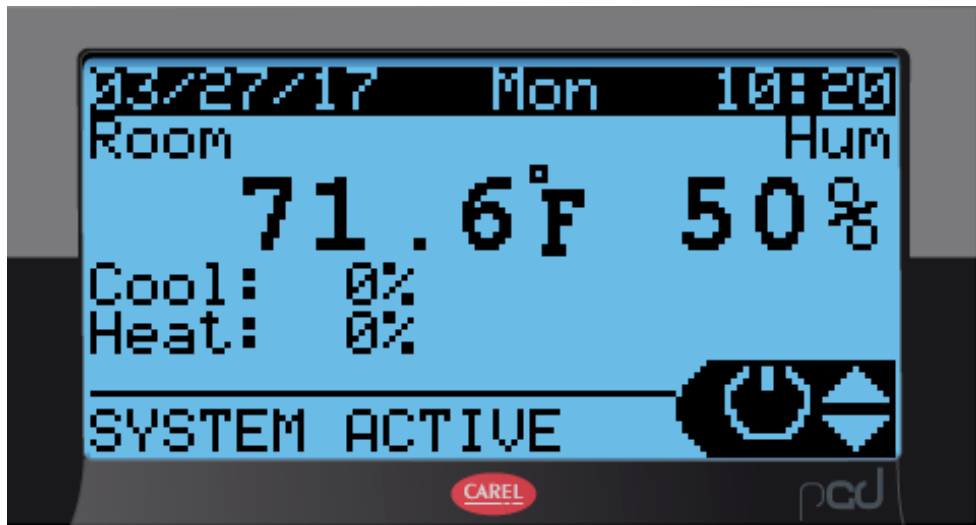




**SYSTEM 2500 S
PROGRAMMABLE CONTROLLER
-USER MANUAL-**



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1.0 INTRODUCTION

The System 2500S is a programmable controller based on a double microprocessor, designed for precise "Smart" control of an air conditioning system. The System 2500S is made up of a microprocessor based MAIN BOARD equipped with a set of terminals used to interface the microcontroller board to the controlled devices; such compressors, fans, heaters, humidifiers, and valves. The program is retained in a flash based memory and configuration parameters are permanently stored (even in the case of a power failure) in a non-volatile memory.

The System 2500S also includes a microprocessor based TERMINAL unit complete with graphical touch screen display with built in navigation keypad and led indicators allowing the users to easily set the controlled parameters for set points, dead bands, alarm thresholds, and carry out the main working operations (on/off, displaying controlled variables, printouts). The controller and graphical display terminal are powered by 24VAC power supply using low voltage control transformers from the unit. Connection between the terminal unit and main board is necessary only when programming the System 2500S basic parameters. The controller is linked to a graphic display terminal via standard three wire cable.

The System 2500S represents the evolution of the microcontroller towards the unrepresented networking capabilities with integrated Ethernet interfaces offer a wide range of open stand protocols for local connectives. The new operating system is optimized to ensure optimal system resource usage and increase speed and reliability.

2.0 QUICK REFERENCE GUIDE

The controller is fully programmed and pre-configured per system configuration. Further tweaking may be required to better fit the application.

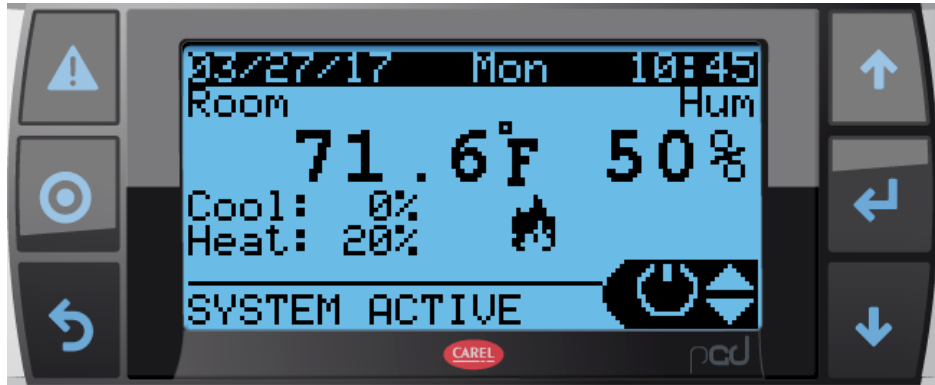


Figure 1 User Interface







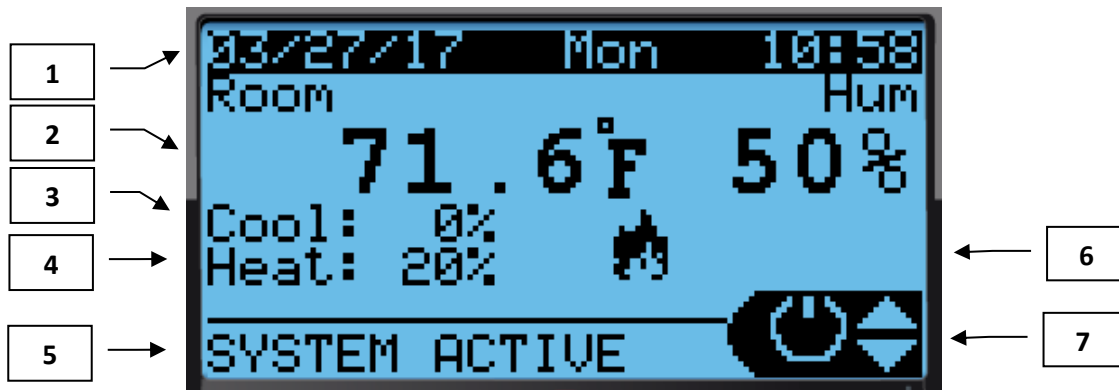
	Active alarm / Reset alarm		Increment/Toggle variables/Up button
	Main menu		Enter selection / Move cursor to next
	Previous screen/menu		Decrease/Toggle variables/Down button

Table 1 Button layout










	Fan active		Humidifier active
	Cooling active		Dehumidification
	Heating active		Air econ active
	Heat-pump active		

Table 2 Mode of operation icons

- 1 Shows current time and date. Time is showed in military format.
- 2 Shows current room temperature and relative humidity
- 3 Shows current cooling demand
- 4 Shows current heating demand
- 5 System status
- 6 Mode of operation. See Table 2.
- 7 Quick Menu: Use Up/Down buttons to toggle option




	On/Off menu
	Setpoint menu
	System status

Table 3 Blink Menu Options

3.0 SEQUENCE OF OPERATIONS

3.1 Standard Units in General

In general, the controller is operated as follows. Note that the followings are applicable while the controller is in active mode and only apply to DX and Chilled Water units.

- Fan starts up on demand for cooling, heating, humidifying or dehumidifying, or operates continuously
- Sequences the compressors on in stages with adjustable delays to meet demand for specified temperature and humidity setpoints.
- Sequences the heaters on in stages with programmable delays to meet demand for heating or reheat during dehumidification mode
- Activates the humidifier as needed to meet the humidity demand
- Dehumidification is achieved by means of cooling to reduce the humidity level. During the dehumidification process, if the temperature falls below the room set point, heating is brought on to reheat the air and maintain room temperature.
- The controller monitors the complete system for any sensors, fans, compressors, heaters and humidifier failure. Upon critical failures, the complete system will shut down with alarm. For certain component failures, the applicable feature is disabled to insure safe operation. For example, when compressor failure occurs, the failed compressor shall be locked out but the system shall provide cooling by other compressor if available. On a heater failure, the heaters are locked out. The system will not use that function until manually reset on the display. The controller also keeps the history of last 100 alarms after you reset them.

3.2 How to Turn the Unit ON

- From the status screen, navigate to the On/Off menu and press enter. Use the Up/Down arrow buttons to toggle the On/Off operation.
- The System Status screen should indicate the current system operating mode
- Default time delay for evaporator fan is 30 seconds to avoid short cycling
- Unit will automatically control the necessary mode of operation to maintain room setpoints

3.3 Lead/Lag Redundancy – cLAN Network

System 2500+ series controllers can be set for n+1 redundancy setup. A maximum of 32 units can be linked together on the cLAN network. The cLAN networked systems are identified with IP address numbers. Any system within the network can be configured as master unit. This alleviates the need to cumbersome wiring with the use of stand card Ethernet cables. In case of master unit is out of service, any of the slave unit can be set as a new master from a few its own interface. No wiring changes are needed. Each controller is self-dependent with necessary sensors and it can be used as a stand-alone unit. When used on the cLAN Network, each unit are not required to have to have the same software revision and date.

When the Master goes offline, all standby systems become active to as standalone mode. This reduces the chance of the controlled space temperature and humidity trails off setpoints. When an active master or slave units goes into alarm, next standby system or all standby systems should become active while the system in alarm is turned off. Network alarm events are programmable via the technician menu. Communication between systems is maintained by a synced heartbeat.

The units can be set to cycle to achieve equal run time on each unit. At the end of each cycle, the role of each unit switches to its counterpart, meaning the Master becomes the Slave and the Slave becomes the Master during the next cycle. During each cycle, the units operate according to the above lead/lag logic.

3.4 Air Cooled DX with Chilled Water Plus

Summary of Equipment

The primary system shall be Chilled Water Cooling. Direct Expansion Cooling shall be setup as a back up to the Chilled Water system. Both systems are designed to work independent of each other.

The Chilled Water System comes standard with a three (3) way water modulating valve, coil, and an optional “no water flow switch”. The DX system is equipped with a DX coil, compressor(s), and outdoor air cooled condenser. Optional heaters and humidifiers are also available if needed.

A unique feature of Air Cooled/Chilled Water Plus units is that the chilled water coil is located at the side of the direct expansion coil. The auxiliary chilled water coil is custom sized so that it provides identical cooling capacity obtained during the refrigeration cycle with the compressor operating.

Cooling-Chilled Water

Chilled Water cooling is the primary cooling system for C+ units. For optimum performance, the controller is programmed to call chilled water cooling for the first 300 seconds regardless of the chilled water temperature.

The C+ unit can switch over from one cooling mode to another based on sensing Chilled Water flow or Chilled Water temperature. The standard practice is to sense the Chilled Water flow for switching.

If “No Water flow” switch is selected, the unit senses the flow of chilled water by using a pressure differential switch and switches over to DX cooling based on loss of water flow. When no water flow switch is selected for switch over, the unit will only work on either DX or C.W. cooling mode. If chilled water supply temperature is selected for switch over, than the unit shall continue with chilled water cooling if the chilled water supply temperature is below the required temperature set point and switch over to the DX cooling.

Cooling-Direct Expansion

Direct Expansion Cooling is designed to operate when the water flow switch senses that there is no water flow. A digital signal is sent to the system from the controller to modulate the three (3) way valve to cut water flow to the chilled water coil and the backup system direct expansion cooling should start. The controller signals the compressor to start cooling. The outdoor condenser gets energized as needed.

3.5 Air Side Economizer

Summary of Equipment

The Economizer Mixing Box is factory provided; however, it might be installed in the field by others. Typically, the Air Side Economizer Mixing Box is provided for our Maxi-Kool unit with System 2200 series controller.

Sequence of Operation

The evaporator fan and a set of dampers for the economizers are energized depending on heating or cooling demands. The CONTROLLER controller commands the economizer box to bring either the minimum amount of outside air or only outside air based on outside air temperature and humidity. The controller determines whether the outdoor air temperature and humidity is suitable for “economizer-cooling”. If the outdoor air is suitable, mechanical cooling shall be locked out by the outdoor enthalpy control. The set of economizer damper actuators shall be energized, operating the outdoor air and the return air dampers. The economizer damper actuators shall be regulated to maintain proper discharge air temperature. When outdoor air is not suitable for “economizer-cooling”, the Economizer shall be locked out and the outdoor air damper shall maintain minimum position while the indoor fan is operating. Upon unit shutting down or power loss, the spring return motor actuator shall close the outdoor air damper. The Economizer shall be automatically locked out during the heat mode (if applicable).

