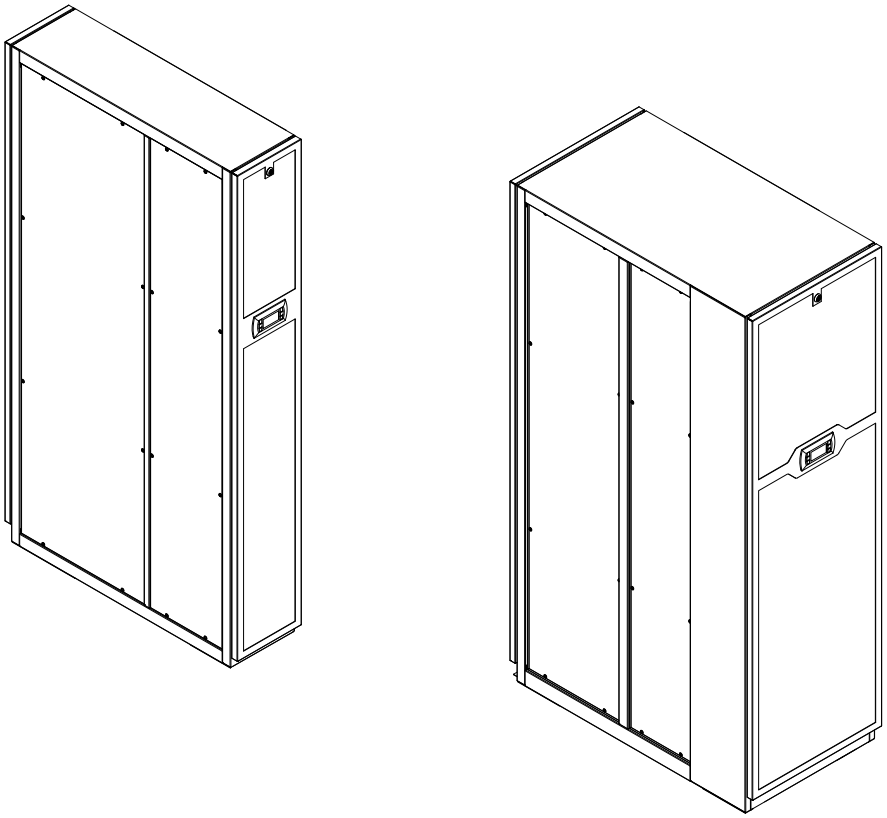

Indoor Cooling

Row

# STULZ CyberRow®

## Data Center Cooling System

Chilled Water
Row Based Data Center Cooling System

IOM Installation, Operation & Maintenance

STULZ®

# MODEL NOMENCLATURE

## CRS-090-C

**CRS = CyberRow System**

**Nominal Capacity in 1,000's of BTU Hrs**

**C = Chilled Water**
G = Glycol Cooled DX
W = Water Cooled DX
AR = Air Cooled DX

### Notice



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

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# 1.0 INTRODUCTION

## 1.1 General

The CyberRow precision air conditioning system covered by this manual is designed and manufactured by STULZ Air Technology Systems, Inc. (STULZ) and uses the latest, state-of-the-art control technology. Recognized as a world leader, STULZ provides air conditioning systems using the finest materials available in the industry. The unit will provide years of trouble free service if installed and maintained in accordance with this manual. Damage to the unit from improper installation, operation or maintenance is not covered by the warranty.

STUDY the instructions contained in this manual. They must be followed to avoid difficulties. Spare parts are available from STULZ to insure continuous operation. Using substitute parts or bypassing electrical or refrigeration components in order to continue operation is not recommended and will VOID THE WARRANTY. Due to technical advancements, components are subject to change without notice.

All STULZ CyberRow systems are designed to be installed indoors.

## 1.2 Product Description

STULZ CyberRow systems are available in Chilled Water cooled, DX-Water/Glycol cooled or DX-Air Cooled configurations. DX CyberRow systems are designed to operate with R410A refrigerant.

CyberRow cabinets are available in two sizes, 12" wide and 24" wide. The cooling capacity in BTU/Hr will depend on the cabinet size and the cooling configuration. Refer to the unit nameplate to identify which cooling configuration is used with your system.

**NOTE**

STULZ CyberRow systems have been designed to capture and neutralize heat within close-coupled rack-based environments. Any use beyond what is described in this manual is deemed to be not intended. STULZ is not liable for any damage resulting from improper use.

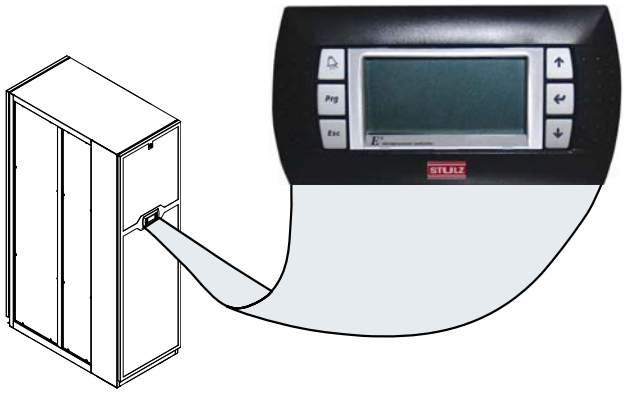
The functional modes of operation are cooling and dehumidification which provides localized cooling to offset hot spots in data centers.

The CyberRow system captures high temperature (hot aisle) discharge air from adjacent rack-based IT equipment and reintroduces it as conditioned air through the front of the unit (cold aisle).

The system is equipped with highly reliable EC (Electronically Commutated) fans which offer considerable energy cost savings and long life. Using an electronically commutated permanent magnet DC motor, AC inverter whine is eliminated. Fan speed is continuously adjustable via a signal from the system controller without the use of VFD's. EC fans offer energy efficient, quiet, low vibration operation.

An advanced ***E²*** series microprocessor controller is mounted inside the CyberRow electric box. The controller provides the following features: input/output monitoring status, full integrated control of cooling and dehumidification, multi-unit control and remote communication with a Building Management System (BMS). The controller may interface directly to a BMS, allowing the ability to monitor the performance of the air conditioner and adjust operating parameters.

The ***E²*** user interface display panel is typically factory mounted on the front access panel of the unit.



Refer to Section 4.0 for detailed instructions on operating the system controller.

## 1.3 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 Product Support Network Factory Warranty Inspection/Start-Up is not performed. Warranty initiation requires factory Start-Up sheets to be submitted to Product Support. Product Support initiates warranty once factory Start-Up sheets have been validated.**

**The 24 Month Precision A/C Upgraded Limited Warranty applies when Product Support Network Factory Authorized Warranty Inspection/Start-Up is performed and is validated by Product Support.**

The 12 Month Precision A/C Limited Warranty, provided by STULZ Air Technology Systems, Inc. warrants your purchase to be free from defects in material and workmanship once required Start-Up documentation has been received and validated by Product Support. STULZ' obligation under this warranty is to repair or replace, at its option, any parts which are determined by STULZ to be defective for a period of 12 months from the date of shipment.

The 24 Month Precision A/C, Upgraded Limited Warranty, provided by STULZ Air Technology Systems, Inc. warrants your purchase to be free from defects in material and workmanship once required Factory Warranty Inspection/Start-Up has been performed and all Warranty Inspection/Start-up documentation has been received and validated by Product Support. The Upgraded Limited Warranty includes a 90 Day Labor Warranty from date of Authorized Start-up by local Product Support Network partners in coverage areas. STULZ Precision Cooling equipment STULZ' obligation under this warranty is to repair or replace, at its option, any part or parts which are determined by STULZ to be defective for a period of 24 months from the date of Factory Authorized Start-up.

Parts repaired or replaced by STULZ under these limited warranties are shipped FOB Factory ground, and are warranted for the balance of the original warranty period or for 90 days from the date of installation, whichever is greater. STULZ reserves the right to provide factory refurbished parts for replacement purposes. If no Factory Start-up documentation is received by Product Support within 180 days from the original date of shipment, all claims to an equipment warranty will terminate on the 181st day from shipment.

A Gap Warranty may be purchased from STULZ to preserve warranty if periods of extended storage in a conditioned facility are required or if Factory Start-up is delayed beyond 180 Days from shipment.

This STULZ limited warranties do not include diagnostics, travel, labor, circuit breaker resetting, refrigerant, service and maintenance items, consumables including belts, filters, humidifier canisters or any other expense required to replace the defective component and bring the unit back to a working status.

This STULZ limited warranties do not cover damage, failures or defects caused by improper or unconditioned storage, improper installation, abuse, misuse, alteration, misapplication, improper or lack of maintenance, negligence, accident, normal deterioration (including wear and tear), corrosive environment or water loops, damage to people, property or equipment not suitably protected from leakage or malfunction, incorrect or improper electrical connections, poor power quality, use of improper parts or unauthorized 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 and required Warranty Inspection/Start-up documentation is received and validated by Product Support. This warranty is non-transferrable or assignable without written permission of STULZ.

STULZ does not control installation, application, and operation of STULZ products. STULZ does not represent this warranty to be a WARRANTY OF PERFORMANCE or WARRANTY OF SUITABILITY

**State of Maryland governs this statement of warranty. All disputes related to any warranty claim must be brought in a state or federal court in Maryland.**

THIS FOREGOING SHALL CONSTITUTE STULZ' ENTIRE LIABILITY AND YOUR EXCLUSIVE REMEDY. IN NO EVENT SHALL STULZ 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. C; 11/11/13

## 1.4 Safety

### 1.4.1 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.

### 1.4.2 Safety Summary

The following statements are general guidelines followed by warnings and cautions applicable throughout the manual.

**CAUTION** ⚠

Prior to performing any installation, operation, maintenance or troubleshooting procedure, read and understand all instructions, recommendations and guidelines contained within this manual.

**CAUTION** ⚠

All maintenance and/or repairs must be performed by a journeyman, refrigeration mechanic or an air conditioning technician.

**CAUTION** ⚠

The unit must be kept in its normal installed position. If the unit is not kept level and vertical, damage may result.

**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** ⚠

Tipping Danger. Keep the shipping support brackets attached to the front and rear of the cabinet after removing the CyberRow unit from the skid. These must remain in place to prevent the unit from tipping over when moving and positioning the cabinet. It is safe to remove the shipping brackets when a server rack is installed on each side of the cabinet.

**CAUTION** ⚠

Position someone on each side of the cabinet to stop it from tipping over if the shipping brackets must be removed before installing the server racks on each side.

**WARNING**

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

**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.

**WARNING**

Always turn off the service disconnect switch and 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.

## WARNING

This unit is fed by incoming power wires. Even with the service disconnect switch in the "Off" position, power may still be "live" between the switch and the main power source. When performing service, always ensure main power is disconnected from the unit.

## CAUTION

Equipment may contain components subject to Electrostatic Discharge (ESD). Before attempting to mount or service these electronic devices, ensure you have no charge built up by touching a ground source. When possible, use a wrist-grounding strap when working on or near electronic devices.

## CAUTION

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

## WARNING

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.

## 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

The air-intake and discharge areas must be free of obstructions. Ensure access panels are secure and latched into position.

## CAUTION

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

## CAUTION

Chilled water cooling coils (and associated piping circuits) are pressurized with a dry nitrogen holding charge 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

After interconnecting piping is installed, the piping system must be cleaned before allowing coolant to flow through the system. Failure to do so will result in equipment problems.

## CAUTION

When filling the chilled water loop, all air must be bled from the piping system.

## WARNING

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

## 1.5 General Design

The STULZ CyberRow unit is housed in a steel frame cabinet rated for indoor use. The exterior of the cabinet is coated with a powder coat finish to protect against corrosion. Removable access panels are located on the front and rear of the cabinet for easy access to all components. Operator controls are conveniently located on the front of the cabinet.

**NOTE**

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

Figure 1 depicts a typical internal layout of a 12" CW CyberRow unit and identifies the major components. Figure 2 depicts a typical internal layout of a 24" CyberRow unit and identifies the major components. The location of some components may vary.

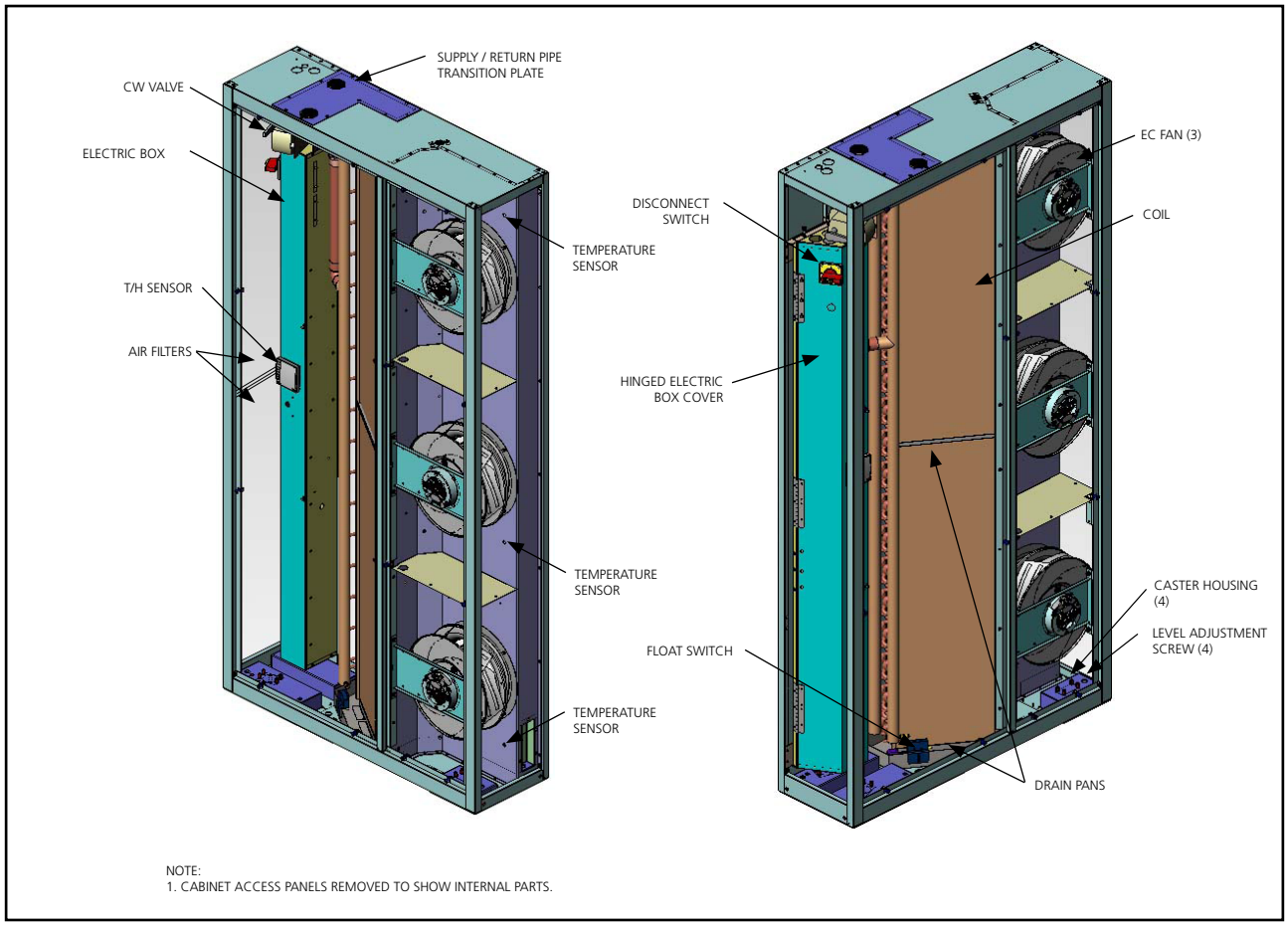



**Figure 1- Typical Internal Layout- CRS-090-C**

### 1.5.1 Electrical Compartment

The electrical components are protected inside an electric box located behind the rear access panel. The electric box cover is safety interlocked with the service disconnect switch (See Figures 1 & 2) preventing the cover from being opened when the switch in the On position. The switch must be turned Off to gain access to the electrical compartment.

The service disconnect switch may be used to turn the unit off for emergency shutdown or when routine

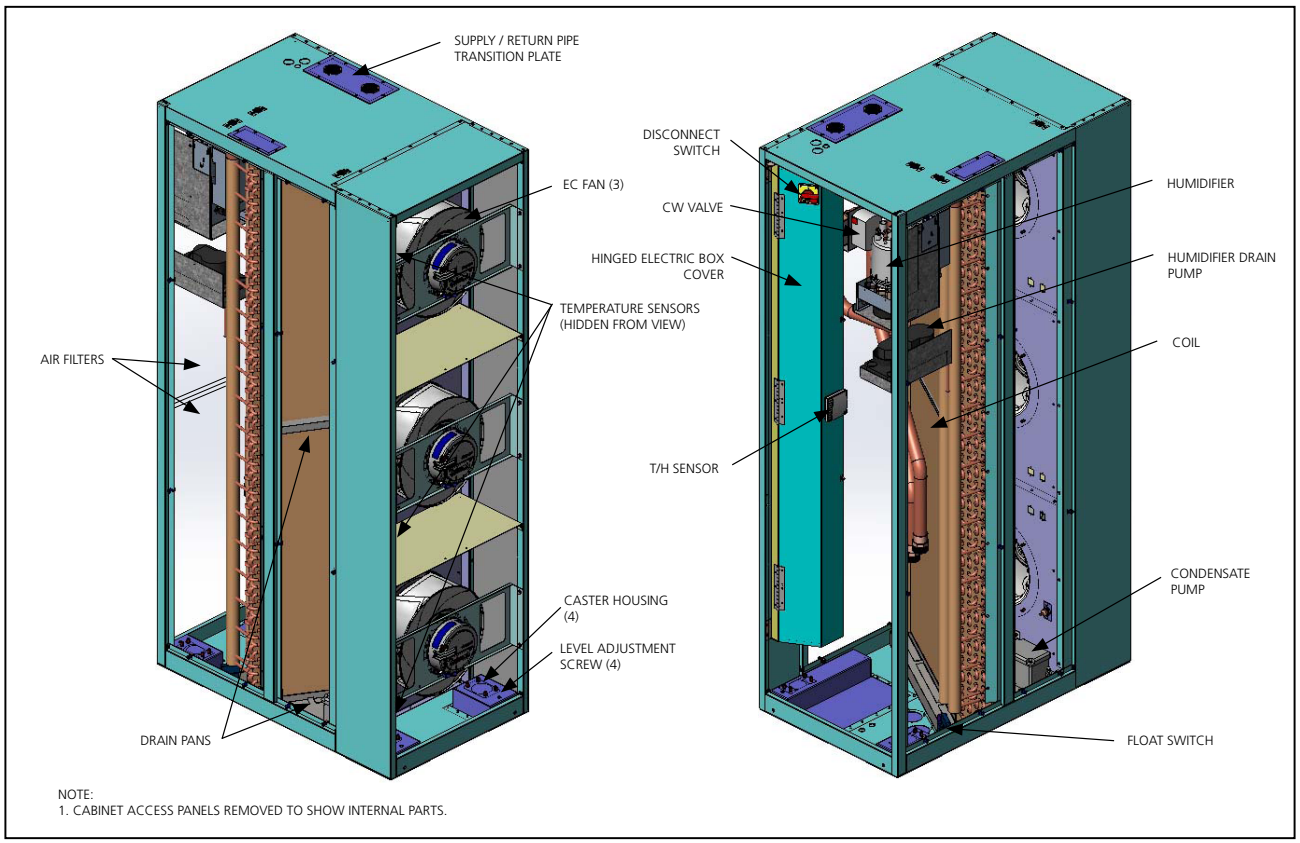



**Figure 2- Typical Internal Layout- CRS-180-C**

maintenance is performed. The handle of the switch may be locked in the "Off" position to prevent unintended operation.

### 1.5.2 Circuit Breakers/Motor Start Protectors

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

### 1.5.3 Coil(s)

Cooling coils are aluminum finned/copper tube construction. The coils are leak tested and cleaned before installation by the factory. Condensate drain pans are provided to collect water condensed by the coils. The drain pans are emptied by a condensate pump that directs the water to a pipe stub located either at the top or the bottom of the A/C unit depending on the piping configuration (see Sections 2.7.1.1 and 2.7.1.2).

A float switch is placed in the lower condensate pan to detect if the water level rises. If the condensate pan fails to drain, the float switch signals the controller to annunciate an alarm.

### 1.5.4 Condensate Pump

A condensate pump is factory installed in the lower drain pan. The pump automatically eliminates condensate water from the drain pan. The pump has an internal float switch which turns the pump on and off based on the water level.

### 1.5.5 EC Fans

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

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

will not produce AC inverter whine.

During start up, the fans begin operating in stages with five second time delays. The middle fan starts first, then the upper fan, then the lower fan. The system controller monitors fan operation. If a fan failure is detected, the controller alerts the operator with an alarm message and increases the speed of the remaining fan(s) to compensate for the loss of air flow.

The system controller may be used to configure the fans for (1) zone temperature control with independently variable fan speeds or (2) static pressure control with all three fans operating at the same variable speed (See Section 4.4.4).

### 1.5.6 Temperature/Humidity Sensors

Control and alarm recognition takes place by means of the controller analyzing signal inputs from the sensors to manage the operation of the A/C unit consistent with the set points entered in the system controller. The system controller monitors three NTC type temperature sensors and a 4-20 mA temperature/humidity (T/H) sensor.

The NTC sensors are factory installed in pre-determined supply air fan zones inside the cabinet. Each NTC sensor is used by the system controller to manage the speed of the fan for that zone to meet the supply air setpoint temperature. The return air is monitored by a temperature/humidity (T/H) sensor which is typically mounted inside the cabinet. As an option, the return air T/H sensor may be removed from the cabinet and mounted in the hot aisle. The actual sensor values may be viewed from the controller user interface display using the Information menu loop.

## 1.6 Optional Equipment

### 1.6.1 Remote Mounted Supply Temperature/Humidity Sensor

As an option, a supply T/H sensor may be provided for field installation (see Section 2.6.2). This is to be mounted in the supply (cold aisle) space for monitoring or control purposes. Refer to the electrical drawing supplied with your unit for wiring details specific to your system.

### 1.6.2 Humidifier

CyberRow CRS-180 systems may be equipped with an optional electrode steam humidifier. The humidifier is factory installed inside the air conditioner and includes fill and drain valves and associated piping to the top (or bottom) of the cabinet for connecting a source of water and a drain line.

Operation of the humidifier's fill and drain cycles is based on water conductivity and is maintained by the on-board humidifier controller. An operating manual for the humidifier is provided under separate cover. Refer to that manual for detailed information on the operation of the humidifier.

### 1.6.3 Water Detector

As an option, STULZ offers spot type or strip/cable type water detectors see Section 2.6.1). Upon sensing a water leak, the water detector control circuit will signal the system controller of the alarm condition. The system will continue operating.

### 1.6.4 Smoke Detector

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

### 1.6.5 Firestat

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

### 1.6.6 Dual Power Auto Transfer Switching

An automatic transfer, main power switching system is available for critical operations. With this option, two main power service disconnect switches are provided on the electric box to connect two independent power sources. If the primary power source (Power Supply A) is interrupted or, if an under-voltage, phase loss or imbalance occurs, the automatic transfer switching circuitry immediately transfers operation of the precision A/C system to a secondary power source (Power Supply B). If power is transferred, the system controller provides an alarm message and the alarm display indicates which power source failed. When the primary power source is functionally restored, the operation of the A/C system is automatically transferred back to the primary power source.

# 2.0 INSTALLATION

## 2.1 Receiving the Equipment

Your CyberRow precision A/C system has been tested and inspected prior to shipment. Carefully remove the protective packaging and perform a visual inspection of the equipment immediately upon delivery to confirm your equipment has been received in excellent condition. Remove the access panels and thoroughly inspect the interior of the unit for any signs of transit-incurred damage. If there is shipping damage, it must be noted on the freight carrier's delivery forms BEFORE signing for the equipment. Any freight claims MUST be done through the freight carrier. STULZ ships all equipment FOB. STULZ can assist in the claim filing process with the freight carrier. Should any damage be present, notify STULZ Product Support prior to attempting any repairs. Refer to Section 6.0 of this manual for instructions.

A unit Data Package has been sent with your unit. It contains this manual, system drawings, applicable MSDS's, warranty registration, other component manuals and applicable instructions based on the configuration of your unit. The data package has been placed in your unit in a clear plastic bag. These documents need to be retained with the unit for future reference. The unit should always be stored indoors in a dry location prior to installation.

**NOTE**

Items that have been shipped loose, such as temperature/humidity sensors, water detectors, etc., are shipped inside the air conditioner unless specified otherwise by the customer. Unpack and store these items in a safe place unless you are using them immediately.

## 2.2 Moving the Equipment

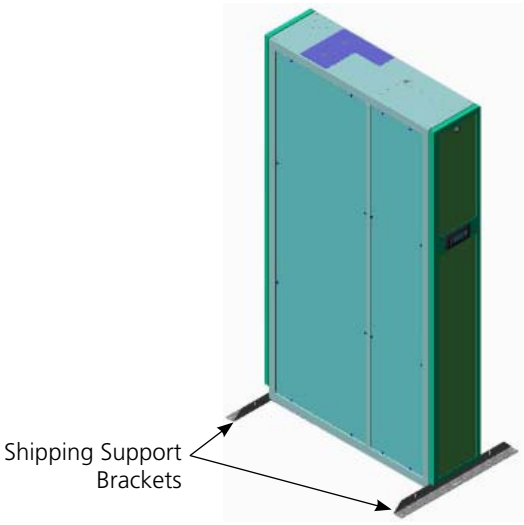
**CAUTION** ⚠

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

CyberRow systems are designed to be kept in a vertical position. The cabinet is equipped with shipping support brackets which are bolted to the skid to facilitate moving the unit prior to installation. Move the unit on the skid with a suitable device such as a forklift, pallet jack or roller bar and dollies which are capable of handling the weight of the equipment. For reference, a weight table is provided on the installation drawing. Unbolt the shipping support brackets from the skid, leaving them attached to the CyberRow unit during the installation process.

**CAUTION** ⚠

Tipping Danger. Keep the shipping support brackets attached to the front and rear of the CyberRow cabinet after removing the unit from the skid. These must remain in place to prevent the unit from tipping over while moving and positioning the cabinet.




**CAUTION** ⚠

It is safe to remove the shipping brackets after a server rack is installed on each side of the cabinet.

**CAUTION** ⚠

Position someone on each side of the cabinet to stop it from tipping over if the shipping brackets must be removed before installing the server racks on each side.

## 2.3 Site Preparation

Removable access panels are located on the front and rear of the CyberRow cabinet for easy service access. In order to have full service access to the internal components, no permanent obstructions should be placed in front or behind the cabinet.

**NOTE**

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

**CAUTION** ⚠

The unit must be installed in the space that will be air conditioned.

**CAUTION** ⚠

Ensure the mounting surface is capable of supporting the weight of the equipment. Before installing the unit, refer to the weight table provided on the installation drawing.

When determining the installation location consider how you'll route the piping and wiring into the cabinet and ensure access is available (see Section 2.7.1). The CyberRow system is ordered form the factory with pilot holes for piping and wiring in either the top or the bottom of the cabinet. See the installation drawing provided with your unit for the pilot hole locations.

### 2.3.1 Conditioned Space

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

| STRUCTURE | R-VALUE |
|---|---|
| Ceiling | R-38 |
| Wall | R-21 |
| Floor | R-19 |
| Door | R-5 |

The vapor barrier is the single most important requirement for maintaining environmental control in the conditioned space. The vapor barrier in the ceiling and walls can be a polyethylene film. Concrete walls and floors should be painted with a rubber or plastic based paint. Doors and windows should be properly sealed and a door sweep used to minimize leakage. Outside or fresh air should be kept to a minimum (as it adds to the cooling load), 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.

## 2.4 Mounting/Placement

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

**NOTE**

The equipment must be level to operate properly.

CyberRow cabinets are designed to be installed in a row of servers between the server racks (see Figure 3). They have a compact footprint, which allows the units to be placed adjacent to the heat producing equipment racks anywhere in the row. They provide cool, conditioned air through the front grille to the adjacent server modules on the cold aisle side of the row. It is recommended to position the unit to obtain optimum air circulation. Allow 36" clearance in the front and rear of the cabinet for servicing the unit.

The optimal placement location is next to highly loaded servers that throw off the most significant heat into the hot aisle side of the row. In this arrangement, the CyberRow minimizes hot spots.

It is best not to place a CyberRow unit at the end of a row unless an air barrier is in place to prevent the conditioned air from being drawn around to the hot aisle side, bypassing the front of the servers.

**NOTE**

Placement of air barriers between the cold aisle/ hot aisle is important. If the supply discharge is too close to the hot aisle, the conditioned supply air will be recirculated back to the intake in the hot aisle side of the cabinet before it has circulated through the equipment to be cooled.

An air barrier may also be provided to prevent conditioned air from being drawn over the top of the row into the hot aisle (See Figure 3).

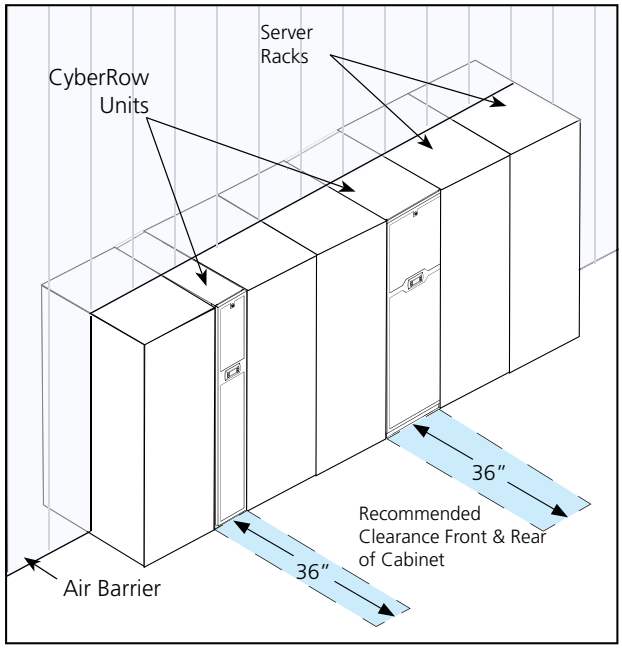



**Figure 3- Recommended Installation**

Once the cabinet is removed from the shipping skid, it may be rolled into position on the casters which are mounted to the bottom of the unit. Do not remove the shipping support brackets unless server racks are installed on each side of the CyberRow cabinet.

The cabinet is equipped with an adjustable foot at each corner to raise the cabinet off the casters after the unit is positioned in its operating location. The adjustable feet are also used for leveling and overall height correction. To adjust the height, use a flat head screwdriver to turn the screws, located at the top of the four caster housings (accessed inside the front & rear corners of the cabinet per Figures 1 and 2), to raise or lower each foot until the cabinet is level and even with the adjacent equipment racks (see Figure 3).

## 2.5 Air Distribution

Air from the hot aisle is drawn into the rear of the CyberRow cabinet and passes through the fins of the cooling coil. The conditioned supply air discharges through the front of the cabinet (see Figure 4a).

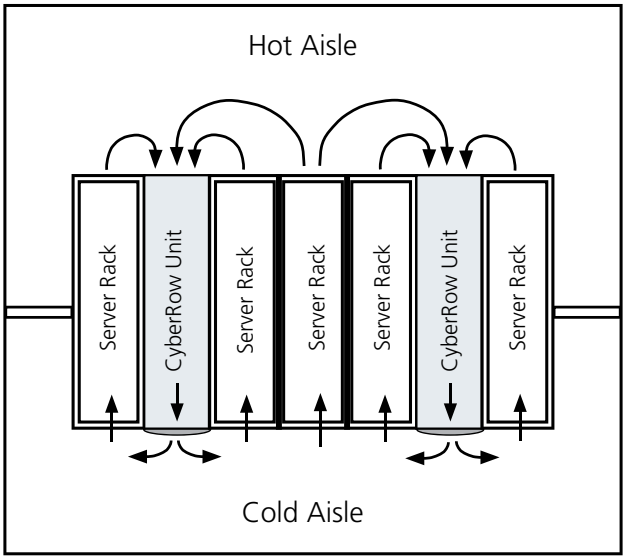



**Figure 4a- Typical Air Distribution**

The front discharge panel directs the supply air out of the CyberRow unit where it will be drawn into the front of the server racks.

