Frick®
BY JOHNSON CONTROLS

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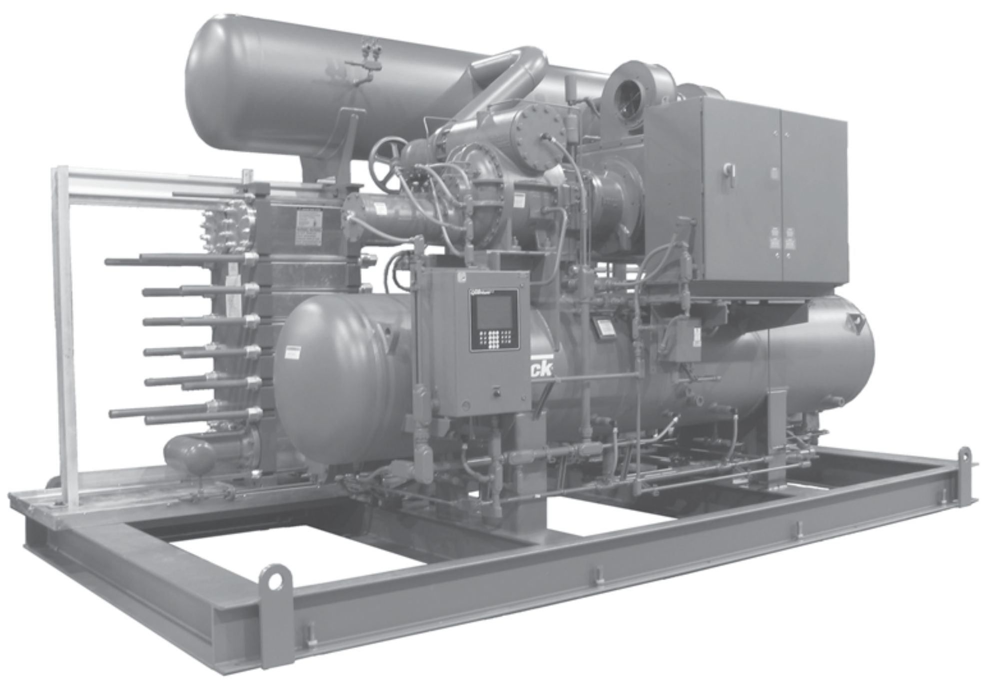
PowerPac™

PACKAGED CHILLER UNITS



THIS MANUAL CONTAINS RIGGING, ASSEMBLY, START-UP, AND MAINTENANCE INSTRUCTIONS. READ THOROUGHLY BEFORE BEGINNING INSTALLATION. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY OR DEATH, DAMAGE TO THE UNIT, OR IMPROPER OPERATION.

Contents

PREFACE

This manual has been prepared to acquaint the owner and serviceman with the INSTALLATION, OPERATION, and MAINTENANCE procedures as recommended by Johnson Controls-Frick for PowerPac™ Chiller Units.

- Dangers resulting from failure to comply with safety precautions when operating the equipment and performing maintenance tasks.
- How to start, operate and stop the equipment safely.
- How to respond when problems occur during operation.
- Scheduled maintenance tasks for the equipment and when/how to carry them out safely.

To prevent accidents, assembly and disassembly of components should be carried out by authorized personnel only.

- It is important that the operating personnel familiarize themselves with the contents of this manual in order to ensure proper and efficient operation. Johnson Controls is not liable for damage occurring during the warranty period where this is attributable to incorrect operation.

For information about the functions of the Quantum™LX control panel, communications, specifications, and wiring diagrams, see publication series 090-020 O, M, CS, and E90-020 SPC. For information about the functions of the compressor packages, see publications 070-410 IOM and 070-610 IOM.

It is most important that these units be properly applied to an adequately controlled refrigeration system. Your authorized Johnson Controls-Frick representative should be consulted for expert guidance in this determination.

Proper performance and continued satisfaction with these units is dependent upon:

CORRECT INSTALLATION

PROPER OPERATION

REGULAR, SYSTEMATIC MAINTENANCE

To ensure correct installation and application, the equipment must be properly selected and connected to a properly designed and installed system. The Engineering plans, piping layouts, etc. must be detailed in accordance with the best practices and local codes, such as those outlined in ASHRAE literature.

A refrigeration compressor is a VAPOR PUMP. To be certain that it is not being subjected to liquid refrigerant carryover it is necessary that refrigerant controls are carefully selected and in good operating condition; that load surges are known and provisions made for control; and that operating cycles and defrosting periods are reasonable.

JOB INSPECTION

Immediately upon delivery examine all crates, boxes and exposed compressor and component surfaces for damage. Unpack all items and check against shipping lists for any discrepancy. Examine all items for damage in transit.

TRANSIT DAMAGE CLAIMS

All claims must be made by consignee. This is an ICC requirement. Request immediate inspection by the agent of the carrier and be sure the proper claim forms are executed.

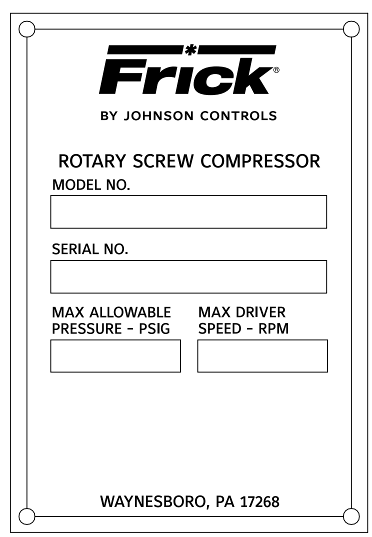
Report damage or shortage claims immediately to Johnson Controls-Frick Sales Administration Department, in Waynesboro, PA.

CHILLER AND UNIT IDENTIFICATION

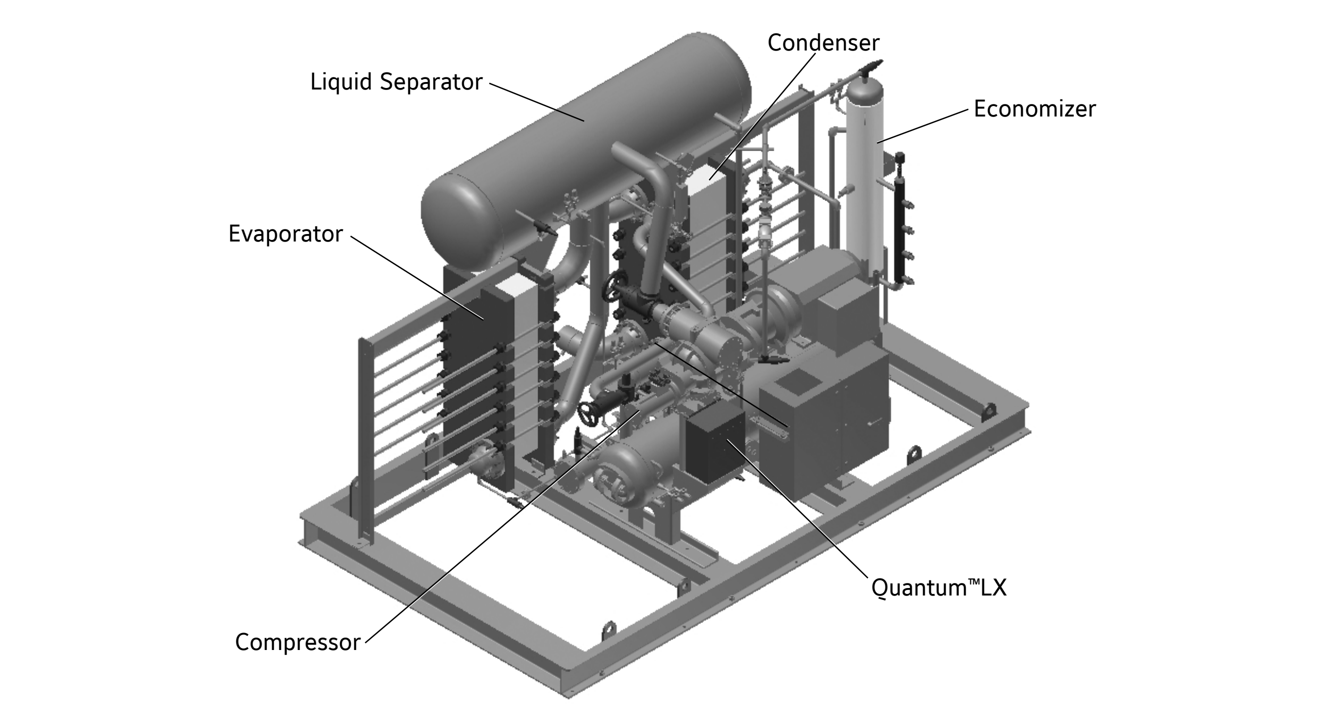
Each chiller unit has 2 identification data plates. The **unit data plate** containing unit model, serial number and Johnson Controls-Frick sales order number is mounted on the side of the compressor base. The **compressor data plate** containing compressor model and serial number is mounted on the compressor body.

NOTE: When inquiring about the compressor or unit, or ordering repair parts, provide the MODEL, SERIAL, and Johnson Controls-Frick SALES ORDER NUMBERS from these data plates.

UNIT DATA PLATE



COMPRESSOR DATA PLATE



PACKAGED AMMONIA CHILLER UNITS

PowerPac™ is a complete, factory-manufactured liquid refrigeration unit intended for water or brine cooling. It is engineered and manufactured to meet the exacting requirements of the industrial refrigeration market. All components have been designed and arranged to assure reliability, accessibility, and ease of service. Units are completely assembled with all interconnecting refrigerant piping and internal wiring. The PowerPac™ unit is controlled by the Quantum™LX control and capacity regulating system. The unit can be equipped with these optional features: Dual Oil Filters and Unit-Mounted Solid-State Starter Packages. Contact Johnson Controls-Frick for details.

