INSTALLATION, OPERATION

AND MAINTENANCE MANUAL

FOR

PD SERIES

PACKAGED POOL DEHUMIDIFICATION UNITS

INDOOR AND OUTDOOR MODELS

UNIT MODEL NO. _____
UNIT SERIAL NO. _____
SERVICED BY: _____
TEL. NO: _____

CANADIAN HEAD OFFICE AND FACTORY

1401 HASTINGS CRES. SE
CALGARY, ALBERTA
T2G 4C8
Ph: (403) 287-2590
Fx: 888-364-2727

USA HEAD OFFICE AND FACTORY

32050 W. 83rd STREET
DESOTO, KANSAS
66018
Ph: (913) 583-3181
Fx: (913) 583-1406

CANADIAN EASTERN FACTORY

1175 TWINNEY DRIVE
NEWMARKET, ONTARIO
L3Y 5V7
Ph: (905) 898-1114
Fx: (905) 898-7244

SALES OFFICES ACROSS CANADA AND USA

Retain instructions with unit and maintain in a legible condition.
Please give model number and serial number when contacting factory for information and/or parts.

www.engineeredair.com

TABLE OF CONTENTS

You Have Responsibilities Too 3
Introduction 3
Safety Precautions 3
Warranty 4
Parts 5
Receiving 5
Temporary Storage 5
Installation 6
Codes 6
Minimum Clearance To Combustibles And For Service In Inches (Mm) 7
Clearance For Condenser Air Flow 8
Lifting 8
Mounting 9
Shipping Materials 10
Assembly 10
    Split Unit Wiring 10
Piping, Electrical Or Control Service Connections 11
Electrical Installation 11
    Recommended 24v Field Wiring Size 12
Coil Connections 13
Drain Traps 13
Flushing And Degreasing Of Water And Glycol Coils 14
    Heat Transfer Fluids 14
    Pool Water Piping 15
Before Start-Up 15
Start-Up Check List 15
Operation 19
Cooling Components 19
Refrigerant Handling 22
Compressor Oil 22
Shutdown Procedure 22
Charging Instructions 23
    Reheat Systems 24
Maintenance 25
Electrical 25
Belt Adjustment 25
Set Screws 26
Bearing Setscrew Torques 27
Lubrication Of Fan Bearings 27
Lubrication Of Dodge Fan Bearings 28
Motor Lubrication 30
Filters 30
Controls 31
Control Enclosure Ventilation 31
Outdoor Air Intakes, Mixing Sections And Dampers 32
Coils 32
    Coil Winterization 32
Coating Maintenance 32
    Heating 33
Refrigeration 33
Trouble Shooting 35
Start Up Record 36

YOU HAVE RESPONSIBILITIES TOO

This installation, operation and maintenance manual cannot cover every possibility, situation or eventuality. Regular service, cleaning and maintaining the equipment is necessary. If you are not capable of performing these tasks, hire a qualified service specialist. **Failure to perform these duties can cause property damage and/or harm to the building occupants and will void the manufacturers' warranty.**

INTRODUCTION

Engineered Air units are high quality products designed and manufactured to provide many years of trouble-free operation. We recommend that this manual be read thoroughly to ensure proper installation, efficient operation and proper maintenance of this equipment. The submittal record is considered to be part of the Installation, Operation and Maintenance Manual. Please report any omissions to the national service manager.

Natatoriums (Indoor swimming facilities) have inherent issues with high relative humidity within the building envelope. Excessive humidity within a structure can compromise the building integrity or promote the growth of mold and mildew. It is necessary to control the relative humidity to minimize the associated problems. The primary function of a pool dehumidifier (PD series unit) is to manage the humidity levels within the facilities. This helps to reduce the adverse effects of high humidity on the building. Additional functions for the pool dehumidifier may include space ventilation, comfort heating and/or cooling and pool water heating.

Control is normally accomplished by measuring the sensible room temperature and the RH%. This is then calculated by the controller to determine the dew point.

SAFETY PRECAUTIONS

Read, understand and follow the complete manual before beginning the installation, including all safety precautions and warnings.

Warning: 	**Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.**

Warning:  	**This unit is connected to high voltages. Electrical shock or death could occur if instructions are not followed. This equipment contains moving parts that can start unexpectedly. Injury or death could occur if instructions are not followed. All work should be performed by a qualified technician. Always disconnect and lock out power before servicing. DO NOT bypass any interlock or safety switches under any circumstances.**

WARRANTY

LIMITED WARRANTY ENGINEERED AIR will furnish without charge, F.O.B. factory, freight collect, replacement parts for, or repairs to products covered herein which prove defective in material or workmanship under normal and proper use for a period of twelve (12) months from the initial start-up or eighteen (18) months from the date of shipment, whichever expires sooner, provided the customer gives ENGINEERED AIR written notice of such defects within such time periods and provided that inspection by ENGINEERED AIR establishes the validity of the claim and all pertinent invoices have been paid in full. The repairs or replacements will be made only when the complete product(s) or part(s) claimed to be defective are returned to ENGINEERED AIR or a depot designated by ENGINEERED AIR, transportation charges prepaid. Repairs or replacements as provided for by this paragraph shall constitute fulfillment of all ENGINEERED AIR's obligations with respect to this warranty. The refrigerant charge is not included in any part of this warranty. This warranty does not apply to any products or parts thereof that have been subject to accident, misuse or unauthorized alterations, or where ENGINEERED AIR's installation and service requirements have not been met.

The foregoing warranty is in lieu of all other warranties, express or implied. ENGINEERED AIR specifically disclaims any implied warranty of merchantability and/or fitness for purpose. Under no circumstances shall ENGINEERED AIR be liable to, nor be required to indemnify, Buyer or any third parties for any claims, losses, labor, expenses or damages (including special, indirect, incidental, or consequential damages) of any kind, resulting from the performance (or lack thereof) of this Agreement or the use of, or inability to use the goods sold hereunder, including, but not limited to, damages for delay, temporary heating/cooling costs, loss of goodwill, loss of profits or loss of use. Furthermore, the parties agree that the Buyer's sole remedy under this Agreement shall be limited to the limited warranty set forth in the preceding paragraph relating to the repair or replacement of any defective goods. Under no circumstances shall any claim or award against ENGINEERED AIR exceed the original contract price whether awarded through arbitration, litigation or otherwise.

ENGINEERED AIR Warranty is void if:

1. The unit is not installed in accordance with this manual.
2. The start-up and operation of the unit is not performed in accordance with this manual.
3. The unit is allowed to operate during building construction.

PARTS

Warning: **Any replacement part must be of equivalent listing or certification and be functionally equivalent. The replacement part must meet the original's specification in terms of functionality including certifications, timing, input and output range, accuracy and operation.**
Failure to replace parts or components with equivalent parts can cause property damage, injury or death.

1. Motors:
   Motor manufacturers have service centers that will repair or replace motors as required.

2. Parts Other Than Motors:
   Contact the nearest Engineered Air sales office or factory. Be sure to include Model Number, Serial Number, date of installation and nature of failure along with the description of the parts required. Some parts may not be stocked items that must be made or ordered.

RECEIVING

Refer to the back of the packing slip for receiving unit instructions.

On receipt of the unit, check for damage. Inspect protective covers for punctures or other signs that there may be internal damage. Remove protective covers and check for internal damage. Replace covers if the unit is not being assembled or installed at this time. Open access doors and check for internal damage. Close access doors when the inspection is complete.

All units are pre-tested at the factory immediately prior to shipping and are ensured to be in good operating condition at that time. If damage is found follow the instructions on the packing slip.

On receipt of the unit, check electrical characteristics (see rating plate) to make sure the unit voltage is compatible with that available for the unit. All parts for field installation are listed on the shipping order form.

TEMPORARY STORAGE

If a unit is to be stored prior to installation the following precautions are required:

- Store in a well-drained area that will not accumulate surface water.
- Store in an area where the unit will not get damaged.
- The entire perimeter and any full height cross members of the unit must be supported by a level surface and the supporting surface must be adequate for supporting the entire weight of the unit.
- All protective coverings that were provided for shipping must be in place.
- Protect indoor units from rain and snow.

INSTALLATION

Warning: 	**Only equipment bearing a CSA C22.2 No. 213 or UL 1604 rating plate (label) with an accompanying CSA Certification mark is suitable for installation in a hazardous location. The hazardous location must conform with the Class, Division, Group and temperature code (if shown) displayed on the rating plate (label).** **If not marked as noted above, the unit is not rated for hazardous locations and should not be installed in areas requiring any hazardous location rating.**

Caution: 	**All wiring, piping and fuel line installation must be completed by qualified persons in accordance with all federal, state, provincial and/or local codes.**

Note: Installation shall be in accordance with this manual and all other associated component and control Installation, Operation and Maintenance Manuals.

