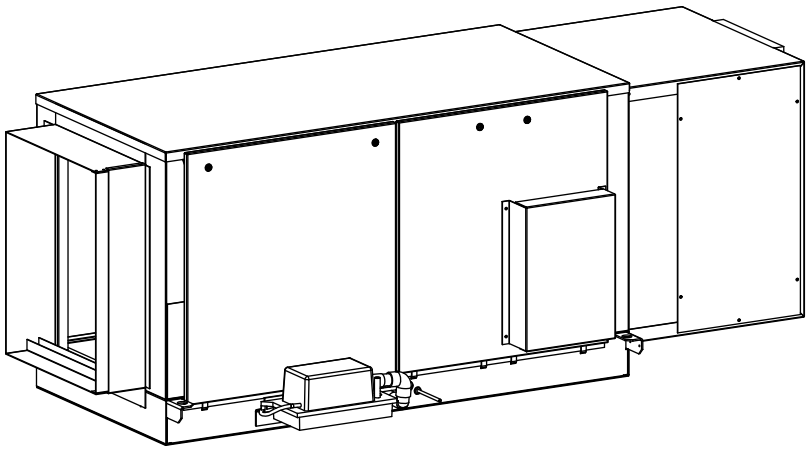
CeilAiR® Series

Ceiling Mounted Supplemental Air Conditioners



Installation, Operation & Maintenance Manual

STULZ
Air Technology Systems. Inc

MODEL NOMENCLATURE

OHS-040-G-FC

OHS = Overhead System

Nominal Capacity in 1,000's of BTU/Hr

AHU = Air Handling Unit
AR = Air-Cooled Remote (Split)
AS = Air-Cooled Self-Contained
C = Chilled Water System
CAA = Indoor Centrifugal Condenser
D( ) = Dual (Two) Circuit System
G = Glycol-Cooled
H( ) = Horizontal Discharge ("H-Series")
RCU-I = Indoor Centrifugal Remote Condensing Unit
W = Water Cooled

AWS = Alternate Water Source
FC = Free Cooling
LP = Low Profile Configuration
SF = Same-Face Air Pattern
SP = Special Configuration

TABLE OF CONTENTS

1.0 Introduction 1-1
1.1 General 1-1
1.2 Product Description 1-1
1.3 Controls 1-2
1.4 Product Warranty 1-3
1.5 Safety 1-4
1.5.1 General 1-4
1.5.2 Safety Summary 1-4
1.6. General Design 1-6

2.0 Installation 2-1
2.1 Receiving the Equipment. 2-1
2.2 Site Preparation 2-1
2.3 Rigging 2-1
2.4 Mounting 2-2
2.4.1 Indoor Equipment 2-2
2.4.2 Outdoor Equipment 2-2
2.4.3 Controls 2-2
2.4.4 Optional Equipment 2-3
2.4.4.1 Transformer 2-3
2.4.4.2 Condensate Pump (Field Inst.) 2-4
2.4.4.3 Non-fused Service Switch 2-4
2.4.5 Remote Sensors 2-4
2.4.5.1 Remote Temperature Sensor 2-4
2.4.5.2 Remote Temperature/Humidity Sensor 2-4
2.4.5.3 Remote Water Detector 2-4
2.4.5.4 Cable Type Water Detector 2-4
2.5 Air Distribution Connection 2-5
2.5.1 Spot Cooler 2-5
2.5.2 Ducted Systems 2-6
2.6 Piping Connections 2-6
2.6.1 Refrigerant 2-6
2.6.2 Chilled Water and Water/Glycol 2-8
2.6.3 Condensate Drain Line 2-9
2.6.4 Humidifier (Optional) 2-9
2.7 Utility Connections 2-10
2.7.1 Main Power 2-10
2.7.2 Controls 2-12
2.7.3 Optional Equipment 2-15
2.7.3.1 Condensate Pump 2-15
2.7.3.2 Remote Temperature Sensor 2-15
2.7.3.3 Remote Water Detector 2-15
2.7.4 Air-Cooled Split Systems 2-16
2.7.4.1 Remote Condenser 2-16
2.7.4.2 Remote Condensing Unit 2-16
2.7.5 Glycol Systems 2-16
2.7.6 Remote Shut Down 2-19
2.8 System Charging Procedures 2-19
2.8.1 R22 Refrigerant Charging Procedures 2-19
2.8.2 R407C Refrigerant Charging Procedures 2-20
2.9 System Settings & Adjustments 2-19
2.9.1 Low/High Limit Switch 2-21
2.9.2 Head Pressure Controls- Air Cooled Systems 2-22
2.9.3 Head Pressure Controls- Water/Glycol Cooled Systems 2-23
2.9.4 Humidifier Adjustment 2-23
2.9.5 Belt Drive Blower 2-24
2.9.6 Thermal Expansion Valve 2-24
2.9.7 Hot Gas Reheat 2-24
2.9.8 Hot Gas Bypass 2-24
2.10 Refrigerant Pressure Characteristics 2-26

3.0 Start-Up / Commissioning 3-1
3.1 Operation 3-1
3.2 Step by Step Start-Up Instructions 3-1
3.3 Thermostat Programming 3-2
3.3.1 A-Tech-1.1 3-2
3.3.2 A-Tech-1.2 3-5
3.3.3 Advanced E^2 Controller 3-7

4.0 Maintenance 4-1
4.1 Periodic General Maintenance 4-1
4.1.1 Precision A/C Unit 4-1
4.1.2 Condensing Unit 4-2
4.2 Troubleshooting 4-2
4.3 Field Service 4-6
4.3.1 Refrigerant Piping 4-6
4.3.2 Leak Detection 4-6
4.3.3 Leak Repair 4-6
4.3.4 General Common Repairs/Component Replacement 4-6
4.3.4.1 Compressor Failure 4-6

TABLE OF CONTENTS *(Continued)*

4.3.4.2 Standard Cleanout Procedure....4-7
4.3.4.3 Burn-Out/Acidic Cleanup Procedure....4-7
4.3.4.4 Humidifier Cylinder Replacement....4-7
4.3.4.5 Filter Replacement....4-8

5.0 Product Support....5-1
5.1 Technical Support....5-1
5.2 Obtaining Warranty Parts....5-1
5.3 Obtaining Spare/Replacement Parts....5-1

List of Figures

Figure 1 Typical Installation....2-2
Figure 2 Spot Cooler Grille....2-5
Figure 3 Ducted System Typical Air Patterns....2-6
Figure 4 Condensate Pump....2-9
Figure 5 Sample Nameplate....2-10
Figure 6 Transformer Schematic....2-11
Figure 7 A-Tech-1.1 Control Wiring....2-13
Figure 8 A-Tech-1.2 Control Wiring....2-15

List of Figures (Cont.)

Figure 9 Interconnecting Field Wiring Remote Condenser....2-17
Figure 10 Interconnecting Field Wiring Remote Condensing Unit (A-Tech-1.1/1.2)....2-17
Figure 11 Interconnecting Field Wiring Remote Condensing Unit (A-Tech-20)....2-17
Figure 12 Interconnecting Field Wiring Glycol Systems....2-18
Figure 13 Belt Drive Blower....2-24
Figure 14 A-Tech-1.1 Control Panel....3-2
Figure 15 A-Tech-1.2 Control Panel....3-5

Appendix A – Forms

Checklist for Completed Installation.... A-1

Periodic General Maintenance Checks and Service Checklist.... A-2

Appendix B – Glossary

Definition of Terms and Acronyms.... B-1

Notice

Stulz Air Technology Systems, Inc.
1572 Tilco Drive
Frederick, MD 21704
USA

1.0 Introduction

1.1 General

Thank you for your selection of the *CeilAiR*® ceiling-mounted air conditioning system made by Stulz Air Technology Systems, Inc.

CeilAiR overhead air conditioning systems (OHS) are designed and constructed using the finest available materials/components, state-of-the-art technology and quality craftsmanship to provide years of trouble-free service. Due to technological advancement, all components are subject to change without notice.

All *CeilAiR* OHS systems and CyberAiR® centrifugal condensers are designed to be installed indoors, unless otherwise noted on the equipment. Propeller-type condensers, condensing units, drycoolers and pump packages are designed for outdoor use.

1.2 Product Description

CeilAiR OHS systems are designed to be the most versatile and flexible ceiling-mounted air conditioning systems in the industry. The unit is available in air-cooled, water-cooled, glycol-cooled and chilled-water configurations. The cooling capacity in BTU/Hr will depend on the unit size, which can range from 1 to 10 tons, and can be either a single stage or dual stage unit.

The functional modes of operation, in addition to cooling, are heating, humidification, dehumidification and filtration, which provides complete environmental control of a conditioned space. The cabinet configuration is available in a 2' x 4' frame for units ranging from 12,000 to 40,000 BTU/Hr (spot cooler or ducted) or a larger frame for units ranging from 48,000 to 120,000 BTU/Hr (ducted only). For ducted units, there are three basic configurations of airflow patterns: 90º/Right Angle, Straight-Thru and In/Out Same-Face (reference Figure 3). Refer to the installation drawing provided with your unit for the type of cabinet configuration and for the layout dimensions.

1.3 Controls

SATS offers a wide variety of control options for *CeilAir* OHS series A/C systems. The controllers are typically remotely mounted to a wall or control panel.

Your unit may be furnished with a Digital Thermostat offered for basic control of *Ceilair* OHS systems. The A-Tech 1.1 is utilized for single stage units and the A-Tech 1.2 is utilized for dual stage units (see Section 3.3.2).

The advanced E^2 microprocessor controller is now available for *Ceilair* OHS systems which provides enhanced 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-unit control and remote communication with building management systems.

A-Tech-1.1

A-Tech- 1.2

Digital Thermostats

E^2 Controller Display

Advanced E^2 Microprocessor Controller

If your unit is equipped with an E^2 controller, an operating manual is provided under separate cover. Refer to that manual for detailed instructions on operating the system controller.

1.4 Product Warranty

STULZ AIR TECHNOLOGY SYSTEMS, INC.
12 MONTH PRECISION A/C LIMITED WARRANTY /
24 MONTHS PRECISION A/C UPGRADED LIMITED WARRANTY

The 12 month Precision A/C Limited Warranty applies when the Product Support Network Factory Start-Up is not purchased at the time of order entry.

The 24 Month Precision A/C Upgraded Limited Warranty applies only if Factory Start-Up was purchased at the time of Order Entry and Start-Up has been validated by Product Support.

The 12 Month Precision A/C Limited Warranty provided by Stulz Air Technology Systems, Inc. (SATS) warrants your purchase to be free from defects in material and workmanship. SATS' obligation under this warranty is to repair or replace, at its option, any part or parts which are determined by SATS to be defective for a period of 12 months from the date of shipment when an accurately completed Factory Start-Up Form has been submitted to SATS, within 180 days from shipment. Parts repaired or replaced under this warranty are shipped FOB Factory, and warranted for the balance of the original warranty period or for 90 days from the date of installation, whichever is greater. If the Factory Start-Up form is not returned to SATS within 180 days from the date of equipment shipment, the equipment warranty will be terminated on the 181st day from shipment. This limited warranty does not include labor, freon, or any other expense required to replace the defective component and bring the unit back to a working status.

The 24 Month Precision A/C, Upgraded Limited, Warranty provided by Stulz Air Technology Systems, Inc. (SATS) warrants your purchase to be free from defects in material and workmanship for 24 months. SATS obligation under this warranty is to repair or replace, at its option, any part or parts which are determined by SATS to be defective for a period of 24 months from the date of start-up. Parts repaired or replaced under this warranty are shipped FOB factory ground, and warranted for the balance of the original warranty period or for 90 days from the date of installation, whichever is greater. If the factory is not allowed to start the equipment within 180 days from the date of shipment, the warranty will commence on the 181st day from equipment shipment. This limited warranty does not include labor, freon, or any other expense required to replace the defective component and bring the unit back to a working status.

Stulz Air Technology System's warranty does not cover failures caused by improper installation, abuse, misuse, alteration, misapplication, improper or lack of maintenance, negligence, accident, normal deterioration (including wear and tear), or the use of improper parts or improper repair.

Purchaser's remedies are limited to replacement or repair of non-conforming materials in accordance with the written warranty. This warranty does not include costs for transportation, travel expenses, costs for removal or reinstallation of equipment or labor for repairs or replacements made in the field.

If any sample was shown to the buyer, such sample was merely to illustrate the general type and quality of the product, and not to represent that the equipment would necessarily conform to the sample.

This is the only warranty given by the seller, and such warranty is only given to buyer for commercial or industrial purposes. The warranty is not enforceable until the invoice(s) is paid in full.

THIS FOREGOING SHALL CONSTITUTE SATS' ENTIRE LIABILITY AND YOUR EXCLUSIVE REMEDY. IN NO EVENT SHALL SATS BE LIABLE FOR ANY DEFECT, INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES, INCLUDING LOST PROFITS (EVEN IF ADVISED OF THE POSSIBILITY THEREOF) ARISING IN ANY WAY OUT OF THE INSTALLATION, USE OR MAINTENANCE OF THE EQUIPMENT. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

This warranty supersedes all other previously printed warranties dated prior to this document.

WARF-1001 Rev. B; 9/20/10

SATS offers a two year standard limited warranty as stated on the previous page. Additionally an extended warranty may be purchased on the unit's compressor. The compressor warranty as stated below will be sent with your unit if the option is purchased and should be retained for future reference. You may consult the factory to verify if the extended compressor warranty was purchased for your system.

STULZ AIR TECHNOLOGY SYSTEMS, INC.
OPTIONAL 60 MONTH COMPRESSOR LIMITED WARRANTY

This warranty applies only when the Product Support Network Factory Start-Up is purchased at the time of order entry.

SATS#:
Unit Serial #:
Unit Model #:
Warranty Start Date:
Warranty End Date:
Compressor 1 Serial #:
Compressor 2 Serial #:

Stulz Air Technology Systems, Inc. (SATS) warrants your purchase to be free from defects in material and workmanship for 60 months (original standard 24 months and purchased additional 36 months). SATS' obligation under this warranty is to repair or replace, at its option, free of charge to the customer, any part or parts which are determined by SATS to be defective for a period of 60 months from the date of start-up. Start-up must be completed within the first 180 days from shipment. The 60 month warranty only covers original compressor(s) that were installed by SATS or a original equipment supplier contracted by SATS to manufacture equipment solely for SATS.

Compressors replaced under this warranty are shipped FOB factory ground, and warranted for the balance of the original warranty period or for 90 days from the date of installation, whichever is greater. If the factory is not allowed to start up the equipment within 180 days from the date of shipment, the warranty will commence on the 181st day from equipment shipment

Stulz Air Technology System's warranty does not cover failures caused by improper installation, abuse, misuse, alteration, misapplication, improper or lack of maintenance, negligence, accident, normal deterioration (including wear and tear), or the use of improper parts or improper repair. Purchaser's remedies are limited to replacement or repair of non-conforming materials in accordance with the written warranty. This warranty does not include cost for torch charges, reclaim charges, Freon, transportation, travel expenses, costs for removal or reinstallation of equipment or labor for repairs or replacements made in the field.

If any sample was shown to the buyer, such sample was merely to illustrate the general type and quality of the product, and not to represent that the equipment would necessarily conform to the sample.

This is the only warranty given by the seller, and such warranty is only given to buyers for commercial or industrial purposes. The warranty is not enforceable until the invoice(s) is paid in full.

THIS FOREGOING SHALL CONSTITUTE SATS' ENTIRE LIABILITY AND YOUR EXCLUSIVE REMEDY. IN NO EVENT SHALL SATS BE LIABLE FOR ANY DEFECT, INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES, INCLUDING LOST PROFITS (EVEN IF ADVISED OF THE POSSIBILITY THEREOF) ARISING IN ANY WAY OUT OF THE INSTALLATION, USE OR MAINTENANCE OF THE EQUIPMENT. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

This warranty supersedes all other previously printed warranties dated prior to this document.

WARF-1003 Rev. A; 8/30/10

1.5 Safety

1.5.1 General

Stulz Air Technology Systems, Inc. uses notes along with caution and warning symbols throughout this manual to draw your attention to important operational and safety information.

A bold text **NOTE** marks a short message in the information to alert you to an important detail.

A bold text **CAUTION** safety alert appears with information that is important for protecting your equipment and performance. Be especially careful to read and follow all cautions that apply to your application.

A bold text **WARNING** safety alert appears with information that is important for protecting you from harm and the equipment from damage. Pay very close attention to all warnings that apply to your application.

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

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

1.5.2 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.

WARNING ⚠

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

WARNING

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

WARNING

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

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 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.

CAUTION ⚠

Do not allow the unit to swing while suspended from a lifting device. Failure to observe this warning may result in injury to personnel and damage to the equipment.

CAUTION ⚠

When transporting and installing the A/C unit, it must be kept in its normal, horizontally installed position. If the unit is not kept level and horizontal, damage to the compressor(s) will result.

WARNING

Always disconnect the main power supply before beginning work on the equipment. A lock-out tag-out procedure should be followed to ensure that power is not inadvertently reconnected.

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

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.

WARNING

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

WARNING

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

WARNING

Refrigerant (R407C or R410A) is used with this equipment. Death or serious injury may result if personnel fail to observe proper safety precautions. Great care must be exercised to prevent contact of liquid refrigerant or refrigerant gas, discharged under pressure, with any part of the body. The extremely low temperature resulting from the rapid expansion of liquid refrigerant or pressurized gas can cause sudden and irreversible tissue damage.

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

Exposure of refrigerant to an open flame or a very hot surface will cause a chemical reaction that will form carbonyl chloride (hydrochloric/hydrofluoric acid); a highly poisonous and corrosive gas commonly referred to as PHOSGENE. 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 MSDS provided with the unit.

WARNING

When performing soldering or desoldering 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 (0.028-0.57 M ³/minute).

CAUTION

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 (MSDS) 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.

CAUTION

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

CAUTION

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.

