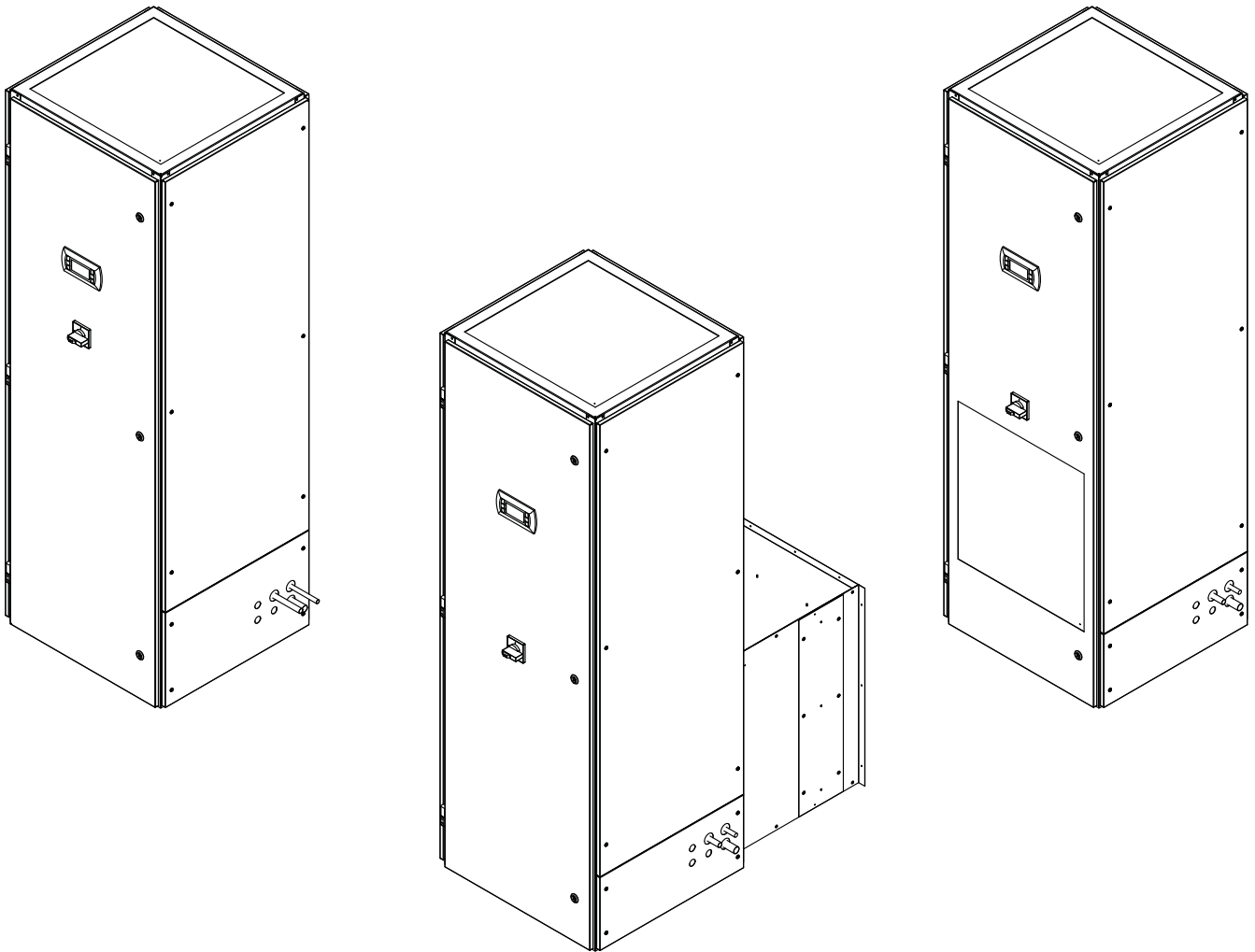


STULZ

CLIMATE. CUSTOMIZED.



Mini-Space EC

DX and CW
4 – 12 kW Systems
Vertical Floor Mounted, 60 Hz Data

Installation, Operation and Maintenance Manual

Mini-Space EC Floor Mounted Systems

Model Nomenclature					
CCX-XXX-X-EC					
CC	Air Pattern	Capacity (kW)	Refrigerant Circuits	Cooling Method	Blower Type
Mini-Space Compact System	D=Downflow	04	0	A=Air	EC
	U=Upflow	06	1	W=Water	
	R=Rear Return	08		G=Glycol	
	F=Front Discharge	11		C=Chilled Water	
		12			

Example:

12 kW capacity, downflow air pattern, 1 circuit, water-cooled DX, EC fans: CCD-121-W-EC

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1.0 INTRODUCTION

1.1 General

The Mini-Space EC™ floor mounted precision air conditioning system covered by this manual is designed and manufactured by STULZ Air Technology Systems, Inc. (STULZ) using the latest state-of-the-art control technology. The unit will provide years of trouble free service if installed and maintained in accordance with this manual. Damage to the unit from improper installation, operation or maintenance is not covered by the system warranty.

Study the instructions in this manual; they must be followed to avoid difficulties. Spare parts are available from STULZ to insure continuous operation. Using substitute parts or bypassing electrical or refrigeration components in order to continue operation is not recommended and will void the warranty. Due to technological advancements, components are subject to change without notice.

Mini-Space EC systems and centrifugal condensers are designed to be installed indoors, unless otherwise noted on the equipment. Propeller-type condensers, drycoolers and pump packages are designed for outdoor use.

1.2 Product Description

The DX-based versions of the Mini-Space EC precision A/C system are available in air-cooled, water-cooled and glycol-cooled configurations. A chilled water configuration of the unit is also available. The cooling capacity in kW will depend on the unit size, which can range from 4kW (12 MBH) to 14 kW (48 MBH). Mini-Space EC systems are designed to operate with R410A refrigerant.

NOTE

Mini-Space EC systems are designed to supply air to only one room.

The functional modes of operation in addition to cooling are heating, humidification, dehumidification and filtration, which provide complete environmental control of a conditioned space. The cabinet is available in one footprint size: A compact 23.8 inches wide by 22.7 inches deep.

The cabinet is designed for convenient, 100% front access. There are four airflow pattern configurations; upflow, downflow, rear return, and front discharge. The basic cabinet height remains the same, (72.8"), regardless of the configuration. An optional plenum box may be selected (for upflow and rear-return units only), which adds an extra 18.5" to the height. See the installation drawing provided with your unit for the layout and dimensions of the cabinet.

The Mini-Space EC unit is provided with a factory-mounted main power disconnect switch with a lockable handle. The disconnect switch electrically isolates the unit during routine maintenance. The system incorporates state-of-the-art component protection with the use of motor start protectors and circuit breakers.


Mini-Space EC units have a STULZ *E²* series microprocessor controller that provides a full alarm system, status monitoring, cooling/humidification control, multi-system networking and BMS integration.

1.3 Safety

1.3.1 General

Note, caution and warning statements are used in this manual to draw attention to important operational and safety information.

- A bold text **NOTE** marks an important detail.
- A bold text **CAUTION** safety alert conveys information important for protecting your equipment and performance. Be especially careful to read and follow all cautions that apply to your application.
- A bold text **WARNING** safety alert conveys information important for protecting you from harm. Pay very close attention to all warnings that apply to your application.

A safety alert symbol —  — precedes a general **WARNING** or **CAUTION** statement.

An electrical shock symbol —  — precedes an electrical shock **WARNING** safety statement.

1.3.2 Safety Summary

The following statements are general guidelines. They are followed by warnings and cautions applicable to the Mini-Space EC system.

- Prior to performing any installation, operation, maintenance or troubleshooting procedure read and understand all instructions, recommendations and guidelines contained within this manual.
- Never operate the unit with any cover, guard, screen panel, etc., removed unless the instructions specifically state otherwise, and then do so with extreme caution to avoid personal injury.
- Never lift any component in excess of 35 pounds without help. If a lifting device is used to move a unit, ensure it is capable of supporting the unit.

- When working on electrical equipment, remove all jewelry, watches, rings, etc.
- Always disconnect the main power supply to the equipment at the main power disconnect switch before beginning work on the equipment. A lock-out/tag-out procedure should be followed to ensure that power is not inadvertently reconnected.
- Never work on electrical equipment unless another person who is familiar with the operation and hazards of the equipment and competent to administer first aid is nearby.
- All personnel working on or near equipment should be familiar with the hazards associated with electrical maintenance. Safety placards/stickers have been placed on the unit to call attention to personal and equipment damage hazards.
- Certain maintenance or cleaning procedures may call for the use and handling of chemicals, solvents, or cleansers. Always refer to the manufacturer's Safety Data Sheet (SDS) prior to using these materials. Clean parts in a well-ventilated area. Avoid inhalation of solvent fumes and prolonged exposure of skin to cleaning solvents. Wash exposed skin thoroughly after contact with solvents.

WARNING 

This equipment should be serviced and repaired only by a journeyman refrigeration mechanic or air conditioning technician.

WARNING 

This unit employs high voltage equipment with rotating components. Exercise extreme care to avoid accidents.

WARNING 

Hazardous voltage will still be present inside the electric box at the motor start protectors and circuit breakers when the unit is turned off at the microprocessor controller. To isolate the unit for maintenance, turn off power at the main power disconnect switch. Always disconnect main power prior to performing any service or repairs.

WARNING 

Refrigerant (R410A) is used with this equipment. Death or serious injury may result if personnel fail

to observe proper safety precautions. Great care must be exercised to prevent contact of liquid refrigerant or refrigerant gas, discharged under pressure, with any part of the body. The extremely low temperature resulting from the rapid expansion of liquid refrigerant or pressurized gas can cause sudden and irreversible tissue damage.

As a minimum, all personnel should wear thermal protective gloves and face-shield/goggles when working with refrigerant. Application of excessive heat to any component will cause extreme pressure and may result in a rupture.

Exposure of R410A refrigerant to an open flame or a very hot surface can cause a chemical reaction that forms fluorophosgene (carbonyl fluoride), a highly poisonous and corrosive gas.

In its natural state, refrigerant is a colorless, odorless vapor with no toxic characteristics. It is heavier than air and will disperse rapidly in a well-ventilated area. In an unventilated area, it presents a danger as a suffocant.

WARNING 

When performing soldering or de-soldering operations, make certain the refrigeration system is fully recovered and purged and dry nitrogen is flowing through the system at the rate of not less than 1–2 CFM (0.03-0.06M³/minute).

CAUTION 

When the air conditioner is in the cooling mode, the return air-intake and discharge (supply) openings must be free of obstructions. Ensure access panels/doors are secure and latched into position.

CAUTION 

Do not use cleaning solvents near open flame or excessive heat. Wear eye protection when blowing solvent from parts. The pressure-wash should not exceed 30 psig. Solvent solutions should be disposed of in accordance with local and state regulatory statutes.

CAUTION 

The unit must be kept in its normal installed position when moving. If the unit is not kept level and vertical, damage to the compressor will result.

1.4 General Design

The Mini-Space EC unit is housed in a steel frame cabinet rated for indoor use. The exterior of the cabinet has a powder coat finish to protect against corrosion. A hinged door on the front of the cabinet gives access to components. Operator controls are conveniently located on the cabinet door.

Figure 1 depicts a typical internal layout of a CCU-041-A-EC (upflow) unit and identifies the major components. Location of the major components vary depending on the purchased Mini-Space EC model and options.

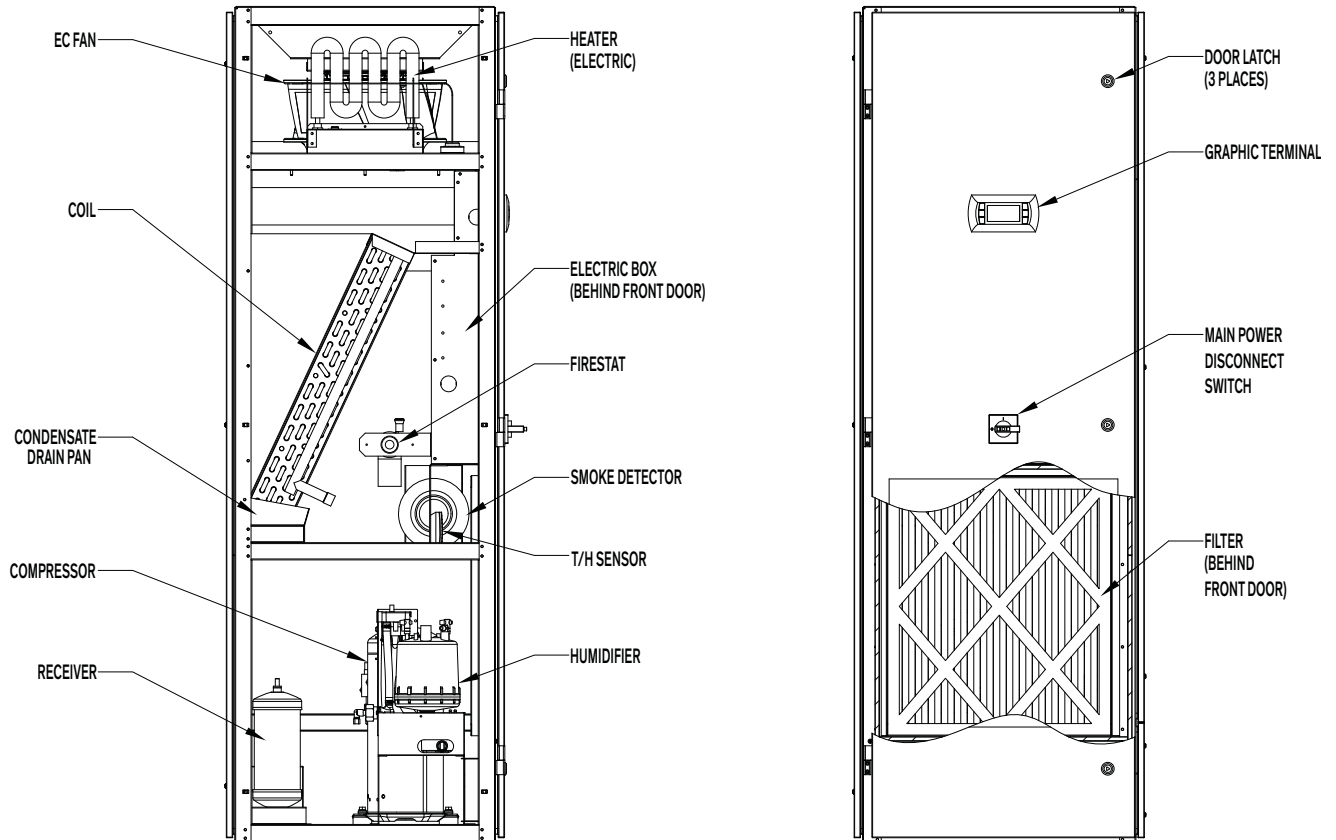


Figure 1. Typical Upflow Internal Layout (Model CCU-041-A-EC shown for reference)

1.4.1 Electric Box Access

Electrical components are protected by the front access door, which is locked in three places. To open the front door, turn the door locks with the triangular key wrench provided. The front door is also safety interlocked with the main power disconnect switch, preventing the door from opening when the switch is in the "On" position. The switch must be turned to the "Off" position to gain access to the electric box.

