

## Installation, Operation and Maintenance Manual

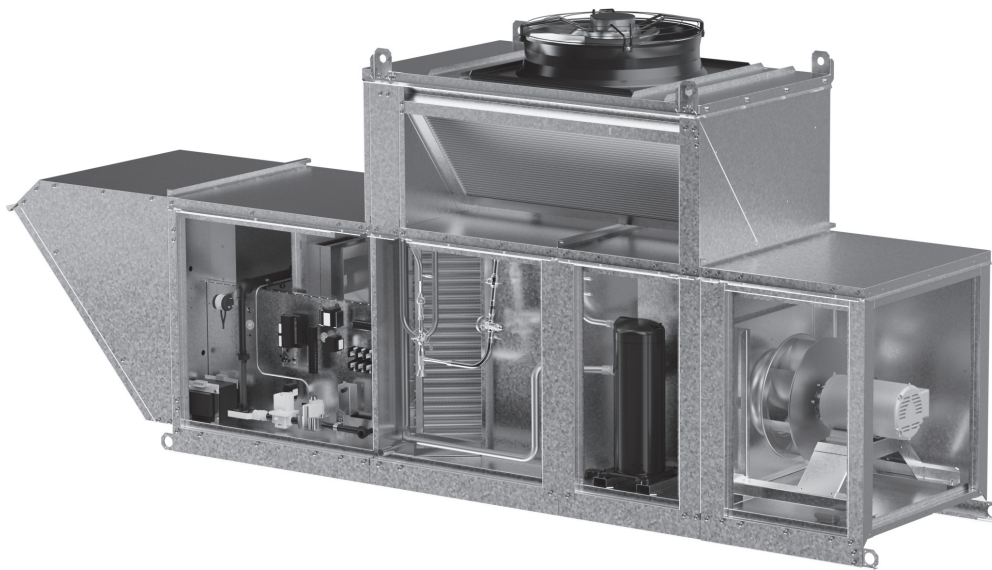
Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.

### As used in Greenheck models

- DGX
- MSX



Refrigerant  
Safety Group  
A2L



## General Safety Information

### ⚠ WARNING

For A2L appliance only. LEAK DETECTION SYSTEM installed. Unit must be powered except for service.

### ⚠ WARNING

This unit is equipped with electrically powered safety measures. To be effective, the unit must be electrically powered at all times after installation, other than when servicing.

### ⚠ WARNING

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).

Do not pierce or burn.

Be aware that refrigerants may not contain an odor.

### DANGER

- Always disconnect power before working on or near this equipment. Lock and tag the disconnect switch or breaker to prevent accidental power up.
- If this unit is equipped with optional gas accessories, turn off gas supply whenever power is disconnected.

### CAUTION

This unit is equipped with a compressed refrigerant system. If a leak in the system should occur, immediately evacuate and ventilate the area.

An EPA Certified Technician must be engaged to make repairs or corrections. Refrigerant leaks may also cause bodily harm.

### CAUTION

When servicing the unit, the internal components may be hot enough to cause pain or injury. Allow time for cooling before servicing.

## General Safety Information

Only qualified personnel should install and maintain this system. Personnel should have a clear understanding of these instructions and should be aware of general safety precautions. Improper installation can result in electric shock, possible injury due to coming in contact with moving parts, as well as other potential hazards. Other considerations may be required if high winds or seismic activity are present. If more information is needed, contact a licensed professional engineer before moving forward.

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC), the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electrical Code (CEC) in Canada.
2. Unit must be securely and adequately grounded.
3. Verify that the power source is compatible with the equipment.
4. Never open access doors to the unit while it is running.

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## Receiving

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This module is installed as a component of a make-up air unit and does not require any special handling. Refer to the Receiving portion of the unit Installation, Operation and Maintenance (IOM) Manual for complete instructions on receiving, unpacking and handling.

### Unpacking

The unit is shipped as a complete installed unit. Protective coverings have been installed on the face of the condenser coil that should be left in place until installation of the unit is complete. The only item shipped loose with the unit is the P Trap kit. Verify that the P Trap kit has been received. Refer to Unpacking instructions in unit IOM.

### Handling

Units are to be rigged and moved by the lifting brackets provided. Do not forklift. Refer to the Handling portion of the unit IOM for complete instructions on handling.

### Storage

#### **⚠ WARNING**

The storage of the appliance should be in accordance with the applicable regulations or instructions, whichever is more stringent.

Units are protected against damage during shipment. If the unit cannot be installed and operated immediately, precautions need to be taken to prevent deterioration of the unit during storage. The user assumes responsibility of the unit and accessories during storage. The manufacturer will not be responsible for damage during storage. The following suggestions are provided solely as a convenience to the user.

### Inspection and Maintenance During Storage

While in storage, inspect units once per month. Keep a record of inspection and maintenance performed. If moisture or dirt accumulations are found on the parts, the source should be located and eliminated. At each inspection, rotate all moving parts by hand ten to fifteen revolutions to distribute lubricant on motor and bearings. If paint deterioration begins, consideration should be given to touch-up or repainting. Units with special coatings may require special techniques for touch-up or repair.

Machined parts coated with rust preventative should be restored to good condition promptly if signs of rust occur. Immediately remove the original rust preventative coating with petroleum solvent and clean with lint-free cloths. Polish any remaining rust from the surface with crocus cloth or fine emery paper and oil. Do not destroy the continuity of the surfaces. Wipe clean thoroughly with Tectyl® 506 (Ashland, Inc.) or the equivalent. For hard to reach internal surfaces or for occasional use, consider using Tectyl® 511M Rust Preventative or WD-40® or the equivalent.

## Product Overview

The Packaged DX Module for make-up air is a horizontally configured unit that is installed as a complete package that has been designed for outdoor installations. The Packaged DX Module is used to temper the air that is supplied to the building. The make-up air unit is designed to provide supply air to replace the air that is exhausted from the building. The PDX module is designed to provide only cooling.

The DX system comes fully charged with R-454B refrigerant from the factory and is ready for operation upon arrival.

### Compressed Refrigerant

All packaged DX modules are charged with environmentally friendly R-454B compressed refrigerant. Do not use tools or parts designed for other refrigerants on this unit.

### Safety Listing

Make-up air units are listed per UL60335-2-40 and are ETL Certified.