CODES

In Canada:

1. The installation of this unit shall be in accordance with the latest edition of the Canadian Electrical Code, Part 1 – C.S.A. Standard C22.1, Provincial and Local Codes, and in accordance with the local authorities having jurisdiction.

2. This unit shall be electrically grounded in accordance with the latest edition of the Canadian Electrical Code, Part 1 – C.S.A. Standard C22.1, Provincial and Local Codes, and in accordance with the local authorities having jurisdiction.

3. The installation of this unit shall be in accordance with the latest edition of the National Plumbing Code of Canada, Provincial and Local Codes, and in accordance with the local authorities having jurisdiction.

4. The installation of this unit shall be in accordance with all other National, Provincial and Local Codes, and in accordance with the local authorities having jurisdiction.

In USA:

1. The installation of this unit shall be in accordance with the latest edition of the National Electrical Code (ANSI/NFPA 70), State and Local Codes and in accordance with the local authorities having jurisdiction.

2. This unit shall be electrically grounded in accordance with the latest edition of the National Electrical Code (ANSI/NFPA 70), State and Local Codes and in accordance with the local authorities

having jurisdiction.

3. If the unit has not been provided with an electric disconnect switch, one of adequate ampacity shall be installed in accordance with Article 430 of the National Electrical Code (ANSI/NFPA 70).

4. The installation of this unit shall be in accordance with the latest edition of the National Standard Plumbing Code (NSPC), State and Local Codes and in accordance with the local authorities having jurisdiction.

5. The installation of this unit shall be in accordance with all other National, State and Local Codes, and in accordance with the local authorities having jurisdiction.

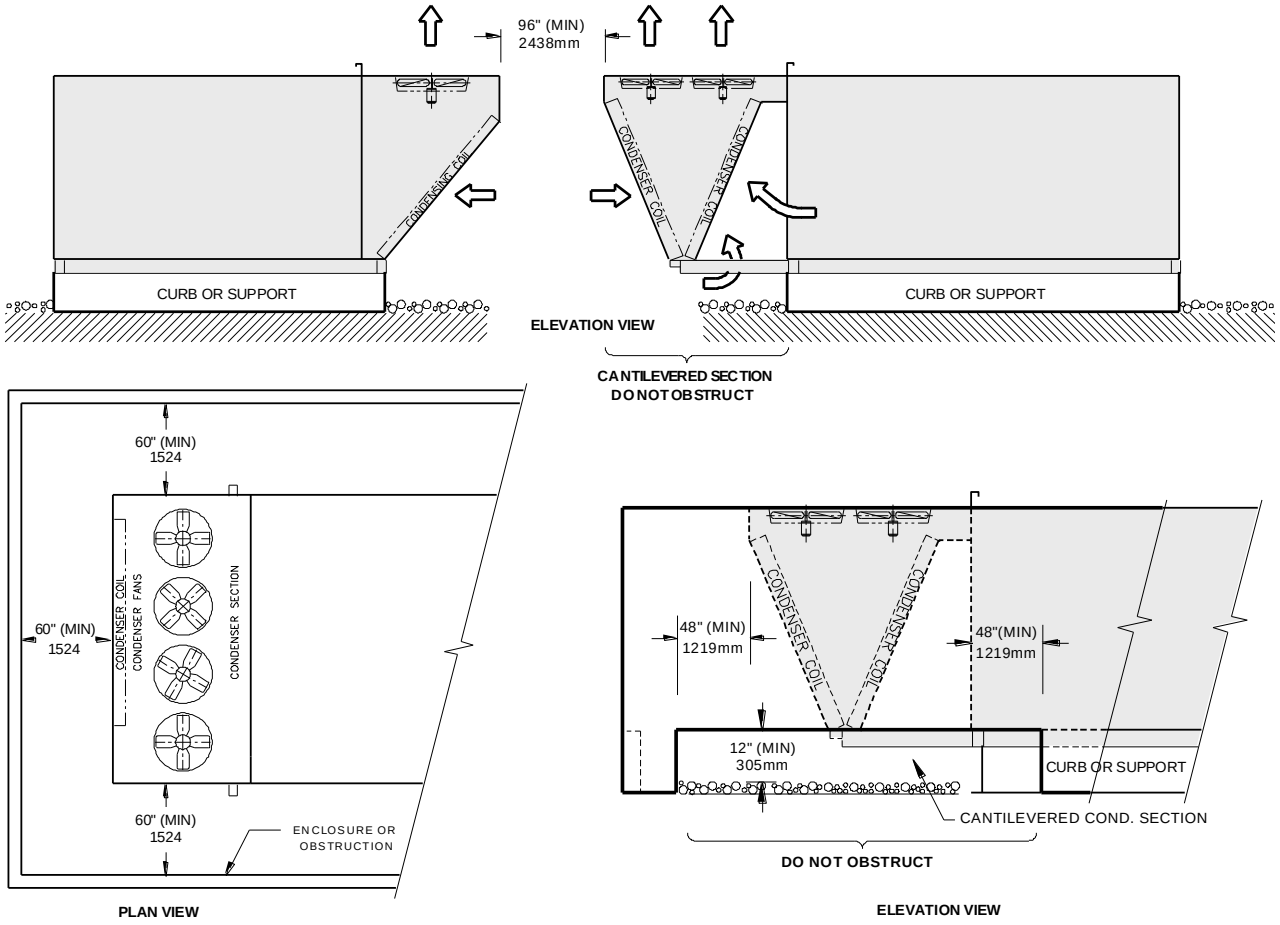
MINIMUM CLEARANCE TO COMBUSTIBLES AND FOR SERVICE IN INCHES (mm)

MODEL	COMBUSTIBLE CLEARANCE					SERVICE CLEARANCE	
	TOP	**FRONT**	**BACK**	**SIDE**	**BOTTOM**	**SERVICE SIDE**	**CONTROL PANEL †**
ELECTRIC HEAT	1" (25)	1" (25)	6" (152)	1" (25)	0	UNIT WIDTH + 10" (254)	42" (1067)
FLUID COILS & RECOVERY DEVICES	1" (25)	1" (25)	1" (25)	1" (25)	0	UNIT WIDTH	42" (1067)
OTHER UNITS	1" (25)	1" (25)	1" (25)	1" (25)	0	24" (610)	42" (1067)

† - As required by the Canadian Electrical Code or the National Electrical Code.
For Safety and Service, the minimum clearances must be observed.

CLEARANCE FOR CONDENSER AIR FLOW

Proper air flow is essential for the operation of this equipment. Maintain at least 60" (1500 mm) clearance between the condenser coil and any obstruction. Maintain at least 96" (2400mm) between adjacent condensing sections. Do not place condenser sections in a well. Wells create a situation where air re-circulates from the condenser fan back to the condenser coil. Enclosures must be designed for proper air flow and to prevent blockage or re-circulated air.



LIFTING

Engineered Air units are constructed on a structural steel base frame. The unit base frame is equipped with lifting lugs specifically located to facilitate proper lifting of the unit. Spreader bars must be used to keep rigging away from the unit cabinetry. All lifting lugs must be used. If using a lift truck, ONLY lift using the perimeter structural frame. DO NOT allow forks to lift on cabinet or unit floor.
Note: There may be bottom mounted components, such as drain piping, that can be easily damaged.

Warning: Injury or death can result from improper rigging and lifting. Rigging and lifting of

equipment must be performed by qualified personnel with proper equipment using appropriate and approved safety precautions.

MOUNTING

Units must be mounted level. Failure to do so can cause water to be trapped in drain pans or operational problems that can void warranty. Failure to do so can result in injury or death, damage the equipment and/or building and can be a cause of poor indoor air quality.

Equipment must be installed so that sufficient working clearance and component access is provided. Some units are designed for cantilevered installation. Consult the Submittal Record for specific unit mounting.

Consult the Submittal Record for specific unit mounting. Engineered Air units are constructed for three types of mounting:

1. Base mounting – Consult the Submittal Record for type of mounting. Unless the unit is specifically designed for point or other mounting, the base of the unit must be supported continuously by a mounting support system that is directly below the unit structural base frame and runs the entire length and width of the unit. Refer to the Submittal Record for mounting information. Units 100" (2500mm) wide and under can be supported on each side continuously along the length of the unit. As a minimum, sleepers that are installed perpendicular to the length of the unit must be continuous across the width of the unit and shall be installed at the end lifting point base rails and the lesser of 80" (2000mm) on center or at all lifting points.

2. Suspended mounting – Where units have been designed for suspended mounting, factory provided connections for hanger rods will be provided. All hanger rod supports must be used. Suspended units must be protected from damage. When installed in aircraft hangers, parking garages or repair garages the installation must comply where applicable with:

    a) The Canadian Natural Gas and Propane Installation Code, C.S.A. Standard B149.1
    b) The Standard on Aircraft Hangers, ANSI/NFPA 409
    c) The Standard on Parking Garages, ANSI/NFPA 88A
    d) The Standard on Repair Garages, ANSI/NFPA 88B

3. Roof curb mounting – The curbs are constructed of heavy gauge load bearing, galvanized steel, and must be fully insulated after installation. Wood nailer strips are provided for easy attachment of roof flashing. Gasket material is supplied with the unit and must be field mounted on the curb to seal the joint between the curb and the unit frame. The curb must be supported along its entire perimeter and any full height cross members as shown on the shop drawings. Point loading of curbs is not permissible.

