GARDNER DENVER®

13-8-637
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April 2, 2002

INTEGRA™
BASE-MOUNTED
COMPRESSORS

MODELS – EFE99A

60 & 75 HP

OPERATING AND
SERVICE MANUAL

GARDNER DENVER

MAINTAIN COMPRESSOR RELIABILITY AND PERFORMANCE WITH GENUINE GARDNER DENVER® COMPRESSOR PARTS AND SUPPORT SERVICES

Gardner Denver Compressor genuine parts, manufactured to design tolerances, are developed for optimum dependability – specifically for Gardner Denver compressor systems. Design and material innovations are the result of years of experience with hundreds of different compressor applications. Reliability in materials and quality assurance are incorporated in our genuine replacement parts.

Your authorized Gardner Denver Compressor distributor offers all the backup you'll need. A worldwide network of authorized distributors provides the finest product support in the air compressor industry. Your local authorized distributor maintains a large inventory of genuine parts and he is backed up for emergency parts by direct access to the Gardner Denver Master Distribution Center (MDC) in Memphis, Tennessee.

Your authorized distributor can support your Gardner Denver air compressor with these services:

1. Trained parts specialists to assist you in selecting the correct replacement parts.
2. Factory warranted new and remanufactured rotary screw airends. Most popular model remanufactured airends are maintained in stock at MDC for purchase on an exchange basis with liberal core credit available for the replacement unit.
3. A full line of factory tested AEON™ compressor lubricants specifically formulated for use in Gardner Denver compressors.
4. Repair and maintenance kits designed with the necessary parts to simplify servicing your compressor.

Authorized distributor service technicians are factory trained and skilled in compressor maintenance and repair. They are ready to respond and assist you by providing fast, expert maintenance and repair services.

For the location of your local authorized Gardner Denver Air Compressor distributor, refer to the yellow pages of your phone directory or contact:

Distribution Center:
Gardner Denver
Master Distribution Center
5585 East Shelby Drive
Memphis, TN 38141
Phone: (901) 542-6100
(800) 245-4946
Fax: (901) 542-6159

Factory:
Gardner Denver
1800 Gardner Expressway
Quincy, IL 62301
Phone: (217) 222-5400
Fax: (217) 224-7814

REMANUFACTURED AIRENDS

Whenever an airend requires replacement or repair, Gardner Denver offers an industry unique, factory remanufactured airend exchange program. From its modern Remanufacturing Center in Indianapolis, IN., Gardner Denver is committed to supplying you with the highest quality, factory remanufactured airends that are guaranteed to save you time, aggravation and money.

Immediately Available
Repair downtime costs you money, which is why there are over 200 remanufactured units in inventory at all times, ready for immediate delivery.

Skilled Craftsmen
Our Remanufacturing assembly technicians average over 20 years experience with air compression products.

Precision Remanufacturing
All potentially usable parts are thoroughly cleaned, inspected and analyzed. Only those parts that can be brought back to original factory specifications are remanufactured. Every remanufactured airend receives a new overhaul kit: bearings, gears, seals, sleeves and gaskets.

Extensive Testing
Gardner Denver performs testing that repair houses just don't do. Magnaflux and ultrasonic inspection spot cracked or stressed castings, monochromatic light analysis exposes oil leaks, and coordinate measurement machine inspects to +/- .0001", insuring that all remanufactured airends meet factory performance specifications.

Warranty
Gardner Denver backs up every remanufactured airend with a new warranty…18 months from purchase, 12 months from service.
Gardner Denver remanufactured airends deliver *quality without question…year in and year out.*
Call Gardner Denver for information on the airend exchange program and the name of your authorized distributor.

Phone Number: 800-245-4946 or
Fax: 901-542-6159

FOREWORD

Gardner Denver Rotary Screw compressors are the result of advanced engineering and skilled manufacturing. To be assured of receiving maximum service from this machine the owner must exercise care in its operation and maintenance. This book is written to give the operator and maintenance department essential information for day-to-day operation, maintenance and adjustment. Careful adherence to these instructions will result in economical operation and minimum downtime.

DANGER

Danger is used to indicate the presence of a hazard which will cause severe personal injury, death, or substantial property damage if the warning is ignored.

WARNING

Warning is used to indicate the presence of a hazard which can cause severe personal injury, death, or substantial property damage if the warning is ignored.

CAUTION

Caution is used to indicate the presence of a hazard which will or can cause minor personal injury or property damage if the warning is ignored.

NOTICE

Notice is used to notify people of installation, operation or maintenance information which is important but not hazard-related.

This book covers the following models:

HP	PSI	Air Cooled	Parts List	Controller Manual
60	100, 125	EFE99A	13-8-527	13-8-623
75	100, 125, 150, 175	EFE99A	13-8-527	13-8-623

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GENERAL INFORMATION

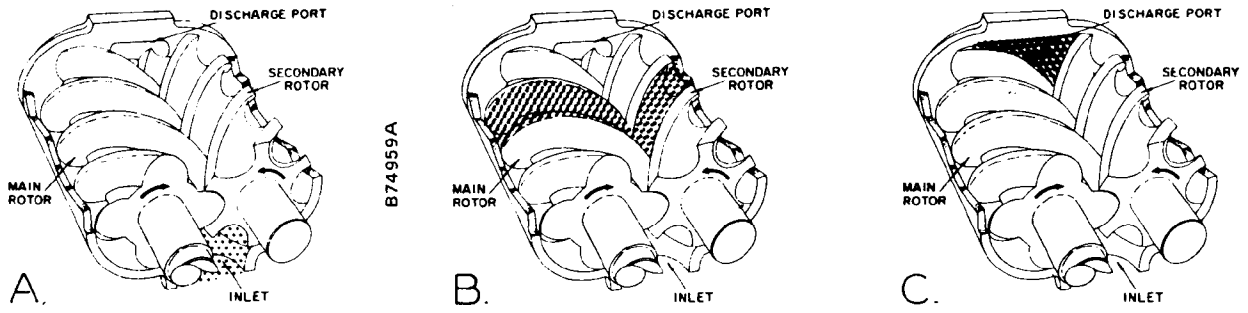

Figure 1-1 – COMPRESSOR CYCLE

COMPRESSOR - The rotary screw compressor is a single stage, positive displacement rotary machine using meshing helical rotors to effect compression. Both rotors are supported between high capacity roller bearings located outside the compression chamber. Single width cylindrical roller bearings are used at the inlet end of the rotors to carry part of the radial loads. Ball and roller bearings at the discharge end locate each rotor axially and carry all thrust loads and the remainder of the radial loads.

COMPRESSION PRINCIPLE (Figure 1-1) - Compression is accomplished by the main and secondary rotors synchronously meshing in a one-piece cylinder. The main rotor has four (4) helical lobes 90° apart. The secondary rotor has five (5) matching helical grooves 72° apart to allow meshing with main rotor lobes.

The air inlet port is located on top of the compressor cylinder near the drive shaft end. The discharge port is near the bottom at the opposite end of the compressor cylinder. *Figure 1-1 is an inverted view to show inlet and discharge ports.* The compression cycle begins as the rotors unmesh at the inlet port and air is drawn into the cavity between the main rotor lobes and the secondary rotor grooves (A). When the rotors pass the inlet port cutoff, air is trapped in the interlobe cavity and flows axially with the meshing rotors (B). As meshing continues, more of the main rotor lobe enters the secondary rotor grove, normal volume is reduced and pressure increases.

Oil is injected into the cylinder to remove the heat of compression and seal internal clearances. Volume reduction and pressure increase continues until the air/oil mixture trapped in the interlobe cavity by the rotors passes the discharge port and is released to the oil reservoir (C). Each rotor cavity follows the same "fill-compress-discharge" cycle in rapid succession to produce a discharge air flow that is continuous, smooth and shock free.

AIR FLOW IN THE COMPRESSOR SYSTEM (Figure 5-1, page 30) - Air enters the air filter and passes through the inlet unloader valve and on into the compression chamber where oil is injected into the air. After compression, the air/oil mixture passes into the oil reservoir where most of the entrained oil is removed by velocity change and impingement and drops back into the reservoir. The air and remaining oil then passes through the air/oil separator. The air then passes through the minimum pressure/check valve, the aftercooler and the moisture separator and into the plant air lines.

LUBRICATION, COOLING AND SEALING - Oil is forced by air pressure from the oil reservoir through the oil cooler, thermostatic mixing valve, and oil filter and discharge into the compressor main oil gallery. A portion of the oil is directed through internal passages to the bearings and shaft oil seal. The balance of the oil is injected directly into the compression chamber to remove heat of compression, seal internal clearances and lubricate the rotors.

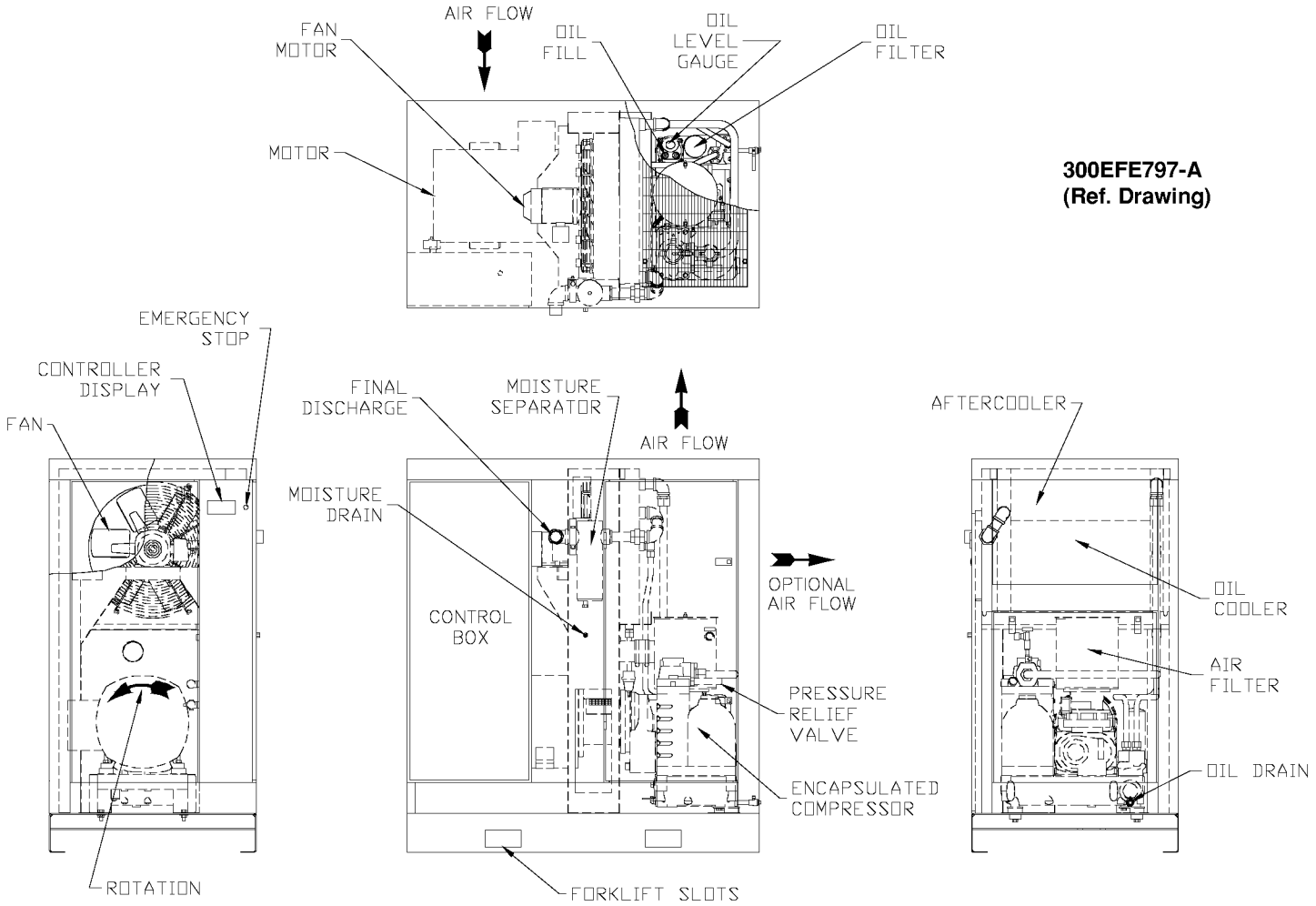

Figure 1-2 – COMPRESSOR ILLUSTRATION

SAFETY PRECAUTIONS

Safety is everybody's business and is based on your use of good common sense. All situations or circumstances cannot always be predicted and covered by established rules. Therefore, use your past experience, watch out for safety hazards and be cautious. Some general safety precautions are given below:

DANGER

Failure to observe these notices could result in injury to or death of personnel.

- **Keep fingers and clothing away from revolving fan, drive coupling, etc.**
- **Do not use the air discharge from this unit for breathing – not suitable for human consumption.**
- **Do not loosen or remove the oil filler plug, drain plugs, covers, the thermostatic mixing valve or break any connections, etc., in the compressor air or oil system until the unit is shut down and the air pressure has been relieved.**
- **Electric shock can and may be fatal.**
- **Perform all wiring in accordance with the National Electrical Code (NFPA-70) and any applicable local electrical codes. Wiring and electrical service must be performed only by qualified electricians.**
- **Open the main disconnect switch, lockout and tagout before working on the control.**
- **Disconnect the compressor unit from its power source, lockout and tagout before working on the unit – this machine is automatically controlled and may start at any time.**

⚠ WARNING

Failure to observe these notices could result in damage to equipment.

