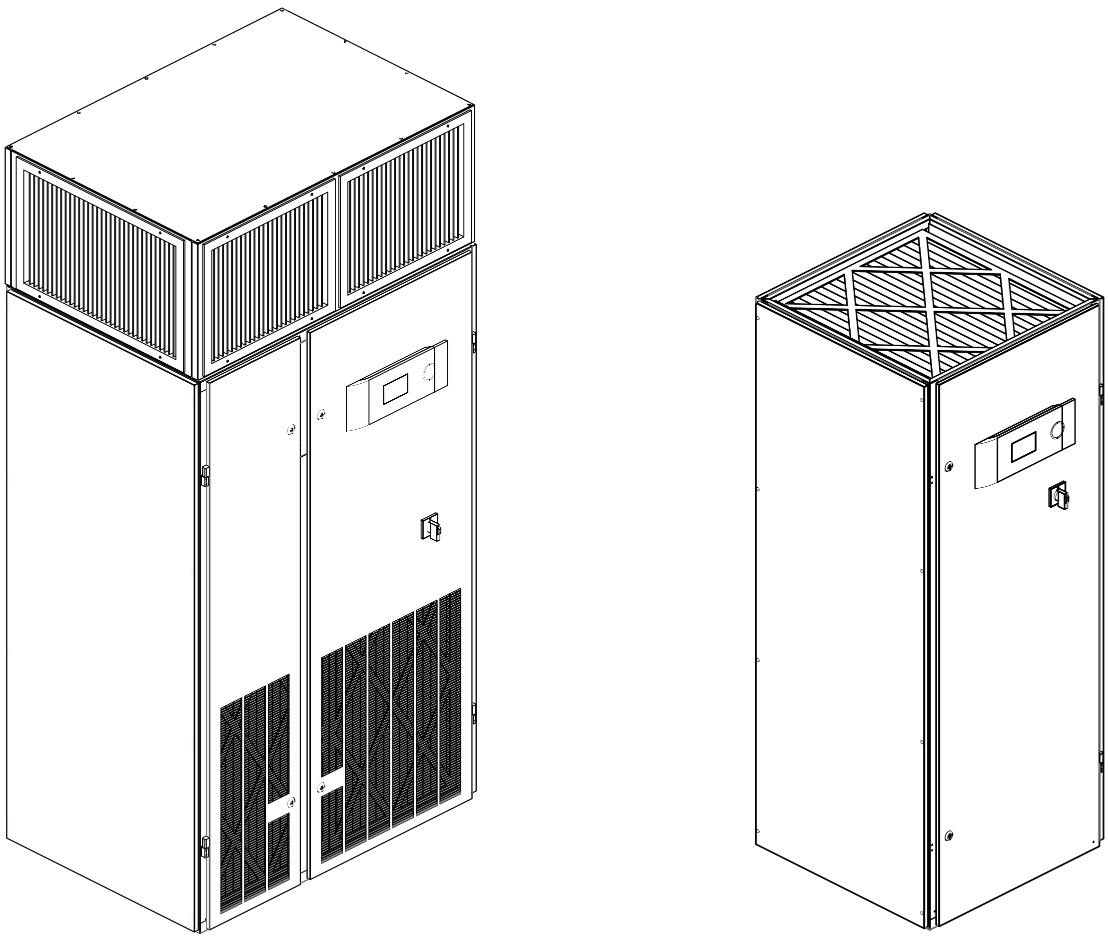
STULZ

CLIMATE. CUSTOMIZED.



CyberOne EC DX

Installation, Operation and Maintenance Manual

Perimeter Precision Air Conditioners
7-35 kW / 60 Hz

Notice

STULZ Air Technology Systems,
Inc. 1572 Tilco Drive
Frederick, MD 21704 USA
https://www.stulz-usa.com/

Table of Contents

Figures

Tables

Nomenclature					
COS-XXX-XXX-XX-X-EC					
System	Capacity in 1,000s BTU/H	Model	AWS/FC	Air Flow Pattern	Fan Cooling
COS = CyberOne	024 042 060 096 120	AHU = Air Handling Unit AR =Air-Cooled Remote (Split) G = Glycol-Cooled RCU-O = Outdoor Propeller Remote Condensing Unit RCU-I = Indoor Centrifugal Remote Condensing Unit S = Single Pump	AWS = Alternate Water Source FC = Free Cooling	D = Downflow U = Upflow	EC = Direct Driven, single in- let, two fold backward curved radial fan with electronically commutated (EC) motor

1.0 INTRODUCTION

1.1 General

The CyberOne EC DX floor mounted precision air conditioning system covered by this manual is designed and manufactured by STULZ Air Technology Systems, Inc. (STULZ) and uses the latest, state-of-the-art control technology. Recognized as a world leader, STULZ provides air conditioning systems with the highest quality craftsmanship using the finest materials available in the industry. The system 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 warranty.

Study the instructions contained 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.

CyberOne EC DX systems are designed to be installed indoors unless otherwise noted on the equipment.

1.2 Product Description

CyberOne EC DX systems are available in air- cooled, water/glycol-cooled and alternate water source configurations. The cooling capacity will depend on the unit size, which can range from 24,000 to 120,000 BTU/H. CyberOne EC systems are designed to operate with R407C refrigerant. Refer to the unit nameplate to identify which refrigerant is used with your system.

NOTE

The CyberOne EC system is designed to supply air to only one room.

The functional modes of operation, in addition to cooling, are heating, humidification and dehumidification, which provide complete environmental control of a conditioned space. The cabinet is available in two configurations. A compact 30.5 in. wide by 31.5 in. deep frame for units ranging from 24,000 to 60,000 BTU/H and a 48 in. wide by 34 in. deep frame for units ranging from 96,000 to 120,000 BTU/H.

There are two basic airflow pattern configurations; upflow and downflow. Cabinet height is determined by these airflow patterns. A downflow cabinet's total height is 76 in. If an optional flange duct/skirt connection is selected the total height is 83 in. An upflow cabinet's total height is 77 in. with a standard flange duct/skirt connection. If an optional discharge plenum box assembly is selected the total height is 95.5 in.

An advanced ***E²*** series microprocessor controller is mounted inside the CyberOne EC electric box. This controller provides superior features for more comprehensive control of the unit. These features include full alarm system; input/output monitoring status; full integrated control of heating, cooling, humidification, and dehumidification; multi-A/C unit control and remote communication with building management systems.

The ***E²*** user interface display panel is typically factory mounted on the front access door of the unit. As an option the small bezel display may be shipped loose for remote mounting to a wall or control panel.

E² Display- Small Bezel

E² Display- Large Bezel

E² Display- Touch Screen

An operating manual for the system controller is provided under separate cover. Refer to that manual for detailed instructions on operating the system controller provided with your unit.

1.3 Safety

1.3.1 General

We use **NOTES**, **CAUTIONS** and **WARNINGS** in the manuals to draw attention to important operational and safety information.

A bold text **NOTE** marks alerts you to an important detail.

A bold text **CAUTION** safety alert marks information that is important for protecting the unit and its performance. Be especially careful to read and follow all cautions that apply to your application.

A bold text **WARNING** safety alert marks information that is important for protecting personnel from harm. Pay very close attention to all warnings that apply to your application.

An exclamation safety alert symbol ⚠ precedes a general **WARNING** or **CAUTION** safety statement.

A lightning safety alert symbol precedes an electrical shock hazard **WARNING** statement.

1.3.2 Safety Summary

The following statements are general guidelines followed by warnings and cautions applicable throughout the manual. Prior to performing any installation, operation, maintenance or troubleshooting procedure, read and understand all instructions, recommendations and guidelines contained within this manual. All maintenance and/or repairs must be performed by a journeyman, refrigeration mechanic or an air conditioning technician.

CAUTIONS ⚠

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

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

WARNING

Never operate the unit with any cover, guard, screen panel, etc., removed unless the instructions specifically state otherwise, then do so with extreme caution to avoid personal injury.

CAUTION ⚠

Never work on electrical equipment unless another person, who is familiar with the operation and hazards of the equipment and competent in administering first aid, is nearby.

WARNINGS

All personnel working on or near equipment should be familiar with hazards associated with electrical maintenance. Safety placards/stickers have been placed on the unit to call attention to all personal and equipment damage hazard areas.

WARNINGS

When working on electrical equipment, remove all jewelry, watches, rings, etc.

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 priorto performing any service or repairs.

A lock-out tag-out procedure should be followed to ensure that power is not inadvertently reconnected.

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

WARNING ⚠

Refrigerant (R407C) 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 refrigerant to an open flame or a very hot surface will cause a chemical reaction that will form carbonyl fluoride, a highly poisonous and corrosive gas commonly referred to as fluorophosgene. 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.

Always refer to the manufacturer's SDS provided with the unit.

CAUTIONS ⚠

Certain maintenance or cleaning procedures may call for the use and handling of chemicals, solvents, or cleansers. Always refer to the manufacturer's material 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.

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.

WARNING ⚠

When performing brazing or debrazing 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 (0.03-0.06 m^3/minute).

CAUTIONS ⚠

Cooling coils (and associated piping circuits) are pressurized (up to 100 psi) and sealed when they leave the factory. Before installing the interconnecting piping, observe appropriate safety precautions and release the pressure via an available stem valve or Schrader valve prior to uncapping the pipes.

After interconnecting piping is installed, the piping system must be cleaned. If solvents/cleaning solutions are used, ensure they are completely flushed from the piping before connecting it to the unit. Failure to do so may result in equipment problems.

CAUTION ⚠

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

WARNING ⚠

Do not use chloride based water conditioning additives in condensate drain pans. This will cause corrosion to occur on the coil fins.

1.4 General Design

The CyberOne EC DX system is housed in a steel frame type cabinet and is rated for indoor use. The exterior of the cabinet is coated with a powder coat finish to protect against corrosion. A hinged door is located in the front of the cabinet for easy access to all components. Operator controls are conveniently located on the front of the cabinet.

NOTE

Customer specified nonstandard features or design variations may not be described in this manual. Refer to the installation and/or electrical drawings supplied with your unit for details on additional feature(s). In some cases, an addendum to this manual may also be included to further describe the feature(s).

Figure 1 depicts a typical internal layout of a typical CyberOne EC downflow unit and identifies the major components. The location of major components vary depending on the model number and options purchased.

Figure 2 depicts a typical internal layout of a typical CyberOne EC upflow unit and identifies the major components. The location of major components vary depending on model number and options purchased.

1.4.1 Electrical Compartment

The electrical components are protected behind the front hinged access door. The location of the electrical components varies depending on the control options provided with your unit.

The access door is safety interlocked with the main power service disconnect switch (See Figure 1 and Figure 2) preventing the door from opening when the switch in the On position. The switch must be turned Off to gain access to the electrical compartment.

The service 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.