CAUTION

DX and chilled water cooling coils (and associated piping circuits) are pressurized 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.

CAUTION

When installing and filling the water/glycol loop, all air must be bled from the piping system and the piping system must be cleaned prior to adding the solution. Failure to do so will result in equipment problems.

WARNING

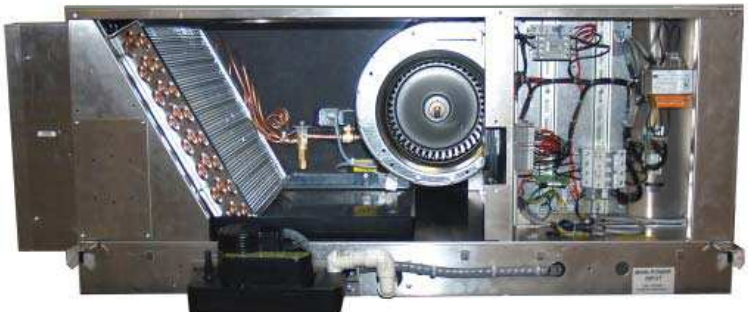
Do not use chloride based water conditioning additives in the condensate drain pans. This will cause corrosion to occur on the coil fins.

1.6 General Design

The *CeilAiR* unit is housed in an aluminum frame type cabinet and is rated for indoor use. Access panels are located on the front and rear of the cabinet for easy access to all components. Additional access may be obtained to some components through the bottom of the unit on spot cooler configurations. The unit has an electrical box inside the cabinet with a removable panel for accessing the electrical components. Operator controls may be conveniently located on a wall within the space to be conditioned.

NOTE

Customer specified non standard features or design variations may not be described in this manual. Refer to the installation and 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).



Ceilair Model OHS-024-AHU
Shown for Reference
(Access Panels Removed)

1.6.1 Electric Box Access

The electrical components are protected in an enclosure located in the cabinet behind an access panel. Before opening the access panel, turn off power at the main power service disconnect switch. This removes power from the system controller and shuts the unit off.

1.6.2 Coil(s)

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

1.6.3 Blower

The unit is equipped with a centrifugal blower with forward curved blades. The blower is contained in a double-width, double-inlet housing. The blower is dynamically and statically balanced to minimize vibration. The blower motor is ODP industrial duty and utilizes permanently lubricated ball bearings.

Smaller *CeilAiR* units (models OHS-012/040) use direct drive blowers (except “H”-series models configured for horizontal discharge).

Larger units (models OHS-048/120) and horizontal discharge units (models OHS-012/040-H), use a belt driven blower. The belt driven blower motor is mounted on an adjustable base for belt tensioning and is furnished with an adjustable pitch sheave to adjust blower speed (see Figure 13).

1.6.3.1 EC Blower

As an option, *CeilAiR* OHS units utilizing the E^2 controller may be provided with high efficiency Electronically Commutated (EC) blower(s). The EC blowers are equipped with backwards curved impellers designed for high aerodynamic efficiency, which results in lower power consumption, lower noise levels and longer operating life. EC blowers utilize a brushless motor equipped with permanent magnets and permanently lubricated ball bearing. The fan speed is variable via a 0-10VDC signal from the system controller..

1.6.4 Temperature Sensor

As a standard for systems utilizing a wall mounted A-Tech 1.1 or A-Tech 1.2 thermostat, the temperature sensor is built into the thermostat for room air control. The sensor monitors the room air conditions and provides input signal(s) to the system controller. The system controller manages the operation of the A/C unit consistent with the set points entered.

As an option, the temperature sensor may be shipped loose for field installation in the room to be conditioned. Refer to the electrical drawing supplied with your unit for details specific to your system.

1.6.5 Optional Equipment

1.6.5.1 Humidistat/Dehumidistat

As an option for systems utilizing an A-Tech 1.1 or A-Tech 1.2 thermostat, a room mounted humidistat and/or dehumidistat may be shipped loose for field installation. Each device has an adjustment dial on the front where the operator selects the desired setpoint.

If an optional humidifier is selected, the humidistat is included to control it's operation. The humidistat controls the humidifier's operation independent of the control thermostat however, the blower must be on for the humidifier to operate.

If the heat/reheat option is selected, a dehumidistat is provided. If room humidity rises above setpoint when the demand for cooling is satisfied, the dehumidistat signals the compressor to turn on, removing humidity. At the same time, the heater(s) are turned on to offset the cooling effect thus maintaining the temperature of the space to be conditioned. Refer to the electrical drawing supplied with your unit for details specific to your system.

1.6.5.2 Temperature/Humidity Sensor

As a standard for systems utilizing the *E*² microprocessor controller, a temperature/humidity (T/H) sensor is typically factory mounted in the return air stream for room air control. As an option, the T/H sensor may be shipped loose for field installation. Refer to the electrical drawing supplied with your unit for details specific to your system.

1.6.5.3 Heaters

The precision A/C unit may incorporate heaters for reheating the supply air as required to offset the sensible cooling of the system during the dehumidification cycle and, for the automatic heating mode. Nichrome wire electric resistance heating elements are factory installed in the supply air stream to heat the supply air. The heating elements are protected with line fuses, thermal fuse links and over-temperature safety switches which automatically reset.

As an option, hot water reheat may be selected for automatic sensible reheating during the dehumidification cycle. A hot water heating coil is factory installed in the supply air stream. A valve is provided to control the flow of hot water through the coil to maintain the correct reheat temperature.

Hot Gas Reheat may be selected (for *CeilAiR* units with DX cooling only) for automatic sensible reheating during the dehumidification cycle. Hot compressor discharge gas is diverted from the condenser to a hot gas heating coil mounted in the supply air stream.

1.6.5.4 Humidifier

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

1.6.5.5 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 is wired to the system controller to signal the alarm condition and automatically shut down the compressor and optional humidifier until the condition is corrected. The blower(s) will continue to operate.

1.6.5.6 Smoke Detector

Optionally mounted in the return air stream, a photoelectric 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.

1.6.5.7 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.

1.6.5.8 Water Detector

As an option, SATS 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 and shut down the air conditioner if your unit is equipped with an A-Tech 1.1 or A-Tech 1.2 thermostat. If your unit is equipped with an *E*² controller, the default program turns off cooling and humidification while the blower(s) continue to operate. The unit will automatically restart when the condition is corrected.

2.0 Installation

2.1 Receiving the Equipment

Your *CeilAiR* OHS system has been tested and inspected prior to shipment. To ensure that your equipment has been received in excellent condition, make 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. SATS ships all equipment FOB. SATS can assist in the claim filing process with the freight carrier. Should any damage be present, notify the SATS Product Support Group 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, system drawings, applicable MSDS's, other component manuals and any other applicable instructions based on the configuration and options of your unit. The data package has been affixed to your unit in a clear plastic bag. These documents need to be kept with the unit for future service.

NOTE

Items that have been shipped loose such as controllers, humidistats, vibration isolators, buck/boost transformers, etc. are shipped inside the air conditioner unless specified otherwise by the customer. Grilles (if applicable) are placed on top of the air conditioner inside the unit's carton. Remove and store these items in a safe place unless you are using them immediately.

2.2 Site Preparation

CeilAiR systems are designed with easy service access in mind. Component access panels are located on the front and rear sides of the equipment. Additional access to some components may be obtained through the bottom of the unit on spot cooler configurations. These units can be fully serviced in the ceiling plenum. In order to have full service access, the air conditioner must be located so that adequate space is provided in front of all access panels.

NOTE

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

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

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 polyethylene film. Concrete walls and floors should be painted with a rubber or plastic-based paint. Doors and windows should be properly sealed and a door sweep used to minimize leakage. Outside or fresh air should be kept to a minimum (as it adds to the cooling, heating, dehumidification and humidifying loads), while maintaining the requirement of the Indoor Air Quality (IAQ) Standard. Lack of these steps can cause erratic operation, unstable room control and excessive maintenance costs.

2.3 Rigging

CeilAiR systems are designed to be kept in a horizontal position. The unit is shipped on a skid to facilitate moving prior to installation. A suitable lifting device should be used to lift the unit from the bottom. A weight table is provided for reference 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 kept level and in the horizontal position to prevent damage.

2.4 Mounting

CeilAiR OHS systems are designed for ceiling mounting in a suspended ceiling grid (spot cooler) or above the suspended ceiling for ducted systems.

NOTE

Do not install the A/C system directly above electronic equipment which may hinder serviceability.

2.4.1 Indoor Equipment (See Figure 1)

CeilAiR OHS systems use a frame and panel configuration for unit rigidity and full service accessibility while the unit is mounted in place. The units are lifted into place from underneath and secured into place using all-thread rods passing through rubber grommets or a 4" x 4" neoprene cork pad in the mounting arms on the sides of the unit. All-thread, nuts and washers (field supplied by others) must be secured so they do not loosen.

Before mounting the unit, ensure the mounting structure is able to support the weight of the equipment. Refer to the weight table provided on the installation drawing. Locate the mounting bolt holes or match drill through the support locations as needed and secure the unit with suitable hardware for the application. An auxiliary drain pan is recommended and can be mounted directly under the cabinet (only on ducted models).

2.4.2 Outdoor Equipment

Install remote condensers/condensing units in a secure location where the unit cannot be tampered with and the power service 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 inches of clearance around the condenser to ensure adequate airflow to the coil. Secure the condenser/condensing unit so the system will not move during operation. Refer to the installation drawing for the non-charged system weight. It is recommended that the remote condenser/condensing unit be mounted with vibration mounts to reduce the amount of vibration transmitted to the mounting surface.

2.4.3 Controls

NOTE

All thermostats/controls should not be located near a doorway, supply air register or area where they would be exposed to direct sunlight or other false heat sources.

2.4.3.1 A-Tech-1.1/1.2 Programmable Thermostat

WARNING ⚠

SATS supplied thermostats/controls do not contain mercury. Mercury is toxic and may be hazardous to health. Any replacement thermostats containing mercury must be disposed of properly. Contact local authorities for disposal information.

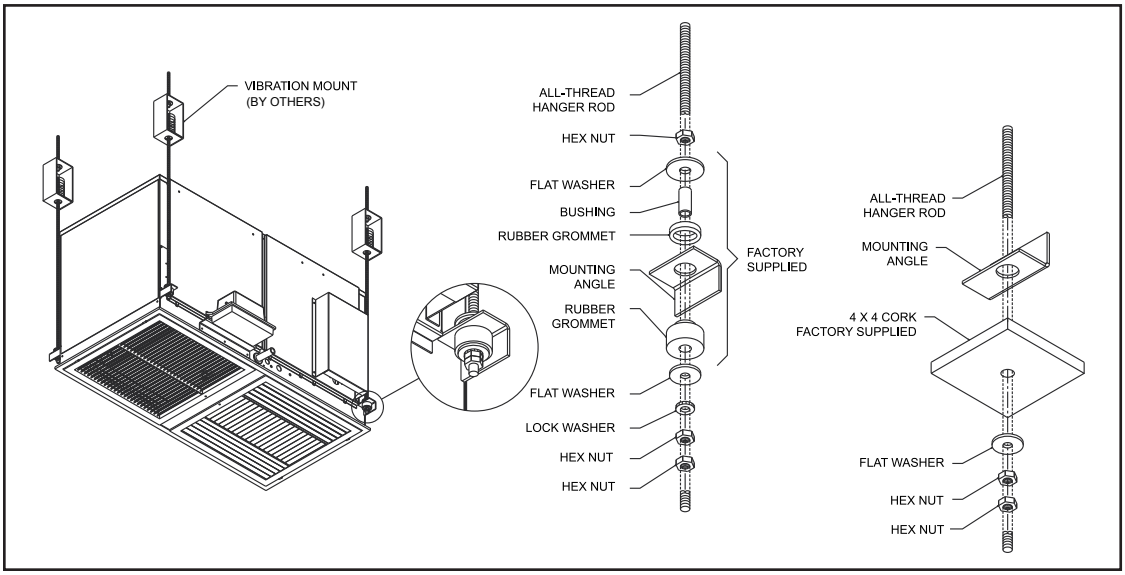


Figure 1- Typical Installation

Note: Equipment must be level to operate properly.

Mount the thermostat upright on an inside wall within the conditioned room that best represents the average room temperature. In most cases, the thermostat should be located near the common return air grille. Mount the thermostat at least 18 inches from an outside wall and approximately 5 ft. above the floor. Follow the steps below to mount. Instructions for wiring the unit and setting the dip switches are provided in Section 2.7, Utility Connections.

1. Unlatch the thermostat from the base. Remove the cover plate and, using a flat head screwdriver, gently insert into the latch access slot (bottom of base) until the lock tab disengages.
2. Pry up the handle of the screwdriver to separate the thermostat panel from the base. Grip the bottom corners of the thermostat panel to remove from base.
3. Place the base temporarily over the wire hole opening in the wall. Level the base and mark location through the two provided mounting slots.

CAUTION ⚠

Do not touch the temperature sensor on the bottom left corner of the thermostat. The sensor can be damaged if handled improperly.

4. If using the supplied anchors, drill two 3/16 inch holes, tap in wall anchors. If only the supplied screws are being used, drill two 3/32 inch holes.
5. Fasten the base to the wall using the supplied screws.
6. Reinstall thermostat to base.

2.4.3.2 Humidistat/Dehumidistat (Optional Supplied with A-Tech-1.1/1.2 Thermostat)

Mounting of the humidistat and dehumidistat is performed in the same manner. Mount the humidistat and/or dehumidistat (as described in Section 2.4.3.1) to a wall within the conditioned room that best represents the average humidity of the space. In most cases, the humidistat and dehumidistat should be located near the common return air grille. Mount the humidistat and dehumidistat at least 18” from an outside wall and approximately 5 ft. above the floor.

Controls may be installed either on a flush switch box or on a surface switch box. Follow the steps below to mount. Instructions for wiring of unit are provided in Section 2.7, Utility Connections.

1. Pull dial knob off, loosen screw (located at bottom of unit) and remove cover.
2. Make wiring connections (see Section 2.7).
3. Mount with the two #6 screws provided.
4. For external setpoint, reinstall cover, tighten screw, and replace dial knob.
5. For internal setpoint:
   a. Turn dial plate to desired setting and tighten dial lock screw.
   b. Break off dial shaft at undercut.
   c. Remove insert from cover.
   d. Remove protective backing from adhesive on the blank insert provided and press firmly in place on cover.
   e. Reinstall cover assembly and tighten screw. (If additional security is required an Allen screw and wrench are provided.)
   f. Remove protective cover from face of cover insert.

2.4.3.3 Advanced Controller (E^2 Microprocessor)

If your unit is equipped with an E^2 controller, a separate manual is sent in the unit data package provided with your unit. The controller display may be field mounted to a wall within the conditioned space or it may be located outside the conditioned space if desired. Refer to the supplemental instructions provided with the mounting kit when mounting the controller display. When locating the display panel, consider the length of wire to be used. As an option, a 30 foot, 75 foot or 150 foot long cable may be provided by SATS.

2.4.4 Optional Equipment

NOTE

Do not mount any optional equipment on the A/C unit’s access panels.

2.4.4.1 Transformer

The buck/boost transformer provided is encapsulated and can be installed indoors or outdoors. If installed outdoors, the unit should be installed with the wiring compartment down to prevent entrance of moisture. For indoor floor installation the unit may be installed horizontally for ease of making wire connections. Each transformer has keyhole mounting slots for mounting with bolts to desired surface (wall, floor or other structure capable of supporting its weight).

2.4.4.2 Condensate Pump (Field Installed)

The condensate pump should be as near to the air conditioning system as possible. The inlet holes in the pump must be below the lowest part of drain from unit. The pump has two mounting supports so it can be hung on an adjacent wall. Ensure that the pump is level for proper operation.

2.4.4.3 Non-Fused Service Switch

The non-fused service switch is used to disconnect main power and isolate the unit during maintenance and service. The switch has a lockable handle to lock power out during maintenance periods. The switch is typically mounted to the A/C cabinet however, it may be shipped loose for field installation. The case has a top keyhole slotting mount and two holes in each bottom corner for mounting. The hardware for mounting the switch is to be field supplied so as to be compatible with the particular mounting surface.

The non-fused service switch can be mounted near the unit or in a central location. The non-fused service switches are rated for either indoor or outdoor use. Ensure that the proper type for your application is used.

NOTE

Refer to local and national electrical codes for the appropriate mounting location.

2.4.5 Remote Sensors

The remote temperature sensor or the temperature/humidity (T/H) sensor must be located so that it will properly sense the temperature and/or humidity conditions to be controlled. The sensor should not be mounted near a doorway or an area where it would be exposed to direct sunlight. When locating the sensor, consider the length of wire to be used. As an option, a 75 foot or 150 foot long cable may be provided by SATS. Refer to the applicable section that follows to mount the sensor. For unit wiring details, refer to Section 2.7, Utility Connections and to the electrical diagrams provided with the unit.

2.4.5.1 Remote Temperature Sensor (A-Tech 1.1 & A-Tech 1.2)

NOTE

The remote temperature sensor has a maximum range of 300 feet.

1. Open the sensor case by depressing the button on the bottom edge of the case until the latch releases.
2. Remove the cover by pulling it out and up at the bottom.
3. Remove the circuit board from the base by pulling back the latch that holds it at the center bottom.
4. Use the base as a template to mark the mounting holes location on the wall.
5. Using a ¼ inch drill, drill the holes and insert the provided wall anchors.
6. Run the wires coming out of the wall through the opening in the base, then secure the base with the screws provided.
7. Snap the circuit board back into the base. Ensure that the latch holds the board properly and that the sensor element is positioned under the holes in the cover but not touching the cover or base.
8. Make the wiring connections.
9. Replace the cover.

2.4.5.2 Remote Temperature/Humidity Sensor

1. Remove the cover from the base of the sensor by squeezing it at the top and bottom.
2. Place the base temporarily over the wire hole opening in the wall. Level the base and mark the mounting hole locations through the two slots.
3. Drill the mounting holes and insert the provided wall anchors.
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.
6. Replace the cover plate on the base.

