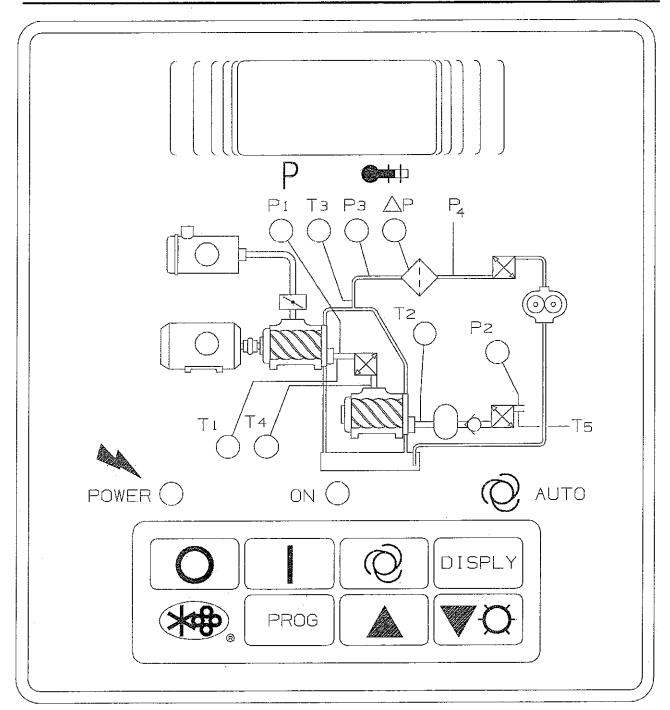
Section 2 SUPERVISOR II DESCRIPTION

Figure 2-1 Supervisor II Panel - All Models Except DS-13



Section 2 SUPERVISOR II DESCRIPTION

Figure 2-1A Supervisor Panel - DS-13



02250073-286

SUPERVISOR II DESCRIPTION

2.1 BASIC INTRODUCTION

Refer to Figure 2–1. The Supervisor II has a two line display to show temperature, pressure and status. It has a keypad for operating the compressor, programming the control points and selecting displays. There is a graphic illustration with lamps that light to show the item being displayed. The lamps flash if that component is in an alarm condition.

2.2 KEYPAD-ALL MODELS

The keypad is used to control the machine as well as display status and change setpoints. Refer to figure 2–1 for following key descriptions.

S Stop — Used to put the machine into manual stop. It is also used to clear alarm conditions.



S Continuous – Starts machine if no alarm conditions are present. Also used to clear alarm conditions while machine is running.



S Auto – Starts machine and selects auto mode if no alarm conditions are present. Also used to clear alarm conditions while machine is running.



S Display – Used to display pressures, temperatures and other status information (See section on STATUS DISPLAYS).



S Logo – Used for various functions described in later sections



\$ Program - Used to enter the parameter change mode where control parameters may be displayed and changed (See PA-RAMETER SETUP).



\$ Up arrow – Used in status displays to change displays and in parameter setup mode to increment a value



S Down arrow, lamp test — Used in status displays to change displays and in parameter setup mode to increment a value. When in the default display the key will light all the lamps for three seconds.



2.3 STATUS DISPLAYS — SEE 2.3A THROUGH 2.3F FOR SPECIFIC MODELS

2.3A STATUS DISPLAYS - ES-8

By default the line pressure (P2) and discharge temperature (T1) are shown on the bottom line of the display, and machine status on the top line. The following are the various machine status messages that indicate the state of the compressor:

(Display graphics shown below)

- S STOP Compressor is off
- S STANDBY Compressor is off but armed to start. This state may be entered because of a power up, or the unload timer had expired and stopped the machine. NOTE: The machine may start at any time.
- § STARTING Machine is trying to start.
- \$ OFF LOAD Machine is running and off loaded.
- \$ ON LOAD Machine is running and loaded.
- S FULL LD Machine is running and fully loaded. This state is only displayed if the machine has a full load valve.
- S RMT STOP Compressor is off but armed to start. The machine will start when the remote start contact is closed. NOTE: the machine may start at any time.
- SSEQ STOP Compressor is off but armed to start. The machine will start when the sequencing conditions meet the critera to start NOTE: the machine may start at any time

This default display appears as follows:

STOP 110 180

SUPERVISOR II DESCRIPTION

If there are alarms active they will alternately be shown with the default display. The machine status will be displayed for 2 seconds then the alarms for 2 seconds each. For example:

T1 HI 110 180

To view other status press the DISPLY key. All temperatures and pressures may be displayed as well as other status information. To scroll through the displays press the up arrow or down arrow keys. Up arrow moves to the next display, down arrow the previous display. To return to the default display press the display key.

S Separator differential pressure and the maximum limit. If the limit is exceeded, a separator maintenance warning will be displayed.

> dP 1 4 MAX 10

\$ Sump pressure and line pressure.

P1 113 P2 108

S Unit discharge temperature and the maximum limit. If the temperature exceeds the limit a T1 HI shutdown will occur.

T1 210 MAX 235

S Total hours that the compressor has been running.

HRS RUN 001234.0

STotal hours that the compressor has been loaded.

HRS LOAD 000987.0

S Last fault log. This shows the fault on the first line and the run hours when the fault occurred.

T1 HI @1 234 S Next to last fault log. This shows the fault on the first line and the run hours when the fault occurred

T1 HI @2 204

To view other status press the DISPLY key. All temperatures and pressures may be displayed as well LS-20s; LS-25 AND EUROPE

By default the line pressure (P2) and discharge temperature (T1) are shown on the bottom line of the display, and machine status on the top line. The following are the various machine status messages that indicate the state of the compressor:

(Display graphics shown below.)

S STOP - Compressor is off.

S STANDBY — Compressor is off but armed to start. This state may be entered because of a power up, or the unload timer had expired and stopped the machine. NOTE: The machine may start at any time.

\$ STARTING — Machine is trying to start.

§ OFF LOAD — Machine is running and off loaded.

S ON LOAD — Machine is running and loaded.

S FULL LD — Machine is running and fully loaded. This state is only displayed if the machine has a full load valve.

S RMT STOP — Compressor is off but armed to start. The machine will start when the remote start contact is closed. NOTE: the machine may start at any time.

SSEQ STOP — Compressor is off but armed to start. The machine will start when the sequencing conditions meet the critera to start. NOTE: the machine may start at any time.

This default display appears as follows:

STOP 110 180

Section 2 SUPERVISOR II DESCRIPTION

If there are alarms active they will alternately be shown with the default display. The machine status will be displayed for 2 seconds then the alarms for 2 seconds each. For example:

> T1 HI 110 180

To view other status press the DISPLY key. All tem- 2.3C - STATUS DISPLAYS - LS-25S & LS-32 peratures and pressures may be displayed as well as other status information. To scroll through the displays press the up arrow or down arrow keys. Up arrow moves to the next display, down arrow the previous display. To return to the default display press the display key.

S Separator differential pressure and the maximum limit. If the limit is exceeded, a separator maintenance warning will be displayed.

> dP 1 4 MAX 10

\$ Sump pressure and line pressure.

P1 113 P2 108

S Unit discharge temperature and the maximum limit. If the temperature exceeds the limit a T1 HI shutdown will occur.

> T1 210 **MAX 235**

\$ Total hours that the compressor has been running

> HRS RUN 001234.0

S Total hours that the compressor has been loaded.

> HRS LOAD 000987.0

S Last fault log. This shows the fault on the first line and the run hours when the fault occcured.

> T1 HI @1 234

S Next to last fault log. This shows the fault on the first line and the run hours when the fault occured.

> T1 HI @2 204

By default the line pressure (P2) and discharge temperature (T1) are shown on the bottom line of the display, and machine status on the top line. The following are the various machine status messages that indicate the state of the compressor:

(Display graphics shown below.)

\$ STOP - Compressor is off.

\$ STANDBY - Compressor is off but armed to start. This state may be entered because of a power up, or the unload timer had expired and stopped the machine. NOTE: The machine may start at any time

S STARTING - Machine is trying to start.

S OFF LOAD - Machine is running and off loaded.

SON LOAD - Machine is running and loaded.

S FULL LD - Machine is running and fully loaded. This state is only displayed if the machine has a full load valve

§ RMT STOP — Compressor is off but armed to start. The machine will start when the remote start contact is closed. NOTE: the machine may start at any time.

SSEQ STOP - Compressor is off but armed to start. The machine will start when the sequencing conditions meet the critera to start. NOTE: the machine may start at any

This default display appears as follows:

STOP 110 180

SUPERVISOR II DESCRIPTION

If there are alarms active they will alternately be shown with the default display. The machine status will be displayed for 2 seconds then the alarms for 2 seconds each. For example:

> T1 HI 110 180

To view other status press the DISPLY key. All temperatures and pressures may be displayed as well as other status information. To scroll through the displays press the up arrow or down arrow keys Up arrow moves to the next display, down arrow the previous display. To return to the default display press the display key.

S Separator differential pressure and the maximum limit. If the limit is exceeded, a separator maintenance warning will be displayed

> dP 1 4 MAX 10

S Sump pressure and line pressure.

P1 113 P2 108

S Oil filter differential pressure and the maximum limit. If the limit is exceeded oil maintenance warning will be displayed.

dP2 4 MAX 20

SPressure before (P4) and after (P3) oil filter.

P3 108 P4 113

\$ Oil differential pressure and the minimum limit. If the pressure goes below the limit a P3 LOW shutdown will occur. Oil differential (dP3) is defined as P3-P1/2

dP3 40 MIN 1

S Unit discharge temperature and the maximum limit. If the temperature exceeds the limit a T1 HI shutdown will occur.

T1 210 MAX 235

S Dry side discharge temperature and the maximum limit. If the temperature exceeds the limit a T2 HI shutdown will occur.

T2 210 MAX 235

S Oil temperature and the maximum limit. If the temperature exceeds the limit a T3 HI shutdown will occur.

T3 210 MAX 235

\$ Total hours that the compressor has been running.

HRS RUN 001234.0

\$ Total hours that the compressor has been loaded.

HRS LOAD 000987.0

S Last fault log. This shows the fault on the first line and the run hours when the fault occurred

T1 HI @1 234

S Next to last fault log. This shows the fault on the first line and the run hours when the fault occured.

T1 HI @2 204

2.3D STATUS DISPLAYS - TS-20 & TS-32

By default the line pressure (P2) and discharge temperature (T1) are shown on the bottom line of the display, and machine status on the top line. The following are the various machine status messages that indicate the state of the compressor: (Display graphics shown below)

SSTOP - Compressor is off

S STANDBY — Compressor is off but armed to start. This state may be entered because of a power up, or the unload timer had expired and stopped the machine. NOTE: The machine may start at any time.

\$ STARTING - Machine is trying to start.

S OFF LOAD - Machine is running and off loaded

\$ ON LOAD - Machine is running and loaded

Supervisor II Description

- S FULL LD Machine is running and fully loaded This state is only displayed if the machine has a full load valve.
- S RMT STOP Compressor is off but armed to start. The machine will start when the remote start contact is closed. NOTE: the machine may start at any time.
- SSEQ STOP Compressor is off but armed to start. The machine will start when the sequencing conditions meet the critera to start. NOTE: the machine may start at any time.

This default display appears as follows:

STOP 110 180

If there are alarms active they will alternately be shown with the default display. The machine status will be displayed for 2 seconds then the alarms for 2 seconds each. For example:

> T1 HI 110 180

To view other status press the DISPLY key. All temperatures and pressures may be displayed as well as other status information. To scroll through the displays press the up arrow or down arrow keys. Up arrow moves to the next display, down arrow the previous display. To return to the default dispaly press the display key.

\$ Separator differential pressure and the maximum limit. If the limit is exceeded, a separator maintenance warning will be displayed.

> dP 1 4 MAX 10

\$ Sump pressure and line pressure.

P1 113 P2 108

S Oil filter differential pressure and the maximum limit. If the limit is exceeded oil maintenance warning will be displayed.

dP2 4 MAX 20

S Pressure before (P4) and after (P3) oil filter.

P3 108 P4 113 S Oil differential pressure and the minimum limit. If the pressure goes below the limit a P3 LOW shutdown will occur. Oil differential (dP3) is defined as P3-P½

dP3 40 MIN 1

S Unit discharge temperature and the maximum limit. If the temperature exceeds the limit a T1 HI shutdown will occur

T1 210 MAX 235

S Dry side discharge temperature and the maximum limit. If the temperature exceeds the limit a T2 HI shutdown will occur.

T2 210 MAX 235

\$ Oil temperature and the maximum limit. If the temperature exceeds the limit a T3 HI shutdown will occur.

T3 210 MAX 235

S Interstage temperature and the maximum limit. If the temperature exceeds the limit a T4 HI shutdown will occur.

T4 210 MAX 235

\$Total hours that the compressor has been running.

HRS RUN 001234.0

S Total hours that the compressor has been loaded

HRS LOAD 000987.0

SUPERVISOR II DESCRIPTION

S Last fault log. This shows the fault on the first line and the run hours when the fault occurred.

T1 HI @1 234

S Next to last fault log. This shows the fault on the first line and the run hours when the fault occurred.

T1 HI @2 204

2.3E STATUS DISPLAYS - LS-16T & LS-20T

By default the line pressure (P2) and discharge temperature (T1) are shown on the bottom line of the display, and machine status on the top line. The following are the various machine status messages that indicate the state of the compressor:

(Display graphics shown below.)

SSTOP - Compressor is off.

S STANDBY — Compressor is off but armed to start. This state may be entered because of a power up, or the unload timer had expired and stopped the machine. NOTE: The machine may start at any time.