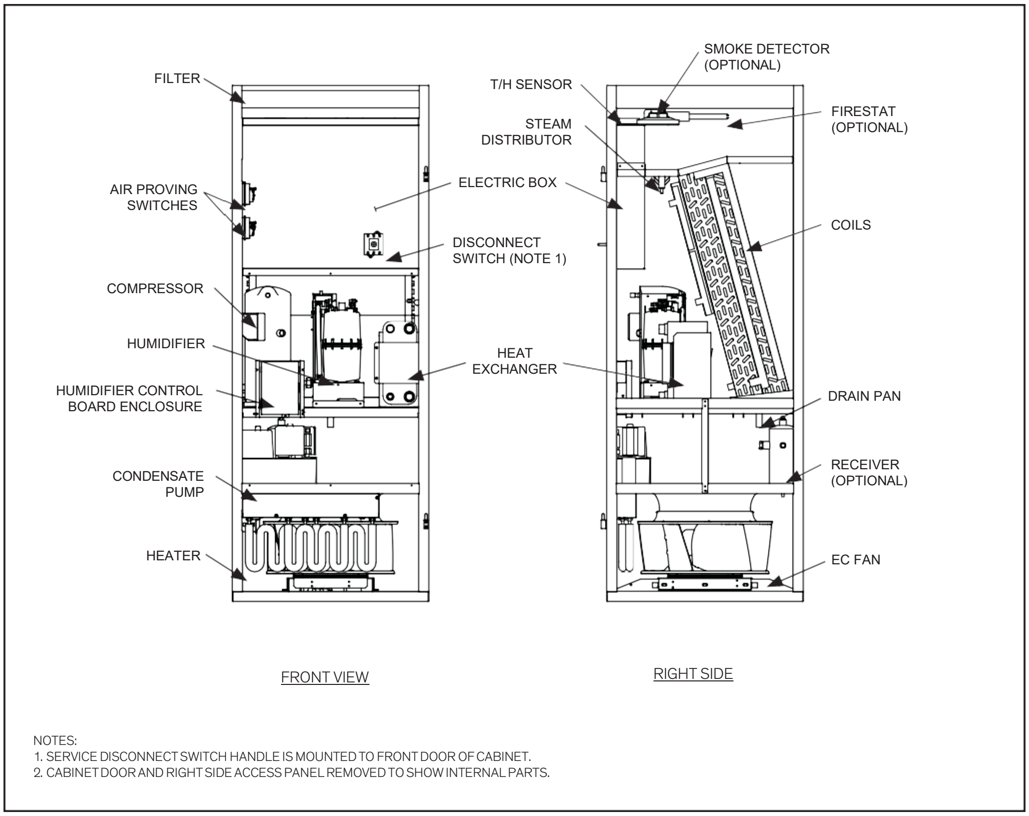


Figure 1. Typical Internal Layout- Downflow Configuration

Model COS-024/060 Shown for Reference

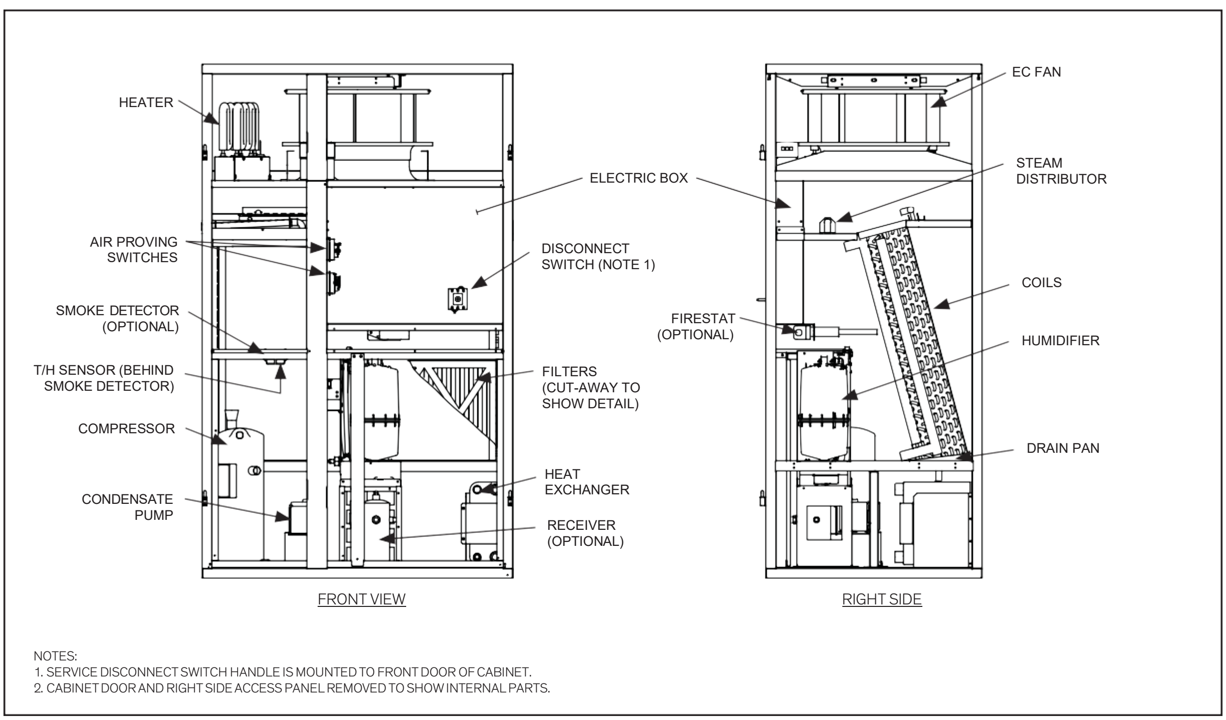


Figure 2. Typical Internal Layout- Upflow Configuration

Model COS-096/120 Shown for Reference

1.4.2 Circuit Breakers/Motor Start Protectors

CyberOne EC systems incorporate state of the art component protection with the use of motor start protectors and circuit breakers. If an overload occurs the switches must be manually re-set after the overload condition is cleared.

1.4.3 Heaters (Optional)

Optional heaters may be furnished for re-heating 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.

1.4.3.1 Hot Gas Re-heat

As an option, hot gas re-heating may be provided for re-heating the supply air as required to offset the sensible cooling of the system during the dehumidification cycle.

1.4.3.2 Hot Water Re-heat

For this option, hot water heating coil(s) are factory installed in the supply air stream after the cooling coils to heat the supply air. A 2-way on/off valve is provided to control the flow of hot water through the coils to maintain the correct re-heat temperature.

1.4.4 Coil(s)

Cooling and optional hot water and hot gas reheat 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 utilize a brushless motor equipped with permanent magnets and permanently lubricated ball bearings. The fan impellers are backward curved and attached to the rotor casing. The fan is balanced and aerodynamically optimized to minimize vibration.

The fan does not utilize drive belts. Fan speed is variable via a 0 to 10 VDC signal from the system controller. The fan motor is equipped with integral electronics and does not require the addition of secondary electronics such as thermal protection, inverters or filters. The fan will not produce AC inverter whine.

EC fans feature an integrated monitoring function to protect the motor and electronics against damage from jamming, phase loss or overheating. If any of the following failure conditions occur, the motor automatically stops and an alarm is signaled:

a. Locked rotor[1]

b. Loss of a phase[1]

c. Low main supply voltage[2]

d. Over-heating of electronics[2]

e. Over-heating of motor[2]

[1] Upon correction of these failure conditions, the motor will automatically reset.

[2] Upon correction of these failure conditions, the motor must be manually reset by turning off power for 20 seconds.

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 set points 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.

1.5 Optional Equipment

1.5.1 Humidifier

CyberOne EC systems are offered with 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 under separate cover. Refer to that manual for detailed information on operation of the humidifier.

1.5.2 Condensate Pump

An optional factory installed condensate pump may be provided. The pump automatically eliminates condensate and humidifier flush water (if applicable) from the drain pan. Should an overflow occur, an internal overflow safety switch will signal the E^2 system controller of the alarm condition.

1.5.3 Water Detector

As an option, STULZ offers spot type or strip/cable type water detectors. Upon sensing a water leak, the water detector control circuit will signal the A/C system controller of the alarm condition.

1.5.4 Smoke Detector

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

1.5.5 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 and shuts down the air conditioner.

1.6 Free-cooling Operation

The free-cooling configuration is available to minimize the use of compressor operation during low ambient conditions for system energy savings. An FC (free-cooling) system uses a remote drycooler or cooling tower to provide water/glycol coolant to a free-cooling coil positioned within a DX refrigerant system. If outdoor air temperatures permit free-cooling operation (adjustable user set point), the free-cooling mode is enabled to take advantage of the low ambient conditions to provide cooling with partial use or without the use of the system compressor(s). Free-cooling provides an excellent opportunity for reduced operational cost by reducing the compressor operating hours.

The free-cooling sequence is enabled when the entering fluid temperature falls below the user adjustable free-cooling enable set point and the return air temperature rises to the free-cooling set point plus dead band. The drycooler pump activates and the 3-way control valve directs chilled water/ glycol coolant to the FC coil. The outdoor fluid cooler is controlled by first switching the leaving fluid control set point from typical DX heat rejection to free-cooling control (adjustable set point, ambient air) and by controlling the leaving fluid to its user adjustable set point. The free-cooling control valve opens proportionally to the demand for cooling based on the return air temperature's deviation from set point.

If the return air temperature continues to rise, the free-cooling valve position eventually reaches 100% open, maximizing the flow of coolant through the free-cooling coil. Continued operation in this position indicates the A/C unit is unable to lower the air temperature to the desired set point in the free-cooling mode.

The compressor activates if the DX cooling stage enable temperature set point has been reached or if the control valve position reaches 100% open for 20 seconds (default). The free-cooling circuit and the compressor operate in parallel to provide maximum cooling. The 3-way control valve continually modulates the flow of coolant in response to temperature with the compressor running.

The compressor cycles off based on the normal compressor temperature cut-out settings once the set point is maintained.

As the outside air temperature increases above the ambient air switch-over setting, the fluid cooler controls cycle back to typical DX heat rejection allowing the leaving fluid control set point to increase above the prevailing ambient conditions. The indoor unit's inlet fluid temperature sensor monitors the fluid temperature and deactivates the free-cooling mode once the fluid temperature increases above the user adjustable enable set point. The system compressors become the primary cooling source and will activate as the return air temperature increases above the set point.

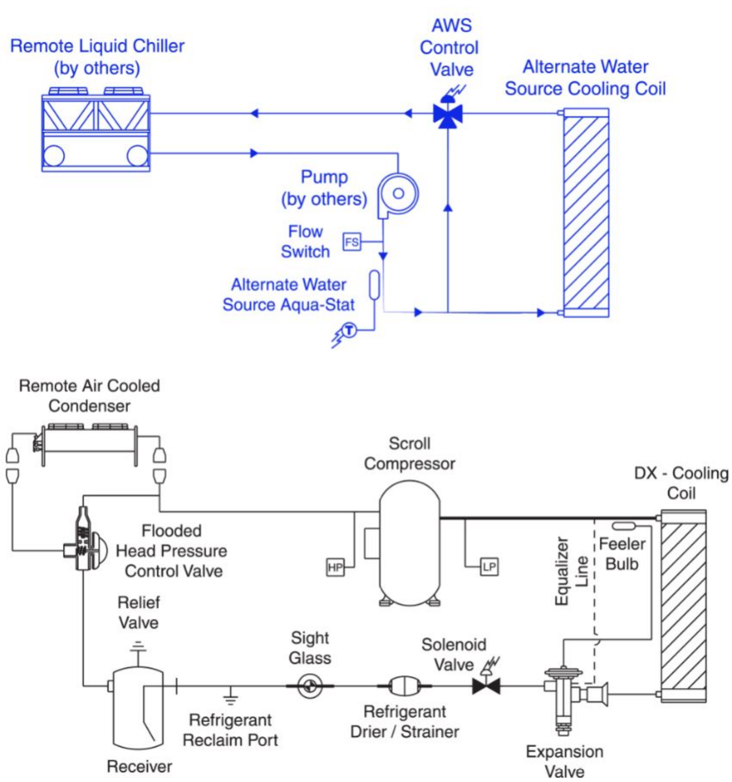


Figure 3. Free Cooling Diagram

1.7 AWS Operation

An AWS system utilizes an independent chilled water source to provide coolant to an AWS cooling coil in the A/C unit. If AWS cooling is unable to handle the load, the separate DX refrigeration circuit can be utilized to assist. Similar to FC operation, when return air temperature rises to the AWS cut-in temperature setpoint, AWS cooling activates provided the chilled water inlet temperature is 55 °F or cooler (adjustable).

If the return air temperature rises to the compressor cut-in set point, the compressor turns on and the AWS control valve closes shutting off the flow of chilled water into the AWS cooling coil. AWS cooling remains disabled and the compressor runs until the cut-out set point temperature is reached provided the minimum run time expires.

If the chilled water inlet temperature is 55 °F or cooler, AWS cooling will resume if the return air temperature is above the AWS cooling cut-in temperature set point.

If the chilled water temperature is above 55 °F, AWS cooling remains off. When the compressor cut-in set point is reached, the compressor turns back on.

In the event of loss of water flow during AWS operation, the AWS control valve is closed and compressor operation is activated.

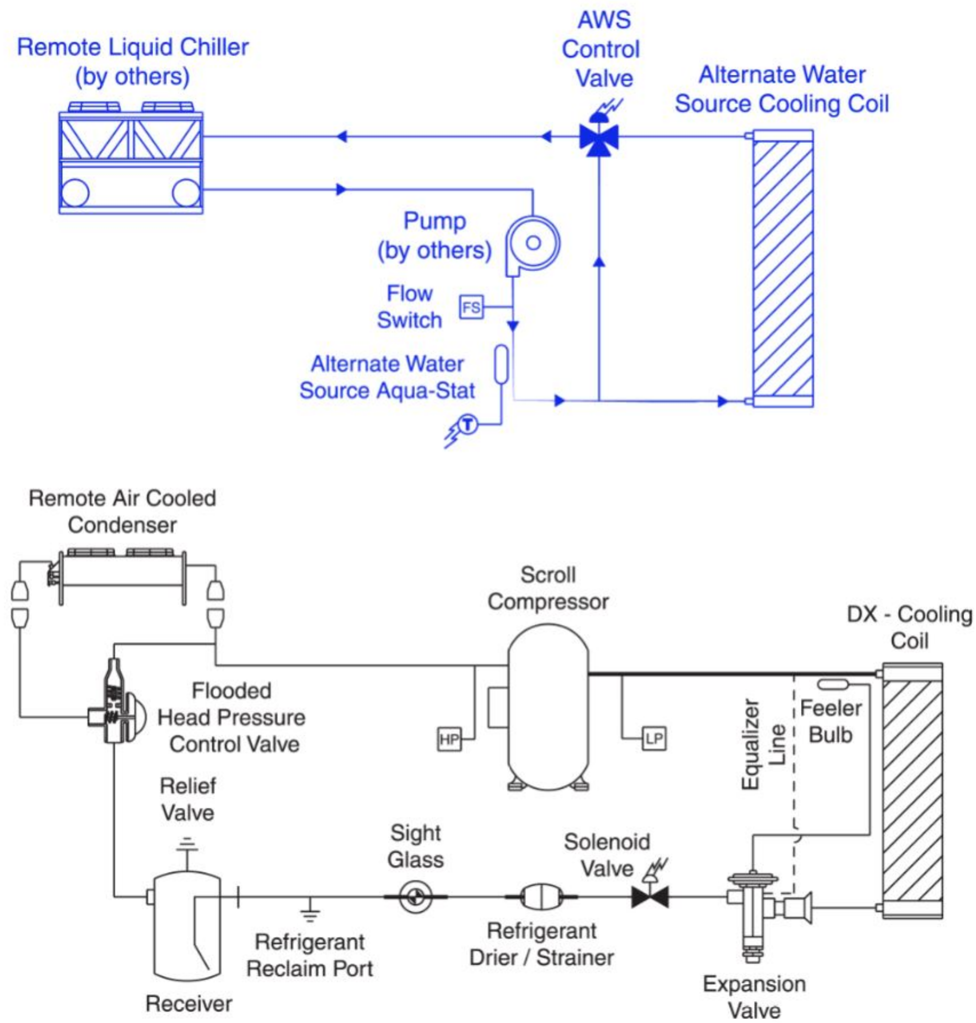


Figure 4. Alternate Water Source Diagram

2.0 INSTALLATION

2.1 Receiving the Equipment

Your CyberOne EC precision A/C system has been tested and inspected prior to shipment. To ensure that your equipment has been received in excellent condition, perform a visual inspection of the equipment immediately upon delivery. Carefully remove the shipping container and all protective packaging. Remove the access panels 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 equipment. Any freight claims must be done through the freight carrier. STULZ ships all equipment FOB. STULZ can assist in the claim filing process with the freight carrier. Should any damage be present, notify STULZ Product Support prior to attempting any repairs. Refer to section five of this manual for instructions.

