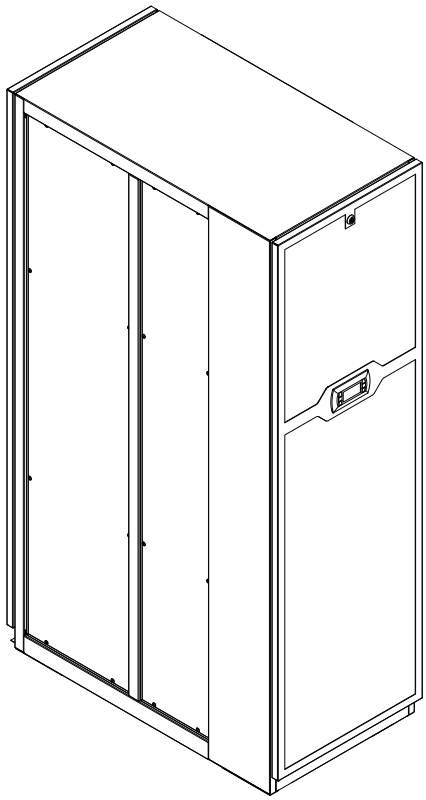
Installation, Operation, and Maintenance

CyberRow CW

Row-Based Precision Air Handlers
26 kW - 53 kW / 60 Hz



⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

April 2023 **AH-SVX014A-EN**

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

NOTICE Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified according to local rules. For the USA, the Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state/national electrical codes.

⚠WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- **Before installing/servicing this unit, technicians MUST put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). ALWAYS refer to appropriate Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate SDS and OSHA/GHS (Global Harmonized System of Classification and Labeling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.**
- **If there is a risk of energized electrical contact, arc, or flash, technicians MUST put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, PRIOR to servicing the unit. NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

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⚠ WARNING

Follow EHS Policies!

Failure to follow instructions below could result in death or serious injury.

- **All Trane personnel must follow the company's Environmental, Health and Safety (EHS) policies when performing work such as hot work, electrical, fall protection, lockout/tagout, refrigerant handling, etc. Where local regulations are more stringent than these policies, those regulations supersede these policies.**
- **Non-Trane personnel should always follow local regulations.**

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Table of Contents

Model Number Descriptions

Digit 1, 2, 3 — System

CSR = CyberRow System

Digit 4, 5, 6 — Nominal Capacity

090 = 090 MBh
180 = 180 Mbh

Digit 7 — Cooling Method

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

Overview

General

The CyberRow precision air conditioning system will provide years of trouble free service if installed and maintained in accordance with this manual. Damage to the unit from improper installation, operation or maintenance is not covered by the warranty.

Study the instructions contained in this manual. They must be followed to avoid difficulties. Spare parts are available from Trane to ensure 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 CyberRow systems are designed to be installed indoors.

Product Description

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-inches wide and 24-inches 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: *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. Trane is not liable for any damage resulting from improper use.*

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).

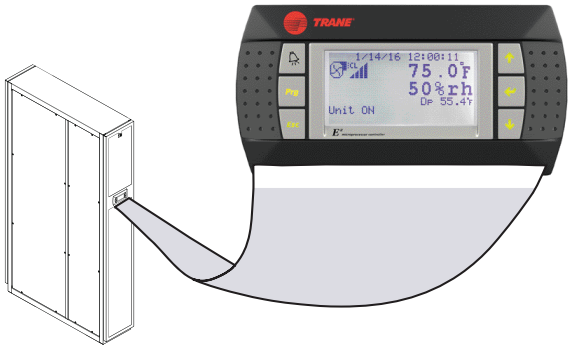
The system is equipped with highly reliable EC (Electronically Commutated) fans which offer considerable energy cost savings and long life. Using an electronically commutated permanent magnet DC motor, AC inverter whine is eliminated. Fan speed is continuously adjustable through a signal from the system controller without the use of VFDs. 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
- Multi-unit control
- 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 “E² Controller,” p. 20 for detailed instructions on operating the system controller.

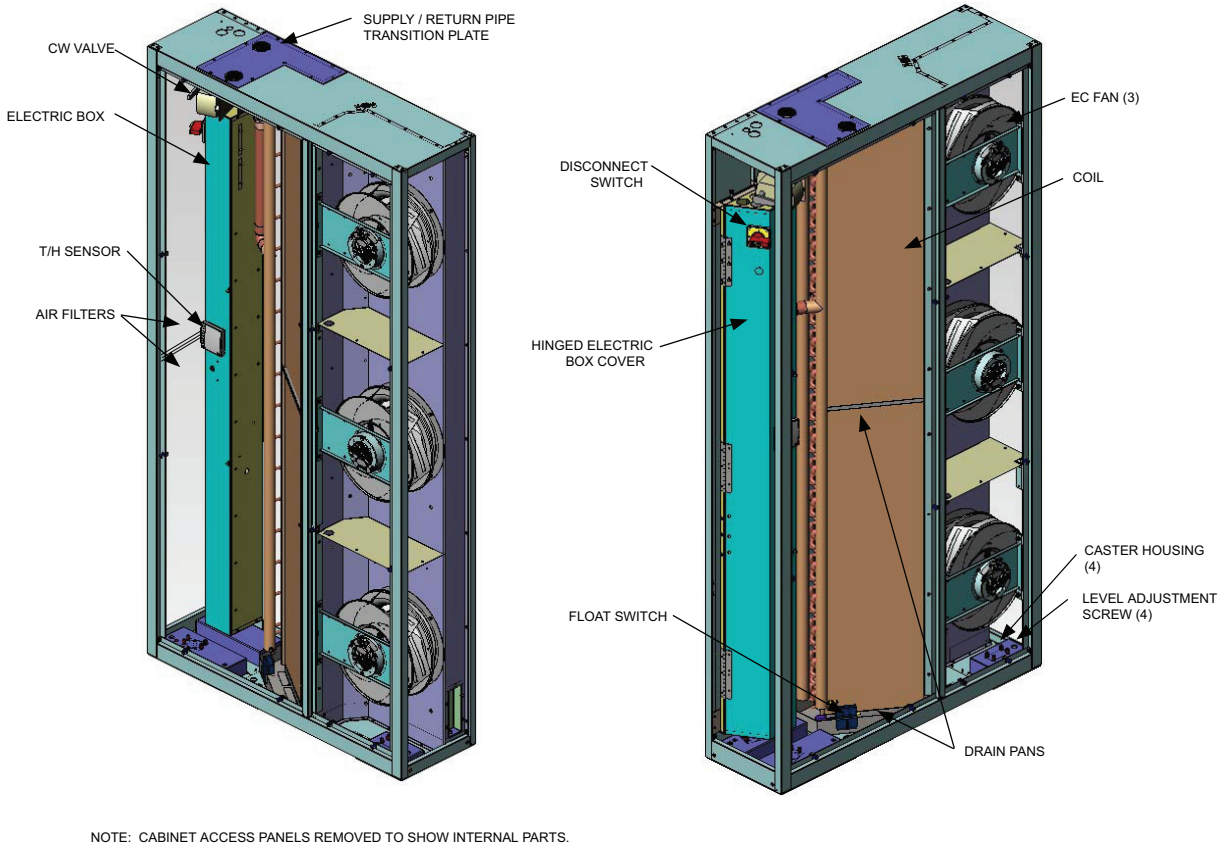
General Design

The 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-inch CW CyberRow unit and identifies the major components. Figure 2, p. 9 depicts a typical internal layout of a 24-inch CyberRow unit and identifies the major components. The location of some components may vary.

Figure 1. Typical internal layout- CRS-090-C



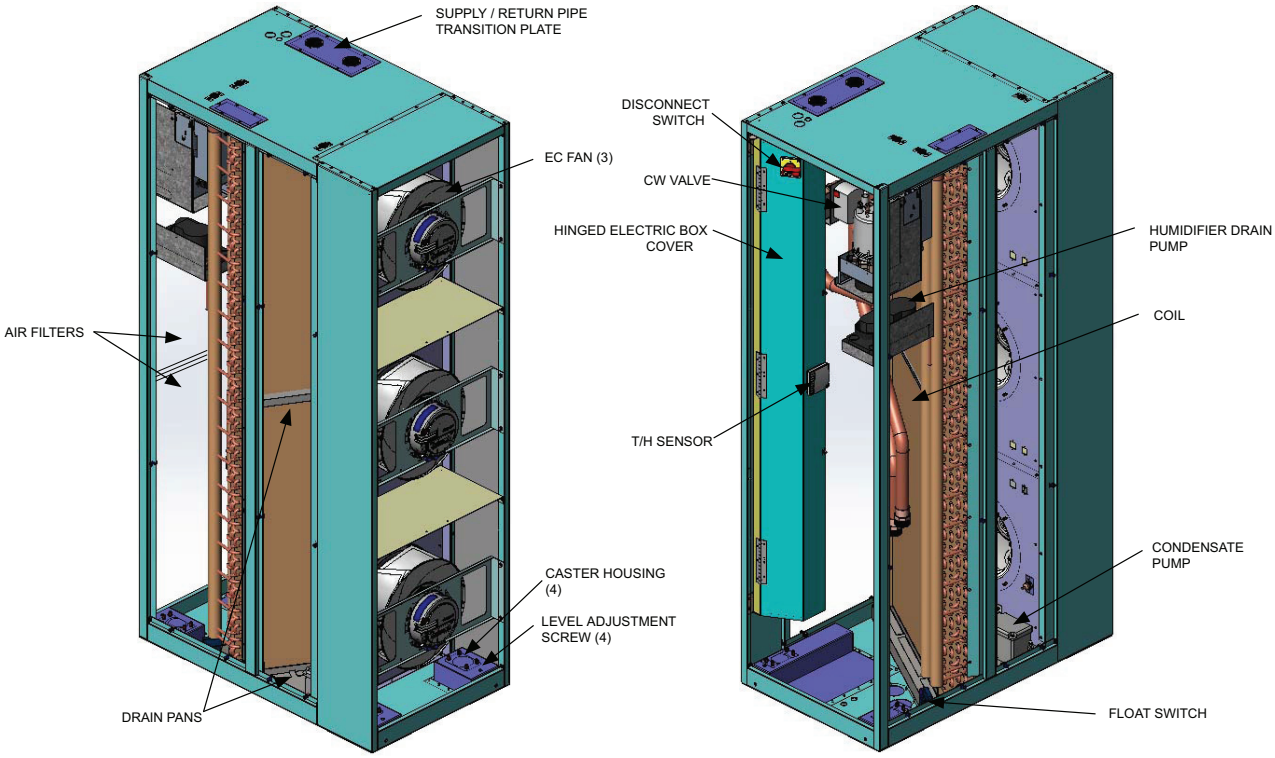
NOTE: CABINET ACCESS PANELS REMOVED TO SHOW INTERNAL PARTS.

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 Figure 1 and Figure 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 maintenance is performed. The handle of the switch may be locked in the **Off** position to prevent unintended operation.

Figure 2. Typical internal layout- CRS-180-C



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.

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 Figure 10, p. 15 and Figure 11, p. 16).

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.

Condensate Pump

A condensate pump is factory installed in the lower drain pan. The pump automatically eliminates condensate water from the drain pan.

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 airflow.

The system may be optionally configured for static pressure control with all three fans operating at the same variable speed (See “Airflow/Fan Speed Control,” p. 27).

Temperature/Humidity Sensors

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

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.

Optional Equipment

Remote Mounted Supply Temperature/ Humidity Sensor

As an option, a supply T/H sensor may be provided for field installation (see “Remote Temperature/Humidity Sensor,” p. 14). 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.

Water Detector

As an option, Trane offers spot type or strip/cable type water detectors (see “Remote Water Detectors,” p. 13). Upon sensing a water leak, the water detector control circuit will signal the system controller of the alarm condition. The system will continue operating.

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.

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.

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.

Installation

Receiving the Equipment

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 carriers delivery forms Before signing for the equipment. Any freight claims MUST be done through the freight carrier. All equipment is shipped FOB. Trane can assist in the claim filing process with the freight carrier. Should any damage be present, notify Trane Product Support prior to attempting any repairs. Refer to "Product Support," p. 64 of this manual for instructions.

A unit Data Package has been sent with your unit. It contains this manual, system drawings, applicable MSDSs, 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.*

Moving the Equipment

NOTICE

Unit Damage!

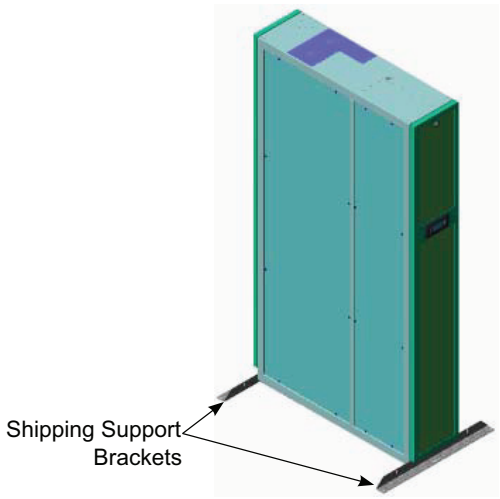
Failure to follow the instruction below could result in damage to the unit.
When moving the unit, lift it vertically and keep it in a level position.

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.

⚠WARNING

Risk of Unit Tipping!

Failure to keep shipping support brackets in place while moving and positioning the cabinet will result in an unstable unit which could tip and result in death or serious injury.
Ensure that the shipping support brackets are attached to the front and rear of the cabinet after removing the unit from the skid.



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

Important: *If the shipping brackets must be removed before installing the server racks on each side, physically support each side of the cabinet to prevent it from tipping over.*

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 must be established prior to mounting the unit. Refer to local and national electrical codes.*

Important:

- *The unit must in installed in an air-conditioned space.*
- *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 will route the piping and wiring into the cabinet and ensure

access is available (see “Piping Connections,” p. 14). 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.

