13-18-606
Version: 09
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GARDNER DENVER

ENERGY STAR PARTNER

VARIABLE SPEED SINGLE STAGE STATIONARY BASE-MOUNTED COMPRESSOR

AirSmart™ CONTROLLER

VS11A

11kW

60HZ

OPERATING AND SERVICE MANUAL

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 is incorporated in our genuine replacement parts.

Your authorized Gardner Denver Compressor distributor offers all the backup you'll need. An AirSmart™ network of authorized distributors provides the finest product support in the air compressor industry.

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 the Remanufacturing Center in Indianapolis, IN., 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, check the Gardner Denver Web Site at www.gardnerdenver.com or contact:

Gardner Denver
1800 Gardner Expressway
Quincy, IL 62305

Phone: (217) 222-5400

Fax: (217) 224-7814

INSTRUCTIONS FOR ORDERING REPAIR PARTS

When ordering parts, specify Compressor MODEL, Method of Cooling, POWER and SERIAL NUMBER (see nameplate on unit). The airend Serial Numbers are also stamped on top of the discharge bearing carrier castings.

All orders for Parts should be placed with the nearest authorized distributor.

Where NOT specified, quantity of parts required per compressor or unit is one (1); where more than one is required per unit, quantity is indicated in parenthesis. SPECIFY EXACTLY THE NUMBER OF PARTS REQUIRED.

DO NOT ORDER BY SETS OR GROUPS.

To determine the Right-Hand and Left-Hand side of a compressor, stand at the motor end and look toward the compressor. Right-Hand and Left- Hand are indicated in parenthesis following the part name, i.e. (RH) and (LH), when appropriate.

WARNING – PROHIBITION – MANDATORY LABEL INFORMATION

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.

Boxed text formats are used, within this manual, to alert users of the following conditions:

Safety Labels are used, within this manual and affixed to the appropriate areas of the compressor package, to alert users of the following conditions:

⚠ DANGER

Indicates a hazard with a high level of risk, which if not avoided, <u>WILL</u> result in death or serious injury.

Equipment starts automatically

Health Hazard – Explosive Release of Pressure

Cutting of Finger or Hand Hazard – Rotating impeller blade

High Voltage – Hazard of Shock, Burn, or Death Present until Electrical Power is Removed

Cutting of Finger or Hand Hazard – Rotating fan blade

Entanglement of Fingers or Hand/Rotating Shaft

⚠WARNING

Indicates a hazard with a medium level of risk which, if not avoided, <u>COULD</u> result in death or serious injury.

Asphyxiation Hazard – Poisonous Fumes or Toxic Gases in Compressed Air

⚠CAUTION

Indicates a hazard with a low level of risk which, if not avoided, <u>MAY</u> result in a minor or moderate injury.

Burn Hazard – Hot surface

PROHIBITION/MANDATORY ACTION REQUIREMENTS

Do not Operate Compressor with Guard Removed

Lockout Electrical Equipment in De-Energized State

Do Not Lift Equipment with Hook – No Lift Point

Loud Noise Hazard – Wear Ear Protection

Handle Package at Forklift Points Only

Read the Operator's Manual Before Proceeding with Task

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:

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

- **Keep fingers and clothing away from rotating fan, drive coupling, etc.**
- **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.**
- **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.**
- **Electrical 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 main disconnect switch, lockout and tagout before working on the control, wait 10 minutes and check for voltage.**

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.**
- **Do not use the air discharge from this unit for breathing – not suitable for human consumption.**
- **An Excess Flow Valve should be on all compressed air supply hoses exceeding 1/2 inch inside diameter (OSHA Regulation, Section 1926.302).**
- **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.**

TABLE OF CONTENTS

This book covers the following models:

KW	PSIG	Air Cooled	Parts List	Controller Manual	Dryer	Communication Module
11	100 THRU 175	VS11A	13-18-503	13-17-600	13-18-605	13-17-604

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.

INDEX

LIST OF ILLUSTRATIONS

SECTION 1
GENERAL INFORMATION

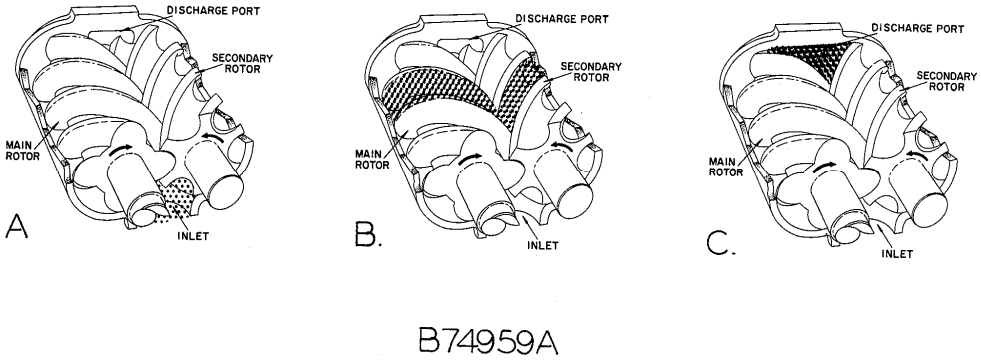


Figure 1-1 – COMPRESSION CYCLE

COMPRESSOR – Your Gardner Denver Rotary Screw package is fitted with one (1) single stage, positive displacement rotary compressor using meshing helical rotors to effect compression. Each pair of rotors is supported between high capacity anti-friction bearings located outside the compression chamber. Single cylindrical roller bearings are used at each end of the rotors to carry the radial loads. An additional angular contact ball bearing is located at the discharge end of each rotor to carry axial thrust loads. The main rotor sits next to its gate companion, in a side-by-side configuration.

COMPRESSION PRINCIPLE (Figure 1-1) - Compression is accomplished by the main and gate rotors synchronously meshing in a one-piece cylinder. The main rotor has five (5) helical lobes, 72° apart, which mesh with six (6) helical grooves, 60° apart, on its matching gate rotor.

The air inlet port is located on top of the compressor cylinder near the drive shaft end. The discharge port is located 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 gate 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 gate rotor groove, 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 continues to increase until the air/oil mixture trapped in the interlobe cavity by the rotors passes the discharge port (C). Each rotor cavity follows the same “fill-compress-discharge” cycle in rapid succession to produce a discharge flow of air that is continuous, smooth and shock free.

AIR FLOW IN THE COMPRESSOR SYSTEM (Figure 4-2, page 30) - Air enters the air filter and passes through the inlet control (poppet) valve to the compressor inlet flange. After compression, the air/oil mixture enters the oil reservoir where most of the entrained oil is removed by change of direction and impingent. It is further removed by centrifugal action and drained down into the reservoir. The air and remaining aerosols pass into a coalescing element where the oil is captured and drained through a drain line back into a lower pressure region of the compressor. The nearly oil-free air passes through the minimum pressure valve, aftercooler, moisture separator, and finally to the distribution network.

LUBRICATION, COOLING AND SEALING (Figure 4-2, page 30) - Oil is forced by differential pressure from the oil reservoir through the oil cooler, servo-driven oil mixing valve, oil filter, and enters the compressor. A portion of the oil is directed to internal passages within the compressor to lubricate the bearings and shaft oil seals. The balance of the oil is injected into the compressor rotors to remove the heat of compression, seal internal clearances and lubricate the rotors

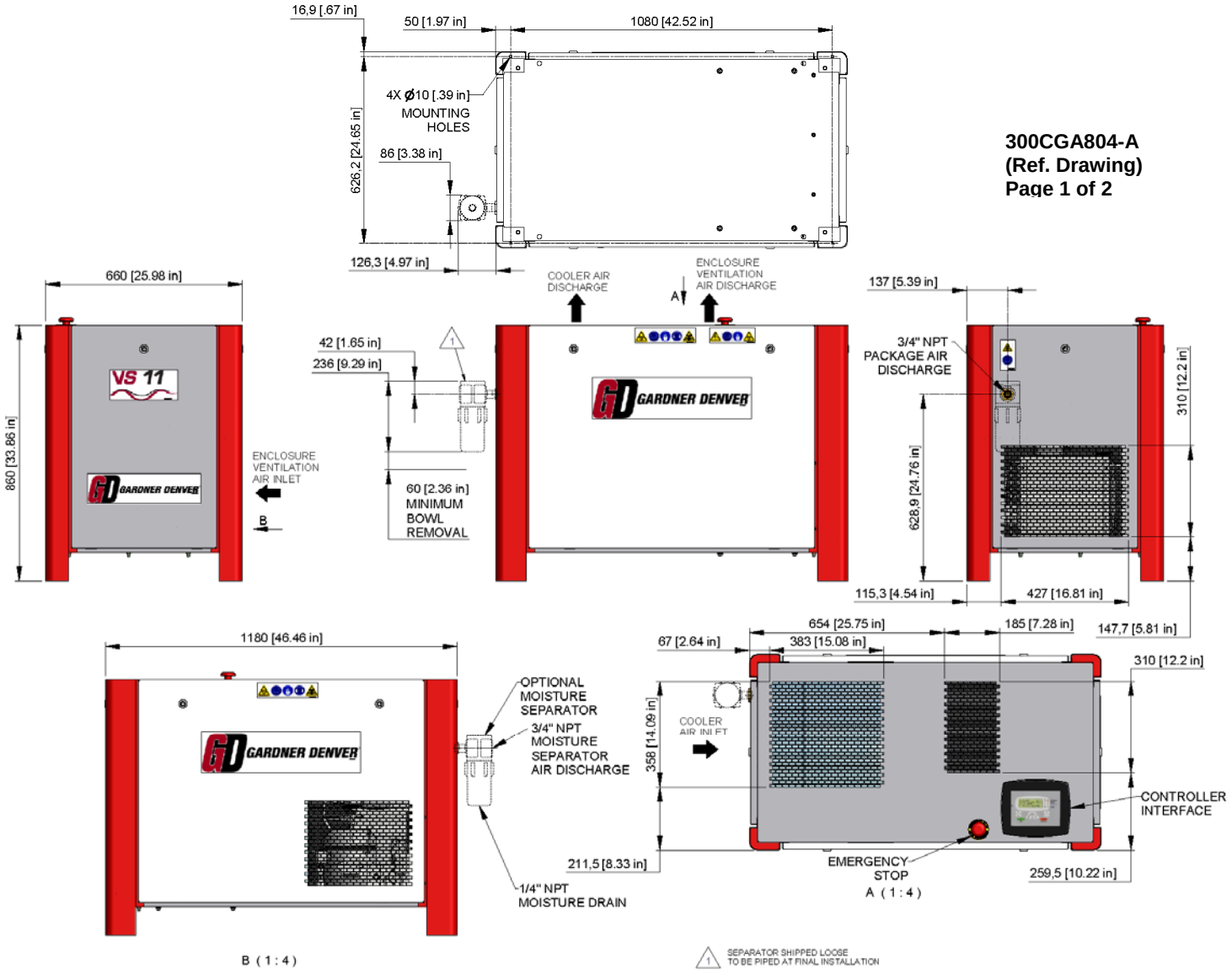
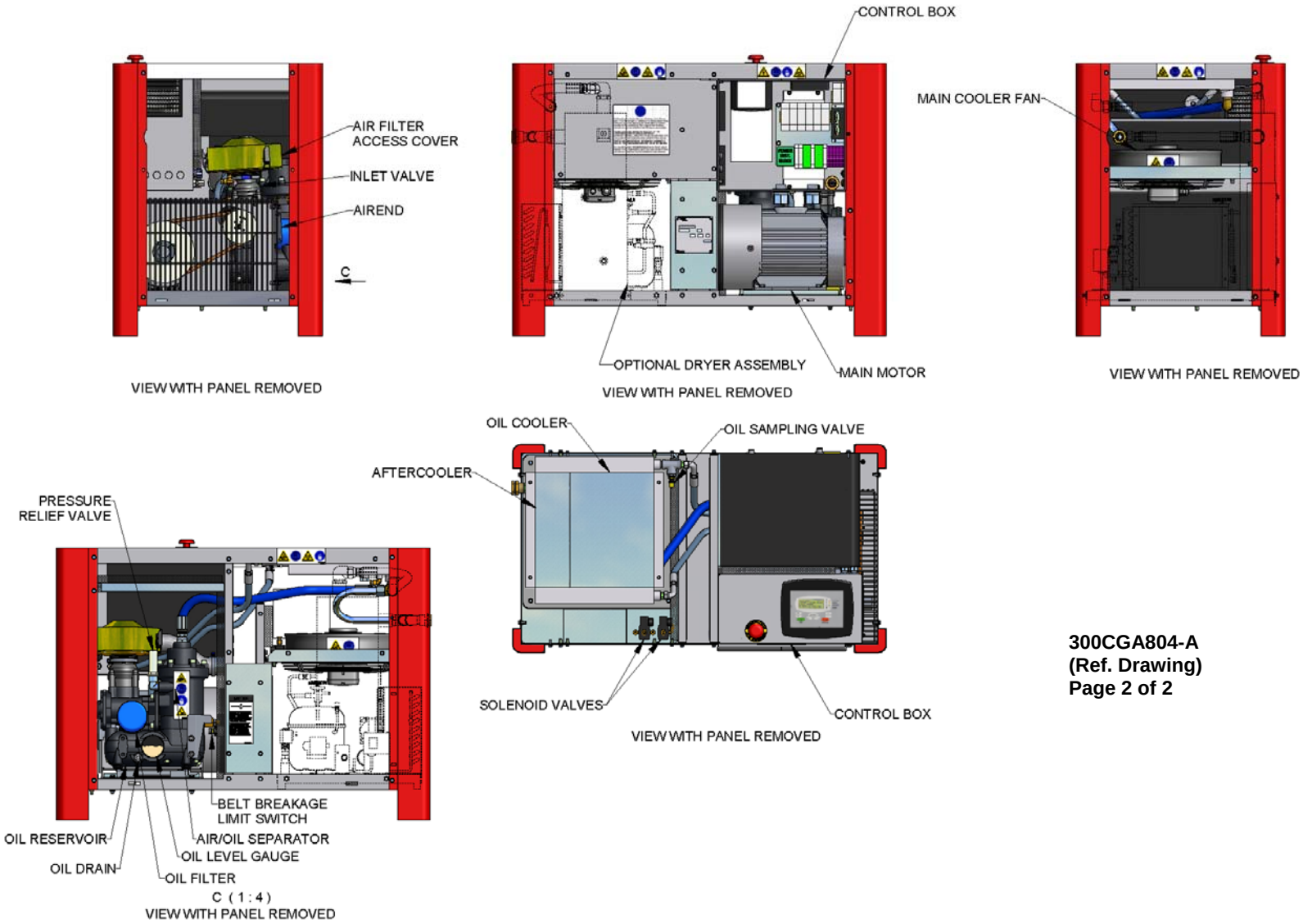


Figure 1-2 – PACKAGE OUTLINE (AIR-COOLED)



300CGA804-A
(Ref. Drawing)
Page 2 of 2

Figure 1-3 – PACKAGE OUTLINE (AIR-COOLED)