An optional front diverted air discharge panel is also available. This directs the supply air sideways out of the CyberRow unit and directly into the front of the server racks (see Figure 4b).

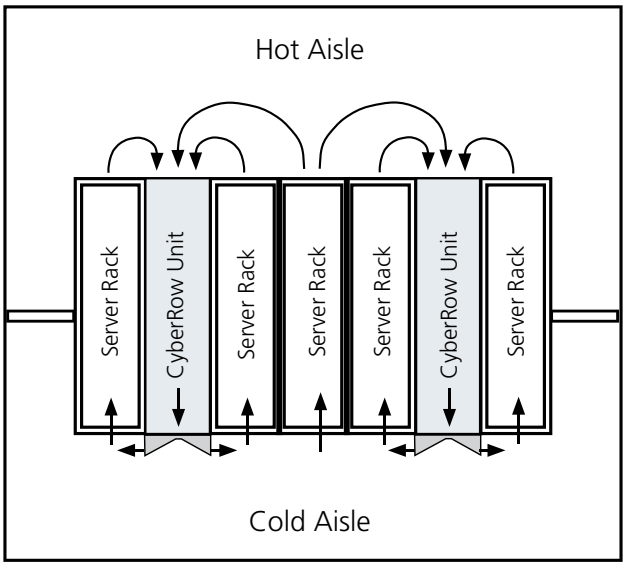



**Figure 4b- Front Diverted Air Distribution**

## 2.6 Optional Equipment (Field Installed)

**NOTE**

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

### 2.6.1 Remote Water Detectors

The remote water detector is normally placed on the sub-floor or in a field supplied auxiliary drain pan located beneath the unit. STULZ provides 2 types of water detectors:

***Spot type water detector-***

Remove the protective cover and connect a two conductor 22 AWG control cable (customer furnished) to the terminals in the base. Replace the cover and place the water detector(s) on the floor with the metal electrodes facing down. The base is provided with a mounting hole in the center which may be used to secure the water detector in place.

Run the control wires into the electric box and connect them to the correct positions on the control terminal block as shown in the wiring diagram provided with your unit. When water is present on the floor, current will flow between the electrodes.

**NOTE**

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

***Cable type water detector-***

Lay the cable water detector flat across the sub-floor where water could collect. Secure the cable every 12-18 inches with J-clips or cable ties with adhesive mounting pads to prevent it from moving when installing it in the airstream. Secure it at each turn of the cable and when routing it around obstructions. Do not tie the water detector cable to a metal floor stand or to pipes. When a water leak on the floor reaches the cable, current will flow between the cable wires.

A two conductor wire harness is provided with a quick connect fitting on one end. The harness mates to the fitting on the water detector and connects it to the control terminal block inside the electric box as shown in the wiring diagram provided with your unit.

### 2.6.2 Remote Temperature/Humidity Sensor

Depending on the type of control selected, the temperature/humidity (T/H) sensor may be factory mounted or shipped loose for field installation. The remote sensor must be located in the conditioned space so that it will properly sense the temperature/humidity conditions to be controlled. The T/H sensor should not be mounted near a doorway or an area where it would be exposed to direct sunlight. When locating the sensor, consider the length of wire to be used. A 20 foot long cable is supplied with the sensor. As an option, a 75 foot or 150 foot long cable may be provided. Follow the steps below to mount the sensor.

**Temperature /Humidity Sensor**

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

**CAUTION** ⚠

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

2. Place the base temporarily against the mounting surface.
3. Level the base. Mark and drill mounting holes through at least two of the available slotted holes.
4. Run a 3 conductor 22 AWG shielded cable through the opening in the base, then secure the base with screws ensuring the word TOP on the PC board is oriented upward.
5. Make the wiring connections. Refer to Section 2.8, Utility Connections and refer to the wiring diagram supplied with your unit.
6. Seal any holes in the wall behind the sensor.
7. Replace the cover plate on the base.

**CAUTION** ⚠

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

## 2.7 CW Cooling

The system utilizes a chilled water source to provide coolant to the cooling coil in the A/C unit. When the hot aisle air temperature rises to the CW cut-in setpoint plus dead band, the controller opens the modulating CW control valve proportionally to the demand for cooling (see Figure 5).

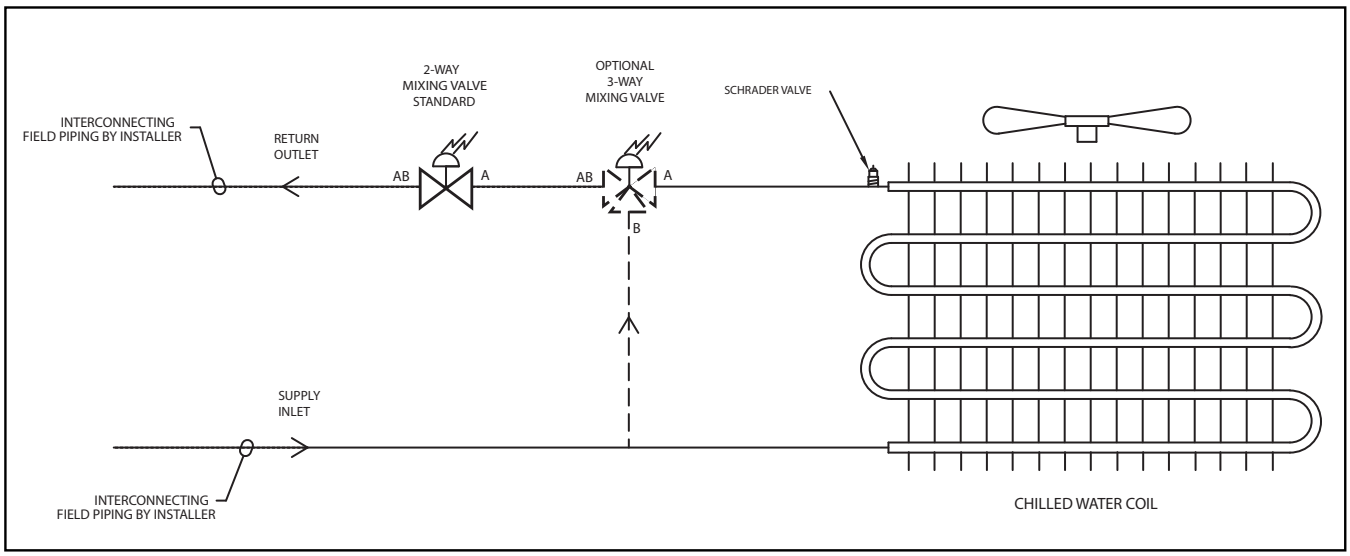



**Figure 5- Typical CW Piping Diagram**

### 2.7.1 Piping Connections

**CAUTION** ⚠

The cooling coil (and associated piping circuits) are **pressurized with dry nitrogen (up to 100 psi)** and sealed when they leave the factory. Before installing the interconnecting piping, release the pressure via an available stem valve or schrader valve prior to uncapping the pipes.

Supply and return lines are routed to either the top or bottom of the cabinet as specified when the CyberRow system is ordered (see Sections 2.7.1.1 and 2.7.1.2). On units that are piped from the top, the chilled water supply and return connections are made outside the cabinet. On units that are piped from the bottom, the chilled water supply and return connections are made inside the cabinet. Pipe connections are threaded NPT connections. The pipes are labeled; i.e. "Supply", "Return". When making the connections, a teflon tape thread sealant is recommended to minimize internal fouling of the piping.

Field piping is not necessarily the same size as the units' pipe connections. Piping should be sized to match the system pressure drop and flow capacity, and may require reducing fittings to match the connection size on the air conditioner. An air vent and several schrader valves are installed in the precision A/C unit piping. It is recommended to provide manual shut-off valves for both the supply and return for isolating the unit when performing routine maintenance or repairs. Refer to the piping diagram supplied with your unit.

**NOTE**

**A 60-mesh strainer should be installed in the supply pipe. Ensure the strainer is readily accessible for servicing or replacement.**

In situations where scaling could be heavy, or where biological growth will be present, a closed loop system is recommended. Untreated water in the unit cooling coils may cause, over a period of time, a loss of heat exchange capacity due to a mineral deposit build-up inside the coil. Only a qualified service mechanic should clean dirty coils.

For pipe connection sizes, refer to the following table:

| PIPE CONNECTION SIZES | | |
|---|---|---|
| **Model #** | **Chilled Water Inlet/Outlet** | **Condensate Drain** |
| CRS-090-C | 1 1/4" | 1/2" |
| CRS-180-C | 1 1/2" | 1/2" |

**NOTE**

Use standard refrigeration practices for piping, leak testing and filling the chilled water circuit.

The piping should be isolated 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 reduce vibration transmission and prevent pipe damage, seal openings in walls using a soft flexible material to pack around the piping. After the piping is installed, seal the gaps between the pipes and the cabinet entrance holes so air won't leak around the pipes.

**NOTE**

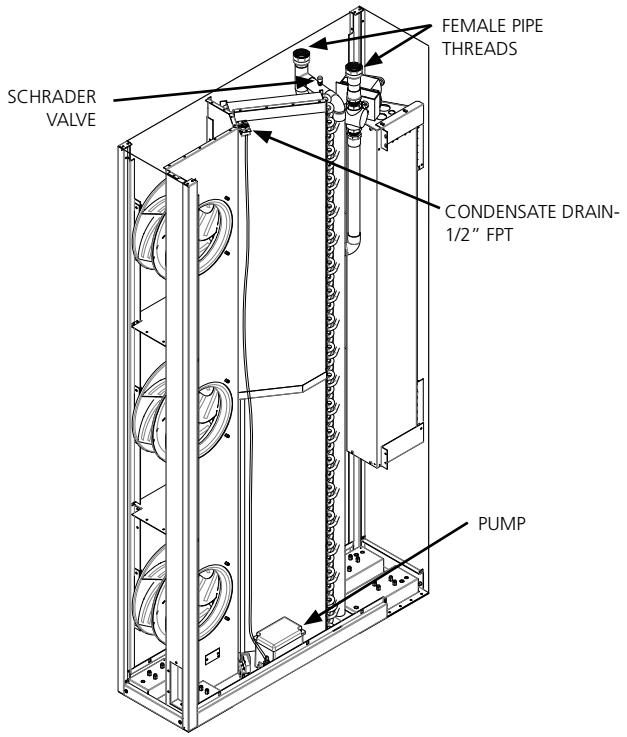
Chilled water lines should be insulated to prevent condensation from forming on the pipes if ambient dew point temperatures are higher than the fluid temperatures.

**CAUTION** ⚠

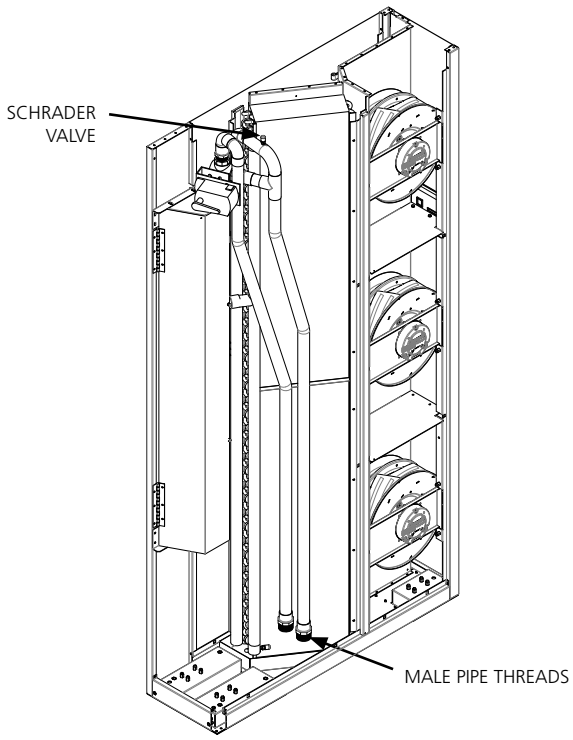
After the interconnecting piping is installed, the entire piping circuit must be thoroughly flushed prior to operating the system.

If newly installed CW supply and return piping is used, it is recommended that the piping system be cleaned prior to connecting it to the unit. **If solvents/cleaning solutions are used, ensure they are completely flushed from the piping before connecting it to the unit.** Failure to do so could result in equipment problems.

### 2.7.1.1 CW Supply and Return Piping Connections- 12" Cabinets

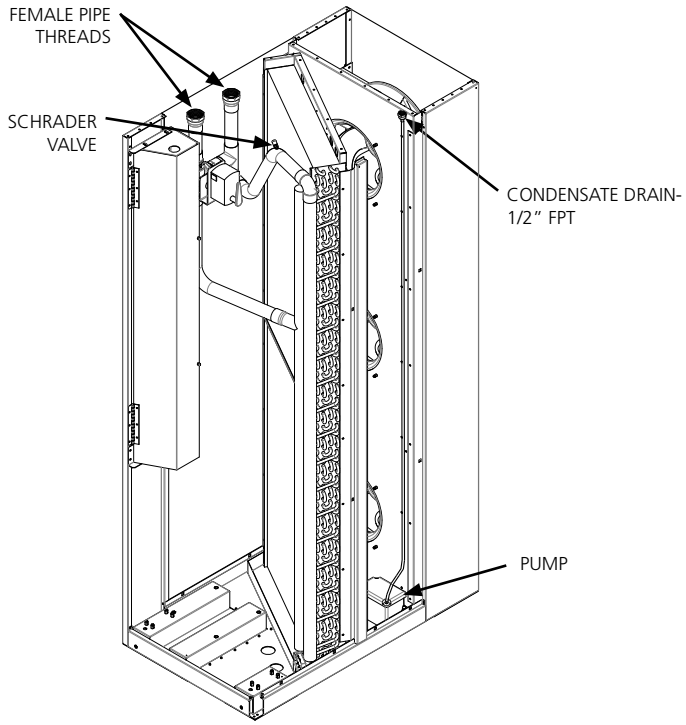



TOP ACCESS PIPING

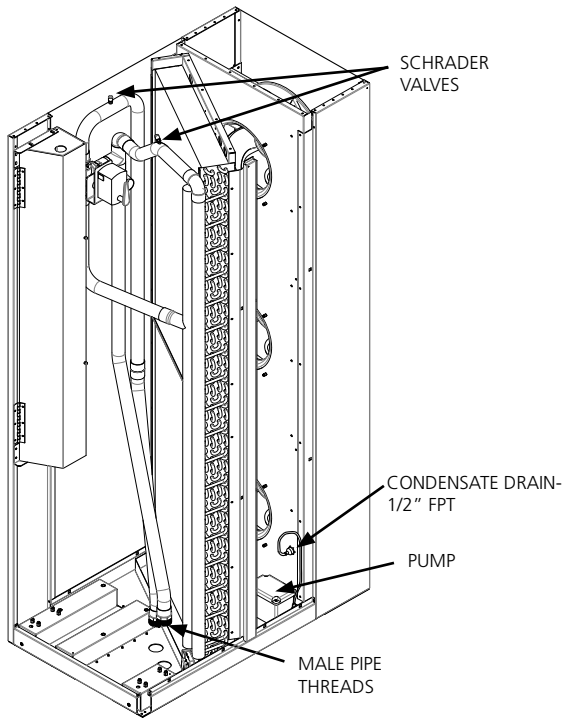



BOTTOM ACCESS PIPING

### 2.7.1.2 CW Supply and Return Piping Connections- 24" Cabinets




TOP ACCESS PIPING




BOTTOM ACCESS PIPING

## 2.7.2 Condensate Drain Line

A condensate pump is factory installed. The drain line connection is typically a 1/2" FPT fitting. The installer must connect a drain line (customer supplied) to the drain fitting to remove water from the cabinet.

The condensate drain fitting is accessed through the top or bottom of the cabinet as configured with the piping connections. The drain fitting is accessed from outside the cabinet on top piped units. The drain fitting is accessed inside the cabinet behind the front discharge panel on bottom piped units. An entrance hole for the drain line is provided in the floor of the fan compartment. See the installation drawing provided with your unit for the location. Connect the drain line to the fitting so water can be directed to an appropriate place such as an open building drain with an air gap per local and national plumbing codes.

## 2.7.3 Humidifier (Optional)

CyberRow CRS-180 systems may be equipped with an electrode steam humidifier. The humidifier empties into its own dedicated drain pump during the flush/ drain cycle. A water supply must be connected to the humidifier and a drain line must be connected to the pump.

**NOTE**

The humidifier drains (hot) water into the drain pump during normal operation.

For top piped cabinets, the supply and drain connections are typically 1/2" FPT and are accessed at the top of the cabinet.

For bottom piped cabinets, a 1/4" OD water supply line must be routed into the bottom of the cabinet through an available knockout and connected directly to the 1/4" compression fitting on the side of the humidifier. Also, route a 3/8" ID flexible drain tubing through the bottom of the cabinet and connect it to the barbed drain stub located on top of the humidifier drain pump.

Drain water must be directed to an appropriate place such as an open building drain. Include an air gap per local and national plumbing codes.

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 for supply water recommendations.

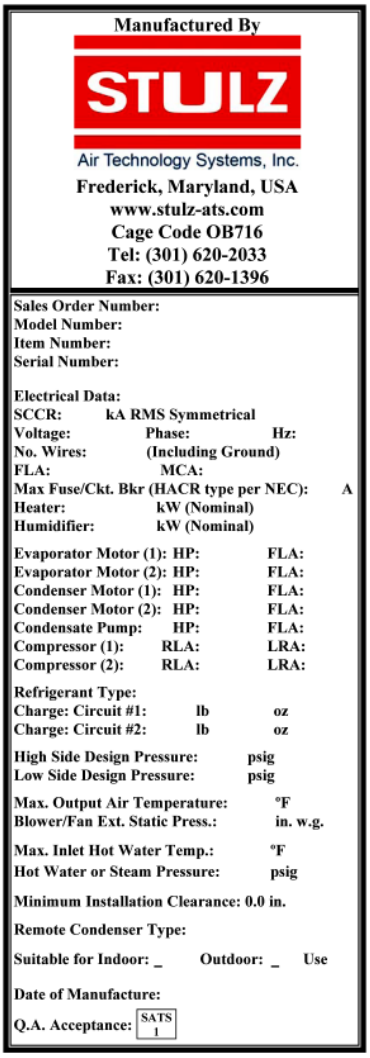
## 2.8 Utility Connections

### 2.8.1 Main Power

The CyberRow 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 6). The nameplate also provides the full load amps (FLA), the current the unit will draw under full design load, the minimum circuit ampacity (MCA) for wire sizing, and the maximum fuse or HACR (Heating, Air Conditioning, Refrigeration) breaker size (MAX FUSE/CKT BKR) for circuit protection. The unit's nameplate is located inside the cabinet within the electrical box.

**NOTE**

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


Manufactured By

STULZ

Air Technology Systems, Inc.
Frederick, Maryland, USA
www.stulz-ats.com
Cage Code OB716
Tel: (301) 620-2033
Fax: (301) 620-1396

Sales Order Number:
Model Number:
Item Number:
Serial Number:

Electrical Data:
SCCR: kA RMS Symmetrical
Voltage: Phase: Hz:
No. Wires: (Including Ground)
FLA: MCA:
Max Fuse/Ckt. Bkr (HACR type per NEC): A
Heater: kW (Nominal)
Humidifier: kW (Nominal)

Evaporator Motor (1): HP: FLA:
Evaporator Motor (2): HP: FLA:
Condenser Motor (1): HP: FLA:
Condenser Motor (2): HP: FLA:
Condensate Pump: HP: FLA:
Compressor (1): RLA: LRA:
Compressor (2): RLA: LRA:

Refrigerant Type:
Charge: Circuit #1: lb oz
Charge: Circuit #2: lb oz

High Side Design Pressure: psig
Low Side Design Pressure: psig

Max. Output Air Temperature: °F
Blower/Fan Ext. Static Press.: in. w.g.

Max. Inlet Hot Water Temp.: °F
Hot Water or Steam Pressure: psig

Minimum Installation Clearance: 0.0 in.

Remote Condenser Type:

Suitable for Indoor: _ Outdoor: _ Use

Date of Manufacture:

Q.A. Acceptance: SATS 1

**Figure 6- Sample Nameplate**

The unit is provided with terminals for all required field-wiring. Refer to the electrical drawing supplied with the unit for all power and control field-wiring. It is important to identify the options that were purchased with the unit in order to confirm which field connections are required.

**NOTE**

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.

## WARNING

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

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

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

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

## CAUTION

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

#### 2.8.1.1 Single-Phase Units 120V

Single-phase units require the hot leg of power to be connected to terminal L1 and the neutral wire to terminal L3 of the main power non-fused service switch.

#### 2.8.1.2 Single-Phase Units 208/230V

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

#### 2.8.1.3 Three-Phase Units

Three-phase units are designed to have the L1, L2 and L3 supply wires connected to corresponding L1, L2 and L3 line terminals of the non-fused service switch. The unit will operate correctly if the supply wires are connected in this manner.

### 2.8.2 Optional Equipment

Additional control wires may be required depending upon the options that were purchased with your unit. Optional sensors are to be connected directly the control terminal blocks inside the CyberRow electric box. You may route the wires through the top or bottom of the cabinet as preferred using the available knock-outs. Refer to the electrical drawing supplied with your unit to determine the total number of interconnecting conductors required for your system.

**NOTE**

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

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(s).

#### 2.8.2.1 Remote Water Detector

Refer to Section 2.6.1. Each remote water detector used will require two conductors to be wired to the control terminal block within the unit electrical box. The wire insulation must be rated at 600V.

#### 2.8.2.2 Remote Temperature/Humidity Sensor

Refer to Section 2.6.2. The remote temperature/humidity sensor is equipped with a shielded cable. The shield is to be terminated at the unit electric box. The electric box includes a control terminal block with box type lugs for the wire connections.

#### 2.8.2.3 Remote On/Off Control

The unit is provided with a means to remotely turn off the air conditioning system via a control input signal to the system controller. A normally open switch is required for this purpose (customer furnished). The control device may be an On/Off switch, thermostat or a humidistat with a minimal contact rating of 15 mA @24VAC. Two conductors from the normally closed switch must be connected to the control terminal block located within the unit electric box. See Section 4.4.6 for additional information on the remote on/off feature. Refer to the electrical drawing for the wiring details.

#### 2.8.2.3 Remote Power Off

The unit is provided with a means to remotely turn off the air conditioning system in an emergency, by removing power from the system controller. The emergency power off (EPO) circuit may be opened to disconnect control power from the A/C unit to stop operation, bypassing all delay timers so the chilled water valve, fans, etc. stop immediately. A normally closed switch is required for this purpose (customer furnished).

If customer provided, the switch contacts must be sized appropriately. The switch contacts must have a minimal rating of 2 Amps @24 VAC. Two conductors from the normally closed switch must be connected to the control terminal block located within the unit electric box. See Section 4.4.7 for additional information on the remote power off feature. Refer to the electrical drawing for the wiring details.

## 2.9 Chilled Water System Preparation

No field refrigerant charging is required for CW units. The following precautions must be observed when installing and filling the CW loop:

- The piping system must be cleaned prior to allowing chilled water to flow through the system.
- When filling the chilled water loop, all air must be bled from the piping system.

1. Open a vent valve at highest point of the system.
2. Fill the system until the solution is discharging from the vent with minimal signs of foaming due to air in the system.
3. Fill out applicable blocks of the Warranty Registration and Start-Up Checklist.

## 2.10 Settings and Adjustments

### 2.10.1 Chilled Water Circuit

In a chilled water A/C unit, cooling is maintained by the flow of chilled water through a cooling coil. A water valve proportionally opens to increase the flow as the temperature rises (or closes as the temperature falls). If the unit is turned off, the valve will return to the closed position shutting off flow through the coil. Chilled Water control valves are available in 2-way or 3-way configurations. Refer to the piping drawing supplied with your unit to determine which type valve is provided.

Location and size of chilled water valve differs with the size of the A/C unit. The chilled water valves are factory set for the correct operating position and should not require field adjustment.

### 2.10.2 EC Fans

The speed of the EC fans are controlled via a 0 to 10 VDC signal from the system controller. The controller is pre-set by the factory for the correct fan speed configuration 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 Section 4.4.4 for instructions on adjusting airflow using the system controller.

### 2.10.3 Humidifier Adjustment

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

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

**CAUTION** ⚠

Adjusting the capacity potentiometer too high may result in the formation of condensate within the system.

# 3.0 START-UP/COMMISSIONING

## 3.1 Initial Operation

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

**NOTE**

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

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

## 3.2 Step by Step Start-Up Instructions

1. Replace any components and access panels that were removed during the installation process prior to performing the start-up checks.
2. Apply power to the system at the service disconnect switch. Upon applying control power the ***E²*** controller begins an initialization sequence, conducting internal diagnostics to confirm functionality (see Section 4.3).
3. After about 20 seconds the Main screen is displayed (see Figure 7). At the bottom of the screen a status message "Unit On" appears.

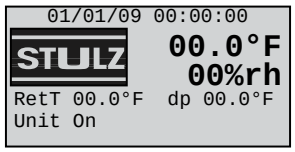



**Figure 7- Main Display Screen**

**NOTE**

You may turn the A/C unit on and off at anytime by pressing and holding the Enter (↵) key for 3 seconds.

4. When "Unit On" appears, the CW valve is signaled to open. After a 45 second time delay, the fans begin operating in 5 seconds, time delayed stages (adjustable). The middle fan is turned on 1st, then the upper fan, then the lower fan. The STULZ logo in the display is replaced with a blower symbol.
5. A 45 second time delay is allowed after the first fan turns on before the controller polls the air proving switch. If adequate air flow is detected, the controller enables its outputs. If the actual room conditions are not within the range of the programmed set points, the system will begin operating in the mode(s) needed (cooling, humidifying, dehumidifying) to reach the set points. Symbols appear in the display to indicate the active operating modes (see Section 4.3).
6. Temperature and humidity alarms are masked out for 30 minutes to allow for conditions to stabilize without triggering nuisance alarms.
7. Ensure that all fans are rotating correctly and freely without any unusual noise.
8. Test cooling operation by decreasing the temperature setpoint (see Section 4.5.4.1) to create a demand for cooling. The chilled water valve should open and the supply air should feel cooler than the return air.
9. Test humidification operation (if applicable)by raising the humidity setpoint to create 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 the desired temperature and humidity level 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 system is meeting the room's requirements.

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

## 3.3 Microprocessor Controller Programming

The ***E²*** microprocessor controller is factory programmed based on the features selected with the system. A user provided BMS may be used to directly interface to the ***E²*** controller. The operator may view all the available menu screens through a BMS, however, changes may be made only to basic parameters such as adjusting set points and setting and acknowledging alarms. More advanced parameter adjustments may be made through the user interface display (see Figure 8). Operating instructions for the ***E²*** controller are provided in Section 4.0.

# 4.0 $E^2$ CONTROLLER

## 4.1 General

The advanced microprocessor based, $E^2$ Series controller is a highly versatile and flexible A/C system controller. It is designed primarily for STULZ Precision Air Conditioners. The controller is equipped with flexible software capable of meeting the specific needs of the application. The controller is completely programmed at the factory and therefore, most applications will require no field set up. However, the default set points and their ranges are easily viewed and adjusted from the user interface display. The program and operating parameters are permanently stored on FLASH-MEMORY in case of power failure.

The $E^2$ Series controller is designed to manage temperature and humidity levels to user defined set points via control output signals to the A/C system. Control parameters have variable outputs from 0 to 100% of the full rated capacity. The controller continually receives inputs for the measurable control conditions (temperature and relative humidity) via sensors installed in the cabinet. The internal logic determines if the conditions require cooling, humidification or dehumidification. Control set points are established to maintain the room's designed conditions. The controller responds accordingly to changes and controls the output(s) to the air conditioning system so temperature/humidity conditions reach the user defined control set points.

### 4.1.1 Features

#### 4.1.1.1 Field Configurable

The program for the $E^2$ Series controller is field configurable, allowing the operator the capability of selecting control parameters and set points specific to the application. Operator interface for the $E^2$ controller is provided via a door mounted user interface display panel. The display panel has a backlit LCD graphical display and function keys giving the user complete control and monitoring capability of the precision cooling system. The menu driven interface provides users the ability to scroll through and enter various menu loops. Monitoring of room conditions and A/C system operation is allowed without entering a password. Modifications to the control set points require the use of a password.

#### 4.1.1.2 Password Protection

Access to the **Info** menu and **Alarms** log is allowed without the use of a password. The controller is programmed to recognize predetermined security levels before allowing access to display screens containing critical variables. Three secured menu levels (**Control**, **Service** and **Factory**) support unique passwords that must be entered to access the menu screens so only authorized personnel may perform modifications to the settings.

#### 4.1.1.3 Restorable Setpoint Parameters

Upon initial start-up the A/C system operates using the set points programmed by the factory. The customer may enter new operating parameters in the Control menu and the system will then operate accordingly. The new set points may be stored as Customer Default set points. The primary set points entered by the factory still remain stored in the controllers' memory as Factory set points.

The set points for the system may be re-adjusted in the Control menu at any time. If it becomes necessary, the customer may restore the set points back to the Customer Default setpoint values or to the original Factory (primary) setpoint values in the Service menu ( See Section 4.5.5.10).

#### 4.1.1.5 A/C Grouping pLAN Operation

Multiple A/C system controllers can be connected (grouped) to a pLAN local network via an RS-485 connection, allowing the communication of data and information from each controller to a central control terminal or Lead controller. The Lead controller display screens can be used to monitor and adjust group control variables for the individual system controllers. Each ***E²*** controller connected to the pLAN network is to be identified with its own unique address.

Multiple A/C units consisting of up to eight (8) STULZ precision air conditioners equipped with like controllers may be controlled and monitored via the ***E²*** series controller. With multiple A/C units each unit can selectively be configured as "Active" to operate as a primary A/C, "Capacity Assist" for staged operation or as "Standby" to come online in case of a failed air conditioning unit to ensure continuous availability. The controller may also be configured to rotate units with timed duty cycling to promote equal run-time and assure that each A/C unit within the rotating group is operationally exercised on a periodic timed basis.

### 4.1.2 User Interface Display Panel

Your unit is equipped with an interface display panel typically mounted on the front panel of the A/C unit.


**Figure 8- User Interface Display Panel**

The user interface display panel features a backlighted, liquid-crystal, alphanumeric display equipped with LED illuminated function keys. The backlight turns off after 5 minutes of no function key activity. The screens that appear on the user interface display panel present data that originates from the controller I/O module (Figure 9).

The controller is operated via a 6-key menu-driven loop structure and offers an alarm log plus four different interface menu levels to the operator; ***Information, Control, Service, and Factory***. These menus permit the user to easily view, control and configure operating parameters for the A/C unit. (See Menu Selections, Figure 11.)

#### 4.1.2.1 Function Keys

| KEY | FUNCTION |
|---|---|
| 🔔 | Accesses the active alarm screen(s)<br>Silences audible alarms<br>Resets active alarms in the alarm menu |
| ***Prg*** | Accesses the main menu<br>Illuminates yellow when unit is on |
| ***Esc*** | Returns to the previous menu level<br>Cancels a changed entry |
| ↑ | Steps to the next screen in the display menu<br>Increases the value of a modifiable numeric field |
| ↵ | Starts/Stops system operation<br>Accepts current value of a modifiable field<br>Advances the cursor to the next active alarm screen |
| ↓ | Steps back to the previous screen in display menu<br>Decreases the value of a modifiable numeric field |

#### 4.1.2.2 Contrast Adjustment

Press and hold the ( 🔔 ) and (***Prg)*** keys; then use the Up (↑) and Down (↓) keys to adjust the contrast.

#### 4.1.2.3 Alarms

Alarm conditions activate a red LED indicator that backlights the alarm function key. As an option, an alarm condition may also be enunciated by an audible alarm signal. An alarm is acknowledged by pressing the alarm key. This calls up alarm display screen(s) that provide a text message detailing the alarm condition(s). After an alarm condition is corrected, the alarm can be cleared by pressing the alarm key.

### 4.1.3 Controller I/O Module

The controller is a microprocessor based I/O module mounted inside the A/C system electric box (see Figure 9). The controller I/O module contains the software that manages the operating parameters of the A/C system.