The main power disconnect switch may be used to turn the unit off for emergency shutdown or when routine maintenance is performed. The handle of the switch may be locked in the "Off" position to prevent unintended operation.

1.4.2 Circuit Breakers / Motor Start Protectors

Individual overload protection is provided by circuit breaker(s) and motor start protectors. These switches must be manually reset once the overload condition is cleared.

1.4.3 Heaters (Optional)

Heaters may be furnished for reheating the supply air, as required to offset the sensible cooling of the system during the dehumidification cycle, and for the automatic heating mode. As a standard, electric resistance heating elements are factory installed in the supply airstream to heat the supply air.

As an option, hot gas reheat may be purchased. A hot gas

heating coil is factory installed in the supply air stream to heat the supply air. A valve is provided to control the flow of hot gas through the coil to maintain the correct reheat temperature.

1.4.4 Coil

The cooling and optional hot gas reheating coils are aluminum finned/copper tube construction. The coils are leak tested and cleaned before installation by the factory.

1.4.5 EC Fan

The unit is equipped with a high efficiency Electronically Commutated (EC) fan. EC fans have a brushless motor equipped with permanent magnets and permanently lubricated ball bearings. The fan impellers are backwards curved and attached to the rotor casing. The fan is balanced and aerodynamically optimized to minimize vibration.

The fan does not use a drive belt. Fan speed is variable via a 0-10 VDC signal from the system controller. The fan motor is equipped with integral electronics such as thermal protection, inverters or filters. The fan will not produce AC inverter whine.

1.4.6 Temperature/Humidity Sensor

As a standard for room air control, a temperature/humidity (T/H) sensor is factory mounted in the return air stream. The (T/H) sensor monitors the return air conditions and provides input signal(s) to the system controller to manage the operation of the A/C unit consistent with the setpoints entered in the system controller. As an option, sensor(s) may be shipped loose for field installation. Refer to the electrical drawing supplied with your unit for details specific to your system.

1.4.7 Controller

Mini-Space EC units have a STULZ E²Series Microprocessor Controller that provides these general features:

- Full alarm system
- Input/output status monitoring
- Full integrated control of cooling
- Multi-system control and remote communication with building management systems



The E²controller is mounted inside the unit electric box. User interaction is through a graphic terminal mounted on the front

of the unit. It has a backlit liquid-crystal alphanumeric display and a set of function keys to navigate through the controller menus and adjust operating parameters.

A customer-provided BMS may be used to directly interface to the E²controller. Operating instructions for the E²controller are provided in the **STULZ E² Series Microprocessor Controller Operators Manual**. Refer to that manual for detailed instructions on operating the system controller.

1.5 Optional Equipment

1.5.1 Humidifier (Optional)

Mini-Space EC systems may utilize an optional electrode steam humidifier. The humidifier is factory installed inside the air conditioner and includes fill and drain valves and associated piping. Operation of the humidifier's fill and drain cycles is based on water conductivity and is maintained by the humidifier controller. An operating manual for the humidifier is provided with the unit under separate cover. Refer to that manual for detailed information about humidifier operation.

1.5.2 Condensate Pump

An optional condensate pump may be used to remove condensate from the air conditioner and flush water from the humidifier. An internal overflow safety switch is wired to the system controller to automatically shut down the precision A/C system should an overflow occur.

1.5.3 Smoke Detector

Optionally mounted in the return air stream, a smoke detector is used to sense the presence of smoke and signal the controller when a smoke alarm condition exists.

1.5.4 Firestat

Optionally mounted in the return air stream, a fire detector senses high return air temperature and signals the controller when a fire alarm condition exists.

2.0 INSTALLATION

2.1 Receiving the Equipment

Your Mini-Space EC unit was inspected and tested for defects before shipment. To ensure the unit is in excellent condition when you receive it, visually inspect it upon delivery. Carefully remove the shipping container and all protective packaging. Open the access panels/doors and thoroughly inspect the unit interior for any signs of transit-incurred damage. If there is shipping damage, it must be noted on the freight carrier's delivery forms before signing for the unit. STULZ ships all systems FOB factory. Any freight claims must be done through the freight carrier. STULZ can assist in the claim filing process with the freight carrier. Should any damage be present, notify the STULZ Product Support Group before attempting any repairs. Refer to section on page 30 for instructions.

A "data package" has been sent with your unit. It contains this manual; an *E²* controller manual and, optionally, other component manuals; system drawings; applicable SDS's; a unit startup checklist; a warranty registration form; and other applicable instructions based on the configuration and options of your unit. The data package has been placed in your unit in a clear plastic envelope. Its documents should be retained with the unit for future reference.

NOTE

Items that have been shipped loose, such as controllers, temperature sensors, water detectors, etc., are shipped inside the air conditioner unless specified otherwise by the customer. The duct connection plate or plenum box (if applicable) are placed on top of the air conditioner inside the unit's carton. Remove and store these items in a safe place unless you are using them immediately.

2.2 Site Preparation

Mini-Space EC systems are designed for easy service access. A component access door is located on the front of the equipment. To maintain full service access through the front hinged access door, no permanent obstructions should be placed within 36 inches of the front of the unit. (See Figure 2).

NOTE

Working clearance requirements need to be established prior to mounting the unit. Refer to local and national electrical codes.

To minimize the effects of the environment surrounding the conditioned space, certain steps must be taken. This

is especially true for critical/precision room preparation (computer rooms/labs) requiring close tolerance control of temperature and humidity. The conditioned space should be well insulated and include a vapor barrier. The installer should ensure that the proper insulation rating is used based on the design of the space, which was the basis for the system selected. The following chart is a recommended minimum R-value (thermal resistance) to ensure optimum equipment operation.

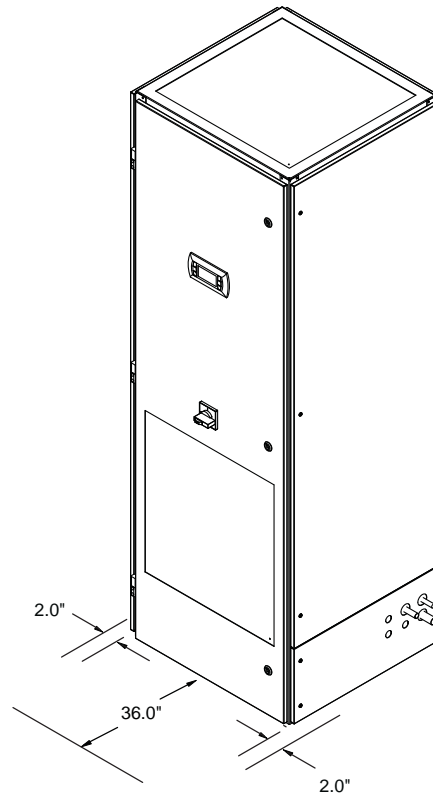


Figure 2. Installation Clearance

Structure	R-Value
Ceiling	R-38
Wall	R-21
Floor	R-19
Door	R-5

The vapor barrier is the single most important requirement for maintaining environmental control in the conditioned space. The vapor barrier in the ceiling and walls can be a polyethylene film. Concrete walls and floors should be painted with a rubber or plastic based paint. Doors and windows should be properly sealed and a door sweep used to minimize leakage. Outside or

fresh air should be kept to a minimum (as it adds to the cooling, heating, dehumidification and humidifying loads), while maintaining the requirement of the Indoor Air Quality (IAQ) standard. Lack of these steps can cause erratic operation, unstable room control and excessive maintenance costs.

2.3 Rigging

Mini-Space EC systems are designed to be kept vertical. Move the unit with a suitable device such as a forklift, pallet jack or roller bar and dollies. A weight table is provided on the installation drawing provided with your unit for reference. The Mini-Space EC unit is shipped on a skid to facilitate moving prior to installation. The unit should always be stored indoors in a dry location prior to installation.

CAUTION

When moving the unit, it must be kept level and vertical to prevent damage.

2.4 Mounting/Placement

Mini-Space EC systems that are not ducted are designed to be located in the conditioned space. Ducted units may be located either inside or outside the space to be conditioned, but are designed to supply air to only one room. Mini-Space EC units have a compact footprint which allows them to be placed in a corner. It is recommended that the unit be positioned to obtain optimum air circulation.

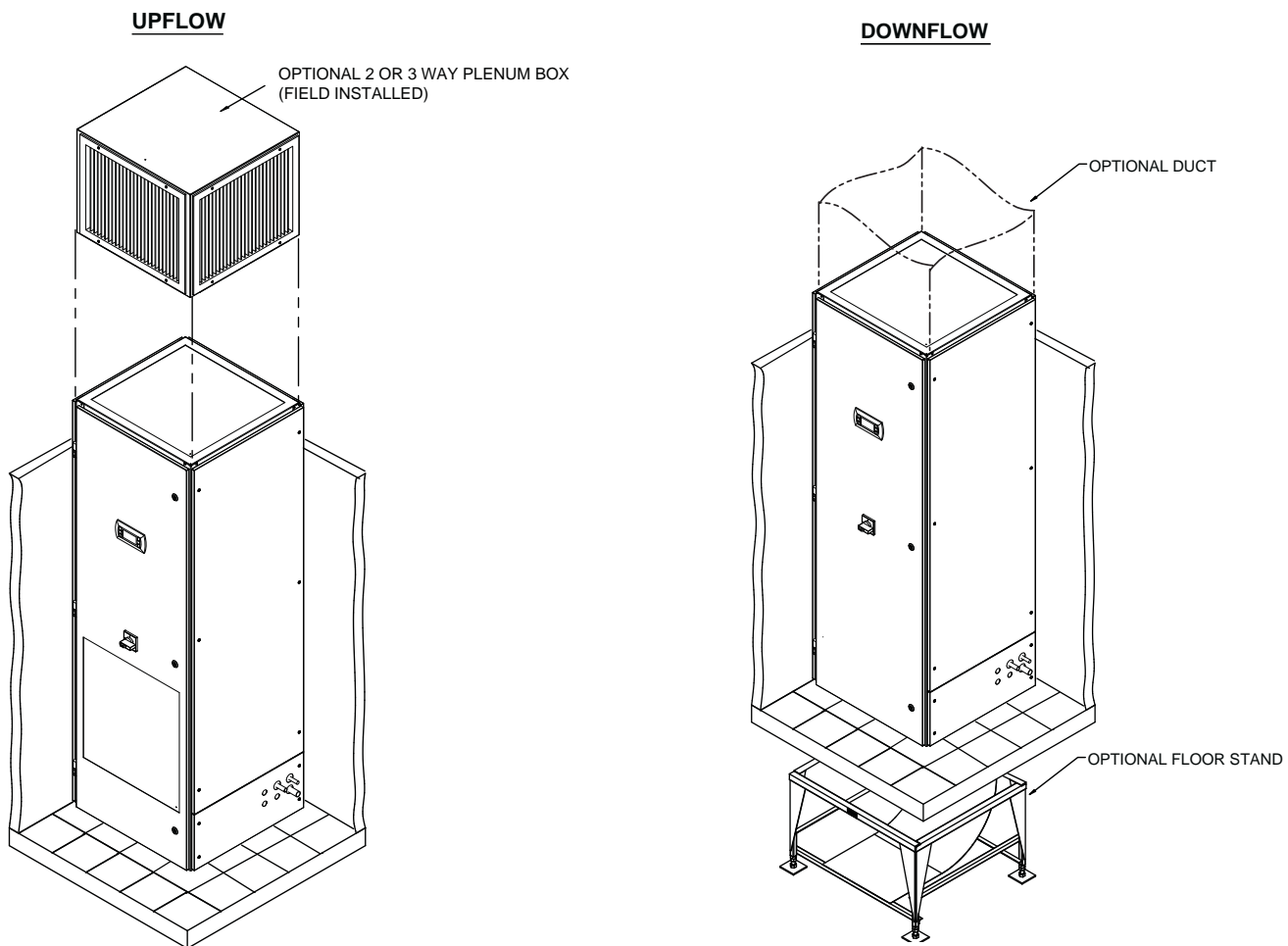


Figure 3. Typical Installation

NOTE

Placement of the floor or ceiling registers is important. If they are too close to the unit, the supply air will be recirculated back to the unit before it has circulated throughout the space.

See Figure 3. The unit is designed to be located on top of the floor (typically upflow) or on a raised floor (typically downflow).

The Mini-Space EC has a frame and panel construction for unit rigidity and full service accessibility while the unit is mounted in place. Ensure the mounting surface is capable of supporting the weight of the equipment. Before mounting the unit, refer to the installation drawing for the weight of your unit.