A unit Data Package has been sent with your unit. It contains this manual, a supplemental microprocessor controller manual, system drawings, applicable SDSs, warranty registration, other component manuals and applicable instructions based on the configuration and options of your unit. The data package has been placed in your unit in a clear plastic bag. These documents need to be retained with the unit for future reference.

NOTE

Items that have been shipped loose, such as controller displays, temperature/humidity sensors, water detectors, etc., are shipped inside the air conditioner unless specified otherwise by the customer. A plenum box (if applicable) is shipped separately. Unpack and store these items in a safe place unless you are using them immediately.

2.2 Moving the Equipment

CyberOne EC systems are designed to be kept in the vertical position. The unit is shipped on a skid to facilitate moving prior to installation. Move the unit with a suitable device such as a forklift, pallet jack or roller bar and dollies capable of handling the weight of the equipment. For reference, a weight table is provided on the installation drawing. The unit should always be stored indoors in a dry location prior to installation.

CAUTION ⚠

When moving the unit it must be lifted vertically and kept in a level position to prevent damage.

2.3 Site Preparation

CyberOne EC systems are designed with easy service access in mind. A hinged access door is provided on the front of the unit and removable access panels are located on each side. In order to have full service access to internal components, no permanent obstructions should be placed in front of the unit. See Figure 5 for the minimum recommended front installation clearance.

NOTE

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

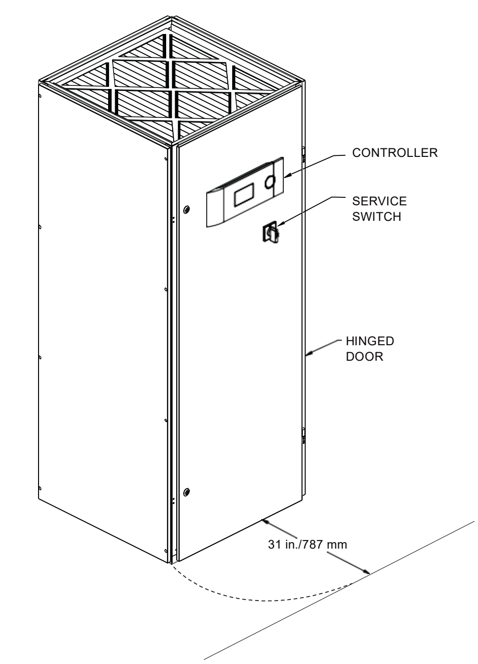


Figure 5. Recommended Installation Clearance

CAUTION ⚠

The A/C unit must be installed in a space that will be air conditioned.

When determining the installation location consider how you'll route the piping and wiring into the cabinet and ensure access is available (see section 2.6 on page 13). Pilot holes for piping and wiring are located on the CyberOne EC unit based on the configuration. On an upflow configuration, the pilot holes are located in the top of the cabinet. On a downflow configuration, they are located in the floor of the cabinet. See the installation drawing provided with your unit for pilot hole locations.

2.2.1 Conditioned Space

Certain steps should be taken to minimize the effects of the environment surrounding the conditioned space. This is especially important 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 table is a recommended minimum R-value (thermal resistance) to ensure optimum equipment operation.

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 Mounting/Placement

CyberOne 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. They have a compact footprint, which allows the units to be placed in a corner or between cabinetry. It is recommended to position the unit to obtain optimum air circulation.

NOTE: These units use welded frame construction for unit rigidity. The system is designed to be installed on a roof curb, which is provided by others and ducted into a singular space to be conditioned. Ensure the curb is sealed to prevent air leakage. See the detail drawing provided with the unit for interface dimensions. These units are designed to be ducted to a space to be conditioned and are intended to condition only one room.

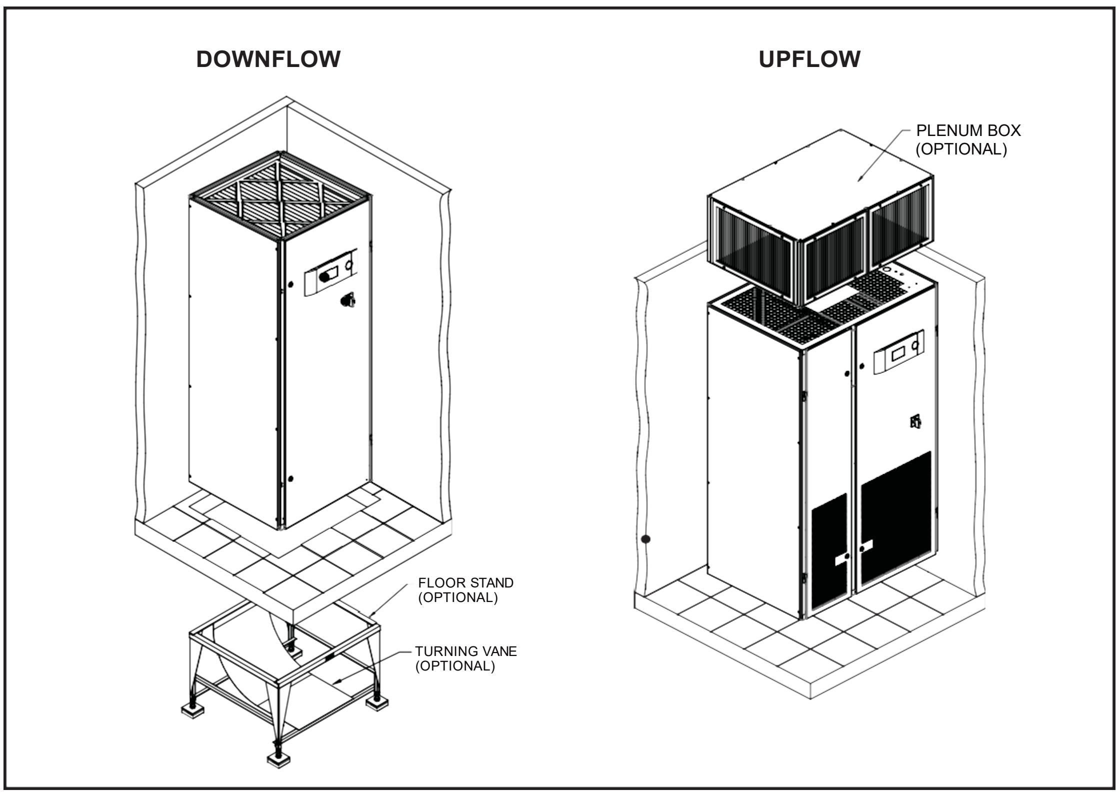


Figure 6. Typical Installation

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 6 on page 9. The unit is designed to be located directly on top of the floor (typically upflow) or on a raised floor (typically downflow).

CAUTION ⚠

Ensure the mounting surface is capable of supporting the equipment. Before mounting the unit, refer to the weight table provided on the installation drawing. On some raised floor installations, a floor stand is required, depending on the load capacity of the existing raised floor.

2.3.1 Precision A/C Unit

The CyberOne EC precision A/C system uses a frame and panel construction for unit rigidity and full service accessibility while the unit is mounted in place.

If a floor stand is selected, 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(s) and cut out the holes required for piping and wiring through the raised floor.

NOTE

The equipment must be level to operate properly.

2.3.2 Outdoor Equipment

Remote condenser/condensing units must be installed in a secure location where it cannot be tampered with and the service disconnect switch cannot be inadvertently turned off. Locate the remote condenser/condensing unit where the fan is not likely to draw dirt and debris into the coil fins. There should be at least 24 in. of clearance around the condenser to ensure adequate airflow to the coil. Secure the condenser/ condensing unit to prevent the system from moving during operation. It is recommended that the remote condenser be installed with vibration mounts to reduce vibration transmitted to the mounting surface.

2.4 Air Distribution Connection

2.4.1 Downflow Configuration Air Patterns

In a downflow configured unit, the conditioned supply air discharges through the bottom of the unit into a raised floor. There are two basic return air patterns: top free return and top ducted return (see Figure 7).

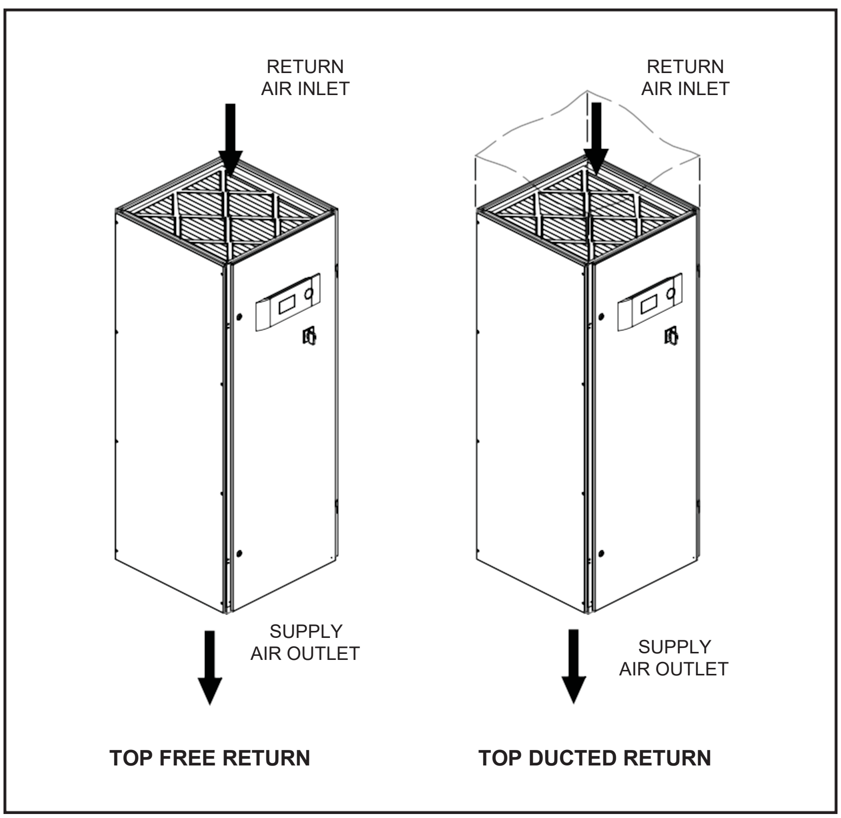


Figure 7. Downflow Configuration Typical Air Patterns

If ductwork is to be installed, always consult your local and state codes when determining ducting requirements. The duct system should be designed to allow the air to move with as little resistance as possible.

The return inlet is provided with flanges for connection of the ductwork. Refer to the installation drawing provided with the unit. The connection of ductwork to the unit may be made with either pop rivets or self-tapping screws.

2.4.2 Upflow Configuration Air Patterns

In an upflow configured unit, the conditioned supply air has two methods of discharge: Ducted or through a 2- or 3-way grilled plenum box (see Figure 8). There are two basic air patterns: Front free return and rear ducted return. If ductwork is to be installed, always consult your local or state codes when determining ducting requirements. The duct system should be designed to allow the air to move with as little resistance as possible.

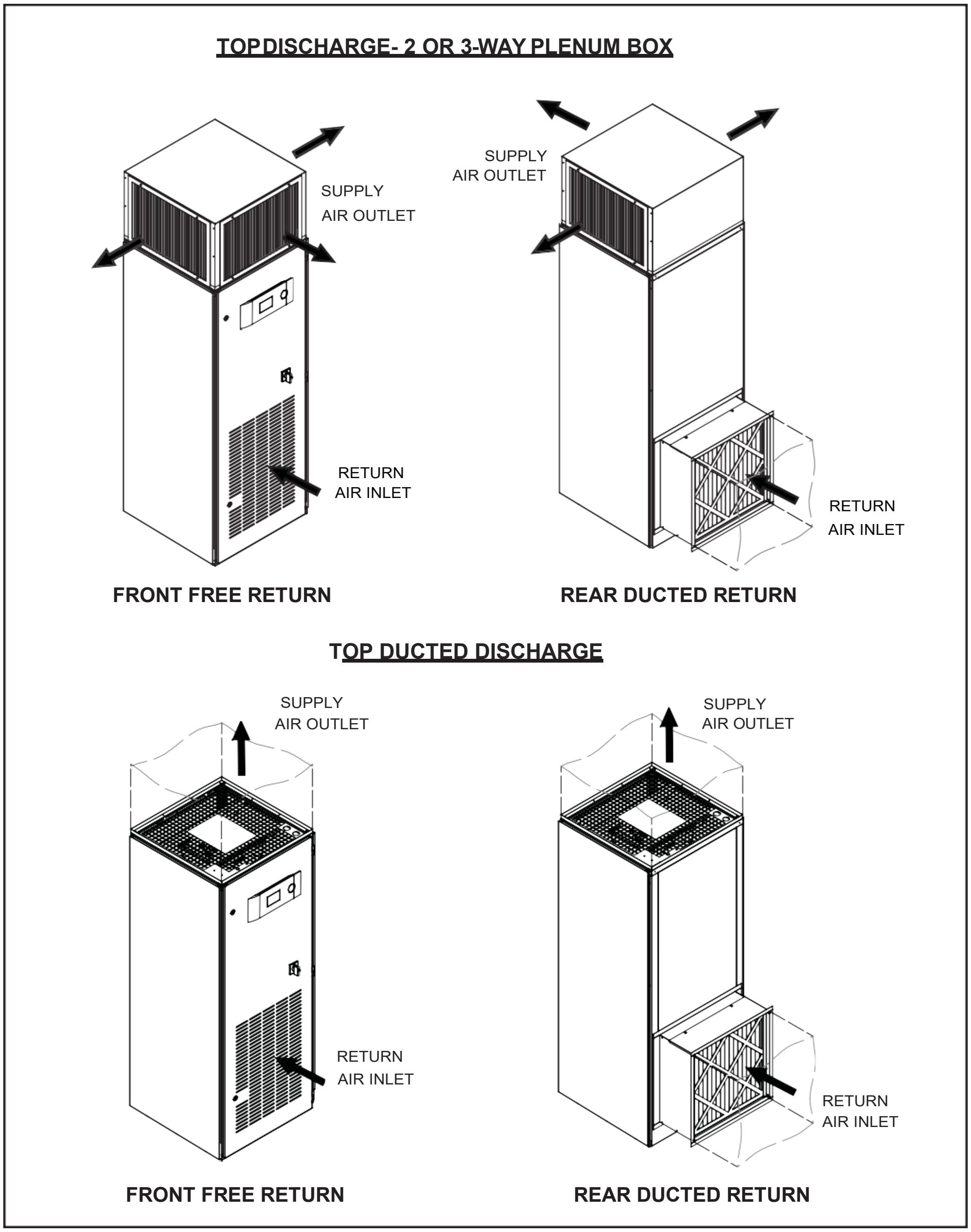


Figure 8. Upflow Configuration Typical Air Patterns

Supply air outlets return inlets and the rear ducted return are provided with flanges for connection of the ducting. Refer to the installation drawing provided with the unit. The connection of ductwork to the A/C unit may be made with either pop rivets or self-tapping screws.