\$ STARTING - Machine is trying to start

S OFF LOAD — Machine is running and off loaded.

S ON LOAD — Machine is running and loaded.

S FULL LD — Machine is running and fully loaded. This state is only displayed if the machine has a full load valve.

S RMT STOP — Compressor is off but armed to start. The machine will start when the remote start contact is closed. NOTE: the machine may start at any time.

SSEQ STOP — Compressor is off but armed to start. The machine will start when the sequencing conditions meet the critera to start. NOTE: the machine may start at any time.

This default display appears as follows:

STOP 110 180 If there are alarms active they will alternately be shown with the default display. The machine status will be displayed for 2 seconds then the alarms for 2 seconds each. For example:

T1 HI 110 180

To view other status press the DISPLY key. All temperatures and pressures may be displayed as well as other status information. To scroll through the displays press the up arrow or down arrow keys. Up arrow moves to the next display, down arrow the previous display. To return to the default display press the display key.

S Separator differential pressure and the maximum limit. If the limit is exceeded, a separator maintenance warning will be displayed.

dP 1 4 MAX 10

\$ Sump pressure and line pressure

P1 113 P2 108

S Oil filter differential pressure and the maximum limit. If the limit is exceeded oil maintenance warning will be displayed.

dP2 4 MAX 20

S'Pressure before (P4) and after (P3) oil filter.

P3 108 P4 113

S Oil differential pressure and the minimum limit. If the pressure goes below the limit a P3 LOW shutdown will occur. Oil differential (dP3) is defined as P3-P1/2

dP3 40 MIN 1

S Unit discharge temperature and the maximum limit. If the temperature exceeds the limit a T1 HI shutdown will occur.

T1 210 MAX 235

S Dry side discharge temperature and the maximum limit. If the temperature exceeds the limit a T2 HI shutdown will occur.

SUPERVISOR II DESCRIPTION

T2 210 MAX 235

S Oil temperature and the maximum limit. If the temperature exceeds the limit a T3 HI shutdown will occur

T3 210 MAX 235

S Interstage temperature and the maximum limit. If the temperature exceeds the limit a T4 HI shutdown will occur.

T4 210 MAX 235

\$ Total hours that the compressor has been running.

HRS RUN 001234.0

\$ Total hours that the compressor has been loaded.

HRS LOAD 000987.0

S Last fault log. This shows the fault on the first line and the run hours when the fault occurred.

T1 HI @1 234

S Next to last fault log. This shows the fault on the first line and the run hours when the fault occurred.

T1 HI @1 204

2.3F STATUS DISPLAYS - DS-13

By default the line pressure (P2) and discharge temperature (T1) are shown on the bottom line of the display, and machine status on the top line. The following are the various machine status messages that indicate the state of the compressor: (Display graphics shown below.)

\$ STOP - Compressor is off

S STANDBY — Compressor is off but armed to start. This state may be entered because of a power up, or the unload timer had expired and stopped the machine. NOTE:

The machine may start at any time.

- \$ STARTING Machine is trying to start
- \$ OFF LOAD Machine is running and off loaded.
- S ON LOAD Machine is running and loaded.
- S FULL LD Machine is running and fully loaded. This state is only displayed if the machine has a full load valve.
- S RMT STOP Compressor is off but armed to start. The machine will start when the remote start contact is closed. NOTE: the machine may start at any time.
- SSEQ STOP Compressor is off but armed to start. The machine will start when the sequencing conditions meet the critera to start. NOTE: the machine may start at any time.

This default display appears as follows:

STOP 110 350

If there are alarms active they will alternately be shown with the default display. The machine status will be displayed for 2 seconds then the alarms for 2 seconds each. For example:

> T1 HI 110 350

To view other status press the DISPLY key All temperatures and pressures may be displayed as well as other status information. To scroll through the displays press the up arrow or down arrow keys. Up arrow moves to the next display, down arrow the previous display. To return to the default display press the display key.

\$ Interstage discharge pressure and line pressure.

P1 30 P2 110

S Oil filter differential pressure and the maximum limit. If the limit is exceeded oil maintenance warning will be displayed.

dP2 4 MAX 20

S Pressure before (P4) and after (P3) oil filter

SUPERVISOR II DESCRIPTION

P3 65 P4 69

S Interstage discharge temperature. Shuts off the compressor it T1 exceeds T1 MAX and system status will display T1 HI.

T1 350 MAX 425

S Final discharge temperature and the maximum limit. If the temperature exceeds the limit a T2 HI shutdown will occur.

T2 350 MAX 425

S Oil temperature and the maximum limit. If the temperature exceeds the limit a T3 HI shutdown will occur.

T3 100 MAX 170

S Interstage temperature after the intercooler and the maximum limit. If the temperature exceeds the limit a T4 HI shutdown will occur.

T4 100 MAX 170

S Package discharge temperature and the maximum limit. If the temperature exceeds the limit a T5 HI shutdown will occur.

T5 100 MAX 170

\$ Total hours that the compressor has been running.

HRS RUN 001234,0

\$ Total hours that the compressor has been loaded.

HRS LOAD 000987.0

\$ Last fault log. This shows the fault on the first line and the run hours when the fault occurred.

> T1 HI @1 234

S Next to last fault log. This shows the fault on the first line and the run hours when the fault occurred.

T1 HI @2 204

2.4 LAMP INDICATORS - ALL MODELS

Embedded into the front panel schematic of the compressor are several lamps. Pressing the lamp test key will light all the lamps for 3 seconds. Each LED lamp has the following purpose

P1 – (Sump and line pressure) If lit steady, signifies that P1 is being displayed, if flashing denotes the presence of an alarm

P2 – (Sump and line pressure) If lit steady, signifies that P2 is being displayed, if flashing denotes the presence of an alarm

P3 - (Pressure aftér oil filter) Same as P1 & P2 except for P3 (Pressure after oil filter)

P4 - (Pressure before oil filter)

dP1 – (Separate differential pressure) If lit steady, signifies that dP1 is being displayed, if flashing denotes replacement of separator is needed.

dP2 - (Oil filter differential pressure)

dP3 - (Oil differential pressure)

T1 - (Dry side discharge temperature) If lit steady, signifies that T1 is being displayed, if flashing denotes the presence of an alarm

 ${f T2}$ – (Discharge temperature) If lit steady, signifies that T2 is being displayed, if flashing denotes the presence of an alarm

T3 – (Oil temperature) If lit steady, signifies that T3 is being displayed, it flashing denotes the presence of an alarm.

T4 – (Interstage temperature) If lit steady, signifies that T4 is being displayed, if flashing denotes the presence of an alarm.

T5 - (Package discharge temperature)

MOTOR – If flashing, indicates the motor overload contact has opened.

INLET FILTER – If flashing, indicates that inlet filter maintenance is needed.

OIL FILTER - If flashing, indicates that oil filter maintenance is needed.

POWER ON — Lit if 120VAC power is applied to the Supervisor II.

ON — If lit steady, the compressor is running. If flashing, indicates that the compressor is armed but stopped because of restart timer not expired, remote stop or sequence stop. The compressor may start at any time.

Supervisor II Description

AUTO – If lit steady, the compressor is running and in auto mode. If flashing, indicates that the compressor is armed but stopped because of restart timer not expired, remote stop or sequence stop. The compressor may start at any time



NOTES

COMPRESSOR OPERATION

3.1 STANDARD PARAMETER SETUP

Pressing the program key enters parameter display and edit mode. To move to the next parameter press the program key. To increment a parameter press the up arrow key or logo key. The logo key will increment by 10. To decrement the value press the down arrow key.

The parameters are displayed in the following or-

S Unload pressure – The pressure where the machine is unloaded. 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).

UNLOAD 100 PSI

S Load differential – The pressure differential below the unload pressure where the machine is loaded. 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).

LOAD 10 PSI

\$ P1 Max — Maximum sump pressure. An alarm and shut down will occur when the sump pressure rises above this pressure.

P1 MAX 135 PSI

S Wye to delta transition timer — For full voltage starters this parameter is set to 0.

WYE DELT 10 SEC

S Restart time — Time to wait after powerup before starting machine. This parameter is used to keep several machines from starting at the same time after power up, or to delay start until other equipment is started if disabled the machine will not automatically start after power up.

RST TIME 10 SEC

S Unload Stop Timer – If the machine is running in AUTO mode, this parameter specifies the ammount of time that the machine will run unloaded 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 5 minutes. This is because there is another timer that keeps the machine from being started more than four times an hour.

UNLD TIM 15 MIN

S Language select – English, German, Spanish, Italian and French may be selected for display language.

LANGUAGE ENGLISH

\$ Units - English or metric units may be selected.

UNITS ENGLISH

S Communications ID # — This is the network address of a machine. If there is more that one machine connected to the network, each machine must have a unique number

COM ID #

S Communications baud rate — This should always be selected to 9600 baud for all sequencing modes. It may be lower for slave or monitoring modes.

BAUDRATE 9600

3.2 DELUXE PARAMETER SETUP

The following parameters are only available on deluxe model Supervisor $\boldsymbol{\Pi}$

S Sequence method – This parameter sets the method used for sequencing. The choices are DISABLED, REMOTE, SLAVE, HOURS, COM ID#. See the Sequencing & Protocol Manual (P/N 02250057-696) for details about these modes.

> SEQUENCE HOURS

COMPRESSOR OPERATION

S Drain interval – The time between actuation of the drain valve.

DRN INTV 10 MIN

S **Drain time** — The amount of time that the drain valve is actuated.

DRN TIM 1 SEC

S Last Communication Number — Used only for sequencing, see Sequencing & Protocol Manual for details.

LAST COM 3

\$ Lowest Allowable Pressure — Used only for sequencing, see Sequencing & Protocol Manual for details.

LOWEST 90 PSI

S Recovery Time — Used only for sequencing, see Sequencing & Protocol Manual for details

RECOVER 10 SEC

SRotate Time — Used only for sequencing, see Sequencing & Protocol Manual for details

ROTATE 50

S Machine Capacity – Used only for sequencing, see Sequencing & Protocol Manual for details.

CAPACITY 100

S Sequence Hours – Used only for sequencing, see Sequencing & Protocol Manual for details.

SEQ HRS 1000

3.3 OPERATING THE COMPRESSOR

Before operating the compressor the operating parameters must be setup. See the previous section

on operating parameter setup.

MANUAL OPERATION MODE

In this mode the compressor will run indefinitely, as long as temperatures and pressure remain within the valid operating ranges, and the motor overload or emergency stop contacts are not tripped. Pressing the "I" will turn on the compressor and put it in manual mode. If the compressor is already running, but in automatic mode, pressing "I" will switch operation to manual Pressing "I" while already running in manual mode will cause the Supervisor to turn off the common fault relay, if engaged, and clear any maintenance indicators

To stop the compressor, press "O". If the compressor is already off when "O" is pressed, the common fault relay will be turned off, if engaged, and it will try to clear the alarm and maintenance indicators. Regardless of what the compressor is doing, pressing "O" puts the Supervisor in manual stop mode.

AUTOMATIC OPERATION MODE

In this mode the compressor will start if line pressure (P2) is less than the LOAD parameter. It will stop if the compressor runs unloaded for the number of minutes indicated by the UNLD TIM parameter. To put the compressor in automatic mode press "©". If P2 is already less than LOAD the compressor will start immediately, otherwise the system status will indicate STANDBY and the LED marked AUTO will flash.

If the compressor is already running, but in continuous mode, pressing "Q" will switch operation to automatic. Pressing "Q" while already running in automatic mode will cause the Supervisor to turn off the common fault relay, if engaged, and clear any maintenance indicators.

In automatic mode the compressor can be stopped manually by pressing **O** Stopping the compressor using **O** will put the Supervisor in manual stop mode.

Regardless of whether in "automatic" or "manual" mode, control of the load solenoid will be based on the parameters **UNLD** and **LOAD**. This operation is as follows:

P2 > UNLD --> load solenoid turned off P2 < LOAD --> load solenoid turned on

POWER FAILURE RESTART

If the restart timer (RST TIME parameter) is disabled the compressor will not try to start after a power up. If this time is set to a value the machine will go into standby after power up. When the line pressure drops below the load setpoint, the restart timer will start timing. When the timer expires the machine will start

SEQUENCING MODES

The following is a brief description of sequencing modes, for details see the Supervisor II Sequencing & Protocol Manual (P/N 02250057-696).

\$ DISABLED - Responds to status and

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COMPRESSOR OPERATION

parameter change messages via the RS485 network but will not respond to start, stop, load or unload messages

- S REMOTE Responds to status and parameter change messages but will not respond to start, stop, load or unload messages. The remote inputs and outputs are enabled (start/stop, load/unload, master/local)
- \$ SLAVE Will respond to all messages, but will not start or load unless comman-

ded to do so by a message. This mode is used to control the machine from a master computer.

- § HOURS Sends status message about once a second, starts, loads and unloads machines based on sequencing hours
- S COM ID # Sends status message about once a second, starts, loads and unloads machines based on machine Com ID#.

3.4 PURPOSE OF CONTROLS

SWITCH	OPERATION
EMERGENCY STOP SWITCH	Pushing in this switch, found adjacent to the Supervisor, cuts all AC outputs from the latter and de-energizes the starter A fault message (E STOP) is displayed by the Supervisor until the button is pulled out and the "O" pad is depressed

3.5 SUPERVISOR OUTPUT RELAYS

RELAY	OPERATION
RUN RELAY (K1) *-DELTA (K2)	Contact closure energizes the compressor starter. A timed contact used to provide wye-delta transition time.
UNLOAD/LOAD (K3)	Controls ON LOAD/OFF LOAD operation of the load control solenoid valve.
COMMON FAULT (K4)	May be used to provide remote indication of any pre- alarm, maintenance or fault shutdown condition.
DRAIN VALVE (K5)	Deluxe only — controls a solenoid valve to provide automatic condensate removal.
FULL LOAD/MODULATE (K6)	Deluxe only - used with sequencing feature

NOTE: All output relays will handle 8 amperes at 120/240 VAC.



