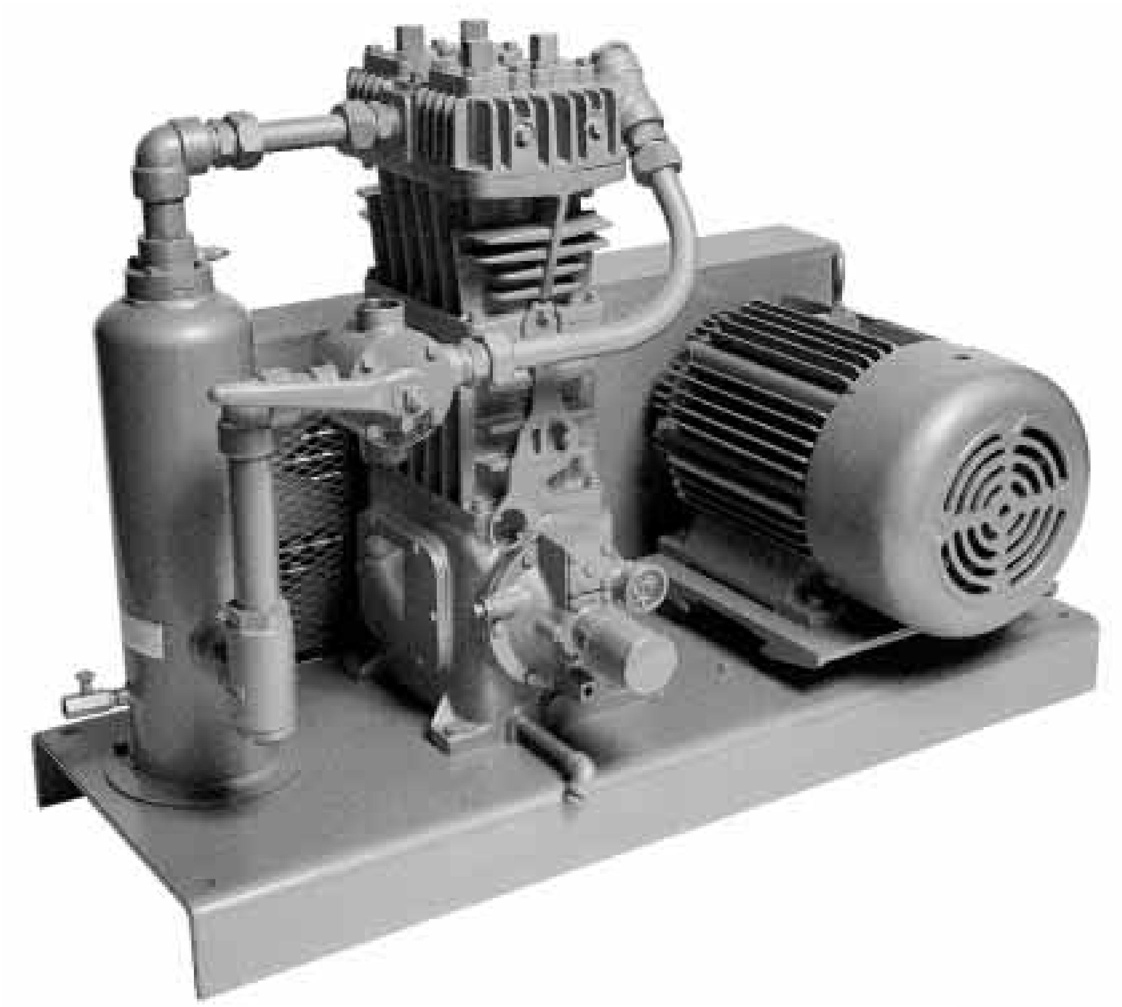
IE101F

IMPORTANT INSTRUCTIONS

LIQUID TRANSFER-VAPOR RECOVERY COMPRESSORS



Solutions beyond products...

CORKEN®

IDEX

Warning: (1) Periodic inspection and maintenance of Corken products is essential. (2) Inspection, maintenance and installation of Corken products must be made only by experienced, trained and qualified personnel. (3) Maintenance, use and installation of Corken products must comply with Corken instructions, applicable laws and safety standards (such as NFPA Pamphlet 58 for LP-Gas and ANSI K61.1-1972 for Anhydrous Ammonia). (4) Transfer of toxic, dangerous, flammable or explosive substances using Corken products is at user's risk and equipment should be operated only by qualified personnel according to applicable laws and safety standards.

WARNING

Install, use and maintain this equipment according to Corken, Inc. instructions and all applicable federal, state, local laws and codes, and NFPA Pamphlet 58 for LP-Gas or ANSI K61.1-1989 for Anhydrous Ammonia. Periodic inspection and maintenance is essential.

CORKEN ONE YEAR LIMITED WARRANTY

Corken, Inc. warrants that its products will be free from defects in material and workmanship for a period of 12 months following date of purchase from Corken. Corken products which fail within the warranty period due to defects in material or workmanship will be repaired or replaced at Corken's option, when returned, freight prepaid to: Corken, Inc., 3805 N.W. 36th Street, Oklahoma City, Oklahoma 73112. Parts subject to wear or abuse, such as mechanical seals, blades, piston rings, valves, and packing, and other parts showing signs of abuse are not covered by this limited warranty. Also, equipment, parts and accessories not manufactured by Corken but furnished with Corken products are not covered by this limited warranty and purchaser must look to the original manufacturer's warranty, if any. This limited warranty is void if the Corken product has been altered or repaired without the consent of Corken. All implied warranties, including any implied warranty of merchantability or expressed warranty period. CORKEN DISCLAIMS ANY LIABILITY FOR CONSEQUENTIAL DAMAGES DUE TO BREACH OF ANY WRITTEN OR IMPLIED WARRANTY ON CORKEN PRODUCTS. Transfer of toxic, dangerous, flammable or explosive substances using Corken products is at the user's risk. Such substances should be handled by **experienced, trained personnel in compliance with governmental and industrial safety standards.**

CONTACTING THE FACTORY

For your convenience, the valve size and serial code are given on the valve nameplate. This serial code tells the month and year your valve was built. Space is provided below for you to keep a written record of this information.

Always include the valve size and serial code when ordering parts.

Model No. ____________________

Serial No. ____________________

Date Purchased ____________________

Date Installed ____________________

Purchased From ____________________

Installed By ____________________

IMPORTANT NOTE TO CUSTOMERS!

CORKEN, INC. does not recommend ordering parts from general descriptions in this manual. To minimize the possibility of receiving incorrect parts for your machine, Corken strongly recommends you order parts according to part numbers in the Corken Service Manual. If you do not have the appropriate service manual pages, call or write Corken with model number and serial number from the nameplate on your compressor.

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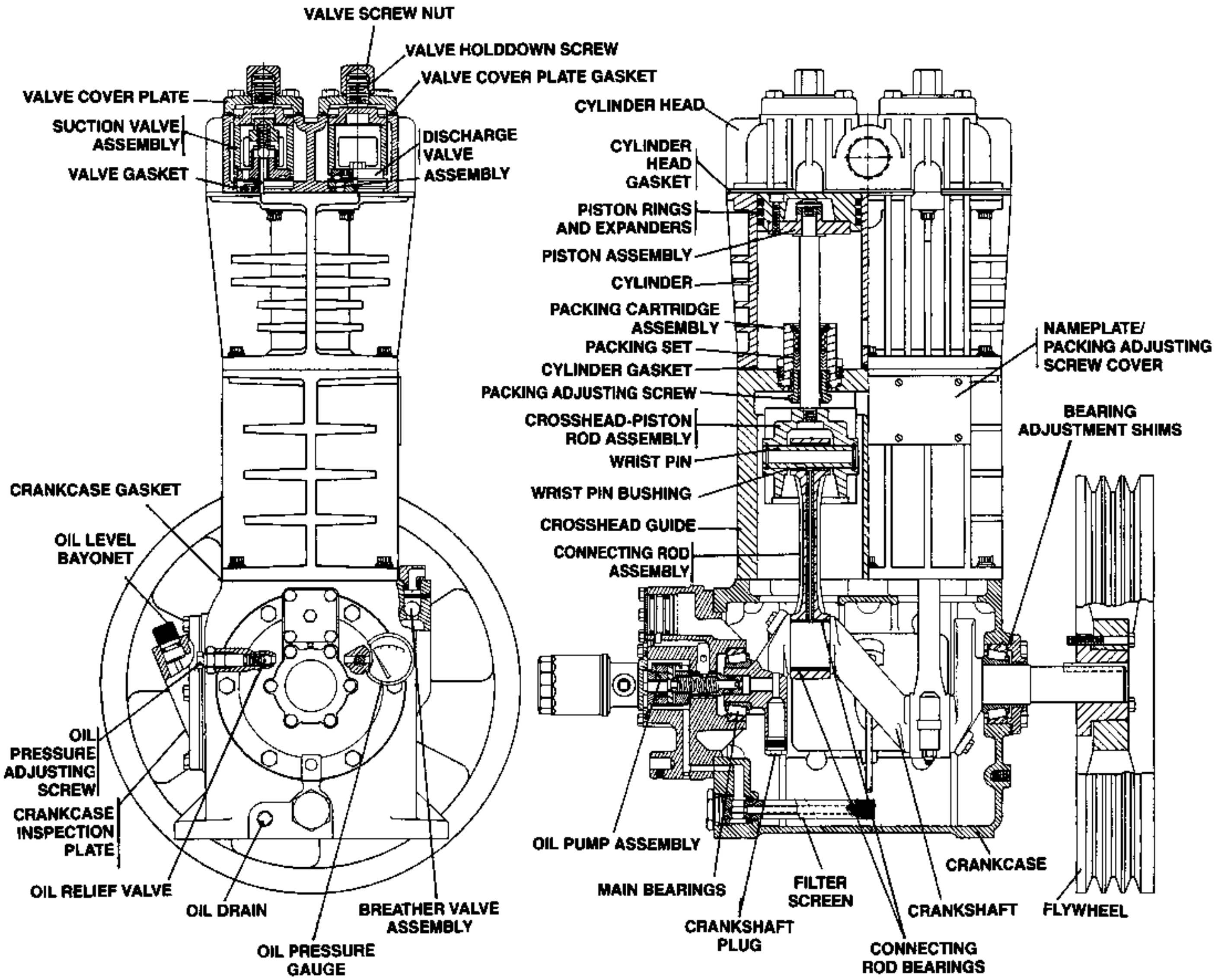


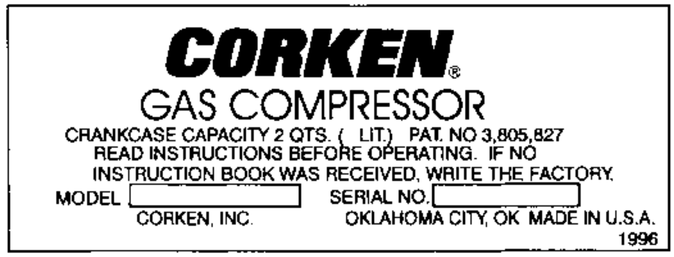
CONSTRUCTION DETAILS - MODEL 491
FIGURE 1.1A

1.1 LIQUID TRANSFER BY VAPOR DIFFERENTIAL PRESSURE

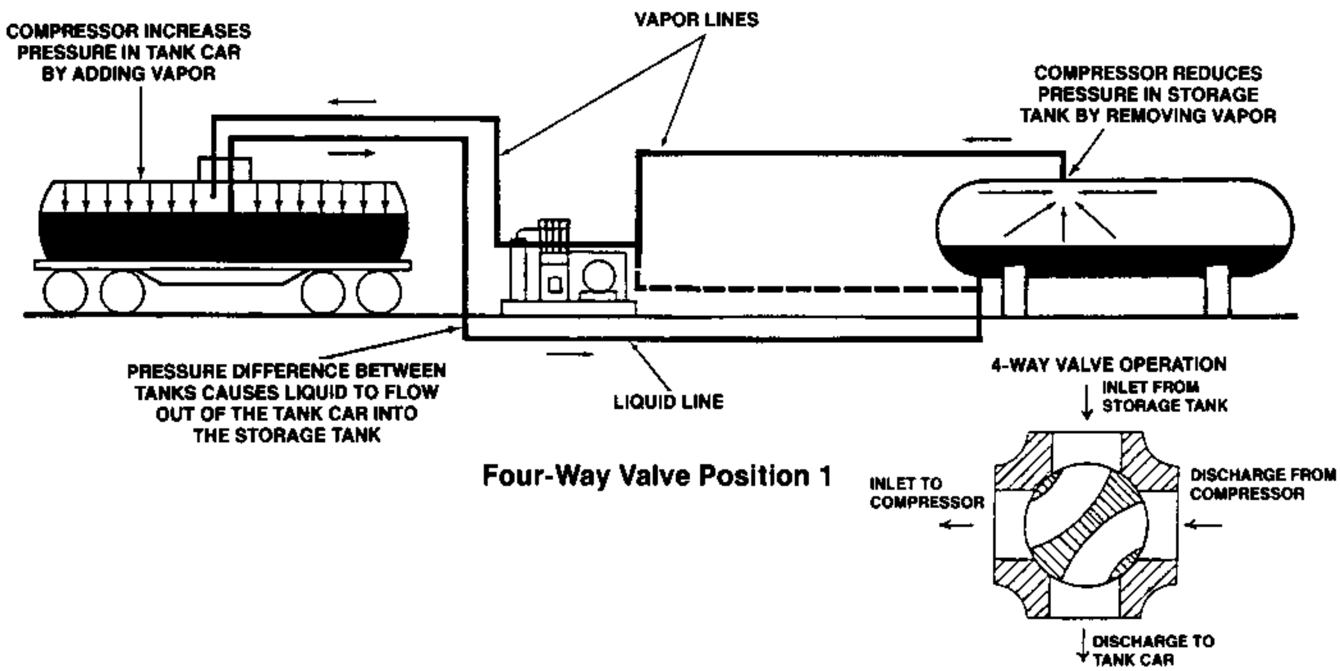
Corken LPG/NH_3 compressors are designed to transfer liquefied gases such as butane/propane mixtures (liquefied petroleum gas or LPG) and Anhydrous Ammonia (NH_3) from one tank to another. Liquefied gases such as LPG & NH_3 are stored in closed containers where both the liquid and vapor phases are present.

There is a piping connection between the vapor sectons of the storage tank and the tank being unloaded, and there is a similar connection between the liquid secitons of the two tanks. If the connections are opened, the liquid will seek its own level and then flow will stop; however, by creating a pressure in the tank being unloaded which is high enough to overcome pipe friction and any static elevation difference between the tanks, all the liquid will be forced into the storage tank quickly (see Figure 1.1C). The Gas Compressor accomplishes this by withdrawing vapors from the storage tank, compressing them and then discharging into the tank to be unloaded. This procedure slightly decreases the storage tank pressure and increases the pressure in the other tank, thereby causing the liquid to flow.

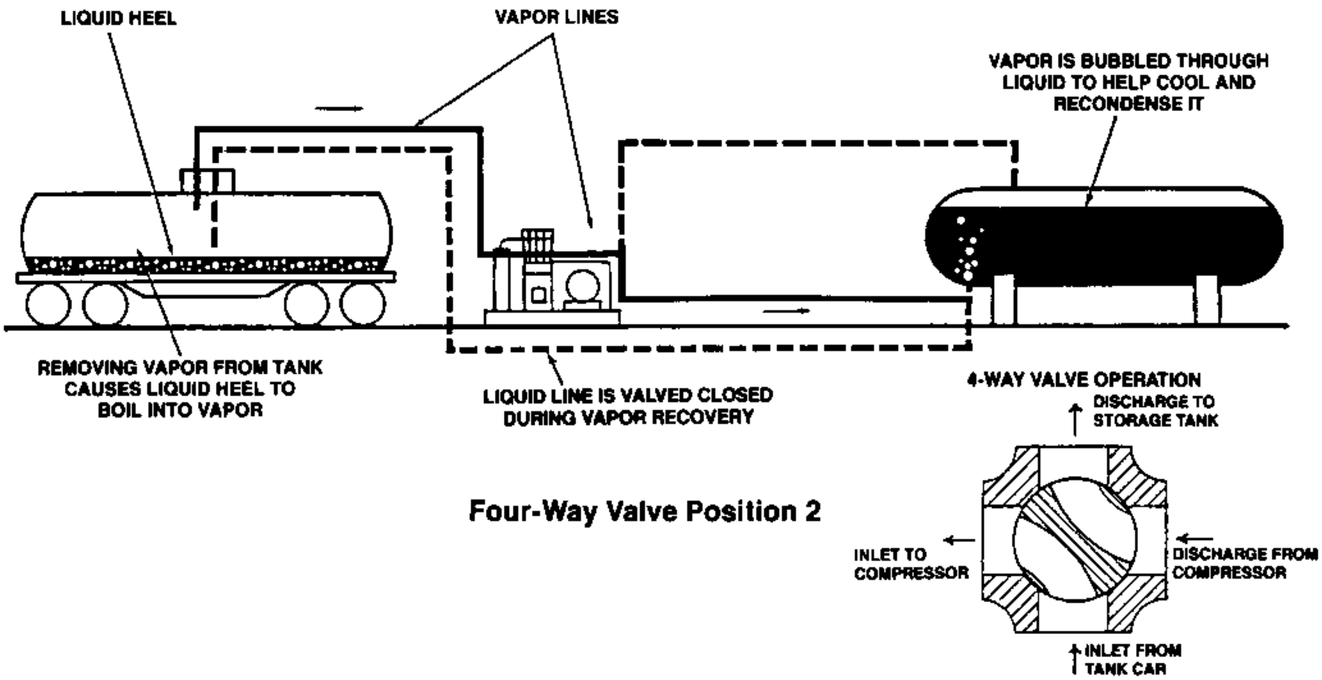
The process of compressing the gas also increases the temperature, which aids in increasing the pressure in the tank being unloaded.