    The gasket material provided for the curb is closed cell foam. Closed cell foam is dense and does not compress easily. If the unit is split and shipped in sections there will also be gasket material for sealing between sections. The gasket material for splits is open cell foam. It is less dense than the

closed cell foam and compresses easily.
ONLY USE THE CLOSED CELL FOAM GASKET PROVIDED FOR SEALING THE CURB.

Curbs may be broken down for shipping. Field assembly is required by the installing contractor. Bolt all sections together at split joints using hardware provided. The installing contractor must caulk and seal all joint and corner flashings. All flashings and braces that are provided must be installed. DO NOT screw/penetrate joint, corner or adaptor flashings. Refer to assembly instructions sent with roof curb.

SHIPPING MATERIALS

Remove shipping materials. Shipping materials may include, but are not limited to:

- Protective covers over openings, inlets, condenser coils etc.
- Protective covers over split sections if provided.
- Tie-down bolts, straps and blocks on fan and compressor vibration isolators.
- Tie-down bolts, straps and blocks on tilt equipped heat pipes and enthalpy/desiccant wheels if supplied.
- Indirect fired heat exchangers may be supported with wood for shipping. Remove.

ASSEMBLY

Warning: ⚠	**Assembly of split units requires bolting together the base frame of adjacent sections. This may require personnel to work under the unit during assembly. Injury or death can result from improper support or improper loading of the curb. Additional temporary support shall be provided by the installer for the safety of personnel.**

If the unit is split and shipped in sections, the sections must be field assembled. All sections are pre-drilled for assembly. The hardware and gaskets are packed in one of the sections. Apply the gasket, align the sections. The base frame must be bolted together first. Access below the unit for bolting of the base frame must be provided. Once the base frame has been tightly fastened, loosely assemble all the bolts and nuts, and then tighten. Caulk all split lines. Install split joint caps. The inlet hood is designed for field installation. On outdoor units connect the hood to the support flange and attach with appropriate fasteners. Connect all wiring on units that had been split for shipment.

SPLIT UNIT WIRING

All split wiring must be completed by an electrician prior to starting the equipment. A number of different methods are used to reconnect the wiring.

Power wire: this wiring is generally not broken or spliced, and will extend from the device back to the contactor or terminal block inside the electrical panel(s). The wire will be tagged to identify which panel it extends to and will be numbered to the corresponding connection.

The location of the equipment split line may result in the wire being disconnected at the device it is feeding. The wire bundle will be tagged and identified. Confirm correct rotation of 3 phase devices after the wiring connections has been completed.

Control wire: this wire is typically broken near the split line, to be reconnected at either a enclosed terminal block, junction box or extended to a nearby control panel. Each wire or wire bundle will be tagged and numbered to indicate the location it is sent to.

Sensor wire shield: The drain wire from the shield must be grounded (at one end only). A ground connection point is available for connection at the point of termination.

All loose wiring must be securely fastened to the equipment casing upon completion.

PIPING, ELECTRICAL OR CONTROL SERVICE CONNECTIONS

DO NOT install anything that will interfere with equipment access or the rating plate.

Engineered Air equipment is constructed with cabinet and floors designed to prevent water from entering the building through the installed unit. When ordered, factory installed pipe chases and/or electrical chases are built into the unit floor. Factory chases are provided with covers that need to be replaced and sealed after piping and electrical connections are made.

All penetrations through the unit walls must be caulked and sealed to prevent air and/or water from entering the unit.

ELECTRICAL INSTALLATION

DO NOT install anything that will interfere with equipment access or the rating plate.

The unit must be electrically grounded and all wiring must be installed in accordance with the National Electrical Code, ANSI/NFPA 70, and/or the Canadian Electric Code CSA 22-1 and to the approval of the authorities having jurisdiction. **THE FLOOR OF THE UNIT HAS BEEN MADE WATER-RESISTANT. DO NOT CUT OR DRILL HOLES IN THE FLOOR OR USE PENETRATING FASTENERS.** Field wiring diagrams, internal wiring diagrams and operating functions are included in the control cabinet. The power requirements are indicated on the rating plate. Where field wiring of control circuits is required, take care to size the field wiring for a maximum 10% voltage drop. The control circuit ampacity is noted on the field wiring diagram. See the field wiring diagram for requirements for shielded or twisted pair wire for solid state devices.

Caution:	**Temporary Power Generation** **The warranty will be void if the voltage being fed from any temporary generator is not within 10% of the nominal rated nameplate voltage and voltage imbalance shall be limited to 2%. A power monitor shall be installed by others to properly monitor power quality and conditions.** **All generator sets shall be provided with overcurrent and earth-fault protection. The protective apparatus should be capable of interrupting, without damage, any short-circuit current that may occur.**

Warning:	**No unspecified external load shall be added to the control transformer circuit(s) or to the main power circuit(s).**

RECOMMENDED 24V FIELD WIRING SIZE

Copper conductors only

Circuit Load (Amps) (1)	Maximum Total Length of Run									
	< 50 Ft (~ 15 m)	< 100 Ft (~ 30 m)	< 150 Ft (~ 45 m)	< 200 Ft (~ 60 m)	< 250 Ft (~ 75 m)	< 300 Ft (~ 90 m)	< 350 Ft (~ 105 m)	< 400 Ft (~ 120 m)	< 450 Ft (~ 135 m)	< 500 Ft (~ 150 m)
1	16 AWG	16 AWG	16 AWG	16 AWG	16 AWG	16 AWG	14 AWG	14 AWG	14 AWG	12 AWG
2	16 AWG	16 AWG	16 AWG	14 AWG	12 AWG	12 AWG	12 AWG	10 AWG	10 AWG	10 AWG
3	16 AWG	16 AWG	14 AWG	12 AWG	12 AWG	10 AWG	10 AWG	10 AWG		
4	16 AWG	14 AWG	12 AWG	10 AWG	10 AWG	10 AWG				
5	16 AWG	12 AWG	12 AWG	10 AWG						
6	16 AWG	12 AWG	10 AWG	10 AWG						
7	14 AWG	12 AWG	10 AWG							
8	14 AWG	10 AWG	10 AWG							
9	14 AWG	10 AWG								
10	12 AWG	10 AWG								
11	12 AWG	10 AWG								
12	12 AWG	10 AWG								
13	12 AWG									
14	12 AWG									
15	12 AWG									

Notes:

1) The field wiring load depends on the actual load on a particular control circuit the field wiring is connected to. Refer to the internal wiring diagram of the unit.
2) The table above is based on a maximum 10% voltage drop on a 24V control circuit. Wire size was calculated using the following formula:

CM = (25 x I x L) / V

Where **CM** is circular mils of conductor for a constant load of **I** amps, wire length **L** in feet from the unit to the field device and back, and voltage drop **V**.

When connecting to a three phase power supply, check for the correct rotation of all motors and fans. If the rotation is incorrect, reverse the rotation at the incoming power only. All electrical conduit outlets in the control panel must be sealed to prevent moist building air from migrating to the control panel.

All penetrations through the unit walls must be caulked and sealed to prevent air and/or water from entering the unit.

COIL CONNECTIONS

This equipment may require field connection of water, steam or refrigerant coils. For proper operation airflow must be counterflow to the flow of the fluid. The inlet water connection is normally at the bottom of one header and the outlet water connection at the top of the other header. The steam connection is at the middle of the supply header and the condensate is at the bottom of the other header.

Caution:

⚠ **Use a backup wrench on threaded coil connections when installing piping.**

For refrigerant coils, all piping is to be installed by a qualified refrigeration mechanic. All refrigeration specialties shall be installed using good refrigeration installation and design practices.

Recovery, reuse, recycling, reclamation, and safe disposal of refrigerant is the only acceptable practice today. Venting of refrigerant into the atmosphere during installation or servicing is unacceptable. To avoid damage, use an accepted refrigerant recovery system whenever removing refrigerant. When working with refrigerants you must comply with all local government safety and environmental laws.

DRAIN TRAPS

Each drain connection requires a separate drain trap supplied and installed by the contractor. For a trap to work properly, it must be primed. During freezing periods, primed traps may need to be heat traced or drain and plug the trap when not in use. If a drain connection has a smaller pipe inside, connect to the outer pipe only. Ensure that the trap is of adequate depth to operate against a static that includes the extra pressure drop for dirty filters.

Warning:

⚠ **Failure to properly trap each connection can result in drain pan flooding, standing water in unit, building damage, injury or death, cause poor air quality or other problems.**

In some applications (e.g. heat recovery units) there may be additional drain connections inside the curb intended to be connected to the building drainage system. These drains must be connected and properly trapped.