NOTES

START-UP PROCEDURES

4.1 MOTOR ROTATION CHECK

After the electrical installation has been done, it is necessary to check the direction of motor rotation

SES-8 COMPRESSORS

Pull out the EMERGENCY STOP button and press once, quickly and in succession, the (START) I and (STOP) O pads. This action will bump start the motor for a very short time. When looking at the motor from the control panel side, view the coupling by looking through the air inlet duct on the lower side of the adapter fan housing. The coupling should be turning clockwise. If the reversed rotation is noted, disconnect the power to the starter and exchange any two of the three power input leads, then recheck rotation. A "Direction of Rotation" decal is located on the motor and cooler shroud to show proper motor/compressor rotation.

S ALL OTHER COMPRESSORS

Pull out the **EMERGENCY STOP** button and press once, quickly and in succession, the **(START)** I and **(STOP)** O pads. This action will bump start the motor for a very short time. When looking at the motor rear end, the driveline should be rotating in the direction indicated by the "Direction of Rotation" decal located on the top of the compressor/motor adapter piece. If the reversed rotation is noted, disconnect the power to the starter and exchange any two of the three power input leads, then re—check rotation. A "Direction of Rotation" decal is located on the top of the compressor/motor adaptor piece.

4.2 INITIAL START-UP PROCEDURE

The following procedure should be used to make the initial start—up of the compressor.

- Read the preceding pages of this manual thoroughly.
- 2 Jog motor to check for correct rotation of fan.
- Be sure that all preparations and checks described in the Installation Section have been made.
- 4. Open the shut-off valve to the service line.
- 5. Check for possible leaks in piping.
- 7. Slowly close the shut—off valve to assure proper nameplate pressure unload setting is correct. The compressor will unload at nameplate pressure. If adjustments are necessary, see Control System Adjustments.
- 7. Observe the operating temperature. If the operating temperature exceeds 200_F (93_C), the cooling system and installation environment should be checked.
- 8. Open shut-off valve to the service line.
- Reinspect the compressor for temperature and leaks the following day

4.3 SUBSEQUENT START-UP PROCEDURE

On subsequent start—ups, check that the proper level is visible in the fluid level sight glass and simply press "I" for manual or "©" for automatic operation. When the compressor is running, observe the various parameter displays.

4.4 SHUTDOWN PROCEDURE

To shut the compressor down, push "O" pad.

NOTES

MAINTENANCE AND TROUBLESHOOTING

5.1 MAINTENANCE INTRODUCTION

As you proceed in reading this section, it will be easy to see that Maintenance Program for the air compressor is quite minimal. The Supervisor monitors the status of the air filter, fluid filter, and separator elements. When maintenance to these devices is re- 5.3 TROUBLESHOOTING INTRODUCTION guired, the Supervisor will display the appropriate maintenance message and flash the location LED on the graphics map as a visual reminder.

A WARNING

DO NOT remove caps, plugs, and/or other components when compressor is running or pressur-

Stop compressor and relieve all internal pressure before doing so.

5.2 DAILY OPERATION

Following a routine start, observe the various Supervisor displays to check that normal readings are being made — previous records are very helpful in determining the normalcy of the measurements. These observations should be made during all expected modes of operation (i.e. full load, no-load, different line pressures, cooling water temperatures, etc).

During the initial start-up or servicing of the package, fluid may have to be added to the sump vessel to restore an adequate level. Frequent fluid addi-

tions to maintain said level would be indicative of excessive fluid consumption, and should be investigated - see the Troubleshooting Section of this manual for probable cause and remedy

The following information has been compiled from operational experience with your package. It identifies symptoms and diagnosis of SEVERAL probable difficulties, but NOT ALL of those possible

The systematic collection of operational data cannot be over-emphasized, as it may give evidence of the presence (or not) of a fault before it turns into a serious breakdown - for example, the vibrations signature increase of a damaged bearing, or the effi-ciency decrease of a dirty heat exchanger.

A detailed visual inspection is worth performing for almost all problems and may avoid unnecessary additional damage to the compressor. Always remember to:

- Check for loose wiring.
 Check for damaged piping.
 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 representative or the Sullair Corporation.

5.4 TROUBLESHOOTING GUIDE - SEE 5.4A THROUGH 5.4D FOR SPECIFIC MODELS

5.4A - ES-8 TROUBLESHOOTING GUIDE

SYMPTOM	PROBABLE CAUSE	REMEDY
T1 HI Message	Discharge Temperature Exceeded 225° F (107 °C) for Pre-Alarm	
	Discharge Temperature Exceeded 235° F (113°C) for Shutdown	
	Ambient Temperature Exceeded 105° F (41 ° C)	Improve local ventilation (i.e., remote intake of process and/or cooling air
	Fluid Level in Sump is Too Low	Check/correct fluid level
	Thermal Valve Malfunctioned Cooler Fins are Dirty	Check/replace thermal valve Clean cooler fins
	Water Flow is Low (water-cooled packages only)	Check cooling water supply (i.e., closed valves)
	Water Temperature is High (water – cooled packages only)	Increase water flow, lower water temperature
	Cooler is Plugged (water-cooled packages only)	Clean tubes and/or shell — if tube plugging persists, provide cleaner water.
	Temperature RTD Malfunction	Check connections from RTD If adequate, replace RTD

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5.4A - ES-8 TROUBLESHOOTING (Continued)

SYMPTOM	PROBABLE CAUSE	REMEDY
P1 HI Message	P1 MAX - 3psi (.2 bar) Exceeded for Pre-Alarm	
	P1 MAX Exceeded for Shutdown	·
	Discharge Pressure Exceeded Shutdown Level Because:	
	Unloading Device (i.e, Blowdown Valve, Sullicon Actuator, Optional Spiral Valve) Failed to Operate	Check operation of unloading device
	Pressure Regulator Maladjusted	Check operation of pressure regulator
	Solenoid Valve Failed to Operate	Check operation of solenoid valve
	Control Air Signal Leaks	Check tubework feeding control signal for leaks
	Control Air Signal Filter Clogged	See compressor Operator's Manual for filter assembly service
SEP MNTN Message	Plugged Separator	Replace separator elements.
J	dP1 > 10 PSI (0 7 bar)	Check P1 & P2 pressure transducers.
COMPRESSOR DOES NOT		
BUILD FULL DISCHARGE PRESSURE	Air Demand Exceeds Supply	Check air service lines for open valves or leaks
	inlet Air Filter Clogged	Check for maintenance message on Supervisor II display Inspect and/or change element
	inlet Valve Not Fully Open	Check actuation and butterfly disc position
	Pressure Sensor and/or Connections at Fault	Check connections from transducer If adequate, replace transducer
LINE PRESSURE RISES ABOVE UNLOAD SETTING	Pressure Sensor P2 at Fault	Check connections from trans— ducer. If adequate, replace transducer
	Unloading Device (i.e., Blowdown Valve, Sullicon Actuator, Optional Spiral Valve) Falled to Operate	Check operation of unloading device
LINE PRESSURE RISES ABOVE UNLOAD SETTING	Solenoid Valve Failed to Operate	Check operation of solenoid valve
	Control Air Signal Leaks	Check tubework feeding control signal for leaks
	Control Air Signal Fitter Clogged	See compressor Operator's Manual for filter assembly service
EXCESSIVE FLUID CONSUMPTION	Clogged Return Line Strainer or Orifice	Clean strainer — screen and o-ring replacement kit available. Clean orifice.
	Damaged or Improperly Gasketed Separator Elements	Inspect separator elements and gaskets Replace if damaged
	Fluid System Leaks	Check tube/pipework for leaks
	Fluid Level Too High	Drain excess fluid
	Excessive Fluid Foaming	Drain and change fluid



MAINTENANCE AND TROUBLESHOOTING

5.4B - TROUBLESHOOTING GUIDE - LS-12; LS-16; LS-20; LS-20S; LS-25 and EUROPE

SYMPTOM	PROBABLE CAUSE	REMEDY
T1 HI Message	Discharge Temperature Exceeded 225° F (107° C) for Pre—Alarm	
	Discharge Temperature Exceeded 235° F (113°C) for Shutdown	•
	Ambient Temperature Exceeded 105° F (41 °C)	Improve local ventilation (i.e., remote intake of process and/or cooling air
	Fluid Level in Sump is Too Low	Check/correct fluid level
	Thermal Valve Malfunctioned	Check/replace thermal valve
	Cooler Fins are Dirty	Clean cooler fins
	Water Flow is Low (water - cooled packages only)	Check cooling water supply (i e , closed valves)
	Water Temperature is High (water - cooled packages only)	Increase water flow, lower water temperature
	Cooler is Plugged (water-cooled packages only)	Clean tubes and/or shell — if tube plugging persists provide cleaner water
	Temperature RTD Malfunction	Check connections from RTD If adequate, replace RTD
P1 Hi Message	P1 MAX - 3psi (2 bar) Exceeded for Pre-Alarm	
	P1 MAX Exceeded for Shutdown	
	Discharge Pressure Exceeded Shutdown Level Because:	
	Unloading Device (i.e., Blowdown Valve, Sullicon Actuator, Optional Spiral Valve) Failed to Operate	Check operation of unloading device.
	Pressure Regulator Maladjusted	Check operation of pressure regulator.
	Solenoid Valve Failed to Operate	Check operation of solenoid valve
	Control Air Signal Leaks	Check tubework feeding control signal for leaks
	Control Air Signal Filter Clogged	Service filter assembly.
SEP MNTN Message	Plugged separator	Replace separator elements
<u></u>	dP1 > 10 PSI (0 7 bar)	Check P1 & P2 pressure transducers
COMPRESSOR DOES NOT		
COMPRESSOR DOES NOT BUILD FULL DISCHARGE PRESSURE	Air Demand Exceeds Supply	Check air service lines for open valves or leaks
	Inlet Air Filter Clogged	Check for maintenance message on Supervisor display Inspect and/or change element
	inlet Valve Not Fully Open	Check actuation and butterfly disc position
	Pressure Sensor and/or Connections at Fault	Check connections from trans— ducer if adequate, replace trans— ducer
OIL MNTN Message	Plugged Oil Filter	Replace oil filter
-	Oil Differential dP2 > 20 psi (1 38 bar)	Check oil differential switch, switch open or if machine has P3 & P4 pressure transducer, check transducers

5.4B - TROUBLESHOOTING GUIDE - LS-12; LS-16; LS-20; LS-20S; LS-25 and EUROPE (Continued)

SYMPTOM	PROBABLE CAUSE	REMEDY
LINE PRESSURE RISES ABOVE		
UNLOAD SETTING	Pressure Sensor P2 at Fault	Check connections from trans— ducer. If adequate, replace transducer
	Unloading Device (i.e., Blowdown Valve, Sullicon Actuator, Optional Spiral Valve) Failed to Operate	Check operation of unloading device
	Solenoid Valve Failed to Operate	Check operation of solenoid valve
	Control Air Signal Leaks	Check tubework feeding control signal for leaks
	Control Air Signal Filter Clogged	See compressor Operator's Manual for filter assembly service
EXCESSIVE FLUID CONSUMPTION	Clogged Return Line Strainer or Orifice	Clean strainer – screen an o – ring replacement kit available Clean orifice.
	Damaged or Improperly Gasketed Separator Elements	Inspect separator elements and gaskets Replace if damaged
	Fluid System Leaks	Check tube/pipework for leaks
	Fluid Level Too High	Drain excess fluid.
	Excessive Fluid Foaming	Drain and change fluid

5.4C TROUBLESHOOTING GUIDE - LS-16T & LS-20T

SYMPTOM	PROBABLE CAUSE	REMEDY
T1 HI, T2 HI Message	Discharge Temperature Exceeded 255° F (124° C) for Pre-Alarm	- · · · · · · · · · · · · · · · · · · ·
	Discharge Temperatur Exceeded 265° F (129° C) for Shutdown	
	Ambient temperature exceeded 105_F (41_C)	Improve local ventilation (i.e., remote intake of process and/or cooling air
	Fluid Level in Sump is Too Low	Check/correct fluid level
	Thermal Valve Malfunctioned	Check/replace thermal valve
	Cooler Fins are Dirty	Clean cooler fins
	Water Flow is Low (water-cooled packages only)	Check cooling water supply (i.e., closed valves).
	Water Temperature is High (water – cooled packages only)	Increase water flow, lower water temperature.
	Cooler is Plugged (water-cooled packages only)	Clean tubes and/or shell – if tube plugging persists provide cleaner water
	Temperature RTD Malfunction	Check connections from RTD If adequate, replace RTD.
P1 Hl Message	P1 MAX – 3 psi (2 Bar) Exceeded for Pre–Alarm	
	P1 MAX Exceeded for Shutdown	
	Discharge Pressure Exceeded Shutdown Level Because:	
	Unloading Device (i.e., Blowdown Valve, Sulficon Actuator, Optional Spiral Valve) Failed to Operate	Check operation of unloading device
	Pressure Regulator Maladjusted	Check operation of pressure regulator
	Solenoid Valve Failed to Operate	Check operation of solenoid valve