If a floor stand is employed, (described in section 2.5.1, "Floor Stand" refer to the installation drawing provided and cut out the raised floor to match the unit's overall base dimension. If a floor stand is not selected, use the installation drawing and cut out the raised floor to match the blower discharge opening and cut out the holes required for piping and wiring through the raised floor.

CAUTION 

Ensure the mounting surface can support the weight of the equipment. On some raised floor installations a floor stand is required, depending on the load capacity of the existing raised floor. Before mounting the unit, refer to the weight table on the installation drawing. Equipment must be level to operate properly.

2.4.1 Outdoor Equipment

Before installing outdoor equipment, refer to the installation manual provided with the equipment. Install the equipment (remote condenser, fluid cooler, pump package) in a secure location where it cannot be tampered with and the main power disconnect switch cannot be inadvertently turned off. Provide a solid base capable of supporting the weight of the equipment. Mount the equipment to the base to prevent it from moving during operation. It is recommended that outdoor equipment be mounted with vibration isolators to reduce the vibration transmitted to the mounting surface.

Locate remote condenser/condensing units where the blower(s) are not likely to draw dirt and debris into the coil fins. There should be at least 24 inches of clearance around the condenser to ensure adequate airflow to the coil.

Install a pump package (if applicable) in accordance with the installation manual and piping diagram provided with the unit. The pump should be at least 3 feet below the height of the expansion tank. Do not form piping loops adjacent to the pump. Avoid piping very rigid lines.

2.5 Optional Equipment (Field Installed)

NOTE

Do not mount any optional equipment on unit access doors.

2.5.1 Floor Stand

Install the optional floor stand directly on the sub-floor, ensuring the side with the "FRONT" label is facing the same direction as the front of the unit (see Figure 4). Refer to the floor stand assembly drawing for the dimensions required to cut the raised floor. The floor stand is designed with adjustable feet on all the legs, allowing for leveling and overall height adjustment. Refer to the floor stand assembly drawing for minimum and maximum height adjustability of your floor stand. To adjust the height, first loosen the middle nuts on each leg. Next, turn the top hex nuts to raise or lower the floor stand. Once the floor stand is level and even with the raised floor, lock all feet in place by tightening the middle hex nuts against the top hex nuts.

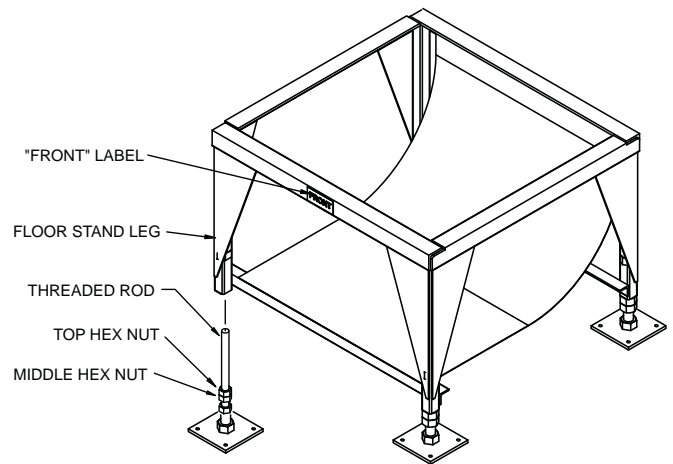


Figure 4. Optional Floor Stand Installation

2.5.2 Plenum Box Assembly

If an optional 2- or 3-way air distribution plenum box is purchased it is typically shipped loose. To install a plenum box, first apply a strip of sealing foam around the top flange of the A/C unit or run a bead of silicone sealant. Place the plenum assembly on top of the unit (see Figure 6). Attach the plenum with self-tapping screws (customer supplied). Holes are pre-drilled in the plenum box. Remove the front grille for access to the mounting holes.

2.5.3 Remote Display

An *E²* controller is supplied with the Mini-Space EC system. As an option, a factory supplied control panel may be remote mounted. For mounting and wiring instructions, refer to the system drawings and *E²* controller manual sent in the data package with your unit.

2.5.4 Condensate Pump

If an optional field-installed condensate pump is included, it should be located as near as possible to the air conditioning system. The pump should be positioned so the inlet hole in the pump is below the drain pan inside the A/C unit. Secure the pump in place with a mounting clamp or use an adhesive that is appropriate for the mounting surface. Ensure the pump is level for proper operation.

2.5.5 Remote Temperature/Humidity Sensor

The remote temperature/humidity (T/H) sensor must be located so that it will properly sense the temperature/humidity conditions to be controlled. The T/H sensor should not be mounted near a doorway or an area where it would be exposed to direct sunlight. When locating the sensor, consider the length of wire to be used. As an option, a 75 foot or 150 foot long cable may be provided by STULZ. Follow the steps below to mount the sensor.



1. Remove the cover from the base of the sensor by squeezing it at the top and bottom.

CAUTION

The sensor can be damaged if handled improperly. Take care to not touch the sensor as this may affect its accuracy.

2. Place the base temporarily against the mounting surface.
3. Level the base. Mark and drill mounting holes through at least two of the available slotted holes.
4. Run a three-conductor shielded cable through the opening in the base, then secure the base with screws ensuring the word TOP on the PC board is oriented upward.
5. Make the wiring connections. Refer to section 2.8.3.2 on page 14 and the wiring diagram supplied with your unit.
6. Seal the hole in the wall behind the sensor.
7. Replace the cover plate on the base.

2.5.6 Remote Water Detector

The remote water detector is normally placed on the sub floor or in a field-supplied auxiliary drain pan located beneath the unit. STULZ provides two types of water detectors, installed as described below.

Spot-type water detector

Remove the protective cover and connect two control wires to the terminals on the base (terminal lugs are provided). Place the water detector(s) on the floor with the metal electrodes facing down.

The base is provided with a mounting hole in the center which may be used to secure the water detector in place. Replace the cover. When water is present, current will flow between the electrodes.



NOTE

Do not place the spot-type water detector on an electrically conductive surface.

Cable type water detector

Lay the cable water detector flat across the sub floor where water could collect. When water is present, current will flow between the two wires.

A two conductor wire harness is provided with a quick connect fitting on the end. The harness mates to the fitting on the water detector and connects it to the control board inside the electric box.



2.6 Air Distribution Connection

If ductwork is to be installed always consult your local or state codes. The duct system should be designed to allow the air to move with as little resistance as possible.

2.6.1 Downflow Configuration Air Patterns (CCD/CCF)

In a downflow unit the conditioned supply air discharge is through the bottom of the unit into a raised floor or through the front door into the conditioned space. There are two basic return air patterns: top free return and top ducted return (see Figure 5).

2.6.2 Upflow Configuration Air Patterns (CCU/CCR)

In an upflow unit the conditioned supply air has two methods of discharge from the top of the unit: Ducted or through a 2 or 3-way grilled plenum box. There are two basic return air patterns: Front free return or rear ducted return (see Figure 6). Units with a rear ducted return are provided with a duct flange for connection of the ducting (refer to the installation drawing provided with the unit). The connection of the duct to the unit may be made with either pop rivets or self-tapping screws.

2.7 Piping Connections

2.7.1 Refrigerant

2.7.1.1 Self-Contained Systems

No refrigerant connections are required for self-contained, water/glycol-cooled systems (models CC()-041/121-W/G-EC) and chilled water systems (models CC()-110-CW-EC).

2.7.1.2 Split Systems

Split air-cooled systems with a remote condenser will require field installed refrigerant piping. All split systems are shipped with a dry nitrogen charge of 50 psig.

NOTE

Mini-Space EC units are not available in a remote condensing unit configuration.

Split systems coupled with a remote condenser will require a copper discharge line and copper liquid line. The connections are made outside the cabinet. The pipe stubs are labeled; for example, "Discharge," "Liquid." See the installation drawing for size and location.

All refrigeration piping should be installed with high temperature soldered joints. Use standard refrigeration practices for piping supports, leak testing, dehydration and charging of the refrigeration circuits. The refrigeration piping should be isolated from the building by the use of vibration-isolating supports. To prevent tube damage when sealing openings in walls and to reduce vibration transmission, use a soft flexible material to pack around the tubes.

Clear all pipe connections of debris and prepare the connections for soldering. Use only "L" or "K" grade refrigerant copper piping. Be careful not to allow solder/piping debris to get inside refrigerant lines. Silver solder containing a minimum of 15% silver is recommended. Dry nitrogen should be flowing through the tubing while soldering at a rate of not less than 1-2 CFM (.03 - .06 m³/minute).

Refrigerant lines for split systems must be sized according to the piping distance between the evaporator and the condenser/condensing unit. Each valve, fitting and bend in the refrigerant line must be considered in this calculation. Refer to the following chart provided for determining the standard equivalent lengths, in feet, of straight pipe.

When installing remote condenser(s) above the evaporator, the discharge line should include a shallow P-trap at the evaporator. The highest point in the discharge line should be above the condenser coil. An inverted trap is required on the discharge line at the remote condenser to help prevent oil and liquid refrigerant from flooding back to the compressor.

Oil traps must be included every 20 feet in the vertical risers and the refrigerant lines must be sloped ¼ inch for every 10

feet in the horizontal lines to ensure proper oil return to the compressor.

Refer to the line size charts provided in Table 1 for recommended line sizing.

**Equivalent Ft." listed in Table 1 through Table 3 accounts for the linear pipe length as well as equivalent length of valves, elbows and Tee's.

Table 1. Equivalent Line Size Chart

Equivalent Length (ft) of Straight Pipe						
OD (In.) Line Size	Globe Valve	Angle Valve	90° Elbow	45° Elbow	Tee Line	Tee Branch
1/2	9.0	5.0	0.9	0.4	0.6	2.0
5/8	12	6.0	1.0	0.5	0.8	2.5
7/8	15	8.0	1.5	0.7	1.0	3.5
1 1/8	22	12	1.8	0.9	1.5	4.5
1 3/8	28	15	2.4	1.2	1.8	6.0
1 5/8	35	17	2.8	1.4	2.0	7.0
2 1/8	45	22	3.9	1.8	3.0	10
2 5/8	51	26	4.6	2.2	3.5	12
3 1/8	65	34	5.5	2.7	4.5	15
3 5/8	80	40	6.5	3.0	5.0	17

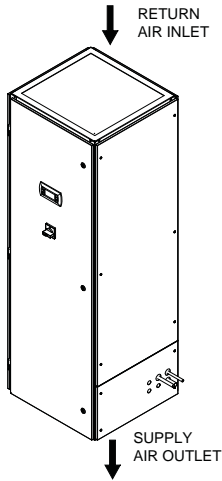
NOTE

Vertical runs are based on a total rise of 30 equivalent feet. For greater lengths, individual calculations must be made. Sizes assume the use of single risers; double risers may be necessary.

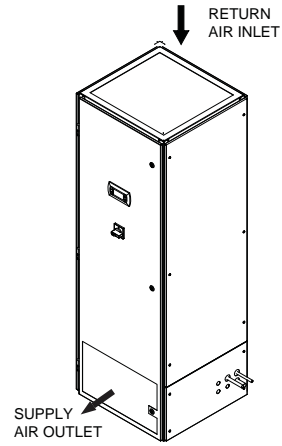
Table 2. Recommended Liquid Line Sizes

CC() Model No./ Total BTU Capacity	Recommended Liquid Line Sizes (For R410A Refrigerant)		
	Receiver to Evaporator (Equivalent Length Ft*)		
	50' or less	100' or less	150' or less
041 / 12,000	3/8	3/8	3/8
061 / 18,000	3/8	3/8	1/2
081 / 24,000	3/8	1/2	1/2
121 / 36,000	1/2	1/2	1/2