- **Stop the unit if any repairs or adjustments on or around the compressor are required**
- **Disconnect the compressor unit from its power source, lockout and tagout before working on the unit – this machine is automatically controlled and may start at any time.**
- **An Excess Flow Valve should be on all compressed air supply hoses exceeding 1/2 inch inside diameter. (OSHA Regulation, Section 1926.302, or local regulations)**
- **Do not exceed the rated maximum pressure values shown on the nameplate.**
- **Do not operate unit if safety devices are not operating properly. Check periodically. Never bypass safety devices.**

DECALS

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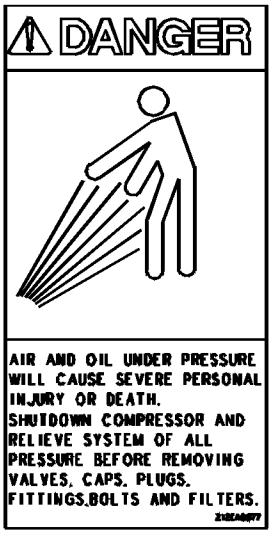

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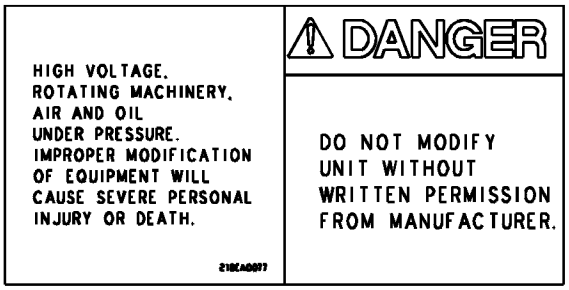

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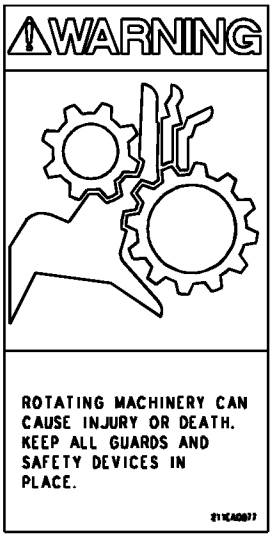

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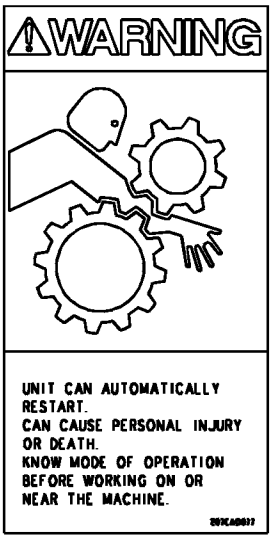

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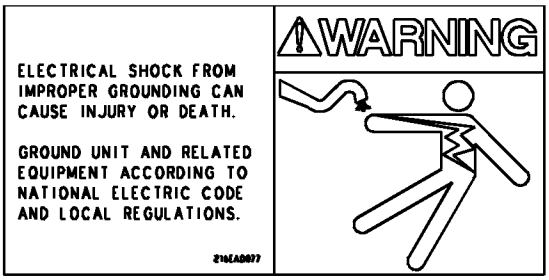

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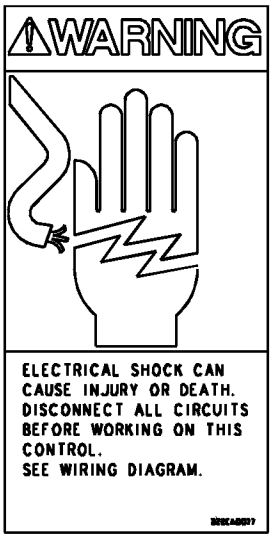

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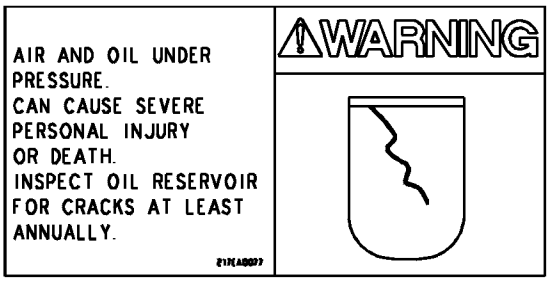

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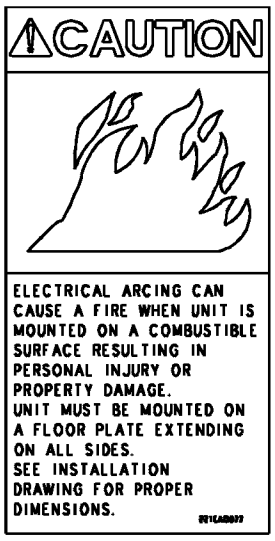

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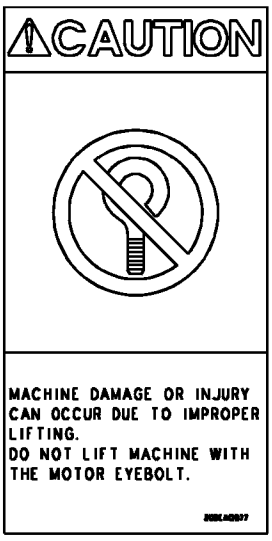

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SECTION 2
INSTALLATION

GENERAL - On receipt of the unit, check for any damage that may have been incurred during transit. Report any damage or missing parts as soon as possible.

CAUTION

Do not electric weld on the compressor or base; bearings can be damaged by passing of current.

LIFTING UNIT - Proper lifting and/or transporting methods must be used to prevent damage. Unit may be moved into location by lift truck.

CAUTION

Lift compressor unit under base only. Do not use other places such as motor, compressor or discharge manifold piping as lifting points.

DANGER

The eyebolts or lugs provided on the motor are for lifting the motor only and should not be used to lift any additional weight. All eyebolts must be securely tightened. When lifting the motor the lifting angle must not exceed 15 degrees. Failure to observe this warning may result in damage to equipment or personal injury.

LOCATION (Figure 2-1, page 8) - The compressor should be installed where it is protected from rain, snow and freezing temperatures, in a clean, well-lighted, well-ventilated area with ample space all around for maintenance. Select a location that provides a cool, clean, dry source of air. In some cases it may be necessary to install the air filter at some distance from the compressor to obtain proper air supply.

AIR-COOLED UNIT - A combination oil/aftercooler is supplied as standard equipment on all air-cooled units. The air-cooled unit with the standard enclosure requires sufficient flow for the compressor oil/aftercooling system and electric motor cooling (Figure 1-2, page 2). Air is drawn into the unit from the side, drawn over the motor and discharged through the cooler. Do not block the air flow to and from the unit. Allow three and one half (3-1/2) feet to the nearest obstruction on the control box end of the unit. Allow three (3) feet to the nearest obstruction above and on other sides of unit. The final discharge of the cooling air can be horizontal or vertical, see Figure 1-2, page 2.

For continuous efficiency, oil cooler cores must be periodically cleaned with either vacuum or compressed air. If wet cleaning is required, shield motor and spray on a mild soap solution and flush with clean water.

⚠ WARNING

For aluminum oil coolers, do not use any cleaning solution that is not compatible with aluminum. Use of improper solution may result in damage to the cooler.

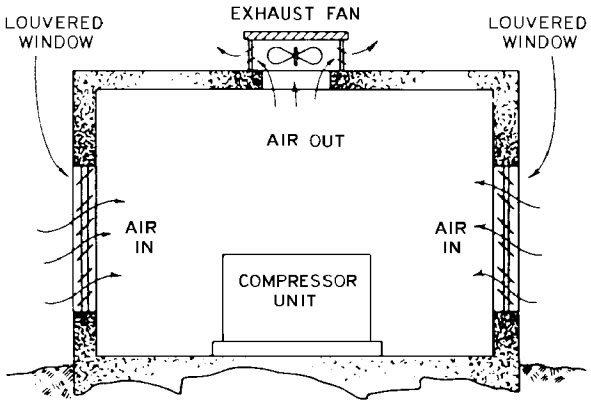


Figure 2-1 – TYPICAL COMPRESSOR ROOM

Minimum Air Flow* For Compressor And Cooling (cubic Feet/Minute)	
	Air Cooled
All Models	14,000 cfm

* 80° F Inlet Air

Figure 2-2 – AIR FLOW CHART

FOUNDATION - The rotary screw compressor requires no special foundation, but should be mounted on a smooth, solid surface. Whenever possible install the unit near level. Temporary installation may be made at a maximum 5° angle lengthwise or 5° sidewise. Mounting bolts are not normally required. However, installation conditions such as piping rigidity, angle of tilt, or danger of shifting from outside vibration or moving vehicles may require the use of mounting bolts and shims to provide uniform support for the base.

OIL RESERVOIR DRAIN - The oil drain is piped from the bottom of the reservoir to the side of the frame. This drain is approximately 10 inches above the floor level.

CAUTION

If the compressor unit base is raised above floor level, the space between the floor and the base bottom must be closed with solid material all around to prevent recirculation of hot air from the oil cooler end and over temperature operation.

ENCLOSURE - The compressor, electric motor, oil cooler and aftercooler are mounted inside the enclosure.

Service panels are provided for maintenance access. Be sure to allow enough space around the unit for the panels to be removed. Any of the enclosure panels may be removed by opening the latch and lifting it up slightly.

DANGER

Do not operate the compressor with the fan and belt guard removed. Exposed fan and belts may cause injury to personnel.

CAUTION

The enclosure doors and panels must be closed and latched while the compressor is operating. Failure to close and latch the doors and panels will cause high temperature shutdowns.

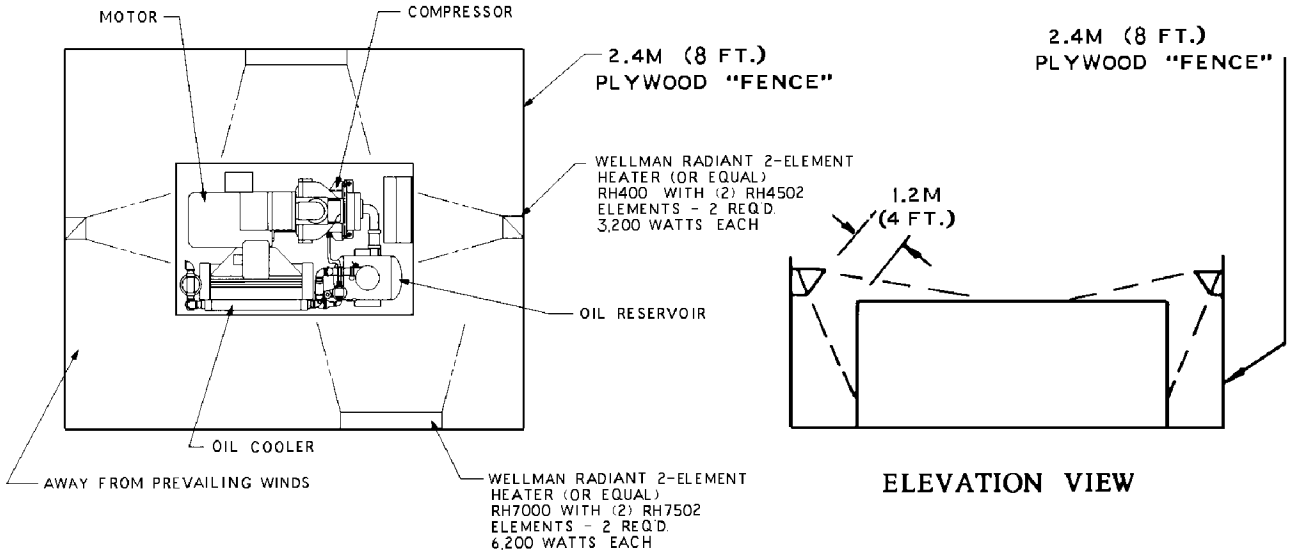


Figure 2-3 – COLD WEATHER INSTALLATION

INSTALLATION FOR COLD WEATHER OPERATION (Figure 2-3, page 9) - It is recommended that the unit be installed inside a shelter that will be heated to temperatures above freezing (32° F, 0° C). This will eliminate many of the problems associated with operating units in cold climates, such as freezing in control lines and downstream of the cooler.

Refer to Engineering Data Sheet 13-9-411 for the advantages of using the heat recovered from rotary compressors. This heat recovery could easily pay for an adequate shelter for the unit.

When an outside installation must be made, the precautions required will depend on the severity of the environment. The following are general guidelines for outside installations:

Cold Weather (Down To +10° F)

1. Be sure all drains, traps, and control lines, including pressure transducer lines are heated to avoid freezing of condensate. Heat tape with thermostat control is generally satisfactory for this purpose and can be obtained at various local plumbing or hardware outlets at nominal cost.

2. Provisions to bypass the aftercooler must be made. Since cold air contains very little moisture, successful operation can be achieved without the aftercooler.

3. Provide at least some simple shelter such as a plywood windbreak to protect against drifting snow.

4. Use only Gardner Denver AEON 9000SP lubricant.

5. Monitor unit carefully during start-up and operation to be sure it is functioning normally.

Remember unsheltered (outside) installations should be avoided where possible. Installation next to a heated building where enough heat can be used to keep the compressor room above freezing will save many complications in the operation and installation of the unit.

AUXILIARY AIR RECEIVER - An auxiliary air receiver is not required if the piping system is large and provides sufficient storage capacity to prevent rapid cycling. When used, an air receiver should be of adequate size, provided with a relief valve of proper setting, a pressure gauge and a means of draining condensate

STANDARD MOISTURE SEPARATOR/TRAP - The unit is equipped with a built-in aftercooler, a combination moisture separator and trap piped into the system down stream of the aftercooler.

CONTROL PIPING - Control piping is not necessary since the rotary screw unit is factory wired and piped for the control system specified.

INLET LINE - Where an inlet line is used between the air filter and the compressor, it must be thoroughly cleaned on the inside to prevent dirt or scale from entering the compressor. **If welded construction is used, the line must be shot blasted and cleaned to remove welding scale**. In either case, the inlet line must be coated internally by galvanizing or painting with a moisture and oil-proof sealing lacquer. Up to ten (10) feet in length, the inlet line should be the full size of the inlet opening on the compressor. If an extra-long line is necessary, the pipe size should be increased according to "Inlet Line Length Chart", page 11.

Accessibility for inlet air filter servicing must be considered when relocating the filters from the unit to a remote location.

INLET LINE LENGTHS

Length of Inlet Line	Diameter of Pipe Size
0 to 10 Feet	Same as Compressor Inlet Opening
10 to 17 Feet	One Size Larger Than Inlet Opening
17 to 38 Feet	Two Sizes Larger Than Inlet Opening

DISCHARGE SERVICE LINE - The discharge service line connection is made at the left hand corner of the package when viewed from the control box end. A hand operated valve, (air service valve) must be installed between the unit and the customer's air system. If a fast operating valve such as a ball valve is used, it must be closed slowly to give the intake valve time to shut and keep the discharge pressure from spiking.

⚠ WARNING

The controller has an automatic start/stop sequence built in. You do NOT need to close the air service valve. Closing the air service valve on start-up or prior to shutdown will cause rapid cycling, and could cause a high pressure shutdown.

When manifolding two or more rotary screw units on the same line, each unit is isolated by the check valve in the unit discharge line.