5.4C TROUBLESHOOTING GUIDE - LS-16T & LS-20T (Continued)

SYMPTOM	PROBABLE CAUSE	REMEDY
P1 HI Message (Continued)	Control Air Signal Leaks	Check tube work feeding control signal for leaks
	Control Air Signal Filter Clogged	Service filter assembly
SEP MNTN Message	Plugged separator	Replace separator elements
	dP1 > 10 PSI (0 7 bar)	Check P1 & P2 pressure transducers
COMPRESSOR DOES NOT		
BUILD FULL DISCHARGE PRESSURE	Air Demand Exceeds Supply	Check air service lines for open valves or leaks
	Inlet Air Filter Clogged	Check for maintenance message on Supervisor display Inspect and/or change element
	Inlet Valve Not Fully Open	Check actuation and butterfly disc position
	Pressure Sensor and/or Connections at Fault	Check connections from transducer If adequate replace transducer
	Blowdown Valve Leaking	Repair or replace
AIR MNTN Message	Inlet Differential	Replace inlet filter check inlet switch.
LO COOL Message	Water Pressure Feed Below 10 psig	Check cooling water supply (i e
(Water-cooled packages only)		closed valves)
(Water—cooled packages only) (Air—Cooled or Water—Cooled w/canopy)	(0.7 bar) Fan Motor Overload Tripped	
(Air-Cooled or Water-Cooled w/canopy)	(0 7 bar) Fan Motor Overload Tripped	closed valves)
(Air-Cooled or Water-Cooled w/canopy) TROUBLESHOOTING - DS	(0 7 bar) Fan Motor Overload Tripped	closed valves)
(Air-Cooled or Water-Cooled w/canopy) D TROUBLESHOOTING - DS-SYMPTOM/MESSAGE	(0 7 bar) Fan Motor Overload Tripped -13 PROBABLE CAUSE	closed valves) Reset after heater elements cool REMEDY
(Air-Cooled or Water-Cooled w/canopy) D TROUBLESHOOTING - DS SYMPTOM/MESSAGE COMPRESSOR WILL NOT START;	(0 7 bar) Fan Motor Overload Tripped -13 PROBABLE CAUSE Main Disconnect Switch Open	closed valves) Reset after heater elements cool REMEDY Close switch
(Air-Cooled or Water-Cooled w/canopy) D TROUBLESHOOTING - DS SYMPTOM/MESSAGE COMPRESSOR WILL NOT START;	(0 7 bar) Fan Motor Overload Tripped -13 PROBABLE CAUSE Main Disconnect Switch Open Line Fuse Blown	closed valves) Reset after heater elements cool REMEDY Close switch Replace fuse
(Air-Cooled or Water-Cooled w/canopy) D TROUBLESHOOTING - DS SYMPTOM/MESSAGE COMPRESSOR WILL NOT START;	(0 7 bar) Fan Motor Overload Tripped -13 PROBABLE CAUSE Main Disconnect Switch Open	closed valves) Reset after heater elements cool REMEDY Close switch
	(0 7 bar) Fan Motor Overload Tripped -13 PROBABLE CAUSE Main Disconnect Switch Open Line Fuse Blown	closed valves) Reset after heater elements cool REMEDY Close switch Replace fuse
(Air-Cooled or Water-Cooled w/canopy) D TROUBLESHOOTING - DS- SYMPTOM/MESSAGE COMPRESSOR WILL NOT START; POWER LED OFF	(0 7 bar) Fan Motor Overload Tripped -13 PROBABLE CAUSE Main Disconnect Switch Open Line Fuse Blown Control Transformer Fuse Blown	closed valves) Reset after heater elements cool REMEDY Close switch Replace fuse Replace fuse Reset after heater elements cool down Should trouble persist, check whether motor starter contacts are functioning
(Air-Cooled or Water-Cooled w/canopy) D TROUBLESHOOTING - DS- SYMPTOM/MESSAGE COMPRESSOR WILL NOT START; POWER LED OFF	Fan Motor Overload Tripped -13 PROBABLE CAUSE Main Disconnect Switch Open Line Fuse Blown Control Transformer Fuse Blown Motor Starter Overloads Tripped	Reset after heater elements cool REMEDY Close switch Replace fuse Replace fuse Reset after heater elements cool down Should trouble persist, check whether motor starter contacts are functioning properly Check voltage. Should voltage check
(Air—Cooled or Water—Cooled w/canopy) D TROUBLESHOOTING — DS-SYMPTOM/MESSAGE COMPRESSOR WILL NOT START; POWER LED OFF MOTOR OL.	Fan Motor Overload Tripped -13 PROBABLE CAUSE Main Disconnect Switch Open Line Fuse Blown Control Transformer Fuse Blown Motor Starter Overloads Tripped Low Incoming Line Voltage	Reset after heater elements cool REMEDY Close switch Replace fuse Replace fuse Reset after heater elements cool down Should trouble persist, check whether motor starter contacts are functioning properly Check voltage. Should voltage check low, consult power company. Check connections from transducer. If adequate, replace

5.4D TROUBLESHOOTING - DS-13 (Continued)

SYMPTOM/MESSAGE	PROBABLE CAUSE	REMEDY	
LOW COOL	Water Pressure Supply Below 5 psig (0 3 bar)	Check cooling water supply (i e closed valves)	
	Cooling Fan Motor Starter Overloads Tripped	Reset after heater elements cool down. Should trouble persist, check whether motor starter con a tacts are functioning properly.	
COMPRESSOR SHUTS DOWN WITH AIR DEMAND:			
MOTOR OL	Motor Starter Overloads Tripped	Reset after heater elements cool down. Should trouble persist, check whether motor starter contacts are functioning properly.(I)	
	Low Incoming Line Voltage	Check voltage. Should voltage check low, consult power company.	
P3 LOW	Oil Pressure Falls Below 40 psig (2.8 bar) While Package is Running Because:		
	Oil Pump Malfunctioned	Consult Sullair Service Dept	
	Oil Filter Clogged	Replace filter element.	
	Oil Temperature Too Low	Check state of globe valve feeding oil cooler. In cold ambient envi— roments below 40_F (4_C) sump heating may be required	
	Sump Oil Level Too Low	Replenish oil level	
	Sump Strainer/Check Valve Clogged	Refer to compressors Operators Manual for sump maintenance	
LO P1	P3 and/or dP Transducer at Fault	Check connection from transducer If adequate, replace transducer	
T1 HI	Exceeded Pre-Alarm Temperature of 415° F (213 °C)		
	Exceeded Shutdown Temperature of 425° F (218° C)		
	LP Inlet Air Temperature Above 105_F (41_C)	Maintain inlet air temperature below 105_F (41_C)	
	High Interstage Pressure	Insufficient water flow to inter— cooler. High water temperature Defective HP stage	
	Cooling fan motor starter overloads tripped	Reset after heater elements cool down. Should trouble persist, check whether motor starter contacts are functioning properly	
	Temperature Transducer Failure	Check connections from transducer if adequate, replace transducer.	
T2 HI	Exceeded Pre-Alarm Temperature of 415° F (213° C)		
	Exceeded Shutdown Temperature of 425° F (218° C)		
	Low Water Flow to Intercooler	Check state of globe valve and/or adjustment of optional water regulating valve	

⁽I) Also check that the compressor—motor driveline rotates freely. In case of rotating resistance or rubbing, contact Sullair Service Department.

5.4D TROUBLESHOOTING - DS-13 (Continued)

SYMPTOM/MESSAGE	PROBABLE CAUSE	REMEDY	
T2 HI (continued)	intercooler Tube Bundle Fouled	Cleanse tube hundle. If fouling persists, then provide cleaner cooler water	
	Discharge Check Valve Leaking	Refer to compressor's Operators Manual for check valve maintenance	
	Inlet Throttling Valve Not Fully Open	See inlet valve adjustment.	
	Inlet Air Filter Clogged	Refer to compressor's Operators Manual for filter maintenance	
	Line Pressure is Too High	Reset Supervisor unload pressure.	
	Temperature Transducer Faillure	Check connection from trans— ducer. If adequate, replace transducer	
P1 HI	Exceeded P1 MAX for PreAlarm Exceeded P1 MAX for Shutdown		
	Exceeded P2 MAX for Shutdown		
	Pressure Transducer Failure	Check connection from trans— ducer. If adequate replace transducer	
P2 HI	Exceeded P2 MAX for Pre-Alarm		
	Exceeded P2 MAX for Shutdown	D. f. J	
	Blowdown Valve Failed to Actuate	Refer to compressor s Operator s Manual for blowdown valve maintenance	
	Solenoid Valve Controlling Blowdown Valve Failed to Operate	Refer to compressor's Operator's Manual for solenoid valve maintenance	
	Control Air Filter Clogged	Refer to compressor's Operator's Manual for control filter maintenance	
COMPRESSOR DOES NOT			
BUILD FULL DISCHARGE PRESSURE	Air Demand Exceeds Supply	Check air service lines for open valves or leaks	
	Inlet Air Filter Clogged	Check for maintenance message on Supervisor II display Change element	
	Inlet Air Valve Not Fully Open	Check actuation and butterfly disc position	
-	Transducer P2 Malfunction	Check connections from trans— ducer If adequate, replace trans— ducer	
	Blowdown Valve Leaking	Refer to compressor s Operator's manual for blowdown valve maintenance	
	Air End(s) Malfunctioning	Consult Sullair Service Department	
LINE PRESSURE RISES ABOVE UNLOAD SETTING	Blowdown Valve Falled to Activate	Refer to compressor's Operator's Manual for blowdown valve maintenance	
	Solenoid Valve Controlling Blowdown Valve Failed to Operate	Refer to compressor's Operator's Manual for solenoid valve maintenance	
	Transducer P2 Malfunction	Check connections from transducer If adequate, replace transducer.	
	Control Air Filter Clogged	Refer to compressor's Operator's Manual for control filter maintenance	



MAINTENANCE AND TROUBLESHOOTING

NOTE ON TRANSDUCERS:

Whenever a sensor is suspected of fault, the recommended cause of action is to measure the signal (pressure, temperature, etc.) with an alternate calibrated instrument and compare readings of readings conflict, the electrical and/or tubing connections should be inspected, and if no faults are evident, then replace the sensor and re—evaluate against the calibrated instrument.

5.5 CALIBRATION

The Supervisor II has software calibration of the pressure and temperature probes. This calibration affects the offset but not the slope of the pressure and temperature calculations. Because of this, the most accurate method is to heat or pressurize the transducer to its operating value. If this is too difficult, room temperature/open atmosphere calibration is adequate. Calibration may only be done while machine is stopped and unarmed.

To enter calibration mode, you must press the following keys in sequence while in the default status display mode: " ", "Y", DISPLY, "B "," PROG. Once in calibration mode, you will see a screen like the following:In the above example, "0"

CAL P1 0 97

refers to the amount of adjustment (in psi or _F, "97" (6.7 bar) refers to the current value of P1). To make adjustments, Press the "Y" (UP ARROW) key to increase the value, press the "B "A" (DOWN ARROW / LAMP TEST) key to decrease the value. The number on the left will increase or decrease always showing the total amount of adjustment. Maximum adjustment is | 7. The DISPLY key exits, wiping out changes to the current item, while saving changes to any previous items. The PROG key saves the current item and advances to the next. All temperatures and pressures may be calibrated individually

Section 6

ORDERING PARTS

6.1 PROCEDURE FOR ORDERING PARTS

Parts should be ordered from the nearest Sullair Representative or the Representative from whom the compressor was purchased. If for any reason parts cannot be obtained in this manner, contact the factory directly at the address, fax or phone numbers below.

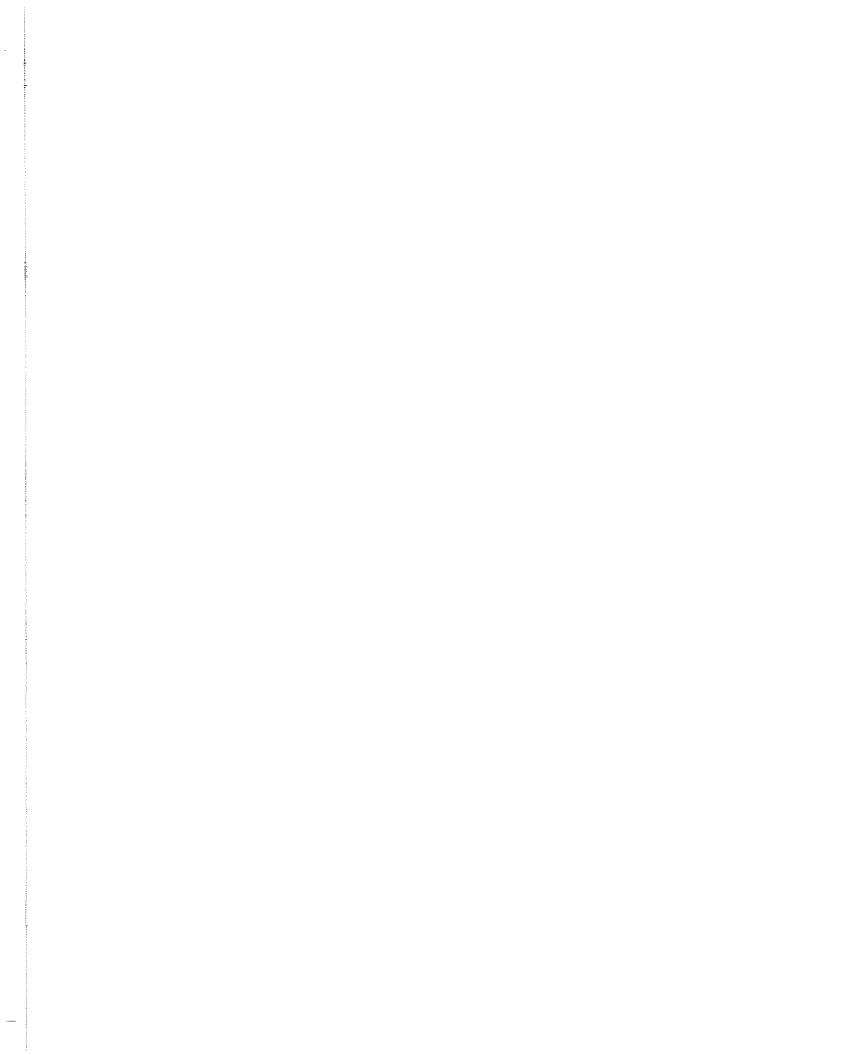
When ordering parts always indicate the **Serial Number** of the compressor. This can be obtained from the Bill of Lading for the compressor or from the Serial Number Plate located on the compressor.