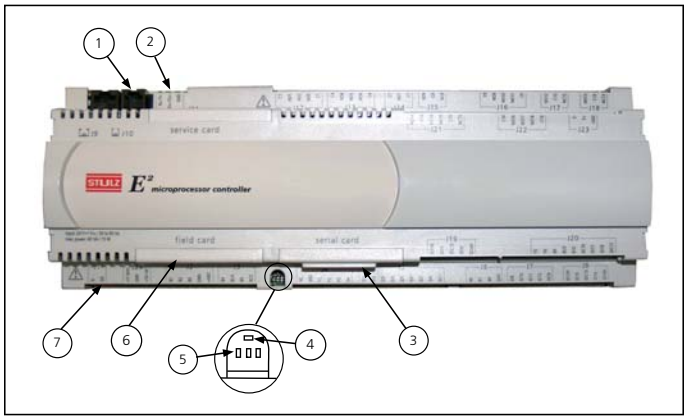



**Figure 9- Controller I/O Module**

#### 4.1.3.1 Controller I/O Module Layout

The controller I/O module contains the logic and input/output terminals. See Figure 9 for details of the controller I/O module layout. The item numbers that follow coincide with the call-outs in Figure 9.

1. Connection (J10) for interface display panel
2. RS-485 connection for pLAN (J11)
3. Hatch for BMS or network card
4. Power on LED (Yellow)
5. Signal LEDs (Red, Yellow, Green)
6. Hatch for expansion I/O module(s)
7. Power connector (J1)

### 4.1.4 BMS Interface

The $E^2$ series controller may incorporate a BMS network card with a communication port (Figure 10). This can be field connected through a RS-485 serial interface to a Building Management System via Modbus, BACnet, SNMP or HTTP protocol as configured by the factory. A controller interfaced to a network must be configured for BMS communication.

BACnet MS/TP

Modbus RTU


BACnet IP, BACnet Ethernet,
HTTP, SNMP, & Modbus IP

**Figure 10- BMS Interface Ports**

## 4.2 Navigating Controller Display Screens

### 4.2.1 Menu Selection

The ***E2*** Series controller provides five user selectable menus needed to view operating data and enter set points for the system (see Figure 11). These menus may be accessed from a scrolling Main Menu screen by pressing the Program ***(Prg)*** key. You are then allowed to scroll between adjacent menu selections within the Main Menu by use of the Up (↑) and Down (↓) arrow keys.

When the desired menu is centered in the screen with bold capital letters and an arrow ⊕ symbol pointing towards the Enter (↵) key, you may press the Enter (↵) key to access that menu loop. The user can access the menu loop screens located within the designated menu selection using the Up (↑) and Down (↓) arrow keys. Access to some menus may be protected by a built in security protocol and may require the use of a password to gain access.

### 4.2.2 Menus

From the Main screen you may press the Program ***(Prg)*** key to select from among the five menus shown in Figure 11.

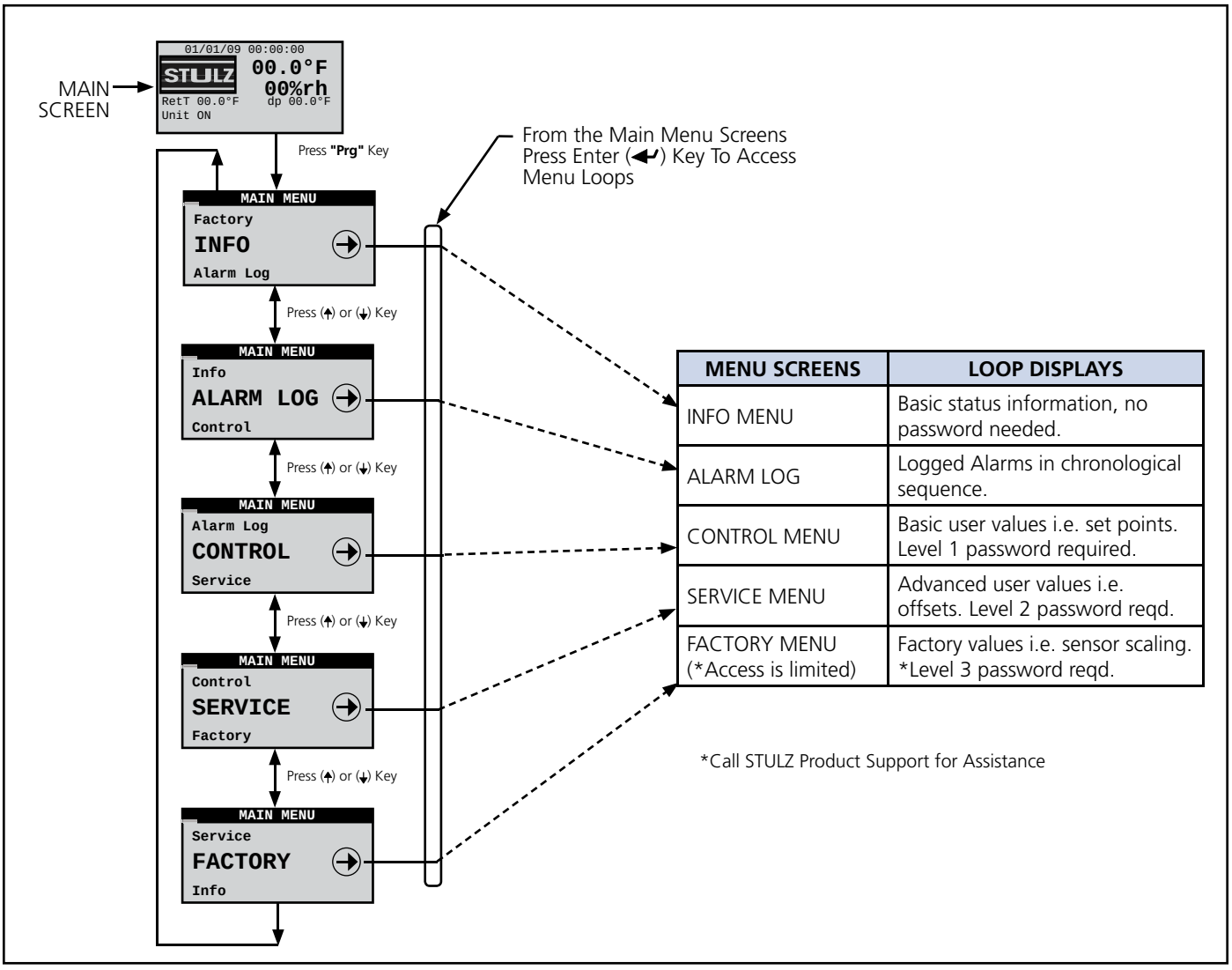



**Figure 11- Menu Selections**

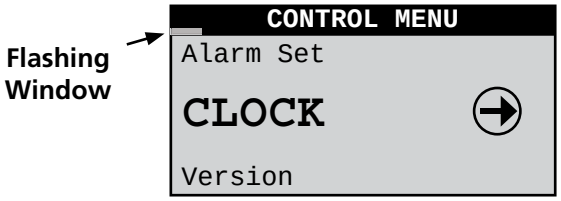
### 4.2.3 Display Variables

The user interface display panel provides screens with three (3) different forms of both the read only and the modifiable variables:

- **Numbers** are displayed as positive (+) or negative (-) integers.
- **Dual-State** can be toggled between two (2) values i.e. On/Off, Yes/No.
- **Word Variables** have a unique text message for each of the variable's possible choices.

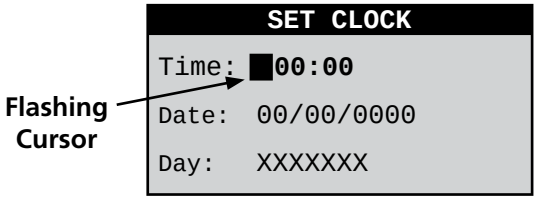
### 4.2.4 Cursor Position in Screens

The following display screen is shown as an example after accessing a new menu loop display screen using the function keys. The name of the menu loop is the line in the upper-most field of the screen. A flashing window also appears in the left of the uppermost field indicating you're in the top level of that menu loop.




From this position the Up (↑) and Down **(↓)** arrow keys may be used to access additional selections within the current display menu.

Each screen supports a specific functional requirement. Pressing the Enter (↵) key allows you access to the selected display screens to adjust any of the modifiable fields. If a screen with modifiable values is accessed, you may use the Enter key to insert a flashing cursor in the modifiable fields within that screen.

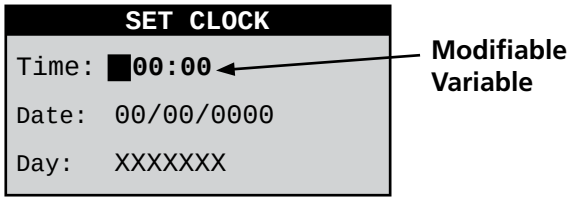



If the flashing cursor is located in a modifiable field, the value of the field will be changed with the use of the Up (↑) and Down (↓) arrow keys. When the Enter (↵) key is pressed the cursor moves to the next modifiable field. After entering the last modifiable field within a screen, pressing the Enter key removes the cursor and the flashing window reappears in the left-hand corner of the upper-most field of the current screen. From here advancement to the next adjacent menu loop screen will occur when the Up or Down key is pressed. Successive use of the Enter key will advance the cursor through the various modifiable fields of the display screen eventually returning to the first field.

Values that are already correct may simply be skipped over by using the Enter (↵) key without modification of the variable. The current value, if not changed, will be retained after pressing the Enter (↵) key**.** Values for fields being adjusted will automatically wrap when adjusted beyond the high or low limit established for that field.

Whenever the flashing cursor is located in a modifiable field, pressing the Escape ***(Esc)*** key one time returns the user to the next menu up. Each successive use of the Escape key returns you to the next menu level up until the Main screen is reached.

### 4.2.5 Modifiable Variables




For the purpose of this manual the examples of user modifiable variables within display screens will be denoted by **bold text**. (Please note the actual display may not use bold text.) Pressing the Enter (↵) key accepts the value displayed and advances the cursor to the next modifiable field. The Up (↑) or Down (↓) key may be used to modify the values of these fields.

If the modifiable field is a positive (+) number, the positive value is indicated by the absence of a (+) or (-) symbol. The (-) negative symbol will be displayed to the left of the first digit for negative numbers.

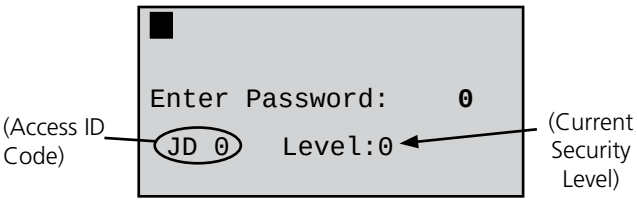
### 4.2.6 Password Authorization Levels

Access to a menu loop may be requested from the main menu. Modifiable control screens have variables that affect system performance. Improper settings may result in erratic operation and possible system failure or damage. Anyone is allowed direct access to the **Info** and **Alarm log** display menus with no security password.

Only authorized personnel who possess a thorough understanding of the system operation should perform modifications to secured menu settings (Control, Service and Factory). These menus are configured with password protection, thus requiring a higher level of authority to access them. The screens must have accurate variables entered otherwise erratic operation may occur.

#### 4.2.6.1 Password Protected Screens

Upon first attempting to select a secure menu in a given session, the "**Enter Password**" screen will be displayed. This screen displays the current security level authorized.




**Enter Password Screen**

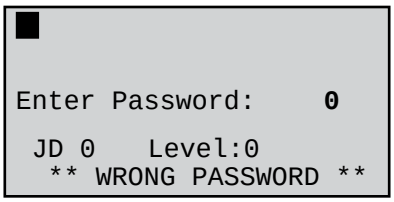
A session is defined as from the time access is gained to a secure menu until 60 seconds elapses with no key activity. Security access will be terminated at this point and the password will have to be reentered to gain access. The menus that may be password protected by the user are the Control and Service menus. The Factory level menu screens are also password protected, however the password is set at the factory to limit access.

It is intended that access to the Factory menu screens only be granted while the user is working with the guidance of STULZ Product Support (see Section 6.0) because incorrect settings made at that level could unintentionally damage the equipment. The Access ID Code in the bottom left of the "Enter Password" screen is needed when contacting Product Support to determine the correct Factory menu password for your specific controller.

The level of authority is established by entering the proper password for a given security level. The controller is shipped from the factory with preset passwords for all of the security levels. The initial passwords are set by the factory to 1 for the Control menu (Level 1) and to 2 for the Service menu (Level 2).

Operators who are allowed access to the Service menu (level 2) for example, must know the password to enter that level. If the entered password equals or exceeds the level requested during a given session, the operator is allowed to access the requested loop. For example, if the entered password allows access to level 2 and the Control menu (level 1) is requested, access will be allowed. If the entered password authority level is lower than the level requested, the words "**WRONG PASSWORD**" will appear for several seconds at the bottom of the screen.

#### 4.2.6.2 Wrong Password




The "**WRONG PASSWORD**" message is displayed any time an incorrect password has been entered and the Enter (↵) key has been pressed. If the "Wrong Password" message appears, pressing the Enter (↵) key will return the operator to the "**Enter Password**" field.

A requested menu screen is displayed any time a valid password has been entered and the Enter (↵) key is pressed.

**NOTE**

If you request the **Control** menu and enter the **Service** menu password, you are granted access to both.

#### 4.2.6.3 Setting the Passwords

Upon entering the Service>Save Cfg menu, the operator is allowed to change the passwords for the menus. If changed, from that point on access may only be gained to that menu by personnel who know the password.

## 4.3 System Operation

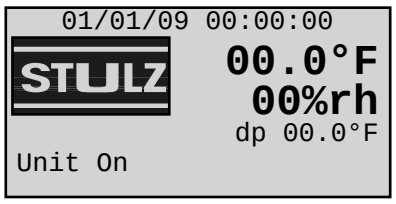
**CAUTION** ⚠

Ensure all system hookups to the air conditioner(s) are completed and that power is available.

1. Turn the main power disconnect switch for the A/C unit to "On". Upon applying control power, the controller display function keys illuminate and the controller begins conducting internal diagnostics to confirm functionality. The controller monitors the alarm inputs and alarm logic to determine if it's safe to start the unit. After an initialization period of about 20 seconds the Main screen is displayed.

The Main Screen is a status screen displaying the current date and time. It displays the current control temperature and relative humidity and the current temperature and dew point as calculated from the T/H sensor. It also displays the current system operating mode(s).

2. If the controller is configured for "Automatic On" operation (standard), a status message "**Unit On**" then appears in the display.




**Main Screen**

3. If the status message "**OFF- Manual Restart Req**" appears instead of "**Unit On**", the Automatic On feature may not be enabled. In this case turn the air conditioner on by pressing the Enter (↵) key.

**NOTE**

You may turn the A/C unit on and off at anytime by pressing and holding the Enter (↵) key for 3 seconds.

Other status messages that may appear at the bottom of the screen are:

**"OFF by remote shutdown"-** Indicates the Remote Start/Stop feature is enabled and requires a remote start switch to be turned On.

**"OFF by Network"-** Indicates the unit is part of a group and is off due to a grouping priority command such as a compressor alarm or loss of airflow

or,

the BMS communication feature is enabled and the unit received a network signal to pause operation.

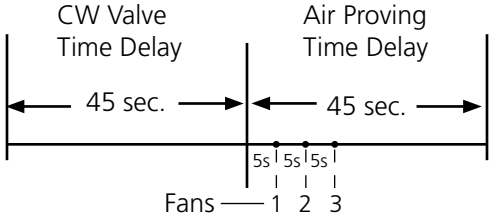
**"OFF by Internal Alarm"-** Unit is off due to a group alarm condition. (Only active with grouped units.)

**"Unit on CL Lockout"-** This indicates cooling has been locked out while there is a demand for dehumidification because the temperature is below the minimum temperature allowable for dehumidification (factory default setting is 4°F below setpoint).

4. After the initialization period expires, the controller enables the control output to the CW valve and signals it to open. Following a 45 second time delay (to allow the valve to fully open) the fans are allowed to begin operating.

5. The STULZ logo in the display is replaced with a blower symbol. The fans begin operating in stages with five second time delays. The middle fan starts first, then the upper fan, then the lower fan.

6. Following a 45 second time delay (after the first fan turns on) the controller polls the air proving switch. If adequate airflow is detected, the controller begins proportionally controlling the output signals to perform cooling, humidification and dehumidification as defined by the system configuration. If there is no call for cooling at that time, the CW valve is returned to the closed position.




7. The controller records the date and time power is re-initialized in the alarm history log.

8. If the actual room conditions are not within the range of the programmed set points, the system will begin operating in the mode(s) needed to reach the set points (cooling, humidifying or dehumidifying). Symbols (shown below) appear in the display to indicate the active operating modes.

= Fan On

= Humidifying

= Dehumidifying

/ = CW Coil Flush Cycle On

9. Temperature and humidity alarms are masked out for 30 minutes to allow for conditions to stabilize without triggering nuisance alarms.

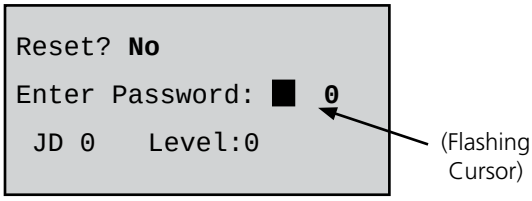
10. Operator interface to the menu loops is available from the Main screen by pressing the Program (***Prg***) key. The controller starts a timer whenever a key sequence is initiated. Every time a button is pressed, the timer is reset. If there is no key activity for 60 seconds, the controller will return to the Main screen unless the Screen Lock feature is enabled in the Information menu loop (see page 4-16).

### 4.3.1 Setpoint Adjustment

1. From the Main screen, access the Main Menu screen by pressing the program ***(Prg)*** key.

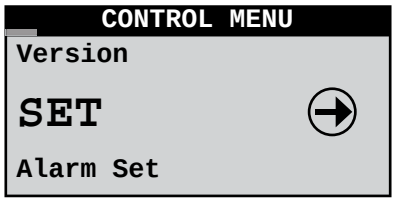
2. Scroll through the Main Menu selections with the Up (↑) and Down (↓) arrow keys and select the Control menu by pressing the Enter (↵) key when "**CONTROL** ⊕" appears in bold letters in the center of the screen. A password entry screen will be displayed.

3. To access the Control menu, press the Enter (↵) key twice to insert a flashing cursor in the "Enter Password" field.

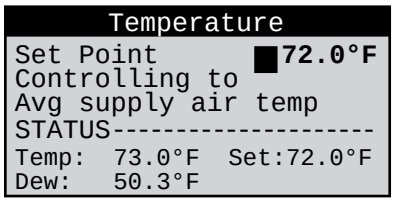



Change the "0" to "1" (or to the current Control menu password if it was changed in the Service menu) with the Up (↑) arrow key and then press the Enter (↵) key to accept the password. Press the Enter (↵) key again to access the Control menu screens.

4. From the Control menu, select Set points by scrolling through the menu selections with the Up (↑) and Down (↓) arrow keys and pressing the Enter (↵) key when "**SET** ⊕" appears in bold capital letters in the center of the screen.

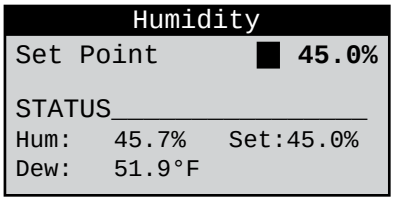



5. After entering the Set points screens, select the Temperature setpoint screen by scrolling the menu selections with the Up (↑) and Down (↓) arrow keys until the word "Temperature" appears in the field at the top of the screen.




Pressing the Enter (↵) key places the flashing cursor in the setpoint value field. Increase or decrease the Temperature Setpoint with the Up (↑) and Down (↓) arrow keys until the desired temperature value is shown. Press the Enter (↵) key again to accept the setpoint (this removes the cursor from the field).

6. From the Temperature setpoint screen, select the Humidity Setpoint screen by scrolling with the Up (↑) or Down (↓) arrow key. When the word "Humidity" appears in the field at the top of the screen, press the Enter (↵) key to move the cursor into the setpoint value field.




Increase or decrease the Humidity Setpoint with the Up (↑) and Down (↓) arrow keys until the desired humidity value is shown. Press the Enter (↵) key again to accept the setpoint and then press the Escape key to return to the Set points (**SET**) Control menu screen.

7. Press the Escape ***(Esc)*** key twice to exit the Control>Set points screens and return to the Main Menu screen.

8. Observe the indicator symbols in the Main screen to determine if the unit is operating in the required mode(s).

9. One to six hours may be required to see the desired temperature/humidity level in the conditioned space. Once room conditions have been programmed or set, a repeat visit to the conditioned site may be required to ensure the air conditioner is meeting the room's requirements.

#### 4.3.1.1 Saving and Restoring Setpoint Parameters

Upon initial start-up the A/C system operates using the set points programmed by the factory (primary set points) as the operating set points. As described in Section 4.3.1, the customer may enter new operating parameters in the Control menu anytime and the system will then operate accordingly. The customer may store the new set points in the Service menu if it is intended to save them. Once stored, the Customer set points now become the operating set points. The primary set points entered by the factory still remain stored in the controllers' memory as the Factory set points.

At any time, set points for the system may be re-adjusted to any value and the system will operate accordingly. If it becomes necessary however, the customer may enter the Service menu and restore the set points to the stored Customer operating setpoint values. The original Factory (primary) setpoint values may also be restored from the Service menu. Whichever set points are restored (Factory or Customer), become the current operating set points.

### 4.3.2 Alarms

As programmed into the system controller, an alarm condition activates the summary alarm logic which illuminates the alarm key and energizes an audible alarm. Some alarms are programmed by the factory to automatically shut down the A/C unit until the alarm condition is remedied and the alarm is cleared by pressing the alarm key. Some of the alarms that may be enabled by the factory are listed in Section 4.5.3.

#### 4.3.2.1 Summary Alarm

A summary alarm will activate when the controller senses any programmed alarm condition. This illuminates the alarm key and if the option is selected, a N.O./N.C. summary alarm contact may be energized for remote monitoring of alarm conditions. If certain critical summary alarm conditions are detected, they will cause the A/C unit to shutdown.

#### 4.3.2.2 Customer Alarms

A customer provided digital (on/off switching) alarm sensor may be connected to terminals provided in the electric box. This alarm input may be for any site specific alarm condition the user wishes to monitor that may or may not be provided in the standard controller alarms menu; i.e. Gas Detection, Intrusion Alarm, etc. Upon detection of a customer alarm, the controller will activate the summary alarm contact and display a screen message indicating a customer alarm message. The screen message "**Customer Alarm 1**" (default) will appear in the controller display or the user may reconfigure the controller to display any alpha-numeric message desired, up to 20 characters long, in the Service>Options>Custom menu loop (see Section 4.5.5.6.6).

#### 4.3.2.3 Custom Alarms

A custom (user configured) alarm is activated upon detection of one or more programmed alarm conditions as set by the operator in the Service>Options>Custom menu loop (see Section 4.5.5.6.7). When a custom alarm condition is detected, a summary alarm is signaled and a designated set of N.O. & N.C. Custom Alarm relay contacts may be energized to provide remote indication of the specific alarm condition(s).

For example you may want to be notified when a change filter alarm is annunciated, giving notice that the air filters need to be cleaned or replaced. That way you are alerted before the filters are so badly clogged that airflow is reduced to a point where a "Loss of airflow" alarm is activated.

The controller may be factory configured to activate up to three custom alarms. One custom alarm with relay contacts is provided as a standard and up to 2 additional custom alarms may be provided as an option.

## 4.4 Controller Operation

The $E^2$ Series controller is designed to control an air conditioning system in a space or process application to temperature and humidity levels as defined by the user. Conditioned air is supplied to the space as needed to maintain the temperature/humidity control set points.

The controller I/O module includes inputs and outputs as depicted in Figure 12. Not all the inputs and outputs shown below are utilized, therefore, only the inputs/outputs needed for the specific A/C system type and application are enabled.

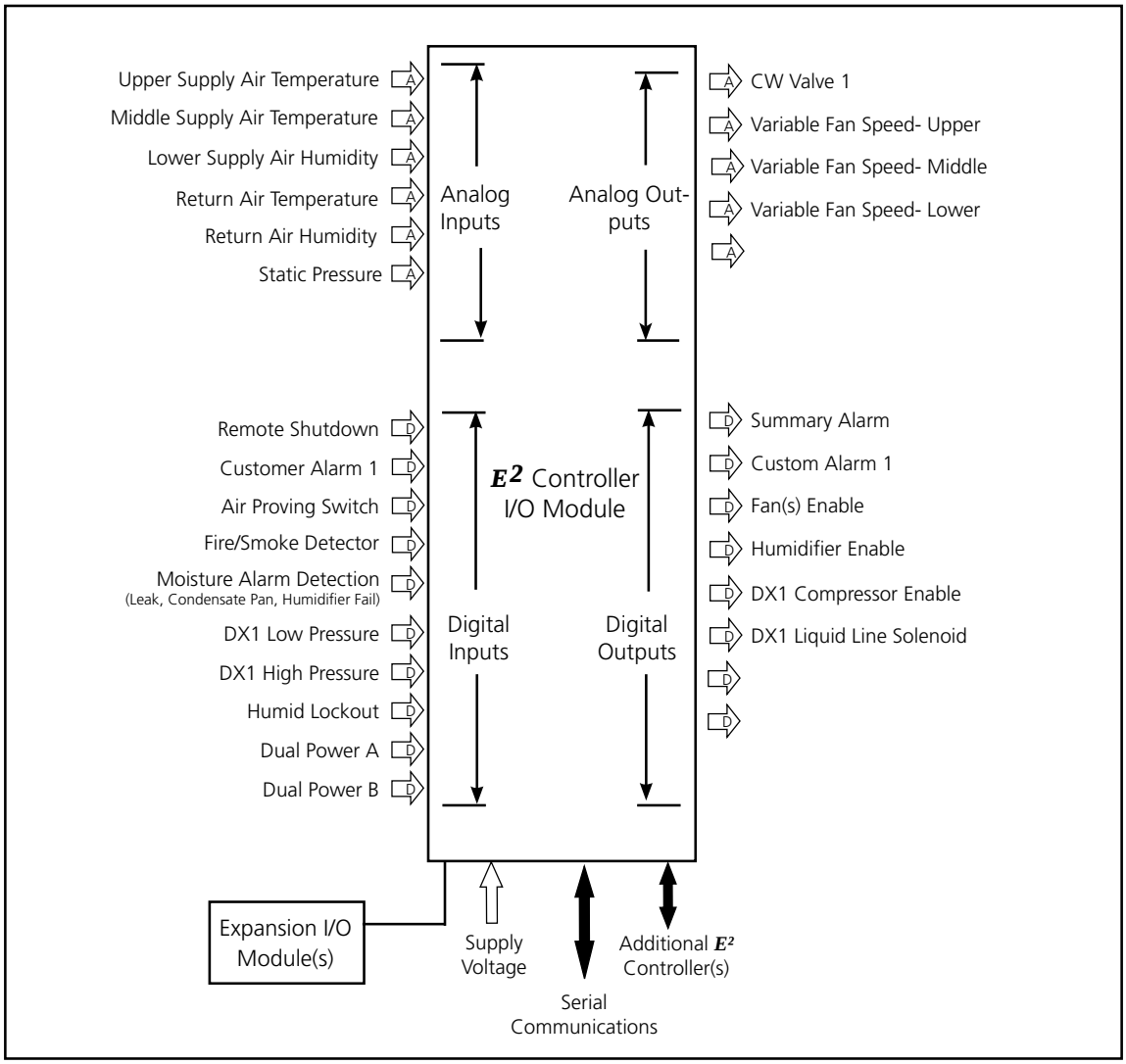



**Figure 12- Control Inputs and Outputs**

The $E^2$ controller continually analyzes the demand for cooling, humidifying and dehumidifying against the control set points and determines the appropriate response (control output signals) to operate the A/C system. The controller is equipped with analog input positions for monitoring temperature and humidity sensor(s). The controller monitors the actual cold aisle supply air conditions for three fan zones (upper, middle and lower) as measured by temperature sensors mounted locally to each zone inside the CyberRow cabinet. The controller also monitors a temperature/humidity (T/H) sensor which is mounted in the return (hot aisle) side of the cabinet.

A remote mounted supply air T/H sensor may also be provided as an option. The controller may be configured by the factory to manage system operation based on the remote T/H sensor inputs which is to be field installed in the supply (cold aisle) space.

### 4.4.1 Control Signals

Control output signals and alarm recognition takes place by means of the controller analyzing signal inputs from the sensor(s) and developing the appropriate digital or proportional response.

#### 4.4.1.1 On/Off Digital Control

Based on control inputs, the controller provides an on/off output signal to activate certain modes of operation for the air conditioner (i.e. humidifier, fans, or annunciate an operating condition status i.e. alarm condition).

#### 4.4.1.2 Proportional/Integral (P/I) Control

The controller calculates proportional control output signal(s) based on the analysis of input signals which then determines the air conditioner's required mode(s) of operation. Signals representing temperature and humidity are each compared by the controller as a percentage value to the maximum control setpoint value resulting in control output values that are directly proportional to the input signal.

The integral value is used to gradually adjust the proportional output when the calculated output does not move the process variable closer to setpoint in a given period of time. Decreasing the integral value decreases the interval for the output corrections (speeding the rate of adjustment). Increasing the integral value increases the interval for corrections (slowing the rate of adjustment).

### 4.4.2 Control Methods

System operation depends on the controller's programmed operating configuration. Control takes place by means of the controller analyzing signal inputs from the supply air temperature sensors and the return air T/H sensor or optional remote mounted supply T/H sensor. The $E^2$ controller may be configured for temperature/relative humidity control (standard) or dewpoint control (optional) for cooling, dehumidification and humidification functions.

The control method, selected in the Factory menu, determines which sensors the controller uses to manage operation of the A/C system. You may view the method selected in the Control>Set menu, see Section 4.5.4.1.

| Control Method | Control Sensor Selection |
|---|---|
| Temperature control | 1. Supply air sensors |
| | 2. Return T/H sensor |
| | 3. Remote Supply T/H sensor |
| Humidity control | 1. Return T/H sensor |
| | 2. Remote Supply T/H sensor |
| Dewpoint control | 1. Return T/H sensor |
| | 2. Remote Supply T/H sensor |

#### 4.4.2.1 Temperature/RH Control

When enabled for temperature/RH control, the controller continuously monitors the selected combination of air temperature sensors and return T/H sensor or optional remote supply T/H sensor, as configured by the factory, to manage system operation.

#### 4.4.2.2 Dewpoint Control

When enabled for dewpoint control, the controller logically examines the combination of temperature and relative humidity (dewpoint) and determines the proper control of cooling, humidification and dehumidification to move the actual conditions to within the boundaries of the dewpoint set points as they would appear on a psychrometric chart (see Figure 13). It avoids scenarios where the A/C unit might both cool and humidify the supply air when cooling alone will achieve the desired result.

The controller calculates dewpoint using the control inputs from the return air T/H sensor or optional remote mounted supply T/H sensor as configured by the factory. The calculated dewpoint property is used to manage system operation which results in higher operational efficiency and shorter component run-times.

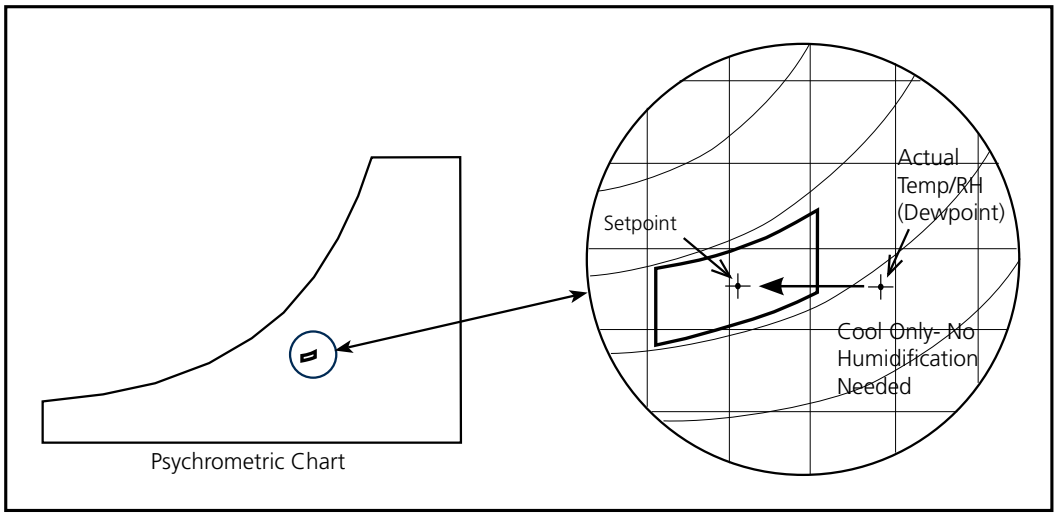



**Figure 13- Dewpoint Control**

### 4.4.3 Operating Configurations

The operating configuration for the controller depends on what type of air conditioner is being controlled (i.e. AR, CW, W/G) and what features are selected. The operating configuration is preset by the factory according to the application. If certain features discussed in this manual are not factory enabled, no screens for that feature will appear in the controller user interface display.