TYPICAL NAMEPLATE
(Also Serves as the Packing Adjusting Screw Cover)
FIGURE 1.1B



LIQUID TRANSFER BY VAPOR DIFFERENTIAL PRESSURE
FIGURE 1.1C



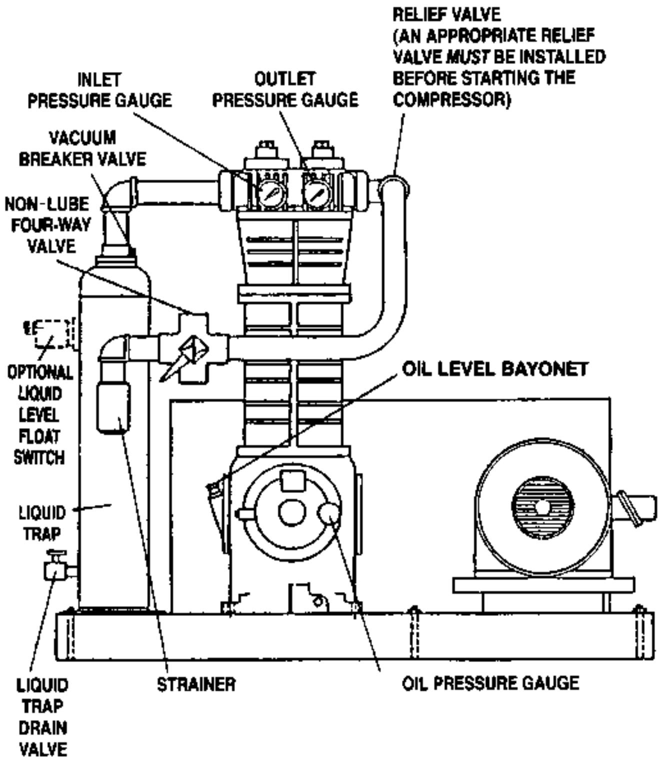
RESIDUAL VAPOR RECOVERY
FIGURE 1.2A

1.2 RESIDUAL VAPOR RECOVERY

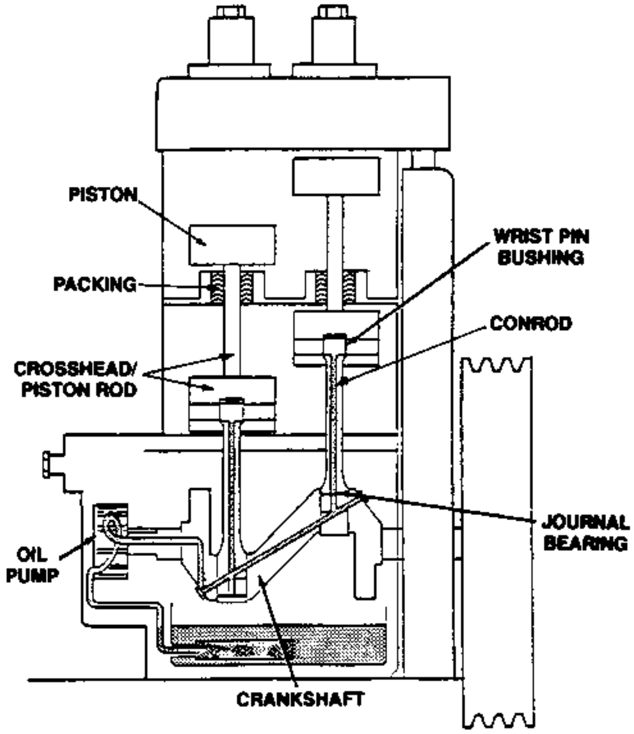
The Principle of Residual Vapor Recovery is just the opposite of Liquid Transfer. After the liquid has been transferred, the Four-Way Control Valve (or alternate valve manifolding) is reversed so that the vapors are drawn from the tank just unloaded and discharged into the receiving tank. **Always discharge the recovered vapors into the liquid section of the receiving tank.** This will allow the hot, compressed vapors to condense, preventing an undesirable increase in tank pressure. See Figure 1.2A.

Residual Vapor Recovery is an essential part of the value of a Compressor. There is an economical limit to the amount of vapors that should be recovered, however. When the cost of operation equals the price of the product being recovered, the operation should be stopped. For most cases in LP Gas and Anhydrous Ammonia services, this point is reached in the summer when the compressor inlet pressure is 40 to 50 psig (3.8 to 4.5 Bars). A good rule of thumb is not to operate beyond the point at which the inlet pressure is one-fourth the discharge pressure. Some liquids are so expensive that further recovery may be profitable, but care should be taken that the ratio of absolute discharge pressure to absolute inlet pressure never exceeds 7 to 1. Further excavation of very high value products would require a Corken Two-Stage Gas Compressor.

Invariably, there is some liquid remaining in the tank after the liquid transfer operation. This liquid “heel” must be vaporized before it can be recovered, so do not expect the pressure to drop immediately. Actually, more vapor will be recovered during the first few minutes while this liquid is being vaporized than that during the same period of time later in the operation. Remember that more than half of the economically recoverable product is usually recovered during the first hour of operation on properly sized equipment.



107-STYLE COMPRESSOR MOUNTING
FIGURE 1.3A



PRESSURE LUBRICATION SYSTEM
FIGURE 1.3B

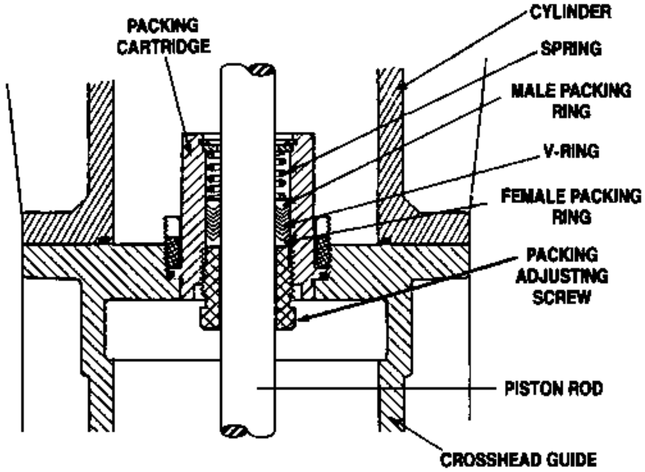
1.3 COMPRESSOR CONSTRUCTION FEATURES

The Corken liquid transfer-vapor recovery compressor is a vertical single-stage, single-acting reciprocating compressor designed to handle flammable gases like LPG and toxic gases such as ammonia. Corken compressors can handle these potentially dangerous gases because the LPG/NH_3 is confined in the compression chamber and isolated from the crankcase and the atmosphere. A typical liquid transfer-vapor recovery compressor package is shown in Figure 1.3A.

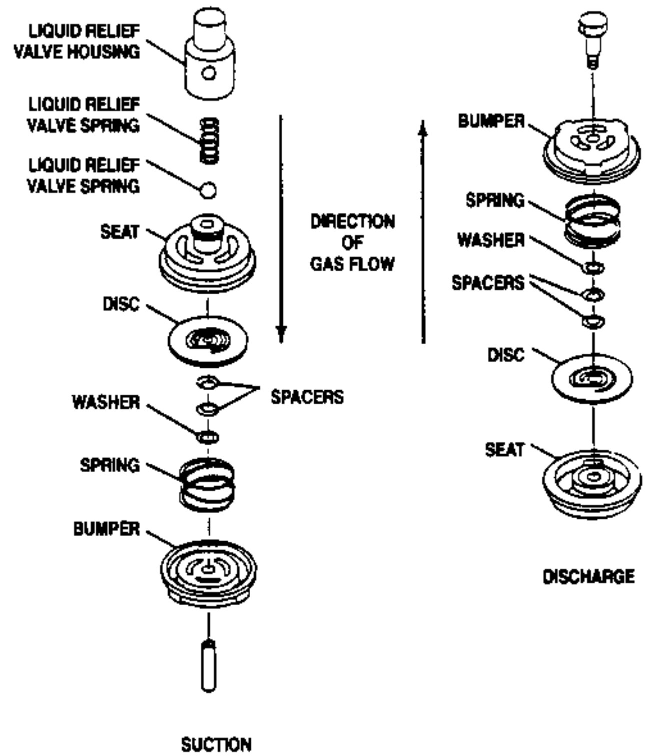
Corken gas compressors are mounted on oil lubricated crankcases that remain at atmospheric pressure. Crankshafts are supported by heavy-duty roller bearings and the connecting rods ride the crankshaft on journal bearings. With the exception of the small Size 91 compressor, all compressor crankcases are lubricated by an automotive type oil pressure system. An automatically reversible gear type oil pump circulates oil through passages in the crankshaft and connection rod to lubricate the journal bearings and wrist pins (see Figure 1.3B). Sturdy iron crossheads transmit reciprocating motion to the piston.

Corken's **automatically** reversible oil pump design allows the machine to function smoothly in either direction of rotation.

Corken compressors use iron pistons that are locked to the piston rod. The standard piston ring material is a glass-filled PTFE polymer specially formulated for nonlubricated services. Piston ring expanders are placed behind the rings to ensure that the piston rings seal tightly against the cylinder wall.



COMPRESSOR SEALING SYSTEM
FIGURE 1.3C



SUCTION AND DISCHARGE VALVES
FIGURE 1.3D

Piston rod packing is used to seal the gas in the compression chamber and prevent crankcase oil from entering the compressor cylinder. The packing consists of several PTFE V-rings sandwiched between a male and female packing ring and held in place by a spring (see Figure 1.3C).

The typical Corken compressor valve consists of a seat, bumper, spring and valve disk as shown in Figure 1.3D. Special heat-treated alloys are utilized to prolong life of the valve in punishing non-lubricated services. The valve opens whenever the pressure on the seat side exceeds the pressure on the spring side. The discharge valve is an inverted version of the suction valve.

CHAPTER TWO

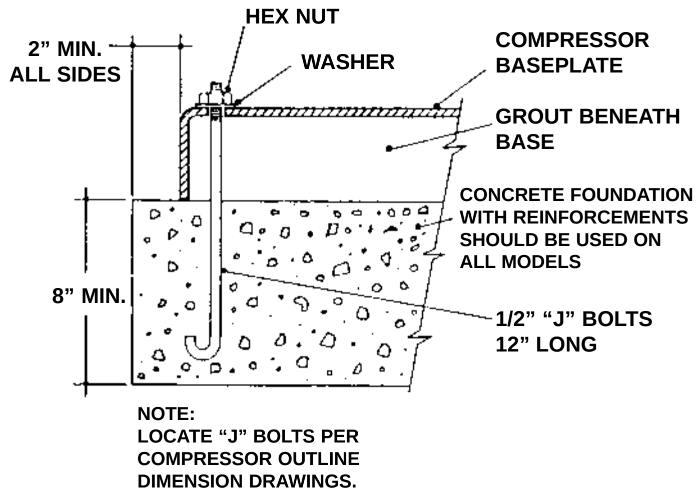
INSTALLING YOUR CORKEN COMPRESSOR

2.1 LOCATION

Corken compressors are designed and manufactured for outdoor duty. For applications where the compressor will be subjected to extreme conditions for extended periods such as corrosive environments, arctic conditions, etc., consult Corken. Check local safety regulations and building codes to assure installation will meet local safety standards.

Corken compressors handling toxic or flammable gases such as LPG/NH_3 should be located outdoors. A minimum of 18 inches (45 cm) clearance between the compressor and the nearest wall is advised to make it accessible from all sides and to provide unrestricted air flow for adequate cooling.

NOISE. Corken vertical compressors sizes 91 through 691 will not exceed an 85 DBA noise level when properly installed.



RECOMMENDED FOUNDATION DETAILS FOR CORKEN COMPRESSORS 91 - 691
FIGURE 2.2A

2.2 FOUNDATION

Proper foundations are essential for a smooth running compression system. Corken recommends the compressor be attached to a concrete slab at least 8” thick with a 2” skirt around the circumference of the baseplate. The baseplate should be securely anchored into the foundation by 1/2” diameter “J” bolts 12” long. The total mass of the foundation should be approximately twice the weight of the compressor system (compressor, baseplate, motor, etc.). After leveling and bolting down baseplate, the volume beneath the channel iron baseplate must be grouted to prevent flexing of the top portion of the baseplate and the “J” bolt that extends beyond the foundation. The grout also improves the dampening capabilities of the foundation by creating a solid interface between the compressor and foundation.

On some of the longer baseplates, such as the 691 107, a 3-inch hole can be cut in the baseplate for filling the middle section of the channel iron base with grout.

2.3 PIPING

Proper piping design and installation is as important as the foundation is to smooth operation of the compressor. Improper piping installation will result in undesirable transmission of compressor vibration to the piping.

DO NOT SUPPORT PIPING WITH THE COMPRESSOR. Unsupported piping is the most frequent cause of vibration of the pipe. The best method to minimize transmission of vibration from the compressor to the piping is to use flexible connectors (see Figure 2.3A).

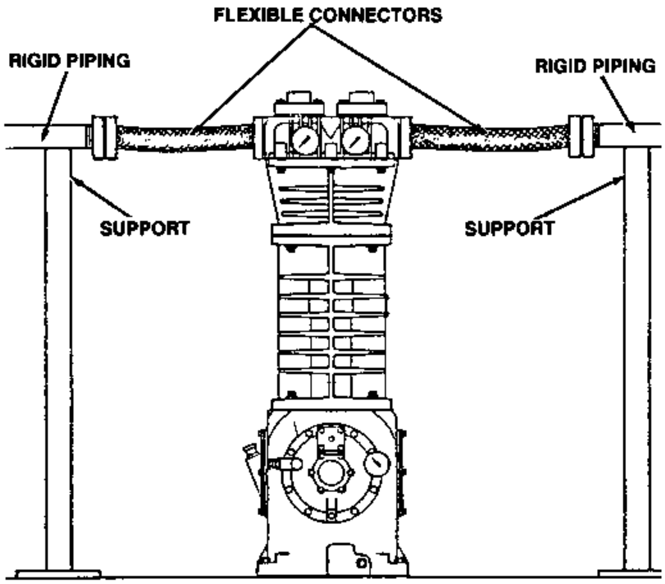


FIGURE 2.3A

Pipe must be adequately sized to prevent excessive pressure drop between the suction source and the compressor as well as between the compressor and the final discharge point. In most cases, piping should be at least the same diameter as the suction nozzle on the compressor. Typically, LPG/NH_3 liquid transfer systems should be designed to limit pressure drops to 20 PSI (1.3 Bar). Appendix F shows recommended pipe sizes for each compressor for typical LPG/NH_3 installations.

Care must be taken if a restrictive device such as a valve, pressure regulator, or back-check valve is to be installed in the compressor's suction line. The suction line volume between the restrictive device and the compressor suction nozzle must be at least ten times the swept cylinder volume.

107 style compressors are usually connected using a five-valve (Figure 2.3B) or three-valve manifold (Figure 2.3C). The five-valve manifold allows the storage tank to be both loaded and unloaded. The three-valve manifold only allows the storage tank to be loaded. Adequate sizing of the liquid and vapor lines is essential to limit the pressure drop in the system to a reasonable level (20 psi or less).