Cooling coil drain pans may have multiple drain connections extending outside the unit casing. Multiple drains may be connected to a common drain providing that each drain is individually trapped and vented to avoid problems from drains in different pressure zones. The drain must be properly sized and sloped.

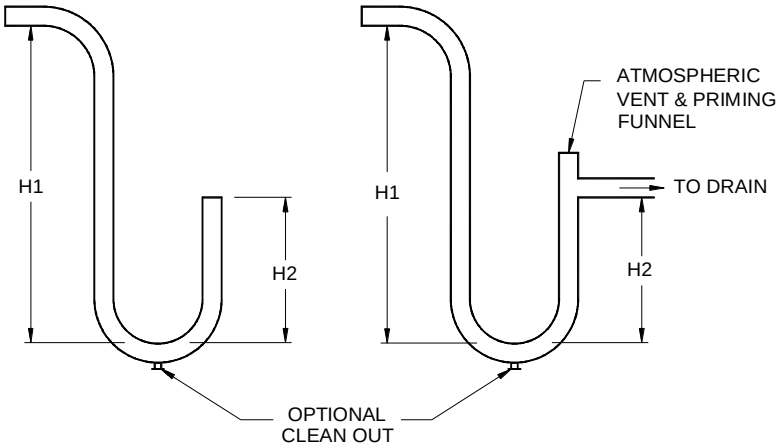
Size drain trap with the following minimum requirements:

a) Units With Draw Through Drain Pans:

H1 = Negative Static† x 1.5 + 3.5" (89mm)
H2 = Negative Static† x 0.75 + 2.5" (64mm)

b) Units With Blow Through Drain Pans:

H2 = Maximum Positive Static† x 1.5
H1 = H2 + 0.5" (13mm)



† Static Water Column (WC) in inches or mm including fully loaded filters.

Ensure adequate clearance for properly sized drain traps.

FLUSHING AND DEGREASING OF WATER AND GLYCOL COILS

Coil tubing may contain material or residue from manufacturing, transportation or storage. To prevent possible damage to other components in the system, the coils must be flushed and degreased. Consult a qualified water treatment specialist.

HEAT TRANSFER FLUIDS

The coil(s) provided have been selected for use with a specific heat transfer fluid as shown on the Submittal Record. Use of other fluids will result in different performance and can damage the coil(s).

It is imperative to properly select and apply heat transfer fluids used in heating and cooling systems. Untreated, improperly treated or improper use of fluids or use of fluids not approved for use in commercial heating and cooling systems can damage coils and system components. For selection and application of heat transfer fluids, always follow the manufacturers' recommendations including treatment, mixing and filling. Warranty will be void if coil damage results from misapplication or improper treatment of the heat transfer fluid.

Some systems may use CPVC piping. Do not use propylene glycol with CPVC.

POOL WATER PIPING

Some systems may incorporate a heat exchanger to reject heat to the pool water. The pool water piping should be considered as potable water. Use proper piping materials for pool water.

BEFORE START-UP

Remove tie-down bolts, straps and blocks on fan and compressor vibration isolators, tilt equipped heat pipes and enthalpy/desiccant wheels if supplied. Ensure all opening covers are removed.

START-UP CHECK LIST

Warning:	**This unit is connected to high voltages. Electrical shock or death could occur if instructions are not followed. This equipment contains moving parts that can start unexpectedly. Injury or death could occur if instructions are not followed. All work should be performed by a qualified technician. Always disconnect and lock out power before servicing. DO NOT bypass any interlock or safety switches under any circumstances.**

The start-up and operation must be in accordance with safe practices. Start-up must be performed by qualified personnel. Complete attached start-up record.

1. Set all associated electrical switches, controls, thermostats and main disconnect switch to “OFF” position.

2. Close all manual valves and field piping valves.

3. Before startup, review the Unit Function (mounted on the control panel door) and all control manuals supplied with this equipment. On units with heating sections, please follow the start-up procedure in the heating manuals. (Pack, DJ, DG, RT, HE, LM-K etc.)

4. Confirm all shipping materials has been removed. On units with semi-hermetic compressors, remove four spring isolator spacers and back off the top nut so that there is 1/32" (0.8mm) to 1/16" (1.6mm) space between the nut and neoprene spacer.

5. Check all bearings, drive and fan set screws for tightness. See page 26.

6. Check drive alignment and belt tension. Refer to Maintenance, page 25.

7. Ensure that refrigerant lines and control capillary lines do not rub against cabinet or other lines.

8. Inspect all electrical wiring, both field and factory installed, for loose connections. Ensure fire alarm contact is installed, or jumpered if not required.

9. Turn disconnect switch ON (control switch is still off) and check the supply voltage. Voltage must be within 10% of rating plate. If not, contact the installing electrical contractor and have the voltage condition corrected before continuing start-up.

10. Crankcase heaters must be energized for at least twenty-four hours prior to starting the compressors. Check to see if heaters are working.

11. Attach service gauges. Some units are equipped with optional service valves at various locations. Ensure all service valves and post valves are back seated (fully open).

12. Rotation check.

    Check rotation of all 3 phase motors. Motors were checked for correct rotation at the factory, if rotation is incorrect, turn off disconnect switch and reverse any two power leads leaving the disconnect switch. Re-check rotation.

Caution:

⚠ **Screw and Scroll compressors MUST be checked for proper rotation at startup. Permanent damage can occur if rotation is not correct.**

Scroll compressors running backwards will typically have low head pressure, high suction pressure and are usually noisy. Screw compressors MUST be checked with a phase meter before starting. If rotation is incorrect, instantaneous permanent damage can occur.

Reciprocating and Turbocor centrifugal compressors do not require rotational checks.

13. At all times of the year units equipped with water cooled condensers are shipped with a glycol solution in the condenser to prevent freeze damage during shipping. Depending on the application, the condensers may have to be flushed prior to use. Dispose of the glycol as required by local authorities having jurisdiction. Turn on the water supply and fill the condenser. Check for water leaks.

14. Turn on the service switch. Set controls to call for cooling. The supply fan will start as described in the unit function. The compressors should now be ready to start. Condenser fans will start as required when compressors are operating. If the compressor is equipped with an oil level sight glass, check the oil level.

15. Check the amperage draw of each motor and compressor. Refer to unit or motor rating plate for full load amps. At the unit, check and record the voltage while it is running. For 3 phase power the phase to phase voltage imbalance should be less than 2%. A 2% voltage imbalance can cause up to a 10% current imbalance that will overheat motor windings.

To calculate voltage imbalance (NEMA method) refer to the following example:

Phase to phase voltage readings:	235V 236V 230V
The average Voltage between legs is	(235+236+230)/3 = 233.7V
Highest voltage deviation from average is:	233.7V – 230V = 3.7V
Voltage imbalance percentage = Highest deviation	divided by average X 100

3.7 / 233.7 x 100 = 1.6% This imbalance is less than 2% and therefore is OK

If voltage imbalance is greater than two percent (2%), turn off main disconnect and contact the installing electrical contractor to have the voltage condition corrected.

16. Confirm field wiring voltage drop is less than 10% when equipment is operating.

17. For the unit to operate properly a system air balance must be performed to ensure correct air flow. Failure to do so can damage the equipment and/or building and can be a cause of poor indoor air quality.

18. Coil air bypass adjustment.
For most pool applications there will be an air bypass section around the evaporator coil. This section allows a portion of air to bypass the evaporator coil allowing the evaporator to have the most efficient moisture removal. **The bypass is factory set to a default value and must be field adjusted to ensure proper operation**. With the system running at full load conditions, install refrigeration gauges. Adjust the bypass damper to maintain a suction pressure that corresponds to a saturated suction temperature as specified in the unit function (and/or the submittal), typically a saturated suction temperature of 40°F to 45°F (5°C to 7°C). Too much bypass air and the coils may freeze. Not enough bypass air, and the coil may not remove enough moisture to satisfy the zone conditions.

19. Damper sections:

a) Flat mixing dampers:
Both the fresh air and return air dampers are fully open when the dampers are at a 45° angle when fully stroked. This provides optimum mixing of the air streams for this damper arrangement.

b) Angle mixing damper:
Angle mixing section dampers open to an angle of 90° when fully stroked. This provides optimum mixing of the air streams for this damper arrangement.

20. Allow system to operate until stable running conditions have been established.

21. Check and record amperage draw of each motor and compressor. Refer to unit label for running full load amps of motors and compressors.

22. Measure and record the suction and discharge pressures. On compressors equipped with an oil pump, measure and record net oil pressure. (net oil pressure is oil pressure minus suction pressure.).

    Check and record the oil level on compressors that are equipped with oil level sight glasses.