2.5 Optional Equipment (Field Installed)

Do not mount any optional equipment on the unit access doors.

2.5.1 Floor Stand

Install the floor stand directly on the sub-floor on the isolation pads supplied, ensuring the side with the FRONT label is facing the same direction as the front of the precision A/C unit (see Figure 9). Refer to the floor stand assembly drawing for the dimensions required to cut the raised floor. The optional 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 hex 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.

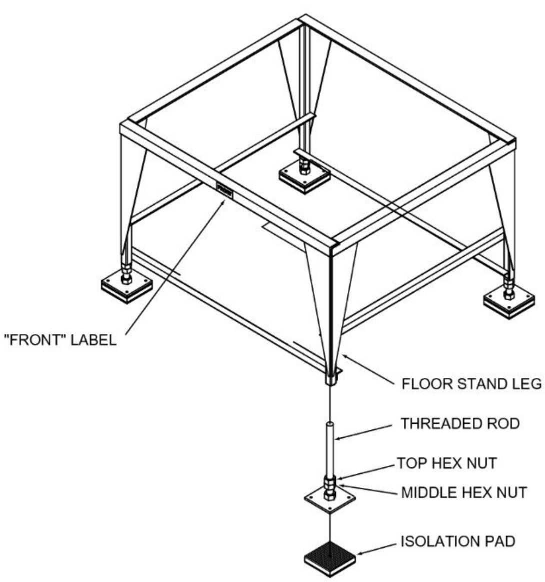


Figure 9. Optional Floor Stand Installation

2.5.2 Remote Display

As an option, the E² controller display panel may be remote mounted. For mounting and wiring instructions, refer to the system drawings and supplemental controller manual sent in the data package with your unit.

2.5.3 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 ft or 150 ft long cable may be provided by STULZ. Follow the steps below to mount the sensor.

Temperature /Humidity Sensor

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

CAUTION ⚠

Take care not to damage the exposed temperature/humidity sensors on the PC board when the cover is removed. The sensors can be damaged if handled improperly.

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 3-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 “Utility Connections” on page 16 and refer to 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.

CAUTION ⚠

The sensor can be damaged if handled improperly. Take care not to damage the exposed temperature/humidity sensor on the PC board. Do not touch the sensor as this will affect its accuracy.

2.5.4 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:

Spot type water detector-

Remove the protective cover and connect two control wires to the terminals on the base (terminal lugs are provided). Replace the cover and place the water detector(s) on the floor with the metal electrodes facing down. When water is present, current will flow between the electrodes.

The base is provided with a mounting hole in the center which may be used to secure the water detector in place.

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 cable and connects it to the terminal block inside the electric box.

2.5.5 Plenum Box Assembly

If an optional plenum box (plenum extension box or 2- or 3-way air distribution plenum box) is selected 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 as shown in Figure 6 on page 9. Attach the plenum with the self-tapping screws provided. Holes are pre-drilled in the unit and the plenum box. If mounting a 2- or 3-way air distribution plenum box, the grilles may be removed for access to the mounting holes.

2.6 Piping Connections

For downflow models, piping is to be routed through the bottom of the cabinet. For upflow models, the piping is to be routed through the top of the cabinet. If an optional plenum box is installed, drill holes in the top or in the side of the box, as preferred, to route the piping out. Once the piping is completed to the A/C unit, install 2-piece pipe penetration plates (shipped loose) around the piping to stop air bypass. Mounting holes are pre-drilled in the plates. Self-drilling screws are provided to attach the plates to the A/C cabinet. Ensure the space between the plates and the pipes are adequately sealed to prevent leakage.

2.6.1 Refrigerant Piping

2.6.1.1 Self-Contained Systems

No refrigerant connections are required for self-contained water or glycol-cooled systems (Models COS-024/120-W/G-( )).

2.6.1.2 Split Systems

Split air-cooled systems with a remote condenser or remote condensing unit will require field installed refrigerant piping. All split systems are shipped with a dry nitrogen charge of 100 psig. Release the pressure via an available stem valve or Schrader valve prior to uncapping the pipes. Do not release the pressure until the field installed refrigerant piping is ready to connect.

Upflow units are stubbed inside the cabinet for connecting to the condenser. Upflow modes are stubbed outside of the cabinet for connecting to the condenser. The pipe stubs are labeled; i.e. Discharge, Suction, Liquid Line. Split systems coupled with a remote condenser will require a copper liquid line and discharge line. Systems utilizing a remote condensing unit will require a copper liquid line and suction line.

The following instructions should be followed to ensure proper installation:

1. Loosen the two clamps located on the bracket in the floor of the cabinet. Run the refrigerant lines through the openings in the cabinet and then secure them with the clamps. The clamps are labeled; i.e. “Discharge”, “Suction”, “Liquid Line” to indicate which line it secures.
2. Measure the distance to the refrigerant lines in the cabinet. Mark each pipe and cut to length.
3. Join the piping together. Tighten the clamps after the pipes are brazed.

All refrigeration piping should be installed with high temperature brazed 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. Provide supports (clamps or hangers) as necessary every 5 to 10 ft along piping runs to minimize vibration and noise transmission. To prevent tube damage when sealing openings in walls and to reduce vibration transmission, use a soft flexible material to pack around the tubes.

Oil traps must be included every 20 ft in the vertical risers and the refrigerant lines must be sloped ¼ in. for every 10 ft in the horizontal lines to ensure proper oil return to the compressor.

Wrap wet rags around the pipes between the areas to be brazed and any nearby refrigeration components to keep excessive heat from traveling through the pipe and causing damage. Clear all pipe connections of debris and prepare connections for brazing. Use only "L" or "K" grade refrigerant copper piping. Be careful not to allow solder/piping debris to get inside refrigerant lines. Dry nitrogen should be flowing through the tubing while brazing at a rate of not less than 1-2 CFM (0.03-0.06 m^3/minute).

If your system is designed for R407C refrigerant, use Silfos alloy for copper-to-copper (piping liquid line or suction line). Silver Solder (Safety-Silv #45) and flux are to be used for copper-to-brass or copper-to steel.

Refrigerant lines for split systems must be sized according to the piping distance between the A/C unit and the condenser/ condensing unit. Each valve, fitting and bend in the refrigerant line must be considered in this calculation. Pipe sizes are given for "equivalent feet", not linear feet. Do not confuse the terminologies. For example, a 7/8" standard 90° elbow has an equivalent length of 1.5 ft; a 7/8" branch Tee has an equivalent length of 3.5 ft. These corrections must be accounted for when sizing your piping.

Refer to the following table provided for determining the standard equivalent lengths, in feet, of straight pipe.

Equivalent Length (Feet) of Straight Pipe

O.D. (in.) Line Size	Globe Valve	Angle Valve	90º Elbow	45º 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

Refer to the following refrigerant line size tables for recommended line sizing:

Recommended Discharge Line Sizes

Model No./ Total Unit BTU/H Capacity	* Equivalent Length in Feet		
	50 or less	100 or less	150 or less
024 / 24,000	5/8	7/8	7/8
042 / 42,000	7/8	7/8	7/8
060 / 60,000	7/8	1-1/8	1-1/8
096 / 96,000	1-1/8	1-1/8	1-3/8
120D / 120,000	1-1/8	1-3/8	1-3/8

Recommended Liquid Line Size

Model No./ Total Unit BTU/H Capacity	*Equivalent Length in Feet		
	50 or less	100 or less	150 or less
024 / 24,000	3/8	1/2	1/2
042 / 42,000	1/2	5/8	5/8
060 / 60,000	1/2	5/8	5/8
096 / 96,000	1/2	7/8	7/8
120 / 120,000	7/8	7/8	7/8

CAUTION ⚠

Do not exceed the maximum line lengths for the system configurations listed below:

RCU with Hot Gas Bypass .... 50 ft
Remote Condensing Unit......................... 100 ft
Remote Air Cooled Condenser .... 150 ft

Recommended Suction Line Size

Model No./ Total Unit BTU/H Capacity	*Equivalent Length in Feet			
	50 or less		100 or less	
	H	V	H	V
024 / 24,000	7/8	7/8	7/8	7/8
042 / 42,000	1-1/8	1-1/8	1-1/8	1-1/8
060 / 60,000	1-1/8	1-1/8	1-1/8	1-1/8
096 / 96,000	1-3/8	1-3/8	1-3/8	1-3/8
120/ 120,000	1-1/8	1-1/8	1-1/8	1-1/8

H=Horizontal Run V= Vertical Run

*Equivalent ft accounts for the linear pipe length as well as equivalent length of Valves, Elbows and Tee's as shown in the preceding line size tables.

Vertical runs are based on a total rise of 30 equivalent ft. For longer rises, individual calculations should be made. Sizes assume the use of single risers; double rises may be necessary.

NOTE

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

2.6.1.3 Remote Air Cooled Condensers (AR)

If the condenser is installed above the evaporator, the discharge line should include a P-trap at the lowest point in the piping. The highest point in the discharge line should be above the condenser coil and should include an inverted trap to help prevent oil and liquid from flooding back to the compressor during off cycles.

If the condenser is installed below the evaporator, an inverted trap the height of the evaporator coil is required on the liquid line to help prevent oil and liquid from flooding back to the compressor during off cycles.

2.6.1.4 Remote Air Cooled Condensing Units (AHU)

When installing remote condensing units above the evaporator, the suction line should be P-trapped at the evaporator.

When installing remote condensing units below the evaporator, the suction line should be trapped with an inverted trap the same height as the evaporator coil. This prevents migration of liquid refrigerant to the compressor during off cycles.

NOTE

Do not exceed 15 ft of vertical distance when installing the condensing unit below the evaporator.

NOTE

All suction lines must be insulated to prevent condensation from forming on the pipes.

2.6.2 Water/Glycol

The piping connections for water/glycol condensers 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 and may require reducing fittings to match the connection size on the air conditioner. Glycol-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.

CAUTIONS ⚠

After the interconnecting piping is installed, the entire piping circuit must be thoroughly flushed prior to operating the system.

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

A strainer should be included in the glycol line. Once the system is operational, the glycol mixture flows through the strainer where any foreign objects are removed. The strainer screen should be cleaned periodically.

2.6.3 Condensate Drain

2.6.3.1 Gravity Drain

A 7/8" O.D. copper (sweat type) line is provided to drain the condensate pan. An S-trap is installed at the end of piping for the installer to connect a 7/8" I.D. drain line to remove water from the cabinet. If an optional humidifier is used, the drain line from the humidifier is typically connected to the condensate drain line.

During normal operation, the humidifier drain line discharges (hot) water into the condensate drain line.

The drain line must be located so it will 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.

2.6.3.2 Condensate Pump

An optional condensate pump (Figure 10) is normally factory installed. The drain connection line is typically 1/2" I.D. vinyl tubing or a 1/2" O.D. copper (sweat connection) may be used.

2.6.4 Humidifier

CyberOne EC systems utilize an electrode steam humidifier. The humidifier empties into the condensate drain line during the flush/drain cycle. A water supply line must be connected to the ¼ in. O.D. copper tubing connection supplied by the factory. Refer to the installation drawing supplied with your unit for the location of the water supply 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.

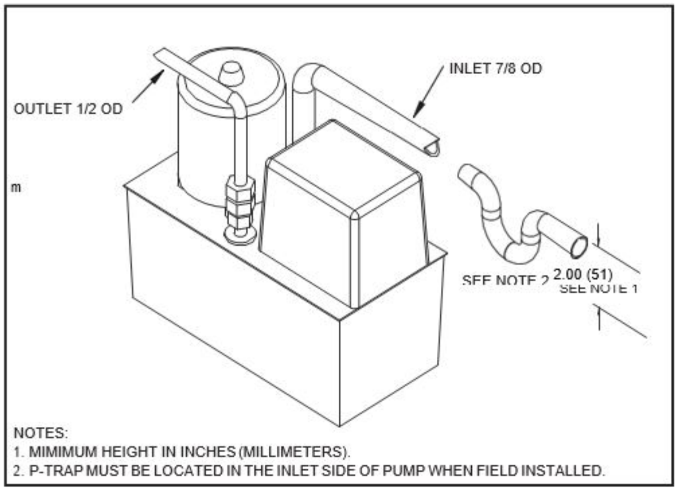


Figure 10. Condensate Pump

CAUTION ⚠

Do not use de-mineralized water in the humidifier.

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

2.7 Utility Connections

2.7.1 Main Power

The CyberOne EC product offering is available in single or three phase variations and a wide range of voltages. It is imperative that the unit nameplate be examined to determine the operating voltage, frequency and phase of the system (See Figure 11). 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 electrical box.