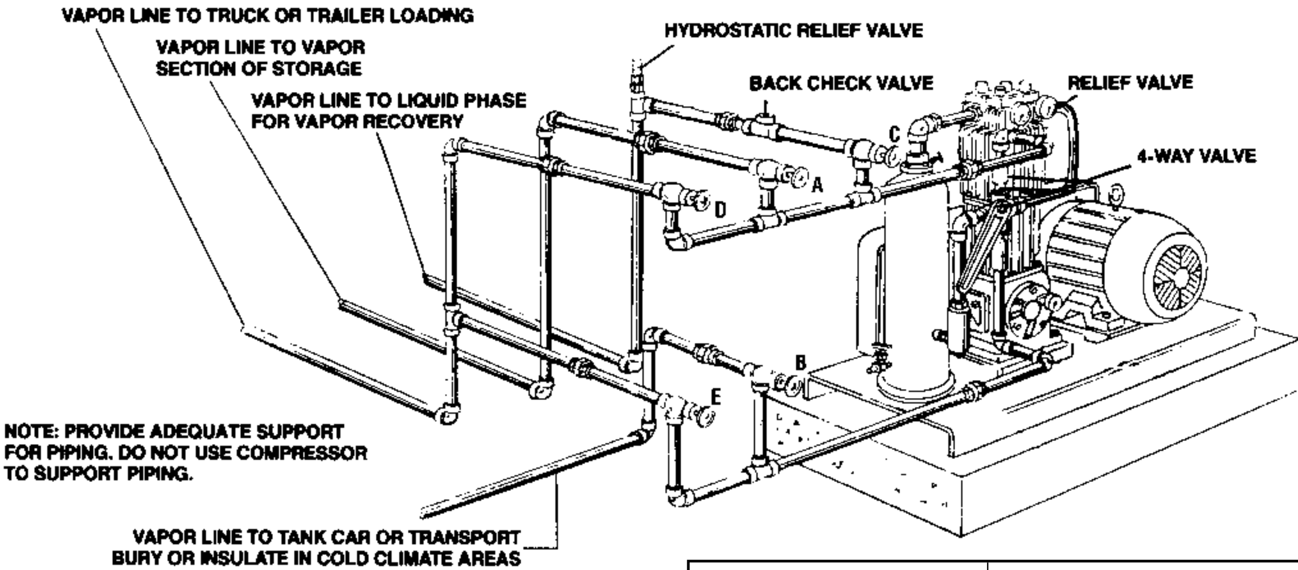
The line size helps determine the plant capacity almost as much as the size of the compressor, and liquid line sizes are a bigger factor than vapor lines. If the pressure gauges on the head indicate more than a 15 to 20 psi (2.07 to 2.40 Bars) differential between the inlet and outlet pressures, the line sizes are too small or there is some fitting or excess flow valve creating too much restriction. The less restriction in the piping, the better the flow. Appendix F shows recommended pipe sizes for typical LPG/NH_3 compressor installation.

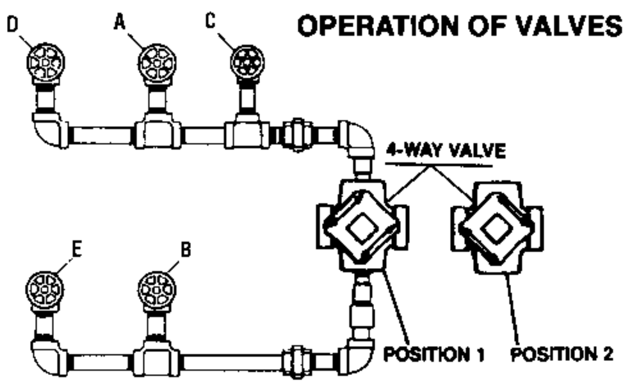
A tank car unloading riser should have two liquid hoses connected to the car liquid valves. If only one liquid hose is used the transfer rate will be slower, and there is a good possibility that the car's excess flow valve may close.

Since the heat of compression plays an important part in rapid liquid transfer, the vapor line from the compressor to the tank car or other unloading container should be buried or insulated to prevent the loss of heat and the compressor should be located as near as possible to the tank being emptied. In extremely cold climates, if the line from the storage tank to the compressor is over 15 feet (4.6 meters) long, it should be insulated to lessen the possibility of vapors condensing as they flow to the compressor. The vapor recovery discharge line is better not insulated. Placing the compressor as close as possible to the tank being unloaded will minimize heat loss from the discharge line for the best liquid transfer rate.

Unloading stationary tanks with a compressor is quite practical. Delivery trucks and other large containers can be filled rapidly if the vapor system of the tank to be filled will permit fast vapor withdrawal, and if the liquid piping system is large enough. Many older trucks (and some new ones) are not originally equipped with vapor excess flow valves large enough to do a good job and these should be replaced by a suitable size valve. The liquid discharge should be connected to the tank truck pump inlet line rather than the often oversized filler valve connection in the tank head.

It is of extreme importance to prevent the entry of liquid into the compressor. The inlet of the compressor should be protected from liquid entry by a liquid trap (see Section 2.4). It is of equal importance to protect the discharge of the compressor from liquid. This may be done by installing a check valve on the discharge and designing the piping so liquid cannot gravity-drain back into the compressor. Make sure to install a check valve on vapor lines discharging to the liquid space of the tank.





SERVICE TO PERFORM	VALVE POSITION					
	4-WAY	A	B	C	D	E
1. Unload Tank Car into Storage Tank	Position One	Open	Open	Close	Close	Close
2. Recover Vapors from Tank Car into Storage Tank	Position Two	Close	Open	Open	Close	Close
3. Unload Transport or Truck into Storage Tank	Position One	Open	Close	Close	Close	Open
4. Recover Vapors from Transport or Truck into Storage Tank	Position Two	Close	Close	Open	Close	Open
5. Load Truck or Field Tank from Storage Tank	Position Two	Open	Close	Close	Close	Open
6. Load Truck or Field Tank from Tank Car	Position One	Close	Open	Close	Open	Close
7. Equalize Between Tank Car and Storage Tank Without using Vapor Pump	---	Open	Open	Close	Open	Open
8. Equalize Between Truck or Field Tank and Storage Tank Without Using Vapor Pump	---	Open	Close	Close	Open	Close

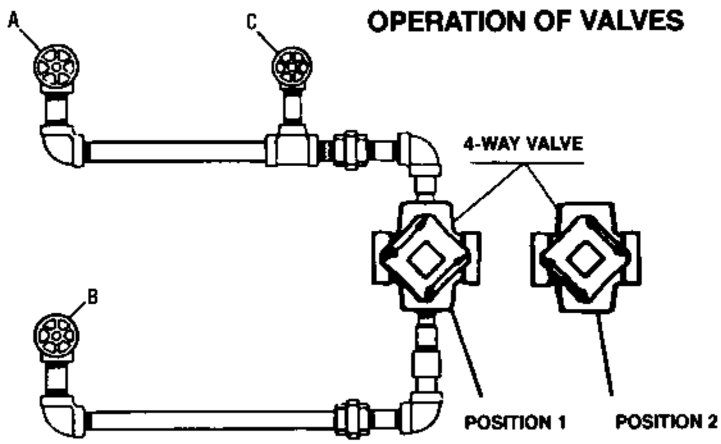
FIVE-VALVE MANIFOLD PIPING SYSTEM
FIGURE 2.3B

All piping must be in accordance with the laws and codes governing the service. In the United States, the following codes apply:

For LP Gas – The National Fire Protection Association Pamphlet No. 58, Standard for the Storage and Handling of Liquefied Petroleum Gases.

For Ammonia – The American National Standards Institute, Inc., K61.1-1989, Storage and Handling of Anhydrous Ammonia.

Copies of these are available from NFPA, 60 Baterymarch Street, Boston, Mass, 02110 and ANSI, 1430 Broadway, New York, N.Y., 10018. Install, use and maintain this equipment according to Corken instructions and all applicable federal, state, and local laws and previously mentioned codes.



SERVICE TO PERFORM	VALVE POSITION			
	4-WAY	A	B	C
1. Unload Tank Car into Storage Tank	Position One	Open	Open	Close
2. Recover Vapors from Tank Car into Storage Tank	Position Two	Close	Open	Open

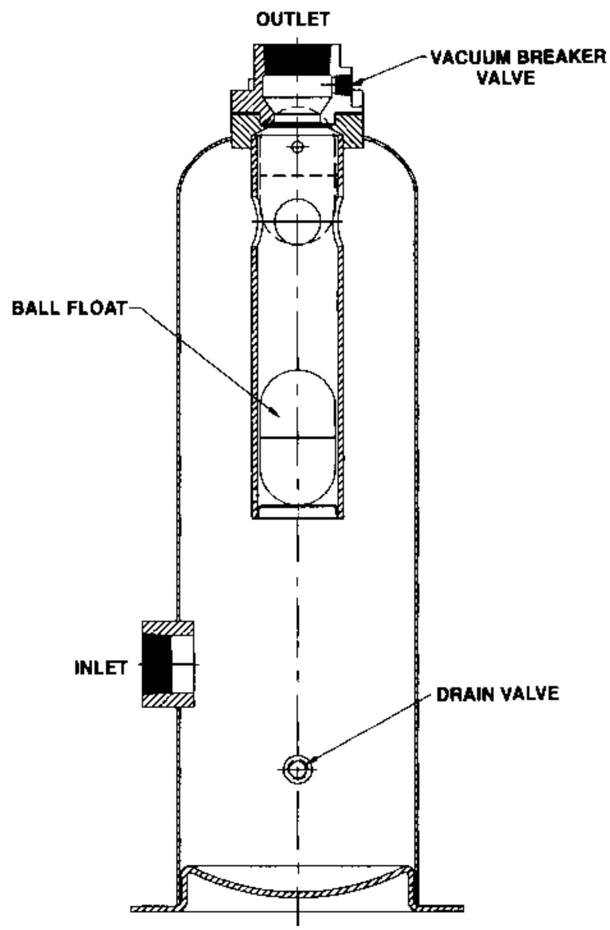
THREE-VALVE MANIFOLD PIPING SYSTEM
FIGURE 2.3C

2.4 LIQUID TRAPS

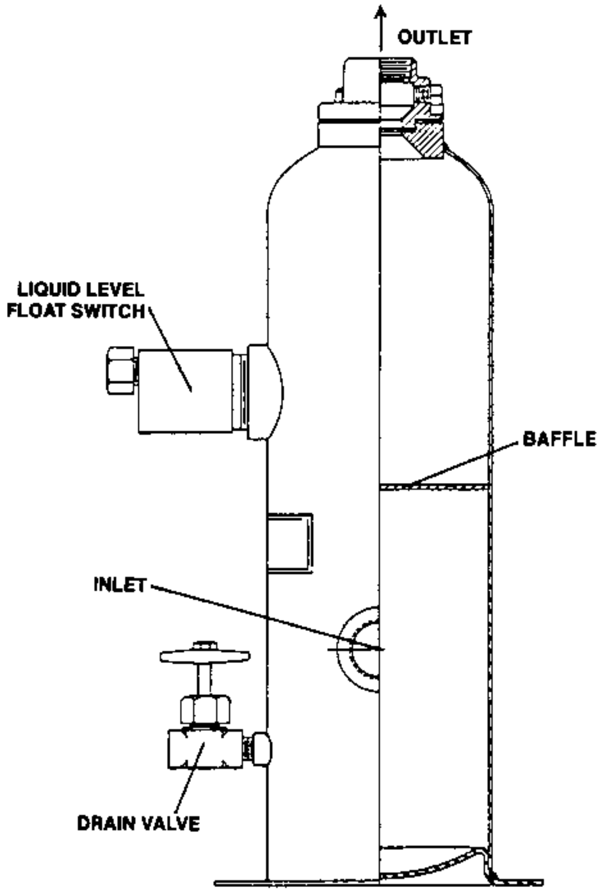
Compressors are designed to pressurize gas, not to pump liquids. The entry of even a small amount of liquid into the compressor will result in serious damage to the compressor.

On liquefied gas applications a liquid trap **must** be used to prevent the entry of liquid into the compressor.

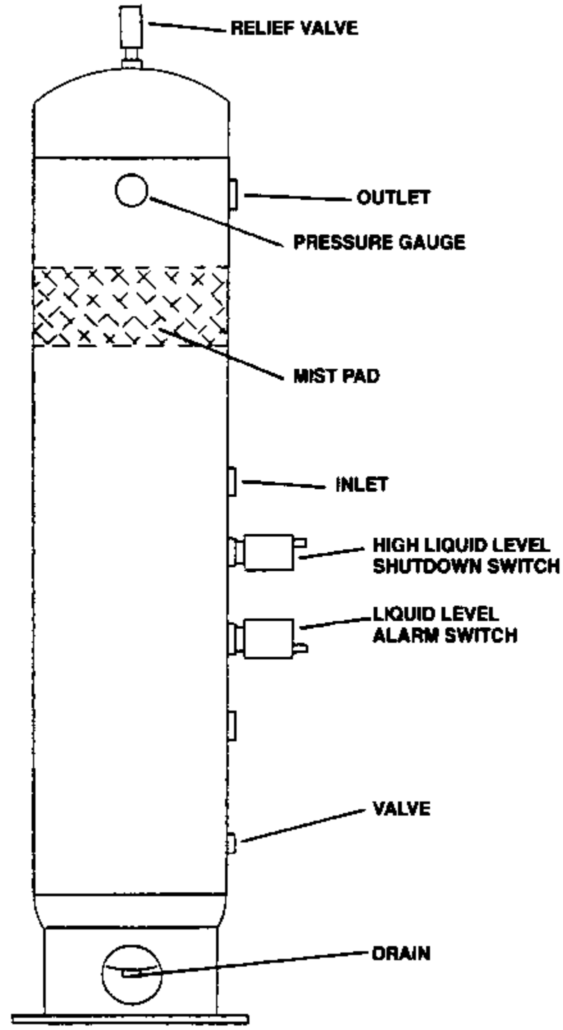
Corken offers three types of liquid traps for removal of entrained liquids. The simplest is a float trap (see Figure 2.4A). As the liquid enters the trap the gas velocity is greatly reduced, which allows the entrained liquid to drop out. If the liquid level rises above the inlet, the float will plug the compressor suction. The compressor creates a vacuum in the inlet piping and continues to operate until the operator manually shuts it down. The trap must be drained and the vacuum-breaker valve opened before restarting the compressor, to allow the float to drop back. This type of trap is only appropriate for use where the operator keeps the compressor under fairly close observation. This trap is provided with the 109 and 107 compressor packages (see bottom of Appendix A for details on standard Corken compressor packages).



MECHANICAL TRAP
FIGURE 2.4A



AUTOMATIC LIQUID TRAP
FIGURE 2.4B



ASME AUTOMATIC TRAP
FIGURE 2.4C

When the compressor will not be under more-or-less constant observation an automatic trap is recommended (see Figure 2.4B). The automatic trap replaces the float with electrical float switches. If the liquid level should rise too high, the level switch will open and disconnect the power to the motor starter, stopping the compressor. This design ensures the machine will be protected even when it is not under close observation and is standard in the 109A and 107A mounting configurations.

Corken's most sophisticated trap provides the most thorough liquid separation (see Figure 2.4C). This trap is larger and is ASME code stamped. It contains two level switches, one for alarm and one for shutdown. In some cases the alarm switch is used to activate a dump valve (not included with trap) or sound an alarm for the trap to be manually drained by the operator. This trap also contains a mist pad. A mist pad is a mesh of interwoven wire to disentrain fine liquid mists. The ASME code trap is standard in the -109B and -107B mounting configurations.

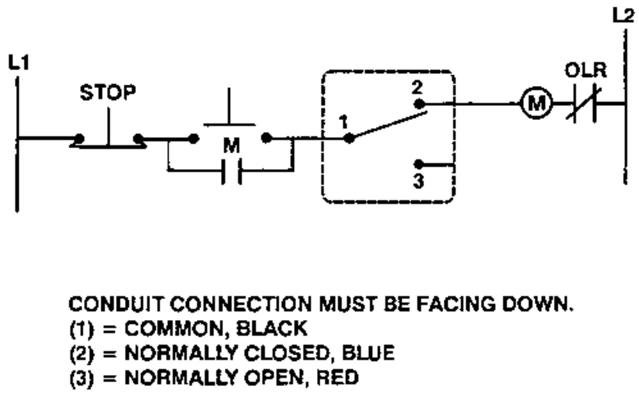


FIGURE 2.4D

A typical wiring diagram for the liquid level switch is shown in Figure 2.4D. If the switch is installed with the conduit connection in the top position, it will be normally closed as shown in Figure 2.4D. If the conduit is in the bottom position, the switch will be normally open.

NOTE: The level switch MUST be removed from the trap before grounding any welding devices to the trap or associated piping! Failure to do so will damage the switch contacts.

If your compressor is equipped with a liquid trap of other than Corken manufacture, make sure it is of adequate size to thoroughly remove any liquid entrained in the suction stream.

2.5 DRIVER INSTALLATION / FLYWHEELS

Corken vertical compressors may be driven by either electric motors or combustion engines (gasoline, diesel, natural gas, etc.). Corken compressors are usually V-belt driven but they are also suitable for direct drive applications as well. Direct drive applications require an extended crankshaft to allow the attachment of a rigid metal coupling.

Note: flexible couplings are not suitable for reciprocating compressors. Never operate a reciprocating compressor without a flywheel.

Drivers should be selected so the compressor operates between 350 to 825 RPM. The unit must not be operated without the flywheel or severe torsional imbalances will result that could cause vibration and high horsepower requirement. The flywheel should never be replaced by another pulley unless it has a higher wk_2 value than the flywheel.