If a rotary screw unit is manifolded to another compressor, be sure the other compressor has a check valve in the line between the machine and the manifold.

If a rotary screw and a reciprocating compressor are manifolded together, an air receiver must be located between the two units.

⚠ DANGER

Discharge air used for breathing will cause severe injury or death.

Consult filtration specialists for additional filtration and treatment equipment to meet health and safety standards.

HEAT EXCHANGER							
		Water Temperature to Heat Exchanger Gallons/minute				Maximum Water Flow GPM *	Approximate Water Pressure Drop @ 90° F Water Temperature PSI
HP	Model	60° F	70° F	80° F	90° F		
60 HP	EFE99A	5.8	7.3	9.7	14.6	26.0	3.3
75 HP	EFE99A	7.2	9.0	12.1	18.1	26.0	4.3
* Flows exceeding "Maximum Water Flow" will cause severe erosion and will void unit warranty.							

Figure 2-4 – HEAT EXCHANGER (OIL COOLER) APPROXIMATE WATER FLOW

AFTERCOOLER							
		Water Temperature to Heat Exchanger Gallons/minute				Maximum Water Flow GPM*	Approximate Water Pressure Drop @ 90° F Water Temperature PSI
HP	Model	60° F	70° F	80° F	90° F		
60 HP	EFE99A	.9	1.2	1.5	2.3	26.0	Less than 1 PSI for any flow rate shown in the table
75 HP	EFE99A	1.1	1.4	1.9	2.9	26.0	
* Flows exceeding "Maximum Water Flow" will cause severe erosion and will void unit warranty.							

Figure 2-5 – AFTERCOOLER APPROXIMATE WATER FLOW

WATER PIPING (Water-Cooled Heat Exchanger Models Only) - On machines equipped with water-cooled heat exchangers, the water inlet and outlet connections are located in the unit base flange on the left side of the unit.

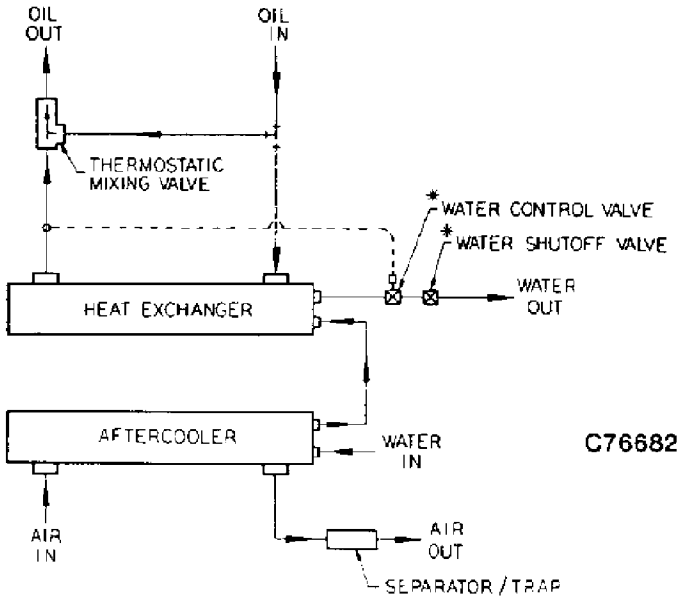
⚠ WARNING

It is mandatory that any water cooled unit be installed in a shelter heated to temperatures above freezing (32° F., 0° C).

The water source should be capable of supplying up to the maximum flow shown in Figure 2-4, page 12, and Figure 2-5, page 12, at a minimum pressure of 40 psig (2.8 bar); maximum allowable water pressure is 150 psig (10.3 bar). The water flow rates shown are approximate and a guide to sizing piping, cooling tower and other water system equipment.

The heat exchanger system is designed to operate with water inlet temperatures from 60° F to 90° F (16° C to 32° C) and a water outlet temperature not to exceed 110° F (43° C). If water cooler than 60° F is used, high water outlet temperatures (over 110° F, 43° C) will be experienced along with shortened heat exchanger life caused by tube fouling and corrosion. If water warmer than 90° F (32° C) is used, higher compressor oil inlet temperatures and high water usage will result.

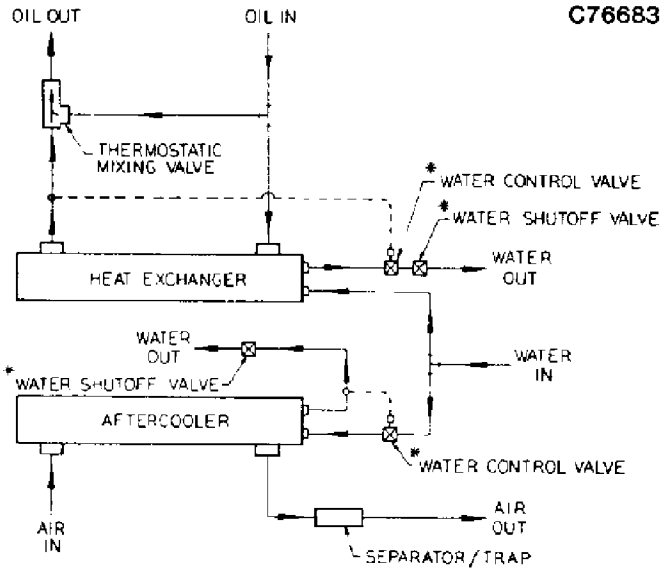
Most water systems will require control of impurities: filtration, softening or other treatment. See Section 5, "Compressor Oil Cooler - Water-Cooled Heat Exchanger" for more information on the water system.



* (Optional) Water Control Valve and Water Shutoff Valve Must Be Ordered Separately

Figure 2-6 – SERIES PIPING

SERIES PIPING (Figure 2-6) - Water flow must be through aftercooler first for effective cooling of discharge air and is so piped on the standard water-cooled unit.



* (Optional) Water Control Valve and Water Shutoff Valve Must be Ordered Separately

Figure 2-7 – PARALLEL PIPING

PARALLEL PIPING (Figure 2-7) - A separate water control valve is required to control the discharge air temperature. If a remote (externally mounted) water-cooled aftercooler is piped in parallel with the heat exchanger, provide a separate water control valve for the aftercooler and pipe separate inlet water lines to both the aftercooler and heat exchanger.

The water control valve is to be adjusted to maintain oil out of the heat exchanger within the 140° F to 150° F (60° C to 66° C) range regardless of inlet water flow or temperature as long as a minimum flow for a given temperature is met (Figure 2-4, page 12, and Figure 2-5, page 12. See Section 5 for adjustment instructions and maximum allowable lubricant temperature.

ELECTRICAL WIRING - Standard Units - The compressor package is factory wired for all connections from the starter to the motor, for the horsepower and voltage specified on the order. The standard unit is supplied with open drip proof motors, and a NEMA 12 starter and controls enclosure. Totally enclosed motors and NEMA 4 enclosures are available as factory options. See "Location" paragraph on page 7, for distance to the nearest obstruction on the control box side of the package.

Perform all wiring in accordance with the National Electrical Code (NFPA-70) and any applicable local electrical codes. Wiring must be performed only by qualified electricians.

⚠ **WARNING**
Electrical shock can cause injury or death. Open main disconnect switch, lockout and tagout before working on control box.

GROUNDING - Equipment must be grounded in accordance with Section 250 of the National Electrical Code.

⚠ WARNING

Failure to properly ground the compressor package could result in injury or death. Install ground wiring in accordance with the National Electrical Code and any applicable local codes.

MOTOR LUBRICATION - Long time satisfactory operation of an electric motor depends in large measure on proper lubrication of the bearings. The following charts show recommended grease qualities and regreasing intervals for ball bearing motors. For additional information, refer to the motor manufacturer's instructions.

The following procedure should be used in regreasing:

1. Stop the unit.
2. Disconnect, lockout and tagout the unit from the power supply.
3. Remove the relief plug and free hole of hardened grease.
4. Wipe lubrication fitting clean and add grease with a hand-operated grease gun.
5. Leave the relief plug temporarily off. Reconnect unit and run for about 20 minutes to expel the excess grease.
6. Stop the unit. Replace the relief plug.
7. Restart the unit.

⚠ WARNING

Rotating machinery can cause injury or death. Open main disconnect, lockout and tagout power supply to starter before working on the electric motor.

ELECTRIC MOTOR GREASE RECOMMENDATIONS (-30° TO 50° C)

MANUFACTURER	TRADE NAME
CHEVRON	SRI #2
SHELL	DOLIUM R
EXXON	UNIREX #2
EXXON	POLYREX

ELECTRIC MOTOR REGREASING INTERVAL

Type of Service	Typical	Rating	Relubrication Interval
Standard	One or Two Shift Operation	Up to 150 HP (112 kW)	18 Months
		Above 150 HP (112 kW)	12 Months
Severe	Continuous Operation	Up to 150 HP (112 kW)	9 Months
		Above 150 HP (112 kW)	6 Months
Very Severe	Dirty Locations, High Ambient Temperature	Up to 150 HP (112 kW)	4 Months
		Above 150 HP (112 kW)	2 Months

SECTION 3
STARTING & OPERATING PROCEDURES

PRESTART-UP INSTRUCTIONS - A new unit as received from the factory has been prepared for shipping only. Do not attempt to operate the unit until checked and serviced as follows:

1. **Compressor Oil** - The oil must be checked before starting the unit and every 8 hours of operation. For instructions on checking the oil and the proper oil level, refer to Figure 5-4, page 36.

   Do not mix different type oils. Unit is shipped filled with Gardner Denver AEON 4000 Lubricating Coolant which is suitable for the first 4000 hours under normal operating conditions. AEON 9000SP is also available. Check the decal on the reservoir to be sure which lubricant is in the machine.

   REPLACE OIL FILTER EVERY 1000 HOURS.

NOTICE
Regular maintenance and replacement at required intervals of the oil filter, air filter and air/oil separator is necessary to achieve maximum service and extended drain intervals of AEON 4000 lubricant. Use only genuine Gardner Denver filters designed and specified for this compressor.

DANGER
Always stop the unit and release air pressure before removing oil filler plug. Failure to release pressure may result in personal injury or death.

2. **Air Filter** - Inspect the air filter to be sure it is clean and tightly assembled. Refer to SECTION 6, page 44 for complete servicing instructions. Be sure the inlet line, if used, is tight and clean.

3. **Piping** – Refer SECTION 2, page 11 “Discharge Service Line” and make sure all piping meets all recommendations.

4. **Electrical** - Check the wiring diagrams furnished with the unit to be sure it is properly wired. See Figure 4-7, page 28, for general wiring diagrams and SECTION 2, page 14, for “Electrical Wiring”.

5. **Grounding** - Unit must be properly grounded according to Section 250 of the National Electrical Code.

WARNING
Failure to properly ground the compressor package could result in controller malfunction.

6. **Rotation** - Check for correct motor rotation by jogging the motor. See “Unit Setup Adjustments” in Controller Operating and Service Manual. Compressor drive shaft rotation must be counterclockwise, standing facing the compressor coupling.

WARNING

Operation with incorrect motor rotation can damage equipment and cause oil eruption from the compressor inlet. When checking motor rotation, induce minimum rotation (less than one revolution if possible). Never allow motor to reach full speed.

WARNING

The compressor unit's direction of rotation must be check every time the compressor is reconnected to the power supply.

7. **System Pressure** - The discharge pressure of the unit is set at the factory. To change the discharge pressure, set the controls to the desired load pressure. DO NOT EXCEED THE MAXIMUM OPERATING PRESSURE ON THE COMPRESSOR NAMEPLATE. See "Operating Adjustments" in Controller Operating and Service Manual.

WARNING

Operation at excessive discharge air pressure can cause personal injury or damage to equipment. Do not adjust the full discharge air pressure above the maximum stamped on the unit nameplate.

8. **Operating Mode** - Refer to SECTION 4, page 20 for detailed information on the control system.

9. **Enclosure** - Check for damaged panels or doors. Check all screws and latches for tightness. Be sure doors are closed and latched.

DANGER

The compressor starts and stops automatically. Automatic restarting can cause injury or death. Open, lockout and tagout main disconnect and any other circuits before servicing the unit.

WARNING

The enclosure doors must be in place and fastened down to keep the compressor package from overheating when the compressor is running.

⚠ WARNING

After an emergency stop, the controller will not allow the compressor to start until the air/oil reservoir has blown down to 5 psig.

⚠ WARNING

The controller has an automatic start/stop sequence built in. You do NOT need to close the air service valve. Closing the air service valve on start-up or prior to shutdown will cause rapid cycling, and could cause a high pressure shutdown.

STARTING THE UNIT - Observe the following starting procedures:

Unit Cold:

1. Open the air service valve (customer furnished) between the main air system and the check valve on the package.

2. Turn on power to the compressor package. To start press STOP/RESET, then press RUN.

3. Run for approximately five minutes or until the temperature stabilizes.

   The unit is equipped with a minimum (65 psig) pressure/check valve. No special procedure is required to maintain the unit reservoir pressure.

Unit Hot (No warm-up period is required):

1. Open the air service valve (customer furnished) between the main air system and the check valve on the package.

2. Run for approximately one minute. The unit is equipped with a minimum (65 psig) pressure/check valve, no special procedure to maintain the unit reservoir pressure is required.

DAILY CHECK - Refer to "Maintenance Schedule," SECTION 8 page 47.

STOPPING THE UNIT:

1. To stop compressor operation, press STOP/RESET.

2. Wait approximately one minute to allow the compressor to stop. The oil reservoir will automatically blow down as the motor stops.

SECTION 4
CONTROLS & INSTRUMENTATION

GENERAL DESCRIPTION

The Gardner Denver rotary screw compressor is prewired with all controls, motor, and starter for the voltage and horsepower at the time of ordering. It is necessary only to connect the compressor unit to the correct power supply and to the shop air line. A standard compressor unit consists of the compressor, oil reservoir, oil cooling system and filter, motor type as specified, NEMA 12 starter / control box, and control components as described below.

AutoSentry® OPERATION

Operation of the "AutoSentry" is dependent on selection of an operating mode from the controller keypad. Prior to starting, the STOP/RESET key must be pressed to place the controller into its READY state (as indicated on the display). Compressor operation may then be started by pressing the RUN key. While in any operating mode, the display will indicate the mode, and the operating light will be on.

Press the STOP/RESET key at any time to stop the compressor under normal conditions.

AUTOMATIC is the most common selected mode of operation, as it automatically will operate the compressor unit in the most efficient manner for the demand of the air system. Refer to the controller manual for descriptions of other modes.