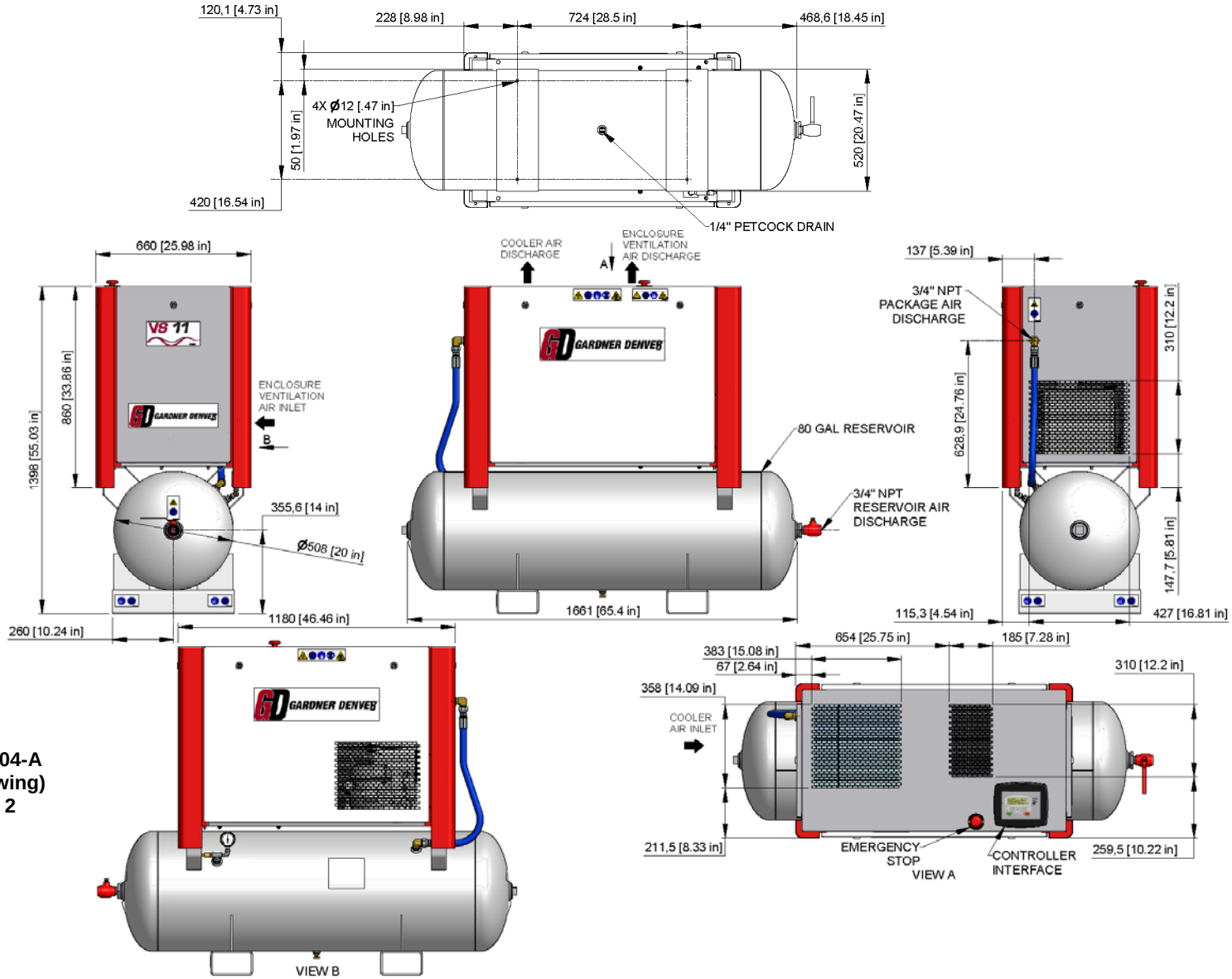


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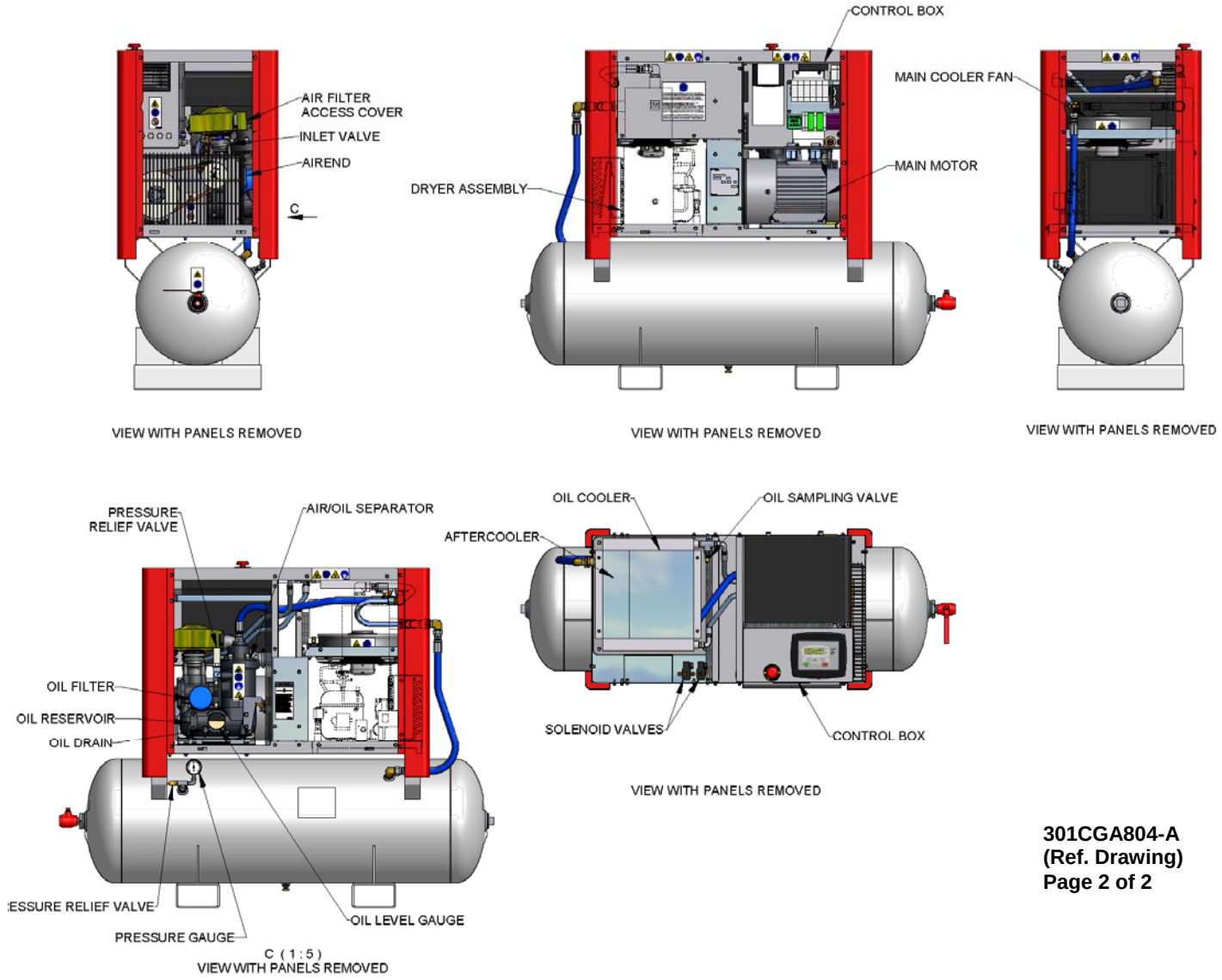
Figure 1-4 – PACKAGE OUTLINE (AIR-COOLED) - TANK MOUNTED



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(Ref. Drawing)
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Figure 1- 5 – PACKAGE OUTLINE (AIR-COOLED) – TANK MOUNTED

SECTION 2
INSTALLATION

GENERAL – When unit is received, 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 passage of current.

LIFTING UNIT - Proper lifting and/or transporting methods must be used to prevent damage:

1. Lift from long side, with controller located at left side of tow truck.
2. Lift from short side, with controller facing tow truck.

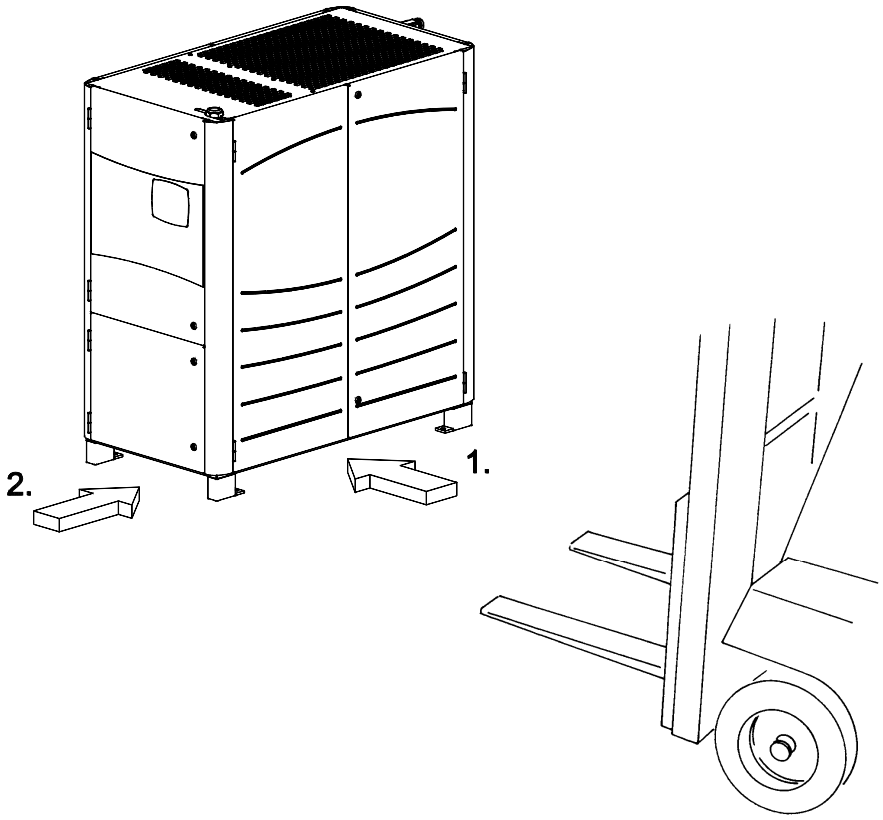


Figure 2-1 – RECOMMENDED LIFTING MODES

CAUTION

Lift compressor package by base only. Do not use other places such as motors, compressors or discharge manifold piping as lifting points.

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

LOCATION - The compressor package shall be installed 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 duct works to reach a source of adequate cooling air or to direct cooling air in and out of the compressor package, to prevent recirculation (e.g., hot cooling air entering the fresh air inlet). The package is designed to operate at ambient temperatures ranging from 40°F to 113°F (at up to 1000 meter elevation). Contact Gardner Denver for package operation at conditions exceeding the stipulated values.

A typical ventilation arrangement is shown in Figure 2-2, page 14.

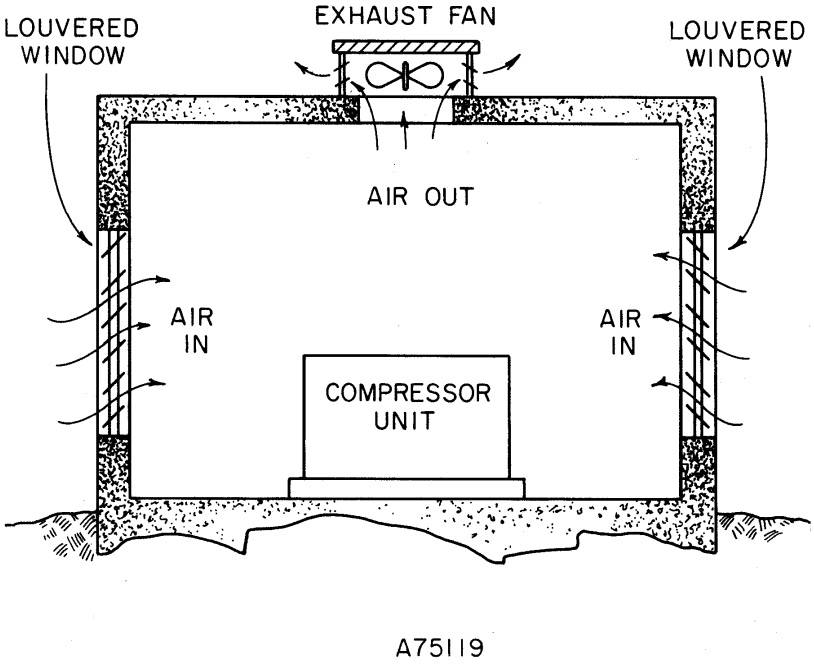


Figure 2-2 – TYPICAL COMPRESSOR ROOM

When selecting the compressor package location, be aware that its noise level may increase above its advertised free-field condition by reflections from nearby objects (e.g., walls, machinery, etc) or by noise from nearby machinery.

Air-Cooled Units - A combination oil/air cooler is supplied as standard equipment on all air-cooled packages. The heat exchangers require sufficient cooling air flow to operate efficiently – please refer to Section 6, Figure 6-1 of this manual for detailed instructions on the operation and maintenance of air-cooled heat exchangers, including minimum heat exchanger cooling and enclosure ventilation requirements.

Cooling air for the heat exchangers and the main motor is drawn in at the intake grill end of the enclosure and is exhausted through a roof vent. Refer to Package Illustrations on Figure 1-2 thru Figure 1-4, pages 9 thru 12, for hardware details.

Air for the electrical enclosure and the compressor intake is drawn in at the intake grill end of the enclosure and exhausted via a smaller roof vent – refer to Section 6 of this manual for enclosure ventilation requirements. Refer to Package Illustrations on Figure 1-2 thru Figure 1-4, pages 9 thru 12.

Do not block flow of air entering or exiting the enclosure - allow minimum of 3-1/2 feet (1.1 m) clearance to the nearest obstruction all around and on top.

FOUNDATION - The Gardner Denver Rotary Screw compressor requires no special foundation, but should be mounted on a smooth, solid surface and as near level as possible. Temporary installation may be made at a maximum 10° angle lengthwise or 10° sidewise.

Mounting bolts are not normally required. However, installation conditions such as piping rigidity, angle of tilt, danger of shifting from outside vibration or moving vehicles, or the mounting of the compressor package on its optional 80 gallon tank may require the use of mounting bolts and shims to provide uniform support for the base.

OIL RESERVOIR DRAIN – Sump drain port, located near the oil filter, is 7-1/2” above the floor level. If this is not sufficient to conveniently drain the oil, other methods are:

1. Elevate the compressor unit on a suitable structure to obtain the desired drain height.
2. Construct an oil sump or trough below the floor level and pump or bail the drained oil.
3. Pump oil from the reservoir filler opening or drain to a container.

ENCLOSURE - The compressors, electric motors and oil/air cooler assembly are mounted inside the enclosure. Service doors are provided for maintenance access. Be sure to allow enough space around the unit for the doors to open completely.

To remove the enclosure doors, open the door and lift it up slightly to disengage the hinges.

CAUTION

Ducting may be required on air-cooled enclosed machines.

⚠ DANGER

Do not operate the compressors with the fan or coupling guard removed. Exposed fan and couplings may cause personal injury.

INSTALLATION FOR COLD WEATHER OPERATION - It is recommended that the unit be installed inside a shelter that will be heated to temperatures above freezing (40° F, 5° C). This will eliminate many of the problems associated with operating units in cold climates where freezing rain, drifting snow, freezing condensate and bitter cold temperatures are encountered.

Unsheltered (outside) installations should be avoided whenever 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.