### Supplemental Installation, Operation and Maintenance Manuals

Refer to the Installation, Operation and Maintenance manual for the Make-Up Air unit for additional information.

### Models and Capacities

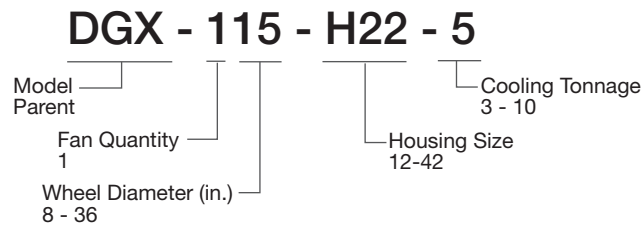
The Packaged DX Module for make-up air units is manufactured

Platform	Tonnage	Circuiting
H12	3, 5, 8, 10	Single

in several different output tonnage options. Examine shipping documents to verify correct model of the module as received.

### Model Number

A metal plate is located on the fixed panel access to the control center. The plate is marked with the Platform type and tonnage.



**Example of Model Name**

## Subassemblies

### Coils

Every module is supplied with a single DX evaporative coil. Single or dual condenser coils are attached to the top of the module with a single condensing fan. All units are single circuit configuration.

### DX System

The DX system in the module is a complete, sealed unit with compressed R-454B refrigerant. It consists of one compressor, evaporator and condenser coils and the following integral components:

- expansion valves
- liquid line filter-drier
- service / charging valves
- moisture indicating sight glass
- crankcase heater on compressor
- hot gas bypass valve

Each DX system incorporates the following:

- high pressure manual reset cutout
- low pressure auto-reset cutout

# Installation

## ⚠ WARNING

If appliances connected via an air duct system to one or more rooms with A2L REFRIGERANTS are installed in a room with an area less than the minimum room area shown in Table A, that room shall be without continuously operating open flames (e.g. an operating gas appliance) or other POTENTIAL IGNITION SOURCES (for example an operating electric heater, hot surfaces). A flame-producing device may be installed in the same space if the device is provided with an effective flame arrest. Additional ventilation is required in accordance with ASHRAE 15.

## ⚠ WARNING

Warning, for appliances using A2L refrigerants connected via an air duct system to one or more rooms, minimum circulation airflow is required to prevent refrigerant stagnation in the event of a refrigerant leak. Open all VAV appliances or zoning dampers to allow for airflow at or above the minimum airflow in Table A.

## ⚠ WARNING

For appliances using A2L refrigerants connected via an air duct system to one or more rooms of insufficient floor space as determined in Table A, additional ventilation is required in accordance with ASHRAE 15.

## ⚠ WARNING

For appliances using A2L REFRIGERANTS connected via an air duct system to one or more rooms, Auxiliary devices which may be a POTENTIAL IGNITION SOURCE shall not be installed in the duct work. Examples of such POTENTIAL IGNITION SOURCES are hot surfaces with a temperature exceeding 700°C and electric switching devices.

## ⚠ WARNING

For appliances using A2L refrigerants connected via an air duct system to one or more rooms, only auxiliary devices approved by the appliance manufacturer or declared suitable with the refrigerant shall be installed in connecting ductwork.

## ⚠ WARNING

For duct connected appliances, false ceilings or drop ceilings may be used as a return air plenum if any external connections are also provided with a refrigerant sensor immediately below the return air plenum duct joint.

## Installation Requirements

Where minimum room areas, minimum airflows and conditioned space areas are defined, the following tables can be utilized to verify the installation in accordance with the releasable charge within a unit. Ensure that the correct table is referenced for the refrigerant utilized in the appliance.

Note: The releasable charge is the maximum refrigerant charge of one circuit within an appliance when more than one circuit is present. An example of a two-circuit system would be a charge of 10 pounds (4.53 kg) in circuit A and a charge of 20 pounds (9.06 kg) in circuit B. The releasable charge of this appliance would be 20 pounds (9.06 kg).

**Table A**  
**Minimum Airflow and Room Areas**  
**R-454B**

Releasable Charge - lbs (kg)	Minimum Airflow CFM (m <sup>3</sup> /hr)	Minimum Total Conditioned Room Area - ft <sup>2</sup> (m <sup>2</sup> )
4 (1.82)	109 (185)	65 (6)
5 (2.27)	137 (231)	76 (7)
6 (2.72)	163 (276)	97 (9)
7 (3.18)	191 (323)	108 (10)
8 (3.63)	217 (368)	130 (12)
9 (4.08)	244 (414)	140 (13)
10 (4.53)	271 (460)	151 (14)
11 (4.99)	299 (506)	173 (16)
12 (5.44)	326 (552)	183 (17)
13 (5.89)	352 (597)	205 (19)
14 (6.35)	380 (644)	216 (20)
15 (6.8)	407 (690)	227 (21)
16 (7.25)	433 (735)	248 (23)
17 (7.71)	461 (782)	259 (24)
18 (8.16)	488 (828)	280 (26)
19 (8.61)	515 (873)	291 (27)
20 (9.06)	542 (919)	302 (28)

Values defined above are in accordance with UL 60335-2-40.

Ensure all national, provincial and local safety codes are followed when installing this equipment including considerations for the installed location and building occupancy classification.



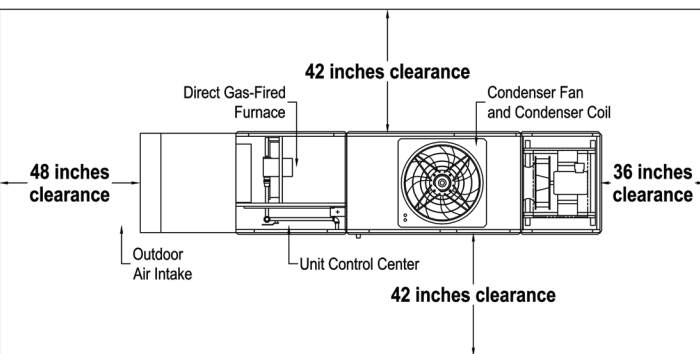
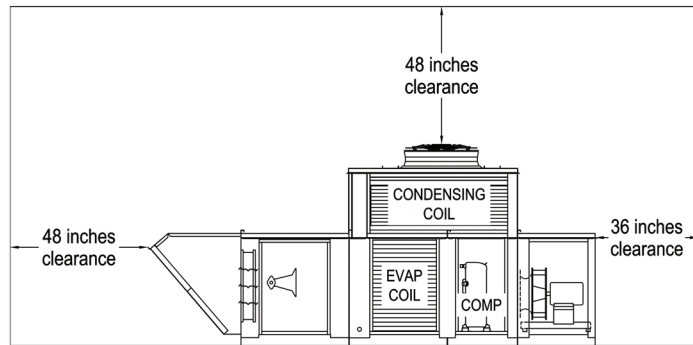
# Installation

## Service Clearances

All make-up air units require minimum clearances on all sides for routine maintenance. Filter replacement, drain pan inspection and cleaning, fan bearing lubrication and belt adjustment are all examples of routine maintenance that must be performed. Blower and motor assemblies and coil and filter sections are always provided with a service door or panel for proper component access. Clearances for component removal may be greater than the service clearances. Refer to submittal drawings for these clearance dimensions.