NOTE

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

The unit has power and control pilot holes for connection of the field-wiring conduits. These pilot holes are located on the CyberOne EC unit based on the configuration. On an upflow configuration, the pilot holes are located in the top of the cabinet. On a downflow configuration, they are located in the floor of the cabinet. A label stating MAIN POWER INPUT is placed in close proximity. See the installation drawing provided with your unit for pilot hole locations. Terminate the main power wires at the line side of the main power service disconnect switch, located within the electric box. A separate equipment ground lug is provided within the electrical box for termination of the earth ground wire.

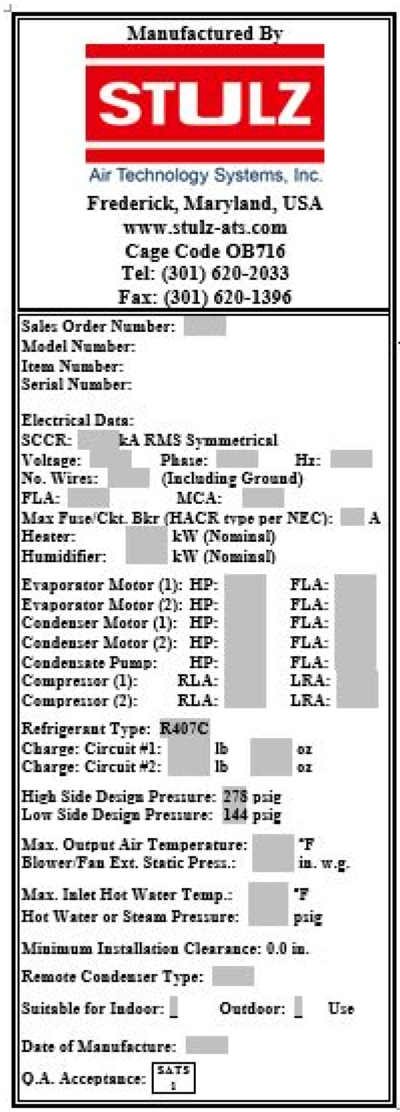


Figure 11. Sample Nameplate

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.

NOTE

Use of copper conductors only is required. Wiring terminations may become loose during transit of the equipment; therefore, it is required to verify that all wiring terminations are secure.

WARNING

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

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 unit.

CAUTION

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

NOTE

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

It is important to verify that the main power supply coincides with the voltage, phase and frequency information specified on the system nameplate. The supply voltage measured at the unit must be within ±10% of the voltage specified on the system nameplate except for 208/230V single-phase units which have a different tolerance listed below.

2.7.1.1 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 ±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.

2.7.1.2 Single-Phase Units 277V

Single-phase units require the hot leg of power to be connected to terminal L1 and the neutral wire to terminal L2 of the main power non-fused service switch.

2.7.1.3 Single-Phase Units (208/230V) with 277/230V Buck/Boost Transformer Applications (See Figure 12)

Certain applications may require the purchase of a unit designed for a 208V, 1PH, 60Hz power supply and supplied with a 277V/230V buck/boost transformer. This configuration allows the equipment to operate from a customer supplied 277V, 1PH, 60Hz power supply. The purpose of the buck/boost transformer is to convert the incoming 277V, 1PH, 60Hz power supply to the required 230V, 1PH, 60Hz power supply for unit operation. If the incoming power supply is within the range of 277V plus 5%, the control transformers within the system must have the primary wire connected to its respective 240V tap instead of the 208V tap.

Upon examination of the buck/boost transformer, it may be observed that the labeled primary voltage is 120, 240 and/or 480 while the secondary voltage is 12, 16, 24, 32 and/or 48 but it's not necessarily limited to these voltages. The transformer is designed as an insulated transformer. It may be wired in a configuration, as recommended by the manufacturer, to modify its electrical characteristics to those of an autotransformer (buck/boost transformer). The primary and secondary windings are no longer insulated, which in this design produces a lower voltage ratio between the primary and secondary windings. This new wiring configuration also results in an increased kVA capacity.

It should be noted that the 277V/230V buck/boost transformer provided with the equipment has been properly sized and is approved for use as a buck/boost transformer. The buck/boost transformer must be installed, wired and provided with overcurrent protection in accordance with local and national electrical code requirements. Please refer to the electrical drawing supplied with the unit for field connections. A means for disconnecting main power is required for the system; sizing and location will depend on the location of the buck/boost transformer with regards to the unit. In addition, wire sizing and overcurrent protection must be provided in accordance with the unit nameplate information given for the buck/boost transformer and the unit.

NOTE

This transformer is used on a wide variety of applications. Use the wiring instructions (the same instructions are supplied with the transformer) for the correct wiring method. Care should be taken to wire the transformer in accordance with the electrical drawing supplied with your unit.

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 of the transformer(s).

2.7.1.4 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 service switch. The unit will operate correctly if the supply wires are connected in this manner.

CAUTION

Improper wire connections will result in the reverse rotation of the fans/blower motors and compressor and may eventually result in damage to the compressor. To correct this problem, exchange any two of the incoming main power wires at the main power service disconnect switch. Do NOT rewire the unit's individual components.

2.7.2 Controls

STULZ offers a wide range of control features to solve your air conditioning control/alarm requirements. If the system controller is mounted on the unit (standard), no utility connection is required. As an option, the E^2 controller display may be remote mounted. A six-conductor cable is provided for interconnect wiring. Refer to the electrical drawing supplied with your unit and Figure 13 thru Figure 15 for details on interconnecting the field wiring.

2.7.3 Optional Equipment

NOTE

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

2.7.3.1 Remote Temperature/Humidity Sensor

The remote temperature/humidity sensor requires a shielded cable with the shield being terminated at the unit electric box. The number of conductors needed depends on which system controller is utilized. For systems utilizing the model E^2 controller, three control conductors are required. 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 the number of conductors required and for the appropriate wire terminations.

2.7.3.2 Remote Water Detector

Each remote water detector used will require two conductors to be wired to the control terminal board within the unit electrical box. The wire insulation must be rated at 600V. Refer to Section 2.5.5 and see the electrical drawing supplied with your unit for proper wire terminations.

2.7.4 Air-Cooled Split Systems

The following system interconnecting field wiring diagrams 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 electrical drawing supplied with your unit 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.

For systems equipped with a remote condenser, or remote condensing unit the installer must provide main power wiring to the main power distribution block located within

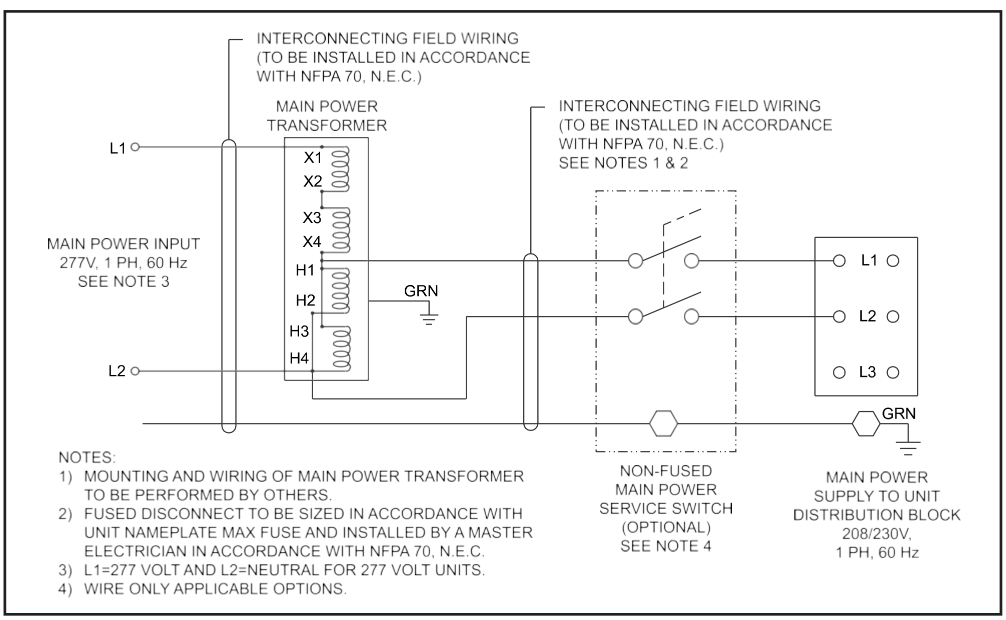


Figure 12. Transformer Schematic

the remote condenser/condensing unit electrical box. A separate equipment ground lug is provided within the electrical box for termination of the earth ground wire. Refer to the electrical drawing supplied with your unit and the wiring diagram supplied with the condenser (typically located in the condenser electric box).

2.7.4.1 Remote Condenser (AR Models)

Control wires are not required between the remote condenser and the A/C system (see Figure 13). As an option, control wiring may be installed for the system controller to enable condenser operation only when the compressor is running. You must remove the jumper from the remote condenser terminal board (see the condenser wiring diagram). Wire 24 VDC control conductors from the terminal board within the A/C unit to the remote condenser terminal board. If control wires aren't installed (and the jumper remains in place), the condenser is always enabled and will turn on and off based on the condenser's pressure control settings. Refer to the electrical drawing for the correct number of field wires needed and for appropriate wire terminations required specifically for your system.

2.7.4.2 Remote Condensing Unit (AHU Models)

Systems equipped with a remote condensing unit require field control wiring between the A/C system and the condensing unit (see Figure 14). The number of conductors required between the two systems varies based upon the control options provided. Refer to the electrical drawing supplied with your unit to determine the exact number of field wires needed and appropriate wire terminations required specifically for your system.

2.7.5 Glycol Systems (G Models)

Systems equipped with a glycol-cooled system/pump package require field wiring between the glycol unit and pump package (see Figure 15). The installer must wire two control conductors from the terminal board within the glycol A/C unit, to the pump package electrical box. Refer to the electrical drawing supplied with your unit for the number of field wires needed and appropriate wire terminations required specifically for your system.