Refer to Engineering Data Sheet 13-9-411, available from an authorized Gardner Denver distributor, for the advantages of using the heat recovered from rotary compressors. This heat recovery could easily pay for an adequate shelter for 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. An adequate receiver capacity for the VS units is 1/2 gallon for each cfm delivered by the compressor package. The VS11 package is offered mounted on an optional 80 gallon receiver.

MOISTURE SEPARATOR/TRAP - Since the unit is equipped with a built-in aftercooler, a combination moisture separator and drain valve is furnished (loose) with the unit. The device must be piped at the outlet of the compressor package during final installation. This device is not used on packages equipped with integrated dryers.

CONTROL PIPING - Control piping is not necessary since the Gardner Denver compressor package is factory wired and piped for the control system specified.

INLET LINE – The air filter assembly used in the VS compressor package is not suitable for relocation, as its housing assembly is an integral part of the enclosure sheet metal components. See “LOCATION” comments in this section of the manual for duct work recommendations to bring in ventilation air.

DISCHARGE SERVICE LINE - The discharge service line connection on the air-cooled units is located at the upper leftt-hand area of the intake grill side of the enclosure. Gardner Denver compressor packages are inherently isolated from the service line by their own minimum pressure/check valves. Installer or end user must ensure that other compressors that are piped into a common pipe manifold with the Gardner Denver compressor package are each provided with an isolation check valve. It is recommended that an additional receiver be installed between the rotary screw and reciprocating compressors sharing a common pipeline. Do not install another check valve in the unit’s discharge line as operational upsets will occur.

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.

BLOW DOWN VALVE PIPING – The blow down valve is vented between the air filter and inlet valve, thus avoiding the need of any external pipe work.

ELECTRICAL WIRING - The compressor package is (internally) factory wired for use with the voltage specified on the order; it is only necessary to connect power supply and ground wires to the provided wire terminal blocks.

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

Gardner Denver Guidelines for proper wiring, grounding and feed power conditioning - This compressor package is provided with a variable speed drive (VFD) to control compressor motor. The indicated Gardner Denver guidelines for proper wiring, grounding, and feed power conditioning must be followed in order to protect the VFD electronics. Failure to do so will void your warranty.

Electrical Wire Sizing – A certified electrician familiar with National Electric Codes and applicable local codes shall size the electrical power wires serving the compressor package. Refer to Figure 2-3, for a summary of maximum package current consumption values.

460 VOLT VS-11 MINIMUM COPPER SUPPLY WIRE RECOMMENDATIONS

				Minimum 75ºC wire	Minimum 90ºC wire	NOTES
Model	Input Voltage	Package Amps (Estimated)	NEC Package Amps at 30ºC	Copper Wire Sized at 40ºC	Copper Wire Sized at 40ºC	
VS-11	460	28.43	34.18	8	10	

The NEC requires that wire sizes be determined by using the appropriate multiplier for the conductor temperature rating at ambient temperatures other than 30º C and then selecting the wire that has sufficient ampacity, after correction, to meet the load requirements shown in the "NEC Package Amps @ 30ºC" column above. Wire ampacity is to be corrected, not "Package Amps". Additional correction multipliers apply based on more than three conductors in one conduit. The appropriate installation and use of 75ºC and 90ºC wire is the responsibility of the electrical professional(s) performing the installation and must be per NEC, local and state regulations as allowed. All of the above recommended minimum wire sizes are based on all terminal connections being rated at 75ºC minimum temperature rating and copper wire run lengths of 100 feet or less. Please note that all UL-508A listed control panels are rated for 40ºC ambient conditions.

Figure 2-3 – PACKAGE MAXIMUM CURRENT CONSUMPTION SUMMARY

Electrical Wire Routing – Routing of the electrical power wires into the electrical hardware enclosure is best done through its roof area.

Line Reactor – A line reactor provides conditioning of the electrical power supply to the compressor package by attenuating noise and fluctuations. It shall be required in your particular application if any of the following conditions exist:

- Transformer KVA is greater than recommended – see Figure 2-4.
- Line has switched Power Factor correction capacitors.
- Existing line reactor not properly sized – see Figure 2-4.
- Other large loads on the same power feed as the compressor.

GD Model	Volts	VFD HP RATINGS	Max KVA
VS11	400/480	15	250

Figure 2-4 – LINE REACTOR SIZING RECOMMENDATIONS

GROUNDING – Equipment must be properly grounded in accordance with the National Electrical Code and/or applicable local codes.

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. Refer to Section 13 page 59 of this manual for complete motor lubrication specifications and details.

SECTION 3
STARTING & OPERATING PROCEDURES

NOTICE

Read the Operator's Manual before operating the compressor.

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

1. **Compressor Oil** - Check the oil level in the sump – with unit stopped, the oil level should reach the top of the measuring rod visible through the site glass. Add oil, with unit stopped and depressurized, when the oil level reaches the bottom of the mark on the measuring rod. Do not mix different type oils. When the unit is shipped, it is filled with Gardner Denver AEON™ 9000SP lubricating coolant, suitable for the first 8000 hours under normal operating conditions.

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 9000SP synthetic lubricating coolant. Use only genuine Gardner Denver filters designed and specified for this compressor.

NOTICE

Whenever the oil is drained from the compressor (e.g., due to oil change or compressor replacement), a minimum amount must be replenished to lubricate and seal the rotors during the start-up phase. Temporarily remove the flexible hose between the air filter assembly and the intake poppet valve and add 1/4 gallon of oil through the intake valve opening.

DANGER

Before removing the oil filler plug, always stop the unit and release air pressure, lockout and tagout the power supply to the compressor package.

Failure to release pressure or properly disconnect the power may result in personal injury or death.

2. **Air Filter** - Inspect the air filter to be sure it is clean and the assembly is sealed tight. Refer to Section 7, "Air Filter", for complete servicing instructions. Be sure the inlet line is clean and sealed tight.

3. **V-belt drive** - Check hub screws for tightness and belts for proper tension. Refer to Section 8.

4. **Piping** - Refer to Section 2, "Installation," and make sure piping meets all recommendations.

5. **Electrical** - Check the wiring diagrams furnished with the unit to be sure it is properly wired. See Figure 4-3 thru Figure 4-6, pages 31 thru 34 for general wiring diagrams and Section 2, for installation instructions. Make sure to check the wiring of the optional compressed air dryer, as it is serviced by an independent electrical power feed.

6. **Grounding** - Equipment must be properly grounded according to Gardner Denver Guidelines for proper wiring, grounding and feed power conditioning.

CAUTION

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

NOTICE

Read the Operator's Manual before operating the compressor.

7. **Rotation** - Check for correct rotation of all electric motors:

   - Use controller "JOG MODE" to bump compressor motor. **Proper rotation shall be counter-clockwise when facing the compressor sheave.**

   - Use controller "JOG MODE" to bump heat exchanger cooling fan. **Proper rotation is achieved when cooling air is discharged upward through cooler core.**

CAUTION

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.

CAUTION

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

8. **System Pressure** – For your convenience, the following excerpt from the Controller Manual 13-17-600 is presented to assist in programming the system pressure:

Quick Start Guide

Operation of the AirSmart controller is easy. Simply select a Target Pressure and then press the Run 

button to start the compressor, no other settings are required. The Target Pressure comes preset from the factory at pressure as ordered. The Unload Pressure is preset to 10 psi higher. If a different pressure setting is desired, the following steps can be used as a guide.

- **Setting the Target Pressure**

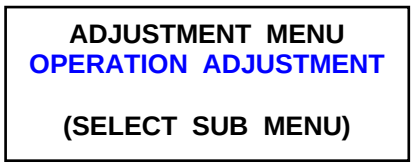
  The Target Pressure setting is used to set the operating point of the compressor. To make any adjustments in the operation of the compressor, the machine must be stopped and in the Ready mode.

  Stop the compressor by pressing the Stop/Reset 

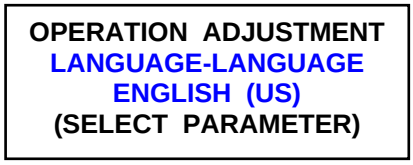
button. The front panel display should read "READY" on line 3.

0 PSI	**75°F**
10 HRS	**AUTOMATIC**
READY	
NO SERVICE ADVISORY	

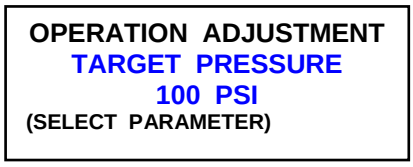
Next, press the Enter  button to access the Adjustment Menu tree



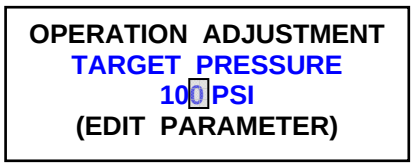
Since the Target Pressure setting is under the Operation Adjustment menu, press Enter  again to access that sub-menu



The Target Pressure is the second item in the Operation Adjustment sub-menu so press the Down  button to navigate to the Target Pressure setting.

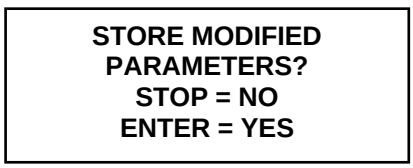


To change the Target Pressure, press the Enter  button to edit the value.



A flashing cursor will appear covering the least significant digit in the Target Pressure value, use the Plus  and Minus  buttons to change its value. Use the Right  and Left  buttons to move the cursor to other digits in the Target Pressure value. When the desired Target Pressure value is displayed, press the Enter  button to save the new value. Pressing the Stop/Reset  button will abort the change and restore the previous value.

In order to save the changes made to parameters, press the Stop/Reset button to go back to the heading of the current menu and then press the Stop/Reset button again. If parameter changes have been made, the following screen will appear.



To permanently save the changes that were made, press the Enter  button. If the Stop/Reset button is pressed, the parameter changes will be lost the next time the compressor power is turned off.

- **Setting the Unload and Load Pressure**

  After setting the Target Pressure, set the Unload and Load Pressures values in a similar fashion. The Unload pressure is the third item in the Operation Adjustment sub-menu so press the Down button to navigate to the Unload Pressure setting. The Unload Pressure will control at which pressure the compressor unload and stops.

  OPERATION ADJUSTMENT
  UNLOAD PRESSURE
  110 PSI
  (SELECT PARAMETER)

  The Load pressure is the fourth item in the Operation Adjustment sub-menu so press the Down button to navigate to the Load Pressure setting. The Load Pressure will control at which pressure the compressor will startup again after unloading.

  OPERATION ADJUSTMENT
  LOAD PRESSURE
  100 PSI
  (SELECT PARAMETER)

DANGER

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.

9. **Operating Mode** - Refer to Controller Manual 13-17-600 for more detailed information on the control system.

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

STARTING THE UNIT - Observe the following starting procedures.

Unit Cold - If the unit is located in a cold environment (e.g., ambient temperature below 40°F, 5 °C), the required external heat source must be energized prior to start. Press the red “STOP/RESET” button to clear any conditions (e.g., “Loss of Power” when electrical system was energized) and start the unit by pushing the green “START” button. Since the unit is equipped with a minimum pressure valve (60 psig, 4.1 bar), no special procedure to maintain minimum reservoir pressure is required.

Unit Hot - Start-up instructions are the same as that of a cold start.

Compressed Air Dryer (Optional) – The dryer module is supplied electrical power from a separate (off-package), disconnect provided by the end user – the disconnect must be engaged prior to dryer operation. Relay contacts, operated by the package AirSmart controller, engage and disengage the dryer from the external power source. The dryer is turned on when the "START" button is pressed, which also starts the compressor system. The dryer remains powered until the "STOP" button is pressed and remains in operation during low air demand periods that temporarily shut down the compressor. Please refer to the dryer manual 13-18-605 for all installation, operation and maintenance instructions.

DAILY CHECK - Refer to Section 14, "Maintenance Schedule".

STOPPING THE UNIT - Press "STOP-RESET" button. The oil reservoir will automatically blow down, as the main motor is de-energized. Be sure external heat is turned on if below 40°F (5°C),

Automatic restarting or electrical shock can cause injury or death. Disconnect, lockout and tagout the unit from the power supply and any other circuits before servicing unit.

When the pressure 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 pressure relief valve to prevent injury.

CAUTION

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

DANGER

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

SECTION 4
CONTROLS & INSTRUMENTATION

GENERAL DESCRIPTION - The Gardner Denver rotary screw compressor package is pre-wired with all electrical components suitable for the voltage and horsepower at time of order. It is only necessary to connect the compressor unit to the correct power supply, to the shop air supply network and to the appropriate water supply, if using the water-cooled variant. A standard single stage compressor package consists of an unitized module that houses a single rotary screw compressor, oil sump, separation, filtering, and internal injection delivery system, a main drive motor, a VFD, an oil/air cooling system, IP54 electrical enclosure to house VFD on common controller and a sound-attenuating enclosure. The various control devices employed are described as follows:

Controller - The compressor package features the AirSmart controller, which integrates all the control functions under microprocessor control. Controller functions include safety and shutdown, compressor regulation, operator control and advisory/maintenance indicators. The keypad and display provides 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.

NOTICE

Read the Operator's Manual before operating the compressor. It is critical that the detailed instructions for the controller, found in the controller manual 13-17-600, are read and understood. Once the appropriate parameters have been selected for the controller, compressor operation may commence. For your convenience, a "Quick Start" excerpt from the controller manual is shown in Section 3.

Press the red "STOP/RESET" button to clear any conditions (e.g., "Loss of Power" when electrical system was energized) and start the unit by pushing the green "START" button. Since the unit is equipped with a minimum pressure (60 psig, 4.1 bar) valve, no special procedure to maintain minimum reservoir pressure is required.

Main VFD and Motor – The compressor is driven by an inverter-duty electric motor, which in turn is energized by a pulse-width modulated, variable frequency drive (commonly referred to as VFD). This combination of components enables the compressor package to match the supply of compressed air (e.g., flow capacity) to meet the customer's demand in real time and in a step-less fashion. The operational logic which governs the drive and motor-combination is supplied by the AirSmart controller and it is based on the following basic rules:

- The speed of the compressor is modulated (e.g., increased or decreased) until the desired system discharge pressure is achieved.

The drive shares a common IP54 protected enclosure with the AirSmart controller and assorted electrical hardware. Ventilation for the electronics is supplied forced air delivered by the heat exchanger cooling fan and filtered by inlet and outlet filters. The motor is built with a TEFC protected frame and mounted directly to the package base – the compressor is pivoted on one axis to provide adjustability for the power transmitting V-belts. The drive includes adequate current overload protection for its companion motor.

The drive and motor are designed to operate with 3ph, 60Hz, 460 vac electrical power, which must be installed in accordance with local (site) Electrical Code requirements.

