UNITED COOLAIR

VariCool®
EZ-Fit Series

Installation, Operation and Maintenance Manual

Effective March 2024

Variable Air Volume
Water-Cooled, Water Source Heat Pump

MEMBER
AHRI
AIR-CONDITIONING, HEATING, & REFRIGERATION INSTITUTE
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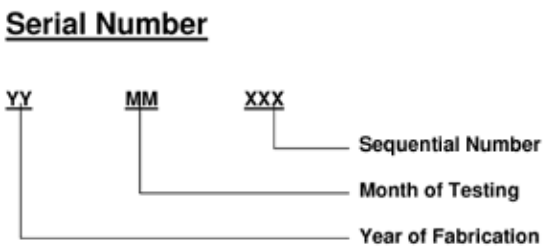
Contents

Wiring Diagram

To retrieve the unit wiring diagram, scan the wiring diagram QR Code label affixed near the unit data tag. This will link to the www.unitedcoolair.com website. Scroll down to the Serial Search box and enter the unit serial number.

The serial number is a combination of the year, month and sequential order of build date.



This will return the Model Number, Job Number and the Wiring Diagram for viewing as well as downloading.

1 results

Serial Number	Model Number	Job Number	Wiring Diagram
1706055	VZWD40G4DTAA-C	26652-003	View

Wiring diagrams are available for units shipped since November 2016. For older units, please contact the factory at www.unitedcoolair.com/general-inquiry/.

Safety Introduction and Labeling Guide

Your Safety is Important to Us!

Please follow and understand the rules and the instructions contained herein carefully. Failure to do so could cause a malfunction of the HVAC equipment, resulting in injury, death and/or property damage. Throughout this manual, and in specific places on the unit itself, the signal words ELECTRICAL HAZARD, WARNING and CAUTION are used to identify levels of hazard seriousness. IMPORTANT and INFORMATION will be used in areas where there is important information but not hazard related.

ELECTRICAL HAZARD

The electrical hazard icon indicates the presence of an electrical hazard which could result in electrical shock or death.

WARNING

The warning icon indicates a potentially hazardous situation which could result in death or serious bodily injury if not avoided.

CAUTION

The caution icon indicates a potentially hazardous situation which may result in minor or moderate injury if not avoided.

INFORMATION

The information icon indicates a situation that may result in equipment or property damage. The information provided alerts the reader to relevant facts and/or conditions.

IMPORTANT

This signifies a critical procedural step that is required by the end user.

These instructions, local codes and ordinances and applicable standards that apply to piping, electrical wiring, ventilation, etc. must be thoroughly understood before proceeding with the installation.

Protective gear is to be worn during installation, operation and service in accordance to the Occupational Safety and Hazard Administration (OSHA). Gear must be in accordance to NFPA 70E, latest revision when working with electrical components. Thin sheet metal parts have sharp edges. To prevent injury, the use of work gloves is recommended.

This equipment must be applied and operated under the general concepts of reasonable use and installed using best building practices.

This equipment is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the equipment by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the equipment.

To obtain additional copies of the Installation, Operation and Maintenance Manual, please contact United CoolAir. For detailed information regarding specifications, dimensional drawings, and weight information, contact your local United CoolAir manufacturer's representative.

General Information

This manual covers most unit configurations. Since many unit are built-to-order some of the information provided may not directly apply to this specific unit.

Inspection of Equipment

IMPORTANT

Upon receiving of the unit, carefully inspect all sections for visible or concealed interior / exterior damage.

United CoolAir has factory run tested this unit and has taken photographs post testing for verification and reference in case of any damage incurred during transportation, handling or rigging. If you have filed a freight damage claim and require pre-transportation photos please contact United CoolAir's local manufacturer's representative with the serial number.

If damage occurred during transit, contact the freight carrier immediately and file a damage claim report.

Inspect the unit data plate to verify the model unit that was ordered is what has been received.

Some options / accessory items may have been shipped loose in one or more boxes. These may have been delivered to another location, or possibly within the unit. If shipped with the unit there will be a sticker that identifies where in the unit the shipped loose items are located. Confirm that all of these options / accessory items are also available and that no damage has occurred.

Handling

To help facilitate handling, most units or modules are shipped on a wooden skid. Use caution when moving the unit or modules so that damage does not occur when moving each piece to the final installation location within the structure.

The units or modules can be moved by the use of a crane, fork lift, pallet jack or roller bars as appropriate. Under no circumstances should the unit or modules be "walked" on the corners of the skid or unit.

If a crane, cables or slings are used to move a unit or module, spreader bars must be used to protect each section's cabinet structure.

INFORMATION

Unit should NOT be located in space subject to freezing temperatures.

Location

Before unit can be installed, a thorough study should be made of the structure. Attention must be given to:

A. Floor, ceiling or wall load limitations as appropriate

B. Required service clearances

C. Condensate removal, trapping and disposal

D. Location of wiring and safety devices

E. Ductwork sizing and connections are per industry standards

F. Maintenance access

G. Mounting location is level in both horizontal planes

H. Water piping location and connection configuration

I. An EZ-Fit Frame Cart is available to verify that the largest cabinet section of a unit will fit through doorways, around corners and onto elevators. Contact United CoolAir's local manufacturer's representative for access to the Frame Cart.

Application Data

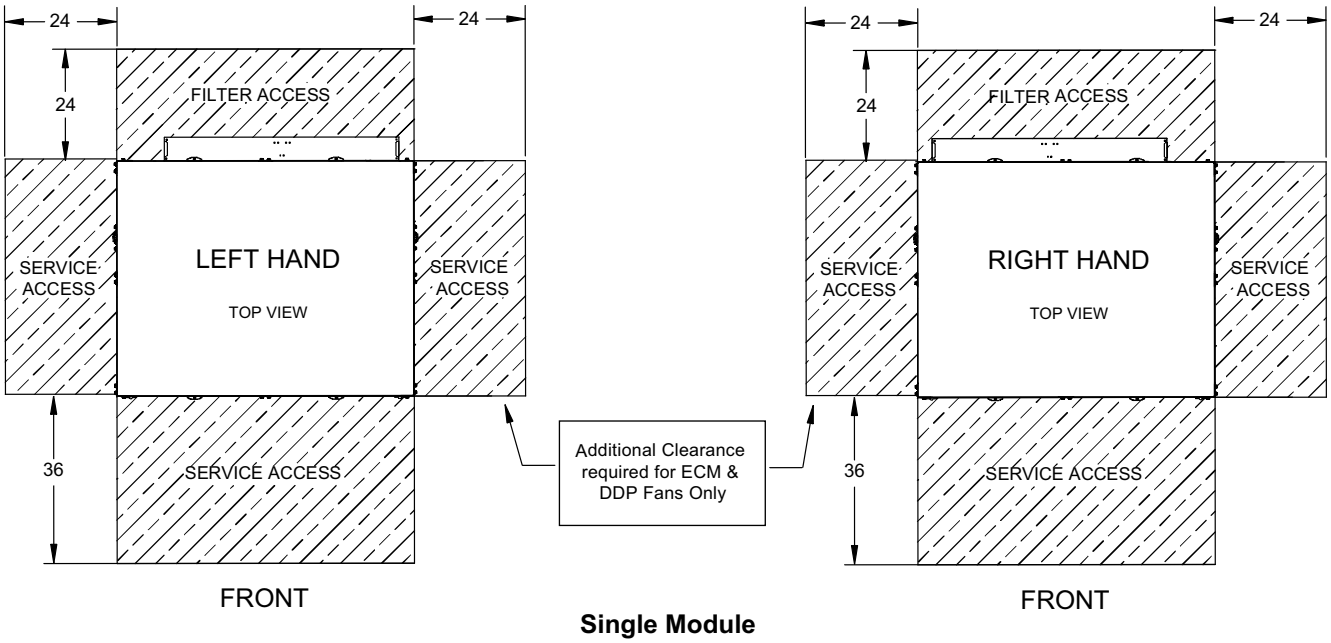
Voltage	280 / 230	460
Variation	187 / 253	414 / 504

Cooling (Air Entering Evaporator)	DB (min./max.)	65 / 110
	WB	57 / 72

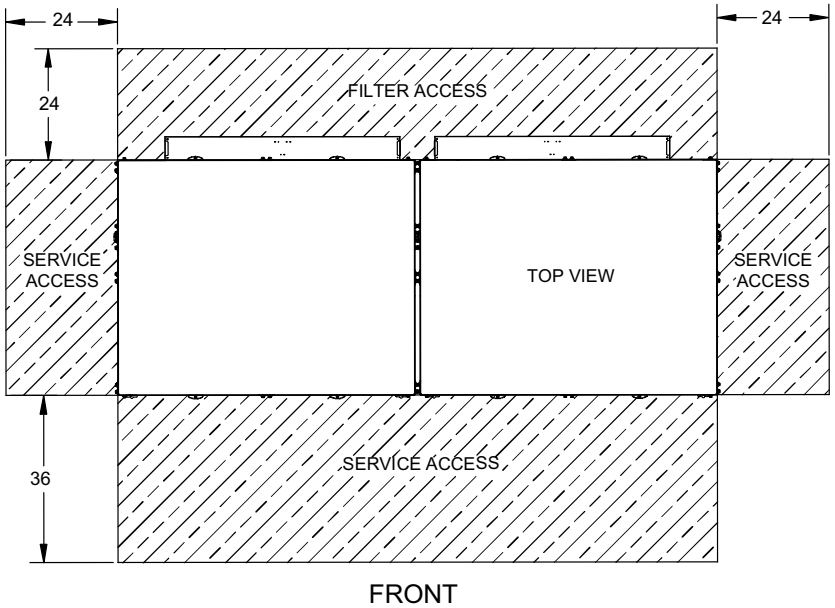
Water-Cooled	GPM / Ton (min./max.)	2.5 / 3.5
	Leaving Water (min./max.)	60 / 115

Note: Not all combinations may be valid.

Service Clearances



Single Module



Dual Module

Notes:
(a) Service clearances apply to all air path configurations
(b) Service clearances apply to all size units

Condensate Drain

Each EZ-Fit evaporator has a condensate drain connection in the base frame (Ref. Figure 1). If the application contains dual modules two (2) drain traps are required.

Traps will need to be connected to the 1-1/4” NPT drain connection(s) (Ref. Figure 1).

A condensate drain trap must be field fabricated and installed. The purpose of the trap is to neutralize the negative pressure created within the blower cabinet.

The negative pressure can vary from less than 1” up to 3” column. The condensate trap must be of sufficient depth in water column to permit the condensate to flow from the drain pan. Failure to have a sufficient drain trap will cause the condensate to overflow the drain pan or to cause the unit to shut down on the drain pan overflow safety.

The “A” dimension (Ref. Figure 2) must equal or exceed the negative static pressure developed by the supply air blower. The “A” dimension will be unique for each unit application. The trap must be 2-1/2” deep to maintain a water seal under all operating conditions, especially during blower start-up.

It is highly recommended that the trap be primed with water prior to start-up.

Each trap must be piped to a suitable waste drain.