CAUTION ⚠

Take care not damage the exposed temperature/humidity sensors on the PC board while screwing in the cover fastening screw. The sensors can be damaged if handled improperly.

2.4.5.3 Remote Water Detector

The remote water detector is normally placed in an auxiliary drain pan located under the unit. It may be attached using double sided tape or with the mounting holes provided in the flanges (one on each side). Once it's in place, loosen the screws provided on the mounting legs to adjust the height of the sensing probes.

CAUTION ⚠

The probes must not touch the mounting surface. Failure to adhere to this may result in improper operation of equipment.

2.4.5.4 Cable Type Water Detector

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

2.5 Air Distribution Connection

2.5.1 Spot Cooler (See Figure 2)

For units that are not ducted, the air conditioner should be mounted above the ceiling grid, leaving sufficient space for the air grilles to rest on the ceiling T-bar.

NOTE

Placement of the grilles is important. The hinged filter grille goes on the return air side of the unit. The 3-way directional grille goes on the conditioned air discharge side of the air conditioner. Gasketing is factory supplied for an air seal between the bottom flange of the air conditioner and the grille. After mounting the air conditioner, lower the air conditioner until the gasket meets the grille.

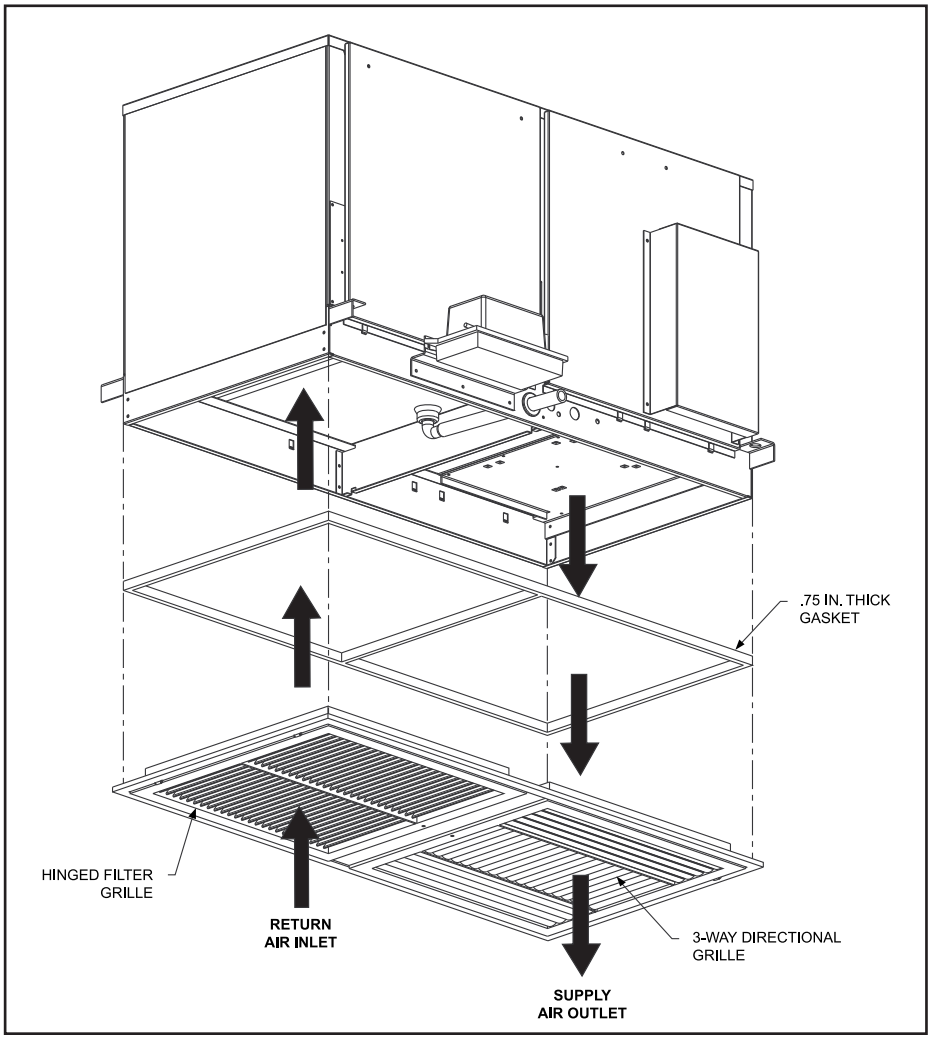


Figure 2- Spot Cooler Grille

2.5.2 Ducted Systems (See Figure 3)

There are three basic configurations of airflow patterns: 90º/Right Angle, Straight-Thru and In/Out Same-Face. When determining ducting requirements, always consult your local and state codes. The duct system should be designed to allow the air to move with as little resistance as possible. Several factors determine ducting material and size. These factors are predetermined, refer to your ducting system schematic.

The connection of ducting to the unit is typically accomplished with a one-inch duct flange. Supply air outlet and return air inlet ducts will require a field provided duct flange (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.

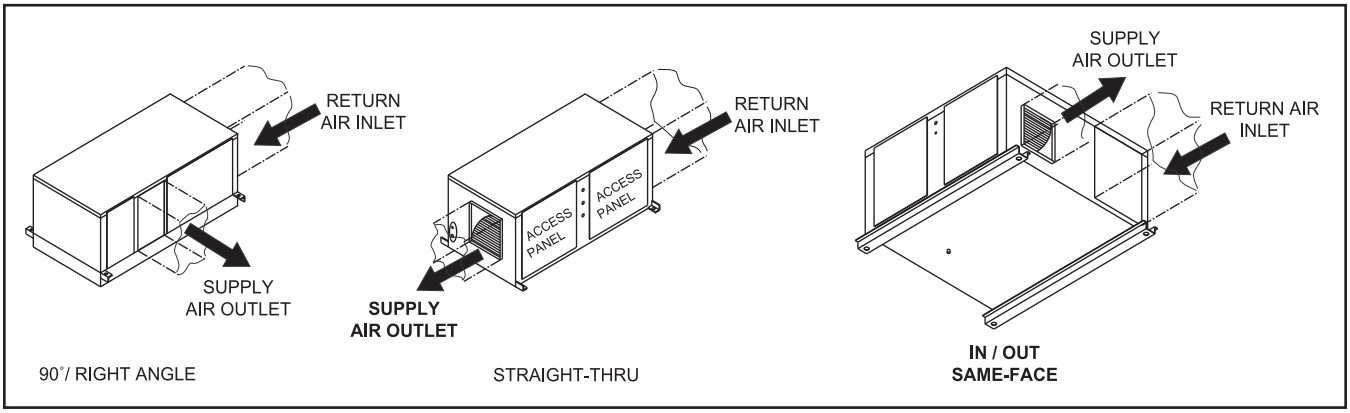


Figure 3- Ducted System Typical Air Patterns

2.6 Piping Connections

2.6.1 Refrigerant

2.6.1.1 Self-Contained Systems

No refrigeration connections are required for self-contained air, water or glycol-cooled systems (Models OHS-012/040-AS, OHS-012/120-C and OHS-012/120-W/G-( )).

2.6.1.2 Split Systems

Split air-cooled systems will require field refrigeration piping. All split systems are shipped with a dry nitrogen charge of 100 psig.

2.6.1.2.1 Remote Air Cooled Condensers (AR Models)

Systems utilizing a remote condenser will require a copper liquid line and discharge line. The piping must not have a refrigerant line pressure drop over 14 psig across the condenser and the interconnecting piping to the condenser sections.

If the condenser is installed above the evaporator, the discharge line should include a P-trap at the evaporator.

NOTE

Ensure proper condenser selection to maintain reasonable sub-cooling temperatures.

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.

Refer to the Recommended Discharge Line and Recommended Liquid Line sizing tables on page 2-7.

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 feet 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.

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

Clear all pipe connections of debris and prep connections for soldering. Use only "L" or "K" grade refrigerant copper piping. Be careful not to allow solder/piping debris to get inside refrigerant lines. Silver solder containing a minimum of 15% silver is recommended. Dry nitrogen should be flowing through the tubing while soldering at a rate of not less than 1-2 CFM (0.028-0.57 M ^{3}/minute).

Refrigerant lines for split systems must be sized according to the piping distance between the evaporator and the condenser/condensing unit. Each valve, fitting and bend in the refrigerant line must be considered in this calculation. 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 feet; a 7/8" branch Tee has an equivalent length of 3.5 feet. These corrections must be accounted for when sizing your piping. Refer to the following table for standard equivalent lengths, in feet, of straight pipe.

EQUIVALENT LENGTH (FT.) OF STRAIGHT PIPE

OD (In.) Line Size	Globe Valve	Angle Valve	90° Elbow	45° Elbow	Tee Line	Tee Branch
1/2	9.0	5.0	0.9	0.4	0.6	2.0
5/8	12	6.0	1.0	0.5	0.8	2.5
7/8	15	8.0	1.5	0.7	1.0	3.5
1 1/8	22	12	1.8	0.9	1.5	4.5
1 3/8	28	15	2.4	1.2	1.8	6.0

Oil traps must be included every 20 feet in the vertical risers and the refrigerant lines must be sloped ¼ inch for every 10 feet in the horizontal lines to ensure proper oil return to the compressor. An inverted trap is required on the discharge line of the remote condenser to help prevent oil and liquid from flooding back to the compressor.

NOTE

In the following 3 tables, the line sizes represent the correct size for individual refrigeration circuits. Dual circuit units, (Models 048**D** to 120**D**), have two separate pairs of refrigeration lines. One per compressor.

RECOMMENDED DISCHARGE LINE SIZES

Model No. / *Total Unit Capacity*	*Equivalent Length Ft.		
	50'or less	100'or less	150'or less
012 / *12,000*	1/2	1/2	5/8
018 / *18,000*	5/8	5/8	5/8
024 / *24,000*	5/8	7/8	7/8
032 / *32,000*	5/8	7/8	7/8
040 / *40,000*	7/8	7/8	7/8
048 / *48,000*	7/8	7/8	7/8
048**D** / *48,000*	5/8	7/8	7/8
060 / *60,000*	7/8	1-1/8	1-1/8
072**D** / *72,000*	7/8	7/8	7/8
084**D** / *84,000*	7/8	7/8	7/8
120**D** / *120,000*	7/8	1-1/8	1-1/8

*Equivalent Ft. accounts for the linear pipe length as well as equivalent length of Valves, Elbows & Tee's as shown in the previous table.

RECOMMENDED LIQUID LINE SIZES

Model No. / *Total Unit Capacity*	Condenser to A/C Unit / Receiver to Evap. (*Equivalent Ft.)		
	50'or less	100'or less	150'or less
012 / *12,000*	3/8	3/8	3/8
018 / *18,000*	3/8	3/8	1/2
024 / *24,000*	3/8	1/2	1/2
032 / *32,000*	1/2	1/2	1/2
040 / *40,000*	1/2	5/8	5/8
048 / *48,000*	1/2	5/8	5/8
048**D** / *48,000*	3/8	1/2	1/2
060 / *60,000*	1/2	5/8	5/8
072**D** / *72,000*	1/2	1/2	1/2
084**D** / *84,000*	1/2	5/8	5/8
120**D** / *120,000*	1/2	5/8	5/8

CAUTION ⚠

Do not exceed the maximum Liquid 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 SIZES				
Model No./ *Total Unit Capacity*	*Equivalent Length Ft.			
	50'or less		100'or less	
	H	V	H	V
012 / *12,000*	5/8	5/8	5/8	5/8
018 / *18,000*	7/8	7/8	7/8	7/8
024 / *24,000*	7/8	7/8	7/8	7/8
032 / *32,000*	7/8	7/8	1-1/8	7/8
040 / *40,000*	7/8	7/8	1-1/8	1-1/8
048 / *48,000*	1-1/8	1-1/8	1-1/8	1-1/8
048**D** / *48,000*	7/8	7/8	7/8	7/8
060 / *60,000*	1-1/8	1-1/8	1-1/8	1-1/8
072**D** / *72,000*	7/8	7/8	1-1/8	7/8
084**D** / *84,000*	1-1/8	1-1/8	1-1/8	1-1/8
120**D** / *120,000*	1-1/8	1-1/8	1-1/8	1-1/8

H = Horizontal Run V = Vertical Run

Vertical runs are based on a total rise of 30 equivalent feet. 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.

2.6.1.2.2 Remote Air Cooled Condensing Units (AHU Models)

Systems utilizing a remote condensing unit (RCU) will require a copper liquid line and suction line. When installing remote condensing units above the evaporator, the suction line should be p-trapped at the evaporator.

NOTE

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

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

All suction lines must be insulated to prevent condensation from forming on the pipes. Refer to provided pipe size charts for recommended pipe sizing.

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

The piping connections for water/glycol, chilled water and systems with hot water reheat are sweat connections. Pipe sizes may not necessarily be the same as the unit connection. Piping should be sized to match the system pressure drop and pump capacity (if applicable) and may require reducing fittings to match the connection size on the air conditioner. The recommended ethylene glycol solution ratio is 40% glycol to 60% water. (SATS recommends Dowtherm SR1 manufactured by Dow Chemical Co.) Glycol-cooled systems with a low entering fluid temperature and all chilled water systems should have insulated piping.

WARNING ⚠

Glycol is hazardous and the manufacturer's MSDS should be consulted.

CAUTION ⚠

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

CAUTION ⚠

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

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

2.6.3 Condensate Drain Line

2.6.3.1 Gravity Drain

A 7/8 inch OD copper (sweat type) line is provided to drain the condensate drain pan. This line also drains the humidifier, if applicable. The drain line must be located so it will not be exposed to freezing temperatures. The drain line should be the full size of the connection. See the installation drawing provided with your unit for the size and location of the condensate drain line.

WARNING ⚠

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

NOTE

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

2.6.3.2 Condensate Pump (See Figure 4)

A condensate pump is used for automatic removal of condensate from the air conditioner and flush water from the humidifier (if applicable). A p-trap must be installed for proper condensate drainage. The height of the trap must be a minimum of 2 inches on most standard systems to ensure proper water drainage of the drain pan. The condensate pump discharge line should be 1/2 inch OD maximum copper or vinyl tubing to prevent excessive back flow to unit.

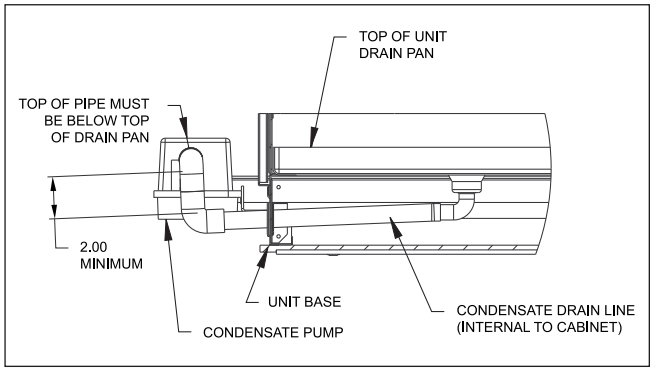


Figure 4- Condensate Pump

NOTE

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

2.6.4 Humidifier (Optional)

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

CAUTION ⚠

Do not use demineralized water.

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

2.7 Utility Connections

2.7.1 Main Power

The *CeilAiR* 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 5). 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 size (MAX FUSE) for circuit protection. The unit's nameplate is located on the outside of the cabinet within close proximity of 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 is provided with terminals for all required field-wiring. It is important to identify the options that were purchased with the unit in order to confirm which field connections are required. Refer to the electrical drawing(s) supplied with the unit for the power and control field-wiring.

WARNING

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

NOTE

All wiring must conform to local and national electrical code requirements. 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.

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.

A manual fused disconnect switch must be installed per local and national electrical codes for service of equipment. Do not mount a shipped loose non-fused service switch or customer supplied

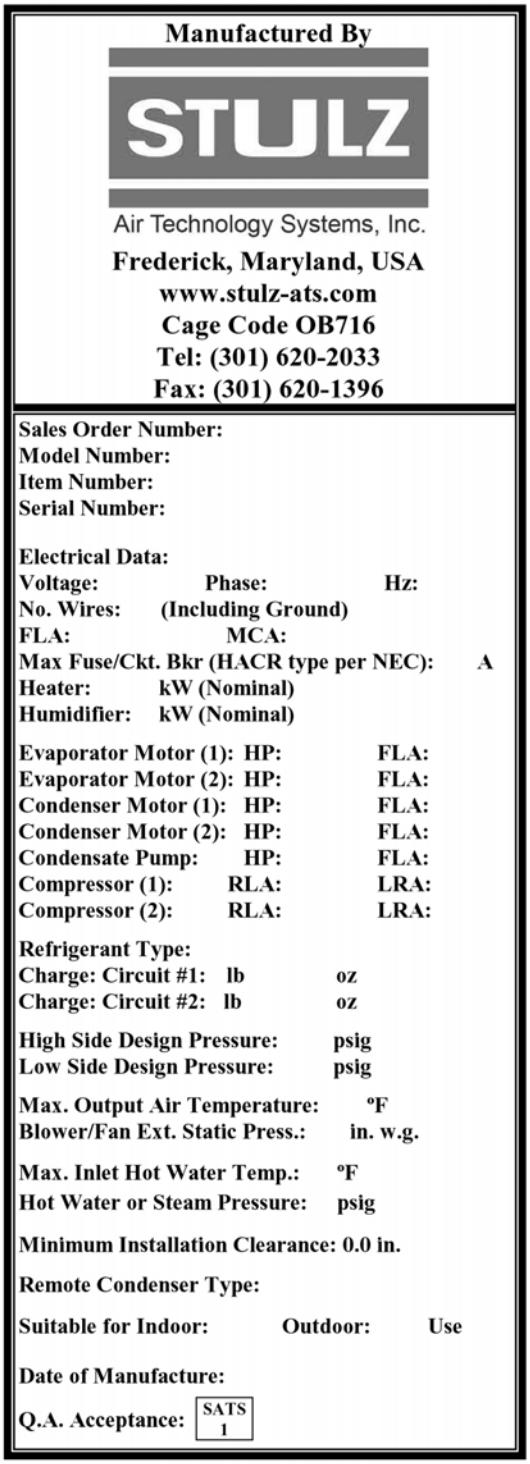


Figure 5- Sample Nameplate

disconnect switch to the surface of the unit. If the factory installed, non-fused service switch option was purchased, the main power and ground connection shall be located at the non-fused service switch, otherwise, the main power connection shall be located as stated below.