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.

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 in order 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-inch clearance in the front and rear of the cabinet for servicing the unit.

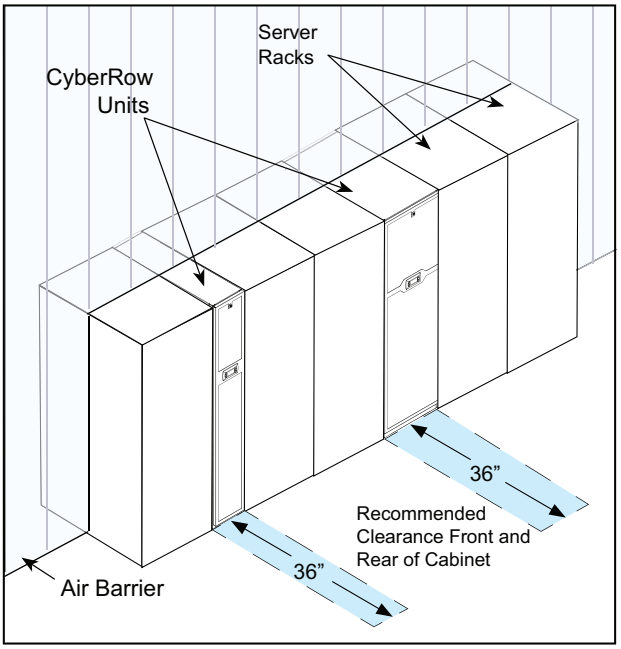
The optimal placement location is next to highly loaded servers that throw off the most significant heat into the hot aisle side of the row. In this arrangement, the CyberRow minimizes hot spots.

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.

Important: *Placement of air barriers between the cold aisle/ hot aisle is critical. 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



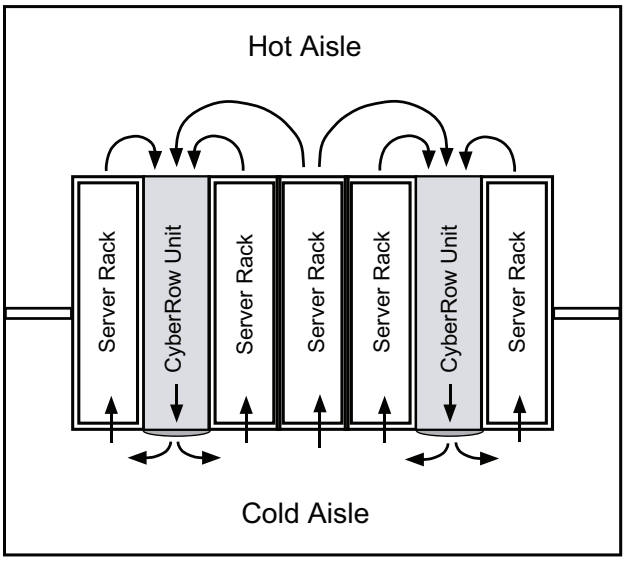
Once the cabinet is removed from the shipping skid, it may be rolled into position on the casters which are mounted to the bottom of the unit. Do not remove the shipping support brackets unless server racks are installed on each side of the CyberRow cabinet.

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 and rear corners of the cabinet per Figure 1 and Figure 2), to raise or lower each foot until the cabinet is level and even with the adjacent equipment racks (see Figure 3).

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 4)

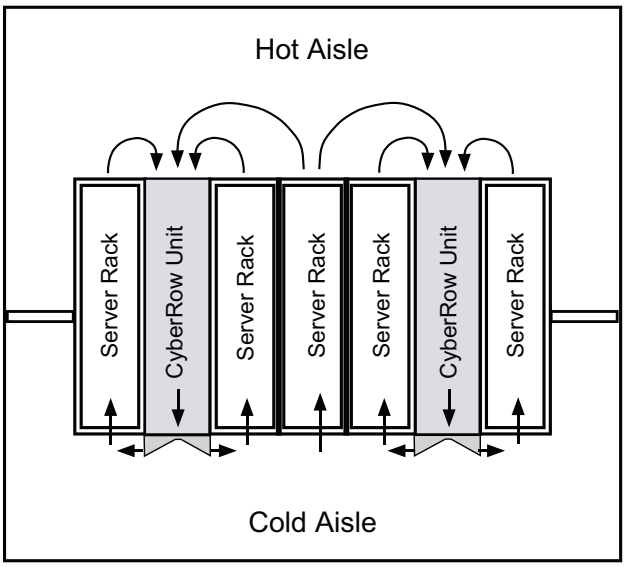
Figure 4. Typical air distribution



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 5).

Figure 5. Front diverted air distribution



Optional Equipment (Field Installed)

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

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. Trane 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.

Figure 6. Spot type water detector

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.

Figure 7. Cable type water detector

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 to mount the sensor.

Figure 8. Temperature/Humidity Sensor

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

NOTICE

Sensor Damage!

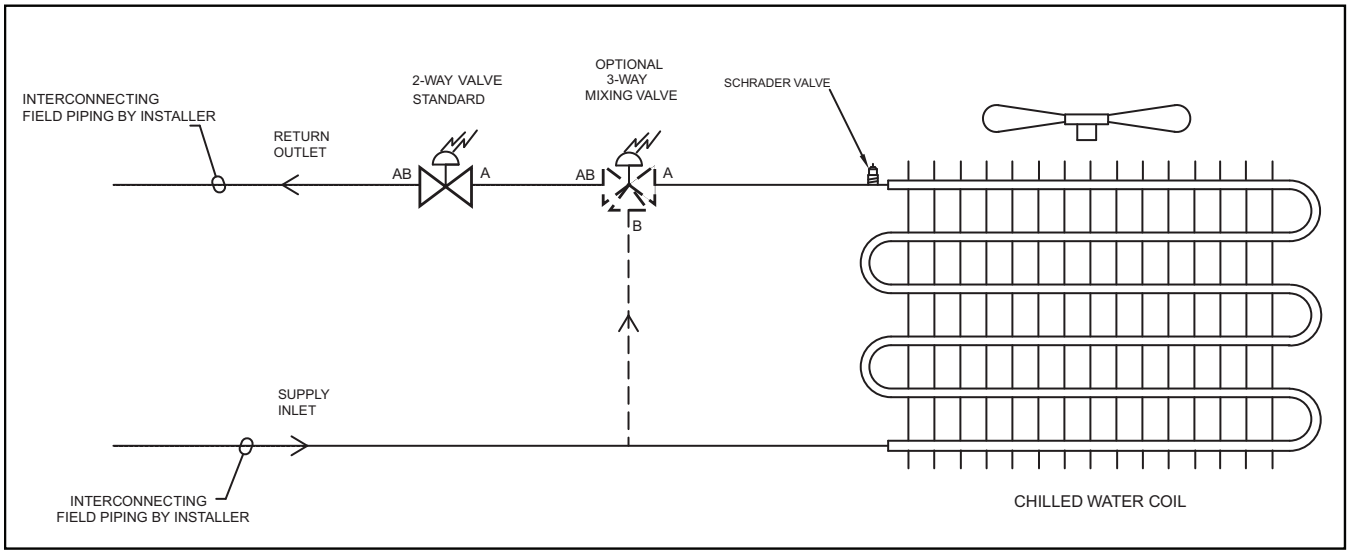
The sensors can be damaged if handled improperly. Do not damage the exposed temperature/humidity sensors on the PC board when the cover is removed. Do not touch the sensor as this will affect its accuracy.

2. Place the base temporarily against the mounting surface.
3. Level the base. Mark and drill mounting holes through at least two of the available slotted holes.
4. Run a 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 "Utility Connections," p. 16 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.

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 9).

Figure 9. Typical CW piping diagram



Piping Connections

Important: *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 Figure 10 and Figure 11).

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 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 industry practices for piping, leak testing, and filling the chilled water circuit.*

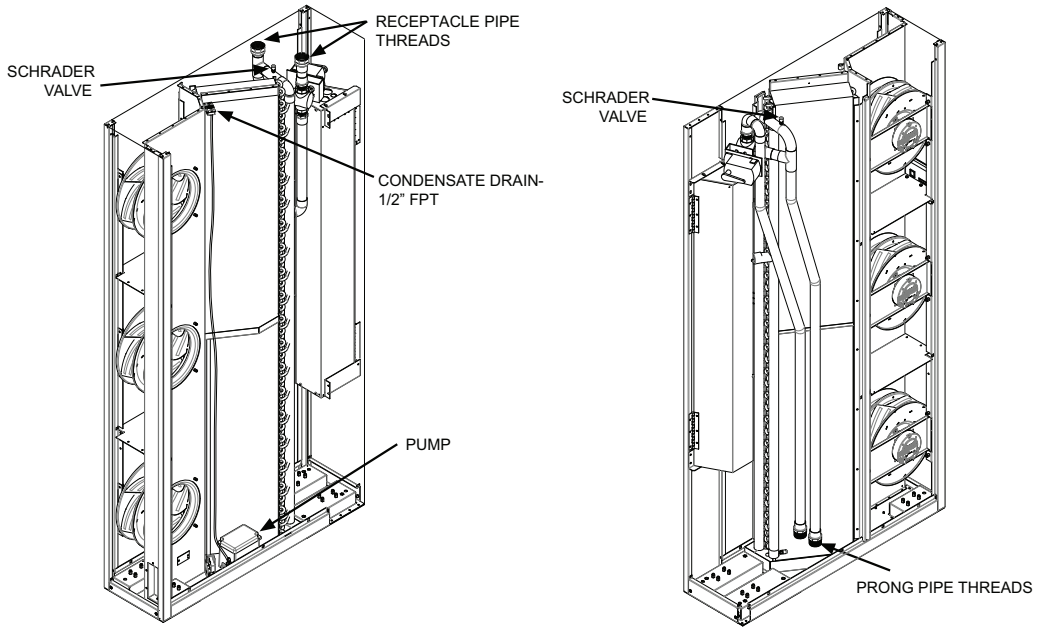
The piping should be isolated by the use of vibration isolating supports. Provide supports (clamps or hangers) as necessary every 5 to 10 feet along piping runs to minimize vibration and noise transmission. To reduce vibration transmission and prevent pipe damage, seal openings in walls using a soft flexible material to pack around the piping. After the piping is installed, seal the gaps between the pipes and the cabinet entrance holes to prevent air leakage around the pipes.

Note: *Chilled water lines must insulated to prevent condensation from forming on the pipes if ambient dew point temperatures are higher than the fluid temperatures.*

Important: *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.

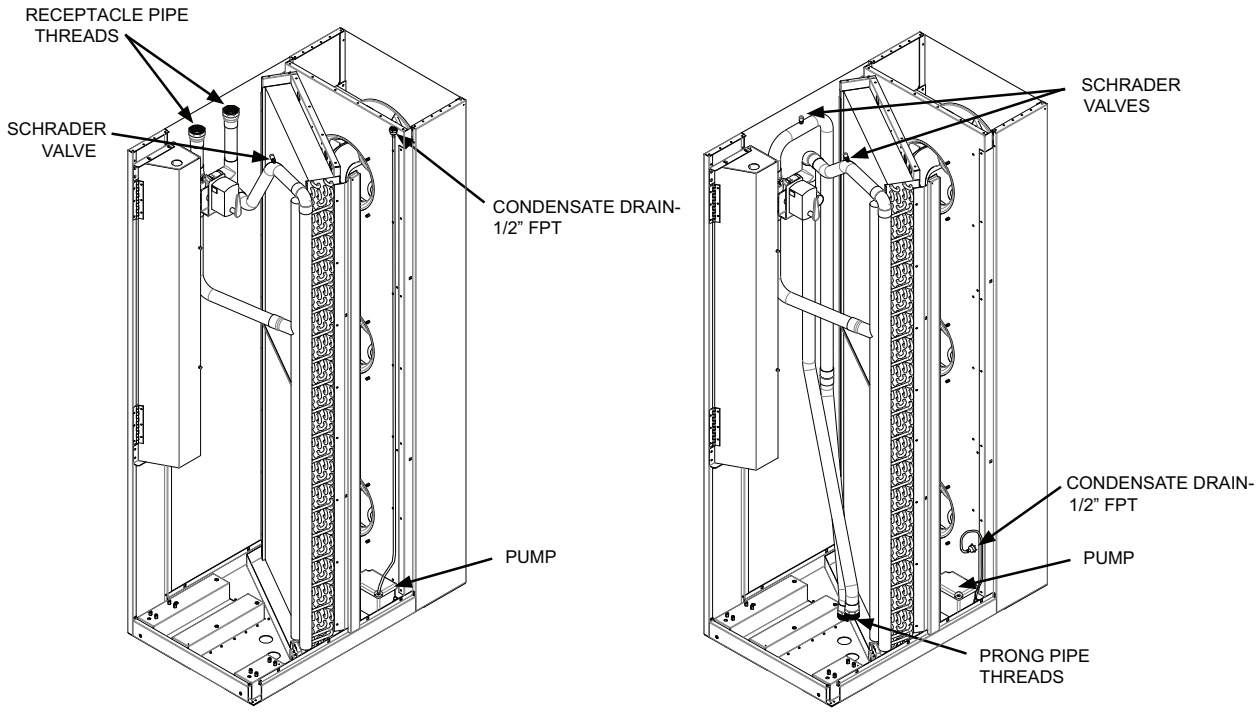
Figure 10. CW supply and return piping connections – 12-inch cabinets



TOP ACCESS PIPING

BOTTOM ACCESS PIPING

Figure 11. CW supply and return piping connections – 24-inch cabinets



Condensate Drain Line

A condensate pump is factory installed. The drain line connection is typically a 1/2-inch 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.