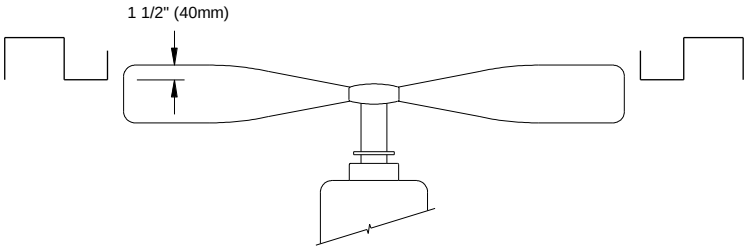
23. Check system charge:

    When thermostatic expansion valves (TX valves) are provided, the charge can be checked with the liquid line sight glass. Under normal operating conditions the sight glass is clear of bubbles. Refer to Charging Instructions.

    NOTE: It is possible for conditions other than low refrigerant charge to cause the sight glass to bubble. Bubbling may occur when condenser fans cycles on, superheat setting is too low or filter-drier is plugged etc.

    The TX valve superheat was checked and adjusted at the factory to maintain a superheat of 18°F (10°C) plus or minus 3°F (2°C) measured on the suction line 10 inches (250mm) from the compressor. This setting rarely requires readjustment. Should adjustment be necessary, refer to the TX valve manufacturers recommendations.

24. Condenser fan blades: Fan blades must be correctly positioned within the orifice for proper air flow.



25. **Set all controls to the settings indicated on the wiring diagram.**

26. Re-install all access panels.

27. Remove any packing material or debris and dispose appropriately.

OPERATION

Warning:	**This unit is connected to high voltages. Electrical shock or death could occur if instructions are not followed. This equipment contains moving parts that can start unexpectedly. Injury or death could occur if instructions are not followed. All work should be performed by a qualified technician. Always disconnect and lock out power before servicing. DO NOT bypass any interlock or safety switches under any circumstances.**

Warning:	**Proper commissioning and start-up of the air handling system is the responsibility of the installing contractor. It is recommended that an air balance be completed by a certified air balancing contractor to insure the air volume being delivered matches the unit rating plate. Failure to perform a proper air balance can cause injury or death, damage to the equipment, property damage, system operational problems, or be a cause of poor air quality. Moisture carry over can result from improper air flow.**

This unit may incorporate one or more functions and a variety of controls and options to suit individual requirements. A description of the unit functions and options is shown on the Electrical Data Sheet and unit wiring diagram. Carefully check your wiring diagram to verify that all remote controls are properly located and correctly field wired.

Dehumidification systems first cool the air with an evaporator coil operating below the dew point temperature, at which time moisture is removed. The cool air is then reheated back to the required supply air temperature. Reheat is generally accomplished using a second, parallel, internal condensing coil to provide the necessary amount of reheat. In some cases, a secondary heat source may be used to reheat the air i.e. electric or gas fired heat exchanger. Condenser reheat systems may employ either a switched or modulating control system. Excess heat may be removed using the outside condenser, and/or a pool water heat exchanger, depending on the system arrangement.

Some equipment may contain programmable unitary controllers or programmable logic controllers (PLC). Additional information can be obtained from the specific programmable control manufacturer. Often this information is available from the control manufacturer's website.

COOLING COMPONENTS

Refer to the wiring diagram and unit function for specific information. Standard pressure control settings are found on page **Error! Bookmark not defined.** and the following notes. Application specific control settings are noted on the wiring diagram and in the unit function.

1. Hermetic Compressors:

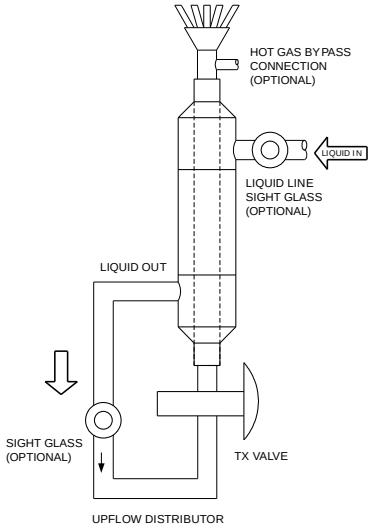
    a. Low Pressure Controls:
    All compressors have an auto-reset low pressure control with contacts that open at low

pressure and close when the pressure increases. See unit function for application specific pressure control settings.

b. High pressure controls:
c. Manual reset for air cooled condensers, automatic reset for water cooled condensers.

d. Overheat and Overload Protection:
e. Hermetic compressors are typically supplied with either a winding thermostat or current sensing overload device. These are capable of sensing motor overheating caused by a shortage of gas, refrigerant system restrictions, single phasing or locked rotor conditions. Note: Winding thermostats can stay open for up to twenty four hours under some conditions.

2. Enga Intercooler
The Engineered Air Flash Intercooler is a heat exchanger installed between the TX valve and the distributor to reduce flash gas at the TX valve under adverse operating conditions.



3. Low Ambient Compressor Lock-Out:
These controls will prevent the cooling system from starting when the ambient temperature is too cold and are provided as standard. The low ambient control may be part of the system controller or a separate device.

4. Head Pressure Control:
Head pressure controls are designed to maintain an adequate operating head pressure, to allow the TX valve and other components to work correctly. Low head pressures can cause flashing in the sight glass, TX valve underfeeding and low system capacity.

Engineered Air systems are custom built and may employ any of several different methods of controlling head pressure. Condenser Fan Cycling (CFC) head pressure controls will cycle fans to maintain proper head pressure on cooler days.

Condenser flooding head pressure controls are used to control the effective surface area of the condensers during modulating reheat operation. These systems do not use pressure actuated fan cycling controls. Condenser fans are either constant run or cycled by ambient temperature. Refer to the valve manufacturers' literature for information regarding operation of these valves. Refer to unit function for a description of system operation.

5. Pumpdown System (Optional):
Depending on options, the cooling system may include a liquid line solenoid for refrigerant control and management, the control circuit may be wired for:

6. solenoid drop, or

7. single pumpdown, or

8. recycling pumpdown, depending on the specific application.

9. Hot Gas Bypass (Optional):
   Hot gas bypass is provided on systems to prevent frost formation on the evaporator coil during low load conditions. The hot gas valve will start to open at a pressure that corresponds to approximately 34°F (1°C) coil temperature. All compressors equipped with unloading should be fully unloaded before hot gas starts to open.

10. Cylinder Unloading (Optional)
    This is a form of capacity control on some compressors that reduces the pumping capacity of the compressor during low load conditions. Unloading may be activated by the control system or by a pressure actuated Cylinder Unloading Control (CUC).

11. Water Cooled Systems (Optional)
    If the system is equipped with a water cooled condenser, set the water flow valve to maintain a saturated discharge temperature of approximately 105°F to 115°F (40°C to 46°C). This applies both to cooling tower systems and city water systems.

    Typical water valve pressure setting:
    R134a = 150 psig (1040 kPa)
    R407C = 270 psig (1870 kPa)
    R410A = 370 psig (2550 kPa)

DX COIL BYPASS DAMPERS

Engineered Air cooling equipment may be provided with application specific DX coil bypass dampers. If bypass dampers are set to allow excessive air to bypass the DX coil, the system will operate with lower suction pressure and capacity than designed, which could lead to coil freezing. If bypass dampers are set to allow excessive air through the DX coil, elevated suction temperatures could cause premature wear on compressors.

Bypass dampers must be field adjusted to match the static pressure drop provided in the Unit Function, after equipment airflow is balanced. Adhering to this procedure will ensure proper airflow across the DX coil when mechanical cooling is operating.

Caution: ⚠	When recovering refrigerant from a system equipped with a water cooled condenser, the water valve must be manually opened so water flows continuously through the condenser while the refrigerant is being recovered. Failure to do so can cause the condenser to freeze, which will permanently damage the condenser.

REFRIGERANT HANDLING

Recovery, reuse, recycling, reclamation, and safe disposal of refrigerant is the only acceptable practice today. Venting of refrigerant into the atmosphere during installation or servicing is unacceptable. To avoid damage, use an accepted refrigerant recovery system whenever removing refrigerant. When working with refrigerants you must comply with all local government safety and environmental laws.

Caution: ⚠	Environmental laws govern the safe handling of refrigerants. Only personnel qualified to safely handle refrigerant may service this equipment. All refrigerant must be handled safely and responsibly. Records must be kept as required by the authorities having jurisdiction.

When servicing the refrigeration system, the refrigerant must be properly recovered to prevent release to atmosphere. Always use the same refrigerant as indicated on the unit rating plate.
Do not change the type of refrigerant in the system. Warranty is void if refrigerant type is changed.

Zeotropic refrigerants (e.g. R410A, R407c, R404A), must be charged into the system as a liquid. Care must be taken to introduce the refrigerant safely.

COMPRESSOR OIL

Several types of oil are used by compressor manufacturers. The different types of oil cannot be mixed or interchanged. Consult the compressor manufacturer for the correct type, viscosity and quantity of oil used in the compressor.