## Additional Clearances for Packaged DX Units

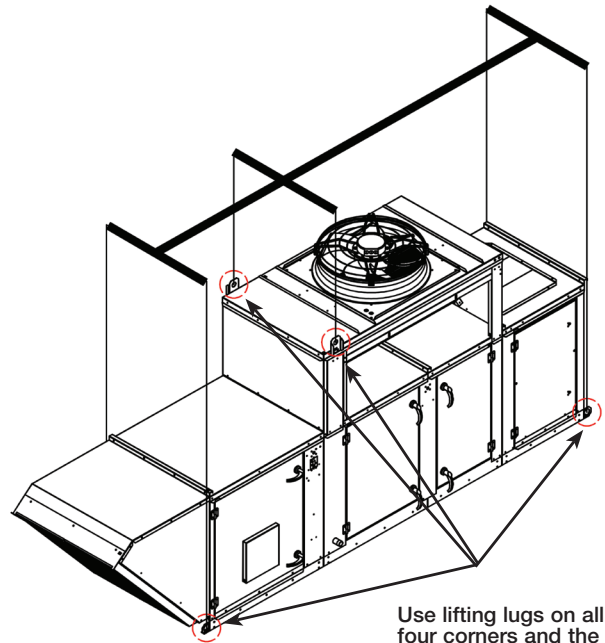
Packaged DX units require additional service clearance because they must have unrestricted air movement around the condenser coil and condenser fans. Hot air is being discharged from the condenser fans during operation and the more clearance available, the better, as this avoids the chance of recirculation or coil starvation. This unit should never be placed under an overhang or inside a building. A minimum of 48 inches above the condenser fans is recommended.



## Lifting

All units equipped with this module are provided with either four or six lifting lugs. **When the unit is being hoisted, all of the provided lugs must be used for support.** Four lifting lugs are on the four corners of the unit, located at the base. In addition, there may be two more lifting lugs located at the top of the unit. The locations of those two top lugs varies somewhat from unit to unit.

Use spreader bars as shown to prevent damage to the cabinet. If top-mounted lifting lugs are present, they must be used in conjunction with the bottom-mounted lifting lugs when hoisting the unit.



Use lifting lugs on all four corners and the two lifting lugs on the condensing module.

## Install Condensate Drain (P Trap)

The only installation step that is specific to the DX module is installation and priming of the engineered P trap. Locate the P trap kit that was shipped with the unit and install the kit in accordance with the enclosed instructions.



## Provide and Install Switch S4

Each Packaged DX unit requires a contact closure to enable the unit to run. This can be a user-supplied switch that may be a toggle switch mounted in a 2 x 4 inch electrical box (mounted in a position chosen by the user), or it may be a simple jumper or even a control switch installed in a remote control panel supplied by the factory. See also "Additional Control Components" on page 5 of this manual.

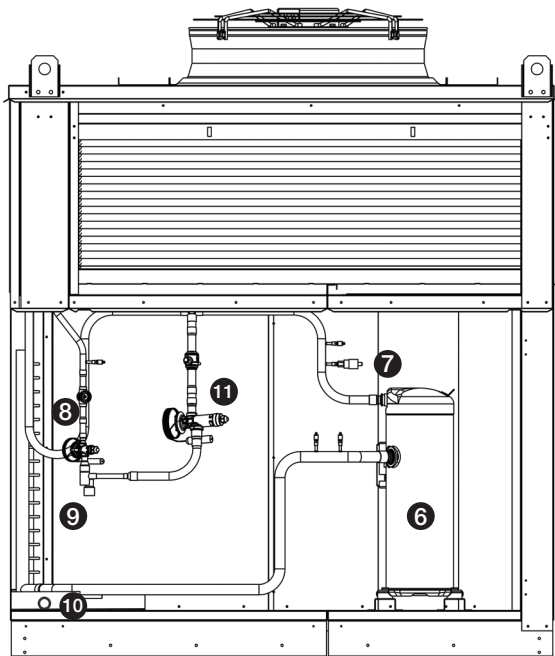
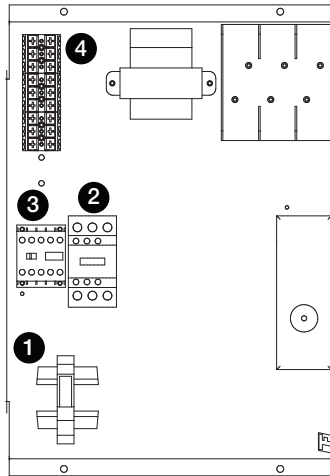
# Component Operation

## Compressor Components

Each Packaged DX module has a complete set of compressor contactors, condenser fan contactors, relays and certain integral safety controls located in the module.

