ROTARY SCREW AIR COMPRESSOR ES-11 SERIES

40 and 50 HP 30 and 37 KW





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NOTES

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 can result in accidents and injuries. Read this manual prior to startup.

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 regulations and all 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 regulations and any applicable Federal, State and Local codes, standards, and regulations relative to personal protective equipment, such as eye and face protective equipment, respiratory protective equipment, equipment intended to protect the extremities, protective clothing, protective shields and barriers and electrical protective equipment, as well as noise exposure administrative and/or engineering controls and/or personal hearing protective equipment.

1.3 PRESSURE RELEASE

A. Install an appropriate flow–limiting valve between the service air outlet and the shut–off (throttle) valve, either at the compressor or at any other point along the air line, when an air hose exceeding 1/2" (13mm) inside diameter is to be connected to the shut–off (throttle) valve, to reduce pressure in case of hose failure, per all applicable Federal, State and Local codes, standards and regulations.

B. When the hose is to be used to supply a manifold, install an additional appropriate flow-limiting valve between the manifold and each air hose exceeding 1/2" (13mm) inside diameter that is to be connected to the manifold to reduce pressure in case of hose failure.

C. Provide an appropriate flow–limiting valve at the beginning of each additional 75 feet (23m) of hose in runs of air hose exceeding 1/2" (13mm) inside diameter to reduce pressure in case of hose failure.

D. Flow-limiting valves are listed by pipe size and rated CFM. 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 devices 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 sump (receiver) to zero internal pressure before removing the cap.

H. Vent all internal pressure prior to opening any line, fitting, hose, valve, drain plug, connection or other component, such as filters and line oilers, and before attempting to refill optional air line anti-icer systems with antifreeze compound.

I. Keep personnel out of line with and away from the discharge opening of hoses or tools or other points of compressed air discharge.

J. Use air at pressures less than 30 psig (2.1 bar) for cleaning purposes, and then only with effective chip guarding and personal protective equipment.

K. DO NOT engage in horseplay with air hoses as death or serious injury may result.

L. DO NOT tamper with sump and unit (if provided) relief valves. Check the relief valve as recommended in the Maintenance Section of this manual or at a minimum of at least weekly to make sure it is not blocked, clogged, obstructed or otherwise disabled. DO NOT change the factory setting of the relief valve.

M. If the compressor is installed in an enclosed area, it is necessary to vent the relief valve to the outside of the structure or to an area of non-exposure.

1.4 FIRE AND EXPLOSION

AWARNING

When installing a Base Load Transfer (BLT) System, remove jumpers between 16-17 & 18-19 (Dual Control Compressors) so the other compressor does not backfeed defeating the shutdown circuitry.

A. Clean up spills of lubricant or other combustible substances immediately, if such spills occur.

B. Shut off the compressor and allow it to cool. Then keep sparks, flames and other sources of ignition away and **DO NOT** permit smoking in the vicinity when checking or adding lubricant or when refilling air line anti-icer systems with antifreeze compound.

C. DO NOT permit fluids, including air line anti-icer system antifreeze compound or fluid film to accumulate on, under, or around acoustical material, or on any external surfaces of the air compressor or on internal surfaces of the enclosure. 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 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 parts.

B. DO NOT attempt to operate the compressor with the fan, coupling or other guards removed.

C. Wear snug-fitting clothing and confine long hair when working around this compressor, especially when exposed to hot or moving parts.

D. Keep access doors, if any, closed except when making repairs or adjustments.

E. Make sure all personnel are out of and/or clear of the compressor prior to attempting to start or operate it.

F. Disconnect and lock out all power at source and verify at the compressor that all circuits are 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.

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 any Federal, State or Local Codes or regulations.



Death or serious injury can result from inhaling compressed air without using proper 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 in 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 the compressor operator's manual lubrication section for information pertaining to compressor fluid 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 15 minutes. A physician, preferably an eye specialist, should be contacted immediately.

H. DO NOT store air line anti-icer system antifreeze compound in confined areas.

I. The antifreeze compound used in air line antifreeze systems contains methanol and is toxic, harmful, or fatal if swallowed. Avoid contact with the skin or eyes and avoid breathing the fumes. If swallowed, induce vomiting by administering a tablespoon of salt, in each glass of clean, warm water until vomit is clear, then administer two teaspoons of baking soda in a glass of clean water. Have patient lay down and cover eyes to exclude light. Call a physician immediately.

1.8 ELECTRICAL SHOCK

A. This compressor should be installed and maintained in full compliance with all applicable Federal, State and Local codes, standards and regulations, including those of the National Electrical Code, and also including those relative to equipment grounding conductors, and only by personnel that are trained, qualified and delegated to do so.

B. Keep all parts of the body and any hand-held tools or other conductive objects away from exposed live parts of electrical system. Maintain dry footing, stand on insulating surfaces and **DO NOT** contact any other portion of the compressor when making adjustments or repairs to exposed live parts of the electrical system. Make all such adjustments or repairs with one hand only, so as to minimize the possibility of creating a current path through the heart.

C. Attempt repairs in clean, dry and well lighted and ventilated areas only.

D. DO NOT leave the compressor unattended with open electrical enclosures. If necessary to do so, then disconnect, lock out and tag all power at source so others will not inadvertently restore power.

E. Disconnect, lock out, and tag all power at source prior to attempting repairs or adjustments to rotating machinery and prior to handling any ungrounded conductors.

F. Dry test all shutdown circuits prior to starting the compressor after installation.

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 Federal, State and Local codes.

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.

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

J. Set compressor down only on a level surface capable of safely supporting at least its weight and its loading unit.

K. When moving compressors by forklift truck, utilize fork pockets if provided. Otherwise, utilize pallet if provided. If neither fork pockets or pallet are provided, then make sure compressor is secure and well balanced on forks before attempting to raise or transport it any significant distance.

L. Make sure forklift truck forks are fully engaged and tipped back prior to lifting or transporting the compressor.

M. Forklift no higher than necessary to clear obstacles at floor level and transport and corner at minimum practical speeds.

N. Make sure pallet-mounted compressors are firmly bolted or otherwise secured to the pallet prior to attempting to forklift or transport them. **NEVER** attempt to forklift a compressor that is not secured to its pallet, as uneven floors or sudden stops may cause the compressor to tumble off, possibly causing serious injury or property damage in the process.

O. DO NOT use the lifting eye bolt on the compressor motor, if supplied, to lift the entire compressor package.

1.10 ENTRAPMENT

A. If the compressor enclosure is large enough to hold a person and if it is necessary to enter it to perform service adjustments, inform other personnel

before doing so, or else secure and tag the access door in the open position to avoid the possibility of others closing and possibly latching the door with personnel inside.

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

Section 2 INSTALLATION

2.1 LOCATION OF COMPRESSOR

The ES-11 Series compressor package may be placed on any level surface capable of supporting its weight and rigid enough to maintain a level compressor frame. The compressor frame must be leveled and secured with foundation bolts, and full uniform contact must be maintained between the frame and foundation. No piping loads shall be transmitted to the compressor at the external connections.

2.2 VENTILATION AND COOLING

Select a location to permit sufficient unobstructed air flow in and out of the compressor to keep the operating temperature stable. The minimum distance that the machine should be from surrounding walls and ceiling is what is needed for service and three (3) feet (914mm) or more from the compressor fluid cooler.

For water-cooled compressors, it is necessary to check the cooling water supply. The proper water flow should be as shown in Table 1 in this section.

TABLE 1 - WATER FLOW REQUIREMENTS

	GPM (LPM) @ 70°F(21°C)	GPM (LPM) @ 80°F(27°C)
40 hp (30kW)	5.3 (20)	7 (26)
50 hp (37kW)	5.3 (20)	9.3 (35)

Table 2 indicates the ventilation requirements necessary to keep the compressor running at a normal operating temperature. The fan air requirement is the volume of air which must flow through the compressor for proper ventilation. The specified 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. It is possible to use this heat for space heating, providing no additional pressure drop is created across the fan. Consult a Sullair office for assistance in utilizing this heat.

DO NOT install a water-cooled or an air-cooled/aftercooled compressor where it will be exposed to temperature less than $32^{\circ}F(0^{\circ}C)$



Be certain the watercooler drain plugs are in place prior to start-up.

2.3 SERVICE AIR PIPING

Service air piping should be installed as shown in Figure 2-1. A shut-off valve should be installed to isolate the compressor from the service line. Also notice that the service line should be equipped with water legs and condensate drains throughout the system.

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 32 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.

2.4 FLUID LEVEL CHECK

A fluid sight glass on the sump housing serves as a level indicator. During operation, the level should not exceed 1/4 to 1/2 of the sight glass. With the compressor shut down the level will rise to the bottom of the fluid fill plug located above the sight glass.

2.5 ELECTRICAL PREPARATION- STANDARD ELECTRO/MECHANICAL

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



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

A few electrical checks should be made to help assure that the first start-up will be trouble-free.

A WARNING

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

1. Check incoming voltage. Be sure that compressor is wired for the correct incoming voltage.

TABLE 2- VENTILATION REQUIREMENTS

Compressor Cooling Type	Air-cooled with Aftercool Water-cooled	
Motor hp (kW)	40hp (30kW) 50hp (37kW)	40hp (30kW) 50hp (37kW)
Heat Rejection BTU/hr (kcal/hr)	120,000 (30,240)149,000 (37,550)	11202 (2822) 14000 (3530)

Section 2 INSTALLATION

- 2. Check starter for correct size, proper overload relay, and heaters.
- 3. 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 turning the "O/I" STOP/START switch to "I" START and check all protective devices to be sure that they will de-energize the starter coil when tripped.
- Reconnect the motor leads and jog the motor for a direction of rotation check as explained in Section 2.7.



Wiring diagram for standard compressors is supplied on the inside cover of the Control Center. Optional compressor wiring diagrams will vary.

2.6 ELECTRICAL PREPARATION- SUPERVISOR II

Interior electrical wiring is performed at the factory. Customer wiring is minimal, but 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.

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

- Check incoming electrical power. Be sure that the incoming voltage matches the compressor voltage.
- 2. Check starter and overload heater sizes.
- 3. Check all electrical connections for tightness.
- "DRY RUN" the electrical controls by disconnecting the three (3) motor leads from the starter. Energize the control circuits by pushing the "I" (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 Section 2.8.

2.7 MOTOR ROTATION DIRECTION CHECK- STAN-DARD ELECTRO/MECHANICAL

NOTE

Motor rotation check must be made at compressor start-up. Remove rear compressor grill panel to view motor rotation.

After the electrical wiring has been completed, it is necessary to check the direction of the motor rota-

tion. This can be done by toggling the "I" (START) and "O" (STOP) positions of the rotary switch on the control box door. When looking at the motor from the end opposite the compressor unit, the shaft should be turning clockwise. If the motor shaft is not turning clockwise, 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 to show proper motor/compressor rotation.

An electrical check should be made to help assure that the first start-up will be trouble free.

An alternative to this procedure is to monitor the sump pressure gauge when toggling the "I" (START) switch. If immediate pressure is shown on the sump pressure gauge when the compressor is started, then, the proper motor rotation has been achieved. If no pressure is indicated, turn switch to the "O" (STOP) position immediately. This indicates improper motor rotation. Disconnect the power to the starter and exchange any two of the three power input leads. Recheck rotation as outlined above.

2.8 MOTOR ROTATION DIRECTION CHECK- SU-PERVISOR II

NOTE

Motor rotation check must be made at compressor start-up. Remove rear compressor grill panel to view motor rotation.

After the electrical wiring has been completed, it is necessary to check the direction of the motor rotation.

Pull out the **EMERGENCY STOP** button-reset and press once, quickly and in succession, the "I" **(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 to show proper motor/compressor rotation.

An alternative to this procedure is to set the Supervisor to display P1. Pull out the **EMERGENCY STOP** button and press once, quickly and in succession, the "**I**" (**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.