This unit should only be charged with the refrigerant for which it was designed. Once charged with refrigerant, connected to electricity and with pipe connections established to water (brine), the unit is ready for operation.

COMPRESSOR

The **Frick** XJF or SGC rotary screw compressor has been designed utilizing the latest technology to offer the most reliable and energy efficient unit currently available. Compressor casings are designed and tested in accordance with the requirements of ANSI/ASHRAE 15 safety code and are designed for 400 psig working pressure. The rotors are manufactured from forged steel and use the latest asymmetric profiles. The compressor incorporates a complete antifriction bearing design for reduced power consumption, improved efficiency, and reduced maintenance. The bearings provide an L_{10} life in excess of 100,000 hours at design conditions.

The XJF compressor incorporates a simple mechanism that adjusts the compressor volume ratio during operation to the most efficient of three possible volume ratios, depending on system requirements. The SGC Compressor includes a patented method of varying the internal volume ratio to match the system pressure ratio. Either compressor reduces the power penalty associated with over/under compression.

The compressor unit is a Frick standard unit, complete with oil separator, oil return system, stop valves, motor etc.

COMPRESSOR CAPACITY CONTROL

Effective capacity control is achieved by use of a slide valve which provides infinite adjustment from 100% down to 25% of full load for an XJF compressor and down to approximately 12% of full load on an SGC Compressor.

Variable speed drives control capacity through changes in rotor speed. They are used for higher efficiency under partially loaded conditions. Variable speed drives also provide faster response to changes in system load.

LUBRICATION SYSTEM

The compressor oil is superior quality semisynthetic, hydrotreated oil for ammonia applications. The oil provides high thermal stability for improved breakdown characteristics and extended service intervals. The compressor is designed specifically for operation without an oil pump. Otherwise, oil required for main oil injection and lubrication is provided by positive gas differential pressure. All compressor oil passes through our new Frick® SuperFilter™II, specifically designed for increased particle capture, cleaner oil, and extended compressor operation. SuperFilter™II actually cleans oil **cleaner than new**. It is also designed for horizontal mounting and furnished with isolation stop valves and drain connections for ease of servicing. **Booster and some low-pressure differential high-stage applications will require the demand oil pump option.**

OIL SEPARATOR/RESERVOIR

The oil separator is a horizontal, three-stage design with integral sump. The separator is designed and constructed in accordance with ASME Section VIII, Div. 1. Replaceable coalescent separator elements are provided for final gas/oil separation of particles down to less than 1 micron.

OIL COOLING

The compressor oil is cooled using a semiwelded plate heat exchanger that is integral with the refrigerant condenser. The heat exchanger plates are AISI 316 stainless steel construction. Maximum design working pressure is 300 or 400 psig.

MOTOR

A factory-mounted flanged motor is close-coupled to the compressor. The compressor/motor assembly requires no field coupling alignment. Standard motors are open drip proof (ODP), have class B insulation, and 1.15 service factor.

SEMIWELDED PLATE CONDENSER

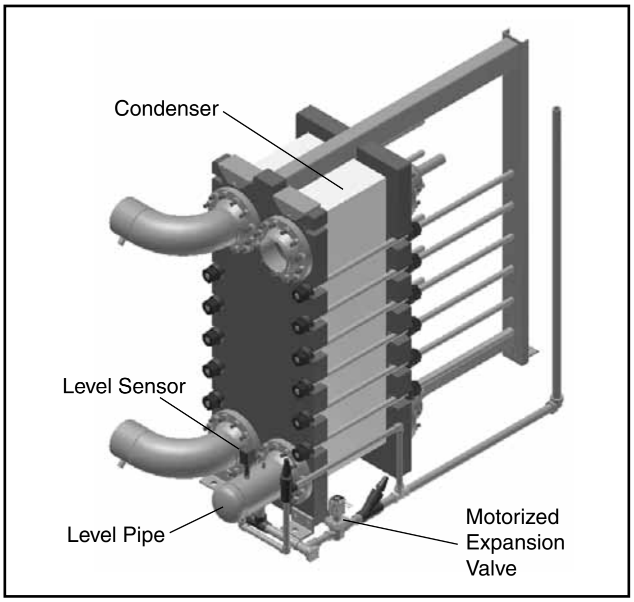


Figure 1 - Semiwelded Plate Condenser

Semiwelded plate heat exchangers have plates constructed of AISI 316 Stainless Steel. Gaskets are a two-piece construction for excellent compatibility with refrigerant and cooling media. The plate heat exchangers can be disassembled for easy cleaning and capacity modification.

Like the evaporator, the CPHE condenser is a plate heat exchanger, and the number of cassettes is exactly adapted to the current operating conditions. Refrigerant condenses between the welded plates which make up the cassettes, and the cooling water circulates in the channels between the cassettes. The plate condenser may have a built-in oil cooler. The unit can also be equipped with other types of condensers.

SEMIWELDED PLATE EVAPORATOR

The evaporator is a plate heat exchanger consisting of a number of cassettes carefully adapted to the actual operating conditions. The cassettes are assembled/bolted together in a frame made for the actual design pressure. The refrigerant evaporates inside the cassettes and brine is cooled on the outside.

The evaporator in Figure 2 is of the flooded type, which means that it is filled with boiling refrigerant. This liquid leaves the liquid separator and is led to the evaporator through the drop leg.

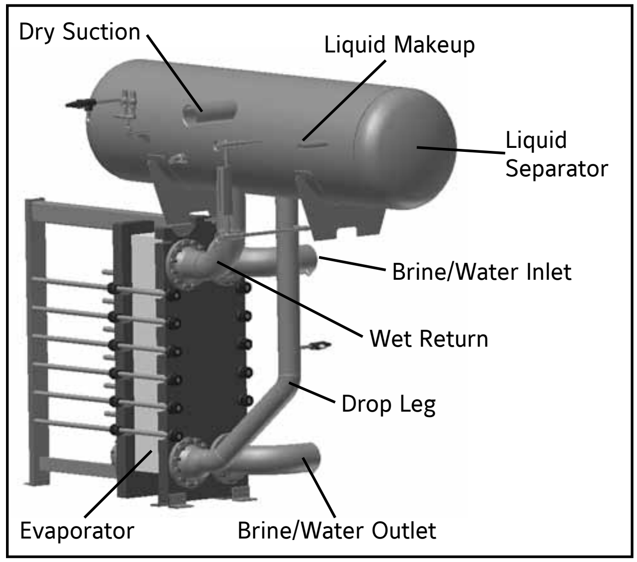


Figure 2 - Semiwelded Plate Evaporator

When the water or brine is cooled in the evaporator on its way through the brine/water connections, the refrigerant boils and a mixture of liquid and vapor flows through the wet return and into the liquid separator. From here the superheated vapor is led to the compressor through the dry suction while the separated liquid is collected at the bottom of the liquid separator. The system is self-circulating and needs no pump on the refrigerant side. Liquid runs from the high pressure side and is supplied to the liquid separator through the liquid makeup line.

QUANTUM™LX CONTROL CENTER

The Quantum™LX is a control and monitoring system for supervision and regulation of the chiller unit. It is factory mounted and completely wired with all required safety and operating devices. The control system includes as standard a single NEMA 4 control panel housing, microprocessor control, and electrical termination points. Included in the microprocessor is time-proportioning capacity control, first-out annunciation, prealarms, volume ratio controls, real-time clock control, access code protection, lead-lag sequencing, alternate suction pressure operation, trending, and more. The operating conditions at the time of the compressor's last ten alarms or shutdowns are stored in memory, providing the ultimate in service and troubleshooting convenience. A built-in telecommunications interface is standard, enabling connection to a remote computer or control device.

LIQUID REFRIGERANT SEPARATOR

The liquid separator, Figure 3, is of the horizontal type and especially designed for plants with small refrigerant charges and small variations in liquid level. The liquid level can be checked on the liquid level column sight glass, Position 9. A horizontal liquid separator is specifically designed for critically charged units with small variations in liquid level. This level must not be more than 2 inches (51 mm) above the bottom of the liquid separator. The separation of liquid from gas is achieved efficiently by leading the return lines to both ends of the liquid separator. This reduces the gas velocity in the liquid separator and allows time for the liquid to collect before the gas travels to the compressor.

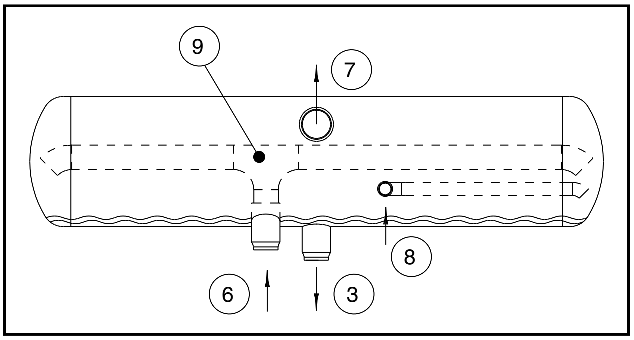


Figure 3 - Liquid Separator

INSTALLATION

FOUNDATION

NOTE: Allow space for servicing at both ends of the unit. A minimum of 24 inches (610 mm) is recommended.

The first requirement of the package chiller foundation is that it must be able to support the weight of the package including oil and refrigerant charge. Screw compressors are capable of converting large quantities of shaft power into gas compression in a relatively small space and a mass is required to effectively dampen these relatively high frequency vibrations.

Firmly anchoring the chiller package to a suitable foundation by proper application of grout and elimination of piping stress imposed on the package is the best insurance for a trouble-free installation. Use only the certified general arrangement drawings from Johnson Controls-Frick to determine the mounting locations and to allow for recommended clearances around the unit for ease of operation and servicing. Foundations must be in compliance with local building codes and materials should be of industrial quality.