### Electrical Components

1. Compressor Relays
2. Condenser Fan Contactor
3. Compressor Contactor
4. Low Voltage Terminal Strip

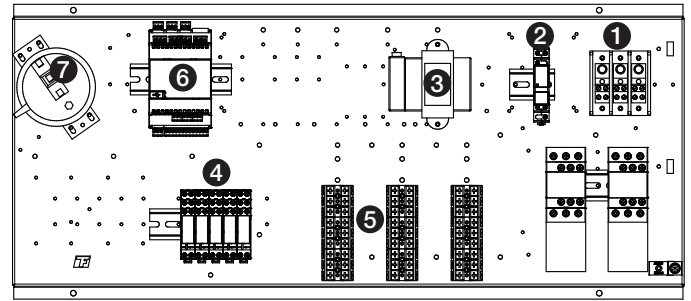


## Refrigerant Components

6. Compressor
7. High Pressure Sensor (Manual Reset)
8. Thermostatic Expansion Valve (TXV)
9. Refrigerant Distributor
10. Condensate Drain (P trap here)
11. Hot gas bypass valve

## Additional Control Components

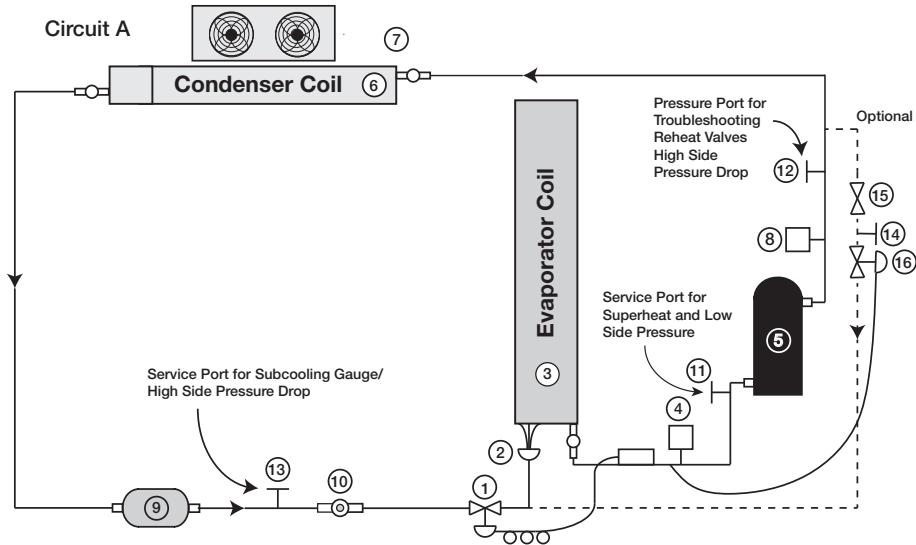
In addition to the control components located in the PDX module, various high- and low-voltage circuits are found in the make-up air unit control center. See the unit-specific wiring diagram (found in the unit control center) for complete information.



Typical Unit Control Center

1. Power Distribution Block - field-supplied power from main disconnect switch is terminated here.
2. Phase Monitor has jumpers going to power distribution block). Constantly checks for loss of a phase or phase reversal. Requires 24 VAC to operate. When a fault is detected, it cuts off the power supply to the low voltage terminal strip, disabling all motors. It has one red LED indicator light. Constant "ON" indicated properly applied power, If the LED is flashing, this indicated a "fault" connection.
3. Transformer provides 24 VAC to various low voltage devices including the Phase Monitor and to Low Voltage Terminal Strip in compressor compartment.
4. Relays RC1 and RC2 are wired to the control center in the compressor compartment.
5. Low Voltage Terminal Strip - Switch S4 terminates here.
6. Microprocessor Controller - factory programmed controller monitors and controls all aspects of the unit operation. Cooling is enabled when inlet air temperature rises above the cooling lockout setpoint (75F, adjustable). Cooling is cycled off if discharge temperature drops below 55F (adjustable).
7. Dirty Filter Switch - optional field-adjustable to monitor filter loading.

# Factory-Installed Refrigeration System Components



## 1. Thermostatic Expansion Valve (TXV)

Each unit is equipped with a Thermal Expansion Valve on each refrigerant circuit. The valve controls the flow of liquid refrigerant entering the evaporator coil by maintaining a constant, factory set superheat of 10°F. The valve is adjustable and is located on the side of the evaporator coil and can be accessed through the coil panel access door.

## 2. Refrigerant Distributor

Attached to the TXV is a refrigerant distributor. The refrigerant distributor evenly distributes the refrigerant to each circuit of the evaporator coil to provide optimum performance.

## 3. Evaporator Coil

The coil is located in the supply airstream. In the DX system, the liquid refrigerant is expanded in the TXV and it then flows through the evaporator coil. The refrigerant enters the coil as a low temperature liquid/gas where it eventually boils into a low temperature, low pressure gas prior to going into the compressor. As the refrigerant passes through the evaporator coil, it absorbs heat from the airstream. To ensure proper operation, the coil surface must be cleaned so that air movement over the coil provides the necessary heat transfer.

## 4. Low Limit Pressure Switch

The switch is installed in the suction line and disables the DX system when the suction pressure drops below the set point. The switch will auto-reset when the pressure rises above the auto-reset set point.

## 5. Compressors

## 6. Condensing Coil

## 7. Condenser Fans

## 8. High Limit Pressure Switch

The switch opens when refrigerant pressure increases above the set point in the liquid line and it then requires a manual reset.

## 9. Liquid Line Filter-Drier

The liquid line filter-drier prevents moisture and foreign matter from entering the expansion valve.

## 10. Moisture Indicating Sight Glass

During normal operating conditions, the sight glass should typically be liquid. Some gas is acceptable, but excessive bubbles may indicate improper charge or a leak in the system. The center dot indicates the moisture level in the refrigerant. A pink dot indicates moisture and needs to be dealt with. A blue dot indicates a dry system. A purple dot indicates caution – there may be moisture above 50 ppm in the system.

## 11-14. Access Ports

## 15. Hot Gas Bypass Manual Shut Off Valve

Used to disable hot gas bypass for service and troubleshooting procedures.

## 16. Hot Gas Bypass Valve

On units equipped with hot gas bypass, hot gas from the compressor is injected into the liquid line of the evaporator coil after the TXV.

**Valve Adjustment** - To adjust the valve, connect a pressure gauge to the suction line and block the entering air to the evaporator coil. The valve should begin to open when the suction pressure drops to approximately 100 PSIG for R-454B (the valve will feel warm to the touch). Adjustments are made by first removing the cap on the bottom of the valve and then turning the adjusting stem clockwise to increase the setting pressure (counterclockwise to decrease). Allow several minutes between adjustments for the system to stabilize. When adjustment is complete, replace the cap on the valve.



## Refrigeration System Service Requirements

Personnel working on appliances must be trained by a national training organization or manufacturer that are accredited to teach the relevant national competency standards that may be set in legislation.

The achieved competence should be documented by a certificate.