Section 2 INSTALLATION

Figure 2-1 Service Air Piping



*REQUIRED ONLY WHEN COMPRESSOR IS INSTALLED WITH AN AIR DRYER. **REQUIRED FOR COMPRESSOR INSTALLATION WITHOUT AN AIR DRYER.

NOTES

Section 3 SPECIFICATIONS

3.1 SPECIFICATIONS-ES-11

50 Hz	KW	M ³ /MIN	BAR	LENGTH (MM)	WIDTH (MM)	HEIGHT (MM)	WEIGHT (I) (KG)	dBA (II) AIRCOOLED
40L	30	5.3	7	1524	838	1645	841	76
40HH	30	4.1	10	1524	838	1645	841	76
40XH	30	3.1	12	1524	838	1645	841	76
50L	37	6.3	7	1524	838	1645	841	76
50HH	37	5.2	10	1524	838	1645	841	76
50XH	37	4.0	12	1524	838	1645	841	76
60 Hz MODEL	НР	ACFM	PSIG	LENGTH (IN)	WIDTH (IN)	HEIGHT (IN)	WEIGHT (I) (LB)	dBA (II)
 40I	 13		100	60	 33	64 75		76
40L 40H	43	163	125	60	33	64.75	1850	76
40HH	43	145	150	60	33	64 75	1850	76
40XH	42	120	175	60	33	64.75	1850	76
50L	54	231	100	60	33	64.75	1850	76
50H	55	210	125	60	33	64.75	1850	76
50HH	54	183	150	60	33	64.75	1850	76
50XH	53	155	175	60	33	64.75	1850	76

(I) Weights are approximate due to options available.(II) Ratings for dBA at one meter.

COMPRESSOR

Type:Single Stage Fluid Injected Screw CompressorMinimum Full Load Operating Pressure:60 psig (4.2 bar)Maximum Full Load Operating Pressure:Nameplate Pressure (I)Bearing Type:Anti-frictionCooling:Pressurized FluidLubricant:See Lubricant SpecificationSump Capacity:3 gallons (11.4 liters)

(I) Compressors are available for full load pressures up to 175 psig (12 bar) & unload pressure 185 psig (12.8 bar).

MOTOR	60Hz	50Hz
Type: Synchronous Speed:	ODP, C-Flange 40 HP-1800 RPM 50 HP-1800 RPM	ODP, C-Flange 30kW-1500 RPM 37kW-1500 RPM
Voltage:		
Standard All Sizes: Optional All Sizes: Optional All Sizes: Optional Only:	230/460 200 575	380/415 220
Type:		
Insulation Class:	F	F
Maximum Ambient Temp.:	40°C (104°F)	40°C (104°F)

Section 3 SPECIFICATIONS

FLUID FILTER

Type: Micron: Internal Bypass Valve Set at 25 psig (1.7 bar)

FLUID SEPARATOR ELEMENT

Type: Efficiency at Maximum Capacity:

3.2 LUBRICATION GUIDE

For best value and longest uninterrupted service, the ES-11 compressor is factory filled and tested with a long life lubricant.

If, due to availability or other reasons, other fluids are required, follow Lubrication Guide below.

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." (Ĭ)

Sullube 32 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.

Spin on, Sullair Proprietary 23 Microns Abs.

Push In Cartridge, Sullair Proprietary 4PPM Maximum

> For light-duty high-humidity service where condensed moisture and emulsification (mayonnaise) may occur, the fluid change interval must be reduced to 300 hours maximum. A non-detergent fluid with rust, oxidation and foam inhibitors and good water separation characteristics should be used.

> DO NOT MIX DIFFERENT TYPES OF FLUIDS. Contamination of non-detergent mineral fluids with traces of detergent motor fluids may lead to operational problems such as foaming, filter plugging, orifice or line plugging.



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.

Sullair encourages the user to participate in a fluid analysis program. This could result in a fluid change interval that is different from those stated in this manual.

3.3 LUBRICANT CHANGE RECOMMENDATIONS AND MAINTENANCE

LUBRICANT Sullube 32 Sullair LLL-4-32 SRF 1/4000 24KT CP-4600-32-F	FLUID CHANGE A , E A , E B , E F , E B , E	FLUID FILTER CHANGE A , C A , C B , C B , C A , C B , C	SEPARATOR CHANGE A , D A , D B , D A , D B , D B , D	
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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 (.7 bar)

- When required by fluid analysis or known contamination Е

F - Does not require replacement during normal service conditions

4.1 INTRODUCTION

Your new Sullair flood-lubricated rotary screw air compressor will provide you with improved reliability and greatly reduced maintenance.

Compared with 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 Section 7 (Maintenance) to keep your compressor in top operating condition. Should any questions arise which cannot be answered in the following text, call your nearest Sullair office or the Sullair Corporation Service Department.

4.2 DESCRIPTION OF COMPONENTS

Refer to Figures 4–1A and 4-1B. The components and assemblies of the ES–11 Series air compressor are clearly shown. The complete compressor consists of an integrated compressor system, inlet system, discharge system, cooling and lubrication system, control system instrumentation and optional Supervisor II control system.

The compact design of the ES-11 Series air compressor provides easy access to all serviceable components.

4.3 INTEGRATED COMPRESSOR SYSTEM, FUNC-TIONAL DESCRIPTION

Refer to Figure 4–2. The integrated compressor includes **compressor unit**, **cooling and lubrication system**, and **drive motor**. The Sullair compressor unit is a single-stage positive displacement lubricated type compressor. This unit is equipped with tapered roller bearings on the discharge and cylindrical roller bearings on the inlet end for high load carrying capacity. This unit provides continuous pulse-free air compression to meet your needs. With a Sullair compressor there will be no maintenance or internal inspection of the compressor.

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

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

The air/fluid mixture discharges directly into the fluid management system.

The fluid cooler bypass valve helps assure proper cooling by directing the fluid to the fluid cooler when discharge temperature reaches the thermostat temperature setting.

During start-up in cool ambient conditions, the cooler pressure drop may cause the filter bypass valve to open up, assuring adequate fluid supply to the compressor.

All fluid entering the compressor unit passes through the replaceable fluid filter element. This replaceable filter element contains a built-in bypass valve. Under conditions of restricted flow through the element, the bypass valve helps ensure adequate compressor fluid flow, as well as helps prevent element failure.

4.4 COMPRESSOR COOLING AND LUBRICATION SYSTEM, FUNCTIONAL DESCRIPTION

Refer to Figures 4–1A, 4–1B and 4–2. The cooling and lubrication system consists of a fan, radiatortype cooler, main line filter, cooler bypass valve, inlet filter and interconnecting piping and tubing.

The fluid flows from the receiver/sump to the thermal valve. The standard thermal valve has a nominal temperature of $185^{\circ}E$ ($85^{\circ}C$), $195^{\circ}E$ ($91^{\circ}C$) for 175 psig (12 bar) compressors. At low temperatures, the fluid passes through the thermal valve, the filter and directly to the compressor unit.

As the discharge temperature rises above 185°F (85°C) for standard compressors, 195°F (91°C) for 175 psig (12 bar) compressors, 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 to the filter, and on to the compressor unit.

For the water-cooled models, a shell and tube heat exchanger and water-flow regulating valve are substituted for the radiator-type cooler and cooler bypass valve listed above.

4.5 AIR INLET SYSTEM, FUNCTIONAL DE-SCRIPTION

The compressor inlet system consists of a dry-type air filter and an air control valve. Reacting on a pressure signal, the valve closes the intake for unloaded operation. The valve also acts as a check valve upon shutdown.

4.6 CONTROL SYSTEM, FUNCTIONAL DE-SCRIPTION- STANDARD ELECTRO/MECHANI-CAL

Refer to Figure 4–3. The purpose of the compressor control system is to regulate the compressor air intake to match the amount of compressed air being used. At approximately 10 psig (.7 bar) air line over pressure, the control system will automatically blow down the compressor and greatly reduce the unload power consumption. The control system consists of

Figure 4-1A Description of Components



Figure 4-1B Description of Components



Figure 4-2 Integrated Compressor System



an inlet valve, (located on the compressor air inlet), blowdown valve, solenoid valve, pressure switch, and a pressure regulator. The functional descriptions of the control system are given below in four distinct phases of compressor operation. The fol-lowing guidelines apply to all STANDARD ES-11 Series compressors. For explanatory purposes this description will apply to a compressor with an operating pressure range of 125 to 135 psig (8.6 to 9.3 bar). A compressor with any other pressure range would operate in the same manner excepting stated pressures.

START - 0 TO 50 PSIG (0 TO 3.4 BAR) When the compressor "I" (START) switch position is engaged momentarily and released, the sump pressure will quickly rise from 0 to 50 psig (0 to 3.4 bar). During this period both the pressure regulator and the solenoid valve are closed, the inlet valve is fully open due to inlet air flow, 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).

NORMAL OPERATING MODE - 50 TO 125 PSIG (3.4 TO 8.6 BAR)

When the pressure air rises above 50 psig (3.4 bar),

the minimum pressure/check valve opens and delivers compressed air to the service line. From this point on, the line air pressure is continually monitored by a line pressure gauge and a pressure switch usually set at 125 psig (8.6 bar). The pressure regulator and the solenoid valve remain closed during this phase. The inlet valve remains fully open for maximum capacity.

MODULATING MODE - 125 TO 135 PSIG (8.6 TO 9.3 BAR)

If less than the rated capacity of compressed air is being used, the service line pressure will rise above 125 psig (8.6 bar). The pressure regulator valve gradually opens, applying air pressure through the control line to the inlet valve piston. This causes the inlet valve to partially close reducing the amount of 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 125 to 135 psig (8.6 to 9.3 bar), in response to varying demands from the service line.

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 lines.

UNLOAD - IN EXCESS OF 135 PSIG (9.3 BAR) LINE PRESSURE

When no air is being used, the service line pressure rises to the setting (cut-out pressure) of the pressure switch. the pressure switch opens, interrupting the electrical power to the solenoid valve. At this time, the solenoid valve allows dry sump tank air pressure to be applied directly to the inlet valve piston and keep it closed. Simultaneously, the solenoid valve sends a pneumatic signal to the blowdown valve. The blowdown valve relieves air pressure to the compressor reducing the sump pressure to approximately 20 to 30 psig (1.4 to 2.1 bar). The check valve in the air service line pressure prevents line pressure from returning to the sump.

When the line pressure drops to the low setting (cutin pressure) of the pressure switch (usually 125 psig [8.6 bar]), the pressure switch closes, re-energizing the solenoid valve and allowing the blowdown valve to close. The re-energized solenoid valve again prevents pressure from reaching the inlet valve. The inlet valve is fully open and the compressor delivers full rated capacity. Should the pressure begin to rise, the pressure regulator will resume its normal function as previously described.

4.7 CONTROL SYSTEM, FUNCTIONAL DE-SCRIPTION- SUPERVISOR II

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 4 distinct phases of operation. The following description text applies to all Series ES-11 compressors with optional Supervisor II. 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 "I" (START) pad is depressed, the sump pressure will quickly rise from 0 to 50 psig (0 – 3.5 bar). 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 (3.5 bar).

FULL LOAD MODE - 50 TO 100 PSIG (3.5 TO 6.9 BAR)

When the compressed air pressure rises above 50 psig (3.5 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 Supervisor. 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 pressure regulator has an orifice which vents a small amount of air to the atmosphere when the pressure regulator controls the inlet control valve. The orifice also bleeds any accumulated moisture from the pressure regulator.

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 Supervisor Control System de-energizes the solenoid valve allowing sump 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 relieves air pressure to the compressor inlet reducing the sump pressure to approximately 20 to 30 psig (1.4 to 2.1 bar). The check valve in the air service line prevents line pressure from returning to the sump.

When the line pressure drops to the low setting (cutin pressure; usually 100 psig [6.9 bar] on low pressure ["L"] compressors and 125 psig [8.6 bar] on high pressure ["H"] compressors, 150 psig [10. bar] on ["HH"] compressors), Supervisor energizes the solenoid valve and allows the blowdown valve to close. The re-energized 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.