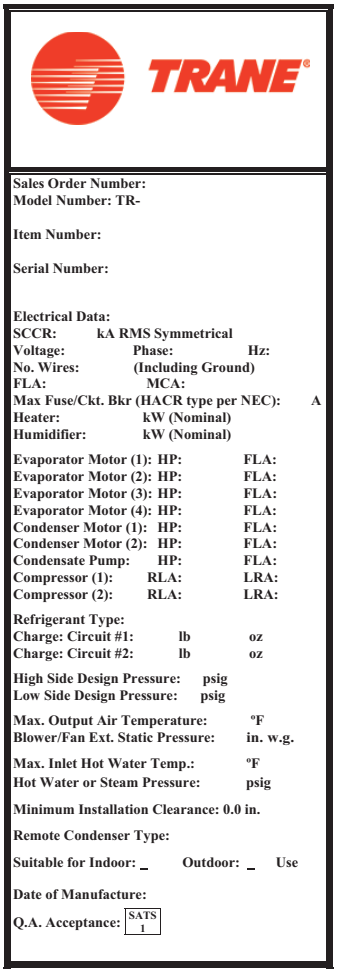
Utility Connections

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 12, p. 17). 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 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.*

Figure 12. 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

Hazardous Service Procedures!

Failure to follow all precautions in this manual and on the tags, stickers, and labels could result in death or serious injury.
Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the following instructions: Unless specified otherwise, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/ tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks.

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.

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

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.

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.

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.

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.

NOTICE

Equipment Damage!

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

Remote Water Detector

Refer to "Remote Water Detectors," p. 13. 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.

Remote Temperature/Humidity Sensor

Refer to "Remote Temperature/Humidity Sensor," p. 14. 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.

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 with a minimal contact rating of 15 mA @24 VAC. Two conductors from the normally closed switch must be connected to the control terminal block located within the unit electric box. See "Remote On/Off Control," p. 28 for additional information on the remote on/off feature. Refer to the electrical drawing for the wiring details.

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 "Dual Power Transfer Monitoring," p. 28 for additional information on the remote power off feature. Refer to the electrical drawing for the wiring details.

Chilled Water System Preparation

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.

Settings and Adjustments

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.

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 controllers programming menu selections. Refer to "Airflow/Fan Speed Control," p. 27 for instructions on adjusting airflow using the system controller.

Start-up/Commissioning

Initial Operation

For new installations, ensure the unit is ready to operate by going through the Checklist for Completed Installation, located in “Appendix A CRS-090-C Preventive Maintenance Inspection Checklist,” p. 65, prior to start-up.

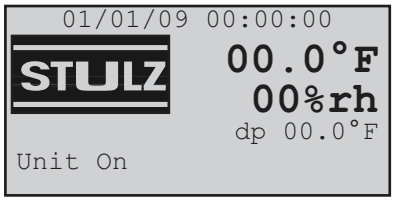
Note: *A Warranty Registration and Start-up Checklist is provided in the unit data package. It should be completed during start-up and sent to Trane. This checklist should be used as a guideline for items that need to be confirmed during start-up.*

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

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 “System Operation,” p. 24).
3. After about 20 seconds the Main screen is displayed (see Figure 13). At the bottom of the screen a status message Unit On appears.

Figure 13. Main display screen



Note: *You may turn the 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 first, then the upper fan, then the lower fan. The vendor 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 required mode to reach the set points. Symbols appear in the display to indicate the active operating modes (see “System Operation,” p. 24).
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 “Setpoint Screens,” p. 34) to create a demand for cooling. The chilled water valve should open and the supply air should feel cooler than the return air.
9. 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 rooms requirements.
10. Fill out the applicable sections of Warranty Registration and Start-up Checklist.

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 “User interface display panel,” p. 20).

Operating instructions for the E² controller are provided in “E² Controller,” p. 20.

E² Controller

General

The advanced microprocessor based, E² Series controller is a highly versatile and flexible A/C system controller. It is designed primarily for Trane 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 E² 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 rooms 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.

Features

Field Configurable

The program for the E² 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 E² 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.

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.

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 setpoints may be stored as Customer Default setpoints. 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 readjusted in the Control menu at any time. If it becomes necessary, the customer may restore the setpoints back to the Customer Default setpoint values or to the original Factory (primary) setpoint values in the Service menu (see “Save Configuration,” p. 41).

A/C Grouping pLAN Operation (Optional)

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) 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.

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 14. 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 15, p. 21).

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 Figure 17, p. 22.)

Function Keys

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

Contrast Adjustment

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

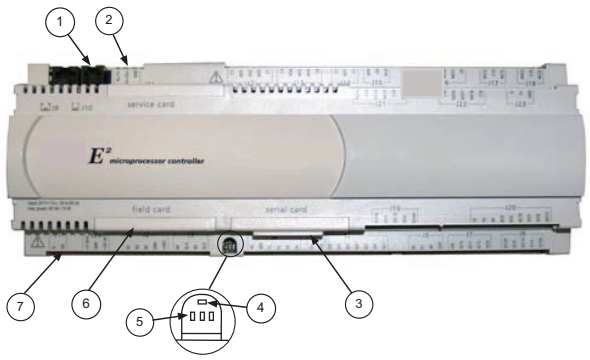
Alarms

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.

Controller I/O Module

The controller is a microprocessor based I/O module mounted inside the A/C system electric box (see Figure 15). The controller I/O module contains the software that manages the operating parameters of the A/C system.

Figure 15. Controller I/O module



Controller I/O Module Layout

The controller I/O module contains the logic and input/ output terminals. See Figure 15 for details of the controller I/O module layout. The item numbers that follow coincide with the call-outs in Figure 15.

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)

BMS Interface

The E² series controller may incorporate a BMS network card with a communication port (Figure 16, p. 21). 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.

Figure 16. BMS interface ports

BACnet MS/TP

Modbus RTU

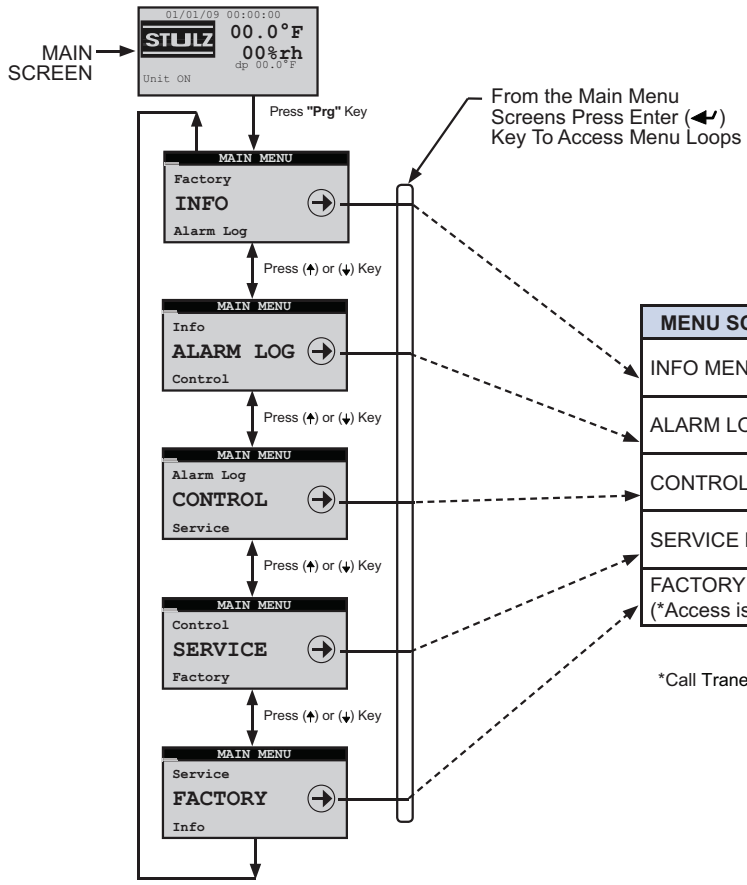
BACnet IP, BACnet Ethernet, HTTP, SNMP, and Modbus IP

Navigating Controller Display Screens

Menu Selection

The E² Series controller provides five user selectable menus necessary to view operating data and enter set points for the system (see Figure 17, p. 22). 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.

Figure 17. Menu selections



MENU SCREENS	LOOP DISPLAYS
INFO MENU	Basic status information, no password needed.
ALARM LOG	Logged Alarms in chronological sequence.
CONTROL MENU	Basic user values i.e. setpoints. Level 1 password required.
SERVICE MENU	Advanced user values i.e. offsets. Level 2 password reqd.
FACTORY MENU (*Access is limited)	Factory values i.e. sensor scaling. *Level 3 password reqd.

*Call Trane Product Support for Assistance

When the desired menu is centered in the screen with bold capital letters and an arrow symbol pointing towards the Enter key, 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.

Menus

From the Main screen you may press the Program **(Prg)** key to select from among the five menus shown in Figure 17, p. 22.

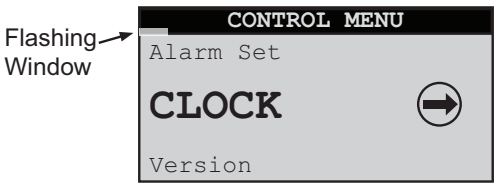
Display Variables

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 variables possible choices.

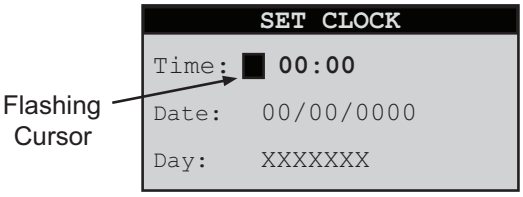
Cursor Position in Screens

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 are 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.

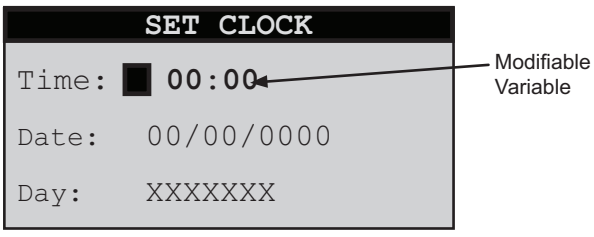


If the flashing cursor is located in a modifiable field, the value of the field will be changed with the use of the Up and Down arrow keys. When the Enter key is pressed the cursor moves to the next modifiable field. After entering the last modifiable field within a screen, pressing the Enter key removes 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.

Modifiable Variables



For the purpose of this manual the examples of user modifiable variables within display screens will be denoted by bold text. (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 arrow 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.

Password Authorization Levels

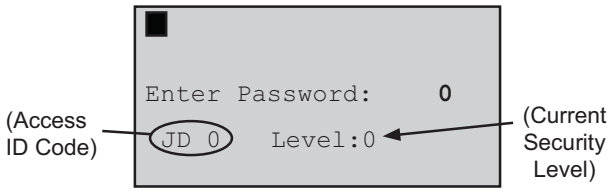
Access to a menu loop may be requested from the main menu. Modifiable control screens have variables that affect system performance. Improper settings may result in erratic operation and possible system failure or damage. Anyone is allowed direct access to the **Info** and **Alarm log** display menus 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.

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.

Figure 18. 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.

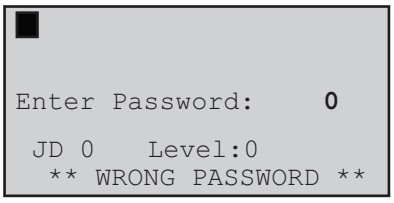
It is intended that access to the Factory menu screens only be granted while the user is working with the guidance of Trane Product Support (see “Product Support,” p. 64) because incorrect settings made at that level could unintentionally damage the equipment. The Access ID Code in the bottom left of the **Enter Password** screen is required 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.

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.*

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.

System Operation

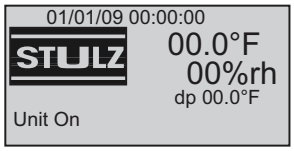
Important: *Ensure all system hookups to the air conditioner(s) are completed and that power is available.*

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 its 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.

Figure 19. 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.*

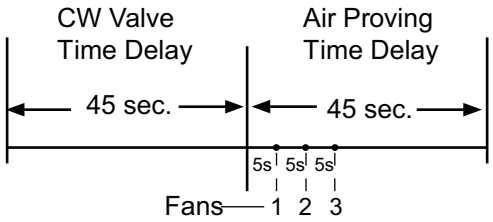
   Other status messages that may appear at the bottom of the screen are:

   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.)

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 Trane 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 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.

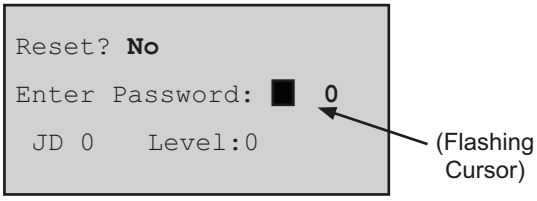
8. If the actual room conditions are not within the range of the programmed set points, the system will begin operating in the mode(s) necessary to reach the set points (cooling, humidifying or dehumidifying). Symbols (shown below) appear in the display to indicate the active operating modes.

	Fan On
	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 "Information Menu Loop," p. 29).

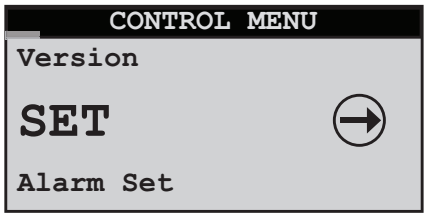
Setpoint Adjustment

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.