Work shall be undertaken under a controlled procedure to minimize the risk of a flammable gas or vapor being present while the work is being performed.

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available on hand. Have a dry powder or CO<sub>2</sub> fire extinguisher adjacent to the charging area.

No person carrying out work in relation to a refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance.

The following checks shall be applied to installations using flammable refrigerants:

- The actual refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed;

- The ventilation machinery and outlets are operating adequately and are not obstructed;
- If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
- Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;
- Refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised. Initial safety checks shall include:

- Capacitors are discharged, this shall be done in a safe manner to avoid possibility of sparking
- No live electrical components and wiring are exposed while charging, recovering or purging the system; that there is continuity of earth bonding.
- Sealed electrical components shall be replaced.
- Intrinsically safe components must be replaced.

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used. The following leak detection methods are deemed acceptable for all refrigerant systems. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be

# Refrigeration System Service Requirements

avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

If a leak is suspected, all naked flames shall be removed/extinguished. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Removal of refrigerant shall be according to Clause DD.9 of UL60445-2-40 4th edition or applicable standards.

## Removal and evacuation

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

safely remove refrigerant following local and national regulations;

- Evacuate;
- Purge the circuit with inert gas;
- Evacuate;
- Continuously flush or purge with inert gas when using flame to open circuit;
- Open the circuit.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems. For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant is within the system (optional for A2L). When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

## Charging procedures

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.

- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.
- Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

## Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

- A. Become familiar with the equipment and its operation.
- B. Isolate system electrically
- C. Before attempting the procedure, ensure that:
  - a. Mechanical handling equipment is available, if required, for handling refrigerant cylinders;
  - b. All personal protective equipment is available and being used correctly;
  - c. The recovery process is supervised at all times by a competent person;
  - d. Recovery equipment and cylinders conform to the appropriate standards.
- D. Pump down refrigerant system, if possible
- E. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- F. Make sure that cylinder is situated on the scales before recovery takes place.
- G. Start the recovery machine and operate in accordance with instructions.
- H. Do not overfill cylinders (no more than 80 % volume liquid charge).
- I. Do not exceed the maximum working pressure of the cylinder, even temporarily.
- J. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.

## Refrigeration System Service Requirements

- K. Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing flammable refrigerants, ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

### Recovery

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

### Adding Refrigerant to the System

Reference the Quick Start Guide for instructions on how to determine if additional refrigerant charge is necessary. Note additional refrigerant in the Charge Add section of the charge label and calculate the resulting charge in the Total Charge section.

REFRIGERANT: <span style="border: 1px solid black; padding: 2px;">R-454B</span>			
CIRCUIT	FACTORY CHARGE	FIELD CHARGE	TOTAL CHARGE
A	(lbs)	(lbs)	(lbs)
	(kg)	(kg)	(kg)
<b>MAXIMUM CHARGE PER CIRCUIT: X lbs (Y kg)</b>			
<b>LEAK DETECTION SYSTEM INSTALLED. UNIT MUST BE POWERED EXCEPT FOR SERVICE.</b>			
<b>THIS UNIT IS EQUIPPED WITH ELECTRICALLY POWERED SAFETY MEASURES. TO BE EFFECTIVE, THE UNIT MUST BE ELECTRICALLY POWERED AT ALL TIMES AFTER INSTALLATION, OTHER THAN WHEN SERVICING.</b>			

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### Refrigerant Leak Detection System

Unit is equipped with refrigerant leak detection sensors. In the event of a leak in the air tunnel, the unit will move stagnant refrigerant from within the unit, duct, and space ensuring proper dilution. Alarm outputs available for monitoring and external action requirements which includes opening of zone dampers in the ductwork, disabling duct mounted electric resistance heaters, and/or enabling mechanical ventilation if required. These outputs are available to the building management system or through hardwire mitigation system contacts in the unit control section.

Verification of the mitigation system response must be performed at start-up by removing the A2L mitigation test jumper found in the control section of the unit. Additional testing may be required by local code.

The refrigerant sensors installed in the appliance will initiate a safety sequence if a leak is detected. Maintain that the sensor is free of any dust or other contaminants. The alarm status is available in the form of an electronic signal from the appliance controller and a relay dry contact suitable for building safety sequences. The end of life of the sensor will result in the appliance operating and displaying that there is a leak detected, please reference the blink code on the bottom of the sensor and order a new sensor from the OEM.

Sensor blink code status:

Solid green = sensor power-up and self-test

Blinking green = normal operation (heartbeat)

Solid red = alarm state – gas detected

Blinking red = sensor fault – replace sensor

## Sequence of Operation with Optional Microprocessor Controller

The microprocessor controller will be located in the unit's main control center.

With a microprocessor controller, the compressor will be energized by the microprocessor. When the outside air temperature rises above the cooling lockout temperature set point (plus the differential), the microprocessor will energize the cooling as required to maintain the supply temperature set point.

The cooling lockout temperature set point is factory set to 75°F with a 5°F differential. The supply temperature set point is factory set to 70°F. The set points and cooling lockout differential are field-adjustable using the microprocessor keypad. For additional information on the microprocessor controller, please reference the Microprocessor Controller Installation, Operation and Maintenance Manual.



## Start-Up Unit

### DANGER

Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit to OFF at disconnect switch(es). Unit may have multiple power supplies.

### CAUTION

Use caution when removing access panels or other unit components, especially while standing on a ladder or other potentially unsteady base. Access panels and unit components can be heavy and serious injury may occur.

### CAUTION

Do not operate without the filters and birdscreens installed. They prevent the entry of foreign objects such as leaves, birds, etc.

### CAUTION

Do not run unit during construction phase. Damage to internal components may result and void warranty.

### WARNING

- Unit was factory tested. All blowers, fans, and compressors are set-up to run correctly when supplied power. If any one fan is running backwards or the compressor is making loud noises, immediately turn off the power. Switch two leads on the incoming power to the disconnect. This will ensure proper operation of the unit. Failure to comply may damage the compressors and void the warranty.
- Do not jumper any safety devices when operating the unit. This may damage components within or cause serious injury or death.
- Do not operate compressor when the outdoor temperature is below 40°F.
- Do not short-cycle the compressor. Allow 5 minutes between “on” cycles to prevent compressor damage.
- DX system is charged with refrigerant. Start-up must be performed by EPA Certified Technician.