AUTOMATIC OPERATION

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

PACKAGE DISCHARGE PORT PRESSURE SWITCH TO PRESSURE BLOWDOWN VALVE **STANDARD** GAUGE ORIFICE ORIFICE SHUTTLE VALVE Q3 Ì PRESSURE REGULATOR CHÈCK VALVE 0 VALVE Ø STRAINER SHAFT SEAL SOLENOID DRAIN VALVE PACKAGE DISCHARGE PORT P3, FLUID PRESSURE BLOWDOWN VAĻVE SUPERVISOR II STRAINER ORIFICE ORIFICE P2, PACKAGE SHUTTLE DISCHARGE VALVE PRESSURE P1, COMPRESSOR UNIT DISCHARGE PRESSURE FLUID FILTER SWITCH 10 CHÈCK VALVE Ø 3-WAY PRESSURE SOLENOID REGULATOR SHAFT SEAL VALVE VALVE DRAIN

Figure 4-3 Pneumatic Control System- Standard & Supervisor II

5.1 GENERAL INTRODUCTION- STANDARD ELEC-TRO/MECHANICAL

Refer to Figure 5-1. The instrumentation for the ES-11 Series air compressors consists of a panel group which continually monitors the operating condition of the compressor. The standard panel group has the following gauges: A **discharge temperature gauge**, a **line pressure gauge** and an **hourmeter**. The optional panel includes the standard gauges plus a **fluid filter gauge**, a **separator maintenance gauge**.

- •The **line(terminal) pressure gauge** is connected to the package discharge port, downstream from the moisture separator/ trap. It continually monitors the air pressure.
- •The **discharge temperature gauge** monitors the temperature of the air/fluid mixture discharged from the compressor unit. The normal reading should be approximately 185°F (85°C) with 70°F (21°C) ambient.
- •The **hourmeter** records the cumulative hours of operation for the compressor. It is useful for planning and logging service operations. The hourmeter is located in the door of the control box.
- •The **air filter restriction indicator** monitors the condition of the air filter and shows red when the element restriction is excessive, which is manually reset after the element has been changed.
- •The **separator maintenance gauge** monitors the condition of the separator element. It indicates when the element restriction is excessive.
- •The **fluid filter maintenance gauge** monitors the condtion of the fluid filter element. It indicates when the element should be

5.2 PURPOSE OF CONTROLS - STANDARD

Figure 5-1 Instrument Panel Group (OPTIONAL)



changed.

•The **sump pressure gauge** is used to determine at start-up whether proper electrical connections were made for motor rotation. An immediate pressure reading indicates proper rotation of the compressor unit. It can also be used to verify a pressure drop in the system.

While Sullair has built into this compressor a comprehensive array of controls and indicators to assure you that it is operating properly, you will want to recognize and interpret the reading which will call for service or indicate the beginning of a malfunction. Before starting your Sullair compressor, read this section thoroughly and familiarize yourself with the controls and indicators – their purpose, location and use.

CONTROL OR INDICATOR	PURPOSE
START/RUN/STOP	START/RUN – Turn switch momentarily to "I" START position to start the compressor, upon release the switch will return to the RUN position.
	STOP – Turn switch to "O" STOP position to stop compressor.
HOURMETER	Records cumulative hours of compressor operation; useful for planning and logging service schedules.

Section 5 COMPRESSOR OPERATION

5.2 PURPOSE OF CONTROLS - STANDARD (CONTINUED)

CONTROL OR INDICATOR	PURPOSE
LINE PRESSURE GAUGE	Continually monitors service line air pressure.
DISCHARGE TEMPERATURE GAUGE	Monitors temperature of the air/fluid mixture dis- charged from the compressor unit. For air-cooled compressors normal reading is approximately 185°F (85°C) with a 70°F (21°C) ambient temperature.
FLUID FILTER MAINTENANCE GAUGE	Indicates when a filter element change is required.
FLUID SEPARATOR MAINTENANCE GAUGE	Indicates when separator element change is required.
AIR FILTER MAINTENANCE INDICATOR	Shows red when air filter element servicing is required. This indicator must be manually reset after servicing filter.
PRESSURE REGULATOR	Opens a pressure line between the sump and air inlet valve allowing the inlet valve to regulate air delivery ac- cording to demand.
FLUID LEVEL SIGHT GLASS	Indicates fluid level in the sump. Proper level is not to fall below the center of the sight glass. Check level when compressor is shut down. DO NOT OVERFILL.
COOLER BYPASS VALVE	Regulates flow of fluid to and around the cooler. Designed to maintain a minimum operating temperature of 185°F (85°C); used for fast warm-up on start-up.
MINIMUM PRESSURE/CHECK VALVE	Maintains minimum of 50 psig (3.4 bar) in the compres- sor sump. Valve piston restricts receiver air discharge from receiver/sump when pressure falls to 50 psig (3.4 bar). Also incorporated in this valve is a terminal check valve which prevents line pressure backflow into the sump during unload conditions and after shutdown.
DISCHARGE TEMPERATURE SWITCH	Shuts the compressor down when the discharge tem- perature exceeds 240°F (116°C).
PRESSURE RELIEF VALVE	Protects compressor by venting compressed air in excess of 200 psig (13.8 bar) to atmosphere.
MODULATING INLET VALVE	Regulates the amount of air allowed to enter the air compressor. This regulation is determined by the amount of air being used at the service line. Also acts as a check valve to prevent reverse compressor rota- tion at shut down.
SOLENOID VALVE	Bypasses the pressure regulator valve causing the in- let valve to close when the compressor reaches maxi- mum operating pressure. Also activates blowdown valve.
WATER REGULATING VALVE (water-cooled only)	Regulates the amount of cooling water used in the cooler to keep the the compressor running at a normal operating temperature of 185°F (85°C).
SUMP PRESSURE GAUGE	The sump pressure gauge is used to determine at start- up whether proper electrical connections were made for motor rotation. An immediate pressure reading indicates proper rotation of the compressor unit. It can also be used to verify a pressure drop in the system.

5.2 PURPOSE OF CONTROLS - STANDARD (CONTINUED)

	PURPOSE
PRESSURE SWITCH	Senses service line pressure. When line pressure reaches maximum setting the pressure switch signals the solenoid valve to unload the compressor.
BLOWDOWN VALVE	Vents sump pressure to the compressor inlet during unload conditions and shutdown.

5.3 INITIAL START-UP PROCEDURE

The following procedure should be used to make the initial start-up of the compressor:

- 1. Read the preceding pages of this manual thoroughly.
- 2. Jog motor to check for correct rotation of motor.
- 3. Be sure that all preparations and checks described in the Installation section have been made.
- 4. Crack open the shut off valve to the service line.
- Start the compressor by turning the START/RUN/ STOP selector switch to the "I" (START) position momentarily and release...
- 6. Check for possible leaks in piping.
- 7. Slowly close the shut-off valve and check that the setting on the pressure switch is set correctly. If set correctly, the compressor will unload at the desired unload pressure. If adjustments are necessary, see Control System Adjustments in the Maintenance Section of the manual.
- 8. Observe the operating temperature. If the operating temperature exceeds 200°F (93°C), the cooling system or installation environment should be checked.
- 9. Observe maintenance indicators.
- 10. Open shut-off valve to service line.
- 11. Re-inspect the compressor for temperature and leaks the following day.

5.4 SUBSEQUENT START-UP PROCEDURE

On subsequent start-ups, check that the proper level is visible in the fluid sight glass and turn the START/RUN/STOP selector switch to the "I" START position momentarily and release. When the compressor is running, observe the instrument panel and maintenance indicators.

5.5 SHUTDOWN PROCEDURE

To shut the compressor down, simply turn the selector switch to the "O" STOP position.

5.6 GENERAL INTRODUCTION- SUPERVISOR II Reference Supervisor II Section 6. While Sullair has built into this compressor a comprehensive array of controls and indicators to assure you that it is operating properly, you will want to recognize and interpret the reading which will call for service or indicate the beginning of a malfunction. Before starting your Sullair compressor, read this section thoroughly and familiarize yourself with the controls and indicators – their purpose, location and use.

5.7 SUPERVISOR II 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 order:

• **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).



• 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 psi (.7 bar), the machine will load when the line pressure goes below 100 psi (6.9 bar).



• **P1 Max** – Maximum sump pressure. An alarm and shut down will occur when the sump pressure rises above this pressure.



• Wye to delta transition timer – For full voltage starters this parameter is set to 0.



• **Restart time** – Time to wait after power up 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 automatical-

Section 5 COMPRESSOR OPERATION

ly start after power up.



• Unload Stop Timer – If the machine is running in AUTO mode, this parameter specifies the amount of time that the machine will run unloaded before shutting off. If the time is set less than 15 minutes (for example five minutes), there may be times when the machine will run unloaded for more than five minutes. This is because there is another timer that keeps the machine from being started more than four times an hour.



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



• Units – English or metric units may be selected.



• **Communications ID #** – This is the network address of a machine. If there is more than one machine connected to the network, each machine must have a unique number.



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



• Sequence method – This parameter sets the method used for optional sequencing. The choices are DISABLED, REMOTE, SLAVE, HOURS, COM ID#. See the Sequencing & Protocol Manual (See Recommended Spare Parts List) for details about these modes.



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



• **Drain time** – The amount of time that the drain valve is actuated.



• Last Communication Number – Used only for sequencing, see Sequencing & Protocol Manual for details.



• Lowest Allowable Pressure – Used only for sequencing, see Sequencing & Protocol Manual for details.



• **Recovery Time** – Used only for sequencing, see Sequencing & Protocol Manual for details.



• Rotate Time – Used only for sequencing – units in HOURS, see Sequencing & Protocol Manual for details.



• Machine Capacity – Used only for sequencing – units in CFM (M3/min), see Sequencing & Protocol Manual for details.



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



5.8 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 " $^{\textcircled{O}}$ " will switch operation to automatic. Pressing " $^{\textcircled{O}}$ " 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 (See Recommended Spare Parts List).

- **DISABLED** Responds to status and parameter change messages via the RS485 network but will not respond to start, stop, load or unload messages.
- **REMOTE** Responds to status and parameter change messages but will not respond to start, stop, load or unload messages. The remote inputs and are enabled (start/stop, load/unload, master/local).
- SLAVE Will respond to all messages, but will not start or load unless commanded 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.
- **COM ID #** Sends status message about once a second; starts, loads and unloads machines based on machine Com ID#.

CONTROL OR INDICATOR	PURPOSE
EMERGENCY STOP SWITCH	Pushing in this switch, found adjacent to the Supervi- sor, cuts all AC outputs from the latter and de-ener- gizes the starter. A fault message (E STOP) is dis- played by the Supervisor until the button is pulled out and the " O " pad is depressed.
DISCHARGE TEMPERATURE PROBE-T1	Shuts the compressor down when the compressor dis- charge temperature exceeds 240°F (116°C). Continu- ally monitors air/fluid mixture discharged from the compressor unit.