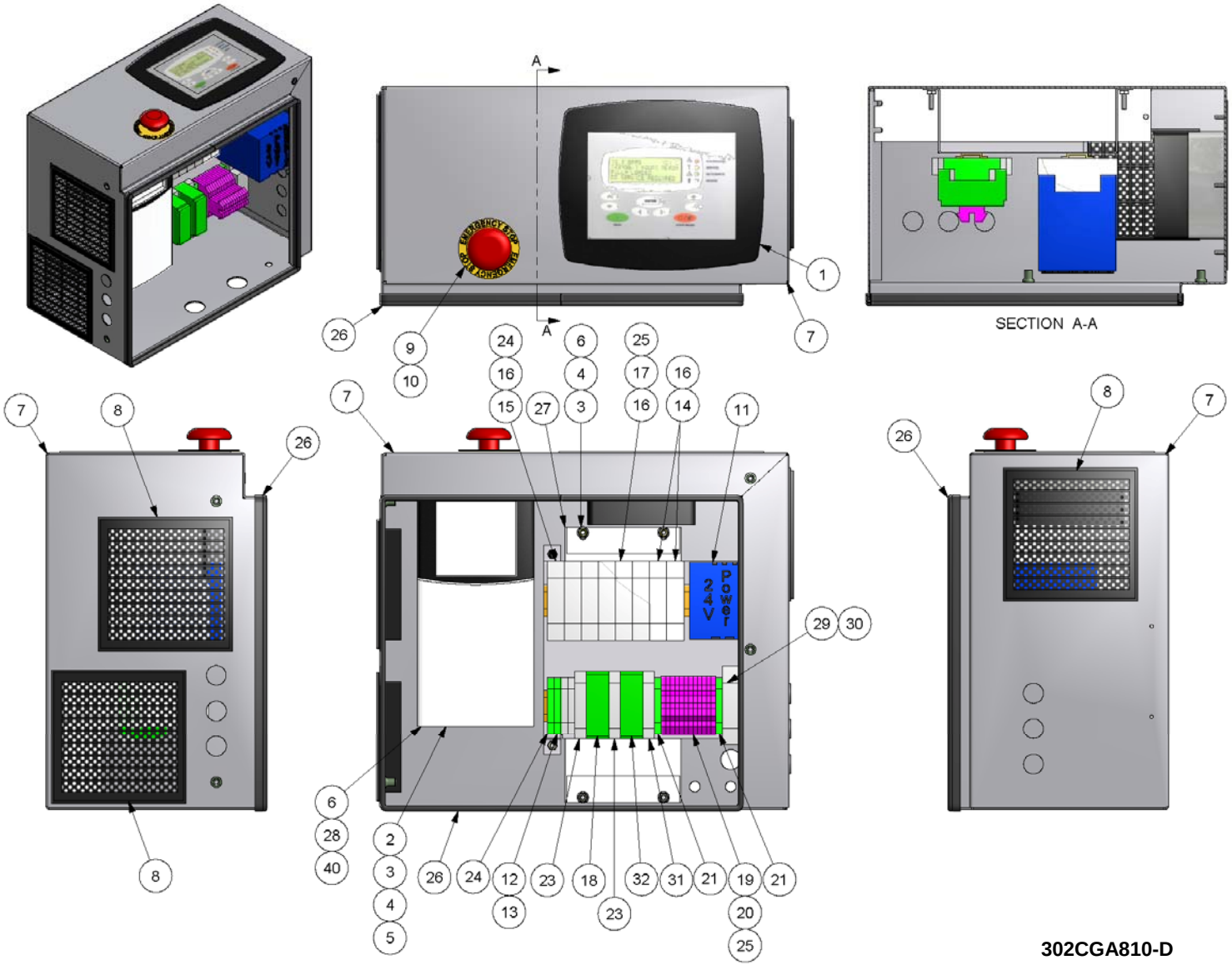


Figure 4-1 – ELECTRICAL ENCLOSURE HARDWARE

ASSEMBLED CONTROL BOX WITH EMC FILTER

1	AIRSMART CONTROLLER
2	DRIVE GROUP
5	SCREW TERMINAL PLUG
7	CONTROL BOX
8	EXHAUST FILTER
9	OPERATOR
10	CONTACT BLOCK
11	POWER SUPPLY
12	POWER DISTRIBUTION BLOCK
15	FUSE
16	FUSE BLOCK
17	FUSE
18	RELAY
19	TERMINAL BLOCK
20	TERMINAL BLOCK
21	GROUND BLOCK (not shown)
23	GROUND BLOCK
24	TERMINAL BLOCK
25	DIN RAIL
26	TRIM SEAL
27	FILTER
28	SPLITTER CABLE
29	FUSE BLOCK
30	FUSE
31	GROUND BLOCK
32	RELAY
40	RESISTOR OHM TERMINATOR

Heat Exchanger Fan/Motor and Starter - The combination axial fan/motor provides cooling air for the heat exchangers and electronics box. The starter provides control for the fan motor only, as the latter includes its own thermally-resettable, internal overload protection. This device is designed to operate with 3 ph-60 Hz-460 vac electrical power – the necessary electrical wiring has been provided.

Control Transformer - This device reduces the incoming power voltage to 110-120 volts for use by various control components (e.g., 24 vdc power supply, electrical enclosure cooling fans, etc.). Two primary fuses and one secondary fuse are provided for overload protection. This device is used with electrical services other than 460 vac.

Power Supply (24vdc) - This device supplies electrical power to the AirSmart controller and various solenoid valves.

For Letter References A thru R below, see Figure 4-2, page 30.

Inlet (Poppet) Valve (B) – This device is located at the intake flange of the compressor. When the compressor is running, a 3-way solenoid valve, energized by the AirSmart controller, vents the poppet internals to atmosphere, allowing it to open (normal state). When the compressor is stopped, a sump pressure signal is fed to the poppet internals, forcing it closed and preventing trapped air and oil within the compressor from exiting through the inlet filter. See SECTION 10 for further details.

Inlet Feed Valve (C) - This (three-way solenoid) device supplies/vents the required pneumatic signal to actuate the inlet poppet valve. When energized, it opens (pressurizes) the inlet poppet valve and when de-energized, it closes (vents) it.

Minimum Discharge Pressure/Check Valve (G) – This device maintains a minimum pressure (60 psig) within the air/oil reservoir, thus insuring (lubrication/cooling) oil injection flow into the compressors. It also prevents the back flow of compressed air from the customer's piping back into the compressor package when the compressor is not running. See for further details.

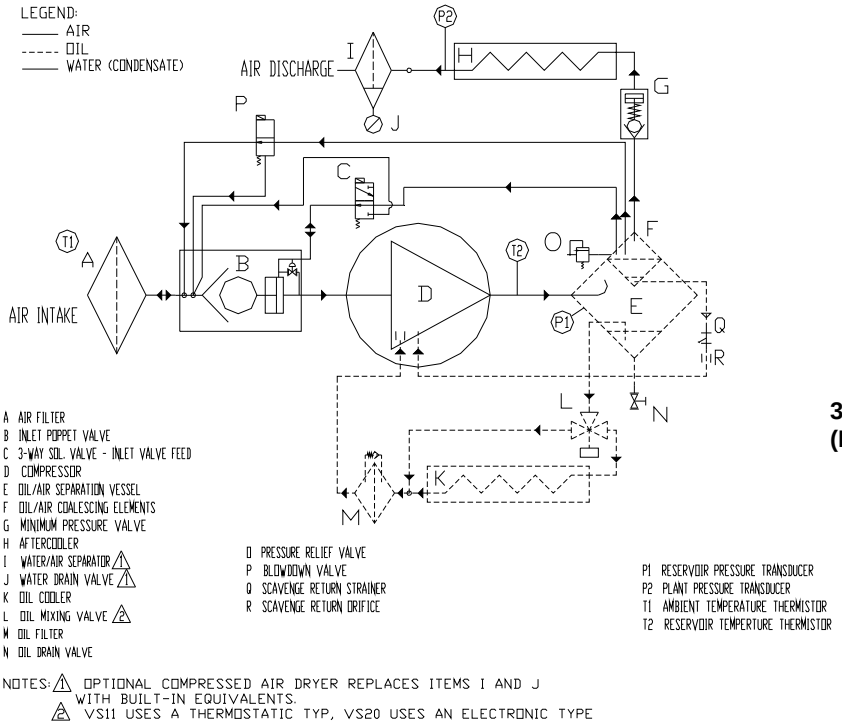
Oil Mixing Valve (L) – This device prevents the compressor from operating at a pressure and temperature combination that condenses water vapor in the oil system. The valve mixes cooled and hot oil, prior to delivery to the oil filter and oil injection line, to maintain a system discharge temperature of 203º F. See SECTION 5 for further details.

Pressure Relief Valve (O) – This device protects the pressure containing components of the compressor package against high pressure exceeding 188.5 psig. See SECTION 11 for further details.

Oil Drain (N) - This device allows the drainage of the oil charge held in the reservoir during oil change operation. Note that the VS11 does not provide a ball valve, but an o-ring sealed threaded plug.

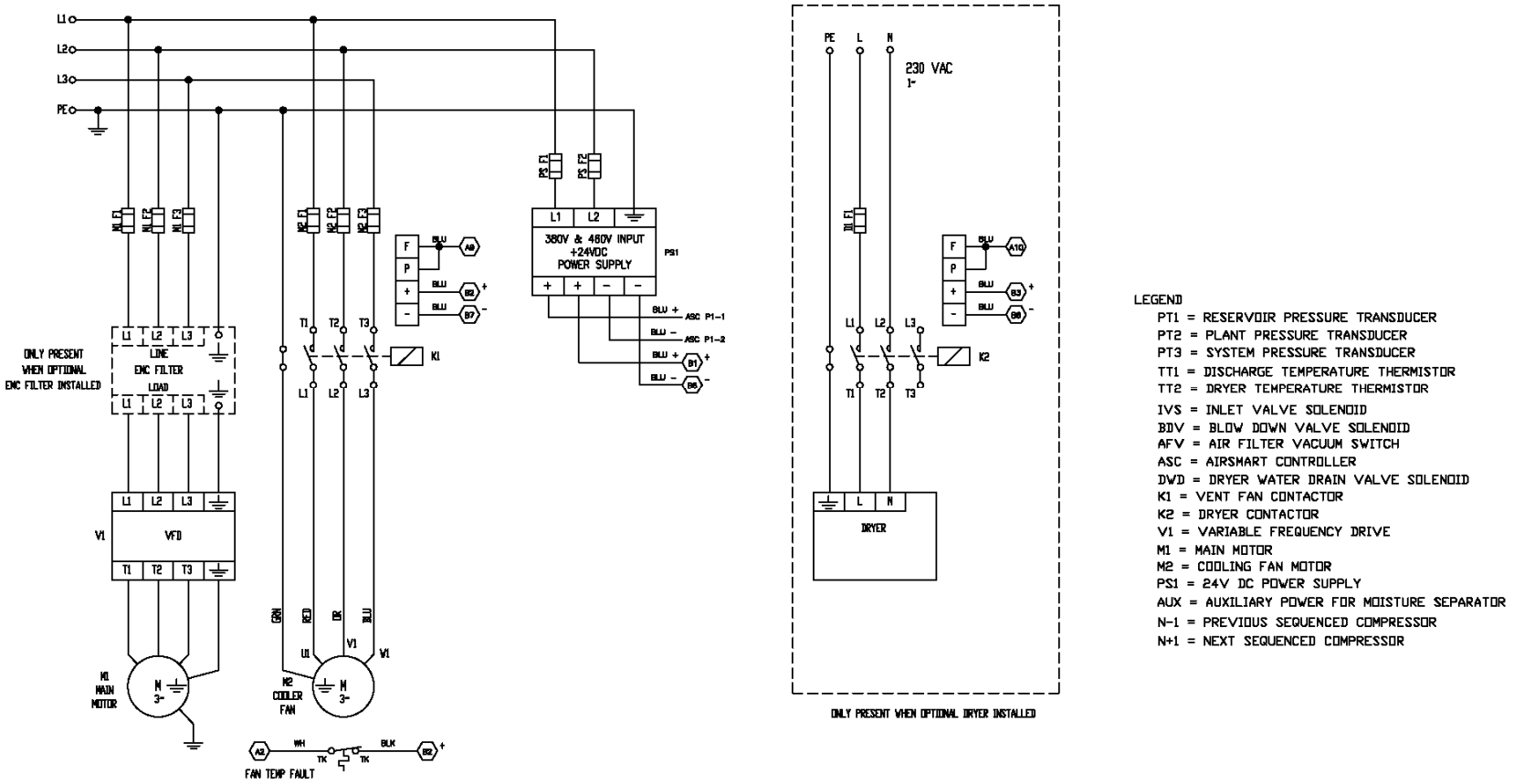
Blow Down Valve (P) - This (two-way solenoid) device vents compressed air from the air/oil sump. During compressor operation (e.g., compressor is running or has temporarily stopped due to line pressure reaching unload pressure); the blow down valve remains energized (closed) and the air/oil reservoir remains pressurized. When compressor operation is halted (e.g., by use of the red "STOP" controller button, by loss of electrical energy, or by a shutdown condition), the valve is de-energized (normally open state) and the air/oil reservoir is blown down.

Limit switch (Belt Break) – This normally closed switch monitors the normal tilt that the compressor achieves when the v-belts are intact. In case the v-belts break, the compressor pivots downward under its weight and triggers the limit switch via a bracket, initiating a shutdown action at the AirSmart controller See SECTION 8, page 49 for the further details.



300CGB797-B
(Ref. Drawing)