NON-DUCTED TOP RETURN WITH FRONT AND BOTTOM DISCHARGE

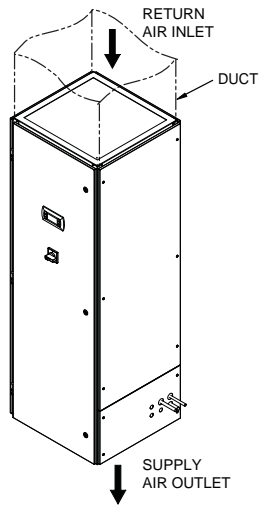


**TOP FREE RETURN/
BOTTOM DISCHARGE**

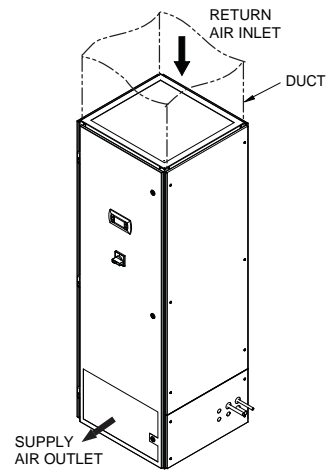


**TOP FREE RETURN/
FRONT DISCHARGE**

DUCTED TOP RETURN WITH FRONT AND BOTTOM DISCHARGE



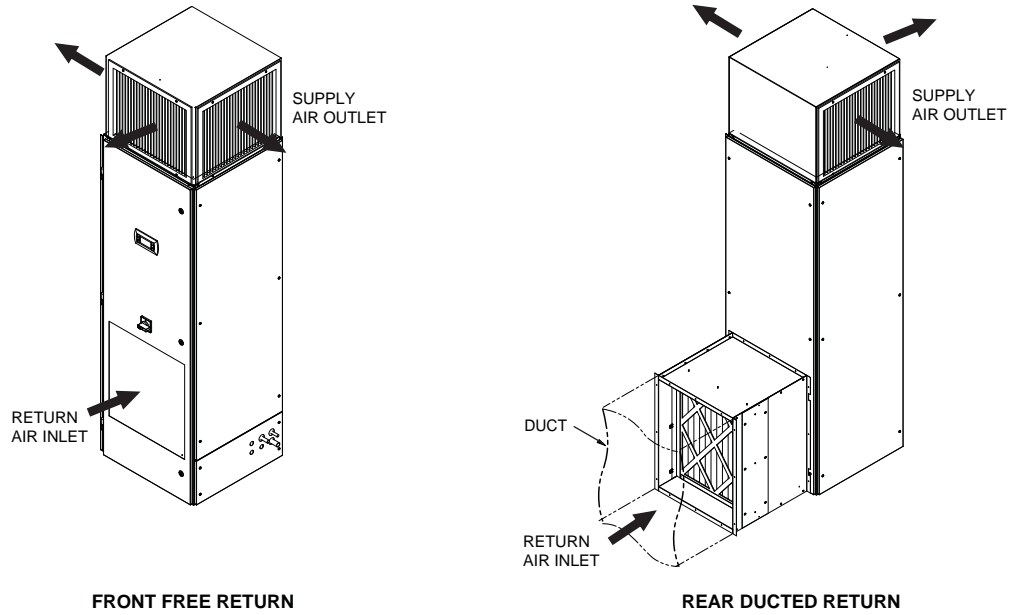
**TOP DUCTED RETURN/
BOTTOM DISCHARGE**



**TOP DUCTED RETURN/
FRONT DISCHARGE**

Figure 5. Downflow Configuration Typical Air Patterns

TOP DISCHARGE WITH 2 OR 3 WAY PLENUM BOX



TOP DUCTED DISCHARGE

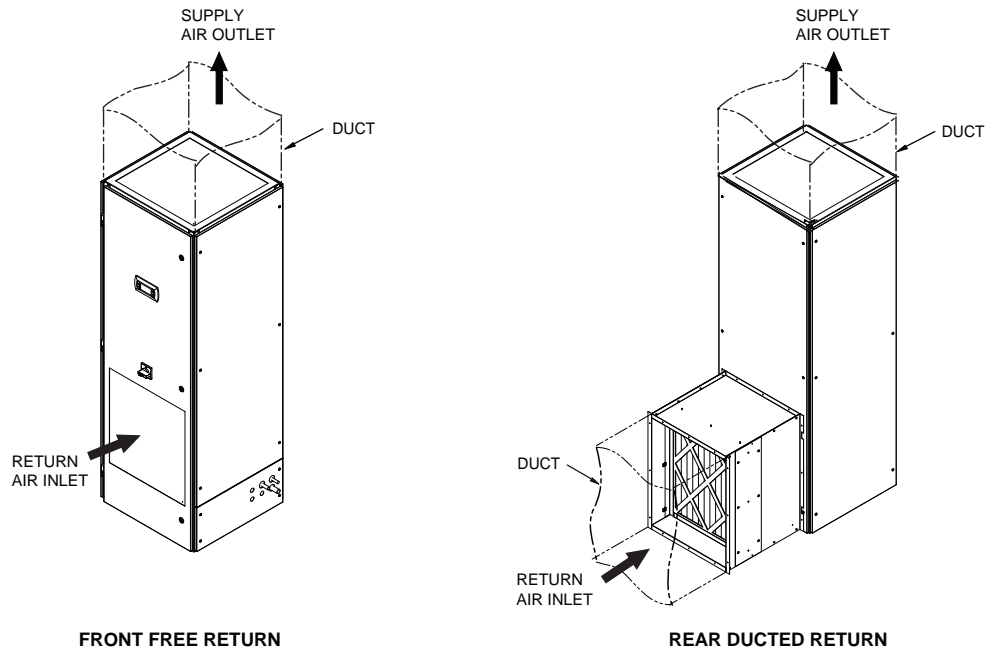


Figure 6. Upflow Configuration Typical Air Patterns

Consult the Copeland applications data guide for detailed information regarding refrigerant line traps and line sizing.

Table 3. Recommended Discharge Line Sizes

Recommended Discharge Line Sizes (For R410A Refrigerant)			
CC() Model No./Total BTU Capacity	Equivalent Length Ft*		
	50' or less	100' or less	150' or less
041 / 12,000	1/2	1/2	5/8
061 / 18,000	5/8	5/8	5/8
081 / 24,000	5/8	7/8	7/8
121 / 36,000	7/8	7/8	7/8

2.7.2 Water/Glycol, Chilled Water and Hot Water Reheat Piping

The piping connections for water/glycol and chilled water systems are sweat connections. Pipe sizes may not necessarily be the same size as the unit connection. Piping should be sized to match the required system pressure drop and pump capacity (if applicable) and may require reducing fittings to match the connection size on the air conditioner.

Water/glycol/chilled water-cooled systems with low entering fluid temperatures should have insulated piping. The recommended ethylene glycol solution ratio is 40% glycol to 60% water. (STULZ recommends Dowtherm SR1 manufactured by Dow Chemical Co.) Use only ethylene glycol with inhibitors for corrosion protection.

WARNING 

Glycol is hazardous. Consult the manufacturer’s SDS for detailed safety information.

CAUTION 

When installing and filling the water/glycol/chilled water loop and optional hot water reheat loop, all air must be bled from the piping system.

CAUTION 

The piping system must be flushed prior to operating the system. Failure to do so will result in equipment problems.

A strainer should be included in the water/glycol/chilled water line. Once the system is operational, the fluid runs through the strainer where any foreign objects are removed. The strainer screen should be cleaned periodically.

2.7.3 Pump Package

Install a concentric reducer at the pump suction and discharge openings and make all piping at least one (1) size larger than the diameter of the openings. If a suction strainer is necessary, install one with a net area 2–3 times larger than the suction piping. The piping leaving the drycooler should enter the pump suction port. Install a check valve in the discharge line to prevent back flow that may damage the pump on shut down. Install a ball valve in the suction and discharge lines for maintenance purposes.

2.7.4 Condensate Drain Line

2.7.4.1 Gravity Drain

A drain line is installed to drain the condensate pan. If an optional humidifier is used, the drain line from the humidifier is typically connected to the condensate drain line. The drain line is run out of the right side of the cabinet. See the installation drawing provided with your unit for the size and location of the condensate drain line.

NOTE

The humidifier drains (hot) water into the condensate drain line during normal operation. As an option, a separate drain line may be provided for the humidifier.

The drain line must not be exposed to freezing temperatures. The diameter of the drain line should be the full size of the connection.

NOTE

Pour some water into the condensate drain pan(s) prior to start-up. This fills the trap and prevents air from being drawn up the drain lines.

2.7.4.2 Condensate Pump

An optional condensate pump shown in Figure 7 on page 13 is available for automatic removal of condensate from the air conditioner and flush water from the humidifier. The condensate pump must be field installed.

AP-trap is installed in the condensate pan drain line, so one is not required for the condensate pump. The condensate pump discharge line should be 1/2 inch OD (maximum) copper pipe to prevent excessive backflow to the condensate pump.

2.7.5 Humidifier

Mini-Space EC systems use an electrode steam humidifier. In most cases the humidifier empties into the condensate drain line during the flush/drain cycle. As an option, the drain for the humidifier may have a separate connection. Refer to the installation drawing provided with your unit for the size and location of the connection.

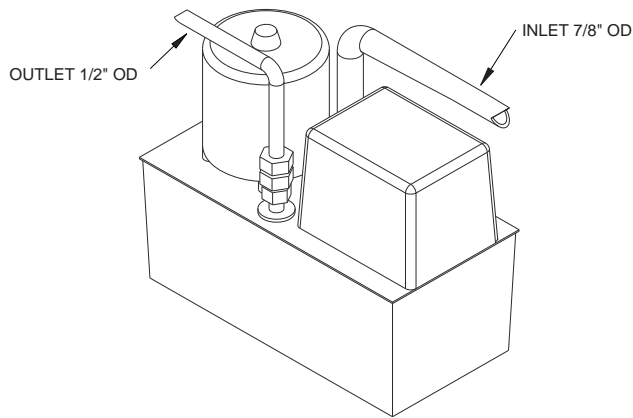


Figure 7. Condensate Pump

A water supply line for the humidifier must be connected to the end of the copper tubing provided by the factory. Refer to the installation drawing provided with your unit for the size and location of the connection. The humidifier requires normal tap water for the water supply. If the supply water is high in particulate, an external filter may be needed.

CAUTION ⚠

Do not use demineralized water.

Refer to the humidifier operator’s manual supplied with the equipment for complete manufacturer’s information on the humidifier and the supply water recommendations.

2.8 Utility Connections

2.8.1 Main Power

The Mini-Space EC is available in single or three phase power in a wide range of voltages. The unit nameplate (see Figure 8) lists the operating voltage, frequency and phase of your unit. The nameplate also provides the full load amps (FLA), the current the unit will draw under full design load, the minimum circuit ampacity (MCA) for wire sizing, and the maximum fuse or HACR (Heating, Air Conditioning, Refrigeration) breaker size (MAX FUSE/CKT BKR) for circuit protection. The unit’s nameplate is located inside the cabinet within the electric box.

NOTE

If the nameplate states MAX FUSE/CKT BKR, it is required to use fuses or an HACR-type circuit breaker to protect the system. Other protection devices are not allowed based upon the product listing.

The unit is provided with terminals for all required field-wiring. Refer to the electrical drawing supplied with the unit for all

power and control field-wiring. It is important to identify the options that were purchased with the unit in order to confirm which field connections are required.

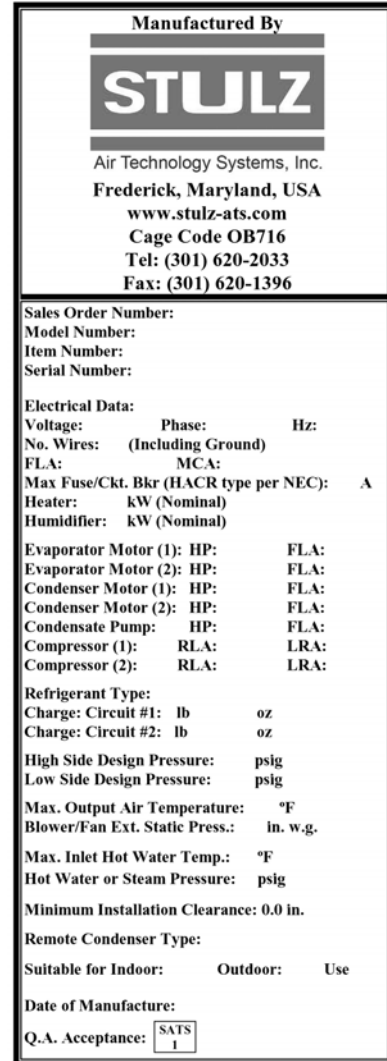


Figure 8. Sample Nameplate

WARNING ⚡

Verify power is turned off before making connections to the equipment.

NOTE

All wiring must conform to local and national electrical codes. Only use copper conductors. Wiring terminations may become loose during transit of the equipment; therefore, it is required to verify that all wiring terminations are secure prior to initial operation.

CAUTION 

Verify facility power to the unit matches the voltage, phase and frequency specified on the system nameplate. Supply voltage measured at the unit must be within $\pm 10\%$ of the voltage specified on the system nameplate except for 208/230V single-phase units, which have a different tolerance listed in the sections to follow.

A main distribution panel must be provided with a manual fused disconnect switch or HACR-type circuit breaker per local and national electrical codes for service to the equipment. Do not mount a customer-supplied manual fused disconnect switch or HACR-type circuit breaker to the surface of the A/C unit.

The unit is provided with a main power pilot hole and a control wiring pilot hole for connection of field-wiring conduits. Typically, these pilot holes are located on the side of the Mini-Space EC cabinet. A label stating "MAIN POWER INPUT" is placed in close proximity.

Terminate the main power wires at the line side of the main power disconnect switch located within the electric box (see Figure 9). A separate equipment ground lug is provided in the electric box for terminating the earth ground wire.

The size of the electric box and location of its components vary according to the Mini-Space EC model. Electric box components are labeled with reference designators which are identified by name on the unit electrical drawing contained in the data package accompanying the unit.

CAUTION 

Prior to unit operation, an adequate unit-to-earth ground must be connected.

2.8.1.1 Single-Phase Units 208/230V

The supply voltage for units that are designed for 208V operation must have a tolerance within -5% and +10%. If the measured supply voltage is 230V, the unit can operate with a tolerance of $\pm 5\%$ if the following change is made. The control transformers within the system must have the primary wire connected to its respective 240V tap instead of the 208V tap.

2.8.1.2 Three-Phase Units

Three-phase units are designed to have the L1, L2 and L3 supply wires connected to corresponding L1, L2 and L3 line terminals of the non-fused main power disconnect switch. The unit will operate correctly if the supply wires are connected in this manner. A ground lug is provided in each unit near the non-fused main power disconnect switch. Prior to unit operation an adequate unit-to-earth ground must be connected to the unit.

CAUTION 

Improper wire connections will result in reverse rotation of the compressor (if applicable) and may eventually result in damage to the compressor in DX-based systems. To correct this problem, exchange any two of the incoming main power wires at the main power disconnect switch. Do not rewire the unit's individual components.

2.8.2 Controls

The *E²* is the standard controller for Mini-Space EC systems. If the graphic terminal is mounted on the unit (standard), no utility connection is required. As an option, the graphic terminal may be factory supplied for remote mounting. A cable harness is typically provided for the interconnect wiring. Refer to the *STULZ E² Series Microprocessor Controller Operators Manual* and the electrical drawing supplied with your unit for details on connecting the graphic terminal.

2.8.3 Optional Equipment**NOTE**

All wiring must be provided in accordance with local and national electrical codes.

2.8.3.1 Condensate Pump

Systems supplied with a field-installed condensate pump require power and control wiring to be connected to the unit. After installing the condensate pump, the installer must connect two power conductors from the condensate pump main power terminals to the air conditioning unit. A ground wire must be connected to the unit ground stud located in the unit electric box.

Two control conductors must be wired to the control terminal board located in the unit electric box. The control wires from the terminal board in the electric box should be run through the overflow switch in the condensate pump housing. The condensate pump is equipped with pigtail leads for splice-type wire connections with twist-on connectors (wire caps). Refer to the electrical schematic supplied with your unit for proper wire terminations.