Each unit is provided with pilot hole(s) in the main power and control panel for connection of the field-wiring. These pilot holes are located near the electrical box and a label stating “MAIN POWER INPUT” is in close proximity. Terminate the main power wires at the line side of the main power distribution block located within the electric box. A separate equipment ground lug is provided within the electrical box for termination of the earth ground wire.

2.7.1.1 Single-Phase Units 208/230V

Units that are designed for a 208V-supply voltage must have a tolerance that is 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 performed. 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 that the hot leg of power be connected to terminal L1 and the neutral wire to terminal L2 of the main power distribution block.

2.7.1.3 Single-Phase Units (208/230V) with 277/230V Buck/Boost Transformer Applications (See Figure 6)

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.

NOTE

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

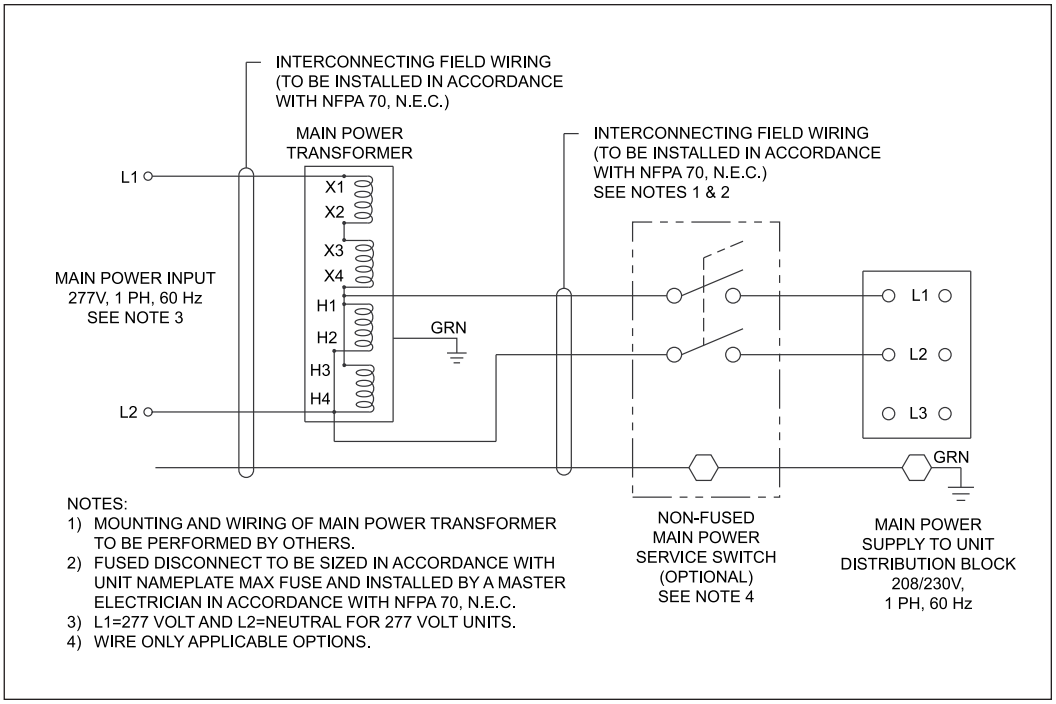


Figure 6- Transformer Schematic

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 not limited to these specific voltages. This transformer is designed as an insulating transformer but if wired in a configuration recommended by the manufacturer it will change 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 schematic supplied with the unit for field connections. A disconnecting means 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 between 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 in wiring the transformer in accordance with the supplied wiring schematic.

Connections are as follows:

1. Splice the hot leg (L1) of the 277V inlet to (X1) (2 wires under this splice cap).
2. Splice the neutral leg (L2) of the 277V inlet to H4, H2 and the wire terminating at L2 of the unit main power distribution block (4 wires under this splice cap).
3. Splice wires (X2) and (X3) together (2 wires under this splice cap).
4. Splice (H3), (H1), (X4) and the wire terminating at L1 of the unit main power distribution block (4 wires under this splice cap).
5. The transformer chassis should be grounded.

After all wiring connections are complete, check the voltage at the main power distribution block in the unit's electrical box to ensure the unit has the correct voltage.

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 main power distribution block. The unit will operate correctly if the supply wires are connected in this manner. A ground lug is provided in each unit near the distribution block.

CAUTION

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

2.7.2 Controls

SATS offers a wide range of control systems to solve your air conditioning control/alarm requirements. Refer to your specific system to identify which control package was purchased. This section will cover the electrical wiring of the A-Tech-1.1 and A-Tech-1.2 thermostats with optional humidistat/dehumidistat controls. If your unit is equipped with an E^2 controller, a separate manual is provided with your unit. Refer to it and the wiring diagram(s) provided for the utility connections. Refer to it and the wiring diagram(s) provided for utility connections.

The air conditioning system is provided with a pilot hole for a conduit connection for the control wiring. It is located near the electrical box in close proximity to the main power pilot hole. The sizing of the conduit must be per the local and national electrical code requirements.

NOTE

All customer provided wiring must be in accordance with local and national electrical code requirements for Class 2 circuits.

2.7.2.1 A-Tech-1.1 Programmable Thermostat (Single Stage Unit; See Figure 7)

Set the dip switches located on the circuit board according to the application needs. Refer to the chart below for factory settings. The thermostat requires four conductors wired to the control terminal board located within the unit electrical box. The thermostat has a terminal strip with box type lugs for wire connections. Refer to the electrical diagram for proper wire terminations.

A-Tech-1.1 Dip Switch Settings

	OFF	ON	OFF	ON
1	☐	■	**4 min. on/off**	**2 min. on/off**

Minimum time Y and W terminal will be energized, and minimum time must elapse between call. Minimum OFF times can be overridden by raising and lowering the setpoint. Minimum ON times can only be overridden by changing the mode.

2	■	☐	**Keypad unlocked**	**Keypad locked**

In locked position only the arrow keys and outdoor temperature button will respond. When any other key is pushed a lock appears on the display. When locked, the setpoint can only be changed by ±3° (F or C) for one hour; when done, a hour glass will appear on the display.

3	☐	■	**Fan w/HT cell**	**Fan w/Plenum Switch**

When off, the G terminal (fan) energizes with the W terminal (heat) immediately with a call for heat. When on, the furnace controls the fan.

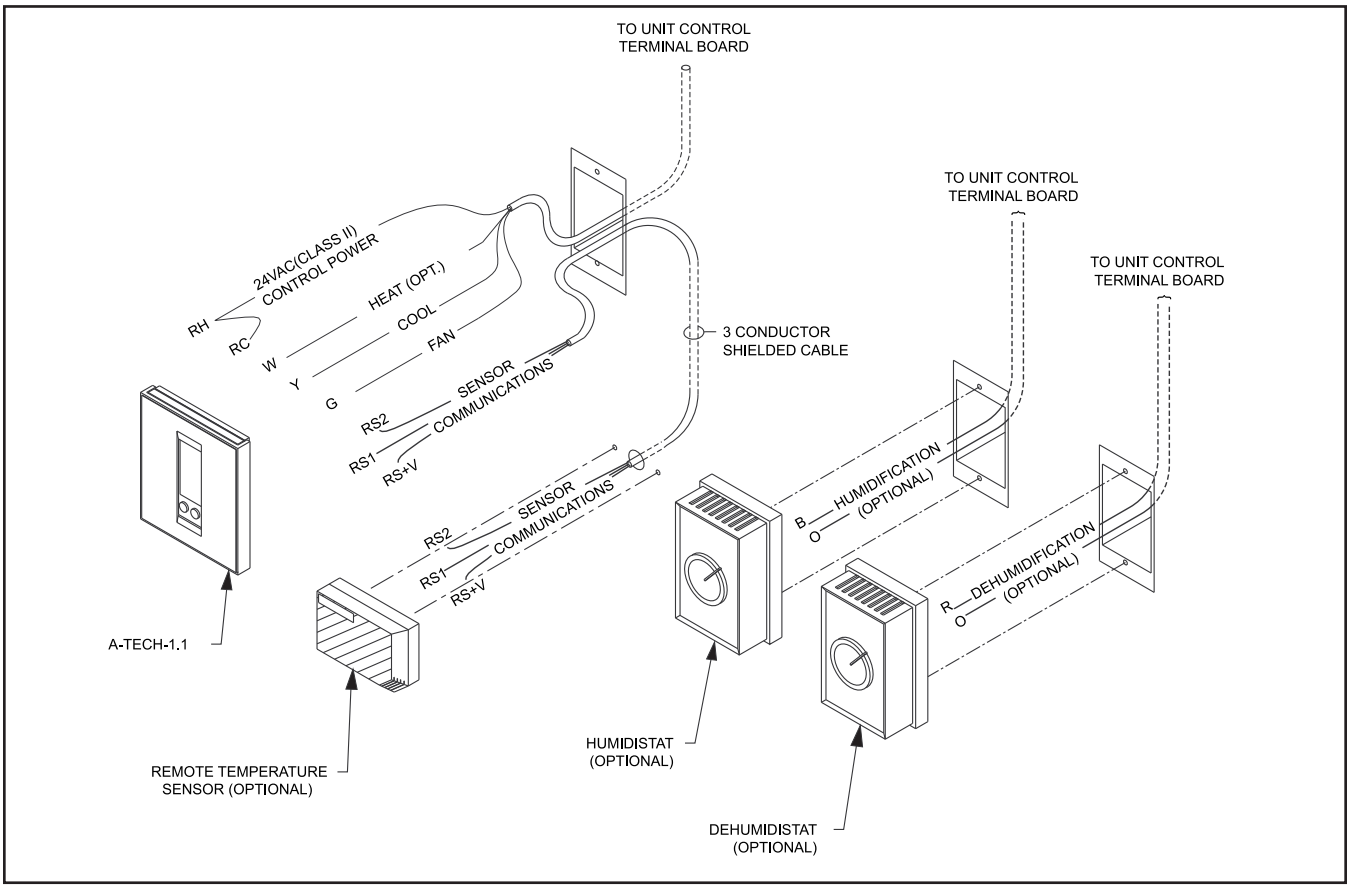


Figure 7- A-Tech-1.1 Control Wiring

2.7.2.2 A-Tech-1.2 Programmable Thermostat (Dual Stage Unit; See Figure 8)

Set the dip switches located on the circuit board according to the application needs. Refer to the following chart provided for factory settings. The thermostat requires seven conductors wired to the control terminal board located within the unit electrical box. The thermostat provides a terminal strip with box type lugs for wire connections. Refer to the supplied electrical schematic for proper wire terminations.

A-Tech-1.2 Dip Switch Settings

	OFF	ON	OFF	ON
1	■	□	**4 Events/day**	**2 Events/day**
Four events or two events for all seven days of the week. Four events are: Morning, Day, Evening, Night; two events are: Day and Night.				
2	■	□	**Smart Fan Disabled**	**Smart Fan Enabled**
When enabled and continuous fan has been selected, the fan terminal (G) will de-energize during the Night event and only cycle on with the equipment.				
3	□	■	**4 min. on/off**	**2 min. on/off**
Minimum time Y and W terminal will be energized, and minimum time must elapse between call. Minimum OFF times can be overridden by raising and lowering the setpoint. Minimum ON times can only be overridden by changing the mode.				
4	■	□	**Keypad unlocked**	**Keypad locked**
In locked position only the arrow keys and outdoor temperature button will respond. When any other key is pushed a lock appears on the display. When locked, the setpoint can only be changed by ±3° (F or C) for one hour; when done, a hour glass will appear on the display.				
5	□	■	**Fan w/HT cell**	**Fan w/Plenum Switch**
When off, the G terminal (fan) energizes with the W terminal (heat) immediately with a call for heat. When on, the furnace controls the fan.				
6	□	■	**Single Stage**	**Multi-Stage**
In Single Stage position, terminals Y2 and W2 are locked out				
7	■	□	**No LCD w/LED 1**	**Filter LCD w/LED 1**
In Filter position, when terminal LED 1 is energized a “replace filter” picture appears on the LCD in addition to LED 1 illuminating.				
8	■	□	**No LCD w/LED 2**	**Wrench LCD w/LED 2**
In wrench position, when terminal LED 2 is energized a picture of a wrench appears on the LCD in addition to LED 2 illuminating.				

2.7.2.3 Humidistat/Dehumidistat (Optional)

The humidistat/dehumidistat are mounted in the same manner but are wired differently. The humidistat/dehumidistat both require two conductors for connection to the air conditioning system. The controls have pigtail leads for splice type wire connections with twist on connectors (wire caps). Refer to the supplied electrical schematic for proper wire terminations.

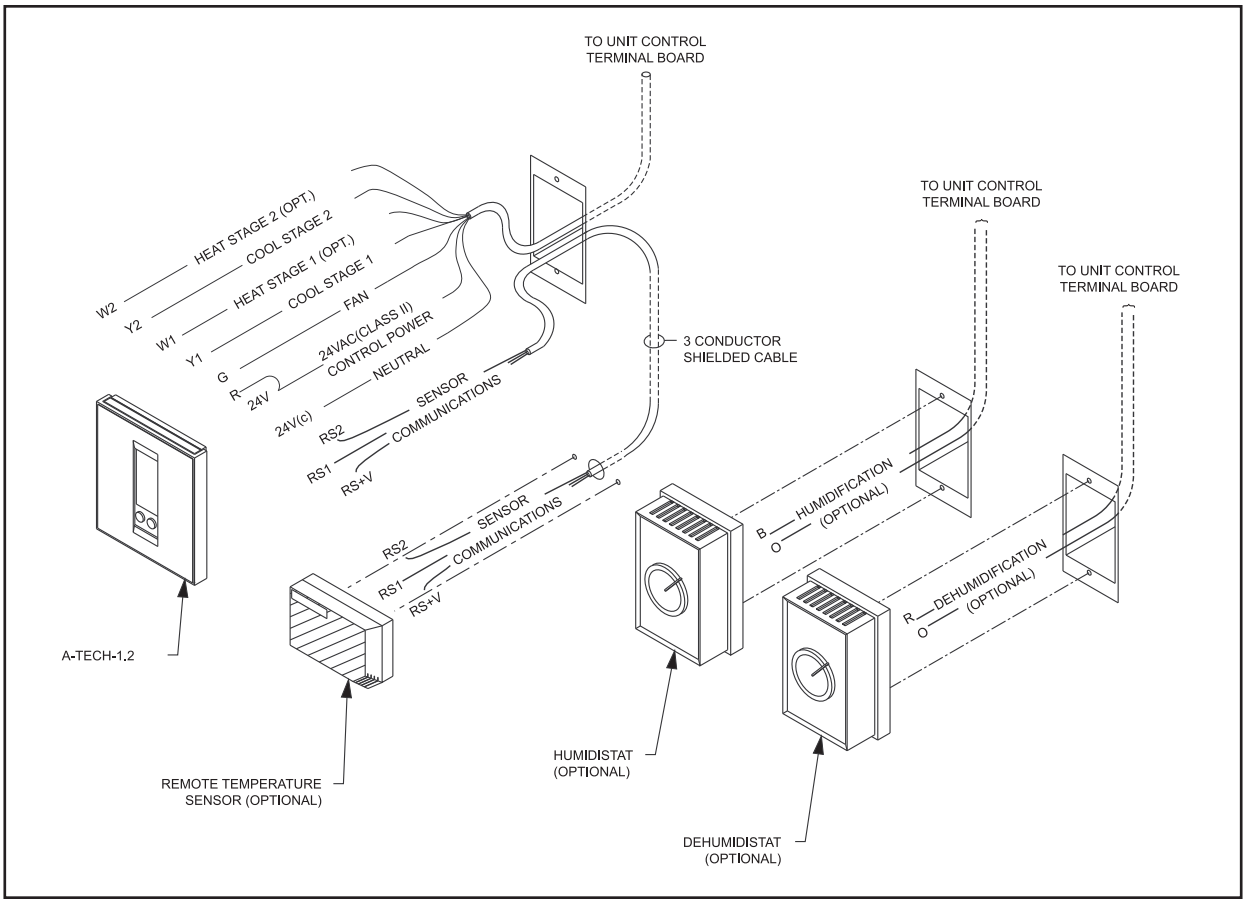


Figure 8- A-Tech-1.2 Control Wiring

2.7.3 Optional Equipment

NOTE

All customer provided wiring must be in accordance with local and national electrical code requirements for Class 2 circuits.

2.7.3.1 Condensate Pump

Systems supplied with a field installed condensate pump will require power and control wiring to be connected to the unit. The control wires from the terminal board in the electric box should be run through the overflow switch in the condensate pump housing. After proper installation of the condensate pump, the installer must connect two power conductors from the condensate pump main power terminals to the air conditioning unit. A ground wire must be connected to the unit ground stud located within the unit electric box. Two control conductors must be wired to the control terminal board located within the unit electric box. The condensate pump provides pigtail leads for splice type wire connections with twist on connectors (wire caps). Refer to the supplied electrical diagram for proper wire terminations.

2.7.3.2 Remote Temperature Sensor (See Figures 7 and 8)

The remote temperature sensor requires a three conductor shielded cable with the shield being terminated at the thermostat. The shield is terminated at the RS2 thermostat terminal. Both the thermostat and the sensor provide a terminal strip with box type lugs for wire connections. Refer to the electrical diagram supplied for proper wire terminations.