#### 4.4.3.1 CW Cooling

Upon a call for cooling the controller activates a chilled water control valve with a proportional/integral (P/I), 0-10 VDC signal. The valve opens proportionally to the demand for cooling based on air temperature. The control settings include a setpoint and a control dead band. The cooling band is adjustable from 0-10°F in the Factory menu. Contact STULZ Technical Support for guidance if adjustment is needed.

When the control air temperature exceeds the programmed setpoint plus offset, the CW valve is opened allowing CW to flow to return the air temperature to the setpoint and maintain it. If the control air temperature continues to rise, the chilled water valve position continues to modulate open as needed, up to 100% (fully open), to maintain the temperature setpoint.

The control output is matched to the valve. If the valve typically opens at 2.5 VDC, the control I/O module will generate the appropriate voltage for opening the valve starting at the minimum voltage of 2.5 VDC. From there the signal increases as needed until the valve position reaches 100% open.

#### 4.4.3.2 Humidifying

If this option is selected (available on CRS-180 units only), an on-board steam humidifier may be turned on or off by the controller to maintain relative humidity to a control setpoint. Once the controller enables humidification, the humidifier will operate at 100% capacity until the humidity setpoint is reached. An on-board control module manages the humidifier operation, i.e. humidity production, fill cycles, drain cycles.

#### 4.4.3.3 Dehumidifying

When dehumidification is called for the fan speed automatically changes to the dehumidification fan speed setting. The controller will operate the system in the cooling mode at full output to strip moisture from the air. In a CW system the control valve may be set to be less than 100% open for dehumidification if desired in the Service>Humidity menu (see Section 4.5.5.2). The system will remain in the cooling mode until the actual relative humidity (or dewpoint) reaches the control setpoint plus the dehumidification cut-out offset. If the control temperature drops below the low temperature cut-out setpoint for the dehumidification mode (temperature setpoint minus 4°F default), cooling operations will be stopped.

### 4.4.4 Air Flow/Fan Speed Control

The ***E²*** controller treats each EC fan as a variable speed fan. The controller manages the speed of each fan from a factory-set minimum up to a factory-set maximum speed. The minimum fan speed is used whenever the A/C unit has no cooling operations running. The maximum fan speed setting is used during times when the A/C unit is cooling

or humidifying. A dehumidification fan speed setting is used when the system is in the dehumidification mode. The speed settings are adjustable in the Service>Blower>Blower Set Up menu loop (see Section 4.5.5.5.3).

EC fan speed may be automatically varied along with the CW control valve position based on temperature. When the system enters the dehumidification mode, the fan speed automatically changes to the dehumidification speed setting.

The ***E²*** controller's software is equipped with an operational fail-safe mode. Upon sensing a temperature sensor failure, the controller signals an alarm. It continues to develop the CW valve and fan control outputs by calculating the averaged value of the remaining sensors to replace the input value of the failed sensor. If all the temperature sensors fail, the controller develops the control outputs based on the entered temperature setpoint plus a programmable temperature offset. Humidity control continues based upon the setpoint. This allows the CyberRow system to continue operating while the cause of the problem is corrected.

The controller continually monitors fan operation. CyberRow CRS-090 units are equipped with an airflow switch to detect the loss of airflow.

CyberRow CRS-180 units are equipped with larger EC fans that include an integrated electronic monitoring function. If any of the following failure conditions occur, the motor automatically stops and an alarm is sent to the controller:

a. Locked rotor
b. Loss of a phase
c. Low main supply voltage
d. Over-heating of electronics
e. Over-heating of motor

If an airflow alarm occurs (CRS-090 units) or if one of the fans fails to operate (CRS-180 units), the controller alerts the operator with an alarm message and increases the speed of the remaining two fans to 99.9% to compensate for the loss of air flow. If the fault does not clear, the fans shut down for 5 seconds and then restart. If the fault continues, the fans reset a second time. If the fault does not clear after the second reset the fan(s) which generated the fault remain off and the operational fans continue running at 99.9% speed.

In the event of a BMS monitoring/control signal failure, the ***E²*** controller will default to local operation at the current set points for the fan and chilled water control valve. The local sensors have priority over the BMS system.

#### 4.4.4.1 Independent Fan Speed Control

The system controller may be configured for independent, variable fan speed control for the upper, middle and lower zone fans while in the cooling mode. With this method, the controller continually monitors supply air conditions for each fan zone (upper, middle and lower) as determined by temperature sensors mounted locally to each zone inside the CyberRow cabinet. The operator may select from three independent fan speed temperature control methods; Variance From Average, Temperature Proportionate or Manual, in the Control>Set>Fan Control menu loop (Section 4.5.4.1). Minimum and maximum fan speed settings for each fan are user adjustable in the Service>Blower>Temp Zone Set Up menu loop (see Section 4.5.5.5.2). The fans will not run at speeds outside of the envelope established in that menu loop.

##### 4.4.4.1.1 Variance From Average Fan Speed Control

When configured for variance from average fan speed control each fan operates independently. The controller manages the speed of each fan by comparing the variance of the fan's local zone temperature sensor to the overall average temperature measured by the sensors for all three fan zones. The controller adjusts the speed of each fan as necessary for that zone to meet the supply air temperature setpoint.

##### 4.4.4.1.2 Temperature Proportionate Speed Control

The controller adjusts the speed of each fan proportionally for that zone to meet the supply air temperature set point. The controller compares the variance of each temperature zone to the temperature set point and develops a proportional control output to modulate the speed of each fan, for that zone to meet the supply air temperature setpoint.

##### 4.4.4.1.3 Manual Fan Speed Control

The controller continually controls the speed of each fan to values manually entered in the system controller Control>Set>Fan Control menu loop (Section 4.5.4.1) without regard to the temperature setpoint.

#### 4.4.4.2 Static Pressure Control

The control of static pressure is used as a means to ensure the constant flow of air across the heat load in server containment configurations. The controller is configured to control fan speed from 100% (full speed) to a minimum setting based on the total system static pressure. Minimum and maximum fan speed settings are user adjustable in the Service menu. The static pressure is either directly read by the controller as an analog input from a sensor or a static pressure input signal may be provided to the controller from a BMS. See Section 4.5.4.1 for instructions on setting static pressure control.

### 4.4.5 Remote Power Off (EPO)

A red jumper is installed between terminals X2-3 and 4 on the control terminal block (refer to the electrical drawing). This jumper may be removed and the customer may connect a remotely located, On/Off switching device

(switch or relay). In an emergency, the circuit may be opened to disconnect control power from the A/C unit to stop operation, bypassing delay timers so the chilled water valve, fans, etc. stop immediately. The A/C system will automatically turn back on when the Emergency Power Off (EPO) switch contacts are closed. Refer to the electrical drawing included with the A/C unit for the wiring details.

**NOTE**

The EPO disconnects control power from the unit contactors causing them to open. MAIN POWER IS STILL PRESENT IN THE UNIT WHEN THE EMERGENCY STOP SWITCH IS OPERATED.

### 4.4.6 Remote On/Off Control

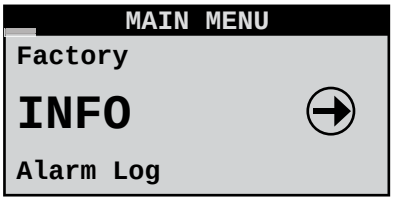
Terminal positions are provided to connect a remotely located, On/Off switching control device. If the A/C unit is turned on and the ***E²*** controller receives a remote input signal to turn off the A/C unit, the controller disables all control outputs and a message "Off by Remote Shutdown" appears in the main display screen. The A/C system will automatically be re-enabled when the remote On/Off signal calls for the A/C unit to turn back on. Refer to the electrical drawing included with the A/C unit for the wiring details.

### 4.4.7 Dual Power Transfer Monitoring

As an option, two sources of input power may be utilized (see Section 1.6.5). With this feature the controller monitors switching between two power sources, such as commercial power and generator backup. Each power source is monitored by a voltage monitor (*used on 1-phase systems*) or a phase relay (*used on 3-phase systems*), one output of which goes into the power switching circuit and the other output sent to the controller for monitoring purposes. Should a power transfer occur, the controller provides an alarm message and the alarm display indicates which power source failed.

## 4.5 Menu Screens

### 4.5.1 Main Menu




The Main Menu is accessed from the Main screen by pressing the ***Prg*** key. The Main Menu screen provides a complete listing of the menu loops that are available. You may scroll through the menu categories using the Up (↑) and Down (↓) arrow keys. From the Main Menu screen you may select from among the following standard menus:

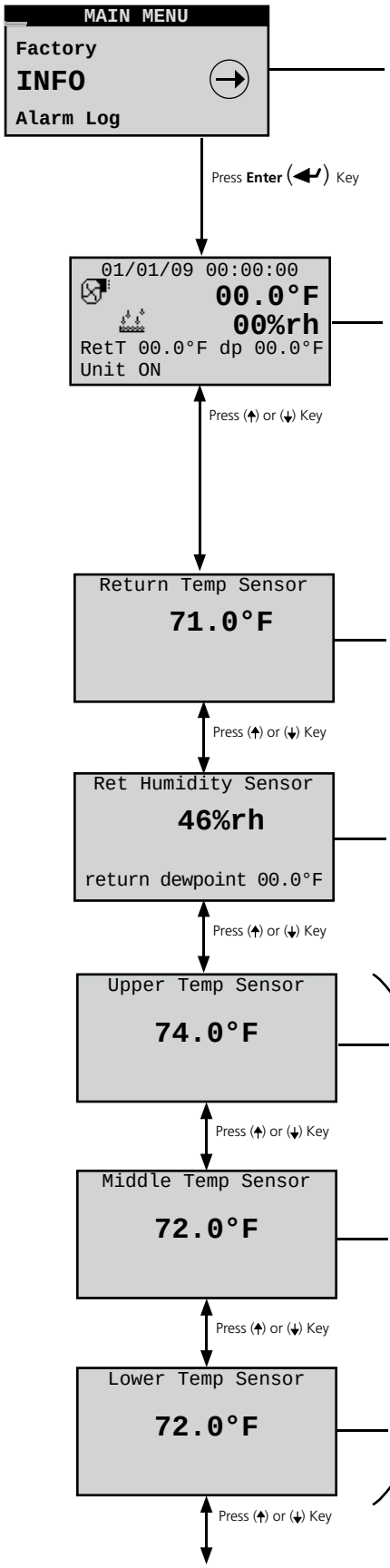
**"Info"**- Displays basic read-only status information. Allows you to monitor system operational parameters. No password is needed at this level.

**"Alarm Log"**- Displays all alarms and "power-ups" in sequential order with a time and date stamp. No password is needed at this level.

**"Control"**- Allows modification of basic control parameters such as set points and clock. Level 1 password is needed to enter this menu.

**"Service"**- Allows modification of advanced control parameters such as offsets, fan speed, BMS set up and permits the user to save customer parameters and reset the controller to the customer or factory default values. Level 2 password is needed to enter this menu.

**"Factory"**- Allows modification of more advanced control parameters such as sensor scaling, start-up delays and grouping parameters. Level 3 password is needed to enter this menu. Entry to the Factory menu is intended for qualified technicians.

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### 4.5.2 Information Menu Loop

The Info menu screens may be accessed from the Main screen by simply scrolling with the Up (↑) and Down **(↓)** arrow keys. The same screens may also be viewed if you enter the Info menu by pressing the ***Prg*** key, then the ↵ key. The Info menu displays screens that provide current temperature "and relative humidity conditions and shows the modes the A/C system is currently operating. There are no adjustable parameters in this loop. From the Info loop you may view the following display screens as they apply to the unit configuration:

#### 4.5.2.1 Operating Conditions

The first Info screen displays the current Date, Time and provides State of Operation icons.

The actual control temperature (**°F**) and relative humidity (rh) is always displayed and the return ("**RetT**") or optional remote supply ("**RSpT**") temperature and dewpoint (**dp**) will appear, dependant on the T/H sensor selection. The values displayed are used by the controller to develop control output signals for managing system operations.

#### 4.5.2.2 Return Temperature Sensor

Displays the air temperature as measured by a return temperature/humidity (T/H) sensor inputs. The return T/H sensor is factory mounted inside the cabinet.

#### 4.5.2.3 Return Humidity Sensor

Displays the relative humidity as measured by the return T/H sensor inputs. Return dewpoint is calculated by the controller based on the return T/H sensor inputs and then shown at the bottom of the display screen.

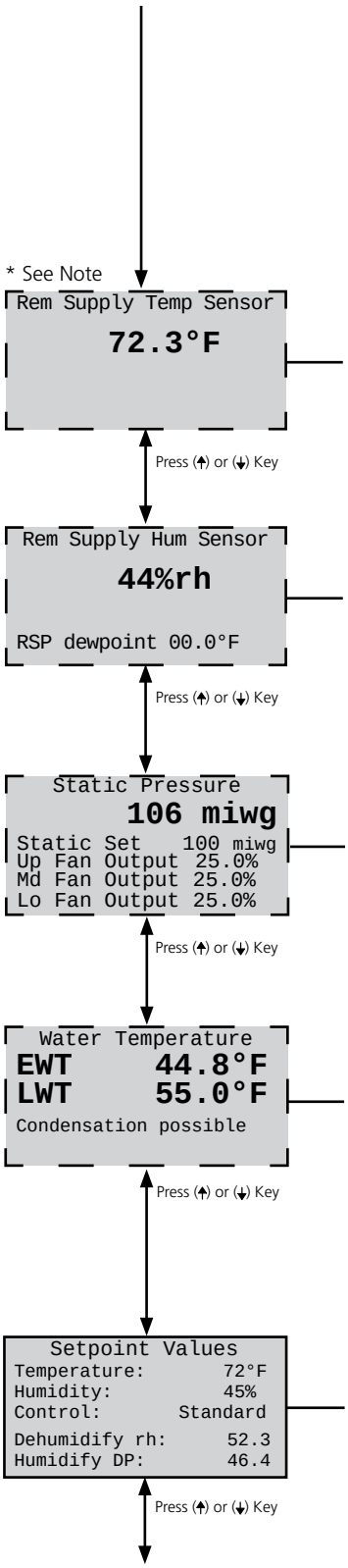
#### 4.5.2.6 Temperature Sensors

The temperature screens display the supply air temperature as measured by sensors located in the cold aisle side of the CyberRow cabinet. The sensors are located within the cabinet in upper, middle and lower zones as called out in the display. Values measured by the sensors may be used to individually control the speeds of the fans (see Section 4.4.4.1).

(Continued from previous page)

## *Screen Lock Feature*

You may lock the status display screens, bypassing the display screen time-out function. Sometimes it is useful to maintain visibility to a specific screen when testing, making adjustments or troubleshooting the system. To do this, you must be in the Info menu loop. Simultaneously press the Program ***(Prg)*** and Enter (↵) key for approximately 3 seconds. This will turn the screen lock feature On or Off. When the screen lock feature is On, the display screens remain displayed when you select different screens with the Up (↑) or Down (↓) arrow keys. A padlock symbol (🔒) appears in the upper right corner indicating the screen lock feature is On. You must unlock the screens to restore the time-out function.




(Continued on next page)

### 4.5.2.4 Remote Supply Temperature Sensor

Displays temperature as measured by an optional, remote mounted supply T/H sensor input.

### 4.5.2.5 Remote Supply Humidity Sensor

Displays relative humidity as measured by the optional, remote mounted supply T/H sensor inputs. Remote dewpoint is calculated by the controller based on the remote supply T/H sensor inputs and shown at the bottom of the display screen.

### 4.5.2.7 Static Pressure

The Static Pressure screen appears if your unit is configured for static pressure control instead of zone temperature control. This screen displays the current operating static pressure. The static pressure setpoint and the current proportional control signal to the fans appear below. With static pressure control, all three fans operate at the same speed and are controlled to maintain a constant static pressure setpoint.

### 4.5.2.8 Water Temperature

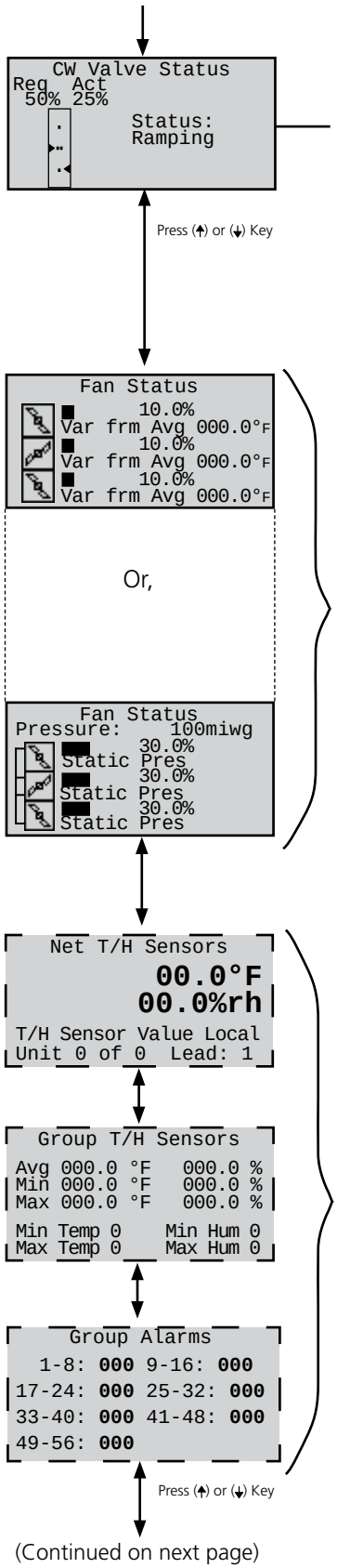
The Water Temperature screen appears only if the controller is configured to monitior optional CW temperature sensors. It displays the temperature of the water entering the coil (EWT) and the temperature of the water leaving the coil (LWT). The controller compares the 2 values and signals a "NO FLOW" alarm condition if the difference between the two values is less than 2°F (adjustable in Factory menu) during cooling operation. The water control valve must be at least 3% open for a minimum of 15 seconds for a "NO FLOW" message to appear. The "NO FLOW" alarm may be disabled in the Factory menu. Also, this screen will display a warning message, "Condensation possible", if the dewpoint of the air is equal to or higher than the EWT.

### 4.5.2.9 Setpoint Values

Displays the current operating Temperature and Humidity set points and control method. If configured for Dewpoint control, the controller displays the calculated dewpoint set points for dehumidification and humidification as derived from the operating temperature and humidity set points.

* **NOTE:** Display screens shown with a dashed border appear only if the applicable feature is enabled.

(Continued from previous page)




### 4.5.2.10 CW Valve Status

This screen displays "**Req**", the value of the analog output signal (0 to 100%) that controls the position of the CW valve and it displays "**Act**", the approximate position of the valve (0 to 100%). The bar gauge provides a visual representation of the output signal and the valve position. The CW valve "**Act**" position is estimated based upon the amount of time the valve is signaled to actuate toward the open or the closed position. A status message appears in the field to the right of the gauge indicating the various states of valve operation. In the example shown, "Ramping" indicates the valve is moving toward the position requested by the analog output signal. When the valve % position matches the analog signal % value, the status changes to "**OK**"

### 4.5.2.11 Fan Status

The Fan Status screen displays symbols indicating the operating status of the upper, middle and lower fans. The symbols are animated when the fans are running. If a fan is not running, the ☒ symbol will appear instead. The value of the proportional output signal (0 to 100%) that controls each fan appears in the field to the right of each symbol. The controller also displays the temperature value for the sensor from each fan zone. The message "**Var from Avg**" or "**Temp Prop**" appears indicating the system is in a zone cooling control configuration (see Section 4.4.4.1) and the unit is in the cooling mode. The message in the field is replaced with "**Dehum**" when the system is in the dehumidification mode. In the dehumidification mode the animated icons are linked together indicating the three fans are being controlled to the same fan speed setting.

If the system is configured for static pressure control (see Section 4.4.4.2), the Fan Status screen displays the current operating static pressure in m.i.w.g. in the first field. The message fields say "**Static Pres**" indicating the system is configured for static pressure fan speed control. The animated icons are linked together indicating the three fans are being controlled to the same fan speed setting for static pressure control.

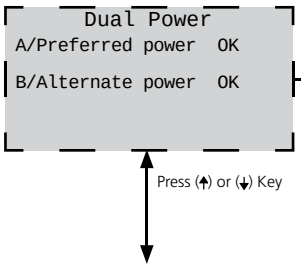
### 4.5.2.12 Group Information Menu Screens

The Group Information menu screens only appear if the controller is set up to operate a multiple A/C unit work group. See Section 4.6.2.8 for a more detailed description of these screens.

(Continued on next page)

## Information Menu

* See Note




### 4.5.2.13 Dual Power

*Dual Power option.* If the controller is configured for Dual Power operation (Section 1.6.6), a display screen shows the status of the power sources. OK indicates the controller senses that the sources of power are available. The power sources are designated as A or B by the way the input power connections are made to the disconnect switches in the electric box. Ensure the preferred (primary) power source is connected to the power source "A" disconnect switch designated (Q80) as shown in the electrical drawing. The alternate (or back up) power source is to be connected to the power source "B" disconnect switch (Q81).

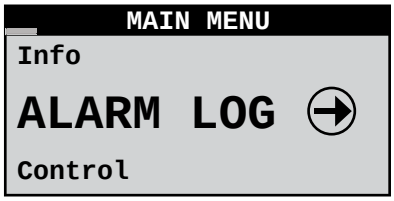

### 4.5.2.14 Software Version/Date

Displays the type of A/C system the controller is configured for (CW, WG AR), the STULZ software version and it's release date.

* **NOTE:** Display screens shown with a dashed border appear only if the applicable feature is enabled.

## Alarm Log Menu

### 4.5.3 Alarm Log




No password is required to view alarm display messages. If an alarm condition occurs, the first active alarm may be displayed by pressing the Alarm (🔔) key. The alarm screen display text message will remain unchanged until the alarm condition is cleared.

If the alarms log is entered from the main menu, any other active alarm message(s) may be viewed by using the Up (↑) and Down (↓) arrow keys to scroll through alarm messages.

#### 4.5.3.1 Alarms

The red LED backlight within the alarm key will illuminate any time an alarm condition is present or previous alarms existed without having been reset or cleared. An audible alarm will also activate when an alarm condition occurs. The audible alarm may be enabled or disabled in the Service>Options menu loop. The first active alarm screen may be displayed by pressing the Alarm (🔔) key. The Alarm display provides you with a text message describing the abnormal operating condition. Use of the Up (↑) and Down (↓) arrow keys allows you to scroll for any additional alarm messages. Only active alarm screens will be displayed when the Alarm (🔔) key is pressed. The alarm screen display will remain unchanged until the alarm condition is corrected and the alarm key is pressed again to clear the alarm.

When access is gained to the Alarm Log loop, use of the Up (↑) and Down (↓) arrow keys allows you to scroll through the log for a history of alarm messages. The alarms log may be cleared in the Service>Alarm log menu loop.

The application software supports two (2) types of alarms, *"Non-Critical"* and "*Critical*". Any alarm may be pro-

grammed to activate the "User Configured" alarm relay contacts.

#### 4.5.3.2 Non-Critical Alarms

A *Non-Critical* alarm will activate the alarm screen with which it is associated. These alarms are programmed to activate the "Summary Fault" alarm and close the "Summary Fault" relay contacts without stopping unit operation. Some examples of the factory programmed, *Non-Critical* alarms are:

- High Temperature
- Low Temperature
- High Humidity
- Low Humidity
- CW Flow
- Condensate Pan
- Water Detector
- Change Filter
- Sensor Failure
- Communication Failure

*Critical* Alarms will coincide with automatic shut down of the A/C unit(s) equipment as needed to prevent possible system damage. The A/C unit(s) equipment will remain shut down until the alarm condition(s) are no longer sensed and the controller has been reset. Some examples of *Critical* alarms are:

- No Air Flow (Air Proving Switch)
- Fire/Smoke Detection
- Off by Internal Alarm (Only for grouped systems)

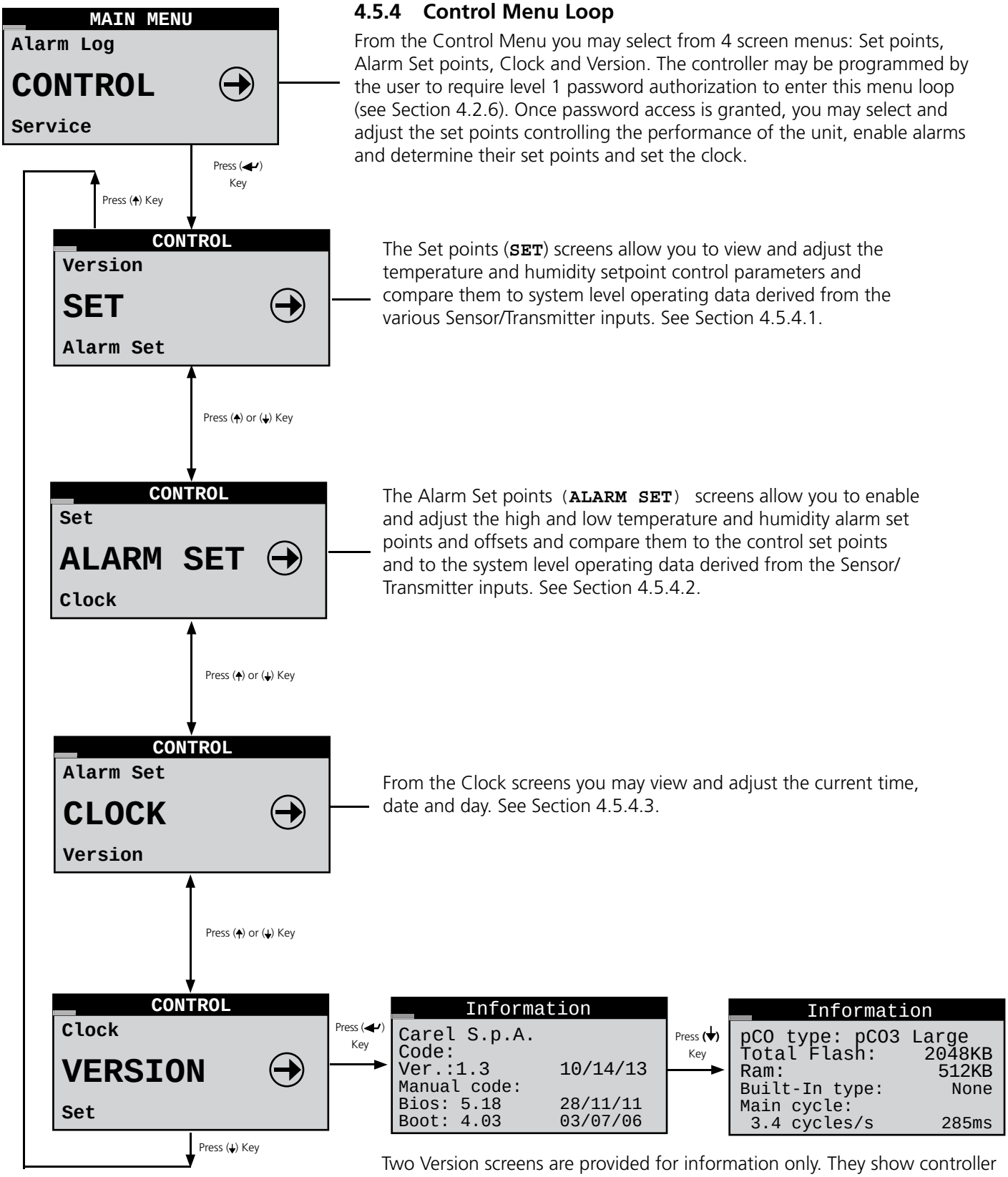
#### 4.5.3.3 Critical Alarms

| ALARM MESSAGE | DESCRIPTION OF ALARM CONDITION |
|---|---|
| **High Temperature** | Air temperature is above user defined alarm setpoint. |
| **Low Temperature** | Air temperature is below user defined alarm setpoint. |
| **High Humidity** | Humidity is above user defined alarm setpoint |
| **Low Humidity** | Humidity is below user defined alarm setpoint. |
| **Sensor Failure** | Sensor is disconnected or faulty. (The failed sensor is identified.) |
| **Communication Failure** | External and/or internal communication lost (BMS or pLAN) |
| **Condensate Pan** | Water level in condensate pan is reaching an unsafe level. |
| **Water** | Water sensed by water leak detector |
| **No Air Flow** ***(CRS-090 units)*** | Insufficient airflow as detected by air proving switch. |
| **Fan Failure** ***(CRS-180 units)*** | Upper, Middle and/or Lower fan failure. |
| **Change Filter** | Filter replacement time interval elapsed; filter needs to be replaced. |
| **Smoke/Fire** | An alarm condition detected by the smoke detector or firestat. |
| **High Air Temp Alarm (Optional)** | Air temperature is above alarm threshold (user configurable). |
| **Low Air Temp Alarm (Optional)** | Air temperature is below alarm threshold (user configurable). |
| **Power Source A Lost** | Power source A not detected (provided with dual power option). |
| **Power Source B Lost** | Power source B not detected (provided with dual power option). |
| **No Flow (Water Temp Sensors)** | No chilled water flow as detected by optional temperature sensors. |
| **Water Temp High Alarm** | Supply EWT temperature is above alarm threshold (optional). |
| **Water Temp Low Alarm** | Supply EWT temperature is below alarm threshold (optional). |
| **No Flow (Flow Switch)** | Insufficient flow of chilled water as detected by optional flow switch. |

#### 4.5.3.4 Alarm Screen Messages

### 4.5.4 Control Menu Loop

From the Control Menu you may select from 4 screen menus: Set points, Alarm Set points, Clock and Version. The controller may be programmed by the user to require level 1 password authorization to enter this menu loop (see Section 4.2.6). Once password access is granted, you may select and adjust the set points controlling the performance of the unit, enable alarms and determine their set points and set the clock.



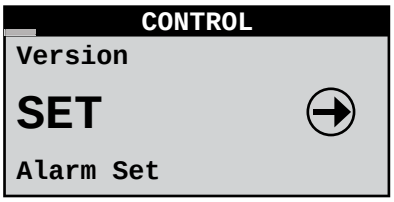

The Set points (**SET**) screens allow you to view and adjust the temperature and humidity setpoint control parameters and compare them to system level operating data derived from the various Sensor/Transmitter inputs. See Section 4.5.4.1.

The Alarm Set points (**ALARM SET**) screens allow you to enable and adjust the high and low temperature and humidity alarm set points and offsets and compare them to the control set points and to the system level operating data derived from the Sensor/ Transmitter inputs. See Section 4.5.4.2.

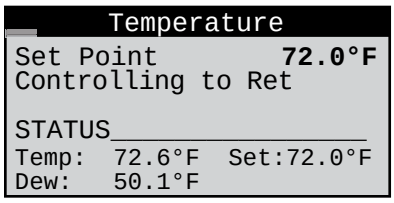
From the Clock screens you may view and adjust the current time, date and day. See Section 4.5.4.3.

Two Version screens are provided for information only. They show controller hardware and software details that are useful to STULZ Product Support if technical assistance is needed.

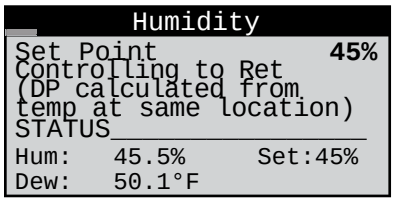
#### 4.5.4.1 Setpoint Screens




The Set points (SET) screens below may be accessed from the Control menu.