⚠ WARNING

Automatic restarting or electrical shock can cause injury or death. Open, lockout and tagout main disconnect and any other circuits before servicing unit.

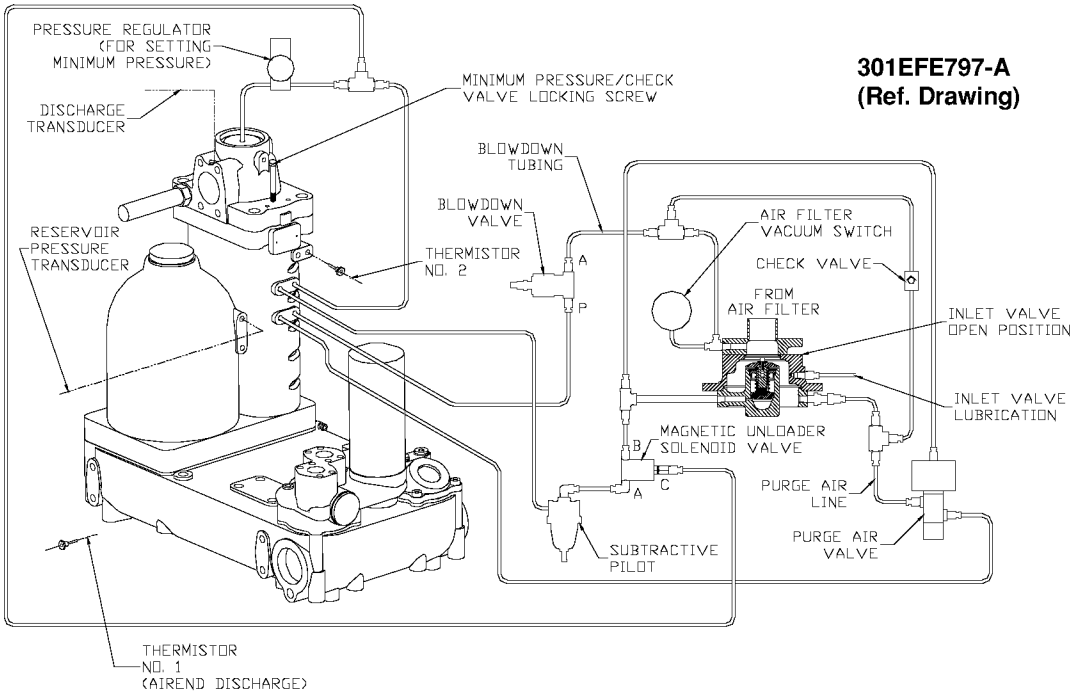


Figure 4-1 – CONTROL SCHEMATIC

CONTROL DEVICES

Controller - This compressor unit features the "AutoSentry" controller, which integrates all the control functions under microprocessor control. Its functions include safety and shutdown, compressor regulation, operator control, and advisory/maintenance indicators. The keypad and display provide the operator with a logical and easily operated control of the compressor and indication of its condition. The controller is factory adjusted for the compressor package, but allows tuning for specific applications.

Detailed instructions for the controller are found in the "AutoSentry" Controller Operating and Service Manual.

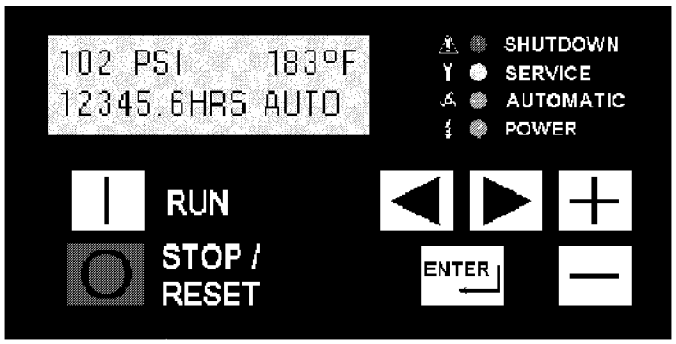


Figure 4-2 – KEY PAD

Relief Valve - A pressure relief valve is installed in the final discharge line and set to approximately 120-125% of the unit's full load operating pressure for protection against overpressure. Periodic checks should be made to ensure its operation.

The relief valve should be tested for proper operation at least once every year. To test the relief valve, raise the system operating pressure to 75% of the relief valve set pressure and manually open the valve by turning the cap.

⚠ WARNING

When the relief valve opens, a stream of high velocity air is released, resulting in a high noise level and possible discharge of accumulated dirt or other debris. Always wear eye and ear protection and stand clear of the discharge port when testing the relief valve to prevent injury.

⚠ CAUTION

Never paint, lubricate or alter a relief valve. Do not plug vent or restrict discharge.

⚠ WARNING

Operation of the unit with improper relief valve setting can result in severe personal injury or machine damage. Ensure properly set valves are installed and maintained.

Oil Level Gauge - This gauge is located on the oil reservoir and indicates the oil level. See "Oil Level Gauge", Figure 5-4, page 36, for how to read oil level.

Minimum Discharge Pressure/Check Valve - An internal spring-loaded minimum pressure valve is used in the final discharge line to provide a positive pressure on the coolant system of the compressor even if the air service valve is fully open to atmospheric pressure. This valve also functions as a check valve to prevent back flow of air from the shop air line when the unit stops, unloads, or is shut down.

The valve incorporates an orifice which, when air is flowing through it, maintains pressure in the oil reservoir. A spring-loaded piston valve senses air pressure on the upstream (reservoir) side of the valve. When the system pressure rises, the spring is overridden and the valve opens to full porting.

Inlet Valve (Figure 4-1, page 20) **-** The Inlet valve is a pilot-actuated valve that restricts the inlet to control capacity and closes to unload the compressor. At shutdown, the inlet valve closes to function as a check valve and prevent back flow of air.

As control pressure is increased the valve will begin to close, restricting the inlet and reducing compressor capacity. Approximately 18 psig (1.2 bar) of control pressure is required to close the inlet valve completely. When closed, the inlet valve prevents the flow of air in either direction. With standard modulating control feature: when the control pressure is less than 18 psig (1.2 bar), the inlet valve will modulate to match compressor capacity to system demand.

Magnetic Unloader Solenoid Valve (Figure 4-1, page 20) **-** This valve controls the position of the inlet valve in response to signals from the "AutoSentry". When de-energized, pressure is relieved from the top of the inlet valve cylinder to unload the compressor. When the solenoid valve is energized, reservoir pressure is supplied to the top of the cylinder to load the compressor.

Check Valve (Figure 4-1, page 20) **-** This valve is normally closed while the compressor is loaded or stopped. While running unloaded, it opens to admit a small amount of purge air to the compressor inlet. This reduces compressor knock, and provides enough air to pressurize the controls during startup.

Blowdown Valve (Figure 4-1, page 20) **-** The blowdown valve is a two-way solenoid valve which is piped into the oil reservoir outlet ahead of the minimum pressure valve. When the solenoid is de-energized, the valve opens and the coolant system is blown down. When the solenoid is energized, the valve closes to allow the coolant system to pressurize.

System Pressure Transducer (Figure 4-1, page 20) **-** This transducer is connected after the minimum pressure valve. It converts the pressure in the plant air system into an electrical signal for use by the "AutoSentry" controller for modulation and control.

Reservoir Pressure Transducer (Figure 4-1, page 20) **-** This transducer is connected to the coolant system. Its signal is used to prevent loaded starts, monitor oil pressure, and to monitor the condition of the separator.

Air Filter Vacuum Switch (Figure 4-1, page 20) **-** This switch is used to monitor air filter condition and alert the user if the filter requires service or replacement.

Subtractive Pilot (Figure 4-1, page 20) - Used to control the inlet valve for modulation. See page 25, for more details.

Purge Valve (Figure 4-1, page 20) – The purge valve is a normally closed two-way air actuated valve that admits purge air from the final discharge manifold to the compressor to counteract the oil knock that occurs in oil-flooded rotary screw compressors when they are completely unloaded with pressure in the oil reservoir. This valve is controlled by the same control pressure which controls the inlet valve.

CAUTION

Machine damage will occur if compressor is repeatedly restarted after any one of the shutdown modes stops operation of the unit. Find and correct the malfunction before resuming operation.

Discharge Thermistor (Figure 4-1, page 20) **-** This sensor is located directly in the compressor discharge. Its signal is used to monitor compressor temperature and shut down the compressor if a coolant problem is detected.

Reservoir Thermistor (Figure 4-1, page 20) **-** This sensor is located in the reservoir/separator housing and is used to monitor temperature and shut down the compressor if temperature problems occur at the separator.

Emergency Stop Pushbutton - This is a maintained pushbutton, and removes power from the controller outputs regardless of controller status. It is located on the upper section of the control box door, next to the keypad. This should be used for emergency purposes only - use the keypad [STOP/RESET] for normal controlled stopping.

WARNING

Automatic restarting or electrical shock can cause injury or death. Open and lock main disconnect and any other circuits before servicing unit.

Control Transformer - This changes the incoming power voltage to 110-120 volts for use by all unit control devices. Two primary and one secondary fuse are provided. Refer to adjacent labeling for replacement information.

Terminal Strip - This provides connections for all 110-120 volt devices not contained within the enclosure.

Main Starter - This starter is used to provide control and overload protection for the main drive motor.

Standard full voltage starters employ a single contactor and overload protection for each motor. Overload heaters should be selected and adjusted based on the motor nameplate amps and the instructions located inside the control box door.

Changing Minimum Pressure/Check Valve Seals

DANGER

Air/oil pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters.

DANGER

Compressor, air/oil reservoir, separation chamber and all piping and tubing may be at high temperature during and after operation.

DANGER

Always stop the unit and release the air pressure before servicing the minimum pressure/check valve. Failure to release the pressure may result in personal injury or death.

1. Be certain the unit is off and that no air pressure is in the air/oil reservoir.
2. Close the air service valve, supplied by others, located downstream of the package.
3. Disconnect, tag and lockout the unit from the power supply.
4. Remove tubing and fittings from top (center) of the minimum pressure/check valve.
5. Install bolt (located on side of minimum pressure/check valve housing, Figure 4-1, page 20) in top (center) of minimum pressure check valve. This keeps the internal parts from falling out when the cover is removed from the air/oil separator housing.
6. Remove the pressure from the line, downstream of the minimum pressure check valve.
7. Remove the 4 bolts holding the minimum pressure/check valve to the air/oil separator housing.
8. Remove the minimum pressure/check valve (air/oil separator housing) cover.
9. Remove the snap ring in the cover.
10. Remove the internal parts and replace the seals in the minimum pressure/check valve.
11. Re-assemble the valve, including the snap ring.
12. Clean the sealing surfaces on the air/oil separator housing and the minimum pressure/check valve.
13. Replace the o-ring between the minimum pressure/check valve and the air/oil separator housing.

14. Install the minimum pressure/check valve assembly and tighten the bolts alternately for even tightness.

15. Remove bolt installed in Step 5.

16. Open the air service valve.

17. Run the unit and check for leaks.

⚠ WARNING

Closing the air service valve on start-up or prior to shutdown will cause rapid cycling and could cause a high pressure shutdown.

Subtractive Pilot – (Modulating Feature) – The subtractive pilot is an adjustable, spring-loaded diaphragm valve that controls pressure in relation to the upstream (discharge) pressure.

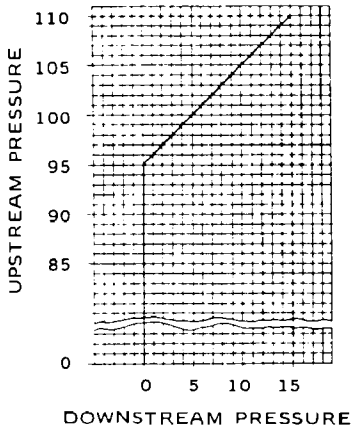


Figure 4-3 – PRESSURE CHART

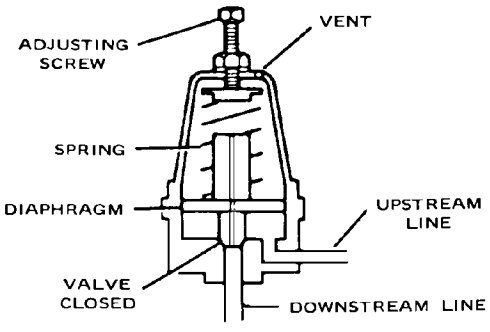


Figure 4-4 – SUBTRACTIVE PILOT (CLOSED)

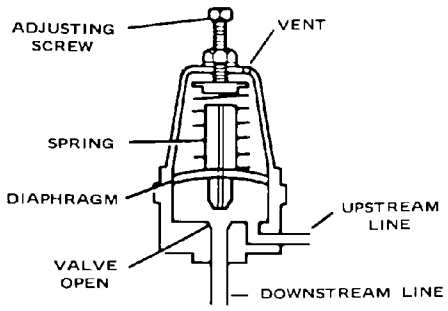


Figure 4-5 – SUBTRACTIVE PILOT (OPENED)

The downstream pressure is maintained equal to the upstream pressure minus a constant which is adjustable. In the example shown in Figure 4-3, page 25, the downstream pressure equals the upstream pressure minus 95 psi (6.6 bar). When the upstream pressure rises to 100 psig (6.9 bar), the downstream pressure rises to 5 psig (.3 bar). This 1 to 1 psi (bar) rise is constant above the set point.

Below the set point, the valve seat is closed and the downstream pressure is vented. In the example of, Figure 4-3, page 25, downstream pressure is vented below 95 psig (6.6 bar)

Figure 4-4, page 25, shows a schematic cross section of the subtractive pilot with the valve seat closed and downstream line vented.

Figure 4-5, page 26, shows the pilot with valve seat open, holding a downstream pressure which is adjustable with the screw. In this position it is normal for the valve to continually bleed air through the small vent hole in the bowl.

Moisture, oil and dirt in the control system lines and components can cause the set point of the subtractive pilot to shift or be erratic. The subtractive pilot can be disassembled and the diaphragm and ports cleaned when necessary.

Operating Air Pressure Adjustment – The "AutoSentry" controller load and unload pressure set points should already be programmed. See Control Manual 13-8-623.

⚠ WARNING

Operation at excessive discharge air pressure can cause personal injury or damage to equipment. Do not set unload pressure above the maximum stamped on the unit nameplate.

To adjust the subtractive pilot:

1. With the unit off, loosen the locknut and back out the adjusting screw several turns so the subtractive pilot will fully unload the compressor before the unload pressure set point of the microprocessor controller is reached.