The Air Side Economizer box shall include: prewired modulating spring return damper actuators, economizer control logic with compressor assist option, minimum outside air damper position control, economizer control sensors including outdoor air temperature and humidity (enthalpy) sensor, supply air and/or mixed air sensors. The supply air temperature sensor is used to maintain the desire supply air temperature using DX and Economizer cooling together. The exhaust of room air during economizer cooling mode shall be done by others in the field.

3.6 Water Side Economizer Energy miser (EM) Unit Using 2-Way Valves

Summary of Equipment

Energy miser units are provided with Dual Cooling options. DX cooling using Compressor based system and Economizer cooling using Water Side Economizer Coil.

The primary system shall be Direct Expansion Cooling. The free cooling Energy miser coil is provided together with the DX cooling coil. If the Water temperature drops below the Energy

miser set point, the condenser water is diverted to the free cooling coil and DX cooling will be programmed to either turned off or made available to assist based on demand.

The Energy miser System shall be provided with a Two (2) way water regulating valve for condenser coil, a Two (2) way modulating chilled water valve for energy miser coil, DX coil(s), compressor(s) and co-axial water condenser(s). The water valves on water cooled condensers and free cooling energy miser CW Valves will allow the water flow in either condenser coil or free cooling EM coil. The two way control valve shall control the amount of flow to auxiliary energy miser cooling coils to meet the demand when in EM cooling mode. The Two way water regulating valve will control the amount of water flow in condenser based on the refrigerant pressure in DX cooling mode. System shall be programmed to do either DX cooling or EM cooling based on entering water temperature.

Energy miser systems are connected to Cooling Tower or Dry Fluid Coolers to obtain re-circulating water or water glycol solution. In addition, the system is equipped with steam generating humidifier, electric reheat and microprocessor based controller.

A unique feature of Energy miser system is that the free cooling water coil is located just before the direct expansion coil and is properly sized to provide the same cooling capacity as the DX system at 45 Deg. F entering water temperature. The indoor unit will send a signal to enable and disable the outdoor auxiliary equipment. The outdoor equipment has its own control logic to provide water temperature suitable for either EM mode or DX cooling mode.

Cooling-Direct Expansion

Direct Expansion Cooling shall operate when the water temperature increases above the specified EM set point. A digital signal is sent to the system by microprocessor to signal the compressors and the two (2) way valves will regulate the water flow into the water cooled condensers based on the refrigerant pressure. Each compressor system shall have separate 2-Way water regulating valves. The Energy miser mode depends on the entering water temperature and it is adjustable.

Cooling-Energy miser Mode

The unit can switch over from DX cooling mode to Free cooling Energy miser mode based on the Entering Water temperature.

Unit shall start in DX cooling mode. If the temperature of water supply drops below the set point for the Energy miser mode, the unit will switch over to the Energy miser free cooling mode. The outdoor fluid cooler shall be provided with energy miser control panel to maintain lower fluid temperature during energy miser mode.

In the free cooling energy miser mode the compressors will remain shut off while the fans of the unit shall be on. Humidification and Dehumidification modes shall be operating as needed.

3.7 Water Cooled Energy Miser

Summary of Equipment

Energy miser units are provided with Dual Cooling options. DX cooling using Compressor based system and Economizer cooling using Water Side Economizer Coil.

The primary system shall be Direct Expansion Cooling. The free cooling Energy miser coil is provided together with the DX cooling coil. If the Water temperature drops below the Energy miser set point, the condenser water is diverted to the free cooling coil and DX cooling will be programmed to either turned off or made available to assist based on demand.

The Energy miser System shall come standard with a three (3) way water regulating valve for condenser coil, a three (3) way modulating chilled water valve for energy miser coil, DX coil(s), compressor(s) and co-axial water condenser(s). The water valves on water cooled condensers and free cooling energy miser CW Valves are Three Way mixing type designed to divert the flow in either condenser coil or free cooling EM coil. Three (3) way is used to maintain pressure drop, as constant GPM is required for free cooling systems. The (3) three way control valve shall control the amount of flow to auxiliary energy miser cooling coils and maintain constant temperature and relative humidity

Energy miser systems are connected to Cooling Tower or Dry Fluid Coolers to obtain re-circulating water or water glycol solution. In addition, the system is equipped with steam generating humidifier, electric reheat and microprocessor based controller.

A unique feature of Energy miser system is that the free cooling water coil is located just before the direct expansion coil and is properly sized to provide the same cooling capacity as the DX system at 45°F entering water temperature.

Cooling-Direct Expansion

Direct Expansion Cooling shall operate when the water temperature increases above the specified set point. A digital signal is sent to the system by microprocessor to signal the three (3) way valve to divert the water flow from the free cooling coil to the water cooled condensers and the direct expansion cooling mode shall start. The microprocessor shall signal the compressor to start cooling and at the same time energize the water regulating valve to supply water flow to the co-axial condenser. The Energy miser mode depends on the entering water temperature and it is adjustable.



Note: *Continuous water shall be flowing through the chilled water valve and will only supply water to coil when called upon.*

Cooling-Energy miser Mode

The unit can switch over from DX cooling mode to free cooling energy miser mode based on the Entering Water temperature.

Unit shall start in DX cooling mode. If the temperature of water supply drops below the set point for the Energy miser mode, the unit will switch over to the Energy miser free cooling mode. The controller will send signal to the auxiliary equipment to run Energy miser mode for fluid temperature control. The outdoor fluid cooler shall be provided with energy miser control panel to maintain lower fluid temperature during energy miser mode.

In the free cooling energy miser mode the compressors may shut off while the fans of the unit shall be on. Humidification and Dehumidification modes shall be operating as needed. The Compressors can be locked to remain off during energy miser mode if necessary.

3.8 Dry Fluid Cooler with Energymizer

Summary of Equipment

DRY FLUID COOLER (DFC): The Dry Fluid Cooler Shall Consist of Casing, Coil, Direct-drive Propeller Fan(s) driven by individual Fan Motor(s), Fan Guard and Mounting Legs. All fan motors shall be factory wired to a common electrical control box. The Dry Fluid Cooler shall be arranged for Vertical Air Flow.

The Glycol Coil shall have aluminum fins bonded to copper tubes and shall have full collars that completely cover the copper tubes. The coil shall be pressure tested to 350 psig and shall be designed for counter flow for high heat transfer efficiency.

The Dry Fluid Cooler casing shall be made from a non-corrosive metal to minimize maintenance. Adjustable mounting legs and supports shall be furnished with the DFC. Vibration isolators of the rubber and shear or spring type are to be field provided by others.

The motors shall be permanently lubricated, sealed ball bearings, with inherent overload protection. Motors shall be mounted inside the Dry Fluid Cooler Casing for weather protection. The direct drive fan blades shall be aluminum, and shall be protected by a heavy gauge, steel wire, zinc plated, and epoxy coated fan guard. Full width baffles to prevent bypass air shall separate each fan section.

Dry Fluid Cooler (DFC) requires separate power supply and one set of dry contact from indoor unit to Enable/Disable.

DFC is equipped with its own control panel that includes power block, fan contactors, aqua stats, freeze stats, relays and single or dual pump package control as necessary.

Aqua stats are installed in the control panel and bulbs to be attached with leaving water header of the coil.

For understanding purpose use 4 fan dry fluid cooler with drawing # 700-232-041

The fluid cooler shall be provided with ambient T-stats to control the water temperature during DX cooling mode. The fluid cooler shall bypass the T-Stat control logic and run all fans continuously during Energy Miser mode.

Condenser cooling mode

If the water temperature is above 50Deg. F. (Default setting) the DFC will be in normal condenser cooling mode. Aqua stat # 1 will be open above 50 Deg. F.

In normal cooling mode, DFC will be enabled by either of the compressor from indoor unit. The Freeze stat is installed in series of the enabling signal. If the freeze stat opens, the DFC unit will be fully disabled.

1. The first fan of DFC runs continuously as long as enabling signal is present.
2. The default setting for second fan to cycle OFF is 60 Deg. F and below with aqua stat
3. The default setting for third fan to cycle OFF is 70 Deg. F. and below with aqua stat #
4. The default setting for forth fan to cycle OFF is 75 Deg. F. and below with aqua stat #
5. All these default settings are field adjustable to fine tune the unit operation.

Energy miser cooling mode

During winter months, when water temperature drops below the 50Deg. F. the aqua stat # 1 will close and DFC unit will switch over to free cooling energy miser mode. In Energy miser mode, all other aqua stat (aqua stat 2, 3 and 4) will be bypassed and all fans will run continuously. The free cooling temperature set point on Aqua stat # 1 must synchronize with Energy miser water temperature set point for indoor unit.

Pumps

Summary of Equipment

PUMP PACKAGE: The pump package shall include a close coupled, industrial duty pump with heavy-duty ball bearings motors, stainless steel shafts and bronze fitted construction. The pump package shall include pump starter, aqua-stats, and fan cycling contactor(s) to control the condenser glycol temperature. The control panel shall be factory provided for field installation in a weatherproof box provided on the Dry Fluid Cooler. The pump shall be protected with a base and weather shield from the ambient conditions.

DUAL PUMP PACKAGE (Optional): The dual pump package shall include close-coupled, industrial duty pumps with heavy-duty ball bearings motors, stainless steel shafts and bronze fitted construction. The pump package shall include pump starters, aqua-stats, and fan cycling contactor(s) to control the condenser glycol temperature. The control panel shall be factory provided for field installation in a weatherproof box provided on the Dry Fluid Cooler. The pumps shall be protected with a base and complete vented weather enclosure from the ambient

conditions. The optional Pressure Differential (No Water Flow) switch shall be provided for field installation.

GLYCOL PUMP: A matching centrifugal circulating pump is provided for field mounting and piping.

Pump Operation

When compressor is on the pump and fluid cooler will be enabled. Note that this is in DX cooling. In free cooling the logic is the same, as pumps is enabled with economizer cooling.

3.9 Special Pump and Dry Fluid Cooler control logic

Pump speed adjusted based on differential pressure across pumps as 2-way control valves modulate.

Dry cooler and Pump controller Sequence of operation

Free cooling mode

Either outdoor air temperature is monitored or a signal from each crac unit (free cooling and DX condenser) is sent to the pump controller to determine which function is provided.

Fan speed may be increased sufficiently to allow pump minimum operating speed to be maintained should zone loads decrease, thus decreasing flow below safe pump operation.

Outside air temperature reaches 48F

Pump controls switch to free cooling mode – Fans run 100% until condenser outlet temperature reaches 38F, at which time fans speed will reduce to maintain 38F or minimum pumps speed is reached, then fans will reduce speed to maintain minimum pump speed, which is accomplished by 2-way valves modulating open in response to increased condenser water supply temperature.

Controls shall monitor both fan KW and Pump KW energy consumption and determine best speed combination to maintain lowest condenser supply water temperature during free cooling more.

DX Cooling mode

Outside air temperature 50F

Pump control increases fan speed as condenser water temperature increases. Maintain 65F condenser outlet water by modulating fan speed. At 75F exiting condenser water temperature fan speed is 100%.

Controls shall monitor both fan KW and Pump KW energy consumption and determine best speed combination to maintain lowest condenser supply water temperature during DX cooling more.

3.10 Optional features

- Discharge air temperature sensor to prevent overheating or cooling of the air stream
- Outside air temperature sensor for automatic temperature adjustment or economizer action
- Free-cooling temperature sensor for water cooled systems
- Hot gas bypass either by solenoid or by modulating electronic valve
- Redundant system operation of two or more units with automatic crossover and compensation
- Networking to a central command computer, or to an existing building automation system

The System 2500S is truly one of the most powerful and flexible controllers available for HVAC units today.

