

Installation and Maintenance Manual

Dedicated Outside Air Systems (DOAS)

**1 thru 15 Tons
(150 thru 3000 CFM)**

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IMPORTANT – Read this instruction manual carefully before attempting to install, operate, or perform maintenance on this unit. This unit must be installed and maintained by qualified installation contractors and service technicians.

DOAS IOM
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WARNING – Warning Signs appear at appropriate places throughout this manual to alert the customer of important information and details regarding the installation and operation of the equipment.



DANGER – RISK OF ELECTRICAL SHOCK. Danger signs appear at the appropriate place throughout this manual to alert customers there is a potential for dangerous voltage levels while the unit is powered up and operational.

100% Outside Air System

The units can be used to provide room neutral air or to provide space conditioned air. The equipment can be coupled directly to an existing air conditioner or it can be de-coupled and provide the supply air directly into the space.

INSPECTION of EQUIPMENT

Upon receipt of the unit, inspect for visible or concealed damage of the unit's exterior and interior cabinet and system components. Report all damage to the freight carrier and file a damage claim.

HANDLING

To facilitate handling, the unit is set on a wooden skid so that it may be picked up with a fork lift or hand truck and moved to the location of installation. Under no circumstances should the unit be "walked" on the corners of the skid. Use dolly trucks or pipe rollers to move the unit through doorways or tight spaces to its proper location.

LOCATION

Before unit is installed, a thorough study should be made of the structure. Careful consideration must be given to location of wiring, condensate disposal, ductwork and accessibility to the unit for maintenance and servicing. Refer to the section on Service Clearance. Attention must also be given to floor or ceiling load limitations.

When installing the unit, consideration must be taken for installing the water piping to the unit's water cooled condenser inlet and outlet lines. Water cooled systems contain a full charge of refrigerant and are shipped ready for operation with the exception of the field installation.

CAUTION: Unit should NOT be located in space subjected to freezing temperatures.

Outdoor Air Quality

Outdoor air quality must be investigated and documented. Survey the building site and its immediate surroundings for any possible sources of contamination. This should be accomplished during the period(s) of time that the building is anticipated to be occupied.

Documentation of the possible contaminants, their source and strength should be made. The target concentration and anticipated exposure limits should also be documented.

Filters must be provided on all air inlet streams. These can be included with the unit (optional) or they can be placed in the incoming ductwork as a field provided and installed item. United CoolAir recommends a MERV 8 or better filter be utilized.

Dependent upon the air quality there may also be other requirements for treatment of the incoming air, such as the ozone level. Local codes may also require other specific treatment(s).

Air Inlet Guidelines

Specific consideration must be exercised when choosing the location of outdoor air intakes in order to minimize indoor air quality problems and maximize the distance from contaminant sources. Minimum separation distances as listed in ASHRAE Standard 62.1 - 2004 "Ventilation for Acceptable Indoor Air Quality", Table 5-1 "Air Intake Minimum Separation Distance" should be adhered to. Any local codes should also be addressed.

Some potential sources of air contaminants would include, but not be limited to, the following:

- Sewer Vents
- Building Exhaust Air
- Truck Loading Docks
- Bus Loading Areas
- High Traffic Volumes
- Cooling Tower Exhaust
- Vehicle Loading Zones

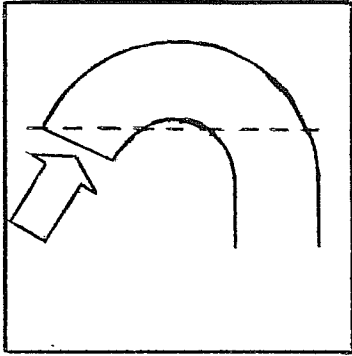
Air inlet velocities should be below 500 FPM to reduce the chance of water or snow penetration. ASHRAE Standard 62.1-2004, Section 5.6.2 provides the guidelines for rain entrainment. This standard also points out that any water that does penetrate the inlet device needs to be managed by providing a drainage area and / or moisture removal device.

Areas that have snow need to have the inlet placed or located above the anticipated snow level. Moisture from melting snow must also be managed.

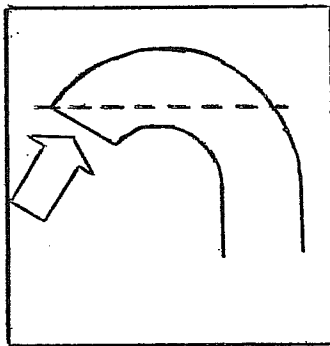
Bird screening should be provided that satisfies any applicable codes.

The outdoor air inlet device should not have any construction that would allow birds to nest.

Figure 1 below is an acceptable construction for an inlet hood, while Figure 2 is not acceptable.



Acceptable
Figure 1



Not Acceptable
Figure 2

Indoor Air Quality

Outside air units have been designed for treatment of the air being brought into the space. They are typically not intended to provide thermal comfort for the occupants. However, under some conditions this may be possible.

Indoor contaminants and the diverse source of these, has an impact on the resulting indoor air quality. Spaces that permit smoking will require additional outside air above and beyond what is specified in ASHRAE Standard 62.1-2004. Research continues as to the concentration of smoke that provides a reasonable or acceptable risk to the occupants.

Appendix B of ASHRAE Standard 62.1-2004 states "At present, there is no quantitative definition of acceptable indoor air quality that can necessarily be met by measuring one or more contaminants." However, it is incumbent that as many efforts as possible be made to help insure the best quality possible, based on today's technology.

Duct Design

On units, such as this 100% Outside Air System, it is critically important that the external static pressure (ESP) be determined prior to unit selection. Care must be made that the designed ESP is achieved for the application.

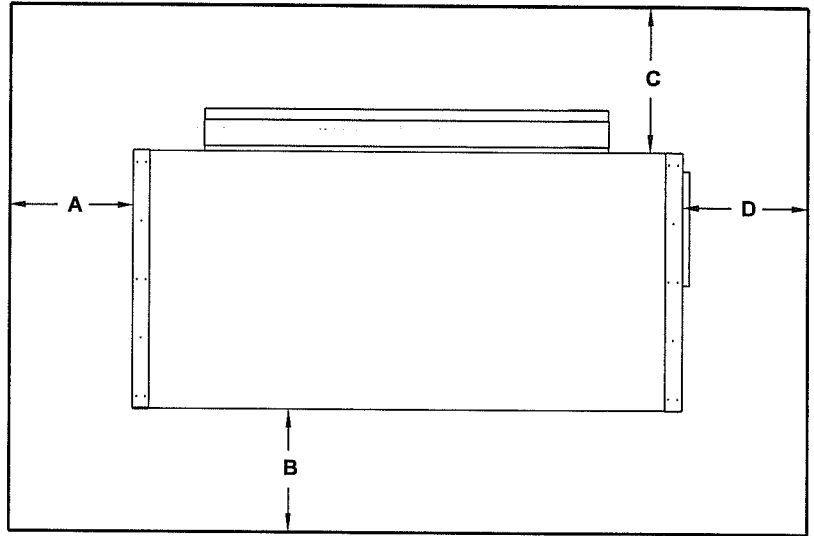
Ducts and louvers must all be fabricated to meet the design ESP. Providing less ESP (i.e. too large of a duct system) will allow the unit to move too much CFM. The result will be poor treatment of the air and thus no benefit towards achieving the designed and desired space conditions.

The duct design must be based on accepted industry practices. These can be found in SMACNA's HVAC Duct Construction Standards - Metal, Flexible and Fibrous. Additionally, standards NFPA 90A and 90B should be satisfied.

It is highly recommended that an air balance be documented for the system.