SULLAIR ASIA, LTD.
Sullair Road, No. 1
Chiwan, Shekou
Shenzhen, Guangdong PRV.
PRC POST CODE 518068
Telephone: 755-6851686
Fax: 755-6853473

SULLAIR EUROPE, S.A.
Zone Des Granges BP 82
42602 Montbrison Cedex, France
Telephone: 33-477968470
Fax: 33-477968499

SULLAIR CORPORATION

3700 East Michigan Boulevard Michigan City, Indiana 46360 U.S.A. Telephone: 1-219-879-5451 Fax: (219) 874-1273 Fax: (219) 874-1835 (Parts) Fax: (219) 874-1288 (Service)



WORLDWIDE SALES AND SERVICE



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Sullair Road, No. 1
Chiwan, Shekou
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PRC POST CODE 518068
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Fax: 755-6853473

SULLAIR EUROPE, S.A.
Zone Des Granges BP 82
42602 Montbrison Cedex, France
Telephone: 33-477968470
Fax: 33-477968499

SULLAIR CORPORATION

3700 East Michigan Boulevard Michigan City, Indiana 46360 U.S.A. Telephone: 1-219-879-5451 Fax: (219) 874-1273 Fax: (219) 874-1835 (Parts) Fax: (219) 874-1288 (Service)

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Specifications Subject To Change Without Prior Notice EN98





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SUPERVISOR CONTROLLERTM

SEQUENCING & PROTOCOL MANUAL

(Including Supervisor II Controller)

OPERATOR'S MANUAL

KEEP FOR FUTURE REFERENCE

Part Number

02250146-060

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AIR CARE **SEMINAR TRAINING**

Sullair Air Care Seminars are courses that provide hands-on instruction in the proper operation, maintenance and service of Sullair equipment. Individual seminars on Industrial compressors and compressor electrical systems are presented at regular intervals throughout the year at a dedicated training facility at Sullair's corporate headquarters in Michigan City, Indiana.

Instruction includes discussion of the function and installation of Sullair service parts, troubleshooting of the most common problems, and actual equipment operation. The seminars are recommended for maintenance and service personnel

For detailed course outlines, schedule and cost information contact:

Sullair Corporate Training Department

219-879-5451 (ext. 5363) www.sullair.com

- Or Write -

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

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Section 1 SAFETY AND INTRODUCTION

1.1 SAFETY

A WARNING

Operator should be familiar with all safety measures as described in the Supervisor Controller $^{\text{TM}}$ or Supervisor II Instruction manuals (whichever pertains).

A WARNING

Machines should be off-line and not running when making parameter changes. Unexpected machine operation may occur.

1.2 SUPERVISOR CONTROLLERS

NOTE

For information specific to the Supervisor Controller or Supervisor II, also consult the Supervisor Controller manual, or Supervisor II Instruction manual (for Supervisor II Deluxe models).

This manual describes sequencing of multiple compressors with Supervisor or Supervisor II Deluxe electronic controllers. Although these differ considerably in individual compressor functions and user interface, they behave similarly in sequence capabilities, and can be mixed within a compressed air system. This manual will use the term "controller" to apply to either device, and will highlight specific differences in the few places where they apply. Refer to the controller manuals for details on compressor operation and adjustment of the controller.

1.3 SEQUENCED COMPRESSOR SYSTEMS

Compressor sequencing refers to using multiple compressors to meet the demands for compressed air. This may be a simple duplex system or may be multiple compressors for applications with widely varying demands. In any case, the compressors automatically stop, if not needed, to reduce operating costs. A properly designed system can offer substantial reductions in operating cost over a single large compressor. Many systems are designed with one spare compressor, allowing the system to remain operational during maintenance of a machine. The controls system does the job of efficiently running the compressors as needed to meet the varying demands during the day, or to run the backup compressor only when needed.

Supervisor and Supervisor II Deluxe controllers all feature internal sequencing functions. Supervisor requires a communications module for these features. These operate as a distributed control system (rather than a master-slave relationship), so the system remains operational even if a member is taken off-line. Refer to Section 2 for details

A system with one or more variable-speed compressors offers some additional opportunities for control. Refer to Section 3 for details.

Section 1 SAFETY AND INTRODUCTION

Section 4 covers application of controllers in master-controlled systems.

Timers used in internal sequencing are described in Section 5

Section 6 contains technical details of the hardware and protocol used on the communication bus. Other equipment may monitor this for data and presentation of system performance.

2.1 NORMAL OPERATION

Supervisor and Supervisor II Deluxe controllers all feature internal sequencing functions. To enable any Supervisor in the system, press the Auto key and Remote key on the keypad. Enable the Supervisor II Deluxe by simply pressing the Auto button. Any unit can be stopped by pressing the STOP key, and remaining members will continue to operate as needed.

The Supervisor Controller has a Remote keypad on the display module that is used to enable and disable the controller from any sequencing mode that is currently programmed. When the Remote key is first pressed after sequencing has been programmed, it will enable that mode and light the REMOTE LED on the Display Module. Pressing that keypad again will turn off the LED and disable the sequencing mode. The compressor will then operate as though it is not in any sequencing mode. The process will be reversed when the keypad is pressed again.

2.2 COMPRESSOR SYSTEM

Internal controller sequencing is designed to operate a group (2-16) of compressors feeding a common header. As air demands change, the compressors will be controlled to deliver the required compressed air in an efficient manner. If a group of similar compressors is used, the controllers can be set up to automatically rotate operation to equalize run time. Or, the controllers can be set up for a desired order of compressor operation. The three modes of sequencing are:

SEQUENCE HOURS - In this mode, machines are started and loaded depending on the SEQUENCE HOURS parameter. The sequence hours parameter is similar to run hours except that it can be changed. Digital inputs for Remote control are disabled. ROTATE hours

A WARNING

DO NOT enable this mode when the above situation is NOT true, because unexpected starts and stops may occur when manually starting or stopping a machine in the sequence for maintenance.

are disabled.

COM NUM - In this mode, machines are started and loaded depending on the COMMUNI-CATION NUMBER parameter. Operation is exactly the same as the SEQUENCE HOURS method (see above) except the communications number is used to determine machine sequence instead of sequence hours. Digital inputs for Remote control are disabled.

SEQUENCE HOURS with ROTATE Hours Enabled - A special version of SEQUENCE hours for balancing run hours for use in only two-machine applications that has a demand for only one machine. DO NOT use with more than two machines (See ROTATE hours parameter setting for more information). Digital inputs for remote control are disabled

It is best if the P2 (line pressure) transducers of all machines are connected to a common header, down stream of individual dryers, etc. Note that the dP1 (separator maintenance



delta pressure) may need to be calibrated to take into account the extra pressure drop of the down stream equipment

2.3 CONTROLS WIRING

Control signals are passed along a simple network cable, Belden 9842 or similar. This cable has two twisted pairs with a shield. One twisted pair is connected to ISO + and ISO - on the Supervisor Comm module. Twisted pairs usually have one colored wire twisted with a black or white wire. Make sure that the colored wire is on ISO + and the white or black wire is on ISO -. Both wires of the other twisted pair are connected to ISO GND. The shield should be connected to ground at one end only

For Supervisor II Deluxe controllers, connect the colored wire to J2-16 and the white or black wire to J2-17. Connect both wires of the other twisted pair is connected to J2-18.

2.4 MACHINE PREPARATION PRIOR TO SEQUENCING

- 1 Complete all machine startup procedures for stand-alone operation for the machines that are to be sequenced together per the compressor operator's manual.
- 2. Relocate the P2 signal for all machines to read the common header pressure. To recalibrate the P2 signal for each machine so that they match within 1 psi of each other, use the system display mode described later to view P2 on all machines. Recalibrate P2 on each machine to match P2 on the other machines.
- 3. Program each machine with a different COM ID number (i.e. 1, 2, 3, etc.).
- 4. Set UNLOAD psi, LOAD psi, BAUD RATE (Supervisor is fixed at 9600), SEQUENCE mode (COM ID or HOURS), LAST COM, LOWEST and RECOVER time (normally set at 10) the same for each machine (except for VSD applications). Leave ROTATE hours disabled except for the specific application described elsewhere. Set all SEQ HRS the same unless it is desired to force certain machines to initially run more than others in the HOURS mode.
- 5. Set the machines to run in AUTO mode. On the Supervisor, also press the Remote key to arm the machines for sequencing. Machines will start immediately if the P2 system pressure is low. On a fully pressurized system the machines will go into SEQ STOP until a demand is seen. The following operation describes how machines are started, fully loaded and unloaded by the sequencing mode selected. The AUTO mode provides the means for each machine to SEQ STOP by timing out on its unload timer (UNLD TIM) when the sequencing order decides the machine is to be unloaded.

2.5 SYSTEM OPERATION

For this example three machines are in a system with the load pressure set at 100, unload at 110 psig (7.6 bar), lowest pressure at 90 psig (6.2 bar), and Recovery Time at 10 seconds (default value). All machines are in sequence stop (top line of the display is SEQ STOP). When the pressure drops below 102 psig (7.6 bar) a timer starts counting down from

120 seconds, if the pressure continues to drop the timer will count down faster. When the timer expires or the pressure drops below 90 psig (6.2 bar) the first machine is started. If the pressure does not go above 90 psig (6.2 bar) for 10 seconds (Recovery Time) the next machine will start and so on until all machines are started.

As machines are started and loaded, there will be only one machine that is modulating, the others will be forced to "FULL LOAD". The modulating (trim) machine will load at 2psig (.14 bar) above the load pressure parameter, 102 psig (7.03 bar) in this example, and unload at 2 psig (.14 bar) below unload pressure parameter, 108 psig (7.4 bar) in this example. The reason for this narrower load/unload band is to keep all machines from loading and unloading at the same time. The trim machine will be identified on the display as "TRIM" operating state. If the pressure rises above the unload pressure -2 psig (.14 bar)(108 psig (7.4 bar) the trim machine will unload (display will say "UNLOADED") and the next machine in the sequence will switch from full load to trim. If after Recovery Time the pressure is still above 108 psig (7.4 bar) then the trim machine will unload and so on until all machines are unloaded. Then if the pressure falls below load pressure + 2 psig (.14 bar) or 102 psig (7.03 bar) the first machine in the sequence will load and be the trim machine. If after the Recovery Time the pressure is still below 102 psig (7.03 bar) then the trim machine will go to full load and the next machine in the sequence will load and become the trim machine.

2.6 SYSTEM SETUP AND TUNING

The following shows the settings for a system of low pressure 90-100 psig (6.2 to 6.9 bar) machines. The Trim High & Low Setpoints are not settable parameters, they are calculated from the Unload and Load pressures. The Trim High Setpoint is 2 PSI (.14 bar) below the Unload pressure and the Trim Low Setpoint is 2 PSI (.14bar) above the Load pressure.

100 psig (6 9 bar) Unload

98 psig (6.8 bar) Trim High Setpoint (calculated parameter)

92 psig (6.3 bar) Trim Low Setpoint (calculated parameter)

90 psig (6.2 bar) Load

85 psig (5.9 bar) Lowest pressure

10 Recover time (seconds)

Note that the unload pressure is set to 100 psi (6.9 bar) and not 110 psi (7.6 bar) as is normal on a stand alone machine. A stand alone machine set up at 100 psi (6.9 bar) to 110 psi (7.6 bar), starts to modulate above 100 psi (6.9 bar) and the horsepower is reduced. However, in a sequenced system a machine may be forced to full load, which would draw more than the rated horsepower above 100 psi (6.9 bar). Therefore the modulation band of machines in a system should be set up to be 10 psi (7 bar) lower than their rated pressure

All running machines operate either at full load or unloaded except for the one that will hereafter be called the trim machine. The trim machine unloads when the line pressure rises above the Trim High setpoint.

The Trim High and Low setpoints are necessary because the trim machine must unload before the fully loaded machines and load before the unloaded machines, otherwise all

machines would load and unload at the same time

The LOWEST pressure parameter specifies the lowest pressure allowed before immediately starting a machine A machine may also be started if the line pressure drops below the Trim Low setpoint for a period of time

The RECOVER time is used to keep multiple machines from loading, unloading or starting at the same time. A timer is reset when a machine loads, unloads or loads after a start. Decisions to load, unload or start another machine are deferred until the timer reaches the RECOVER time setpoint. Note that the timer starts when a machine is added or taken away from the system. If the pressure recovers within the RECOVER time, and then at a later time the pressure drops below the Trim Low setpoint, another machine will load immediately. The shorter the recovery time the more responsive the system to load changes, but the less energy efficient it is because machines may not shut off as often. The more often a machine loads the less likely it is to stay unloaded and shut off after the Unload timer expires. The RECOVER TIME has a default value of 10 sec. and may be adjusted from 2 to 59 sec.