Figure 4-2 – PIPING AND INSTRUMENTATION ILLUSTRATION

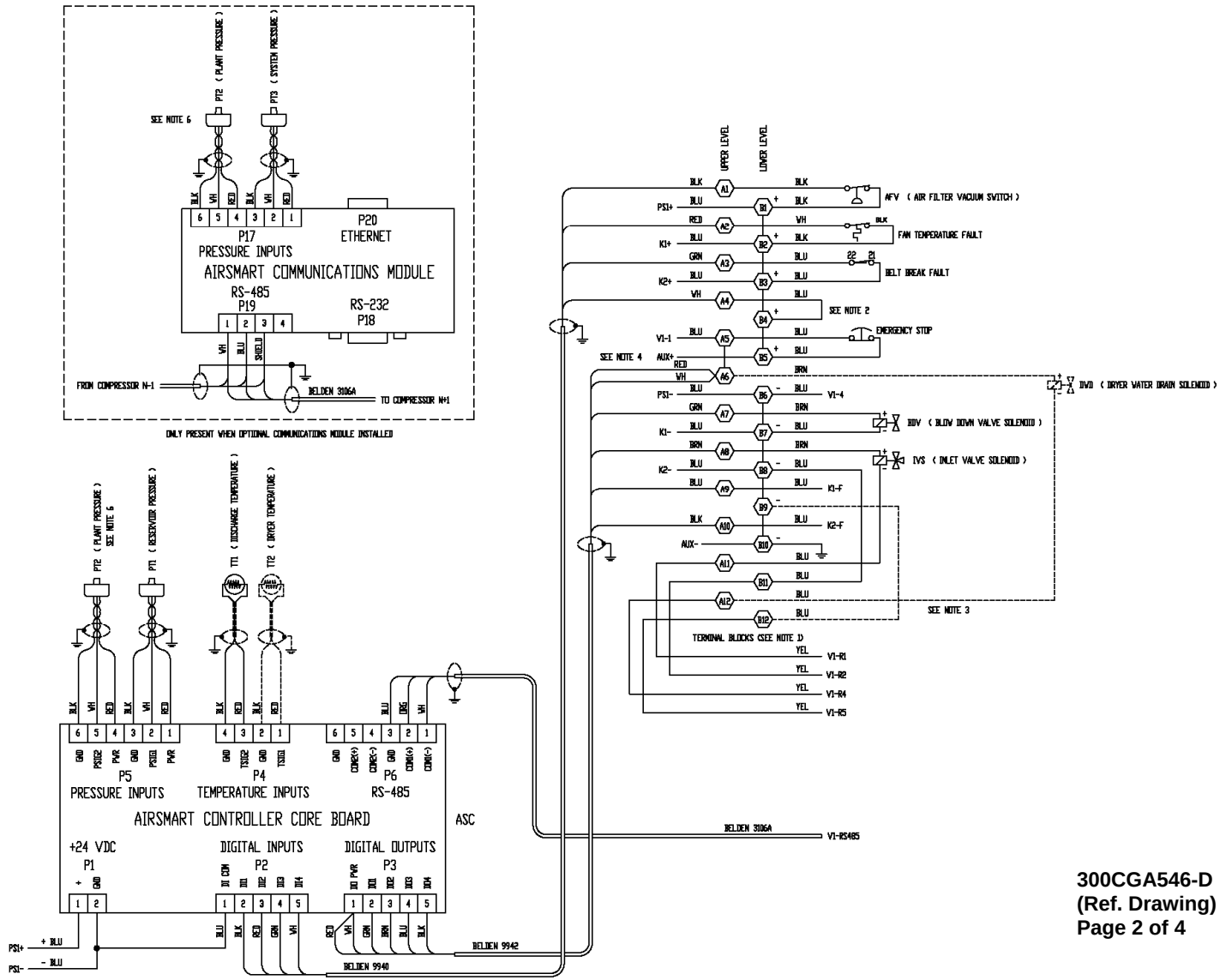


LEGEND

- PT1 = RESERVOIR PRESSURE TRANSDUCER
- PT2 = PLANT PRESSURE TRANSDUCER
- PT3 = SYSTEM PRESSURE TRANSDUCER
- TT1 = DISCHARGE TEMPERATURE THERMISTOR
- TT2 = DRYER TEMPERATURE THERMISTOR
- IVS = INLET VALVE SOLENOID
- BDV = BLOW DOWN VALVE SOLENOID
- AFV = AIR FILTER VACUUM SWITCH
- ASC = AIRSMART CONTROLLER
- DWD = DRYER WATER DRAIN VALVE SOLENOID
- K1 = VENT FAN CONTACTOR
- K2 = DRYER CONTACTOR
- V1 = VARIABLE FREQUENCY DRIVE
- M1 = MAIN MOTOR
- M2 = COOLING FAN MOTOR
- PS1 = 24V DC POWER SUPPLY
- AUX = AUXILIARY POWER FOR MOISTURE SEPARATOR
- N-1 = PREVIOUS SEQUENCED COMPRESSOR
- N+1 = NEXT SEQUENCED COMPRESSOR

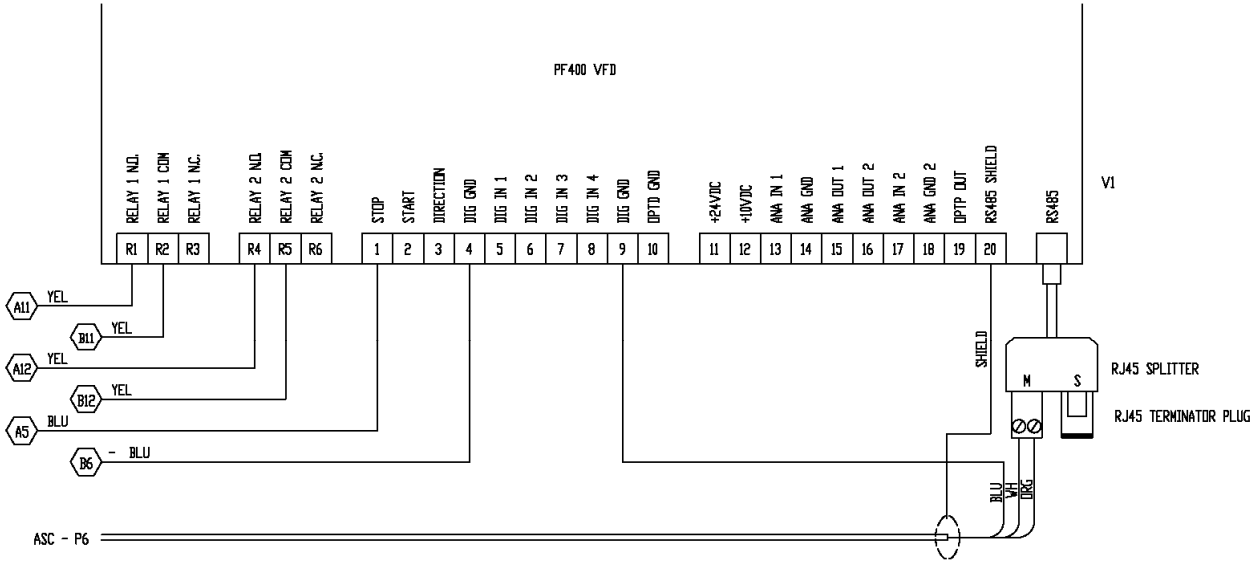
300CGA546-D
Ref. Drawing)
Page 1 of 4

Figure 4-3 – WIRING DIAGRAM – (AIR-COOLED) Single-Stage VS Control



300CGA546-D
(Ref. Drawing)
Page 2 of 4

Figure 4-4 – WIRING DIAGRAM – (AIR-COOLED) Single-Stage VS Control

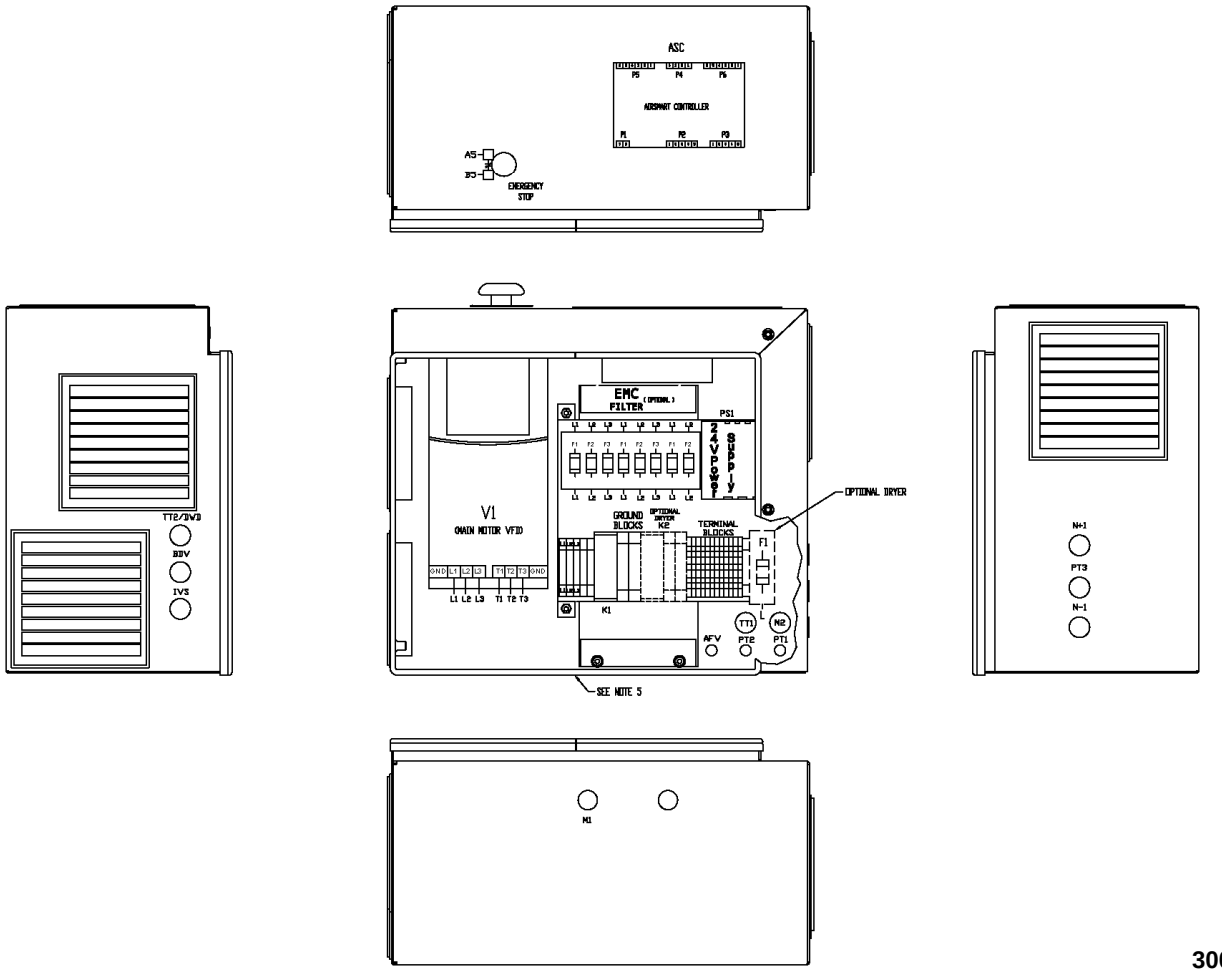


NOTES:

1. SHORTING JUMPERS INSTALLED ON TERMINALS BLOCKS AS FOLLOWS
   +24VDC - B1, B2, B3, B4, B5
   DC GND - B6, B7, B8, B9, B10
   E-STOP QUALIFIED +24VDC - A5, A6
2. FOR CONTROL BY REMOTE CONTACT, REMOVE JUMPER BETWEEN TERMINALS A4 AND B4 AND CONNECT N.C. SWITCH
3. WHEN DRYER IS NOT INSTALLED ADVISORY/SHUTDOWN ALARM CONTACT BETWEEN A12 AND B12 CONTACT RATING: N.O., 3A @ 30VDC, 3A @ 240VAC
4. AUXILIARY POWER FOR MOISTURE SEPARATOR NOT INSTALLED WHEN DRYER IS USED.
5. BACK PLATE MUST BE BONDED TO CONTROL BOX USING 4 AWG (MIN) BONDING STRAP.
6. WHEN COMMUNICATIONS MODULE IS INSTALLED AND PT3 IS INSTALLED, CONNECT PT2 TO P17, PINS 4-6.

300CGA546-D
(Ref. Drawing)
Page 3 of 4

Figure 4-5 – WIRING DIAGRAM – (AIR-COOLED) Single-Stage VS Control



300CGA546-D
(Ref. Drawing)
Page 4 of 4

Figure 4-6 – WIRING DIAGRAM – (AIR-COOLED) Single-Stage VS Control

SECTION 5
COMPRESSOR LUBRICATION – SEPARATION, FILTRATION AND CONTROLS

⚠ 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 compressor package before removing valves, caps, plugs, fittings, bolts and filters.

CAUTION

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

COMPRESSOR OIL SYSTEM – Lubricating oil is employed to absorb the heat of compression, lubricate moving parts and seal internal clearances between the rotor and air cylinder. Pressure differential between the air/oil reservoir and various injection points is used to flow oil through the package.

Oil exits the air/oil sump and is then routed to the heat exchanger and the thermal mixing valve, where cold (oil cooler branch) and hot (bypass branch) are mixed to a temperature that will avoid water vapor condensation within the oil system. Tempered oil is sent to the oil filter for cleaning, then onto injection. The injected oil absorbs heat from compression while progressing through the compression chamber and is then discharged back into the oil separation chamber as a mixture of liquids and aerosols (oil) and gas (air).

Centrifugal action within the air/oil reservoir separates the bulk of the oil from the air, where it is collected and readied for the next cooling cycle. The compressed air and aerosols continue through a coalescing filter, where all but 2 ppm of oil is removed from the compressed air and discharged to the aftercooler.

RECOMMENDED LUBRICANT – The Gardner Denver compressor is factory-filled with AEON 9000SP lubricant. This lubricant is formulated to the highest quality standards and is factory-authorized, tested and approved for use in our rotary screw compressors. AEON 9000SP lubricant is available through your authorized Gardner Denver compressor distributor.

OIL SPECIFICATIONS - The factory fill compressor lubricant is Gardner Denver AEON 9000SP lubricating coolant for all-year-round operation. This is a polyalphaolefin (PAO) synthetic lubricant specially formulated for rotary screw compressor service.

It is highly recommended that the lubricating oil be analyzed frequently in order to identify its quality and remaining operational life. A sampling valve, located on the tubing between the oil filter and the injection manifold, is provided for this purpose.

CAUTION

Use of improper lubricants will cause damage to equipment. Do not mix different types of lubricants or use inferior lubricants.

CAUTION

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

AEON 9000SP Synthetic Lubricating Coolant is not compatible with Nitrile (Buna N) or acrylic paints. AEON 9000SP is compatible with most air system downstream components.

Material Safety Data Sheets (MSDS) are available for all AEON lubricants from your authorized Gardner Denver distributor or by calling 217-222-5400.

MOISTURE IN THE OIL SYSTEM - The oil mixing valve provided with your compressor package has been designed to avoid water vapor condensation during all modes of operation (e.g., load level, ambient temperature or relative humidity and discharge pressure). See “Oil Mixing Valve” notes within this section for further details on this device.

This feature does not eliminate the need to analyze the lubricating oil frequently. If an analysis reveals the presence of water in the oil, it may indicate that the oil mixing valve is malfunctioning. Contact your authorized Gardner Denver factory distributor for assistance.

OIL SIGHT GLASS - This device indicates oil level within the air/oil reservoir. Check oil level only with the compressor running. Normal oil level is the area between “min” and “max” marks. Add oil only when oil level has reached the “min” mark. Drain oil only when the oil level has exceeded the “max” mark.

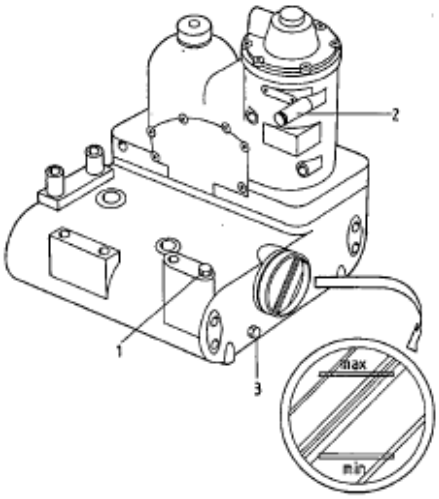


Figure 5-1 – CHECKING OIL LEVEL

ADDITION OF OIL BETWEEN CHANGES – Oil losses (typically 2 ppm) from the oil separation system may require replenishment between scheduled changes. If (during operation only) the sight glass shows oil level below the "min" mark, add oil per following steps: (See Figure 5-1.

1. Be sure the unit is completely off and oil sump is depressurized.

2. Disconnect lockout and tagout the power supply to the compressor package.

3. Close (when provided) valve isolating compressor package from air system.

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

5. Remove the oil filler plug (1) and add (or drain by removing plug (3) if correcting high level) sufficient oil to adjust its level to nearly the top of the measuring rod.

6. Install the oil filler plug, open isolation valve (when provided), restore power, then run unit to check for leaks.

Note that repeated addition of oil between oil changes may indicate excessive oil carry-over and should be investigated.

CAUTION

Excessive oil carry-over can damage equipment. Never fill oil reservoir above the "max" level mark.

CAUTION

Use only CLEAN containers and funnels to avoid contamination of oil. Provide for clean storage of oils. Changing the oil will be of little benefit if done in a careless manner

OIL CHANGE INTERVAL – The AEON 9000SP Synthetic Lubricating Coolant shall be changed every 8000 hours of operation or as prescribed by the results of an oil analysis, whichever comes first. Note that severe operating conditions (e.g., very dusty, high humidity, etc.), may require more frequent oil changes.