5.9 PURPOSE OF CONTROLS - SUPERVISOR II

Section 5 COMPRESSOR OPERATION

5.9 PURPOSE OF CONTROLS - SUPERVISOR II (CONTINUED)

CONTROL OR INDICATOR	PURPOSE
AIR END DISCHARGE PRESSURE-P1	Shuts the compressor down when the compressor dis- charge pressure exceeds P1 MAX. Continually monitors the discharge pressure of the compressor unit. Indicates pressure in compressor sump upon start-up to verify ro- tor motor rotation.
PACKAGE OUTLET PRESSURE-P2 (Service Line Pressure)	Continually monitors service line pressure. When line pressure reaches the UNLOAD setting, the Supervisor control signals the solenoid valve to unload the compressor.
FLUID PRESSURE-P3	Continually monitors injection fluid pressure and shuts down the compressor in the event of low fluid pressure.
FLUID FILTER DIFFERENTIAL SWITCH	Continually monitors fluid filter differential and generates an alarm when the fluid filter needs replacement.
INLET FILTER MAINTENANCE SWITCH	Monitors condition of compressor inlet air filter and indi- cates when replacement is required.
FLUID LEVEL SIGHT GLASS	Indicates fluid level in the sump. Proper level is not to fall below the center of the sight glass. Check level when compressor is shut down. DO NOT OVERFILL.
COOLER BYPASS VALVE	Regulates flow of fluid to and around the cooler. Designed to maintain a minimum operating temperature of 185°F (85°C); used for fast warm-up on start-up.
MINIMUM PRESSURE/CHECK VALVE	Maintains minimum of 50 psig (3.4 bar) in the compres- sor sump. Valve piston restricts receiver air discharge from receiver/sump when pressure falls to 50 psig (3.4 bar). Also incorporated in this valve is a terminal check valve which prevents line pressure backflow into the sump during unload conditions and after shutdown.
PRESSURE RELIEF VALVE	Protects compressor by venting compressed air in ex- cess of 200 psig (13.8 bar) to atmosphere.
MODULATING INLET VALVE	Regulates the amount of air allowed to enter the air compressor. This regulation is determined by the amount of air being used at the service line. Also acts as a check valve to prevent reverse compressor rota- tion at shut down.
SOLENOID VALVE	Bypasses the pressure regulator valve causing the in- let valve to close when the compressor reaches maxi- mum operating pressure. Also activates blowdown valve.
WATER REGULATING VALVE (water-cooled only)	Regulates the amount of cooling water used in the cooler to keep the the compressor running at a normal operating temperature of 185°F (85°C).
BLOWDOWN VALVE	Vents sump pressure to the compressor inlet during un- load conditions and shutdown.

5.10 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)	Controls optional solenoid valve to provide automatic condensate removal.
FULL LOAD/MODULATE (K6)	Used with optional sequencing feature.

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

5.11 INITIAL START-UP PROCEDURE

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

- 1. Read the preceding pages of this manual thoroughly.
- 2. Jog motor to check for correct rotation of motor (refer to Section 2.8).
- 3. 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.
- 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.
- 9. Reinspect the compressor for temperature and leaks the following day.

5.12 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 " $^{\textcircled{O}}$ " for automatic operation. When the compressor is running, observe the various parameter displays.

5.13 SHUTDOWN PROCEDURE

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

NOTES

Section 6 SUPERVISOR II

6.1 INTRODUCTION-SUPERVISOR II

Refer to Figure 6–1 and Section 5 for information regarding your compressor with Supervisor II. 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.

6.2 KEYPAD

The keypad is used to control the machine as well as display status and change setpoints. Refer to Figure 6–1 for following key descriptions.

• **Stop** – Used to put the machine into manual stop. It is also used to clear alarm conditions.



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



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



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



• 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.



• **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.



6.3 STATUS DISPLAYS

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 with LCD graphics listed 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.
- STARTING Machine is trying to start.
- **OFF LOAD** Machine is running and off loaded.
- **ON LOAD** Machine is running and loaded.
- FULL LD Machine is running and fully loaded. This state is only displayed if the machine has a full load valve and under sequence control.
- **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.
- SEQ STOP Compressor is off but armed to start. The machine will start when the sequencing conditions meet the criteria to start. NOTE : the machine may start at any time.

This default display appears as follows:

Section 6 SUPERVISOR II

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:



To view other status press the DSP 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.

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



• Sump pressure and line pressure.



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



• Total hours that the compressor has been running.



• Total hours that the compressor has been loaded.



• Last fault log. This shows the fault on the first line and the run hours when the fault occured.



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



6.4 LAMP INDICATORS

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 – If lit steady, signifies that P1 is being displayed, if flashing denotes the presence of an alarm.

P2 – If lit steady, signifies that P2 is being displayed, if flashing denotes the presence of an alarm.

 \triangle **P1** – If lit steady, signifies that nP1 is being displayed, if flashing denotes replacement of separator is needed.

 $\Delta \textbf{P2}$ – If lit, indicates replacement of oil filter is needed.

T1 – If lit steady, signifies that T1 is being displayed, if flashing denotes the presence of an alarm.

INLET FILTER – Same as $\triangle P2$.

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

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.

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.

Section 6 SUPERVISOR II

Figure 6-1 Supervisor II Panel



NOTES



7.1 INTRODUCTION

A WARNING

Before doing compressor maintenance, disconnect compressor from power source and lock out power source. Isolate compressor from line pressure by closing recommended discharge shutoff valve and releasing all internal pressure from compressor.

As you proceed in reading this section, it will be easy to see that the maintenance program for the air compressor is quite minimal. If your compressor is equipped with the optional Supervisor II, it will monitor the status of the separator element. When maintenance to this device is required, the Supervisor will display the appropriate maintenance message and flash the location LED on the graphics map as a visual reminder. See instructions for each item in Section 7.6, Parts Replacement and Adjustment Procedures.

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.

7.2 DAILY OPERATION

Prior to starting the compressor, it is necessary to check the fluid level in the sump. Should the level be low, simply add the necessary amount. If the addition of fluid becomes too frequent, a minor problem has developed which is causing this excessive loss. For proper fluid selection and change schedule see Section 3. See the Troubleshooting Section under Excessive Fluid Consumption for probable cause and remedy.

After a routine start has been made, a general check of the overall compressor should be made to assure that the compressor is running properly.

7.3 MOTOR BEARING LUBRICATION

A WARNING

Before doing compressor maintenance, disconnect compressor from power source and lock out power source. Isolate compressor from line pressure by closing recommended discharge shutoff valve and releasing all internal pressure from compressor.

See motor manufacturer's lubrication instructions.

7.4 FLUID FILTER MAINTENANCE

A WARNING

Fluid filter has internal bypass. DO NOT SUBSTI-TUTE. Replace the fluid filter element under any of the following conditions:

- 1. As recommended in the Lubrication Guide in the Specification Section.
- 2. Every year.
- 3. Every fluid change.
- 4. Refer to Lubricant Change table in Section 3.

7.5 COOLER MAINTENANCE

If cooler becomes restricted, use standard spray degreaser/cleaner and brush to clean cooler. Use air pressure to blow cooler clean. Care must be taken as not to damage cooler fins.

A WARNING

Before doing compressor maintenance, disconnect compressor from power source and lock out power source. Isolate compressor from line pressure by closing recommended discharge shutoff valve and releasing all internal pressure from compressor.

7.6 PARTS REPLACEMENT AND ADJUSTMENT PROCEDURES

A WARNING

Before doing compressor maintenance, disconnect compressor from power source and lock out power source. Isolate compressor from line pressure by closing recommended discharge shutoff valve and releasing all internal pressure from compressor.

PRESSURE RELIEF VALVE

Check the relief valve at least weekly to see that it is functional. **DO NOT** tamper with the preset factory pressure setting of the valve. **DO NOT** plug the valve for any reason; should it leak, have it replaced.

FLUID FILTER REPLACEMENT

Refer to Figure 7-1.

- To prevent spillage and loss of reusable fluid, place a contaminant-free fluid receptacle beneath fluid drain valve and fluid filter.
- Drain fluid by opening drain valve located beneath compressor (for complete fluid change, drain fluid from cooler).
- 3. Remove the old element and gasket.
- 4. Clean gasket seating surface.
- 5. Apply a light film of fluid to the new gasket.
- 6. Hand tighten new element until gasket is seated.
- 7. Continue tightening element an additional 1/2 to 3/4 turn.
- 8. Replace fluid. Fill sump to the bottom of the fluid fill plug hole. **DO NOT OVERFILL.**
- 9. Restart compressor and check for leaks.

AIR FILTER MAINTENANCE

Refer to Figure 7–2. Air filter maintenance should be performed every 6 months, 4000 hours, or more frequently if conditions so require.

Section 7 MAINTENANCE

Figure 7-1 Fluid Filter (P/N 02250078-544)



A WARNING

Before doing compressor maintenance, disconnect compressor from power source and lock out power source. Isolate compressor from line pressure by closing recommended discharge shutoff valve and releasing all internal pressure from compressor.

ELEMENT INSPECTION

- Place a bright light inside the element to inspect for damage or leak holes. Concentrated light will shine through the element and locate any holes.
- Inspect all gaskets and gasket contact surfaces of the housing. Should faulty gaskets be evident, correct the condition immediately.
- 3. If the clean element is to be stored for later use, it must be stored in a clean container.
- After the element has been installed, inspect and tighten (if necessary) all air inlet connections prior to resuming operation.

FLUID SEPARATOR ELEMENT REPLACE-MENT

Refer to Figure 7–3. Check maintenance schedule in Section 3. Follow the procedure explained below for element replacement.



Before doing compressor maintenance, disconnect compressor from power source and lock out power source. Isolate compressor from line pressure by closing recommended discharge shutoff valve and releasing all internal pressure from compressor.

- 1. Remove the separator maintenance gauge line and fluid return line from their connections, if equipped.
- 2. Remove the 4 capscrews that secure the separator housing to the compressor. Remove housing.
- Remove old separator element and o-ring.
 Clean all surfaces. Install new element and oring into compressor main housing.
- Install new o-ring on the separator housing and attach separator housing to compressor main housing using the 4 capscrews. Torque capscrews to 148 ft. lb. (200 Nm).
- Replace the separator maintenance gauge line and fluid return line from their connections, if equipped.

MOISTURE SEPARATOR ELEMENT REPLACE-MENT

The moisture separator element should be changed every 4000 hours or when the pressure differential across the filter unit exceeds 10 psig (0.7 bar).

A WARNING

Before doing compressor maintenance, disconnect compressor from power source and lock out power source. Isolate compressor from line pressure by closing recommended discharge shutoff valve and releasing all internal pressure from compressor.

- 1. Remove the separator gauge line, from its connection, if equipped.
- 2. Unscrew and remove the threaded bowl and bowl seal.
- 3. Unscrew lower baffle and remove filter element and gaskets (2).
- 4. Clean all internal parts before reassembling.

Fiugre 7-2 Air Filiter



*Replacement Element P/N 02250087-420




*Replacement Element Kit P/N 02250083-659

- 5. Install element and gaskets (2).
- 6. Attach lower baffle and tighten firmly.
- 7. Replace bowl seal.
- 8. Screw bowl into body and tighten firmly.



Be certain to connect a water drain line, leading away from compressor, at the moisture drain outlet located on the side of the compressor package below compressor air discharge pipe.

CONTROL SYSTEM ADJUSTMENT- STAN-DARD ELECTRO/MECHANICAL

Refer to Figure 7-4. Prior to adjusting the Control System, it is necessary to determine the desired operating pressure range and also the maximum pressure at which your compressor is to operate. The pressure must not exceed the maximum operating pressure which is stamped on the compressor serial number nameplate. The following explanation applies to a typical installation with a desired operating range of 100 to 110 psig (6.9 to 7.6 bar). This information will apply to a compressor with any other operating range excepting the stated pressures.

Remove the cover of the pressure switch, pressure regulator and inlet valve as required. With the shutoff valve closed (or slightly cracked open) start the compressor. Observe the line pressure gauge and pressure switch contacts. When the line pressure reaches 110 psig (7.6 bar), the pressure switch contacts should open. If the pressure switch contacts do not open or they open prior to the desired pressure, the pressure switch setting will require adjustment (refer to Figure 7–4).

FOR PRESSURE RANGE ADJUSTMENT:

- 1. Remove cover to pressure switch.
- 2. Turn the range adjusting screw to the high pressure setting. Turning the screw counterclockwise lowers both the high and low pressure equally.

FOR DIFFERENTIAL ADJUSTMENT:

Differential is the difference between the high and low pressure settings. 10 psig (0.7 bar) is typical.