In the following discussion 'highest' refers to the machine with the highest SEQ HRS or COM ID and 'lowest' refers to the machine with the lowest SEQ HRS or COM ID.

The following rules are used to load, unload and start:

- 1. Only the highest loaded machine will trim; the rest will be forced to full load.
- 2 The trim machine will unload when the line pressure rises above the Trim High setpoint. The next highest loaded machine will then become the trim machine. If pressure remains above the Trim High setpoint, the new Trim machine will unload after Recovery Time expires. This process will continue until only enough machines are running and loaded to maintain proper system pressure.
- 3. The lowest unloaded machine will load (trim) when the line pressure drops below the Trim Low setpoint. If the pressure remains below the Trim Low setpoint the next Unloaded or Sequence Stopped machine will load or start after the Recovery Timer expires. This process will continue until only enough machines are running and loaded to maintain proper system pressure.
- 4. The lowest stopped machine will start when the line pressure drops below the Trim Low set point, and after a variable time out period. This time out is dependent on how far the line pressure is below the Trim Low set point. The farther below the set point the shorter the time to start.
- 5. The lowest stopped machine will override the above variable time out feature and start when the line pressure drops below the Lowest Pressure set point, and after the recovery timer expires.

2.7 CHANGING SEQUENCE PARAMETERS

To change parameters on the Supervisor, push the Down arrow key **U** until Sequencing menu is displayed. Press Enter **I** To select a parameter for change, move up and down the menu with the Up **I** and Down **U** arrow keys. Press Enter **I** to select the parameter for editing. The Up arrow and Down arrow keys will adjust the settings. If a numeric value

is to be entered, position to the character space with the Right **3** and Left **4** arrow keys Adjust the value with the Up and Down keys. To save the changed value, push the Enter **4** key.

To change parameters on the Supervisor II Deluxe, push the Program key until the top line of the display identifies the parameter to be changed. The Up arrow and Logo keys will increment the parameter value; the Lamp Test will decrement. Push

the Program key to save the changed value. The next parameter will then be displayed.

Parameter names and numerical order are shown in [brackets] below.

The following parameters may need to be changed for sequencing:

Sequence by (SEQUENCE [9]) - Select the desired sequencing mode

Seq Hrs - To change this parameter in the Supervisor, push the key and change the values as described above. The maximum value for sequence hours is 100,000. A rollover to zero will occur if that number is exceeded.

(SEQ HRS [17]) - To change this parameter in the Supervisor II Deluxe, push the Program

key until SEQ HRS is displayed on the top line of the display. Pushing the Logo key will increment by 1000 hours, the Up arrow key will increment by 100 hours and the Lamp Test key will decrement by 100 hours. The number will roll over at 30,000

hours. To set the hours to a lower number it may be easier to push the Logo key until the display reads 30,000, then hit the Up arrow key, the display will then go to 0.

Com Number (COM ID #[7]) - Must be unique for every machine in the system. If there are three machines in a system, for example, they must be numbered 1, 2 and 3. Up to 16 machines may be sequenced with the Supervisor Controller.

Machines (LAST COM [12]) - Set to total number of machines in a system.

Low Press (LOWEST [13]) - This should be set to the lowest allowable pressure before a machine has to start. Normally this is 5 to 10 psi (.3 to .7 bar) below the load pressure. If the system pressure drops below this limit then the machine with the lowest SEQ HRS or COM ID is started immediately. A machine will also start if the pressure is below the Trim Low Setpoint for a period of time. The length of this time is 0 to 120 seconds depending on the pressure. The closer the pressure is to LOWEST pressure the shorter the time. For example if the pressure drops below the Trim Low Setpoint by 1 psi (.07 bar), and stays there a machine will start in 120 seconds. If the pressure drops near LOWEST PRESSURE then a machine will start in just a few seconds.

Recover Time (RECOVER [14]) - Recovery time. This parameter adds a delay between subsequent start, load and unload commands. See Sequencing Timer Section for further explanation.

Rotate (ROTATE [15]) - Rotate time for two-machine systems. There are some systems where the trim machine never unloads or stops and the second machine is never required;

MARNING

DO NOT enable this mode when the above situation is NOT true, because unexpected starts and stops may occur when manually starting or stopping a machine in the sequence for maintenance.

specifically a two-machine system where one machine runs all the time and the other is used only for backup. The rotate parameter forces the trim machine to stop (allowing the other machine to start). The trim machine will stop when its sequencing hours are more than a stopped machine sequencing hours by the rotate hours value.

For example, consider a two-machine system with SEQUENCING hours of 1000 and ROTATE of 50 hours on each machine. If one machine is started and continuously loaded, it will run until it's sequence hours are 1050 (50 hours more than the stopped machine) then stop. The other machine will start and run until it's sequence hours are 1100 (50 more than the stopped machine) then stop, and so the machine will rotate back and forth every 100 hours.

Min, Hour, Day, Month, Year – (Supervisor only) Use to set the clock in the communications module. This time is displayed while in sequence mode of operation

(BAUD RATE [8]) - Supervisor II Deluxe has adjustment of the serial communications baud rate, almost always set to 9600. The Supervisor is fixed at 9600 baud. All controllers in the system must be the same speed.

2.8 SYSTEM DISPLAY- SUPERVISOR

The SYSTEM menu selection is helpful for trouble-shooting, and calibration. The first column of the display shows the numbers 1 through the number of machines in the system (set by parameter LAST COM). The second column shows the status of each machine. The status letters are:

E - E-Stop

U - Unloaded

M - Manual stop

B - Standby

L - Loaded

F - Full Load

T - Trim (loaded and modulating)

S - Starting

R - Remote or sequence stop

The third column displays the capacities of the machines that are running. The fourth column indicates first the highest system P2 value and then P2 for each compressor in the sequence. Lower case letters indicate that service is needed.

2.9 SYSTEM DISPLAY- SUPERVISOR II DELUXE

There is a system display that may be helpful for trouble-shooting, and calibration. While in

the main display, push the Logo key followed by the Display key. The top line of the display should show the numbers 1 through the number of machines in the system (set

by parameter LAST COM). The second line shows the status of each machine. If the status letter is lower case then the machine has a fault or warning. The status letters are:

E - E-Stop

U - Unloaded

M - Manual stop

B - Standby

L - Loaded

F - Full Load

T - Trim (loaded and modulating)

S - Starting

R - Remote or sequence stop

If the Up arrow key is pushed the system line pressure is displayed. If the Up arrow key is pushed again the line pressure and run hours of the first machine is displayed, if the arrow key is pushed again the second machine is displayed and so on The Lamp Test key changes to the previous display.

2.10 REMOVING A MACHINE FROM SEQUENCE FOR MAINTENANCE

To temporarily disable a machine from sequencing for maintenance, simply press the STOP pad and/or E-Stop Button, remove power to that machine and apply the appropriate Lockout/Tagout procedure. The rest of the networked machines will continue to sequence properly. When restoring the machine to the network, simply restore power, pull out the E-

Stop, press STOP then AUTO for Supervisor II Deluxe. If the sequencing parameters have not been changed, the machine will sequence in at the appropriate time. By revising that machine's SEQUENCE HOURS before enabling sequencing, one may force it to move up or down in the start priority in the HOURS sequencing mode. To permanently

A WARNING

DO NOT enable this mode when the above situation is NOT true, because unexpected starts and stops may occur when manually starting or stopping a machine in the sequence for maintenance.

remove a machine from sequence, reprogram the other compressors as though the downed machine/s is/are not there. (Relocate the COM NUMBERS as needed and change the LAST COM value per the number of machines removed.) Remember that any program changes must be done while the machine is manually stopped.

2.11 CALIBRATION OF P2 PRESSURE TRANSDUCERS - SUPERVISOR

Because each machine has it's own pressure transducer it is possible that after a long period of time these can read differently. If this happens the Supervisors should be re-calibrated. This re-calibration is best done when the system is at a stable pressure. Measure the pressure using an independent gauge then change the calibration parameter for P2 so that the Supervisor reads the same as the gauge. Changing of the calibration parameters is entered by a separate password in the Calibration menu to protect from inadvertent changes. If the password is not equal to zero, cursor to the password line, press the ENTER

key and then enter a value that is four more than the existing number. Press the ENTER key and the number should go to zero. Repeat process if a keying error occurs that does not release the password.

Cursor to the line that reads CAL P2 The display will show the (current P2 reading) and the calibration parameter (+ 7 to -7). Press the ENTER key to adjust the value. The Up arrow key will increase the reading and the Down arrow key will decrease the reading. Use these keys to correct the P2 reading, then push the ENTER key The ENTER key must be pressed after setting the calibration parameter to make it permanent. Return to the main display by pressing ESC and check to make sure the pressure is correct.

2.12 CALIBRATION OF P2 PRESSURE TRANSDUCERS – SUPERVISOR II DELUXE

Because each machine has it's own pressure transducer it is possible that after a long period of time these can read differently. If this happens the supervisors should be re-calibrated. This re-calibration is best done when the system is at a stable pressure. Measure the pressure using an independent gauge then change the calibration parameter for P2 so that the supervisor reads the same as the gauge. The changing of the calibration parameters is entered by a special key sequence to protect from inadvertent change. The key sequence

is: Logo , Up arrow , Display ; Lamp Test , Program The first line of the display should read CAL P1, if not push the Display key and try again. If the first line of the display reads CAL P1 push the Program key, and the first line of the display should read CAL P2. The second line of the display will show the calibration parameter (+ 7 to -7) and the current P2 reading corrected by the calibration parameter. The Up arrow key

will increase the reading and the Lamp Test will decrease the reading. Use these keys to correct the P2 reading, then push the program key. The program key must be pressed after setting the calibration parameter to make it permanent. Return to the main display and check to make sure the pressure is correct

2.13 FULL LOAD FEATURE

The full load feature energizes a solenoid valve on the machine that forces the base machine/s to full load when being sequenced. Spiral valve machines may also require a relay that de-energizes the spiral control solenoid valve during full load mode.

Section 3 SEQUENCING WITH VARIABLE SPEED DRIVE COMPRESSORS

3.1 VARIABLE SPEED DRIVE APPLICATIONS

Multiple compressor systems can be designed using a variable-speed-drive (VSD) compressor combined with either fixed speed or other VSD compressors. The most efficient use of a VSD machine in sequencing is to make it always be the trim machine and always be running. This can be accomplished using the existing Sullair sequence logic.

3.2 SETUP FOR FIXED SPEED MACHINES AND A VSD COMPRESSOR

The fixed-speed machine(s) must be set up for load/unload operation. If controlled with Supervisor II Deluxe controllers, the pressure regulator/s must be made to have no effect by operating the system below their effective range. If controlled by the Supervisor Controller, the controls may be programmed for Load/No load operation whereby the Full Load valve is energized any time the machine is running, thus defeating modulation. Alternately, the Full Load solenoid valve may be rewired to the Load output with either the Supervisor Controller or Supervisor II Deluxe to accomplish the same thing In any case care must be taken to not overload these compressors by only operating at pressures within the capability of the drive motor. See the following chart for suggested settings.

Since this machine is to always be the trim machine, no Full Load action is needed. The Max Speed input signal should be disabled unless more than one VSD machine is in the same sequence.

In this configuration, only the fixed-speed compressors are sequenced and the VSD is run with its sequencing disabled. Sequence hours mode can then be used to automatically rotate the fixed-speed machines, or you may select to sequence based on Com#. Depending on the application and system demands, the VSD compressor can either be run continuously or in the AUTO mode to minimize the unload time to as little as an immediate stop on unload. In this arrangement, the VSD machine will always be operating as the trim machine because it will restart at a higher pressure than the fixed-speed machines. By adjusting the VSD Unload time in AUTO mode and the fixed-speed Restart times, rapid cycling and hunting can be minimized.

Target system pressure at discharge of compressors: 99 psi

	VSD Compressor	Fixed-Speed Compressor(s)
Unload Setpoin	t 104	102
Load Delta	6	6
VSD Setpoint	99	
Com #		COM #1, 2 (, 3, 4, etc.)
Lowest Pressur	·e	90

Since a fixed-speed L (100 psi) compressor's pressure regulator doesn't begin to throttle until 101- 102 psi, it should have no effect, thereby causing the machine to operate Load/Unload with or without the Full Load solenoid valve. The net result would have the VSD always running and be able to modulate; the fixed-speed machines would come on and go off as necessary but operate Load/Unload. Note that the normal load delta becomes narrower while operating a sequenced system; the settings above will load at 97 and unload

Section 3 SEQUENCING WITH VARIABLE SPEED DRIVE COMPRESSORS

at 101 psi The system will normally cruise at 98-100 psi

3.3 SETUP FOR MULTIPLE VSD COMPRESSORS

With pressure-controlled VSD circuits, configure all compressors by Sequence Hours or Com Number, as desired. Enable the Max. Speed Input function. All but one of the compressors will be full-loaded, thus limiting the pressure to the rated value of the machines.

With serial-controlled VSD circuits, configure all compressors by Sequence Hours or Com Number, as desired. The Supervisors allow all machines to run at reduced speeds, to match delivery to demand. Unneeded machines will be stopped automatically. If the compressors are L (100 psi) machines, set the program points as listed below:

Target system pressure at discharge of compressors: 95 psi

Unload Setpoint 102
Load Delta 8
VSD Setpoint 98
Lowest Pressure 90
Recover Time 10 sec.