A humid climate can cause problems, particularly in explosion proof motors. The normal breathing of the motor, and alternating between being warm when running and being cool when stopped, can cause moist air to be drawn into the motor. This moist air will condense, and may eventually add enough water inside the motor to cause it to fail. To prevent this, make a practice of running the motor at least once a week on a bright, dry day for an hour or so without the V-belts. In this period of time the motor will heat up and vaporize the condensed moisture, driving it from the motor. No motor manufacturer will guarantee his explosion proof or totally enclosed (TEFC) motor against damage from moisture.

For installation with engine drivers, thoroughly review instructions from the engine manufacturer to assure the unit is properly installed.

2.6. CRANKCASE LUBRICATION

Non-detergent oil is recommended for Corken vertical compressors. Detergent oils tend to keep wear particles and debris suspended in the oil, whereas non-detergent oils let them settle in the bottom of the crankcase. When non-detergent oils are not available, detergent oils may usually be successfully substituted, although compressors handling ammonia, amine, or imine gases are notable exceptions. These gases react with the detergent and cause the crankcase oil to become corrosive and contaminated. Figures 2.6A and 2.6B show recommended oil viscosities and crankcase capacities.

Synthetic lubricants are generally not necessary. Please consult the Factory if you are considering the use of synthetic oil.

Ambient Temperature At Compressor	SAE Viscosity
Below 0°F (-18°C)	5W, 5W-30
0° to 32°F (-18° to 0°C)	10W, 5W-30, 10W-40
32°F to 80°F (0° to 27°C)	20, 5W-30, 10W-40
Above 80°F (27°C)	30, 5W-30, 10W-40

OIL SELECTION CHART
FIGURE 2.6A

Compressor Model	Approximate Quarts	Capacity Liters
91	0.9	0.8
290, 291	1.5	1.4
490, 491	3.0	2.8
690, 691	7.0	6.6

OIL CAPACITY CHART
FIGURE 2.8A

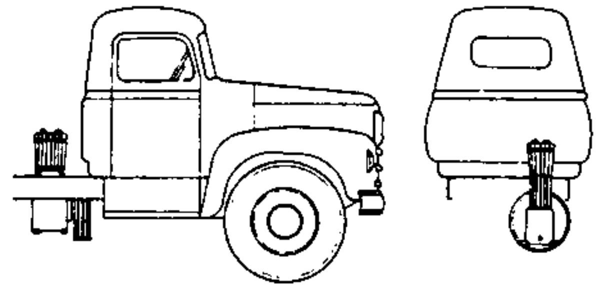
2.7 RELIEF VALVES

An appropriate relief valve **must** be installed at the compressor discharge. On 107-style mounted units a relief valve should be fitted in the piping between the compressor discharge and the four-way valve (see Figure 1.3A). Relief valves should be made of a material compatible with the gas being compressed. Local codes and regulations should be checked for specific relief valve requirements. Also, relief valves may be required at other points in the compressor's system piping.

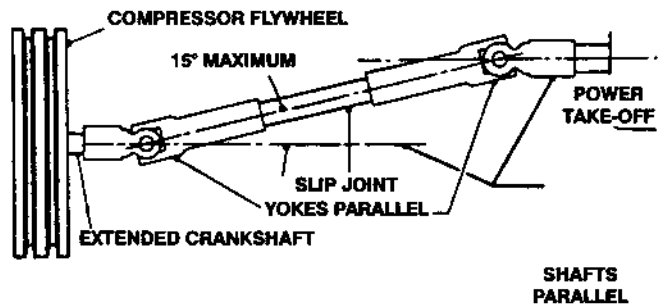
2.8 TRUCK MOUNTED COMPRESSORS

Corken compressors are frequently mounted on trucks to perform liquid transfer operations as described in Section 1.1. The compressor should be mounted so the inspection plate is accessible for packing adjustment. The compressor must be protected against liquid as explained in Section 2.4 and a relief valve must be installed in the discharge piping before the first downstream shutoff valve.

Three types of mountings are typically used. The inside mounting (Figure 2.8A) drives the compressor directly off the PTO shaft. The PTO must be selected to drive the compressor between 400 and 800 RPM. An extended compressor crankshaft is required so the U-joint yoke may connect to the compressor



INSIDE TRANSPORT MOUNTING
FIGURE 2.8A



U-JOINT DRIVE FOR COMPRESSOR
FIGURE 2.8B

without removing the flywheel. Do not operate the compressor without a flywheel. Use a U-joint with a splined joint and make sure the connections are parallel and in line. The U-joint angle should be less than 15 degrees (see Figure 2.8B). Always use an even number of U-joints.

Depending on the truck design, the compressor may be outside or top mounted as shown in Figures 2.8C and 2.8D to be V-belt driven. Power is transmitted through a U-joint drive shaft, jackshaft with two pillow block bearings, V-belt sheave and V-belts. An idle pulley may be used under the truck frame.

2.9 SHUTDOWN/ALARM DEVICES

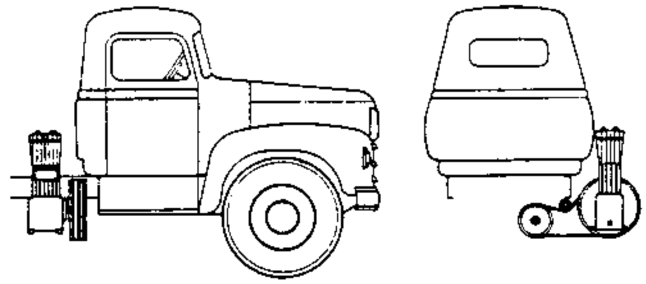
For many applications, shutdown/alarm switches will provide worthwhile protection that may prevent serious damage to your compressor system. All electronic devices should be selected to meet local code requirements. Shutdown/alarm devices typically used on Corken compressors are:

Low Oil Pressure Switch - shuts down the unit if crankcase oil pressure falls below 12 psi due to oil pump failure or low oil level in crankcase.

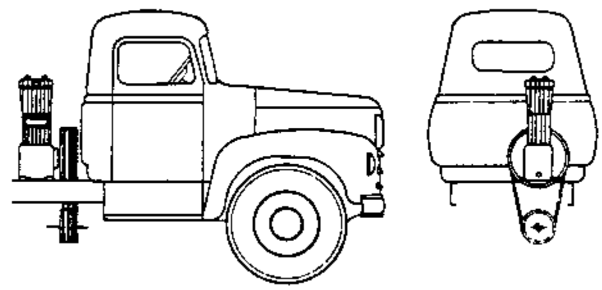
High Temperature Switch - shuts down unit if the normal discharge temperature is exceeded, and is strongly recommended for all applications. Typically, the set point is about 30°F (-1°C) above the normal discharge temperature.

Low Suction, High Discharge Pressure Switch - shuts down unit if inlet or outlet pressures are not within preset limits.

Vibration Switch - shuts down unit if vibration becomes excessive. Recommended for units mounted on portable skids.



OUTSIDE TRANSPORT MOUNTING
FIGURE 2.8C



TOP TRANSPORT MOUNTING
FIGURE 2.8D

CHAPTER 3

STARTUP UP YOUR CORKEN COMPRESSOR

NOTE: Before initial startup of the compressor be sure the principal of using a compressor for liquid transfer by vapor differential pressure is understood (see Section 1.1). Read this entire chapter, then proceed with the startup checklist.

3.1 INSPECTION AFTER EXTENDED STORAGE

If your compressor has been out of service for a long period of time, you should verify that the cylinder bore and valve areas are free of rust and other debris (see the maintenance section of this manual for valve and/or cylinder head removal instructions).

Drain the oil from the crankcase and remove the nameplate and crankcase inspection plate. Inspect the running gear for signs of rust and clean or replace parts as necessary. Replace the crankcase inspection plate and fill crankcase with the appropriate lubricant. Squirt oil on the X-heads and rotate the crank by hand to ensure that all bearing surfaces are coated with oil.

Rotate unit manually to ensure running gear functions properly. Replace nameplate and proceed with startup.

3.2 FLYWHEEL AND V-BELT ALIGNMENT

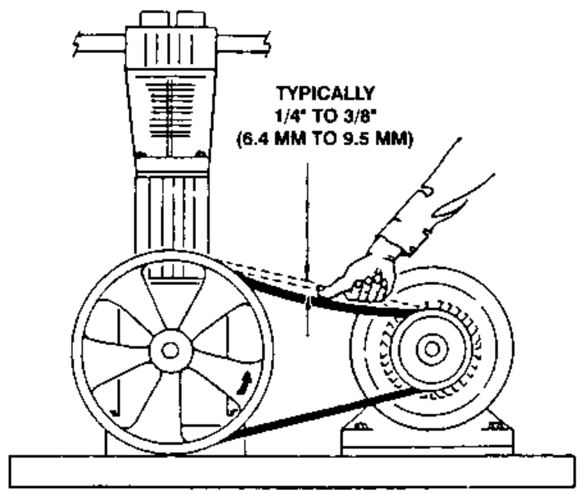
Before working on the drive assembly, be sure that the electric power is disconnected. When mounting new belts, always make sure the driver and compressor are close enough together to avoid forcing.

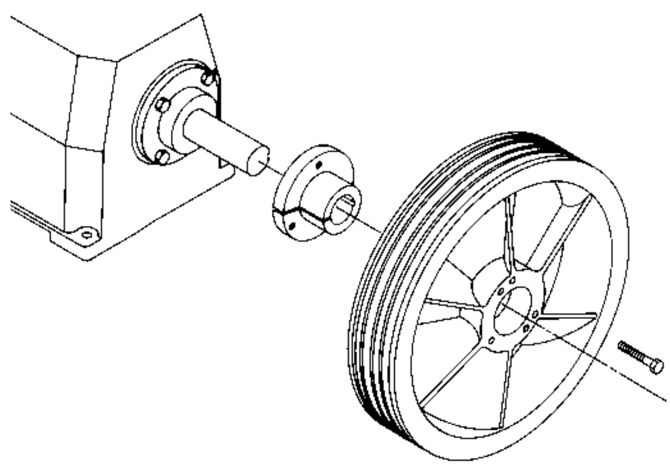
Improper belt tension and sheave alignment can cause vibration, excessive belt wear and premature bearing failures. Before operating your compressor, check alignment of the V-grooves of the compressor and driver sheaves: visual inspection often will indicate if the belts are properly aligned, but use of a square is the best method.

The flywheel is mounted on the shaft via a split, tapered bushing and three bolts. These bolts should be tightened in an even and progressive manner until torqued as specified below. There must be a gap between the bushing flange and the sheave when installation is complete. **Always check the flywheel runout before startup and readjust if it exceeds the value listed in Appendix E.**

Bushing Size	Diameter In. (cm)	Bolt Torque Ft.-lb. (kg-meter)
SF	4.625 (11.7)	30 (4.1)
E	6.0 (15.2)	60 (8.3)
J	7.25 (18.4)	135 (18.7)

Tighten the belts so that they are taut, but not extremely tight. Consult your V-belt supplier for specific tension recommendations. Belts that are too tight may cause premature bearing failure.





FLYWHEEL INSTALLATION
FIGURE 3.2A

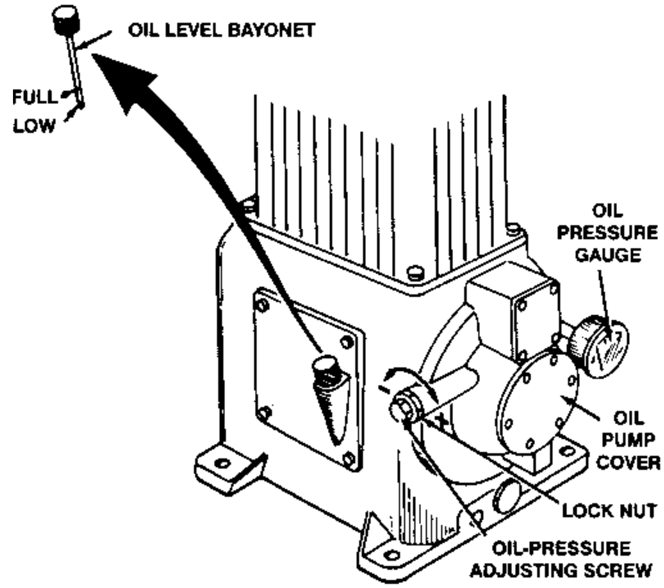
3.3 CRANKCASE OIL PRESSURE ADJUSTMENT

Corken compressor models 291 through 691 are equipped with an automatically reversible gear type oil pump (if your compressor is the splash lubricated Model 91, proceed to Section 3.4). It is essential to ensure the pumping system is primed and the oil pressure is properly adjusted in order to assure smooth operation.

Before starting your compressor, check and fill crankcase with the proper quantity of lubricating oil (see Figure 5.5A for proper filling location).

When the compressor is first started, observe the crankcase oil pressure gauge. If the gauge fails to indicate pressure within 30 seconds, stop the machine. Remove the pressure gauge. Restart the compressor and run it until oil comes out of the pressure gauge opening. Reinstall the gauge.

The oil pressure should be about 20 psi (2.4 Bars) minimum for normal service. If the discharge pressure is above 200 psi (14.8 Bars) the oil pressure must be maintained at a minimum of 25 psi (2.7 Bars). A spring-loaded relief valve mounted on the bearing housing opposite the flywheel regulates the oil pressure. As shown in Figure 3.3A, turn the adjusting screw clockwise to increase the oil pressure and counterclockwise to lower it. Be sure to loosen the adjusting screw locknut before trying to turn the screw and tighten it after making any adjustment.



FLYWHEEL INSTALLATION
FIGURE 3.3A

3.4 STARTUP CHECK LIST

Please verify all of the items on this list before starting your compressor! Failure to do so may result in a costly (or dangerous) mistake.

Before Starting the Compressor

1. Become familiar with the function of all piping associated with the compressor. Know each line's use!
2. Verify that actual operating conditions will match the anticipated conditions.
3. Ensure that line pressures are within cylinder pressure ratings.
4. Clean out all piping.
5. Check all mounting shims, cylinder and piping supports to ensure that no undue twisting forces exist on the compressor.
6. Verify that strainer elements are in place and clean.
7. Verify that cylinder bore and valve areas are clean.
8. Check V-belt tension and alignment. Check drive alignment on direct drive units.
9. Rotate unit by hand. Check flywheel for wobble or play.
10. Check crankcase oil level.
11. Drain all liquid traps, separators, etc.
12. Verify proper electrical supply to motor and panel.
13. Check that all gauges are at zero level reading.
14. Test piping system for leaks.
15. Purge unit of air before pressurizing with gas.
16. Carefully check for any loose connections or bolts.
17. Remove all stray objects (rags, tools, etc.) from vicinity of unit.
18. Verify that all valves are open or closed as required.
19. Double-check all of the above.

After Starting Compressor

1. Verify and note proper oil pressure. Shut down and correct any problem immediately.
2. Observe noise and vibration levels. Correct immediately if excessive.
3. Verify proper compressor speed.
4. Examine entire system for gas, oil or water levels.
5. Note rotation direction.
6. Check start-up voltage drop, running amperage and voltage at motor junction box (not at the starter).
7. Test each shutdown device and record set points.
8. Test all relief valves.
9. Check and record all temperatures, pressures and volumes after 30 minutes and 1 hour.
10. After 1 hour running time, tighten all head bolts, valve holddown bolts, and baseplate bolts.

CHAPTER 4

ROUTINE MAINTENANCE CHART

ITEM TO CHECK	Daily	Weekly	Monthly	Six Months	Yearly
Crankcase Oil Pressure	X				
Compressor Discharge Pressure	X				
Overall Visual Check	X				
Crankcase Oil Level			**	**	
Drain Liquid from Accumulation Points	X***	X***			
Drain Distance Piece		X			
Clean Cooling Surfaces on Compressor and Intercooler		X			
Lubricator Supply Tank Level		X			
Check Belts for Correct Tension			X		
Inspect and Clean Filter Felts on Control Pilot (Valve Spec. 78, 8)			X		
Inspect and Clean Filter Felts on Crankcase Hydraulic Unloader (Valve Spec. 7, 78)			X		
Inspect Valve Assemblies				X	
Lubricate Motor Bearings in Accordance with Manufacturers' Recommendations				X	
Inspect Motor Starter Contact Points					X
Piston Rings				*	X

* Piston ring life varies greatly, depending on application, gas, and operating pressures. Consult factory for additional recommendations for your specific applications.

** Change oil every 2200 hours of operation or every 6 months, whichever occurs first. If the oil is unusually dirty, change it as often as needed to maintain a clean oil condition. Change replacement filter 4225 with every oil change.

*** Liquid traps should be drained prior to startup.

CHAPTER 5

ROUTINE SERVICE AND REPAIR PROCEDURES

CAUTION: Always relieve pressure in the unit before attempting any repairs. After repair, the unit should be pressure tested and checked for leaks at all joints and gasket surfaces.