- 1. Turn the differential adjusting screw to the lower (reset) setting. Turning the screw counterclock-wise widens the differential by lowering the reset (lower) setting only.
- 2. When the pressure switch adjustment is complete, the pressure regulator should be adjusted for the pressure at which modulation of air delivery should begin. In this case that pressure will be 103 psig (7.1 bar). The regulator is adjusted by loosening the jam nut on the end of the cone shaped cover of the pressure regulator. When the jam nut is loose, turn the adjusting screw clockwise to increase or counterclockwise to decrease the setting.
- 3. To set the regulator, continue closing the service valve, until the line pressure is 103 psig (7.1 bar). At this point regulator should pass a signal to the inlet valve to start closing it. If the line pressure keeps on rising or if the modulation does not begin, adjust the regulator valve as described above. After adjustment line pressure should be

Figure 7-4 Pressure Switch (P/N 040694)



approximately 103 psig (7.1 bar) and 1.00 in. Hg vacuum below the inlet.

- 4. Now close the service valve, line pressure will start rising. When line pressure reaches 110 psig. (7.6 bar), the inlet valve will be closed to its maximum position. The inlet vacuum at this point will be around 25 in. Hg. The machine should unload at this point.
- 5. Open the service valve so the line pressure is 100 psig (6.9 bar). Machine is now set for operation. Recheck the unload pressure by closing of the service valve. Machine should unload via the pressure switch at 110 psig (7.6 bar).

After the control pressures have been adjusted, the "unloaded" sump pressure should be checked. It will be necessary to shut the compressor down, remove the pressure switch cover and disconnect one of the two lead wires that are connected to the microswitch (contact block). After disconnecting the lead, tape the exposed wire with electrician's tape to make sure that it does not come in contact with any metallic surface.



DO NOT touch the electrical contacts, terminal or leads with any metallic object. Severe electrical shock may occur.

With the lead taped, you may start the compressor again. Allow the sump pressure to stabilize.

The sump pressure should read 30 to 35 psig (2.1 to 2.8 bar).

Once this is checked, shut the compressor down once again and reconnect the taped lead and replace the pressure switch cover. At this time, start the compressor and cycle the Control System several times and re-check all pressure settings and adjustments.

DO NOT touch the pressure switch, electrical contacts, terminal board or leads with any part of the body or any uninsulated metallic object. Severe electrical shock may occur.

A WARNING

Before doing compressor maintenance, disconnect compressor from power source and lock out power source. Isolate compressor from line pressure by closing recommended discharge shutoff valve and releasing all internal pressure from compressor.

CONTROL SYSTEM ADJUSTMENT- SUPERVI-SOR II

All components in the Control System are designed and manufactured to close tolerances to help eliminate any need for adjustments.



DO NOT touch the electrical contacts, terminal or leads with any part of the body or any uninsulated metallic object. Severe electrical shock may occur.

PRESSURE VALVE ADJUSTMENT- SUPERVI-SOR II

If pressure valve adjustment is required the adjustment procedure below should be followed:

- 1. Start compressor.
- 2. Lower line pressure (P₂) until machine goes on load.
- Loosen hex nut on the regulator valve to adjust machine modulation. Adjust screw in or out until on load/off load modulation of compressor takes place.
- 4. Close service valve downstream from receiver tank. The pressure will increase depending on the regulator valve adjustment screw setting. Adjust screw until line pressure (P₂) rises to the Supervisor II preprogrammed off load setting. Tighten hex nut.
- Open service valve and observe correct on load/ off load modulation.

INLET CONTROL VALVE

Refer to Figure 7–5. The inlet control valve normal maintenance requires only the replacement of the o-rings. Use repair kit no. 02250083–661 and follow the procedure below for proper disassembly and assembly procedures.

A WARNING

Before doing compressor maintenance, disconnect compressor from power source and lock out power source. Isolate compressor from line pressure by closing recommended discharge shutoff valve and releasing all internal pressure from compressor.

A WARNING

Assure that line pressure gauge on compressor indicates "ZERO" pressure before any work is done. Failure to comply can cause injury.

- 1. Remove access panels and air filter ...
- 2. Identify and tag plastic lines connected to the inlet adapter and disconnect.
- 3. Remove snap ring.
- 4. Remove inlet adapter and o-ring.
- 5. Remove inlet valve and spring.
- 6. Remove retaining ring.



While removing the snap ring, push the spring retainer down to overcome the force created by the spring.

- 7. Remove retainer, piston and spring.
- 8. Inspect and clean all parts.
- 9. Oil and install new piston o-ring; reinstall piston spring and retainer. Secure with retaining ring.



* Repair Kit P/N 02250083-661

- 10. Reinstall inlet valve and spring.
- Oil and install o-ring. Install inlet adapter; secure with snap ring.



After installation, make sure the snap ring is properly seated into the groove.

- Reconnect the plastic lines to the appropriate fittings on the inlet adapter.
- 13. Reassemble other parts removed earlier.

COMPRESSOR/MOTOR REMOVAL

A WARNING

Before doing compressor maintenance, disconnect compressor from power source and lock out power source. Isolate compressor from line pressure by closing recommended discharge shutoff valve and releasing all internal pressure from compressor.

Refer to lifting decal in Section 9.11. Should it become necessary to remove the compressor/motor assembly from the compressor package, care must be taken to lift properly.

The main lift points on the compressor/motor assembly are at the air filter support bracket mounting hole on top of the main body of the compressor and the eye bolt on top of the motor. Insert a suitable lifting device into the main compressor body hole. The compressor/motor assembly may also be lifted using a forklift truck with fork extensions. To lift the entire assembly from beneath the compressor use supporting blocks for the motor. Position the blocks on the forks beneath the motor to assure lifting the assembly level.

A WARNING

Follow all appropriate SAFETY SECTION instructions and practices when lifting this assembly.

In the event a new factory replacement compressor unit is required, the compressor unit must be pre-lubricated prior to operation.



When adding fluid to the compressor unit be certain it is the identical fluid used originally in the lubrication system.

Pre-lubricating the compressor unit requires adding approximately 1/2 gallon (1.9 liters) of lubricant through the inlet port. This is accomplished by pushing the inlet check valve (reference Figure 7-5) open and pouring lubricant directly into the inlet.



Clean all parts and surfaces prior to pre-lubrication procedure. Extreme care must be taken to avoid contamination of the compressor fluid.

Check compressor sump housing for proper fluid level prior to start-up.

COMPRESSOR COOLER CLEANING - AIR-COOLED

Refer to Figure 7-6.



Before doing compressor maintenance, disconnect compressor frompower source and lock out power source. Isolate compressor from line pressure by closing recommended discharge shutoff valve and releasing all internal pressure from compressor.

To access the compressor cooler if cleaning is required follow the procedure below.

- 1. Remove all necessary hardware fastening cooler shroud to the compressor enclosure.
- 2. Lift cooler shroud up and away from compressor enclosure and cooler.
- Disconnect fluid cooler lines that are attached to cooler. Plug cooler and lines to avoid fluid contamination.
- 4. Flush dirt from the cooler fins with low pressure air or water.
- 5. Assemble cooler in reverse order of disassembly.
- 6. Once compressor is assembled, check fluid for proper level.

Figure 7-6 Cooler Cleaning



7.7 MAINTENANCE RECORD

MODEL NO. ______ SERIAL NO. _____

DATE	HOURMETER	MAINTENANCE PERFORMED	WORK PERFORMED BY	AUTHORIZED BY

NOTES

8.1 STANDARD ELECTRO/MECHANICAL

TROUBLESHOOTING INTRODUCTION

The information contained in the Troubleshooting chart is based upon both the reports about actual field applications, and extensive testing done at the factory. 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 the trouble should be systematically analyzed before undertaking any repairs or component replacement procedures. A detailed visual inspection is worth performing for almost all problems. Doing so can prevent unnecessary damage. Always remember to:

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

Should your problem persist after making the recommended check, consult your nearest Sullair representative or the Sullair Corporation factory.

8.2 TROUBLESHOOTING - STANDARD ELECTRO/MECHANICAL

SYMPTOM	PROBABLE CAUSE	REMEDY
COMPRESSOR WILL NOT START	Main Disconnect Switch Open	Close switch.
	Line Fuse Blown	Replace fuse.
	Control Transformer Fuse Blown	Replace fuse.
	Motor Starter Overloads 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	Reset; if trouble persists, check that line pressure does not exceed maximum operating pressure of the compressor (specified on nameplate).
	Low Incoming Voltage	Consult power company.
	Excessive Operating Pressure	Defect in line pressure switch; check pressure at which contact points open.
		Separator requires maintenance; check maintenance gauge under full load conditions.
		Defective solenoid valve. Repair if defective.
		Defective blowdown valve; blowdown valve should exhaust sump pressure to 30 to 35 psig (2.1 to 2.4 bar) when maximum operating pressure is reached. Repair if defective.
	Discharge Temperature Switch Open	Cooling water temperature too high; increase water flow (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. (air-cooled only).
		Ambient temperature is too high; provide sufficient ventilation.
		Low fluid level; add fluid.
		Clogged filter; change the fluid filter element if indicated by the maintenance gauge.

8.2 TROUBLESHOOTING (CONTINUED)

SYMPTOM	PROBABLE CAUSE	REMEDY
COMPRESSOR SHUTS DOWN WITH AIR DEMAND PRESENT	Discharge Temperature Switch Open	Thermal valve not functioning properly; replace element (air-cooled only).
		Water flow regulating valve not functioning properly; change (water-cooled only).
COMPRESSOR WILL NOT BUILD UP FULL DISCHARGE PRESSURE	Air Demand is Too Great	Defective discharge temperature switch; check for a short or open circuit to probe and correct wiring. Check service lines for leaks or open valves.
	Dirty Air Filter	Check the filter indicator and change if required.
	Pressure Regulator Out of Adjustment	Adjust regulator according to control adjustment instructions in the Maintenance section.
	Defective Pressure Regulator	Check diaphragm and replace if necessary (kit available).
	Defective or Dirty Inlet Valve	Check that valve fully opens when full air demand is present. Repair or clean as necessary.
LINE PRESSURE RISES ABOVE CUT-OUT PRESSURE SETTING ON PRESSURE SWITCH	Leak in Control System Causing Loss of Pressure Signals	Check for leaks.
	Defective Pressure Switch	Check that diaphragm and contacts are not damaged. Replace if necessary.
	Defective Solenoid Valve	Repair kit available.
	Defective Blowdown Valve	Check that sump pressure is exhausted to the atmosphere when the pressure switch contacts open or repair or replace if necessary (kit available).
EXCESSIVE COMPRESSOR FLUID	Separator Element Damaged or Not Functioning Properly	Change element.
	Leak in the Lubrication System	Check all pipes, connections and components.
	Excess Fluid Foaming	Drain and change.
	Fluid Level Too High	Drain to correct level.
PRESSURE RELIEF VALVE OPEN REPEATEDLY	Defective Pressure Relief Valve Separator Differential (plugged)	Replace pressure relief valve. Replace Separator
LIQUID WATER IN COMPRESSED AIR LINES	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. Main- tain them regularly.

8.3 OPTIONAL SUPERVISOR II TROUBLESHOOTING INTRODUCTION

The information contained in the Troubleshooting chart is based upon both the actual applied situations and extensive testing at the factory. 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 the trouble should be systematically analyzed before undertaking any repair or component replacement procedures.

A detailed visual inspection is worth performing for almost any problems which may prevent unnecessary damage to the compressor. Always remember to:

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

Should your problem persist after making the recommended check, consult your nearest Sullair representative or the Sullair Corporation factory.

8.4 TROUBLESHOOTING - SUPERVISOR II

SYMPTOM (DISPLAY)	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 (air-cooled only)	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.
T1 FAIL	Temperature RTD Malfunction	Check connections from RTD. If connection is good, replace RTD.
P1 HI Message	Discharge Pressure Exceeded Shutdown Level Because:	
	P1 MAX-3psi (0.2 Bar) Exceeded for Pre-Alarm	
	P1 MAX Exceeded for Shutdown	
	Unloading Device (i.e., Blowdown Valve) Failed to Operate	Check operation of unloading device.
	Pressure Regulator adjusted incorrectly	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.
P1, P2, P3 FAIL	Pressure Transducer Malfunction	Check connections from Transducer. If connections are good, replace Transducer.
P3 LOW	Oil Pressure falls below 10 psig (.7 bar) or less than 1/2 of P1 while compressor is running because: Oil Filter Clogged Sump Oil Level Too Low	Replace filter element Replenish oil level
SEP MNTN Message	Plugged Separator	Replace separator element.
	Δ P1 > 10 psi (.7 bar)	Check P1 & P2 pressure transducers.