Parameters may require adjustment based on system capacity and application. Unload Setpoint should **NEVER** be more than 2 psi above package rating. Note that the normal load delta becomes narrower while operating a sequenced system; the settings above will load at 95 and unload at 101 psi. The system will normally cruise at 97-99 psi.

Section 4 OPERATION WITH REMOTE CONTROLLERS

4.1 NORMAL OPERATION

The controllers are capable of operation from remote-control devices. Depending on system design, these may simply enable automatic operation, or may be responsible for loading the compressor. When a remote-controlled system is set up, each compressor must be programmed for remote sequencing, and enabled locally. To enable any Supervisor in the system, press the Auto key and Remote key on the keypad. Enable the Supervisor II Deluxe by simply pressing the Start button. Any unit can be stopped by pressing the Stop key, and remaining members will continue to operate as needed.

The Supervisor Controller has a Remote keypad on the display module that is used to enable and disable the controller from any sequencing mode that is currently programmed.

When the Remote key is first pressed after sequencing has been programmed, it will enable that mode and light the REMOTE LED on the Display Module. Pressing that keypad again will turn off the LED and disable the sequencing mode. The compressor will then operate as though it is not in any sequencing mode. The process will be reversed when the keypad is pressed again.

4.2 CONTROLS WIRING AND ADJUSTMENT - SUPERVISOR

There are three inputs and one output that are enabled in this mode:

Remote Stop/Start Input D5
Remote Load/Unload Input D6
Local/Master Input D7
Local/Master Output K8

D5, D6 and D7 are wired through customer furnished relay contacts to ground (Supervisor Signal GND). If D5 is open the machine will stop, and be held stopped. If D5 is grounded, the machine will be enabled to start; the following table describes how the other inputs work:

Local/MasterLoad/UnloadOperationOpenOpenNormal load and unloadOpenClosedForce unloadClosedOpenForce load, unload at P1 max - 3ClosedClosedForce unload

The Local/Master Output (K8) is closed when the Local/Master Input is on and the machine is not in E-stop or Stop. The Local/Master Output is a relay contact that can handle 250VAC at 10 amperes.

To change parameters on the Supervisor, push the Down 2 arrow key until Sequencing menu is displayed. Press Enter 3. To select a parameter for change, move up and down the menu with the Up 1 and Down 2 arrow keys. Press Enter 3 to select the parameter for editing. The Up arrow and Down arrow keys will adjust the settings. If a numeric value is

Section 4 OPERATION WITH REMOTE CONTROLLERS

to be entered, position to the character space with the Right and Left arrow keys. Adjust the value with the Up and Down keys. To save the changed value, push the Enter key.

Select the sequencing group, and adjust Sequence by. Select the REMOTE mode. This enables three digital inputs for Remote Start/Stop, Unload/Load and Master Control. These inputs are normally controlled by remote relay contacts or a PLC controller. The Supervisor may then be interfaced with custom sequencing panels, which provide signals for a 2-wire stop/start operation. The remaining adjustments in the sequencing group have no effect in REMOTE mode.

4.3 CONTROLS WIRING AND ADJUSTMENT - SUPERVISOR II DELUXE

There are three inputs and one output that are enabled in this mode:

Remote Start/Stop Input D10 J3-19
Remote Load/Unload Input D9 J3-18
Local/Master Input D8 J3-17
Local/Master Output K6 J1-14,15

Inputs D8, D9 and D10 are wired through customer furnished relay contacts to ground (Supervisor II Deluxe Common J3-20). If D10 is open the machine will stop, and be held stopped. If D10 is grounded the machine will be enabled to start. If remote start/stop is not needed then jumper D10 (J3-19) to GND (J3-20). The following table describes how the other inputs work when D10 connected to GND J3-20:

Local/MasterLoad/UnloadOperationOpenOpenNormal load and unloadOpenClosedForce unloadClosedOpenForce load, unload at P1 max - 3

Closed Closed Force unload

The Local/Master Output is on when the Local/Master Input is on and the machine is not in E-stop or Stop. If the Local/Master output is on the display will have two stars (**) in the mid-dle of the bottom line. The Local/Master Output is a relay contact that can handle 250VAC at 8 amperes. (J1-14 & J1-15)

To change parameters on the Supervisor II Deluxe, push the Program key until the top line of the display identifies the parameter to be changed. The Up arrow and Logo

keys will increment the parameter value; the Lamp Test will decrement. Push

the Program key played. The next parameter will then be displayed. From the main screen, press the program key 9 times and adjust SEQUENCE. Select the REMOTE sequencing mode. This enables three digital inputs for Remote Start/Stop, Unload/Load and Master Control. These inputs are normally controlled by remote relay contacts or a PLC controller. The Supervisor may then be interfaced with custom sequencing panels, which provide signals for a 2-wire stop/start operation.

Section 5 SEQUENCING TIMERS

5.1 RECOVERY TIME AND DELAYED START TIMER

The Recovery Timer is used to keep machines from starting, loading or unloading all at the same time. The Delayed Start timer is used to keep machines from starting unnecessarily due to temporary load changes. These timers and the Lowest Pressure Parameter are used to tune a system so that it is energy efficient but still responds to system demand changes.

Delaying loading and starting of machines will make the system more efficient, but must be balanced against system demands. For example delaying the start of a machine will be more energy efficient but could cause system pressure to drop below desired levels.

The Recovery Timer is used in conjunction with the load and unload parameters. There are also two calculated parameters derived from the load and unload settings. These are the Sequencing Unload and Sequencing Load pressures. The Sequencing Unload pressure is 2 psi below the unload setting. The Sequencing Load pressure is 2 psi above the load setting. For example, if the Unload Parameter is set to 110 and the Load Delta parameter is set to 10 then:

- 110 Unload pressure, all machines unload above this pressure
- 108 Sequencing unload pressure, trim machine unloads above this pressure
- 102 Sequencing load pressure, next machine in sequence loads below this pressure
- 100 Load pressure, all machines load below this pressure

If the system pressure goes above 110 (eg. 111) for any reason, all machines will unload immediately (regardless of recovery timer). If the system pressure goes below 100 (eg. 99) all running machines will load (regardless of recovery timer). The recovery timer only comes into play if the pressure is between 108-110 (for unloading), or 100-102 (for loading). The following examples will describe operation.

Note: The recovery timer is an accurate timer. However because of system delays caused by variables like filtering and communications, this may vary from 0 to 5 seconds. So for example if the recovery timer is set to 10 seconds, the actual delay may be from 10 to 15 seconds.

The Delayed Start Timer and the Lowest Pressure parameter are used to keep machines from starting unnecessarily due to temporary load changes. If system pressure drops below the Load Pressure setting, but is above the Lowest Pressure setting, then the Delayed Start Timer is used to time the start of the next machine in sequence. This timer starts at 120 seconds but will time out sooner if the pressure drops. The length of time is prorated over the difference between the Load Pressure setting and the Lowest Pressure setting. For example if the Load pressure is 100 and the Lowest Pressure is 70 then.

If System Pressure is above 100 and drops to (and stays at):

- 99, machine will start in about 2 minutes.
- 85. machine will start in about 1 minute.
- 70. machine will start in about 30 seconds.

Because of varying pressures and other delays these times are approximate. The following examples show how the Recovery and Delayed Start timers work.

Section 5 SEQUENCING TIMERS

5.1.1 EXAMPLE 1- UNLOAD OPERATION

Suppose there are three machines running and loaded, the recovery timer is set to 10 seconds and the unload pressure is set at 110 on all three machines. The sequence unload pressure will be 108

<u> Machine</u>	<u>Status</u>
1	Full Load
2	Full Load
3	Trim

If the pressure rises above the sequence unload pressure (108) the trim machine will unload and the next machine in sequence will trim

<u>Machine</u>	<u>Status</u>
1	Full Load
2	Trim
3	Unloaded

The new trim machine will wait for 10 seconds before unloading if the pressure stays at 109 or 110. If the pressure goes below 109 unloading will be unnecessary. If the pressure goes above 110 the machine will unload immediately (regardless of the recovery timer).

5.1.2 EXAMPLE 2- LOAD OPERATION

Suppose there are three machines running and with two unloaded and one in trim, the recovery timer is set to 10 seconds and the load pressure is set at 100 on all three machines. The sequencing load pressure will be 102.

<u>Machine</u>	<u>Status</u>	
1	Trim	
2	Unloaded	(Next machine in sequence)
3	Llinloaded	

If the pressure drops below the sequence load pressure (102) the next machine in sequence (2) will load and be the trim machine, and the previously trimming machine (1) will go to full load.

<u>Machine</u>	<u>Status</u>	
1	Full Load	
2	Trim	
3	Unloaded	(Next machine in sequence)

The next machine in sequence will wait for 10 seconds before loading if the pressure stays at 101 or 100. If the pressure goes above 101 loading will be unnecessary. If the pressure goes below 100 the machine will load immediately (regardless of the recovery timer).

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5.1.3 EXAMPLE 3- STARTING EXAMPLE (pressure drops below lowest pressure setting)

Machines will start when the system pressure drops below the Lowest Pressure setting, or when system pressure drops below the load setting for a period of time determined by the Delayed Start timer. The following example shows operation when the pressure drops below the Lowest Pressure setting. A later example will show how the Delayed Start timer works (ie. the pressure is below the Load setting but above the Lowest Pressure setting).

Suppose there are three machines where one is in trim, and two are stopped. The Lowest Pressure setting is 70 psi.

<u>Machine</u>	<u>Status</u>	
1	Trim	
2	Stopped	(Next machine in sequence)
3	Stopped	

If the system pressure drops below the lowest pressure setting (70) the next machine in sequence (2) will start and trim, the previously trimming machine (1) will go to full load.

<u>Machine</u>	<u>Status</u>	
1	Full Load	
2	Trim	
3	Stopped	(Next machine in sequence)

The next machine in sequence will wait for 10 seconds before starting if the pressure stays below 70. If the pressure goes above 70 the machine will start after the Delayed Start timer expires (explained later).

5.1.4 EXAMPLE 4— STARTING EXAMPLE (pressure between lowest and load pressure setting)

The Delayed Start timer comes into play only when the system pressure is below the Sequencing Load pressure setting but still above the Lowest Pressure setting. This timer value is prorated between the Sequence Load pressure and Lowest Pressure.

For example if the Load Pressure is 100 and the Lowest Pressure is 70 then:

If System Pressure is above 101 and drops to (and stays at):

99, machine will start in about 2 minutes

85 machine will start in about 1 minute.

70 machine will start in about 30 seconds.

Suppose there are three machines where one is in trim, and two are stopped. The Lowest Pressure setting is 70 psi.

<u>Machine</u>	<u>Status</u>	
1	Trim	
2	Stopped	(Next machine in sequence)

Section 5 SEQUENCING TIMERS

3 Stopped

If the system pressure drops below the Sequence Load pressure (102) but is above the Lowest Pressure (70), the next machine in sequence (2) will start and trim, and the previously trimming machine (1) will go to full load after the Delay Start timer expires. If the pressure is at 85 then the machine will start in about 1 minute (see previous table).

<u>Machine</u>	<u>Status</u>	
1	Full Load	
2	Trim	
3	Stopped	(Next machine in sequence)

If the system pressure stays below the Sequence Load pressure then the next machine in sequence (3) will start after the Delay Start timer expires If the pressure is at 85 then the machine will start in about 1 minute (see table above)

<u>Machine</u>	<u>Status</u>
1	Full Load
2	Full Load

Section 5 SEQUENCING TIMERS

5.2 SUMMARY

110	Unload pressure - All machines unload above this pressure regardless of Recovery timer.
108-110	Recovery timer active - Trim machine will unload after Recovery timer expires
108	Sequencing unload pressure - Trim machine unloads above this pressure, Recovery timer starts
102	Sequencing load pressure - Next machine in sequence loads below this pressure, Recovery timer starts.
100-102	Recovery timer active - Next machine in sequence loads after Recovery timer expires.
100	Load pressure - All machines load below this pressure, Start Delay timer starts.
70-99	Start Delay Timer active - Next machine in sequence starts after Start Delay timer expires.
70	Lowest Pressure - Next machine in sequence starts immediately regardless of Start Delay timer



NOTES

6.1 OVERVIEW

This document describes features that are more technical in nature than the normal operation of the machine, in particular sequencing and communication. This information may be used for the design of monitoring systems of controllers. Communications connections are included with all Supervisor II Deluxe controllers. A communications module is added to standard Supervisor controllers for any external communications. Most features are common to either controller, unless specifically noted below.

The communications link is a RS-485 (two wire) serial line. The following three parameters must be set correctly to be able to communicate through this link.

COM ID# Unique number for each machine on the link.

BAUDRATE Must be the same for all machines (default is 9600).

SEQUENCE Sequencing mode Refer to earlier sections for full descriptions of sequencing operation. The function of the link is specified by the setting of the Sequence parameter as follows:

<u>DISABLED. REMOTE</u> - Responds to status and parameter change queries

<u>HOURS, COM ID#</u> - Broadcasts net status message about once a second, responds to status and parameter change queries during monitor time slot. In this manner, each machine knows the status of every other machine. Sequencing decisions are made individually by each machine based on the status of all on line machines in the system. Collisions on the serial channel are avoided by a time slice scheme (See section on Time Slice)

6.2 ADVANTAGES OF BROADCAST MODE

- System operation is not dependent on a single master controller.
- Because there is no master, the number of messages are cut in half (decreasing response time). In master/slave mode the master must send a message to request status and the machine must send a message back. In broadcast mode, each machine sends it's status approximately once a second.
- When a machine goes off line or on line there is no need to poll for a new master. Individual machines may be taken off line or put on line with no effect on communications. This is handy for maintenance or when a machine is to be controlled manually. When the machine is stopped it still sends net status messages so other machines or a monitor can display it's status. When the machine is DISABLED it will not send net status messages but will respond to status and parameter change messages.
- Because decisions are made locally, the response of the system is very good; less than one second for trimming, loading and unloading. One second plus starting time for a machine to start.
- There are no extra communications for monitoring. Since each machine sends its status every second, the monitor does not need to send messages. However, the monitor may send messages to get other status, or change parameters.
- The monitor does not need to be continuously connected. A monitor may be con-

nected or disconnected at any time.