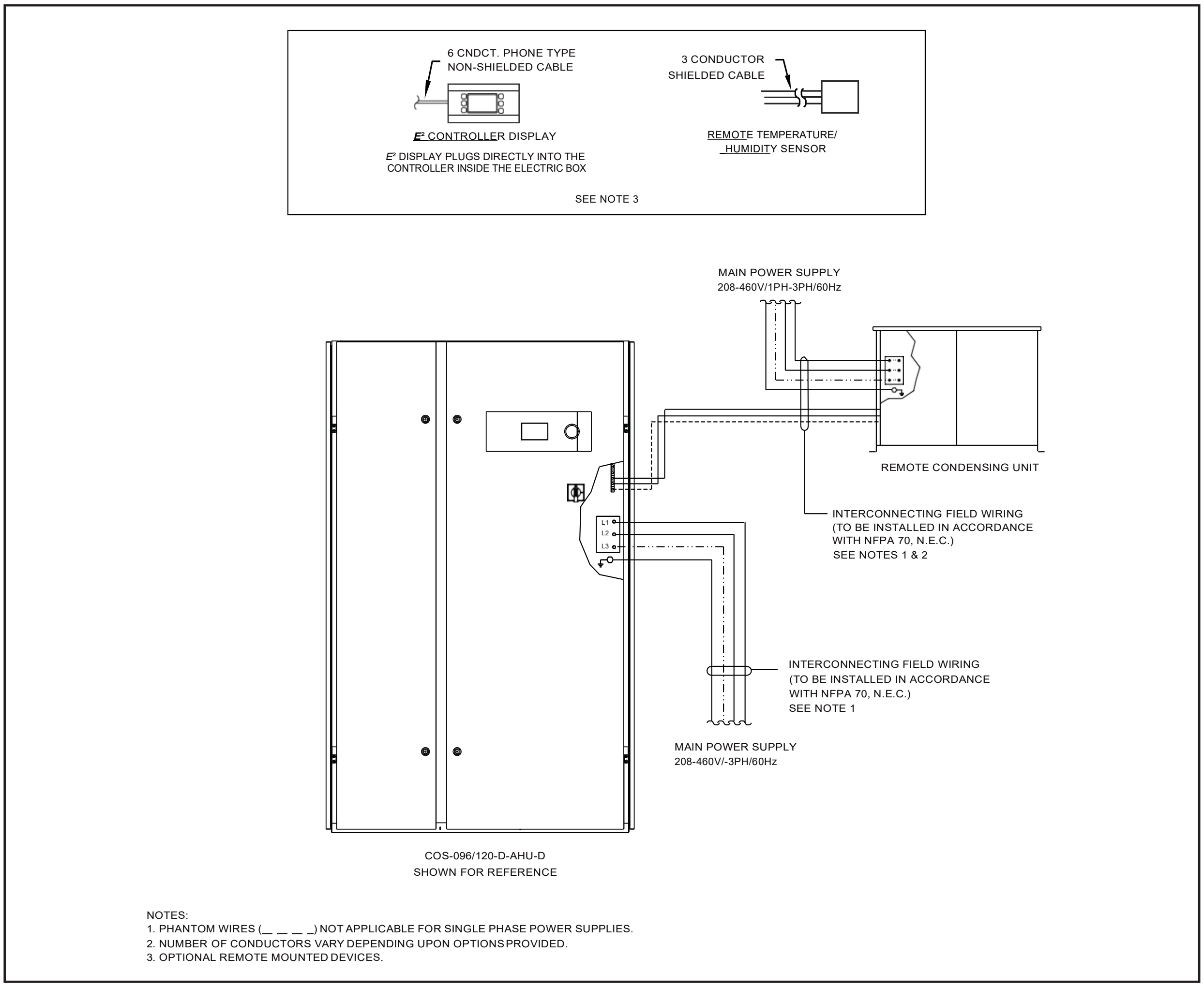


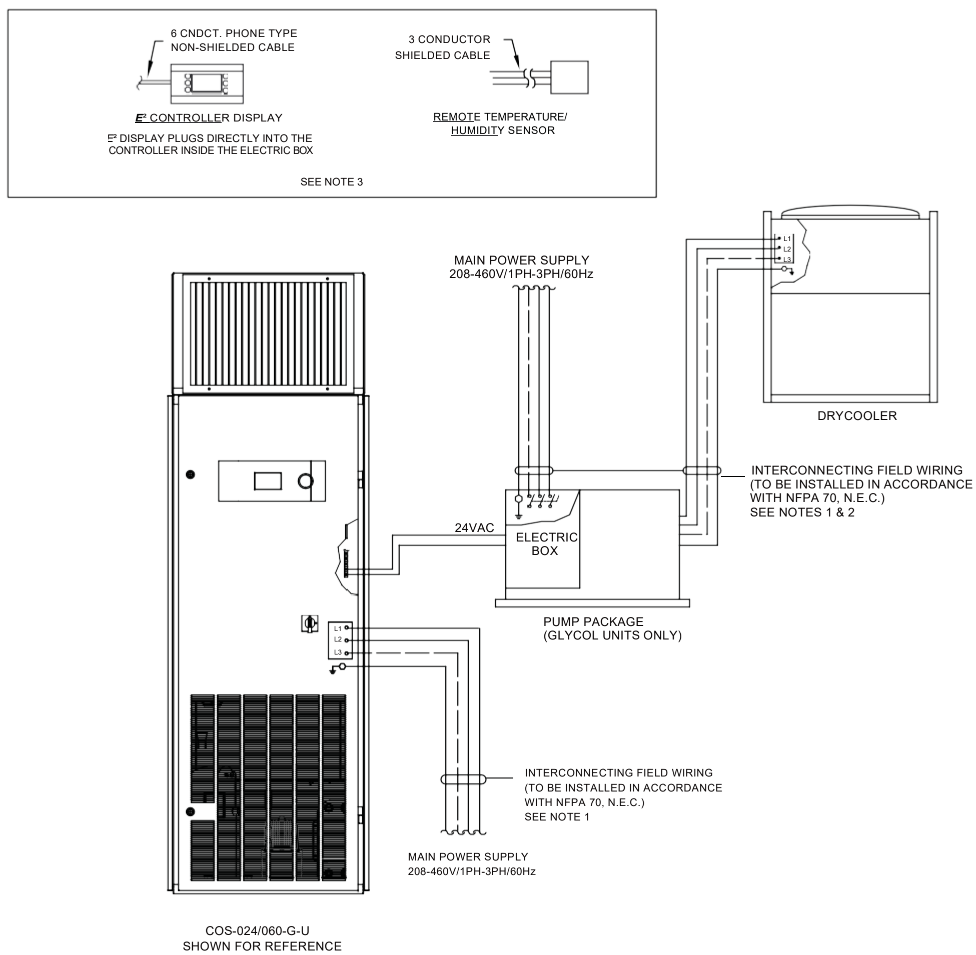
Figure 14. Interconnecting Field Wiring Remote Condensing Unit

2.8 System Charging Procedures

2.8.1 Water/Glycol Systems

All self-contained water/glycol cooled units (units that require no refrigerant field piping) are factory charged with refrigerant. No field refrigerant charging is required. The following precautions must be observed when installing and filling the water/glycol loop:

- The piping system must be cleaned prior to adding water/glycol to the system.
- Glycol must be mixed with water before it is added to the system. All air must be bled from the piping system. Use only water/glycol solution with inhibitors for corrosion protection.



NOTES:
1. PHANTOM WIRES (__ __ __) NOT APPLICABLE FOR SINGLE PHASE POWER SUPPLIES.
2. NUMBER OF CONDUCTORS VARY DEPENDING ON NUMBER OF FAN MOTORS.
3. OPTIONAL REMOTE MOUNTED DEVICES.

Figure 15. Interconnecting Field Wiring Glycol Systems

1. Open the vent valve at 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.

2.8.1.1 Pump

If a pump is to be used, ensure the system is filled before turning the pump on. The pump is not self-priming so it is important that there is a pressure on the suction inlet.

CAUTION ⚠

Do not run the pump 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.

2.8.2 DX Unit Charging Requirements

When performing the specific DX charging procedures in this section, follow these best practices:

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines must be as short as possible to minimize the amount of refrigerant contained in them.
- Keep cylinders upright.
- Ensure the refrigeration system is grounded to Earth before charging the system with refrigerant.
- Label the system when charging is complete (if it is not labeled already).
- Exercise extreme care to avoid overfilling the refrigeration system.

Before recharging the system, it must be pressure tested with oxygen-free nitrogen (OFN). The system must be leak tested upon completion of charging but prior to commissioning. A follow-up leak test must be carried out prior to leaving the site.

2.8.3 Remote Air-Cooled Systems (AR/AHU)

Remote air-cooled units are provided with a dry nitrogen holding charge, which must be removed before piping and charging the unit.

NOTE

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

CyberOne EC systems use R407Crefrigerant. Refrigerant charging pressures vary depending on the type of refrigerant used in the unit. Before charging, check the unit nameplate to confirm the type of refrigerant to use. Tables are provided in Section 2.8.8 showing the temperature/pressure characteristics for R407C.

CAUTION ⚠

POE oil is used in systems with R407C refrigerant. POE oil quickly absorbs moisture when exposed to air. High POE oil moisture levels react with refrigerant to form acid which results in system contamination. Keep the entire system sealed as much as possible and minimize exposure of the POE oil to outside air.

2.8.4 R407C Refrigerant

R407C is a refrigerants recognized for being safer for the environment. It contains no chlorine, the component in HCFC's that destroy the earth's ozone layer. However, the same care should be taken to prevent leakage because R407C can contribute to the greenhouse effect if released. If the refrigerant gas is released in an enclosed space, it can become a suffocant.

Refrigerants that are multi-component blends have component parts with different volatilities that result in a change in composition and saturation temperature as evaporation and condensation occur. Typically, the composition of R407C vapor is different than that of R407C liquid within a contained system. The composition of liquid R407C refrigerant remains relatively constant, however, the refrigerant vapor tends to separate into its component parts even when circulating.

Refrigerant R407C is a blended refrigerant that consists of component parts; however, the component parts of the refrigerant have the same composition at various operating temperature/pressures in the liquid phase and gas phase reducing the temperature glide effect experienced with R407C.

2.8.5 Estimating Refrigerant Charge

When charging a system with R407C refrigerant it will be necessary to weigh in the refrigerant and confirm by checking the superheat and sub-cooling temperatures. You can estimate the amount of refrigerant needed by adding the amount of refrigerant required for the condenser (see the condenser manual provided separately) plus the refrigerant piping (Table 1) plus the refrigerant for the A/C unit (Table 2). The values in Table 2 are the estimated weights for the compressor circuit. 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.

Table 1. Weight of Refrigerant (lb/100 ft of type L tubing)

Line Size O.D.	Liquid Line	Discharge Line
	R407C	R407C
1/2	6.51	0.87
5/8	10.46	1.40
7/8	21.73	2.91
1 1/8	37.04	4.95
1 3/8	56.43	7.55
1 5/8	79.87	10.68
2 1/8	175.32	23.44

Example: Estimate the amount of refrigerant required for a refrigeration circuit in a system using R407C refrigerant consisting of a 5 ton COS-060-AR A/C unit with Hot Gas Reheat and Hot Gas Bypass connected with a 1/2" x 30 ft liquid line and 7/8" x 30 ft discharge line to a STULZ Model SCS-060-SAA -30 °F condenser with flooded head pressure control and a receiver. Refer to the SCS Installation, Operation and Maintenance Manual for details.

Condenser w/Receiver = **12.2 lb**

+ 1/2" Liquid Line- $30.0 \times \frac{6.51}{100}$ = **1.953 lb**

+ 7/8" Discharge Line- $30.0 \times \frac{2.91}{100}$ = **0.873 lb**

+ A/C Unit = **4.0 lb**

+ Adder for HGRH and HGBP = **3.2 lb**

Estimated Refrigerant Charge = **22.226 lb**

2.8.6 Preparing 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 to150 psig. Ensure all service and solenoid valves are energized open and that no part of the system is isolated from the pressurized nitrogen (liquid, suction or discharge lines and reheat coil).
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.

CAUTION ⚠

A proper vacuum must be drawn on the refrigerant system to remove moisture prior to charging. If this

Table 2. Weight of Refrigerant For A/C Units (lb)

COS EC Model Number	Approximate R407C Charge	
	Base Charge	Charge Adder w/ HGRH* & HGBP**
024- AHU	3.1	3.6
024- AR	3.2	3.6
042- AHU	3.9	3.6
042- AR	4.0	3.6
060- AHU	3.9	3.6
060- AR	4.0	3.6
096- AR	6.8	3.6
120- AR	6.8	3.6

*HGRH = Hot Gas Reheat
**HGBP = Hot Gas Bypass

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.

NOTES

A vacuum pump should be used that is capable of evacuating the entire volume of the A/C system, including newly installed or existing piping. It is essential to use a well maintained pump that is in good operating condition. Always ensure it contains clean, fresh oil. Manufacturers recommend you change the oil in the pump every 20 minutes to maintain its ability to remove moisture.

Use high quality hoses ensuring they are free of defects and don't leak. It is recommended to use copper tubing instead of hoses if possible due to the low vacuum that must be attained when evacuating the system. The use of short, large diameter hoses helps reduce evacuation time.

EVACUATE THE SYSTEM

3. After ensuring there are no leaks, relieve pressure and evacuate the entire system while maintaining all the solenoids (and hot gas reheat valve) open. Pull an initial vacuum of 1500 microns or lower using the suction and discharge service ports and the service port of the receiver (if applicable).

NOTE

When pulling a vacuum, the Schrader valves will unnecessarily restrict the openings, increasing the evacuation time. During the evacuation process 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.

4. 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) it indicates moisture is in the system that still needs to be boiled off. Proceed to step #5. If the pressure rises rapidly up to atmospheric pressure (more than 50 microns per minute) it indicates 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.
5. 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 nitrogen molecules to disperse in the system absorbing moisture.
6. 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.
7. 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.
8. Replace the Schrader valve cores if you removed them during the evacuation steps. You may now introduce the refrigerant charge through the Schrader valves.

2.8.7 Refrigerant Charging Procedures

1. R407Crefrigerant must be weighed in when performing the charge. Referring to Section 2.8.5, calculate the estimated amount of refrigerant needed for your system.
2. 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 (R407C) 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.

INITIAL SYSTEM CHARGE

Follow the step by step instructions below to charge systems using R407C refrigerant. The initial charge will be performed by introducing liquid refrigerant (R407C) 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 (R407C) 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.

FINE TUNING THE SYSTEM CHARGE

Once the initial charge is completed, additional refrigerant will need to be added with the unit 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. Start the A/C system and use the system controller to lower the room temperature set point 3-5 °F below actual room temperature thus ensuring cooling remains on as the unit is charged.

When fine tuning the charge on cool days it will 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 2.8.8 for the operating temperatures and pressures for the type of refrigerant used in your system.

2.8.7.1 0 °F Fan Cycling and -20 °F Variable Speed Control

The following instructions are for charging systems with condenser fan cycling or variable fan speed control using R407C refrigerant.

1. Block off the intake air to the condenser with cardboard until a constant discharge pressure can be obtained. This will lower the possibility of overcharging (for units with fan cycling only).
   a. R407C Refrigerant- Allow the discharge pressure to rise to 325-350 psig and hold it constant.
2. 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.

3. Take a superheat temperature reading near the feeler bulb from the thermal expansion valve with the temperature measuring device being well insulated. The ideal superheat temperature is 12-15 °F. Maximum allowable superheat temperature is 20 °F.
4. 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.
5. If necessary, (slowly) add liquid refrigerant to the suction side to achieve the sub-cooling temperature.
6. If the unit has hot gas reheat (optional), the previous steps are still followed except the hot gas reheat valve must be open to allow refrigerant to flow into the reheat coil to obtain the proper amount of refrigerant charge. This can be done by using the system controller to enable a call for dehumidification (lower the humidity set point). This process may need to be repeated several times. After cycling the system through the hot gas reheat cycle, recheck the system charge with the system only in the Cooling mode.

CAUTION ⚠

Remove the blockage to the air intake of the condenser.

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

2.8.7.2 -30 °F Flooded Head Pressure Control

NOTE

For units using flooded head pressure control, a receiver is used to store the refrigerant during the time the condenser is not utilizing the extra refrigerant charge.

NOTE

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

1. Fine tune the charge following steps 1-6 in Section 2.8.7.
2. The head pressure control valve setting is printed on the valve body. This setting is the lowest head pressure that will be maintained during system operation. It may be necessary to add additional refrigerant to raise the head pressure or remove refrigerant to lower the head pressure to the value printed on the valve (225 psig for R407C).
3. If a refrigerant level sight glass is included on the side of the receiver, it may be used to assist in charging the air conditioning system. The proper charge can be confirmed by viewing the level of refrigerant in the receiver while the unit is running at an elevated discharge pressure.

4. Add refrigerant charge until the refrigerant level in the receiver rises to the center of the sight glass, indicating the receiver is 80% filled.
5. When the refrigerant in the receiver reaches the center of the sight glass, the unit is fully charged.

CAUTION ⚠

Remove the blockage to the air intake of the condenser.

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

2.8.8 Refrigerant Characteristics

2.8.8.1 Pressure/Temperature Settings

The following table is provided to assist with the normal settings of the system for R407C refrigerant. Where applicable, minimum and maximum settings are given along with normal operating pressures.

Refrigerant Pressure/Temperature Settings			
Sub-cooling °F	Nor* 10	Min 5	Max 20
Superheat °F	15	10	20
Design Condensing Temp. @ 95 °F Ambient	125	105	140
Suction Pressure (psig)- R407C	70	55	85
Fan Cycling Control- Fan On (psig)- R407C	320	240	340
Fan Speed Control (psig)- R407C	320	—	—
Flooded HP Control Valve (psig)- R407C	205	—	—

Nor = Normal, Min = Minimum, Max = Maximum

2.8.8.2 Saturated Refrigerant Pressure Tables

The following refrigerant pressure tables are provided for reference for R407C refrigerant.