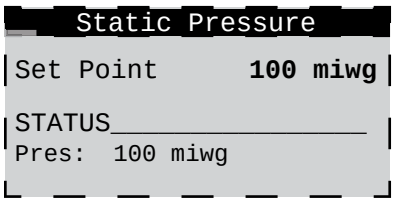



Press (▼) Key




Press (▼) Key

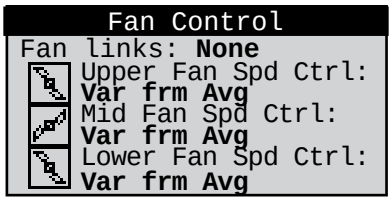
The Temperature and Humidity setpoint screens allow you to view and adjust the control set points and compare them to system level operating data derived from the various Sensor/Transmitter inputs.




Press (▼) Key

The Static Pressure screen only appears if your unit is configured for static pressure control at the factory. It allows you to adjust the static pressure set point and compare it to the actual static pressure measured.

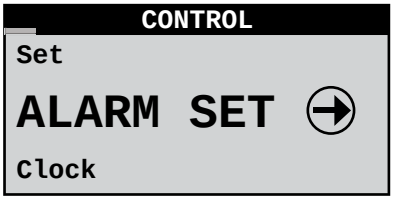
Static pressure should be set when commissioning the A/C unit. The operating static pressure can only be set correctly after the A/C unit is installed and operable in its intended location. When setting the static pressure, the A/C unit must be turned on and the fan(s) should be allowed to reach full speed before making adjustments.



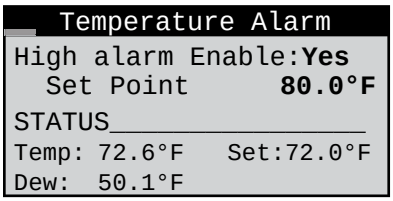

If your unit is configured for zone temperature fan speed control instead of static pressure control, the Fan Control screen allows you to select a fan speed control method (Variance from Average, Temperature Proportional or Manual, see Section 4.4.4) for each of the three fans. You may also link the fan temperature zones together in any combination so selected fans operate at the same speed. The linked zones use the average of the linked temperature sensors to control fan speed. Link bars appear to the left of the fan icons indicating which fan zones have been linked.

The lower two fields disappear from the Fan Control screen when the system is in the humidification or dehumidification modes. In these modes individual fan speed control ceases and the fan speeds are automatically linked and controlled to the same speed.

#### 4.5.4.2 Alarm Setpoint Screens




The Alarm Set points screens may be accessed from the Control menu. These screens allow you to enable the High and Low temperature and humidity alarms, adjust their set points and compare them to the control set points and to the current system level operating data derived from the sensor inputs.




High Temperature Alarm

Press (▼) Key

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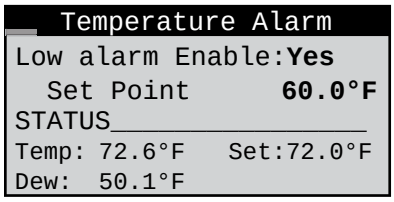
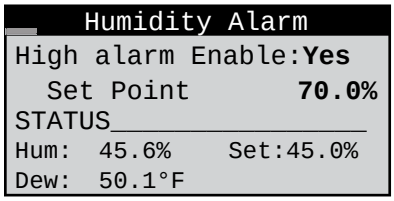
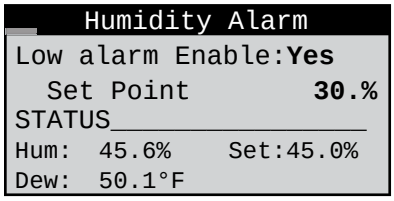



Low Temperature Alarm

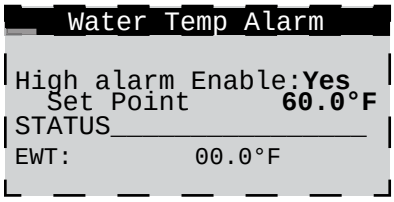



High Humidity Alarm

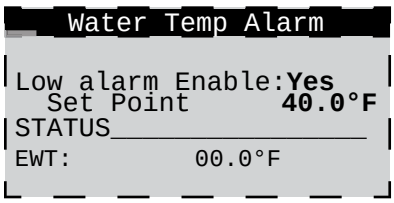



Low Humidity Alarm

The following 2 screens appear only if your unit is factory configured to utilize an optional entering water temperature (EWT) sensor input.



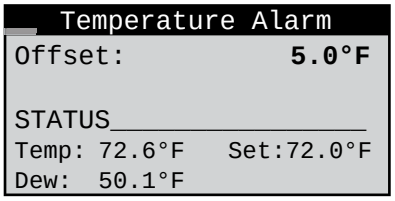

High Entering Water Temperature Alarm




Low Entering Water Temperature Alarm

Following the alarm enable screens are the alarm offset screens. From these screens you may adjust offsets for the high and low alarm set points at which the alarm will be cancelled. The entered offset applies to both the upper and lower values entered in the Alarm Set points Screens. The offset is subtracted when it's applied to the high alarm setpoint and it is added when it's applied to the low alarm setpoint.

**EXAMPLE 1: Temperature Alarm Offset**




If the offset for the temperature alarm is set at 5.0°F (default), the high temperature alarm will cancel when the actual temperature drops to the High Temperature Alarm setpoint (80.0°F) - the Offset (5.0°F)

or,

80.0°F - 5.0°F = 75.0°F

The High Temperature Alarm will cancel at 75°F.

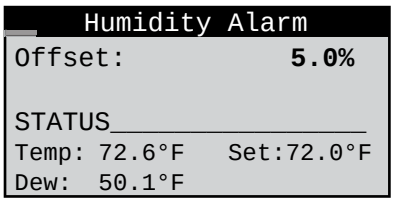
Conversely, the low temperature alarm will cancel when the actual temperature rises to the Low Temperature Alarm setpoint (60.0°F) + the Offset (5.0°F)

or,

60.0°F + 5.0°F = 65.0°F

The Low Temperature Alarm will clear at 65.0°F

**EXAMPLE 2: Humidity Alarm Offset**




High Temperature Alarm Offset

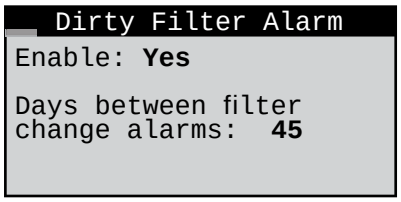
If the offset for the humidity alarm is set at 5% (default), the high humidity alarm will cancel when the actual humidity drops to the High Humidity Alarm setpoint (70.0%) - the Offset (5.0%)

or,

70.0% - 5.0% = 65.0%

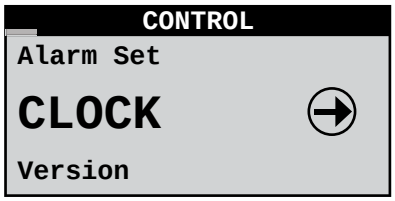
The High Humidity Alarm will cancel at 65%.

#### 4.5.4.2.1 Dirty Filter Timer

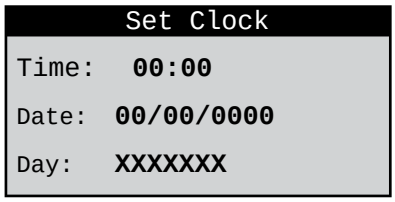



This screen allows you to enable the dirty filter notification timer which provides an alarm indication when it's time to clean or change the air filter. The filter change period is adjustable and should be set according to the conditions at the site. Extremely dusty environments may require more frequent filter changes.

### 4.5.4.3 Clock Screen

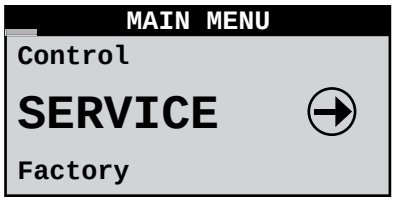



The Clock screens may be accessed from the Control menu. From this screen you may set the time, date and day.




The Set Clock screen allows you to set and/or adjust the current time, date and day.

### 4.5.5 Service Menu Loop




The Service screens allow the user to enter cut-in and cut-out values, calibrate the system control sensor(s), save and restore parameters and view the event log. The Service menu may be entered and programmed by the user via the password menu (requires level 2 password). Once password access is granted, the user may access the service screens.

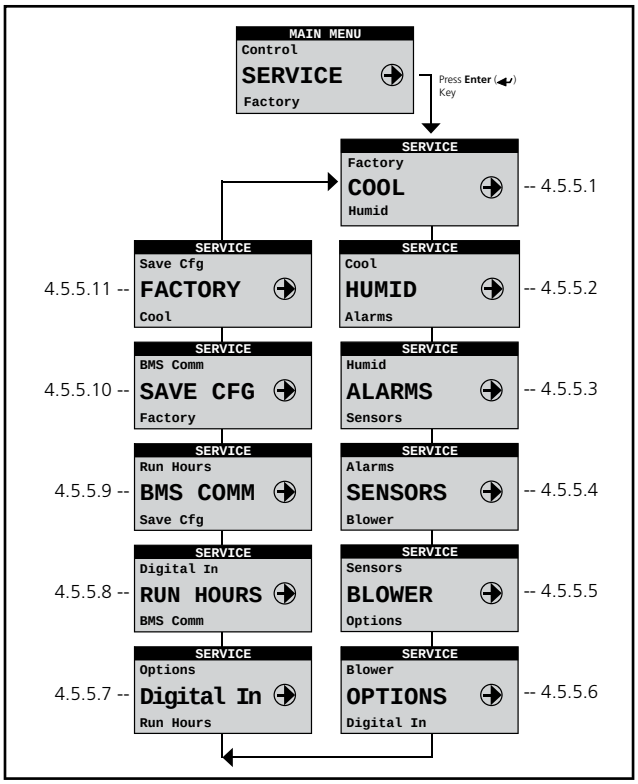
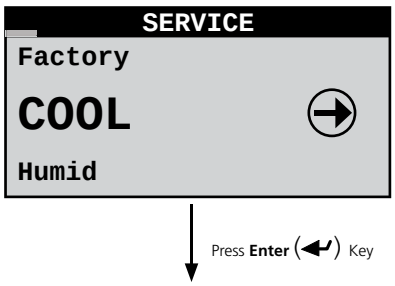


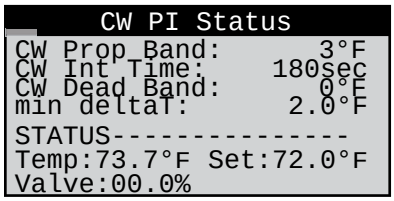

**Figure 13- Service Menu Loop Selections**

#### 4.5.5.1 Cool

The Service>Cool menu provides a screen displaying the status of the cooling control parameters.



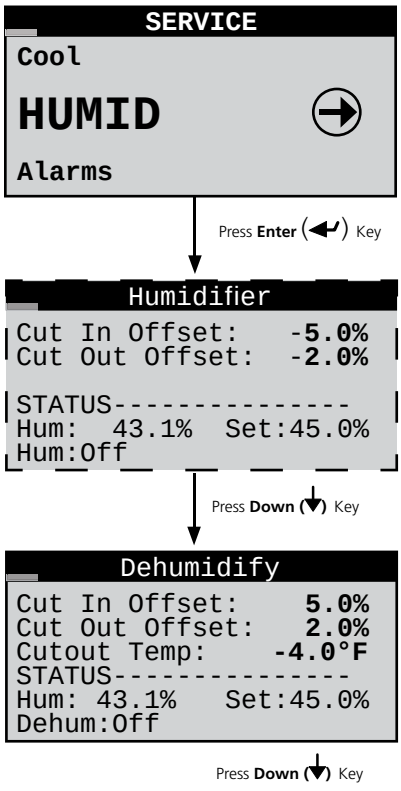

#### 4.5.5.1.1 CW Cooling Status




The cooling band may be viewed (only) from the Service>Cool menu. The "**CW Prop Band**" establishes the number of degrees above setpoint for the CW valve to reach fully open. The "**CW Int Time**" is the integral factor used to adjust the proportional output response. The "**CW Dead Band**" establishes the range, above and below setpoint, where P/I temperature control begins managing the valve position. The "**min deltaT**" field appears if optional EWT and LWT sensors are provided. It is the minimum temperature rise expected between the entering and leaving water temperature. A flow alarm may be enabled in the Factory menu to activate if the temperature difference falls below this value while the unit is actively cooling. This screen also displays the current air temperature and setpoint temperature. The current proportional control output signal to the CW control valve is shown at the bottom of the screen.

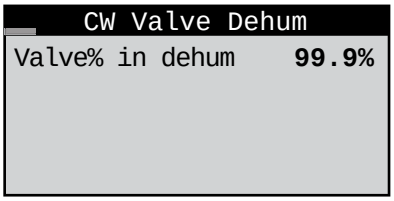
#### 4.5.5.2 Humidity

The cut-in/cut-out offsets for the Humidify and Dehumidify modes may be adjusted from the Service>Humid menu.

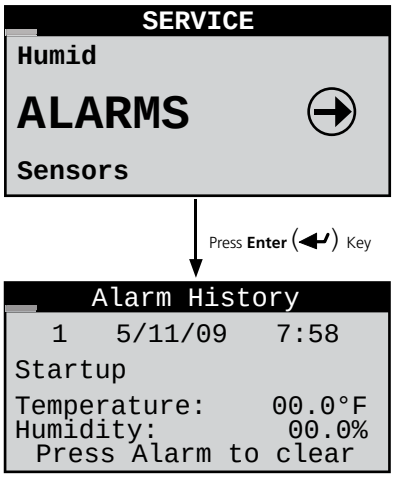



NOTE: The Humidifier screen only appears if your A/C unit is equipped with a humidifier at the factory.

The following screen is used to set a maximum position for the CW valve opening in the dehumidification mode. This may be used when the heat load is low to reduce possible setpoint temperature overshoot while the unit is dehumidifying the air. The fan speed during dehumidification can be adjusted to limit the potential for over-cooling (see Blower Set Up, Section 4.5.5.5.3).




#### 4.5.5.3 Alarms

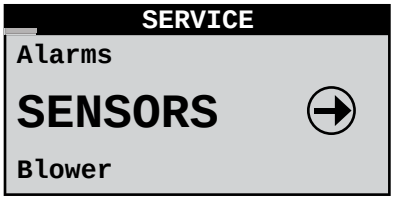



A log of events is stored for view from the Service>Alarms menu. This menu displays the last 50 events sequentially numbered in order of occurrence. The alarm log is cleared by pressing the Alarm (🔔) key while in this menu.

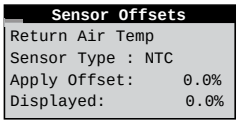
**NOTE**

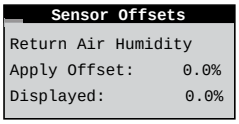
If the Alarm (🔔) key is pressed when in any of the Service>Alarms screens, all stored alarm messages will be permanently erased from the controller's memory.

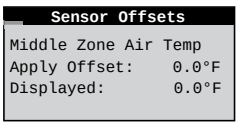
#### 4.5.5.4 Sensors

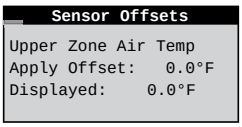



From the Service>Sensors menu you may access multiple display screens to enter offsets for calibrating the unit's various temperature and humidity sensors.

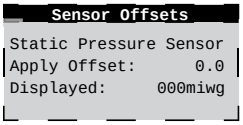



A Static Pressure Offset screen only appears if your unit is configured for static pressure control.

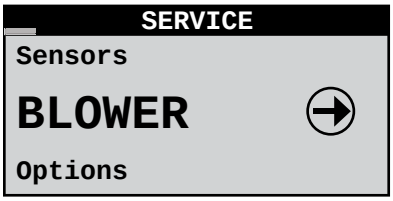



Additional sensor offset screens are available for optional sensors if enabled at the factory such as: Entering Water Temperature, Leaving Water Temperature, Remote Supply Air Temp and Remote Supply Air Humidity.

**NOTE**

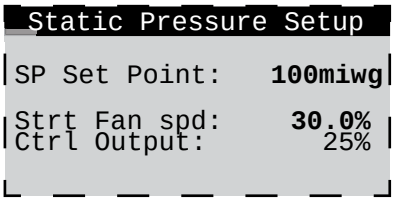
When calibrating sensors, an offset at one extreme may produce an error at the other extreme. Always verify that any offset is valid over the entire range of the sensor.

#### 4.5.5.5 Blower




From the Service>Blower menu you may access screens to view set up the static pressure if applicable and adjust the fan speeds.

##### 4.5.5.5.1 Static Pressure Setup

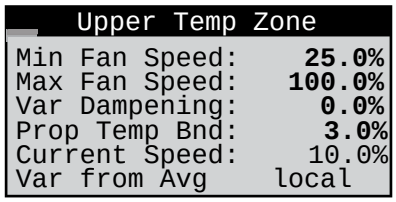


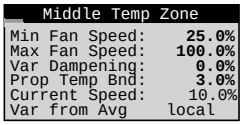

The Static Pressure PI Status screen only appears if your unit is configured for static pressure control. From this screen you may adjust the static pressure setpoint and starting fan speed and view the proportional fan control output signal.

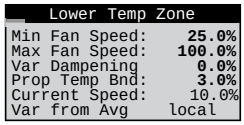
If it becomes necessary to adjust the static pressure PI control values, it will be necessary to access the Factory level menu. Contact Product Support (See Section 6.0) for the password

that allows access to the Factory menu and for guidance on setting the PI control values.

#### 4.5.5.5.2 Temp Zone Set Up

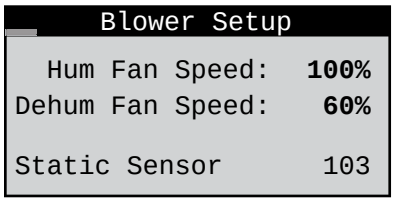


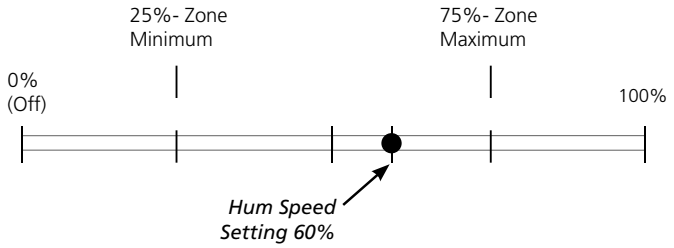

If your unit is configured for zone temperature control, Blower>Temp Zone display screens are available for the upper, middle and lower fan. These screens allow you to adjust minimum and maximum fan speed settings and modify the fan speed PI control response parameters. The variable dampening value, used with Variance From Average fan speed control (see Section 4.4.4.1.1), adjusts the effect of the variance on the final fan speed.

#### 4.5.5.5.3 Blower Set Up



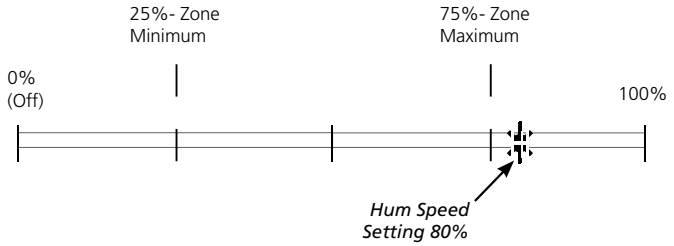

The fans will operate at the Hum Fan Speed setting during humidification, and the Dehum Fan Speed setting during dehumidification. Humidification and dehumidification fan speeds are limited to the most restrictive value between the factory preset minimum and maximum, the Temp Zone minimum and maximum, and the speed setting for the operating mode. The higher minimum value is the low speed limit and the lower maximum value is the high speed limit.

Ex: If the Hum Speed is changed to 60% in the Blower Set Up screen and the maximum speed for the Lower Temp Zone fan is set to 75%, the fans will run at 60% during humidification.




Fans will run at 60% of full speed during humidification.

If the Hum Speed is set to 80%, the lower fan will run at 75% during humidification as it is limited by the maximum speed setting for the lower temperature zone.



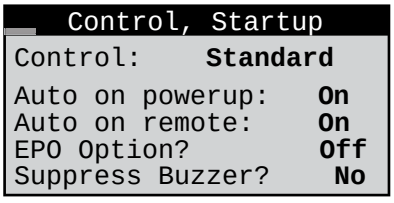

Lower fan will run at 75% of full speed during humidification (limited by the Temperature Zone Maximum).

If your system is configured for static pressure control at the factory, the fan speed is controlled to maintain the static pressure at the setpoint entered in the Control>Set>Static Pressure menu screen. When static pressure control is enabled, if you adjust the speed values in the Blower Setup screen it will have no effect on the operating fan speeds as they are controlled by static pressure.

#### 4.5.5.6 Options Menu Loop


From the Service>Options menu you may press the Enter (↵) key to access a menu loop with screens used to set up and adjust various options.

#### 4.5.5.6.1 Control, Startup




The Service>Options>Control, Startup screen allows you

to select the control method.

**Standard** = Temperature/Humidity Control

**Dewpoint** = Dewpoint Control

**<Reserved>** = For future use. DO NOT select this control method.

**"Auto on powerup"**- If set to **On**, the A/C unit turns on automatically when main power is applied.

**"Auto on remote"**- If set to **On**, the A/C unit may be turned on via a remote On/Off switch.

**"EPO Option"** (Emergency Power Off)- If set to **On**, the off delay timers are bypassed so compressors, fans etc. stop operating immediately when the unit is turned off by a remote power off switch, remote shutdown command from a BMS or a critical alarm.

**"Suppress Buzzer"**- Allows you to enable or disable the alarm signal buzzer.

#### 4.5.5.6.2 Unit Timers

| Unit Timers | |
|---|---|
| Startup delay: | **5s** |
| Airflow delay: | **45s** |
| Shutdown delay: | **60s** |
| Recovery time: | **30mins** |

The Service>Options>Unit Timers screen allows you to adjust the unit timers controlling various start-up or shutdown delay periods.

**"Startup delay"**- Time delay before fan(s) begin operating after pushing the Enter (↵) key or after turning the unit on with a remote on command.

**"Airflow delay"**- Time delay for allowing the fans to reach adequate speed before the air proving sensor actively monitors an airflow alarm condition.

**"Shutdown delay"**- Time delay before unit stops operating after pressing the Enter (↵) key for 3 seconds or after turning it off with a "remote off" command.

**"Recovery time"**- Time period after startup that temperature and humidity alarms are masked from signalling nuisance high or low temperature and humidity alarms.

#### 4.5.5.6.3 T/H Offset Scaling

| T/H Offset Multiplier | |
|---|---|
| Temperature Scale | **1.0** |
| Humidity Scale | **1.0** |
| Scales effect all the cut-in, cut-out values | |

The Service>Options>T/H Offset Multiplier screen allows you to enter a multiplier to apply to scale both the temperature and humidity cut-in/cut-out offsets. The multipliers are factored to the system offset values set in the Service menu (Sections 4.5.5.1 and 4.5.5.2).

**Default Cut-in/Cut-out Offsets**

Temp. Cut-in Offset= 2.0°F; Cut-out Offset= 0.3°F
Humidity Cut-in Offset= -5.0%; Cut-out Offset= -2.0%

**EXAMPLE 1: Temperature Offset Multiplier**

With the default cut-in offset for temperature at 2.0°F, a temperature scale multiplier of 1.0 x 2°F results in a 2°F offset. This means the unit will begin operating in the cooling mode at 74.0°F (Setpoint 72.0°F + Offset 2°F). Conversely, with the default cut-out offset at 0.3°F, the cooling mode will turn off at 72.3°F.

(Setpoint 72.0°F + (1.0 x Cut-out Offset 0.3°F))

72.0°F + 0.3°F = 72.3°F

**EXAMPLE 2: Temperature Offset Multiplier**

If M.2.0 is entered, the offset for temperature is multiplied by 2.0. (M.2.0 x 2°F= 4°F). This means the unit will begin operating in the cooling mode at 76.0°F (Setpoint 72.0°F + Offset 4°F). Conversely, the cooling mode will turn off at 72.6°F (Setpoint 72.0°F + (M.2.0 x Cut-out Offset 0.3°F)).

**EXAMPLE 3: Humidity Offset Multiplier**

With the default cut-in offset for humidity at -5%, if a humidity scale multiplier of 0.7 is entered, M.0.7 x -5.0% = -3.5%. This means the humidifier will begin operating at 41.5% RH (Setpoint 45.0% + Offset -3.5%). Conversely, with the default cut-out offset at -2.0% the humidifier will turn off at 43.6%RH (Setpoint 45.0% + Offset -1.4%).

#### 4.5.5.6.4 Auto Flush Cycle

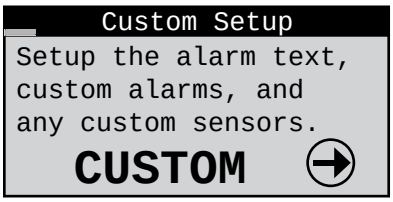
| Auto Flush Cycle | |
|---|---|
| Enable auto flush | **No** |
| For valve under | **00.0%** |
| Interval | **48** hrs |
| Duration | **300** secs |
| Number flushes | 0000 |

The Service>Options/Flush Cycle screen may be used to

enable a periodic flushing of the CW coils with the control valve open at 100%. This is used to remove any sediment that may have collected.

If enabled, you may set a minimum valve opening threshold below which a periodic flush cycle is required. That is, if the control valve position ever exceeds the percentage entered since the last flush cycle, the scheduled flush cycle will be skipped and a new interval will begin. If the valve does not reach the minimum open position entered, a flush cycle will occur when the interval since the last flush cycle expires. The interval between flushes may be varied from 1 hour to 720 hours (30 days). The duration of the flush cycle may be varied from 30 to 300 seconds. The number of flushes displayed at the bottom of the screen is the total number of flush cycles since the A/C unit was initialized.

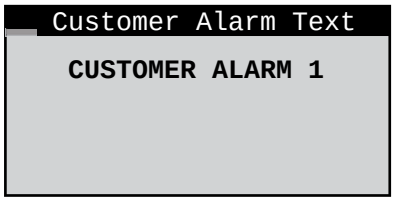
#### 4.5.5.6.5 Custom Setup

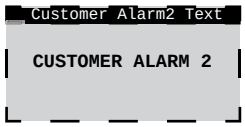



From the Service>Options>Custom Setup screen you may press the Enter (↵) key to access a menu loop to set up custom alarm features. Any controller alarm or signal failure will activate the summary alarm output. Upon receiving an alarm indication, the user may press the alarm key and call up alarm screen messages.

#### 4.5.5.6.6 Customer Alarm Input

If enabled, a customer provided alarm input may be used to activate the Summary Alarm relay and show a specific Customer Alarm message in the alarm display screen. A Customer Alarm message may simply be displayed as "CUSTOMER ALARM 1" as shown below, or you may press (↵) and use the (↑) and (↓) arrow keys to construct a specific alpha/numeric message in the field stating the specific alarm condition in your own terms; i.e. "**GAS DETECTION**", "**INTRUSION ALARM**", etc. The Customer Alarm message may be set up on one line with up to 20 characters.



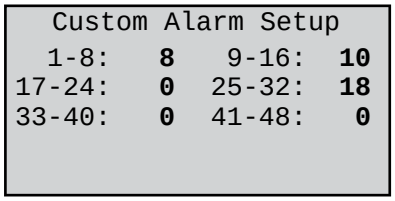



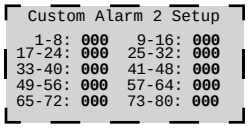


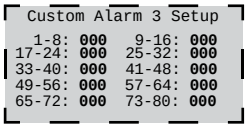
The controller may be equipped with up to 2 additional Customer Alarms as an option.

#### 4.5.5.6.7 Custom Alarm Setup

The ***E²*** controller may activate a Custom Alarm output and energize a designated N.O./N.C. relay. A custom alarm output is set up by adding the binary bitmask numbers assigned to the specific alarms and signal failures you wish to monitor via the relay and then entering them in the Custom Alarm Setup screen.




The controller may be equipped with up to 2 additional Custom Alarms as an option.

You can select any mix of the 48 alarm variables as shown in the tables that follow. As an example, for a custom alarm based only on the occurrence of moisture alarm, condensate pan, pump, failure of the return humidity sensor you would enter the following bitmask values for the applicable alarm numbers and enter 0 for the rest:

Custom Alarm number 1 - 8.....Moisture alarm (No. 4) = **8**
Custom Alarm number 9 - 16.....Fire/smoke (No. 10) + Condensate pan (No. 12) = **10** (2+8)
Custom Alarm number 25- 32.....Middle temp. sensor (No. 26) + Return humidity sensor (No. 29) = **18** (2+16)

The custom alarms are set up by entering the bitmask totals developed from the following tables:

Alarms 1 to 8

| No. | Description | Bit mask | Default |
|---|---|---|---|
| 1 | ***Upper Fan alarm*** | ***1*** | ***1*** |
| 2 | ***Lower fan alarm*** | ***2*** | ***2*** |
| 3 | ***Middle fan alarm*** | ***4*** | ***4*** |
| 4 | ***Moisture alarm*** | ***8*** | ***8*** |
| 5 | ***Emergency shutdown*** | ***16*** | ***16*** |
| 6 | ***Remote shutdown*** | ***32*** | ***32*** |
| 7 | Customer alarm 1 | 64 | 0 |
| 8 | ***Airflow alarm*** | ***128*** | ***128*** |
| | **Factory Default Bitmask Total** | | **191** |

Alarms 9 to 16

| No. | Description | Bit mask | Default |
|---|---|---|---|
| 9 | Filter alarm | 1 | 0 |
| 10 | ***Fire/Smoke alarm*** | ***2*** | ***2*** |
| 11 | ***Water detection alarm*** | ***4*** | ***4*** |
| 12 | ***Condensate pan alarm*** | ***8*** | ***8*** |
| 13 | ***Circuit1 low pressure alarm*** | ***16*** | ***16*** |
| 14 | ***Circuit1 high pressure alarm*** | ***32*** | ***32*** |
| 15 | Dual power input A alarm | 64 | 0 |
| 16 | Dual power input B alarm | 128 | 0 |
| | **Factory Default Bitmask Total** | | **62** |

NOTE: The default values (***shown in bold italics***) are factory set to generate a custom alarm output on any of the major alarms and any sensor failure. Only the enabled sensors can generate an alarm. To enable an additional custom alarm, add the alarm bitmask number to the factory default total and enter the new total for the applicable alarm numbers in the Custom Alarm Setup screen. If an alarm condition appearing in the following tables is detected, it needs to be reset at the interface display panel or via the BMS.