4.0 CONFIGURATION

The display unit is pre-configured at the factory for the most common user requirements. Nonetheless, some settings can be changed to adapt the device specific needs.

4.1 Software version

Software version: During boot-up, the splash screen is shown briefly with a quick summary of the loaded operation system along with software, boot, and O/S version. The about screen can also be access via the menu. Version number is needed prior contacting the factory for technical support.

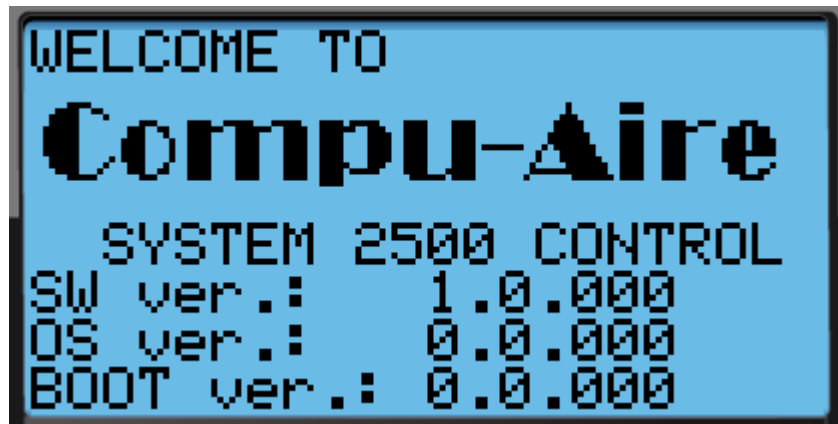


Figure 2 about Screen

5.0 TECHNICAL SPECIFICATIONS

5.1 Controller and Display

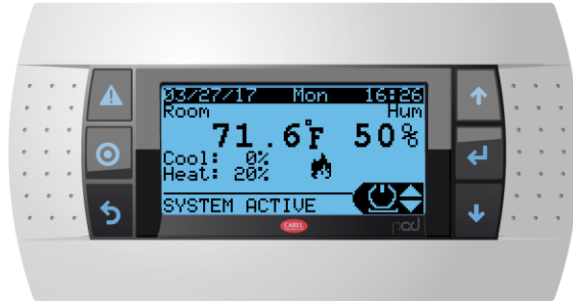


Figure 3 External display

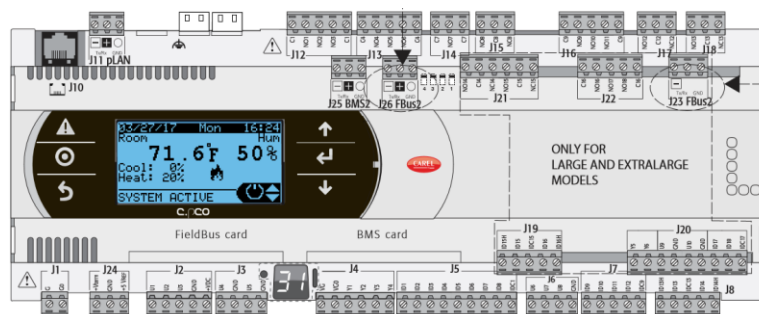


Figure 4 System 2500 controller

5.2 General Characteristics

System 2500 is a microprocessor-based electronic controller developed in compliance with the European RoHS standards. It provides a solution for many applications in the air-conditioning and refrigeration sectors ensuring absolute versatility, allowing specific products to be created to customer request. CONTROLLER runs the control program, and is fitted with the set of terminals required for connection to the devices (compressors, fans...). The program and the parameters are saved to FLASH-MEMORY and E2prom for safe keeping even in the event of power failures (without requiring a backup battery). CONTROLLER also allows connection to the cLAN (Compu-Aire Local Area Network) and can be connected, as well as to other System 2500S controllers. All the controllers in the cLAN can exchange information (variables, digital or analogue, depending on the application software used) at high transmission speed. Up to 32 units can be connected via

RJ45 interface. The connection to the supervisor serial line, via the Modbus™, Bacnet, or Lontalks protocols are also supported via RS485 standard or over TCP/IP connection.

System 2500 also equipped with USB peripheral that allowed easy firmware/software upgrade via a standard thumb drives. Each controller supports both LCD and touch screen interface.

5.3 Mechanical Characteristics

SMALL 13 DIN modules 110 x 227.5 x 60mm

Plastic container

Assembly

Fitted on DIN rail as per DIN 43880 and IEC EN 50022

Material

techno-polymer

Flame retardancy

V0 (UL94) and 960°C (IEC 695)

Ball pressure test

125°C

Resistance to creeping current

≥250 V

Color

Grey RAL7035

5.4 Electrical Characteristics

Power Supply	24VAC 50/60Hz P=40 VA
Terminal Block	Plug-in male/female connectors, max voltage 250 Vac; cable cross-section: min. 0.5 mm ² - max 2.5 mm ²
Clock	Built in with battery backup

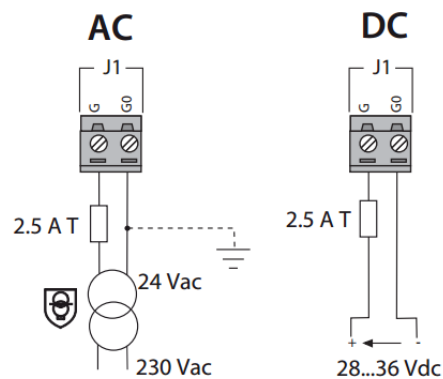


Figure 5 power connection

5.5 Digital Inputs

The controller features digital inputs for connecting safety devices, alarms, device status indicators and remote switches. Digital inputs are not optically isolated and have voltage free connects.

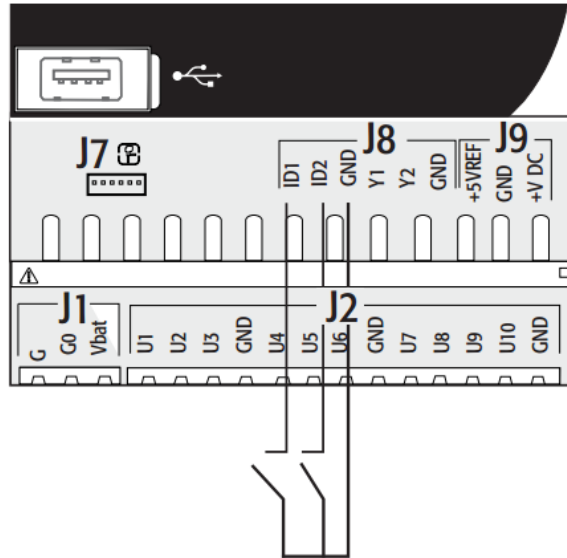


Figure 6 Digital inputs



Note: Separate as much as possible the probe and digital input signal cables from the cables carrying the inductive loads and the power cables, to avoid possible Electromagnetic disturbance.

5.6 Universal inputs

Universal inputs/outputs are distinguished by the letter U. They can be configured from the application for many different uses such as NTC, 4-20mA, voltage inputs, dry contact, or PWM. Maximum number of analog inputs that can be connected to the universal inputs/outputs depends on the type used.

Type of signal		Maximum number of inputs connectable to universal inputs/outputs				
		c.pCO				
		mini - c.pCOe	Small	Medium/ Built-in driver/ Extralarge	Large	
Analogue inputs	- NTC/PTC/ PT500/PT1000 probes	10	5	8	10	
	- PT100 probes	max 5	2	3 (2 on U1...U5, 1 on U6...U8)	4 (2 on U1...U5, 1 on U6...U8, 1 on U9... U10)	
	- 0 to 1 Vdc/0 to 10 Vdc signals from probes po- wered by the controller	0	max tot 5	5	6	max tot 10
	- 0 to 1 Vdc/0 to 10 Vdc si- gnals powered externally	10		5	8	
	- 0 to 20 mA /4 to 20 mA inputs from probes po- wered by the controller	max tot 4	2	4	6: (max 4 on U1... U5, 3 on U6...U8)	6: (max 4 on U1... U5, 3 on U6...U8, 2 on U9...U10)
	- 0 to 20 mA / 4 to 20 mA inputs from probes powe- red externally		4	4	7: (max 4 on U1... U5, 3 on U6...U8)	9: (max 4 on U1... U5, 3 on U6...U8, 2 on U9...U10)
	- 0 to 5 V signals from ratiometric probes po- wered by the controller	max 2	max 5	max 6	max 6	

WARNING: The 21VDC available at the +Vdc terminal (J2) can be used to power any active probes, the maximum current is 150 mA, thermally protected against short-circuits. To supply the ratiometric 0 to 5 V probes, use the +5VREF (Imax: 60 mA) present at terminal J24.

5.7 Analog Outputs

The controller features 0-10Vdc and PWM analog outputs without optical isolation, powered directly by the controller.

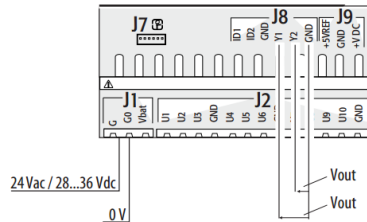


Figure 7 Analog outputs

5.8 Digital Outputs

The controller features digital outputs with electromechanical relays. For ease of installation, the common terminals of some of the relays have been grouped together. Some relays feature changeover contacts.

5.9 Cable Length

Cable Type	Power Supply Distance	Power Supply
Telephone	50m	150mA from CONTROLLER
AWG24 shielded cable	200m	150mA from CONTROLLER
AWG20/22 shielded cable	500m	Separate power via TCONN6J000

The maximum cable length between the two controllers using AWG20/22 shielded cable is 500 meters.

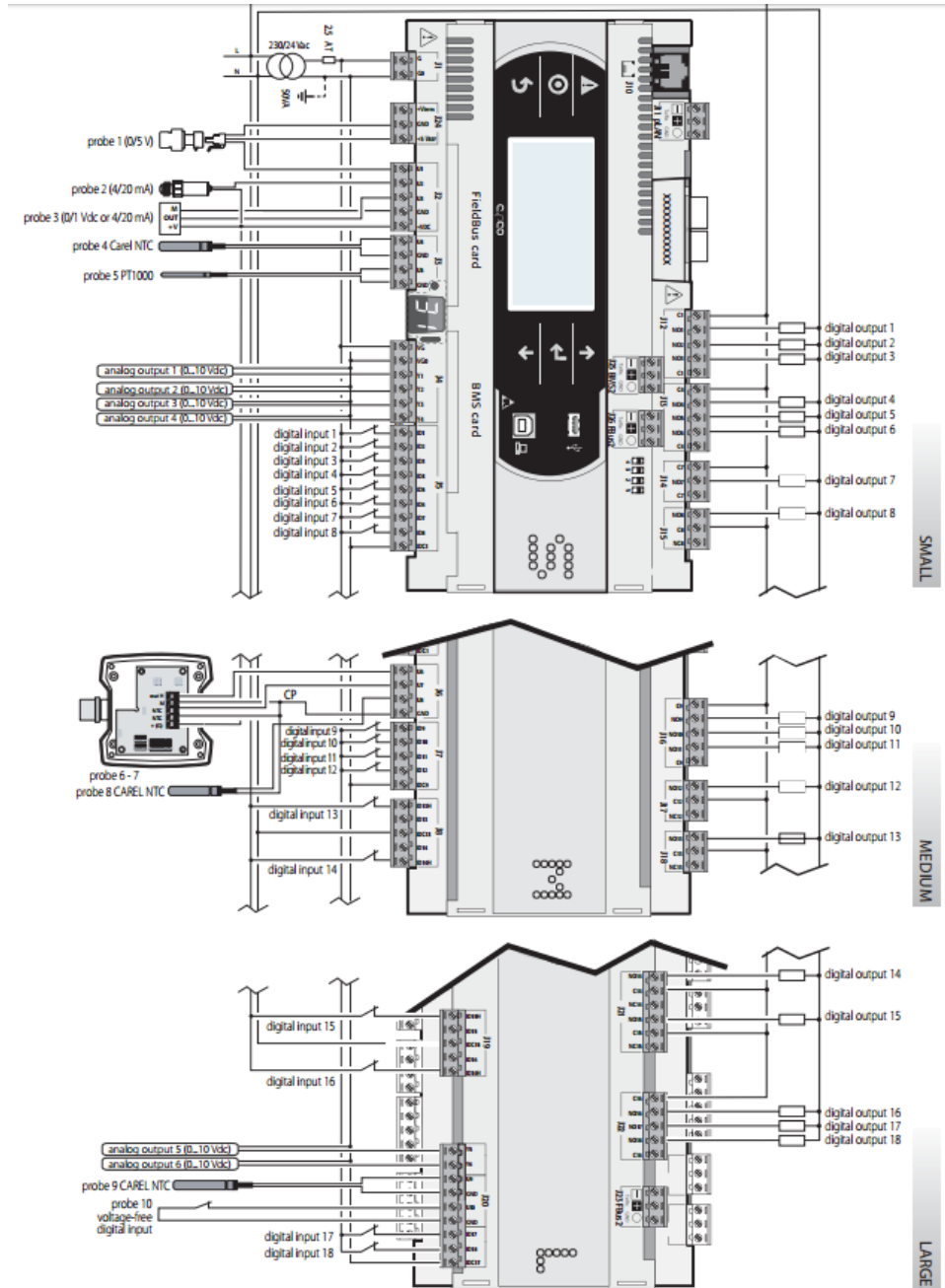


Note:







- A maximum of one terminal (pCOT, pCOI, pGDO, pGD1) can be connected, or two terminals but without using the backlighting on display. One version of the controller features optically-isolated connection to the pLAN network.
- The graphic terminal and aria terminal should be always powered with a separate power supply.
- The 21VDC present at +Vterm (J24) can be used to power an external terminal with a maximum input of 2 W. Only one terminal can be connected (for example PLD terminal or ARIA terminal) in addition to the one connected to terminal J10.

5.10 Standard Input / Outputs

The following table defines standard I/O ports for the System 2500 controller. Refer to the electrical wiring diagram for actual wiring.



5.11 Optional Features

Option	Function
	RS-485 CARD Protocol: MODBUS
	PCO-WEB CARD Protocol: BACNET, SNMP,HTTP,FTP,TCP/IP
	PCO-NET Protocol: BACNET MS/TP
	LONCARD Protocol: LONWORKS
	pGD Touch 4.3" graphical touch screen user interface
	Remote LCD interface

5.12 Functional characteristics

Multiple controllers may be used to combine cooling units into a cLAN network that operates as a single entity, enhancing the already-high performance and efficiency of units.

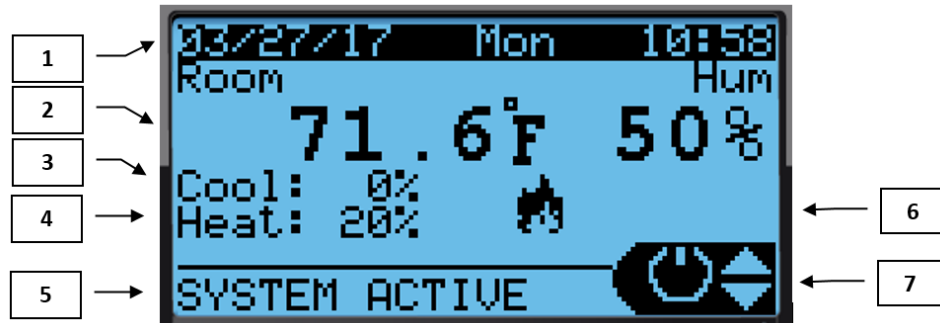
System 2500 controllers are available as factory-installed assembly. Remote console box with graphic touch sensitive display wall-mount version is also available for remote operation and monitoring of cooling units.

Supported Protocol: cLAN protocol, "Point-Point" protocol with up to 32 nodes
 Backlighting Level: Two levels of brightness, "high" and "normal"

5.13 Building Management System

BMS Protocol: LONWorks
 BACnet over TCP/IP
 BACnet over MS/TP
 Modbus over RS-485
 Web based interface

6.0 CONTROLLER INTERFACE



6.1 Navigation Buttons

Key Name	Function
1	Time and date
2	Room temperature and relative humidity
3	Cooling demand
4	Heating demand
5	System status
6	Mode of operation
7	Blink menu

Table 4 Status Info

7.0 Navigation Menu

The controller's menu is organized under different categories. Each category may require a different password if set up from the factory setting. At any given time, pressing the ESC key will take the screen back to the previous menu.

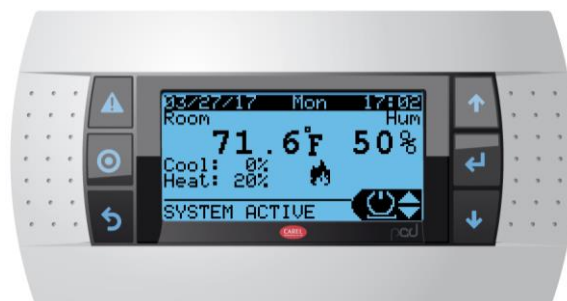


Figure 8 – Status screen

7.1 Menu Tree

Accessing protected menu may require assisted passwords. There are 3 level of accessing privileges. Level 1 requires no password. Level 2 allows accessing to the technician menu, and level 3 provides access to factory settings. Changes to factory settings are not recommended without consulting factory. Press the menu button to gain access to menu function.

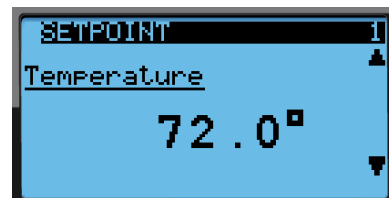


Figure 9 Menu tree

Main Menu

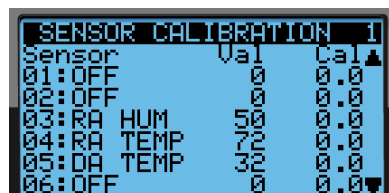
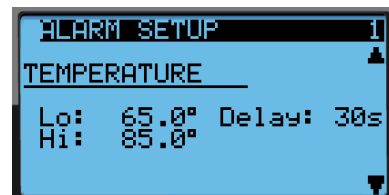
I. Setpoint

- a. Temperature (Cooling/Heating)
- b. Humidity
- c. Discharge (If applicable)
- d. Dehumidification (If applicable)
- e. Economizer (If applicable)
- f. Cooling Assist (If applicable)



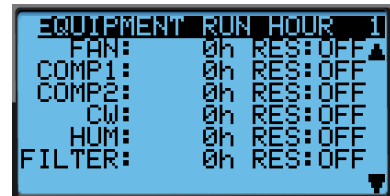
II. Technician

- a. Alarm Setup
 - Temperature hi/lo, delay
 - Humidity hi/lo, delay
 - Discharge hi/lo, delay
 - Firestat
 - Evaporator fan feedback
 - Condensate water alarm mode
 - Condensate pump alarm mode
 - Transducers hi/lo, delay
- b. Calibration
 - U1 THROUGH U10



c. Run Hours

- Evaporator Fan
- Comp1/Comp2
- Chilled water
- Humidifier
- Filter
- Heat[1:5]



d. Network

- IP, DHCP, Mask, Gateway, DNS
- Network Config, Polls, Sensor used
- Network switch over alarms
- P-LAN display ID

e. Manual Control

7.2 Accessing Submenus

While viewing the menu, use the up and down arrow keys to scroll through the icons page-by-page. To scroll through the icons one-by-one, press the enter key then use the up and down arrow keys.



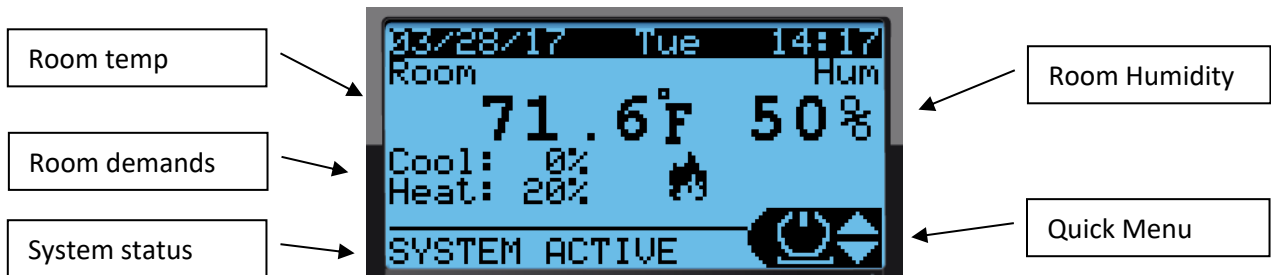
Note: Viewing settings require a password
Level 1 Password = 1 Level 2 Password = 2 Factory Setting = 1798

7.3 Main Menu Selection

Icon	Function
Status	Displays current temperature, humidity, and system demands, and current operation
Alarms	Display or Reset current/previous alarms
Setup	Unit setup

Table 5 - Main menu description

7.4 Unit Status



General unit status shows the current room temperature, humidity, heating, and cooling demands. Additional sensors are listed by pressing the (up↑) or (down↓) buttons.

Icon	Function
Demands	Displays Fan, cooling, heating, humidification, dehumidification, excess humidity draining, and humidifier
Cooling	Displays current active cooling stages
Heating	Displays current active heating stages

Table 6 Demands

7.5 Alarms

System 2500 controller provides both audible and visual alarm event log. Up to 200 event entries are automatically saved in a non-volatile memory area in descending order. The last event always displays when the alarm button is depressed from the any screen.



Figure 10 - Alarms Message

7.5.1 Alarm Viewing and Function

Only active alarms are accessible under the “Alarm button”. Consult the alarm history, under setup, to view the remaining alarms.

Action	Function
Alarm	Pressing the alarm button at any time
Next	Shows the next alarm
Previous	Shows previous alarm
Reset	Press and hold the alarm button for 3 seconds to reset all active alarms

7.5.2 Alarm Reset

The controller generates both visual and audible alarm continuously until cleared. To reset alarm, press the alarm button and scroll down to the reset menu by pressing the down button. Press the Reset button on the screen.



Note: *All active alarms remain active until the root cause of the event is rectified.*

8.0 SETUP MENU

“SETUP MENU” has three (3) levels of passwords to control the access for accessing end user, technician, and setting reserved for factory setup. A password must be supplied to gain access to any setting. Level1 and level2 passwords are not enabled by default.

Note: Your system 2500 series controller is already programmed, configured, and tested for your application. The system can be turned ON by using the ON/OFF through the graphical interface or via through the quick menu. The operating mode (Active System, System OFF, or Standby) is indicated under System Status screen. Entering a password

No password is required to view system status, active alarm, or turning the unit ON/OFF. System is automatically locked out after 5 minutes of inactivity and returned to the main screen. A new password must be entered to regain access to the setting. Once a password is entered, it times out in five (5) minutes if no screen and button activity are detected. A higher level of password also grants access to lower level access. If a factory password (level3) is enter, the screen will return the main menu.



Figure 11 password prompt

Password	Level	Accessibility
0	1	Setpoint Menu
1	2	Technician Menu
1798	3	Factory Setup (Consult factory for more information)

Figure 12 default passwords



Note: Entering a service menu requires a password. Default password is listed in **Table 5**.

Password is entered by using the up/down arrow. Each digit is input followed an enter button to move to next digit.

8.1 Setpoints

The controller is shipped with default selections for all necessary settings. In some cases, adjustments can be made to meet the application requirements. Use **Up** and **Down** arrow buttons to navigate between settings for different sensor.