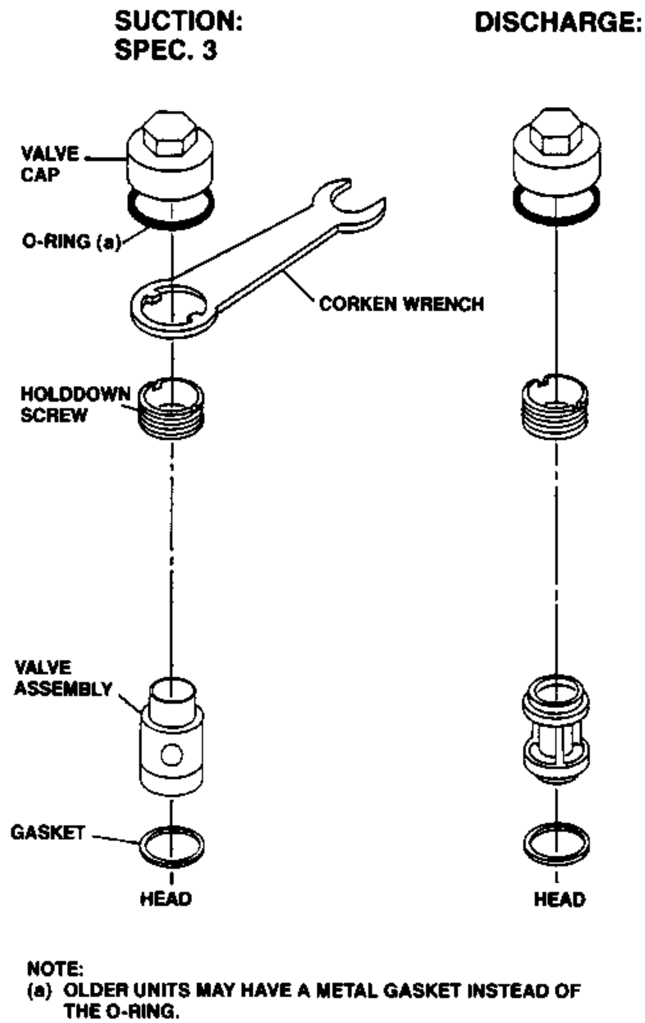
If routine maintenance is performed as outlined in Chapter 4, repair service on your Corken Gas Compressor is generally limited to replacing valves or piston rings. When it comes time to order replacement parts, be sure to consult your Corken Service Manual, Section E, for the correct part number and include the Compressor Model and Serial Number.

5.1 VALVES

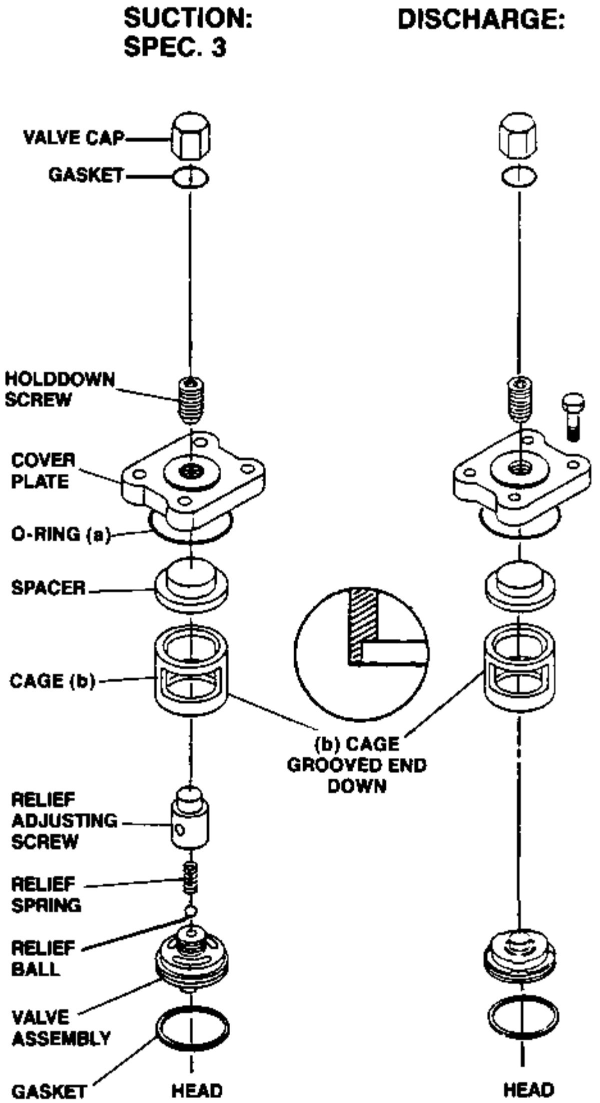
Test the Compressor valves by closing the inlet piping valves while the unit is running; do not allow the machine to operate in this way very long, however. If the inlet pressure gauge does not drop to zero almost immediately, one or more of the valves is probably either damaged or dirty. It is possible of course, that the pressure gauge itself is faulty.

To remove and inspect valves, **begin by depressurizing and purging** (if necessary) the unit. Next, remove the valve cap and then remove the valve holddown screw (see Figure 5.1A through 5.1C) with the special wrench supplied with the compressor. Valves in sizes 91 through 291 may then be removed. Sizes 491 through 691 require removal of the valve cover plate before the valves can be removed.

Inspect valves for breakage, corrosion, and scratches on the valve disc and debris. In many cases, valves may simply be cleaned and reinstalled. If the valves show any damage, they should be repaired or replaced. Replacement is usually preferable, although repair parts are available. If valve discs are replaced, seats should also be lapped until they are perfectly smooth. If more than .005” must be removed to achieve a smooth surface, the valve should be discarded. If discs are replaced without relapsing the seat, rapid wear and leakage may occur.

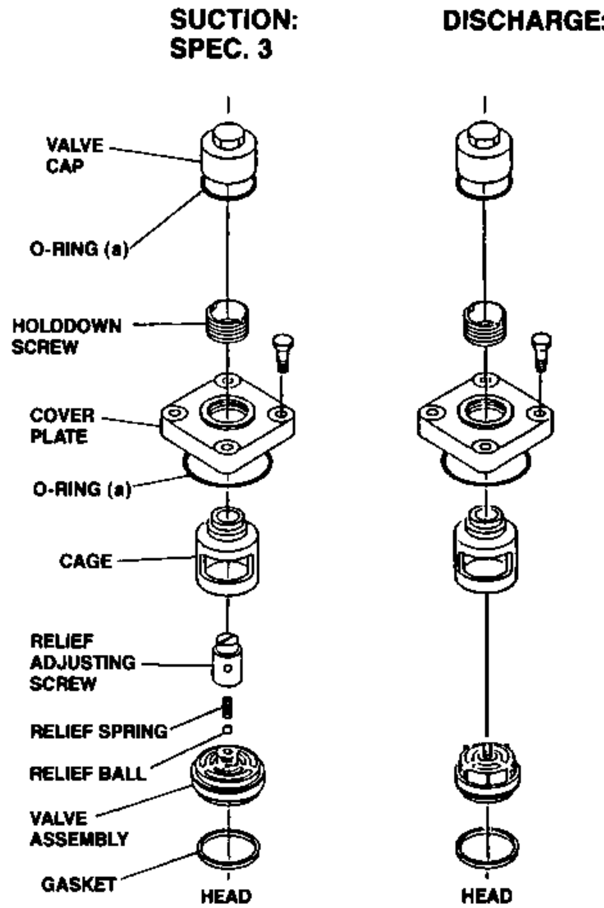


COMPRESSOR SIZES 91, 290, 291
FIGURE 5.1A



NOTE:
(a) OLDER UNITS MAY HAVE A METAL GASKET INSTEAD OF THE O-RING.

COMPRESSOR SIZE 491
FIGURE 5.1B



NOTE:
(a) OLDER UNITS MAY HAVE A METAL GASKET INSTEAD OF THE O-RING.

COMPRESSOR SIZE 691
FIGURE 5.1C

The metal valve gasket should always be replaced when the valve is reinstalled. Make sure suction and discharge valves are in the right slots as shown in the illustrations. Reinstall cages and spacers, then tighten the valve hoiddown screw to the value listed in Appendix D to ensure the valve gasket is properly seated. O-rings sealing the valve cover and valve cap should be replaced if they show any signs of wear or damage. Valve caps sealed by flat metal gaskets should be reinstalled with new gaskets. Refer to Appendix D for torque values.

*Some Spec 3 suction valves have an adjusting screw to set the liquid relief pressure. To adjust, tighten the adjusting screw until it bottoms, then back one turn on the size 491. (91/291/691's are pre-set).

5.2 CYLINDERS AND HEAD

Cylinders and heads very seldom require replacement if the compressor is properly maintained. The primary cause of damage to cylinders and heads are corrosion and the entry of solid debris or liquid into the compression chamber. Improper storage can also result in corrosion damage to the head and cylinder (for proper storage instructions see Section 5.8).

If the cylinder does become damaged or corroded, use a hone to smooth the cylinder bore and then polish it to the value shown in Appendix E. If more than .005” must be removed to smooth the bore, replace the cylinder. Cylinder liners and oversized rings are not available. Overboring the cylinder will result in greatly reduced ring life.

Many compressor repair operations require removal of the head and cylinder. While the compressor is disassembled, special care should be taken to avoid damage or corrosion to the head and cylinder. If the compressor is to be left open for more than a few hours, bare metal surfaces should be coated with rust preventative.

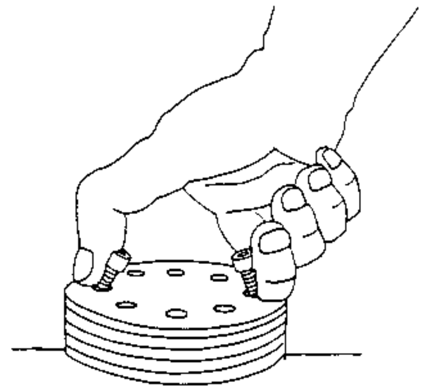
When reassembling the compressor, make sure the bolts are retightened as shown in Appendix D.

5.3 PISTON RINGS AND PISTON RING EXPANDERS

Piston ring life will vary considerably from application to application. Ring life will improve dramatically at lower speeds and temperatures.

To replace the piston rings: **Depressurize the compressor and purge if necessary.** Remove the head to gain access to the compressor cylinder. Loosen the piston head bolts. Remove the piston as shown in Figure 5.3A by pinching two loose bolts together. Piston rings and expanders may then be easily removed and replaced. Corken recommends replacing expanders whenever rings are replaced.

To determine if rings should be replaced, measure the radial thickness and compare it to the chart in Appendix E.



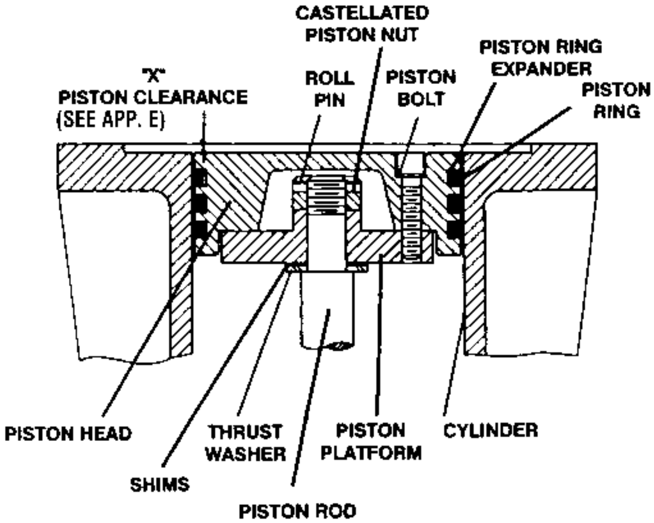
PISTON REMOVAL
FIGURE 5.3A

5.4 PISTONS

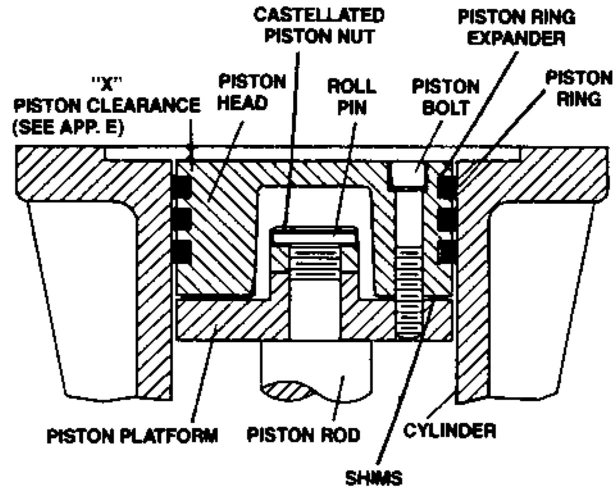
To replace the pistons: **Depressurize the compressor and purge if necessary.** Remove the compressor cylinder and head (see Section 5.2). Remove the piston head by loosening and removing the socket head bolts holding the piston head to the piston platform (see Figure 5.3A). Next, remove the roll pin with a pair of needle nose pliers. The castellated nut may now be removed and the piston platform lifted off the end of the piston rod. Check the thrust washer and shims for damage and replace if necessary.

Before installing the new piston, measure the thickness of the existing shims. For Models 91 through 491, the shims are placed between the thrust washer and piston platform. For model 691, the shims are placed between the platform and piston head (see Figure 5.4A and 5.4B).

Reinstall the piston platform with the same thickness of shims as before, BUT DO NOT REINSTALL THE ROLL PIN. Replace the cylinder and install the piston heads with new piston rings and expanders. Now measure dimension “X” shown in the illustration. If this measurement does not fall within the tolerances shown in Appendix E, remove the piston, adjust the shims as necessary and remeasure the “X” dimension. When the piston is properly shimmed, tighten the castellated nut as shown in Appendix D. Now install a new roll pin to lock the castellated piston nut in place. Install the piston head and tighten the socket head bolts in an alternating sequence. Reinstall the head (see Section 5.5) and follow standard startup procedure. (Note: New compressors may have self-locking nuts without roll pins.)



PISTON CROSS SECTION
SIZES 91 THROUGH 491
FIGURE 5.4A



PISTON CROSS SECTION
SIZE 691
FIGURE 5.4B

5.5 PISTON ROD PACKING ADJUSTMENT

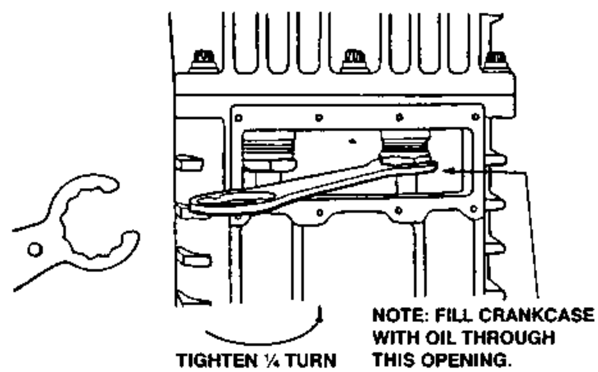
Piston rod packing should be adjusted or replaced whenever leakage becomes noticeable. Typically, it is a good idea to replace piston rod packing and piston rings at the same time.

Instructions for packing replacement are included with each set of packing.

Inspection of the rod packing is generally not productive, since packing that cannot be adjusted to an acceptable leakage rate should be replaced.

To adjust the packing, remove the compressor nameplate, tighten the packing adjusting nut(s) 1/4 turn with the wrench supplied, then run the compressor a few minutes to reseat the packing. If the leakage is still unacceptable, tighten the adjusting nut as necessary, using 1/4 turns at a time. Do not overtighten! If the adjusting nut is tightened until the packing spring is solid, the packing should be replaced. If packing will not seal, carefully inspect piston rods for possible scoring. Replace if needed.

Reattach the compressor nameplate after adjustments or repairs are made.



PACKING ADJUSTING NUTS
FIGURE 5.5A

5.6 BEARING REPLACEMENT

To replace the crankcase roller bearings, wrist pin bushing and connecting rod bearings, begin by removing the head, cylinder, piston, crosshead guide and crosshead. Drain the crankcase and remove the inspection plates. Loosen and remove the connecting rod bolts in order to remove the crosshead/connecting rod assembly.

5.6.1 WRIST PIN BUSHING REPLACEMENT

To replace the wrist pin bushing, remove the retainer rings that position the wrist pin in the crosshead. **Press** out the wrist pin so the crosshead and connecting rod may be separated. Inspect the wrist pin for wear and damage and replace if necessary.

Press out the old wrist pin bushing and press a new bushing into the connecting rod. DO NOT MACHINE THE O.D. OR I.D. OF THE BUSHING BEFORE PRESSING INTO CONNECTING ROD. Make sure the lubrication hole in the bushing matches the oil passage in the connecting rod. If the holes do not align, drill out the bushing through the connecting rod lubricant passage with a long drill. Bore the wrist pin bushing I.D. as indicated in Appendix E. Overboring the bushing can lead to premature failure of the wrist pin bushing. Inspect the oil passage for debris. Clean thoroughly before proceeding. **Press** the wrist pin back into the crosshead and wrist pin and reinstall retainer rings. NOTE: The fit between the wrist pin and bushing is tighter than on ordinary lubricated air compressors and combustion engines.