The floor shall be a minimum of 6 inches (152 mm) of reinforced concrete. Housekeeping pads are recommended. Anchor bolts are required to tie the unit firmly to the floor. Once the package is rigged into place (See HANDLING and MOVING), it must be shimmed in order to level the unit. The shims should be placed to position the package rails one inch (25.4 mm) above the housekeeping pad to allow space for grouting. An expansion-type epoxy grout must be worked under all areas of the base, filling all voids. It should be allowed to settle with a slight outward slope so oil and water can run off of the base.

When installing on the upper floors of buildings, extra precautions should be taken to prevent normal package vibration from being transferred to the building structure. It may be necessary to use rubber or spring isolators, or a combination of both, to prevent the transmission of compressor vibration directly to the structure. However, this may increase package vibration levels because the compressor is not in contact with any damping mass. Rubber or spring pipe supports may be required to avoid exciting the building structure at any pipe supports close to the chiller package. It is best to employ a vibration expert in the design of a proper mounting arrangement.

Proper foundations and proper installation methods are vital; and even then, sound attenuation or noise curtains may be required to reduce noise to desired levels.

For more detailed information on Screw Compressor Foundations, please request Frick publication S70-210 IB.

HANDLING AND MOVING

Use a crane and rigging whenever the unit is moved. **DO NOT USE A FORKLIFT. Refer to the engineering drawings provided with the unit for shipping weight.**

⚠CAUTION **Spreader bars should be used on both the length and width of the package to prevent damage to the package. CAUTION must also be used in locating the lifting ring. Appropriate adjustment in the lifting point should be made to compensate for the center of gravity.**

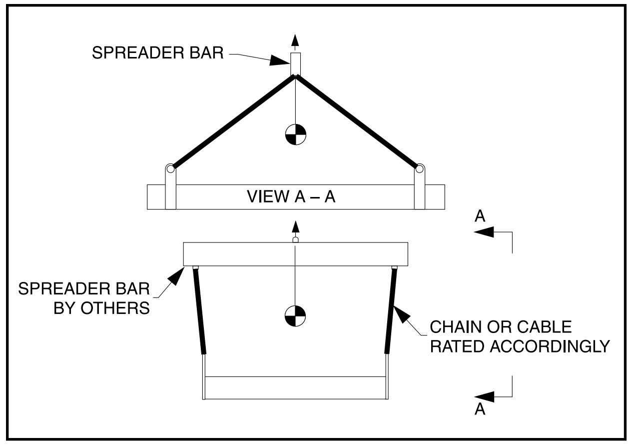


Figure 4

⚠WARNING **The unit may be top heavy. Lifting operators must use extreme care to check the level and stability of the load before lifting the load more than a few inches. Impose an imbalance by sequentially adding weight to each corner and carefully observing the load reaction to make sure the load does not shift. Balancing chains, cables or straps are essential in both directions to prevent load shift and instability during rigging. Call Johnson Controls-Frick Engineering for an estimate of the location of the center of gravity of the package if one is not given. The center of gravity may NOT be located in the center of the package.**

NOTES:

1. Reference OSHA Safety And Health Standards (29 CFR 1910), sections 1910.179 and 1910.184.
2. Hooks, chains, cables and spreader bars shall meet manufacturer's recommendations and shall not be overloaded.
3. This unit shall be lifted using the four lifting lugs welded to the base as shown above. Shackles and screw pins shall be provided (by others) as shown in Figure 5 as minimum.
4. Spreader bars and balancing chains must be used to prevent instability and damaging or straining system piping, instrumentation or vessels.
5. Adjust cables or chains to ensure that the package (skid) is stable and lifted in a level manner.
6. Lifting must be done by a qualified operator.

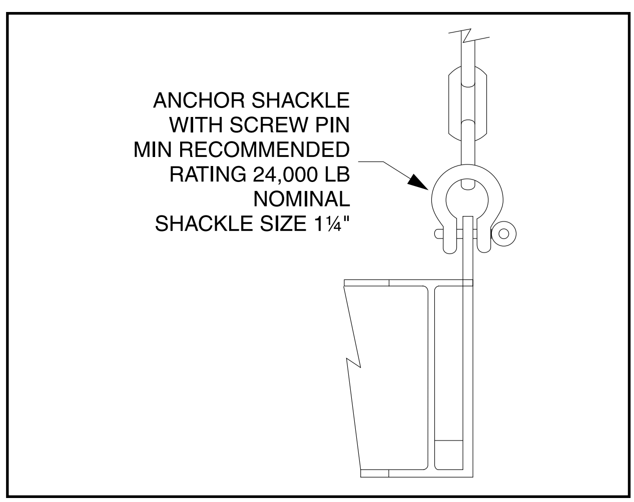
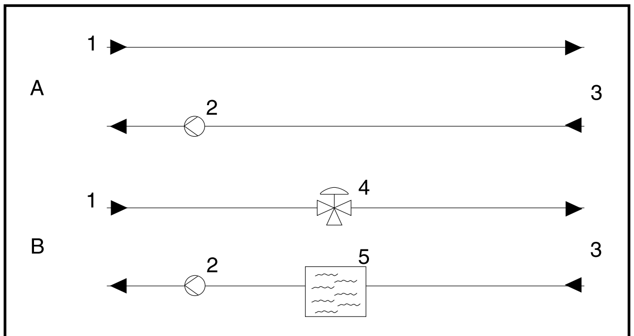


Figure 5

LIFTING LUG CAPACITY, LB/LUG		
NOMINAL BEAM MEMBER SIZE	CABLE ANGLE	
	VERTICAL	45°
W8	15,200	14,990
W10	19,400	14,990

BRINE / WATER SYSTEMS

For the most efficient operation of the unit, ensure a full flow of either water or brine through the evaporator. Full flow is achieved by using either of systems A or B in Figure 6.



1. Brine/water to/from PowerPac™
2. Circulating pump
3. Brine/water to/from the system
4. Modulating 3-way valve
5. Buffer tank

Figure 6

A: Continuously Loaded System: The cooling media circulates continually through the system and the evaporator.

B: System with load variations: (Example: air conditioning system with several adjustable cabinets in which the cooling media flow can be varied.) The modulating 3-way valve will maintain a constant cooling media flow throughout the evaporator. Installation of a buffer tank is recommended, as shown in Position 5, Figure 6.

NOTE: Install vent valves (Position 1, Figure 6) at the highest point in the system as well as at the drainage valves (Position 2), which are located at the lowest point.

Connections and valves for chemical cleaning should be installed. All cold piping should be insulated in order to avoid condensation.

Water Treatment For Heat Exchangers

Often, brine and water for industrial refrigeration plants contain impurities that can create a coating on the heat conducting surfaces. This reduces the heat transmission. In some cases, this coating can cause corrosion of the heat conducting surfaces. Use a 12 mesh or finer filter for water or brine in evaporator and condenser circuits.

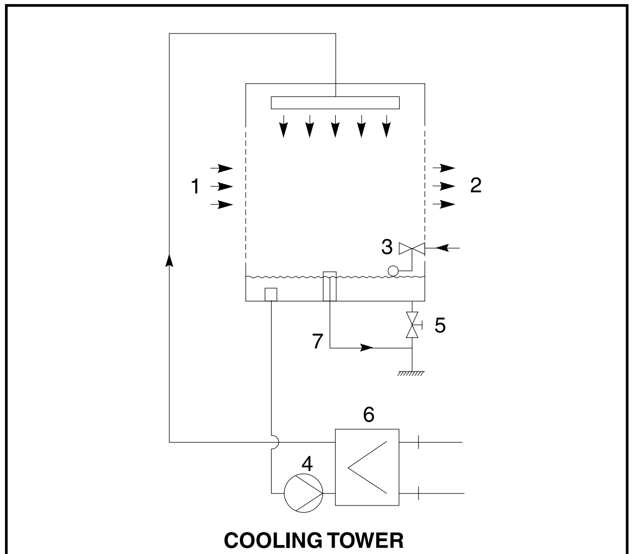
This makes it **important** to monitor brine and water quality. Consult a water expert concerning additives to the system before installing the system.

Warranty does not include any damage that may occur due to harmful impurities in the system.

Attention is drawn to the fact that all cooling towers experience a constant loss of water due to evaporation. This makes impurities remain in the refrigeration system in an ever-increasing concentration, also increasing their harmful effects.

Using a drainage system can minimize the concentration of impurities. This drains off some of the polluted cooling tower water and replaces it with fresh water.

This drainage system consists of a hand-operated adjusting valve (Position 5, Figure 7), that is opened sufficiently to drain the polluted cooling tower water to a treatment system. Fresh water is provided through the float valve shown at Position 3.



1. Air in
2. Air out
3. Float valve
4. Pump
5. Adjusting valve with outlet to treatment system
6. Condenser
7. Overflow pipe

Figure 7

ELECTRIC WIRING

All electric wiring inside the PowerPac™ unit has been connected at the factory on units ordered with solid-state, package-mounted starters, or mounted variable frequency drives.

External wiring connections that must be established once the PowerPac™ unit is installed are:

1. Mounting of main power supply cable to the control panel
2. Mounting of control line for starting of the condenser pump
3. Mounting of control line for starting of the evaporator pump
4. Mounting of flow switch, if any
5. Mounting of outside thermostat, if any

HOLDING CHARGE AND STORAGE

Each PowerPac™ chiller is pressure and leak tested at the factory and then thoroughly evacuated and charged with dry nitrogen to ensure the integrity of the unit during shipping and short term storage prior to installation.

NOTE: Care must be taken when entering the unit to ensure that the nitrogen charge is safely released.

⚠WARNING

Holding-charge shipping gauges on separator and external oil cooler are rated for 30 PSIG and are for checking the shipping charge only. They must be removed before pressure testing the system and before charging the system with refrigerant. Failure to remove these gauges may result in catastrophic failure of the gauge and uncontrolled release of refrigerant resulting in serious injury or death.