2.8.3.2 Remote Temperature/Humidity Sensor

Each remote temperature/humidity sensor requires a three-conductor shielded cable with the shield being terminated at the unit electric box. Both the electric box and the sensor include a terminal strip with box-type lugs for wire connections. Refer to the electrical drawing supplied with your unit for proper wire terminations.

2.8.3.3 Remote Water Detector

Each remote water detector will require wiring two conductors to the control terminal board in the unit electric box. The wire insulation must be rated at 600V. Refer to the electrical drawing supplied with your unit for proper wire terminations.

2.8.4 Split Systems

The following system interconnecting field wiring sections detail the number of conductors required for a typical system. Additional control conductors may be required depending on the options purchased with the equipment. Refer to the supplied electrical schematic to determine the total number of interconnecting conductors required for your system. It is important to note that the control transformer(s) supplied with the equipment have been sized and selected based upon the expected loads for each system.

CAUTION

Do not connect any additional loads to the system control transformers. Connecting additional loads to the factory supplied control transformer(s) may result in overloading the transformer(s).

NOTE

All wiring must be provided in accordance with local and national electrical codes.

2.8.4.1 Glycol Systems

Systems equipped with a glycol-cooled system/pump package require field wiring between the glycol unit and pump package (see Figure 9). The installer must wire two control conductors from the terminal board in the Mini-Space EC electric box to the pump package electric box. Refer to the electrical drawing supplied with your unit for the number of field wires needed and appropriate wire terminations for your system.

2.8.4.2 Remote Condenser

Systems equipped with a remote condenser require field wiring between the Mini-Space EC unit and the remote condenser (see Figure 10). Refer to the electrical drawing supplied with your unit and the wiring diagram supplied with the condenser (typically located in the condenser electric box). The installer must provide main power wiring to the main power distribution block located in the remote condenser control box. A separate equipment ground lug is provided in the electric box for termination of the earth ground wire.

The installer must also wire control conductors from the terminal board in the A/C unit to the control terminal board in the remote condenser electric box. Refer to the electrical drawing for the correct number of field wires needed and for the appropriate wire terminations for your specific unit.

2.9 System Charging Procedures

2.9.1 Water-Water/Glycol Cooled Systems

No field refrigerant charging is required for fluid cooled units. Observe the following precautions when installing and filling the water-water/glycol loop:

- Clean the piping system before water or water/glycol is allowed to flow through the system.
 - Mix glycol with water before it is added to the system. Use only water/glycol solution with inhibitors for corrosion protection.
 - Bleed all air from the piping system before filling the water-water/glycol loop.
1. Open a vent valve at the highest point of the system.
 2. Fill the system until the solution is discharging from the vent with minimal signs of foaming due to air in the system.

2.9.2 Pump

If a pump is used, ensure the system is filled before turning the pump on; if the pump is not self-priming, there must be pressure on the suction inlet.

CAUTION

Do not run the pump when dry.

If the pump has no pressure on the discharge side, leave the discharge valve partially shut to create a back pressure in the pump so that liquid can build up in the impeller housing (to keep the impeller housing from getting too hot). Make sure there is always liquid flowing through the pump to cool the impeller and housing. If there is no liquid leaving the pump, shut the pump off immediately to prevent damage to the pump. Check for proper rotation of the motor, observing the arrow on the side of the impeller housing.

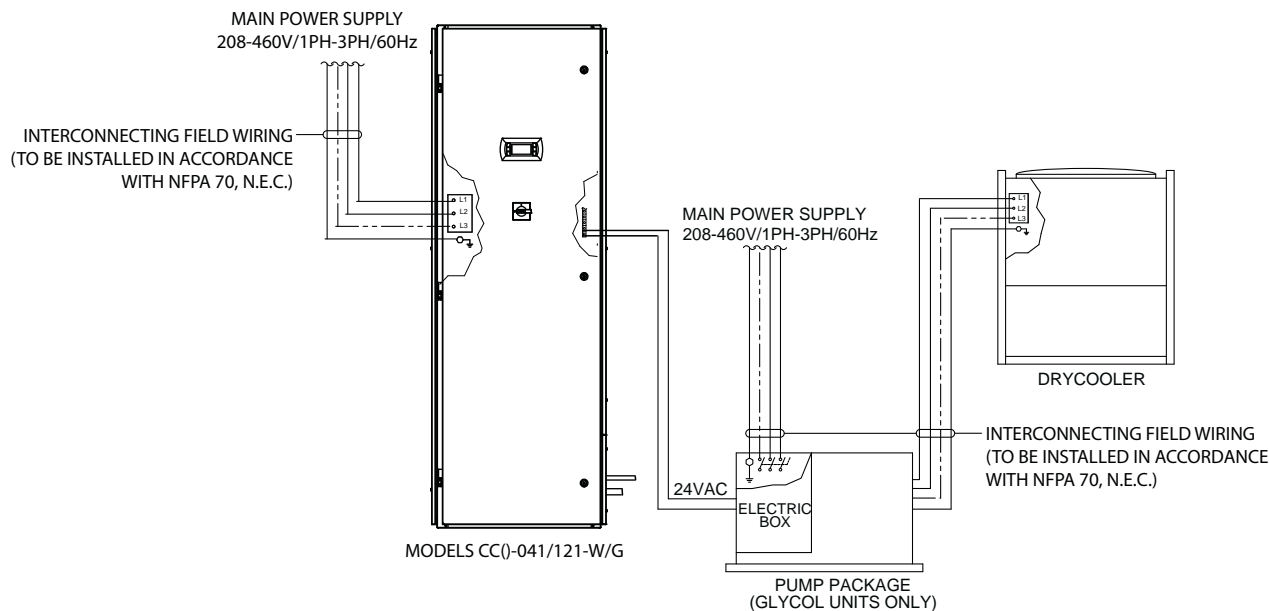
2.9.3 Remote Air-Cooled Systems

Remote air-cooled systems are provided with a dry nitrogen holding charge, which must be removed before piping and charging the unit. Before charging, check the unit nameplate to confirm the type of refrigerant to use.

NOTE

Refrigerant charging must be performed by a qualified air conditioning technician.

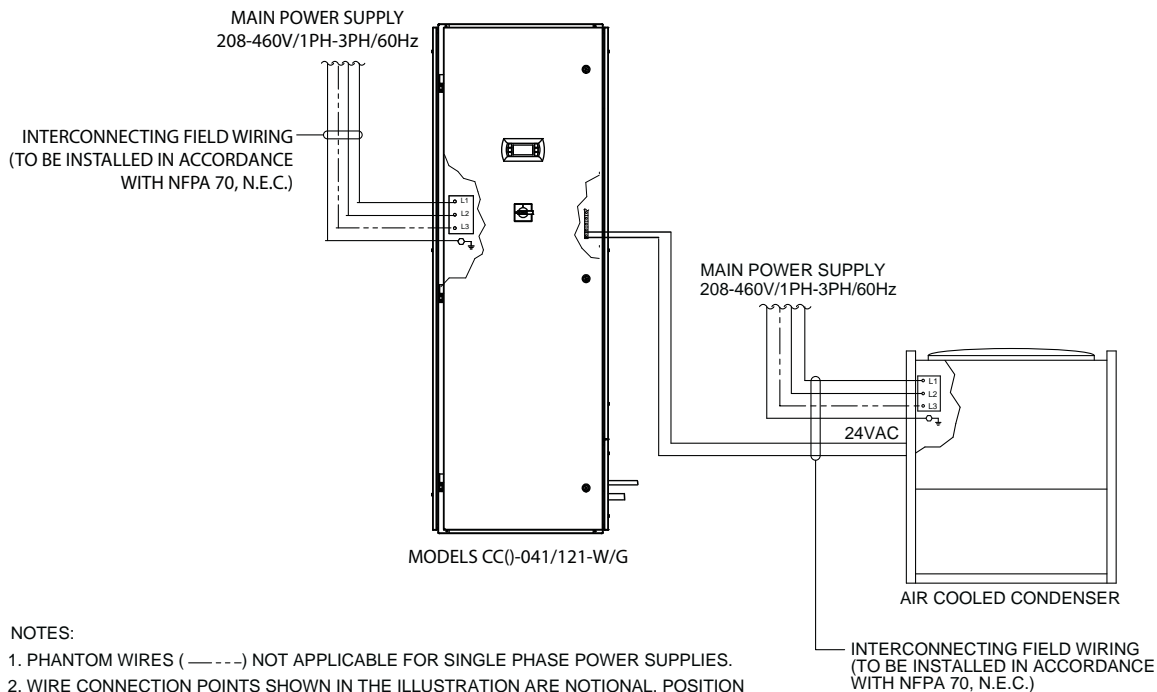
Mini-Space EC systems use R410A refrigerant. Refrigerants that are multi-component blends like R410A have component parts with different volatilities that result in a change in composition and saturation temperature as evaporation and condensation occur. The composition of liquid R410A refrigerant however, remains relatively constant.



NOTES:

1. PHANTOM WIRES (---) NOT APPLICABLE FOR SINGLE PHASE POWER SUPPLIES.
2. WIRE CONNECTION POINTS SHOWN IN THE ILLUSTRATION ARE NOTIONAL. POSITION OF TERMINATION POINTS IN THE CABINET WILL DIFFER FROM THAT SHOWN.

Figure 9. Interconnecting Field Wiring - Glycol Systems



NOTES:

1. PHANTOM WIRES (---) NOT APPLICABLE FOR SINGLE PHASE POWER SUPPLIES.
2. WIRE CONNECTION POINTS SHOWN IN THE ILLUSTRATION ARE NOTIONAL. POSITION OF TERMINATION POINTS IN THE CABINET WILL DIFFER FROM THAT SHOWN.

Figure 10. Interconnecting Field Wiring - Remote Condenser

CAUTION 

PVE oil is used in systems with R410A refrigerant. PVE oil quickly absorbs moisture when exposed to air. Acid forms in systems with high PVE oil moisture levels (via reaction between moisture and refrigerant), resulting in system contamination. Keep the entire system sealed as much as possible and minimize exposure of PVE oil to outside air.

R410A systems operate at high pressures, which must be considered when checking the operating temperatures/pressures while charging or troubleshooting the system. Tables are provided in Section 2.11.1 on page 21 showing the temperature/pressure characteristics for R410A.

2.9.4 Estimating Refrigerant Charge

When charging a system with R410A refrigerant it will be necessary to weigh in the refrigerant and confirm the charge is correct by checking the superheat and sub-cooling temperatures (see Section 2.9.4.3 on page 18).

You can estimate the amount of refrigerant needed by adding the amount of refrigerant required for the A/C unit (3.8 lbs for all CC()-()-A-EC units) plus the condenser (see Table 4) plus the interconnecting refrigerant piping between the A/C unit and the condenser (see Table 5). The values in the tables are the estimated weights for the refrigerant circuit.

Table 4. Estimated Refrigerant Charge Weight for STULZ SCS Condensers

SCS Model Number	R410A Charge (less receiver)	R410A Charge (with receiver)
SCS-018	0.5 lbs	2.6 lbs
SCS-024	1.0 lbs	5.2 lbs
SCS-036	1.5 lbs	7.8 lbs
SCS-060	2.2 lbs	11.7 lbs
SCS-MC-015	0.8 lbs	4.0 lbs
SCS-MC-018	1.0 lbs	4.2 lbs

Table 5. Weight of R410A Refrigerant (lbs/100 ft of type L tubing)

Line Size O.D.	Liquid Line	Discharge Line
1/2"	5.88 lbs	1.27 lbs
5/8"	9.44 lbs	2.03 lbs
7/8"	19.62 lbs	4.22 lbs

Table 4 shows the estimated charge weights for STULZ model SCS condensers. Depending upon site specific conditions,

refrigerant may need to be added or removed when fine tuning the charge to obtain the correct superheat and sub-cooling temperatures.

Example: Estimate the amount of refrigerant required for a refrigeration circuit in a system using R410A refrigerant consisting of a CCD-041-A-EC unit connected with a 1/2" x 30 foot liquid line and 5/8" x 30 foot discharge line to a STULZ Model SCS-018 condenser.

A/C Unit	= 3.8 lbs
+1/2" Liquid Line- 30 × (5.88 /100)	= 1.764 lbs
+ 5/8" Discharge Line- 30 × (2.03/100)	= 0.609 lbs
+ Condenser	= 0.5 lbs
Estimated Refrigerant Charge	= 6.673 lbs
(Round off to nearest 0.1 lb)	= 6.7 lbs

2.9.4.1 Preparing the System For Charging

1. With all the system piping connections made, perform a dry nitrogen leak detection test on the system. Using dry nitrogen only, pressurize the system to 150 psig. Ensure all service and solenoid valves are energized open and that no part of the system is isolated from the pressurized nitrogen.
2. Since there is no refrigerant in the system to detect at this point, leaks may be detected by observing if there's been a change in the standing pressure after 12 hours. A significant drop in pressure (>10 psig) indicates a leak in the system that needs to be repaired. After the system is determined to be free of leaks, you may evacuate the system.

2.9.4.2 Evacuate the System

CAUTION 

A proper vacuum must be drawn on the refrigerant system to remove moisture before charging. If this is not done, the refrigerant charge will combine with moisture in the pipes to form an acid that will eventually lead to compressor failure. A triple evacuation procedure with dry nitrogen is recommended, especially for systems with newly installed refrigerant piping.

NOTE

Use a vacuum pump capable of evacuating the entire volume of the A/C system, including newly installed or existing piping. The pump must be in good operating condition. Ensure it contains clean, fresh oil. Manufacturers recommend you change the oil in the pump regularly to maintain its ability to remove moisture.

NOTE

Use high quality hoses, and ensure they are free of defects and don't leak. To achieve the low vacuum that must be attained when evacuating the system, you should use copper tubing instead of hoses if possible. The use of short, large diameter hoses helps reduce evacuation time.

1. After ensuring there are no leaks, relieve pressure and evacuate the entire system while maintaining all the solenoids open. Pull an initial vacuum of 1500 microns or lower using the suction and discharge service ports.