UNIT CLEARANCES

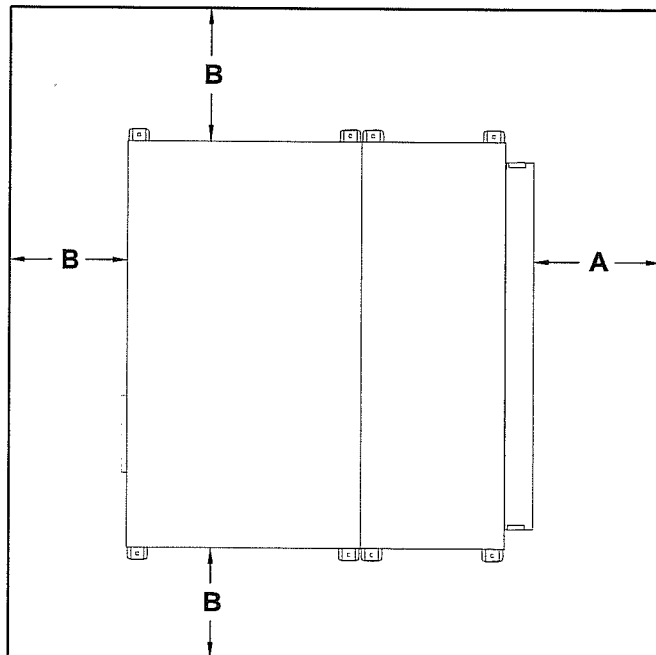
FIGURE 3 – Service Clearances (Vertical)



NOTE: A and D dimensions must be at least 30" on one side or the other for filter access.

Nom. Tons	(A) Dim	(B) Dim	(C) Dim	(D) Dim
1 – 3	30"	36"	20"	30"
4 – 8	30"	36"	20"	30"
9 – 15	30"	36"	20"	30"

FIGURE 4 – Service Clearances (Horizontal)



Nom. Tons	(A) Dim	(B) Dim
1 – 3	20"	36"
4 – 8	20"	36"
9 – 15	20"	36"

UNIT INSTALLATION

Vibration Absorbers (Vertical)

When installing the vertical unit on a concrete pad, support rails, or methods other than spring isolation, use of vibration absorbers is recommended to prevent mechanical transmission. Also make sure the unit foundation the unit is being installed on is level.

1. Figure 5 – Vibration Pads (Vertical) shows the recommended points for vibration absorbent pads (field provided). We recommend the use of a minimum 1" thick Neoprene vibration absorbent pad under each point shown in Figure 5. Small cabinets 1-3 Ton only require the pads under the corners only not the middle.

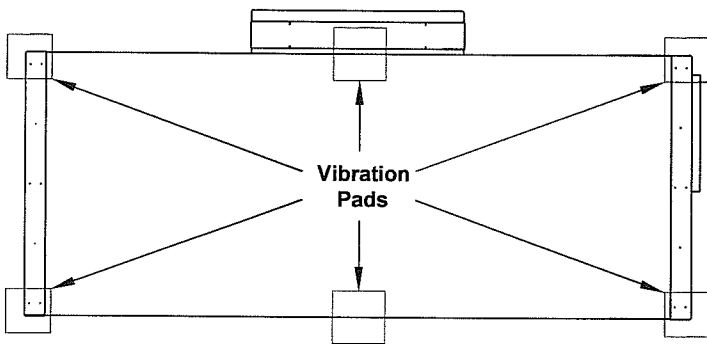


FIGURE 5 – Vibration Pads (Vertical)

2. Place each vibration isolator into positions shown in Figures 5, and then move the OmegaAir unit to the location and set it onto the pads.

Vibration Absorbers (Horizontal)

When installing the horizontal unit on a concrete pad, support rails, or methods other than spring isolation, use of vibration absorbers is recommended to prevent mechanical transmission. Also make sure the unit foundation the unit is being installed on is level.

NOTE: Be sure the foundation the horizontal unit is being installed on allows for clearance to build a

condensate trap. The unit may need to be elevated on the foundation to provide enough height for trap installation.

1. Do not remove the tie rails from the unit when placing the Horizontal unit onto vibration absorbing pads.
2. Figure 6 – Vibration Pads (Horizontal) shows the recommended points for vibration absorbent pads (field provided). We recommend the use of a minimum 1" thick Neoprene vibration absorbent pad under each point shown in Figure 6. Small cabinets 1-3 Ton only require the pads under the corners only not the middle.

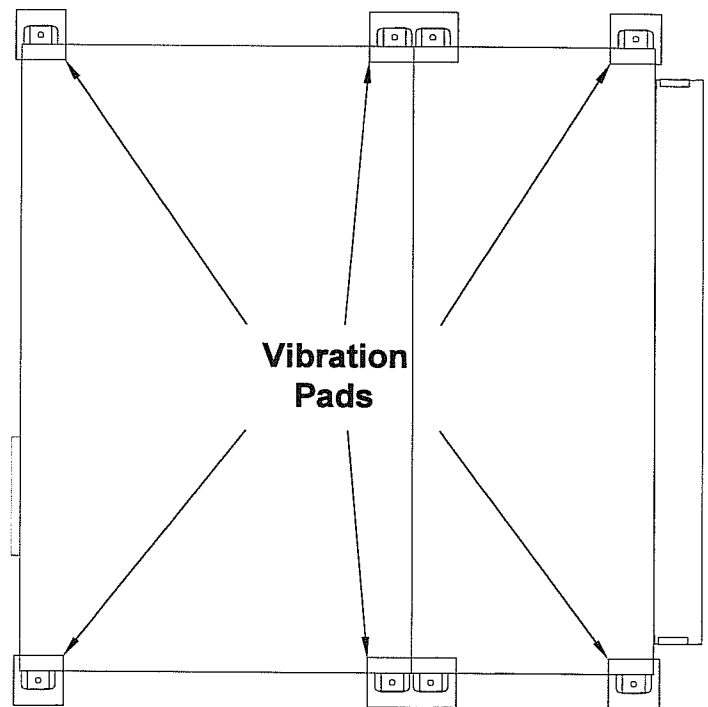


FIGURE 6 – Vibration Pads (Horizontal)

Hanging Rods (Horizontal Units)

When installing the horizontal unit on hanging rods (field supplied), use minimum 1/2" diameter threaded rods of the proper length with washers, lock washers, nuts, and locking nuts. Observe proper service clearances for the horizontal unit

1. Predetermine where the unit will be hung checking the support structure for proper strength and stability.

2. Note the locations/dimensions of the holes for the hanging rods through the support rails in the unit.
3. Install the hanging rods at those dimensions in the support structure where the horizontal unit will be hung.



WARNING: BE CERTAIN TO COMPLETELY TIGHTEN THE HARDWARE TO THE SUPPORT STRUCTURE.

4. Using a support lift, carefully lift the unit to the location of installation positioning the pre-hung rods through the hanging rod holes in the support rails. Be certain to install vibration isolator-type mounts if required.
5. Tighten all mounting hardware and level as required.

Refrigerant Connections (Air-Cooled)

Systems with Remote Air Cooled Condensers require connections with interconnecting refrigerant piping (field provided). The following explanation assumes the use of a BC Condenser Unit with re-sealable fittings on the 100% outside air section and the condenser section.

Once the outside air system's evaporator and the BC Series Condenser Sections are setting at their location of installation, the interconnecting refrigerant lines should be installed. The re-sealable fittings will not permit refrigerant flow until they are completely tight. Follow these steps for the split application with Remote BC-Series Condenser:

1. Remove the caps (if equipped) on the quick connect refrigerant lines.
2. Using a small amount of National 150 or 3G brand refrigerant oil, lightly lubricate the threads of the quick connect fittings.
3. Align each quick connect fitting and hand thread the Female Quick Connect fittings

onto the Male Quick Connect fittings as shown in Figure 7 – Quick Connect.

4. For installation purposes, only thread the coupling onto the male coupling about 2-3 full turns. At this time, DO NOT tighten the two halves completely until the field installed refrigerant piping is installed completely.
5. Install Refrigerant Grade Copper tubing/piping between the remote air cooled condenser and the outside air unit. Connecting the piping into the Female Quick Connect halves.
6. Do not braze the connections until all lines have been pre-piped. Once pre-piping is completed, install the Schrader access fittings into each end of the pipe at the quick connect fittings.
7. **Heavily wrap the quick connect fittings with a wet rag or use a water bath making sure to leave just enough of the braze joint exposed to braze the field installed piping to the quick connect fitting.**
8. At this point, braze the quick connect fittings and Schrader access ports to the field installed piping.
9. Once all fittings are brazed, pressurize the lines with 400 psi of dry nitrogen and leak-check all braze joints and piping.
10. If no leaks are present, release the nitrogen and evacuate the line sets between the outside air unit and BC-Series remote condenser to a level lower than 500 microns.
11. When the level is lower than 500 microns, shut off all service valves and allow the system to set for approximately ½ hour. If the micron level remains lower than 750 microns, the system is ready for final connection.
12. If the micron level increases above 1000 microns, there may be moisture within the system so restart the evacuation process until the level is below 500 microns.