2. Close the air service valve and start the unit in the "RUN" mode. Allow unit to reach the pressure at which the subtractive pilot fully unloads the compressor.

3. Turn-in the adjusting screw until the unload pressure set point is reached and the microprocessor controller allows the unit to blow down.

4. Turn-in the adjusting screw and additional one eighth (1/8) turn and tighten the locknut. As a result, the subtractive pilot will not fully unload the compressor before the microprocessor controller's unload pressure set point is reached.

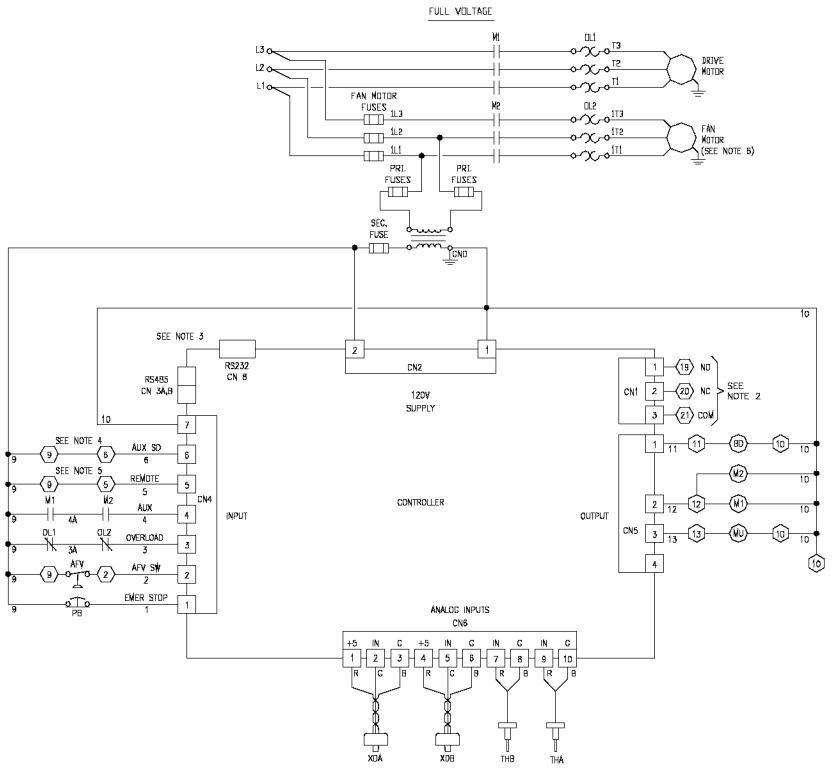
5. Using the air service valve, cycle the unit between load and unload several times to be certain that the unit will reach the microprocessor controller's unload pressure set point and blow down.

NAMEPLATE FULL LOAD OPERATING PRESSURE	CONTROL SYSTEM PRESSURE	
	LOAD	UNLOAD
100 PSIG (6.9 bar)	100 PSIG (6.9 bar)	108 PSIG (7.5 bar)
125 PSIG (8.6 bar)	125 PSIG (8.6 bar)	133 PSIG (9.2 bar)
150 PSIG (10.4 bar) *	150 PSIG (10.4 bar)	158 PSIG (10.9 bar)
175 PSIG (12.1 bar) *	167 PSIG (11.5 bar)	175 PSIG (12.1 bar)

* 75 HP ONLY

Figure 4-6 – MAXIMUM SET POINTS FOR AUTOSENTRY RS2000 CONTROLLER

NOTICE
Load set point cannot be set within 8 psi (.6 bar) of the unload set point. Minimum operating pressure is 60 to 65 psig (4.1 to 4.5 bar)



300EFE546-B
(Ref. Drawing)
Page 1 of 2

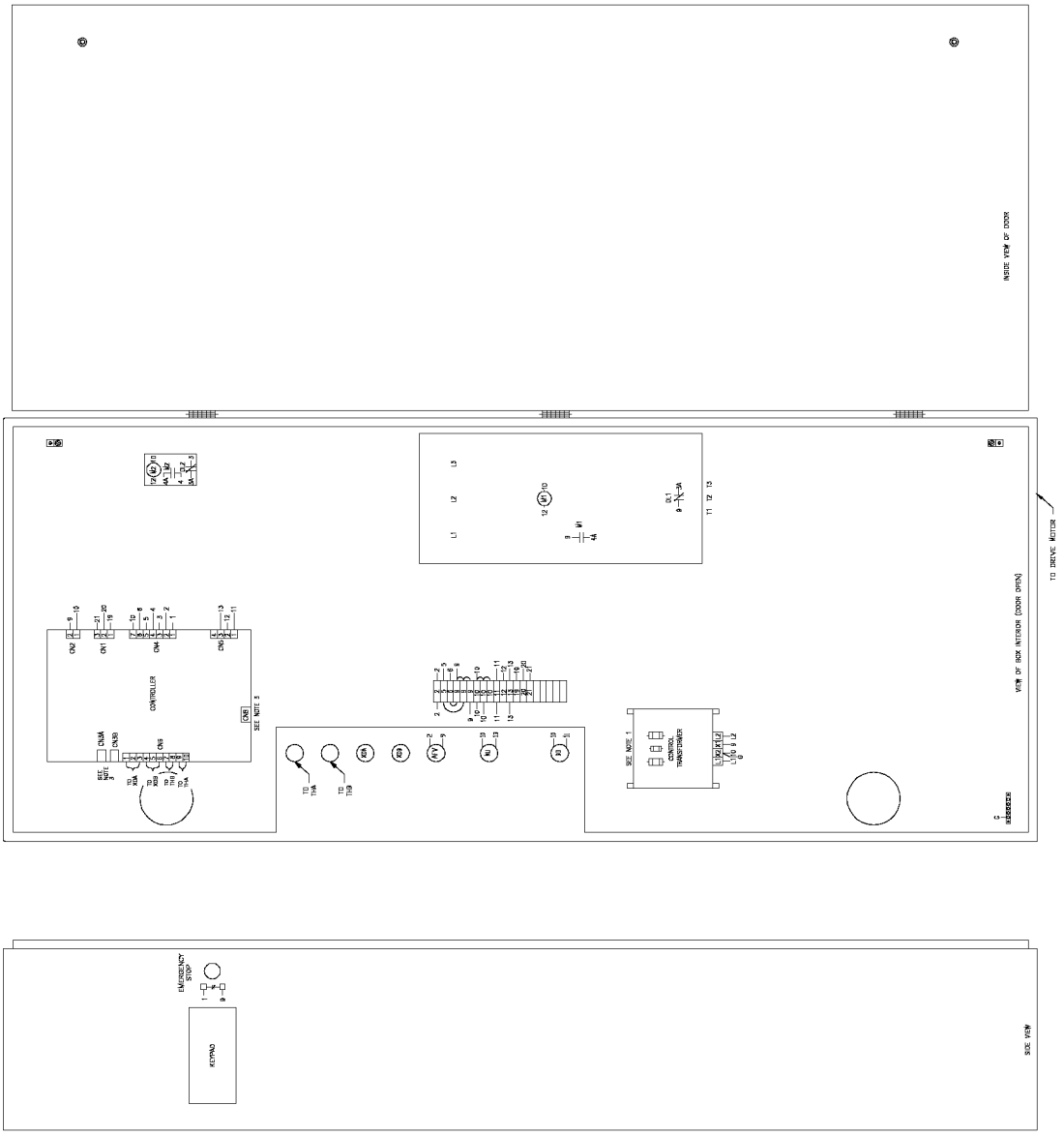
NOTE 1: REFER TO CONTROL TRANSFORMER DECAL FOR WIRING CONNECTIONS.
NOTE 2: FORM C CONTACT FOR USE BY OTHERS. CONTACT OPERATES FOLLOWING COMPRESSOR SHUTDOWN. RATING: 120VAC, 2 AMP.
NOTE 3: CN3A, CN3B AND CN8 ARE FOR USE OF OPTIONAL COMMUNICATIONS CABLE.
NOTE 4: FOR USE WITH OPTIONAL SHUTDOWN SWITCH, REMOVE JUMPER BETWEEN TERMINALS 6 & 9. CONNECT N.C. SWITCH CONTACT TO TERMINALS 6 & 9.
NOTE 5: FOR CONTROL BY REMOTE CONTACT, REMOVE JUMPER BETWEEN TERMINALS 5 & 9. CONNECT CONTACT TO TERMINALS 5 & 9.
NOTE 6: FAN MOTOR IS NOT USED ON WATERCOOLED UNITS WITHOUT ENCLOSURE. UNITS WITHOUT FAN HAVE NO CONNECTION TO 1T1, 1T2, & 1T3.
NOTE 7: WHEN A MAGNETIC WATER VALVE IS USED, CONNECT TO TERMINALS 12 & 10. VALVE COIL IS 120 VOLTS. NOT TO EXCEED 80VA

LEGEND:
AFV – AIR FILTER VACUUM SWITCH
BD – BLOWDOWN VALVE
THA – COMPRESSOR DISCHARGE THERMISTOR
THB – SEPARATOR THERMISTOR
XDA – SYSTEM PRESSURE TRANSDUCER
XDB – RESERVOIR PRESSURE TRANSDUCER
MU – MAGNETIC UNLOADER
– CONNECTION TO CONTROL BOARD
– PANEL TERMINAL BLOCK

MAIN MOTOR	FV STARTER
FAN MOTOR	AIR/WATER COOLED
CONTROLLER	RS 2000
ACCESSORY	NONE

Figure 4-7 – WIRING DIAGRAM

300EFE546-B
(Ref. Drawing)
Page 2 of 2



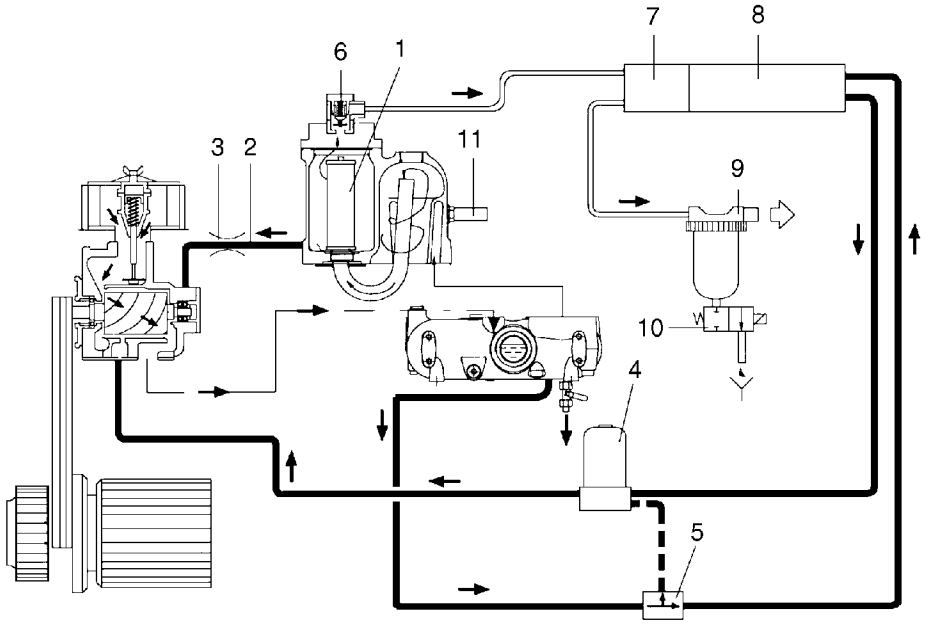
SECTION 5
LUBRICATION
OIL COOLER, OIL FILTER & SEPARATOR

COMPRESSOR OIL SYSTEM (Figure 5-1) The compressor oil system cools the compressor, lubricates moving parts and seals internal clearances in the compression chamber.

Air pressure in the oil reservoir forces oil through the oil cooler, thermostatic mixing valve, oil filter and into the compressor main oil gallery.

The oil passes through internal passages for lubrication, cooling and sealing. The air-oil mixture is then discharged to the oil reservoir where a large part of the entrained oil drops out of the air stream. The remaining mixture then passes through the final oil separator where most of the remaining oil is removed. The air then passes to the aftercooler. The oil separated from the air is sent to the oil cooler and recirculated throughout the system. Oil separated at the air/oil separator is sent via an oil return line through an orifice and back into the compressor.

RECOMMENDED LUBRICANT - Gardner Denver compressors are factory filled with AEON lubricants. These lubricants are formulated to the highest quality standards and are factory authorized, tested and approved for use in rotary screw compressors. AEON lubricants are available through your authorized Gardner Denver compressor distributor.



Ref. No.	Description
1	Air/oil Separators
2	Oil Scavenge Line
3	Orifice
4	Oil Filter
5	Thermostatic Mixing Valve
6	Minimum Pressure/Check Valve
7	Aftercooler
8	Oil Cooler
9	Moisture Separator
10	Electronic Drain
11	Pressure Relief Valve

Figure 5-1 – FLOW DIAGRAM

OIL SPECIFICATIONS - The recommended compressor lubricant is Gardner Denver AEON 4000 Lubricating Coolant which can be used for year-round operation except as noted in the "High Temperature Operation" paragraph, page 31, or low temperature, see "Installation for Cold Weather Operation," page 10. AEON 4000 Lubricating Coolant is a superior petroleum base lubricant formulated and containing additives for use in Gardner Denver compressors.

CAUTION

Specific AEON™ lubricants are recommended for use in this equipment. Other lubricants may cause excessive carryover or compressor damage. Do not mix different types of lubricants or use inferior lubricants. Check the decal on the oil reservoir for lubricating coolant specification.

HIGH TEMPERATURE OPERATION - If the discharge temperature is sustained between 200-210° F. for a period of more than four (4) hours due to continuing high ambient air temperature, use Gardner Denver AEON 9000SP Lubricating Coolant which is a superior synthetic lubricant. Short periods of up to four (4) hours of sustained discharge temperatures up to 210° F. do not require a change from the recommended year-round lubricant AEON 4000.

COLD AMBIENT OPERATION - See "Installation for Cold Weather Operation," page 10 and Figure 2-3, page 9.

PROCEDURE FOR CHECKING OIL LEVEL (Figure 5-4, page 36) - Check the oil level when the compressor is shutdown and the oil/air mixture has separated. The oil should be visible between the min. and max. range, shown in Figure 5-4, page 36. If the oil level is above the max. range, the oil must be drained. If the oil level is below the min. range, oil must be added.