Alarms 17 to 24

| No. | Description | Bit mask | De-fault |
|---|---|---|---|
| 17 | ***Humidifier alarm*** | ***1*** | ***1*** |
| 18 | High temperature alarm | 2 | 0 |
| 19 | Low temperature alarm | 4 | 0 |
| 20 | High humidity alarm | 8 | 0 |
| 21 | Low humidity alarm | 16 | 0 |
| 22 | High water temperature CW1 | 32 | 0 |
| 23 | Low water temperature CW1 | 64 | 0 |
| 24 | ***Loss of power*** | ***128*** | ***128*** |
| | **Factory Default Bitmask Total** | | **129** |

Alarms 25 to 32- (*Sensor Failure Alarms)*

| No. | Description | Bit mask | Default |
|---|---|---|---|
| 25 | ***Lower temperature sensor fail*** | ***1*** | ***1*** |
| 26 | ***Middle temperature sensor fail*** | ***2*** | ***2*** |
| 27 | ***Optional temperature sensor fail*** | ***4*** | ***4*** |
| 28 | ***Upper temperature sensor fail*** | ***8*** | ***8*** |
| 29 | ***Return humidity sensor fail*** | ***16*** | ***16*** |
| 30 | ***DX1 discharge pressure fail*** | ***32*** | ***32*** |
| 31 | ***Static air pressure sensor fail*** | ***64*** | ***64*** |
| 32 | ***DX1 suction press sensor fail*** | ***128*** | ***128*** |
| | **Factory Default Bitmask Total** | | **255** |

Alarms 33 to 40- (*Sensor Failure Alarms)*

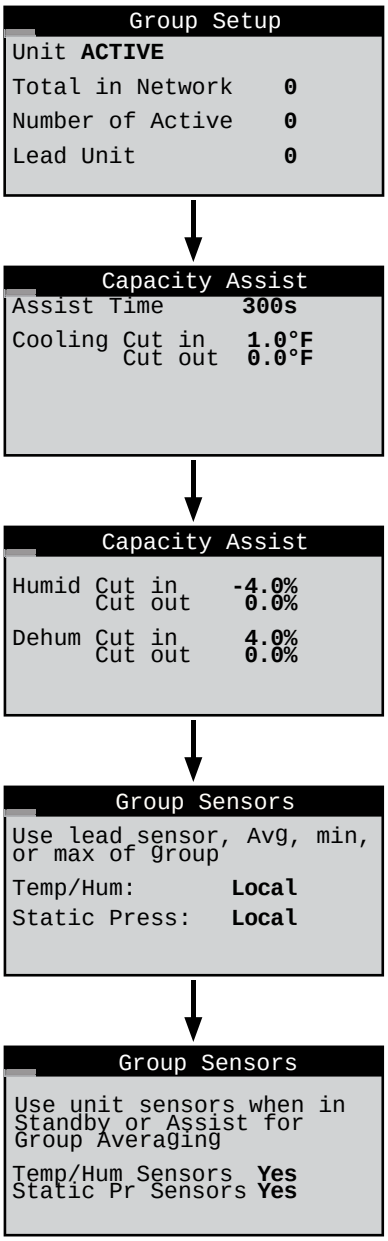
| No. | Description | Bit mask | Default |
|---|---|---|---|
| 33 | ***DX1 suction temp sensor fail*** | ***1*** | ***1*** |
| 34 | ***Custom sensor 1 fail*** | ***2*** | ***2*** |
| 35 | Reserved | 4 | 0 |
| 36 | Reserved | 8 | 0 |
| 37 | Reserved | 16 | 0 |
| 38 | Reserved | 32 | 0 |
| 39 | Reserved | 64 | 0 |
| 40 | Reserved | 128 | 0 |
| | **Factory Default Bitmask Total** | | **3** |

Alarms 41 to 48

| No. | Description | Bit mask | Default |
|---|---|---|---|
| 41 | System Off | 1 | 0 |
| 42 | BMS keep alive off | 2 | 0 |
| 43 | Customer alarm 2 | 4 | 0 |
| 44 | Customer alarm 3 | 8 | 0 |
| 45 | Flow switch | 16 | 0 |
| 46 | Reserved | 32 | 0 |
| 47 | Reserved | 64 | 0 |
| 48 | Reserved | 128 | 0 |
| | **Factory Default Bitmask Total** | | **0** |

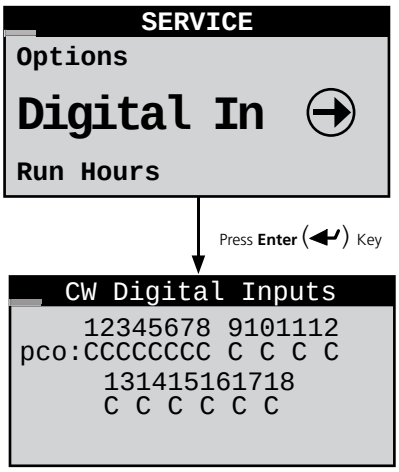
#### 4.5.5.6.8 Work Group Screens

The Service>Group display screens shown below only appear if two or more units are wired together as a group. They allow you to configure parameters that apply to how the A/C units interact in the work group.



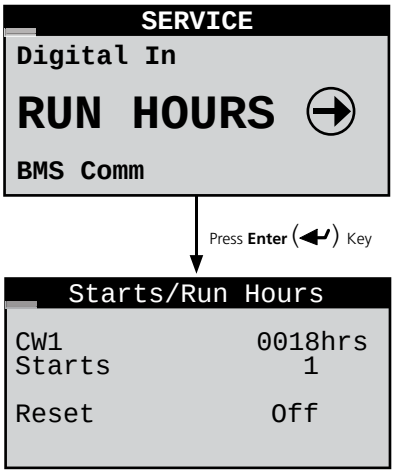

See Section 4.6 for a detailed description of how work groups are set up and for information on setting the operating parameters available in these screens.

#### 4.5.5.7 Digital In



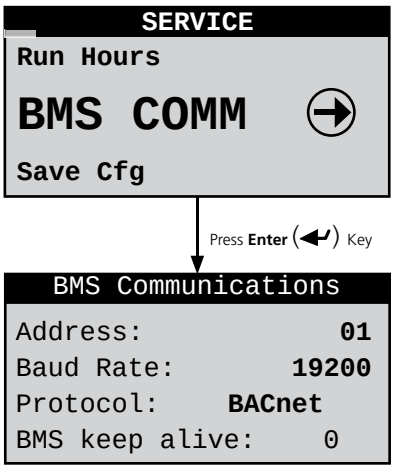

The Service>Digital In screen is provided for information only. It shows the state of each digital input as either Closed (+24 V) or Open (0 Volts).

#### 4.5.5.8 Run Hours



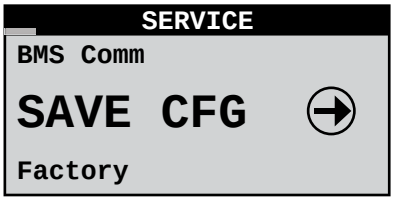

From the Service>Run Hours menu you may access a loop consisting of the component run hours display screens applicable to your unit using the Up (↑) and Down (↓) arrow keys. Each screen displays the number of run hours and number of starts logged for the component (i.e. CW valve, fans, humidifier, air filter changes, etc.). The run hours and starts values+ may be reset to 0 from the display screens. The values displayed in each screen are the values logged since the last time the screen was reset.

#### 4.5.5.9 BMS Communication

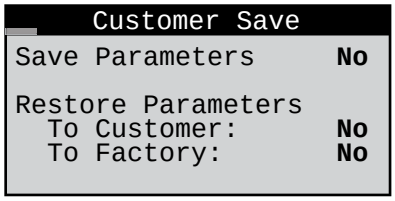



The Service>BMS Comm menu is used to set up parameters to allow a BMS (BAS) to interface with the controller. See Section 4.7.2 for a description of this screen and instructions for setting up BMS communication.

#### 4.5.5.10 Save Configuration




The default set points may be restored and passwords may be changed from the Service>Save Cfg menu.




The first Service>Save Cfg menu screen allows you to save any adjustments made in Service level menu screens as the new "Customer" parameters or, restore the controller to the previously saved "Customer" parameters. The user may also restore the controller to original factory default parameter values shown in Table 1.

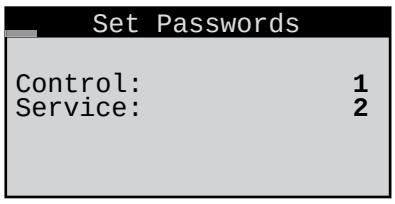
Use the Enter (↵) key to move the flashing cursor to the field you wish to confirm and press the Up (↑) or Down (↓) arrow key. The word "**No**" will momentarily change to "**Yes**" indicating the command has been accepted. Then press the Enter (↵) key sequentially until the flashing cursor returns to the top left corner of the screen.

The table that follows are the Factory default parameters.

**Table 1- Factory Default Parameters**

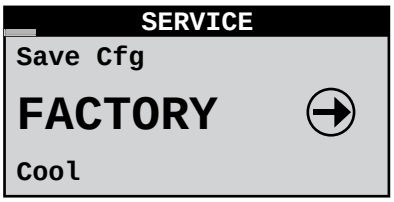
| PARAMETER | DEFAULT VALUE | UNIT RESPONSE |
|---|---|---|
| **Temperature Setpoint** | **72.0° F** | |
| CW Prop Band | 3.0° F | Controller begins sending proportional signal to CW valve at 72.0° F. (CW valve starts opening). Proportional control signal ramps up to 100% at 75.0°F. (CW valve is signaled to be 100% open). |
| CW Int Time | 180 sec | Proportional control signal adjusts to deviations in temperature within 180 seconds. |
| Dead Band | 0.0° F | Controller is proportionally controling CW valve at 72.0°F. |
| Minimum Fan Speed | 25% | Fan motor speed varies between these values when proportionally controlled. |
| Maximum Fan Speed | 100% | |
| **Humidity Setpoint** | **45% RH** | **UNIT RESPONSE** |
| Dehumidify Cut-in Offset | +5% RH | CW valve cuts in at 50% RH. |
| Dehumidify Cut-out Offset | +2% RH | CW valve cuts out at 47% RH. |
| Dehumidification Fan Speed | 60% | Fan motor limited to 60% of maximum speed. ***(Note 1)*** |
| Humidify Cut-in Offset | -5% RH | Optional humidifier turns on at 40%RH. |
| Humidify Cut-out Offset | -2% RH | Optional humidifier turns off at 43% RH. |
| Humidification Fan Speed | 100% | Fan motor operates at maximum, 100% speed. ***(Note 1)*** |
| **Passwords** | **DEFAULT VALUE** | **UNIT RESPONSE** |
| Control | 1 | When entered, access to Control menu screens is granted |
| Service | 2 | When entered, access to Service menu screens is granted |

*Note 1: Or as limited by max speed setting in Service>Blower menu. See Section 4.5.5.5.*




The second Service>Save Cfg menu screen allows you to set new passwords for entering the Control and Service menus.

#### 4.5.5.11 Factory Menu




The Factory menu loop may be accessed from the Service>Factory screen. You must enter the factory level password to gain access to the loop.

## 4.6 Communication With The Controller

It is possible for the $E^2$ controller to communicate in multiple ways. The controller may be set up to utilize a pLAN network to link with additional $E^2$ controllers to create a work group consisting of multiple A/C units (see Figure 15 and Section 4.6.1).

Using an optional BMS interface port, the unit may also be connected to a BMS for monitoring and control of data points using a multitude of different serial communication protocols (see Section 4.7).

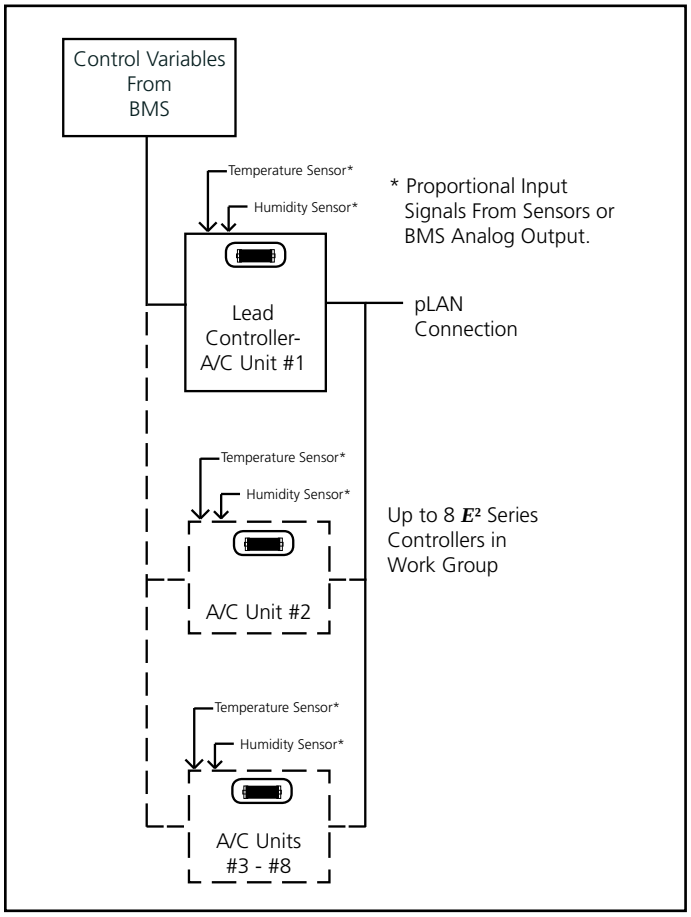
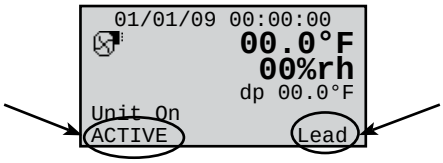



**Figure 15- Configuring Multiple A/C Units**

### 4.6.1 Work Group Set-up

The controller may be networked with a group of A/C unit controllers via an RS-485 pLAN connection to manage their outputs as a system in an N+M (M = number of standby units) group. The controllers from up to seven additional A/C units may be tied to a Lead controller. The number of units to be assigned as Active, Capacity Assist or Standby duty is to be configured by the factory, however, they may be reconfigured in the field. A unit may also be designated as "Out of Service".

The Main screen of each unit in the work group will indicate that unit's duty assignment in the bottom field. If the controller is the group lead, it will be indicated in the bottom field also.




**Multiple Unit Display Screen**

One controller may be designated as the work group lead and networked with the controllers from a series of up to 7 additional A/C units. If configured for multi-unit operation, the work group lead controller display panel allows access to the same data and group control sensor choices that are available from networked system controller display panels.

#### 4.6.1.1 Standby

If the lead controller in the work group loses a signal acknowledgement from an active A/C unit in the group, that A/C unit is deemed as failed or taken out of service. The failed unit will be replaced with the first available standby unit from the work group. The standby unit is cycled on and designated as the new active unit.

#### 4.6.1.2 Capacity Assist

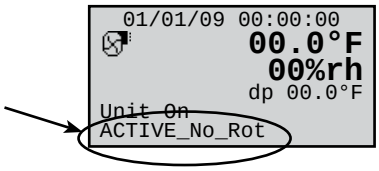
The Capacity Assist option can be used to maximize efficiency for conservation of energy and to more precisely control capacity at low demand. This feature enables Active A/C units to handle the demand up to a certain temperature/humidity setpoint and then enables additional units to begin operating as needed. If the Active A/C units are running and unable to satisfy the demand, Capacity Assist A/C unit(s) are programmed to turn on to assist the Active units.

Each Capacity Assist unit may be set to control operation based on it's local temperature/humidity sensor values or on network sensor values transmitted from the lead controller. Multiple Capacity Assist units are typically set with each unit in the group assigned incrementally increasing/decreasing offsets for cooling, humidifying and dehumidifying so they will turn on one at a time only if the unit(s) currently operating are unable to satisfy the demand. They should incrementally turn off as each unit reaches it's cut-out setpoint, while active A/C unit(s) continue to maintain room conditions at the desired level.

#### 4.6.1.3 Unit Rotation

In this mode, the lead controller will rotate duty between the grouped A/C units to promote equal run time and will rotate the role of group lead. When set up for unit rotation, the A/C units will rotate duty in order of their group addresses. Active, Capacity Assist and Standby units are all in the rotation cycle so even a standby unit will be cycled into active duty on a scheduled basis. A/C units in the group may have their duty assignments locked so they do not join the rotation cycle. In this case the message

"**No_Rot**" appears after the duty assignment displayed in the main screen.




The controller of an Active_No_Rot unit is always On therefore, it will not rotate out. An Active_No_Rot unit controller will still be able to take the role as lead controller during a rotation, however, its functional components will not operate. Units designated as "Out of Service" do not rotate nor will their controller be used as the lead.

The rotation time period is typically 1 week, however it may be set by the user via the Factory menu.

#### 4.6.1.4 Out of Service

A unit may be removed from the group entirely by placing it Out of Service. In this mode, the unit will not operate. A unit may be placed in this mode as a safety measure to prevent it from unexpectedly starting when performing maintenance or repairs.

### 4.6.2 Configuring a Work Group

A workgroup can consist of up to 8 controllers (I/O boards) with pLAN addresses 1 to 8. Their corresponding display terminals will be assigned pLAN addresses from 32 down to 25. The ***E²*** controller program is defaulted with the controller address set to 1 and its terminal (display) address set to 32. As such, a normal stand-alone controller does not need any changes made to either the controller or the terminal address. The method to setting up work groups is to retain the first (group lead) controller's pLAN address as #1 and terminal address as #32 so that the sum of the addresses equals 33. The first controller added to the group is assigned pLAN address #2 and its terminal is assigned address #31, the sum of which again equals 33.

**NOTE**: The sum of the controller and terminal address numbers must always equal 33.

A work group should ALWAYS start with controller address 1 and go up from there. DO NOT skip over controller addresses. The list of suitable controller/display terminal address pairs is shown below:

| Corresponding Controller to Terminal pLAN Addresses | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Controller (I/O board) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Display Terminal | 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 |

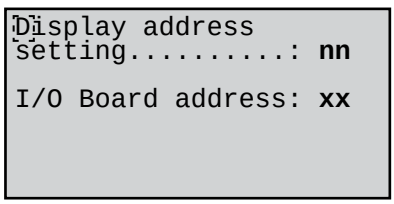
You must assign the terminal and controller I/O board addresses for each controller to be grouped. Review Sections 4.6.2.1 to 4.6.2.3 first, before turning power on and the assigning addresses. **Do not interconnect the controllers together before assigning their terminal and I/O board pLAN addresses.**

The first step is to change the terminal address of each controller to 0 referring to Section 4.6.2.1 below. You must set the terminal address to 0 before you can assign the controller (I/O board) address.

**NOTE**: If the terminal remains inactive (no key is pressed) for more than 30 seconds, the group set up procedure is exited automatically, without saving any changes.

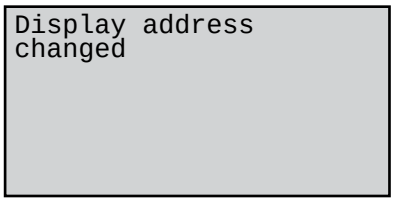
#### 4.6.2.1 Configure the Terminal Address

The address of the terminal (display) can only be configured if it's telephone jack is connected to the I/O control module in the electric box and power is turned on. The factory default value for the display terminal address is 32. To reassign the terminal address, press and hold the Up (↑), Down (↓) and Enter (↵) keys simultaneously for **5** seconds until the Address Configuration screen shown below appears with the flashing cursor in the top left corner:




**Address Configuration**

1. To change the address of the terminal (Display address setting), press the Enter (↵) key once. The cursor will move to the address field (nn).
2. Use the Up (↑), Down (↓) keys to select the desired value (0), and confirm by pressing Enter (↵) again.




**Display Address Changed**

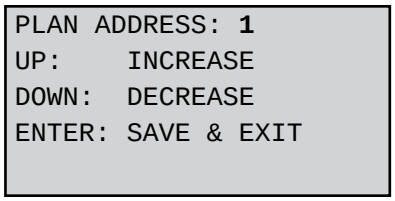
The Display Address Changed screen will appear indicating the display address selected is not the same as the one saved previously and the new value will be saved to the permanent memory.

3. Once the terminal address is set to zero, cycle the power to the unit Off and then back On.

**NOTE:** If the "**Display address setting:__**" field is set to **0**, the terminal will communicate with the controller (I/O board) using point-to-point protocol (not pLAN). The display field "**I/O Board address:__**" will disappear as it has no meaning until you set the controller (I/O board) pLAN address.

### 4.6.2.2 Configure the Controller (I/O Board) pLAN Address

Immediately after turning power back on, press and hold the Alarm (🔔) and the Up (↑) Arrow keys simultaneously for 10 to 15 seconds. First you will see a display message "**self test please wait**" then the pLAN Address Configuration screen shown below will appear. **Don't press the (↵) key, the cursor is already in the modifiable field.**




**Controller Address Configuration**

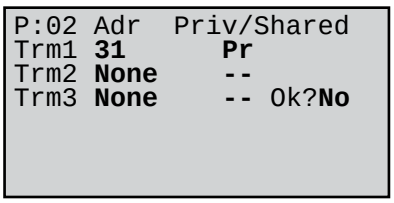
Press the (↑) key to set the pLAN address (#1 – 8) for the controller (I/O Board). The pLAN address #1 is already assigned by default to the first (Lead) controller in the group. Address #2 is to be assigned to the first controller added to the group (address #3 is to be assigned to the second controller added and so on). Then press the (↵) key to confirm your selection. A message "**NO LINK**" will appear.

Next , press the Up (↑), Down (↓) and Enter (↵) keys simultaneously. Reconfigure the terminal address following the steps in Section 4.6.2 again. This time set the terminal address to match the corresponding controller (I/O board) address.. If the controller is assigned address 2, then the corresponding terminal address should be set to 31 as shown in the table on the preceding page. If the next controller is assigned address 3, the corresponding terminal should be set to 30.

After setting the correct terminal address, press the (↵) key once to confirm your selection. A message "**NO LINK**" will appear. At this point, the terminal has been set with the correct address for the controller and the controller has been set for the terminal, but now they need to be assigned to each other.

### 4.6.2.3 Assign the Terminal to the Controller

1. Access the Terminal Address Configuration screen again using the Up (↑), Down (↓) and Enter (↵) keys.
2. Press the (↵) key until the cursor moves to the field "**I/O board address:__**".
3. Using the (↑) (↓) keys, enter the address (1 – 8) for the controller I/O board.
4. Press the (↵) key twice to display the Terminal Configuration screen shown below.




**Terminal Configuration**

5. Here too, the (↵) key moves the cursor from one field to the next, and the (↑) (↓) keys change the value of the current field. The field "**P:0**_" depicts the pLAN address (1 – 8) assigned to the I/O board. In the example shown, the controller has been assigned address 2.

6. Press the (↵) key to move to the field "**Trm1 xx**". The field represents the address of the terminal associated with the controller. Using the (↑) (↓) keys enter the address (25 – 32) of the terminal assigned to the controller (I/O board). In the example shown, address 31 has been entered for the first A/C unit added to the group.

7. The Priv/Shared column indicates the type of terminal. The workgroup is setup using private terminals. **Do not** change the value ("**Pr**"). Press the (↵) key to move to the last field
8. Enter the field "**Ok?No**", choose "**Yes**" using the (↑) (↓) keys and confirm by pressing (↵) to save the data and exit the group set up procedure.
9. Referring to the wiring diagram provided with your A/C units, interconnect the units together with the pLAN cable(s) provided.

#### 4.6.2.4 Fault messages

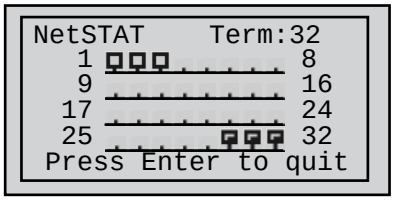
If the terminal detects the status of the I/O board it is associated with is off-line, the display shows the message: **"I/O Board xx fault".** If this appears, check the Signal LED's on the control I/O module (Figure 9) for an error signal. See Section 4.8 for guidelines on analyzing the signal LED's.

On the other hand, if the terminal receives no signal from the network, the display shows the following message: **"NO LINK".** If this appears, check the pLAN cables and ensure they are connected properly.

#### 4.6.2.5 Displaying the Network Status and Firmware Version

Once each A/C unit is configured with its new controller and terminal pLAN address, you can examine the entire network set up. Press the group set up keys (↑) (↓) (↵) together as done to access the Address Configuration screen but continue holding after the Address Configuration screen appears for at least **5** seconds until the "Network Status" screen appears.

The Network Status screen, shown below, provides overview of the pLAN group indicating which and how many devices are connected and the corresponding pLAN addresses.




**Network Status**

Key:

: Controllers (I/O Boards) active in network

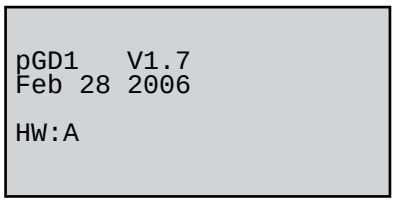
: Terminals active in network

: No device connected

The example shown represents:
Controllers active in network, addresses: 1, 2, 3
Terminals active in network, addresses: 30, 31, 32.

The terminal for controller 1 is always addressed 32; the terminal for controller 2 is always addressed 31, and so on such that the sum of the controller address number and the terminal address number always equals 33. Therefore, when viewing controller number 1, its terminal address will be 32. When viewing controller number 2, its terminal address will be 31, and so on.

Press a (↑) or (↓) arrow key to display the next screen showing the version of the firmware residing in the terminal.



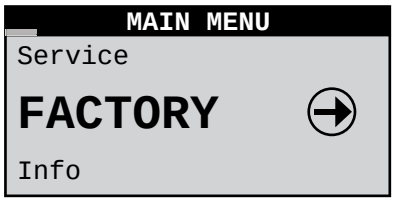

**Firmware Version**

To exit the Network Status loop, press (↵).

The next step is to access the Factory>Group screens used to configure the work group parameters (Section 4.6.2.6).

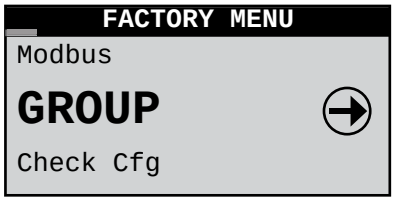
#### 4.6.2.6 Configure Work Groups

The Factory>Group menu screens allow you to define grouping parameters (duty, rotation, offsets, etc) for the A/C units in the work group. These screens should be accessed after setting up the work groups (Section 4.6.2). The Factory>Group menu screens may be accessed from the main screen by pressing the ***Prg*** key and scrolling through the menu selections until the word Factory appears in the center of the screen.

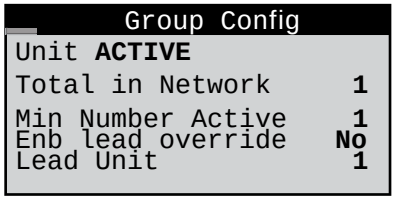



Press the Enter (↵) key twice and you'll be prompted to enter the password for the Factory level (***contact STULZ Product Support for the password***).

Once the Factory level password is entered, press Enter (↵) to call up the menu screens. From here you may press the Up (↑) or Down (↓) arrow keys to scroll through the Factory menu selections.

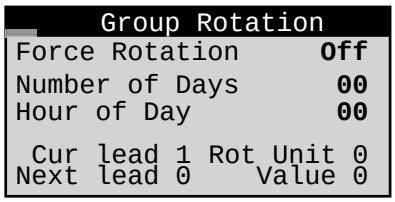



When the word GROUP appears in the center of the screen, press the Enter (↵) key to access the Factory>Group menu screens. From here you may use the Up (↑) or Down (↓) arrow keys to scroll through the Factory>Group menu selections.




**Factory>Group> Group Config (Screen 1)** (See table below.)

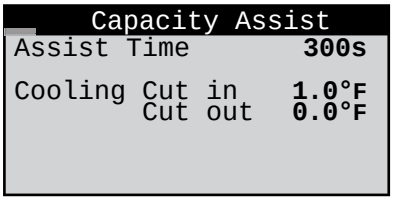
| Display | Description | Variables | Default |
|---|---|---|---|
| Unit | Assign the duty of the A/C unit within the group.<br>*The duty must be assigned for each A/C unit at its local display terminal.* | 0= Out of Service<br>1= Active<br>2= Standby<br>3= Assist<br>4= Active_No_Rot<br>5= Standby_No_Rot<br>6= Assist_No_Rot | 1 |
| Total in Network | Enter the total number of A/C units in the group. | 0 to 9 | 1 |
| Min Number Active | Enter the total number of active A/C units in the group. | 0 to 9 | 1 |
| Enb lead override | If set to yes, you may manually assign the lead unit in the following field. | 0= No<br>1= Yes | No |
| Lead Unit | Identifies which A/C unit controller is currently the lead unit in the group. If "Enb lead override" is set to yes, you may select which unit is lead. | 1 to 8 | 1 |




**Factory>Group>Group Rotation (Screen 2)**

From this screen you may set the schedule to rotate operation of the A/C units to promote equal run times.

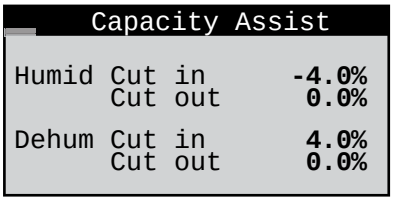
| Display | Description | Variables | Default |
|---|---|---|---|
| Force Rotation | This field only appears on the Lead controller. If you select "**On"** and press (↵) it initiates a manual rotation cycle to rotate duty between active and standby units. It also rotates the role of Lead controller. The field will disappear after the role of Lead is rotated to the next A/C unit. | Off<br>On | 0 |
| Number of Days | Enter the number of days between rotating active units. | 0 to 999 | 0 |
| Hour of Day | Enter the hour of day for unit rotation to occur. | 0 to 23 | 0 |
| Cur Lead | Identifies which A/C unit controller is currently the lead unit in the group. | 1 to 8 | 0 |
| Next lead | Identifies which A/C unit controller is designated to be the next lead unit. | 1 to 8 | 0 |
| Rot Unit | Identifies which A/C unit is designated to be the next unit to rotate duty. | 1 to 8 | 0 |
| Value | Identifies the duty of the A/C unit by displaying the variable number assigned in Factory>Group screen 1 (0=Out of Service, 1=Active, 2=Standby, etc.). | 0 to 6 | 0 |




**Factory>Group> Capacity Assist (Screen 3)**

Each A/C unit in the group may be assigned local cut-in and cut-out set points for it's capacity assist operation. The values entered are offsets which are applied to the control set points established at the lead controller. Each unit in the group should be assigned incrementally increasing/decreasing offsets for cooling humidifying and dehumidifying so they will turn on one at a time only if the unit(s) currently operating are unable to satisfy the demand. This screen may also be accessed in the Service>Options>Group Setup menu (see Section 4.6.2.7.2).

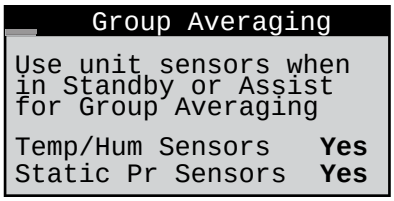
| Display | Description | Variables | Default |
|---|---|---|---|
| Assist Time | Enter the delay period for capacity assist unit(s) to begin operating. | 0 to 999 | 300 |
| Cooling Cut in | Enter a temperature setpoint offset for cooling capacity assist operation to begin. | -99.9 to 99.9 | 1.0 |
| Cut out | Enter a temperature setpoint offset for cooling capacity assist operation to stop. | -99.9 to 99.9 | 0.0 |




**Factory>Group>Capacity Assist (Screen 4)**

This screen may also be accessed in the Service>Options>Group Setup menu (see Section 4.6.2.7.3).

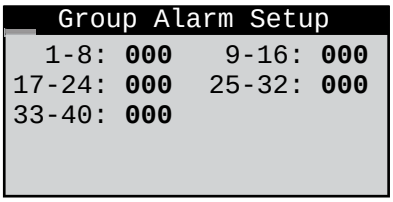
| Display | Description | Variables | Default |
|---|---|---|---|
| Humid Cut in | Enter relative humidity setpoint offset for humidifying capacity assist operation to begin | -99.9 to 99.9 | -4.0 |
| Cut out | Enter relative humidity setpoint offset for humidifying capacity assist operation to stop | -99.9 to 99.9 | 0.0 |
| Dehum Cut in | Enter relative humidity setpoint offset for dehumidifying capacity assist operation to begin | -99.9 to 99.9 | 4.0 |
| Cut out | Enter relative humidity setpoint offset for dehumidifying capacity assist operation to stop | -99.9 to 99.9 | 0.0 |




**Factory>Group>Group Averaging (Screen 5)**

This screen may also be accessed in the Service>Options>Group Setup menu (see Section 4.6.2.7.5).

| Display | Description | Variables | Default |
|---|---|---|---|
| Temp/Hum Sensors | Enter Yes for the unit to respond to it's local sensors for Standby or Capacity Assist operation. Enter No for unit to respond to the Group sensors. (See 4.6.1.2 Capacity Assist description) | No<br>Yes | Yes |
| Static Pr Sensors | | No<br>Yes | Yes |




**Factory>Group>Group Alarm Setup (Screen 6)**

This screen may be accessed on the controller for each unit to be grouped. You may enter bitmask numbers to establish which alarm conditions for that particular unit will initiate a group internal alarm. The group alarms may be set before the A/C units are wired together. When a group alarm condition is detected by a unit it causes that unit to temporarily switch over from "Active" to "Off" and if another unit is available in the group, it may rotate into its place. A status massage "**Off by internal alarm**" will appear in the Main screen of the unit that detected the group alarm and switched off.

See Section 4.5.5.6.7 for an overview of how to select alarms using bitmask values. The Group Alarms bitmask values are shown in the following tables. The settings may be viewed at the Info level following the network sensors screen. If an alarm condition appearing in the following tables is detected, it needs to be reset at the unit's display terminal or via the BMS for the unit to return to "Active" and resume operation.