Gardner Denver offers a free oil analysis program with our AEON 9000SP lubricant. The first sample from a new unit should be sent in between 40-100 hours of operation.

DRAINING AND CLEANING OIL SYSTEM - 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, use the following method:

1. Be sure the unit is completely off and oil sump is depressurized.

2. Disconnect lockout and tagout the power supply to the compressor package.

3. Close (if provided by user) valve isolating compressor package from air system.

4. Wipe away all dirt around the oil fill plug (1) and remove it.

5. Remove drain (3) plug to evacuate oil.

6. Replace drain plug (3), add oil up to the max level on the oil sight gauge, and replace fill plug (1).

7. Restore power and run unit to check for leaks.

8. After 1-2 minutes of operation, stop the unit, allow the oil to settle, and check that a proper oil level has been achieved. If additional oil is required, repeat steps 1, 2, 3, 4, 6, and 7 to correct oil level.

9. If the drained oil and/or the oil filter element are contaminated with dirt, flush the entire system, reservoir, oil cooler, mixing valve and lines. Inspect the 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.

REFILLING OIL SYSTEM - The steps to refill the drained oil system are the same as those already presented for the addition of oil between changes – see page 37 for full details. The only exception in filling all the empty lines and components (e.g., oil cooler, compressors, and oil filter) will be a much larger volume of oil required.

The VS11 package requires nearly 1.25 gallons of AEON 9000SP Synthetic Lubricating Coolant to fill all the lines and components and achieve normal oil level.

COMPRESSOR OIL FILTER - The oil filter is a vital part in maintaining a trouble-free compressor, since it removes dirt and abrasives from the circulated oil. It should be replaced every 1000 hours of operation, sooner if necessary due to dirty environment and when the oil is changed. See Figure 1-3, page 10, for the location of the oil filter cartridge relative to the package hardware.

A flow bypass valve, mounted inside the filter cartridge, provides uninterrupted oil flow when the filter element is contaminated and its backpressure exceeds 29-36 psid (at typical operating conditions of 167° F and 100 psi). However, since this condition introduces unfiltered, potentially contaminated oil into the compressor, it is best avoided by following the recommended filter replacement intervals.

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.

The filter media is contained within an easily replaced, spin-on cartridge. Use the following procedure to replace the filter. Do not disturb the piping:

1. Be sure the unit is completely off and that the oil sump is depressurized.
2. Disconnect, lockout and tagout the power supply to the compressor package.
3. Close (when provided) valve isolating compressor package from air system.
4. Unscrew (counter-clockwise) the cartridge with adequate tool (e.g., strap wrench) and remove.
5. Clean (wipe) and lubricate sealing surface on filter housing with grease.
6. Lubricate o-ring seal on new element with grease.
7. Screw-new element onto filter head firmly – approximately 3/4 turns after cartridge and head make contact.
8. Open isolation valve (when provided), restore power, then run unit to check for leaks. Re-set oil filter service interval in AirSmart controller.

OIL MIXING VALVE (Thermostatic) – This device prevents the compressor from operating at a pressure and temperature combination that condenses water vapor in the oil system, and it is an integral component of the compressor assembly.

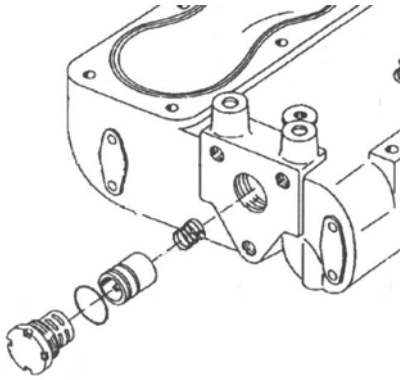


Figure 5-2 – OIL MIXING VALVE (THERMOSTATIC) HARDWARE

The valve mixes cooled and hot oil, prior to delivery to the oil filter and oil injection line, to maintain a system discharge temperature of 203º F. At startup, the mixing valve is on full bypass mode. As system heat load increases with ambient temperature or load, the mixing valve sends more oil flow to the cooler to maintain adequate compressor discharge temperature.

See Figure 5-3, for pressure dew point trends at various combinations of operating pressures and saturated ambient air temperatures.

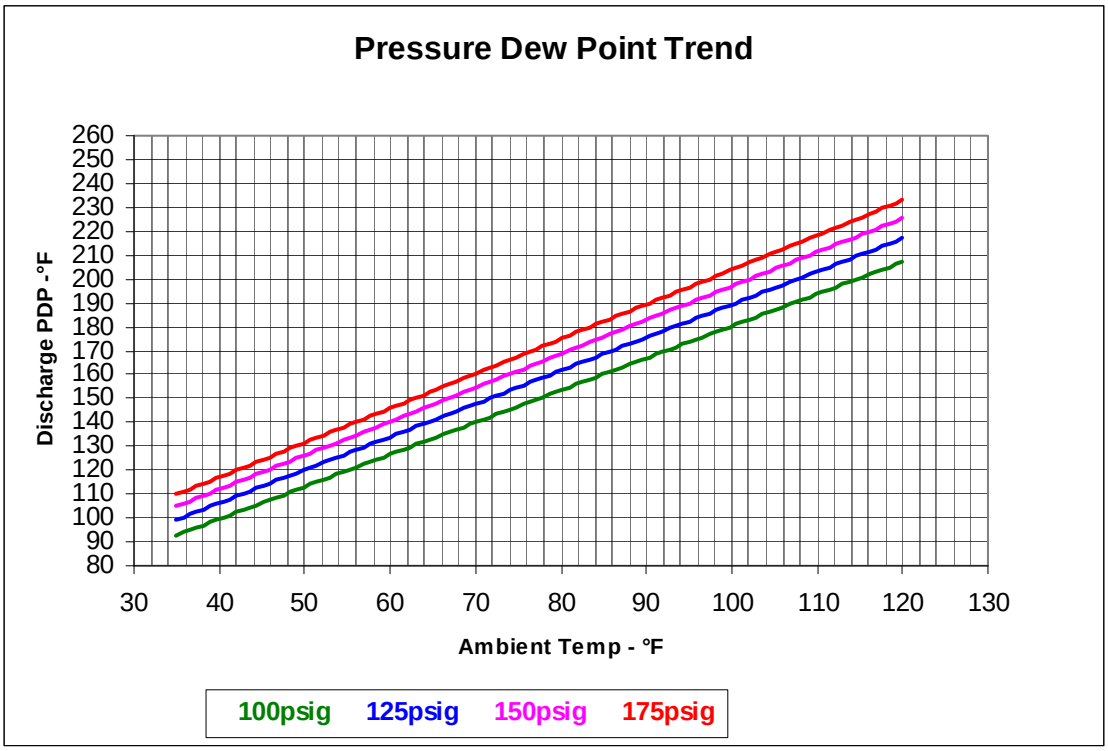


Figure 5-3 – PRESSURE DEW POINT OF COMPRESSED AIR

Low Air Demand and Package Operation – During periods of very low air demand, such as when the package is operated in short cycles, the oil system may not reach a high enough temperature to keep water vapor from condensing, in spite of the oil mixing valve bypassing all flow around the heat exchanger.

Under these conditions, it is recommended that the package operation be prolonged after each unload condition is achieved – this can be easily accomplished by adjusting the "Auto Timer" option in the AirSmart controller. Refer to the AirSmart controller user's manual 13-17-600 for detailed programming instructions of this parameter and adjust the "Auto Timer" parameter to a value of at least 5 minutes.

OIL SEPARATION RESERVOIR / COALESCING ELEMENT - This device serves multiple functions in the compressor package:

- **Air/oil centrifugal separation** - The bulk of the liquid oil is separated, by change of direction, impingement and additional centrifugal effects, away from the compressed air and aerosol streams, and is then gravity-collected at the bottom of the sump.

- **Oil degassing and holding** - The sump has sufficient holding capacity to degas the oil mass before it is drained off on its way to cooling, filtering and re-injection. It also serves as a storage volume for the oil mass migrating from higher elevations (e.g., oil cooler, compressor casings, and piping).

- **Air/oil final separation** - The aerosols and compressed air streams are led to the upper portion of the sump, where the coalescing element resides. The fine droplets of oil (aerosol) are trapped in the element media, coalesced, then gravity-drained, through a low-point connection and associated tubing (oil return line) into a lower pressure region of the compressor.

Separation performance - The package oil separation system has been designed to yield 2 ppm total oil carryover at the discharge of the air/oil reservoir – the oil content level at the discharge of the package will be lower and will depend on the amount of moisture rejected by the aftercooler.

This high level of performance will be affected by the following typical offset conditions:

- Contaminated (e.g., dirt, varnish, moisture) or damaged (e.g., ruptured) coalescing element.
- Contaminated (e.g., dirt, varnish, moisture) or inadequate oil in use.
- High oil level in air/oil reservoir.
- Blockages of oil return line strainer or orifice.
- Abnormally frequent or fast depressurization cycles - leading to oil foaming.

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 gauging or by inspection.

Oil Coalescing Element Monitoring - The AirSmart controller keeps track of the pressure differential across the coalescing element. A pressure differential of 8 psi will trigger a service advisory to change the element and a pressure differential of 15 psi will initiate a system shutdown.

CAUTION

Using an oil separator element at excessive pressure differential can cause damage to equipment. Replace the separator when the "Change Separator" advisory appears.

NOTICE

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

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

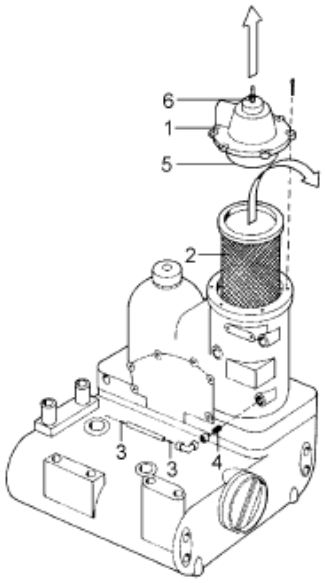


Figure 5-4 – CHANGING OIL COALESCING ELEMENT

Oil Coalescing Element Service – Use the following procedures to replace or inspect the element:

1. Be sure the unit is completely off and that oil sump is depressurized.

2. Disconnect, lockout and tagout power supply to the compressor package.

3. Remove cap screws and body of MPV/sump cover (1).

4. Lift the air/oil coalescing element from sump.

5. Inspect and/or replace the element if necessary - shine a light inside the element to reveal areas of heavy dirt, varnish deposits or breaks (ruptures) in its media. Also inspect (sealing) o-ring in element for damage. Before installing new or old element, apply (heavy) grease to sealing o-ring – to avoid damage during installation.

6. Inspect oil scavenge orifice (3) and strainer (4) for fouling. Replace if necessary.

7. Wipe the MPV/sump cover seal o-ring (5) clean and inspect for damage. Replace if necessary.

8. Lower element into sump and press element down into holder. Do not use excessive force as element damage may occur.

9. Carefully place MPV/sump cover and o-ring seal on sump flange. Check that centering pin (on MPV/sump cover) has engaged element cavity and that MPV/sump cover lays flat against sump flange. Install and tighten cap screws.

10. After compressor is started and pressurized, inspect MPV/sump cover joint for leaks. Reset oil coalescing element service interval in AirSmart controller.

SECTION 6
HEAT EXCHANGERS (OIL, AIR)

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

Do not attempt inspection or cleaning of air-cooled heat exchangers until cooling fan has stopped rotating. Disconnect, lockout and tagout package from power supply.

Automatic restarting or electrical shock can cause injury or death. Disconnect, lockout and tagout package from the power supply.

OIL/AIR HEAT EXCHANGERS – The heat of compression absorbed by the oil injected into the compressors (for cooling and lubrication) is ultimately rejected in a convenient medium such as air (for air-cooled cores) or water (for water-cooled cores). Proper operation of these heat exchangers is essential for the following processes:

- The compressors require a stable, cool (167° F typical at 80° F ambient air) supply of injection oil in order to operate at optimal efficiency. Under these conditions, the oil core allows 5.8 gpm oil flow with less than 10 psid pressure loss.

- The lubricating and cooling oil must be kept at a normal operating temperature below 225° F in order to preserve its longevity.

- The compressed air supply must be delivered into the distribution system at a temperature not exceeding 15° F above the ambient level in order to protect other devices (e.g., filters, dryers, tools, etc) against damage. At 100 psi of discharge pressure, the air core allows the flow of 57 cfm with 0.3 psid pressure loss.

AIR-COOLED HEAT EXCHANGERS – Air-cooled cores (radiator-type) are provided as standard feature. An axial fan, located below the heat exchangers, pumps the required amount of cooling air and expels it through an opening on the enclosure roof. The fan is driven by a close-coupled, IP54-protected, electric motor. A full-voltage starter energizes the fan motor.

Refer to Figure 6-1 for estimates of ventilation requirements. Please note that the air-cooled package requires the combined total of the heat exchanger plus the enclosure ventilation flow rates (which include motor ventilation and compressor intake). Furthermore, when package location makes it necessary to duct fresh cooling air in/out, these ducts must be sized with a maximum (total) pressure loss of .1 inch water gauge to avoid impacting the heat exchanger cooling air system. An external ventilation fan may be required to properly evacuate hot air from the compressor room.

Minimum Cooling Air Flow Requirements		
CFM		
KW	Air-Cooled Heat Exchangers	Enclosure Ventilation
11	1500	175

Figure 6-1 – AIR FLOW CHART

All the required hardware, mechanical and electrical connections have been made at the Gardner Denver factory, thus the only regular maintenance required is to keep the exterior core fins free from dirt and other airborne debris per the following procedure:

CAUTION

Air-cooled heat exchanger cores are fabricated from aluminum. Do not use caustic liquids to cleanse core or permanent damage will take place.

1. Be sure the unit is completely off and that oil reservoir is depressurized.

2. Disconnect, lockout and tagout power supply to the compressor package.

3. Open and/or remove enclosure door panels adjacent to cooler assembly. The fan and bottom of cooler core are now accessible. If additional access is required, locate and remove side plates. See Figure 1-3, page 10, for details.

4. Inspect core area. If blocked with debris, use a moderate (e.g., 100psi) source of compressed air and/or water while directing nozzle (pointed through core to inside) to dislodge debris and clean. Vacuum

(applied from inside) can also be employed to clean the heat exchanger cores – see Figure 6-2, for details.

5. Remove all loose debris and water from cooler box after cleaning process is complete.

6. Re-attach cooler housing side covers with provided fasteners and re-install enclosure door panels.

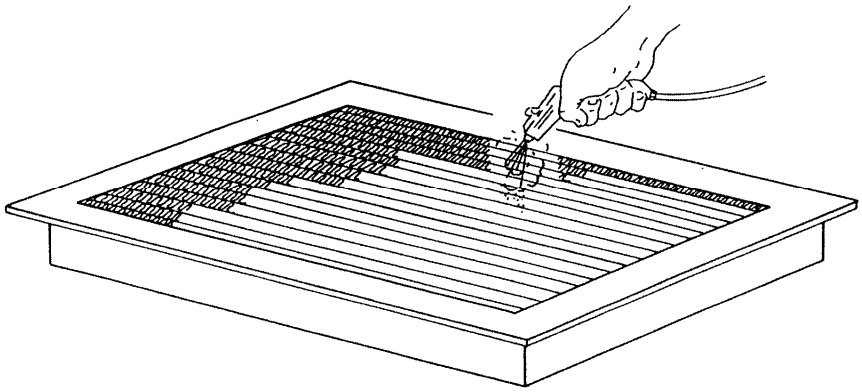


Figure 6-2 – CLEANING COOLER CORE

WATER SEPARATOR AND DRAIN – These devices separate and drain the water (condensed by the air cooler) mixed with the compressed air delivered by the compressor package. Note that if this device is not used, the optional compressed air dryer is supplied; as the latter's water separator is employed for this process.