13. When ready for final connection, bring the vacuum level above atmospheric pressure with Freon gas.
14. Make the final connections by completely disconnecting the quick connects then restart the female half onto the male half while counting the complete number of turns while threading.

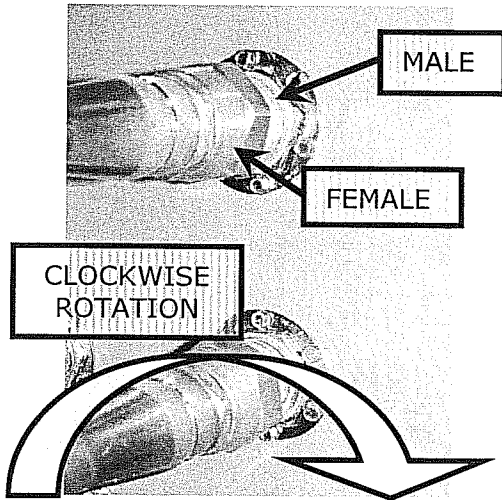


FIGURE 7 – Quick Connect

NOTE: Be certain to count the number of complete thread rotations. Observe the number of turns, reference Table 6 to determine how tight to make the quick connect couplings.

15. Continue to hand thread until slight resistance is observed.
16. Once slight resistance is evident, continue to tighten the fittings using appropriate size wrenches listed in Table 5.

TABLE 5		
QC-Size	Wrench	# Full Turns
3/8"	1-3/16"	6
1/2"	1-3/16"	6
5/8"	1-5/8"	7-3/4
3/4"	1-5/8"	7-3/4
7/8"	1-5/8"	8
1-1/8"	2"	8

17. If the quick connect still feels loose, tighten just a bit more until complete resistance is evident.

NOTE: Once tight, refrigerant should be able to pass through the quick connect couplings. If problems with low refrigerant pressure appear during system startup, double check the tightness of these quick connect couplings as loose fittings will restrain full refrigerant flow.

If a condenser from a different manufacturer is utilized, the OmegaAir Unit will be provided with the refrigerant lines stubbed and with a nitrogen holding charge only. Field installation of the tubing, the evacuation and charging process will need to follow industry accepted practices.

Duct Connections

Ducting must be connected from the air inlet side of the unit to an outdoor air grille. Ducting must also be connected from the supply air blower outlet to the main supply air duct distribution system. Follow appropriate industry guidelines for ducting installation. Provide a duct length that is 4 to 5 times the diameter of the blower wheel before making the first transition. Provide turning vanes when required.

Duct sizing for the outside air units is critical. If the External Static Pressure (ESP) varies substantially from what the unit was designed for, the system will not perform as expected.

Water Piping / Water Flow

As a standard, units shall have coaxial type, tube in tube counter flow water-cooled condenser(s). Water-cooled units are provided with a 2-way, 150 psi head pressure control valve as standard. The water-cooled condenser(s) and water valve(s) are pre-piped to external connection points located on the side of the each cabinet. Refer to the Product Specifications section for water inlet and outlet connection sizes.

Dependent upon your application the unit(s) may also have the optional 3-way and / or 350 psi head pressure control valve(s).

Water Connections

Do not reduce water inlet and outlet connections as this will restrain water flow and increase water pressure. The inlet water line should have a strainer (field supplied and installed) accessible for periodic cleaning. Both the inlet and outlet water lines should have field installed water shut-off valves (Ball Valve type is recommended). The shutoff valves are required for maintenance, system repairs, or long periods of system shut down. Refer to the Product Specifications section for required Water Flow Rates and Water Pressure Drops.

Condensate Drain

Consideration must be taken for proper condensate drain installation. Each outside air system unit has an IAQ type drain pan. Each vertical unit has an internal drain trap so there is no need to install a drain trap during installation. Each horizontal unit must have a condensate trap field fabricated and installed. Methods for elevating the horizontal system units, unless otherwise installed from hanging rods, are support rails, concrete pad(s), or spring isolators.

Each horizontal system unit has a condensate drain connection. A condensate drain trap must be field fabricated and installed onto the 3/4" I.D. drain connection. Each trap must then be piped to a common waste drain. Refer to Figure 8 – Condensate Trap for reference dimensions.

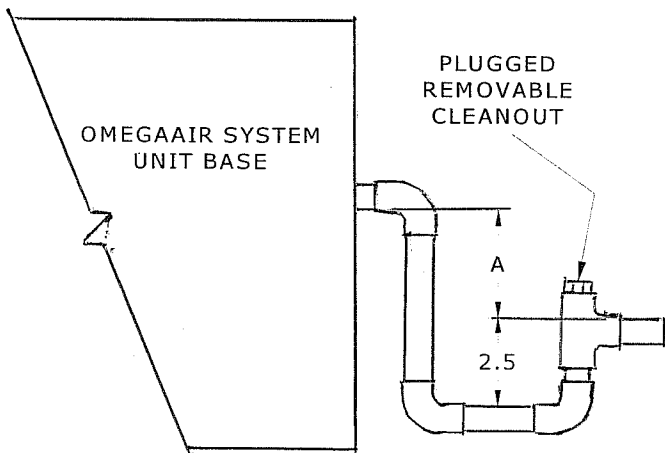


FIGURE 8 – CONDENSATE TRAP

The depth of the condensate trap will vary due to the model of the unit ordered and field requirements. The purpose of the trap is to neutralize the negative pressure created within the blower cabinet. Refer to the order specifications for external static pressure (ESP) to calculate the depth required for the "A" Dimension shown in Figure 8. The "A" Dimension must equal or exceed the negative pressure developed by the supply air blower. If it does not, the condensate will not drain properly and may allow the drain pan to overflow. The lower leg of the trap must maintain a minimum depth of 2-1/2" to maintain a water seal during all operating conditions.

ELECTRICAL CONNECTIONS



DANGER: DISCONNECT MAIN POWER SUPPLY BEFORE CONNECTING THE UNIT(S) TO THE SOURCE POWER.

NOTE: Use copper conductors only.

All electrical wiring must be in accordance with NEC (National Electrical Code) Latest Revision, as well as state and local building codes. Refer to the Electrical Data section or the unit's data tag for the unit's power requirements. Locate the unit's main power entrance hole(s). Punched holes are provided for electrical entrance for both the power and control wiring. Hole sizes may need to be increased depending on the amount of conductors and the gauge conductor used.

Service Disconnect

A single point power service (fused) disconnect is required. Install the service disconnect in accordance with NEC, State, and Local building codes. NEC guidelines require a unit disconnect (fused or non-fused) be installed within sight of the unit.

A factory provided power block is installed internal to the unit's electrical control panel. Route the main power wires in accordance with electrical codes to the field provided unit disconnect and terminate them on the line side of the disconnect. Route the power wires from the Load side of the

field provided service disconnect to unit power block inside the electrical panel.

A Ground (GND) termination point is located within the electrical control panel. A Ground conductor is required. Grounding by use of metal conduit is not acceptable.

CONTROL WIRING



DANGER: DISCONNECT MAIN POWER SOURCE FROM THE UNIT BEFORE CONNECTING CONTROL COMPONENTS.

Depending on the control options provided, the unit may have an OA3 Microprocessor controller. If the unit has the OA3 Microprocessor Controller, refer to the installation information in the OA3 Manual for installation of field installed control components (wall display, sensors, etc.)

If the unit(s) have been provided without the OA3 controls, a set of field interlocking terminal strips are provided for interlocking of field control components. Refer to the electrical diagram provided on the electrical box cover for connection of field control components.

UNIT COMPONENTS – Electrical

Contactors

Contactors are used to energize the evaporator motor and compressor motor. Contactors have a set of high current carrying contacts for conducting line voltage to the load (device) and a magnetic holding coil which closes the line voltage contacts whenever control voltage of 24 VAC is applied by the unit's microprocessor controller or field control device. The evaporator blower and compressor motors have built-in internal overload protection to protect against high current draw. They automatically reset when the motors have cooled down.