### WARNING

Prior to starting up the unit, power must be energized for 24 hours without a call for cool to allow the compressor crankcase heaters time to boil off any liquid refrigerant present in the compressor.



# Start-Up Unit

Every installation requires a comprehensive start-up to ensure proper operation of the unit. As part of that process, the following checklist must be completed and information recorded. Starting up the unit in accordance with this checklist will not only ensure proper operation, but will also provide valuable information to personnel performing future maintenance. Should an issue arise which requires factory assistance, this completed document will allow unit experts to provide quicker resolve. Qualified personnel should perform start-up to ensure safe and proper practices are followed.

Unit Model No. \_\_\_\_\_

Unit Serial No. \_\_\_\_\_

Compressor 1 Model No. \_\_\_\_\_

Start-Up Date \_\_\_\_\_

Start-Up Personnel Name \_\_\_\_\_

Start-Up Company \_\_\_\_\_

Phone Number \_\_\_\_\_

## Pre-Start-Up Checklist

- Disconnect and lock-out all power switches.
- Remove any foreign objects that are located in the unit.
- Check all fasteners, set-screws, and locking collars on the fans, bearings, drives, motor bases and accessories for tightness.
- Rotate the fan wheels by hand and ensure no parts are rubbing.
- Filters can load up with dirt during building construction. Replace any dirty pleated filters and clean the aluminum mesh filters in the intake hood.
- Verify that non-motorized dampers open and close properly.
- Check the tightness of all factory wiring connections.
- Verify control wire gauge.
- Verify proper drain trap installation.
- Check condensing fans for any damage or misalignment. Spin the blades and make sure they don't contact any parts and are free turning without any resistance.
- Look over the piping system.
- Inspect all coils within the unit. Fins may get damaged in transit or during construction. Carefully straighten fins with a fin comb.
- This unit contains a crankcase heater for each compressor which needs power supplied to it 24 hours prior to start-up. If start-up is scheduled in 24 hours, unlock the disconnect power and energize unit.

## SPECIAL TOOLS REQUIRED

- Voltage Meter (with wire probes)
- Amperage Meter
- Pressure Gauges – (refrigerant)
- Tachometer
- Thermometer
- Incline manometer or equivalent

## Start-Up Procedure

The unit will be in operational mode during start-up. Use necessary precautions to avoid injury. All data must be collected while the unit is running.

- Ensure the Pre-Start-Up checklist is complete.
- Jumper R to G, R to Y1, and R to Y2 (if applicable) on the control board.
- Turn the disconnect on. After 3 minutes compressors will come on. Make sure all fans and compressors are rotating the correct direction.
- Allow the unit to run until the refrigerant system stabilizes. Approximately 5-10 minutes.

## Voltage Imbalance

In a 3-phase system, excessive voltage imbalance between phases will cause motors to overheat and eventually fail. Maximum allowable imbalance is 2%. To determine voltage imbalance, use recorded voltage measurements in this formula.

Key: V1, V2, V3 = line voltages as measured  
VA (average) =  $(V1 + V2 + V3) \div 3$   
VD = Line voltage (V1, V2 or V3) that deviates farthest from average (VA)

Formula: % Voltage Imbalance =  $[100 \times (VA - VD)] \div VA$



# Start-Up Checklist

Line Voltage. Check at unit disconnect.

L1-L2 \_\_\_\_\_ Volts      L2-L3 \_\_\_\_\_ Volts      L1-L3 \_\_\_\_\_ Volts

## Condensing Fans

Condensing Fan 1      L1 \_\_\_\_\_ Amps      L2 \_\_\_\_\_ Amps      L3 \_\_\_\_\_ Amps

## Compressors

Outdoor Air Temperature      \_\_\_\_\_ Deg F      Outdoor Air Relative Humidity      \_\_\_\_\_ % RH

Return Air Temperature      \_\_\_\_\_ Deg F      Return Air Relative Humidity      \_\_\_\_\_ % RH

### Compressor 1:

\_\_\_\_\_ L1 amps  
\_\_\_\_\_ L2 amps  
\_\_\_\_\_ L3 amps  
\_\_\_\_\_ Crankcase Heater

Superheat      \_\_\_\_\_ Deg. F.

*Should be between 8° and 12°F.*

Subcooling      \_\_\_\_\_ Deg. F.

*Should be between 7° and 11°F.*

Discharge Pressure      \_\_\_\_\_ PSIG

*Should be between 300 and 550 PSIG*

Suction Line Pressure      \_\_\_\_\_ PSIG

*Should be between 100 and 135 PSIG*

Liquid Line Temperature      \_\_\_\_\_ Deg. F.

Suction Line Temperature      \_\_\_\_\_ Deg. F.

### Moisture Indicating Sight Glass

Liquid Visible      Yes / No  
Color of Center Dot      Green / Yellow

Hot Gas Bypass Operational      Yes / No

### Verify refrigerant monitoring system operation.

With unit powered, but disabled,  
remove A2L Mitigation Jumper.

Does fan damper open and fan operate?      Yes / No

Replace jumper when complete

## Troubleshooting – Refrigeration Circuit

### TROUBLESHOOTING NOTE

Before any components are changed on the refrigeration system, the cause of the failure must be determined. Further problems will exist unless the true cause or problem is identified and corrected.

### IMPORTANT

Do not release refrigerant to the atmosphere! If required service procedures include the adding or removing of refrigerant, the service technician must comply with all federal, state and local laws. The procedures discussed in this manual should only be performed by a qualified EPA Certified Technician.

**NOTE:** Unit is equipped with a phase loss/phase reversal control. If system does not start, reverse two wires of the incoming power supply.