5.6.2 CONNECTING ROD BEARINGS

Connecting rod bearings are easily replaced after removing the semicircular inserts. Make sure the indentations in the connecting rod bearing and connecting rod line up when installing the new bearings.

Before reinstalling the crosshead/connecting rod assembly, make sure the crankshaft throw and bearing surface are clean and lubricated. Tighten the connecting rod bolts to the torques listed in Appendix D.

5.6.3 ROLLER BEARINGS

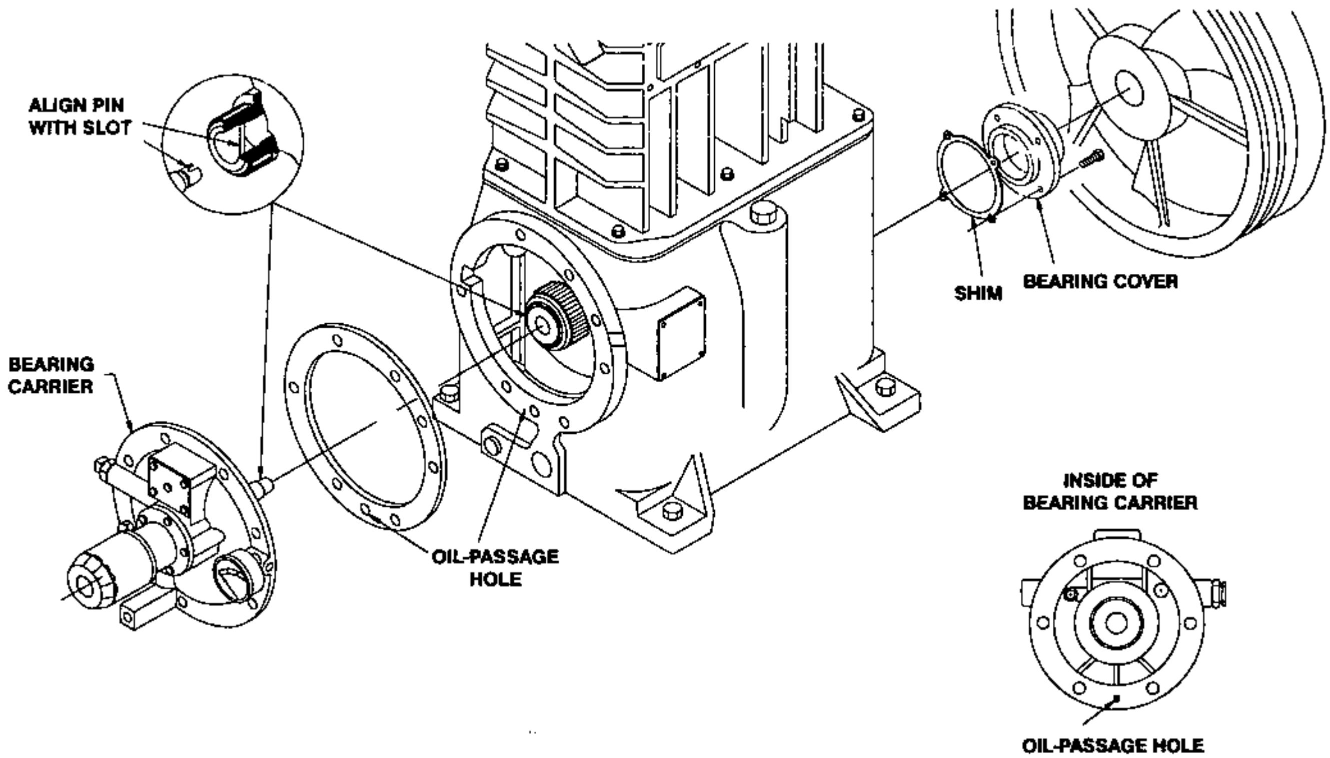
To inspect the roller bearings, remove the flywheel from the crankshaft and then remove the bearing carrier and crankshaft from the crankcase. If corrosion or pitting is present, the roller bearing should be replaced. When replacing roller bearings, always replace the entire bearing, not just the cup or the cone.

To replace the bearings, press the cups out of the crankcase and bearing carrier and press the cones off the crankshaft. Press the new bearings into position and reassemble the crankshaft and bearing carrier to the crankcase. When reinstalling the bearing carrier, make sure the oil pump shaft slot is aligned with the pin in the crankshaft. Make sure to install the bearing carrier gasket so the oil passage hole is not blocked (see Figure 5.6.3A).

In order to check the crankshaft end play, the oil pump must first be removed (see Section 5.7). Press the end of shaft towards the crankcase; if a clicking noise or motion is detected, the crankshaft has too much end play. To reduce end play, remove the bearing cover and remove a thin shim. Recheck the end play after replacing the bearing cover. When there is no detectable end play, the shaft must still be able to rotate freely. If the shaft sticks or becomes abnormally warm, then the crankshaft bearings are too tight. If the shaft is too tight, add more shims but make sure not to overshim. (Appendix E lists the proper crankshaft end play).

When the shaft can be rotated freely by hand and no end play is present, the rest of the compressor may be reassembled. If the crankshaft roller bearings are too tight or too loose, premature bearing failure will result.

Reinstall the flywheel on the crankshaft and check the run out as shown in Appendix E.



BEARING CARRIER REPLACEMENT
FIGURE 5.6.3A

5.7 OIL PUMP INSPECTION

If the compressor operates for a prolonged period with dirty or contaminated crankcase oil, damage to the oil pump may result. To check the oil pump, unbolt the pump cover and remove the oil pump, spring guide, spring and oil pump shaft adapter as shown in Figure 5.7A. Inspect the gears in the oil pump for corrosion or pitting and replace if necessary. Check the oil pump shaft bushing in the bearing carrier. If the bushing is corroded, pitted or worn, the oil pump shaft bushing should be replaced.

Before reassembling the oil pump mechanism, replace the 0-rings in the oil pump cover and on the oil pump adapter shaft (see Figure 5.7A). Rotate the drive pin in the crankshaft to a vertical position for easiest reassembly. Insert the shaft adapter so it engages the drive pin. Next, insert the spring, spring guide and oil pump assembly. The tang on the oil *pump* ***must*** align with the slot in the shaft adapter. Install the pump cover so the pin on the case is in the opening on the oil pump assembly as shown in Figure 5.7A. When you are sure the pin is properly aligned, install the cover bolts **finger tight.** Rotate the crankshaft by hand to ensure smooth operation. Then rotate it in opposite directions, listening for a click, which indicates proper alignment of the oil pump's pins and slots. Finally, tighten the bolts in an alternating sequence. See Section 3.3 for directions on oil pressure adjustment.

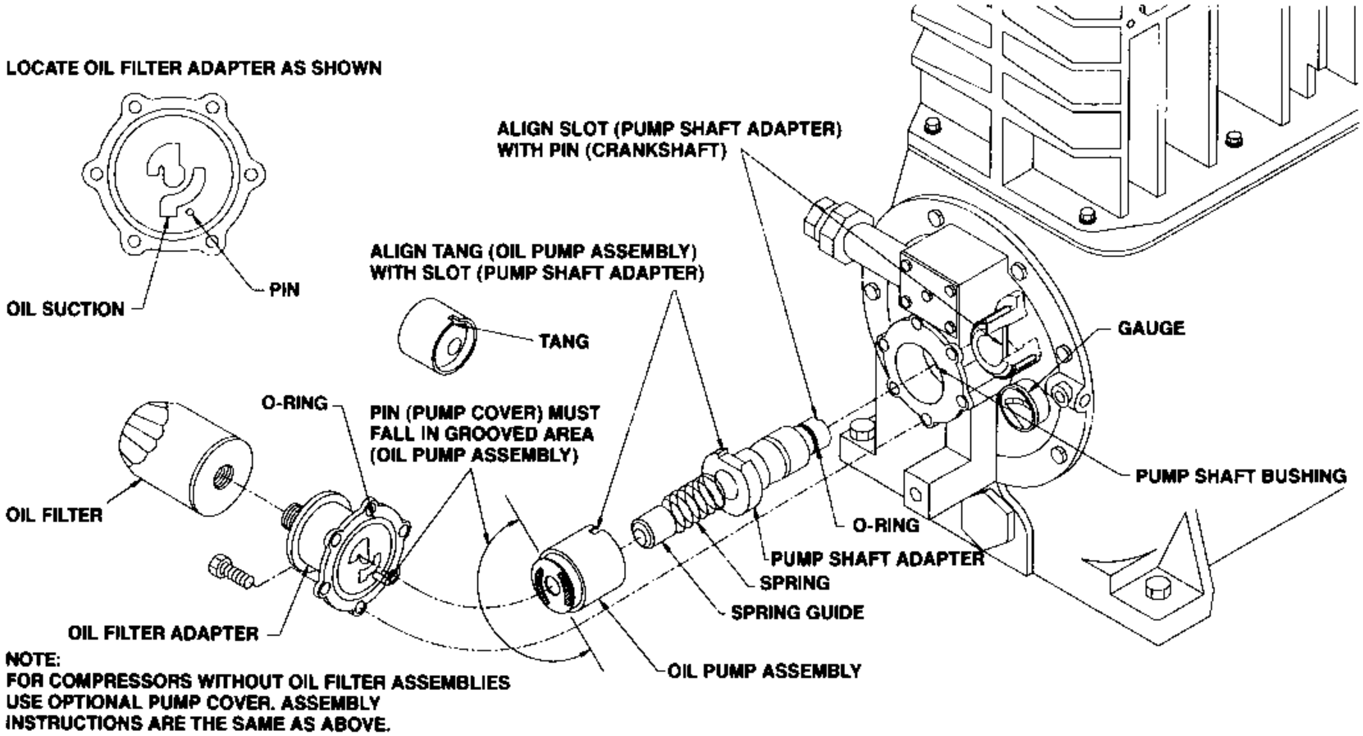

LOCATE OIL FILTER ADAPTER AS SHOWN
OIL SUCTION
PIN
ALIGN SLOT (PUMP SHAFT ADAPTER)
WITH PIN (CRANKSHAFT)
ALIGN TANG (OIL PUMP ASSEMBLY)
WITH SLOT (PUMP SHAFT ADAPTER)
TANG
GAUGE
O-RING
PIN (PUMP COVER) MUST
FALL IN GROOVED AREA
(OIL PUMP ASSEMBLY)
OIL FILTER
PUMP SHAFT BUSHING
O-RING
PUMP SHAFT ADAPTER
SPRING
SPRING GUIDE
OIL FILTER ADAPTER
OIL PUMP ASSEMBLY
NOTE:
FOR COMPRESSORS WITHOUT OIL FILTER ASSEMBLIES
USE OPTIONAL PUMP COVER. ASSEMBLY
INSTRUCTIONS ARE THE SAME AS ABOVE.

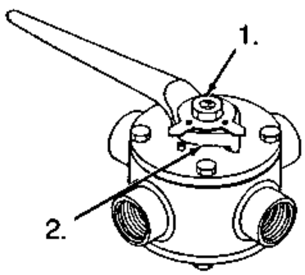
FIGURE 5.7A

5.8 SERVICING THE FOUR-WAY VALVE

Unlike older units, new Corken compressors mounted in the –107 arrangement are being supplied with a non-lube four-way valve. No maintenance is normally required on this valve. If you have reason to disassemble the valve, please follow the instructions below.

CAUTION: ***Always Relieve Pressure In The Unit Before Attempting Any Repairs.***

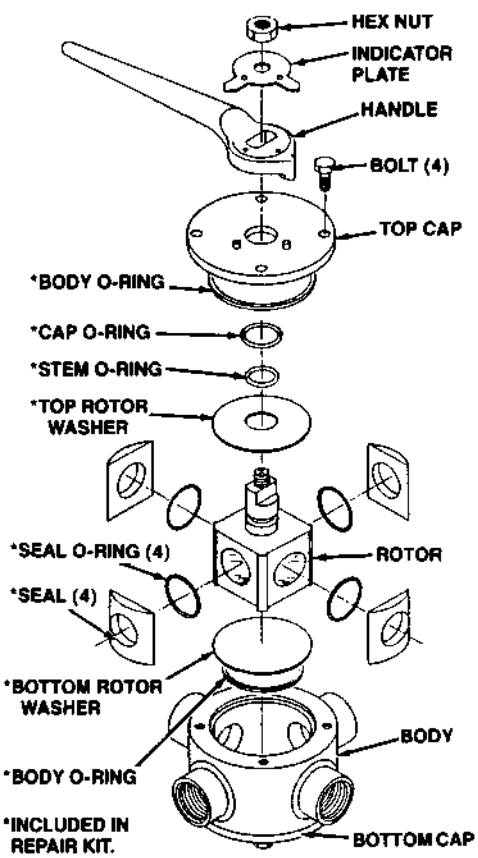
BEFORE DISASSEMBLY:



1. Record the position marks on the end of the rotor shaft.

2. Record the positions of the handle stops on the cap.

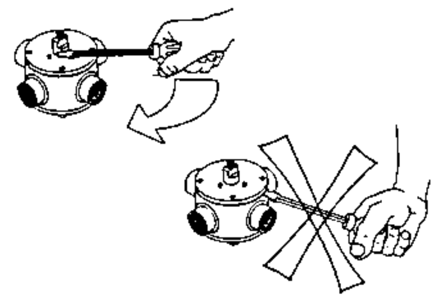
NOTE: A small amount of silicone grease applied to each part before assembly facilitates assembly if allowed.



DISASSEMBLY: Refer to the drawing for item description.

1. Remove the hex nut, indicator plate and handle from the rotor shaft.

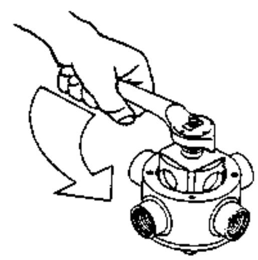
2. Remove the four hex head bolts and the cap from the body. Cap should be rotated until free, do not pry.



Inspect cap for wear and damage.

3. Remove the body O-ring, stem O-ring,, cap O-ring, and top rotor washer and discard.

4. Remove the rotor and four seals as a unit from the body. **IMPORTANT:** Because of the close



tolerance, care must be taken to remove the rotor on its axis to prevent damage to the rotor and body. Rotating the handle with a lifting action will help remove the rotor.

5. Discard the four seals. Inspect the rotor for wear and damage.

6. Remove the bottom rotor washer and discard. Inspect the body for wear and damage.

REASSEMBLY: Refer to drawing. Have Repair Kit laid out.

1. Place the new bottom rotor washer into the body.

2. Assemble the four seals and 0-rings onto the appropriate surfaces of the rotor.

3. Assemble the rotor and seal assembly into the body.

IMPORTANT: Because of the close tolerance, care must be taken to press the rotor on its axis to prevent damage to the rotor and body. A ring compressor is helpful. Be sure that the rotor is bottomed in the body.

ROTATE THE ROTOR SO THAT THE POSITION MARKS ON THE END OF THE ROTOR SHAFT ARE THE SAME AS RECORDED BEFORE DISASSEMBLY.

4. Assemble the new top rotor washer and cap O-ring, onto the shoulder of the rotor.

5. Assemble the new stem o-ring and the body o-ring into their grooves in the rotor and body.

6. Place the cap over the rotor shaft.

ROTATE THE ROTOR SO THAT THE POSITION OF THE HANDLE STOPS ON THE CAP ARE THE SAME AS RECORDED BEFORE DISASSEMBLY.

7. Assemble the four hex head bolts through the cap and into the body. Be sure that the body o-ring is in the proper position and tighten the hex head bolts.

8. Reassemble the handle, indicator plate and hex nut. Be sure that the handle is assembled so that the stop on the handle mates with the stops on the cap.

CHAPTER 6
EXTENDED STORAGE PROCEDURES

Following a few simple procedures will greatly minimize the risk of the unit becoming corroded and damaged. Corken recommends the following precautions to protect the compressor during storage:

1. Drain the crankcase oil and refill with rust inhibiting oil.

2. Operate for a few minutes while fogging oil into the compressor suction.

3. Relieve V-belt tension.

4. Plug all openings to prevent entry of insects and moisture. (The cylinders may also be protected by the use of a vapor phase inhibitor, silica gel, or dry nitrogen gas. If the silica gel is used, hang a tag on the unit indicating that it must be removed before a start-up.)