ADDITION OF OIL BETWEEN CHANGES - Oil must be added when the oil level is below the min. range on the oil gauge. The oil must be checked with the machine shutdown, blowndown and the air/oil mixture settled out to air and oil.

DANGER

Air/oil under pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters.

DANGER

Compressor, air/oil reservoir, separation chamber and all piping and tubing may be at high temperature during and after operation.

CAUTION

Excessive oil carryover can damage equipment. Never fill oil reservoir above the max. range of the gauge.

To add oil, follow these steps:

1. Be sure the unit is completely off and that no air pressure is in the oil reservoir.

2. Disconnect, lockout and tagout the power supply to the starter.

3. Wipe away all dirt around the oil filler plug. It is located by the oil filter.

4. Remove the oil filler plug and add oil as required to return the oil level to the max. line on the site gauge.

5. Install the oil filler plug, run and check for leaks.

DO NOT OVERFILL. The quantity required to raise the oil level from the min. line to the max. line, (See Figure 5-4, page 36), is one (1) gallon (Figure 5-2, page 32). Repeated addition of oil between oil changes may indicate excessive oil carryover and should be investigated.

Use only CLEAN containers and funnels so no dirt enters the reservoir. Provide for clean storage of oils. Changing the oil will be of little benefit if done in a careless manner.

	60 to 75 HP (45 – 56 kW)
Refill Capacity For Normal Oil Change	8.00 U. S. Gallons (30 Liters)
Bottom of Site Glass to Top of Site Glass	1 U. S. Gallon (4 Liters)

Figure 5-2 – APPROXIMATE OIL SYSTEM CAPACITIES

OIL CHANGE INTERVAL - Recommended oil change intervals are based on oil temperature. Figure 5-3, shows how the change interval is affected by temperature.

When operating conditions are severe (very dusty, high humidity, etc.), it will be necessary to change the oil more frequently. Operating conditions and the appearance of the drained oil must be surveyed and the oil change intervals planned accordingly by the user. Gardner Denver offers a free oil analysis program with the AEON lubricants and we recommend a sample be sent in at 100 hours on a new unit.

Discharge Temperature	AEON™ 4000 Change Interval	AEON™ 9000SP Change Interval
Up to 180° F (82° C)	4000 hrs.	8000 hrs.
180° F to 190° F (82° C to 88° C)	3000 hrs.	6000 hrs.
190° F to 200° F (88° C to 93° C)	2000 hrs.	4000 hrs.
200° F+ (93° C)	1000 hrs.	2000 hrs.

Figure 5-3 – OIL CHANGE INTERVAL

DRAINING AND CLEANING OIL SYSTEM

DANGER

Air/oil under pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters.

Always drain the complete system. Draining when the oil is hot will help to prevent varnish deposits and carry away impurities.

To drain the system:

1. Be sure the unit is completely off and that no air pressure is in the air/oil reservoir.
2. Disconnect, lockout and tagout the power supply to the starter.
3. Stick the end of the drain tube into a suitable container, such as a 5 gallon pail.
4. Open the drain valve and allow oil to drain out of the air/oil reservoir.
5. Close the drain valve.

If the drained oil and/or the oil filter element are contaminated with dirt, flush the entire system: the reservoir, oil cooler and lines. Inspect the air/oil separator element for dirt accumulation; replace if necessary. If a varnish deposit exists, contact the factory for recommendations for removal of the deposit and prevention of varnish.

FILLING OIL RESERVOIR

DANGER

Air/oil under pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters.

DANGER

Compressor, air/oil reservoir, separation chamber and all piping and tubing may be at high temperature during and after operation.

1. Be sure the unit is completely off and that no air pressure is in the oil reservoir.
2. Disconnect, lockout and tagout the power supply to the starter.

3. Wipe away all dirt around the oil filler plug.

4. Remove the oil filler plug and add oil as required to return the oil level to the max. range on the oil gauge.

5. Install the oil filler plug and operate the unit for about a minute allowing oil to fill all areas of the system. Check for leaks.

6. Shut down unit, allowing the oil to settle, and be certain all pressure is relieved.

7. Add oil, if necessary, to bring level to the max. range on the oil level gauge (Figure 5-4, page 36).

DO NOT OVERFILL as oil carryover will result. The quantity of oil required to raise the oil level from the min. range to the max range on the site glass is shown in Figure 5-2, page 32. Repeated addition of oil between oil changes may indicate excessive oil carryover and should be investigated.

Use only CLEAN containers and funnels so no dirt enters the reservoir. Provide for clean storage of oils. Changing the oil will be of little benefit if done in a careless manner.

CAUTION

Excessive oil carryover can damage equipment. Never fill oil reservoir above the top of the site glass.

LUBRICANT UPGRADE PROCEDURE - Upgrading to a longer life lubricant is essentially a very worthwhile practice. The following are the primary steps to be completed when upgrading or changing the type of lubricant.

CAUTION

Improper equipment maintenance with use of synthetic lubricants will damage equipment. Oil filter and oil separator change intervals remain the same as for AEON 4000 -- See Maintenance Schedule, Page 47 .

DANGER

Air/oil under pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters.

WARNING

High temperature operation can cause damage to equipment or personal injury. Do not repeatedly restart the unit after high temperature stops operation. Find and correct the malfunction before resuming operation.

⚠ WARNING

All materials used in Gardner Denver® compressor units are compatible with AEON 9000SP Lubricating Coolant. Use caution when selecting downstream components such as air line lubricating bowls, gaskets and valve trim.

AEON 9000SP Synthetic Lubricant is not compatible with low nitrile Buna N or acrylic paints. AEON 9000SP is compatible with most air system downstream components.

1. Be sure the unit is completely off and that no air pressure is in the air/oil reservoir.

2. Disconnect, tag and lock out the power supply to the starter.

3. Thoroughly drain system:
   - Drain oil from airend and cooler while hot.
   - Break low point connections and drain oil from pipe runs.
   - Dump Oil from filter and reinstall used filter.

4. Fill system with a 50 percent charge of the new lubricant:
   - Start the machine and stay there to observe.
   - Allow the machine to run about five minutes at temperature, or until temperature stabilizes, then shut down

5. Thoroughly drain machine.

6. Change to a new filter and separator.

7. Fill system with a full charge of the new lubricant.

8. Machine should then be run normally; however, total run time after the initial changeouts should be 50 percent of normal anticipated service life of the new lubricant.
   - Drain all lubricant from system, change filter and separator, and replace with full charge of the new lubricant.

9. Subsequent lubricant changeouts should be at normal intervals. (See "Oil Change Interval" and chart, page 32.

Material Safety Data Sheets (MSDS) are available for all AEON lubricants from your authorized Gardner Denver distributor or by calling (901) 542-6100.

OIL LEVEL GAUGE (Figure 5-4) - The oil level gauge indicates the amount of oil in the air/oil reservoir. Read oil level only when the unit is shut down and the air/oil mixture has separated. Add oil only when the oil level is in the bottom red range, below the white range on the gauge (you must use a flashlight). Drain oil only when the oil level is in the upper red range above the white range on the gauge (you must use a flashlight).

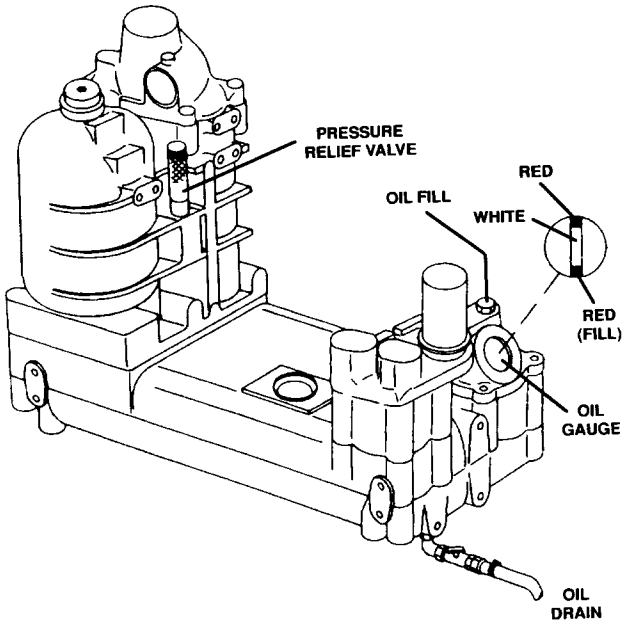


Figure 5-4 – OIL LEVEL GAUGE, OIL FILL AND OIL DRAIN

MOISTURE IN THE OIL SYSTEM - In normal humidity and with normal operating temperatures and pressures, the thermal mixing valve controls the oil temperature and prevents moisture contamination of the oil. Unusual cooling of the oil reservoir, short loaded cycle in high humidity or malfunctions of the thermal valve may result in moisture in the oil system which is detrimental to compressor lubrication and could cause oil carryover. If moisture is observed in the oil reservoir, drain the moisture and correct the condition causing the accumulation.

See “Compressor Oil System Check”, page 42 and “Thermal Control Valve", page 40.

COMPRESSOR OIL FILTER (Figure 1-2, page 2 and Figure 5-5, page 37) - This replaceable element filter is a vital part in maintaining a trouble-free compressor, since it removes dirt and abrasives from the circulated oil.

CAUTION

Improper oil filter maintenance will cause damage to equipment. Replace filter element every 1000 hours of operation. More frequent replacement could be required depending on operating conditions. A filter element left in service too long may damage equipment.

Use only the replacement element shown on the filter tag or refer to the parts list for the part number. Use the following procedure to replace the filter element. Do not disturb the piping.

DANGER

Air/oil under pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters.

DANGER

Compressor, air/oil reservoir, separation chamber and all piping and tubing may be at high temperature during and after operation.

1. Stop unit and be sure no air pressure is in the oil reservoir.
2. Disconnect, tag and lock out the power supply to the starter.
3. Remove the spin-on element.
4. Clean the gasket face of the filter body.
5. Coat the new element gasket with clean lubricant used in the unit.
6. Screw new element on filter body and tighten clockwise by hand 3/4 turn after contact. DO NOT OVERTIGHTEN ELEMENT.
7. Reset the filter life setting to 1000 hours, see "Maintenance Adjustments" in Controller Operating and Service Manual.
8. Run the unit and check for leaks.

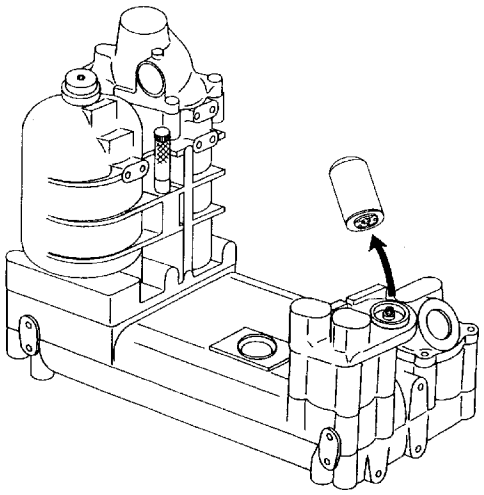


Figure 5-5 – OIL FILTER

COMPRESSOR OIL COOLER - RADIATOR TYPE (Figure 1-2, page 2) - The oil cooler motor and fan is mounted on the oil cooler module; air is exhausted through the oil cooler and away from the unit. Do not obstruct air flow to and from the oil cooler. Allow a minimum of three (3) feet clearance around the cooler. Keep both faces of cooler core clean for efficient cooling of compressor oil.

DANGER

Compressor, air/oil reservoir, separation chamber and all piping and tubing may be at high temperature during and after operation.

COMPRESSOR OIL COOLER - WATER-COOLED HEAT EXCHANGER - The heat exchanger oil cooler is a multiple pass type, with water in the tubes and oil in the shell. The oil temperature is controlled by the thermal (thermostatic mixing) valve. The optional water control valve may be used to conserve water.

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It is mandatory that any water-cooled unit be installed in a shelter heated to temperatures above freezing (32° F, 0° C).

Oil cooler malfunction may be traced by checking pressure at oil inlet and outlet. At normal operating air service pressure (65 psig to 150 psig, 4.5 bar to 10.3 bar) with the unit warm, a pressure drop of 3 psi to 15 psi (.2 bar to 1 bar) can be expected between the oil inlet and the oil outlet.

Water pressure drop from water inlet to outlet will vary with the inlet pressure and amount of water flowing. A normal pressure drop may range from 5 psi to 10 psi (.3 bar to .7 bar). Any change in the pressure drop from that normally held may indicate tube leakage or fouling and should be investigated.

In many instances, the cooling water supply for the heat exchanger will contain impurities in solution and/or suspension. These substances can cause scale formation, corrosion and plugging of any water-cooled heat exchanger equipment. Disregarding the possibility that one or more of these conditions exist may result in increased maintenance and operation expense, reduced equipment life and emergency shutdown. It is strongly recommended that a reputable, local water treatment concern be engaged to establish the corrosion, scale forming and fouling tendency of the cooling water and take steps necessary to remedy the situation if a problem does exist. The need for water treatment may involve only filtration (screening) to remove debris, sand and/or salt in the cooling water supply. However, chemical treatment methods may be necessary in certain instances to inhibit corrosion and/or remove dissolved solids, to alter the water's tendency to form scale deposits, or prevent the growth of microorganisms. The normal maintenance program for the unit should also include periodic cleaning of the tubes (water side) of the heat exchanger to remove deposits which enhance fouling and corrosion.

Hex head zinc anodes are used in the return bonnet (opposite end to the water pipe connections) of heat exchangers to provide internal water system corrosion protection. These anodes should be inspected periodically and replaced when the zinc has been reduced to about 1/2 inch (13mm) in length.

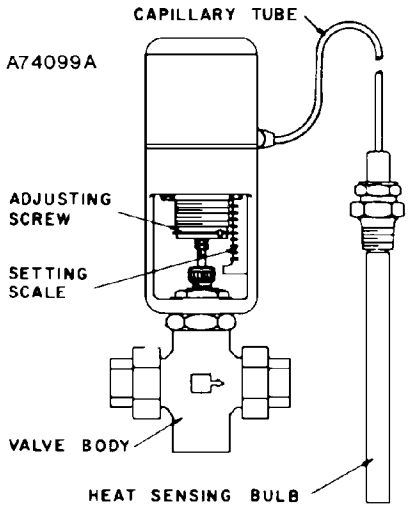

Figure 5-6 – WATER CONTROL VALVE

WATER FLOW CONTROL VALVE FOR HEAT EXCHANGER (Optional Equipment) (Figure 5-6) - The water flow control valve is adjustable to compensate for varying water inlet temperatures and pressures and is to be mounted in the water outlet line after the oil cooler (Figure 2-6, page 13, and Figure 2-7, page 14). Use the compressor discharge air temperature gauge on the instrument panel in setting the flow control valve. The compressor discharge temperature must be maintained a minimum of 10° F (5° C) above the dew point temperature at the maximum anticipated ambient; refer to Figure 5-7, for the dew point temperature at the operating pressure and ambient temperature of the application.