High Pressure Safety Switch

The high-pressure switch is designed to protect the compressor circuit from unusually high refrigerant pressures. If the refrigerant pressure rises above 630 PSIG, the pressure switch will open causing the compressor to shut off. The switch is a manual reset device. If the unit has the OA3

Microprocessor Controller, a manual reset is required through the wall controller. Refer to the OA3 Manual for reset information. If the unit does not have the OA3 Control, the unit has a lockout relay to prevent the compressor from restarting. Power must be cycled off then back on to reset the lockout relay.

Low Pressure Safety Switch

The low-pressure switch is designed to protect the compressor circuit from unusually low refrigerant pressures. If the refrigerant pressure falls below 30 PSIG, the switch will open causing the compressor to shut off. As the pressure starts to rise above 60 PSIG, the switch will reset. If the unit has the OA3 Microprocessor Controller, a manual reset is required through the wall controller. Refer to the OA3 Manual for reset information. If the unit does not have the OA3 Control, the unit has a lockout relay to prevent the compressor from restarting. Power must be cycled off then back on to reset the lockout relay.

NOTE: The evaporator blower will continue to operate when either pressure switch takes the compressor(s) off line.

Phase Monitor (Optional)

A phase monitor is supplied to monitor the phase rotation of the power. When main power supply to the unit is out of phase, the unit will not start in any mode. Swapping any two leads of the incoming line voltage at the power connection block inside the unit's main control box will correct this situation.

The unit is supplied from the factory properly phased for all the components. Under no circumstances should internal unit wiring be changed to rectify a phase reversal situation.

Time Delay (TD) – Compressor Short Cycling

Single Phase units without the OA3 control must have a time delay relay that delays the start of the compressor for 5 minutes when there is a call for dehumidification/cooling. Each single phase unit must have a time delay relay for compressor short cycling to prevent immediate restart after a brief operating period. If the compressor tries to restart due to constant space loading, mechanical loading due to un-equalized refrigerant system pressure would prevent the compressor from operating and

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over a period of time, could cause premature failure of the compressor. When the compressor becomes mechanically bound due to un-equalized pressures, the motor windings heat up which cause the compressor to trip on thermal overload.

Time Delay (TD) – Dual Compressor Systems without OA3 Controls

On single phase systems that are not manufactured with the OA3 Controls, a time delay relay is installed to prevent the second stage compressor from starting at the exact same time the first stage compressor is starting. If these compressors start simultaneously, a large inrush (starting current) is placed on the systems which may cause circuit protectors to trip or motors within the unit to fail prematurely.

UNIT COMPONENTS – Mechanical

Compressor

The compressor is scroll hermetic type except for 1 and 1-1/2 ton units which are reciprocating type.

Water-Cooled Condenser Coil

The condenser is typically a co-axial type that is of counter flow configuration.

Sight Glass

A liquid sight glass is located in the liquid line between the outlet of the Liquid Receiver and inlet of the Thermostatic Expansion Valve. Flashing (bubbles) will appear in the sight glass during the first minute or two of operation until the expansion valve fully adjusts. If flashing is constant during the compressor operation, it may be an indication the unit is short of refrigerant. When the unit is operating in Hot Gas Reheat and/or Hot Gas Bypass mode there will be flashing in the sight glass.

Filter Drier

The filter drier, filters loose particles, moisture and possible brazing residue from the system. If the unit starts tripping on low pressure cutout and the refrigerant line is frosted up to the outlet of the filter drier, check the refrigerant pressure drop across

the filter drier and replace the filter drier if necessary.

Thermostatic Expansion Valve

The 100% outside air systems utilize an MOP Type thermal expansion valve. The Maximum Operating Pressure (MOP) or pressure limiting valve provides several benefits and functions for 100% outside air applications. The units will see a wide variety of operating conditions. The TXV will open only slightly to maintain the pressure at 100 psig or less. This helps to keep the compressor operation stable and avoids the superheat from going too high and causing the compressor thermal overload from taking the system off line. After several minutes of operation the refrigerant circuit has stabilized and the valve will start to control based on the superheat setting.

Evaporator Coil

The evaporator coil is constructed with copper tubes mechanically expanded into aluminum fins.

Hot Gas Reheat Coil

The Hot Gas Reheat Coil is used to maintain supply air or space air temperature at space neutral conditions. In order to do this, if the unit is operating in the dehumidification mode and the air temperature leaving the evaporator coil is less than the set point (supply temperature or space temperature depending on OA3 control setup), the control opens the Hot Gas Reheat Valve to reject heat energy back into the supply air through the Hot Gas Reheat Coil to try to maintain the temperature set point.

In the vertical configuration the reheat coil is sloped so that any oil in the coil will drain out. In the horizontal configuration the reheat coil is mounted vertically in the cabinet with the manifold at the bottom so that the oil will drain out.

Additionally, the OA3 controls will periodically provide a "flush" cycle to make sure no oil has accumulated in the reheat coil.

All the refrigerant from the hot gas reheat coil is routed through the condenser coil to assure that it is all turned back into liquid refrigerant.

Hot Gas Reheat Valve

The Hot Gas Reheat Valve is driven open based on supply air temperature conditions as determined by the type of control (supply/space) set point.

If the supply air temperature is below the supply air temperature set point and the system is operating in the dehumidification mode, the modulating valve is opened to provide only the amount of discharge gas to the Hot Gas Reheat Coil that is required to maintain the Supply Air Temperature or Space Air Temperature as close to Room Neutral conditions as possible.

The modulating valve is a balanced port design. This means that the valve will maintain equal pressure in both the condenser coil and reheat coil to maximize the reheat capability. This also provides more stability and closer control over the leaving air temperature.

ROUTINE MAINTENANCE

To keep the 100% outside air system unit operating safely and efficiently, it is recommended that a qualified serviceman check the entire system at least once a year and perform required routine maintenance once every month or as required due to the conditions the system is subjected to.



DANGER: DISCONNECT THE UNIT FROM THE MAIN POWER SOURCE AT THE SINGLE POINT POWER DISCONNECT BEFORE SERVICING THE UNIT.

Air Filters

It is very important to keep the air filters clean. Be sure to inspect them at least once each month because of the system pulling in 100% outdoor air. Refer to the filter dimensions in the specifications section for replacement information. The replacement filter thickness and efficiency level must be field verified as the units can be ordered with a variety of filter configurations.

When required, replace the air filters with the same type and size.

Note: Do not attempt to clean disposable air filters.

Water Inlet Strainer

If a field supplied strainer was installed in the water piping, shut off the water supply at the water service valves, remove the water strainer and flush it in the opposite direction with water. Once the strainer is clean, replace the strainer and reattach the cover. Set the water valves back to the on position.

Blower and Motor Drive Components

If the outside air system unit has the upgrade to Pillow Block Bearings, the pillow block bearings must be greased once every two (2) months. To grease the bearings, use high quality lithium grease and rotate the blower by hand when applying grease. Rotating the blower wheel will help force air pockets that have formed internal to the bearing outward. Once grease slightly exudes through the sides of the bearings, the bearing is completely packed with grease.

CAUTION: Over lubrication of pillow block bearings will cause the bearing to overheat and could cause the bearing seal to blow out.

If the evaporator blower does not have pillow block bearings, it indicates the blower bearing is pre-greased and sealed. Pre-greased and sealed bearings require no maintenance.

The evaporator blower motors have pre-lubricated and sealed bearings. No maintenance is required.

Belt Tensioning

Excessive belt tension is the number one cause for blower and motor bearing failure. Proper belt tension and pulley alignment are essential for trouble free operation. Insufficient deflection indicates that the belt tension is entirely too tight, and if not loosened somewhat, noise due to excessive vibration, premature bearing failure, shortened belt life, and a reduction in fan performance may result. **Deflection** is the amount the belt gives when force is applied, usually by finger, to the belt at the approximate center point to the belt span. Tight belts may also overload the motor and cause the efficiency to drop considerably or even cause premature motor failure as well. **Belt**

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Span is the distance in inches between the drive shaft center point and the fan shaft center point. Refer to Figure 9 – Belt Tensioning below.