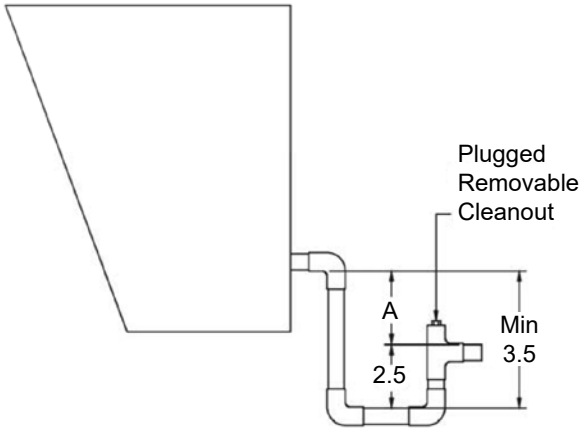


Figure 2 - Condensate Trap Dimensions

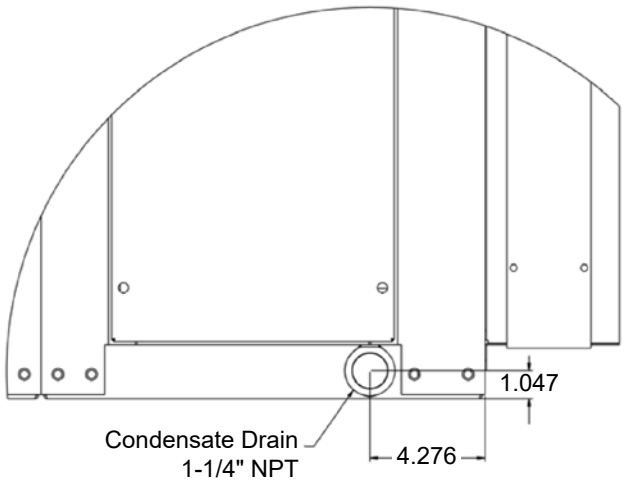


Figure 1 - Condensate Drain Location

Physical Data

Single Module

Nominal Tons	Blower Type			Filter Size		Evap. Coil		Compressor	R-410A
	ECM	iDDP	DWDI	Qty	Size (in)	Rows	FPI	Qty	Lbs/Ckt
15	•	•	•	4 / 2	15x20 / 20x20	4	14	2	7
20	•	•	•	6	18x25	4	14	2	10.8
25	•	•	•	6	18x25	4	14	2	11.8
30	•	•		6 / 3	24x20 / 20x20	5	14	2	15
35	•	•		2 / 5 / 2	20x20 / 20x24 / 24x24	5	14	2	20
40	•	•		3 / 6	14x24 / 25x25	6	14	2	24.1
45	•	•		3 / 6	14x24 / 25x25	6	14	2	27

Dual Module

Nominal Tons	Blower Type			Filter Size		Evap. Coil		Compressor	R-410A
	ECM	iDDP	DWDI	Qty	Size (in)	Rows	FPI	Qty	Lbs/Ckt
30	•	•	•	8 / 4	15x20 / 20x20	4	14	4	7
40	•	•	•	12	18x25	4	14	4	10.8
50	•	•	•	12	18x25	4	14	4	11.8
60	•	•		12 / 6	24x20 / 20x20	5	14	4	15
70	•	•		4 / 10 / 42	20x20 / 20x24 / 24x24	5	14	4	20
80	•	•		6 / 12	14x24 / 25x25	6	14	4	24.1
90	•	•		6 / 12	14x24 / 25x25	6	14	4	27

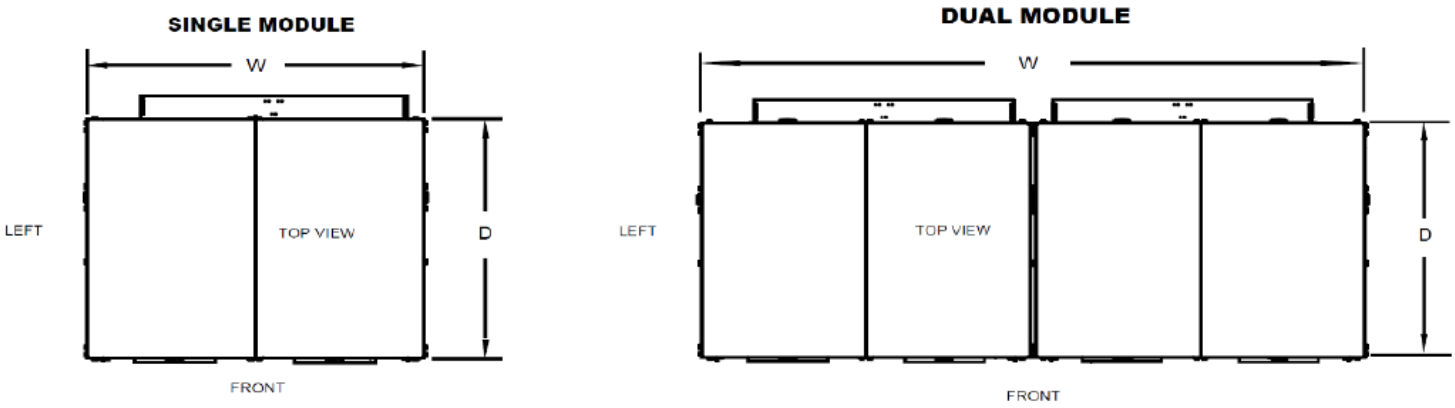
1. Standard Filters - 2” MERV 13, Optional Filters - 2” MERV 8 Pre- and 4” MERV 13 Final
2. Total Unit Working Fluid Pressure:

Coaxial Condenser (Std. A/C) - up to 250 psig

Brazed Plate Condenser (Std. WSHP) - up to 250 psig

Shell and Tube Condenser (Option) - up to 150 psig

Dimensions and Weights



Clearances / Service Access: Front - 36" LH Side, RH Side, and Rear - 24"

Assembled Unit

Single Module

Nominal Tons				Unit Weight		
	W[1]	D[1,2]	H	ECM	iDDP	DWDI
15	55-1/2	49-5/8	88-1/8	1635	1675	1650
20-25	65-1/2	52-1/8	93-1/8	2200	2250	2175
30	70-1/2	58-1/8	105-1/8	3140	3140	N/A
35	77-1/2	60-1/8	105-1/8	3660	3780	N/A
40-45	77	59-1/2	112	4220	4350	N/A

Dual Module

Nominal Tons				Unit Weight		
	W[1]	D[1,2]	H	ECM	iDDP	DWDI
30	110-1/2	49-5/8	88-1/8	3270	3350	3300
40-50	130-1/2	52-1/8	93-1/8	4400	4500	4350
60	139	56-5/8	105-1/8	6280	6280	N/A
70	153	58-5/8	105-1/8	7320	7560	N/A
80-90	152-1/2	58	112	8440	8700	N/A

Cabinet Sections

Single Module

Nominal Tons	Condensing Section					Evaporator Section					Fan Section (Each)				
	Qty	W[1]	D[1]	H	Wgt	Qty	W[1]	D[1,2]	H	Wgt	Qty	W[1]	D[1]	H	Wgt[3]
15	1	55-1/2	32-1/4	56	800	1	55-1/2	17-1/4	56	375	1	55-1/2	49-5/8	32	460
20-25	1	65-1/2	34-3/4	59	1075	1	65-1/2	17-1/4	59	525	1	65-1/2	52-1/8	34	600
30	1	70-1/2	34-3/4	71	1340	1	70-1/2	23-1/4	71	1000	2	35-1/4	58-1/8	34	400
35	1	77-1/2	34-3/4	71	1570	1	77-1/2	25-1/4	71	1170	2	38-3/4	60-1/8	34	460
40-45	1	77	34-1/2	78	1850	1	77	25	78	1450	2	38-1/2	59-1/2	34	460

Dimensions and Weights

Dual Module

Nominal	Condensing Section (Each)					Evaporator Section (Each)					Fan Section (Each)				
Tons	Qty	W[1]	D[1]	H	Wgt	Qty	W[1]	D[1,2]	H	Wgt	Qty	W[1]	D[1]	H	Wgt[3]
30	2	55-1/2	32-1/4	56	800	2	55-1/2	17-1/4	56	375	2	55-1/2	49-5/8	32	460
40-50	2	65-1/2	34-3/4	59	1075	2	65-1/2	17-1/4	59	525	2	65-1/2	52-1/8	34	600
60	2	70-1/2	34-3/4	71	1340	2	70-1/2	23-1/4	71	1000	4	35-1/4	58-1/8	34	400
70	2	77-1/2	34-3/4	71	1570	2	77-1/2	25-1/4	71	1170	4	38-3/4	60-1/8	34	460
80-90	2	77	34-1/2	78	1850	2	77	25	78	1450	4	38-1/2	59-1/2	34	460

1. Dimension (in.) includes hardware.
2. Dimension (in.) does not include depth of removeable Filter Rack. Filter rack depth is 5 to 24 inches, based on combination of options installed (2" and/or 4" filters plus aux. coil or elec. heat).
3. Weight (lbs.) with ECM Fans

NOTE: Alternate Narrow cabinet is available. See www.unitedcoolair.com website for drawings.

Supply Air Opening

Single	Dual	ECM[1]			iDDP[1]			DWDI[2]		
Nominal Tons		Front	Top	Rear	Front	Top	Rear	Front	Top	Rear
15	30	17-5/8 x 24			N/A	17-5/8 x 24		18-7/8 x 16-1/8		
20-25	40-50	15-1/2 x 25				15-1/2 x 25		22-1/8 x 18-7/8		
30	60	15-1/2 x 25				15-1/2 x 25		N/A		
35	70	19 x 25				19 x 25				
40-45	80-90	19 x 25				19 x 25				

1. Quantity two fans per module
2. Quantity one fan per module

Mounting and Placement

Mounting Options

When installing any floor mounted unit, some form of vibration isolation is required.

IMPORTANT

The assembled EZ-Fit cabinet has not been designed for corner point only loading with vibration isolators.

The EZ-Fit cabinet has one (single) or two (dual) modules. Each module has three or more cabinet sections. The EZ-Fit requires support on the corners, the middle of each section, and wherever sections come together. If the entire cabinet base of each section is not supported, refrigeration pipe breakage and/or coil leaks will occur, and the warranty coverage will be void.

Cabinet Vibration Isolation Method Options:

One of the following recommended cabinet vibration isolation methods are required and must be provided by the field. Keep in mind that sufficient height of the cabinet vibration isolation must account for the required height of the condensate drain trap.

1. Steel Frame with Spring Isolation – Fabricate a steel frame to provide support around the entire perimeter of the unit. Allow sufficient clearance for any door or panel access that is required to provide field service or maintenance on the unit. The frame will also need to be designed with suitable cross bracing. See Figure 3B and notice that the middle beam supports the mid-section of the unit. Field supplied spring vibration isolators are to be installed on each corner of each frame per module.
2. Channel Steel with Waffle Pads - Obtain channel steel rail of an approved gauge to support the unit weight and place underneath the unit in 4 locations per single module or 7 locations per dual module, see Figure 3C. Place waffle pad type furnace pads underneath the channel steel rail inside the “C” facing down for sound dampening. It is important that the channel steel rail does not touch the ground or sound dampening will not occur. All the rails must be level before placing the unit atop them. Please note the locations of the pads.
3. Waffle Pads Only - If cabinet height prevents adequate space for framing, waffle pads alone may be used, reference Figure 3E. It is highly recommended that each pad be of identical height and that the pads are kept no smaller than 4”x 4”. You will need at minimum 30 pads to support the EZ-Fit properly. Additional pads, more than the specified count, will improve the support of the unit. The goal is to keep the middle of the unit from sagging. Support under the compressors and water coils is key.