8.4 TROUBLESHOOTING - SUPERVISOR II (CONTINUED)

SYMPTOM (DISPLAY)	PROBABLE CAUSE	REMEDY
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 position.
	Pressure Sensor and/or Connections at Fault	Check connections from trans- ducer. If adequate, replace trans- ducer.
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) 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	Service filter assembly.
EXCESSIVE FLUID CONSUMPTION	Damaged or Improperly Gasketed Separator Element	Inspect separator element and gasket. 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.
LIQUID WATER IN COMPRESSED AIR LINES	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. Main- tain them regularly.

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. If 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.

8.5 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 calibra-

tion 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: "", " \bigstar ", **DSP**, " \blacktriangledown ", **PRG**. Once in calibration mode, you will see a screen like the following:



In the above example, "0" refers to the amount of adjustment (in psi or $^{\circ}$ F, "97" refers to the current value of P1).

The number on the left will increase or decrease always showing the total amount of adjustment. Maximum adjustment is \pm 7.

The **DSP** key exits, wiping out changes to the current item, while saving changes to any previous items. The **PRG** key saves the current item and advances to the next. All temperatures and pressures may be calibrated individually.

NOTES

9.1 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.

The genuine Sullair service parts listed meet or exceed the demands of this compressor. Use of replacement parts other than those approved by Sullair Corporation may lead to hazardous conditions over which Sullair Corporation has no control. Such conditions include, but are not limited to, bodily injury and compressor failure.

SULLAIR CORPORATION

Subsidiary of Sundstrand Corporation 3700 Éast Michigan Boulevard Michigan City, Indiana 46360 U.S.A. Telephone: 1-800-SULLAIR (U.S.A. Only) or 1-219-879-5451 Fax: (219) 874-1273 Fax: (219) 874-1835 (Parts) Fax: (219) 874-1805 (Service)

SULLAIR ASIA, LTD. Sullair Road, Nó. 1 Chiwan, Shekou Shenzhen, Guangdong PRV. P.R.C. Post Code 518068 Telephone: 755-6851686 FAX: 755-6853473

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

9.2 RECOMMENDED SPARE PARTS LIST

repair kit for fluid filter 02250083	656 1 659 1
repair kit for ninkit02250083repair kit for air/fluid separator02250083repair kit for air filter02250087repair kit for shaft seal02250087tool kit, shaft seal02250087replacement element for thermal valve 185°F (85°C)02250087replacement element for thermal valve 195°F (91°C)02250087replacement element for thermal valve 195°F (91°C)02250087replacement element for thermal valve 250025-655250031-1repair kit for pressure regulator valve 250017-280250019-4repair kit for solenoid valve 250030-164250038-674replacement coil for solenoid valve 250030-164250035-2repair kit for solenoid valve 250038-67402250087repair kit for minimum pressure/check valve02250087repair kit for moisture separator02250087drain kit for moisture separator02250087fluid, SRF 1/4000, 5 gallons(20 liters)250019-4fluid, Sullube 32, 5 gallons(20 liters)250019-4menuel Soguencia & Pretocol (1)250025-repair kit for solenoig & Pretocol (1)250025-repair kit for moisture separator02250087fluid, Sullube 32, 5 gallons(20 liters)250019-4repair kit for solenoig & Pretocol (1)250025-repair kit for solenoig & Pretocol (1)250025-repair kit for moisture separator250025-fluid, Sullube 32, 5 gallons(20 liters)250025-repair kit for solenoig & Pretocol (1)250025-repair kit for solenoig & Pretocol (1)250025-repair	420 1 4455 1 455 1 456 1 457 1 838 1 72 1 53 1 661 1 92 1 940 1 38 1 423 1 423 1 662 1

PLEASE NOTE: WHEN ORDERING PARTS. INDICATE SERIAL NUMBER OF COMPRESSOR

(I) This document is required to program your personal computer to communicate with the Supervisor II panel.

9.3 FRAME, MOTOR, COMPRESSOR AND PARTS



9.3 FRAME, MOTOR, COMPRESSOR AND PARTS

key		part	
number	description	number	quantity
1	unit,compressor	Consult Factory	1
2	frame	02250084-321	1
3	seal (I)(II)	02250078-044	1
4	sleeve (I)(II)	02250078-472	1
5	housing, adapter	02250075-043	1
6	seal (I)(II)	02250077-851	1
7	motor, drive	Consult Factory	1
8	gear	Consult Factory	1
9	o-ring	826502-263	1
10	isolator	02250085-254	2
11	isolator	02250085-255	2
12	screw, 5/16 x 3/4"	829705-075	8
13	washer, metric m12	838812-250	2
14	capscrew, 5/8–11 x 1–1/2"	828410-150	4
15	capscrew, 8.8 m12 x 76mm	828012-076	2
16	insert, 5/16" steel	02250043-765	32
17	screw, 3/8-16 x 1-1/2"	829706-150	2
18	screw, 4762 m16 x 65mm	829316-065	5
19	washer, 3/8"	837206-071	2
20	screw, 4762 m16 x 45 - 8.8	829316-045	8
21	screw, 4029 m16 x 30mm	865816-030	1
22	screw, 4762 m16 x 55mm	829316-055	22

- (I) For maintenance on ES-11 shaft seal, order tool kit part number 02250087-456 (Note: Items not sold separately).
- (II) For maintenance on ES-11 shaft seal, order repair kit part number 02250087-455 (Note: Items not sold separately).

9.4 COMPRESSOR AND PARTS



9.4 COMPRESSOR AND PARTS

key number	description	part number	quantity
1	unit, assembly (I) (II) (VI)	Consult Factory	1
2	cover, separator	02250086-168	1
3	housing, bell	02250064-668	1
4	piston	02250075-038	1
5	seat	02250075-042	1
6	retainer	02250073-424	1
7	сар	02250075-035	1
8	cylinder,inlet valve	02250073-422	1
9	stem	02250075-037	1
10	piston	02250073-423	1
11	stem	02250073-668	1
12	valve,inlet check	02250073-425	1
13	adapter,inlet	02250092-406	1
14	sight, glass	250025-420	1
15	element,separator (III)	02250091-385	1
16	plug, fluid fill	250039-359	1
17	valve, thermal 185°F (85°C) (IV)	02250078-204	1
	•valve, thermal 195°F (91°C) (V)	02250092-081	1
18	screw M10X20	829310-020	1
19	adapter, oil filter	02250077-706	1
20	element	02250078-544	1
21	screw M10X25	829310-025	9
22	screw	829316-060	4
23	o-ring	826502-144	1
24	screw	829316-055	12
25	o-ring	02250078-405	1
26	spring,piston	02250064-666	1

(Continued on page 45)

- (I) For maintenance on minimum pressure valve, order kit no. 02250087–458 (Note: Items not sold separately).
- (II) For maintenance on inlet control valve, order kit no. 02250083-661 (Note: Items not sold separately).
- (III) For maintenance on separator element, order kit no. 02250083-659.
- (IV) For maintenance on thermal valve part no. 02250078-204, order kit no. 02250087-457.
- (V) For maintenance on thermal valve part no. 02250092–081, order kit no. 02250090–838.
- (VI) Consult Factory for unit assembly exchange program.

9.4 COMPRESSOR AND PARTS



9.4 COMPRESSOR AND PARTS (CONTINUED)

key number	description	part number	quantity
			90.000
27	o-ring	826502-263	1
28	washer	866010-035	1
29	spring	02250077-764	1
30	spring	02250077-765	1
31	o-ring	02250064-663	1
32	o-ring	826502-226	1
33	ring,retaining	02250064-664	1
34	o-ring	826502-334	1
35	screw	829306-016	1
36	o-ring	826502-157	1
37	ring,retaining-inlet	836369-500	1
38	spring,check	02250064-665	1
39	orifice	02250091-395	1
40	connector	250018-428	1
41	insert	02250052-841	2
42	hose, nylon	842215-004	1
43	elbow	250018-430	1
44	screw M10X16	829310-016	1

9.5 MOTOR, AND PARTS





9.5 MOTOR AND PARTS

key		part	
number	description	number	quantity
1	motor, main drive	Consult factory	1
2	conduit	846315-150	1
3	elbow	846500-150	1
4	cord grip	250018-497	2
5	fitting	846400-150	1
6	enclosure	Consult factory	1
7	motor, fan	Consult factory	1
8	washer, conduit	847008-060	2
9	ring, terminal	849304-010	1
10	wire	850215-010	2
11	bushing,conduit	848815-150	2
12	ring, terminal	849302-010	1
13	wire	850604-012	1
15	connector, wire yellow	851000-074	3
16	joint	250006-065	3
17	insulator, splice	250006-112	3
19	connector,wire yellow	851000-074	3
21	connector,wire yellow	851000-074	4
23	connector,wire yellow	851000-074	4
25	connector,wire yellow	851000-074	6
27	connector,wire yellow	851000-074	3

9.6 INLET FILTER AND PARTS



9.6 INLET FILTER AND PARTS

key number	description	part number	quantity
1	support, air filter	02250085-565	1
2	spacer, inlet filter support	02250085-595	1
3	elbow, rubber	049307	1
4	clamp,hose	040642	1
5	clamp, hose	041993	1
6	filter,inlet (I)	02250085-253	1
7	band, mounting	040598	1
8	nut,ring-m16 x 2-582 (II)	02250094-650	1
9	stud,m16 x 50(nom.)	02250094-647	1
10	nut, 5/16	825305-283	2
11	screw, 5/16-18 x 1	829705-100	2
12	washer, metric m16	838816-350	1

(I) For maintenance on air filter no. 02250085–253 order repair kit no. 02250087–420.

(II) NOTE: LOCATION FOR PRIMARY COMPRESSOR/MOTOR ASSEMBLY LIFTING DEVICE ATTACHMENT.

9.7 COOLING SYSTEM AND PARTS- AIR-COOLED



9.7 COOLING SYSTEM AND PARTS- AIR-COOLED

key number	description	part number	quantity
1	panel, front		
	•standard	02250084-224	1
	•deluxe	02250084-283	1
	•Supervisor II	02250083-892	1
2	tube, cooler	02250091-095	1
3	angle,air piping	02250086-227	1
4	panel, louver side	02250085-868	1
5	panel,corner rear	02250083-859	1
6	connector, tube-m 1-1/2 x 1-1/2"	810224-150	1
7	elbow	02250093-177	1
8	connector	02250085-144	1
9	elbow	02250087-070	2
10	elbow	810524-150	1
11	separator,moisture 1-1/2" (I)	02250078-841	1
12	bulkhead, pipe 1/4" npt	841500-004	1
13	elbow,1/4t x 1/4npt	250018-430	1
14	elbow,1/4t x 1/8npt	250018-429	1
15	clamp,exhaust – 2–1/4"	040385	1
16	bushing, reducing 1/2 x 1/4"	807602-010	1
17	connector,1/4t x 1/4 npt	250018-428	1
18	nut, retainer-5/16"	861405-092	4
19	tee,reducing	02250053-609	1
20	valve, ball 1/4" npt	047115	1
21	elbow, 45 deg sae x orfs 1.00"	02250087-073	1
22	hose, medium pressure	02250087-169	1
23	hose, medium pressure	02250051-453	1
24	hose, medium pressure	02250087-166	1
25	tube, nylon .25od x.040w blk(ft)	02250054-861	1
26	screw, 5/16x3/4"	829705-075	10
27	nut, 5/16	825305-283	2
28	coupling, pipe 1-1/2 galvanized	803215-060	1
29	washer, 5/16"	838505-078	2
30	nipple,galvanized 1–1/2 x 3.0 (40)	823124-030	1
31	nipple,galvanized 1–1/2 x 6 (40)	823124-060	1

(Continued on page 53)

(I) For maintenance on moisture separator no. 02250078–841 order repair kit no. 02250087–423. For maintenance on moisture separator drain, order repair kit no. 02250087–422.