R407A Refrigerant	
Tempera-ture (°F)	Pressure (psig)
Saturated Evaporating Temperature	
20	78.4
22	81.9
24	85.5
26	89.2
28	93.1
30	97.0
32	101
34	105
36	109
38	114
40	118
42	123
44	128
46	133
48	137
50	143
55	155
60	170
65	185
70	201
75	218
80	236
85	255
90	274
95	295
100	318
105	341
110	365
115	391
120	418
125	446
130	477
135	508
140	541

2.9 System Settings and Adjustments

2.9.1 Low/High Pressure Limit Switch

Air conditioning systems utilizing DX refrigerant are equipped with hermetically sealed high-pressure and low-pressure switches. These switches are pre-set by the manufacturer and cannot be adjusted.

R407C Pressure Switch Settings:
The high-pressure switch opens at 410 psig and has a manual reset. The low-pressure switch opens at 10 psig (±4) and closes at 32 psig (± 5) and has an automatic reset.

2.9.2 Head Pressure Controls-Air Cooled Systems

2.9.2.1 Condenser Fan Cycling (Condenser Model SCS-AA, 0 °F)

Used for outdoor installations where ambient condenser air inlet temperatures are 0 °F or higher, this method utilizes a high-pressure differential control switch with SPST (Single Pole, Single Throw) contacts and an automatic reset. The switch activates the condenser blower contactor when the discharge pressure reaches a pre-determined value to maintain the condensing temperature.

R407C Refrigerant
Factory setting: The fan cycling switch contacts are set to close on a pressure rise to 320 psig and open at 250 psig. Set point range is 170 to 375 psig. The differential is set at 70 psi and is adjustable.

2.9.2.2 Condenser Multi-Speed Fan Switch (Model HES-CAA , 0 °F)

Used for indoor installations where ambient condenser air inlet temperatures are 0 °F or higher, the condenser fan speed switch senses refrigerant discharge pressure and changes the condenser blower speed to maintain proper condenser pressures.

The condenser fan speed switch changes the fan (blower) from low to high speed when pressure rises and returns the fan (blower) from high speed to low speed when the pressure lowers.

R407C Refrigerant: Factory setting: On pressure rise, the high fan speed contacts close at 320 psig, increasing the condenser fan speed. A pressure drop to 250 psig will close the low fan speed contacts, reducing the fan speed. The set point range is 170 to 400 psig. The differential is set at 70 psi and is adjustable.

NOTE
This switch and settings do not apply to units designed for a power supply greater than 277V.

2.9.2.3 Variable Condenser Fan Speed (Condenser Model SCS-SA, -20 °F)

Used for outdoor installations where ambient temperatures may fall to -20 °F, a variable speed condenser motor control is used to maintain head pressure. The variable speed motor is located closest to the header end of the condenser. The fan speed control is a continual modulation of the motor's speed. The controller is factory installed in the outdoor condenser/condensing unit. The fan speed controller requires no adjustment.

The fan speed controller will automatically control the head pressure at a level to maintain design refrigerant discharge pressures. On systems with more than one fan on the condenser, the remaining motors cycle on and off based on pressure.

2.9.2.4 Intelligent Control (Condenser Model SCS-EC only, -20 °F)

Used for outdoor installations where ambient condenser air inlet temperatures may fall to -20 °F, intelligent pressure control is designed to maintain discharge pressure by constantly modulating condenser fan speed. SCS outdoor condensers are equipped with highly efficient, electronically commutated (EC), axial fan(s). The EC fan speed is infinitely variable up to full speed. The control system utilizes refrigerant pressure transducer(s) to monitor refrigerant discharge pressure and control the EC fan(s) to the precise speed needed to maintain design refrigerant discharge pressures.

2.9.2.5 Flooded Head Pressure Control (Condenser Model SCS-AA with Fan Cycling, -30 °F)

Used for outdoor 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 are 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 (approximately 320 psig for R407C) and the condenser fan is cycled on, as described in Section 2.9.1. 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 greater than 14 psig across the condenser and the interconnecting piping to the condenser sections.

2.9.2.6 Flooded Head Pressure Control (Condenser Model HES-CAA , -30 °F)

Used for indoor installations where ambient condenser air inlet temperatures may fall to -30 °F. First, familiarize yourself with Flooded Head Pressure Control as discussed in Section 2.9.2.5. Instead of cycling the fan on and off, the condenser fan speed is continuous. The head pressure control valve diverts discharge gas to the receiver causing liquid to back up in the condenser, as described in Section 2.9.2.5, while the fan continues to run.

2.9.3 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 system controller monitors a signal from a pressure transducer to determine how far to open the valve. The controller automatically changes the control valve position to maintain head pressure based on the difference between the set point value and the actual measured value. The controller transmits a proportional 0 to 10 VDC signal to the regulating valve with 10 VDC corresponding to the valve opening 100%.

The system controller is factory set for the correct condensing pressure however, it can be adjusted to increase or decrease the condensing pressure. Adjustment is made by entering the Factory menu in the E² controller. Contact STULZ Product Support for a password to enter the Factory menu and for technical assistance if adjustment is necessary.

Adjustments should be made in small increments. Adequate time must be allowed between adjustments for the valve to fully respond to the control signal and for the changes in system operation to be observed.

2.9.4 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 is 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 the formation of condensate within the system.

2.9.5 EC Fan

The speed of the EC fan is controlled via a 0 to 10 VDC signal from the system controller. The controller is set by the factory and should not require adjustment. If it is determined that the air flow needs adjustment, this may be done using the controller's programming menu selections. Refer to the operator's manual provided under separate cover for the system controller. It is recommended that STULZ Product Support be contacted before making adjustments to the controller.

2.9.6 Thermal Expansion Valve

CyberOne EC units utilize 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.

2.9.7 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.

2.9.7.1 Snap Acting Hot Gas Bypass (Optional)

3 The two most common systems provided by STULZ for hot gas bypass are snap acting and full floating. 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 50–55 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 5/16 inch Allen wrench, turn clockwise to increase pressure or counterclockwise to lower pressure.

3.2.1.1 Full Floating

A full floating hot gas bypass system is provided for split AHU/Remote Condensing Units. The full floating hot gas bypass system may include a quench valve and solenoid, a quench thermal expansion valve, a hot gas (discharge) valve and solenoid and a hot gas bypass valve.

The hot gas bypass valve allows refrigerant to flow from the discharge line, directly to the suction line. The hot gas bypass entering the suction side of the compressor would raise the operating temperature of the compressor to a point where failure could occur. To prevent overheating the compressor, a small amount of liquid refrigerant passes through the quench valve and mixes with the hot gas entering the compressor, maintaining normal compressor suction pressure and temperature.

The full floating hot gas bypass system provides freeze protection for the evaporator coil by limiting the minimum refrigerant pressure, preventing the surface temperature of the evaporator coil from dropping below 32 °F. The hot gas (discharge) regulating valve has a normal control setting at 50–55 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, remove the adjustment cap from end of the valve. Using a 5/16 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.

3.0 COMMISSIONING, OPERATION AND DECOMMISSIONING

3.1 Commissioning

For new installations, ensure the unit is ready to operate by going through the Checklist for Completed Installation, located in Appendix A, prior to start-up.

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 an air conditioning technician.

3.1.1 Start-Up

CAUTION ⚠

For outdoor remote condensing units, apply power to the eight hours before operating system. This time is required to allow liquid refrigerant to be driven out of the compressor. The compressor crankcase heater is energized as long as power is applied to the unit.

1. Replace all equipment removed prior to performing the start-up checks.
2. Apply power to the CyberOne EC system at the main power disconnect switch.
3. Ensure that all blowers and fans are rotating correctly and freely without any unusual noise.
4. Test cooling operation by setting the temperature set point below the actual room temperature to create a demand for cooling. The compressor should come on and the discharge air should feel cooler than the return air.

NOTE

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

5. Test heating operation by adjusting the temperature set point 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 the humidifier is operational. In all cases, 1 to 6 hours might be required to see a desired level or rise in humidity in the conditioned space. Once room conditions have been programmed or set, a repeat visit to the conditioned space may be required to ensure the humidifier is meeting the rooms' requirements.

   An Operation and Maintenance manual for the humidifier is provided with your unit under separate cover. Refer to that manual for detailed information on the humidifier operation.
7. Test dehumidification operation by creating a demand for dehumidification. Decrease the dehumidification set point 10% below the actual room conditions (the set point may already be below actual room conditions, especially at start-up). 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 re-adjust the set point as you check the operation. An adequate heat load within the space is required.
8. For Electric Reheat use an amp meter on the heater circuit to determine if the heater is operational. For Hot Gas Reheat, utilizing a voltmeter and a point to point method, ensure the control signal has energized the hot gas reheat solenoid coil. For Hot Water Reheat ensure that the control signal has energized the control valve and the temperature of the water has decreased as it passes through the unit.
9. In all cases, 1 to 6 hours might be required to see a desired level or decrease in humidity in the conditioned space. Once room conditions have been programmed or set, a repeat visit to the conditioned space may be required to ensure the dehumidification mode is meeting the room's requirements.

3.1.2 Microprocessor Controller Programming

The microprocessor controller is factory programmed based on the model of the A/C system and 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.

3.2 Decommissioning the Unit

Personnel performing the decommissioning must be completely familiar with the unit before starting. Best practice requires all refrigerants be recovered safely; see section 3.2.1 for guidelines. Prior to recovery, an oil and refrigerant sample should be taken in case analysis is required prior to re-use of the reclaimed refrigerant. Electrical power must be available before decommissioning is started.

Follow these decommissioning guidelines:

a. Become familiar with the equipment and its operation.
b. Isolate the system electrically.
c. Before attempting the procedure ensure that:
    - Mechanical handling equipment is available, if required, for handling refrigerant cylinders
    - All required personal protective equipment is available and used correctly
    - The recovery process is supervised at all times by competent personnel
    - Recovery equipment and cylinders conform to the appropriate standards
d. Pump down the refrigerant system, if possible.
e. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
f. Place the cylinder receiving the refrigerant on the scale before starting recovery.
g. Start the recovery machine and operate in accordance with manufacturer's instructions.
h. Do not overfill cylinders. (They should contain no more than 80 % volume liquid charge).
i. Do not exceed the maximum working pressure of the cylinder, even temporarily.
j. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
k. Recovered refrigerant must not be charged into another refrigeration system unless it has been cleaned and checked.

3.2.1 Recovering Refrigerant

When removing refrigerant from a system, either for servicing or decommissioning, best practice is to remove all refrigerants safely. Use the following recommended guidelines:

- When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge are available and that all cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e., special cylinders for the recovery of refrigerant). Cylinders must be complete with pressure relief valve and associated shut-off valves in good working order. Empty recovery cylinders must be evacuated and, if possible, cooled before recovery occurs.
- Recovery equipment must be in good working order with a set of instructions concerning the equipment at hand, and the equipment must be suitable for recovering flammable refrigerants. In addition, a set of calibrated weighing scales must be available and in good working order. Hoses must be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.
- Recovered refrigerant must be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant Waste Transfer Note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.
- If compressors or compressor oils are to be removed, ensure they have been evacuated to an acceptable level to make certain flammable refrigerant does not remain within the lubricant. The evacuation process must be carried out prior to returning the compressor to the suppliers. Only electric heating of the compressor body may be employed to accelerate this process. When oil is drained from a system, it must be carried out safely.

3.2.2 Labeling the Decommissioned Unit

Equipment must be labelled stating that it has been decommissioned and emptied of refrigerant. The label must be dated and signed. Ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

4.0 MAINTENANCE

4.1 Periodic General Maintenance

Systematic, periodic general maintenance of the CyberOne EC unit is required for optimum system performance. General maintenance should include, but is not limited to the following: replacing filters and humidifier cylinders, tightening electrical connections, checking the condensate drain line to ensure it is free of debris, cleaning the interior of the unit, inspecting the units' components visually, checking belt tension, checking level of refrigerant and ensuring no moisture is in the refrigerant.

Use copies of the Periodic General Maintenance Checklist in this manual (see Appendix A) to record periodic general maintenance inspections. For assistance, contact STULZ Product Support. Ensure adherence to all safety statements while performing any type of maintenance.

WARNINGS

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

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 priorto performing any service or repairs.

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.

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

4.1.1 CyberOne EC DX A/C Unit

Check the refrigerant sight glass on a monthly basis while the unit is running and ensure it is free of bubbles. Bubbles in the sight glass indicate a low refrigerant charge or a clogged filter-drier. Check for humidity in the refrigerant by viewing the color of the indicator in the center of the sight glass and comparing it to the color scale on the outer ring. If humidity is present, the system must be evacuated and recharged.

Check the superheat and sub-cooling temperatures semi-annually and ensure they are within the range shown in the refrigerant pressure/temperature table in Section 2.8.8.1. If necessary, adjust the refrigerant charge to achieve the correct values. If the refrigerant level is low, check the system for leaks.

4.1.1.1 Air Filter

The air 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. Conditions of spaces vary and air filters should be checked based on those conditions.

4.1.1.2 EC Fan

Periodic checks of the EC fan system should include checking the wiring, fan motor mounts, housing and impeller wheel. Ensure all electrical connections are tight. Check that all mounts are secure and the impeller wheel is tightly mounted. The impeller blades should be kept free of debris.

4.1.1.3 Drain Pan

Inspect the drain pan on a monthly basis to ensure proper drainage. Ensure the drain pan outlet is always free of debris and the drain pan does not leak.

4.1.1.4 Coils

Coil(s) should be inspected semi-annually 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 refrigerant lines and capillaries for vibration isolation and support as necessary. Check all piping for signs of leaks.