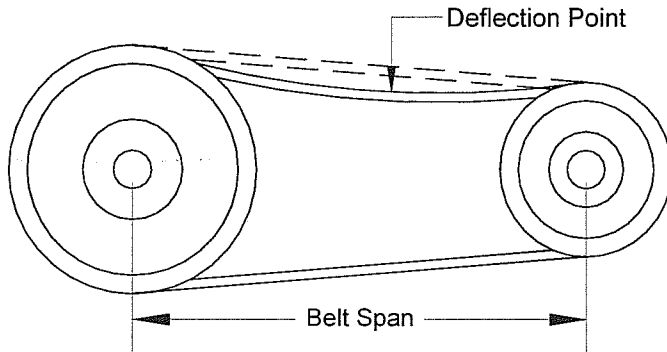


Figure 9 – Belt Tensioning

Excessive deflection is an indication that the belt is not tight enough. If not corrected, slippage may occur causing loss of blower speed and belt failure. The belts will glaze then crack or even break due to increased temperatures caused by slippage. Belts may slip during start-up, but slipping should stop as soon as the fan reaches full speed. For proper tensioning, an excellent method to use is listed in the equation below. Belt span is in inches.

$\text{Deflection} = \frac{\text{Belt Span}}{64}$

Check the sheave alignment to make sure that the sheave faces are in the same plane. Check this by placing a straight edge across the face of the sheaves. Any gap between the edge and sheave faces indicates misalignment.

Caution: This method is only valid when the width of the surfaces between the belt edges is the same for both sheaves. When they are not equal or when using adjustable pitch pulleys, adjust so that the belts have approximately equal tension. Both shafts should be at right angles to the belt. Check the setscrew and/or bushing bolt tightness.

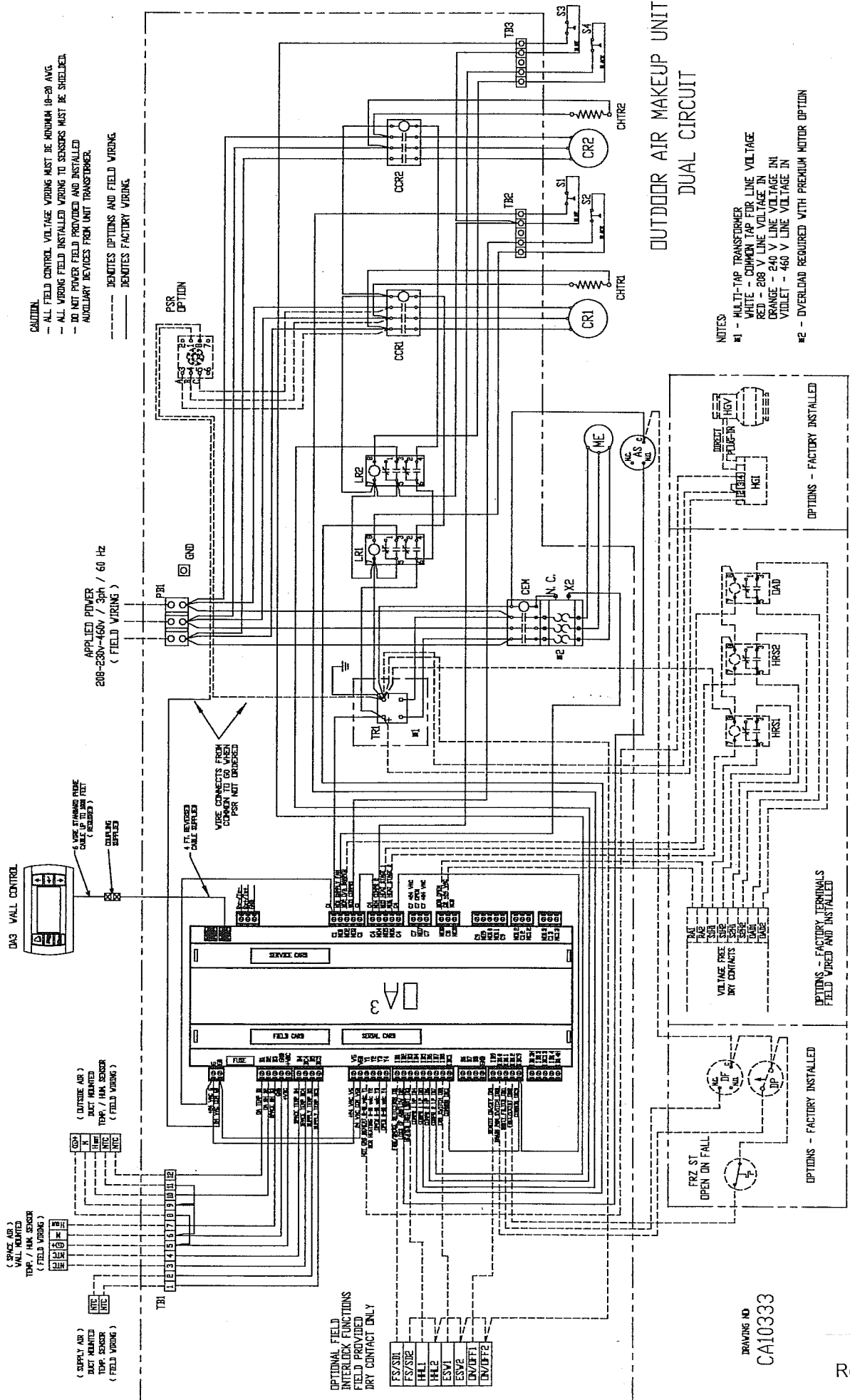
Belts tend to stretch somewhat after installation. Recheck belt tension after several hours of operation.

APPENDIX

Electrical Legend
Electrical Diagram
Dimensional Data
Physical Data
Piping Diagrams
Leaving Dew Point
Refrigerant Line Sizing

Electrical Legend

AS – Airflow Switch
CCR1 – Contactor, Compressor 1
CCR2 – Contactor, Compressor 2
CEM – Contactor, Evaporator Motor
OVL – Overload Evaporator Contactor (Premium Motor Option)
CHTR1 – Compressor 1 Crankcase Heater
CHTR21 – Compressor 2 Crankcase Heater
CR1 – Compressor 1
CR2 – Compressor 2
GND – Ground Lug
HGI – Hot Gas Interface
HGV – Hot Gas Valve
HRS1 – Heat Relay Stage 1
HRS2 – Heat Relay Stage 2
LR1 – Relay, Lock Out, Compressor 1
LR2 – Relay, Lock Out, Compressor 2
ME – Evaporator Motor
OADR – Outdoor Air Damper Relay
PB1 – Power Block 1
PSR – Phase Sensing Relay (Option)
S1 – Switch Low Pressure Cutout, Compressor 1
S2 – Switch High Pressure Cutout, Compressor 1
S3 – Switch Low Pressure Cutout, Compressor 2
S4 – Switch High Pressure Cutout, Compressor 2
TB1 – Terminal Board, Sensors
TB2 – Terminal Board, Compressor 1, Hi/Lo Pressures Switches
TB3 – Terminal Board, Compressor 2, Hi/Lo Pressure Switches
TR1 – Transformer, 100 VA



CAUTION

- ALL FIELD CONTROL VOLTAGE WIRING MUST BE MINIMUM 18-20 AWG
- ALL WIRING FIELD INSTALLED WIRING TO SENSORS MUST BE SHIELDED
- DO NOT POWER FIELD PROVIDED AND INSTALLED AUXILIARY DEVICES FROM UNIT TRANSFORMER

--- DENOTES OPTIONS AND FIELD WIRING
 - - - - - DENOTES FACTORY WIRING

APPLIED POWER
 208-230V-460V / 3ph / 60 Hz
 (FIELD WIRING)

DMS WALL CONTROL

USE 18 AWG WIRE (FIELD WIRING)
 USE 18 AWG WIRE (FIELD WIRING)
 USE 18 AWG WIRE (FIELD WIRING)

(SUPPLY AIR)
 DUCT RELATED
 TEMP. SENSOR
 (FIELD WIRING)

(OUTSIDE AIR)
 DUCT RELATED
 TEMP. / HUM. SENSOR
 (FIELD WIRING)