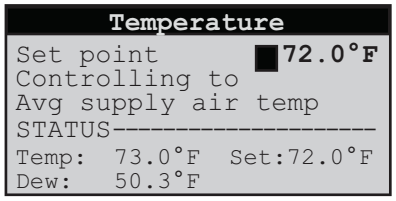


Change the 0 to 1 (or to the current Control menu password if it was changed in the Service menu) with the Up arrow key and then press the Enter key to accept the password. Press the Enter key again to access the Control menu screens.

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).

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 "Setpoint Adjustment," p. 25, 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.

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 shutdown 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 "Alarm Log," p. 31.

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.

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 “Customer Alarm Input,” p. 38).

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 “Custom Alarm Setup,” p. 39). When a custom alarm condition is detected, a summary alarm is signaled and a designated set of N.O. and 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.

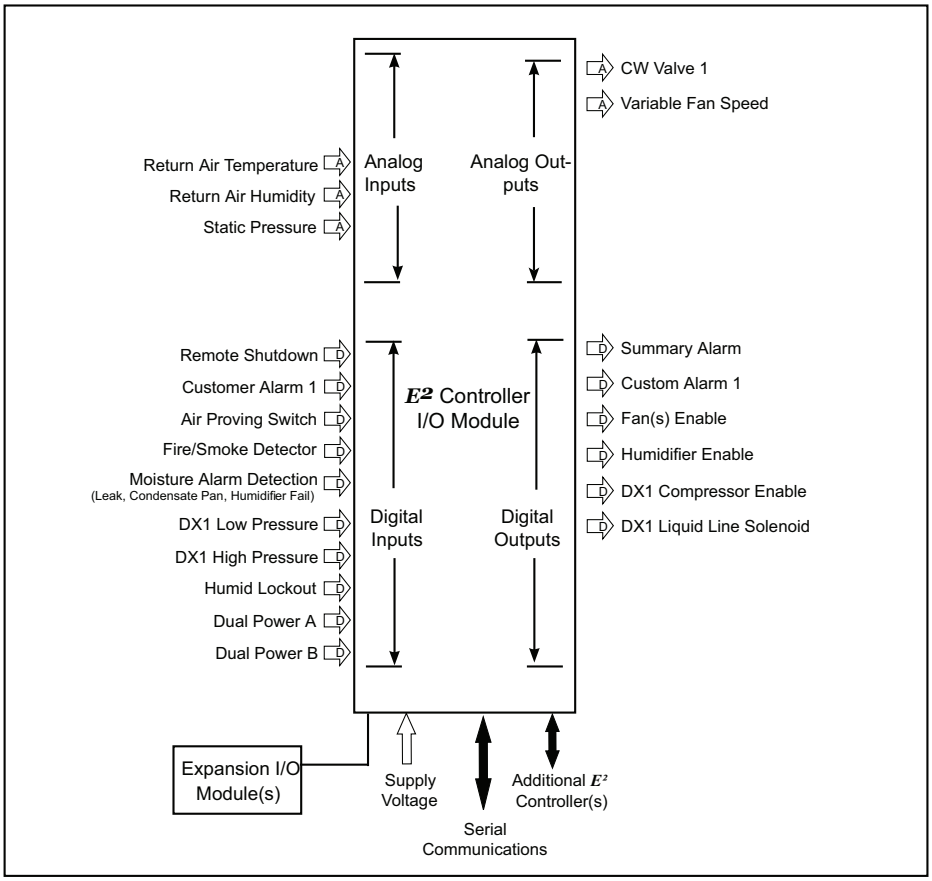
The controller may be factory configured to activate up to three custom alarms. One custom alarm with relay contacts is provided as a standard and up to 2 additional custom alarms may be provided as an option.

Controller Operation

The E² 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 20. Not all the inputs and outputs shown below are utilized, therefore, only the inputs/outputs required for the specific A/C system type and application are enabled.

Figure 20. Control inputs and outputs



The E² controller continually analyzes the demand for cooling against the control set points and determines the appropriate response (control output signals) to operate the A/C system. 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.

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.

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).

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 conditioners 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).

Control Methods

System operation depends on the controllers 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 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 “Setpoint Screens,” p. 34.

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

Temperature Control

When enabled for temperature 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.

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.

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 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.

Airflow/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. The speed settings are adjustable in the Service>Blower>Blower Set Up menu loop (see “Blower Setup,” p. 37).

EC fan speed may be automatically varied along with the CW control valve position based on temperature.

The E² controllers 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:

- Locked rotor
- Loss of a phase
- Low main supply voltage
- Over-heating of electronics
- 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.

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 ("Setpoint Screens," p. 34) with- out regard to the temperature setpoint.

Static Pressure Control (Optional)

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 "Setpoint Screens," p. 34 for instructions on setting static pressure control.

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.*

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.

Dual Power Transfer Monitoring

As an option, two sources of input power may be utilized (see "Firestat," p. 10). 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.

Menu Screens

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 required at this level.

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

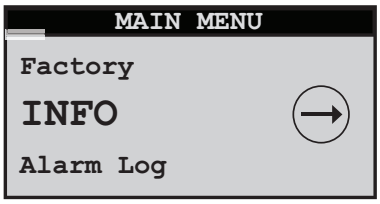
Control - Allows modification of basic control parameters such as set points and clock. Level 1 password is required to enter this menu.

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 required 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 required to enter this menu. Entry to the Factory menu is intended for qualified technicians.

Information Menu Loop

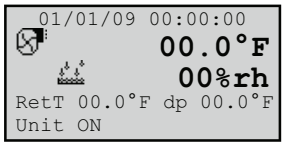
The Info menu screens may be accessed from the Main screen by simply scrolling with the Up and Down arrow keys. The same screens may also be viewed if you enter the Info menu by pressing the **Prg** key, then thekey. The Info menu displays screens that provide current temperature and relative humidity 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:



Operating Conditions

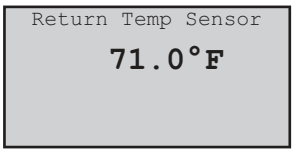
The first Info screen displays the current Date, Time and provides State of Operation icons.

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.



Return Temperature Sensor

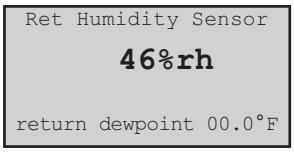
Displays the air temperature as measured by a return temperature/humidity (T/H) sensor inputs. The return T/H sensor is factory mounted inside the cabinet.



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

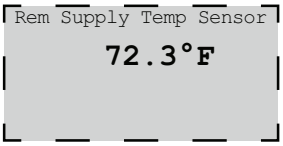
Return Humidity Sensor

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.



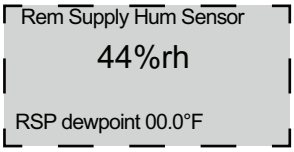
Remote Supply Temperature Sensor

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



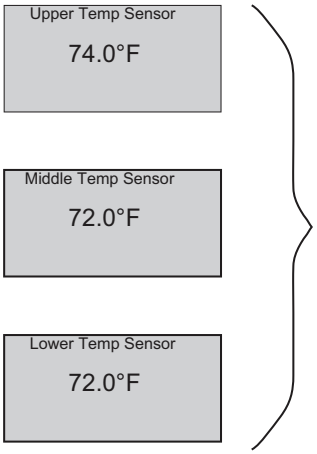
Remote Supply Humidity Sensor

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.



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.

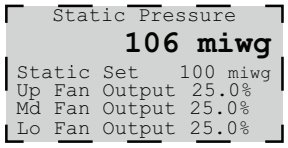


Screen Lock Feature

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.

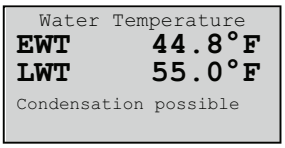
Static Pressure

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.



Water Temperature

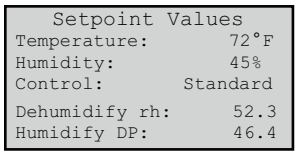
The Water Temperature screen appears only if the controller is configured to monitor optional CW temperature sensors. It displays the temperature of the water entering the coil (EWT) and the temperature of the water leaving the coil (LWT). The controller compares the 2 values and signals a **NO FLOW** 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.



Setpoint Values

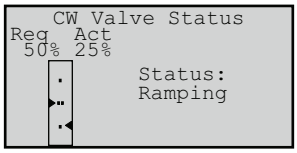
Displays the current operating Temperature and Humidity set points and control method. If configured for Dewpoint control, the controller displays the calculated dewpoint set points for dehumidification and humidification as derived from the operating temperature and humidity set points.

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



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.**

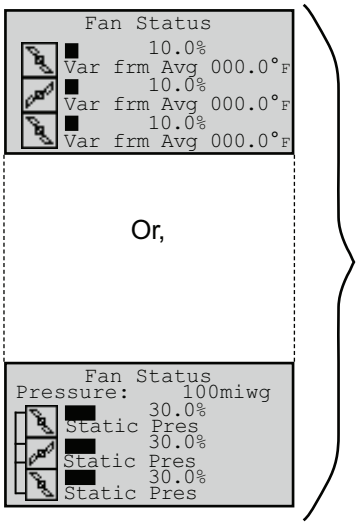


Fan Status

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 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

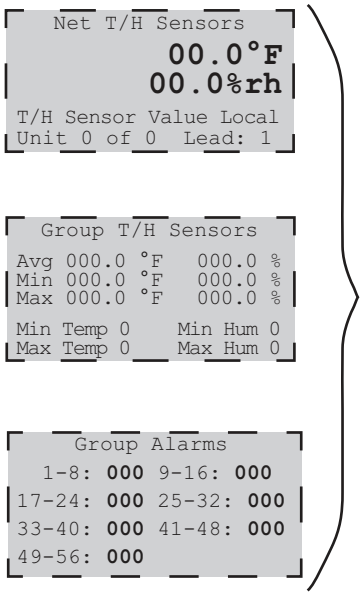
animated icons are linked together indicating the three fans are being controlled to the same fan speed setting.

If the system is configured for static pressure control (see "Static Pressure Control (Optional)," p. 28), 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.



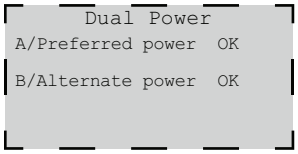
Group Information Menu Screens

The Group Information menu screens only appear if the controller is set up to operate a multiple A/C unit work group. See "Information Menu Group Menu Screens," p. 50 for a more detailed description of these screens.



Dual Power

Dual Power option - If the controller is configured for Dual Power operation ("Dual Power Auto Transfer Switching," p. 10), 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).

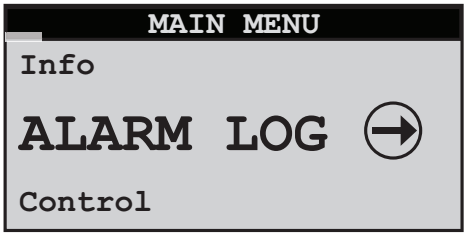


Note: *Display screens shown with a dashed border appear only if the applicable feature is enabled.*

Software Version/Date

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

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.

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 programmed to activate the User Configured alarm relay contacts.

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

Critical Alarms will coincide with automatic shut down of the A/C unit(s) equipment as required 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 Airflow (Air Proving Switch)
- Fire/Smoke Detection
- Off by Internal Alarm (Only for grouped systems)

Alarm Screen Messages

Table 1. Alarm screen messages

Alarm Message	Description of Alarm Condtion
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

Table 1. Alarm screen messages (continued)

Alarm Message	Description of Alarm Condtion
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.

Control Menu Loop

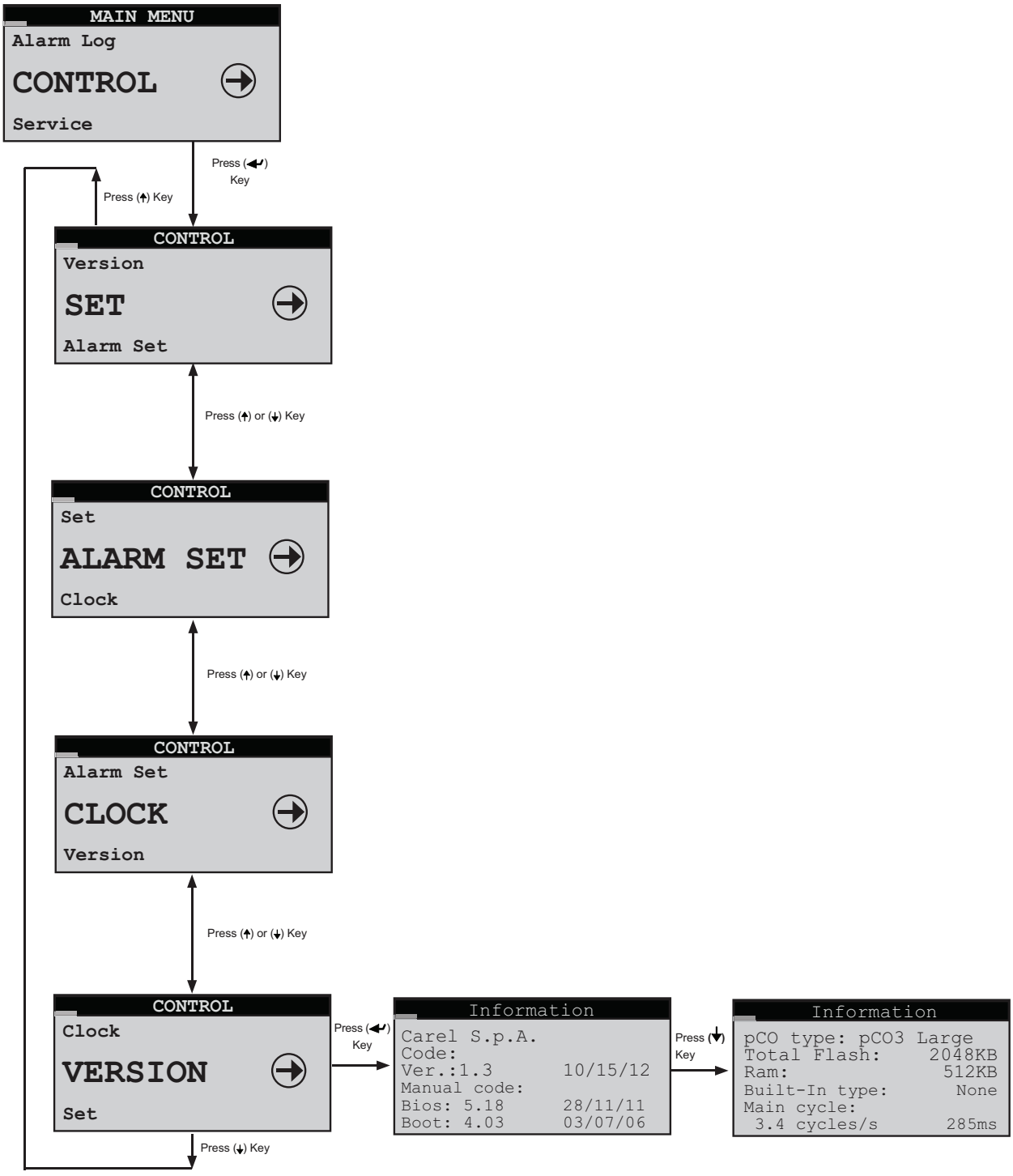
From the Control Menu you may select from 4 screen menus: Set points, Alarm Set points, Clock and Version. The controller may be programmed by the user to require level 1 password authorization to enter this menu loop (see “Password Authorization Levels,” p. 23). Once password access is granted, you 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 “Setpoint Screens,” p. 34.