5. Store in a dry area, off the ground if possible.

6. Rotate the flywheel every two weeks if possible.

MODEL NUMBER AND MOUNTING IDENTIFICATION CODE

MODELS INVOLVED	DESCRIPTION	CODE	FEATURE	EXAMPLE
ALL	ANSI/DIN FLANGE INLET AND OUTLET	F	HEAD CONNECTION STYLE	
	SINGLE-STAGE, DUCTILE IRON NOTE: MODELS ARE AVAILABLE **NOTE:** MODELS ARE AVAILABLE WITH DIN IRON HEAD/CYLINDER MODEL NO. WILL BE DESIGNATED BY A "2" THE LAST DIGIT OF THE MODEL NO.	91, 291 491/492 491-3	BASIC MODEL 691/692	491
ALL	INLET PRESSURE ABOVE ATMOSPHERIC	A	PACKING ADJUSTMENT	A
91 ONLY 91-491 ALL EXCEPT 91 ALL EXCEPT 91 ALL EXCEPT 91 ALL EXCEPT 91	SPLASH LUBRICATED CRANKCASE EXTENDED CRANKSHAFT STANDARD PRESSURE LUBRICATED CRANKCASE STANDARD CRANKCASE WITH CRANKCASE HEATER STANDARD CRANKCASE WITH EXTERNAL COMPRESSOR LUBRICATOR STANDARD CRANKCASE WITH EXTERNAL COMPRESSOR LUBRICATOR AND CRANKCASE HEATER	J E M MH L LH	CRANKCASE STYLE	M
ALL ALL ALL ALL EXCEPT 391-491 ALL EXCEPT 391-491	LIQUID RELIEF SUCTION VALVES STANDARD SUCTION AND DISCHARGE VALVES SUCTION VALVE UNLOADERS SPEC 4 VALVES AS NOTED ABOVE WITH PEEK VALVE PLATES SPEC 9 VALVES AS NOTED ABOVE WITH PEEK VALVE PLATES	3 4 9 4P 9P	VALVES	3
91-491 SERIES 691 ALL	PTFE PISTON RING AND PACKING MATERIAL PTFE PISTON RING AND ALLOY 50 PACKING MATERIAL SAME AS F WITH THE ADDITION OF K-RING SPACERS	F FK	PISTON RING AND PACKING MATERIAL	F
ALL ALL ALL	ALUMINUM GASKET MATERIAL COPPER GASKET MATERIAL IRON-LEAD GASKET MATERIAL	B C D	GASKET MATERIAL	B
ALL ALL ALL	BUNA-N NEOPRENE* VITON*	A B D	O-RING MATERIAL	A
ALL SINGLE STAGE COMPRESSORS	NOT APPLICABLE - SINGLE STAGE COMPRESSOR (NO INTERCOOLER)	N	INTERCOOLER	N
191-491 SERIES ONLY 91-491 SERIES ONLY ALL ALL	14" FLYWHEEL USED IN CONJUNCTION WITH EXTENDED CRANKSHAFT HEAVY DUTY FLYWHEEL NO FLYWHEEL SUPPLIED STANDARD FLYWHEEL	E H N S	FLYWHEEL	S
ALL	NO COATING	N	PROTECTIVE COATING	N
ALL	NITROTEC PISTON ROD COATING (STANDARD)	N	PISTON ROD COATING	N

MODEL NUMBER

*VITON AND NEOPRENE ARE REGISTERED TRADEMARKS OF DUPONT.

APPENDIX A

MATERIAL SPECIFICATIONS

	STANDARD		OPTIONAL	
PART	**SIZE**	**MATERIAL**	**SIZE**	**MATERIAL**
HEAD, CYLINDER	91, 291, 491, 691	DUCTILE IRON ASTM A536		NONE
CROSSHEAD GUIDE CRANKCASE, FLYWHEEL BEARING CARRIER	ALL	GRAY IRON ASTM A48, CLASS 30		NONE
FLANGE	691	DUCTILE IRON ASTM A536	690,691	STEEL WELDING
VALVE SEAT AND BUMPER	91,291 491 691	17-4 PH STAINLESS STEEL DUCTILE IRON ASTM A536 GRAY IRON ASTM A48, CLASS 30		NONE
VALVE PLATE	91,291 491 691	410 STAINLESS STEEL 17-7 PH STAINLESS STEEL STEEL, ROCKWELL 50C		NONE
VALVE SPRING	91,291,691 491	17-7 PH STAINLESS STEEL INCONEL		NONE
VALVE GASKETS	ALL	SOFT ALUMINUM	ALL	IRON-LEAD
PISTON	ALL	GRAY IRON ASTM A48, CLASS 30		NONE
PISTON ROD	ALL	C1050 STEEL, HARD CHROMIUM PLATED ROCKWELL 60C		NONE
CROSSHEAD	ALL	GRAY IRON ASTM A48, CLASS 30		NONE
PISTON RINGS	ALL	PTFE, GLASS- AND MOLY-FILLED		NONE
PISTON RING EXPANDERS	ALL	302 STAINLESS STEEL		NONE
HEAD GASKET	91, 291, 491, 691	O-RING (BUNA-N)	91,290,291, 491, 691	PTFE, VITON, NEOPRENE*
ADAPTER PLATE, PACKING CARTRIDGE, CONNECTING ROD	ALL	DUCTILE IRON ASTM A536		NONE
PACKING RINGS	ALL	PTFE, GLASS- AND MOLY-FILLED		NONE
CRANKSHAFT	ALL	DUCTILE IRON ASTM A536		NONE
CONNECTING ROD BEARING	ALL	BIMETAL D-2 BABBIT		NONE
WRIST PIN	ALL	C1018 STEEL, ROCKWELL 62C		NONE
WRIST-PIN BUSHING	ALL	BRONZE SAE 660		NONE
MAIN BEARING	ALL	TAPERED ROLLER		NONE
INSPECTION PLATE	ALL	ALUMINUM		NONE
O-RINGS	ALL	BUNA-N	ALL	PTFE, VITON, NEOPRENE*
RETAINER RINGS	ALL	STEEL		NONE
MISCELLANEOUS GASKETS	ALL	COROPRENE		NONE

*VITON AND NEOPRENE ARE REGISTERED TRADEMARKS OF DUPONT.

APPENDIX B

MECHANICAL SPECIFICATIONS

Specifications	SINGLE STAGE						
	91	290	291	490	491	690	691
Cylinder Bore, Inches (cm) First Stage	3 (7.62)	3 (7.62)	3 (7.62)	4 (10.16)	4 (10.16)	4.5 (11.43)	4.5 (11.43)
Stroke, Inches (cm)	2.5 (6.35)	2.5 (6.35)	2.5 (6.35)	3 (7.62)	3 (7.62)	4 (10.16)	4 (10.16)
Piston Displacement CFM (Lit/Min) Min. at 300 RPM Max. at 825 RPM	3 (85) 8 (226)	6 (170) 16 (453)	6 (170) 16 (453)	13 (368) 36 (1019)	13 (368) 36 (1019)	22 (623) 60 (1699)	22 (623) 60 (1699)
*Max. Pressure psia (bars)	350 (24.14)	280 (19.31)	350 (24.14)	280 (19.31)	350 (24.14)	280 (19.31)	350 (24.14)
Max. Motor Size HP	7.5	15	15	15	15	35	35
Max. Outlet Temperature °F (°C)	350 (177)	350 (177)	350 (177)	350 (177)	350 (177)	350 (177)	350 (177)

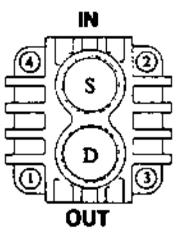
* These numbers specify pressure-containing abilities of the compressor cylinder and head. For many applications, factors other than the pressure rating will limit the maximum allowable discharge pressure to lower values. These factors include horsepower, temperature and rod load.

APPENDIX C

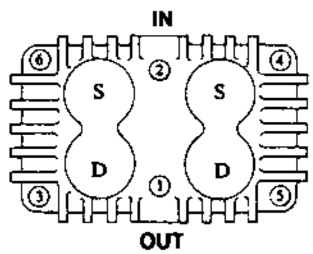
BOLT TORQUE VALUES

SIZE	CONN. ROD BOLT FT-LB	BEARING CARRIER FT-LB	BEARING COVER FT-LB	CRANK-CASE INSPEC PLATE FT-LB	X-HEAD GUIDE FT-LB	CYL. TO HEAD (1,2) FT-LB	VALVE COVER PLATE BOLT FT-LB	VALVE HOLD-DOWN SCREW 2 FT-LB	PISTON LOCK NUT TORQUE FT-LB	PISTON SCREW TORQUE IN-LB	VALVE CAP TORQUE (W/ GASKETS) FT-LB	VALVE CAP TORQUE (W/ O-RINGS) FT-LB
91	28	38	38	15	30	20	--	40	45	50	40	25
291	28	30	30	13	25	20	--	40	45	50	40	25
491	30	26	35	8	33	33	35	40	45	100	40	25
691	40	40	40	9	40	30	37	40	60	100	40	25

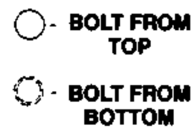
(1) Preliminary tightening – snug all headbolts in the sequence shown. Final torqueing – torque all headbolts in the sequence shown to the listed value.
(2) Retorque to the listed value after 2 – 5 hours running time.

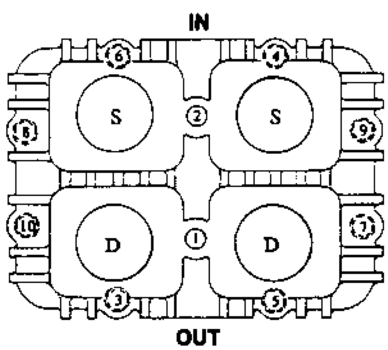


MODEL 91



MODELS 290 AND 291





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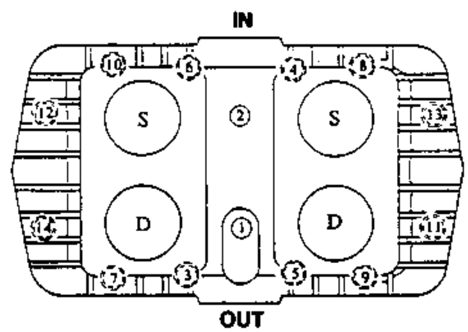

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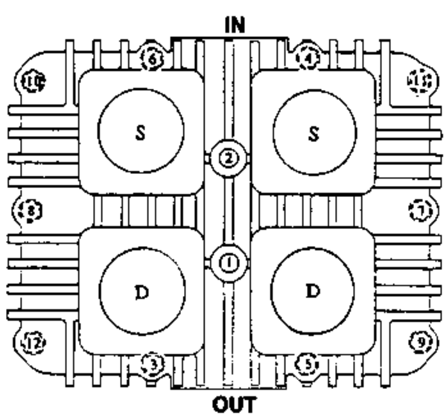
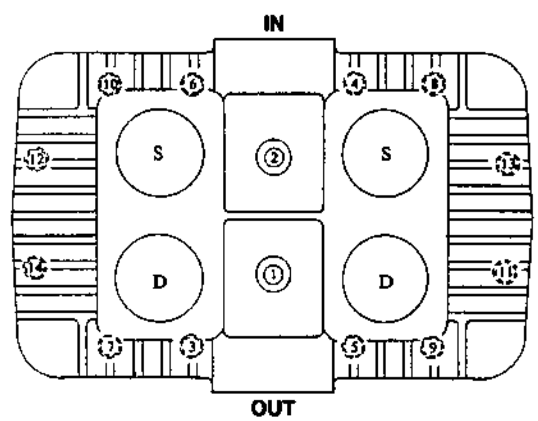


MODEL 690



MODEL 691

APPENDIX D

ALL DIMENSIONS ARE IN INCHES.

	91	**291**	**491**	**691** (M Crankcase)
**Clearance: "X" Piston Fig. 5.4A & 5.4B	0.020 0.044	0.020 0.044	0.000/0.020 0.024/0.044	0.000/0.015 0.012/0.027
Clearance: Conrod bearing to crankshaft journal	0.0005 0.0025	0.0005 0.0025	0.0005 0.0025	0.0019 0.0035
Clearance: Wrist pin to wrist pin bushing* (max)	0.0009	0.0009	0.0009	0.0020
Cylinder Bore Diameter (max)	3.009	3.009	4.011	4.515
Cylinder Finish (RMS)	16-32	16-32	16-32	16-32
Piston ring radial thickness (min)	0.082	0.082	0.082	0.082
Clearance: Oil pump adapter shaft to bushing* (max)	0.0050	0.0050	0.0050	0.0050
Crankshaft end play (cold)	0.000 0.002	0.000 0.002	0.000 0.002	0.002 0.003
Flywheel runout at O.D. (max)	0.020	0.020	0.020	0.020
Clearance: Crosshead to crosshead guide bore (max)	0.011	0.011	0.012	0.013
Crosshead guide bore finish	32 RMS (limited number of small pits and scratches are acceptable)			

* Dimensions for honing are included with new bushings (which must be installed, then honed).
** Clearance should be set with machine **cold**.

APPENDIX E

PROPANE COMPRESSOR SELECTION TABLE

SERVICE	CAPACITY GPM (1)	DISPLACEMENT CFM	COMPRESSOR		DRIVER SEAVE SIZE P.D.* (2)		DRIVER HORSEPOWER: LIQUID TRANSFER AND RESIDUAL VAPOR RECOVERY		DRIVER HORSEPOWER: LIQUID TRANSFER WITHOUT RESIDUAL VAPOR RECOVERY		PIPING SIZE (3)	
			MODEL	RPM	1750 RPM	1460 RPM	100°F	80°F	100°F	80°F	VAPOR	LIQUID
SMALL BULK PLANTS	23	4	91	400	A 3.0	A 3.6	5	3	3	3	¾	1¼
	29	5	91	505	A 3.8	B 4.6	5	5	5	5	¾	1¼
	34	6	91	590	B 4.6	B 5.6	5	5	5	5	1	1¼
	40	7	91	695	B 5.4	B 6.6	5	5	5	5	1	1¼
	39	7	291	345	A 3.0	A 3.6	3	3	3	3	1	1¼
UNLOADING SINGLE TANK CARS OR TRANSPORT	45	8	91	795	B 6.2	B 7.4	7½	7½	7½	7½	1	1½
	44	8	291	390	A 3.4	B 4.0	5	3	3	3	1	1½
	50	9	291	435	A 3.8	B 4.6	5	3	3	3	1	1½
	56	10	291	490	B 4.4	B 5.2	5	5	5	5	1	2
	61	11	291	535	B 4.8	B 5.8	5	5	5	5	1	2
	66	12	291	580	B 5.2	B 6.2	7½	5	5	5	1	2
	71	13	291	625	B 5.6	B 6.6	7½	5	7½	5	1¼	2
	79	14	291	695	B 6.2	B 7.4	7½	7½	7½	7½	1¼	2
	84	15	291	735	B 6.6	B 8.0	10	7½	10	7½	1¼	2½
	84	15	491	345	A 3.0	A 3.6	7½	7½	5	5	1¼	2½
	89	16	491	780	B 7.0	B 8.6	10	10	10	10	1¼	2½
	89	16	491	370	A 3.2	A 3.8	7½	7½	7½	5	1¼	2½
UNLOADING TWO OR MORE TANK CARS AT ONE TIME, OR LARGE TRANSPORT WITH EXCESS FLOW VALVES OF ADEQUATE CAPACITY	95	17	491	390	A 3.4	B 4.0	7½	7½	7½	7½	1¼	3
	101	18	491	415	A 3.6	B 4.4	10	7½	7½	7½	1¼	3
	106	19	491	435	A 3.8	B 4.6	10	7½	7½	7½	1¼	3
	108	20	491	445	B 4.0	B 4.8	10	7½	7½	7½	1¼	3
	114	21	491	470	B 4.2	B 5.0	10	7½	7½	7½	1¼	3
	119	22	491	490	B 4.4	B 5.2	10	10	7½	7½	1¼	3
	125	23	491	515	B 4.6	B 5.6	10	10	10	7½	1¼	3
	130	24	491	535	B 4.8	B 5.8	15	10	10	10	1¼	3
	136	25	491	560	B 5.0	B 6.0	15	10	10	10	1¼	3
	141	26	491	580	B 5.2	B 6.2	15	10	10	10	1¼	3
	147	27	491	605	B 5.4	B 6.4	15	10	15	10	1¼	3
	152	28	491	625	B 5.6	B 6.6	15	15	15	15	1½	3
	158	29	491	650	B 5.8	B 7.0	15	15	15	15	1½	3
	163	30	491	670	B 6.0		15	15	15	15	1½	3
	163	30	691	400	B 4.4	B 5.2	15	15	10	10	1½	3
	168	31	491	695	B 6.2	B 7.4	15	15	15	15	1½	3
	171	31	691	420	B 4.6	B 5.6	15	15	10	10	1½	3
	179	32	491	740	B 6.6	B 8.0	15	15	15	15	1½	3
	178	32	691	440	B 4.8	B 5.8	15	15	10	10	1½	3
	186	34	691	455	B 5.0	B 6.0	15	15	15	10	1½	3
	193	35	691	475	B 5.2	B 6.2	15	15	15	10	1½	3
	200	36	691	495	B 5.4	B 6.4	15	15	15	15	1½	3
UNLOADING LARGE TANK CARS, MUTIPLE VESSELS, BARGES OR TERMINALS	208	38	691	510	B 5.6	B 6.8	20	15	15	15	1½	4
	215	39	691	530	B 5.8	B 7.0	20	15	15	15	1½	4
	223	41	691	550	B 6.0	A 7.0	20	15	15	15	1½	4
	230	42	691	565	B 6.2	B 7.4	20	15	15	15	2	4
	237	43	691	585	B 6.4	A 7.4	20	15	15	15	2	4
	245	45	691	605	B 6.6	B 8.0	20	15	15	15	2	4
	252	46	691	620	B 6.8		20	20	15	15	2	4
	260	47	691	640	B 7.0	A 8.2	20	20	20	15	2	4
	275	48	691	675	B 7.4	B 8.6	25	20	20	20	2	4
	297	54	691	730	B 8.0	B 9.4	25	20	20	20	2	4
	319	58	691	785	B 8.6		25	20	25	20	2	4
	334	60	691	820	TB9.0	A 10.6	30	25	25	20	2	4

Consult factory for compressors for higher flows.