9.7 COOLING SYSTEM AND PARTS- AIR-COOLED



9.7 COOLING SYSTEM AND PARTS- AIR-COOLED (CONTINUED)

key number	description	part number	quantity
32	nipple,pipe (80)	822204-000	2
33	elbow, pipe 1/4 galvanized	803515-010	1
34	guard, fan • 22 in. (56 cm) • 24 in. (61 cm)	241501 241079	1 1
35	adapter, venturi/cooler	02250087-273	1
36	support, fan motor • 2 hp (1.5kW) • 3 hp (2.2kW)	02250087-475 02250087-271	1 1
37	venturi,panel • 22 in. (56 cm) • 24 in. (61 cm)	02250087-272 250018-329	1 1
38	fan,cooling • 22 in. (56 cm) • 24 in. (61 cm)	241390 049971	1 1
39	motor, fan	Consult Factory	1
40	elbow,1-1/2 x 1-1/2	860224-150	1
41	cooler	02250081-393	1
42	nut,hex locking 5/16	825505-166	4
43	screw, 5/16x3/4"	829705-075	24
44	washer, lock 5/16"	837505-078	3
45	washer, 5/16"	838205-071	7
46	capscrew, 5/16 x 1"	828605-100	7
47	weatherstrip, 3/16 x 3/8 ft.	250022-436	11
48	insert, 5/16" steel	02250043-765	42

9.8 COOLING SYSTEM AND PARTS- WATER-COOLED



9.8 COOLING SYSTEM AND PARTS- WATER-COOLED

key number	description	part number	quantity
1	tee	02250085-979	1
2	bracket	02250085-822	1
3	panel, louver side	02250085-868	1
4	panel, cooler front		
	•standard	02250084-224	1
	•deluxe	02250084-283	1
	•Supervisor II	02250083-892	1
5	tube.nvlon .25 odx .040w blk(ft)	02250054-861	3
6	tube, stainless-steel	02250091-134	1
7	angle	02250086-227	1
8	tube, water	02250087-292	1
9	tube,stainless-steel	02250091-135	1
10	tube, water out stainless-steel	02250091-136	1
11	tube, water stainless-steel	02250091-137	1
12	panel,corner	02250083-859	1
13	tube	02250092-571	1
14	adapter, sae 1 5/16 x 1 5/16 – 12	02250086-022	1
15	valve, water 3/4"	047398	1
16	cooler, oil	02250085-718	1
17	heat exchanger, air	250017-527	1
18	u-bolt,1/2" x 5" pipe	829008-500	1
19	separator, moisture 1 1/2" fpt (I)	02250078-841	1
20	connector, sae seal lok 1.00"	02250087-067	3
21	elbow,1/4t x 1/8npt	250018-429	1
22	elbow,1/4t x 1/4npt	250018-430	2
23	union, tube hex 3/4"	811312-075	1
24	hose, medium pressure	02250086-628	1
25	clamp, exhaust – 2–1/4"	040385	1
26	tee, reducing 1 1/2 x 1/2 x 1 1/2"	02250053-609	1
27	elbow	02250087-073	1
28	hose, medium pressure	02250087-169	1
29	tee, reducing	867503-013	1
30	valve, ball 1/4" npt	047115	1
31	hose	02250087-163	1
32	elbow	02250092-524	1

(Continued on page 57)

(I) For maintenance on moisture separator no. 02250078-841, order repair kit no. 02250087-423. For maintenance on moisture separator drain, order repair kit no. 02250087-422.

9.8 COOLING SYSTEM AND PARTS- WATER-COOLED



9.8 COOLING SYSTEM AND PARTS- WATER-COOLED (CONTINUED)

key number	description	part number	quantity
31	hose	02250087-163	1
32	elbow	02250092-524	1
33	bulkhead,pipe 1/4 npt	841500-004	1
34	valve,solenoid (II)	250039-723	1
35	nipple,pipe 3/4 x 10.0 sc 40 galv	823112-100	1
36	washer, 1/2"	838208-112	2
37	elbow, pipe 3/4" galv	803515-030	2
38	elbow, tube-m 3/4 x 3/4"	810512-075	2
39	bushing,red 1 x 3/4 150#	802104-030	4
40	connector, tube m 3/4 x 3/4	810212-075	8
41	nipple,pipe 3/4 x 3.5 sc 40 galv	823112-035	1
42	screw, hex ser wash 5/16 x 1 1/2"	829705-150	6
43	nipple,pipe 3/4 x cl sc 80 galv	823212-000	1
44	washer, spr lock 1/2"	837508-125	2
45	screw, hex serr 5/16-18 x 1	829705-100	3
46	washer, pl b r 5/16"	838205-071	8
47	nut,hex flanged 5/16	825305-283	2
48	connector, tube m 1 1/2 x 1 1/2	810224-150	2
49	screw, ser wash 5/16x3/4"	829705-075	8
50	nipple,pipe 1–1/2 x cl sc 80 galv	823224-000	1
51	elbow, pipe 1/4 45 d	801415-010	1
52	nipple,pipe 1/4 x cl sc 80	822204-000	1
53	coupling, pipe 1-1/2 galv	803215-060	1
54	nipple,pipe 1/4 x cl sc 80 galv	823204-000	1
55	elbow, tube-m 1/4 x 1/4"	Consult Factory	1
56	bushing,red galv 1/2 x 1/4"	804102-010	1
57	washer, sprlock reg pltd 5/16"	838505-078	2
58	nipple,pipe 1–1/2 x 3.5 sc 40 galv	823124-035	1
59	shroud,fan	02250086-228	1
60	support	02250085-820	2
61	panel,vent	02250085-821	1
62	fan,enclosure	241580	1

(Continued on page 59)

(II) For maintenance on solenoid valve no. 250039–723, order repair kit no. 02250061–218 and replacement coil no. 250030–232.

9.8 COOLING SYSTEM AND PARTS- WATER-COOLED



9.8 COOLING SYSTEM AND PARTS- WATER-COOLED (CONTINUED)

key number	description	part number	quantity
63	guard,fan	241579	1
64	support	02250085-823	1
65	screw, hex ser wash 5/16 x 1 1/2"	829705-150	5
66	insert,5/16" steel	02250043-765	31
67	washer, pl-b reg pltd 1/4"	838204-071	4
68	capscrew, hex gr 5 1/4–20 x 1"	828604-100	4
69	nut,hex 1/4	824204-226	4
70	screw, ser wash 5/16x3/4"	829705-075	6

9.9 CONTROL BOX AND PARTS- STANDARD



9.9 CONTROL BOX AND PARTS- STANDARD

key number	description	part number	quantity
1	gasket,panel supervisor II	02250048-822	1
2	bracket	250018-146	1
3	support	02250084-823	1
4	valve, pressure regulator (l)	250017-280	1
5	panel, instrument	02250077-639	1
6	plate	02250086-265	1
7	decal	02250086-263	1
8	plate	02250086-266	1
9	specification, enclosure	02250091-079	1
10	connector, 1/4"tube x 1/4"npt	250018-428	5
11	elbow, 1/4"tube x 1/4"npt	250018-430	9
12	valve	045244	1
13	hourmeter	042988	1
14	block, contact	250027-126	2
15	block, contact	250027-125	1
16	block, contact	02250057-765	1
17	starter	02250056-882	1
18	valve,blowdown 1/4" (II)	250025-655	1
19	elbow, 90 lqtite 1/2"	846600-050	3
20	light, pilot assy green	250000-104	2
21	plug, hole seal n4	409918-002	4
22	decal	02250083-361	1
23	conduit (ft)	846315-050	9
24	locknut,cond seal n4 1/2"	02250071-362	2
25	switch	02250069-625	1
26	tee,male 1/4"tube x 1/8"npt	250028-581	1
27	switch,pressure	040694	1
28	strainer,v-type 300psi 1/4" (III)	241771	1
29	bulkhead,pipe 1/4" npt	841500-004	1
30	light, pilot assy red	250000-103	2
31	terminal,ring tng 3/8 x 14-16	849306-014	1

(Continued on page 63)

(I) For maintenance on pressure regular valve no. 250017-280, order repair kit no. 250019-453.

(II) For maintenance on blowdown valve no. 250025–655, order repair kit no. 250031–772.

(III) For maintenance on strainer no. 241771, order repair kit no. 241772.

9.9 CONTROL BOX AND PARTS- STANDARD


9.9 CONTROL BOX AND PARTS- STANDARD (CONTINUED)

key number	description	part number	quantity			
32	valve (IV)	250038-674	2			
33	decal	02250086-262				
34	gasket	02250090-872 1				
35	valve,shuttle 1/4"	408893 1				
36	orifice,1/4m x 1/4f x .062	028831	1			
37	panel	02250089-302	1			
38	connector, straight liq-tite 1/2"	846400-050	2			
39	switch	250017-992	1			
40	connector, 1/4"tube x 1/8"npt	250018-427	3			
41	unilet, type lb 1/2"	847915-050	1			
42	gasket	02250086-269	1			
43	switch, temperature 240f nc	040588	1			
44	switch	250034-647	1			
45	coupling	250007-179	1			
46	locknut, conduit 1/2"	847200-050				
47	nipple,conduit 1/2 x 4"	250007-172				
48	orifice,1/8npt x 1/8fpt x .031	025690	1			
49	tee,male 1/4"tube x 1/4"npt	250028-582	2			
50	elbow, 1/4"tube x 1/8"npt	250018-429	2			
51	plug, pipe 1/8" stl	807800-005	1			
52	nut,hex pltd sae #10-32	825801-130	13			
53	nipple,chase cond 1/2	847815-050	2			
54	nipple,pipe 1/4 x cl sc 80 ga	823204-000	12			
55	nut,hex metric m4 x .7	825904-070	14			
56	nut,hex pltd #10	825202-130	2			
57	screw, mach phillips #10-24x1/2	250025-692	2			
58	nipple,pipe 1/4 x 3.5 sc 40 g	823104-035	1			
59	nut,hex flanged 5/16	825305-283	2			
60	screw, ser wash 5/16x3/4"	829705-075	6			
61	washer, spr lock reg pltd #10	838502-047	2			
62	washer, lock ext. tooth 10	838402-025	13			
63	washer, sprlock reg m4	838804-090	14			
64	washer, pl br 5/16"	837205-071	1			
65	screw, ser wash 5/16-18 x 1-1/4	829705-125	2			

(Continued on page 65)

(IV) For maintenance on solenoid valve no. 250038–674, order repair kit no. 02250055–940 and replacement coil no. 250031–738 .