2.7.3.3 Remote Water Detector

Spot Type:

A remote spot type water detector requires three conductors to be wired to the control terminal board within the unit electrical box. The wire insulation must be rated at 600V. The water detector provides pig-tail leads for splice type wire connections with twist on connectors (wire caps). Refer to the supplied electrical diagram for proper wire terminations.

Strip/Cable Type:

A remote strip/cable type water detector is provided with a two conductor cable harness with a quick connect fitting on the end. The harness mates to the fitting on the water detector and connects it to the control board inside the electric box. Refer to the supplied electrical diagram for proper wire terminations.

2.7.4 Air-Cooled Split Systems

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

CAUTION ⚠

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

NOTE

All wiring must be provided in accordance with local and national electrical code requirements for Class 2 circuits.

2.7.4.1 Remote Condenser (See Figure 9)

Systems equipped with a remote condenser require field wiring between the evaporator system and the remote condenser. Refer to the supplied electrical schematic and the wiring diagram supplied with the condenser (typically located in the condenser electric box). The installer must provide main power wiring to the main power distribution block located within the remote condenser control box. A separate equipment ground lug is provided within the electrical box for termination of the earth ground wire.

The installer must also wire two control conductors from the terminal board within the evaporator unit to the control terminal board within the remote condenser control box. Refer to the supplied electrical diagram for proper wire terminations.

2.7.4.2 Remote Condensing Unit (See Figure 10 and 11)

Systems equipped with a remote condensing unit require field wiring between the evaporator system and the remote condenser unit. The number of conductors required between the two systems varies based upon the number of options provided. A single stage cooling system typically requires three conductors. Refer to the supplied electrical diagram(s) to determine the exact amount of field wires and proper wire terminations required for your specific unit.

2.7.5 Water/Glycol Systems (See Figure 12)

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

CAUTION ⚠

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

NOTE

All wiring must be provided in accordance with local and national electrical code requirements for Class 2 circuits.

Systems equipped with a glycol-cooled system/pump package require field wiring between the glycol unit and pump package. The installer must wire two control conductors from the terminal board within the glycol unit to the pump package electrical box. Refer to the supplied electrical schematic for proper wire terminations.

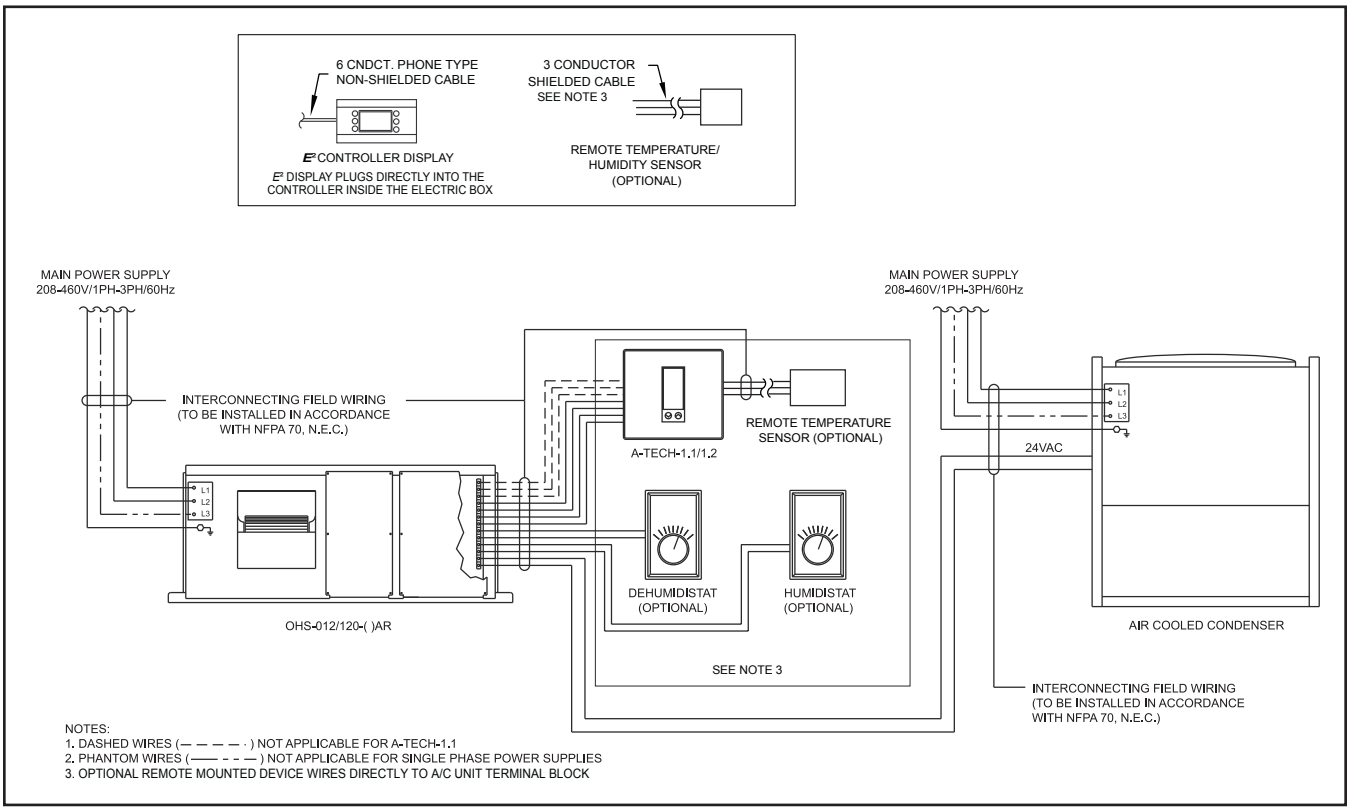


Figure 9- Interconnection Field Wiring Remote Condenser

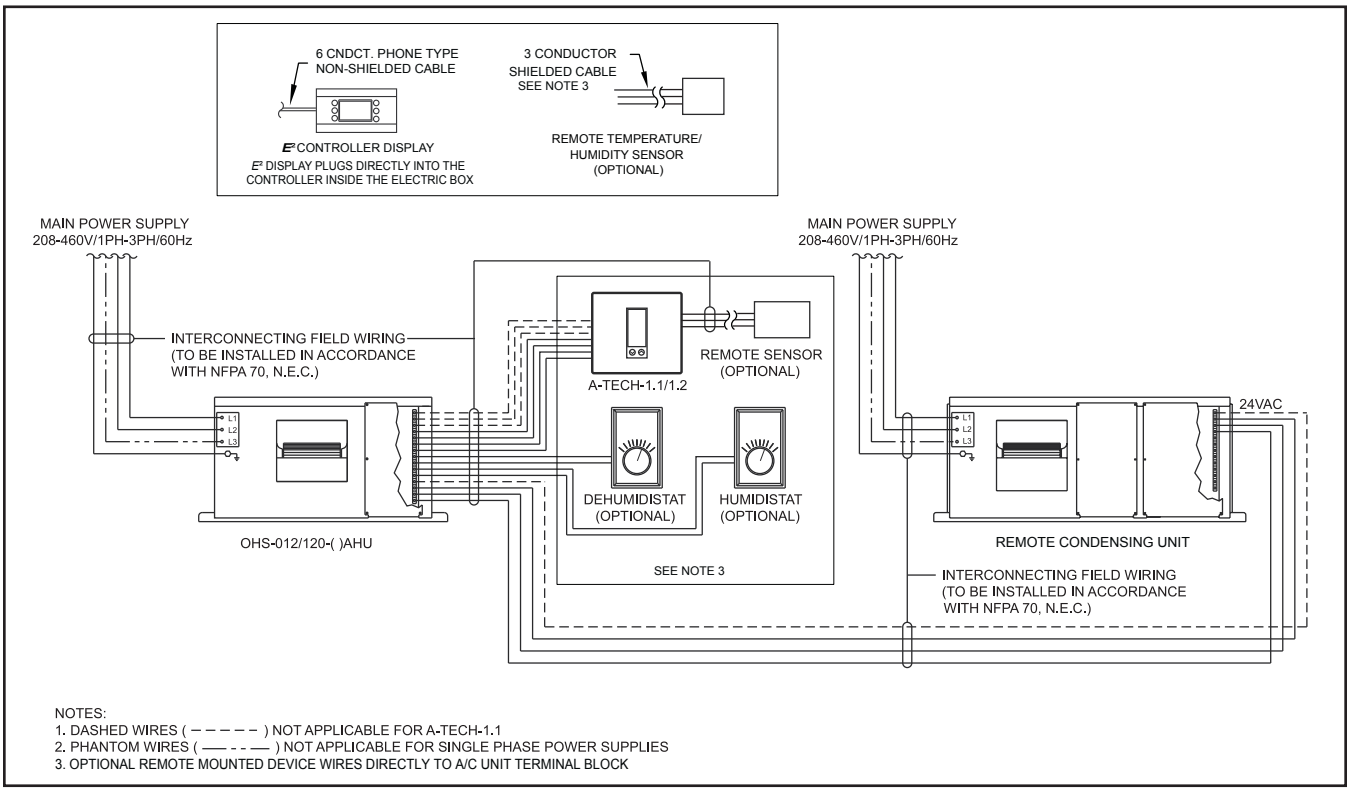


Figure 10- Interconnection Field Wiring Remote Condensing Unit

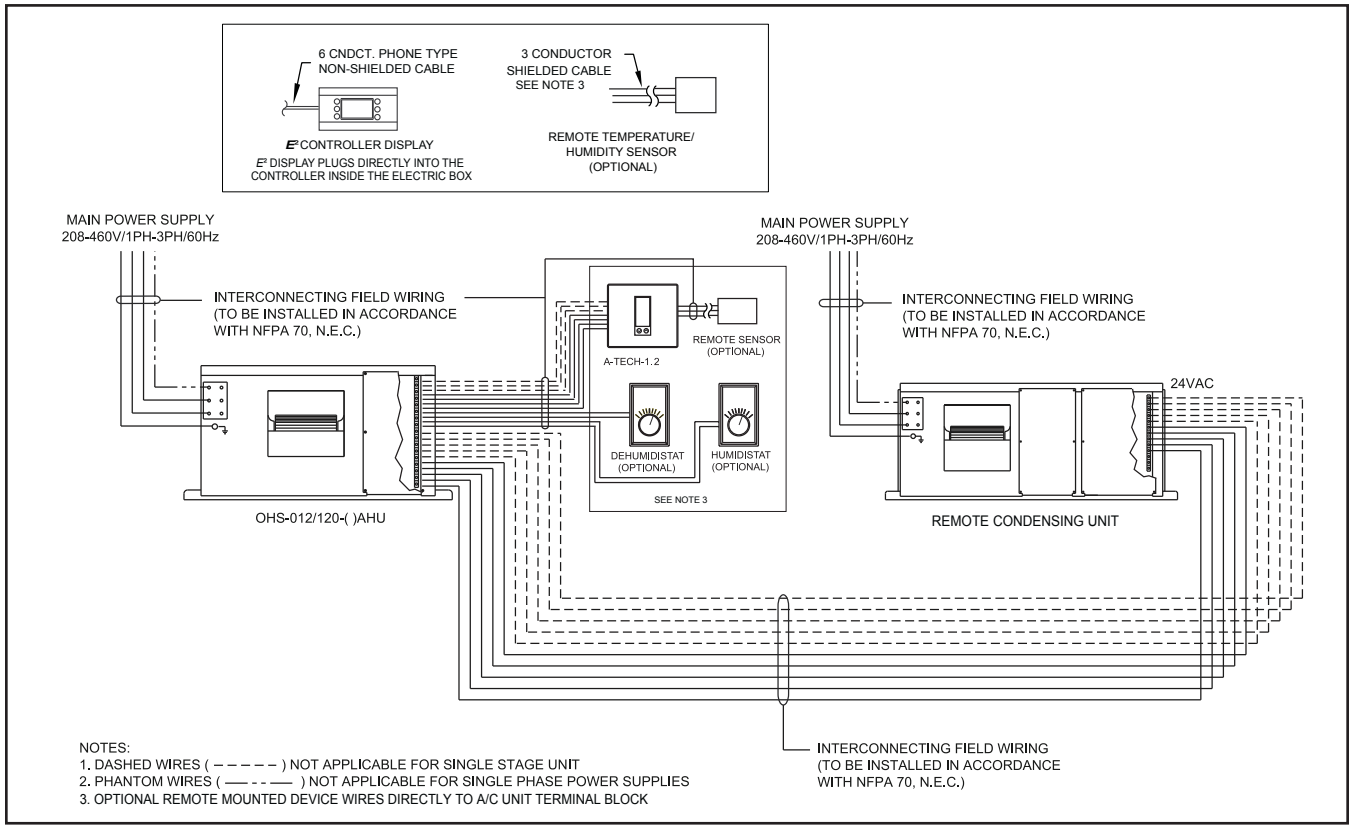


Figure 11- Interconnection Field Wiring Remote Condensing Unit with Dual Compressors

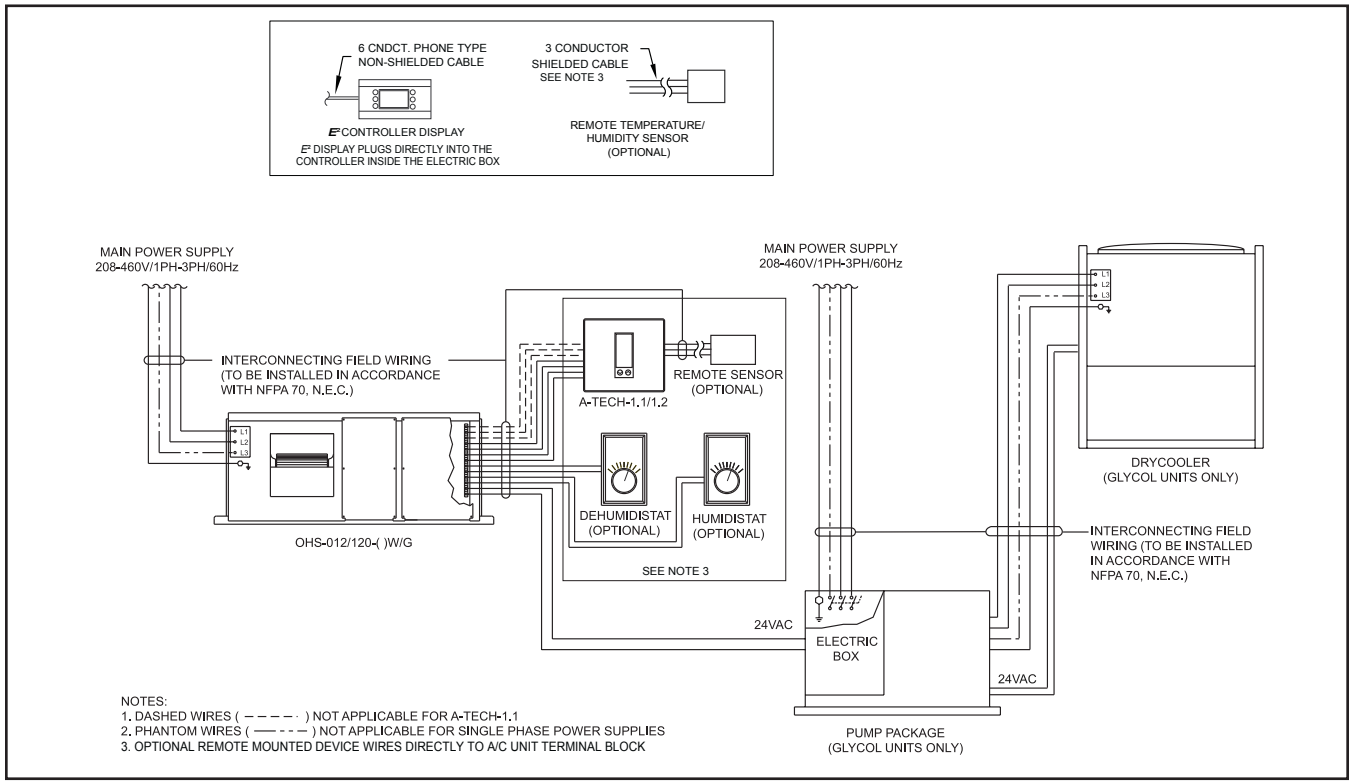


Figure 12- Interconnection Field Wiring Glycol Systems

2.7.6 Remote Shut Down

NOTE

All wiring must be provided in accordance with local and national electrical code requirements for Class 2 circuits.

Each unit is provided with a means to remotely shut down the air conditioning unit. A normally closed switch rated at 5 amperes at 24VAC is required for this purpose. Two conductors from the normally closed switch must be connected to the control terminal board located within the unit electric box. Refer to the supplied electrical schematic for proper wire terminations.

2.8 Refrigerant Charging Procedures

Refrigerant charging procedures vary depending on the type of refrigerant used in the unit. Before charging, check the unit nameplate to confirm the refrigerant type. If the unit operates with R22 refrigerant see section 2.8.1. If R407C is used, see section 2.8.2.

NOTE

Refrigerant charging must be performed by a journeyman, refrigeration mechanic or an air conditioning technician.

2.8.1 R22 Refrigerant Charging Procedures

2.8.1.1 Self-Contained Systems

All self-contained water/glycol-cooled units (units that require no refrigerant field piping) are factory charged with R22. No field charging is required.

2.8.1.2 Remote Air-Cooled Split Systems (AR/AHU)

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

PREPARING SYSTEM FOR CHARGING

1. Once all connections have been made, pressurize the system to 150 psig with dry nitrogen. Leaks may be detected by checking the standing pressure.
2. After ensuring there are no leaks, relieve pressure and evacuate the system. Pull a vacuum of 50 microns or less using the suction and discharge service ports and the service port of the receiver (if applicable). Hold the vacuum for 2 hours. Ensure no portion of system has been isolated from the evacuation process (liquid, suction or discharge lines).