On larger compressors, it is a good practice to do an acid test yearly. If the oil is acidic, discolored or has a bad smell, change the oil and take corrective action to stop acid formation.

Small Hermetic compressors have no visual means of determining oil level. In the case of a leak, if the amount of oil lost is small and can be reasonably calculated, this amount should be added to the compressor. If there is a major loss of oil, the service personnel must remove the compressor, drain the oil completely and add the compressor manufacturers measured oil charge for replacement compressors before placing the compressor into operation. Contact the compressor manufacturer for the type and quantity of oil required.

Larger hermetic, semi-hermetic and screw compressors are equipped with an oil level sight glass. Consult compressor manufacturer for correct oil level. The oil level sight glass is typically between 1/4 and 3/4 full. Excessive oil in the system can damage the compressor.

SHUTDOWN PROCEDURE

Warning: ⚠	Electrical shock or death can occur if instructions are not followed. This equipment contains moving parts that can start unexpectedly. Injury or death could occur if instructions are not followed. All work should be performed by a qualified technician.

⚠	Always disconnect power before servicing. DO NOT bypass any interlock or safety switches under any circumstances.

1. Temporary Shutdown
   To shut the unit down for a short time (such as for inspection or service). Shut of the service switch in the main control panel then turn off the main disconnect.

2. Re-Startup after Temporary Shutdown

   a) Turn on main disconnect for the unit.

   b) After the crankcase oil is warm again, turn on service switch.

3. Extended Shutdown
   Note: Leaving the main power on will keep the crankcase heaters energized and will not harm the system.

4. Re-Start After Extended Shutdown

   a) If the main power was off, re-connect main power and allow 24 hours for crankcase heaters to work prior to start-up of compressors.

   b) If main power was left on, check to ensure the crankcase heaters are still operating. If not, replace them and allow at least 24 hours before starting the compressor.

   c) Follow the steps in the initial start-up procedure.

CHARGING INSTRUCTIONS

Charging a system should be done at design conditions. Refer to the submittal record for details. Condenser air flow can be temporarily restricted to simulate this condition. The following describes systems that do not use a refrigerant reheat coil.

Raise the head pressure to a saturated discharge pressure that corresponds to 130°F (54°C). Charge refrigerant into the system slowly until the system sight glass is clear. The system must be at design air flow and load.

If the system is equipped with an Engineered Air Intercooler sight glass only, raise the head pressure to a value corresponding to 130°F (54°C). Charge system until the flash intercooler sight glass is clear. Add additional refrigerant until the liquid line entering the intercooler is subcooled 5°F (2.7°C).

REHEAT SYSTEMS

Reheat systems operate by controlling the flow of liquid refrigerant (not gas).

All circuits with an auxiliary condenser (reheat or pool heat plus standard condenser) will have a receiver. Subcooling will be accomplished with either a dedicated subcooling circuit in the bottom of the reheat coil, or with an Engineered Air Intercooler. The sight glass should be clear of bubbles during stabilized operation.

When the system switches modes from reheat to the outdoor coil or vice versa, it is normal for the sight glass to bubble until the system has stabilized. The sight glass may take several minutes to stabilize after a mode change.

BEFORE ADDING REFRIGERANT CHECK THE FOLLOWING:

1. Make sure the system has not experienced a mode change in the last several minutes.

2. Check to make sure that the coil bleed solenoid valves are energized on the inactive condenser coil.

3. The bleed solenoid valve or the internal bleed port in the three-way heat reclaim valve is designed to recover the refrigerant from the inactive coil and move it to the suction line when the coil is not in use. If the check valve leaks or the bleed solenoid is inoperative; the inactive coil will trap and hold refrigerant and the rest of the circuit will be out of gas.

4. To check for refrigerant in the inactive coil, install a refrigerant gauge on the inactive condenser coil (reheat, pool heat or condenser coil) and check the pressure. When the coil has been off for a long time, the pressure in the coil should be the same as the suction pressure.

5. If the pressure is higher than suction pressure, cycle the heat reclaim valve to the other condenser coil. Check the sight glass. If the bubbles go away, the system has enough refrigerant, and it was being trapped in the idle coil. Investigate the reason and repair. If the glass still bubbles, leak check the system, locate and repair the leak. Evacuate and recharge refrigerant as described in the charging section.

MAINTENANCE

Warning:	**This unit is connected to high voltages. Electrical shock or death could occur if instructions are not followed. This equipment contains moving parts that can start unexpectedly. Injury or death could occur if instructions are not followed. All work should be performed by a qualified technician. Always disconnect and lock out power before servicing. DO NOT bypass any interlock or safety switches under any circumstances.**

Warning:	**Follow the cleaning instructions and recommended inspection schedule to reduce the risk of mold or other bacterial growth. Property damage or personal injury claims may result from mold or biological growth arising from improper installation, inadequate maintenance, or failure to inspect. Engineered Air has no responsibility for and makes no express or implied warranties regarding mold or bacterial growth or any other indoor air quality issues. If mold or biological growth is present, determine and fix the cause. Properly remove and dispose of the contamination. Properly clean and sanitize the affected area using only approved sanitizers suitable for HVAC equipment.**

To provide a maintenance history, It is recommended that the owner have a maintenance file for each unit. **The following maintenance instructions are to be carried out each spring and fall or as otherwise indicated by qualified service personnel.**

Caution:	**Label all wires prior to removal when servicing controls or critical components. Wiring errors can cause improper and dangerous operation.**
	Verify proper operation after servicing.

ELECTRICAL

1. Check all wiring for loose connections.
2. Check voltage at unit (while in operation).
3. Check amperage draw against unit rating plate.
4. Where possible, all contactors should be inspected to ensure that contacts are clean and are making good contact. If contacts are abnormally pitted or burned badly, replace contactor. Single phasing and motor burnouts can result from bad contacts.

BELT ADJUSTMENT

For maximum belt and bearing life, pulley alignment and belt tension must be properly maintained. Only replace with belts of the proper type and size.

NOTE: If belts are too tight or improperly aligned, the life expectancy of the motor(s), fan bearings and belt(s) are reduced.

Alignment: Pulleys must be aligned to within 1/16" per foot (1mm per 760mm) of span.

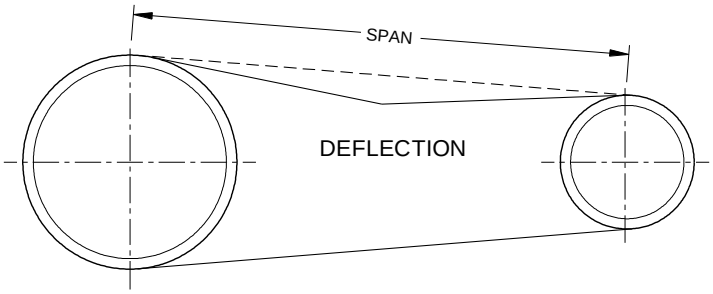
FOR FANS EQUIPPED WITH SPIDER BRACKETS:

A properly adjusted V-belt rides the inside of the pulley faces. Because the sides of the belt wedge in the pulleys, the V-belt does not have to be extremely tight. It should be as loose as possible without slipping in the pulley grooves.

Belt deflection: 3/4 " (19mm) for each foot (300mm) of span between the pulleys.

FOR FANS EQUIPPED WITH PILLOW BLOCK BEARINGS:

Belt Deflection: Allow 1/64" (0.4mm) of deflection for each 1" (25.4 mm) of span length.



Caution:

⚠ **Excessive belt tension is the most frequent cause of belt wear, bearing wear and noise.**

SET SCREWS

Check set screws on fan wheel, fan bearings, fan and motor pulleys for looseness on the shaft. Tighten where required. IT IS IMPORTANT TO PERFORM THIS CHECK BEFORE INITIAL START-UP, AFTER A RUN-IN PERIOD OF 2 WEEKS AND THEN ON 4 MONTH INTERVALS.