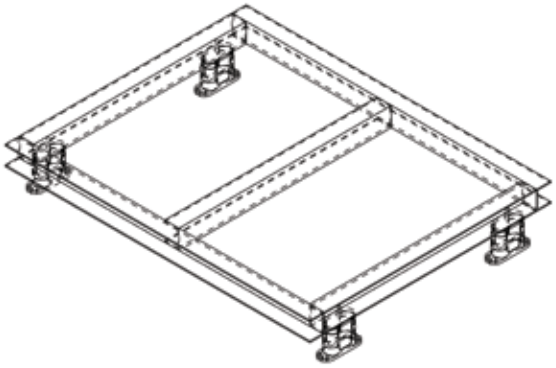


Figure 3A - Base Option 1- Steel Frame with Spring Isolation

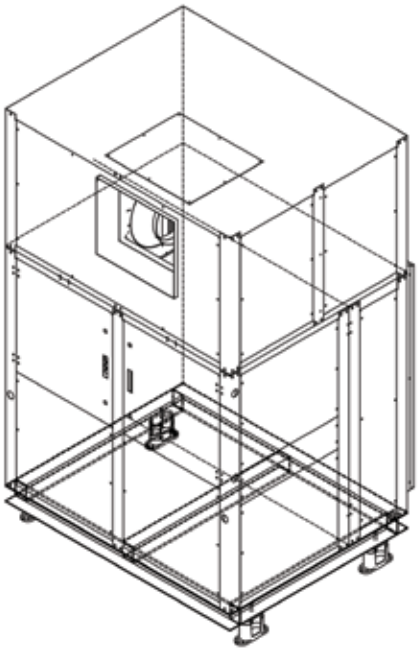


Figure 3B - Base Option 1 - Unit View - Single Module

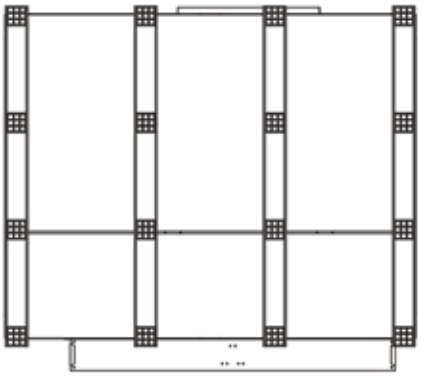


Figure 3C - Base Option 2 - Channel Steel with Waffle Pads - Bottom View

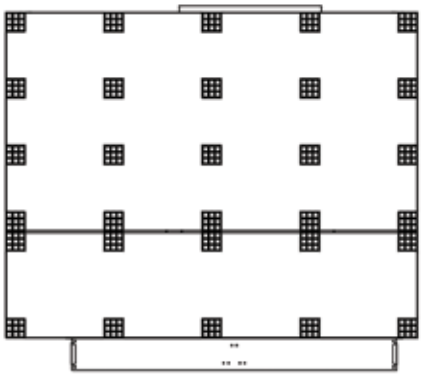


Figure 3E - Base Option 3 - Waffle Pads Only - Bottom View

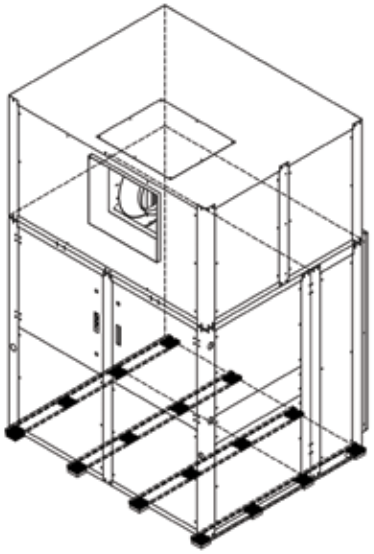


Figure 3D - Base Option 2 - Unit View - Single Module

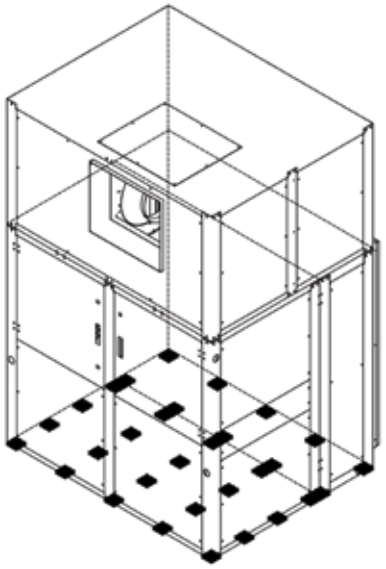


Figure 3F - Base Option - Unit View - Single Module

Suggested Assembly Sequence

1. Set Evaporator section in place.
2. Set Compressor / Condensing section in place.
   a. On Dual Module systems connect the factory provided water pipes between modules.
3. Connect resealable refrigerant fittings.
4. Attach 3D-Intelliclamps
5. Set Blower section in place.

NOTE: If space is limited in the mechanical room it may be advantageous to suspend the blower section(s) temporarily as the initial step.

6. Attach 3D-Intelliclamps.
   a. On Dual Module systems connect the factory provided power and control wiring from one module to the other.

Each module has three or more cabinet sections. Dual modules have a left hand and a right hand module.

Each section will be labeled as to which system it is. These labels are typically something such as AC-1, AC-2 or AHU-1, AHU-2, etc. Make sure when mating up the sections that each section is correctly matched for the appropriate module.

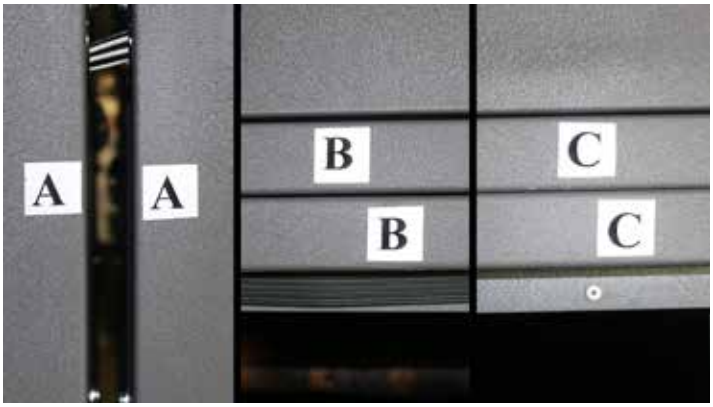
Additionally, when a dual module system is being assembled there will also be an indication as to which sections are left hand (LH) or right hand (RH). Left and Right hand is determined when viewing the unit from the control box side (side opposite the filters).

Each section is also alphabetically labeled so that each section can be mated properly. Set the sections so that point:

A aligns to A

B aligns to B

C aligns to C



Evaporator Section

Start by locating the evaporator section first. Set each section as needed, making sure that in dual module applications the evaporator sections are placed correctly as left hand and right hand.

Gasket Material

Gasket material has been factory supplied for field installation between each unit section. The gasket material must be installed to minimize air leakage and to help reduce transmission of noise.

Before applying any gasket material make sure the surface is clean and dry.

Gasket material, 3" wide, should be applied to those surfaces identified as "3" in Figure 4 (evaporator and compressor / condensing section).

Gasket material, 2" wide, should be applied to those surfaces identified as "2" in Figure 4 (evaporator and compressor / condensing section).

Compressor / Condensing Section

Next, locate the compressor / condensing section(s). Make sure the alphabetical labels align properly for either the single module or dual module configuration. Set the compressor / condensing section(s) in place.

Dual Module Units - Condenser water piping for dual module units are a single water inlet and outlet. Piping and grooved end couplings are factory provided to connect the two modules together. These items are shipped loose with the sections.

An insulation piece is factory installed between the module sections to seal any possible air leakage where the water piping passes through the cabinets. Cut a hole in the insulation to feed both the inlet and outlet water piping through.

Install the pipes and attach to the existing unit piping using the grooved end couplings. Hand tighten the bolts on the grooved end couplings until all interconnecting piping connections are made. Then, fully tighten all the bolts as necessary.

The interconnecting piping needs to be wrapped to minimize any condensate forming on the piping. The same gasket material used to seal between the cabinet sections can be used.

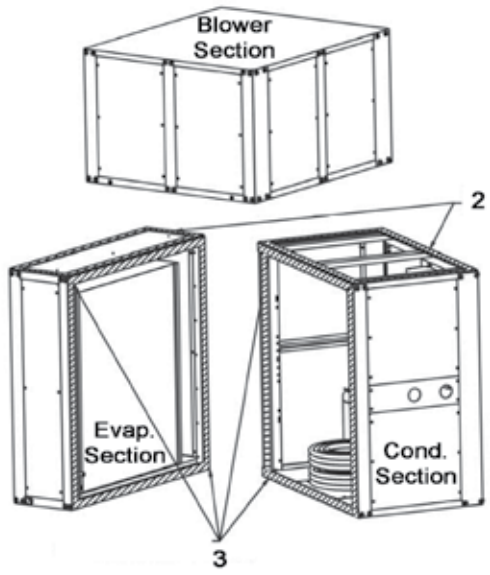


Figure 4 - Gasket Material

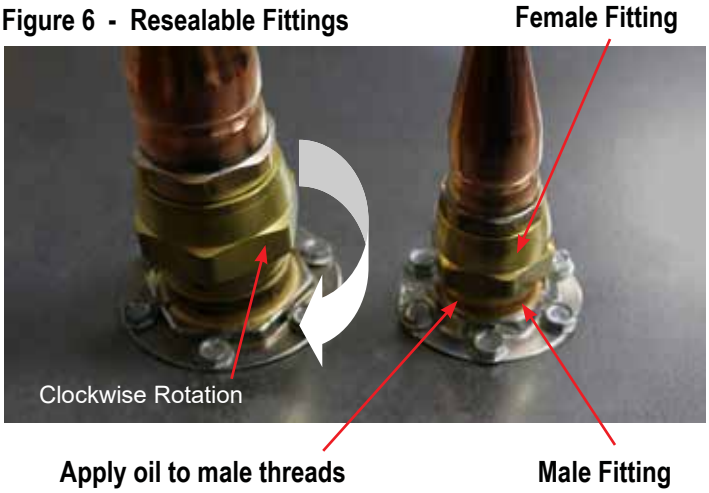
Resealable Refrigerant Fittings

All units are shipped from the factory with a full factory refrigerant charge. The resealable refrigerant fittings must be connected and properly tightened to facilitate refrigerant flow between the evaporator and compressor / condensing section.

For shipping purposes the refrigerant fittings are held in place to the cabinet using vinyl coated hangers and a mounting bracket. These are to be removed before the refrigerant fittings are connected.

1. On the refrigerant resealable fittings, apply a few drops (5 to 6 droplets are recommended) of refrigerant oil to the male coupling halves before starting the assembly (Ref. to Figure 6).
2. Align each resealable fitting and hand thread the female fitting onto the male fitting (Ref. to Figure 6). Continue to hand thread until resistance is observed.
3. Once slight resistance is evident, continue to tighten the fittings using the appropriate size wrenches listed in Table 1. Please note that it is important to support the male side of the fitting with a wrench when tightening the female side with a wrench.

Figure 6 - Resealable Fittings



4. If the resealable fittings still feel loose, tighten a bit more as required.

INFORMATION

Count the number of threaded rotations. Use Table 1 to determine how many total rotations are required for proper sealing of the fittings.

Size	Wrench	Full Turns Required
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

Table 1 - Resealable Fitting Turns

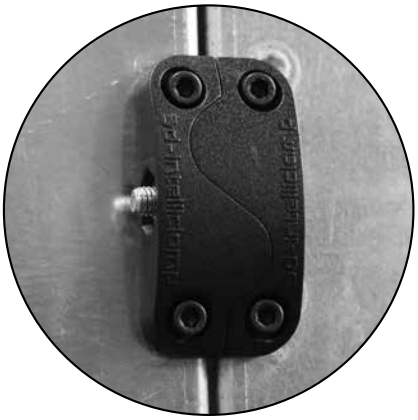
INFORMATION

If low refrigerant pressure is evident during the start-up process, check the tightness of all resealable fittings. A fitting that is not fully open will restrict refrigerant flow.

3D-Intelliclamps

Each section of a single module is furnished with 3D-Intelliclamps to facilitate connection to the adjacent section. These have been installed at the factory during production and consist of two interlocking halves that mate and are then bolted together. Once tightened, they ensure perfect alignment of the mating section surfaces.

Once adjacent sections have been put into place, use the included hardware to pull sections together until the curved surfaces of the 3D-Intelliclamps are completely mated.