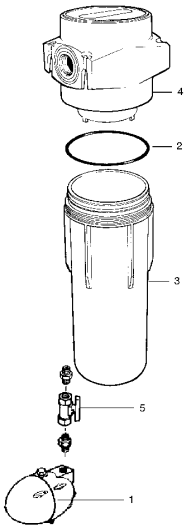


Figure 6-3 – WATER SEPARATOR AND DRAIN

The separator (4) removes the liquid water from the compressed air stream by inertial effects and collects it in a lower bowl (3). Collected water is evacuated with the use of a float-type drain valve (1). The device prevents the loss of compressed air by only allowing the discharge of liquid water during its opening phase. An isolation ball valve (5) is provided between the separator bowl (3) and the drain valve body (1). This allows the safe and quick removal of the drain valve for servicing, in case the drain valve malfunctions.

In case the drain valve is fouled with dirt, cleanse the collection bowl:

1. Be sure the unit is completely off and oil sump is depressurized.
2. Disconnect, lockout and tagout power supply to the compressor package.
3. Close (when provided) valve isolating compressor package from air system.
4. Unscrew drain valve (1) from isolation valve (5).
5. Unscrew collection bowl (3) from separator housing (4).
6. Inspect and cleans collection bowl and sealing o-ring.
7. Reinstall in reverse order.

SECTION 7
AIR FILTER

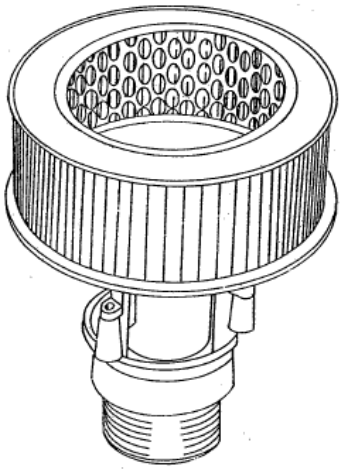


Figure 7-1 – AIR FILTER (STANDARD)

AIR FILTER - This device cleans the air stream entering the compressor inlet and is furnished as standard equipment with the compressor package. Its single high efficiency, synthetic media element is housed in a metal housing integrated in the enclosure structure.

Efficient compressor package operation depends on the unrestricted, clean supply of fresh air delivered by the air filter. In turn, the longevity of the filter element depends on the cleanliness of the local environment.

NOTICE

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

CAUTION

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 air filter element. Never use elements that are damaged, ruptured or wet. Keep spare elements on hand to reduce downtime. Store elements in a protected area free from damage, dirt and moisture. Handle all parts with care.

Filter Element Inspection and Replacement:

1. Loosen latches fastening air cleaner cover to bottom plate, remove air cleaner cover and remove filter element.

2. Visually inspect housing inner tube against which the element makes a seal. Wipe dirt from outer surface if necessary. Also visually inspect the matching o-ring seal that is bonded to the element for defects and dirt, then wipe clean if necessary.

3. Visually inspect media. If flaws (e.g., tears of media, damage to sealing o-ring, etc.) are evident or if the pressure loss has triggered the vacuum switch (activation level is 30 inches water gauge) provided with the package instrumentation, replace the element. Cleansing the element with air or water is not recommended, as media damage is very probable.

4. Replace element and cover and fasten cover to filter housing.

SECTION 8
DRIVE V-BELTS

DRIVE V-BELTS – Power supplied by the electric motor is transmitted to the compressor via shaft-mounted sheaves and V-belts. The electric motor is mounted on a fixed support, where as the compressor is mounted on a [two-point] pivoted support which automatically sets v-belt tension.

Servicing the V-Belts:

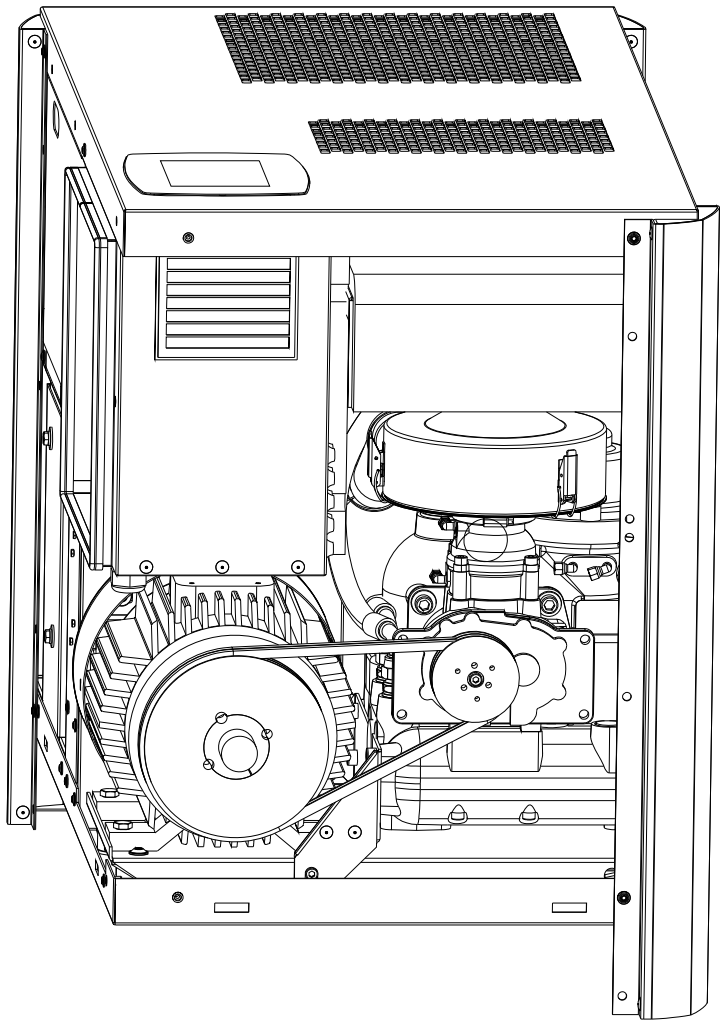


Figure 8-1 – V-BELT ASSEMBLY

1. Disconnect, lockout and tagout power supply to the compressor package.

2. Lift/pivot compressor to loosen and remove belts.

3. Inspect belts for signs of wear and tear. Replace if necessary.

4. After installing belts, check that the motor weight tightens the belts. Also check that the belt breakage limit switch has been re-set and that there is a gap (about 3/8") between the triggering bracket and the limit switch roller. See Figure 1-3, page10 for the location of the limit switch.

SERVICING THE MOTOR SHEAVE ASSEMBLY:

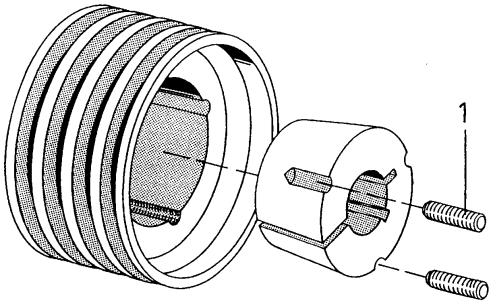


Figure 8-2 – MOTOR SHEAVE AND BUSHING

1. Disconnect, lockout and tagout power supply to the compressor package.
2. Lift/pivot compressor to loosen and remove belts.
3. Remove all screws from the bushing and insert one into the removal hole.
4. Tighten the screw evenly until the bushing comes off the hub – do not hammer.
5. Remove loosened bushing and sheave from the shaft, taking care not to damage the latter's surface.
6. When ready to reassemble components, place bushing in the sheave and align the holes.
7. Grease both screws (1), insert in the holes shown in (threads are cut in the sheave), and tighten lightly.
8. Cleanse shaft surface and slide sheave/bushing assembly unto shaft. Make sure position the motor sheave in alignment with its mating sheave on the compressor shaft; otherwise, v-belt life will be compromised.
9. Once proper sheave alignment is achieved, tighten the screws to torque value listed on Fig 8-3. Note that the bushing type is scribed on its body.
10. Knock the sleeve lightly with a drift, and retighten the screws. **Repeat this a few times** to make sure the sleeve is firmly fixed in place.
11. Check the tightness of the screws from time to time.
12. Fill the extraction holes e.g. with grease to protect them against dirt.

Bushing	Tightening torque Nm
1610	20
2012	31

Figure 8-3 – MOTOR SHEAVE/BUSHING FASTENER TORQUE

SERVICING THE COMPRESSOR SHEAVE ASSEMBLY:

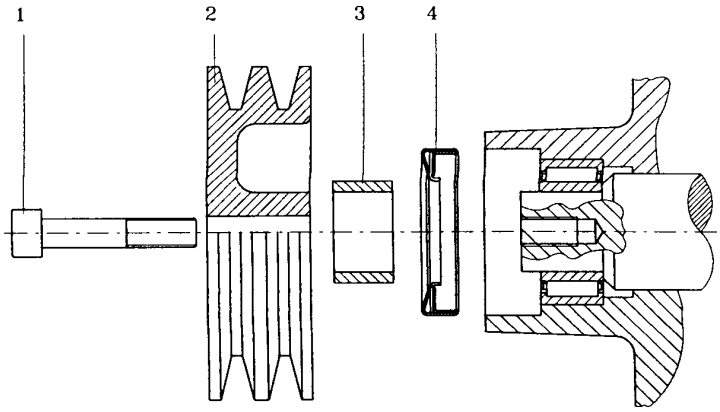


Figure 8-4 – COMPRESSOR SHEAVE AND SLEEVE SERVICING

1. Disconnect, lockout and tagout power supply to the compressor package.

2. The thread on fastening bolt (1) is **left-handed**. To remove the bolt, use an Allen key. Rap the key bar sharply with a hammer, holding the sheave in place by means of Gardner Denver clamping tool part number **EFC03476918** or appropriate pincers.

3. Pull sheave (2) from the rotor shaft with a suitable extractor. Protect the threaded hole in the shaft end. Note that wear sleeve (3) comes off with the sheave.

4. Remove the wear sleeve (3) from the sheave by knocking it loose with Gardner Denver drift tool part number **EFC03477088** through the three holes in the sheave. Always replace both wear sleeve (3) and shaft seal (4) whenever servicing either part.

5. Pull out shaft seal (4) with a suitable extractor. Protect the threaded hole in the shaft end.

6. When ready to reassemble components, cleanse the shaft surface and housing.

7. Apply Loctite 542 on shaft seal housing and press seal (4) into housing with Gardner Denver drift tool.

8. Apply Loctite 601 on the surface of the sheave (2) were the wear sleeve(3) will rest. Press the wear sleeve (3) in place and mount the sheave (2) unto shaft with the help of bolt (1). While holding the sheave (2) in place with Gardner Denver clamping tool part number **EFC03476918**, tighten bolt (1) to 80 Nm torque value.

9. **Note!** Make sure that the compressor sheave is aligned with the motor sheave. In case of misalignment, see “Servicing the motor sheave” notes above.

SECTION 9
MINIMUM PRESSURE/CHECK VALVE

MINIMUM PRESSURE/CHECK VALVE - This device maintains minimum pressure within the air/oil reservoir, thus insuring (cooling/lubricating) oil injection flow into the compressors. It also serves as a check valve to prevent back flow of compressed air flow from the customer's piping or pipe network back into the compressor package when the compressor is not active. The spring-loaded piston does not allow the discharge of compressed air from the air/oil reservoir until the compressor builds up reservoir pressure exceeding 60 psig. Beyond this pressure level, the valve remains fully open.

The valve does not require maintenance or adjustment. If the valve fails to function, check the valve stem O-ring for sealing, valve orifices for restriction, or valve and valve seat for burrs and dirt. Repair kits are available from your local authorized Gardner Denver distributor.

Before servicing the minimum pressure valve, always stop the unit, release air pressure, lockout and tagout the power supply to the compressor package. Failure to release pressure or properly disconnect the power may result in personal injury or death.

NOTICE

Working spring within valve body is under tension. Failure to relieve spring tension gradually may cause serious injury upon cap removal.

Minimum Pressure/Check Valve (MPV) Inspection:

1. Be sure the unit is completely off and that the oil sump is depressurized – including pipe works between MVP and (external) isolation valve.
2. Disconnect, lockout and tagout power supply to the compressor package.
3. Tighten nut (12) on the MPV frame (5) – this compresses the internal components prior to removal.
4. Unscrew bolts fastening MPV frame (5) to the sump housing and remove MPV assembly.
5. Remove snap ring (8) restraining internal components to the cover.
6. Remove internal component assembly (1-4, 6-11, 15) away from MPV frame (5) and inspect or replace components.
7. Re-assemble internal assembly (1-4, 6-11, 15) into MPV frame (5) in reverse order.
8. Clean o-ring sealing surfaces between sump and bottom of MPV frame (5). Inspect, clean and or replace o-ring prior to re-installation.

9. Re-install MPV unto sump with provided bolts.
10. Adjust nut (13) so that there is a small (.05” to .08”) between itself and the frame (5) surface.
11. Check for leaks after unit is back in operation.