CAUTION ⚠

A proper vacuum must be drawn on the refrigerant system prior to charging. If this is not done the refrigerant will combine with the moisture in the pipes to form an acid that will eventually cause compressor failure.

FINE TUNING THE SYSTEM CHARGE

2.8.1.2.1 0ºF Fan Cycling and -20ºF Variable Speed Control

The following instructions are for charging systems with condenser fan cycling or variable speed control using R22 refrigerant.

1. Bleed air from hoses and “break” the system vacuum by supplying R22 **vapor.** Supply R22 **vapor** to the suction port until the pressure is raised to about 50 psig. This small holding charge allows the low pressure switch to “make” through out the process of fine tuning the system charge.

WARNING ⚠

Do not add **liquid** R22 refrigerant to suction side of system.

2. Referring to Section 3.0, start the system and use the microprocessor controller to lower the temperature set-point 3-5°F below room temperature. This will ensure the cooling mode stays on during the charging procedure.

CAUTION ⚠

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

3. Supply R22 **vapor** to the suction port until the liquid line sight glass is cleared of all bubbles.
4. After the unit has stabilized, the liquid line sight glass should be clear and the discharge pressure should be a minimum of 200 psig. A superheat reading should be taken near the feeler bulb from the thermal expansion valve, ensuring the temperature measuring device is well insulated. The superheat should be approximately 12-15ºF.
5. A sub-cooling reading should be taken on the output side of the condenser, with the

temperature-measuring device being well insulated. The sub-cooling temperature should be approximately 10-20ºF.

NOTE

Under cold climate conditions it is recommended to do the following:

6. Block off the intake air to the condenser with cardboard (or reduce the water glycol flow) until a constant discharge pressure (225-280 psig) can be obtained. This will lower the possibility of overcharging and avoid the occasional bubbles that may appear in the sight glass during fan cycling. (For units with fan cycling only.)
7. If the unit has a hot gas reheat option, the previous steps are still followed except the hot gas reheat valve must be opened to allow refrigerant to flow into the reheat coil to obtain the proper amount of unit charge. This process may need to be repeated several times, which can be done by enabling a call for dehumidification. After cycling the system through the hot gas reheat cycle, recheck the system charge in the COOLING-ONLY mode.
8. Ensure the crankcase heater is operational by checking the amperage.

CAUTION ⚠

Remove the blockage to the air intake of the condenser (or restore the water/glycol flow).

9. Fill out applicable blocks of Warranty Registration and Start-Up Checklist.

2.8.1.2.2 -30ºF Flooded Head Pressure Control

The following instructions are for charging systems with flooded head pressure control using R-22 refrigerant.

1. Bleed air from hoses and “break” the system vacuum by supplying R22 **liquid** to the service valve of the receiver until the receiver is full. Then supply R22 **vapor** to the suction port until the pressure is raised to about 50 psig (low pressure switch makes).
2. Referring to Section 3.0, start the system and use the microprocessor controller to lower the temperature set-point 3-5°F below room temperature. This will ensure cooling remains on during charging procedure.

CAUTION ⚠

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

3. After starting the system, immediately supply R22 **vapor** to the suction port until the liquid line sight glass is clear of all bubbles.
4. Raise the discharge pressure to 300-325 psig and hold it constant by blocking the air intake of the condenser.
5. Once the discharge pressure has stabilized for 5 to 10 minutes, additional refrigerant R22 **vapor** must be added to the suction port until the “float ball” in the level indicator of the receiver begins to float.

CAUTION ⚠

Remove the blockage to the air intake of the condenser.

6. Take a superheat reading near the feeler bulb from the thermal expansion valve. The ideal superheat temperature is 12-15°F. The maximum allowable superheat temperature is 20°F.
7. Ensure the crankcase heater is operational by checking the amperage.
8. Fill out applicable blocks of Warranty Registration and Start-Up Checklist.

2.8.2 R407C Refrigerant Charging Procedures

R407C is a blended refrigerant recognized for being safer for the environment. 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. When charging a system using blended refrigerants, it is essential that the composition of the refrigerant is maintained. To ensure correct composition, introduce 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 to maintain the correct refrigerant composition while the cylinder is emptied.

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 entire system sealed as much as possible and minimize exposure of POE oil to outside air.

Familiarize yourself with the charging procedures discussed in section 2.8.1 of this manual. Instead of adding R22 vapor to the suction port as described under "Preparing System for Charging", the initial charge will be performed by introducing R407C **liquid** to the discharge side of the compressor. (See below)

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 to 150 psig. Since there is no refrigerant in the system to detect, leaks may be detected by observing the standing pressure.

2. After ensuring there are no leaks, evacuate the system to 50 microns and hold the vacuum for 2 hours.

3. Break the vacuum by supplying R407C **liquid** to the discharge port near the compressor until the pressure is raised to about 50 psig. This small holding charge allows the low pressure switch to "make" through the process of fine tuning the system charge.

FINE TUNING THE SYSTEM CHARGE

4. Disconnect the refrigerant cylinder from the discharge side of the compressor and connect it to the suction side.

5. Start the system and use the microprocessor controller to lower the temperature setpoint 3-5°F below room temperature, ensuring cooling remains on as the unit is charged.

6. Allow the discharge pressure to rise to 225-280 psig and hold it constant. On cool days it may be necessary to restrict the airflow across the condenser (or reduce the water glycol flow), to raise the pressure.

7. Slowly meter R407C **liquid** refrigerant through the suction side while watching for the sight glass to clear of bubbles.

CAUTION ⚠

Add liquid refrigerant **slowly** to prevent the refrigerant oil from "washing out" of the compressor.

8. Take a superheat reading near the feeler bulb from the thermal expansion valve, ensuring the temperature-measuring device is well insulated. The ideal superheat temperature is 12-15°F. The maximum allowable superheat temperature is 20°F.

9. While monitoring the sight glass, take a sub-cooling temperature reading on the output side of the condenser. The sub-cooling temperature should be 10-20°F.

10. If necessary, add **liquid** refrigerant to maintain adequate sub-cooling temperature.

2.8.2.1 Flooded Head Pressure Control Systems

In units with R407C refrigerant using flooded head pressure control, a receiver is provided to store the refrigerant during the time the condenser is not using the extra refrigerant charge. Once a clear sight glass has been achieved, additional refrigerant must be added to the receiver.

A level indicator is located on the side of the receiver to assist the service technician in charging the air conditioning system. The proper charge can be determined by viewing the position of the "float ball" while the unit is running. If the "float ball" is positioned at the bottom of the sight indicator, additional refrigerant charge is needed. When the "float ball" reaches the top of the indicator, the unit is fully charged.

2.9 System Settings and Adjustments

2.9.1 Low/High Pressure Limit Switch

Air conditioning systems utilizing thermal expansion valves are equipped with hermetically sealed high-pressure and low-pressure switches. These switches are pre-set by the manufacturer and cannot be adjusted. 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 275 psig to maintain the condensing temperature.

Factory setting: Switch contacts are set to close on a pressure rise to 275 psig and open at 205 psig. Setpoint range is 170 to 375 psig. The differential is non-adjustable and set at 70 psi.

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 at approximately 325 psig and returns the fan (blower) from high speed to low speed at approximately 255 psig.

Factory setting: On pressure rise, the high fan speed contacts are set to close at 325 psig. This will increase the condenser fan speed. A pressure drop to 255 psig will close the low fan speed contacts and reduce the fan speed. Set point range is 170 to 400 psig. The differential is nonadjustable and set at 70 psi.

NOTE

This switch and settings does 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. 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 275 psig and the condenser fan is cycled on, as described in Section 2.8.4.1. When ambient temperature drops, the discharge pressure drops also. When the discharge pressure drops to approximately 180 psig, 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.

This method of controlling head pressure allows the condenser fan to run continuously. 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 2.8.4.5. 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 2.8.4.5, 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 regulating valve is factory set for the correct condensing temperature, however, it can be adjusted to increase or decrease the condensing temperature.

Head pressure regulating valves are available in 2-way or 3-way configurations. Refer to the piping diagram to determine which type of valve is provided. The location and size of regulating valves varies with the size and model of the A/C unit. Methods for adjusting the valves for condensing pressure differ with the valve types which can be differentiated by the maximum water pressure rating of the valve, (150, 350, or 450 psig).

2.9.3.1 150 PSIG Pressure Valves

Adjustment is made by turning the slotted square stem on top of the valve clockwise to increase the condensing temperature or decrease water/glycol flow and counterclockwise to decrease the condensing temperature or increase the water/glycol flow. A directional arrow is stamped on the metal housing of the valve stem.

2.9.3.2 350 PSIG and 450 PSIG High Pressure Valves

Adjustment is made by turning the round-holed knob counterclockwise inside the valve's metal housing to increase condensing pressure or decrease water/glycol flow and clockwise to decrease the condensing temperature or increase the water/glycol flow. A directional arrow is stamped on the metal housing of the valve stem.

2.9.4 Humidifier Adjustment

The humidifier has a capacity adjustment potentiometer on the humidifier control circuit board. The capacity potentiometer may need to be field adjusted if the humidifier does not supply enough capacity for the current room conditions.

CAUTION ⚠

Adjusting the capacity pot too high may result in condensation within the system.

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

2.9.5 Blower Adjustment

2.9.5.1 Belt Drive Blower (see Figure 13)

Systems with belt drive blowers are supplied with adjustable sheaves to change the blower speed and adjustable motor bases for belt tensioning. Follow the following procedure to change the blower speed.

1. Turn system off.
2. Turn off all power to unit at non-fused service switch, use lock-out tag-out procedure.

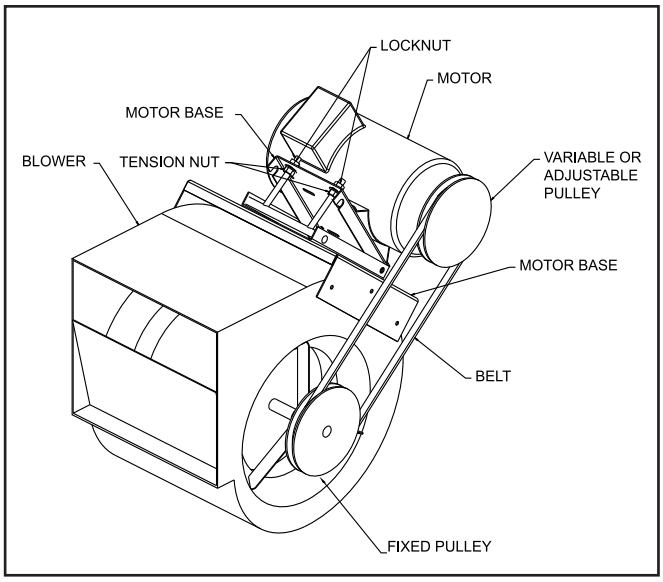


Figure 13- Belt Drive Blower

3. Remove the blower belt(s).
4. Loosen the set screw in the side of the sheave with an Allen wrench.
5. Remove the sheave key.
6. Adjust the blower speed by closing the sheave one half turn to increase speed or opening the sheave one half turn to decrease speed.
7. Replace the sheave key and tighten set screw.
8. Proper belt tension is achieved when the belt has a deflection of ¾ inch per foot of span between the blower and motor pulleys, with a firm pressure placed on the side of the blower belt. Adjust the blower belt tension by raising (to tighten) or lowering (to loosen) the nuts on the adjustment rods of the motor base.

CAUTION ⚠

If the belt tension is too tight, it will cause premature blower and/or motor bearing failure. If the belt is too loose, the belt will slip and cause belt squeals and eventual belt failure.

9. Restore power to system.
10. Check the current draw on the blower motor to make sure it does not exceed the nameplate rating of the motor.
11. If current draw exceeds nameplate rating of motor repeat steps 1 through 9 to decrease blower speed. If the motor pulls too much current, slow the blower down by opening the adjustable sheave one half turn at a time until the motor current is at or below the nameplate FLA.
12. Check the motor overload on the blower starter to confirm its setting is correct for the FLA of the motor.

2.9.5.2 EC Blower(s)

The speed of the EC Blowers 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 SATS Product Support be contacted before making adjustments to the controller.

2.9.6 Thermal Expansion Valve

All *CeilAiR* units utilizing thermal expansion valves (TEV) control the flow of refrigerant entering the evaporator to maintain a constant superheat of the refrigerant vapor at the outlet of the evaporator. Superheat is the difference between the refrigerant vapor temperature and its saturation temperature at that pressure. By controlling superheat, the TEV keeps nearly the entire evaporator surface active while not permitting liquid refrigerant to return to the compressor. The standard super-heat 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.

2.9.8 Hot Gas Bypass (Optional)

The two most common systems provided by SATS for hot gas bypass are snap acting and full floating described as follows.

2.9.8.1 Snap Acting Hot Gas Bypass

The snap acting hot gas bypass system provides for 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 to maintain a preset suction pressure. The compressor cycles on demand from the controller.

The snap acting hot gas bypass system also 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 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 end of valve. Using a 5/16 inch Allen wrench, turn clockwise to increase pressure or counterclockwise to lower pressure.

2.9.8.2 Full Floating Hot Gas Bypass

A full floating hot gas bypass system is provided for capacity control and freeze protection. The hot gas bypass system may include a quench solenoid valve, a quench solenoid coil, a quench expansion thermal valve, a hot gas (discharge) solenoid valve, a hot gas (discharge) solenoid coil, and a hot gas bypass valve. To ensure a constant running compressor, the hot gas and quench solenoid valves are open and the liquid line solenoid valve cycles on the demand of the controller.

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 of 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.

The quench valve normal control setting is 20°F superheat (when there is no call for cooling). The valve is factory set and no adjustment should be necessary. If adjustment is required, remove adjustment cap from the valve. Turn the adjusting stem clockwise to increase superheat and counterclockwise to decrease the superheat.

2.10 Refrigerant Characteristics

2.10.1 Pressure / Temperature Settings

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

Pressure/Temperature Settings For R22 & R407C			
Normal	**Min.**	**Max.**	
Sub-Cooling °F	10	5	20
Superheat (°F)	15	10	20
Condensing Temperature Air-Cooled (°F)	125	105	140
Condensing Temperature Water-Cooled (°F)	105	105	140
Condensing Temperature Glycol-Cooled (°F)	130	105	140
Suction Pressure (psig)	70	58	84
Condenser Fan Switch ON Air-Cooled (psig)	275	265	285
Condenser Fan Speed Air-Cooled (psig)	325	-	-
Opens	**Closes**		
Low Pressure Switch (psig)	10	32	
High Pressure Switch (psig)	410	Manual Reset	

2.10.2 Saturated Refrigerant Pressure Tables

The following refrigerant pressure tables are provided for reference.

R22 Refrigerant

Temp. (°F)	Pressure (psig)
20	43.2
22	45.5
24	47.8
26	50.2
28	52.6
30	55.1
32	57.7
34	60.4
36	63.1
38	65.9
40	68.7
42	71.7
44	74.7
46	77.8
48	81.0
50	84.2
55	92.7
60	102
65	111
70	122
75	132
80	144
85	156
90	168
95	182
100	196
105	210
110	226
115	242
120	260
125	278
130	296
135	316
140	337

R407C Refrigerant

Temp. (°F)	Pressure (psig)
Superheat	
20	37.0
22	39.1
24	41.3
26	43.6
28	46.0
30	48.4
32	50.9
34	53.5
36	56.2
38	58.9
40	61.7
42	64.6
44	67.6
46	70.7
48	73.8
50	77.1
Sub-cooling	
95	206
100	222
105	239
110	257
115	275
120	294
125	315
130	336
135	358
140	381

Dew Point (Saturated Vapor)

Bubble Point (Saturated Liquid)

3.0 Start-Up / Commissioning

3.1 Operation

For new installations, ensure the unit is ready to operate by going through the completed installation checklist provided with the unit, prior to start-up.

NOTE

Warranty Registration and Start-Up Checklist should be completed during start-up and sent to SATS. This checklist should be used as a guideline for items that need to be checked during start-up.

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

3.2 Step by Step Start-Up Instructions

CAUTION ⚠

For air-cooled outdoor condensers, apply power to condenser eight hours before operating system. This time is required to allow liquid refrigerant to be driven out of the compressor. The compressor crank case heater is energized as long as power is applied to the unit.

1. Replace all equipment, access panels and ceiling panels removed prior to performing start-up checks.
2. Apply power to start the *CeilAiR* OHS system at the service disconnect switch, then turn the A/C system on at the controller.

NOTE

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

3. Ensure that all blowers and fans are rotating freely and without any unusual noise.

   Water/Glycol-cooled units have a head pressure water regulating valve that has been factory set. A valve adjustment may be required based on water temperatures or water/glycol flow conditions at your site. (Refer to System Settings and Adjustments.)

   If you have selected a dual circuit unit, both refrigeration circuits must be tested at start-up. There are several ways to force the second circuit into operation. If a microprocessor controller was purchased it allows the unit to be placed in a manual mode, refer to the separate Controller Operations Manual sent with your unit.
4. Test cooling operation by setting the temperature setpoint below the actual room temperature. The compressor should come on and the discharge air should feel cooler than the return air.
5. Test heating operation by setting the temperature setpoint above the actual room temperature. The source of heat should be energized to increase discharge air temperature.
6. Test humidification operation by creating a demand for humidification. Use an amp meter to determine current draw of the humidifier. Visually check for vapor leaving the steam head or feel if the cylinder is warm to verify if the humidifier is operational. In all cases, 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 room's requirements.
7. Test dehumidification operation by creating a demand for dehumidification. If necessary, set the dehumidification setpoint 10% below actual room conditions, (the set point may already be below actual room conditions, especially at start-up). The chilled water valve should open to begin the dehumidification process. While in this mode, room temperature may decrease and the reheat function may activate. As conditions in the room change, you may have to readjust the setpoint as you check 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 Water Reheat, ensure the control signal has energized the control valve and the temperature of the water has decreased as it passes through the unit. 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

.