4.1.1.5 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.

4.1.1.6 Humidifier

4.1.1.7 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 yellow LED on the humidifier cabinet will flash four times in a repeating pattern when the cylinder requires replacement.

NOTE

The yellow LED may illuminate during initial start-up but it doesn't necessarily mean the cylinder needs to be replaced.

Refer to Section 4.3.4.4 and the humidifier operator's manual supplied under separate cover for detailed instructions on changing the cylinder.

4.1.1.8 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 that the discharge line is open and water can pass through it freely.

4.1.2 Condenser

Maintenance access to the condenser is through one or two removable panels (depending on model). For air-cooled condensers, clean the condenser coil of all debris that will 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 lines for signs of leaks.

CAUTION ⚠

In a remote condensing unit, the compressor crankcase heater is energized as long as power is applied to the unit. If the main switch is disconnected for long periods do not attempt to start a remote condensing unit until 8 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.

4.2 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 doors 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.

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. Defective contactor.	Repair or replace.
	c. Condensate Switch Open.	Ensure unit is level. Check that condensate pan is draining properly. Clear obstructions.
	d. Motor starter protector tripped	Reset motor starter protector and check amperage of motor. Compare to setting of motor protector and adjust FLA.
	e. Control transformer circuit breaker tripped	Check for short circuit or ground fault; if none reset circuit breaker.
	f. No control signal to fan(s).	Check the Control I/O Board for a 0-10 VDC control signal to the fan(s). Refer to the electric drawing to determine the correct I/O board terminal numbers. This must BE done within 15 seconds of turning the disconnect switch On or the controller will go into Air Proving Alarm mode.

Symptom	Probable Cause	Recommendation
Blower Fails to Start (Con't)	g. EC fan's internal overheat protection Determine the cause of the interruption interrupted fan motor operation.	Determine the cause of the interruption and correct. Possible causes are: 1. Locked rotor. 2. Low supply voltage > 5 seconds. 3. Loss of phase > 5 seconds. After causes 1, 2, and 3 are corrected, the motor will automatically reset. After the causes below are corrected, the fan(s) must be manually reset by turning off power for 20 seconds: 4. Over temperature of electronics. 5. Over temperature of motor.
Control is Erratic	Wiring improperly connected or broken.	Check wiring against electrical drawing.
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/glycol 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.	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 properly.	Adjust or repair controls.
	c. Control pressure adjusted too low.	R407C- Readjust to 320 psig.

Symptom	Probable Cause	Recommendation
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. Broken compressor valve (compressor knocking, suction pressure rises faster than 2 lb/min after shutdown).	Replace compressor.
	d. Liquid slugging.	System overcharged. Reclaim excess refrigerant.
	e. 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.
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 fan speed.
	d. Lack of refrigerant.	Check for leak. Repair and recharge system.
	e. Short cycling of conditioned air.	1. Supply and/or return grilles are too close together. Move farther apart. 2. 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 the remote temperature sensor. Relocate sensor if necessary.

Symptom	Probable Cause	Recommendation
Heater Inoperative	a. Fuses blown.	Check for short circuit, replace fuses.
	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 Note: See humidifier manual for additional help.	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 1/4 teaspoon (1.23 ml) 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:

WARNING

If refrigerant gas is released in an enclosed area it will displace oxygen and act as a suffocant. Always ensure adequate ventilation during refrigeration repairs.

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.

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, sand cloth or sandpaper and wipe the area clean before attempting repair. Protect nearby parts from heat damage by wrapping with water-soaked cloths.

4.3.3 Refrigerant Piping

When replacing refrigeration components, the following consumable materials are recommended:
For R407C repairs use Silfos alloy for copper-to-copper (piping liquid line or suction line repairs). Silver solder (Safety-Silv #45) and flux are to be used on copper-to-brass or copper-to-steel repairs.

Wrap wet rags around the pipes between the areas to be brazed and any nearby refrigeration components to keep excessive heat from traveling through the pipe and causing damage.

When component replacement is complete, remove all traces of flux. After any repair, pressure check the system to 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 the air conditioner. Numerous safety devices are provided to protect the compressor from failing.

If a compressor failure has occurred, determine whether it is an electrical or a mechanical failure. An electrical failure will be indicated by the distinct pungent odor once the system has been opened. If a burnout has 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.

An analysis of 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 acid 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 in handling contaminated parts.

All electrical connections should be checked to ensure they are tight and properly made. Check all circuit breakers, contactors and wiring. The contactors should be examined and replaced if 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 also the entire refrigeration circuit must be cleaned of the harmful contaminants left by the burnout. See "4.3.4.3 Burn-Out/Acidic Cleanup Procedure" on page 39 for the proper procedure.

If there is no acid in the oil, there has been a mechanical failure. See "4.3.4.2 Standard Cleanout Procedure" on page 39 (Standard Cleanout) for the proper cleaning procedure.

CAUTIONS ⚠

Damage to a replacement compressor caused by improper system cleaning constitutes abuse under the terms of the warranty. This will void the compressor warranty. Always consult the factory prior to replacing the compressor.

POE oil is used in systems with R407C refrigerant. If a replacement compressor is provided, ensure that it is filled with POE oil before installing.

4.3.4.2 Standard Cleanout 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.

4.3.4.3 Burn-Out/Acidic Cleanup Procedure

CAUTION ⚠

Avoid touching or allowing the gas and oil from contacting bare skin. Severe burns will result. Use long rubber gloves to handle contaminated parts.

NOTE

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

1. These systems should be cleaned using the suction line filter-drier method.
2. Turn off power to the unit at the main power disconnect switch.
3. Remove the burned-out compressor and install the new compressor.
4. Install a suction line filter-drier designed for acid removal.
5. Remove the liquid line drier and install an oversized liquid line filter-drier (one size larger than the normal selection size).
6. Check the expansion valve, sight glass and other controls to see if cleaning or replacement is required.
7. 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.
8. Recharge the system through the access valve on the suction line filter-drier.
9. Turn on power at the main power disconnect switch and start the system.
10. 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).
11. 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.
12. In 2 weeks, examine oil to determine if another suction line filter-drier change is necessary.

4.3.4.4 Humidifier Cylinder Replacement

After an extended period of operation, the yellow LED on the humidifier cabinet will repeatedly flash four times indicating that the cylinder is completely used and a replacement cylinder must be installed. The cylinder is disposable and cylinder life is dependent on water supply conditions and humidifier usage. Refer to the humidifier operator's manual supplied under separate cover for detailed instructions on changing the cylinder. The following procedures are to be followed when replacing the cylinder.

CAUTION ⚠

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

NOTE

Decrease the humidity set point below ambient humidity to allow the cylinder to cool down before removing the cylinder.

1. Turn the A/C unit off by pressing and holding the Enter key.

2. Turn off the water supply to the humidifier.
3. Turn the main power disconnect switch on the electric box to the Off position and open the door of the unit electric box.
4. Use vise grips to turn the shaft of the main power switch to the On position to provide power for the humidifier drain solenoid.
5. Follow the steps of the cylinder replacement procedure in the humidifier installation and operation manual sent under separate cover with your unit.
6. Close the door to the electric box and turn the main power disconnect switch to the On position.
7. Turn the A/C unit On by pressing the Enter key.
8. Readjust the humidity to the desired set point.

If the humidifier is to be shut down for an extended period, follow the steps of the Extended Shutdown procedure in the humidifier installation and operation manual sent under separate cover with your unit.

4.3.4.5 Air Filter Replacement

To change the air filters, open the front doors of the cabinet. The air filters are accessed from inside the cabinet (except for upflow units with rear return). For upflow units, the filters are located behind the air intake grilles. For downflow units, the filters are located at the top where the label “FILTER ACCESS” appears. Remove the old filters from the trays. Insert the new filter(s), ensuring the directional airflow arrows on the filters are correct, then close the front doors.

5.0 PRODUCT SUPPORT

STULZ provides its customers with Product Support which not only provides technical support and parts but the following additional services, as requested:

- Performance Evaluations
- Start-up Assistance
- Training

STULZ recommends using the services of our Field Service Department to perform start-up and commissioning. They will ensure your equipment is correctly installed and operating properly. This will help to ensure your unit provides years of trouble free service while operating at its highest efficiency.

5.1 Technical Support

The STULZ Technical Support Department is dedicated to the prompt reply and solution to any problem encountered with a unit. Should a problem develop that cannot be resolved using this manual, you may call (888) 529-1266 Monday through Friday from 8:00 a.m. to 8:00 p.m. EST. If a problem occurs after business hours, provide your name and telephone number. One of our service technicians 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
- Unit Serial Number
- STULZ Sales Order Number
- Description of Problem

5.2 Obtaining Warranty Parts

Warranty inquiries are to be made through the Technical Support Department at (888) 529-1266 Monday through Friday from 8:00 a.m. to 8:00 p.m. EST. A service technician at STULZ will troubleshoot the system over the telephone with a field service technician to determine the defect of the part. If it is determined that the part may be defective a replacement part will be sent 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 give 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 No. and Serial No.

The customer is responsible for the shipping cost incurred for returning the defective part(s) 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 Form and the address label received with the replacement part.

5.3 Obtaining Spare/Replacement Parts

Spare and replacement parts requests are to be made through Product Support by fax (301) 620-1396, telephone (888) 529-1266 or E-mail (parts@stulz-ats.com). Quotes are given for specified listed parts for a specific unit.

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. To receive credit for returned repair/replacement parts, the parts must be returned to STULZ within 30 days of the purchase date. Spare part sales over 30 days old will be considered final and the parts will remain the sole property of the ordering party.

Installation Checklist

#	Y/N	Tasks	Comments
1		Proper clearances for service access have been maintained around equipment.	
2		Equipment is level and mounting fasteners are tight.	
3		If required, piping completed to refrigerant or coolant loop.	
4		All field installed piping leak tested.	
5		If required, refrigerant charge added.	
6		Condensate drain line connected with P-trap and is filled with water.	
7		If required, water supply line connected to humidifier (if required).	
8		If manual cut-off valve is installed, open valve.	
9		Humidifier On/Off/Drain switch is in the on position.	
10		Filter(s) installed.	
11		Duct plenums sealed.	
12		Incoming line voltage matches equipment nominal nameplated rating ± tolerances.	
13		Main power wiring connections to the equipment, including earth ground, have been properly installed.	
14		Customer supplied main power circuit breaker (HACR type) or fuses have proper ratings for equipment installed.	
15		All wiring connections are tight.	
16		If required, control wiring connections completed to field mounted sensors.	
17		Foreign materials have been removed from inside and around all equipment installed (shipping materials, construction materials, tools, etc.).	
18		Inspect all piping connections for leaks during initial operation.	

Maintenance Checklist

Prepared by		Model Number	
Title		Item Number	
Date		Serial Number	

Monthly

Filters	Y/N	Fans	Y/N	Condensate Drain	Y/N
Cleanliness		Fan(s) rotate		Drain is open	
No obstructions				Condensate pan safety switch operates freely	
Additional					
Check chilled water/hot water circuits for air (bleed as required)					
Coils clean and clear of obstructions					
Humidifier cylinder and controls operate properly					

Semi-Monthly

	Y/N		Y/N
Tighten electrical connections		Clean coils	
Check contacts on contactors for pitting		Clean condensate pump	
Heat/reheat operational		Inspect and clean CW screen	
Clean unit			

Annually

	Y/N
Inspect chilled water unit for leaks and corrosion	
Conduct a complete check of all services listed above	
Clean unit interior	

Comments

Identify below all unit concerns for follow up actions below.

If you need technical support, call 888 529 1266 or email stulztechnicalsupport@stulz-ats.com. Support is available 24/7/365. Provide the model number, serial number, and STULZ item number from the unit nameplate. This will speed up the process and ensure accuracy.

Signature: ______________________________

Glossary

Term	Definition	Term	Definition
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers	IT	Information Technology
BTUH/Hr	British Thermal Units Per Hour	IOM	Installation, Operation, and Maintenance Manual
CCD	Compact-CWE	Kw	kilowatt
CFM	Cubic Feet Per Minute	kVA	Kilo Volt Amps
CNDCT	Conductor	LWT	Leaving Water Temperature
CRAC	Computer Room Air Conditioner	MAX CKT BKR	Maximum Circuit Breaker
CRAH	Computer Room Air Handler	MAX FUSE	Maximum Fuse
CW	Chilled Water	MCA	Minimum Circuit Ampacity
DB	Dry Bulb	NEC	National Electric Code
DF	Downflow	NFPA	National Fire Protection Agency
EC	Electronically Commutated	PH	Phase
DP	Dewpoint	PSI	Pounds Per Square Inch
DX	Direct Expansion	PSIG	Pounds Per Square Inch Gauge
ESD	Electrostatic Discharge	RLA	Run Load Amps
EST	Eastern Standard Time	RMA	Return Material Authorization
°F	Degrees Fahrenheit	R-Value	Thermal Resistance
FLA	Full Load Amps	SDS	Safety Data Sheet
FOB	Freight on Board	SPDT	Single Pole, Double Throw
HGBP	Hot Gas Bypass	UF	Upflow
HACR	Heating, Air Conditioning, Refrigeration	UL	Underwriters Laboratories
HP	Horsepower	UPS	Uninterruptible Power Supply
HVAC	Heating, Ventilation and Air Conditioning	V	Volt
HX	Heat Exchanger	VA	Volt-Amperes
Hz	Hertz	VAC	Volt, Alternating Current
IAQ	Indoor Air Quality	VFD	Variable Frequency Drive
in. w.g.	Inches of Water Gauge	W	Watt(s)

North American Headquarters

STULZ Air Technology Systems, Inc.

1572 Tilco Drive | Frederick, MD 21704

301.620.2033 | Fax: 301.662.5487 | info@stulz-ats.com

Technical Support: 888.529.1266

www.stulz-usa.com