All units must be kept in a clean, dry location to prevent corrosion damage. Reasonable consideration must be given to proper care for the components of the microprocessor panel and related instrumentation.

Units which will be stored for more than two months must have the nitrogen charge checked periodically.

Packaged equipment and all vessels should be visually inspected to verify that all components are intact, undamaged and that the configuration is consistent with the sales order requirements. Temporary coverings such as tarps or shrink-wrap should be inspected to ensure that they are not trapping water in contact with the equipment. Enclosures should be checked for accumulated water and drained as applicable.

The packaged equipment and all vessels should be visually inspected for rust, paint fade, paint blisters and surface imperfections that may have occurred as a result of handling and storage damage. The paint may indicate some visual, not functional, deterioration, especially epoxy paint coatings. Water spots and chalking are typical flaws of exposed epoxy (Amerlock 385) paint systems, and some minor rust staining will occur at locations such as casing splits, flanges, and tags. We recommend touching-up these areas. Touch-up paint can be purchased from the Baltimore Parts Center.

Packaged equipment and all vessels are purged and placed under a regulated dry nitrogen purge pressure of 5 to 15 psig. Gauges are installed in the appropriate locations to confirm that the nitrogen pressure is being maintained. Gauges should be checked every two weeks. If within the first three months of storage, inspection records indicate a repetitive loss of nitrogen charge, then the Frick Service department should be contacted.

To prevent damage to the shaft seals and false brinelling of the antifriction bearings, the drive shafts for the compressor, drive motor, oil pump and motor should be rotated every two weeks. The drive shafts should be rotated 90 degrees beyond one full rotation.

All drive motors shipped from the factory have prelubricated bearings to sustain the motor over the short term. Care must be taken to keep the bearings dry and moisture free. Water and/or condensation will cause the bearing cages to rust and cause premature failure.

OPERATION

PRESTART CHECKLIST

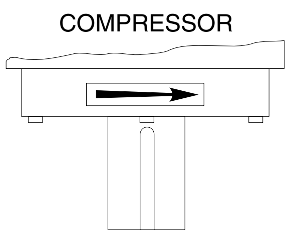
After the PowerPac™ has been installed and all connections for refrigerant, water and electricity, instruments and safety switches have been completed, proceed as follows:

Check the rotation direction of the motor, with the coupling dismantled, to be certain it is correct. **An arrow on the compressor end-cover marks the proper direction of rotation. (See PRESTART CHECKLIST in FORMS section)**

CHECKING MOTOR/COMPRESSOR ROTATION

⚠WARNING **Make sure coupling hubs are tightened to the shaft before rotating the motor to prevent them from flying off and possibly causing serious injury or death.**

⚠ CAUTION **Injury may occur if loose clothing, etc, becomes entangled on the spinning motor shaft.**



COMPRESSOR ROTATION IS CLOCKWISE WHEN FACING THE END OF THE COMPRESSOR SHAFT. Under **NO** conditions should the motor rotation be checked with the coupling center installed as damage to the compressor may result. Bump the motor to check for correct compressor rotation. After verification, install the disk drive spacer, as applicable.

COMPRESSOR/MOTOR COUPLING INSTALLATION

The PowerPac™ chiller has compressor-to-motor alignment through the use of a machined cast iron tunnel. This tunnel is factory set through machining tolerances ensuring motor/compressor alignment. No alignment is required in the field. For replacement motors, the shaft alignment should be checked and tolerances verified with the Johnson Controls-Frick service department.

COUPLING

A clamping style Elastomeric Coupling is used in most applications. This coupling consists of two drive hubs and a gear-type Hytrel or EDPM and neoprene drive spacer. The split hub is clamped to the shaft by tightening the clamp screws. Torque is transmitted from the motor through an elastomeric gear which floats freely between the hubs. Because of the use of a motor/compressor adapter housing, no field alignment is necessary.

1. Inspect the shaft of the motor and compressor to ensure that no nicks, grease, or foreign matter is present.

2. Inspect the bores in the coupling hubs to make sure that they are free of burrs, dirt, and grit.

3. Check that the keys fit the hubs and shafts properly.

4. Slide one hub onto each shaft as far as possible. It may be necessary to use a screwdriver as a wedge in the slot to open the bore before the hubs will slide onto the shafts.

5. Hold the elastomeric gear between the hubs and slide both hubs onto the gear to fully engage the mating teeth. Center the gear and hub assembly so there is equal engagement on both shafts. Adjust the space between hubs as specified in the Coupling Data Table below.

6. Torque the clamping bolts and the keyway set screws in both hubs to the torque value given in the Coupling Data Table. **DO NOT USE ANY LUBRICANT ON THESE BOLTS.**

COUPLING DATA TABLE

Coupling Hub																
CH Series	Between Shaft Spacing				Shaft Engagement				Face Spacing		Clamp Bolt			Keyway Setscrew Torque		Size UNC
	Min.		Max.		Min.		Max.				Torque (Dry)		Size			
Size	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	Ft-Lb	Nm		Ft-Lb	Nm	
6	2	50.8	2 3/4	69.9	1	25.4	1 15/16	49.2	7/8	22.2	15	20.3	1/4-20 UNC	13	17.6	5/16-18
7	2 5/16	58.7	3 7/16	87.3	1	25.4	2 3/16	55.6	1 1/16	27.0	30	40.7	5/16-24 UNF	13	17.6	5/16-18
8	2 9/16	65.1	4	101.6	1 1/16	27.0	2 1/2	63.5	1 1/8	28.6	55	74.6	3/8-24 UNF	13	17.6	5/16-18
9	3 1/16	77.8	4 5/8	117.5	1 7/16	36.5	3	76.2	1 7/16	36.5	55	74.6	3/8-24 UNF	13	17.6	5/16-18
10	3 9/16	90.5	5 1/4	133.4	1 11/16	42.9	3 1/2	88.9	1 11/16	42.9	130	176.3	1/2-20 UNF	13	17.6	5/16-18
11	4 1/8	104.8	5 7/8	149.2	1 7/8	47.6	4	101.6	1 7/8	47.6	130	176.3	1/2-20 UNF	13	17.6	5/16-18

COMPRESSOR UNIT OIL

WARNING **DO NOT MIX OILS of different brands, manufacturers, or types. Mixing of oils may cause excessive oil foaming, nuisance oil level cutouts, oil pressure loss, gas or oil leakage and catastrophic compressor failure.**

NOTE: The Frick oil charge shipped with the unit is the best suited lubricant for the conditions specified at the time of purchase. If there is any doubt due to the refrigerant, operating pressures, or temperatures, refer to Frick Oil publication 160-802 spc for guidance.

For standard PowerPac™ units, use only semisynthetic hydrotreated oil as provided by **Johnson Controls-Frick.**

Semisynthetic hydrotreated oil is a synthetic oil with a low vapor pressure. This greatly reduces the amount of oil that is passed with the R-717 discharge gas from the compressor to the separator during operation. The result is noticeably lower oil consumption.

Because semisynthetic hydrotreated oils do not mix well with R-717, there is a considerable reduction of any content of this oil taken from the compressor into the refrigeration system. The high viscosity index of semisynthetic hydrotreated oils makes the oil slide off evaporator plates more easily and gather on the bottom of the evaporator. Then, the oil is returned to the compressor via the automatic oil return system.

Frick® ester-based synthetic lubricants are especially suited for HFC refrigerants, R-134A, R-507, R-404 and the new refrigerant blends. Frick® synthetic oils are custom blended with additives for oxidation inhibition, corrosion protection, defoaming, and antiwear. Synthetic oils have extremely low pour points. The low pour point makes it specially suited for low temperature refrigeration applications. The high thermal stability of Frick® synthetic oil resists breakdown and extends service intervals. Consult factory for application assistance.

EVACUATION

When the chiller unit has been installed in its final position and all connections for refrigerant, water and electricity, instruments, potential equalizer connection (ATEX only) and safety switches have been connected, proceed as follows:

a. Check that the direction of rotation of the motor is correct, with the coupling dismantled. The direction of rotation is marked by an arrow on the compressor end cover.

b. Check the direction of rotation of the oil pump.

c. Mount the coupling and check that the tolerances and the alignment are in accordance with the instructions concerning the coupling.

d. Connect the vacuum pump to valve position 414 (see piping diagram) and evacuate the unit to a vacuum of approximately 4 to 5 mm Hg. A thermostatic vacuum meter may be used to measure the pressure. If necessary, charge dry air or nitrogen until the pressure reaches 1 bar. Evacuate again to 4 to 5 Hg.

e. Usually, the unit has been charged with oil from the factory. If not, see the procedure about Oil Charging in the Operating manual for the compressor.

CHARGING REFRIGERANT

The refrigerant charge for a PowerPac™ unit is very small, in relation to the large cooling capacity. Most of the refrigerant liquid is present in the evaporator by design. The total amount of refrigerant is indicated on the engineering drawing included with the unit.

1. Connect a refrigerant cylinder to the charge valve. Purge the charge hose with refrigerant before tightening the union nut on the valve.
2. Open the charge valve. Refer to the Start-up procedure, outlined above, to initiate compressor operation.
3. Start the compressor as described in the Control Panel manual.
4. Check the compressor for any abnormal noises and make sure that the compressor is building differential pressure.
5. Charge the amount of refrigerant gradually as indicated in the table in *Technical Data*. Check the amount by weighing the refrigerant cylinders on a scale. The liquid level in the liquid separator should be no higher than 2.5 inches (64 mm).
6. Close the charge valve and slowly increase capacity to 100%.