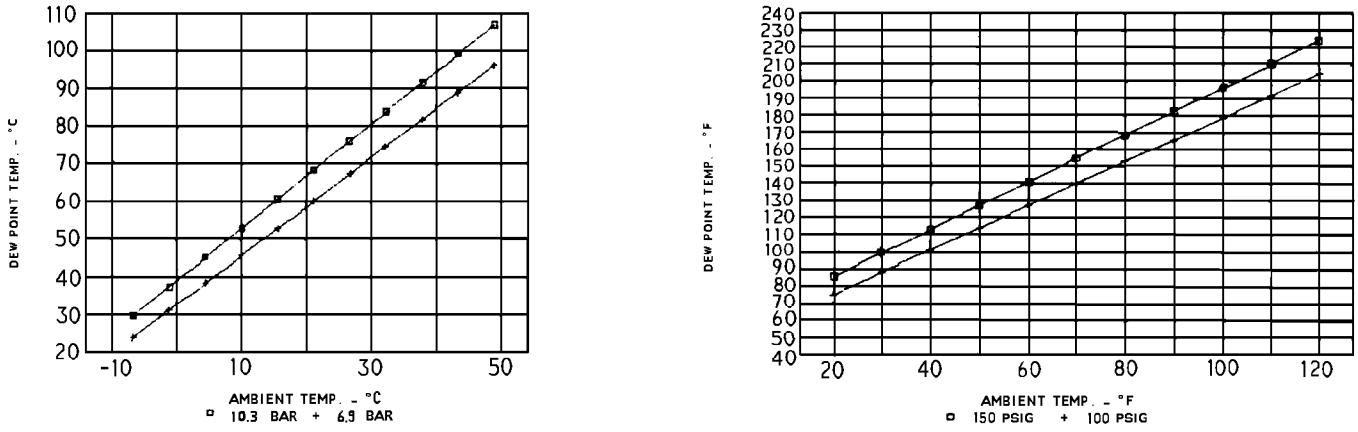

Figure 5-7 – DEW POINT TEMPERATURE VS. AMBIENT TEMPERATURE (100% RELATIVE HUMIDITY)

To decrease water flow (increase compressor discharge air temperature) turn the adjusting screw from left to right, increasing spring tension. **To increase water flow** (decrease compressor discharge air temperature) turn the adjusting screw in the opposite direction. The groove at the lower edge of the adjusting screw is an index line for use with the index scale 0 to 8 in obtaining a desired setting.

These valves must be handled with care and proper tools and techniques must be used when working on the valve.

Care must be used when handling the capillary tube; a kink or break in the tubing or connections will make the valve inoperative. Never attempt to change capillary length. Excess capillary tube should be carefully coiled and placed so that damage will not occur in normal maintenance or traffic past the unit.

If a leak develops through the packing, tighten the packing gland nut firmly with a wrench to reseat the packing around the valve stem, then back off the nut until loose, and finally retighten the nut finger tight. Tightening the packing nut too tight may cause erratic operation. An occasional drop of oil on the valve stem at the packing nut will prolong packing life.

If valve malfunctions, check for bent or binding, paint or corrosion on valve stem, foreign material in valve, erosion, or thermal system (capillary) failure. If foreign material or scale is likely, the use of a strainer in the inlet water line is recommended.

WATER SHUTOFF VALVE - WATER-COOLED HEAT EXCHANGER (Optional Equipment) (Figure 2-6, page 13 and Figure 2-7, page 14) - A magnetic solenoid-operated water shutoff valve rated at 150 psig (10.3 bar) water pressure should be mounted in the water outlet line after the oil cooler. The valve should be wired into the compressor control circuit so that the valve opens to allow water to flow any time the compressor is running. When compressor stops under automatic control, or is shut off manually, the valve should close, stopping water flow through the system. See Wiring Diagrams in Section 4.

THERMAL CONTROL (THERMOSTATIC MIXING) VALVE (Figure 5-1 page 30) - is installed in the system. This valve is used to control the temperature of the oil. On start-up with unit cold, the element is open to bypass, allowing oil to pass directly from the reservoir to the compressor during warm-up. As oil warms, the element gradually closes to the bypass allowing more of the oil from the cooler to mix with oil from the bypass.

After the unit is warmed up, the mixing valve maintains oil injection temperature into the compressor at a minimum of 150° F (66° C). This system provides proper compressor warm-up and prevents moisture contamination of the oil.

To check the element, heat it in oil - it should be fully extended at 150° F (66° C). If the unit shuts down due to high air discharge temperature, the cause may be that the element is stuck open to the bypass. When flushing the oil system, remove the mixing valve and clean all parts thoroughly.

OIL RESERVOIR - The oil reservoir-separator combines multiple functions into one vessel. The lower half is the oil reservoir, providing oil storage capacity for the system and the top portion, a primary oil separation means. The reservoir also provides limited air storage for control and gauge actuation.

COMPRESSOR AIR/OIL SEPARATOR (Figure 5-8, page 43) - Located in a separate housing, consists of two (2) renewable cartridge-type separator element and provides the final removal of oil from the air stream.

Oil impinging on the inside of the separator element drains directly back into the oil reservoir by gravity. Oil collected outside the element is returned through tubing to the compressor cylinder.

Oil carryover through the service lines may be caused by a faulty oil separator, overfilling of the oil reservoir, oil that foams, oil return line malfunction, or water condensate in the oil. If oil carryover occurs, inspect the separator only after it is determined that the oil level is not too high, the oil is not foaming excessively, the oil return tube from the bottom of the separator to the compressor cylinder is not clogged or pinched off, the check valve in the oil return is functioning properly, and there is not water or an oil/water emulsion in the oil.

Oil carryover malfunctions of the oil separator are usually due to using elements too long, heavy dirt or varnish deposits caused by inadequate air filter service, use of improper oil, or using oil too long for existing conditions. Excessive tilt angle of the unit will also hamper separation and cause oil carryover.

Oil separator element life cannot be predicted; it will vary greatly depending on the conditions of operation, the quality of the oil used and the maintenance of the oil and air filters. The condition of the separator can be determined by pressure differential or by inspection.

Pressure Differential Gauging – The "CHANGE SEPARATOR" advisory will flash when the pressure differential across the oil separator reaches approximately 8 PSID (.55 Bar). Replace the oil separator element at this time. If ignored, the unit will shutdown and the advisory will illuminate steadily when the pressure differential reaches 15 PSID (1 Bar).

CAUTION

Using an oil separator element at excessive pressure differential can cause damage to equipment. Replace the separator when the differential pressure is greater than 8 psi or every 4,000 hours (at least once a year).

NOTICE

A sudden drop of zero pressure differential or sudden heavy oil carryover may indicate a ruptured element.

Inspection - After removal of separator element, shine a light inside the element to reveal areas of heavy dirt or varnish deposits or breaks (ruptures) in element media.

Removal of Oil Separator For Inspection or Replacement: (Figure 5-8, page 43)

DANGER

Air/oil under pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters.

DANGER

Compressor, air/oil reservoir, separation chamber and all piping and tubing may be at high temperature during and after operation.

1. Be certain the unit is off and that no air pressure is in the oil reservoir. The compressor package will automatically blowdown in about 2 minutes.

2. Close the air service valve located after the compressor package discharge.

3. Disconnect, lockout and tagout the power supply to the starter.

4. Remove the control lines from the minimum pressure/check valve. Install the bolt, located on the side of the minimum pressure/check valve Figure 4-1, page 20, into the top of the minimum pressure/check valve. This keeps the internal parts from falling out when the cover is removed from the air/oil separator housing.

5. Remove the minimum pressure/check valve, see Item 1, Figure 5-8, page 43 (air/oil separator housing) cover.

6. Lift out the air/oil separator element. See Item 2, Figure 5-8, page 43.

7. Inspect and/or replace the separator as necessary.

8. Clean the sealing surfaces on the air/oil separator and the minimum pressure/check valve.

9. Clean the orifice, Item 3, Figure 5-8, page 43, in the oil return line, the strainer, Item 4, Figure 5-8, page 43, in the oil return line, and if necessary, the air/oil separator housing.

10. Grease the O-Ring on the separator element and install the separator into the housing.

11. Replace the O-Ring, Item 5, Figure 5-8, page 43, between the minimum pressure/check valve and the air/oil separator housing.

12. Replace the sealing kit in the minimum pressure/check valve. See "Changing Minimum Pressure/Check Valve Seals", Section 4, page 24

13. Install the minimum pressure/check valve assembly and tighten the bolts alternately for even tightness.

14. Remove the bolt installed in Step 4 from the top of the minimum pressure/check valve assembly.

15. Open the air service valve.

16. Run the unit and check for leaks.

COMPRESSOR OIL SYSTEM CHECK - The following readings are based on ambient temperature of 80° F (27° C) with the system in good condition. The compressor should be at operating temperature at the time of the checks. One-half hour of loaded operation is usually sufficient to reach level-out operating temperatures.

Air and Oil Discharge Temperature - 160° F to 180° F (71°C to 82° C) - Check with a thermometer at the discharge housing.

Compressor Oil Inlet Temperature - 150° F to 165° F (66° C to 74° C) - Install a tee at the oil filter outlet and check with a thermometer.

Oil Inlet Pressure - Check at the fitting in the line near the compressor oil inlet. With air receiver pressure at 100 psi (6.9 Bar), oil inlet pressure should be 80 to 90 psig (5.5 to 6.2 Bar).

Oil Cooler Oil Pressure Differential (Air-Cooled Radiator) - Check differential across the oil system by measuring oil inlet pressure as described above.

Oil Cooler Temperature Differential (Air-Cooled Radiator) - The oil temperature differential depends on the temperature of the air at the oil cooler fan and cleanliness of the core faces. As ambient temperatures and core restrictions increase, the oil cooler outlet temperature will increase. The oil inlet temperature is approximately the same as the air discharge temperature.

Ref. No.	Description
1	Minimum Pressure/Check Valve
2	Air/Oil Separator Element
3	Oil Scavenge Line Orifices
4	Oil Scavenge Line Strainer
5	O-Ring
6	Minimum Pressure/Check Valve Adjusting Nut

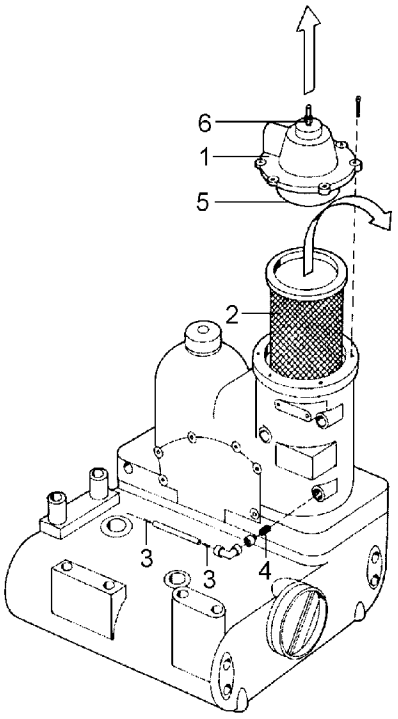

Figure 5-8 – OIL SEPARATOR

SECTION 6
AIR FILTER

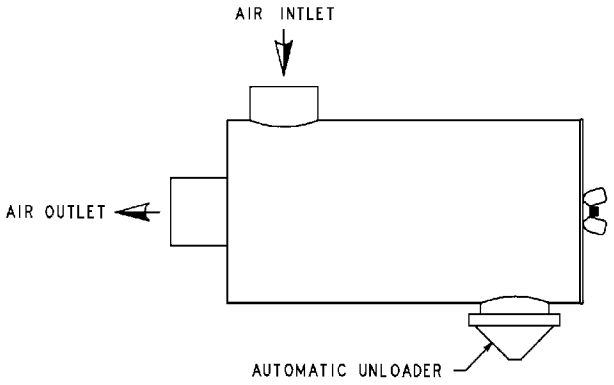

Figure 6-1 – AIR FILTER

HEAVY-DUTY AIR FILTER (Figure 6-1) furnished as standard equipment on units with an enclosure is a heavy-duty washable element dry type air filter. The air filter must receive proper maintenance if maximum service is to be obtained from the unit. Establishing adequate and timely filter service is MOST IMPORTANT. An improperly maintained air filter can cause a loss of compressor air delivery.

Filter Element - Service the air filter element when the "CHANGE AIR FILTER" LED is illuminated. Clean every 50 to 150 operating hours depending on dust conditions.

NOTICE
Use only genuine Gardner Denver air filter elements on Gardner Denver compressor units. Genuine parts are available through your authorized Gardner Denver distributor.

To service:

1. Remove the wingnuts and pull out the filter element.

2. Visually inspect the element. If cleaning is not necessary, reinstall the filter element. If the element requires cleaning, follow steps 3, 4 and 5.

3. Wash the element by soaking about 15 minutes in warm water with a mild non-sudsing detergent. Rinse the element thoroughly with clean water; a hose may be used if the water pressure does not exceed 40 psig (2.8 bar).

4. Inspect the element for ruptures or cracks in the pleated media; replace the element if any are found. Inspect the gasket on the bottom (outlet end) of the element; replace the entire element if the gasket is damaged. A spare element will keep down time to a minimum.

5. Allow the element to air dry COMPLETELY. Do not expose the element to heat over 150° F (66° C). Install the element in the filter body and fasten securely with the wing nut.

⚠ WARNING
Do not oil this element. Do not wash in inflammable cleaning fluids. Do not use solvents other than water. Improper cleaning may damage the element.

NOTICE
Never operate the unit without the element. Never use elements that are damaged, ruptured or wet. Never use gaskets that won't seal. Keep spare elements and gaskets on hand to reduce downtime. Store elements in a protected area free from damage, dirt and moisture. Handle all parts with care.

Filter Element Life - The element should be replaced after six (6) cleanings or if:

1. Visual inspection indicates a rupture, crack or pin hole in the pleated media. Inspection should be done by placing a bright light inside the element.