Default Settings:

- Temperature: 72°F
 - Humidity: 50%
 - Discharge temp: 55°F
 - Water in Econ: 50°F
- Alarm hi/lo: 85 / 55
65 / 35

8.1.1 Changing Setpoints

Press menu and navigate to setpoint. The cursor is shown on the upper left of the screen. Move the cursor to the setpoint by pressing the enter key once. Use the up/down arrow keys to alter the setting. Press enter to save the value. In order to navigate to next menu, move the blinking cursor to the upper left and press the up/down arrow keys.

Note that only applicable setpoints are shown in the menu.

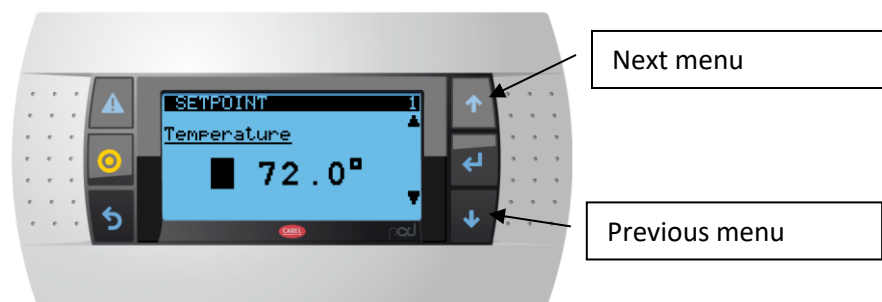


Figure 13 temperature setpoint



Figure 14 Discharge setpoint



Figure 15 Humidity setpoint



Figure 16 Economizer setpoint

8.1.2 Changing Alarm Setpoints

The alarm High and Low setpoints trigger an alarm event when the room returns temperature falls below or exceed the set limits.

To gain access to alarm setpoints: Menu->Technician->Alarm Setup

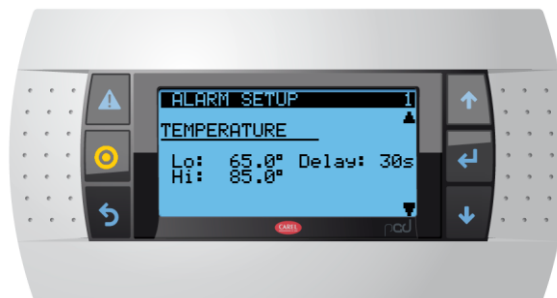


Figure 17 Temperature alarm setpoints

- Tap on the High/Low value
- Enter a new value from the virtual keyboard
- Tap the enter button when done

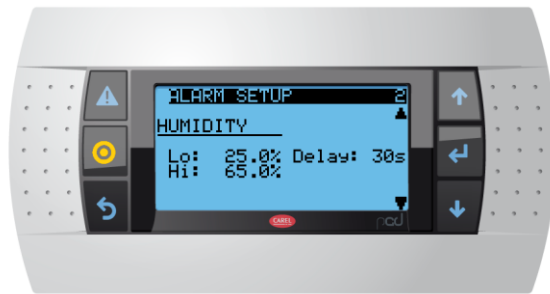


Figure 18 Humidity alarm setpoints



Figure 19 Discharge alarm setpoints

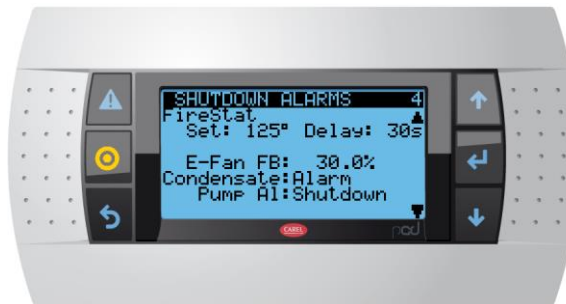


Figure 20 Shutdown alarms

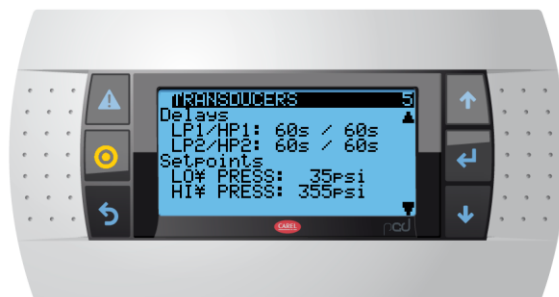


Figure 21 Transducers alarm setpoints



Note: *The controller is programmed to shut down the entire system once the return air temperature reaches 125°F. This alarm event supersedes all other events.*

8.2 Clock Setup

The controller features an internal clock. Current time and date are backed up by an internal Lithium-Ion battery. Consult the factory for battery replacement. To change the clock, press: Menu->Settings->Date/Time.

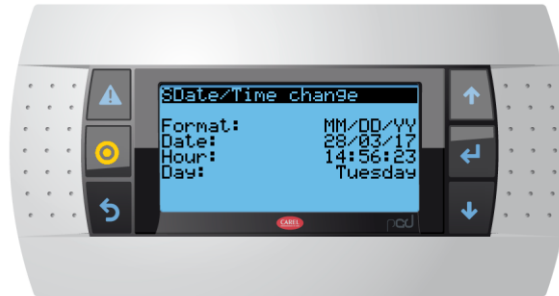


Figure 22 Date and time

8.2.1 Time and Date Setup

Tap on the corresponding number on the touch screen. Enter a new number from the virtual keypad. Press Enter when finished. Changes take effect immediately and require no system reset.

8.2.2 Night Setback

The controller supports 7 days unoccupied and occupied modes. Separate temperature and humidity setpoints are available and take priority when the night setback mode is active.

To active the Night Setback, change its setting to “YES” and follow the on screen directions. Use the arrow keys to navigate through the different screens to program each individual day.

NIGHT SETBACK IS ONLY AVAILABLE ON THE TOUCH SCREEN USER INTERFACE.



Note: *It is not recommended to set the Night Setback for computer room cooling.*

9.0 RUN TIME HOUR METERS

The controller keeps track of run time for each individual component for servicing purposes. Each counter can be reset individually. Run time can be access via
Menu->Technician->Run Hour.

Setting Timer

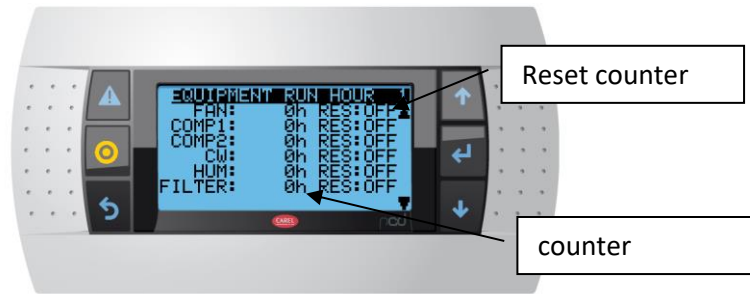


Figure 23 equipment run hours

10.0 BUILDING MANAGEMENT SYSTEM (BMS)

System 2500 controller is capable of communicating with external remote **B**uilding **M**anagement **S**ystem (BMS). Supporting protocol is enabled by a plug-in communication card.

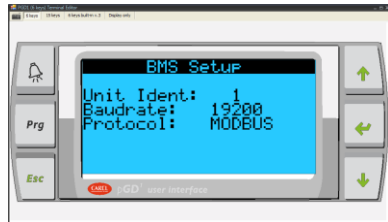


Figure 24 - Building management system



Figure 25 - Communication protocol

Protocol	Description	Default Baud Rate
Modbus	Serial communication through RS-485	19,200
LONWorks	LONTalk communication	4,800
BACnet MS/TP	BACnet over MS/TP	4,800
BACnet TCP/IP	BACnet over TCP/IP, SMNP, HTML, FTP	19,200

CONTROLLER controller also features an alternative method of networking multiple cooling unit in a built in standalone cLAN network through terminal **J11**. Baud Rate setting under BMS menu is only applied for Modbus protocol. Other protocol required separate software interface. Consult factory for more information.

Default Setting:

Unit Identification: 1 Baud Rate: 19200 Protocol: Modbus

10.1 Modbus

The CONTROLLER controller supports an optional RS-485 card, which allows you to interface directly the controller to a supervisory network RS485. The max baudrate available is 19200 baud (it can be set by software).

10.1.1 Mounting

To install the card in the pCO unit follow these instructions:

1. Remove the "serial card" placement cover with a screwdriver.
2. Remove the pre-punctured plastic piece corresponding to the card being installed.
3. Insert the optional card into the corresponding connector; confirm the card is firmly placed on both plastic supports on the controller case.
4. Close the cover using the screwdriver making sure the outside card terminal fits within the punched hole made on the cover.

The connection with the RS485 network is carried out by means of the plug-in terminal connector on the card. Pin-wiring of the connector is stamped on the card. If the card is placed in the last position of the supervision serial line, pins 2 and 3, you must connect a 120 Ω - 1/4 W end line resistors.

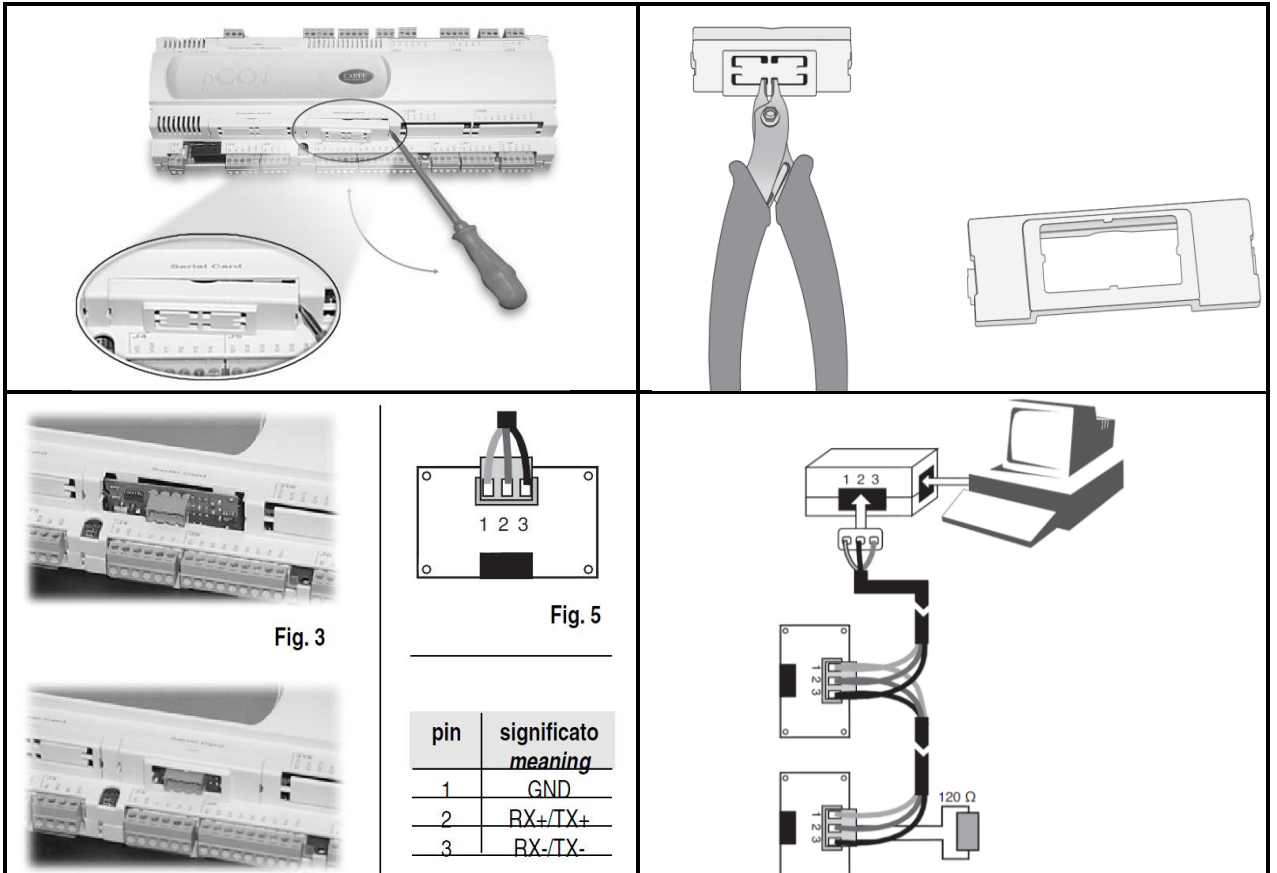


Table 7 - Modbus card installation

Warning

When handling the card, please follow the advice below. Electrical damage may occur to the electronic components as a result of electrostatic discharges from the operator. Suitable precautions must be taken when handling these components.