CAUTION **Never leave the unit unattended during the first 60 minutes following start-up.**

DRAINING REFRIGERANT

Use the following procedure to drain refrigerant from the unit:

- Run the system normally. Manually reduce the chiller package capacity to minimum.
- Connect the drain valve to a refrigerant vessel approved for this purpose. The connection must be made with an approved refrigerant hose.

WARNING **Check that the vessel is large enough to hold the entire charge without being overfilled and that it is made for the particular refrigerant used. DO NOT charge the vessel beyond 90% liquid volume .**

Before connecting the vessel, place it in chilled water or cool it by some other means.

- **Open** the drainage valve and stop valve on the refrigerant vessel.
- Close valves that supply liquid refrigerant to the evaporator.
- Using this procedure, the evaporator is pumped down and the condensed liquid transferred to the refrigerant vessel. After dismantling, the refrigerant vessel and protecting cap must both be weighed to ensure that the vessel is not overfilled. Net and gross weights stamped into the vessel include the weight of the protecting cap.

SYSTEM PUMPDOWN

After pressure testing, evacuate the refrigeration system to remove any atmospheric air or moisture.

The boiling point of a liquid is defined as the temperature at which the vapor pressure is equal to atmospheric pressure. The boiling point of water is 212°F (100°C). If the pressure is lowered, so is the water's boiling point. The table indicates the boiling point of water at very low pressures:

BOILING POINT of WATER °F (°C)	AT PRESSURE IN. H_2O (mm HG)
41 (5)	3.6 (6.63)
50 (10)	4.9 (9.14)
59 (15)	6.8 (12.73)
68 (20)	9.5 (17.80)

For pumpdown, use a vacuum pump that empties the package of both air and water vapor.

The vacuum pump must be able to lower the pressure to approximately 0.05 in. H_2O (0.1-mm Hg), and it must be equipped with a gas ballast valve. Use this valve as much as possible in order to prevent the condensation of water vapor in the vacuum pump.

IMPORTANT: NEVER use the refrigeration compressor to pump down a system.

For pumpdown to be satisfactory, the final pressure must be lower than 2.7 in. H_2O (5 mm Hg).

NOTE: There is a risk that any water still present in the refrigeration system may freeze if the ambient temperatures drops below 50°F (10°C). If this occurs, add heat to the environment of the components because ice does not evaporate easily.

OPERATING LOG

Monitor the condition of the package. Log data manually using the History and Trending capabilities of the Frick® Quantum™LX. See the Quantum™LX Operating Manual shipped with the package.

This operating log should be maintained at regular intervals, providing important information about the cause of any undesired changes in the operating state.

The operating log should also contain data about the compressor's cooling system functions, and whether there are unusual noises or vibrations.

HIGH PRESSURE REGULATING SYSTEM

The PowerPac™ unit is equipped with either a mechanical high pressure float valve or an electrical sensor and motorized expansion valve. Both systems are mounted at the outlet of the condenser and regulate the liquid level in the condenser. At the same time, they control the expansion between the low pressure and high pressure sides of the chiller unit.

Mechanical Float Valve

The mechanical float valve (Figure 8) is mounted on the condenser liquid outlet, resulting in a compact design and a very low liquid charge.

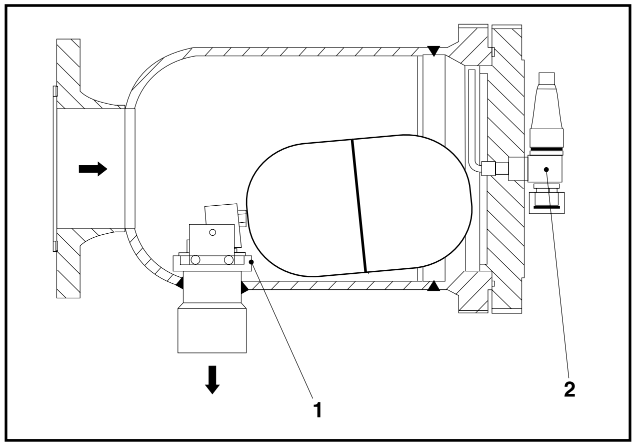


Figure 8

The float valve has a bypass boring (Position 1). This ensures that a pressure equalization occurs at standstill between the high and low pressure sides, with a subsequent emptying of liquid from the float housing. The hole is placed below liquid level, but note that a small amount of liquid may be left when dismantling the float vessel .

The vent valve (Figure 9) is located in the middle of the end cover of the float housing and allows access to the top of the float housing through a tube.

Electrical Regulation

To regulate the liquid level in the condenser, a level sensor registers the liquid level. The level is converted to a signal which is sent to the Quantum™LX panel. The Quantum™LX panel controls the opening degree of the motorized expansion valve.

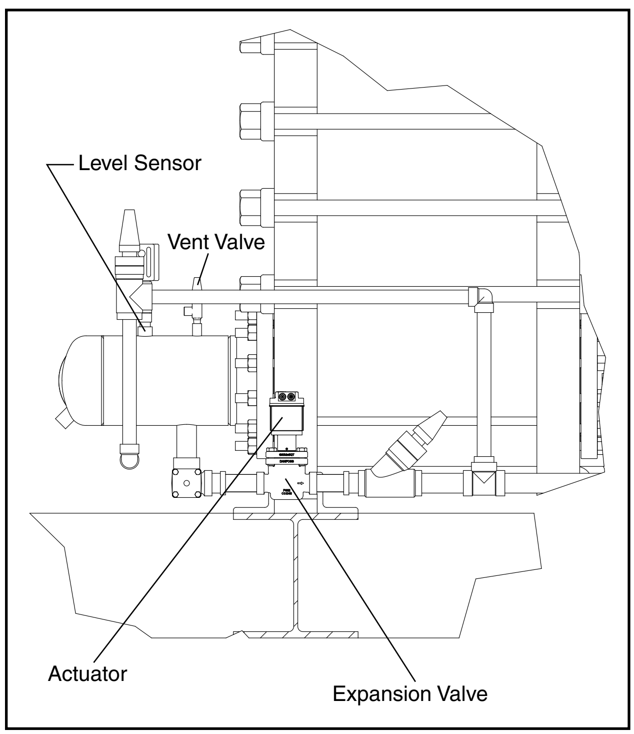


Figure 9

PURGING THE SYSTEM

Purging of air or other noncondensable gases is required in order to keep high performance of the system and avoid corrosion of the equipment which could endanger the safety of persons and equipment.

When purging a refrigeration system, make sure to observe the following:

- Refrigerants must not be released into the atmosphere except CO_2, which can be released slowly into the atmosphere.
- When purging an R-717 system, use an approved air purger. The purged air must pass through an open container of water for any remaining R-717 to be absorbed. The water mixture must be sent to an authorized incineration plant.
- Halocarbon refrigerants (CFC, HCFC and HFC) cannot be absorbed by water. An approved air purger must be fitted to the system. This must be checked regularly by use of a leak detector. All precautionary measures practicable must be taken to prevent and minimize leakage of refrigerant from refrigeration and air conditioning systems to the atmosphere.

NOTE: The occurrence of air is usually an indication of poor maintenance or lack of thoroughness at installation. If the chiller contains air, it tends to gather on the high pressure side of the system.

NOTE: R-717 systems should be purged on a regular basis to avoid atmospheric air and other noncondensable gases.

AUTOMATIC OIL RETURN SYSTEM

The small amount of oil leaving the compressor unit with the discharge gas is eventually collected at the bottom of the evaporator if the refrigerant is ammonia. A reservoir is mounted in this location. This oil is automatically returned to the compressor. Oils used with halocarbons are skimmed from the surge drum, then returned to the compressor.

The float switch controls solenoid valves M1 and M2 (shown in Figure 10). With a rising oil level, the built-in reed switch will activate the solenoid valves. The oil is conveyed to the compressor suction line by means of the hot gas ejector E1. With a falling oil level, the solenoid valves will close.

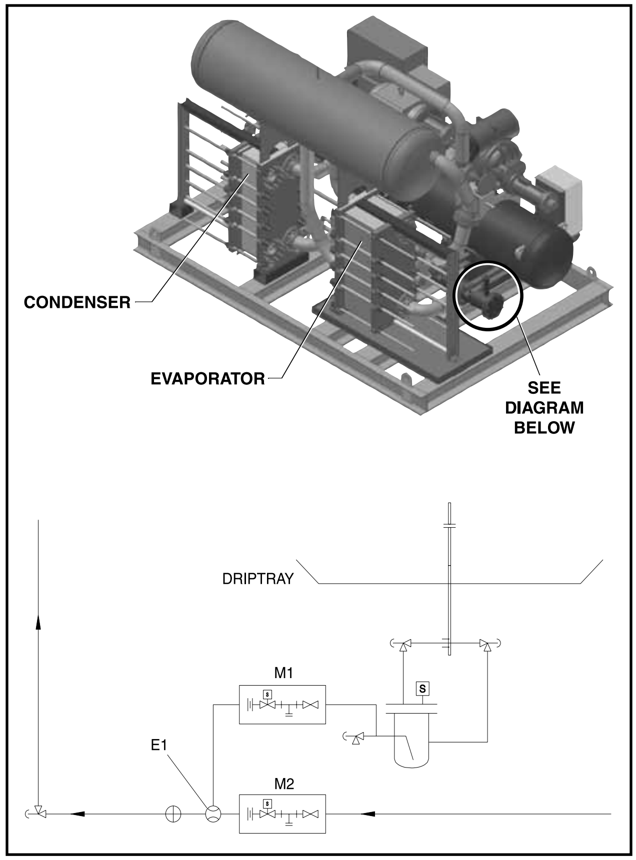


Figure 10

MAINTENANCE

The operator must be familiar with the unit and this instruction manual in order to service and maintain the PowerPac™ unit properly.

Before dismantling any portion of the unit, it is important to make sure that the pressure in the unit or its components has been equalized to atmospheric pressure. Parts to be dismantled must not contain refrigerant.