3D-Intelliclamp

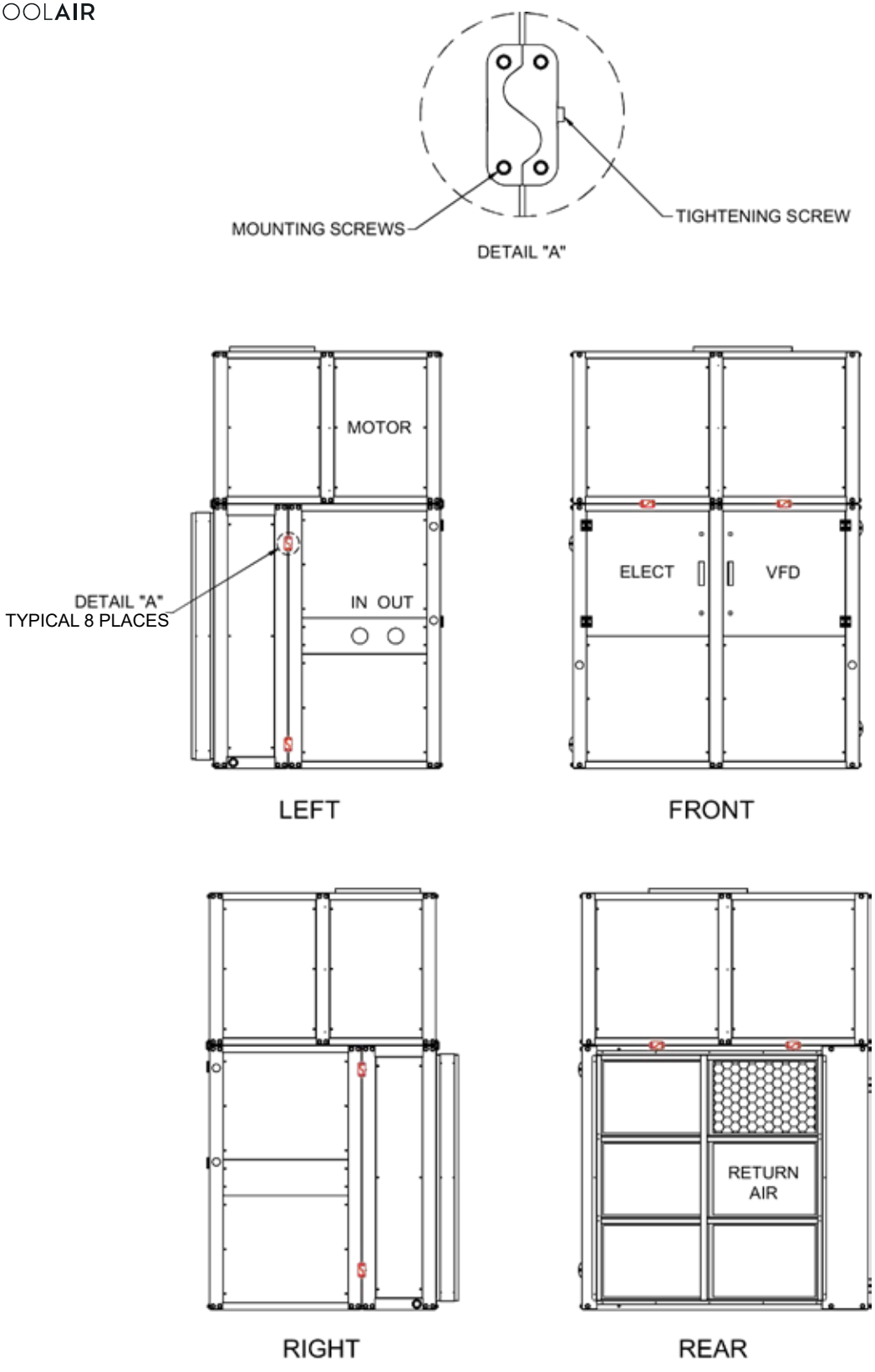


Figure 5A - Single Module

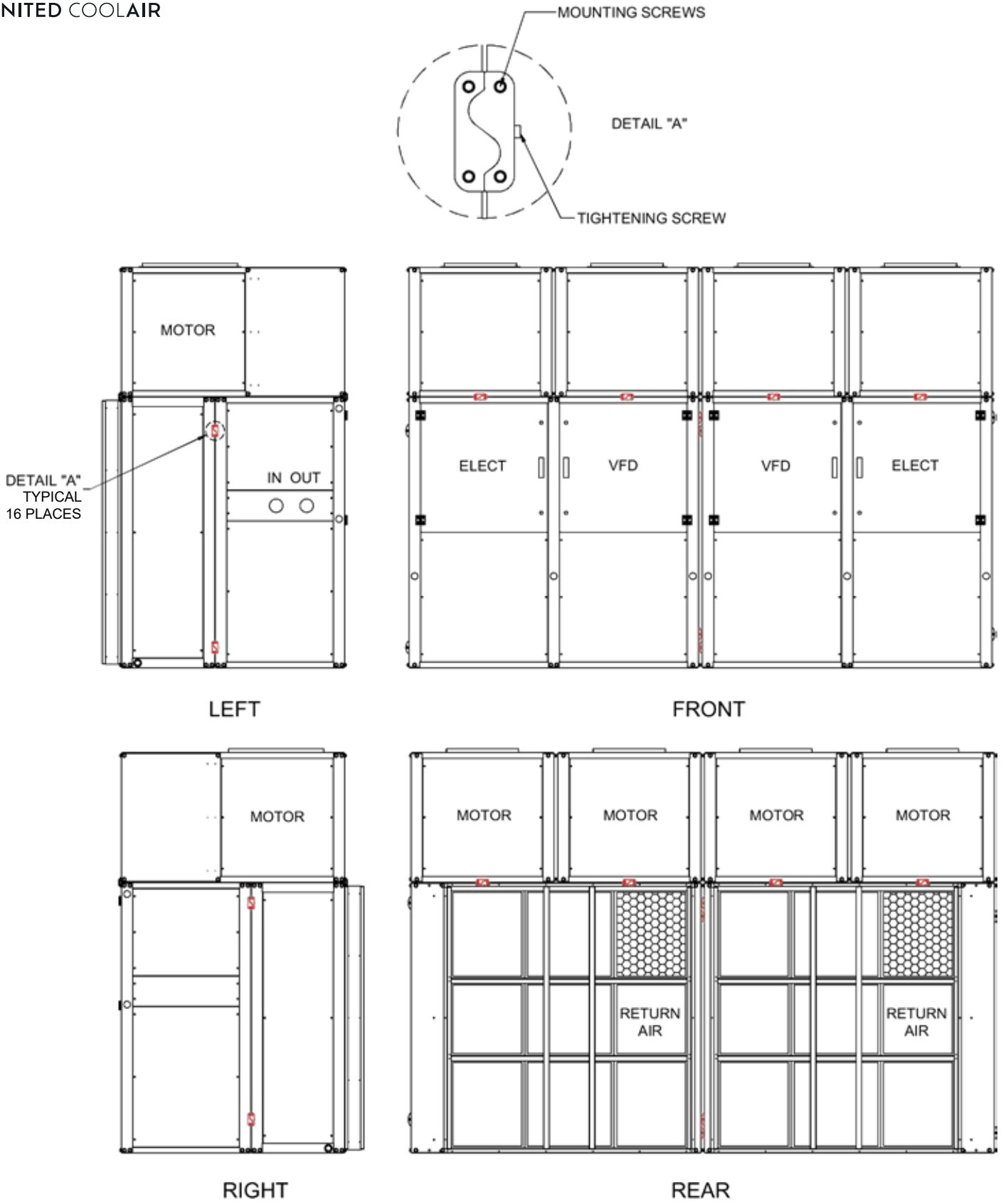


Figure 5B - Dual Module

Blower Section

Before installing the blower section(s), make sure the appropriate gasket material has been applied to the top of the evaporator section and the compressor / condensing section (Ref. Figure 4, surfaces identified as “2”). Make sure the alphabetical labels align properly for either a single module or a dual module configuration. Set the blower section(s) in place and attach the 3D-Intelliclamps.

Dual Module Units -- There is a 15 pin connector set to join the low voltage controls from one module to the second module. The pin connector must be snapped together and only fits in one direction.

There is factory provided power wiring to connect one module with the second module. Route the power wiring from the one control box to the other and attach to the appropriate power terminals located in the second module.

Duct Connections

Ductwork must be designed using applicable industry standards and practices. Use of turning vanes is recommended. Verify that the designed duct external static pressure is in line with the capability of the unit blower / motor provided.

Connection to the unit supply air outlet flange must be made using a field provided flexible collar.

Units that incorporate the EC fans or the direct drive parallel (DDP) fans should have the two supply outlets serve a common duct arrangement.

When dual modules are used in the application, a common supply duct should be used between both modules.

Ductwork and plenums shall be insulated in accordance with applicable industry standards or local codes.

Typically these units are installed using the mechanical room as the return air plenum. However, return ductwork can be applied. Sufficient duct flange area exists on the filter frame for this purpose. Field provided flexible collar should be used.

Make sure that all duct work is supported independently from the equipment.

INFORMATION

If the duct work is built in a manner that will split into 2 separate supply ducts directly off of the plenum, **contact the factory immediately.** A second pressure transducer will be required to control the duct static pressure to the lowest value of two duct static pressures.

Water Requirements

It is recommended that the water or coolant distribution system be of proper PH and free from debris. The filtration used for this must be maintained as unmaintained filtration systems that may cause low GPM will not be acceptable operating conditions. A minimum mesh strainer rated at 16-20 mesh must be installed on the systems inlet piping. 20-40 mesh is the best choice and strongly recommended for brazed plate heat exchanger applications. Mesh pressure drop must be assumed and is not considered when unit pressure drop is provided. The field must verify the proper GPM supply to the unit.

INFORMATION

Water-cooled units have been designed for use with fresh water application only. Do not use for brackish water or salt water unless appropriate condenser and water piping has been applied.

The water should be maintained at a ph of 7.4 and not less than 7.0 or higher than 8.0 for proper heat exchanger life. If this is not possible the unit should be verified to have had specialty coatings or heat exchanger coils installed if reasonable life of the heat exchangers is to be expected.

Water Piping

WARNING

HEAT EXCHANGER FREEZE RISK: Heat Exchanger will fail if operated at or near the freezing point of water/glycol mixture.

The following precautions must be taken:

- At startup, fluid side must be started first.
- At shutdown, refrigerant side must be shut down first.
- Fluid side outlet must have temperature monitoring and emergency shutdown equipment in case temperature approaches too close to the freezing point.

INFORMATION

Do not reduce the water inlet or outlet connection size as this will restrict water flow and increase water pressure drop.

CAUTION

Ensure that the water pressure to the unit does not exceed 250 psig.

INFORMATION

All field installed piping must conform to applicable local, state and federal laws.

The following items are to be field supplied and applied:

A. Water shut-off valves (Gate or Ball Type)

B. Inlet water strainer with isolation shut off valves on each side for periodic cleaning.

C. Water flow switch

The standard condenser heat exchangers are co-axial type. These are tube-in-tube type that are chemically cleanable. The inner tube carries the water and the outer tube the refrigerant. When designing and installing the water piping, some consideration for the chemical cleaning should be made if desired for future maintenance.

In some units, the optional shell & tube condensers may be incorporated. Care must be taken when designing the water piping and other items external to the unit to allow room for mechanically cleaning the heat exchangers if required.

IMPORTANT

Units have been tested at the factory before shipment. The test fluid at the factory contains a glycol mixture. It is important to flush the internal unit piping and heat exchangers at the job site prior to start-up or connection to the cooling fluid circuit being used.

INFORMATION

It is advantageous to record the inlet and water outlet temperatures and the heat exchanger pressure drop during the unit start-up procedure. These are then a valid reference point for maintenance considerations in the future.

INFORMATION

Factory inlet and outlet water connections contain grooved end connections. The appropriate connection in the field (grooved end, threaded etc.) must be field supplied. Refer to Table 2 for Water Connection Sizes.

INFORMATION

Field supplied water piping must include a pet cock or other suitable means at the highest point to bleed air from the water piping.

INFORMATION

High inlet water temperature or low water flow rate may result in nuisance tripping of the refrigerant high pressure switch.

INFORMATION

Water-cooled units with a glycol cooling fluid will require a higher GPM / Ton flow rate. Contact the factory for details.

Water Pipe Connection Sizes		
	Tons	**Size**
Single Module	15	2”
	20	2.5”
	25	2.5”
	30	3”
	35	3”
	40	3”
	45	3”
Dual Module	30	2”
	40	2.5”
	50	2.5”
	60	3"
	70	3”
	80	3”
	90	3”

Table 2 - Water Connection Sizes

Electrical and Controls

ELECTRICAL HAZARD

Only a qualified licensed electrician or other individual that is properly trained in handling live electrical components should perform the wiring installation. Failure to follow all electrical safety precautions and industry accepted practices when exposed to live electrical components could result in death or serious injury.