NOTE

When pulling a vacuum, the Schrader valves will unnecessarily restrict the openings, increasing the evacuation time. It is recommended to remove the Schrader valve cores with a Schrader valve removal tool, and draw the vacuum through the port on the removal tool.

2. If you cannot evacuate the system below 1500 microns, close the vacuum pump isolation valve and perform a rate-of-rise test by observing the standing pressure over time. If the pressure rises slowly (up to 200 microns in 15 minutes), the system still contains moisture that needs to be boiled off. Proceed to step #5. If the pressure rises rapidly up to atmospheric pressure (more than 50 microns per minute), there is a leak that wasn't detected during step #2. In this case, troubleshoot the entire system for leaks and repair them, then begin the initial evacuation process again starting at step #3.
3. If no leaks are detected after the initial vacuum, release the vacuum and pressurize the system with 2-3 lbs of dry nitrogen. Allow the system to stand for two hours with the dry nitrogen charge. This gives time for the moisture-absorbing nitrogen molecules to disperse in the system.
4. After two hours, release the pressure, then turn on the vacuum pump and evacuate the system a second time down to 1500 microns or less. Close the vacuum pump isolation valve and pressurize the system again with dry nitrogen and allow the system to stand for two hours as in step #5.
5. After two hours release the pressure. Turn on the vacuum pump and complete the process of evacuating the system, this time with a goal of achieving a 250 micron vacuum or less. Close the vacuum pump isolation valve. When you can hold the vacuum at 500 microns or lower for at least 2 hours with no significant rise in pressure, the system is ready to charge.

6. Replace the Schrader valve cores if you removed them during the evacuation steps. You may now introduce the refrigerant charge through the schrader valves.

2.9.4.3 Refrigerant Charging Procedure

R410A refrigerant must be weighed in when performing the charge. Refer to section 2.9.4, "Estimating Refrigerant Charge" and calculate the estimated amount of refrigerant needed for your system.

When charging a system using a blended refrigerant, it is essential that the composition of the refrigerant is maintained. To ensure correct composition, introduce the refrigerant (R410A) into the system in liquid form rather than vapor form. Cylinders which are not provided with dip tubes should be inverted to allow only liquid refrigerant to charge the system. Keeping the temperature of the cylinder below 85 °F will help maintain the correct refrigerant composition while the cylinder is emptied.

WARNING 

If refrigerant gas is released in an enclosed area, it may accumulate in low areas and near the floor, displacing available oxygen. If a major leak occurs, there is a risk of asphyxiation. In such case, the area should be immediately evacuated and ventilated. Personnel should remain away from the area until it is determined to be safe.

2.9.4.3.1 Initial System Charge

Follow the step-by-step instructions below to charge systems using R410A refrigerant. The initial charge will be performed by introducing liquid refrigerant to the discharge side of the compressor or an available liquid line port with the A/C unit turned off.

1. Bleed air from hoses and break the vacuum by supplying liquid refrigerant to the discharge port near the compressor until the pressure is equalized. This holding charge allows the low pressure switch to "hold," enabling the compressor to operate throughout the process of charging the system.

2.9.4.3.2 Fine Tuning the System Charge

Once the initial charge is completed, add refrigerant to the unit while it is running.

CAUTION 

An adequate heat load must be supplied to ensure a proper charge.

2. Disconnect the refrigerant cylinder from the discharge side of the compressor and connect it to the suction side.
3. Refer to “3.0 Start-Up/Commissioning” on page 22. Start the A/C system and use the system controller to lower the room temperature setpoint 3-5 °F below actual room temperature, thus ensuring cooling remains on as the unit is charged.
4. When fine tuning the charge on cool days it may be necessary to restrict the airflow across the condenser coil to raise the pressure. The fan closest to the header must be running. When fine tuning the charge, ensure the pressures are correct for the type of refrigerant used. Refer to the tables in section 2.11.1, “Pressure/Temperature Settings” for the operating temperature and pressure ranges for R410A refrigerant.
5. Block off a portion of the intake air to the condenser until a constant discharge pressure can be obtained. This will lower the possibility of overcharging. Allow the discharge pressure to rise to 445-480 psig and hold it constant.
6. Slowly meter liquid refrigerant through the suction side while watching the pressure gauges and monitoring superheat and sub-cooling temperatures.

CAUTION 

Add liquid refrigerant slowly to prevent the refrigerant oil from “washing out” of the compressor.

7. Take a superheat temperature reading near the feeler bulb from the controller with the temperature measuring device being well insulated. The ideal superheat temperature is 12-15 °F. Maximum allowable superheat temperature is 20 °F.

CAUTION 

Do not exceed 20 °F superheat. Exceeding this temperature may cause the compressor to fail.

8. While monitoring the pressure, take a sub-cooling temperature reading on the output side of the condenser. The sub-cooling temperature should be 10–20 °F.
9. If necessary, (slowly) add liquid refrigerant to the suction side until the correct sub-cooling temperature is achieved.

CAUTION 

Remove the blockage from the air intake of the condenser.

10. Fill out the applicable sections of the Warranty Registration and Start-Up Checklist.

2.9.4.4 -30 °F Ambient Applications

NOTE

For units designed for -30 °F operation, a receiver is used to store the refrigerant during the time the condenser is not using the extra refrigerant charge.

1. Follow steps 1-9 in section 2.9.4.3, “Refrigerant Charging Procedure” . Once superheat and sub-cooling temperatures are stabilized, additional refrigerant must be added to the receiver.

NOTE

It is important not to exceed 80% of the total condenser and receiver volume to allow room for expansion.

2. A refrigerant level sight glass is located on the side of the receiver to assist the service technician in charging the air conditioning system. The proper charge can be determined by viewing the level of refrigerant in the receiver while the unit is running at an elevated discharge pressure.
3. Keep the air intake to the condenser blocked and maintain the discharge pressure at 445 psig and hold it constant. The condenser fan nearest the condenser header should be operating continuously. All other fans, if additional fans exist, should be off during this time.
4. Add additional refrigerant charge to the receiver as needed until the refrigerant level rises to the center of the sight glass, indicating the receiver is 80% filled.

When the refrigerant in the receiver reaches the sight glass, the unit is fully charged.

CAUTION 

Remove the blockage to the air intake of the condenser.

5. Fill out the applicable sections of the Warranty Registration and Start-Up Checklist.

2.10 System Settings and Adjustments

2.10.1 Low/High Pressure Limit Switch

Air conditioning systems utilizing thermal expansion valves are equipped with hermetically sealed high-pressure and low-pressure switches. These switches are preset by the manufacturer and cannot be adjusted. The high-pressure switch opens at 630 psig and has a manual reset. The low-pressure switch opens at 65 psig (± 10) and closes at 105 psig (± 10) and has an automatic reset.

2.10.2 Head Pressure Controls-Air Cooled Systems

2.10.2.1 -20°F Condenser Fan Speed

Used for outdoor or indoor installations where ambient condenser air inlet temperatures may fall to -20°F, variable speed condenser motor control is used to maintain head pressure. The fan speed control is a continual modulation of the motor's speed. The condenser fan speed controller is factory installed in the remote outdoor condenser electric box. The fan speed controller requires no adjustment.

Wire the condenser in accordance with the electrical schematic and appropriate codes. The fan speed controller will automatically control the head pressure.

Factory setting: Switch contacts are set to close on a pressure rise to 440 psig and open at 330 psig. Set point range is 200 to 610 psig. The differential is set at 110 psi and is adjustable.

2.10.2.2 -30°F Flooded Head Pressure Control

Used for outdoor or indoor installations where ambient condenser air inlet temperatures may fall to -30°F, flooded head pressure control is designed to maintain head pressure during low ambient conditions. A head pressure control valve and a receiver is used in the refrigeration circuit to back up liquid refrigerant into the condenser coil. The head pressure control valve is a 3-way modulating valve controlled by discharge pressure.

When the A/C unit begins to operate, the discharge pressure rises to 330 psig and the condenser fan is cycled on, as described in Section 2.10.2.1. When ambient temperature drops, the discharge pressure drops also. When the discharge pressure drops, the head pressure control valve diverts discharge gas away from the condenser to the receiver. Liquid flow from the condenser is restricted, causing liquid to back up in the condenser.

Flooding the condenser reduces the area available for heat transfer. The desired result is to increase the pressure into the condenser, maintaining a minimum discharge pressure during low ambient operation thus ensuring proper condensing temperature. The head pressure control valve requires no adjustment.

While the fan is running, the flooded head pressure control valve modulates the amount of discharge gas entering the receiver. As the pressure increases, the valve diverts more discharge gas to the condenser, allowing more liquid to flow from the condenser to the receiver.

When using this method of head pressure regulation there must be enough refrigerant in the system to ensure adequate charge at the lowest expected ambient temperature in which

the system will be operating. A receiver is used to store the extra refrigerant when the condenser is not using it.

NOTE

Systems utilizing air cooled condensers must not have a refrigerant line pressure drop over 14 psig across the condenser and the interconnecting piping to the condenser sections. See the line sizing tables in section 2.7.1.2 on page 9.

2.10.3 Head Pressure Controls-Water/Glycol Cooled Systems

In a water/glycol condenser, condensing temperature is maintained by the liquid flowing through a regulating valve and then into a liquid-cooled condenser. The regulating valve opens to increase the liquid flow as the refrigerant pressure rises (or closes as the refrigerant pressure falls). The regulating valve is factory set for the correct condensing temperature; however, it can be adjusted to increase or decrease the condensing temperature.

Head pressure regulating valves are available in 2-way or 3-way configurations. Refer to the piping diagram to determine which type valve is provided. The location and size of regulating valves varies with the size and model of the A/C unit.

2.10.4 Humidifier Adjustment

The humidifier has an adjustable capacity potentiometer on the humidifier control circuit board. The potentiometer may need to be field adjusted if the humidifier is not supplying enough capacity for the current room conditions.

It is recommended that if the humidifier capacity potentiometer requires adjustment, the adjustment be made in small increments and verified. Refer to the humidifier manual sent with your unit for the capacity potentiometer location.

CAUTION

Adjusting the capacity potentiometer too high may result in condensate forming in the system.

2.10.5 Thermal Expansion Valve

Mini-Space EC units employ a Thermal Expansion Valve (TEV). The TEV maintains constant superheat of the refrigerant vapor at the outlet of the evaporator by metering the flow of refrigerant into the evaporator. Superheat is the difference between the refrigerant vapor temperature and its saturation temperature at a given suction pressure. By controlling superheat, the TEV keeps nearly the entire evaporator surface active while preventing liquid refrigerant from returning to the compressor. As a standard, superheat is factory set at 12–15 °F and should not need adjustment.

2.10.6 Hot Gas Reheat (Optional)

The hot gas reheat option incorporates a hot gas reheat solenoid valve and a hot gas reheat coil. Under normal operation when no reheat is required, the hot gas reheat valve is de-energized and hot gas flows directly from the compressor discharge to the condenser. When there is a call for reheat, the controller energizes the hot gas reheat solenoid valve. The hot gas reheat solenoid valve diverts hot gas to the reheat coil, mounted directly downstream of the evaporator coil, before it travels to the condenser. No adjustment to the valve is necessary.

2.10.7 Snap Acting Hot Gas Bypass (Optional)

The snap acting hot gas bypass system provides some modulated capacity control and freeze protection. The hot gas bypass system includes a discharge bypass valve that allows some hot gas from the compressor discharge line to pass into the evaporator coil in order to maintain a preset suction pressure.

The snap acting hot gas bypass system also provides freeze protection for the evaporator coil by limiting the minimum refrigerant pressure, thereby preventing the surface temperature of the evaporator coil from dropping below 32 °F.

The normal control setting is 120 psig (suction pressure) read from the suction (low) side of the compressor as it operates in full hot gas bypass operation. The valve is factory set and no adjustment should be necessary. If adjustment is required, block one half of the coil and remove adjustment cap from the end of the valve. Using a 3/8 inch Allen wrench, turn clockwise to increase pressure or counterclockwise to lower pressure.

CAUTION 

Do not exceed 20 °F superheat. Exceeding this temperature may cause failure of the compressor.

2.11 Refrigerant Characteristics

2.11.1 Pressure/Temperature Settings

Table 6 is provided to assist with the normal settings of the system for R410A refrigerant. Where applicable, minimum and maximum settings are given along with normal operating pressures.

Table 6. R410A Pressure/Temperature Settings

R410A Refrigerant Pressure/Temperature Settings			
	Normal	Min.	Max.
Sub-cooling °F	10	5	20
Superheat °F	15	10	20
Design Condensing Temp. @ 95°F Ambient	125	105	140
Suction Pressure (psig)-	130	105	155
Fan Cycling Control- Fan On (psig)-	440	330	480
Fan Speed Control (psig)-	440	-	-

2.11.2 Saturated Refrigerant Pressure

The refrigerant temperature/pressure table (Table 7) is provided for reference for R410A refrigerant.

Table 7. R410A Refrigerant Pressure

Temp. (°F)	Pressure (psig)	Temp. (°F)	Pressure (psig)
20	78.4	75	218
22	81.9	80	236
24	85.5	85	255
26	89.2	90	274
28	93.1	95	295
30	97.0	100	318
32	101	105	341
34	105	110	365
36	109	115	391
38	114	120	418
40	118	125	446
42	123	130	477
44	128	135	508
46	133	140	541
48	137		
50	143		
55	155		
60	170		
65	185		
70	201		

3.0 START-UP/COMMISSIONING

3.1 Operation

For new installations, ensure the unit is ready to operate before starting it by completing the Start-up Checklist.

NOTE

A Warranty Registration and Start-up Checklist is provided in the unit data package. It should be completed during start-up and sent to STULZ. This checklist should be used as a guideline for items that need to be confirmed during start-up.

Start-up must be performed by a journeyman refrigeration mechanic or air conditioning technician.

3.2 Step-by-Step Start-Up Instructions

1. Replace all removed access panels and equipment prior to performing the start-up checks.
2. Apply power to the precision A/C system at the main power disconnect switch. Turn the system on at the controller.
3. Ensure that all blowers and fans are rotating correctly and freely without any unusual noise.