3.3 Thermostat Programming

3.3.1 A-Tech-1.1 (See Figure 14)

The A-Tech-1.1 is a programmable thermostat that represents one of the most advanced, solid-state, microcomputer temperature controllers available. The A-Tech-1.1 programmable thermostat provides the user with the following features: single stage cooling/heating control, heat/cool/auto/off modes of operation, continuous/auto fan, day/time clock, setback feature (accomplished through programming) and temperature setpoint override. See control panel for additional features.

The temperature setpoint can be overridden temporarily or for an extended period. It is recommended to run the fan continuously especially during cooling mode to enhance efficiency. The thermostat may also be switched between Celsius and Fahrenheit.

The thermostat allows one program for Monday through Friday and one program for Saturday and Sunday. The thermostat has been programmed from the factory and it is suggested that your personal schedule be programmed. Complete the program schedule chart provided before beginning programming.

NOTE

While programming you must press a button, at least every 15 seconds or the thermostat will revert to the operational mode. If this happens, simply repeatedly press the PROGRAM button until you get back to where you left off. The information you have already entered has been retained.

If it is desired at any time to change the clock, scheduled times and/or temperatures the same procedure is followed as setting.

3.3.1.1 Setting the Current Day and Time

STEP 1 - If you are currently in Daylight Savings Time, Press the DST Button and ◯ will appear in the lower right-hand corner of the display.

STEP 2 - Press and release the CLOCK button. Display will flash **Mo** (Monday) or another day of the week. Press the decrease ▼ or increase ▲ button until the symbol for the current day flashes on the display.

STEP 3 - Press and release the **CLOCK** button again. Display will flash the hour (**12: _ _**) and (**AM**) or (**PM**). Press the decrease ▼ or increase ▲ button until the current hour appears on the display with proper (AM) or (PM) designation.

STEP 4 - Press and release the **CLOCK** button. Display will flash minutes (:00). Press the decrease ▼ or increase ▲ button until current minutes appear on the display.

STEP 5 - Press **CLOCK** button again. Clock is now set and the current time will appear on the display.

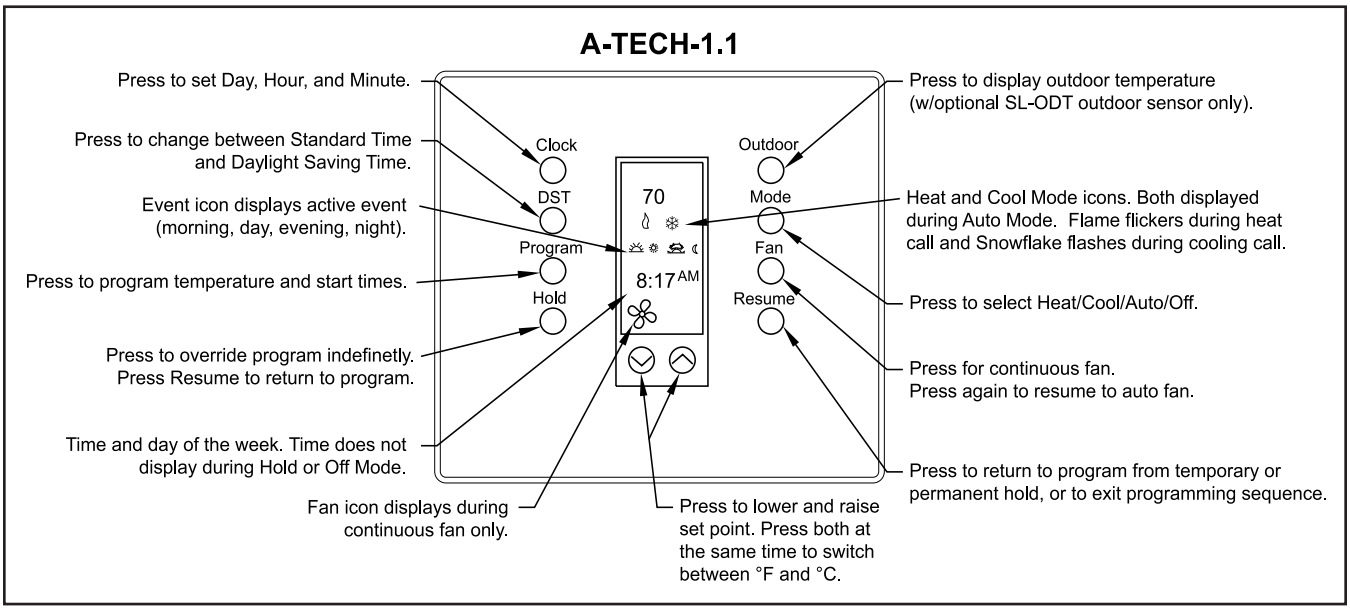


Figure 14. A-Tech-1.1 Control Panel

3.3.1.2 Setback Feature - Setting the Weekday Program Schedule and Heating Temperatures

STEP 1 - Press and release the **MODE** button until the word **HEAT** and the heating symbol appears on the display.

STEP 2 - Press and release the **PROGRAM** button. **Mo Tu We Th Fr** will appear on the display along with the morning symbol and the flashing starting time hour including (**AM**) or (**PM**).

STEP 3 - Press the decrease ▼ or increase ▲ button until the display shows the desired start hour for the morning event.

STEP 4 - Press and release the **PROGRAM** button. The starting minutes will flash.

STEP 5 - Press the decrease ▼ or increase ▲ button until the display shows the desired start minutes. (Start minutes are in 10-minute increments.)

STEP 6 - Press and release the **PROGRAM** button. The current heating temperature will begin to flash.

STEP 7 - Press the decrease ▼ or increase ▲ button until the desired heating temperature is displayed for the morning event.

STEP 8 - Repeat programming steps 2 through 7 for each desired event.

NOTE

You may wish to use only 2 schedules, such as morning and night. To skip through the day and evening schedule, repeatedly press and release the **PROGRAM** button until the night symbol appears then repeat programming steps 2 through 7.

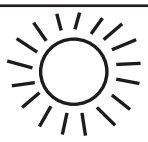
3.3.1.3 Setback Feature - Setting the Weekend Program Schedule and Heating Temperatures

STEP 1 - After setting the night event schedule, press and release the **PROGRAM** button. The display will flash **Sa Su**.

STEP 2 - You may now set the weekend program schedule and heating temperatures by repeating steps 2 through 7 in the weekday schedule.

STEP 3 - When completed with all events, press and release the **RESUME** button to start running the program.

Program Schedule

Event	Thermostat Symbol	Desired Temperature Setting	Time Schedule	
			Monday - Friday	Weekend
Morning		Heat = Cool =		
Day		Heat = Cool =		
Evening		Heat = Cool =		
Night		Heat = Cool =		

3.3.1.4 Setback Feature - Setting the Weekday and Weekend Cooling Temperatures

Since the programmed time schedules are the same for both heating and cooling, you only need to set the cooling temperatures providing you have already programmed the weekday and weekend heating schedules.

The cooling temperature must be set at least two degrees higher than the heating temperature. Example: if the heating temperature has been set at 70°F the cooling, temperature must be set at 72°F or higher. If you attempt to set the cooling temperature closer than two degrees above the heating temperature, the thermostat will automatically maintain a two-degree separation between heating and cooling, thus lowering the heating temperature.

STEP 1 - Press and release the **MODE** button until the cooling symbol ❄ appears on the display.

STEP 2 - Press and release the **PROGRAM** button. **Mo Tu We Th Fr** along with the morning symbol and the flashing starting time will appear on the display.

STEP 3 - Press and release the **PROGRAM** button repeatedly until the temperature flashes.

STEP 4 - Press the decrease ▼ or increase ▲ button until the desired cooling temperature is displayed for the morning event.

STEP 5 - Repeat steps 2 through 4 for each desired event.

(Day , Evening , Night)

STEP 6 - After setting the cooling temperature for the weekday night event, press and release the **PROGRAM** button until **Sa Su** along with the morning event symbol and the flashing time appears on the display.

STEP 7 - Repeat steps 2 through 4 for each desired event.

(Day , Evening , Night)

STEP 8 - When the last scheduled weekend cooling temperature is set, press and release the **RESUME** button to start running the program.

3.3.1.5 Reviewing Scheduled Times and Temperatures

To review your programming schedules, press and release the **MODE** button to advance to desired mode (heating or cooling). Repeatedly press and release the **PROGRAM** button. Each scheduled event is displayed starting with the weekday start times and temperatures and ends with the weekend start times and temperatures. When your review is complete, press and release the **RESUME** button.

3.3.1.6 Temperature Override

3.3.1.6.1 Temporarily Override the Set Temperature

Press and hold the decrease ▼ or increase ▲ button to change the room set point temperature in 1-degree increments. The new set point temperature will be held for three hours, then the thermostat will automatically return to the program.

3.3.1.6.2 Hold a New Temperature Set Point

Press and hold the decrease ▼ or increase ▲ button to change the room set point temperature in 1-degree increments. The new set point temperature can be maintained indefinitely by pressing and releasing the **HOLD** button. The word **HOLD** will be displayed. The thermostat will maintain the new set point until the **RESUME** button is pressed returning the thermostat to the original program.

3.3.1.7 Change Between °F and °C

The thermostat has the capability of displaying either Celsius or Fahrenheit temperatures. Simultaneously press the decrease ▼ and increase ▲ button to switch between Celsius and Fahrenheit

3.3.1.8 Continuous Auto/Fan

At any time the system fan may be set to run continuously by pressing the **FAN** button. The fan symbol will appear at the lower part of the display indicating the fan is continuously operating. To return the fan to normal operating mode, press the **FAN** button again, which will remove the fan symbol from the display.

3.3.2 A-Tech-1.2 (See Figure 15)

The A-Tech-1.2 is a programmable thermostat that represents one of the most advanced, solid-state, microcomputer temperature controllers available. The A-Tech-1.2 programmable thermostat provides the user with the following features: dual stage cooling/heating control, heat/cool/auto/off modes of operation, continuous/auto fan, day/time clock, setback feature (accomplished through programming) and temperature setpoint override. See control panel for additional features.

The temperature setpoint can be overridden temporarily or for an extended period. It is also recommended to run the fan continuously especially during cooling mode to enhance efficiency. The thermostat may also be switched between Celsius and Fahrenheit.

The A-Tech-1.2 thermostat is programmed in the same way as the A-Tech-1.1. It has an additional enhanced feature besides dual stage control. The A-Tech-1.2 allows a different program for each day of the week. The thermostat has been programmed from the factory and it is suggested that your personal schedule be programmed. It can be programmed for either a two events per day (Day and Night, only) or four. It is factory programmed for four events. If a two-day event is desired during installation, the correct No.1 dip switch selection must be made. Complete the program schedule chart provided before beginning programming.

NOTE

While programming you must press a button, at least every 15 seconds or the thermostat will revert to the operational mode. If this happens, simply repeatedly press the PROGRAM button until you get back to where you left off. The information you have already entered has been retained.

If it is desired at any time to change the clock, scheduled times and/or temperatures the same procedure is followed as setting.

NOTE

It is suggested that you set your desired program times one hour before the time that you will actually require the space to reach the desired temperature. If you want the space to be a certain temperature by 7:00 am, set the morning temperature for 6:00 am.

3.3.2.1 Setting the Current Day and Time

STEP 1 - Press and release the **CLOCK** button. Display will flash **Mo** (Monday) or another day of the week. Press the decrease ▼ or increase ▲ button until the symbol for the current day flashes on the display.

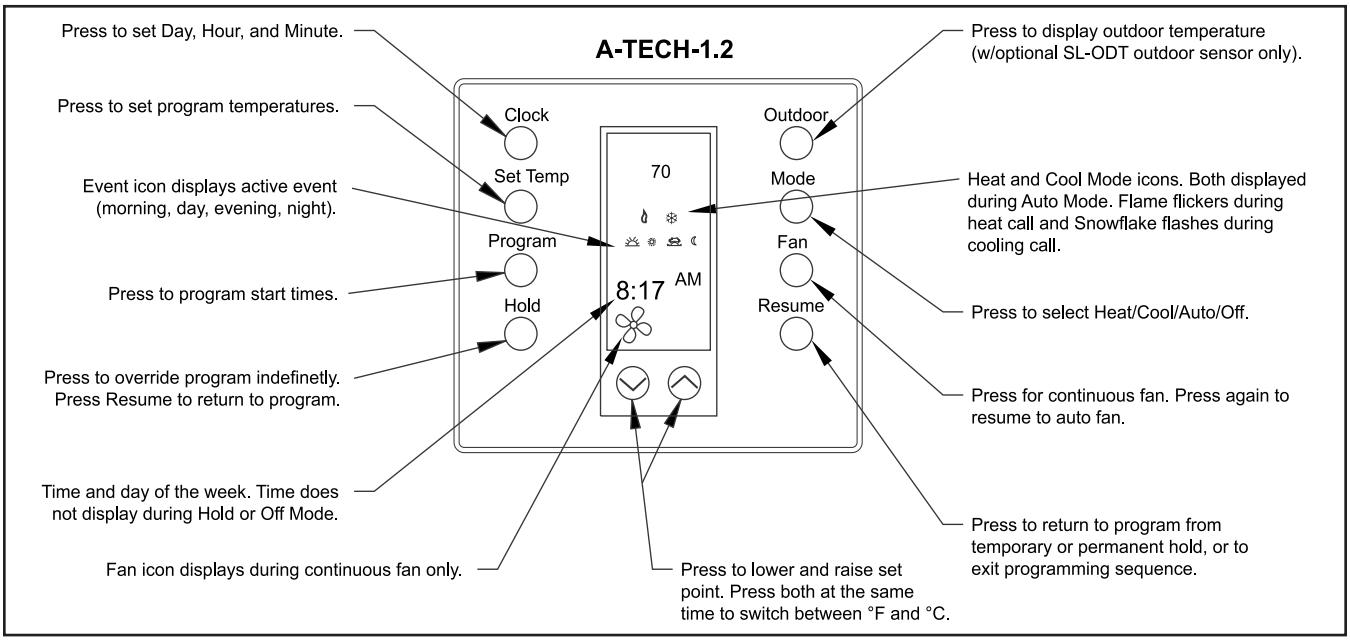


Figure 15. A-Tech-1.2 Control Panel

STEP 2 - Press and release the **CLOCK** button again. Display will flash the hour (**12: _ _**) and (**AM**) or (**PM**). Press the decrease ▼ or increase ▲ button until the current hour appears on the display with proper (**AM**) or (PM) designation.

STEP 3 - Press and release the **CLOCK** button. Display will flash minutes (**:00**). Press the decrease ▼ or increase ▲ button until current minutes appear on the display.

STEP 4 - Press **CLOCK** button again. Clock is now set and the current time will appear on the display.

3.3.2.2 Setback Feature - Setting the Program Times

STEP 1 - Press and release the **PROGRAM** button. **Mo** or current day will flash on display along with either the morning or the day event symbol.

STEP 2 - Press the decrease ▼ or increase ▲ button until the display shows the day of the week you wish to start programming.

STEP 3 - Press and release the **PROGRAM** button. The hour (**12: _ _**) and (**AM**) or (**PM**) will flash. Press the decrease ▼ or increase ▲ button until the display shows the desired start hour for event.

STEP 4 - Press and release the **PROGRAM** button. The minutes (:00) will flash. Press the decrease ▼ or increase ▲ button until the display shows the desired start minutes for event (program times are set in 10 minute increments).

STEP 5 - Press and release the **PROGRAM** button. The next event of the day will appear and the hour and (**AM**) or (**PM**) will flash.

STEP 6 - Repeat steps 2 through 4 for each event of the day. (Number of events determined during utility connection.)

STEP 7 - Press and release the **PROGRAM** button. The word **COPY** and the day just programmed will appear on the display. If the schedule is the same for consecutive days, press the decrease ▼ or increase ▲ button to add days to the display. (This prevents having to program same times repeatedly or continue to step 8 to program the next day.)

STEP 8 - Press and release the **PROGRAM** button to continue to the next day to be programmed. Repeat steps 2 through 6 for each day.

3.3.2.3 Setting Heating Temperatures

STEP 1 - Press and release the **MODE** button until the word **HEAT** and the heating symbol and either morning or the day event symbol appears on the display.

STEP 2 - Press and release **SET TEMP** button. The event symbol (morning or day) along with a flashing temperature will appear on display.

STEP 3 - Press the decrease ▼ or increase ▲ button until the display shows the desired temperature for the event displayed. Then press and release **SET TEMP** button.

STEP 4 - Repeat steps 2 and 3 for each event.

3.3.2.4 Setting Cooling Temperatures

The cooling temperature must be set at least two degrees higher than the heating temperature. Example: if the heating temperature has been set at 70°F, the cooling temperature must be set at 72°F or higher. If you attempt to set the cooling temperature closer than two degrees above the heating temperature, the thermostat will automatically maintain a two-degree separation between heating and cooling, thus lowering the heating temperature.

Setting the cooling temperatures is identical to setting heating temperatures except in **STEP 1** the word **COOL** and the cooling symbol R needs to appear on the display along with event of the day.

3.3.2.5 Reviewing the Scheduled Times

To review your programmed schedules, repeatedly press the **PROGRAM** button. Each scheduled event will be displayed, starting with the temperature, day, hour and minute for each day of the week. When your review is complete, simply press and release the **RESUME** button.

3.3.2.6 Reviewing Your Programmed Temperatures

To review your programmed temperatures, repeatedly press the **SET TEMP** button. The display will start flashing and change each time the button is pressed to show the Mode, Event and the Temperature selected.

Program Schedule								
Event	Thermostat Symbol	Desired Temperature Setting	Time Schedule					
			Mo	Tu	We	Th	Fr	Sa	Su
Morning		heat = Cool =							
Day		heat = Cool =							
Evening		heat = Cool =							
Night		heat = Cool =							

3.3.2.7 Temperature Override

3.3.2.7.1 Temporarily Override the Set Temperature

Press and hold the decrease ▼ or increase ▲ button to change the room set point temperature in 1-degree increments. The new set point temperature will be held for three hours, then the thermostat will automatically return to the program.