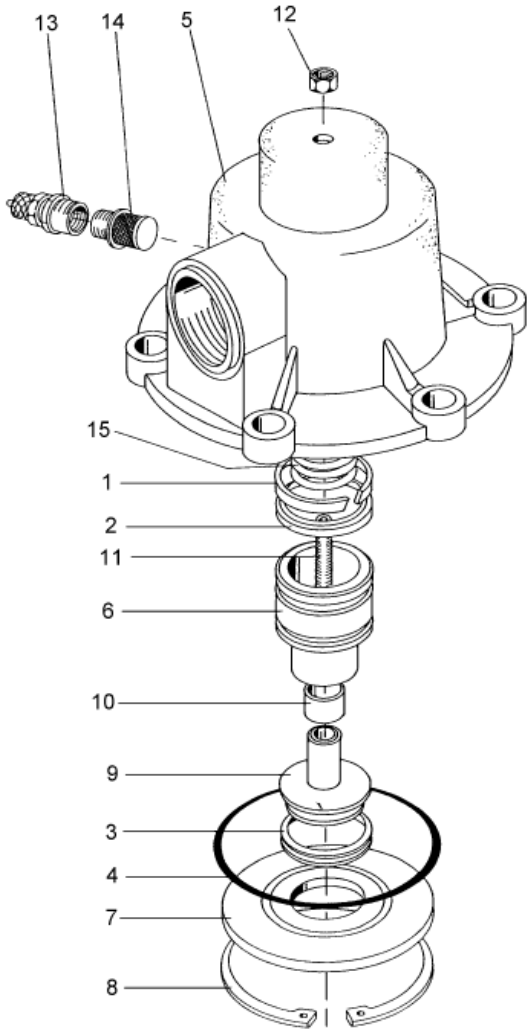
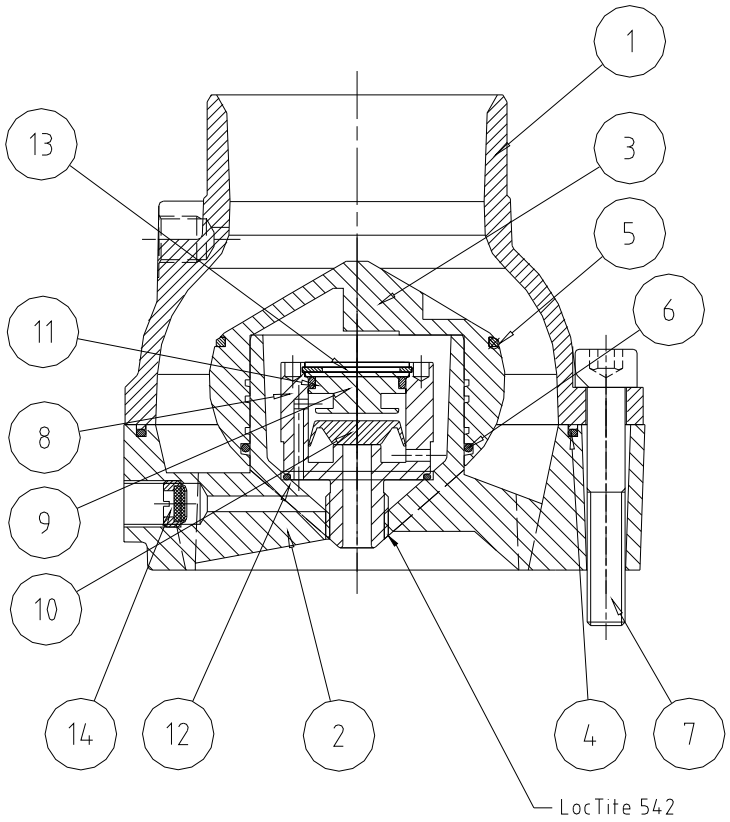


Figure 9-1 – MINIMUM DISCHARGE PRESSURE/CHECK VALVE

SECTION 10
INLET CONTROL VALVE

INLET CONTROL VALVE – This device is located at the intake flange of the compressor, and allows the compressor to remain pressurized and ready for quick response to air demand when the latter is not running.

During compressor operation, the underside of the poppet is vented to atmosphere via a 3-way solenoid valve, allowing it to fall (open) and feed fresh air to the compressor inlet. An internal self-actuated blow-off valve helps to quickly vent the air signal trapped below the poppet. During stopped operation modes (e.g., commanded from the key pad or initiated by protective shutdowns), the 3-way solenoid valve feeds sump air to the underside of the poppet, forcing it upward (closed) and blocking-off the compressor intake. The internal blow-off valve is also forced closed by the sump air signal.



D301977-B
(Ref. Drawing)

Figure 10-1 – INLET CONTROL VALVE

Inlet Control Valve (Body) Inspection - The valve does not require maintenance or lubrication. If air/oil leaks develop across the valve disc during pressurized conditions (e.g., machine stopped), valve seals should be inspected for wear and tear signs:

1. Be sure the unit is completely off and oil sump is depressurized.
2. Disconnect, lockout and tagout power supply to the compressor package.
3. Close (when provided) valve isolating compressor package from air system.
4. Identify (by position) each tube connected to the valve body and remove.

5. Remove four bolts (7) securing valve body to compressor body and remove valve.

6. Inspect poppet seal (o-ring) (5) for wear and tear. Replace, if necessary.

7. In case of noted malfunction (e.g., valve will not open/close properly with good air signal), proceed to dismantle internal blow-off valve.

    - Carefully lift and remove poppet (3).
    - Remove lock ring (13).
    - Pull cover (9) and inspect seals (10 & 11) for wear and tear. Replace if necessary.
    - Re-assemble blow-off valve in reverse order.

8. Reassemble inlet control valve in reverse order.

SECTION 11
PRESSURE RELIEF VALVE

Pressure Relief Valve - This device protects the pressure-containing components of the compressor package against pressures exceeding 188.5 psig. It is installed on the dry-side of the oil sump.

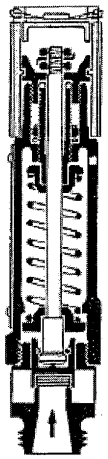


Figure 11-1 – PRESSURE RELIEF VALVE

⚠ DANGER

Before inspecting the pressure relief valve, release air pressure, lockout and tagout the power supply to the compressor package. Failure to release pressure or properly disconnect the power may result in personal injury or death.

⚠ CAUTION

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

DANGER

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.

Pressure Relief Valve Check During Operation – The pressure relief valve has no user-serviceable or repairable components. However, it should be tested for proper operation at least once every year. To test the pressure relief valve:

- Raise the system operating pressure to its normal level.
- Turn the top cap on valve 1-2 turns counter-clockwise to open valve and let it vent for a few seconds.
- Close the valve by firmly turning top cap clockwise. Make sure that cap is firmly tightened to avoid damage by vibrations.

SECTION 12
VENTILATION FILTERS (ELECTRICAL ENCLOSURE)

Ventilation Filters - The electronics housed in the standard IP54 enclosure box are ventilated by a combination of an intake air filter and pressurized air provided by the heat exchanger cooling fans.

Filter Inspection - In order to ensure the electronics operate at peak efficiency and free from troublesome temperature-related stoppages, it is imperative that the filter elements be kept clean:

1. Be sure the unit is completely off and oil reservoir is depressurized.

2. Disconnect, lockout and tagout power supply to the compressor package.

3. To service intake-side filter, open access door to the control panel – Refer to Figure 4-1, page 27, for details. The discharge-side filter is accessible from the exterior roof panel.

4. Remove filter element (2) from each bracket by prying open the retaining grill area (1).

5. Inspect the elements. If dirty, gently clean with soapy water and allow to dry completely before re-installation. If damage is evident, replace.

6. Replace elements into frame and replace snap grills.

7. Replace access panel in reverse order.

8. Close access doors.

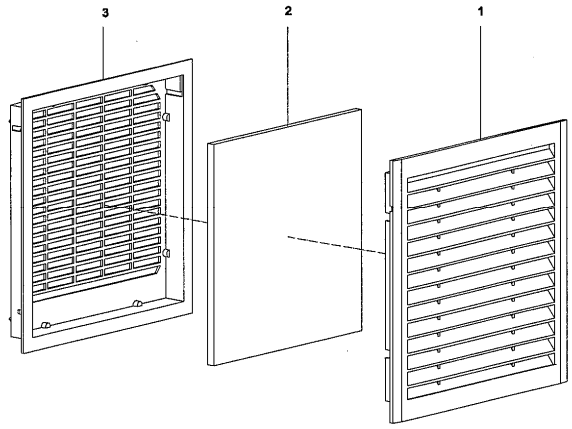


Figure 12-1 – VENTILATION FILTER ASSEMBLY

SECTION 13
MOTOR LUBRICATION

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

Motor Lubrication – Your WEG motor is supplied with sealed bearings which were greased at the factory. No grease fittings are provided with the motor as no field re-greasing is required or possible.

SECTION 14
MAINTENANCE SCHEDULE

SERVICE CHECK LIST

Daily Checks:

- **Air Filter (Compressor)** - Replace when controller displays “CHANGE AIR FILTER” message. Refer to Section 7 for air filter details.
- **Oil Separator Element** - Replace when controller displays “CHANGE OIL SEPARATOR ELEMENT”. Refer to Section 5 for oil separator element details.
- **Air/Oil Reservoir Oil Level** - Check the reservoir oil level during compressor operation only - add oil if required. Refer to Section 5 for full details. DO NOT MIX LUBRICANTS.
- **Start/Modulation/Stop Operation** – Verify that compressors maintain steady compressed air pressure.
- **AirSmart Operational Parameters** – Maintaining a periodic log of package critical parameters (e.g., pressures, temperatures, speeds, load levels, etc) helps identify when abnormal operation occurs.
- **AirSmart Controller Messages and Alarms** – Acknowledge the presence of an abnormal condition and take action to correct it.

Weekly Checks:

- **Heat Exchangers (air-cooled)** - Check for dirt accumulation on (air-cooled) air/oil heat exchanger finned surfaces. Refer to Section 6 for detailed instructions to clean heat exchanger surfaces.
- **Air Filter (Electrical Box)** – Check filter elements for dirt accumulation. Refer to Section 12 for detailed instruction to clean filter elements.

Every 1000 Hours or as often as operating conditions require it:

- **Oil Filter** - Replace.
- **Oil** - Sample and analyze.

Every 8000 Hours (or as Prescribed by Oil Analysis Results):

1. **Compressor Lubricant –** Replace.

Yearly Checks:

- **Heat Exchangers (air cooled)** – Check cooling performance of air and oil cores – see Section 6 of this manual for details on typical performance expectations as well as recommended cleaning procedures.

- **Pressure Relief Valve –** Check operation of device – see Section 11, page 56 for test procedure.

- **Motor Lubrication –** Inspect motors for abnormal noise and vibration. Grease-lubricate per guidelines included in Section 13 of this manual.

- **Compressor/Motor v-belts –** Check V-belts for signs of wear and tear – see Section 8, page 49 for detailed instruction on v-belt inspection procedures.

SECTION 15
TROUBLESHOOTING

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 compressor package before removing valves, caps, plugs, fittings, bolts and filters.

SYMPTOM		POSSIBLE CAUSE		REMEDY
Compressor fails to start	1.	Main disconnect open	1.	Check and reset.
	2.	Blown fuses in control box	2.	Check voltage and fuses. Replace fuses.
	3.	Shutdown event sensed by controller not re-set	3.	Investigate cause of fault and press “STOP/RESET” button to reset.
	4.	Read error message on control panel	4.	Take appropriate action. See Control Manual 13-17-600.
	5.	Remote Contact is open	5.	Replace switch or jumper.
	6.	Variable Frequency Drive fault active	6.	Investigate and correct cause of fault and press “STOP/RESET” button to reset.
	7.	System pressure exceeds set pressure	7.	Wait until system pressure falls below set pressure.
Compressor starts but stops after a short time	1.	High discharge temperature	1.	See “High Discharge Air Temperature,” this section.
	2.	Low oil injection pressure	2.	Check oil filter dP.
	3.	Blown fuse in control box	3.	Replace fuse (investigate if fuses continue to blow).
	4.	Variable Frequency Drive overload sensor tripped	4.	Reset and investigate cause of overload.

SYMPTOM		POSSIBLE CAUSE		REMEDY
Compressor does not unload (or load)	1.	Improperly adjusted controller	1.	Refer to Control Manual 13-17-600 and adjust control.
	2.	Feed 3-way solenoid valve malfunction	2.	Repair, clean or replace valve.
	3.	Inlet valve stuck	3.	Inspect and replace valve.
	4.	Blow down valve malfunction	4.	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.
Compressor starts too slowly	1.	Acceleration time in VFD set too long	1.	Contact your Gardner Denver distributor.
	2.	Minimum Pressure/Check Valve is leaking	2.	Repair or replace.
Compressor is low on delivery and pressure	1,	Improperly adjusted control	1.	Refer to Control Manual 13-17-600 and adjust control.
	2.	Restricted air filter	2.	Clean or replace filter element.
	3.	Inlet valve not fully open	3.	Inspect, adjust or replace feed solenoid valve and/or pressure regulator.
	4.	Minimum pressure valve stuck closed	4.	Inspect, service or replace valve.
	5.	Blowdown valve leaking	5.	Inspect or replace solenoid valve. Ensure local ambient temperature has not exceeded 113°F. limit.
	6.	Air demand exceeds supply	6.	Make sure air demand matches compressor specifications for flow and pressure.

SYMPTOM		POSSIBLE CAUSE		REMEDY
Excessive oil consumption	1.	Oil separation malfunction	1.	See “Oil Carryover” in this section.
	2.	Oil leaks at fittings and gaskets	2.	Detect and correct oil leaks.
	3.	Shaft seal leaking	3.	Inspect or replace shaft seal.
High discharge air, oil Temperature (air, water cooled cores)	1.	Oil mixing valve stuck on bypass mode	1.	Check 24Vdc power feed to servo. Check ModBus connection to servo. Check servo-to-valve coupling. Check rotation of ball valve.
	2.	Clogged oil filter	2.	Inspect and replace filter.
	3.	Clogged cooler (interior)	3.	Inspect and clear cooler.
	4.	Clogged oil lines	4.	Inspect and clear oil lines.
	5.	Low oil level	5.	Add oil to proper level.
High discharge air, oil Temperature (air cooled cores)	1.	Dirty or clogged cooler outer surfaces.	1.	Inspect and clean cooler outer surfaces.
	2.	Insufficient cooling air flow	2.	Verify (ductwork) back pressure does not exceed .1” water gauge.
VFD Shutdown on Overheat	1.	Ambient temperature exceeds 45° C	1.	Check location ventilation and improve if necessary.
	2.	VFD air filters dirty	2.	Inspect, clean or replace elements.
VFD Shutdown on “Belt Break” fault	1.	V-Belt has broken and limit switch triggered.	1.	Replace broken v-belt and make sure that limit switch is reset.

SYMPTOM		POSSIBLE CAUSE		REMEDY
Excessive oil at intake filter area	1.	Intake valve seals leaking.	1.	Check location ventilation and improve if necessary. Inspect, repair or replace valve.
	2.	Slow intake valve poppet action	2.	Inspect poppet and guide surfaces. Replace if necessary.
	3.	Feed 3-way solenoid valve malfunction	3.	Repair, clean or replace valve.
Oil carryover	1.	Overfilling oil separation vessel	1.	Drain excess oil from system.
	2.	Clogged oil return line orifice	2.	Inspect and service.
	3.	Clogged oil return line strainer	3.	Inspect and service.
	4.	Clogged, broken, or loose oil return line fittings	4.	Inspect and tighten or replace.
	5.	Ruptured oil separator element.	5.	Replace element.
	6.	Loose assembly	6.	Tighten all fittings and gaskets.
	7.	Foam caused by use of incorrect oil	7.	Use Gardner Denver AEON 9000SP oil only.
	8.	Minimum pressure valve malfunction – discharge pressure below 80 psig	8.	Repair or replace. Inspect, adjust or replace regulator.

Gardner Denver

WARRANTY
VS AND VST SERIES
LUBRICATED ROTARY SCREW COMPRESSORS

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, free of defects in 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/or serviced by others.
5. Any reconditioned or prior owned product.

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, any part, which in its judgment proved not to be as warranted within the applicable Warranty Period as follows. Regular lubricant sampling and use of genuine GD OEM parts is strongly recommended.

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. Shaft seals are a routine maintenance item and carry a 12 month warranty. Inlet valves and airends contain wearing items that must be serviced according to the operator's manual. A material or workmanship defect in these items is warrantable. Normal wear and servicing of these items is not covered under the warranty.

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 AirSmart™ controller, variable frequency drive, drive motor(s), reservoir, mixing valve, drive coupling, coupling insert, cooling fan(s) and cooling fan motor(s) are warranted for 24 months from date of initial use or 27 months from date of shipment to the first purchaser, whichever occurs first, as provided in, and subject to the terms of the original component manufacturer's warranty. The oil cooler and aftercooler are warranted for 36 months from date of initial use or 39 months from date of shipment to the first purchaser, whichever occurs first, as provided in, and subject to the terms of the original, component manufacturer's warranty.

OTHER COMPONENTS

All other components not specified above 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 AND HEREBY EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING WITHOUT LIMITATION, EXPRESSED, IMPLIED OR STATUTORY WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE.

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.

For additional information contact your local representative or

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