The first step is to check airflow conditions. (e.g. improper ductwork, atypical wet bulb / dry bulb, etc.) After these steps have been eliminated, proceed with troubleshooting by following this guide:

Symptom	Possible Cause	Corrective Action
Compressor will not run or does not start	Open disconnect switch or circuit breaker.	Close switch and/or breaker.
	Compressor contactor not closing.	Check voltage to contactor coil, transformer, slave relay, system. Replace parts as necessary.
	Blown fuse or tripped breaker.	Check for shorted wire or motor. Replace fuse after correcting problem.
	Low line voltage.	Check line voltage. If the voltage varies more than 10% from the nameplate voltage of the compressor, the incoming voltage must be corrected.
	Compressor motor protector open.	Motor thermal protector automatically resets. Allow time (2 hours) for compressor to cool down so protector will reset. Restart and check for reason overheat occurred.
	Compressor defective.	Check motor for open circuit, short circuit, grounded windings, or burn out. Compressor may be seized; check refrigerant. If necessary, replace compressor.
	High pressure switch open or defective.	If manual reset (high pressure), reset switch. (Switch opens at 600 psi and will not reset above 420 psi for R-410A). Replace if defective.
	Low pressure switch open or defective.	Switch will open at 50 psi and auto-close at 90 psi. Replace if defective.
	Open room thermostat or control. (No cooling required).	Check room temperature. If temperature is proper, wait for thermostat to close.
	Loose wiring.	Check all wire terminals and tighten as necessary.
Compressor starts but cuts out on low pressure  <i>Low pressure switch activates at 50 PSIG</i>	Low or loss of refrigerant charge.	Check refrigerant pressures and temperatures (subcooling.)
	Airflow restricted.	Check for dirty evaporator coil, dirty filters, dampers closed, iced evaporator coil, improper belt, check motor amps, check duct design.
	Restriction in refrigerant line.	Check refrigerant pressures, look for frosted tubing and components indicating a restriction. Check pressure drop across the filter drier.
	Defective low pressure switch.	Replace.

Always have a completed Pre-Start-Up Checklist and Start-Up Checklist prior to requesting parts or service information.

## Troubleshooting – Refrigeration Circuit *(continued)*

Symptom	Possible Cause	Corrective Action
Compressor starts but cuts out on high pressure switch  <i>High pressure activates at 600 PSIG</i>	Refrigerant overcharge.	Check pressures, charge by subcooling.
	Condenser fan motor defective.	Check fan motor.
	Condenser coil inlet obstructed or dirty.	Check coil and clearances. Clean coil if necessary.
	Air or non-condensables in system.	Check high side equalized pressures, check thermal expansion valves.
	Defective high pressure switch.	Replace.
	Restriction in discharge or liquid line.	Check refrigerant line pressures, check thermal expansion valves, replace any defective component.
	Condensing fan relay not pulling in.	Replace.
Compressor cuts out on thermal overload	Low voltage.	Check voltage.
	Sustained high discharge pressure.	Check running amperage and conditions described under “low suction pressure” symptoms.
	High suction and discharge pressures.	Check thermal expansion valve setting, check for air in system. Check air conditions and cfm.
	Defective compressor overload.	If compressor is hot, allow compressor to cool for two hours. Recheck for open circuit.
	Improper refrigerant charge.	Check subcooling.
	Improperly wired.	Review wiring schematics.
	Loose wiring.	Check all connections.
	Defective start relay.	Replace relay.
Motor windings damaged.	Verify amp draw.	
Compressor hums, but will not start	Improperly wired.	Review wiring schematics.
	Low line voltage.	Check voltage.
	Loose wiring.	Check all connections.
	Defective start relay.	Replace relay.
	Motor winding damaged.	Verify amp draws. Replace compressor if necessary.
	Internal compressor mechanical damage.	Replace.
Compressor noisy or vibrating	Refrigerant overcharge.	Check pressures and subcooling.
	Liquid floodback.	Check thermal expansion valve setting. Check for refrigerant overcharge.
	Tubing rattle.	Dampen tubing vibration by taping or clamping. Carefully bend tubing away from contact where possible.
	Scroll compressor rotating in reverse. (3-phase)	Check high and low side pressures during operation to confirm. Rewire for opposite rotation.
	Damaged compressor.	Replace the compressor.
	Improper mounting on unit base.	Check that compressor is properly isolated and mounting bolts are tight.

*Always have a completed Pre-Start-Up Checklist and Start-Up Checklist prior to requesting parts or service information.*

## Troubleshooting – Refrigeration Circuit *(continued)*

Symptom	Possible Cause	Corrective Action
High suction pressure	Excessive load on evaporator coil.	Check for high entering wet bulb temperature, check for excessive airflow.
	Compressor is unloaded. (digital scroll)	Check digital scroll controller signal and solenoid valve.
	Expansion valve sensing bulb not secured to suction line.	Check the thermal expansion valve, ensure bulb is insulated. Check superheat. If superheat is high, then valve is choking refrigerant flow. <ul style="list-style-type: none"> <li>• Check bulb for contact.</li> <li>• Adjust valve for superheat ~10°F.</li> <li>• Replace valve power head or valve.</li> </ul>
	Thermostatic expansion valve. Overfeeding.	Check bulb location and clamping. Adjust superheat. Replace expansion valve power head.
	Room load too large.	Reduce the load or add more equipment.
	Overcharged.	Check pressures and subcooling.
High discharge pressure	Thermal expansion valve setting.	Check thermal expansion setting and calibrate superheat / subcooling.
	Air inlet to condenser dirty or obstructed.	Check for proper clearances and possible air recirculating. Clean coil.
	Condenser fan motor defective.	Check condenser fan motor.
	Too much refrigerant.	Check subcooling. Remove excess refrigerant.
	Non-condensable in system.	Remove non-condensable from system.
	Dirty condenser coil.	Clean condenser coil.
	Condenser fan not running or running backwards.	Check electrical circuit and fuse. Check fan cycling controls.
	High load conditions.	Add more equipment or reduce load.
Low suction pressure	Refrigerant undercharge/loss of refrigerant charge.	Check pressures and subcooling.
	Blower running backward.	Confirm blower rotation. If reversed, interchange any two wires from 3-phase disconnect.
	Loose blower, pulley or belts.	Check drive pulley alignment, belt tension.
	Low entering air temperature. (Low load conditions).	Check entering air wet bulb conditions.
	Refrigerant leak.	Check system for leaks. Repair leaks and add refrigerant.
	Evaporator dirty or iced-up, or airflow restricted.	Clean the coil. Check fan operation. Check airflow.
	Plugged liquid line filter-drier.	Replace filter-drier, check psi across filter.
	Improper hot gas bypass setting.	Check setting and correct as required.
	Expansion valve defective, superheat too high or valve too small.	Adjust valve for proper superheat or replace the expansion valve if too small or defective.
	Moisture in system, check sight glass.	Reclaim refrigerant, check for leaks, recharge.