Operator safety is improved by using gloves and face protection. It is suggested that a suitable gas mask be at hand.

It is useful to have spare gaskets available for replacement use.

Only use **the recommended Frick oil specified** for your PowerPac™ unit. When handling refrigerants, oils, brines etc., personal safety and protection of the environment should have a very high priority.

Use only the refrigerant for which the unit was originally designed.

Before starting the dismantling/servicing process, remove all main fuses, switch off all electric components on the compressor/unit, and **LOCK THE MAIN SWITCH**.

Make sure that the motor cannot start up inadvertently.

Make sure that there is no over-pressure and no refrigerant in the part to be dismantled.

Close all necessary stop valves.

Use the prescribed tools and check that they are properly maintained and in good working condition. In explosion-proof areas, use tools suited for this specific purpose. Also use electrical protection equipment and tools suited for electrical operation purposes.

Use only Johnson Controls original spare parts; other parts may impair the safety of the compressor/unit.

TROUBLESHOOTING AND CAPACITY MEASUREMENT

OPERATING CONDITIONS

Variations in pressures and temperatures within the cooling cycle can provide information about the operating state of the chiller package.

Suction and condensing pressures, as well as the temperatures of suction and discharge gas, can provide important information.

Small changes in the variable pressures and temperatures are sufficient to create considerable changes in the operating conditions.

These issues highlight the importance of using the Operating Log.

TROUBLESHOOTING

An error in the system often leads to changes in operating conditions, but not to a total shutdown. For that reason, check the operating state of your PowerPac™ at regular intervals.

Refer to compressor manuals for further detail.

CAPACITY MEASUREMENT

If the system does not produce the capacity indicated, check for possible sources of error. Before taking any action, check the possible causes indicated in Tables 1 and 2 below.

INCORRECT CAPACITY MEASURING

The PowerPac™ chiller is equipped with a Frick® Quantum™LX control system for control and regulation of the package capacity according to leaving brine/water temperature. The Quantum™LX has a display to read the operating conditions. The pressures and temperatures indicated are not exact. They can only be used to perform approximate capacity calculations. Exact measurements should be calculated in accordance with ASHRAE procedures.

TABLE 1 - EXCESSIVE CONDENSING PRESSURE

Cause	Remedies
Insufficient water flow through the condenser	Adjust water supply or clean the strainer
Fouling in the condenser	Clean the condenser
Overheated cooling water	Obtain colder cooling water or reduce compressor capacity
The plant is overcharged	Drain refrigerant into an empty vessel
Air or noncondensable gases in the system	Remove air from the condenser
A condensing temperature 2°F lower results in 1% additional cooling capacity.	

TABLE 2 - EVAPORATING TEMPERATURE TOO LOW

Causes	Remedies
Fouling in the evaporator	Clean the evaporator
Oil in the evaporator	Inspect the oil return system
Insufficient refrigerant charge	Add more refrigerant to the plant.
An evaporating temperature 2°F higher results in 4% additional cooling capacity.	

First Aid In Case Of Ammonia Accidents (Chemical Formula: Nh_3 – Refrigerant R-717)

GENERAL

Ammonia is easy to identify. It has a strong, distinctive odor that is noticed by most people, even at very low, harmless concentrations. Ammonia serves as its own warning agent so that no one will voluntarily remain in a room in which concentrations have become hazardous. Because ammonia is lighter than air, adequate ventilation is the best means of preventing a concentration.

Experience has shown that ammonia is difficult to ignite and, under normal conditions, it is a very stable compound.

NOTE: In concentrations greater than 15%, ammonia can form ignitable mixtures with air and oxygen. It should always be treated with respect.

Basic rules of First Aid

1. **Call a doctor immediately.**
2. **Be prepared**: Keep an irrigation bottle available, containing a sterile isotonic (0.9%) NaCl–solution (salt water).
3. A shower bath or water tank should be available near all major ammonia installations.
4. Individuals applying first aid should be properly protected to avoid further injury.

INHALATION

1. Move affected personnel into fresh air immediately, and loosen clothing to facilitate breathing.
2. **Call a doctor/ambulance with oxygen equipment immediately**
3. Keep the patient still and warmly wrapped in blankets.
4. If mouth and throat are burnt (thermal or chemical burn), let the conscious patient drink water, a little at a time.
5. If the patient is conscious and the mouth is **not** burnt, give hot, sweet tea or coffee (never force feed an unconscious person).
6. Oxygen may be administered, but **only** when authorized by a doctor.
7. If breathing stops, apply artificial respiration.

EYE INJURIES FROM LIQUID SPLASHES OR CONCENTRATED VAPOR

1. Force the eyelids open and rinse eyes immediately for at least 30 minutes with salt water solution.
2. **Call a doctor immediately.**

SKIN BURNS FROM LIQUID SPLASHES OR CONCENTRATED VAPOR

1. Wash immediately with large quantities of water and continue for at least 15 minutes. Remove contaminated clothing carefully while washing.
2. **Call a doctor immediately.**
3. After washing, apply wet compresses (saturated with a sterile isotonic (0.9%) NaCl solution (salt water) to affected areas until medical assistance is available.

FOLLOW YOUR COMPANY GUIDELINES FOR PROCESS SAFETY MANAGEMENT (PSM).

ADDITIONAL FACTS ABOUT R-717:

- Ammonia is easily absorbed by water: At 59°F (15°C), 1.06 qt (1 liter) of water can absorb approximately 1.1 lb (.05-kg) liquid ammonia (or approximately 185 gal. (700 liters) ammonia vapor.
- Even small amounts of ammonia in water are enough to destroy marine life if allowed to pollute waterways and lakes.
- Because ammonia is alkaline it will damage plant and animal life if released into the atmosphere in large quantities.

Refrigerant evacuated from a refrigeration plant must be charged into refrigerant cylinders intended for this specific refrigerant.

If the refrigerant is not to be reused, **return** it to the supplier or to an authorized incineration plant.

Halocarbon refrigerants are colorless and odorless. Their presence is undetectible without instrumentation. Their ability to displace oxygen can make them deadly!

Never mix R-717 with halocarbon refrigerants.

PROTECTING THE ENVIRONMENT

Many countries have passed legislation in an effort to reduce pollution and preserve the environment.

Be especially careful with the following substances:

- refrigerants
- cooling media (brines etc)
- lubricating oils

ADDITIONAL FACTS ABOUT REFRIGERANTS

Refrigerants usually have a natural boiling point which lies a good deal below 32° (0°C). This means that liquid refrigerants can be extremely harmful if they come into contact with skin or eyes.

In high concentrations, R-717 causes respiratory problems. When ammonia vapor and air mix between 15 to 28 % volume, the combination is explosive and can be ignited by an electric spark or open flame.

When halocarbon vapors come into contact with open flame or hot surfaces **over approximately 572°F (300°C)** they decompose to produce poisonous chemicals. These chemicals have a very strong odor warning us of their presence.

Oil mist in the ammonia vapor increases this risk significantly as the point of ignition falls below that of the mixture ratio stated.

Usually the strong smell of ammonia will give ample warning of its presence before concentrations become dangerous.

CAUTION **Check official limits in the location of your installation. They may differ from those stated.**

VENTILATING A REFRIGERATION PLANT

If it is necessary to ventilate a refrigeration plant, make sure you observe the following:

- **Never** release refrigerants directly into the atmosphere.
- When ventilating an R-717 plant, you must use an approved air ventilator. **Released air must pass through an open water** container in which the remnants of R-717 refrigerant will be absorbed. Send the water containing R-717 to an authorized incineration plant.

COOLING AGENTS

Standard PowerPac™ units are designed to use glycol or water as the cooling agent. Other cooling agents include: Salt solutions (brines) of calcium chloride ($CaCl_2$) or sodium chloride (NaCl).

In general, all brines must be considered harmful to nature. Use caution when charging or purging a refrigeration plant.

Never empty brines down a sewer or into the environment.

The brine must be collected in suitable containers, clearly marked with the contents, and sent to an approved incineration plant.

OILS

To lubricate screw compressors included in the PowerPac™ units, use only Semisynthetic hydrotreated oil.

When changing the oil in the compressors and when emptying the vessels, the used oil must be charged into containers marked “waste oil” and sent to an approved incineration plant.

NOTE: The owner of the refrigeration plant is responsible for ensuring compliance with all Federal, state, and local regulations. PSM procedures should be routinely followed.

READ THIS FIRST: COMPRESSOR PRESTART CHECKLIST

The following items MUST be checked and completed by the installer prior to the arrival of the Frick Field Service Supervisor. Details on the checklist can be found in this manual. Certain items on this checklist will be reverified by the Frick Field Service Supervisor prior to the actual start-up.