INFORMATION

Use Copper Conductors Only. Failure to use copper conductors may result in equipment damage.

INFORMATION

All electrical wiring must be in accordance with NEC (National Electrical Code), and NFPA (National Fire Protection Agency) most current versions as well as any applicable state or local codes.

INFORMATION

The correct phase sequence of the incoming power supply is a requirement. If the phase sequence is not correct it could cause damage or failure to electrical components. Reverse the incoming wiring to resolve the issue. Do not switch any internal unit wiring.

INFORMATION

Confirm that the incoming power supply matches the unit data tag.

INFORMATION

Unit wiring and components have been designed for the specific unit application and factory assigned controls. Do not use the unit transformers or alter the unit wiring to interface any field supplied accessories or controls.

Power Wiring

A factory provided power block is installed internal to the unit’s electrical control panel. Route the main power wires in accordance with all codes from the disconnect to the unit power block.

A proper ground termination lug has been provided in the unit control panel.

Dual Module Units - There is factory provided power wiring to connect one module with the second module. Route the power wiring from the one control box to the other and attach to the appropriate power terminals located in the second module.

ELECTRICAL HAZARD

Conduit is not an acceptable grounding source. A separate ground conductor must be connected from Earth Ground to the factory supplied grounding lug internal to the unit.

Transformer

Dual voltage units, 208/230, are wired from the factory for the 208 volt power supply. If the power supply will be consistently above 220 volts the transformer should be wired on the 230 volt tap.

Voltage Unbalance

Voltage unbalance occurs when the RMS line voltages on a 3-phase power supply are unequal. Voltages are never balanced between phases, but if the level of the unbalance becomes excessive it will create problems for not only motors but also controls.

The maximum desirable voltage unbalance is 2.0%.

When testing for voltage unbalance, the phase-to-phase voltages should be measured rather than the phase-to-neutral voltages since 3-phase motors are connected across phases. Use the following formula to determine the percent of voltage unbalance:

Percent Voltage Unbalance = 100 x (Maximum Voltage Deviation / Average Voltage)

Example:

Phase-Phase voltages

A-B = 479V

B-C = 472V

C-A = 450V

Average Voltage = (479 + 472 + 450) / 3 = 467 Maximum Voltage Deviation from Average =

467 - 450 = 17 (Must always be positive) Voltage Unbalance = 100 x (17/467) = 3.6%

In this example the percent of voltage unbalance exceeds the desired maximum of 2%. Additional checks should be made at the unit disconnect to confirm the values. Use accepted industry practices to check or test the quality of the power supply. Often, it is just a matter of repairing malfunctioning equipment or redistributing loads to improve the unbalance.

If no cause can be located and resolved for the unit power supply, the building manager or owner should be notified of the issue to get the proper power supplied to the unit.

INFORMATION

Variable Frequency Drive (VFD) - An unbalanced power supply to a variable frequency drive (VFD) may result in nuisance tripping and 3rd harmonic currents.

High Duct Static Pressure Switch

A high duct static pressure switch is factory installed on a unit configured for a multi-zone VAV application. The high static pressure switch is a manual reset type. Its purpose is to protect the ductwork in an event that all VAV boxes close and the call for the unit operation over pressurizes the duct work. The duct static switch requires field tubing installation. The tubing must be mounted in the supply (+) side of the duct work and external to cabinet pressure (-). There is an adjustment on the switch to set the trip point in “W.C. It is accessible inside the switch by removing the 2 front screws. Simply adjust the inner adjustment screw by hand or with a flat screw driver and align the red band with the “W.C. line you wish the switch to trip at.

If this failure signal is sent back to the Marvel Premium controller, the unit will shut down. Adjustments should be verified with a manometer or magnehelic.

Low Voltage Control Devices

Low voltage control devices are located internal to the evaporator section. Wiring and tubing are factory provided for these items. Snap together the multi-pin connector. The multi-pin plug and receptacle only fit together in one direction. Route the tubing to the appropriate low voltage control device in the control box and connect to the switch. For dual module configurations, there will be connectors in each module.

Wall Display

The Wall Display is a shipped loose item along with 100 feet of interconnecting cable. Refer to the Marvel Premium installation instructions for specific mounting instructions, details and precautions.

BMS Applications

The EZ-Fit unit is equipped with a Marvel Premium controller and BACnet MS/TP (field convertible to IP/Ethernet). Refer to the Marvel Premium installation instructions for BMS integration.

United CoolAir provides the latest versions of BACNet®. There have been installations where the legacy BAS cannot communicate forward to the current version. Any communication issues that arise due to legacy BAS/BMS not communicating to current protocols will be a controls issue to be resolved by the field. United CoolAir, as an OEM, uses the current software and is not responsible for any conversion software installed.

Static Pressure Transducer

The duct mounted supply air static pressure transducer is a factory supplied, field installed, shipped loose item for a multi-zone VAV application. The static pressure transducer is polarity sensitive. Miswiring this sensor will destroy the input on the controller! Traditionally, the static pressure transducer should be placed 2/3 down the main duct trunk. It should be away from any turning vanes, VAV boxes, reducers, in duct heaters, turns, bends, and transitions. The sensor may be placed closer to the supply as long as low turbulence condition exists.

INFORMATION

If there are 2 equal duct takeoffs acting as 2 supply mains off of the unit, the duct static pressure transducer will not control properly, if placed 2/3 down one of the takeoffs. Either a long enough run of main supply before the split must contain the static pressure sensor, or an additional duct static pressure transducer will be required and the positive pressure input must be split and shared to each side to average the two static pressures. Contact the factory.

Supply Air Temperature Sensor

The duct mounted supply air temperature sensor is a factory supplied, field installed, shipped loose item. The supply air temp sensor should be placed in the plenum in the middle towards the top end to achieve the best reading for the supply temperature. This will help to ensure that the controller gets accurate and reliable information. The supply temp sensor must be placed in a main branch or plenum. Placement in another location will result in inaccurate control.

Return Air Temperature Sensor

The duct mounted return air temperature sensor is a factory supplied, field installed, shipped loose item. The return air temp sensor should be placed in an area that can properly average all of the return air, preferably right before the filters if possible. For maintenance room plenum applications, the return sensor should not be placed anywhere that can be influenced by outside sourced temperatures. Common items influencing the return temperature sensor are large transformers, computers, control panels, doorways, outside air dampers, water heaters, sinks and washbasins, etc.

Sequence of Operation Manuals

Single-Zone Variable Air Volume

Multi-Zone Variable Air Volume

Constant Air Volume

Water Flow Switch Installation

EZ-Fit units utilize Head Pressure Control valves which modulate the water flow to maintain adequate refrigerant head pressure. If a water flow switch is provided by the field, do not install the switch in the BRANCH pipe feeding condenser water to the unit. A reduction of water flow from the unit head pressure control valve operation may cause nuisance trips. Water flow switch trips will cause "loss of water flow" alarms, which in turn will prevent the compressors from starting or will cause the active compressors to shut down.

Install the field provided water flow switch in the MAIN water pipe supplying condenser water to the building, close to the unit's supply branch, to accurately reflect flow conditions in the main line (Figure 9).

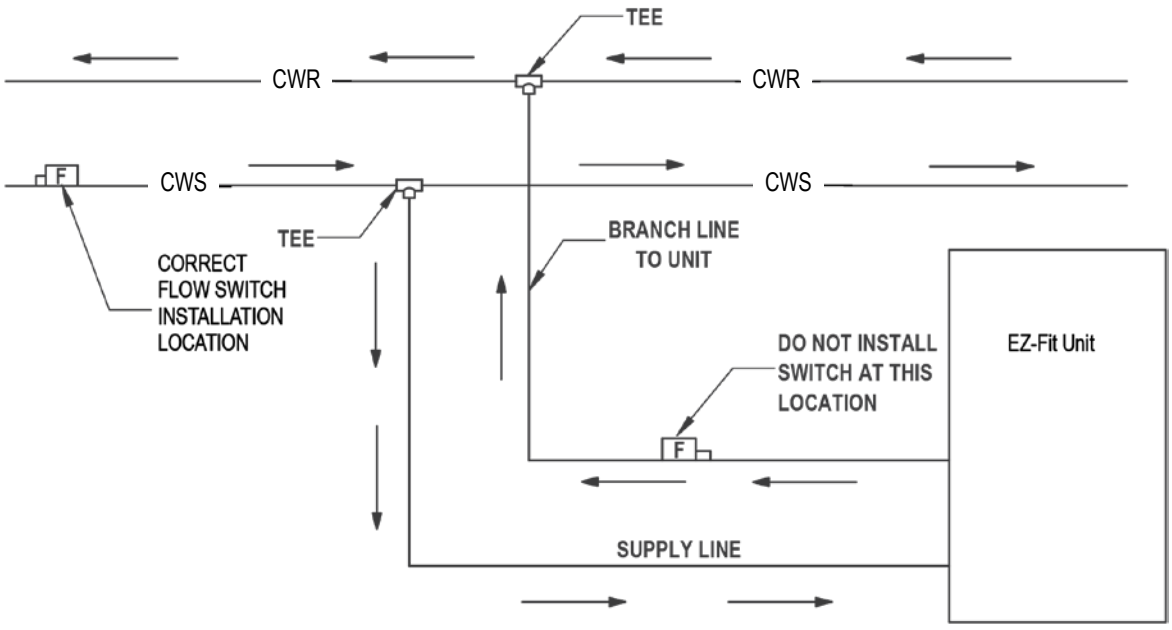


Figure 9

Maintenance Procedures

ELECTRICAL HAZARD

Turn OFF power and lockout service before conducting any maintenance. Keep hands, clothing and tools clear of electrical terminals.

WARNING

Make sure to keep hands and clothing clear of any moving belts, blowers and motors while performing any maintenance. Failure to do so could result in death or serious bodily injury.

CAUTION

Any maintenance should be conducted by qualified HVAC service personnel only. Potentially hazardous situations may result in personal injury, equipment or property damage.

To keep the unit operating safely and efficiently, it is recommended that a qualified service technician check the entire system at least once a year. Check the system more frequently depending on use and surrounding conditions.

Filters

To keep the system operating as efficiently as possible, change the air filters as required. Be sure to inspect them at least one time per month when the system is in constant operation. The unit is equipped with pleated throwaway air filters. Make sure to replace them with the same type and size.

NOTE: Do not attempt to clean throwaway air filters.

On units that have return air ductwork, remove the screws to the hinged filter access door (either side). Slide the filters out. Replace the filters and slide back into position. Reinstall the screws on the filter access door.

On units that do not have return air ductwork, the filters can simply be lifted up to clear the lower frame edge and pulled towards you for removal.

The filters are directionally specific for air flow, reinsert the new filter in the correct air flow direction.

DWDI Blowers

Check that the blower wheel is tight on the shaft and does not contact the blower housing (DWDI type).

Check for restrictions or foreign material in the air circuit.

Lubrication

Belt Driven (DWDI)

The evaporator blowers have Pillow Block bearings which must be lubricated. Lubricate the bearings using high quality lithium grease. Each Pillow Block Bearing has a Zerk fitting to connect the grease gun to, for adding the grease. It is preferable to add grease to the blower bearings while rotating the shaft to ensure that grease forces the air pockets from the bearing, allowing a grease seal throughout the entire volume of the bearing. Grease should be added until it slightly exudes through the bearing seals. When enough grease is added, beads will form at the seals. Once these beads are slightly visible, it indicates the bearing is full of grease. Do not continue adding grease once these beads are visible.

CAUTION

Over lubricating will cause the bearing to overheat and could cause the grease seal to blow out.

Both excessive or inadequate grease may cause premature failure. Provided there is some grease in the bearings for lubrication, under lubrication is better than over lubrication as grease can easily be added but not removed. Always allow a slight bead around the circumference of the seals to protect the bearing from foreign matter and helps flush out the bearing as well.