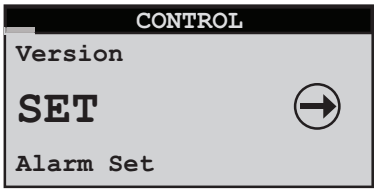
The Alarm Set points (**ALARM SET**) screens allow you to enable and adjust the high and low temperature and humidity alarm set points and offsets and compare them to the control set points and to the system level operating data derived from the Sensor/Transmitter inputs. See “Alarm Setpoint Screens,” p. 34.

From the Clock screens you may view and adjust the current time, date and day. See “Clock Screen,” p. 35.

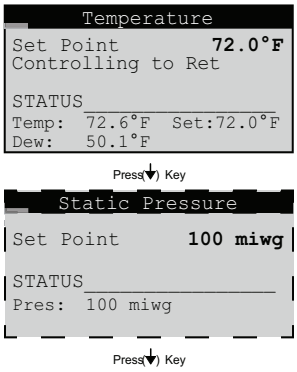
Two Version screens are provided for information only. They show controller hardware and software details that are useful to Trane Product Support if technical assistance is required.



Setpoint Screens



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



The Temperature setpoint screen 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.

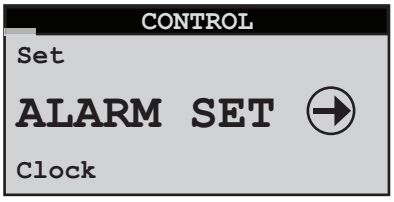
The Static Pressure screen only appears if your unit is configured for static pressure control at the factory. It allows you to adjust the static pressure set point and compare it to the actual static pressure measured.

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 “Airflow/Fan Speed Control,” p. 27) 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.

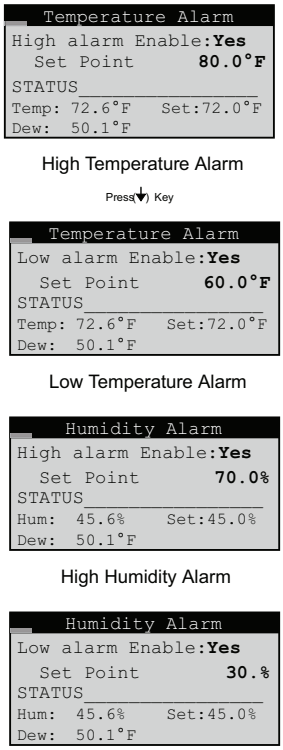
The lower two fields disappear from the Fan Control screen when the system is in the humidification or dehumidification modes. In these modes individual fan speed control ceases and the fan speeds are automatically linked and controlled to the same speed.

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.

Figure 21. Alarm setpoint screens



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

Figure 22. High entering water temperature alarm

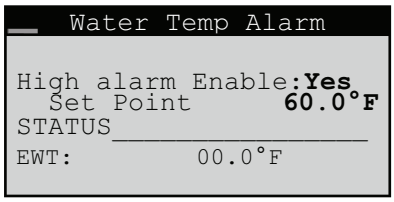
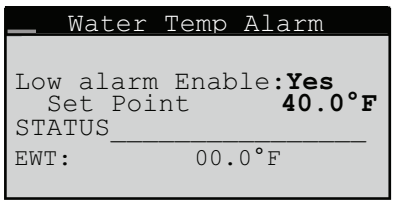
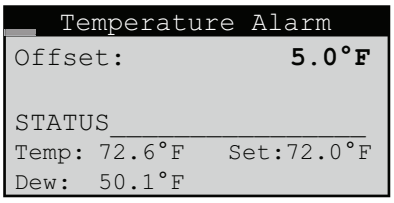


Figure 23. Low entering water temperature alarm



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 its applied to the high alarm setpoint and it is added when its applied to the low alarm setpoint.

EXAMPLE 1: Temperature Alarm Offset



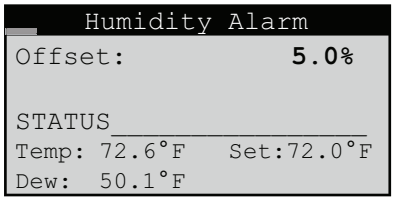
If the offset for the temperature alarm is set at 5.0°F (default), the high temperature alarm will cancel when the actual temperature drops to the High Temperature Alarm setpoint (80.0°F) - the Offset (5.0°F) or, 80.0°F - 5.0°F = 75.0°F

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

EXAMPLE 2: Humidity Alarm Offset

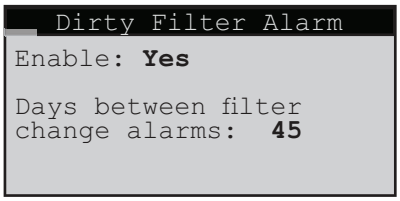
Figure 24. High temperature alarm offset



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%

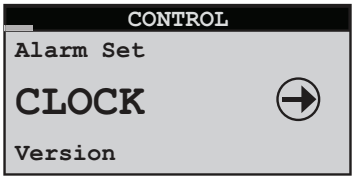
The High Humidity Alarm will cancel at 65%.

Dirty Filter Timer:

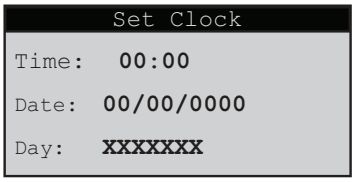


This screen allows you to enable the dirty filter notification timer which provides an alarm indication when its time to clean or change the air filter. The filter change period is adjustable and should be set according to the conditions at the site. Extremely dusty environments may require more frequent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

Clock Screen

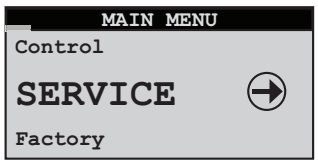


The Clock screens may be accessed from the Control menu. From this screen you may set the time, date and day.



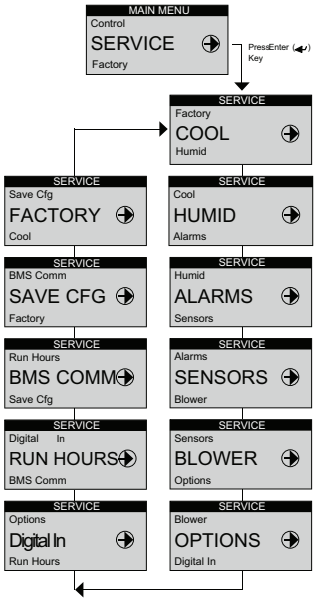
The Set Clock screen allows you to set and/or adjust the current time, date and day.

Service Menu Loop



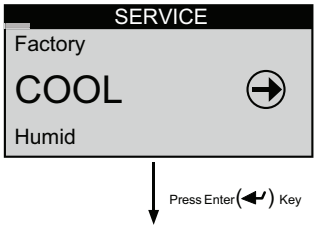
The Service screens allow the user to enter cut-in and cut-out values, calibrate the system control sensor(s), save and restore parameters and view the event log. The Service menu may be entered and programmed by the user via the password menu (requires level 2 password). Once password access is granted,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

Figure 25. Service menu loop selections

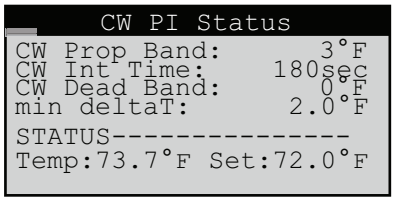


Cool

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



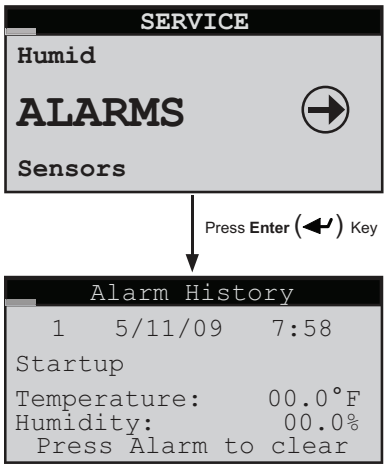
CW Cooling Status:



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.

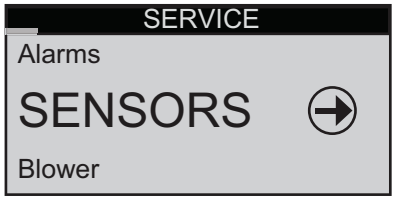
Alarms



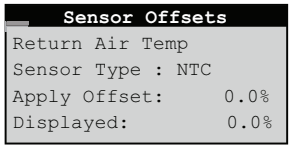
A log of events is stored for view from the Service>Alarms menu. This menu displays the last 50 events sequentially numbered in order of occurrence. The alarm log is cleared by pressing the Alarm key while in this menu.

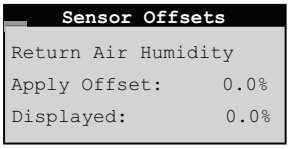
Note: *If the Alarm key is pressed when in any of the Service>Alarms screens, all stored alarm messages will be permanently erased from the controllers memory.*

Sensors

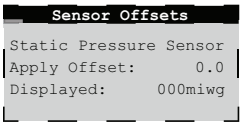


From the Service>Sensors menu you may access multiple display screens to enter offsets for calibrating the units various temperature and humidity sensors.





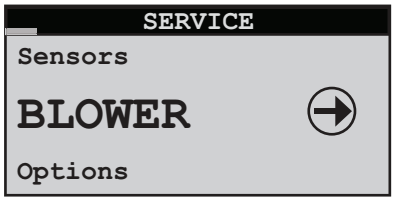
A Static Pressure Offset screen only appears if your unit is configured for static pressure control.



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.

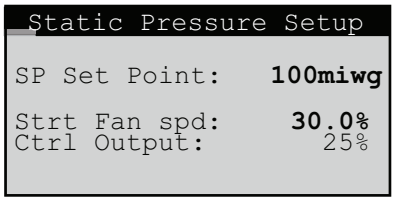
Note: *When calibrating sensors, an offset at one extreme may produce an error at the other extreme. Always verify that any offset is valid over the entire range of the sensor.*

Blower



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

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 "Product Support," p. 64) for the password that allows access to the Factory menu and for guidance on setting the PI control values.

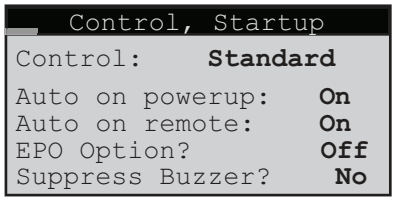
Blower Setup:

If the 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.

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.

Control, Start-up:



The Service>Options>Control, Start-up screen allows you to select the control method.

Standard = Temperature/Humidity Control

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

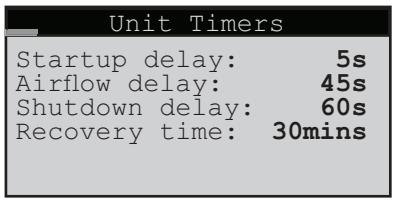
Auto on powerup - If set to **On**, the A/C unit turns on automatically when main power is applied.

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.

Unit Timers:



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

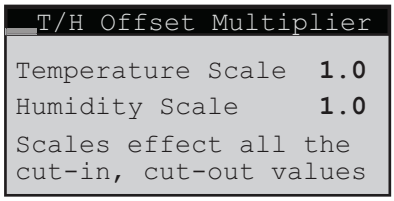
Start-up delay - Time delay before fan(s) begin operating after pushing the Enter key or after turning the unit on with a remote on command.

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 start-up that temperature and humidity alarms are masked from signalling nuisance high or low temperature and humidity alarms.

T/H Offset Scaling:



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 (see "Cool," p. 36).

Default Cut-in/Cut-out Offsets

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

HumidityCut-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

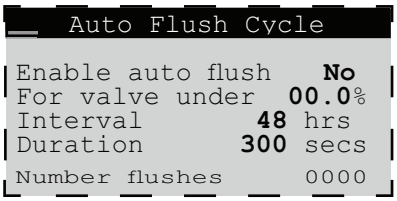
EXAMPLE 2: Temperature Offset Multiplier

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%).