Mechanical Checks

__ Confirm that motor disconnect is open
__ Isolate suction pressure transducer
__ Pressure test and leak check unit
__ Evacuate unit
__ Remove compressor drive coupling guard
__ Remove coupling center and **DO NOT reinstall** (motor rotation must be checked without center)
__ Check for correct position of all hand, stop, and check valves **PRIOR** to charging unit with **OIL** or **REFRIGERANT**
__ Charge unit with correct type and quantity of oil
__ Lubricate electric drive motor bearings **PRIOR** to checking motor rotation
__ Check oil pump alignment (if applicable)
__ Check for correct economizer piping (if applicable)
__ Check separate source of liquid refrigerant supply (if applicable, liquid injection oil cooling)
__ Check water supply for water-cooled oil cooler (if applicable, water cooled oil cooling)
__ Check thermosyphon receiver refrigerant level (if applicable, thermosyphon oil cooling)
__ Check for **PROPER PIPE SUPPORTS** and correct foundation
__ Check to ensure **ALL** piping **INCLUDING RELIEF VALVES** is completed

Electrical Checks

__ Confirm that main disconnect to motor starter and micro is open
__ Confirm that electrical contractor has seen this sheet, **ALL PERTINENT WIRING** information, and drawings
__ Confirm proper power supply to the starter package
__ Confirm proper motor protection (breaker sizing)
__ Confirm that all wiring used is stranded copper and is 14 AWG or larger (sized properly)
__ Confirm all 120 volt control wiring is run in a separate conduit from all high voltage wiring
__ Confirm all 120 volt control wiring is run in a separate conduit from oil pump and compressor motor wiring
__ Confirm no high voltage wiring enters the micro panel at any point
__ Check current transformer for correct sizing and installation
__ Check all point-to-point wiring between the micro and motor starter
__ Confirm all interconnections between micro, motor starter, and the system are made and are correct
__ Ensure all electrical panels are free from installation debris, METAL PARTICLES, and moisture

After the above items have been checked and verified:

__ Close the main disconnect from the main power supply to the motor starter
__ Close the motor starter disconnect to energize the micro
__ Manually energize oil pump and check oil pump motor rotation
__ Manually energize compressor drive motor and check motor rotation
__ Leave micro energized to ensure oil heaters are on and oil temperature is correct for start-up

Summary: The Frick Field Service Supervisor should arrive to find the above items completed. He should find an uncoupled compressor drive unit (to verify motor rotation and alignment) and energized oil heaters with the oil at the proper standby temperatures. Full compliance with the above items will contribute to a quick, efficient and smooth start-up.

The Start-up Supervisor will:

1. Verify position of all valves
2. Verify all wiring connections
3. Verify compressor motor rotation
4. Verify oil pump motor rotation
5. Verify the % of FLA on the micro display
6. Verify and finalize alignment (if applicable)
7. Calibrate slide valve and slide stop
8. Calibrate temperature and pressure readings
9. Correct any problem in the package
10. Instruct operation personnel

NOTE: Customer connections are to be made per the electrical diagram for the motor starter listed under the installation section and per the wiring diagram listed under the maintenance section of the IOM.

Please complete and sign this form & fax to 717-762-8624 as confirmation of completion.

Frick Sales Order Number: ____________________
Compressor Model Number: ____________________
Unit Serial Number: ____________________
End User Name: ____________________
Address of Facility: ____________________
City, State, Zip: ____________________

Print Name: ____________________
Company: ____________________
Job Site Contact: ____________________
Contact Phone Number: ____________________

Signed: ____________________

Start-up Report

Frick Order No: ______________________

Sold To: ____________________________________ Contact Name:________________________ Date:________________
End User: ___________________________________ Contact Name:________________________ Phone:________________
End User Address: ____ Fax No:________________
City, State, Zip: ______________________________ Start-up Representative ________________

Unit General Information

Unit Model # ____ Customer Package Identification # _______________________
Compressor Serial #___________________________________ Separator National Board #_____________________________
Unit Serial #____ Oil Cooler National Board # ____________________________
Evaporator National Board #_______ Serial # ______________ Condenser National Board #________ Serial # ______________
Oil Pot National Board # _______________________________ H.P. Receiver National Board #______
Economizer National Board # ___________________________ Suction Accumulator National Board # ____________________
Refrigerant_____________ Oil Filters _______________ Lube Oil Type_________ Design Operating Conditions
Oil Cooling __________________________________ __________ ° Suct. /_________ ° Disch.

Micro Information

Micro Type ______________________ Program Software Ver # _______ and Date_________ UL Serial # ________________
Digital I/O Board #1 Serial # _______________________________ Software Ver # _________and Date __________________
Digital I/O Board #2 Serial # _______________________________ Software Ver # _________and Date __________________
Analog Board #1 Serial #__________________________________ Software Ver # _________and Date __________________
Analog Board #2 Serial #__________________________________ Software Ver # _________and Date __________________

Compressor Motor Starter / Drive Information

Manufacturer ________________________ Part # _________________ Model # _____________________
Starter Type__________________________ Serial #_______________________
Input Voltage _____________ Voltage Range __________ Phase ____________ Hz ____________ Current ___________
Output Voltage ________ Phase ________ Hz _______ Max FLA ________Max LRA ______ Min Load FLA ____ Job FLA _____
Logic Board Serial # _________________ U33 Prog. Ver. ________ Date __________P/N ______________________
U34 Prog. Ver. ________ Date __________P/N ______________________
U45 Prog. Ver. ________ Date __________P/N ______________________
Harmonic Filter Serial #__________________ Prog. Ver. ________ Date __________P/N ______________________
Frick Interface Serial #___________________ Prog. Ver. ________ Date __________P/N ______________________
CT Location Checked ☐ CT Phase ______ CT Ratio ______ Transition Time _________ DBS Ver.# ____________

Oil Pump Information

Pump Mfg. __________ Model # _________ Serial #_______________ Motor Mfg.____________ H.P. _______________
Motor RPM_________ Service Factor ______ Volt _______ HZ ______ FLA _____ Design ____ Code _____ Starter Size______

Cooling Fan Information

Motor HP ______ RPM_________ Service Factor ___________ Volt _______ Hz _________ FLA _______ Cooling Fans _______

Special Options

☐ ______________________ ☐ ___________________________ ☐ _________________________ ☐ _________________________

Prestart Checks

- ☐ Installation, Foundation
- ☐ Position of all valves
- ☐ Proper oil charge
- ☐ All wiring connections
- ☐ Starter Cleanliness
- ☐ All micro settings
- ☐ 4-20 CT Channel 16 Setup
- ☐ Compressor PHD Setup
- ☐ Motor PHD Setup
- ☐ Motor Winding RTD's Setup
- ☐ Motor Bearing RTD's Setup
- ☐ Motor Temperature Thermistor Setup
- ☐ 4-20 Motor Drive Signal Calibrated
- ☐ Cold alignment
- ☐ Coolant Installed
- ☐ 4-20 Coolant Loop Pump Setup
- ☐ Coolant Loop Temp Setup
- ☐ Cooling Fan Motor I/O Setup
- ☐ Cooling Fan Rotation Checked
- ☐ Oil pump motor rotation
- ☐ Motor rotation
- ☐ 4-20 Output Calibration – Liquid Makeup Valve, Coolant Temp Valve, Economizer Makeup Valve

Configuration

Capacity	Channel	Direction
Mode 1 ____________	__________	__________
Mode 2 ____________	__________	__________
Mode 3 ____________	__________	__________
Mode 4 ____________	__________	__________
VFD Hi & Low PI Control	__________	__________

Package

Compressor _____________
Pump _____________
Dual Pump _____________
Drive __________________________
Refrigerant __________ K-Factor _________
Filter ___________________________
PowerPac ____________

Miscellaneous:

Sequencing _______________
Condenser _______________
Screen Saver _______________

Page 2 Unit Serial #______________ Frick Order No: ______________

Capacity Control Setpoints

Setpoint	High	Low	Regulation Safeties		Setpoint	High	Low	Regulation Safeties	
			Load Inhibit	___				Load Inhibit	___
Prop. Band	___	___	Force Unload	___	Prop. Band	___	___	Force Unload	___
Dead Band	___	___	Warning	___	Dead Band	___	___	Warning	___
Cycle Time	___ Sec	___ Sec	Warning Delay	___ Sec	Cycle Time	___ Sec	___ Sec	Warning Delay	___ Sec
VFD Prop Band	___	___	Shutdown	___	VFD Prop Band	___	___	Shutdown	___
VFD Integ. Time	___ Sec	___ Sec	Shutdown Delay	___ Sec	VFD Integ. Time	___ Sec	___ Sec	Shutdown Delay	___ Sec
Channel	___				Channel	___			

Auto Cycle		**Low Suction**		**Auto Cycle**		**Low Suction**	
Start	___	Load Inhibit	___	Start	___	Load Inhibit	___
Start Delay	___ Min	Force Unload	___	Start Delay	___ Min	Force Unload	___
Stop	___	Warning	___	Stop	___	Warning	___
Stop Delay	___ Min	Warning Delay	___ Sec	Stop Delay	___ Min	Warning Delay	___ Sec
		Shutdown	___			Shutdown	___
		Shutdown Delay	___ Sec			Shutdown Delay	___ Sec

Compressor Safeties

High Discharge Temperature
Load Inhibit ___
Force Unload ___
Warning ___
Warning Delay ___Sec
Shutdown ___
Shutdown Delay ___Sec

Start Differential
Pressure Below
50 PSI

High Suction Pressure
Load Inhibit ___ PSIG
Force Unload ___ PSIG
Warning ___ PSIG
Warning Delay ___ Sec
Shutdown ___ PSIG
Shutdown Delay ___ Sec

High Discharge Pressure

Regulation	Modes 1 & 3	Modes 2 & 4
Load Inhibit	___ PSIG	___ PSIG
Force Unload	___ PSIG	___ PSIG
Warning	___ PSIG	___ PSIG
Warning Delay	___ Sec	___ Sec
Shutdown	___ PSIG	___ PSIG
Shutdown Delay	___ Sec	___ Sec

Dual Mode ___

Maximum Discharge Pressure ___ PSIG
Highest Cap. To Permit Start ___ %
Start Period Before Cap. Increase ___
Stopping Period For Cap. Unload ___
Compressor Auto Mode Min. Cap. ___ %
Capacity Unload Assist. ___ Rate ___%
Separator Velocity Ref. ___
Compression Ratio ___
Liquid Slug Warning ___
Liquid Slug Shutdown ___

Economizer ___
On When Above ___%
Off When Below ___%
Override Discharge Pressure ___
Port Value ___
Pressure Input ___
Fixed Pressure Setpoint ___

Balance Piston
On ___%
Off ___%
Ignore Delay ___ Min
Fail Delay ___ Min
Oil Log ___ Delay ___ Sec.