Caution:

⚠ **Caution: overtightening set screws can damage bearings.**

BEARING SETSCREW TORQUES

Table 1

Shaft diameter	NTN	KOYO	NTN	KOYO	DODGE
Type	UC SERIES (set screw)		UK SERIES (adapter sleeve locknut)		SC 203-215 SERIES
3/4" (19mm)	35 in-lb (3.9 Nm)	35 in-lb (4.0 Nm)	Install the washer and lock nut; tighten the nut fully by hand. Apply a punch or screw driver into the notch of the nut and tap it with a hammer. Stop tapping after the nut has turned 60° to 90°. Do not strike the seal. Bend the tab on the rim of the washer, which is in line with the notch of the nut. If a tab does no line up with a notch, tighten the nut further. DO NOT BACK THE NUT OFF.		66 - 80 in-lb (7.5 - 9 Nm)
1" (25mm)	35 in-lb (3.9 Nm)	35 in-lb (4.0 Nm)			126 -156 in-lb (14 - 18 Nm)
1 3/16" (30mm)	43 in-lb (4.9 Nm)	35 in-lb (4.0 Nm)			126 -156 in-lb (14 - 18 Nm)
1 7/16" (37mm)	51 in-lb (5.8 Nm)	75 in-lb (8.5 Nm)			126 -156 in-lb (14 - 18 Nm)
1 11/16" (43mm)	69 in-lb (7.8 Nm)	75 in-lb (8.5 Nm)			228 -272 in-lb (26 - 31 Nm)
1 15/16" (49mm)	69 in-lb (7.8 Nm)	155 in-lb (17.5 Nm)			228 -272 in-lb (26 - 31 Nm)
2 3/16" (56mm)	87 in-lb (9.8 Nm)	155 in-lb (17.5 Nm)			228 -272 in-lb (26 - 31 Nm)
2 7/16" (62mm)	147 in-lb (16.6 Nm)	155 in-lb (17.5 Nm)			228 -272 in-lb (26 - 31 Nm)
2 11/16" (68mm)	173 in-lb (19.6 Nm)	248 in-lb (28.0 Nm)			228 -272 in-lb (26 - 31 Nm)
2 15/16" (75mm)	173 in-lb (19.6 Nm)	248 in-lb (28.0 Nm)			228 -272 in-lb (26 - 31 Nm)

Refer to bearing manufacturers literature for all other types of bearings.

CONDERSER FANS

It is recommended that all condenser fan set screws be inspected at least once a year. Check set screws to ensure tightness according to recommended torque values below.

Condenser Fan Type	Torque Setting (in.lbs)
LAU	150-165
REVCOR	120-150
HESSAIRE	100-120

LUBRICATION OF FAN BEARINGS

Pool dehumidifier equipment bearings are susceptible to airborne chemical attack. The following tables are suggested, and based on a 24 hour operation. Actual lubrication schedules should be determined on an individual basis.

Some fans have permanently lubricated sealed ball bearings which should not require lubrication. These bearings are factory packed 30 to 50% full. Bearings that require lubrication should be greased while the bearing is rotating slowly, with the following quantities of a lithium base lubricant. DO NOT OVERGREASE. DO NOT USE NON-LITHIUM BASED GREASE.

Extended lubrication lines may be provided. Tubing is not factory filled.

RECOMMENDATIONS FOR BALL BEARINGS

Bearing Temperature ° F (°C)	Re-Greasing Interval
	Dusty & Wet
Under 120 (50)	2 Months
Under 158 (70)	2 Weeks

Shaft Dia.	3/4" (19mm)	1" (25mm)	1 3/16" (30mm)	1 7/16" (37mm)	1 11/16" (43mm)	1 15/16" (49mm)	2 7/16" (62mm)	2 15/16" (75mm)
Grease	0.06 oz. (1.8g)	0.12 oz. (3.3g)	0.20 oz. (5.6g)	0.23 oz. (6.5g)	0.27 oz. (7.7g)	0.36 oz. (10.3g)	0.53 oz. (14.9g)	1.00 oz. (31.0g)

For additional information refer to the fan and/or bearing manufacturers' literature.

LUBRICATION OF DODGE FAN BEARINGS

Suggested Re-lubrication Schedule (Months)* for **Dodge Ball Bearing Pillow Block**

Speed (RPM)	500	1000	1500	2000	2500	3000	3500	4000	4500
Shaft DIA.									
½" - $1\frac{1}{16}$"	3	3	2 ½	1 ½	1 ½	1	1	1	½
$1\frac{15}{16}$" – $2\frac{7}{16}$"	3	2 ½	2	1	1	½	½	½	½
$2\frac{11}{16}$" – $2\frac{5}{16}$"	2 ½	2	1 ½	1	½	½	½		
$3\frac{7}{16}$" – $3\frac{15}{16}$"	½	1 ½	1	½	½				

* Suggested initial greasing interval. If safety permits, re-lubricate while running until some purging occurs at seals. Adjust lubrication frequency depending on condition of purged grease. Hours of operation, temperature and surrounding conditions will affect the re-lubrication frequency required.

Lubricate with a multipurpose NLGI No. 2 or No. 3 ball bearing grease having rust inhibitors, antioxidant additives and a minimum viscosity of 500 SSU at 100°F (38°C). Some examples of grease having these properties are:

Shell	Alvania RL 2
Mobil	Mobilith SHC220
Exxon	Ronex MP

Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

Suggested Re-lubrication Schedule (Months)* for **Dodge Spherical Roller Bearing - Solid Pillow Block**

Speed (RPM)	500	1000	1500	2000	2500	3000	3500	4000	4500
Shaft DIA.									
3/16" – 1 7/16"	3	2	2	1	½	½	½	½	¼
11/16" – 2 3/16"	2	2	2	½	¼	¼	¼	¼	¼
7/16" – 3 7/16"	1 ½	1	½	¼	¼				
15/16" – 4 15/16"	1 ½	½	¼						

Suggested initial greasing interval. If safety permits, re-lubricate while running until some purging occurs at seals. Adjust lubrication frequency depending on condition of purged grease. Hours of operation, temperature and surrounding conditions will affect the re-lubrication frequency required. For 24 hour operation double the lubrication frequency.

Lubricate with a multipurpose roller bearing NLGI No. 2 having rust inhibitors and antioxidant additives, and a minimum oil viscosity of 500 SSU at 100°F. Some examples of grease having these properties are:

Shell	Alvania No. 2
Mobil	Mobilith AW2
	Mobilith SHC100
Texaco	Premium RB2
American	Rykon Premium 2

Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

Suggested Re-lubrication Schedule (Months)* for **Dodge Spherical Roller Bearing – Split Pillow Blocks**

Speed (RPM)	500	750	1000	1500	2000	2500	3000	3500	4000	** oz.
Shaft DIA.										
1 7/16" – 1 15/16"	3	2	2	2	2	1	1	½	½	0.05
2 3/16" – 2 11/16"	3	2	1	1	1	1	¼			0.75
2 15/16" – 3 15/16"	2	2	2	1	1	½	¼			2.00
4 7/16" – 4 15/16"	2	2	1	½	¼					4.00
5 7/16" – 5 15/16"	2	2	½	½						7.00

* Suggested initial greasing interval. Remove bearing cap and observe condition of used grease. Adjust lubrication frequency as needed. Hours of operation, temperature and surrounding conditions will affect the re-lubrication frequency required. Clean and repack bearing annually (or more often, if required). Remove old grease, pack bearing full and fill housing reservoirs on both sides of bearing to bottom of shaft.

** Grease to be added at each interval.

Lubricate with a multipurpose roller bearing NLGI No. 2 having rust inhibitors and antioxidant additives, and a minimum oil viscosity of 500 SSU at 100°F. Some examples of grease having these properties are:

Shell	Alvania No. 2
Mobil	Mobilith AW2
	Mobilith SHC100
Texaco	Premium RB2
American	Rykon Premium 2

Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

Static Oil Lubrication

Use only highest quality mineral oil with a minimum viscosity of 100 SSU at the oil's operating temperature. The oil's operating temperature is approximately 10°F greater than the bearing's housing. SAE values having this viscosity at the following operating temperature are:

150° - SAE 20 160° - SAE 30 180° - SAE 40

Static oil level should be at the center of the lower-most roller (do not overfill).

MOTOR LUBRICATION

Refer to motor manufacturer for lubrication recommendations.

On motors having grease drain plugs, remove the plugs and operate the motor for 15 minutes before replacing plugs. **DO NOT OVER GREASE.**

Recommended motor lubrication intervals:

Hours Service per Day	Up to 7.5 Hp Up to 5.6 kW	10 to 40 Hp 7.5 to 29.8 kW	Over 40 Hp Over 29.8 kW
Less than 12	5 Years	3 Years	1.5 Years
More than 12	2 Years	1 Year	9 Months

NOTE: Motors that run in severe conditions should be greased as specified by the motor manufacturer.

FILTERS

Filter-changing intervals can be based on the pressure drop across the filter, or by calendar scheduling, or visual inspection. Scheduled intervals should be between one and six months, depending on the pollutant loading from indoor and outdoor air. More-frequent changes may be required during the economizer season.

Extra attention must be made to filters in pool environments due to high levels of moisture and chlorine. Increased replacement frequency is often required and can only be determined on an individual basis. Check filters weekly to establish a replacement schedule.

Warning:
⚠ **Failure to maintain filter quality may cause building damage, injury or death, poor air quality or other problems.**

Units that operate with high levels of outside air should have filters removed (or moved to winter filter location if available) during the winter months in areas that have heavy frost or snow.

Plugged or excessively dirty filters can cause damage to the equipment. See submittal record for filter quantities, sizes and types. Use same size and type for replacement.

High Velocity Permanent:

It is important that the filters be checked and cleaned regularly during the period immediately following installation, in order to determine the best service interval. To clean, rinse with water. Shake off excess water and re-install. These filters do not require an oil adhesive.