Auto Flush Cycle:

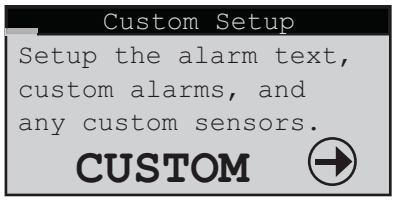


The Service>Options/Flush Cycle screen may be used to enable a periodic flushing of the CW coils with the control valve open at 100%. This is used to remove any sediment that may have collected.

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.

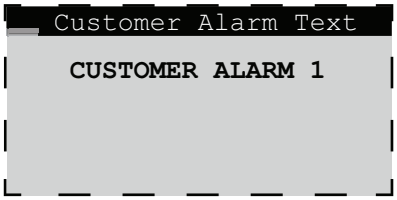
Custom Setup:

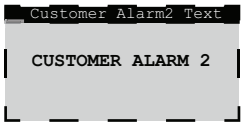
From the Service>Options>Custom Setup screen you may press the Enter key to access a menu loop to set up custom alarm features. Any controller alarm or signal failure will activate the summary alarm output. Upon receiving an alarm indication, the user may press the alarm key and call up alarm screen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

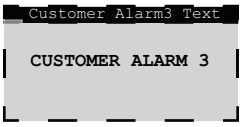


Customer Alarm Input:

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 Enter key and use the Up and Down 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.



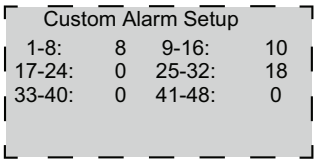


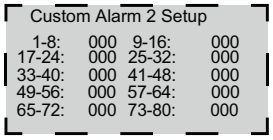


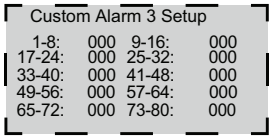
The controller may be equipped with up to 2 additional Customer Alarms as an option.

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 to 8: Moisture alarm (No. 4) = 8

Custom Alarm number 9 to 16: Fire/smoke (No. 10) + Condensate pan (No. 12) = 10 (2+8)

Custom Alarm number 25 to 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:

Table 2. 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**

Table 3. 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.*

Table 4. Alarms 17 to 24

No.	Description	Bit mask	De- fault
17	***Reserved***	***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

Table 5. Alarms 25 to 32 (sensor failure alarms)

No.	Description	Bit mask	Default
25	***Reserved***	***1***	***1***
26	***Reserved***	***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**

Table 6. Alarms 33 to 40 (sensor failure alarms)

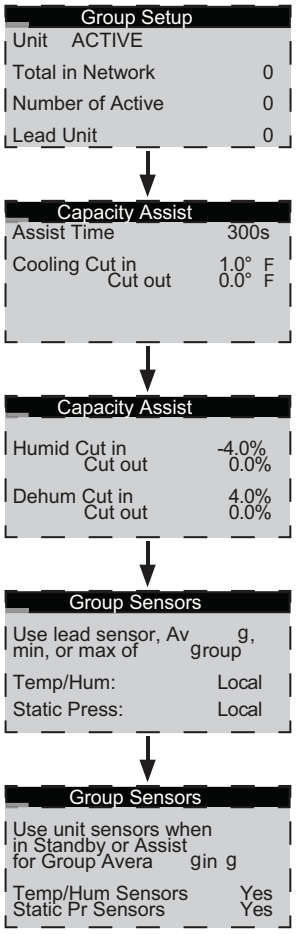
No.	Description	Bit mask	Default
33	***DX1 suction temp sensor fail***	***1***	***1***
34	***Custom sensor 1 fail***	***2***	***2***
35	Reserved	4	0
36	Reserved	8	0
37	Reserved	16	0
38	Reserved	32	0
39	Reserved	64	0
40	Reserved	128	0
	Factory Default Bitmask Total		**3**

Table 7. 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**

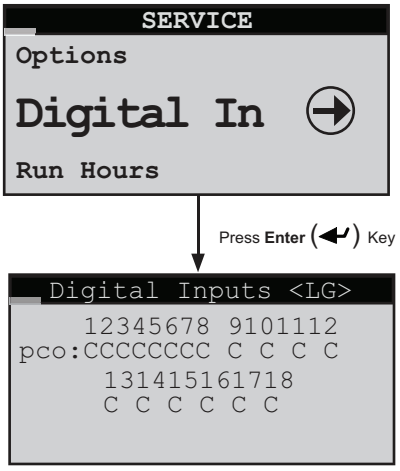
Work Group Screens:

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.



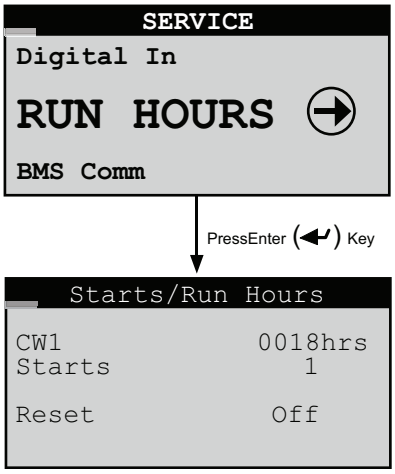
See "Communication with Controller," p. 43 for a detailed description of how work groups are set up and for information on setting the operating parameters available in these screens.

Digital In



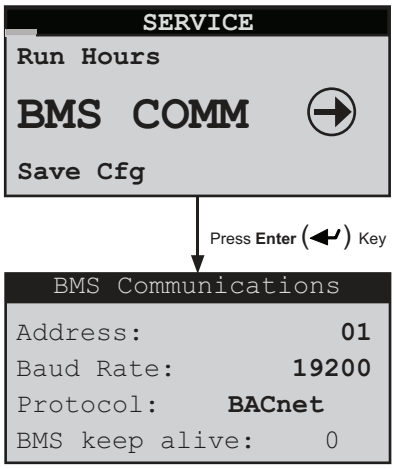
The Service>Digital In screen is provided for information only. It shows the state of each digital input as either Closed (+24 V) or Open (0 Volts).

Run Hours



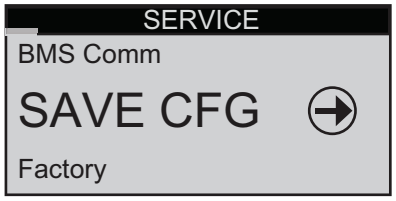
From the Service>Run Hours menu you may access a loop consisting of the component run hours display screens applicable to your unit using the Up and Down arrow keys. Each screen displays the number of run hours and number of starts logged for the component (i.e. CW valve, fans, humidifier, air filter 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.

BMS Communication

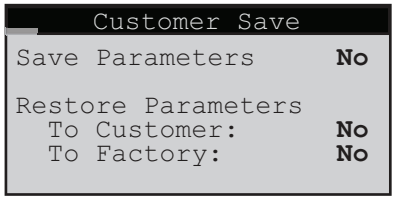


The Service>BMS Comm menu is used to set up parameters to allow a BMS (BAS) to interface with the controller. See "BMS Communication," p. 51 for a description of this screen and instructions for setting up BMS communication.

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 8, p. 42.

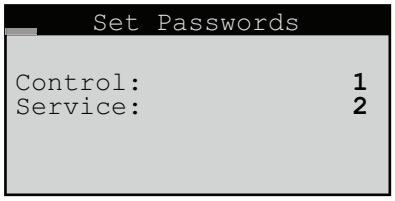
Use the Enter key to move the flashing cursor to the field you wish to confirm and press the Up or Down arrow key. The word **No** will momentarily change to **Yes** indicating the command has been accepted. Then press the Enter key sequentially until the flashing cursor returns to the top left corner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

The Table 8 that follows are the Factory default parameters.

Table 8. 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 controlling CW valve at 72.0°F.
Minimum Fan Speed	25%	Fan motor speed varies between these values when proportionally controlled.
Maximum Fan Speed	100%	
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: *Or as limited by max speed setting in Service>Blower menu. See "Blower," p. 37.*



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

Factory Menu

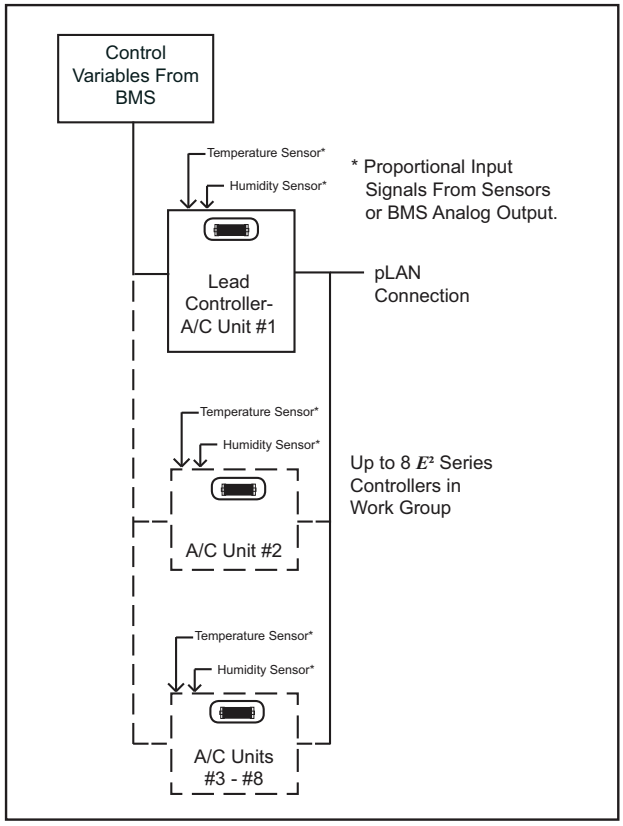
The Factory menu loop may be accessed from the Service>Factory screen. You must enter the factory level password to gain access to the loop.

Communication with Controller

It is possible for the E² controller to communicate in multiple ways. The controller may be set up to utilize a pLAN network to link with additional E² controllers to create a work group consisting of multiple A/C units (see Figure 26, p. 43 and "Work Group Setup," p. 43).

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 "BMS Communication," p. 51).

Figure 26. Configuring multiple A/C units

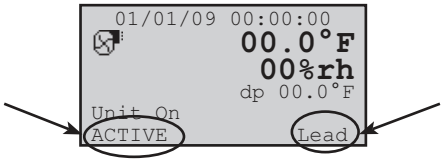


Work Group Setup

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 units duty assignment in the bottom field. If the controller is the group lead, it will be indicated in the bottom field also.

Figure 27. 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.

Standby

If the lead controller in the work group loses a signal acknowledgment 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.

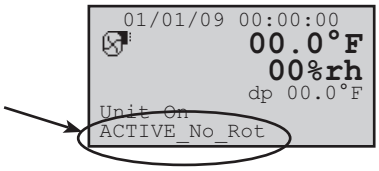
Capacity Assist

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 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 its 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 its cut-out setpoint, while active A/C unit(s) continue to maintain room conditions at the desired level.

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.

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.

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) controllers 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

Assign the terminal and controller I/O board addresses for each controller to be grouped. Review "Configure Terminal Address," p. 44

to "Assign Terminal to the Controller," p. 45 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.**

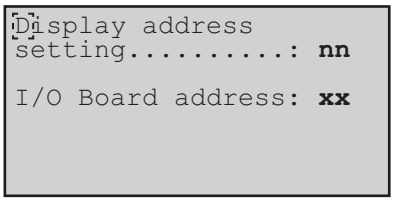
The first step is to change the terminal address of each controller to 0 referring to "Configure Terminal Address," p. 44 below. You must set the terminal address to 0 before you can assign the controller (I/O board) address.

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.*

Configure Terminal Address

The address of the terminal (display) can only be configured if its 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:

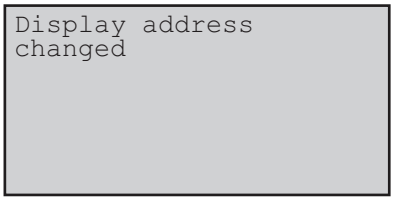
Figure 28. Address configuration



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

   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.

Figure 29. Display address changed



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.*

Configure 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. **Do not press the Enter key, the cursor is already in the modifiable field.**

Figure 30. Controller address configuration

```
PLAN ADDRESS: 1
UP:    INCREASE
DOWN:  DECREASE
ENTER: SAVE & EXIT
```

Press the Up arrow 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 Enter 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 "Configuring a Work Group," p. 44 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 Enter 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.

Assign Terminal to the Controller

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

Figure 31. Terminal configuration

```
P:02 Adr  Priv/Shared
Trm1 31       Pr
Trm2 None     --
Trm3 None     -- Ok?No
```

5. Here too, the Enter key moves the cursor from one field to the next, and the Up, Down arrow 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 Enter key to move to the field **Trm1 xx**. The field represents the address of the terminal associated with the controller. Using the Up, Down arrow keys enter the address (25 - 32) of the terminal Terminal Configuration 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 Enter key to move to the last field.
8. Enter the field **Ok?No**, choose **Yes** using the Up, Down arrow keys and confirm by pressing Enter 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.

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 LEDs on the control I/O module (Figure 15, p. 21) for an error signal. See "Troubleshooting the Control I/O Module Signal LEDs," p. 52 for guidelines on analyzing the signal LEDs.

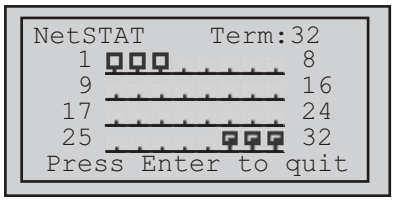
On the other hand, if the terminal receives no signal from the network, the display shows the following message: **NO LINK**. If this appears, check the pLAN cables and ensure they are connected properly.

Displaying 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 Up, Down and Enter 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.