Main Oil Injection On When Discharge Temperature Is Above ___ °F for ___ Sec

Package Safeties

Low Compressor Oil Temperature
Warning ___ Delay ___ Sec
Shutdown ___ Delay ___ Sec

High Compressor Oil Temperature
Warning ___ Delay___ Sec
Shutdown ___ Delay___ Sec

Low Compressor Oil Pressure
Warning ___PSI Delay___ Sec
Shutdown ___PSI Delay___ Sec

High Filter Pressure
Warning ___PSI Delay___ Min
Shutdown ___PSI Delay___ Min

Main Oil Injection ___
Shutdown ___PSI Delay___ Sec

Oil Heater Off Above ___
High Level Shutdown Delay ___ Sec
Low Oil Level Delay ___ Sec
Oil Pump Lube Time Before Starting ___ Sec
Dual Pump Transition Time ___ Sec

Pull Down ___
Capacity Position ___ %
Amount of Time ___ Sec

Pump Down ___
On When Suction Above ___ PSIG Delay___ Min

DX Circuit
#1 Action___
Off When Below ___ %
On When Above ___ %
#2 Action ___
Off When Below ___%
On When Above ___%

Liquid Injection ___
On When Above ___ Delay___ Sec
Dual Port Transition ___

Hot Gas Bypass ___%
Power Assist ___ Sec

Page 3 Unit Serial #____________________ Frick Order No: ____________________

Compressor Motor Setpoints and Information

Motor Name Plate
Motor Amps ________
Volts ________
Service Factor ________
Horsepower ________
CT Factor ________
Recycle Delay ________ Min
High Motor Amps
Load Inhibit________
Force Unload________
Warning________ Delay___ Sec
Shutdown________ Delay___ Sec

Low Motor Amps
Shut Down ________ Delay______ Sec
Confirmed Running Motor Amps _______
Starting Motor Amps Ignore Period ________ Sec

VFD
Maximum Drive Output ___ %
Minimum Drive Output ___ %
Remote Control
Rate Of Increase ________ % Delay ____ Sec
Rate Of Decrease _______ % Delay ____ Sec
Capacity Control
When Slide Valve Reaches ________ %
Drive Speed Reaches ________ %
Variable Speed Min. Slide Valve Position _______ %

Skip Frequency Bands

Bottom	**Top**
_______	______
_______	______
_______	______
_______	______
_______	______

Manufacturer ____________
Frame Size ____________
H.P. ____________
RPM ____________
Serial # ____________
Service Factor ____________
Voltage ____________
Hz ____________
Design ____________
Code ____________
Bearing Type ____________
Motor Coupling ____________

Vyper Coolant Setpoints

Vyper Standby Time ______
Vyper Coolant Low Temp. Alarm______ Delay______ Shutdown______ Delay________
High Temp. Alarm______ Delay______ Shutdown______ Delay________

PHD Monitoring Setpoints

Compressor Bearing ____________

Suction End **Delay**
High Warning______ gF_____ Sec
High Shutdown ____ gF_____ Sec

Discharge End **Delay**
High Warning _____ gF_____ Sec
High Shutdown ____ gF_____ Sec

Motor Bearing ____________

Shaft Side **Delay**
High Warning_______ F_____ Sec
High Shutdown _____ F_____ Sec

Opposite Shaft Side **Delay**
High Warning ______ F_____ Sec
High Shutdown _____ F_____ Sec

Motor Stator ____________

Stator 1 **Delay**
High Warning______F ______ Sec
High Shutdown ____F ______ Sec

Stator 2 **Delay**
High Warning _____F ______ Sec
High Shutdown ____F ______ Sec

Stator 3 **Delay**
High Warning______F ______ Sec
High Shutdown ____F ______ Sec

Condenser Control

Condenser Control Setpoint ____________

Digital Controls	**Step Order**
Module A	________
Module B	________
Module C	________
Module D	________

Step Up Dead Band _________PSI
Step Up Delay ________ Sec
Step Down Dead Band _________PSI
Step Down Delay ________ Sec
High Pressure Override _________PSI
High Pressure Override Delay _____ Sec

Analog Controls Analog Output A ___________
Analog Output B ___________
Proportional Band ________PSI
Integration Time _______ Sec
High Limit ________PSI
Low Limit _______ Sec

Miscellaneous

Remote Capacity Deadband _______%
High Compressor Oil Pressure ______________
Shutdown_____PSI Delay ____ Sec

Max Slide Valve Timer _______ 1/10 Sec
Max Discharge Pressure ___________PSI
Max Discharge and Oil Temp ________°F

Page 4 Unit Serial #________________ Frick Order No: ____

P&ID Setpoints

Name	____________	________	____________	________
Control	________	________	________	________
Action	________	________	________	________
Control Point	____________		____________	
Device Source	__________	________	__________	________
Device Channel	_____		_____	
Setpoint	________	________	________	________
Dead Band	________	________	________	________
Prop. Band	________	________	________	________
Integral Gain	________	________	________	________

Communications

Compressor ID ______

Comm 1	**Comm 2**	**Comm 3**	
Baud Rate________	Baud Rate ________	Baud Rate________	
Data Bits ________	Data Bits________	Data Bits________	
Stop Bits ________	Stop Bits ________	Stop Bits________	
Parity ________	Parity ________	Parity________	
RS 485 Connection _______	RS 485 Connection _______	RS 485 Connection _______	
Protocol ________	Protocol ________	Protocol ________	Use Map File ________

Ethernet

IP Data		**Naming Data**	**Protocols**
Address Type	________	Host Name ________	ModBus TCP ________
IP Address	________	Work Group ________	Ethernet I/P ________
Gateway Address	________	Comments ________	Profinet________
Subnet Mask	________		
Web Server Port	________		

VIBRATION DATA SHEET

Date: ______________________________

End User: ______________________________

Address: ______________________________

Sales Order Number: ______________________________

Installing Contractor: ______________________________

Service Technician: ______________________________

Equipment ID (As in Microlog): ______________

Compressor Serial Number: ______________

Unit Serial Number: ______________

National Board Number: ______________

Running Hours: ______________

Manufacturer and Size of Coupling: ______________

Motor Manufacturer: RAM______________

Motor Serial Number: ______________

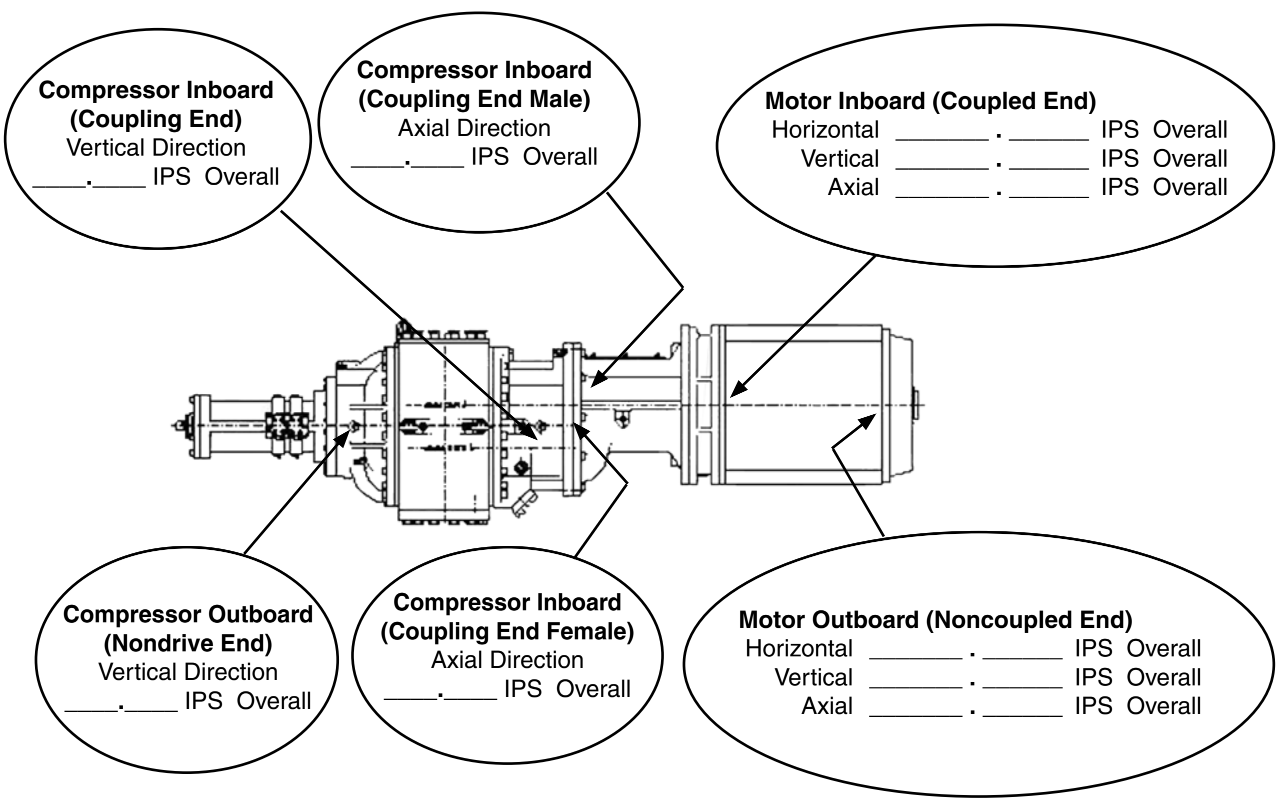
RPM: ________ Frame Size: __________ H.P. _________

Refrigerant:

Ambient Room Temperature: ___________°F

Operating Conditions:

SUCTION	DISCHARGE	OIL	SEPARATOR	Slide Valve Position %
Press #	Press #	Press #	Temp °F	V.I. Ratio
Temp °F	Temp °F	Temp °F		F.L.A. %



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