2. Pressure drop through a filter with a freshly cleaned element is below three (3) inches (76 mm) of water with the compressor running at full load - this would indicate a rupture or crack.

Inlet Tube - Inspect the inlet screen and tube for dirt accumulation each time the filter is serviced. Clean the tube when required by ramming a clean dry cloth through the tube. Wipe the inside of the filter body to remove any dirt falling from the inlet tube before reinstalling the element.

Causes of short element life include: severe dust conditions, infrequent servicing, improper cleaning, or contamination by oil or chemical fumes.

SECTION 7
COUPLING

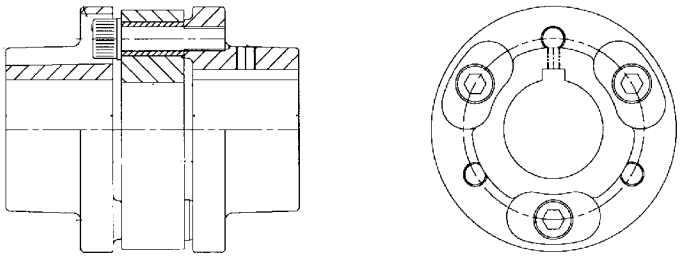

Figure 7-1 – INSTALLATION OF COUPLING CUSHIONS

⚠ DANGER
Rotating machinery can cause personal injury or death. Turn the unit completely off, open the main disconnect, lockout and tagout before servicing the coupling.

COUPLING - The motor and compressor are direct connected by a resilient type flexible coupling with several individual cushions. The coupling does not require lubrication.

If maintenance on mating parts is requires, reassemble coupling as follows:

Single Element Design (Figure 7-1)

1. Slide coupling halves over shaft extensions. Lock compressor half (half with element pre-bolted to it) down with set screw.
2. Assemble the motor to the compressor.
3. Working through the coupling guard opening, slide motor half (half with pins) into compressor half.
4. Check to see if element is centered between shaft ends. If element is centered, lock all set screws to 50 ft-lbs. If element is not centered, unlock set screws and slide coupling to center element between shaft ends and then lock all set screws to 50 ft-lbs.

⚠ DANGER
Rotating machinery can cause personal injury or death. Do not operate unit with either the coupling guard or the collar removed. All bolts and screws must be properly tightened.

Alignment - The coupling is permanently aligned by the flanges on the compressor and motor.

SECTION 8
MAINTENANCE SCHEDULE

SERVICE CHECK LIST –

Air Filter - Operating conditions determine frequency of service. See "Air Filter," SECTION 6, page 44.

Motor Lubrication - Refer to SECTION 2, page 15.

Every 8 Hours Operation

1. Check the reservoir oil level - add oil if required. See SECTION 5, page 30. If oil consumption is high, refer to "Excessive Oil Consumption," page 50.

2. Observe if the unit loads and unloads properly.

3. Check discharge pressure and temperature.

Every 125 Hours Operation

1. Check for dirt accumulation on oil/aftercooler core faces and the cooling fan. If cleaning is required, clean the exterior fin surfaces of the cores by blowing compressed air carrying a nonflammable safety solvent in a direction opposite that of the cooling fan air flow. This cleaning operation will keep the exterior cooling surfaces clean and ensure effective heat dissipation.

Every 1000 Hours Operation

1. Change oil filter element.

Every 4000 Hours Operation

1. Change the compressor lubricant. UNDER ADVERSE CONDITIONS, CHANGE MORE FREQUENTLY (refer to "Oil Change Interval", Figure 5-3, page 32). Flush system if required.

Every Year

1. Check the relief valve for proper operation. See Section 4, page 20.

2. Change oil separator, see "Removal of Oil Separator for Inspection or Replacment", Section 5, page 30, for further details (or when 8 psid pressure differential across the element).

MAINTENANCE SCHEDULE (See Detail Notes above)

Maintenance Action	As Indicated by AutoSentry Controller	Every 8 Hours	Every 125 Hours	Every 1000 Hours	Every 4000 Hours	Every Year
Check/Change Air Filter	•					
Change Oil Separator	•					•
Check Reservoir Oil Level **		•				
Check for Proper Load/Unload		•				
Check Dirt Accumulation on Cooler			•			
Change Oil Filter Element & Clean Oil Return Strainer				•		
Change Compressor Lubricant (AEON 4000) *					•	
Check Relief Valve						•
Check Condition of Hoses					•	•
Check Operation of Condensate Removal Solenoid Valve		•				

* See “Oil Change Interval Chart”, Figure 5-3, page 32, for specific lubricant life.

** Must be checked when the compressor is stopped and the air/oil mixture is separated.

SECTION 9
TROUBLESHOOTING

SYMPTOM		POSSIBLE CAUSE		REMEDY
Compressor fails to start	1.	Wrong lead connections.	1.	Change leads.
	2.	Blown fuses in control box.	2.	Replace fuse.
	3.	Motor starter overload heaters tripped .	3.	Reset and investigate cause of overload.
	4.	Pressure in reservoir.	4.	Inspect blowdown valve.
	5.	Read error message on control panel.	5.	Take appropriate action. See Manual 13-8-623.
	6.	Remote contact is open.	6.	Replace switch or jumper.
Compressor starts but stops after a short time	1.	High discharge temperature.	1.	See "High Discharge Air Temperature," this section.
	2.	High discharge compressor temperature switch malfunction.	2.	See "High Discharge Air Temperature", this section.
	3.	Blown fuse in starter/ control box.	3.	Replace fuse (investigate if fuses continue to blow).
	4.	Motor starter overload heaters trip.	4.	Reset and investigate cause of overload.
Compressor does not unload (or load)	1.	Improperly adjusted control.	1.	Refer to SECTION 4, page 20 and Manual 13-8-623 and adjust control.
	2.	Air leak in control lines.	2.	Determine source of leak and correct.
	3.	Restricted control line.	3.	Clean control lines.
	4.	Faulty inlet valve solenoid.	4	Replace solenoid valve.
	5.	Blowdown valve malfunction.	5.	Repair, clean or replace valve.
Compressor cycles from load to unload excessively	1.	Insufficient receiver capacity.	1.	Increase receiver size.
	2.	Restriction in service piping.	2.	Inspect and clean service piping.
	3.	Restriction in control tubing.	3.	Inspect and clean control tubing.
	4.	Plugged aftercooler.	4.	Inspect and clean aftercooler.
Compressor starts too slowly	1.	Minimum Pressure/Check Valve is faulty.	1.	Repair or replace.
	2.	Supply voltage is too low.	2.	Check the supply voltage.

SYMPTOM		POSSIBLE CAUSE		REMEDY
Compressor is low on delivery and pressure	1.	Restricted air filter.	1.	Clean or replace filter.
	2.	Sticking inlet valve.	2.	Inspect and clean inlet valve.
	3.	Minimum pressure valve stuck closed.	3.	Replace valve.
	4.	Oil separator clogged.	4.	Replace.
	5.	Condensate drain solenoid valve is faulty.	5.	Replace.
	6.	Leaks in the compressed air system.	6.	Check for leaks, fix any leaks found.
	7.	Coupling broken.	7.	Replace.
	8.	Pressure limits incorrectly set.	8.	Check/correct pressure limits in the AutoSentry Controller.
	9.	Aftercooler is frozen	9.	Thaw out. This machine cannot operate in temperatures below 32° F (0° C).
High discharge air temperature	1.	Dirty or clogged cooler face.	1.	Clean cooler.
	2.	Insufficient cooling air flow.	2.	Provide unrestricted supply of cooling air.
	3.	Clogged oil filter or cooler (interior).	3.	Replace filter or clean cooler.
	4.	Low compressor oil.	4.	Add oil to proper level.
	5.	Faulty temperature sensor.	5.	Replace sensor.
	6.	Thermostatic mixing valve stuck open.	6.	Repair or replace valve.
Excessive oil consumption	1.	Oil carryover through lines.	1.	See “Oil Carryover”, in this section.
	2.	Oil leaks at all fittings and gaskets.	2.	Tighten or replace fittings or gaskets.
	3.	Shaft seal leaking.	3.	Replace shaft seal.

SYMPTOM		POSSIBLE CAUSE		REMEDY
Oil carryover	1.	Overfilling the reservoir.	1.	Drain excess oil from system.
	2.	Clogged, broken or loose oil return lines.	2.	Tighten or replace faulty lines.
	3.	Ruptured oil separator element.	3.	Replace element.
	4.	Loose assembly.	4.	Tighten all fittings and gaskets.
	5.	Foam caused by use of incorrect oil.	5.	Use Gardner Denver AEON 2000, 4000 or 9000SP lubricating coolant.
	6.	Inoperative minimum pressure valve.	6.	Replace seals in valve.
	7.	Operation at elevated discharge temperatures.	7.	Reduce temperature. See "High Discharge Air Temperature", this section.
	8.	Scavenge line check valve failure.	8.	Replace check valve.
	9.	Water condensate in oil.	9.	Check oil reservoir temperature and if low, change thermal mixing valve element to higher temperature.

DANGER

Air/oil under pressure will cause severe personal injury or death. Shut down compressor, relieve system of all pressure, disconnect, lockout and tagout power supply to the starter before removing valves, caps, plugs, fittings, bolts and filters

TROUBLESHOOTING VOLTAGE PROBLEMS

The compressor package has been designed, built, and tested to operate within one of the following standard ranges:

200-208 Volts, 60 Hertz

230-240 Volts, 60 Hertz

460-480 Volts, 60 Hertz

575-600 Volts, 60 Hertz

Connection to higher voltages will reduce the life of electrical devices within the compressor package. As voltages get further above the design range, other symptoms may show up.

High voltages may lead to high motor currents. The overload relay will sense these and shut down the compressor to protect the motor.

If the control transformer primary fuses blow, check that the transformer is properly connected for the incoming line voltage.

Operation with lower voltages will reduce motor life and load capacity. As voltages get further below the design range, other symptoms may show up.

Low voltages may lead to high motor currents. The overload relay will sense these and shut down the compressor to protect the motor. If voltage is low while the compressor is off, locate and correct the cause. If the voltage drops low only while the compressor is running, look for poor connections or undersized wiring.

If any of the starters or contactors within the box chatter, or if the electronic controller drops out while attempting to start, it is a clear indication that the wiring is inadequate for the compressor. Look for poor connections or undersized wiring.

NOTICE
Gardner Denver factory remanufactured replacement compressor airend units are available from your authorized distributor, on an exchange basis, for all rotary screw compressor units.

GENERAL PROVISIONS AND LIMITATIONS
Gardner Denver (the "Company") warrants to each original retail purchaser ("Purchaser") of its new products from the Company or its authorized distributor that such products are, at the time of delivery to the Purchaser, made with good material and workmanship. No warranty is made with respect to:

1. Any product which has been repaired or altered in such a way, in the Company's judgment, as to affect the product adversely.

2. Any product which has, in the Company's judgment been subject to negligence, accident, improper storage, or improper installation or application.

3. Any product which has not been operated or maintained in accordance with the recommendations of the Company.

4. Components or accessories manufactured, warranted and serviced by others.

5. Any reconditioned or prior owned product.

Claims for items described in (4) above should be submitted directly to the manufacturer.

WARRANTY PERIOD
The Company's obligation under this warranty is limited to repairing or, at its option, replacing, during normal business hours at an authorized service facility of the Company, and part which in its judgment proved not to be as warranted within the applicable Warranty Period as follows.

AIRENDS
Airends, consisting of all parts within and including the cylinder and gear housing, are warranted for 24 months from date of initial use or 27 months from date of shipment to the purchaser, whichever occurs first.

Any disassembly or partial disassembly of the airend, or failure to return the "unopened" airend per Company instructions, will be cause for denial of warranty.

MAJOR PACKAGE COMPONENTS
The drive motor, air or water cooled coolers and the AutoSentry Controller are warranted for 24 months from date of initial use or 27 months from date of shipment to the first purchaser, whichever occurs first.

OTHER COMPONENTS
All other components are warranted for 12 months from date of initial use or 15 months from date of shipment to first purchaser, whichever occurs first.

LABOR TRANSPORTATION AND INSPECTION
The Company will provide labor, by Company representative or authorized service personnel, for repair or replacement of any product or part thereof which in the Company's judgment is proved not to be as warranted. Labor shall be limited to the amount specified in the Company's labor rate schedule.

Labor costs in excess of the Company rate schedule amounts or labor provided by unauthorized service personnel is not provided for by this warranty.

All costs of transportation of product, labor or parts claimed not to be as warranted and, of repaired or replacement parts to or from such service facilities shall be borne by the Purchaser. The Company may require the return of any part claimed not to be as warranted to one of its facilities as designated by Company, transportation prepaid by Purchaser, to establish a claim under this warranty.

Replacement parts provided under the terms of the warranty are warranted for the remainder of the Warranty Period of the product upon which installed to the same extent as if such parts were original components.

DISCLAIMER
THE FOREGOING WARRANTY IS EXCLUSIVE AND IT IS EXPRESSLY AGREED THAT, EXCEPT AS TO TITLE, THE COMPANY MAKES NO OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY.

THE REMEDY PROVIDED UNDER THIS WARRANTY SHALL BE THE SOLE, EXCLUSIVE AND ONLY REMEDY AVAILABLE TO PURCHASER AND IN NO CASE SHALL THE COMPANY BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES. UNDER NO CIRCUMSTANCES SHALL THE COMPANY BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, LOSSES OR DELAYS HOWSOEVER CAUSED.

No statement, representation, agreement, or understanding, oral or written, made by any agent, distributor, representative, or employee of the Company which is not contained in this Warranty will be binding upon the Company unless made in writing and executed by an officer of the Company.

This warranty shall not be effective as to any claim which is not presented within 30 days after the date upon which the product is claimed not to have been as warranted. Any action for breach of this warranty must be commenced within one year after the date upon which the cause of action occurred.

Any adjustment made pursuant to this warranty shall not be construed as an admission by the Company that any product was not as warranted.

Gardner Denver

Specifications subject to change without notice.

 Litho in U.S.A.

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For additional information contact your local representative or

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1800 Gardner Expressway, Quincy, Illinois 62301
Customer Service Department Telephone:
(800) 682-9868 FAX: (217) 224-7814

Sales and Service in all major cities.

For parts information, contact Gardner Denver,
Master Distribution Center, Memphis, TN
Telephone: (800) 245-4946 FAX: (901) 542-6159