OPTIONAL FIELD INTERLOCK FUNCTIONS FIELD PROVIDED DRY CONTACT ONLY

FS/S01
FS/S02
HL1
HL2
ESV1
ESV2
UN/OFF1
UN/OFF2

NOTES

#1 - MULTI-TAP TRANSFORMER
 WHITE - COMMON TAP FOR LINE VOLTAGE
 RED - 208 V LINE VOLTAGE IN
 ORANGE - 240 V LINE VOLTAGE IN
 VIOLET - 460 V LINE VOLTAGE IN

#2 - OVERLOAD REQUIRED WITH PREMIUM MOTOR OPTION

OUTDOOR AIR MAKEUP UNIT
 DUAL CIRCUIT

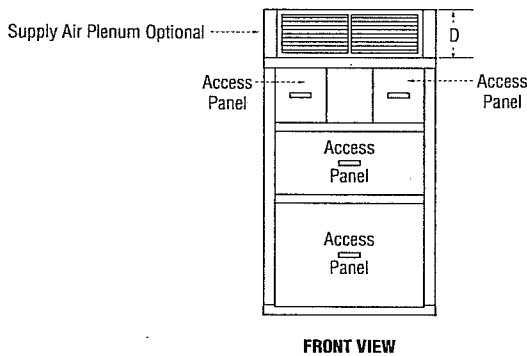
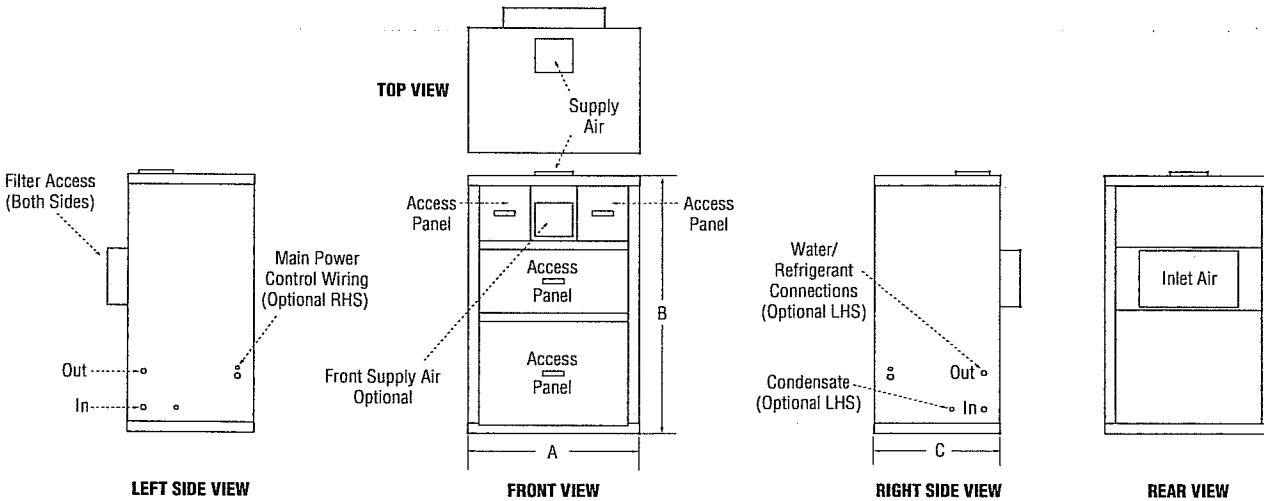
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 Rev. A (0409)

UNIT DIMENSIONS

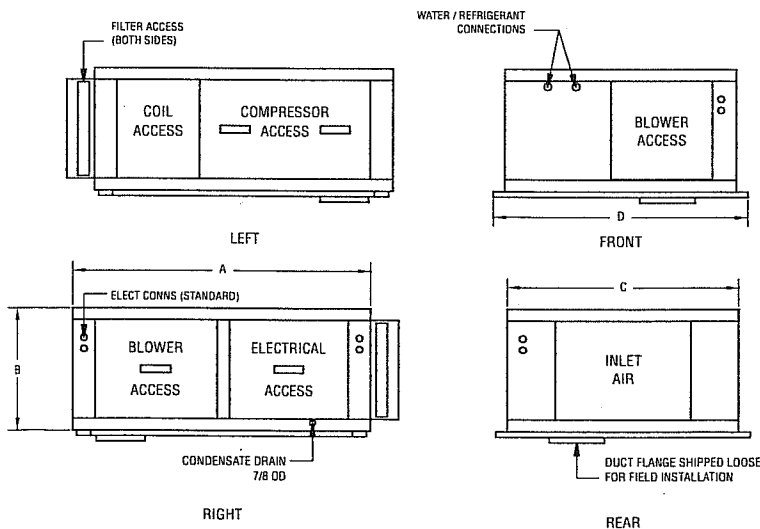
**NOTE: Dimensions shown are general overall cabinet dimensions.
Refer to the web site for specific unit configurations and detailed
dimensional drawings.**

Dimensional Data: Vertical Units



Nominal Tons	CFM Range	A	B	C	D
1 to 3	150 to 600	42"	64"	31"	12"
4 to 8	600 to 1,600	48"	72"	31"	12"
9 to 15	1,350 to 3,000	72"	78"	31"	12"

Dimensional Data: Horizontal Units



Nominal Tons	CFM Range	A	B	C	D
1 to 3	150 to 600	53"	72"	41"	45"
4 to 8	600 to 1,600	61"	26"	50"	54"
9 to 15*	1,350 to 3,000	71"	30"	66"	70"

* Cabinet is split-able.

PHYSICAL DATA

	TONS							
	1	1-1/2	2	2-1/2	3	4	5	6
Voltage (e) (f)	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60
	208/230-3-60	208/230-3-60	208/230-3-60	208/230-3-60	208/230-3-60	208/230-3-60	208/230-3-60	208/230-3-60
	460-3-60	460-3-60	460-3-60	460-3-60	460-3-60	460-3-60	460-3-60	460-3-60
Supply Air (a)	150 - 200	225 - 300	300 - 400	375 - 500	450 - 600	600 - 800	750 - 1000	900 - 1200
	Up To 0.3"	Up To 0.3"	Up To 0.3"	Up To 0.3"	Up To 0.3"	Up To 0.3"	Up To 0.3"	Up To 0.3"
	Up To 1"	Up To 1"	Up To 1"	Up To 1"	Up To 1"	Up To 1"	Up To 1"	Up To 1"
Evap. Blower	Size							
	HP (Std)	1/4	1/4	1/4	1/3	1/2	1/2	1/2
	HP (Optional)	(e)	(e)	1/3	1/2	3/4	3/4	3/4
Evaporator Coil	Qty	1	1	1	1	1	1	1
	Rows Deep	6	6	6	6	6	6	6
	Fins / Inch	10	10	10	10	10	10	10
Filter (Optional)	Face Area	0.67	0.83	1.18	1.42	1.67	2.22	3.33
	Size	14 x 25	14 x 25	14 x 25	14 x 25	14 x 25	20 x 20	20 x 20
	Qty	1	1	1	1	1	2	2
Water Cooled Cond.	Type	Pleated Throwaway	Pleated Throwaway	Pleated Throwaway	Pleated Throwaway	Pleated Throwaway	Pleated Throwaway	Pleated Throwaway
	Thickness (Optional)	2" or 4"	2" or 4"	2" or 4"	2" or 4"	2" or 4"	2" or 4"	2" or 4"
	Efficiency (Optional)	30% or 60%	30% or 60%	30% or 60%	30% or 60%	30% or 60%	30% or 60%	30% or 60%
Water Cooled Cond.	GPM	3	4.5	6	7.5	9	12	15
	Pressure Drop (b)	3.7	9.42	7	5.8	6.4	7	8.1
	Int. Volume (Water, Gallons)	0.1	0.1	0.2	0.3	0.3	0.2 ea	0.2 ea
Head Pressure Control Valve (d)	Size	3/8	3/8	1/2	1/2	3/4	1/2	3/4
	Qty	1	1	1	1	1	2	2
	Compressor	1	1	1	1	1	2	2
Charge R-410a (Lbs-Ozs) (c)	Air-Cooled							
	Water-Cooled							
	Approx. Weight (Net Operating)	507	510	517	539	552	728	777
Water-Cooled	517	524	534	562	575	767	814	828

- (a) Air flow performance may require other than standard drive components.
- (b) Does not include water regulating valve.
- (c) Split units need additional refrigerant. Refer to Installation Manual. Inclusion of some refrigerant circuit components may add additional charge.
- (d) Standard head pressure control valve is 2-way-150 psig. Alternate valve configurations possible in 3-way and 350 psig.
- (e) Drive set upgrade only.