NOTES: (1) The capacities shown are based on 70°F, but will vary depending upon piping, fittings used, product being transferred and temperatures. The factory can supply a detailed computer analysis if required.
(2) Driver sheaves; 91-2 belts; 290, 291, 490, 491-3 belts; 690, 691-4 belts.
(3) The piping sizes shown are considered minimum. If the length exceeds 100 ft., use the next larger size.

APPENDIX F

N-BUTANE COMPRESSOR SELECTION TABLE

SERVICE	CAPACITY GPM (1)	DISPLACEMENT CFM	COMPRESSOR		DRIVER SEAVE SIZE P.D.* (2)		DRIVER HORSEPOWER: LIQUID TRANSFER AND RESIDUAL VAPOR RECOVERY		DRIVER HORSEPOWER: LIQUID TRANSFER WITHOUT RESIDUAL VAPOR RECOVERY		PIPING SIZE (3)	
			MODEL	RPM	1750 RPM	1460 RPM	100˚F	80˚F	100˚F	80˚F	VAPOR	LIQUID
SMALL BULK PLANTS	13	4	91	400	A 3.0	A 3.6	3	3	3	3	¾	1¼
	17	5	91	505	A 3.8	B 4.6	3	3	3	3	¾	1¼
	20	6	91	590	B 4.6	B 5.6	3	3	3	3	1	1¼
	24	7	91	695	B 5.4	B 6.6	5	5	5	5	1	1½
	23	7	291	345	A 3.0	A 3.6	2	2	2	2	1	1½
UNLOADING SINGLE TANK CARS OR TRANSPORT	27	8	91	795	B 6.2	B 7.4	5	5	5	5	1	1½
	26	8	291	390	A 3.4	B 4.0	2	2	2	2	1	1½
	30	9	291	435	A 3.8	B 4.6	3	3	3	3	1	1½
	33	10	291	490	B 4.4	B 5.2	3	3	3	3	1	2
	36	11	291	535	B 4.8	B 5.8	3	3	3	3	1	2
	39	12	291	580	B 5.2	B 6.2	5	3	5	3	1	2
	42	13	291	625	B 5.6	B 6.6	5	5	5	5	1¼	2
	47	14	291	695	B 6.2	B 7.4	5	5	5	5	1¼	2
	50	15	291	735	B 6.6	B 8.0	5	5	5	5	1¼	2½
	50	15	491	345	A 3.0	A 3.6	5	5	5	5	1¼	2½
	53	16	291	780	B 7.0	B 8.6	7½	5	7½	5	1¼	2½
	53	16	491	370	A 3.2	A 3.8	5	5	5	5	1¼	2½
UNLOADING TWO OR MORE TANK CARS AT ONE TIME, OR LARGE TRANSPORT WITH EXCESS FLOW VALVES OF ADEQUATE CAPACITY	56	17	491	390	A 3.4	B 4.0	5	5	5	5	1¼	3
	60	18	491	415	A 3.6	B 4.4	5	5	5	5	1¼	3
	63	19	491	435	A 3.8	B 4.6	5	5	5	5	1¼	3
	65	20	491	445	B 4.0	B 4.8	5	5	5	5	1¼	3
	68	21	491	470	B 4.2	B 5.0	5	5	5	5	1¼	3
	71	22	491	490	B 4.4	B 5.2	7½	5	7½	5	1¼	3
	75	23	491	515	B 4.6	B 5.6	7½	5	7½	5	1¼	3
	77	24	491	535	B 4.8	B 5.8	7½	7½	7½	7½	1¼	3
	81	25	491	560	B 5.0	B 6.0	7½	7½	7½	7½	1¼	3
	84	26	491	580	B 5.2	B 6.2	7½	7½	7½	7½	1¼	3
	87	27	491	605	B 5.4	B 6.4	7½	7½	7½	7½	1¼	3
	91	28	491	625	B 5.6	B 6.6	7½	7½	7½	7½	1½	3
	94	29	491	650	B 5.8	B 7.0	10	7½	10	7½	1½	3
	97	30	491	670	B 6.0		10	7½	10	7½	1½	3
	94	30	691	400	B 4.4	B 5.2	7½	7½	7½	7½	1½	3
	100	31	491	695	B 6.2	B 7.4	10	7½	10	7½	1½	3
	98	31	691	420	B 4.6	B 5.6	10	7½	10	7½	1½	3
	107	32	491	740	B 6.6	B 8.0	10	10	10	10	1½	3
	103	32	691	440	B 4.8	B 5.8	10	7½	10	7½	1½	3
	110	33	491	760	B 6.8	B 8.0	10	10	10	10	1½	3
	113	34	491	780	B 7.0	B 8.6	10	10	10	10	1½	3
	107	34	691	455	B 5.0	B 6.0	10	10	10	10	1½	3
	111	35	691	475	B 5.2	B 6.2	10	10	10	10	1½	3
	119	36	491	825	B 7.4	B 8.6	15	10	15	10	1½	3
	116	36	691	495	B 5.4	B 6.4	10	10	10	10	1½	3
UNLOADING LARGE TANK CARS, MULTIPLE VESSELS, BARGES OR TERMINALS	120	38	691	510	B 5.6	B 6.8	10	10	10	10	1½	4
	124	39	691	530	B 5.8	B 7.0	10	10	10	10	1½	4
	129	41	691	550	B 6.0	A 7.0	10	10	10	10	1½	4
	133	42	691	565	B 6.2	B 7.4	10	10	10	10	2	4
	137	43	691	585	B 6.4	A 7.4	10	10	10	10	2	4
	142	45	691	605	B 6.6	B 8.0	15	10	15	10	2	4
	145	46	691	620	B 6.8		15	10	15	10	2	4
	150	47	691	640	B 7.0	A 8.2	15	10	15	10	2	4
	158	48	691	675	B 7.4	B 8.6	15	15	15	15	2	4
	184	54	691	730	B 8.0	B 9.4	15	15	15	15	2	4
	184	58	691	785	B 8.6		15	15	15	15	2	4
	193	60	691	820	TB9.0	A 10.6	15	15	15	15	2	4

Consult factory for compressors for higher flows.

NOTES: (1) The capacities shown are based on 70˚F, but will vary depending upon piping, fittings used, product being transferred and temperatures. The factory can supply a detailed computer analysis if required.

(2) Driver sheaves; 91-2 belts; 290, 291, 490, 491-3 belts; 690, 691-4 belts.

(3) The piping sizes shown are considered minimum. If the length exceeds 100 ft., use the next larger size.

APPENDIX F2

AMMONIA COMPRESSOR SELECTION TABLE

SERVICE	CAPACITY GPM (1)	DISPLACEMENT CFM	COMPRESSOR MODEL	COMPRESSOR RPM	DRIVER SEAVE SIZE P.D.* (2) 1750 RPM	DRIVER SEAVE SIZE P.D.* (2) 1460 RPM	DRIVER HORSEPOWER LIQUID TRANSFER AND RESIDUAL VAPOR RECOVERY 100˚F	DRIVER HORSEPOWER LIQUID TRANSFER AND RESIDUAL VAPOR RECOVERY 80˚F	DRIVER HORSEPOWER LIQUID TRANSFER WITHOUT RESIDUAL VAPOR RECOVERY 100˚F	DRIVER HORSEPOWER LIQUID TRANSFER WITHOUT RESIDUAL VAPOR RECOVERY 80˚F	PIPING SIZE (3) VAPOR	PIPING SIZE (3) LIQUID
SMALL BULK PLANTS	23	4	91	400	A 3.0	A 3.6	5	3	3	3	¾	1¼
	29	5	91	505	A 3.8	B 4.6	5	5	5	3	¾	1¼
	34	6	91	590	B 4.6	B 5.6	5	5	5	5	1	1¼
	40	7	91	695	B 5.4	B 6.6	5	5	5	5	1	1½
	43	7	291	345	A 3.0	A 3.6	3	3	3	3	1	1½
UNLOADING SINGLE TANK CARS OR TRANSPORT	46	8	91	795	B 6.2	B 7.4	7½	5	5	5	1	1½
	45	8	291	390	A 3.4	B 4.0	5	3	3	3	1	1½
	50	9	291	435	A 3.8	B 4.6	5	3	3	3	1	1½
	56	10	291	490	B 4.4	B 5.2	5	5	5	3	1	2
	62	11	291	535	B 4.8	B 5.8	7½	5	5	5	1	2
	67	12	291	580	B 5.2	B 6.2	7½	5	5	5	1	2
	72	13	29/1	625	B 5.6	B 6.6	7½	5	5	5	1¼	2
	80	14	291	695	B 6.2	B 7.4	7½	7½	7½	5	1¼	2
	85	15	291	735	B 6.6	B 8.0	10	7½	7½	7½	1¼	2½
	85	15	491	345	A 3.0	A 3.6	7½	7½	5	5	1¼	2½
	90	16	491	780	B 7.0	B 8.6	10	7½	7½	7½	1¼	2½
	90	16	491	370	A 3.2	A 3.8	10	7½	5	5	1¼	2½
UNLOADING TWO OR MORE TANK CARS AT ONE TIME, OR LARGE TRANSPORT WITH EXCESS FLOW VALVES OF ADEQUATE CAPACITY	96	17	491	390	A 3.4	B 4.0	10	7½	5	5	1¼	3
	102	18	491	415	A 3.6	B 4.4	10	7½	7½	7½	1¼	3
	107	19	491	435	A 3.8	B 4.6	10	7½	7½	7½	1¼	3
	110	20	491	445	B 4.0	B 4.8	10	7½	7½	7½	1¼	3
	115	21	491	470	B 4.2	B 5.0	10	7½	7½	7½	1¼	3
	120	22	491	490	B 4.4	B 5.2	15	10	7½	7½	1¼	3
	126	23	491	515	B 4.6	B 5.6	15	10	7½	7½	1¼	3
	131	24	491	535	B 4.8	B 5.8	15	10	10	7½	1¼	3
	138	25	491	560	B 5.0	B 6.0	15	10	10	7½	1¼	3
	142	26	491	580	B 5.2	B 6.2	15	10	10	7½	1¼	3
	148	27	491	605	B 5.4	B 6.4	15	10	10	10	1¼	3
	153	28	491	625	B 5.6	B 6.6	15	10	10	10	1½	3
	160	29	491	650	B 5.8	B 7.0	15	15	10	10	1½	3
	165	30	491	670	B 6.0		15	15	15	10	1½	3
	165	30	691	400	B 4.4	B 5.2	15	15	10	10	1½	3
	170	31	491	695	B 6.2	B 7.4	15	15	15	10	1½	3
	173	31	691	420	B 4.6	B 5.6	15	15	10	10	1½	3
	181	32	491	740	B 6.6	B 8.0	15	15	15	15	1½	3
	180	32	691	440	B 4.8	B 5.8	15	15	10	10	1½	3
	188	34	691	455	B 5.0	B 6.0	20	15	10	10	1½	3
	195	35	691	475	B 5.2	B 6.2	20	15	10	10	1½	3
	203	36	691	495	B 5.4	B 6.4	20	15	15	10	1½	3
UNLOADING LARGE TANK CARS, MULTIPLE VESSELS, BARGES OR TERMINALS	211	38	691	510	B 5.6	B 6.8	20	15	15	10	1½	4
	218	39	691	530	B 5.8	B 7.0	20	15	15	15	1½	4
	226	41	691	550	B 6.0	A 7.0	20	15	15	15	1½	4
	233	42	691	565	B 6.2	B 7.4	20	15	15	15	2	4
	240	43	691	585	B 6.4	A 7.4	20	20	15	15	2	4
	248	45	691	605	B 6.6	B 8.0	20	20	15	15	2	4
	255	46	691	620	B 6.8		25	20	15	15	2	4
	264	47	691	640	B 7.0	A 8.2	25	20	15	15	2	4
	278	48	691	675	B 7.4	B 8.6	25	20	15	15	2	4
	301	54	691	730	B 8.0	B 9.4	25	20	20	15	2	4
	323	58	691	785	B 8.6		30	25	20	20	2	4
	334	60	691	820	TB9.0	A 10.6	30	25	25	20	2	4

Consult factory for compressors for higher flows.

NOTES: (1) The capacities shown are based on 70˚F, but will vary depending upon piping, fittings used, product being transferred and temperatures. The factory can supply a detailed computer analysis if required.

(2) Driver sheaves; 91-2 belts; 290, 291, 490, 491-3 belts; 690, 691-4 belts.

(3) The piping sizes shown are considered minimum. If the length exceeds 100 ft., use the next larger size.

APPENDIX F3

COMPRESSOR TROUBLESHOOTING

In most cases, problems with your Corken Gas Compressor can be solved quite simply. This chart lists some of the more frequent problems that occur with reciprocating compressors along with a list of possible causes. If you are having a problem which is not listed, or if you cannot find the source of the problem, consult the factory.

PROBLEM	POSSIBLE CAUSE
Low capacity	1, 2, 3, 4, 16
Overheating	1, 2, 3, 5, 6, 11, 15
Knocks, rattles and noise	1, 7, 9, 10, 11, 14
Oil in cylinder	8, 14
Abnormal piston-ring wear	1, 3, 5, 6, 11, 14, 15
Product leaking through crankcase breather	8, 14
Product leakage	4, 8, 14, 16
Oil leakage around compressor base	17, 18
No oil pressure	19, 20
Excessive vibration	1, 7, 9, 10, 11, 12, 13, 28
Motor overheating or starter tripping out	21, 22, 23, 24, 25, 26, 27, 28

REF.	POSSIBLE CAUSES	WHAT TO DO
1.	Valves broken, stuck or leaking	Inspect and clean or repair
2.	Piston ring worn	Inspect and replace as necessary
3.	Inlet strainer clogged	Clean or replace screen as necessary
4.	Leaks in piping	Inspect and repair
5.	Inlet or ambient temperature too high	Consult factory
6.	Compression ratio too high	Check application and consult factory
7.	Loose flywheel or belt	Tighten
8.	Worn piston-rod packing	Replace
9.	Worn wrist pin or wrist-pin bushing	Replace
10.	Worn connecting-rod bearing	Replace
11.	Unbalanced load	Inspect valve or consult factory
12.	Inadequate compressor base	Strengthen, replace or grout
13.	Improper foundation or mounting	Tighten mounting or rebuild foundation
14.	Loose valve, piston or packing	Tighten or replace as necessary
15.	Dirty cooling fins	Clean weekly
16.	4-way control valve not lubricated	Inspect and lubricate
17.	Leaking gas blowing oil from crankcase	Tighten packing
18.	Bad oil seal	Replace
19.	No oil in crankcase	Add oil
20.	Oil-pump malfunction	See oil-pressure adjustment
21.	Low voltage	Check line voltage with motor nameplate. Consult power company
22.	Motor wired wrong	Check wiring diagram
23.	Wire size too small for length or run	Replace with correct size
24.	Wrong power characteristics	Voltage, phase and frequency must coincide with motor nameplate. Consult with power company.
25.	Wrong size of heaters in starter	Check and replace according to manufacturer's instructions
26.	Compressor overloading	Reduce speed
27.	Motor shorted out	See driver installation
28.	Bad motor bearing	Lubricate according to manufacturer's instructions

APPENDIX G

CORKEN COMPRESSOR LOG SHEET (ELECTRIC-DRIVEN UNITS)

Compressor Model # ______________________ Serial # ______________________

RPM ______________________ Package #

Motor BHP ________ , Frame ________ , RPM ________ , F.L. Amps ________ , Manuf. ________

Installation Date ______________________ Start-up Date ______________________

Customer ______________________

Location ______________________

Field Contact ______________________ Telephone # ______________________

Make and Grade of Oil ______________________

Pressure-Switch Settings:

Suction Pressure ______________________ Discharge Pressure ______________________

Date ____________ Time ____________ Outside Temperature ____________ Hour Meter ____________

Readings:

Suction Pressure ____________ Suction Temperature ____________

Discharge Pressure ____________ Discharge Temperature ____________

Check List:

Oil Level ____________ Strainers ____________

Change Oil ____________ Valve Positions ____________

Flywheel Bolts ____________ Belt Tension ____________

Mounting Bolts ____________ Gauges (Zero Position) ____________

Motor Amperage ____________ Drain Liquid Trap ____________

Additional Notes: ______________________

____

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Checked By: ______________________

APPENDIX H

Solutions beyond products...

CORKEN

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