Frequency of Lubrication depends on operating conditions. Lubrication should be checked every 1-2 months when blower is operating constantly.

Belt Tensioning

Excessive belt tension is the number one cause for blower bearing failure. Proper belt tension and pulley alignment are essential for trouble free operation.

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.

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 supply air blower performance may result. Tight belts may also overload the motor and cause the efficiency to drop considerably or even premature motor failure as well.

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.

If the midpoint (midway between the blower and motor shaft) of the belt is pressed inward, there should be about 1/2" to a 1" of deflection when the belt is properly tensioned.

Refer to Figure 8 – Belt Tensioning below.

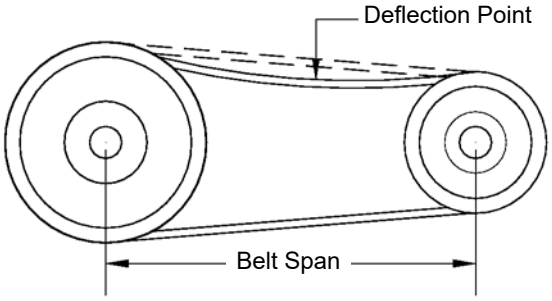


Figure 8 – Belt Tensioning

For proper tensioning, use the following equation:

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

Belt span is in inches from center pulley to center pulley (see Figure 8).

Belt tension is adjusted by using the adjusting bolt on the end of the motor mounting frame.

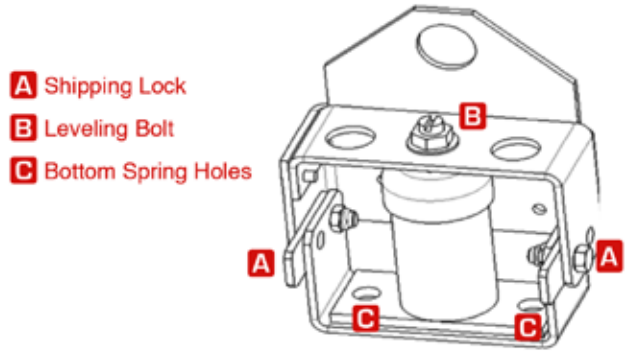
Check the alignment of the sheaves to make sure that the sheave faces are in the same plane. Check this by placing a straight edge across the face of the sheaves. Any gap between the edge and sheave faces indicates misalignment

NOTE: This alignment 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.

Direct Drive Blowers

Verify the spring isolators have the shipping locks removed and the leveling bolts are adjusted to the proper height for suspension. If the shipping locks are not removed and adjusted, the fans will be very noisy and cause damage to them.



INFORMATION

Some models of IDDP fans will have a max impeller RPM that is less than the motor built with it. UCA factory will program the VFD to maintain the de-rated RPM required by the fan. Reference the table below for de-rated RPM values. All motors supplied operate at 3450 RPM at 60hz.

IDDP Wheel size	Max Wheel RPM	Max VFD Hz Operation
105	5195	60
122	4425	60
135	4038	60
150	3650	60
165	3275	53
182	2979	51

Drain Pan

Every six (6) months, or as learned from the specific application, check the condensate drain pan, trap and condensate line to ensure that the condensate is draining properly. If there is any indication that any standing water is or has been present, the cause needs to be determined and fixed immediately.

Drain pans should be cleaned, as needed, using industry accepted practices.

Evaporator Coil

Finned coils can become “fouled” due to a build up of contaminants in the air path that are not caught or captured in the air filters. Over time this build up on the fin surface can reduce heat transfer and increased resistance to air flow. The end result might be higher operating costs or occupant discomfort.

The finned coils in a unit should be checked at least every six (6) months or more frequently based on experience of the specific application.

Before cleaning any finned coils remove the filters. Remove any large debris or visible dirt accumulation.

Protect any controls or sensors that should not be exposed to water or coil cleaning solutions.

WARNING

Make sure to follow all safety precautions when cleaning any coil with a commercially available coil cleaner. Follow all recommendations for safety clothing and gear. Failure to follow all safety instructions could result in death or serious injury.

CAUTION

Clean coils only with cold water and a suitable detergent or a commercially available coil cleaner. DO NOT use hot water or steam to clean a coil containing refrigerant as this may cause a high pressure situation that could damage the coil and associated safety devices or refrigerant components.

CAUTION

Confirm that any coil cleaning agents, detergents or solutions are suitable for use on a copper tube/aluminum fin coil. If the cleaning agent is to acidic or alkaline, damage to the coil fins may result.

Rinse all coils thoroughly after any coil cleaning.

Use a suitable fin comb after the coil cleaning to straighten any bent fins.

Condenser

Any fluid that is used to carry the heat away through the condenser contains, minerals, dust from a cooling tower or other foreign materials. Over time these contaminants will build up on the walls of the heat exchanger.

This scale or fouling will result in a reduction in water flow, less water temperature difference between inlet and outlet, high condensing temperature and higher fluid pressure drop. All of these affect the operating performance and efficiency of the system and need to be addressed. The performance values that were recorded during the initial start-up procedure will help to determine when maintenance is required.

Coaxial heat exchangers will need to be cleaned using a chemical solution. These are available commercially. Follow all manufacturer recommendations and safety warnings.

Shell and tube heat exchangers can be mechanically cleaned. Use industry accepted practices to clean the tubes.

Water Side Economizer Coil

If a unit contains the optional water side economizer coil it may also require a periodic cleaning. These coils will need to be cleaned using a chemical solution. These are available commercially. Follow all manufacturer recommendations and safety warnings.

Water Valves

At least once a quarter check the water vales to make sure that no leaks are present. Look at the valve stem and all piping joints.

If any leaks are found follow the manufacturers recommendations for tightening any seals or replacing any gaskets.

Refrigerant System

Each refrigerant circuit contains a liquid line sight glass. If bubbles appear in the sight glass, the system is either undercharged with refrigerant or there may be a restriction in the liquid line upstream of the sight glass. However, bubbles will appear every now and then in units with a hot gas bypass valve. Bubbles will also appear upon compressor start up, but normally clear to pure liquid after a few minutes of operation.

Check the filter drier for obstructions. If the temperature drop across the filter drier is more than 3° to 5°, there is a good likely hood that the filter drier is blocked to some extent and should be replaced.

The sight glass contains a moisture indicator that changes color when moisture is present in the refrigerant system glass. If the color of this indicator is green or blue, the refrigerant is normal. When the indicator is yellow, an abnormal condition exists, such as moisture within the refrigerant circuit. If an abnormal appearance exists, servicing is required by a qualified technician.

INFORMATION

After installation and during equipment start up, the sight glass may appear pink or purple. This occurs during prolonged periods of non-operation and should turn blue or green after several hours (up to 12) of operation.

Operations Verification Check List

This checklist is designed to be a list of verifications after the initial install has been completed. Assuming all electrical and tie in operations are complete and without issue.

1. Base Verification – Ensure the base of the unit is supported in 1 of the 3 ways depicted in the Mounting Options section. If not, support properly before any operation of the unit occurs.
2. Air balance verification - Your unit was sold to specific parameters for CFM delivery at an ordered static pressure (ESP). An air balance must be performed. To determine the total external static pressure, measure using a manometer or magnehelic gauge. Place the negative side of the device into the return ductwork, and the positive side into the supply ductwork. The supply must have a static pressure pitot tube to reduce velocity pressure and must not be near the blower, main plenum, or near 90°s, turning vanes, dampers or duct reducers, i.e. anywhere turbulence can occur. The reading indicated on the device is the total ESP. If the unit is using an open mechanical room as the plenum, the negative side may be placed in the room near the filters, but the door to the mechanical room must be closed. You can then verify (on the controller status screen) the RPM at which the unit is operating the VFD drive. Perform a duct traverse at the same time with an anemometer (or similar device), with similar operating parameters, to obtain the CFM.
3. Water balance verification – Ensure that the unit has 3 gpm per ton available to it at all times, if a pump is of variable speed it must be able to ramp up its speed based on that demand. Variable Speed compressors require a minimum of 12 hours of continuous crank case heater energization before operation. **Failure to do so may result in liquid slugging on initial startup** which may cause damage to the compressor and will void warranty. To test the full water demand of the unit, you must use the controller on the unit and apply a manual control to the discharge pressure control valve. Visually inspect the valve to ensure it reads or points to the OPEN position. Also verify that the Water side economizer valve is in the CLOSED position. This ensures that the valve is now requesting a full water load scenario for the unit in mechanical cooling. At this time you may read the pressure drop across the system and compare it to the unit's submittal data. Note that each unit is built to custom specifications and you will need data about your specific unit. The pressure drop data is an indicator of the heat exchangers pressure drop, it does not include the piping which will be marginal but will add additional resistance. Note that units may be ordered with multiple DPC valves and other valves, in such case the design may require some additional consideration before a water balance/ verification can be performed. The entering water temperature should not exceed 90°F and should not be reduced to less than 50°F for best operating results. If equipped with a water side economizer the set point of water side economizer operation should be verified.

Troubleshooting Guide

ELECTRICAL HAZARD

Turn OFF power to unit before conducting any troubleshooting, unless the tests you are performing require system operation. Keep hands, clothing and tools clear of electrical terminals.

WARNING

Make sure to keep hands and clothing clear of any moving belts, blowers and motors while performing any tests. Failure to do so could result in death or serious bodily injury.

CAUTION

Any troubleshooting or test procedures are to be conducted by qualified HVAC service personnel or electricians only. Potentially hazardous situations which may result in personal injury, equipment or property damage.