Figure 32. Network status



Key	Description
	Controllers (I/O Boards) active in network
	Terminals active in network
	No device connected

The example shown represents:

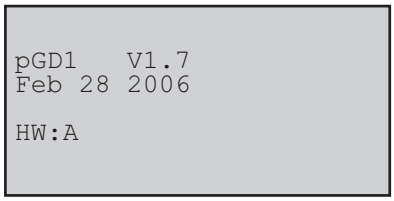
Controllers active in network, addresses: 1, 2, 3

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 Up or Down arrow key to display the next screen showing the version of the firmware residing in the terminal.

Figure 33. Firmware version



To exit the Network Status loop, press Enter key.

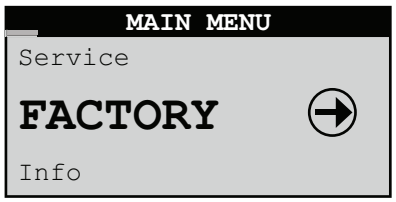
The next step is to access the Factory>Group screens used to configure the work group parameters ("Configure Work Groups," p. 46).

Configure Work Groups

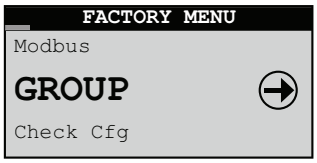
The Factory>Group menu screens allow you to define grouping parameters (duty, rotation, offsets, etc) for the A/C units in the work group. These screens should be accessed after setting up the work groups (see "Configuring a Work Group," p. 44). The Factory>Group menu screens may be accessed from the main screen by pressing the **Prg** key and scrolling through the menu selections until the word Factory appears in the center of the screen.

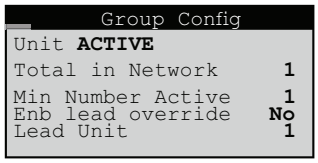
Press the Enter key twice and you will be prompted to enter the password for the Factory level (contact Trane Product Support for the password).

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



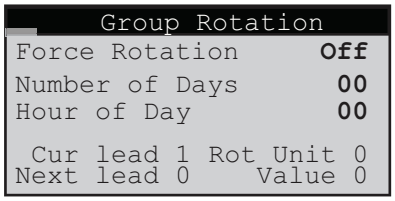
When the word GROUP appears in the center of the screen, press the Enter key to access the Factory>Group menu screens. From here you may use the Up or Down arrow keys to scroll through the Factory>Group menu selections.





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

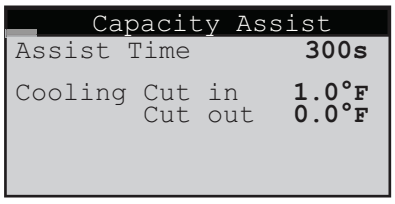
Display	Description	Variables	Default
Unit	Assign the duty of the A/C unit within the group. The duty must be assigned for each A/C unit at its local display terminal.	0= Out of Service 1= Active 2= Standby 3= Assist 4= Active_No_Rot 5= Standby_No_Rot 6= Assist_No_Rot	1
Total in Network	Enter the total 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 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, set the schedule to rotate operation of the A/C units to promote equal run times.

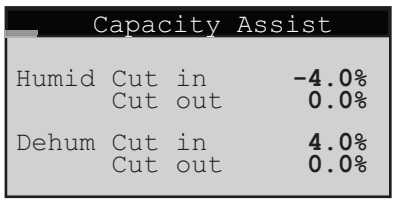
Display	Description	Variables	Default
Force Rotation	This field only appears on the Lead controller. If you select **On** and press Enter key it initiates a manual rotation cycle to rotate duty between active and standby units. It also rotates the role of Lead controller. The field will disappear after the role of Lead is rotated to the next A/C unit.	Off 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	Identifi es 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 its 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 “Capacity Assist,” p. 49)

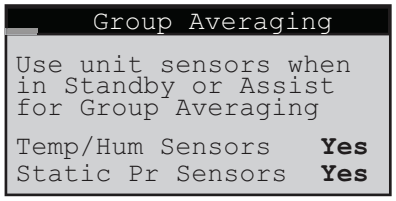
Display	Description	Variables	Default
Assist Time	Enter the delay period for capacity assist unit(s) to begin operating.	0 to 999	300
Cooling Cut in	Enter a temperature setpoint offset for cooling capacity assist operation to begin.	-99.9 to 99.9	300
Cut out	Enter a temperature setpoint offset for cooling 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 “Group Sensors,” p. 50).

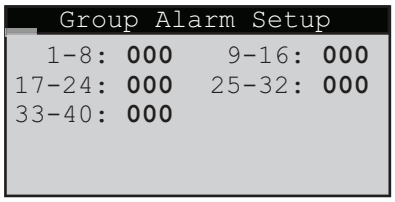
Display	Description	Variables	Default
Humid Cut in	Enter relative humidity setpoint offset for humidifying capacity assist operation to begin	-99.9 to 99.9	-4.0
Cut out	Enter relative humidity setpoint offset for humidifying capacity assist operation to stop	-99.9 to 99.9	0.0
Dehum Cut in	Enter relative 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 “Group Averaging,” p. 50).

Display	Description	Variables	Default
Temp/Hum Sensors	Enter Yes for the unit to respond to its local sensors for Standby or Capacity Assist operation. Enter No for unit to respond to the Group sensors. (See “Capacity Assist,” p. 49)	No Yes	Yes
Static Pr Sensors		No 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 "Custom Alarm Setup," p. 39 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 units display terminal or via the BMS for the unit to return to Active and resume operation.

Table 9. Group alarms 1 to 8

No.	Description	Bit mask	Default
1	Reserved	1	0
2	Pump	2	0
3	Customer alarm 1	4	0
4	Reserved	8	0
5	Reserved	16	0
6	Reserved	32	0
7	Reserved	64	0
8	Reserved	128	0

Table 10. Group alarms 9 to 16

No.	Description	Bit mask	Default
9	Reserved	1	0
10	Reserved	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

Table 11. 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

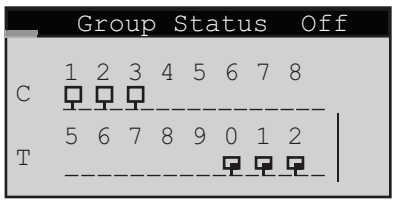
Table 12. Group alarms 25 to 32

No.	Description	Bit mask	Default
25	Reserved	1	0
26	Reserved	2	0
27	Reserved	4	0
28	Return humidity sensor	8	0
29	Optional temperature sensor	16	0
30	Reserved	32	0
31	Reserved	64	0
32	Reserved	128	0

Table 13. 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

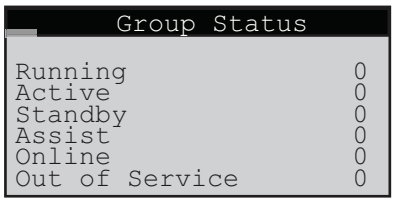
There are several automatic crossover signals that will cause a switch over from Unit Active to Unit Off. They are the occurrence of a remote shutdown command, unit shutdown from a group alarm or BMS command, fire/smoke detection, loss of all cooling (all compressors or all CW valves) or loss of airflow.



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 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

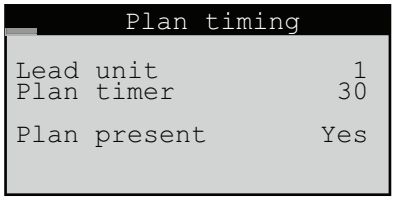


Factory>Group>Group Status (Screen 8)

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 Display indicates how many units in the group are currently available to operate.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 “Service>Options>Group Menu Screens,” p. 49).



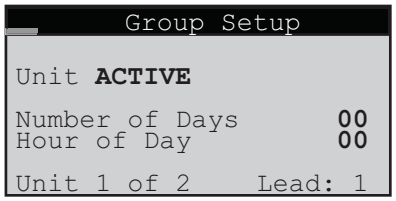
Factory>Group>Plan timing (Screen 9)

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 1= Yes	No

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.

Group Setup:

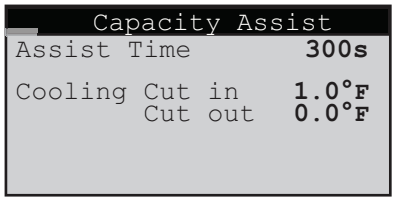


The Service>Options>Group Setup screen allows you to select the work group duty assignment for the A/C unit. The duty must be assigned for each grouped A/C unit at its local display terminal.

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.

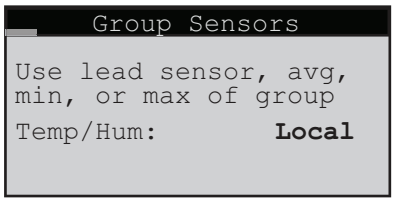
Capacity Assist:



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 its 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 so they will turn on one at a time only if the unit(s) currently operating are unable to satisfy the demand.

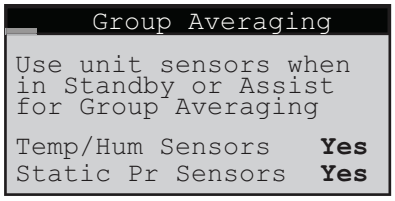
Group Sensors:



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.

Group Averaging:

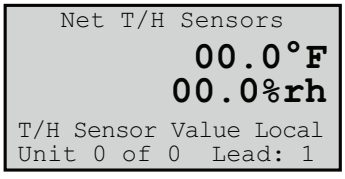


Enter Yes for the unit to respond to its local sensors for Standby or Capacity Assist operation. Enter No for unit to respond to the Group sensors.

Information Menu Group Menu Screens

The following display screens appear in the Information menu loop ("Water Temperature," p. 30) if two or more units are wired together as a group. They display key operating parameters for grouped A/C units.

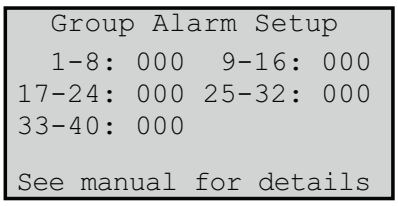
Group Sensor Values:



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, "Service>Options>Group Menu Screens," p. 49.

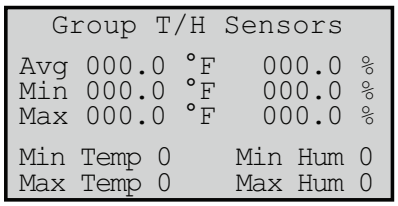
The last field shows the unit group address assigned to the controller within the group and the address of the current lead controller.

Group Alarms:



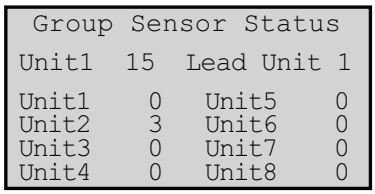
This screen only appears when the controller is wired with additional A/C unit controllers. It displays bitmask values indicating the alarm conditions that will initiate a group internal alarm causing the unit to switch over from Active to Unit Off. See Factory>Group (Group Alarm Setup screen 6) in "Configure Work Groups," p. 46.

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.

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.

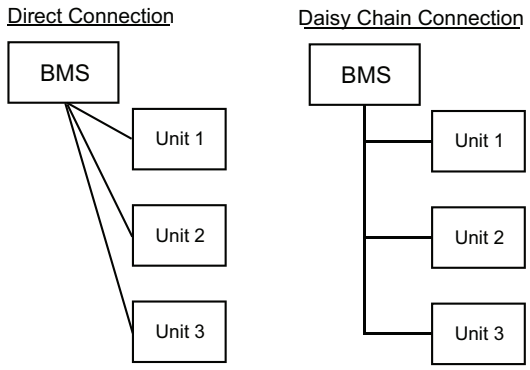
The number shown for unit 2 is three, the result of adding 1 + 2. This confirms unit number 2s Supply Temperature and Return Humidity sensors are detected by the Lead controller. If a one appeared instead for unit number 2, it would indicate the signal for the Return Humidity sensor is not present. That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

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 "BMS Interface," p. 21). 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



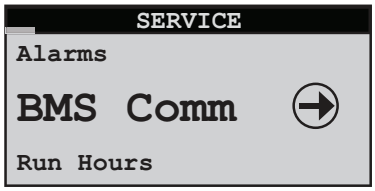
If multiple A/C units are grouped together, each controller added to the group must be configured with a CPU address for BMS communication.

Direct BMS Control

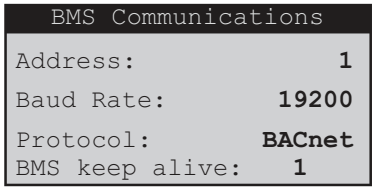
The controller may be configured to accept proportional analog signals that mimics a sensor. The controller will act on that signal whether it comes from a real sensor or a BMS analog output.

Refer to "BMS Parameters, Version 1.3," p. 52 for the E² controllers BMS parameters.

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 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.

Troubleshooting the Control I/O Module Signal LEDs

The E² control I/O module includes 3 signal LEDs (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 LEDs are positioned adjacent to the yellow, Power On LED (see Figure 15, p. 21). The signal LEDs may be used for diagnostic purposes if a problem arises with the control I/O module.

Figure 34. Controller manual I/O modular signal LEDs

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 (subordinate) active on serial 0.