Group Alarms 1 to 8

| No. | Description | Bit mask | Default |
|---|---|---|---|
| 1 | Humidifier | 1 | 0 |
| 2 | Pump | 2 | 0 |
| 3 | Customer alarm 1 | 4 | 0 |
| 4 | Circuit 1 high pressure | 8 | 0 |
| 5 | Circuit 1 low pressure | 16 | 0 |
| 6 | DX lockout | 32 | 0 |
| 7 | Humidifier lockout | 64 | 0 |
| 8 | FC/AWS lockout | 128 | 0 |

Group Alarms 9 to 16

| No. | Description | Bit mask | Default |
|---|---|---|---|
| 9 | Upper fan alarm | 1 | 0 |
| 10 | Middle fan alarm | 2 | 0 |
| 11 | Lower fan alarm | 4 | 0 |
| 12 | Water detection | 8 | 0 |
| 13 | Condensate pan | 16 | 0 |
| 14 | Moisture | 32 | 0 |
| 15 | Filter | 64 | 0 |
| 16 | Reserved | 128 | 0 |

Group Alarms 17 to 24

| No. | Description | Bit mask | Default |
|---|---|---|---|
| 17 | High temperature | 1 | 0 |
| 18 | Low temperature | 2 | 0 |
| 19 | High humidity | 4 | 0 |
| 20 | Low humidity | 8 | 0 |
| 21 | High water temperature CW1 | 16 | 0 |
| 22 | Low water temperature CW1 | 32 | 0 |
| 23 | Reserved | 64 | 0 |
| 24 | Reserved | 128 | 0 |

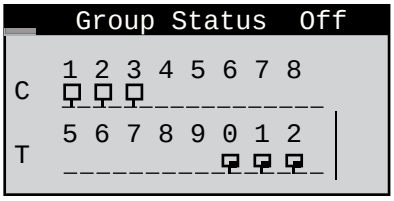
Group Alarms 25 to 32

| No. | Description | Bit mask | Default |
|---|---|---|---|
| 25 | Upper temp sensor | 1 | 0 |
| 26 | Middle temp sensor | 2 | 0 |
| 27 | Lower temp sensor | 4 | 0 |
| 28 | Return humidity sensor | 8 | 0 |
| 29 | Optional temperature sensor | 16 | 0 |
| 30 | Circuit 1 discharge pressure | 32 | 0 |
| 31 | Circuit 1 suction pressure | 64 | 0 |
| 32 | Circuit 1 suction temperature | 128 | 0 |

Group Alarms 33 to 40

| No. | Description | Bit mask | Default |
|---|---|---|---|
| 33 | Static air pressure | 1 | 0 |
| 34 | Differential air pressure | 2 | 0 |
| 35 | Dewpoint | 4 | 0 |
| 36 | Airspeed | 8 | 0 |
| 37 | Reserved | 16 | 0 |
| 38 | Reserved | 32 | 0 |
| 39 | Reserved | 64 | 0 |
| 40 | Reserved | 128 | 0 |

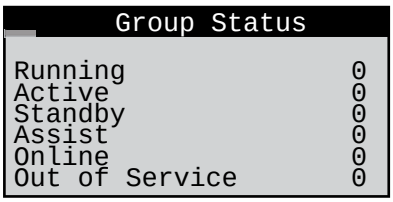
There are several automatic crossover signals that will cause a switch over from Unit Active to Unit Off. They are the occurrence of a remote shutdown command, unit shutdown from a group alarm or BMS command, fire/smoke detection, loss of all cooling (all compressors or all CW valves) or loss of airflow.




**Factory>Group>Group Status (Screen 7)**

The next screen, Factory>Group Screen 7, provides an overview of pLAN work group.

| Display | Description | Variables | Default |
|---|---|---|---|
| Group Status | Indicates if multiple A/C unit grouping is enabled. | On<br>Off | 0 |
| C 1 2 3 4 5 6 7 8 | Indicates the address (1-8) of each controller in the pLAN. | | 1 |
| T 5 6 7 8 9 0 1 2 | Indicates the address (25-32) of the terminal for each controller in the pLAN. The terminal address numbers range from 25 to 32 but only the last digit appears in the screen. | | 32 |

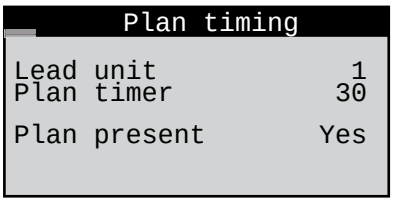



**Factory>Group>Group Status (Screen 8)**

This screen provides an overview of the current duty status for all the A/C units combined in the group.

| Display | Description | Variables | Default |
|---|---|---|---|
| Running | Display indicates how many units in the group are currently operating. | 0 to 8 | 0 |
| Active | Display indicates how many units in the group are currently active. | 0 to 8 | 0 |
| Standby | Display indicates how many units in the group are currently in standby. | 0 to 8 | 0 |
| Assist | Display indicates how many units in the group are currently operating in the capacity assist mode. | 0 to 8 | 0 |
| Online | Display indicates how many units in the group are currently available to operate. | 0 to 8 | 0 |
| Out of Service | Display indicates how many units in the group are not available to operate. | - | 0 |

The final step to configure a work group is to access the Service>Options>Group Setup screens used to configure parameters that apply to how individual A/C units interact in the work group (see Section 4.6.2.7).



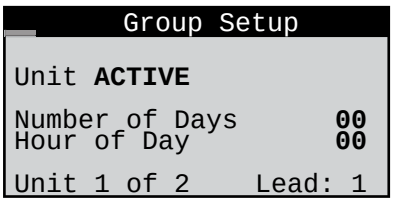

**Factory>Group>Plan timing (Screen 9)**

| Display | Description | Variables | Default |
|---|---|---|---|
| Lead unit | Display indicates which unit is currently the lead. | 0 to 8 | 0 |
| Plan timer | Display indicates the time delay (in seconds) between the detection of a communication failure and the annunciation of a Comm alarm. | 0 to 60 | 30 |
| Plan present | Display indicates if a pLAN is detected by the controller. | 0= No<br>1= Yes | No |

### 4.6.2.7 Service>Options>Group Menu Screens

Accessed in the Service menu, the Service>Options>Group Setup screens only appear if two or more units are wired together as a work group.

#### 4.6.2.7.1 Group Setup



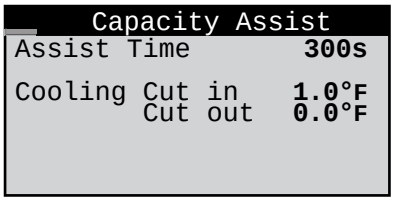

The Service>Options>Group Setup screen allows you to select the work group duty assignment for the A/C unit. The duty must be assigned for each grouped A/C unit at its local display terminal.

Enter the number of days between rotating active units.

Enter the hour of day for unit rotation to occur.

The screen also displays a status message indicating which A/C unit you are accessing and which unit is currently the lead unit in the group.

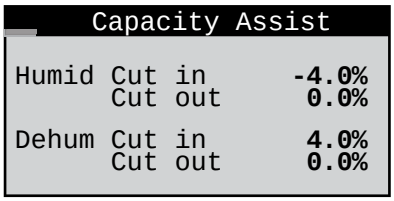
#### 4.6.2.7.2 Capacity Assist




The first Service>Options>Capacity Assist screen allows you to enter the delay period for the unit to begin operating if it is in the capacity assist mode. Also, each A/C unit in the group may be assigned local cut-in and cut-out set points for it's capacity assist operation. The values entered are offsets which are applied to the control set points.

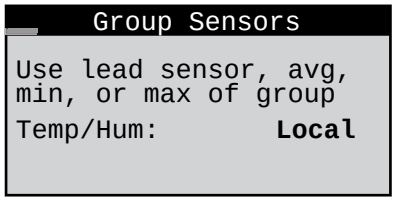
Each unit in the group should be assigned incrementally increasing/decreasing offsets for cooling, humidifying and dehumidifying so they will turn on one at a time only if the unit(s) currently operating are unable to satisfy the demand.

#### 4.6.2.7.3 Capacity Assist #2




The second Service>Options>Capacity Assist screen allows you to adjust local capacity assist humidification and dehumidification set points.

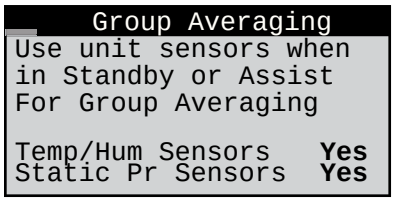
#### 4.6.2.7.4 Group Sensors




The lead controller polls the controllers from all the A/C units in the work group and calculates the averaged value of their temperature sensors and humidity sensors. It also determines the minimum (lowest) temperature sensor value and the lowest humidity sensor value in the A/C group and conversely, determines the maximum (highest) temperature sensor value and maximum humidity sensor value in the A/C group.

The Service>Options>Group Sensors screen allows you to select whether to control the A/C work group using the T/H sensors connected to individual A/C units (Local) or control the work group using network sensor values transmitted from the lead controller. You may select the network sensor values to be the Lead, Average, Min or Max values. The selections made in this screen will affect all the controllers in the work group no matter which controller you access the screen from.

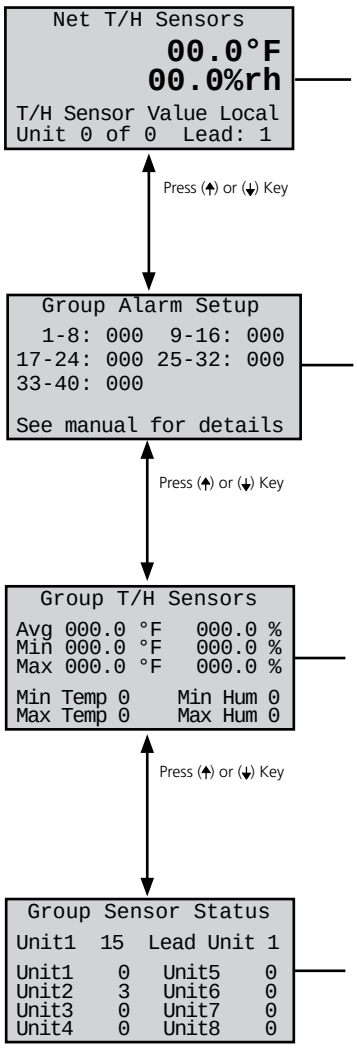
#### 4.6.2.7.5 Group Averaging




Enter Yes for the unit to respond to it's local sensors for Standby or Capacity Assist operation. Enter No for unit to respond to the Group sensors.

### 4.6.2.8 Information Menu Group Menu Screens

The following display screens appear in the Information menu loop (Section 4.5.2.8) if two or more units are wired together as a group. They display key operating parameters for grouped A/C units.




#### 4.6.2.8.1 Group Sensor Values

This displays the current group temperature and humidity control values transmitted from the Lead controller. The field below displays the selected control T/H sensor arrangement (lead, avg, min, max, local) depending upon how the group is set up. See Service>Options screens, Section 4.6.2.7.
The last field shows the unit group address assigned to the controller within the group and the address of the current lead controller.

#### 4.6.2.8.2 Group Alarms

This screen only appears when the controller is wired with additional A/C unit controllers. It displays bitmask values indicating the alarm conditions that will initiate a group internal alarm causing the unit to switch over from "Active" to "Unit Off". See Factory>Group (Group Alarm Setup screen 6) in Section 4.6.2.6.

#### 4.6.2.8.3 Lead Controller Group Sensors

This screen appears only in the display of the controller that is designated as the Lead in a multi-unit work group. The lead controller polls the Temperature and Humidity sensors from all the A/C units in the work group and displays the averaged values. It also displays the value of the minimum (lowest) temperature sensor and the value of the minimum humidity sensor in the A/C group and conversely, displays the value of the maximum (highest) temperature sensor and maximum humidity sensor in the A/C group. The fields at the bottom are the addresses of the controllers in the group that have the min. (lowest) and max. (highest) temperature and humidity sensor readings.

#### 4.6.2.8.4 Group Sensor Status

This screen appears only in the display of the controller that is designated as the Lead in a multi-unit work group. It shows what sensors exist on each A/C unit for the Lead controller to perform the group sensor averaging calculation. The numbers are the sums of index values assigned to the sensors as shown in the following key:

1 = Control Temperature Sensor
2 = Control Humidity Sensor
4 = Supply Temperature Sensor
8 = Supply Humidity Sensor
16 = Static Pressure Sensor

To determine which sensors are enabled and operable for each unit, simply determine which index numbers, derived from the key above, will produce the number shown in the screen. In the example shown, the number for the lead (**Unit1**) is 15. This results from adding 1 *Control Temperature* + 2 *Control Humidity* + 4 *Supply Temperature* + 8 *Supply Humidity* together, confirming the controller is getting a signal from those sensors.

The number shown for unit 2 is three, the result of adding 1 + 2. This confirms unit number 2's Supply Temperature and Return Humidity sensors are detected by the Lead controller. If a one appeared instead for unit number 2, it would indicate the signal for the Return Humidity sensor is not present. That sensor is either not enabled or it has failed.

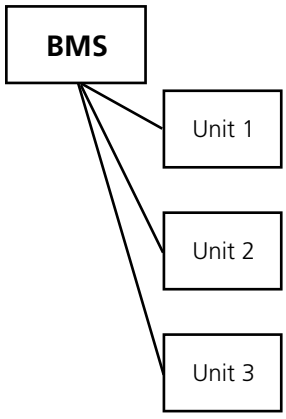
## 4.7 BMS Communication

When BMS communication is utilized, the controller must be equipped with an optional network card with BMS interface port that is designed for one of a variety of serial communication protocols available (see Section 4.1.4). The interface port allows the controller to be field connected to a central Building Management System (BMS) for monitoring and control of data points.

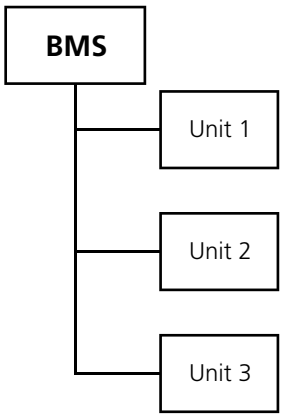
A RS-485 serial port is available for Modbus or BACnet MS/TP protocols and a 10BaseT port is available for TCP/IP based protocols such as BACnet over IP, BACnet over Ethernet, SNMP or HTTP.

| Supported Protocols | Media | Connection |
|---|---|---|
| BACnet over IP | 10BaseT | RJ45 direct |
| BACnet over Ethernet | 10BaseT | RJ45 direct |
| HTTP | 10BaseT | RJ45 direct |
| SNMP V1, V2c | 10BaseT | RJ45 direct |
| Modbus over IP | 10BaseT | RJ45 direct |
| BACnet MS/TP | twisted pair | daisy chain |
| Modbus RTU | twisted pair | daisy chain |

Direct Connection




Daisy Chain Connection



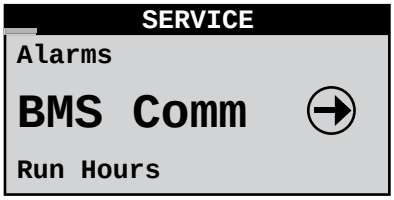

If multiple A/C units are grouped together, each controller added to the group must be configured with a CPU address for BMS communication.

### 4.7.1 Direct BMS Control

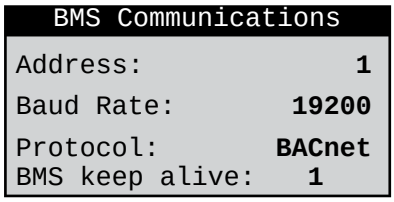
The controller may be configured to accept proportional analog signals that mimics a sensor. The controller will act on that signal whether it comes from a real sensor or a BMS analog output.

Refer to Section 4.9 for the ***E²*** controller's BMS parameters.

### 4.7.2 BMS Communication




The Service>BMS Comm menu is used to set up the parameters to allow a BMS (BAS) interface for monitoring controller operation for the serial-based networks such as BACnet MS/TP. Units using the BACnet over IP, BACnet over Ethernet, or HTTP protocols do not need to change anything in this menu loop.




The BMS address and baud rate have meaning only on RS-485 networks and with the serial protocols of Modem, Modbus RTU, Commission, and Carel. The baud rate is fixed for BACnet. Systems utilizing a 10BaseT interface should use the defaults of address 1, baud rate 19200, and protocol BACnet.

Certain Integer and Digital variables that start with BMS (see page 4-53) require that the BMS "keep alive" parameter changes between 1 and 2 within a 10 minute span. The general procedure is to set up variables like the BMS low fan speed and then write a 1 to the BMS "keep alive" address.

## 4.8 Troubleshooting the Control I/O Module Signal LED's

The $E^2$ control I/O module includes 3 signal LED's (red, yellow and green) that provide information on the operation of the control I/O module and status of the connection to the pLAN. These signal LED's are positioned adjacent to the yellow, "Power On" LED (see Figure 9). The signal LED's may be used for diagnostic purposes if a problem arises with the control I/O module.

**Key:** ● LED off ○ LED on ⊖ LED flashing

| RED LED | YELLOW LED | GREEN LED | |
|---|---|---|---|
| ○ | ● | ● | Application with error or no pLAN table. |
| ○ | ○ | ○ | Application with error or no pLAN table. Controller connected to ONLY one terminal. |
| ● | ○ | ○ | Application with correct pLAN table. |
| ● | ○ | ○ | Correct operation in pLAN. |
| ● | ⊖ | ● | Awaiting communication with WinLoad (factory configuration software). Check address. |
| ● | ⊖ / ● | ● / ⊖ | (LED flashing alternately) Communication with WinLoad not valid. No power supply or wrong driver. |
| ● | ● | ⊖ | Communicating with WinLoad (in low level operation). |
| ● | ⊖ | ⊖ | Communication with WinLoad on hold. |
| ⊖ | ⊖ | ⊖ | WinLoad not suitable or incorrect software protection password. |
| ● | ○ | ⊖ | Communicating with WinLoad (in normal operation). |
| ● | ● | ○ | Controller supervisor protocol (slave) active on serial 0. |

## 4.9 BMS Parameters, Version 1.3

| Supported Protocols | Speed | Media | Connection | Notes |
|---|---|---|---|---|
| BACnet over IP | 10 Mbps | 10BaseT | RJ45 direct unit connection | Uses BMS addresses |
| BACnet over Ethernet | 10 Mbps | 10BaseT | RJ45 direct unit connection | Uses BMS addresses |
| HTTP | 10 Mbps | 10BaseT | RJ45 direct unit connection | Uses BMS addresses |
| SNMP V1, V2c | 10 Mbps | 10BaseT | RJ45 direct unit connection | Uses BMS addresses |
| Modbus over IP | 10 Mbps | 10BaseT | RJ45 direct unit connection | Uses Modbus addresses |
| BACnet MS/TP | 19200 baud | Twisted pair | Daisy chain connection | Uses BMS addresses |
| Modbus RTU | 19200 baud | Twisted pair | Daisy chain connection | Uses Modbus addresses |

### 4.9.1 Signed Values for HTTP, SNMP / Modbus Holding Registers / Analog Values for BACnet

| BMS Address | Modbus Address | BACnet Address | Description | Default | Read/ Write |
|---|---|---|---|---|---|
| 1 | 002 | 1 | Temperature setpoint | 72.0 | R/W |
| 2 | 003 | 2 | Humidity setpoint | 45.0 | R/W |
| 3 | 004 | 3 | Return temperature sensor current value | 0.0 | R |
| 4 | 005 | 4 | Suction pressure S1 act. cs. | 0.0 | R |
| 5 | 006 | 5 | Suction temp S2 act. cs. | 0.0 | R |
| 6 | 007 | 6 | Suction pressure S1 act. vfd. | 0.0 | R |
| 7 | 008 | 7 | Suction temp S2 act. vfd. | 0.0 | R |
| 8 | 009 | 8 | C1 discharge pressure sensor current value | 0.0 | R |
| 9 | 010 | 9 | C1 discharge pressure sensor current value | 0.0 | R |
| 10 | 011 | 10 | Rotor speed scaled [0.0% -100.0%] | 0.0 | R |
| 11 | 012 | 11 | Valve A opening percent | 0.0 | R/W |
| 12 | 013 | 12 | Average zone supply temperature display value | 0.0 | R |
| 13 | 014 | 13 | Return humidity sensor current value | 0.0 | R |
| 14 | 015 | 14 | Dewpoint of ret_t_disp and ret_h_disp | 0.0 | R |
| 15 | 016 | 15 | Dewpoint of rem_t_disp and rem_h_disp | 0.0 | R |
| 16 | 017 | 16 | Middle fan speed | 0.0 | R |
| 17 | 018 | 17 | Upper fan speed | 0.0 | R |
| 18 | 019 | 18 | Lower fan speed | 0.0 | R |
| 19 | 020 | 19 | Mid fan man speed | 20.0 | R/W |
| 20 | 021 | 20 | Upper fan man speed | 20.0 | R/W |
| 21 | 022 | 21 | Lower fan man speed | 20.0 | R/W |
| 22 | 023 | 22 | Static pressure sensor current value | 0.0 | R |
| 23 | 024 | 23 | C1 discharge pressure sensor current value | 0.0 | R |
| 24 | 025 | 24 | Suction pressure S1 | 0.0 | R |
| 25 | 026 | 25 | Suction temp S2 | 0.0 | R |
| 26 | 027 | 26 | Discharge temp S4 | 0.0 | R |
| 27 | 028 | 27 | Remote temperature sensor current value | 0.0 | R/W |
| 28 | 029 | 28 | EWT1 temperature sensor current value | 0.0 | R |
| 29 | 030 | 29 | LWT1 temperature sensor current value | 0.0 | R |

## BMS Parameters, Version 1.3 (cont.)

| BMS Address | Modbus Address | BACnet Address | Description | Default | Read/ Write |
|---|---|---|---|---|---|
| 30 | 031 | 30 | Superheat valve A | 0 | R |
| 31 | 032 | 31 | Discharge superheat | 0 | R |
| 32 | 033 | 32 | Motor current | 0 | R |
| 33 | 034 | 33 | Setpoint discharge superheat | 35.0 | R/W |
| 34 | 035 | 34 | Setpoint discharge temperature | 105.0 | R/W |
| 35 | 036 | 35 | Condensing pressure | 0 | R |
| 36 | 037 | 36 | Condensing temperature | 0 | R |
| 100 | 101 | 100 | High air temperature alarm limit | 80.0 | R/W |
| 101 | 102 | 101 | Low temperature alarm limit | 60.0 | R/W |
| 102 | 103 | 102 | High humidity alarm limit | 70.0 | R/W |
| 103 | 104 | 103 | Low humidity alarm limit | 30.0 | R/W |
| 104 | 105 | 104 | High water temperature limit (EWT1 or EWT2) | 60.0 | R/W |
| 105 | 106 | 105 | Low water temperature alarm limit | 40.0 | R/W |

### 4.9.2 Unsigned Values for HTTP, SNMP / Modbus Holding Registers / Analog Values for BACnet

| BMS Address | Modbus Address | BACnet Address | Description | Default | Direction |
|---|---|---|---|---|---|
| 1 | 130 | 1001 | Cooling analog output | 0 | R |
| 2 | 131 | 1002 | Middle Fan Speed analog output | 0 | R |
| 3 | 132 | 1003 | Rotor speed (Hz) | 0 | R |
| 4 | 133 | 1004 | Rotor Speed (rpm) | 0 | R |
| 5 | 134 | 1005 | HPC analog output | 0 | R |
| 6 | 135 | 1006 | Power+ temperature | 0 | R |
| 7 | 136 | 1007 | Frequency | 0 | R |
| 8 | 137 | 1008 | Prop humidifier control output | 0 | R |
| 9 | 138 | 1009 | Comp error | 7 | R/W |
| 10 | 139 | 1010 | Cooling analog output | 0 | R |
| 11 | 140 | 1011 | Upper fan analog control value | 0 | R |
| 12 | 141 | 1012 | Lower Fan analog control value | 0 | R |
| 13 | 142 | 1013 | Motor Voltage | 0 | R |
| 14 | 143 | 1014 | Actual circuit cooling capacity valve A | 3 | R/W |
| 15 | 144 | 1015 | Out of envelop timing | 0 | R |
| 16 | 145 | 1016 | Packed bit for BMS -alarms | 0 | R |
| 17 | 146 | 1017 | Packed bit for BMS -alarms | 0 | R |
| 18 | 147 | 1018 | Packed bit for BMS -alarms | 0 | R |
| 19 | 148 | 1019 | Packed bit for BMS -sensor fails | 0 | R |
| 20 | 149 | 1020 | Packed bit for BMS -sensor fails | 0 | R |
| 21 | 150 | 1021 | Packed bit for BMS -digital inputs | 0 | R |
| 22 | 151 | 1022 | Packed bit for BMS -digital inputs | 0 | R |
| 23 | 152 | 1023 | Packed bit for BMS -digital outputs | 0 | R |
| 24 | 155 | 1025 | Packed bit for BMS -digital outputs | 0 | R |
| 25 | 156 | 1026 | Envelope status (0=OK;1=Max.compr.ratio; 2=Max. disch.P.;3=Curr.limit; 4=Max.suct.P.;5=Min.compr.ratio; 6=Min.DeltaP;7=Min.disch.P.; 8=Min.suct.P.) | 0 | R |

## BMS Parameters, Version 1.3 (cont.)

| BMS Address | Modbus Address | BACnet Address | Description | Default | Direction |
|---|---|---|---|---|---|
| 26 | 157 | 1027 | Cooling analog output | 0 | R |
| 27 | 158 | 1028 | Fan link control (0 to 4) ***See 4.9.2.1*** | 0 | R/W |
| 28 | 159 | 1028 | Lower fan speed control (0 to 2) ***See 4.9.2.1*** | 2 | R/W |
| 29 | 160 | 1029 | Middle fan speed control (0 to 2) ***See 4.9.2.1*** | 2 | R/W |
| 30 | 161 | 1030 | Upper fan speed control (0 to 2) ***See 4.9.2.1*** | 2 | R/W |
| 100 | 229 | 1100 | BMS keep alive parameter | 0 | R/W |
| 101 | 230 | 1101 | BMS low fan speed for CW units | 0 | R/W |
| 102 | 231 | 1102 | BMS run fan speed for CW units | 0 | R/W |
| 103 | 232 | 1103 | BMS dehum fan speed for CW units | 0 | R/W |
| 105 | 234 | 1105 | Control mode of dewpoint, standard | 0 | R/W |
| 106 | 235 | 1106 | Temperature control sensor selection | 1 | R/W |
| 107 | 236 | 1107 | Humidity control sensor selection | 1 | R/W |
| 109 | 238 | 1109 | Lockout (heat= bit 0, hum=bit 1, dx=bit2, fc/aws=bit3, all 4=fans only) | 3 | R/W |

### 4.9.2.1 Variable/Value Descriptions

| Variable Description | Description for Value 0 | Description for Value 1 | Description for Value 2 | Description for Value 3 | Description for Value 4 | Description for Value 5 | Description for Value 6 |
|---|---|---|---|---|---|---|---|
| Fan link control | None | Upper & Middle | Upper & Lower | Middle & Lower | All | | |
| [X] fan speed control | Manual | Temperature Proportionate | Variance from Average | | | | |

### 4.9.3 Boolean Values for HTTP, SNMP / Modbus Coils / Binary Values for BACnet

| BMS Address | Modbus Address | BACnet Address | Description | Default | Direction |
|---|---|---|---|---|---|
| 1 | 002 | 1 | Global alarm output | 0 | R |
| 2 | 003 | 2 | System on status | 0 | R |
| 3 | 004 | 3 | Airflow has been proven | 0 | R |
| 4 | 005 | 4 | Call for cooling | 0 | R |
| 5 | 006 | 5 | Inverter status | 0 | R/W |
| 6 | 007 | 6 | Call for humidification | 0 | R |
| 7 | 008 | 7 | Call for dehumidification | 0 | R |
| 8 | 009 | 8 | Emergency shutdown | 0 | R |
| 9 | 010 | 9 | Moisture alarm | 0 | R |
| 10 | 011 | 10 | Sensor reading has failed (outside limits for set period of time) | 0 | R |
| 11 | 012 | 11 | Sensor reading has failed (outside limits for set period of time) | 0 | R |
| 12 | 013 | 12 | Optional temperature failure alarm | 0 | R |
| 13 | 014 | 13 | Sensor reading has failed (outside limits for set period of time) | 0 | R |
| 14 | 015 | 14 | Relay status | 0 | R/W |
| 15 | 016 | 15 | Thermistor status | 0 | R/W |
| 16 | 017 | 16 | Undervoltage status | 0 | R/W |
| 17 | 018 | 17 | Fan status | 0 | R/W |

## BMS Parameters, Version 1.3 (cont.)

| BMS Address | Modbus Address | BACnet Address | Description | Default | Direction |
|---|---|---|---|---|---|
| 18 | 019 | 18 | Inverter status | 0 | R/W |
| 19 | 020 | 19 | Autotuning status | 0 | R/W |
| 20 | 021 | 20 | Emergency shutdown | 0 | R |
| 21 | 022 | 21 | Remote shutdown | 0 | R |
| 22 | 023 | 22 | Customer alarm 1 | 0 | R |
| 23 | 024 | 23 | Airflow alarm | 0 | R |
| 24 | 025 | 24 | Filter alarm | 0 | R |
| 25 | 026 | 25 | Fire/Smoke alarm | 0 | R |
| 26 | 027 | 26 | Water detection alarm | 0 | R |
| 27 | 028 | 27 | Motor overload status | 0 | R/W |
| 28 | 029 | 28 | Condensate pan alarm | 0 | R |
| 29 | 030 | 29 | Circuit1 low pressure alarm | 0 | R |
| 30 | 031 | 30 | Circuit1 high pressure alarm | 0 | R |
| 31 | 032 | 31 | Power supply status | 0 | R/W |
| 32 | 033 | 32 | Drive alarm | 0 | R/W |
| 33 | 034 | 33 | Pump alarm | 0 | R |
| 34 | 035 | 34 | Dual power input A alarm | 0 | R |
| 35 | 036 | 35 | Dual power input B alarm | 0 | R |
| 36 | 037 | 36 | Customer alarm 2 | 0 | R |
| 37 | 038 | 37 | Customer alarm 3 | 0 | R |
| 38 | 039 | 38 | Humidifier alarm | 0 | R |
| 39 | 040 | 39 | Flow temp sensors CW1 alarm | 0 | R |
| 40 | 041 | 40 | Alarm off-line power+ | 0 | R |
| 41 | 042 | 41 | Upper Fan alarm | 0 | R |
| 42 | 043 | 42 | Lower fan alarm | 0 | R |
| 43 | 044 | 43 | Middle fan alarm | 0 | R |
| 44 | 045 | 44 | High temperature alarm | 0 | R |
| 45 | 046 | 45 | Low temperature alarm | 0 | R |
| 46 | 047 | 46 | High humidity alarm | 0 | R |
| 47 | 048 | 47 | Low humidity alarm | 0 | R |
| 48 | 049 | 48 | High water temperature CW1 | 0 | R |
| 49 | 050 | 49 | Low water temperature CW1 | 0 | R |
| 50 | 051 | 50 | General Inverter Alarm | 0 | R |
| 51 | 052 | 51 | Discharge temperature alarm | 0 | R/W |
| 52 | 053 | 52 | Loss of power | 0 | R |
| 53 | 054 | 53 | Low pressure difference alarm | 0 | R/W |
| 54 | 055 | 54 | Flow switch CW1 alarm | 0 | R |
| 55 | 056 | 55 | Out of envelope alarm | 0 | R/W |
| 56 | 057 | 56 | Compressor fails to start alarm | 0 | R/W |
| 57 | 058 | 57 | Alarm state that shut off compressor | 0 | R |
| 58 | 059 | 58 | LowSH (low super heat) alarm -Valve A | 0 | R |
| 59 | 060 | 59 | EEV motor error -Valve A | 0 | R |
| 60 | 061 | 60 | Return temperature sensor fail | 0 | R |
| 61 | 062 | 61 | Return humidity sensor fail | 0 | R |