3.3.2.7.2 Hold a New Temperature Set Point

Press and hold the decrease ▼ or increase ▲ button to change the room set point temperature in 1-degree increments. The new set point temperature can be maintained indefinitely by pressing and releasing the **HOLD** button. The word **HOLD** will be displayed. The thermostat will maintain the new set point until the **RESUME** button is pressed returning the thermostat to the original program.

3.3.2.8 Change Between °F and °C

The thermostat has the capability of displaying either Celsius or Fahrenheit temperatures. Simultaneously press the decrease ▼ and increase ▲ button to switch between Celsius and Fahrenheit.

3.3.2.9 Continuous Auto/Fan

At any time the system fan may be set to run continuously by pressing the **FAN** button. The fan symbol will appear at the lower part of the display indicating the fan is continuously operating. To return the fan to normal operating mode, press the **FAN** button again, which will remove the fan symbol from the display.

3.3.3 Advanced E² Controller

If the advanced *E*² controller is selected, it is factory programmed based on the optional features selected. Most applications require no field start-up or program adjustment beyond setting the current date and time. Separate operating instructions for the controller have been sent with your unit, including each feature's factory "default" setting and the available adjustment range, if applicable.

4.0 Maintenance

4.1 Periodic General Maintenance

Systematic, periodic general maintenance of the CeilAiR unit is recommended 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 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 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 the SATS Product Support Group. Ensure to adhere to all safety statements while performing any type of maintenance.

WARNING

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

WARNING

Turn off power to unit at the service disconnect switch unless you are performing tests that require power. With power and controls energized, unit could begin operating automatically at any time.

Hazardous voltage will still be present at evaporator, condenser, heat/reheat and humidifier, even with the unit turned off at the control panel. To isolate unit for maintenance, turn off power at non-fused service switch.

Always disconnect main power prior to performing any service or repairs. To prevent personal injury, stay clear of rotating components because automatic controls may start them unexpectedly.

WARNING

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

WARNING

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

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

4.1.1 Precision A/C Unit

4.1.1.1 Filter

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

NOTE

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

4.1.1.2 Blower

The blower motor is provided with permanently lubricated bearings and should not require lubrication for the lifetime of the equipment. Periodic checks of the blower system should include checking the wiring, blower motor mounts, housing bolts and blower wheel. Ensure all electrical connections are tight. Check that all mounts are secure and the blower wheel is tightly mounted on the shaft and does not rub against the fan housing. The blower vanes should be kept free of debris.

4.1.1.3 Coils

The coil(s) should be inspected semi-annually and cleaned as required following standard coil cleaning practices. Using a brush, clean fluid 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 if necessary. Check all piping for signs of leaks.

Inspect electric heating elements to ensure they are free of debris semiannually.

4.1.1.4 Drain Pan

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

4.1.1.5 Condensate Pump

The optional condensate pump should be inspected semiannually 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.

4.1.1.6 Humidifier

The optional humidifier's steam cylinder has a limited lifetime and must be replaced periodically. Because water conditions and humidifier usage rates vary greatly, it is difficult to establish intervals for changing the cylinder. Individual maintenance schedules must be determined for each location, based upon periodic examination of the humidifier. A change cylinder light on the humidifier cabinet will illuminate (red) when the cylinder requires replacement.

NOTE

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

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

4.1.2 Condensing Unit

Maintenance access to the condensing unit is through one or two removable panels (depending on model). Clean the air-cooled 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 and coolant lines for signs of leaks.

CAUTION ⚠

The compressor crank case 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 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. Keep hands, clothing and tools clear of the electrical terminals and rotating components. Equipment located in the ceiling can pose unusual difficulties. Ensure that your footing is stable at all times.

SYMPTOM	PROBABLE CAUSE	RECOMMENDATION
Suction Pressure Too Low	a. Loss of refrigerant (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.
Chilled Water Valve Fails to Open or Close	a. Thermostat set too high.	Adjust to correct temperature setting.
	b. No control power to the chilled water 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.

SYMPTOM	PROBABLE CAUSE	RECOMMENDATION
Evaporator Coil Ices (Cont.)		2. Check for and clear any obstructions across or in the (supply) discharge airstream.
		3. Check correct rotation of evaporator blower.
	b. Temperature setting too low (68°F min.).	Increase temperature setpoint.
	c. Discharge air short cycling back to return.	Check discharge grille orientation.
	d. Low refrigerant charge.	Find leak, repair and recharge system.
Blower Fails to Start	a. Power failure.	Check main voltage power source input cable.
	b. Control transformer circuit breaker tripped.	Check for short circuit or ground fault; if none, reset circuit breaker.
	c. Defective contactor.	Repair or replace.
	d. Condensate switch open.	1. Ensure unit is level.
		2. Check that condensate pan is draining properly. Clear obstructions.
	e. Thermal overload tripped.	Reset overload and check amperage of motor. Compare to setting on overload and adjust to FLA. All direct-drive motors are internally protected and do not require overload.
Control is Erratic	Wiring - improperly connected or broken	Check wiring against schematic diagram.
Condenser Pressure too High	a. Non-condensable gas or air in the system.	Recover system and recharge. Install new drier/strainer.
	b. Condenser air intake is blocked.	Remove debris and clean condenser.
	c. Overcharge of refrigerant.	Reclaim excess refrigerant from system.
	d. Low water flow to water-cooled condenser.	Reset-determine cause and fix.
	e. Condenser fan not operating.	Check pressure/temperature operating switches and motor. Replace as needed.
	f. Water/glycol temperature too high.	Check flow and operation of drycooler.
	g. Condenser pressure regulating valve setting too high.	Adjust to obtain correct pressure.
	h. Flow of water/glycol too low.	1. Check glycol solution level and concentration.

SYMPTOM	PROBABLE CAUSE	RECOMMENDATION
Condenser Pressure Too High (Cont.)		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. Water regulating valve adjusted too low.	Readjust to 240-250 psig.
Noisy Compressor	a. Expansion valve stuck in open position (abnormally cold suction line).	Ensure feeder bulb is tight on suction line. Check operation and superheat.
	b. Broken compressor valve (compressor knocking, suction pressure rises faster than 2lbs/min after shutdown).	Replace compressor.
	c. Worn or scarred compressor bearings.	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. Thermostat set too high.	Adjust to desired temperature.
	b. Compressor internal 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.
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. and evaporator coil.	Check belt tension, filters.

SYMPTOM	PROBABLE CAUSE	RECOMMENDATION
Compressor Short Cycles	a. Low line voltage causing compressor to overheat.	Check power source for cause oflow line voltage.
	b. Dirty or iced over evaporator coil.	Defrost and/or clean coil.
	c. Reduced airflow. (when applicable).	Check filter and belt tension.
	d. Lack of refrigerant.	Check for leak. Repair and recharge system.
	e. Short cycling of conditioned air.	1. Supply and/or return grilles are incorrectly oriented. Re-orient.
		2. Supply and return grilles are too close together. Move further apart.
		3. Insufficient heat load. Add temporary heat load to compensate.
	f. Thermostat is improperly located.	Check for supply registers that may be too close to thermostat. Relocate if necessary.
Heater Inoperative	a. Fuses blown.	Check for short circuit, replace fuse.
	b. Thermostat set too low.	Increase temperature setpoint.
	c. Overheat switch open.	Insufficient airflow across heater elements. Check for dirty filters or obstructions that may reduce air flow. Correct or replace as needed.
	d. Fuse link blown.	Replace fuse link (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. Electrical connections are loose.	Tighten electrical connections.
	c. Humidifier fuses are blown.	Check for over current by the humidifier electrodes. Drain water from tank and refill. Replace fuses.
	d. Relative humidity is above set point.	Adjust humidistat setpoint.
	e. Electrode canister change cylinder light is on.	1. Consult humidifier manual.
		2. Water conductivity is too low and water is at the top of the cylinder (see next item).
	f. Water conductivity is too low.	Add a teaspoon of table salt to the water through the top of the cylinder. Typically only required on initial start-up.

4.3 Field Service

NOTE

Do not attempt to make repairs without the proper tools.

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

1. Ensure all electrical connections are tight.

2. Check all fuses, contacts and wiring. Contactors should be replaced if contacts are worn or pitted.

4.3.1 Leak Detection

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

NOTE

Halogen leak detectors are inefective with R407C refrigerant because unlike R22 refrigerant, R407C does not contain chlorine.

4.3.2 Leak Repair

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

4.3.3 Refrigerant Piping

When replacing components within the cabinet of the unit the following consumable materials are recommended. Use Silfos alloy for copper-to-copper (piping discharge or suction line repairs). Silver solder (Stay-Silv #45) and flux are to be used on copper-to-brass or copper-to-steel repairs. For liquid line repairs at the drier, strainer, sight glass, or expansion valve, use a 95 % tin to 5 % antimony solder with flux.

When component replacement is complete, remove all traces of flux. After any repair, pressure check the system to check for 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 ensure 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 quite 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 oil varies 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.

All electrical connections should be checked to be sure that they are tight and properly made. Check all fuses, contactors and wiring. The contactor 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 section 4.3.4.3 (Burn-Out/Acidic Cleanup) for the proper procedure.

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

CAUTION ⚠

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.

CAUTION ⚠

POE oil is used in systems with R-407C refrigerant. If a replacement compressor is provided, ensure that it is filled with POE oil before installing.

4.3.4.2 Standard Cleanout Procedure

CAUTION ⚠

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

NOTE

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

1. Turn off power to 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

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

1. If your unit is equipped with an E² controller, 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. Remove the cover from the electric box.
4. Fashion a jumper wire and install it across the terminals on the Air Flow Switch (F40).
5. Using a pair of vise grips, turn the shaft of the main power switch to the On position to provide power for the humidifier drain solenoid.
6. Drain the cylinder by pushing the “On-Off-Drain” switch to the “Drain” position.

7. After the cylinder has drained, push the “On-Off-Drain” switch to the “Off” position.

CAUTION ⚠

Do not leave the “On-Off-Drain” switch in the “Drain” position for longer than 10 minutes or the drain solenoid could burn out.

8. Remove the jumper wire from the Air Flow switch and turn the main power disconnect switch Off to disconnect power from the humidifier.
9. The power wires to the cylinder are attached by cylinder plugs to the electrode pins on top of the cylinder. Pull these plugs vertically off the pins.

CAUTION ⚠

The cylinder and steam hose may be hot and burns may result.

10. Loosen the steam hose clamp(s) and pull the steam hose off vertically.
11. Using a flathead screwdriver, press the tab on the cable tie to release it. Lift the cylinder straight up to disengage it from the humidifier.
12. Place the new cylinder on the side mounting slots within the unit, ensuring the cylinder mounting stubs are seated properly.
13. Replace the cylinder plugs on the pins, ensuring the white sensor plug goes on the single pin, which is offset from the others.
14. Ensure the plugs are secured on the pins. If the plugs are loose, they may be temporarily squeezed together, however, the plugs must be replaced since a loose plug could generate enough heat to melt and destroy the plug.
15. Replace the steam hose and tighten the clamp(s).
16. Push the “On-Off-Drain” switch to the “On” position.
17. Replace the cover on the electric box and turn the main power disconnect switch to the On position.
18. Turn on the water supply to the humidifier.
19. If your unit is equipped with an E² controller, turn the A/C unit On by pressing the Enter key.
20. Readjust the humidity to the desired setpoint.

If the humidifier is to be shut down for an extended period, always drain the cylinder first. Follow the above steps (1 through 8 ensuring the “On-Off-Drain” switch is in the Off position. Failure to do this will drastically shorten the cylinder life.

4.3.4.5 Filter Replacement

The filters are located either internal or external to the cabinet depending on the configuration of the unit. Regardless of location, the filter is accessed through an access panel, which is labeled “FILTER ACCESS”. Remove access panel and old filter. Ensuring directional airflow arrows on filter are correct, insert new filter and replace the access panel.

5.0 Product Support

SATS 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

5.1 Technical Support

The SATS 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
- SATS Sales Order Number
- SATS Item Number
- Unit Serial Number
- Description of Problem

5.2 Obtaining Warranty Parts

Warranty inquires 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 SATS 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 SATS 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
- SATS Stated Part Price
- Customer Billing Address
- Shipping Address
- Customer's Telephone and Fax Numbers
- Contact Name
- Unit Model No., Serial No. & SATS Item No.

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

When returning defective part(s) complete the Return Material Authorization Tag and the address label received with the replacement part.

See the SATS Standard Warranty located in section one of this manual.

5.3 Obtaining Spare/Replacement Parts

Spare and replacement parts requests are to be made through Product Support by fax (301) 620-1396, telephone (240) 529-1399 or E-mail (parts@stulz-ats.com). Quotes are given for specified listed parts for a specific unit.

SATS accepts Visa and MasterCard. SATS 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 SATS 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.

NOTES

Telephone: (301) 620-2033
Facsimile: (301) 620-1396

Appendix A - Forms

Checklist for Completed Installation

- ❑ 1 Proper clearances for service access have been maintained around equipment.
- ❑ 2 Equipment is level and mounting fasteners (if applicable) are tight.
- ❑ 3 Piping completed to refrigerant or coolant loop (if required).
- ❑ 4 All field installed piping leak tested.
- ❑ 5 Refrigerant charge added (if required).
- ❑ 6 Condensate pump installed (if required).
- ❑ 7 Condensate drain line connected.
- ❑ 8 Water supply line connected to humidifier. If a manual cut-off valve is installed, open valve.
- ❑ 9 Humidifier “On/Off/Auto/Drain” switch is in the “Auto” position.
- ❑ 10 Safety pan installed under ceiling mounted equipment (if required).
- ❑ 11 Filter box installed (if required).
- ❑ 12 Filter (s) installed (if required).
- ❑ 13 Duct work completed or optional plenum installed (if required).
- ❑ 14 Incoming line voltage matches equipment nominal nameplated rating ± tolerances.
- ❑ 15 Main power wiring connections to the equipment, including earth ground, have been properly installed.
- ❑ 16 Customer supplied main power circuit breaker (HACR) type or fuses have proper ratings for equipment installed.
- ❑ 17 All wiring connections are tight.
- ❑ 18 Control wiring connections completed to evaporator unit and condenser/condensing unit (if required), including wiring to wall mounted control panel and optional controls.
- ❑ 19 Foreign materials have been removed from inside and around all equipment installed (shipping materials, construction materials, tools, etc.).
- ❑ 20 Fans and blowers rotate freely by hand without unusual noise.
- ❑ 21 Inspect all piping connections for leaks during initial operation.

STULZ
Air Technology Systems, Inc.
Frederick, Maryland USA 21704
Telephone: (301) 620-2033
Facsimile: (301) 620-1396

OHS Series Precision Air Conditioner

Periodic General Maintenance Checks and Services Checklist

Date: _____ Prepared By: _____

Model Number: _____ Serial Number: _____

Item Number: _____

Monthly

Filters
- ❑ Cleanliness
- ❑ No Obstructions

Blower Section
- ❑ Blower Turns
- ❑ Belts (if applicable)

Condensate Drain
- ❑ Drain is Open
- ❑ Condensate Pan Safety Switches Operate Freely

Miscellaneous
- ❑ Check Glycol or Chilled water for Air (bleed as required)
- ❑ External Heat Exchanger Clean and Clear of Obstructions
- ❑ Humidifier Cylinder and Controls Operate Properly

Semi-Annually

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

Annually

Refrigerant Systems
- ❑ Inspect Glycol System for Leaks and Corrosion
- ❑ Conduct a Complete Check of All Services Listed Above and Clean Unit's Interior

Chilled Water Systems
- ❑ Inspect Chilled Water System for Leaks and Corrosion
- ❑ Conduct a Complete Check of All Services Listed Above and Clean Unit's Interior

Notes:

_____

_____

_____

_____

Signature:_____

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

Appendix B – Glossary

Definition of Terms and Acronyms

SATS - Stulz Air Technology Systems, Inc.
BTU/Hr - British Thermal Units Per Hour
CFM - Cubic Feet Per Minute
CNDCT - Conductor
ESD - Electrostatic Discharge
º F - Degrees Fahrenheit
FLA - Full Load Amps
FOB - Freight on Board
HACR - Heating, Air Conditioning, Refrigeration
HP - Horse Power
Hz - Hertz
IAQ - Indoor Air Quality
in. w.g. - Inches of Water Gauge
KVA - Kilo Volt Amp
kW - Kilowatts
LRA - Locked Rotor Amps
MAX FUSE - Maximum Fuse
MCA - Minimum Circuit Ampacity
MSDS - Material Safety Data Sheet
NEC - National Electric Code
NFPA - National Fire Protection Agency
PH - Phase
PSI - Pounds Per Square Inch
psig - Pounds Per Square Inch Gauge
RLA - Rated Load Amps
R-Value - Thermal Resistance
R410A - Blended Refrigerant
SPDT - Single Pole, Double Throw
TEV - Thermal Expansion Valve
V - Volt
VAC - Volt, Alternating Current

Globally close to you

Stulz-ATS, located in Frederick, MD USA, is part of The STULZ Group with headquarters in Hamburg, Germany and production facilities world wide. Our network of manufacturer's representatives and sales partners span the globe, providing innovative solutions to your unique environmental control needs.

www.stulz-ats.com

STULZ
Air Technology Systems, Inc.

Stulz Air Technology Systems, Inc.
1572 Tilco Drive, Frederick, Maryland 21704
Phone: (301) 620-2033, Fax: (301) 662-5487
Email: info@stulz-ats.com
www.stulz-ats.com

ISO-9001 Quality Registered

OCH0006-B; March, 2012
OHS Series Installation, Operation & Maintenance 03/11- Specifications are subject to change without notice.