INFORMATION

For operating and troubleshooting instructions for microprocessor controller, refer to specific controller instructions that accompany the unit.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Control is erratic	**1.** Control wiring not installed correctly **2.** Loose control connections **3.** Broken wiring	**1.** Check wiring connections against schematic. **2.** Check all connections for tightness. **3.** Check wire continuity.
Blower fails to start	**1.** Controller not set properly **2.** Motor failure **3.** Defective contactor **4.** Overload tripped **5.** Controller alarm **6.** VFD not functioning properly	**1.** Turn on and set controller for desired operation **2.** Replace motor **3.** Replace contactor **4.** Check cause and resolve then reset manual overload (internal overloads will have to reset themselves) **5.** Resolve alarm condition **6.** Confirm VFD programming and operation
Compressor fails to start	**1.** Controller not set properly **2.** Loss of refrigerant charge **3.** High head pressure **4.** Low line voltage **5.** Controller alarm	**1.** Turn on and set controller for desired operation **2.** Repair leak, evacuate and recharge refrigerant system **3.** Confirm proper fluid flow quantity through condenser **4.** Confirm acceptable fluid temperatures entering the condenser **5.** Resolve incoming voltage issue **6.** Resolve alarm condition **[Note: Compressor internal overload may require an extended period of time (1 hour or more) to reset]**
Compressor short cycles	**1.** Reduced air flow **2.** Loss of refrigerant charge **3.** Short cycling of conditioned air **4.** Drain pan switch open	**1.** Check filters and coil for any blockages **2.** Replace filters if dirty **3.** Repair leak, evacuate and recharge refrigerant system **4.** Make sure that supply air is not short cycling back into return air stream **5.** Confirm that unit condensate is draining properly.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Evaporator coil ices	**1.** Lack of air flow **2.** Low return air temperature **3.** Loss of refrigerant charge **4.** VFD not functioning properly	**1.** Check filters and coil for any blockages **2.** Replace filters if dirty **3.** Verify that blower is rotating in the proper direction **4.** Make sure that supply air is not short cycling back into return air stream **5.** Repair leak, evacuate and recharge refrigerant system
Noisy compressor	**1.** Expansion valve stuck open **2.** Worn or scarred compressor bearings **3.** Excessive head pressure **4.** Broken compressor valve (compressor knocking) **5.** Liquid slugging	**1.** Ensure thermal expansion valve bulb is tight on suction line **2.** Confirm thermal expansion valve bulb is located properly on suction line **3.** Check superheat **4.** Replace compressor **5.** Reduce head pressure **6.** System overcharged. Reclaim excess refrigerant from the high side of the system.
System short of capacity	**1.** Flash gas in liquid line **2.** Expansion valve stuck open or possibly obstructed **3.** Clogged filter drier **4.** Iced or clogged evaporator coil **5.** Head pressure control valve not operating properly **6.** Condenser needs cleaned	**1.** Check for refrigerant leaks **2.** Repair leak, evacuate and recharge refrigerant system **3.** Check sub-cooling **4.** Ensure thermal expansion valve bulb is tight on suction line **5.** Confirm thermal expansion valve bulb is located properly on suction line **6.** Replace thermal expansion valve **7.** Replace filter drier **8.** Check filters and coil for any blockages **9.** Replace filters if dirty **10.** Verify that blower is rotating in the proper direction **11.** Confirm proper fluid flow quantity through condenser **12.** Confirm acceptable fluid temperatures entering the condenser **13.** Clean condenser
Head pressure too high	**1.** Possible non-condensible in system **2.** Overcharge of refrigerant **3.** Condenser water flow not adequate **4.** Condenser entering fluid temperature too hot **5.** Condenser air intake, duct or coil blocked. **6.** Condenser blower not operating or running backwards.	**1.** Repair leak, evacuate and recharge refrigerant system. Install new filter drier. **2.** Reclaim excess refrigerant from high side of system **3.** Confirm proper fluid flow quantity through condenser **4.** Confirm acceptable fluid temperatures entering the condenser **5.** Verify that head pressure control valve is operational **6.** Reset high pressure safety switch if tripped **7.** Clean away debris from condenser air circuit. **8.** Check phase of incoming power to unit. Reverse any two incoming power supply wires (except ground).
Head pressure too low	**1.** Condenser water flow too high **2.** Entering fluid temperature too low **3.** Excessive air flow across condenser.	**1.** Confirm proper fluid flow quantity through condenser **2.** Confirm acceptable fluid temperatures entering the condenser **3.** Confirm proper air flow amount. Adjust blower drive package as necessary.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Suction pressure too low	**1.** Flash gas in liquid line **2.** Obstructed expansion valve **3.** Loss of fluid in expansion valve bulb **4.** Clogged filter drier **5.** Lack of air flow **6.** Entering WB too low **7.** Evaporator blower running backwards	**1.** Check for refrigerant leak **2.** Repair leak, evacuate and recharge refrigerant system. **3.** Replace thermal expansion valve **4.** Replace filter drier **5.** Check filters and coil for any blockages **6.** Verify that blower is rotating in the proper direction **7.** Confirm that entering return air conditions fall within acceptable range **8.** Reset low pressure safety switch if necessary **9.** Check phase of incoming power to unit. Reverse any two incoming power supply wires (except ground).
No cooling	**1.** Controller not set properly **2.** Control wiring issue **3.** Controls in an alarm condition **4.** High or low pressure switch open **5.** Compressor thermal overload open	**1.** Turn on and set controller for desired operation **2.** Check wiring connections against schematic. **3.** Check all connections for tightness. **4.** Check wire continuity. **5.** Refer to controller troubleshooting **6.** Reset high or low pressure switch **7.** Compressor internal overload may require an extended period of time (1 hour or more) to reset
Condensate carry over	**1.** Air flow too high	**1.** Reduce air flow
Condensate pump does not run	**1.** Check to see that power to the pump is present **2.** Confirm that float is moves freely **3.** Confirm that dirt or algae is not interfering with float action	**1.** Locate and repair electric issue. **2.** Clean float and sump
Condensate pump runs with no discharge	**1.** Tubing blocked or kinked **2.** Check valve blocked **3.** Impeller blocked **4.** Tubing elevation or run exceeds head capability.	**1.** Inspect, clean or straighten as necessary. **2.** Clean check valve **3.** Remove debris from pump impeller **4.** Verify tubing run is within pump head limitations.

Limited Warranty

The following is the Limited Warranty provided by United CoolAir (a trade name of United CoolAir LLC, herein “Seller”) to any customer (herein “Buyer”) for any goods and services (a “deliverable”):

1. Limited Warranty. Seller provides such warranty as set forth in any instruction manual provided with the deliverable, or if there is no such warranty or instruction manual, Seller warrants to Buyer that such deliverable will be free from defects in material and workmanship (in either case the "Limited Warranty"). Except as expressly set forth in this section or specifically authorized by an executive officer of Seller in writing, the Limited Warranty is not transferable or assignable and any such transfer or assignment is void. If Buyer is authorized by Seller to be a reseller of deliverables that are goods or an installing contractor, the Limited Warranty may be passed through to Buyer's customer, but Buyer shall not alter the Limited Warranty in any way. Notwithstanding the foregoing, if Buyer re-brands Seller's deliverable or Seller, at Buyer's request, brands the deliverable with a mark not owned by Seller, the Limited Warranty may not be transferred or assigned, and all claims under the Limited Warranty shall be made directly by Buyer to Seller and not by any customer of Buyer. The Limited Warranty applies only to products installed in the continental United States, Alaska, Hawaii, Puerto Rico and Canada.

EXCLUSIONS

The Limited Warranty does not cover service trips, service calls, costs of removing and reinstalling components and other labor charges or the cost of shipment of replacement parts.

The Limited Warranty excludes damages due to:

(i) failure to install, operate or maintain deliverables as directed in any instruction manual provided or under applicable law or regulation,

(ii) misuse, abuse, neglect or modification of a deliverable or any controls, in any way,

(iii) improper service, use of replacement parts or accessories that are not specified by Seller,

(iv) improper installation, or any relocation of a deliverable after initial installation,

(v) incorrect supply, accident, fire, flood, acts of God or another casualty,

(vi) use of a deliverable other than its intended purpose and normal usage,

(vii) use of a deliverable in a corrosive atmosphere or any atmosphere containing contaminants,

(viii) shipment of a deliverable (all claims must be filed with carrier),

(ix) use of a deliverable in the vicinity of combustible or explosive materials,

(x) any defect in a deliverable arising from a drawing, design, or specification supplied by or on behalf of Buyer,

(xi) failure of parts, components, services, accessories or hook-ups not supplied or approved by Seller,

(xii) incompatibility with items not supplied by Seller,

(xiii) a deliverable not properly installed by a qualified (licensed Commercial HVAC Contractor) contractor experienced in installing the deliverable,

(xiv) inadequacy or interruption of electrical service, improper voltage conditions, blown fuses, or other like circumstances

(xv) failure to properly and routinely clean air and/or water side of condenser and evaporator,

(xvi) improper sizing, application or lack of load in space,

(xvii) deliverable being allowed to exceed its proper temperature limits due to improper operation or maintenance of inadequate air over it,

(xviii) (I) freezing of the condenser water or condensate (II) use of corrosive water (III) fouling or restriction of the air/water circuit by foreign material or like causes,

(xix) improper or rapid cycling of the compressor.

This warranty does not apply to the installation, plumbing, wiring, ducting not integral to the product.

Limited Warranty

Wear items or consumables such as belts, filters, coolant, refrigerant, etc. are not included under the Limited Warranty. The Limited Warranty does not cover the equipment and materials not manufactured by Seller; the warranty for those items shall belimited to only such warranty as that furnished by the manufacturer thereof as may properly be assigned to Buyer.

No warranty coverage is applicable if Buyer cannot prove original purchase date and required annual maintenance history, provide factory start up report, air and/or water balance, the data plate and/or serial number on any deliverable is removed, defaced, modified, or altered in any way, or Seller is not permitted to inspect the damaged deliverable.

No person other than an executive officer of Seller has authority to change or extend the terms of the Limited Warranty, and Buyer confirms that no other warranty terms have been extended by Seller or are applicable to the deliverables. Change or extensions to the terms of the Limited Warranty are binding only if confirmed in writing by Seller's duly authorized executive officer.

2. Limitation on Warranties/Damages. Any claim under the Limited Warranty set forth in section 1 must be made within the following time periods or such claim is waived:

(a) for compressors, the claim must be made within sixty (60) months from the date of purchase by Buyer;

(b) for replacement parts, the claim must be made within the latter of twelve (12) months from the date of shipment of deliverable by Seller or any Limited Warranty period remaining on the deliverable with which the replacement part is used or is intended to be used;

(c) for all other deliverables, the claim must be made within twelve (12) months from the date of start-up or eighteen (18) months from the date of shipment of deliverable by Seller, whichever occurs first.

Except as set forth in these terms, Seller makes no representation or warranty of any type, express or implied, including any warranty of merchantability, warranty of fitness for a particular purpose or warranty of non-infringement or warranty arising from any course of dealing, course of performance or usage of trade.

Seller will not under any circumstances, be liable for any special, indirect, punitive, or consequential damages (even if Seller has been notified of the possibility of such damages) resulting from or related to a product including, without limitation, any loss of profits, or loss of opportunity. Some jurisdictions do not allow limitations on warranties or damages, so this limitation or exclusion may not apply to Buyer.

3. Remedy. Seller's sole obligation and Buyer's exclusive remedy with respect to any deliverable, whether arising in contract, tort (including negligence), strict liability, breach of warranty or otherwise, is limited to Seller, at its discretion, replacing or repairing the defective deliverable, providing replacement parts or issuing Buyer a credit equal to the price paid to Seller for such defective deliverable, and in no event will Seller's liability exceed the amounts actually received by Seller for any deliverable.

This exclusive remedy shall not be deemed to have failed its essential purpose so long as Seller is willing and able to repair or replace a defective deliverable or parts thereof or, also at Seller's option, to refund the price received by Seller for the defective deliverable, within a reasonable time after Buyer demonstrates that a defect exists in accordance with the terms and limitations of the Limited Warranty.

TO OBTAIN WARRANTY SERVICE

Contact the installing or servicing contractor with the details of the problem. Provide the model number, serial number and date of installation. Warranty requests directed to the factory will be referred back through the local distribution network.

Model: _____ Serial Number: _____ Date of Installation: _____

Water-Cooled Unit

Pre Startup Checklist

Installing contractor should verify the following items.		
1. Is there any visible shipping damage?	Yes	No
2. Is the unit level?	Yes	No
3. Is proper vibration isolation provided in accordance with IOM?	Yes	No
4. Are the unit clearances adequate for service and operation?	Yes	No
5. Do all panel and/or access doors open freely and are the handles operational?	Yes	No
6. Have all shipping braces been removed?	Yes	No
7. If iDDP/DDP fans are installed, have shipping blocks been removed and spring isolators been adjusted?	Yes	No
8. Have all electrical connections been tested for tightness?	Yes	No
9. Does the electrical service correspond to the unit nameplate?	Yes	No
10. On 208/230V units, has the transformer tap been adjusted to the voltage being applied?	Yes	No
11. Has overcurrent protection (breakers/fuses) been installed to match the unit nameplate requirement?	Yes	No
12. Do all fans rotate freely?	Yes	No
13. Does the field water piping to the unit appear to be correct size and pressure rating per design parameters?	Yes	No
14. Does the inlet (supply) water piping of the main water loop run to the inlet water connection of the unit?	Yes	No
15. Does the outlet (return) water piping of the main water loop run to the outlet water connection of the unit?	Yes	No
16. Is all copper tubing isolated so that it does not rub?	Yes	No
17. Are air filters installed with proper orientation?	Yes	No
18. Have condensate drain and p-trap been connected?	Yes	No
19. Is the condensate trap primed with water?	Yes	No
20. Is the TXV sensing bulb in the correct location?	Yes	No
21. Does the TXV sensing bulb have proper thermal contact and is properly insulated?	Yes	No
22. Are all ship loose items installed and wired properly?	Yes	No

Start-Up Procedures (R-410a Systems)

1. Start up must be performed by a qualified HVAC Technician.
2. Make certain that all power is disconnected at the main power circuit breaker or service disconnect before starting any of this procedure.
3. Check all electrical screw terminals and wiring lugs for tightness internal to the equipment. Components may have loosened due to vibration during transit or handling. Verify that the main power block lug connections made in the field are tight and secure.
4. Confirm that the voltage rating of the equipment data tag coincides with the power that will be delivered to the unit.
5. Verify that the circuit protection for the unit satisfies Local and National Codes according to the unit data tag Minimum Circuit Ampacity (MCA) and Maximum Fuse Size (MFS).
6. Leak check the refrigerant system. While the unit was leak checked at the factory, leaks can develop during transit and / or handling.
7. Confirm that the unit condensate has been adequately trapped and taken to a suitable point for disposal.
8. Verify that the filters are in place, clean and usable.
9. Apply power to the unit. Switch the circuit breaker or field supplied electrical service disconnect switch to the on position.