## BMS Parameters, Version 1.3 (cont.)

| BMS Address | Modbus Address | BACnet Address | Description | Default | Direction |
|---|---|---|---|---|---|
| 62 | 063 | 62 | Remote temperature sensor failure alarm | 0 | R/W |
| 63 | 064 | 63 | Remote humidity sensor failure alarm | 0 | R/W |
| 64 | 065 | 64 | EWT1 temperature sensor fail | 0 | R |
| 65 | 066 | 65 | LWT1 temperature sensor fail | 0 | R |
| 66 | 067 | 66 | Low suction temperature alarm -Valve A | 0 | R |
| 68 | 069 | 68 | DX1 discharge pressure fail | 0 | R |
| 76 | 077 | 76 | Static air pressure sensor fail | 0 | R |
| 80 | 081 | 80 | Alarm probe S1 | 0 | R |
| 82 | 083 | 82 | Alarm probe S2 | 0 | R |
| 84 | 085 | 84 | Custom sensor 1 fail | 0 | R |
| 100 | 101 | 100 | BMS value to pause the unit | 0 | R/W |
| 101 | 102 | 101 | BMS value to reset alarms | 0 | R/W |
| 102 | 103 | 102 | Force rotation of units in group manual or BMS | 0 | R/W |
| 103 | 104 | 103 | BMS value to switch CW sources | 0 | R/W |
| 104 | 105 | 104 | BMS value to switch dual power primary | 0 | R/W |
| 105 | 106 | 105 | BMS value to activate lockout function | 0 | R/W |
| 106 | 107 | 106 | Reset Dirty Filter Alarm | 0 | R/W |

### 4.9.4 Alarm Packed Bit Variables

| Bit | Alarms 1 | Alarms 2 | Alarms 3 |
|---|---|---|---|
| 0 | Emergency shutdown | Middle fan alarm | *Reserved* |
| 1 | Remote shutdown | Upper fan alarm | *Reserved* |
| 2 | Customer Alarm 1 | Lower fan alarm | *Reserved* |
| 3 | Airflow | High temperature | *Reserved* |
| 4 | Filter | Low temperature | *Reserved* |
| 5 | Fire/Smoke | High humidity | *Reserved* |
| 6 | Water detection | Low humidity | *Reserved* |
| 7 | Condensate pan | High water temp CW1 | *Reserved* |
| 8 | Moisture | Low water temp CW1 | *Reserved* |
| 9 | Circuit 1 low pressure | Customer Alarm 2 | *Reserved* |
| 10 | Circuit 1 high pressure | Customer Alarm 3 | *Reserved* |
| 11 | Pump | Flow alarm (temp sensors) | *Reserved* |
| 12 | Dual power input A | Flow alarm (flow switch) | *Reserved* |
| 13 | Dual power input B | Reserved | *Reserved* |
| 14 | Humidifier | Reserved | *Reserved* |
| 15 | Loss of power | Reserved | *Reserved* |

### 4.9.5 Sensor Failure Packed Bit Variables

| Bit | Sensor Failures 1 | Sensor Failures 2 |
|---|---|---|
| 0 | Middle temperature | *Reserved* |
| 1 | Upper temperature | *Reserved* |
| 2 | Lower temperature | *Reserved* |

## BMS Parameters, Version 1.3 (cont.)

| Bit | Sensor Failures 1 | Sensor Failures 2 |
|---|---|---|
| 3 | Return temperature | *Reserved* |
| 4 | Return humidity | *Reserved* |
| 5 | Static air pressure | *Reserved* |
| 6 | Suction pressure | *Reserved* |
| 7 | Suction temperature | *Reserved* |
| 8 | Discharge pressure | *Reserved* |
| 9 | *Reserved* | *Reserved* |
| 10 | Remote temperature | *Reserved* |
| 11 | Remote humidity | *Reserved* |
| 12 | Entering water temperature | *Reserved* |
| 13 | Leaving water temperature | *Reserved* |
| 14 | *Reserved* | *Reserved* |
| 15 | *Reserved* | *Reserved* |

### 4.9.6 Digital Input Packed Bit Variables

| Bit | Digital Inputs 1 | Digital Inputs 2 |
|---|---|---|
| 0 | Remote shutdown | Customer alarm 2 |
| 1 | Customer alarm 1 | Customer alarm 3 |
| 2 | Water | *Reserved* |
| 3 | Condensate pan | *Reserved* |
| 4 | Humidifier | *Reserved* |
| 5 | Moisture | *Reserved* |
| 6 | Middle fan alarm | *Reserved* |
| 7 | Upper fan alarm | *Reserved* |
| 8 | Fire/smoke | *Reserved* |
| 9 | Lower fan alarm | *Reserved* |
| 10 | Dual power input A | *Reserved* |
| 11 | Dual power input B | *Reserved* |
| 12 | Circuit 1 low pressure | *Reserved* |
| 13 | Circuit 1 high pressure | *Reserved* |
| 14 | Pump alarm | *Reserved* |
| 15 | Humidifier lockout | *Reserved* |

### 4.9.7 Digital Output Packed Bit Variables

| Bit | Digital Outputs 1 | Digital Outputs 2 |
|---|---|---|
| 0 | Global alarm | *Reserved* |
| 1 | Custom alarm 1 | *Reserved* |
| 2 | Master fan enable | *Reserved* |
| 3 | DX1 enable | *Reserved* |
| 4 | DX1 liquid line solenoid | *Reserved* |
| 5 | Humidifier enable | *Reserved* |
| 6 | Dual power output A | *Reserved* |
| 7 | Dual power output B | *Reserved* |

## BMS Parameters, Version 1.3 (cont.)

| Bit | Digital Outputs 1 | Digital Outputs 2 |
|---|---|---|
| 8 | Pump enable | *Reserved* |
| 9 | Custom alarm 2 | *Reserved* |
| 10 | Custom alarm 3 | *Reserved* |
| 11 | *Reserved* | *Reserved* |
| 12 | *Reserved* | *Reserved* |
| 13 | *Reserved* | *Reserved* |
| 14 | *Reserved* | *Reserved* |
| 15 | *Reserved* | *Reserved* |

The R/W BMS variables fall into two categories. Variables like the temperature setpoint are permanent. As permanent variables, they retain their value regardless of power loss or BMS communication failure. The controller's flash memory is limited to one million write cycles for permanent variables. The other category is the integer and digital variables that start with "BMS". These are expected to be changed frequently and require that the BMS is active when changing them. All BMS variables require that the BMS "keep alive" parameter (Variable 100) changes between 1 and 2 within a 10 minute span. The general procedure is to set up variables like the BMS low fan speed and then write a 1 to the BMS "keep alive" address. If the controller does not see a 2 written to the BMS "keep alive" address within 10 minutes, all the BMS variables will revert to their previous values.

### 4.9.8 Unsigned Values for HTTP, SNMP / Modbus Holding Registers / Analog Values for BACnet

| BMS Address | Modbus Address | BACnet Address | Description | Default | Direction |
|---|---|---|---|---|---|
| 100 | 229 | 1100 | BMS keep alive parameter | 0 | R/W |
| 101 | 230 | 1101 | BMS low fan speed for CW units | 0 | R/W |
| 102 | 231 | 1102 | BMS run fan speed for CW units | 0 | R/W |
| 103 | 232 | 1103 | BMS dehum fan speed for CW units | 0 | R/W |

### 4.9.9 Boolean Values for HTTP, SNMP / Modbus Coils / Binary Values for BACnet

| BMS Address | Modbus Address | BACnet Address | Description | Default | Direction |
|---|---|---|---|---|---|
| 100 | 101 | 1100 | BMS value to pause the unit | 0 | R/W |
| 101 | 102 | 1101 | BMS value to reset alarms | 0 | R/W |
| 102 | 103 | 1102 | Force rotation of units in group manual or BMS | 0 | R/W |
| 103 | 104 | 1103 | BMS value to switch CW sources | 0 | R/W |
| 104 | 105 | 1104 | BMS value to switch dual power primary | 0 | R/W |

# 5.0 MAINTENANCE

## 5.1 Periodic General Maintenance

Systematic, periodic general maintenance of the CyberRow unit is required for optimum system performance. General maintenance should include, but is not limited to the following: replacing filters, tightening electrical connections, checking the condensate pans and drain line to ensure they are free of debris, cleaning the interior of the unit, inspecting the units' components visually, checking level of refrigerant and ensuring no moisture is in the refrigerant IF APPLICABLE.

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

**WARNING**

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

**WARNING**

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

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

**WARNING**

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

### 5.1.1 Filters

The filter is usually the most neglected item in an air conditioning system. To maintain efficient operation, the filter should be checked every month and cleaned or replaced as required.

**NOTE**

Conditions of spaces vary. Extremely dusty environments may require more frequent filter maintenance.

The air filters are located behind the air intake grille at the rear of the cabinet. To access the filters, unlatch the rear access panel at the top and remove it from the cabinet.

#### 5.1.1.1 Cleanable Filters

Cleanable filters are spring loaded in the holding trays in the access panel. Using a flat head screwdriver, gently push the filters to one side and remove the filters from the trays (Figure 16).

**Figure 16- Cleanable Filters**

Clean the filter media using a vacuum cleaner, low pressure compressed air or rinse with water. A mild detergent such as dish washing liquid may be used. DO not use solvents or cleaning agents. Replace the filters every 2 to 3 years when they become too flimsy.

#### 5.1.1.2 Cartridge Filters

Disposable pleated cartridge filters are held in place by an end cap in the bottom of the rear access panel. Lay the access panel down on a piece of cardboard or padded surface. Remove the four screws holding the end cap in place. Remove the end cap and slide the old filters out of the tray as shown in Figure 17. Slide the new filters into the tray and replace the end cap. Ensure the four screws are fully tightened.

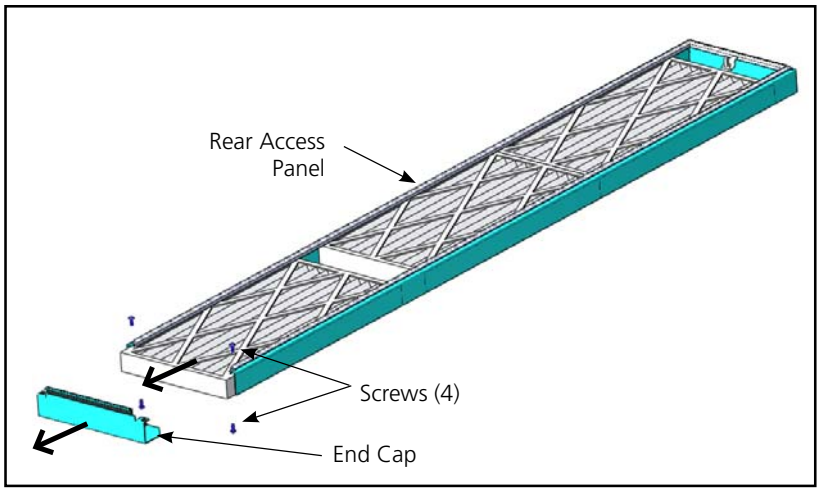



**Figure 17- Cartridge Filters**

### 5.1.2 EC Fans

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

### 5.1.3 Coil

The coil should be inspected semi-annually and cleaned as required, following standard coil cleaning practices. Using a brush, clean the coil fins of all debris that will inhibit airflow. This can also be done with compressed air or with a commercial coil cleaner. Check for bent or damaged coil fins and repair as necessary. Check all CW lines for vibration isolation and provide supports as necessary. Check all piping for signs of leaks.

### 5.1.4 Drain Pans

To ensure proper drainage, inspect the drain pans regularly. Make sure the drain pan outlets are always free of debris so they empty readily and ensure the drain pans do not leak.

**WARNING** ⚠

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

### 5.1.5 Condensate Pump

The condensate pump should be inspected semi-annually and cleaned. It will be necessary to remove the pump as described in Section 5.3.2.4.

Inspect the water level switch and ensure that the float works freely. Wipe the float with a wet cloth and detergent to remove dirt. Check that the discharge line is open and water can pass through it freely.

### 5.1.6 Humidifier

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

**NOTE**

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

Refer to Section 5.3.2.1 and the humidifier operator's manual supplied separately for detailed instructions on changing the cylinder.

#### 5.1.6.1 Humidifier Drain Pump

The humidifier drain pump (located beneath the humidifier) should be inspected semi-annually and cleaned. The same maintenance procedures, as detailed in Section 5.1.5, should be performed to properly maintain the humidifier drain pump.

## 5.2 Troubleshooting

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

| SYMPTOM | PROBABLE CAUSE | RECOMMENDATION |
|---|---|---|
| **Air Flow Too Low** | Dirty air filters. (Reduced airflow) | Clean/replace filters. |
| **CW Valve Fails to Open or Close** | a. Temperature setpoint too high. | Adjust to correct temperature setting. |
| | b. No control power to the valve. | Valve actuator wiring faulty. Check wiring for loose connections, breaks or shorts. Tighten connections or replace broken/shorted wires if required. |
| | c. Actuator failed. | Replace actuator. |
| **System Short of Capacity** | a. Low airflow. | 1. Check filters. Replace as needed.<br>2. Check for and clear any obstructions across or in the (supply) discharge air stream. Clear coil fins of debris. |
| | b. Low Chilled Water flow | 1. Check for leaks. Repair and refill the CW system.<br>2. Check for obstructions in supply/return CW lines.<br>3. Check for clogged strainer (if applicable). |
| | c. Supply water temperature too high | Check chilled water supply |
| | d. Temperature setting too high | Decrease temperature setpoint. |
| | e. Discharge air short cycling back to return. | Place air barrier between hot/cold aisles. |
| **EC Fan(s) Fail to Start** | a. Power failure. | Check main voltage power source input cable. |
| | b. Motor starter protector tripped. | Reset motor starter protector and check amperage of motor against nameplate. |
| | c. Control transformer circuit breaker tripped. | Check for short circuit or ground fault; if none, reset circuit breaker. |
| | d. Condensate overflow switch. | 1. Ensure unit is level.<br>2. Check that condensate pan is draining. |
| | e. Defective contactor. | Repair or replace. |

| SYMPTOM | PROBABLE CAUSE | RECOMMENDATION |
|---|---|---|
| **EC Fan(s) Fail to Start (cont.)** | f. No control signal to fan(s). | Check the Control I/O Board for a 0-10 VDC control signal to the fan(s). Refer to the electric drawing to determine the correct I/O board terminal numbers. This must done within 15 seconds of turning the disconnect switch "On" or the controller will go into "Air Proving Alarm" mode. |
| | g. EC fan's internal overheat protection interrupted fan motor operation.<br><br>3. Loss of phase > 5 seconds. | Determine the cause of the interruption and correct. Possible causes are:<br>1. Blocked rotor.<br>2. Low supply voltage > 5 seconds.<br><br>After causes 1, 2, and 3 are corrected, the motor will automatically reset.<br>After the causes below are corrected, the fan(s) must be manually reset by turning off power for 20 seconds:<br>4. Over temperature of electronics.<br>5. Over temperature of motor. |
| **Control is Erratic** | Wiring improperly connected or broken. | Check wiring against electrical drawing. |
| **System Fails to Start** | a. Critical alarm condition not cleared. | Press Alarm key to reset alarm (See Section 4.5.3). |
| **Humidifier Inoperative** | a. Water supply has been turned off or not connected.<br><br>b. Humidifier switch is in "Off" position.<br>c. Electrical connections are loose.<br>d. Humidifier fuses are blown.<br><br>from tank and refill. Replace fuses.<br>e. Relative humidity is above set point.<br>f. Yellow status LED is flashing.<br>g. Water conductivity is too low. | Connect and/or turn on water supply.<br><br>Turn switch to "Auto/On" position.<br>Tighten electrical connections.<br>Check for over current by the humidifier electrodes. Drain water<br><br>Adjust humidity setpoint.<br>Consult humidifier manual.<br>Add a teaspoon of table salt to the water through the top of the cylinder, typically only required on initial start-up. |

## 5.3 Field Service

**NOTE**

Do not attempt to make repairs without the proper tools.

NOTE: Repairs to refrigeration systems must be performed by a journeyman refrigeration mechanic or air conditioning technician.

### 5.3.1 CW System

If the Chilled Water system isn't cooling or if cooling is reduced, check for leaks in the system. Check for clogged water lines. If strainers are installed in the CW lines, check the condition of the filters. Clean or replace the filters if necessary.

In situations where scaling could be heavy, untreated water in the unit cooling coils may cause, over a period of time, a loss of heat exchange capacity due to a mineral deposit build-up inside the coil. Only a qualified service mechanic should clean dirty coils.

#### 5.3.1.1 Leak Detection/Repair

A leak in a chilled water cooling system will usually form a puddle of fluid beneath the unit that can be easily seen.

When a leak is detected, turn off the CW supply before attempting repairs. Adjacent piping must be thoroughly cleaned by removing all paint, dirt and oily film. Use 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.

For copper-to-copper (piping) repairs use SILFOS Alloy. No flux is required with Silfos Alloy. Silver solder (Stay Silv #45) and flux are to be used on copper-to-brass or copper-to-steel repairs.

When repairs are completed, remove all traces of flux. After any repair, pressurize the system to check for leaks prior to recharging the system.

### 5.3.2 System Repairs/Component Replacement

Turn off power to the unit at the main power disconnect switch when repairing, removing and replacing components. Ensure power is turned back on at the main power disconnect switch after repairs are completed.

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

#### 5.3.2.1 Humidifier Cylinder Replacement

Remove the rear access panel from the CyberRow cabinet to access the humidifier.

After an extended period of operation, the yellow LED on the humidifier control panel 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. Turn the A/C unit Off by pressing (and holding) the Enter key on the ***E²*** controller.
2. Turn off the water supply to the humidifier.
3. Remove the front panel from the A/C unit and turn the main power disconnect switch on the electric box to Off.

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. Remove the rear panel to access the humidifier and drain the cylinder by pushing the "On-Off-Drain" switch to the "Drain" position.
7. When drained, push the "On-Off-Drain" switch to the "Off" position.
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 flat head 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. Turn the main power disconnect switch to the On position.
18. Turn on the water supply to the humidifier.
19. Replace the front and rear panels.
20. Turn the A/C unit On by pressing the Enter key on the ***E²*** controller.
21. 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.

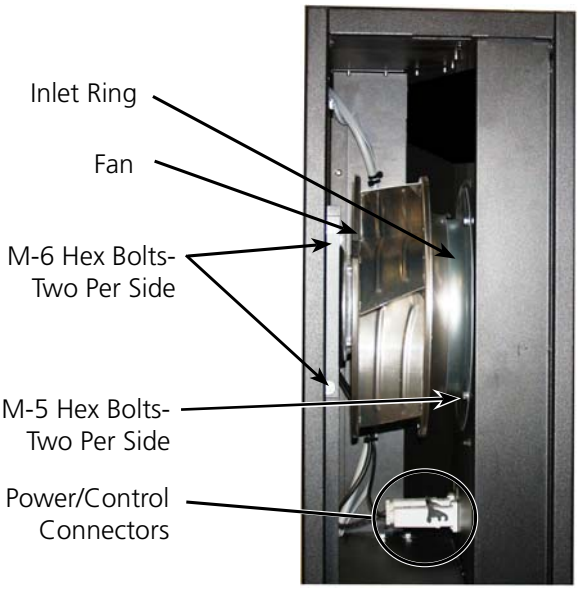
#### 5.3.2.1.1 Humidifier Drain Pump Replacement

The humidifier drain pump is located on a shelf beneath the humidifier assembly. To access the pump, the rear access panel must be removed as described in Section 5.3.2.1.

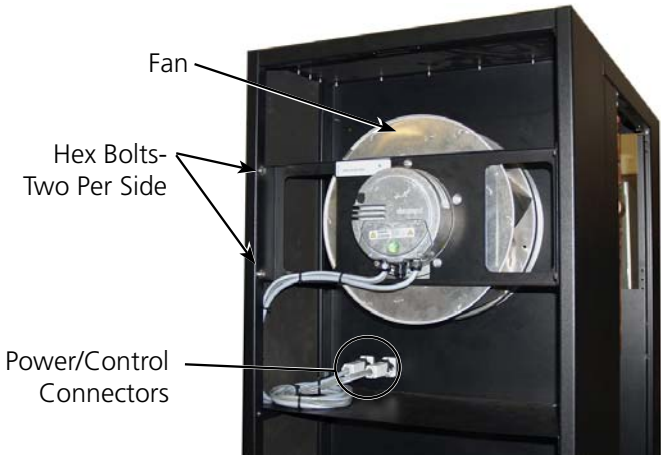
Cut the wire-ties holding the clear plastic discharge line (reference Section 5.3.2.4). Remove the discharge line from the barbed stub fitting. Release the cable retaining clip on the side of the pump and cut the wire-ties holding the cable loop. Remove the pump from the shelf with the cable still attached and remove the cover to expose the wire terminals. Remove the wires from the pump and remove the pump from the cabinet. Install the replacement pump in the same manner that the old pump was removed, reversing the procedure.

#### 5.3.2.2 Fan Replacement

The EC Fans are located behind the front access panel. The panel must be removed to access the fans. The fans are equipped with quick connect fittings for the power and control cables to make swap-out easy. Lift the retaining latch on top of the power and control cable connector housings to unplug the cables. Cut the wire-ties holding the cable bundle in the cabinet.




**12" Cabinet**

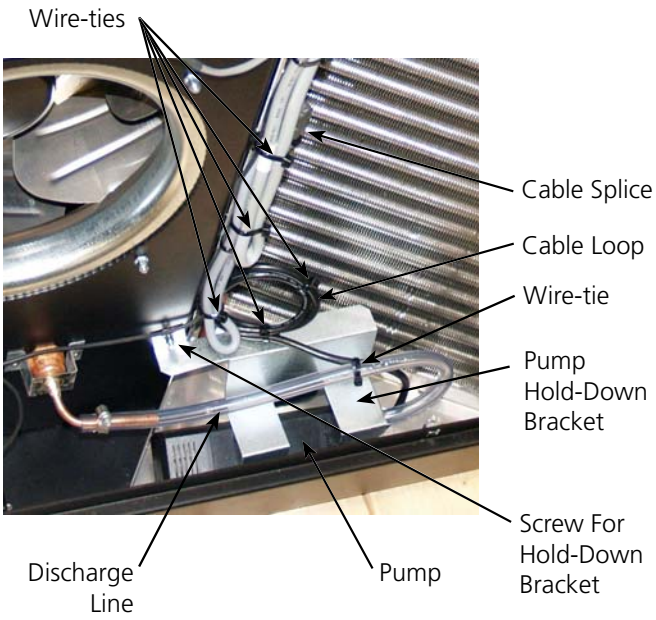



**24" Cabinet**

Remove the four M-5 hex-bolts holding the inlet ring then remove the four M-6 hex-bolts holding the fan mounting bracket. Remove the fan assembly together with the inlet ring from the cabinet. Remove the mounting bracket from the old fan and install it on the new fan. Bolt the new fan assembly (together with the inlet ring) into the cabinet and plug the power and control cables into the connectors.

#### 5.3.2.3 Condensate Pump Replacement

The condensate pump is located behind the lower cabinet fan assembly (see the figures in Sections 2.7.1.1 and 2.7.1.2). To access the pump, the lower fan must be removed as described in Section 5.3.2.2.




Working in the fan compartment in the front of the cabinet, remove the mounting screw for the pump hold-down bracket. Reach inside the fan opening and slide the hold-down bracket off the pump. Reach inside the fan opening to grasp the pump. Tilt the pump up and cut the wire-ties holding the clear plastic discharge line and the cable loop. Also cut the two wire ties harnessing the cables beneath the cable splice. Remove the discharge line from the barbed stub fitting on the pump.

Maneuver the pump out of the fan opening with the cable still attached and remove the black heat shrink tubing to expose the wire splice terminals. Cut the wires where they are spliced and remove the pump from the cabinet. Install the replacement pump in the same manner that the old pump was removed, reversing the procedure. When splicing the pump wires back to the cable, ensure the terminals are sealed to protect them from moisture.

# 6.0 PRODUCT SUPPORT

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

- Performance Evaluations
- Start-up Assistance
- Training

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

## 6.1 Technical Support

The STULZ Technical Support Department is dedicated to the prompt reply and solution to any problem encountered with a unit. Should a problem develop that cannot be resolved using this manual, you may call (888) 529-1266 Monday through Friday from 8:00 a.m. to 5:00 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 Serial Number
- Unit Model Number
- STULZ Sales Order Number
- Description of Problem

## 6.2 Obtaining Warranty Parts

Warranty inquiries are to be made through the Technical Support Department at (888) 529-1266 Monday through Friday from 8:00 a.m. to 5:00 p.m. EST. A service technician at STULZ will assist in troubleshooting the system over the telephone with a field service technician to determine the defect of the part. If it is determined that the part may be defective a replacement part will be sent via UPS ground. If the customer requests that warranty part(s) be sent by any other method than UPS ground the customer is responsible for the shipping charges. If you do not have established credit with STULZ you must give a freight carrier account number.

A written (or faxed) purchase order is required on warranty parts and must be received prior to 2:00 p.m. for same day shipment. The purchase order must contain the following items:

- Purchase Order Number
- Date of Order
- STULZ Stated Part Price
- Customer Billing Address
- Shipping Address
- Customer's Telephone and Fax Numbers
- Contact Name
- Unit Model No., Serial No. & STULZ Item No.

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

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

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

## 6.3 Obtaining Spare/Replacement Parts

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

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

A 25% minimum restocking charge will be applied on returned stocked parts that were sold as spare/replacement parts. If the returned part is not a stocked item, a 50% restocking charge may be applied. Additionally a Return Material Authorization Number is required when returning parts. To receive credit for returned repair/replacement parts, the parts must be returned to STULZ within 30 days of the purchase date. Spare part sales over 30 days old will be considered final and the parts will remain the sole property of the ordering party.

**NOTES**

# APPENDIX A - FORMS

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

**Checklist for Completed Installation**

- ❑ 1 Proper clearances for service access have been maintained in front of the equipment.
- ❑ 2 Equipment is level and mounting fasteners are tight.
- ❑ 3 Field installed piping completed.
- ❑ 4 All field installed piping leak tested.
- ❑ 5 Condensate drain line connected.
- ❑ 6 Water supply line connected to humidifier (if required). If manual cut-off valve is installed, open valve.
- ❑ 7 Humidifier "On/Off/Drain" switch is in "On" position.
- ❑ 8 Filter(s) installed.
- ❑ 9 Incoming line voltage matches equipment nominal nameplated rating ± tolerances.
- ❑ 10 Main power wiring connections to the equipment, including earth ground, have been properly installed.
- ❑ 11 Customer supplied main power circuit breaker (HACR type) or fuses have proper ratings for equipment installed.
- ❑ 12 All wiring connections are tight.
- ❑ 13 Foreign materials have been removed from inside and around all equipment installed (shipping materials, construction materials, tools, etc.).
- ❑ 14 Inspect all piping connections for leaks during initial operation.

STULZ

Frederick, Maryland USA 21704

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

# STULZ CyberRow Series

## Periodic General Maintenance Checks and Services Checklist

Date: _____ Prepared By: _____

Model Number: _____ Serial Number: _____

Item Number: _____

### Monthly

**Filters**

- ❑ Cleanliness
- ❑ No Obstructions

**Blower Section**

- ❑ All Blowers Turn Freely

**Condensate Drain**

- ❑ Drain Is Open
- ❑ Condensate Pan Safety Switch Operates Freely

**Miscellaneous**

- ❑ Check Chilled Water Circuit For Air (bleed as required)
- ❑ Humidifier and Controls Operate Properly

### Semi-Annually

- ❑ Tighten Electrical Connections
- ❑ Check Contacts On Contactors For Pitting
- ❑ Clean Inside Of Cabinet
- ❑ Clean Coils
- ❑ Clean Condensate Pump

### Annually

**Chilled Water Systems**

- ❑ Inspect Chilled Water System For Leaks and Corrosion
- ❑ Conduct a Complete Check of All Services Listed Above

**Notes:** _____

_____

_____

_____

_____

**Signature:**_____

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

# Appendix B – Glossary

## Definition of Terms and Acronyms

**STULZ -** STULZ Air Technology Systems, Inc.

**BTU/Hr -** British Thermal Units Per Hour

**CFM -** Cubic Feet Per Minute

**CNDCT -** Conductor

**CW -** Chilled Water

**DX -** Direct Expansion

**ESD -** Electrostatic Discharge

**ºF -** Degrees Fahrenheit

**FLA -** Full Load Amps

**FOB -** Freight on Board

**HACR -** Heating, Air Conditioning, Refrigeration

**HP -** Horse Power

**Hz -** Hertz

**IAQ -** Indoor Air Quality

**m.i.w.g. -** milli-Inches of Water Gauge

**kVA -** Kilo Volt Amps

**kW -** Kilowatt

**LRA -** Locked Rotor Amps

**MAX CKT BKR -** Maximum Circuit Breaker

**MAX FUSE -** Maximum Fuse

**MCA -** Minimum Circuit Ampacity

**MSDS -** Material Safety Data Sheet

**NEC -** National Electric Code

**NFPA -** National Fire Protection Agency

**PH -** Phase

**PI -** Proportional/Integral (Control)

**PSIG -** Pounds Per Square Inch Gauge

**RLA -** Run Load Amps

**R-Value -** Thermal Resistance

**R407C -** Blended Refrigerant

**SPDT -** Single Pole, Double Throw

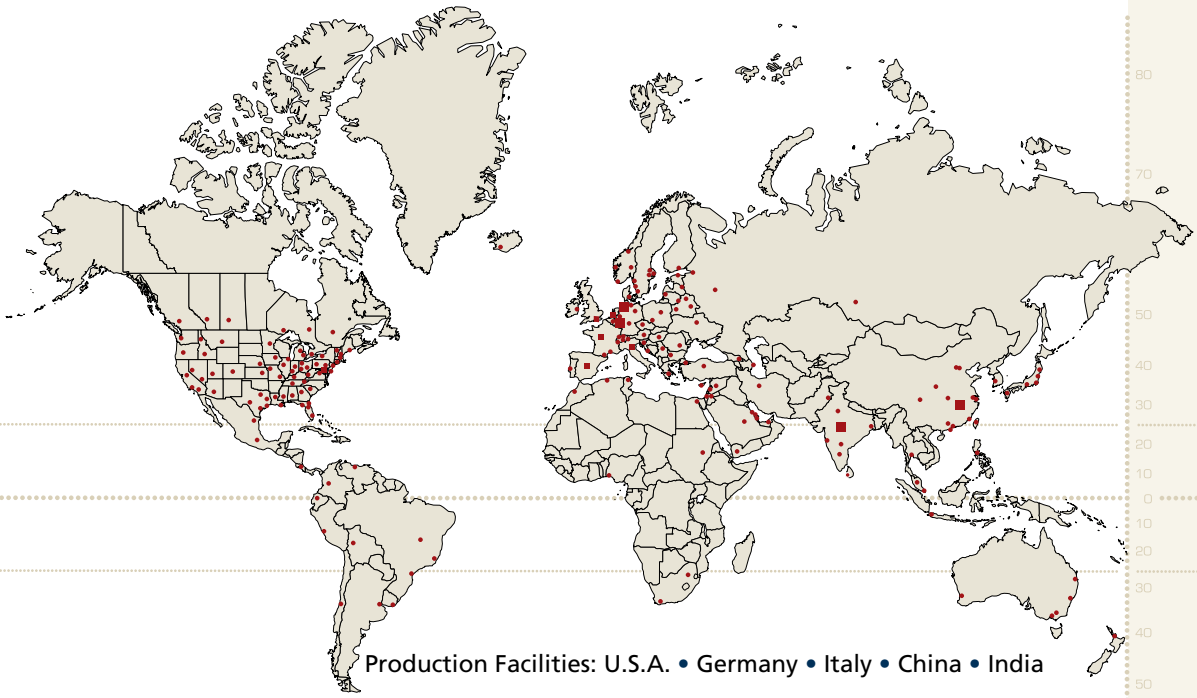
**TEV -** Thermal Expansion Valve

**V -** Volt

**VAC -** Volt, Alternating Current

**VDC -** Volt, Direct Current

**WG -** Water Glycol



Production Facilities: U.S.A. • Germany • Italy • China • India


*STULZ mission is to be the premier provider of energy efficient temperature and humidity control solutions for mission critical applications.*

STULZ®

STULZ Air Technology Systems, Inc.
1572 Tilco Drive, Frederick, Maryland 21704
Phone: 301.620.2033, Fax: 301.662.5487
E-mail: info@stulz-ats.com
www.STULZ.com

ISO 9001 Quality Management System - Requirements

Dec., 2013
OWR0117C