NOTE

The compressor may have a time delay on start-up.

Water/glycol-cooled units have a head pressure regulating valve that has been factory set. A valve adjustment may be required based on water temperatures or water/glycol flow conditions at your site. Valve adjustments are made through the *E²* controller. Refer to the **STULZ E² Series Microprocessor Controller Operators Manual** for instructions.

4. Test cooling operation by adjusting the temperature setpoint below the actual room temperature. The compressor should come on (in DX units) and the discharge air should feel cooler than the return air.
5. Test heating operation by adjusting the temperature setpoint above the actual room temperature. The source of heat should be energized to increase discharge air temperature.
6. Test humidification operation by creating a demand for humidification. Use an amp meter to determine current draw of humidifier. Visually check for vapor leaving the steam head or feel if the cylinder is warm to verify if the humidifier is operational. In all cases, one to six hours might be required to see a desired level or rise of humid-

ity in the conditioned space. Once room conditions have been programmed or set, a repeat visit to the conditioned site may be required to ensure the humidifier is meeting the room's requirements.

7. Test dehumidification operation by creating a demand for dehumidification. Decrease the dehumidification setpoint 10% below the actual room conditions. The compressor circuit will be energized to begin the dehumidification process. While in this mode, the room temperature may decrease and the reheat function may activate. As conditions in the room change, you may have to readjust the setpoint as you check the operation. An adequate heat load within the space is required.
8. To verify electric reheat, use an amp meter on the heater circuit to determine if the heater is operational. For hot gas reheat, use a voltmeter and a point-to-point method to verify the control signal has energized the hot gas reheat solenoid coil. For hot water reheat, verify that the control signal has energized the control valve and the temperature of the steam or water has decreased as it passes through the unit.

In all cases, one to six hours might be required to see a desired level or decrease of humidity in the conditioned space. Once room conditions have been programmed or set, a repeat visit to the conditioned site may be required to ensure the dehumidification mode is meeting the room's requirements.

3.3 Unit Shutdown

To shut down the unit, command the shutdown from the BMS managing the unit or use the graphic terminal connected to the unit controller to power down the unit, as described in the **STULZ E² Series Microprocessor Controller Operators Manual**.

To perform an emergency shutdown, set the main power disconnect switch to the Off position.

3.4 Microprocessor Controller Programming

The microprocessor controller is factory programmed based on the optional features selected. Most applications require no field start-up or program adjustment beyond setting the current date and time. Separate operating instructions for the controller have been sent with your unit, including each feature's factory "default" setting and the available adjustment range, if applicable.

4.0 MAINTENANCE

4.1 Periodic General Maintenance

Systematic, periodic general maintenance of the Mini-Space EC unit is recommended for optimal system performance. General maintenance should include, but is not limited to, the following: replacing filters and humidifier cylinders, tightening electrical connections, checking the condensate line to ensure it is free of debris, cleaning the interior of the unit, inspecting the unit's components visually, checking the level of refrigerant and ensuring no moisture is in the refrigerant.

Use copies of the Periodic General Maintenance Checklist at the back of this manual to record periodic general maintenance inspections. For assistance, contact the STULZ Product Support Group. Ensure adherence to all safety statements while performing any type of maintenance.

WARNING

This equipment should be serviced and repaired by a journeyman or a qualified refrigeration technician only.

WARNING

This unit employs high voltage equipment with rotating components. Exercise extreme care to avoid accidents and ensure proper operation.

Hazardous voltage will still be present inside the electric box at the motor start protectors and circuit breakers, even with the unit turned off at the microprocessor controller. To isolate the unit for maintenance, turn off power at the main power disconnect switch. Always disconnect main power prior to performing any service or repairs.

WARNING

Turn off power to the unit unless you are performing tests that require power. With power and controls energized, the unit could begin operating automatically at any time. To prevent personal injury, stay clear of rotating components, as automatic controls may start them unexpectedly.

WARNING

Fluorophosgene, a deadly poisonous gas, is generated when R410A refrigerant is exposed to flame. Always ensure adequate ventilation during refrigeration repairs.

WARNING

Always recover all refrigerant prior to any system repairs. Failure to do so may result in system over pressurization and rupture.

4.1.1 Filter

The filter is usually the most neglected item in an air conditioning system. To maintain efficient operation, the filter should be checked at least monthly and replaced as required. Refer to Section 4.3.4.5 for filter replacement instructions.

NOTE

Air cleanliness varies from one space to the next. Establish a frequency for checking filters based on the conditioned space.

4.1.2 Drain Pan

To ensure proper drainage, inspect the drain pan regularly. Make sure the drain pan outlet is always free of debris and ensure the drain pan does not leak.

4.1.3 Coils

Coil(s) should be inspected semiannually and cleaned as required following standard coil cleaning practices. Using a brush, clean the coil fins of all debris that will inhibit airflow. This can also be done with compressed air or with a commercial coil cleaner. Check for bent or damaged coil fins and repair as necessary. Check all piping for signs of leaks.

4.1.4 Heat/Reheat

The heat/reheat equipment should be inspected semi-annually to ensure it is operational. If you have electric heat/reheat, inspect the heating elements to ensure they are free of debris.

4.1.5 Humidifier

The steam cylinder has a limited lifetime and must be replaced periodically. Because water conditions and humidifier usage rates vary greatly, it is difficult to establish intervals for changing the cylinder. Individual maintenance schedules must be determined for each location, based upon periodic examination of the humidifier. A change cylinder light on the humidifier cabinet will flash yellow in a repeating four-flash pattern when the cylinder requires replacement.

See section 4.3.4.4 for detailed instructions on changing the cylinder.

CAUTION

Failure to replace the cylinder at the end of cylinder life may result in humidifier damage.

4.1.6 Condensate Pump

The condensate pump should be inspected semi-annually and cleaned. Ensure that the float works freely. Wipe the float with a wet cloth and detergent to remove dirt. Clean the tank bottom. Check the discharge line to ensure it is open and water can pass through it freely.

4.1.7 Condenser

Maintenance access to the condenser is through one or two removable panels (depending on the unit model). For air-cooled condensers, clean the condenser coil of all debris that could inhibit airflow. This can be done with compressed air or with a commercial coil cleaner. Check for bent or damaged coil fins and repair as necessary. On outdoor units in winter, do not permit snow to accumulate on or around the condensing unit. Check all refrigerant lines and capillaries for vibration isolation and support as necessary. Check all refrigerant and coolant lines for signs of leaks.

CAUTION

The compressor crankcase heater is energized as long as power is applied to the unit. If the main switch is disconnected for a long period, do not attempt to start the condensing unit until eight hours after applying power. This allows enough time for all liquid refrigerant to be driven out of the compressor. This is especially important at low ambient conditions.

4.1.8 Pump Package

Routinely examine the areas around the pump motor(s) and inlets and outlets. Check coolant and piping for signs of leaks. Examine all wiring for signs of chafing, loose connections or other obvious damage. Examine brackets, motor mounts and hardware for loose or missing parts or other damage. Lubricate motor bearings if applicable. (See the instruction manual provided with the pump package.)

4.2 Troubleshooting

Turn off all power to the unit before conducting any troubleshooting procedures, unless the procedure specifically requires the system to operate. For troubleshooting purposes the system may be operated with the door open by using a pair of channel lock pliers to turn the shaft of the main power disconnect switch to the “On” position. When the switch is turned on, high voltage will be present inside the cabinet. Exercise caution to prevent injury. Keep hands, clothing and tools clear of the electrical terminals and rotating components. Ensure that your footing is stable at all times.

Table 8. Troubleshooting Guide

SYMPTOM	PROBABLE CAUSE	RECOMMENDATION
Suction Pressure Too Low	a. Loss of refrigerant (excessive bubbles in sight glass).	Locate leak and repair. Recharge system.
	b. Expansion valve stuck or obstructed (short cycle or continuous running).	Remove and clean or replace valve.
	c. Clogged drier/strainer (feels cold).	Replace with new drier/strainer.
	d. Dirty air filters.	Clean/replace filters.
Water/Glycol Valve Fails to Open or Close	a. Temperature set point too high.	Adjust to correct temperature setting.
	b. No control power to the valve.	Thermostat wired incorrectly. Check wiring diagram and rewire if required.
	c. Actuator failed.	Replace actuator.
Evaporator Coil Ices	a. Low airflow.	1. Check filters. Replace as needed.
		2. Check for and clear any obstructions across or in the (supply) discharge air-stream.
		3. Check correct rotation of evaporator blower.
	b. Temperature setting too low.	Increase temperature setpoint (68 °F min.).
c. Discharge air short cycling back to return.	Check discharge grille orientation.	
d. Low refrigerant charge.	Find leak, repair and recharge system.	
Blower Fails to Start	a. Power failure.	Check main voltage power source input cable.
	b. Control transformer circuit breaker tripped.	Check for short circuit or ground fault; if none, reset circuit breaker.
	c. Defective contactor.	Repair or replace.
	d. Condensate Switch Open.	Insure unit is level.
		Check that condensate pan is draining properly. Clear obstructions.
e. Motor starter protector tripped	Reset motor starter protector and check amperage of motor. Compare to setting of motor protector and adjust FLA.	
Control is Erratic	Wiring improperly connected or broken.	Check wiring against electrical drawing.

SYMPTOM	PROBABLE CAUSE	RECOMMENDATION
Condenser Pressure Too High	a. Non-condensable gas or air in system.	Recover system and recharge. Replace drier/strainer. Evacuate to 50 microns and recharge.
	b. Condenser air intake is blocked.	Remove debris and clean condenser.
	c. Overcharge of refrigerant.	Reclaim excess refrigerant from system.
	d. Low water flow to water-cooled condenser.	Reset-determine cause and fix.
	e. Condenser fan not operating.	Check pressure/temperature operating switches and motor. Replace as needed.
	f. Water/glycol temperature too high.	Check flow and operation of drycooler.
	g. Condenser pressure regulating valve setting too high.	Adjust to obtain correct pressure.
	h. Flow of water/glycol too low.	<ol style="list-style-type: none"> 1. Check glycol solution level and concentration. 2. Valves not open or partially open. Repair/replace as needed. 3. Air in system - bleed system. 4. Check all strainers and clean if needed.
	i. Water/glycol solution not mixed prior to adding to system.	Remove solution and premix. Refill system.
Condenser Pressure Too Low	a. Loss of refrigerant (indicated by bubbles in sight glass).	Locate and repair leak. Recharge system.
	b. Condenser fan controls not set Adjust or repair controls properly.	Adjust or repair controls.
	c. Water regulating valve adjusted too low.	R410A - Readjust to 440 psig.
Noisy Compressor	a. Expansion valve stuck in open position (abnormally cold suction line).	Ensure feeder bulb is tight on suction line. Check operation and superheat.
	b. Worn or scarred compressor bearings.	Replace compressor.
	c. Liquid slugging.	System overcharged. Reclaim excess refrigerant.
	d. Scroll compressor not properly phased.	Phase correctly at main power source. Do not rewire compressor.
Compressor Fails to Start	a. Temperature setpoint too high.	Adjust to desired temperature.
	b. Compressor internal overload protector is open.	Check compressor for short circuit or ground.
	c. Complete loss of refrigerant charge (low pressure safety switch).	Locate and repair leak. Recharge system.
	d. Condenser pressure too high (high pressure safety switch).	Check condenser for obstructions.
	e. Minimum off time has not expired.	Wait for time to expire.

SYMPTOM	PROBABLE CAUSE	RECOMMENDATION
System Short of Capacity	a. Low refrigerant (indicated by bubbles in sight glass).	Check for leaks Repair and recharge system.
	b. Expansion valve stuck or obstructed (short cycling or continuous running).	Remove valve and clear obstruction or replace valve.
	c. Clogged drier/strainer (feels cold).	Replace with new drier/ strainer.
	d. Reduced airflow.	Check belt tension, filters and clear evaporator coil of debris.
Compressor Short Cycles	a. Low line voltage causing compressor to overheat.	Check power source for cause of low line voltage.
	b. Dirty or iced over evaporator coil.	Defrost and/or clean coil.
	c. Reduced airflow (when applicable).	Check filter and belt tension.
	d. Lack of refrigerant.	Check for leak. Repair and recharge system.
	e. Short cycling of conditioned air.	1. Supply and/or return grilles are incorrectly oriented. Re-orient. 2. Supply and return grilles are too close together. Move further apart. 3. Insufficient heat load. Add temporary heat load to compensate.
	f. Remote temperature sensor is improperly located.	Check for supply registers that may be too close to thermostat. Relocate if necessary.
Heater Inoperative	a. Fuses blown.	Check for short circuit, replace fuse.
	b. Temperature set too low.	Increase temperature set point.
	c. Overheat switch open.	Insufficient airflow across heater elements. Check for dirty filters or obstructions that may reduce airflow. Correct or replace as needed.
	d. Manual-reset overheat safety switch tripped.	Reset manual overheat safety switch (See item immediately above).
	e. Heater element burned out.	Check continuity with an ohmmeter. Replace heater element.
Humidifier Inoperative <i>Note: See humidifier manual for additional help.</i>	a. Water supply has been turned off or not connected.	Connect and/or turn on water supply.
	b. Humidifier switch is in "Off" position.	Turn switch to "Auto/On" position.
	c. Electrical connections are loose.	Tighten electrical connections.
	d. Humidifier circuit breaker tripped.	Check for over current by the humidifier electrodes. Drain water from tank and refill. Reset circuit breaker.
	e. Relative humidity is above set point.	Adjust humidistat set point.
	f. Humidistat yellow status LED is flashing.	Consult humidifier manual.
	g. Water conductivity is too low.	Add a teaspoon of table salt to the water through the top of the cylinder. Typically only required on initial start-up.

4.3 Field Service

NOTE

Do not attempt to make repairs without the proper tools.

It may be necessary to perform repairs on the refrigeration system. If field repairs are necessary, the following procedures apply.