NOTE: If the unit has crankcase heaters and the surrounding ambient is 70˚ F or lower, let the compressors sit for approximately 24 hours before proceeding.

10. Record the voltage at the unit terminals.
11. On the wall controller, navigate to the system enables menu. Set the compressor to OFF. Set the system ON/OFF menu to the ON position.
12. Verify that the evaporator blower(s) are rotating in the correct direction (three phase units only).

NOTE: If the evaporator blower motor runs backwards, shut off all power to the unit. Switch any two of the incoming power leads at the unit main power terminal block. The unit has been wired and phased properly at the factory. DO NOT change any factory wiring to correct for a phase problem.

NOTE: Before conducting the following start up sections connect a refrigerant gauge set to the unit Schrader connections. Install temperature sensors or probes to record the appropriate refrigerant line temperatures.

13. Set the wall controller to a temperature set point approximately 5˚ lower than the entering air temperature. This should energize the compressor(s).

NOTE: Dependent upon the options and/or the thermostat, there may be a delay for the compressor(s) operation.

14. While waiting for the compressor(s) to stabilize, record the External Static Pressure (ESP) for the evaporator blower.

NOTE: Make sure all the unit access panels are in place when taking these readings.

WARNING

HEAT EXCHANGER FREEZE RISK: Heat Exchanger will fail if operated at or near the freezing point of water/glycol mixture.

The following precautions must be taken:

- At startup, fluid side must be started first.
- At shutdown, refrigerant side must be shut down first
- Fluid side outlet must have temperature monitoring and emergency shutdown equipment in case temperature approaches too close to the freezing point.

15. Verify that the incoming water / fluid pressure does not exceed the rating for the water / fluid control valves.
16. Verify that the unit piping and heat exchangers will not be subjected to freezing conditions.
17. Confirm that no joints are leaking in the cooling fluid circuit(s).
18. Document the type of fluid being used as the cooling medium. If glycol is being used, make sure the mixture is adequate for any low ambient conditions that may be possible.

Continued on next page

Start-Up Procedures (R-410a Systems) **Continued:**

1. If possible, record the fluid flow rate (GPM).
   - **a.** Make sure the flow rate is within the proper limits:
     - **i.** Minimum 2.5 GPM / Ton
     - **ii.** Maximum 3.5 GPM / Ton
2. Record the entering and leaving fluid temperatures.
   - **b.** Make sure the leaving fluid temperature is within the proper limits:
     - **i.** Minimum 60˚ F
     - **ii.** Maximum 115˚ F
3. Record the pressure drop of the water / fluid across the unit.
4. Verify that all valves on each fluid circuit function properly.
5. Record the suction line pressure and the suction line temperature for each circuit near the compressor.
6. Using an appropriate pressure / temperature chart for R-410a refrigerant, look up and record the saturation temperature corresponding to the suction pressure.
7. Calculate and record the suction superheat for each circuit by taking the difference between the suction line temperature and the saturation temperature corresponding to the suction pressure.
8. Record the liquid line pressure and the liquid line temperature for each circuit near the condenser heat exchanger outlet.
9. Using an appropriate pressure / temperature chart for R-410a refrigerant, look up and record the saturation temperature corresponding to the liquid line pressure.
10. Calculate and record the liquid sub-cooling for each circuit by taking the difference between the liquid line temperature and the saturation temperature corresponding to the liquid line pressure.
11. Record the Amps for the evaporator blower motor and each compressor. If the system is single phase, use L1 and L2 only.
    - **a.** Make sure the pressures on each compressor circuit are within the proper limits:
      - **i.** 290 – 550 Discharge
      - **ii.** 100 – 140 psig Suction
    - **b.** Compressor Amperage is below the RLA Amps listed on the unit data tag.
      - **i.** The maximum compressor operating current (amps) at start up depends a lot on the system loading. The lower the load, the less the current. The higher the load, the higher the current.
    - **c.** The blower motor FLA value should never be exceeded.
      - **i.** If the FLA value is exceeded, shut the unit off and check the duct design, sheave turns open or make sure there is no blockage / obstruction in the duct or filters.
12. Document any additional information deemed appropriate for the specific application or installation.
13. Shut the system down and remove all test instruments and test sensors.
14. Leave the system in the operating mode as appropriate for the customer and the application.

Optional Heating Start Up:

15. If the system has any optional heat, set the room thermostat approximately 5° higher than the actual room temperature. Set the thermostat operating mode to the HEAT position.
16. Dependent upon the heating source the heating valve or switch / contactor should be activated.
17. After several minutes of operation, record the return air temperature and the supply air temperature.
18. Based on the heating source, document the appropriate temperatures, pressures, voltage or amp values.

Water-Cooled Unit

Start-Up Procedures

Please complete the form and include contact, start-up date and all requested information.

Job Name: _____ **Date:**_____
Address:_____
City:_____ **State:** _____**ZIP**_____
Unit Model No.: _____
Unit Serial No.:_____

Screw Lugs & Terminals OK?.....Yes _____ No _____
Describe any loose connections and action(s) taken:

_____

Power Supply Correct Voltage and Phase? .....Yes _____ No _____
If not in agreement with unit data tag contact the Distributor.

_____

Is the Circuit Protection the correct type and does it meet
the unit data tag requirements?.....Yes _____ No _____
If not correct describe what action(s) have been taken to correct:

_____

Unit controller wiring verified? .....Yes _____ No _____
"C" Terminal hooked up if necessary?.....Yes _____ No _____

_____

Unit leak check OK?.....Yes _____ No _____
If leak was located describe where and how repaired:

_____

Condensate trapped & run to a suitable disposal point?.....Yes _____ No _____

_____

Is the condensate trap primed? .....Yes _____ No _____

_____

Air Filters are in place, clean & usable?.....Yes _____ No _____

_____

Three Phase Measured Voltage.....L1-L2 _____ L2-L3_____ L1-L3 _____

_____

Evaporator Blower Motor Rotation OK?.....Yes _____ No _____
If three phase power and rotation is not correct describe action(s) taken to correct:

_____

Supply Air External Static Pressure.....(ESP): In. WG _____

_____

Verify that incoming fluid pressure does not exceed .....Yes _____ No _____
rating for the fluid control valves.

_____

Are unit piping and heat exchangers subject to freezing conditions?. .....Yes _____ No _____

If yes, is corrective action being taken? .....Yes _____ No _____
Please Describe:

Are there cooling fluid leaks? ..... Circuit 1: Yes _____ No_____ Circuit 2: Yes _____ No_____

Cooling Fluid Type
If Glycol what percentage of mix:. _____ Good to a temperature of _____

Water / Fluid flow rate.....GPM _____

Entering Water Temperature (EFT): °F _____ Leaving Water Temperature (LFT): °F _____

Water / Fluid Pressure Drop across unit:..... PSI _____

Verify that all valves on each circuit are functioning properly. .....Yes _____ No _____

Verify water/fluid discharge pressure set point. .....Yes _____ No _____

Water mesh screen installed and mesh size. .....Yes _____ No _____ Mesh Size _____

Cooling Mode

System Air Temperatures .....Return: °F _____ Supply: °F_____

	Compressor 1	Compressor 2	Compressor 3	Compressor 4
Suction Pressure:	psi _____	psi _____	psi _____	psi _____
Suction Line Temperature:	°F_____	°F_____	°F_____	°F_____
Saturation Temperature:	°F_____	°F_____	°F_____	°F_____
Suction Superheat:	° _____	° _____	° _____	° _____
Liquid Line Pressure:	psi _____	psi _____	psi _____	psi _____
Saturation Temperature:	°F_____	°F_____	°F_____	°F_____
Liquid Line Temperature:	°F_____	°F_____	°F_____	°F_____
Sub-cooling:	° _____	° _____	° _____	° _____

Electrical

Evap. 1 Motor Amps .....L1 _____ L2 _____ L3 _____

Evap. 2 Motor Amps .....L1 _____ L2 _____ L3 _____

Compressor 1 Amps.....L1 _____ L2 _____ L3 _____

Compressor 2 Amps.....L1 _____ L2 _____ L3 _____

Heating Mode (Optional Hot Water Coil, Steam Coil or Electric Heat)

System Air Temperatures .....Return: °F _____ Supply: °F_____

Entering Water Temperature:.....°F_____ Leaving Water Temperature:.....°F _____
Steam Pressure: psi_____

Electric Heat kW: _____ Voltage:_____

Electric Heat Amps: Stage1.....L1 _____ L2 _____ L3 _____

Stage2.....L1 _____ L2 _____ L3 _____

Misc.

_____

Technician (print name):_____ Phone: _____

Company: _____

Signature:_____ Date:_____

Product Nomenclature

EXAMPLE:	VZ	W	R	20	G	3	A	T	A	A	30	-	A	-	X
	a	b	c	d	e	f	g	h	i	j	k		l		m

a.	"VZ" = VariCool EZ-Fit	
b.	"W", or WH"	
	"W" = Water-Cooled, Air Conditioner	
	"WH" = Water Source Heat Pump	
c.	"R", "L" or "D"	Module Quantity/ Style
	"R" = Right Hand Single Module	
	"L" = Left Hand Single Module	
	"D" = Dual Module	
d.	"15", "20", 25", "30", "35", "40" or "45" Nominal Cooling Capacity in Tons (Single Module)	
	"30", "40", "50", "60", "70", "80" or "90" Nominal Cooling Capacity in Tons (Dual Module)	
e.	"G"	Common to all
f.	"3" = 208/230-3-60	
	"4" = 460-3-60	
g.	"A" = Two Compressors	
	"D" = Four Compressors	
h.	"T"	Traditional Cabinet
	"N"	Narrow Cabinet
i.	"A" = R410a Refrigerant	
j.	"A" = DWDI Blower	
	"B" = Direct Drive Plenum Fan	
	"C" = ECM Fans	
k.	Nominal Heat kW	
l.	"A", "C", "R"	Evaporator Air Path (see table below)
m.	"X" = Special Configuration	

Not all combinations of unit Product Nomenclature are valid. Check with the factory for correct model identification.

EVAPORATOR AIR PATHS			
Blower Type	Front	Top	Rear
DWDI Blower	"C"	"A"	"R"
Direct Drive Plenum Fans	Not Available	"A"	"R"
ECM Fans	"C"	"A"	"R"

Maintenance Log

This log must be kept with the unit. It is the responsibility of the owner and/or maintenance/service contractor to document any service, repair or adjustments. United CoolAir Service and Warranty Departments are available to advise and provide phone help for proper operation and replacement parts. The responsibility for proper startup, maintenance and servicing of the equipment falls to the owner and qualified licensed HVAC technician.

Entry Date	Action Taken	Name/Tel.

NOTE: United CoolAir service contact information: Phone (717) 843-4311
Please have the serial number of the unit, service team members are available Monday through Friday from 7:00 AM to 5:00 PM Eastern Standard Time.

After hours tech support available Monday — Friday till 7:00 PM Eastern Standard Time.
Saturday 8:00 AM — 4:00 PM
Call: (717) 843-4311 and Dial extension 165

NOTES:

Authorized Distributor:

LIMITED WARRANTY

United CoolAir Units are backed by a 1 year limited warranty on parts and a 5 year limited warranty on the compressor (labor not included). Maintenance items such as filters and belts are excluded under this limited warranty.

FACTORY TESTED

All units are functionally run tested before shipment to ensure a trouble-free start-up and unit commissioning. Industry proven components are used throughout to enhance system reliability and peace of mind.

UNITED COOLAIR

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MEMBER AHRI AIR-CONDITIONING, HEATING, & REFRIGERATION INSTITUTE
we make life better™