6.3 RS-485 SERIAL CHANNEL

The half-duplex RS-485 is a party line type channel, ie. any device on the channel may transmit or receive on the same wires. The transmitters and receivers are differential type that use two wires and a ground. These have very good noise immunity because the receiver measures the voltage between two signals, and not between a signal and ground (as RS-232 does). If noise occurs on both lines it will be rejected by the receiver. The ground is used to keep the receiver from floating too high above the transmitter. A one is transmitted as 5 volts on the + line and 0 volts on the - line. A zero is 0 volts on the + line and 5 volts on the - line. The transmitters are tri-state, meaning they can drive the transmission line to a one (5 volts), zero (0 volts) or be turned off (high impedance). All transmitters except one must be in tri-state mode, otherwise the transmission will be garbled and damage to the transmitters can occur.

6.4 TIME SLICING OF THE RS-485 SERIAL CHANNEL

When the sequencing mode is set to HOURS or COM ID# the machines will broadcast their status (net status message) about once a second. To keep machines from sending messages simultaneously, time is sliced into periods (up to 17 maximum), one for each machine and one for a monitor. A machine will only send a net status messages during it's time slice (see table below).

Time Slot	COM ID#	Time out
0	Monitor	5 sec
1	1	.125 sec
2	2	.125 sec
3	3	125 sec
4	4	125 sec
5	5	125 sec
6	6	125 sec
7.	7	125 sec
8	8	125 sec

The number of time slots is determined by the LAST COM parameter. If the LAST COM parameter is set to 4 then there will be 5 time slots (0 through 4). One for each machine and one for the monitor. The time slot for a monitor is longer because it may not be able to respond as quickly to a message as the Supervisors.

The Supervisors establish what the current time slot is by either receiving messages or timing out. Any net status message establishes the time slot because the senders COM ID# is embedded in the message. For example if a net message from machine 2 is received then time slot 2 has just finished and 3 is started.

If there is no message for a time out period (see table above) then it is assumed that the

machine assigned to that time slot is off line and the next time slot starts.

A machine sends a net status message immediately after a message is received from the next previous machine, or that machine's time slot has expired. For example if the time slot has been established as 2 and either machine 2 sends a net status message or no message is sent within 125 seconds, then machine 3 will send a net status message (if on line).

During time slot 0 a monitor may send a message, typically a status request or parameter change message. A message that is sent by the monitor may need a response from one of the machines. This response must come before the time out period (5 sec).

Consider the following system with 4 machines with no monitor and machine 3 is off line.

Time Slot	COM ID#	<u>Status</u>	<u>Action</u>
0	Monitor	Off line	5 sec time out
1	1	On line	Machine 1 net message
2	2	On line	Machine 2 net message
3	3	Off line	.125 sec time out
4	4	On line	Machine 4 net message

Let's start this example at time slot 1. Machine 1 sends a net message. Machine 2 receives the message and establishes the time slot as 2. Machine 2 immediately sends its net status message establishing the slot at 3. Since machine 3 is off line no message will be sent and after 125 sec. the time slot will rotate to 4. Machine 4 will send it's net status message, and the time slot will roll over to slot 0. Since there is no monitor, after 5 sec. the time slot will rotate to 1 and machine 1 will send it's net status message. This cycle will repeat until other machines go off or on line. When a machine is switched on line or powered up it does not know what the time slot is until it receives a net message from another machine. If only one machine is put on line, or multiple machines are powered up at the same time, none of them will know what the current time slot is. To overcome this deadlock the following scheme is used.

When a machine comes on line it waits for an initial timeout period of 1.5 seconds times its COM ID#. For example if it's COM ID# is 4 then it will wait 6 seconds. If a message is received during the initial timeout period then the time slot will be known because the sender's COM ID# is embedded in the message. For example if a net message from machine 2 is received then the time slot is 2.

If no messages are received within the initial timeout period then a net message is sent. It can be assumed that either there are no other machines on line or that they have been put on line at the same time and are waiting for their initial timeout to expire. This keeps several machines that are powered up at the same time from all sending net status messages simultaneously.

6.5 MESSAGE FORMAT

Messages are RS-485 half-duplex, 9600 baud, 8 bit, 1 step bit, no parity. Control characters are used to frame a message. These characters mark the start of the message and the end of the message. All messages have the following format:

STX - Start of text. Signifies the start of a message. (0x02)

- Two character com number

m - one character message type

d - data, one to several characters long. Multiple items are separated by commas.

- two character checksum, based on all characters after STX

CR - Carriage Return. CR-LF signifies end of a message. (0x13)

LF - Line Feed CR-LF signifies end of a message (0x10)

In the examples shown in the following section, STX, CR, and LF are not shown.

6.6 MESSAGE TYPES

Messages follow the forms listed below. Details of the data within the messages are listed in the DATATYPES. N & M messages are broadcast by controllers in a sequenced system. Remaining exchanges may be initiated by a monitor or master on non-sequenced systems, or during the time immediately following a monitor enable in a sequenced system.

MESSAGE TYPE

<u>FORMAT</u>

EXAMPLE

N - Net status broadcast

##N19,2,15,17,18xx

01N0,115,2000,M,C88

Controller's broadcast status in stand-alone sequencing.

Data fields are:

- 19 Capacity in cfm
- 2- P2 pressure in psig
- 15- Total run time in hours
- 17- Run Status (See DATA TYPES)
- 18- Mode (See DATA TYPES)

M - Monitor Enable broadcast ##Mxx

01M52

Controller's monitor enable in stand-alone sequencing.

Time follows for queries by a monitor.

I – Information Request

##Ixx

01156

Monitor's request for controller information. The controller responds with i message type.

i – Display Response ##i1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18xx Example: 01i104,95,41,78,110,127,101,83,186,3,2,0008,3C2,3C2,0,0,E,c26

The controller's response to a valid message type D request.

- 1- P1 pressure in psig
- 2- P2 pressure in psig

- 3- P3 pressure in psig
- 4- P4 pressure in psig
- 5- T1 temperature in deg F
- 6- T2 temperature in deg F
- 7- T3 temperature in deg F
- 8- T4 temperature in deg F
- 9- T5 temperature in deg F
- 10- eConnect ID number
- 11- Analog Shutdown
- 12- Digital Outputs
- 13- Digital Shutdown
- 14- Digital inputs
- 15- Total run time in hours
- 16- Total load time in hours
- 17- Run Status (See DATA TYPES)
- 18- Mode (See DATA TYPES)

Q - Quick Status Request

##Qxx

01Q4E

Monitor request for data from slave controllers. Slave responds with q message type

##q19,2,15,17,18xx 01q0,115,2000,M,C65 q – Quick Status Response

Controller's response of quick status Data fields are:

- 19- Capacity in cfm
- 2- P2 pressure in psig
- 15- Total run time in hours
- 17- Run Status (See DATA TYPES)
- 18- Mode (See DATA TYPES)

G - Get parameter Request

##G22,xx

01G3,58

Monitor's request to change a parameter. The controller responds with g message type

22- Parameter number (See DATA TYPES)

g – Get parameter Response ##g22,21xx

01g3,4A5

The controller's response to a valid message type G request

- 22- Parameter number (See DATA TYPES)
- 21- Value of the parameter (See DATA TYPES)

P – Put parameter Request ##P22,21,xx

01P3,4,90

Monitor's request to change a parameter. The controller responds with p message type.

- 22- Parameter number (See DATA TYPES)
- 21- Value of the parameter (See DATA TYPES)

p – Put parameter Response ##p22,21xx

01p3,49C

The controller's response to a valid message type P request.

- 22- Parameter number (See DATA TYPES)
- 21- Value of the parameter (See DATA TYPES 6 for details)

D – Display Request

##Dxx

01D5B

Monitor's request for controller's display. The controller responds with d message type.

d - Display Response

##d20,20xx

01d E-STOP, 95 110B7

The controller's response to a valid message type D request.

20- Display alphanumeric string (See DATA TYPES)

6.7 DATA TYPES

- 1- P1 pressure in psig, 1 to 3 digits
- 2- P2 pressure in psig, 1 to 3 digits
- 3- P3 pressure in psig, 1 to 3 digits
- 4- P4 pressure in psig, 1 to 3 digits
- 5- T1 temperature in deg F, 1 to 3 digits
- 6- T2 temperature in deg F, 1 to 3 digits
- 7- T3 temperature in deg F, 1 to 3 digits
- 8- T4 temperature in deg F, 1 to 3 digits
- 9- T5 temperature in deg F, 1 to 3 digits
- 10- eConnect ID number, 1 to 2 digits
- 11- Analog Shutdown
 - 1-4: P1-P4
 - 5-7: dP1-dP3
 - 8-13: T1-T6
- 12- Digital Outputs, 4 digit (bit0=K1, bit1=K2, etc)
- 13- Digital Shutdown, 3 digit (bit0=D1, bit1=D2, etc)
- 14- Digital inputs, 3 digit (bit0=D1, bit1=D2, etc)
- 15- Total run time in hours, 1 to 6 digits
- 16- Total load time in hours, 1 to 6 digits
- 17- Run Status, 1 character code:
 - E- E-Stop
 - M- Manual Stop
- m- Manual Stop & Common Fault
- R- Remote Stop
- r- Remote Stop & Common Fault b- Standby & Common Fault

B- Standby S- Starting

s- Starting & Common Fault

U- Unloaded

u- Unloaded & Common Fault

L- Loaded

!- Loaded & Common Fault

T- Trim

t- Trim & Common Fault

F- Full Load

f- Full Load & Common Fault

18- Mode, 1 character code

- A- Auto run mode, remote start/stop enabled
- a- Auto run mode, remote start/stop disabled
- C- Cont run mode, remote start/stop enabled
- c- Cont run mode, remote start/stop disabled
- 19- Capacity in cfm, 1 to 4 digits
- 20- The Supervisor II Deluxe sends two 8-character strings, corresponding to top & lower line of the keypad display: e.g. "01d E-STOP, 95 110B7"

The Supervisor sends two 20-character strings, which are from the queue of the first four scrolling messages on line 2 of the display. On successive queries, sends message A & B or message C & D; query twice to get all four messages.

- eg. "02dT1 Discharge High ,T2 Dry Side High 45"
- 21- Values for parameters may be from one digit to the length shown in the table below. Actual minimum and maximums are software- and model-dependent. Refer to the user's manual for further description.
- 22- Parameters are identified by parameter number over serial communications, shown in the table below. Parameters for Supervisor II Deluxe and Supervisor are as noted in second and third columns. Current software versions include the following:

Parameter	II	s	Description	Digits	Units
3	. *	*	Language	n	list
4	*		Units of measure	n	list
4	,	*	Temp units of measure	n	list
5	*	*	Unload Pressure	nnn	psi
6	×	*	Load Pressure delta	nn	isq
8	*	*	Unload Time	nn	min
9	*	*	Wye-Delta time	nn	sec
10	*	*	Drain Interval Time	nn	min
11	*	*	Drain Time	nn	sec
12	*	*	Restart time	nn	sec
17		*	Stop Timer	nn	sec
18		*	Sequence com number	nn	
19	*	*	eConnect ID	nn	
20 .	*	*	Seq number of machines	nn	
21	*	*	Sequence method	n	list
22	*	*	Sequence hours	nnnnnn	hour
23	*	*	Sequence lowest pressure	nnn	psi
24	*	*	Sequence recover time	nn	sec
25	*	*	Machine max capacity	nnnnn	cfm
26	*	*	Seq Rotate time	nnn	hour
30		*	Modulate Mine	n	y/n
31		*	Pressure units	n	list
32		*	VSD setpoint	nnn	psi
	*		T1 calibrate		psi
40 41	*		1	n n	
	*		T2 calibrate		
42	*		T3 calibrate	n n	
43	*	-	T4 calibrate	n	
44	*		T5 calibrate	n	· · · · · · · · · · · · · · · · · · ·
45		*	T6 calibrate	n n	
45	*	*	Pressure calibrate password	nnn	
46	*	*	P1 calibrate	n n	
47	*	*	P2 calibrate	n	
48	*	*	P3 calibrate	n -	
49			P4 calibrate	<u>n</u>	
50	*	*	dP1 calibrate	<u>n</u>	
51	~	*	P3 maximum	n	[
54		*	Maintenance warning	nnnn	hour
55			Maintenance filter	nnnnn	hour
56		*	Maintenance separator	nnnnn	hour
57		*	Maintenance air filter	nnnnn	<u>hour</u>
58		*	Maintenance oil	nnnnn	hour
59		*	Maintenance oil analysis	nnnnn	hour
70	*	*	Parameter protection	n	y/n
71	*	*	Shutdown on warning	n	y/n
80		*	Load cycles (read only)	nnnnnn	
81		*	Number of starts (read only)	nnnnnn	
98		*	Run hours (read only)	nnnnnn	hour
99		*	Load hours (read only)	nnnnnn	hour

NOTES

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