All specifications subject to change without notice.

PHYSICAL DATA

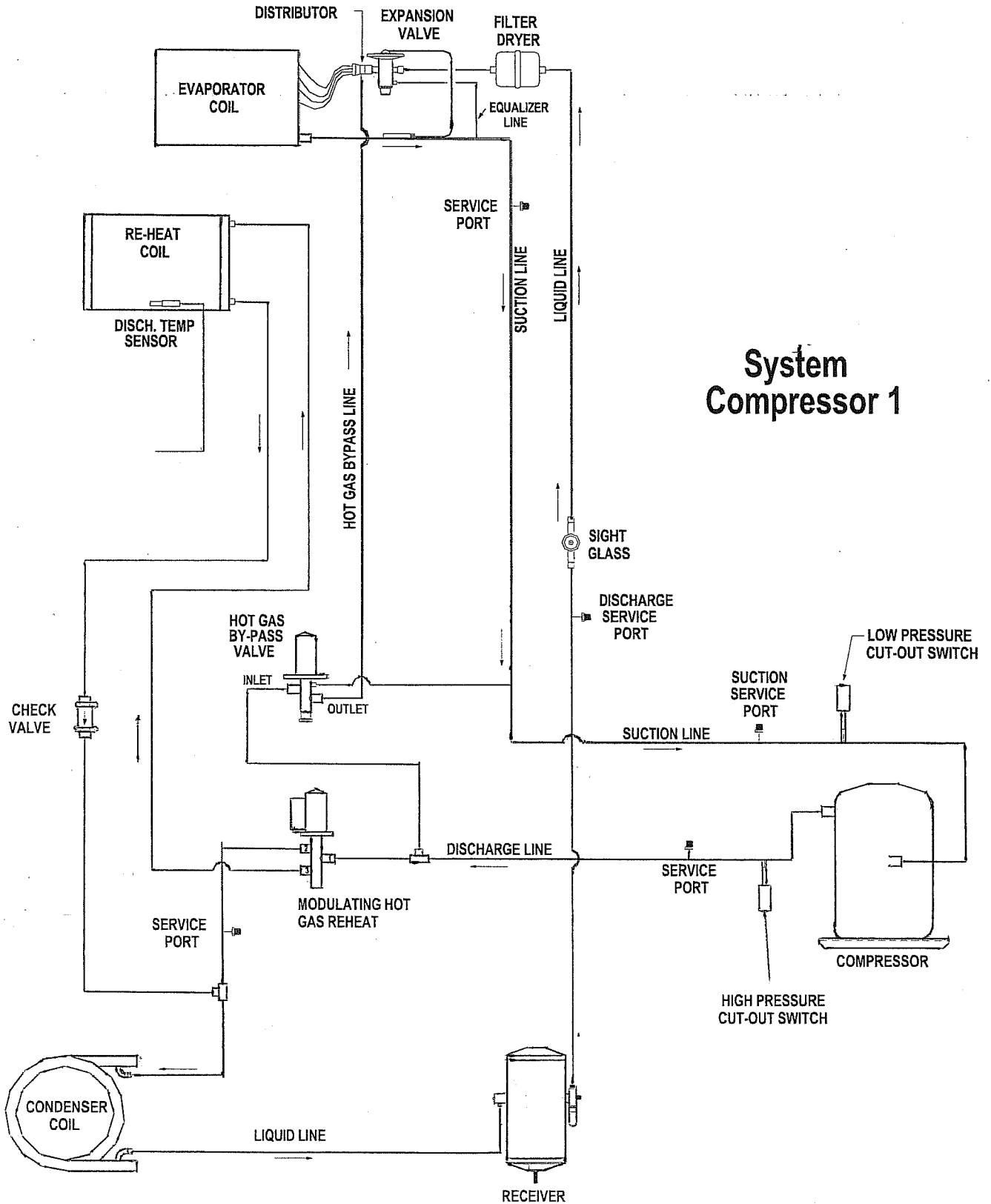
	TONS									
	7	8	9	10	11	12	13.5	15		
Voltage (e) (f)	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60	---	---
	208/230-3-60	208/230-3-60	208/230-3-60	208/230-3-60	208/230-3-60	208/230-3-60	208/230-3-60	208/230-3-60	208/230-3-60	208/230-3-60
Supply Air (a)	460-3-60	460-3-60	460-3-60	460-3-60	460-3-60	460-3-60	460-3-60	460-3-60	460-3-60	460-3-60
	1050 - 1400	1200 - 1600	1350 - 1800	1500 - 2000	1650 - 2200	1800 - 2400	2000 - 2700	2250 - 3000		
	Up To 0.3"	Up To 0.3"	Up To 0.3"	Up To 0.3"	Up To 0.3"	Up To 0.3"	Up To 0.3"	Up To 0.3"	Up To 0.3"	Up To 0.3"
ESP (Upgrade)	Up To 1"	Up To 1"	Up To 1"	Up To 1"	Up To 1"	Up To 1"	Up To 1"	Up To 1"	Up To 1"	Up To 1"
Evap. Blower	Size									
	HP (Std)	3/4	3/4	3/4	3/4	1	1-1/2	1	1-1/2	1-1/2
Evaporator Coil	HP (Optional)	1	1	1	1-1/2	1-1/2	2	2	2	2
	Qty	1	1	1	1	1	1	1	1	1
Filter (Optional)	Rows Deep	6	6	6	6	6	6	6	6	6
	Fins / Inch	10	10	10	10	10	10	10	10	10
Water Cooled Cond.	Face Area	3.78	4.88	5.19	5.67	6.67	7.33	7.33	7.33	9
	Size	20 x 20	20 x 20	20 x 25	20 x 25	20 x 25	20 x 25	20 x 25	20 x 25	20 x 25
Water Cooled Cond. (Optional)	Qty	2	2	3	3	3	3	3	3	3
	Type	Pleated Throwaway	Pleated Throwaway	Pleated Throwaway	Pleated Throwaway	Pleated Throwaway	Pleated Throwaway	Pleated Throwaway	Pleated Throwaway	Pleated Throwaway
Water Cooled Cond. (Optional)	Thickness (Optional)	2" or 4"	2" or 4"	2" or 4"	2" or 4"	2" or 4"	2" or 4"	2" or 4"	2" or 4"	2" or 4"
	Efficiency (Optional)	30% or 60%	30% or 60%	30% or 60%	30% or 60%	30% or 60%	30% or 60%	30% or 60%	30% or 60%	30% or 60%
Water Cooled Cond.	GPM	21	24	27	30	33	40	40	45	45
	Pressure Drop (b)	8.1	8.8	9.9	10.2	8.4	8.8	9.8	10.2	10.2
Water Cooled Cond. (Optional)	Int. Volume (Water, Gallons)	0.4 ea	0.4 ea	0.7 ea	0.7 ea	0.4 ea	0.4 ea	0.7 ea	0.7 ea	0.7 ea
	Head Pressure	3/4	3/4	1	1	1	1-1/4	1-1/4	1-1/4	1-1/4
Water Cooled Cond. (Optional)	Control Valve (d)	2	2	2	2	2	2	2	2	2
	Compressor	2	2	2	2	2	2	2	2	2
Water Cooled Cond. (Optional)	Charge R-410a (Lbs-Ozs) (c)									
	Approx. Weight (Net Operating)	812	851	1062	1104	1116	1126	1157	1256	1372
Water Cooled Cond. (Optional)		875	914	1137	1179	1208	1218	1273	1372	1372

- (a) Air flow performance may require other than standard drive components.
- (b) Does not include water regulating valve.
- (c) Split units need additional refrigerant. Refer to Installation Manual. Inclusion of some refrigerant circuit components may add additional charge.
- (d) Standard head pressure control valve is 2-way-150 psig. Alternate valve configurations possible in 3-way and 350 psig.
- (e) Drive set upgrade only.