4.3.1 Leak Detection

Several methods can be used to detect a leak in the refrigeration system. The most modern and easiest method is to use an electronic leak detector. Follow the manufacturer’s directions and any leak can be quickly located. A second method is to use soap bubbles. Apply a solution of soapy water with a brush or sponge to the joints and connections in the refrigeration lines. A leak in the lines will cause bubbles to form.

NOTE

Use a halogen leak detector capable of detecting R410A refrigerant.

4.3.2 Leak Repair

When a leak is located, properly reclaim the remaining refrigerant charge before beginning repairs. Adjacent piping must be thoroughly cleaned by removing all paint, dirt and oily film. Use a wire brush, sandcloth or sandpaper and wipe the area with clean, dry cloths. Protect nearby parts from heat damage by wrapping with water-soaked cloths.

4.3.3 Refrigerant Piping

When replacing components within the cabinet of the unit, the following solders are recommended: Silfos alloy for copper-to-copper (piping discharge or suction line repairs); silver solder (Stay-Silv #45) and flux for copper-to-brass or copper-to-steel repairs; and a 95% tin to 5% antimony solder with flux for liquid line repairs at the drier, strainer, sight glass, or expansion valve.

When component replacement is complete, remove all traces of flux. After any repair, pressure check the system and ensure there are no leaks prior to recharging the system.

4.3.4 General Common Repairs/Component Replacement

4.3.4.1 Compressor Failure

The compressor is the most important component of a DX unit. Numerous safety devices are provided to protect the compressor from failing.

When a compressor fails, determine whether the cause is electrical or mechanical. An electrical failure is indicated by a distinct pungent odor once the system has been opened. If a

burnout occurred, the oil will be black and acidic. A mechanical failure will have no burned odor and the motor will attempt to run. An abnormal or excessive noise may be present.

Analyzing the oil is the only way to determine the proper procedure for cleaning the refrigerant system. Acid test kits are available from several manufacturers for measuring the acid level in the oil. These are capable of making accurate acidity measurements, but if they are not available a check of the oil by sight and smell can give a quick indication if contamination remains in the system. Since refrigeration oils vary in color, a sample of the new oil in the replacement compressor should be removed prior to installation and sealed in a small glass bottle for comparison purposes. If the oil has been exposed to refrigerant, the bottle should not be tightly capped, since the residual refrigerant may create a high pressure if tightly sealed and exposed to high temperature.

CAUTION 

Avoid touching or contacting the gas and oil with exposed skin. Severe burns will result. Use long rubber gloves when handling contaminated parts.

All electrical connections should be checked to ensure they are tight and properly made. Check all circuit breakers, contactors and wiring. Contactors should be examined and replaced if the contacts are worn or pitted.

If there is acid in the oil, there has been an electrical failure which has caused the compressor motor to burn out. The acid diffuses throughout the refrigeration system and must be removed by using a burnout filter kit before a new compressor is placed in service. Not only must the compressor be replaced, but the entire refrigeration circuit must be cleaned of the harmful contaminants left by the burnout. See section 4.3.4.3, “Burn-Out/Acid Cleanup Procedure” for the proper procedure.

If there is no acid in the oil, there has been a mechanical failure. See section 4.3.4.2, “Standard Clean out Procedure” for the proper cleaning procedure.

CAUTION 

Damage to a replacement compressor caused by improper system cleaning constitutes abuse under the terms of the warranty and will void the warranty.

CAUTION 

POE oil is used in systems with R410A refrigerant. If a replacement compressor is provided, ensure that it is filled with POE oil before installing.

4.3.4.2 Standard Clean out Procedure

NOTE

Cleaning operations must be performed by a journeyman refrigeration mechanic or air conditioning technician.

1. Turn off power to unit at the main power disconnect switch.
2. Remove the old compressor and install the new compressor.
3. Remove the liquid line drier and install an oversized liquid line filter-drier (one size larger than the normal selection size).
4. Evacuate the system according to standard procedures. Normally, this will include the use of a high-vacuum pump and a low-vacuum micron gauge for measuring the vacuum obtained.
5. Recharge the system.
6. Turn on the power at the main power disconnect switch and start the system at the controller.

4.3.4.3 Burn-Out/Acid Cleanup Procedure

The unit should be cleaned using the suction line filter-drier method.

CAUTION 

Avoid touching or contacting the gas and oil with exposed skin. Severe burns will result. Use long rubber gloves in handling contaminated parts.

NOTE

Cleaning operations must be performed by a journeyman refrigeration mechanic or air conditioning technician.

1. Turn off power to the unit at the main power disconnect switch.
2. Remove the burned out compressor and install the new compressor.
3. Install a suction line filter-drier designed for acid removal.
4. Remove the liquid line drier and install an oversized liquid line filter-drier (one size larger than the normal size for the unit).
5. Check the expansion valve, sight glass and other controls to see if cleaning or replacement is required.
6. Evacuate the system according to standard procedures. Normally, this will include the use of a high-vacuum pump and a low-vacuum micron gauge for measuring the vacuum obtained.

7. Recharge the system through the access valve on the suction line filter-drier.
8. Turn on power at the main power disconnect switch and start the system at the controller.
9. The permanently installed suction line filter-drier permits small system cleanup to be completed in one service call. The pressure drop across the suction line filter-drier should be measured during the first hour of operation. If the pressure drop becomes excessive, the suction line filter-drier should be replaced (See Sporlan Bulletin 40-10, for the maximum recommended pressure drop (PSI) for the suction line filter drier).
10. In 24 hours, take an oil sample. Observe the color and test for acidity. If the oil is dirty or acidic, replace the suction line filter-drier.
11. In 2 weeks, examine oil to determine if another suction line filter-drier change is necessary.

4.3.4.4 Humidifier Cylinder Replacement

The cylinder is disposable and cylinder life is dependent on water supply conditions and humidifier usage. After an extended period of operation a yellow LED on the humidifier cabinet will flash in a four-flash sequence to indicate the cylinder is completely used and a replacement cylinder must be installed. The following procedures should be followed when replacing the cylinder.

CAUTION 

Failure to replace cylinder at the end of cylinder life may result in humidifier damage.

NOTE

Decrease the low humidity setpoint below ambient humidity to allow the cylinder to cool down before removing the cylinder.

1. Turn the unit off, preferably in a manner that uses the controller, such as via the graphic controller, BMS or external shutdown control.
2. Drain the cylinder by switching the “On/Off/Drain” switch to the “Drain” position. Let the humidifier drain until no more water is flowing out to drain (usually not more than 10 minutes).
3. Turn the humidifier On/Off/Drain switch to off.
4. Turn off water supply to the humidifier.
5. Exit the cabinet and disconnect power to the humidifier at the main power disconnect switch.

6. Follow the steps of the cylinder removal, drain valve cleaning and cylinder installation procedures in the **Nortec MES2 Installation and Operation Manual** provided under separate cover with your unit.
7. Close the Mini-Space EC cabinet door and reconnect main power at the main power disconnect switch.
8. Turn on the water supply to the humidifier.
9. Readjust the humidity setpoint.

CAUTION

If the humidifier is to be shut down for an extended period, follow the steps of the Extended Shutdown procedure in the **Nortec MES2 Installation and Operation Manual**.

4.3.4.5 Filter Replacement

The filters are behind the front door or in the rear filter box depending on the configuration of the unit. Ensuring directional airflow arrows on the filters are correct, insert the new filters then close and/or replace the access panel.

5.0 PRODUCT SUPPORT

STULZ Product Support provides aftermarket technical and field support, warranty authorization and part sales to contractors and end users. Factory authorized services are available by request and include:

- Factory Authorized Start-up/Warranty Inspection
- Commissioning Assistance
- Break Fix Repair
- Preventive Maintenance Contracts
- Performance Evaluations
- Technician and Owner Training

5.1 Technical Support

The STULZ Technical Support Department is dedicated to the prompt reply and resolution of issues experienced with supplied equipment. Please contact (888) 529-1266 Monday through Friday from 8:00 a.m. to 5:00 p.m. EST. After hours support is also available. Please provide your name and contact information and a support technician will return your call.

When calling to obtain support, it is important to have the following information readily available, (information is found on the unit's nameplate):

- Unit Model Number (CCX-XXX-X-EC)
- STULZ Sales Order Number
- STULZ Item Number
- Unit Serial Number
- Description of Problem

5.2 Obtaining Warranty Parts

All Warranty Parts Authorizations are validated and processed through the Technical Support Department at (888) 529-1266 Monday through Friday from 8:00 a.m. to 5:00 p.m. EST. A support technician at STULZ will provide troubleshooting assistance over the telephone. If it can be determined that a part may be defective, a warranty authorization for a replacement part will be processed by STULZ Technical Support. The replacement part will then be shipped via UPS ground. If the customer requests that warranty part(s) be sent by any other method than UPS ground, the customer is responsible for the shipping charges. If you do not have established credit with STULZ you must provide a freight carrier account number.

A written (or faxed) purchase order is required on warranty parts and must be received prior to 12:00 p.m. for same day shipment. The purchase order must contain the following items:

- Purchase Order Number
- Date of Order
- STULZ Stated Part Price
- Customer Billing Address
- Shipping Address
- Customer's Telephone and Fax Numbers
- Contact Name
- Unit Model Number and Serial Number

The customer is responsible for the shipping cost incurred for returning the defective part(s) back to STULZ. Return of defective part(s) must be within 30 days, at which time an evaluation of the part(s) is conducted and if the part is found to have a manufacturing defect a credit will be issued.

When returning defective part(s), complete the Return Material Authorization Tag and the address label provided with the replacement part. For prompt processing, please affix the RMA in a prominent place on the external packaging of the returned part.

5.3 Obtaining Spare/Replacement Parts

Maintaining a recommended spare parts inventory is an industry best practice for critical facilities. On-site spares kits reduce downtime and can eliminate the cost of expedited freight charges. Recommended spares and replacement parts sales are available through Product Support by fax (301) 620-1396, telephone (888) 529-1266, or email (parts@stulz-ats.com).

STULZ accepts Visa and MasterCard. STULZ may extend credit to its customers; a credit application must be prepared and approved (this process could take one week).

A 25% minimum restocking charge will be applied on returned stocked parts that were sold as spare/replacement parts. If the returned part is not a stocked item, a 50% restocking charge may be applied. Additionally a Return Material Authorization Number is required when returning parts. Repair/replacement parts may be returned for credit up to 30 days after purchase.

Periodic General Maintenance Checks and Services Checklist

Date: _____ Prepared By: _____
 Model Number: _____ Serial Number: _____
 Item Number: _____

Monthly

<p>Filters</p> <p><input type="checkbox"/> Cleanliness</p> <p><input type="checkbox"/> No Obstructions</p>	<p>Blower Section</p> <p><input type="checkbox"/> Blower Turns</p> <p><input type="checkbox"/> Belts (if applicable)</p>	<p>Condensate Drain</p> <p><input type="checkbox"/> Drain is Open</p> <p><input type="checkbox"/> Condensate Pan Safety Switches Operate Freely</p>
<p>Miscellaneous</p> <p><input type="checkbox"/> Check Glycol or Chilled Water for Air (bleed as required)</p> <p><input type="checkbox"/> External Heat Exchanger Clean and Clear of Obstructions</p> <p><input type="checkbox"/> Humidifier Cylinder and Controls Operate Properly</p>		

Semi-Annually

<input type="checkbox"/> Check Refrigerant Charge (bubbles in sight-glass)	<input type="checkbox"/> Tighten Electrical Connections
<input type="checkbox"/> Check Suction & Discharge Pressure	<input type="checkbox"/> Check Contacts on Contactors for Pitting
<input type="checkbox"/> Check Glycol Solution Concentration in System	<input type="checkbox"/> Clean Unit as Necessary
<input type="checkbox"/> Clean Coils	<input type="checkbox"/> Test the Glycol Solution Inhibitors (flush if necessary)
<input type="checkbox"/> Heat/Reheat Operational	<input type="checkbox"/> Clean Condensate Pump

Annually

<p>Refrigerant Systems</p> <p><input type="checkbox"/> Inspect Glycol System for Leaks and Corrosion</p> <p><input type="checkbox"/> Conduct a Complete Check of All Services Listed Above and Clean Unit's Interior</p>	<p>Chilled Water Systems</p> <p><input type="checkbox"/> Inspect Chilled Water System for Leaks and Corrosion</p> <p><input type="checkbox"/> Conduct a Complete Check of All Services Listed Above and Clean Unit's Interior</p>
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Notes: _____

Signature: _____

*** If factory assistance is required for any reason, provide the model number, serial number, and STULZ item number found on the unit nameplate. This will speed the process and ensure accuracy of information. ***

Glossary

STULZ	STULZ Air Technology Systems, Inc.	MAX CKT BKR	Maximum Circuit Breaker
BMS	Building Management System	MAX FUSE	Maximum Fuse
BTU/Hr	British Thermal Units Per Hour	MCA	Minimum Circuit Ampacity
CFM	Cubic Feet Per Minute	NEC	National Electric Code
CNDCT	Conductor	NFPA	National Fire Protection Agency
ESD	Electrostatic Discharge	PH	Phase
° F	Degrees Fahrenheit	pLAN	Pico Local Area Network
FLA	Full Load Amps	PSI	Pounds Per Square Inch
FOB	Free on Board	psig	Pounds Per Square Inch Gauge
HACR	Heating, Air Conditioning, Refrigeration	RLA	Run Load Amps
HP	Horse Power	R-Value	Thermal Resistance
Hz	Hertz	R-410A	Blended Refrigerant
IAQ	Indoor Air Quality	SDS	Safety Data Sheet
in. w.g.	Inches of Water Gauge	SPDT	Single Pole, Double Throw
kVA	Kilo Volt Amps	TXV	Thermostatic Expansion Valve
kW	Kilowatt	V	Volt
LEWT	Low Entering Water Temperature	VAC	Volt, Alternating Current
LRA	Locked Rotor Amps	VDC	Volt, Direct Current

Notes

Notes



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