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

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
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

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
26	157	1027	Cooling analog output	0	R
27	158	1028	Fan link control (0 to 4) See “Variable/Value Descriptions,” p. 55	0	R/W
28	159	1028	Lower fan speed control (0 to 2) See “Variable/Value Descriptions,” p. 55	2	R/W
29	160	1029	Middle fan speed control (0 to 2) See “Variable/Value Descriptions,” p. 55	2	R/W
30	161	1030	Upper fan speed control (0 to 2) See “Variable/Value Descriptions,” p. 55	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

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 and Middle	Upper and Lower	Middle and Lower	All	X	X
[X] fan speed control	Manual	Temperature Proportionate	Variance from Average	X	X	X	X

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
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

BMS Address	Modbus Address	BACnet Address	Description	Default	Direction
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
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

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

Sensor Failure Packed Bit Variables

Bit	Sensor Failures 1	Sensor Failures 2
0	Middle temperature	Reserved
1	Upper temperature	Reserved
2	Lower temperature	Reserved
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

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

Digital Output Packed Bit Variables

Bit	Digital Outputs 1	Digital Outputs 2
0	Global alarm	Reserved
1	Custom alarm 1	Reserved
2	Manager 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
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 controllers 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.

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

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

Maintenance

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 Check- list in this manual (see “Appendix A CRS-090-C Preventive Maintenance Inspection Checklist,” p. 65) to record periodic general maintenance inspections. For assistance, contact Trane Product Support. Ensure your adherence to all safety statements while performing any type of maintenance.

⚠WARNING

Hazardous Service Procedures!

Failure to follow all precautions in this manual and on the tags, stickers, and labels could result in death or serious injury.
Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the following instructions: Unless specified otherwise, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/ tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks.

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

Rotating Components!

Failure to disconnect power before servicing could result in rotating components cutting and slashing technician which could result in death or serious injury. During installation, testing, servicing and troubleshooting of this product it may be necessary to work with live and exposed rotating components. Have a qualified or licensed service individual who has been properly trained in handling exposed rotating components, perform these tasks.

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.

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 35).

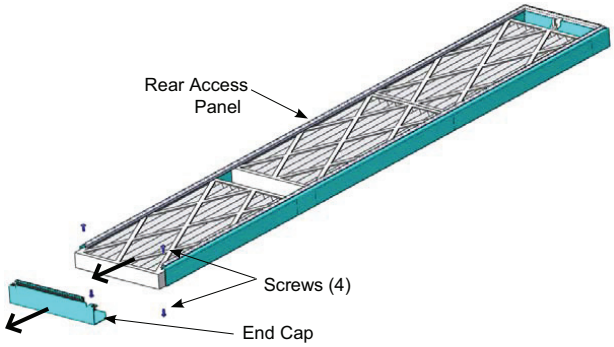
Figure 35. Cleanable filters

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 or when they become too flimsy.

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 36, p. 60. Slide the new filters into the tray and replace the end cap. Ensure the four screws are fully tightened.

Figure 36. Cartridge filters



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.

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.

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.

NOTICE

Coil Fin Damage!

Failure to follow instruction below could cause corrosion on the coil fins and cause coil fin damage. Do not use chloride based water conditioning additives in condensate drain pans.

Condensate Pump

The condensate pump should be inspected semi-annually and cleaned. It will be necessary to remove the pump as described in “Condensate Pump Replacement,” p. 62.

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.

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
Airflow Too Low	Dirty air filters. (Reduced airflow)	Clean/replace filters.
CW Valve Fails to Open or Close	Temperature setpoint too high.	Adjust to correct temperature setting.
	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.
	Actuator failed.	Replace actuator.
System Short of Capacity	Low airflow.	1. Check filters. Replace as needed. 2. Check for and clear any obstructions across or in the (supply) discharge air stream. Clear coil fins of debris.
	Low chilled water flow.	1. Check for leaks. Repair and refill the CW system. 2. Check for obstructions in supply/return CW lines. 3. Check for clogged strainer (if applicable).
	Supply water temperature too high.	Check chilled water supply.
	Temperature setting too high.	Decrease temperature setpoint.
	Discharge air short cycling back to return.	Place air barrier between hot/cold aisles.
EC Fan(s) Fail to Start	Power failure.	Check main voltage power source input cable.
	Motor starter protector tripped	Reset motor starter protector and check amperage of motor against nameplate.
	Control transformer circuit breaker tripped.	Check for short circuit or ground fault; if none, reset circuit breaker.
	Condensate overflow switch.	1. Ensure unit is level. 2. Check that condensate pan is draining.
	Defective contactor.	Repair or replace.
	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.
	EC fans internal overheat protection interrupted fan motor operation.	Determine the cause of the interruption and correct. Possible causes are: 1. Blocked rotor. 2. Low supply voltage > 5 seconds.
	Loss of phase > 5 seconds.	After causes 1, 2, and 3 are corrected, the motor will automatically reset. After the causes below are corrected, the fan(s) must be manually reset by turning off power for 20 seconds: 1. Over temperature of electronics. 2. Over temperature of motor
Control is Erratic	Wiring improperly connected or broken.	Check wiring against electrical drawing.
System Fails to Start	Critical alarm condition not cleared.	Press Alarm key to reset alarm (See “Alarm Log,” p. 31).

Field Service

Notes:

- Do not attempt to make repairs without the proper tools.
- Repairs to refrigeration systems must be performed by a journeyman refrigeration mechanic or air conditioning technician.

CW System

If the Chilled Water system is not 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.

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.

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.

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.

Figure 37. 12-inch cabinet

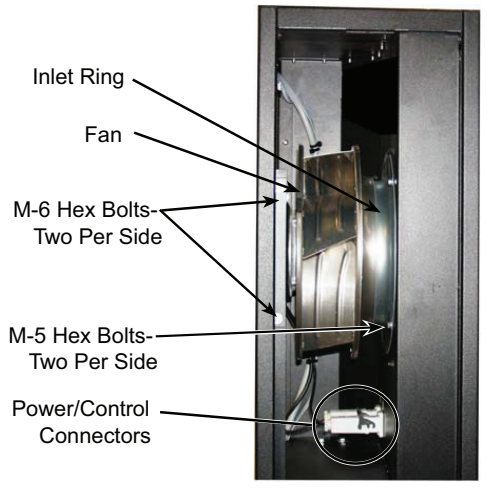
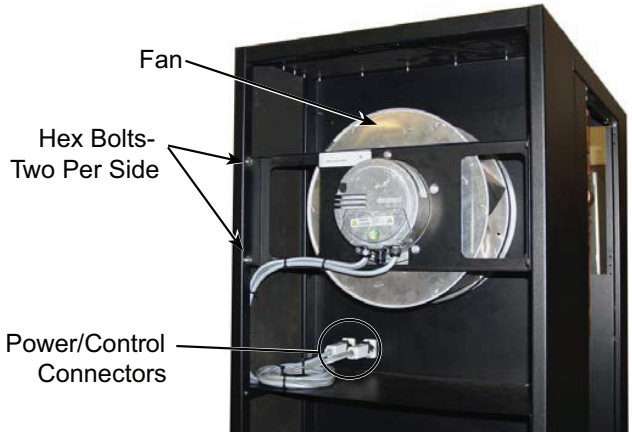


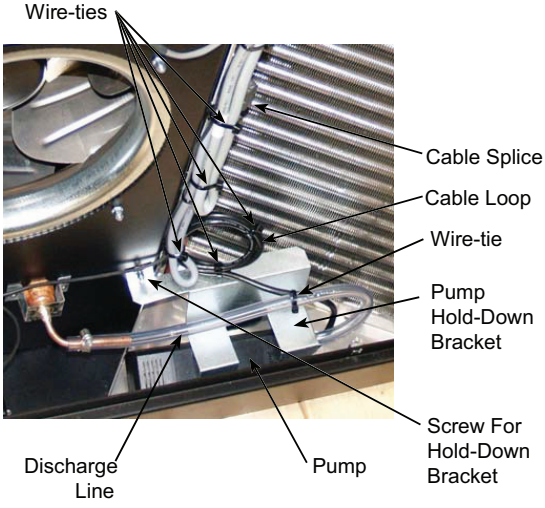
Figure 38. 24-inch cabinet



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.

Condensate Pump Replacement

The condensate pump is located behind the lower cabinet fan assembly (see the figures in Figure 10, p. 15 and Figure 11, p. 16). To access the pump, the lower fan must be removed as described in "Fan Replacement," p. 62.



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.

Product Support

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

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

Factory Authorized Start-up/Warranty Inspection

Factory Authorized Start-up/Warranty Inspection ensures that your equipment is installed and operating per recommended guidelines. This essential service guarantees that equipment has the best warranty coverage available.

precision cooling equipment is covered by an industry leading 24-Month Upgraded Parts Warranty and 90 Day Labor Warranty once Factory Authorized Warranty Inspection/Start-up is performed and start-up checklists are returned and validated by product support.

A Limited 12-Month Parts Only Warranty applies if Factory Authorized Start-up/Warranty is not purchased and start-up checklists are received from an unauthorized party and validated by product support.

Technical Support

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

- Unit Model Number
- Sales Order Number
- Item Number
- Unit Serial Number
- Description of Problem

Obtaining Warranty Parts

A support technician will provide troubleshooting assistance over the telephone.

If it can be determined that a part may be defective, a warranty authorization for a replacement part will be processed by Technical Support. The replacement part will then be shipped via UPS ground. If the customer requests that warranty part(s) be sent by any other method than UPS ground, the customer is responsible for the shipping charges.

The purchase order must contain the following items:

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

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

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

Obtaining Spare/Replacement Parts

Maintaining a recommended spare parts inventory is an industry best practice for critical facilities. Onsite spare kits reduce downtime and can eliminate the cost of expedited freight charges.

Appendix A CRS-090-C Preventive Maintenance Inspection Checklist

Complete a copy of this document for each CRS-090-C unit.

Site Name		**Site Contact**	
Site Address		**Site Phone**	
City, State		**Service Date**	
Zip		**Technical Name**	
Unit Model		**Unit Serial**	

Table 14. Current room conditions

Room Temperature:		Room Humidity:	

Table 15. Unit setpoints

Return Temperature:		Return Humidity:	
Remote/Supply Temperature:		Remote/Supply Humidity:	

Table 16. Electrical panel

Inspect unit disconnect for proper operation:	☐ Pass	☐ Fail	☐ N/A
Inspect internal wire for discoloration:	☐ Pass	☐ Fail	☐ N/A
Inspect fuses:	☐ Pass	☐ Fail	☐ N/A
Inspect for secure electrical connections:	☐ Pass	☐ Fail	☐ N/A
Inspect low voltage connections:	☐ Pass	☐ Fail	☐ N/A
Inspect relays and contactors for serviceability, i.e. pitted contacts, weak coils:	☐ Pass	☐ Fail	☐ N/A

Note: *The following should be performed by Trained Service Personnel only.*

Table 17. Record supply voltage

L1-GND:		L2-GND:		L3-GND:	
L1-L2:		L2-L3:		L1-L3:	

Table 18. Unit operation

Verify Control Device Operation:	☐ Pass	☐ Fail	☐ N/A
Verify Customer Setpoints:	☐ Pass	☐ Fail	☐ N/A
Inspect Filter Clog/Air Safety Switches and Tubing:	☐ Pass	☐ Fail	☐ N/A
Chilled Water Valve Operation:	☐ Pass	☐ Fail	☐ N/A
Condensate pump operation:	☐ Pass	☐ Fail	☐ N/A

Table 19. Blow section

Inspect motor pulleys and sheaves for excessive grooves:	☐ Pass	☐ Fail	☐ N/A
Inspect bearings for excessive wear:	☐ Pass	☐ Fail	☐ N/A
Inspect Blower Section for any loose parts or debris:	☐ Pass	☐ Fail	☐ N/A
Filter condition:	☐ Replace	☐ Good	☐ N/A
Belt condition:	☐ Replace	☐ Good	☐ N/A

Appendix A CRS-090-C Preventive Maintenance Inspection Checklist

Table 20. Record fan motor amp draw

(Fan 1)L1:		L2:		L3:	
(Fan 2)L1:		L2:		L3:	
(Fan 3)L1:		L2:		L3:	

Table 21. Check compressor operation

Check electrical connections:	☐ Yes	☐ No	☐ N/A
Visual inspect for oil leaks:	☐ Yes	☐ No	☐ N/A
Check for excessive vibration:	☐ Yes	☐ No	☐ N/A
Check crankcase heater operation:	☐ Yes	☐ No	☐ N/A
Oil level during operation	Compressor 1:	☐ Empty ☐ ¼ ☐ ½ ☐ ¾ ☐ Full ☐ N/A	
	Compressor 2:	☐ Empty ☐ ¼ ☐ ½ ☐ ¾ ☐ Full ☐ N/A	
Sight glass	Circuit 1:	☐ Green ☐ Yellow ☐ N/A	
	Circuit2:	☐ Green ☐ Yellow ☐ N/A	

Table 22. Record compressor amp draw

(Compressor 1) L1:		L2:		L3:	
(Compressor 2) L1:		L2:		L3:	

Table 23. Record compressor amp draw

Circuit 1	Discharge Pressure:		Suction Pressure:	
	Discharge Line Temp:		Suction Line Temp:	
	Liquid Line Temp:			
	Subcooling:		Superheat:	
	EW		LWT:	
Circuit 1	Discharge Pressure:		Suction Pressure:	
	Discharge Line Temp:		Suction Line Temp:	
	Liquid Line Temp:			
	Subcooling:		Superheat:	
	EW		LWT:	

Table 24. Record humifier amp draw

L1:		L2:		L3:	

Table 25. Check heater operation

Check electrical connections:	☐ Yes	☐ No	☐ N/A
Check heater elements for any damage:	☐ Yes	☐ No	☐ N/A
Inspect heater overloads for damage:	☐ Yes	☐ No	☐ N/A

Table 26. Record heater(s) amp draw

(Heater 1)L1:		L2:		L3:	
(Heater 2)L1:		L2:		L3:	
(Heater 3)L1:		L2:		L3:	
(Heater 4)L1:		L2:		L3:	

Table 27. Site recommendations

1.
2.
3.
4.
5.

Table 28. Final verification

Technician Signature:		Date:
QA Verification:		Date:

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