All specifications subject to change without notice.

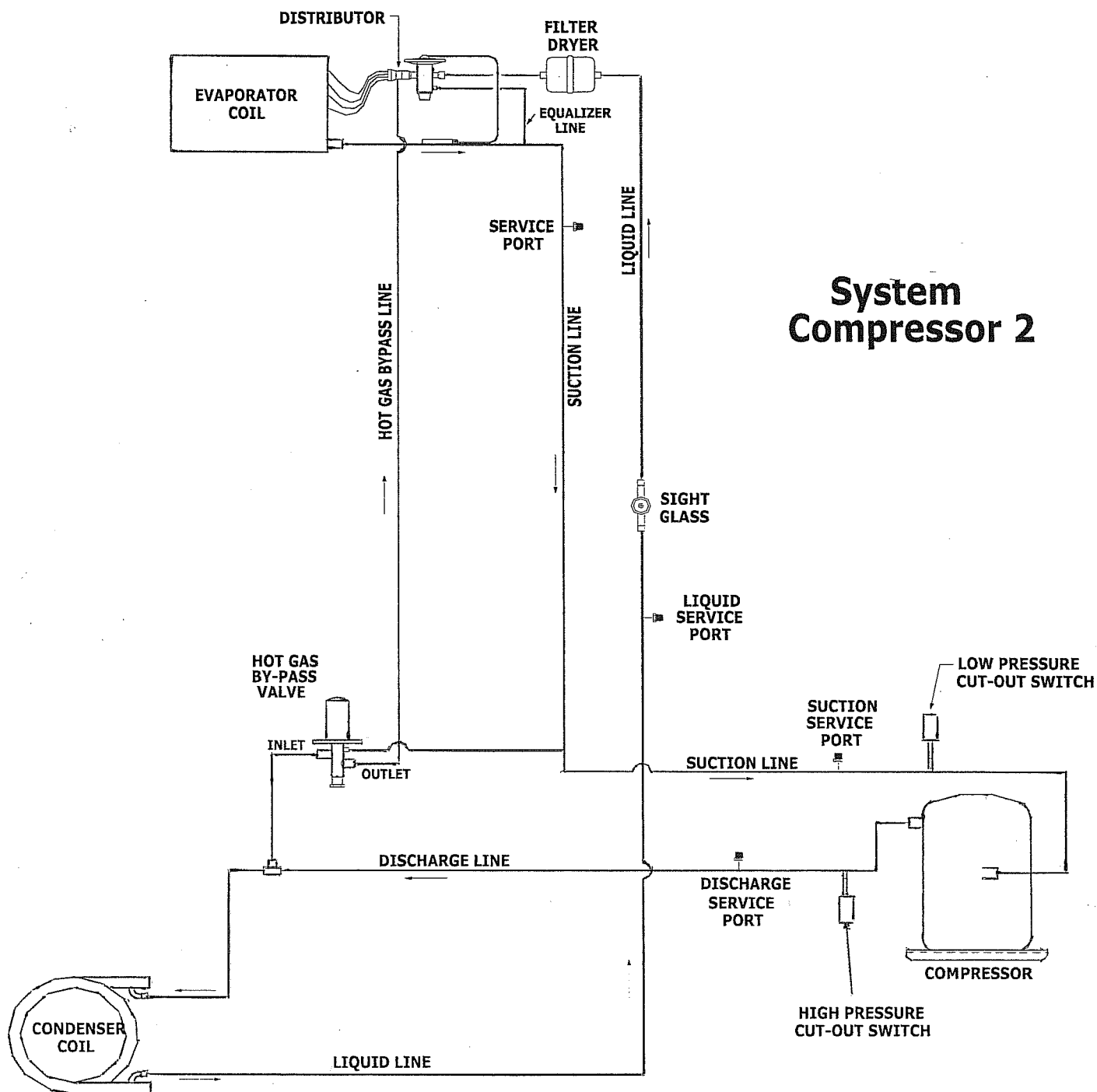
PIPING DIAGRAM

Single Compressor System and/or Stage One of a Dual Compressor System



PIPING DIAGRAM

Stage Two of a Dual Compressor System



**System
Compressor 2**

Leaving Dew Point (1) (2)

Nominal Tons	CFM	Outdoor Design Wet Bulb					
		70	72	74	76	78	80
		Leaving Dew Point Temperature (3) (4)					
1	150						
	200						
1.5	225						
	300						
2	300						
	400						
2.5	375						
	500						
3	450						
	600						
4	600						
	800						
5	750						
	1000						
6	900						
	1200						
7	1050						
	1400						
8	1200						
	1600						
9	1350						
	1800						
10	1500						
	2000						
11	1650						
	2200						
12	1800						
	2400						
13.5	2000						
	2700						
15	2250						
	3000						

- Notes:
- (1) Water-Cooled performance based on 85° F entering water temperature and a flow rate of 3 GPM/Ton.
 - (2) Air-Cooled performance based on 95° F DB / 78° F WB entering air with 95° F DB outdoor ambient entering the condenser.
 - (3) Dew point values not adjusted for motor heat.
 - (4) Use of glycol as cooling fluid will alter the leaving dew point values.

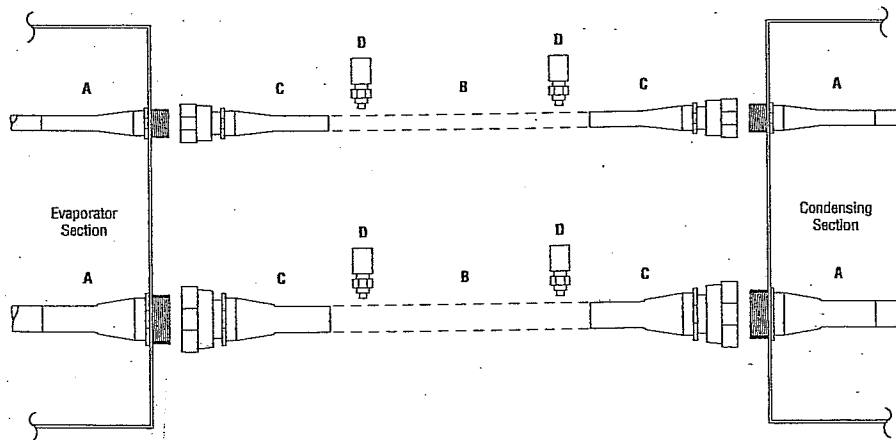
* Contact factory

Nominal Tons	Discharge Line		Liquid Line
	Evap. Below Cond.	Evap. Above Cond. or Same Level	
	Up To 100 Ft.	Up To 100 Ft.	Up To 100 Ft.
1			
1.5			
2			
2.5			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13.5			
15			

Always follow accepted industry practice for sizing lines based on the length and elevation difference.

Limit single phase compressors to _____ feet of separation and _____ feet elevation difference. Over 100 feet contact the factory. Additional refrigerant circuit components may be required.

Over _____ feet in elevation difference contact the factory. Additional refrigerant circuit components may be required.



- A - Male resealable fittings on unit sections
- B - Refrigerant piping between sections (field supplied)
- C - Female resealable fittings in interconnect kit (4) / circuit
- D - Schrader fittings in interconnect kit (4) / circuit

Figure 10

Interconnect Kits

Air-cooled units will require an interconnect kit for each circuit to connect with the remote air-cooled condenser section. The units and kits will be supplied with unique OEM resealable fittings on the refrigerant lines between the sections.

The fittings on the unit sections will be male. The interconnect kits will have the matching female fittings. Refrigerant piping between the sections is field supplied.

Figure 10 illustrates a typical piping arrangement for one circuit. Units up to and including 3-tons will have one (1) set of refrigerant lines, while units 4-tons and larger will have two (2) sets of refrigerant lines. A set of refrigerant lines will consist of a hot gas discharge line and a liquid line.

The interconnect kit also contains four (4) Schrader fittings. The installer can place one in each refrigerant line or one at each end of the refrigerant line. These enable the refrigerant line to be evacuated and charged as needed based on size and length.

In some situations, the desired refrigerant line size may differ from the fitting size provided. The line size should be reduced or enlarged at the fittings as necessary.