- Before using any electronic component or card, ground yourself (not touching the card does not prevent a spike, as static electricity can produce a 10000V spike discharge which can form an arc of about 1cm)
- All components must be kept inside their original package as long as possible. If necessary, take the board from its package and place it into an antistatic package without touching the back of the board with your hands
- Absolutely avoid non-antistatic plastic bags, polystyrene or sponge.
- Do not pass the card directly to other operators (to prevent from electrostatic induction and discharges).

10.2 LONWORKS

The serial interface boards for LonWorks® networks are optional accessories for the CONTROLLER controller which allows the controllers to be connected directly to a LonWorks® network. The use of these boards requires knowledge of and experience with the LonWorks® network installation and maintenance tools.

10.2.1 General characteristics



Note: *The LONTalk card is preprogrammed at the factory. Commissioning the device is required to have proper readings when probing.*

The program installed on the board may correspond to a standard LonMark® profile. The board is programmed by the manufacturer when LonMark® profiles are used or in the field for custom profiles.

10.2.2 Physical channels

Depending on the model, the interface boards communicate via two physical channels, TP/FT-10 and TP-RS485-39, as described in the LonWorks® literature. The LONTalk card uses an Echelon® FTT-10 transceiver, approved for use on the TP/FT-10 channel. This channel has the following main characteristics:

- Allows the connection of a maximum of 64 nodes for each network segment;
- The nodes can be connected without any restrictions in the topology: that is, star, ring, on one bus only, or with any combination of these;
- Communication speed: 78,125 kbps;
- Maximum distance (Belden 85102 cable): 500m for connections between the nodes with free topology; 2700m for bus connections with double line terminator.

10.2.3 Physical Circuit Board Layout

1. Connector to the CONTROLLER Controller
2. Terminal block for LonWorks® network (GND, A, B)
3. Service pin
4. Green service LED
5. Red fault LED

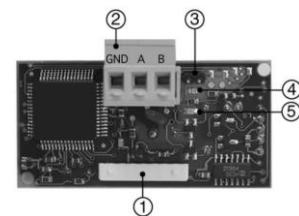


Figure 26 - LONTalk Card



Note: *The ground wire (GND) is not required in some applications.*

10.2.4 LED Color Description

The green service LED:

- Signals the status of the node, as per the LonWorks® protocol
- Hardware fault: always ON or always OFF
- Node configured (normal operation): ½ second ON, then always OFF
- Node NOT configured: flashing at ½ Hz
- Node without software application: 1 second ON, 2 seconds OFF, then always OFF
- Node in continuous reset: flashing
- Remains on during the activation of the service pin
- Remains on for one second when receiving a wink command via the network

The red fault LED:

- Signals problems in the connection between the board and the pCO.

WARNING: If the red LED comes on make sure the instructions described under Installation have been carefully followed. THE COMMUNICATION BAUD RATE ON THE PCO HAS BEEN SET TO 4800 BAUD.

10.2.5 Installation

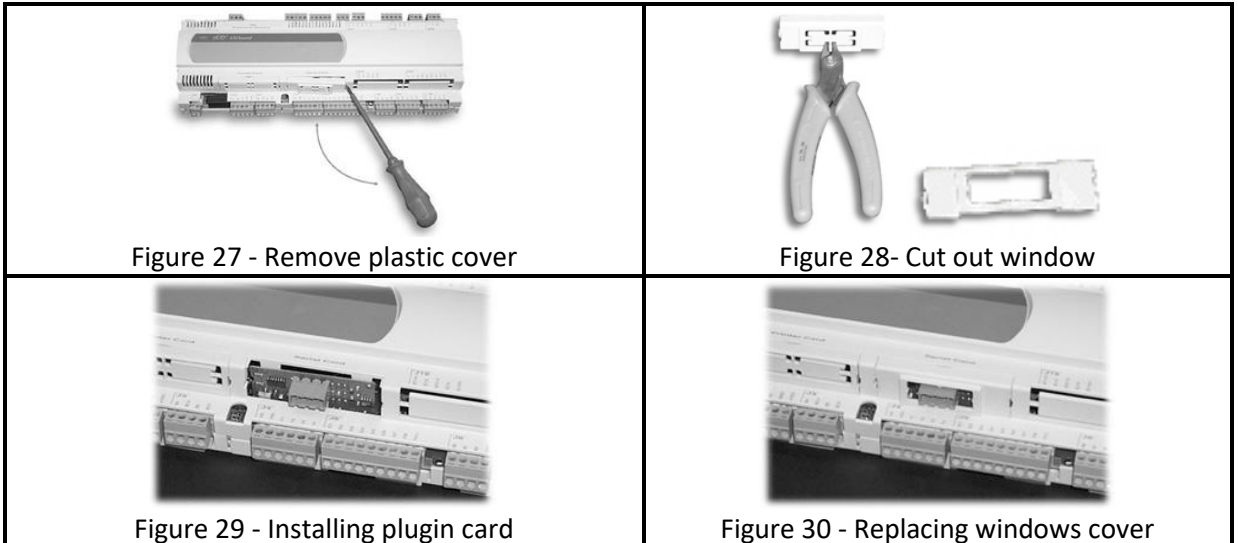
WARNINGS: precautions in handling the board. Electrical damage may occur to the electronic components as a result of electrostatic discharges from the operator. Suitable precautions must be taken when handling these components, specifically:

- Before handling any electronic component or board, touch an earthed object (simply not touching the component is not enough to prevent a spike, as static electricity can produce a 10000V discharge, which can form an arc of about 1cm)
- All materials must be kept inside their original package as long as possible. If necessary, take the controller from its package and place it into antistatic packaging, without touching the back of the board
- Absolutely avoid non-antistatic plastic bags, polystyrene or sponges;
- Do not pass the electronic components or boards directly to other operators (to prevent electrostatic induction and discharges)

10.2.6 Connection to the CONTROLLER Controller

With reference to **Figures 25-28** below, insert the board in the controller as follows:

1. Disconnect the power supply to the controller and use a screwdriver, remove the serial card cover
2. Remove the pre-cut plastic part from the cover to make a rectangular window cutout
3. Insert the optional board in the corresponding plug-in connector, initially holding it diagonally and then making sure it is properly inserted and pushed up against the two plastic supports on the case of the CONTROLLER
4. Close the cover and aligning the connector on the serial board with the hole made in the cover
5. Reconnect the power supply to the pCO. If the pCO supervisor serial communication has been set to use the Carel protocol at 4800 baud, the red LED on the board will come on for a few seconds and then will go off immediately, indicating normal operation.



10.2.7 Connection to the LonWorks® network

The physical connection to the LonWorks® network is performed using the connector with removable terminals fitted on the board, according to the Echelon® instructions and specifications. For further information on installation, maintenance, the cross-section and type of cable, refer to the LonWorks® literature.

10.2.8 Service pin

To activate the service pin, simply momentarily short-circuit the two pins on the board (see Figure 24) with the tip of a screwdriver or a similar tool. The service pin must only be activated during the installation of the node. When the pin is activated, the node sends a broadcast message over the LonWorks® network, containing the information required for identification.

10.2.9 WINK event

A generic supervisor can send the WINK command to a specific node on the LonWorks® network. This generates an event that the application on the specific node can respond to with any action decided by the programmer. In this specific case, the service LED on the interface comes on for one second, thus making it possible to check the correct operation of the connection between the interface and LonWorks® network.

10.3 BACNET OVER TCP/IP

10.3.1 Installation

The board is installed in the CONTROLLER controller, when off, as follows

1. Remove the “Serial Card” cover from the controller using a screwdriver.
2. Insert the board in the corresponding plug-in connector, making sure it is fully inserted and in contact with the two supports located on the case of the CONTROLLER. This operation may be difficult due to the limited space, consequently, it is recommended to insert the board at an angle and then turn it until aligning the connectors.
3. Close the cover again, using the cover supplied with the board, lining up the connector on the serial board with the opening in the cover.
4. (optional): stick one or both labels supplied outside and/or inside the electrical panel near the controller, so that the MAC ADDRESS can be read without needing to open the electrical panel for the connection to the Ethernet network, use an S/FTP cable, category 5e or higher.

10.3.2 Functions

The pCOWeb board is used to connect the controller to an Ethernet network and consequently perform the following functions.

- Access the information on the controller (network variables and parameters) using an Internet browser, such as Internet Explorer™ installed on a PC and connected to the pCOWeb via TCP/IP (see Web server)
- Connection to a supervisory network that uses one of the following standard protocols
 - SNMP v1 & v2c
 - BACnet Ethernet ISO8802-2/8802-3
 - BACnet/IP

10.3.3 Default parameters

In order to access the configuration (see the Configuration section), the pCOWeb can be started using the “factory bootswitch parameters”:

- **IP address= 172.16.0.1 Net mask= 255.255.0.0;**
- **“root” user password: froot**
- **“httpadmin” user password: fhhttpadmin**
- **“guest” user password: fguest**

To start the pCOWeb with default parameters, proceed as follows:

When the pCOWeb is off:

- switch on the controller controller with the pCOWeb already inserted and hold the button for at least 20 s, until the status LED starts flashing SLOWLY 3 times, red-dark;
- release the button while the LED is flashing, after having flashed 3 times, the LED turns green, then, to confirm the recognition of the button, the LED will flash QUICKLY 3 times, red-dark.
- To complete the pCOWeb boot phase, wait approximately 50 s until the status LED flashes regularly. From this moment on, the pCOWeb can be accessed via the network

When the pCOWeb is already on:

- Restart the pCOWeb software (see “Restarting the software”)
- After restarting, proceed as above for when the pCOWeb is off.



Note: In “factory bootswitch parameters” mode, the pCOWeb does not save the parameters recalled, but simply uses them, and therefore, when next restarted without pressing the button, it will use the parameters set by the user (if just acquired, with DHCP)

10.3.4 Restarting the software

To restart the software when the board is in stable operation (that is, with the status LED flashing regularly), press and hold the button for between 5 and 10 seconds; after around 10 s from releasing the button, the status LED will stop flashing, and after a further 15 seconds the software on the board will restart.

10.3.5 Configuration



Note: For the correct operation of the pCOWeb, a number of basic parameters need to be set, such as the IP address and Netmask; each device connected to an Ethernet network, to communicate with a host, must have a unique IP address.

PCOWeb is supplied with the DHCP function already active. Therefore, in a network served by a DHCP server, pCOWeb will automatically acquire the necessary parameters without requiring configuration. In the case of a network without DHCP, the parameters need to be configured manually (see the “Accessing the user configuration...” section).

Accessing the user configuration (via Ethernet network and configuration web pages)

Automatic network configuration (DHCP): ask the network administrator for the address that has automatically been assigned to the pCOWeb already connected; the administrator will need to know the MAC ADDRESS of the pCOWeb.

Network without DHCP: when first using the board, it is recommended to connect pCOWeb directly to a computer using a crossed Ethernet cable; then start the board with the “factory bootswitch” parameters (see “Pushbutton”).