Pleated Throwaway and/or Replaceable Media (Cartridge, Bag):

Replacement filters can be obtained from any Engineered Air representative.

In some applications the used filters/media may contain chemical or biological hazards. All local, regional and national regulations for safety and disposal should always be followed.

VFD ENCLOSURE

Filters may be located on the air inlet of VFD enclosures. Filter-changing intervals can be based on calendar scheduling or visual inspection. Scheduled intervals should be between one and six months, depending on the pollutant loading in the enclosure area.

CONTROLS

Annually clean and recalibrate all controls, check for proper operation, and repair or replace any faulty controls. Check all damper hardware settings every three months. Replace blown fuses with equivalent size and type fuse. Failure to do so can result in damage to the unit.

CONTROL ENCLOSURE VENTILATION

Control enclosures are often ventilated to provide component cooling. Semi-annually check the fan, filter and controls for correct operation.

OUTDOOR AIR INTAKES, MIXING SECTIONS AND DAMPERS

Outdoor air intakes, screens, and adjacent areas shall be checked semi-annually for cleanliness, integrity and proper operation. Adjust dampers where required. The DX coil bypass damper must be adjusted according to directions stated on the submittal record. Failure to set correctly could result in inadequate dehumidification or coil freezing.

COILS

Inspect coils and drain pans for cleanliness and biological growth regularly (every 2-3 months).

Warning: ⚠	**Dirty coils can be a cause of poor air quality. Failure to maintain clean coils can cause injury or death, damage to the equipment, property damage or system operational problems. Moisture carry over can result from dirty coils.**

The external surface of finned coils can be cleaned using a low pressure water spray and a brush. Coil fins are easily damaged. Do not use high pressure steam or water to clean coils; it will permanently damage the coil. When using cleaning additives or solutions they must be compatible with the coil materials or coatings. Use a fin comb to straighten any damaged or bent fins.

COIL WINTERIZATION

Water coils that are not in use must be protected from freezing. Coils should be drained and blown out with compressed air and then filled and drained several times with appropriate strength pre-mixed inhibited HVAC glycol or other suitable fluid.

COATING MAINTENANCE

Most natatorium HVAC equipment will have an epoxy interior coating. Regularly inspect the coating for integrity. Touch up epoxy paint is readily available from a variety of coating suppliers.

Heresite® is an air-dried phenolic coating used to protect metals from corrosion typically applied to piping and coils. Inspect once per year or more often as required. Clean with low pressure air and vacuum with a soft brush. Low pressure, chemical free water may be used.

Repair Instructions:

1) Ensure surfaces are completely dry.
2) Use a nylon brush to remove any loose scale.
3) Roughen up areas to be repaired with a wire brush.
4) Vacuum fins or the affected area to ensure any loose residue is gone.
5) Spray or brush Heresite® S-440 solvent* (or any equivalent cleaner) to dissolve any oils or grease.
6) Again, vacuum the affected area.
7) Allow one hour for the solvent to dissolve completely.
8) Cover areas not requiring repair with plastic (or equivalent) and masking tape.

9) Using Heresite® VR-554-T* coating spray all affected areas from different angles to ensure complete coverage. Apply 2-3 full coats. Let dry 3 to 4 hours between coats.
10) Allow Heresite® to cure 24 hours before putting equipment back into service.

* Review the MSDS documentation included with the solvent and coating spray.

HEATING

Follow maintenance procedures for applicable Pack, DJ(E), DG, RT, HE , LM-K electric heat section etc.

REFRIGERATION

Seasonal Maintenance

1. On semi-hermetic and screw compressors, check compressor oil level and add refrigerant oil if necessary.

2. Check operating temperature and pressures.

3. On units with sight glasses, check for leaks. There should be no foaming under steady state operation.

Condensing Section:

Water Cooled - With time, condensers can foul with mineral deposits from the water, resulting in a reduced heat transfer capacity and increased refrigerant head pressure. Should this condition occur, the condenser coil should be chemically cleaned or replaced.

Air Cooled – The external surface of finned coils can be cleaned using a low pressure water spray and a brush. Coil fins are easily damaged. Do not use high pressure steam or water to clean coils; it will permanently damage the coil. When using cleaning additives or solutions they must be compatible with the coil materials or coatings. Use a fin comb to straighten any damaged or bent fins.

1. Inspect refrigerant lines for evidence of oil leaks.

2. Check condenser fans and tighten set screws.

NOTE: Air flow is restricted by dirty coils, dirty filters, slipping fan belts etc. This will reduce cooling capacity and coil frosting can occur.

ROTOLOCK FITTINGS

It is recommended that systems with compressor Rotolock fittings be checked for tightness according to compressor manufacturers recommended torque at the start of every cooling season. If the fittings are found to be loose, they may need to be re-torqued at increased intervals.

PRESSURE CONTROLS

Encapsulated pressure controls have fixed settings and are not adjustable. Most pressure controls have the setpoint marked directly on the control. The following table shows typical cut in and cut out setpoint using saturated temperature; refer to refrigerant specific saturated temperature/pressure tables to convert to pressure.

TYPICAL SETTINGS (Saturated Temperature)

Pressure Controls	Cut In	Cut Out
Low Pressure	35°F (1.7°C)	15°F (-9.4°C)
High Pressure	Manual	150°F (65.6°C)
High Pressure (Water Cooled)	105°F (40.6°C)	125°F (51.7°C)
Condenser Fan	Various settings to maintain saturated condensing temperature between 85°F to 125°F (29.4°C to 51.7°C)	

Note: Specialized applications or different refrigerants may have pressure control settings outside typical settings. Refer directly to mounted pressure controls; wiring diagram and/or unit function for specific details.

Note: Equipment with a receiver can use high pressure controls with the lower setting of than that noted above, the maximum rated working pressure of the receiver, 90% of the pressure relief valve rating.

TROUBLE SHOOTING

Unit not operating properly, high humidity in room	Humidistat turned off / set too low.	Turn humidistat on and set to desired RH% level, usually around 50-60%.
	Air filters dirty.	Replace filters.
	Pool water temperature too high.	Lower pool water temperature usually between 78-82°F. Usually 2-4°F below room air temperature.
	Blower belt loose and slipping.	Check belts and replace or adjust as necessary.
	Airflow across evaporator coil is too high.	Increase opening of coil bypass damper.
	Poor RH% sensor location.	Move sensor.
Compressor does not start.	Compressor off as a result of internal overload.	Allow to cool, reset automatic.
	High pressure switch tripped.	Press control reset button, and check operating pressures. Clean outdoor condenser coil and reheat coil.
	Low pressure switch tripped.	Check refrigerant charge.
	Compressor discharge temperature switch tripped.	Reset switch, and check refrigerant charge.
Ice formation on evaporator coil.	Cold inlet temperature.	Raise the entering air temperature.
	Air filters dirty.	Replace filters.
	Low air flow.	Check belts and replace or adjust as necessary.
	Low refrigerant charge.	Repair leak and adjust refrigerant charge. See charging procedure.
	Expansion valve not working.	Adjust sensing bulb location, replace expansion valve.
	Bypass damper not set correctly.	Reduce bypass opening.
High suction pressure.	Return air temperature too high.	Lower room temperature.
	Too much airflow through evaporator coil.	Increase opening of coil bypass damper.
Low suction pressure.	Refrigerant charge too low.	Adjust the refrigerant charge.
	Low air flow.	Check belts and replace or adjust as necessary.
	Return air temperature too low.	Increase room air temperature to between 78-82°F (typical).
	Air filters dirty.	Replace filters.
High head pressure.	Condenser or reheat coil dirty.	Clean coil.
	Inadequate water flow through pool water heat exchanger (if equipped).	Increase water flow.

START UP RECORD

Model:					
All shipping material removed.					
All fan, bearing and pulley setscrews checked for tightness.					
Incoming power Voltage measurements:				Phase 1-2	V
				Phase 2-3	V
				Phase 3-1	V
Rotation correct.					
Amperage measurements:	Phase 1	Phase 2	Phase 3	Compressor refrigerant pressure measurements	
				Suction	Discharge
Compressor 1				psig	psig
Compressor 2				psig	psig
Compressor 3				psig	psig
Compressor 4				psig	psig
Compressor 5				psig	psig
Compressor 6				psig	psig
Compressor 7				psig	psig
Compressor 8				psig	psig
Condenser fan 1					
Condenser fan 2				Ambient Temperature:	
Condenser fan 3					
Condenser fan 4					
Condenser fan 5					
Condenser fan 6					
Condenser fan 7					
Condenser fan 8					
Condenser fan 9					
Condenser fan 10					
Condenser fan 11					
Condenser fan 12					
Start-Up Completed By:					
Technician: Company				Company	
Note: Not all units have all of the components listed in the Start-Up Record.				Nov 04	