*Always have a completed Pre-Start-Up Checklist and Start-Up Checklist prior to requesting parts or service information.*

## Troubleshooting – Refrigeration Circuit *(continued)*

Symptom	Possible Cause	Corrective Action
Low discharge pressure	Insufficient refrigerant charge.	Check subcooling, check for leak. Repair leak and add refrigerant.
	Defective or improperly adjusted expansion valve.	Check superheating and adjust thermal expansion valve.
	Low suction pressure.	See “low suction pressure”.
Compressor short cycles	Thermostat location or controls malfunction.	Check thermostat, check heat anticipator setting.
	Improper refrigerant charge.	Check subcooling, verify superheat.
	Defective high or low pressure control.	Check high or low pressure switch.
	Poor air distribution.	Check ductwork for recirculating.
	High discharge pressure.	See “high discharge pressure” in Troubleshooting section.
	Low airflow at evaporator(s).	Check blower operation and airstream restrictions.
Compressor loses oil	Incorrect unit selection (oversized).	Contact factory.
	Refrigerant leak.	Check system for leaks. Repair leaks and add refrigerant.
	Short cycling.	Check low pressure control settings.
Not enough cooling or lack of cooling	Refrigerant flood back.	Check thermal expansion valve setting. Check for refrigerant overcharge. Check crankcase heater operation.
	Refrigeration undercharged.	Check subcooling. Adjust charge, if necessary.
	Dirty filter or evaporator coil.	Check filter, coil and airflow.
	Dirty or clogged condenser coil.	Check coil and airflow.
	Air or other non-condensables in system.	Check equalized high side pressure with equivalent outdoor temperature.
	Restriction in suction and liquid line.	Check for restrictions in refrigerant circuit.
	Control contacts stuck.	Check wiring.
Excessive load.	Add more equipment or reduce room load.	
Liquid line is frosted or wet	Restriction in liquid line.	Clear restriction upstream of point of frosting.
Suction line is frosting	Insufficient evaporator airflow.	Check airflow, check filters, check drive for loose parts or belts. Check VFD control signal for proper operation.
	Malfunctioning or defective expansion valve.	Check bulb of thermal expansion valve.
Frost on evaporator coil	Hot gas bypass valve not functioning properly.	Check valve. If defective, replace.
	Manual hot gas bypass valve closed.	Open valve.
	Low load or airflow.	Increase airflow, check filters.

*Always have a completed Pre-Start-Up Checklist and Start-Up Checklist prior to requesting parts or service information.*



## Routine Maintenance

### DANGER

Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to the unit to OFF at disconnect switch(es). Unit may have multiple power supplies.

### CAUTION

Use caution when removing access panels or other unit components, especially while standing on a ladder or other potentially unsteady base. Access panels and unit components can be heavy and serious injury may occur.

This unit requires minimal maintenance to operate properly. To ensure proper operation and longevity, the following maintenance schedule should be followed.

The items in this list assume a relatively clean air environment and may require attention more frequently in a dusty or dirty area.

An EPA Certified Technician must complete all refrigeration systems checks.

### Maintenance Frequency:

#### Monthly

1. Condensate Drain  
Inspect and clean. Refill with water or glycol.

#### Annually

It is recommended that the annual inspection and maintenance occur at the start of the cooling season. After completing the checklist, follow the unit start-up checklist provided in the manual to ensure the refrigeration system operates in the intended manner.

1. Door Seal  
Check if intact and pliable.
2. Wiring Connections  
Check all connections for tightness.
3. Cabinet  
Check entire cabinet, inside and out, for dirt build-up or corrosion. Remove accumulated dirt, remove any surface corrosion and coat the area with appropriate finish.
4. Evaporator Coil Maintenance  
Check for cleanliness. Clean if required.
5. Condenser Coil Maintenance  
Check for cleanliness. Clean if required.
6. Condensate Drain  
Inspect and clean. Refill with water.
7. Condensing Fan Blades and Motors  
Check for cleanliness.  
Check all fasteners for tightness.  
Check for fatigue, corrosion and wear.

## Maintenance Procedures:

### Lubrication

Check all moving components for proper lubrication. Apply lubricant where required. Any components showing excessive wear should be replaced to maintain the integrity of the unit and ensure proper operation.

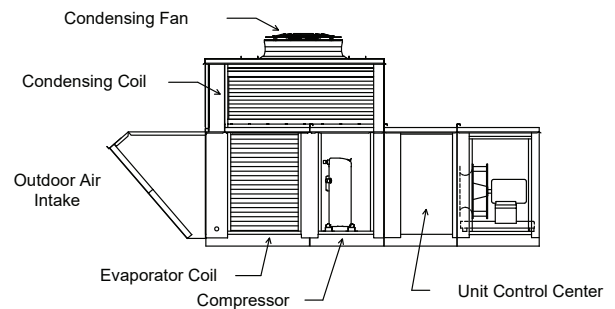
### Dampers

Check damper (if present) to ensure it opens and closes properly and without binding. Apply power to motorized dampers to ensure the actuator opens and closes the damper as designed.

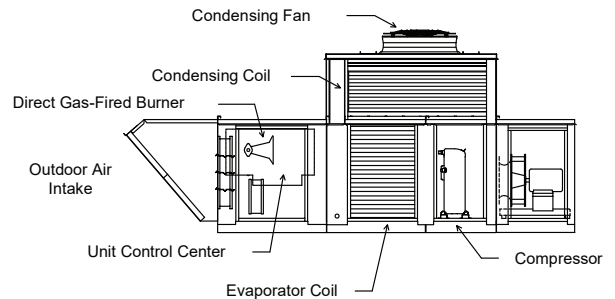
## Reference

### Component Location

#### Model MSX Make-Up Air Unit with Electric Heat



#### Model DGX Make-Up Air Unit



# Maintenance Log

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Date \_\_\_\_\_ Time \_\_\_\_\_ AM/PM

Notes: \_\_\_\_\_

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## Our Commitment

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*As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.*

Product warranties can be found online at [Greenheck.com](http://Greenheck.com), either on the specific product page or in the literature section of the website at [Greenheck.com/Resources/Library/Literature](http://Greenheck.com/Resources/Library/Literature).

AMCA Publication 410-96, Safety Practices for Users and Installers of Industrial and Commercial Fans, provides additional safety information. This publication can be obtained from AMCA International, Inc. at [www.amca.org](http://www.amca.org).