To allow the PC to access the pCOWeb:

- The PC used for the configuration must be in the same sub-network as the pCOWeb; set the network parameters on the PC as follows:
 - IP address= if DHCP: ask the network administrator; with “factory bootswitch parameters”: 172.16.xxx.xxx (with xxx.xxx as desired, as long as different from the 0.1 already used by pCOWeb);
 - Netmask= 255.255.0.0.
- The browser on the PC must have the option corresponding to the use of a proxy server disabled. If the network settings on the PC and the browser are correct, typing the IP address of the pCOWeb in the address bar will access the default home page of the pCOWeb. Then enter the area reserved for the administrator, using the special link (Go to Administrator Area) and the following pre-set account:
 - username= admin
 - password= fadmin

The basic parameters for communication and access are located in the “Configuration” area. Choose “Network”: the primary IP address of the board and three aliases can be set.

To configure the DHCP function type “DHCP” in the place of the IP address. If the network does not use DHCP, ask the network administrator for a valid IP address and Netmask for the local network that the controller will be connected to.



Figure 31 - PCOWeb



Figure 32 - Window cover

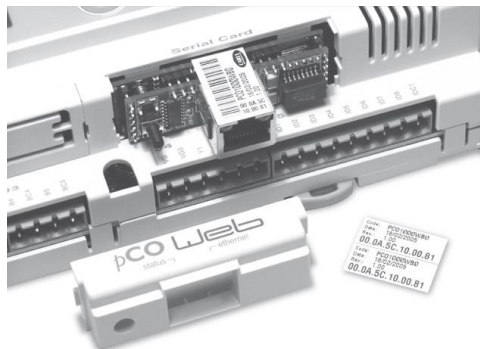


Figure 33 - Installing PCOWeb



Figure 34 - Installing plastic cover



Note: *the parameters recalled with the “Pushbutton” cannot be modified and must not be confused with the values that are modifiable by the user. For a complete description of all the parameters that can be set, consult the factory for user manual.*

10.3.6 Web server

The web server included in the pCOWeb is “thttpd”, compliant with the HTTP 1.1 specifications, and is used to display HTML pages directly on the Internet browser. A client application can thus control and monitor the controller controller that the pCOWeb board is installed on from a remote location.

The HTML pages can be easily created and downloaded to the pCOWeb by the end user with any FTP client. Common programs can be used to create the custom HTML pages (e.g. Macromedia® Dreamweaver™ or Microsoft® FrontPage™) and download them to the pCOWeb via FTP client such as SmartFTP™ (www.smartftp.com).

10.3.7 Accessing the operating system by authentication

The system can be accessed via a telnet terminal or via FTP. Authentication with user name and password is required for each access. The following users are registered.

User Name	Description	Default Password	Allowed
root	administrator of the operating system	froot	no limitation
httpadmin	web administrator	Fhttpadmin	R/W access to the http directory; read-only to the other directories.
guest	guest	fguest	

Table 8 - PCOWeb passwords

The password can be modified by accessing the administrator page. The password recalled with the “Pushbutton” function will not be modified and must not be confused with the passwords that are modifiable by the user. This page can also be used to set the access restrictions for each of the various directories in the http tree. Consequently, connecting via FTP and logging in as the web administrator, as follows will access the pCOWeb user file system

- username= httpadmin;
- password= fhttpadmin (note “F” as in “factory” as the first letter).

The customized pages should be saved in the following directory: /usr/local/root/flash/http.



Note: *The pages downloaded to the pCOWeb must have the correct properties and be able to be displayed with a browser; setting these attributes correctly via FTP is quite difficult, and consequently the “auto-set attributes” function is available in the administrator pages. To activate this function, simply click the “Adjust HTML pages attributes” link; it is recommended to do this whenever modifying one or more HTML pages.*

10.3.8 CGI script

CGI scripts can be written in bash language or compiled languages. These must have the .cgi extension and must reside in the http/usr-cgi directory. As for the HTML pages, these files must also have the properties correctly set and enabled. IMPORTANT: It is recommended to click on the “Adjust HTML pages attributes” link whenever modifying one or more .cgi scripts.

10.3.9 SNMP

PCOWeb is able to communicate using the SNMP protocol (v1 & v2c). It therefore acts as a gateway between the CAREL proprietary protocol and SNMP. The information available via SNMP relates to all the data sent to the supervisors by the application loaded on the controller.

PCOWeb manages some standard traps and allows a trap to be defined for each digital variable on the controller. The parameters relating to the management of the SNMP protocol can be set using the administrator configuration pages.

10.3.10 BACnet

PCOWeb is able to communicate using the BACnet protocol over Ethernet:

- ISO8802-2 over 8802-3;
- BACnet/IP.

It acts as a gateway between the controller proprietary protocol and BACnet. The information transferred involves all the data sent to the supervisor by the application loaded on the controller.

The parameters relating to the management of the BACnet protocol are set using the administrator configuration pages.

10.3.11 WARNINGS

Precautions when handling the board!

The electrical damage that occurs to electronic components is almost always due to electrostatic discharges caused by the operator. Consequently, suitable precautions must be taken when handling these components, in particular:

- Before handling any electronic component or board, touch an earthed object (avoiding contact with a component is not sufficient, as a 10,000 V discharge, a voltage that can easily be reached by static electricity, creates an arc of around 1 cm);
- The materials must remain as long as possible inside their original packages. If necessary, remove the board from the packing and then place the product in antistatic packaging without touching the sides of the board containing the electronic components;
- Always avoid using plastic, polystyrene or non-antistatic materials;
- Always avoid passing the board between operators (to avoid the phenomena of electrostatic induction and consequent discharges).

10.4 BANET over MS/TP

Optional add on board is available for BACnet over Master/Slave application.

10.4.1 Installation

1. Disconnect the power supply from the controller and remove the "Serial Card" cover.
2. Insert PCOnet card in the plug-in connector, making sure that it is fully inserted and in contact with the two supports on the controller. As there is little space available, this operation may be complex: as a result, insert the PCOnet card at an angle then tilt it back until the connectors line up.
3. Insert the required jumpers (see below for the meanings of these).
4. Fit the cover supplied with the PCOnet.



Note: If the device used to read the data from the 485 network is grounded and the RS232-RS485 converter or the RS485 serial port on the device have functional insulation of less than 2kV, connector GO on the CONTROLLER board must be grounded. The board cannot be installed in direct contact with the metal panel on the electrical panel.

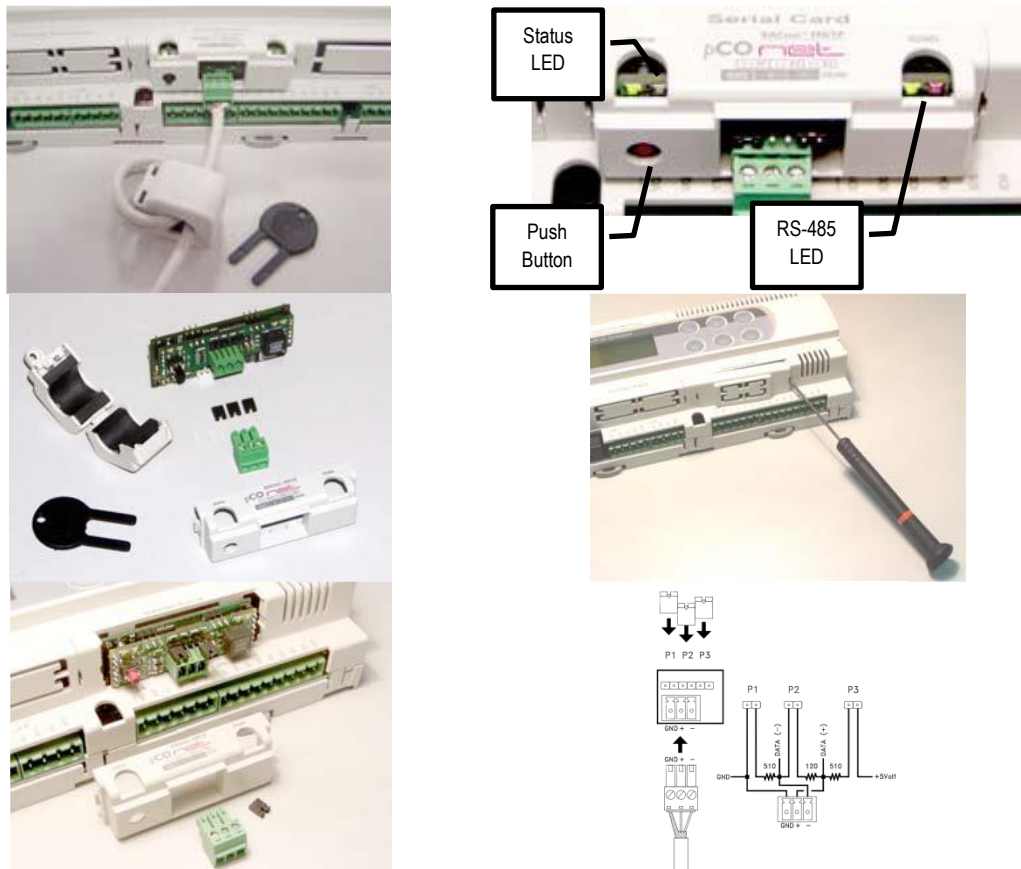


Table 9- Installation guide

10.4.2 Meaning of the jumpers

Jumpers P1, P2 and P3 are located inside the front opening of the cover. See table 7 for installation guide.

- Jumper P1 adds a 510 ohm polarization resistance between the negative data line (-) and GND
- Jumper P2 adds a 120 ohm terminal resistance between the two data lines (+) and (-);
- Jumper P3 adds a 510 ohm polarization resistance between the positive data line (+) and the +5 VDC internal voltage.

Insert all three jumpers on the unit at the start of network and the unit at the end of the network. Do not insert the jumpers on the intermediate units. For compliance of the product with the European EMC standards, add the ferrite supplied to the network cable, as illustrated in Table 7.

10.4.3 Operation

The Status LED (left) indicates the status of communication with the controller and the status of the PCOnet.

Starting sequence: on power-up, or after restarting PCOnet, the Status LED switches in the following sequence:

- OFF for 2 seconds;
- 2 seconds after restarting: quick flash red-green-red-green
- 5 seconds after restarting: green on steady
- Approximately 50 seconds after restarting: flashing (color: see below - Status of communication with the controller) PCOnet-pCO* communication starts.

Status of communication with the controller: Once the starting sequence has been completed, the Status LED flashes to indicate the quality of communication with the CONTROLLER:

- Quick green-OFF-green if communication with the controller is OK (pCO* ON-LINE);
- Slow red-OFF-red if communication has not been established with the pCO* (controller OFF-LINE)
- Green-red-green if PCOnet detects errors or a temporary lack of response from the controller.

The RS485 LED (right) indicates the status of communication with the BACnet MS/TP network (RS485). The LED shows the following information:

Starting sequence: on power-up or after rebooting PCOnet, the RS485 LED switches in the following sequence:

- Off for approximately 50 seconds;
- Approximately 50 seconds after restarting PCOnet: slow green–red–green–red: at the end, BACnet will be active.

Status of communication with the BACnet MS/TP network: once the starting sequence has been completed, the RS485 LED flashes to indicate the quality of communication with the BACnet MS/TP network:

- Green with occasional red flashes if communication is OK (BACnet MS/TP meaning: green ON = PCOnet keeps the Token (control of the MS/TP network); green OFF = PCOnet DOES NOT keep the Token; red on = Poll-For-Master, search for a Master to pass the Token to)
- Green and red ON together (BACnet MS/TP meaning: continuous Poll-For-Master): communication not established (connection problems, or no network device found); this may depend on electrical connection difficulties or communication settings that are not compatible with the other network devices connected. See the section on configuration.