9.9 CONTROL BOX AND PARTS- STANDARD



9.9 CONTROL BOX AND PARTS- STANDARD (CONTINUED)

key number	description	part number	quantity
66	tee, pipe 1/4" galv	804415-010	3
67	elbow, pipe 1/4 galv	803515-010	3
68	tee,straight 1/8 galv	804415-005	2
69	nipple,pipe 1/8 x cl sc 80 ga	823202-000	1
70	bushing,red 1/4x1/8 galv	804100-005	1
71	nipple,pipe 1/8 x 2.0 sc 40 g	823102-020	2
72	coupling, pipe galv 1/8"	803215-005	1

9.9A CONTROL BOX AND PARTS - SUPERVISOR II



9.9A CONTROL BOX AND PARTS - SUPERVISOR II

key	departies	part	quantity		
number	description	number	quantity		
1	block	02250051-765	1		
2	plate	02250086-268	1		
3	harness, wire	02250054-328	1		
4	harness, wire	02250054-329	1		
5	valve, pressure regulator (I)	250017-280	2		
6	support	02250084-823	1		
7	plate	02250086-265	1		
8	specification, enclosure	02250091-079	1		
9	gasket	02250086-269	1		
10	transducer	02250078-933	3		
11	grip	02250071-380	4		
12	connector, 1/4"tube x 1/4"p	250018-428	6		
13	switch	02250085-504			
14	keypad	02250086-264	1		
15	block	250027-125	3		
16	block	02250057-765	1		
17	starter	02250056-882	1		
18	valve,blowdown 1/4" (II)	250025-655	1		
19	grip	02250071-379	2		
20	controller	02250083-801	1		
21	locknut	02250071-362	2		
22	bulkhead,pipe 1/8" npt	841500-002	3		
23	switch, vacuum	02250078-249	1		
24	valve,shuttle 1/4"	408893	2		
25	strainer (III)	241771	1		
26	elbow, 1/4tube x 1/4p	250018-430	12		
27	bulkhead,pipe 1/4" npt	841500-004	1		
28	terminal	849306-014	1		
29	valve (IV)	250038-674	2		
30	connector,male 1/4t x 1/8p	250018-427	6		
31	switch	02250050-154	1		

(Continued on page 69)

- (I) For maintenance on pressure regular valve no. 250017–280, order repair kit no. 250019–453.
- (II) For maintenance on blowdown valve no. 250025–655, order repair kit no. 250031-772.
- (III) For maintenance on strainer no. 241771, order repair kit no. 241772.
- (IV) For maintenance on solenoid valve no. 250038–674, order repair kit no. 02250055–940 and replacement coil no. 250031–738 .

9.9A CONTROL BOX AND PARTS - SUPERVISOR II



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9.9A CONTROL BOX AND PARTS - SUPERVISOR II (cont.)

key number	description	part number	quantity			
number	description	number	quantity			
32	orifice, 1/4m x 1/4f x .062	028831	1			
33	conduit (ft)	846315-050	6			
34	connector, straight liq-tite 1/2"	846400-050	1			
35	switch	250017-992	1			
36	valve	045244	1			
37	elbow, 1/4"tube x 1/8"npt	250018-429	2			
38	tee,male 1/4t x 1/4p	250028-582	1			
39	panel	02250089-302	1			
40	gasket	02250090-872	1			
41	orifice,.031 .125m x .125f hrs	025690	1			
42	decal	02250086-259	1			
43	board	02250088-098	1			
44	tee,male 1/4t x 1/8p	250028-581	1			
45	spacer	02250064-616	2			
46	nipple,chase cond 1/2	847815-050				
47	nipple,pipe 1/4 x cl sc 80 ga	823204-000	12			
48	washer, sprlock reg m4	838804-090	14			
49	nut,hex metric m4 x .7	825904-070	20			
50	nipple,pipe 1/8 x cl sc 80 ga	823202-000	2			
51	washer, pl br 5/16"	837205-071	1			
52	screw, ser wash 5/16x3/4"	829705-075	4			
53	screw, ser wash 5/16-18 x 1-1/4	829705-125	2			
54	tee, pipe 1/4" galv	804415-010	3			
55	elbow, pipe 1/4 galv	803515-010	3			
56	nut,hex pltd sae #10-32	825801-130	13			
57	washer, lock ext tooth 10	838402-025	13			
58	screw, mach-rd 6-32 x 1"	831600-100	2			
59	nipple,galv 1/4 x 3–1/2"	823104-035	1			
60	tee,straight 1/8 galv	804415-005	3			
61	bushing,red 1/4x1/8 galv	804100-005	1			
62	washer, lock int tooth #6	837400-021	4			
63	screw, mach-rd 6-32 x 1/2"	831600-050	2			
64	coupling, pipe galv 1/8"	803215-005	1			
65	nipple,pipe 1/8 x 2.0 sc 40 g	823102-020	2			

9.9B CONTROL PANEL AND PARTS - ELECTRO/MECHANICAL



NOTES

- 1. A = FROM SUMP-WET SIDE-E/M DLX
- 2. B = BACK TO HIGH SIDE 'DELTA P'
- 3. C = FROM SUMP-WET SIDE-E/M STD
- 4. D = FROM LINE PRESSURE SWITCH
- 5. E = INLET VACUUM
- 6. F = FROM SUMP PRESSURE TEE P1
- 7. G = FROM SUMP DRY SIDE
- 8. H = FROM OIL FILTER HIGH PRESSURE SIDE
- 9. I = FROM OIL FILTER LOW PRESSURE SIDE

9.9B CONTROL PANEL AND PARTS - ELECTRO/MECHANICAL

key number	description	part number	quantity
1	gauge, pressure	250005-185	2
2	gauge, temperature	042582	1
3	gauge, vacuum	250003-797	1
4	gauge, differential pressure	250003-798	1
5	gauge, differential pressure	250003-799	1
6	coupling, galvanized pipe	803215-005	7
7	connector, 1/4"tube x 1/8"npt	250018-427	7
8	tee,male 1/4t x 1/8p	250028-581	1

9.10 CANOPY, ACOUSTICAL PANELS AND PARTS



9.10 CANOPY, ACOUSTICAL PANELS AND PARTS

key number	description	part number	quantity	
1	panel,corner end front	02250083-858	1	
2	panel, top-motor end		1	
	•aircooled	02250085-252	1	
	 watercooled 	02250086-221	1	
3	panel, motor end	02250084-348	1	
4	panel,cooler support	02250083-863	1	
5	panel,acoustical insulation	02250081-399	1	
6	panel,seal plate	02250091-256	1	
7	panel,top end		1	
	•aircooled	02250091-236	1	
	 watercooled 	02250086-282	1	
8	panel,louver assy-rear	02250084-344	1	
9	panel,acoustical insulation	02250092-115	1	
10	panel,acoustical insulation	02250081-401	1	
11	panel,acoustical insulation	02250084-758	2	
12	panel,acoustical insulation	02250084-761	2	
13	panel,acoustical insulation	02250081-477	1	
14	panel,acoustical insulation	02250081-400	1	
15	panel,acoustical insulation	02250092-116	1	
16	nut, 5/16	825305-283	19	
17	screw, 5/16 x 3/4"	829705-075	39	
18	weatherstrip,3/16 x 3/8 ft.	250022-436	6	
19	panel, acoustical insulation	02250081-396	1	
20	screw, 5/16-18 x 1	829705-100	6	
21	washer, 5/16"	837205-071	2	
22	panel, access end	02250077-997	1	
23	panel,acoustical insulation	02250081-389	2	
24	catch,access panel	049764	1	
25	weatherstrip,3/16 x 3/8 ft.	250022-436	13	
26	nut,hex flanged 3/8	825306-347	2	
27	capscrew, 3/8 x 1"	828906-100	2	
28	panel, roof end	02250083-921	1	

(Continued on page 79)

9.10 CANOPY, ACOUSTICAL PANELS & PARTS



9.10 CANOPY, ACOUSTICAL PANELS AND PARTS (CONTINUED)

key number	description	part number	quantity		
number	description	number	quantity		
29	panel,roof-motor end	02250083-920	1		
30	panel,roof-front side	02250083-864	1		
31	panel,roof-rear side	02250083-865	1		
32	panel,roof-top	02250083-919	1		
33	grille,roof-left	02250084-537	1		
34	grille,roof-right	02250078-578	1		
35	panel,acoustical insulation	02250084-762 1			
36	panel,acoustical insulation	02250081-398 2			
37	panel,acoustical insulation	02250081-397	2		
38	grommet,rubber-1/4"	040125	8		
39	screw, 5/16x3/4"	829705-075	12		
40	insert, 5/16" steel	02250043-765	20		
41	panel,access-front	02250084-226	1		
42	panel,acoustical insulation	02250084-759	2		
43	catch,access panel	049764	1		
44	weatherstrip,3/16 x 3/8 ft.	250022-436	11		
45	nut,hex flanged 3/8	825306-347	2		
46	capscrew, nylok 3/8 x 1"	828906-100	2		

9.11 DECAL GROUP



9.11 DECAL GROUP

key number	description	part number	quantity
1	sign, warning – compressor fluid fill cap	049685	1
2	sign, danger electrocution	049850	1
2a	decal, electrocution (50 hertz compressors)	02250077-472	1
3	sign, warning – hot surfaces	407408	1
4	decal, warning auto start	041065	1
5	decal, danger breath air	250027-935	1
6	sign, warning "food grade" lube	250003-144	1
		(Continued on page	age 83)

9.11 DECAL GROUP



9.11 DECAL GROUP (CONTINUED)

key number	description	part number	quantity
7	decal, rotation direction	040745	1
8	decal, compressor fluid SRF 1/4000 (I)	02250069-391	1
9	decal, earth ground	02250075-046	2
	 decal, protective earth ground (not shown) 	02250075-045	1
	 decal, PE designation (not shown) 	02250075-540	1
10	decal, danger hi voltage	042218	1
11	sign, warning ground fault	049852	1
12	decal, ISO 9001	02250059-288	1
13	decal, ES-11 warning lift	02250091-200	1
14	decal, ES-11 Supervisor II dlx info (not shown)	Consult factory	1
15	decal, ES-11 Supervisor II front (See Figure 6-1 in Operator's Section)	02250083-803	1

(I) Decal will change with fluid requirement.

9.12 WIRING DIAGRAM - FULL VOLTAGE - STANDARD ELECTRO/MECHANICAL



9.13 WIRING DIAGRAM - FULL VOLTAGE - SUPERVISOR II



9.14 WIRING DIAGRAM - WYE DELTA 50/60 HZ - ELECTRO/MECHANICAL



9.15 WIRING DIAGRAM - WYE DELTA 50/60 HZ - SUPERVISOR II



9.16 WIRING DIAGRAM - WYE DELTA 50 HZ (EUROPE) - ELECTRO/MECHANICAL



9.17 WIRING DIAGRAM - WYE DELTA 50 HZ (EUROPE) - SUPERVISOR II



9.18 TORQUE TABLE FOR <u>METRIC FASTENERS</u> (+/- 10%)

	PROPE	RTY CLA	SS 5.6	PROPERTY CLASS 8.8			PROF	OPERTY CLASS 12.9		
	CLAMP	TIGHTE TORQU (NDm)	ENING IE	CLAMP	TIGHT TORQ (NDm)	ENING	CLAMP	TIGHT TORQ (NDm)	ENING UE	
SIZE	(kN)	DRY	LUB.	(kN)	DRY	LUB.	(kN)	DRY	LUB.	
M3x0, 5 M4x0, 7 M5x0, 8 M6x1 M8x1, 25 M10x1, 5 M12x1, 75 M16x2	1.06 1.84 2.98 4.23 7.69 12.2 17.7 32.9	.9 2 4 6.8 17 33 56 136	.7 1.6 3.1 5.3 13 25 43 104	2.19 3.82 6.17 8.75 15.9 25.2 36.7 68.2	1.8 4.2 8.3 14 34 67 115 281	1.4 3.3 6.4 11 27 52 89 216	3.66 6.39 10.3 14.6 26.6 42.2 61.3 114	3 7 14 24 58 113 193 471	2.4 5.4 11 18 45 87 149 362	
M20x2, 5 M24x3 M30x3, 5	51.4 74.0 118	267 459 911	205 353 699	110	572	440	178 256 408	925 1592 3156	711 1223 2422	

Basic pitch diameters are used to calculate torque values. Coefficients of friction used are .2 and .15 for dry and lubricated conditions, respectively. Clamp load is calculated by arbitrarily assuming usable bolt strength is 75% of bolt proof load (PSI) times tensile stress area (IN²) of thread section of each bolt size.

PROPERTY CLASS	MATERIAL	TENSILE N/mm ²	YIELD N/mm ²	PROOF N/mm ²	SIZE mm	INDENTIFICATION
5.6	ISO 898-1 1988 (E)	500	300	280	Thru 39	5.6
8.8	ISO 898-1 1988 (E)	800 830		580 600	< = 16 > 16 Thru 39	8.8
12.9	ISO 898-1 1988 (E)	1220		970	Thru 39	12.9

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NOTES

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