The Pushbutton Function

- restart PCOnet
- recall the factory configuration

Restarting PCOnet

With the board on and in stable operation (Status LED flashing continuously), hold the button for more than 5 seconds and no more than 10 seconds. Approximately 10 seconds after releasing the button, the Status LED will stop flashing, and 15 seconds later PCOnet will be restarted: Status LED quickly flashing red-green-red-green.

10.4.4 Recalling the factory configuration (“factory bootswitch” mode)

With the following procedure, PCOnet uses the default parameters instead of the ones specified by the user. See the table of parameters and factory values in the section on Configuration. In “factory bootswitch” mode, PCOnet does not save the recalled values, and consequently when next restarted without pressing the button, PCOnet will again load the user settings. When purchasing PCOnet, the user parameters are set to the factory configuration values.

With PCOnet OFF:

- Switch PCOnet on (i.e. switch on the pCO* controller with the PCOnet board inserted) by pressing and holding the button for at least 20 seconds: the Status LED will flash SLOWLY 3 times, red-off
- Release the button while the LED is flashing: after 3 red flashes, the LED comes on green; the LED then confirms recognition of the button by flashing QUICKLY 3 times red-off, and then comes on green again

Complete start-up of the PCOnet will take another 40 seconds, then the RS485 LED starts flashing; only from this moment on can PCOnet be accessed via a remote connection.

With PCOnet already ON:

- Restart PCOnet (see above: Restarting PCOnet)
- After the restart procedure, follow the steps described above for PCOnet OFF

10.4.5 Configuration

Configuring the PCOnet parameters for correct communication over an MS/TP network:

- Connect PCOnet via RS485 to a computer: during configuration, the CAREL product code CVSTDUMOR0 for USB ports can be used.
- Converters should not be used in the installation due to the large volume of data transmitted across a complex BACnet™ network.
- Install the CAREL “BACset” configuration tool, available free-of-charge at ksa.carel.com.



Note: *If the values of the pCOnet parameters are not suitable, communication with BACset may not be possible. To connect to pCOnet, restart pCOnet using “factory bootswitch” mode (see the section on Operation - Pushbutton).*

10.4.6 BACNET Parameter Description

Device Instance

This is a number that uniquely identifies a device inside the BACnet® network (the BACnet® network can also include non-MS/TP BACnet® devices). If two units have the same Device Instance, identification errors will be generated.

Station Address

This is a number that differentiates the units in the BACnet® MS/TP network. If two units have the same Station Address, identification errors will be generated. To speed up the data exchange between the Master units, the Station Address of the Master units should start from 0 and continue without skipping any numbers.

Max Info Frames

This establishes the maximum number of information packages exchanged, above which the Master unit will give up control (Token) of the network to another Master unit. It thus indirectly establishes a sort of priority between the Master units in the network: high numbers guarantee the Master a higher data exchange volume.

MaxMaster

To speed up data exchange between the Master units, Max Master should be set to the Station Address of the Master with the highest Station Address. In fact, each Master, after having used the network, passes over control to the next Master. The Max Master parameter specifies to pCOnet the address of the network Master with the highest Station Address: using this parameter, pCOnet will know that there is no other Master with a higher Station Address than Max Master; pCOnet will then give control of the network to the next Master, however not beyond Max Master; if no next Master is found, the cycle will begin again, with control being given to the Master with the lowest Station Address.

Baud Rate

Data transfer speed. The Baud Rate must be the same for all the devices connected. Otherwise the exchange of data will generate communication errors. For extended networks, low baud rates should be specified, as these guarantee less communication errors. If Baud Rate=76800, make sure the device supports this communication speed. This baud rate is not supported by the RS232 serial port on a normal PC.

Parameter	Min	Max	Factory
Device Instance	0	4194303	77000
Station Address	0	127	0
Max Master	0	127	127
Max Info Frames	0	255	20
Baud Rate	9600, 19200, 38400,76800		

Table 10 - BACnet MS/TP parameters

11.0 TECHNICIAN MENU

The service menu has settings that assist the installation and maintaining process. Each setting is defined as shown below.

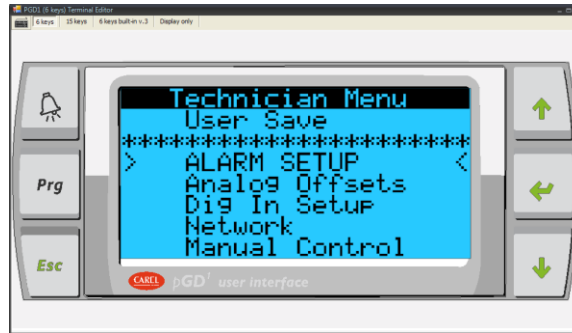


Table 11 - Technician menu

Icon	Description
Alm Setup	Alarm sensor setup for temperature, humidity, smoke, no air flow, etc.
Analog Offsets	Sensor calibration offset
Dig In Setup	Controller digital input setup
Network	CLAN network setup
Manual Control	Manual control for each components

Table 12 - Technician menu description

11.1 Alarm Setup

The controller supports a general alarm or global alarm for the following events. Each individual alarm can be configured to be part of a global arm. R2 is the second relay which is connected to a normally opened dry contactor. Consult the electrical wiring diagram for more information.

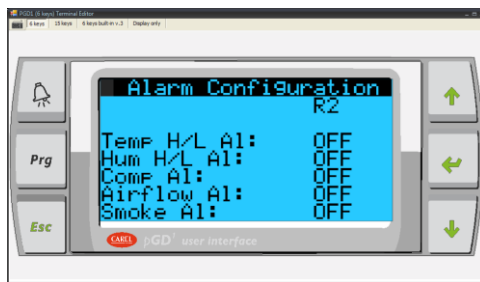


Figure 35 - Alarm setup

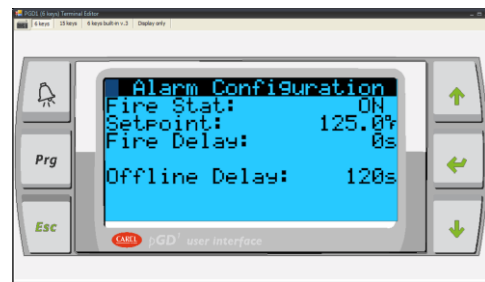


Figure 36 - Alarm Setup

R2 = Selectable alarms

Note: S.W for switching over option only shows up when more than one controllers are connected for CLAN configuration.

Default Setting:

<u>Configuration</u>	<u>R2</u>	<u>SW</u>
Temp. H/L Alarm:	OFF	OFF
Hum. H/L Alarm:	OFF	OFF
Compressor Alarm:	OFF	ON
Air Flow Alarm:	OFF	ON
Smoke Detect alarm:	OFF	OFF

<u>Configuration</u>	<u>R2</u>	<u>SW</u>
Dirty Filter Alarm:	OFF	OFF
Sensor Failure Alarm:	OFF	ON
Drain Full Alarm:	OFF	OFF
Fire Stat Alarm:	OFF	OFF



Note: *Not all systems are equipped with a general alarm or global alarm. Setting the SW=ON will shut the current active unit down and switch the operation over to standby unit. The “Switch Over” column setting only available when more than one unit are networked together.*

11.1.1 Available Alarms

Alarm	Function
Temperature H/L Alarm	High low alarm set under Setpoint
Humidity H/L Alarm	Humidity high/low set under setpoints
Compressor Alarm	Compressor fail
Air Flow Alarm	Air flow loss
Smoke Detect Alarm	Smoke is detected in the system
Dirty Filter Alarm	Filter is dirty, need replacement
Fire Stat Alarm	Temperature reaches 125°F

Table 13 - Global alarms

The alarm status is notated by its current setting. To set the alarm, change the setting to either “ON/OFF” by tapping the screen and toggling via the virtual keyboard.

The CONTROLLER controller implements time out sensor delays to insure smooth operation. Each delay is dictated in second unless otherwise noted.

Default Setting

- RMT/OAH Sensor: 0s
- FC/OAT/B10: 0s
- Fire Stat: ON Temp: 125.0°F
- Fire Stat Alarm Delay: 0s
- Offline Alarm Delay: 60s
- Alarm Buzzer: OFF
- T/H Alarm Delay: 15M
- All Alarm Switchover: OFF
- Disc Cool/Heat: 0.2°F 0s

11.1.2 Sensor Offset

Use the sensor calibration to match the reading to a reference device. Setting can be positive or negative offset. All adjustments take effect immediately.

Menu->Technician->Calibration

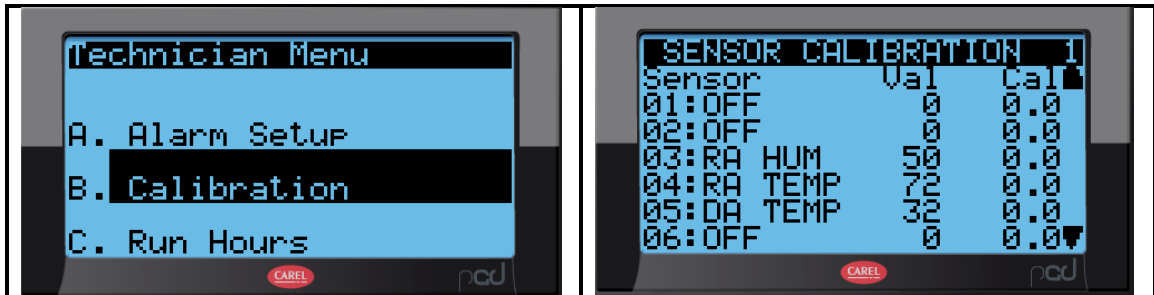


Table 14 - Sensor calibration

Default Setting

Offset: 0

11.2 Network Setup

The controller supports up to 32 units working together as single unity in a pLAN network. A pLAN network composes of one (1) master unit with up to fifteen (32) slave devices. Proper unit identification is required prior to proceeding. See pLAN setup section for more information.

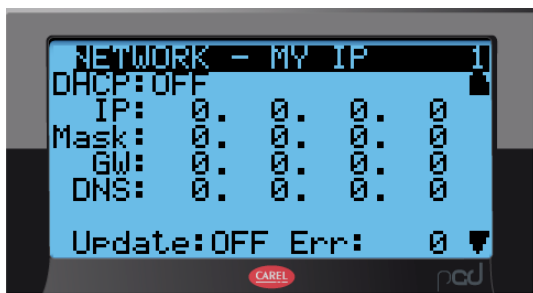


Figure 37 – IP address



Figure 38 - Network configuration



Note: A pLAN network has a minimum of two units and a maximum of 32 units. Only one master is allowed per group.

11.3 Manual Control

Manual control is design to assist troubleshooting and during startup. Each of the analog outputs and digital outputs are capable of being override from the controlled logic. Applicable analog/digital outputs are selectable as **ON**, **OFF**, or **AUTO** mode. The following components are available in the manual setting.

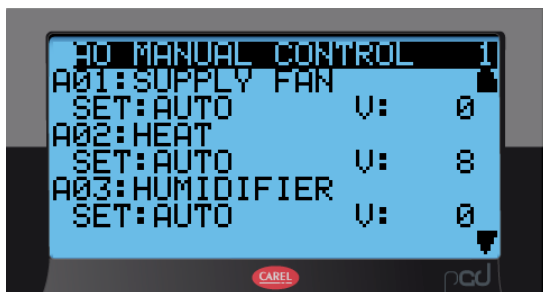


Note: Do not use this option to permanently turn off components such as reheat or humidifier. Refer to Factory->HVAC setting for detail.

Default Setting: AUTO for all components

- Blower
- Low pressure bypass
- Heaters
- Compressors
- Liquid Solenoids
- Humidifier
- Analog outputs
- Global alarm

Note: All analog outputs must be set to "0" for normal operation.



12.0 FACTORY SETTING

The controller is fully programmed at the factory to meet its specifications. Adjustments to the default settings sometime are required in the field to fine tune the controller to adapt it to the environment.



Note: A level 3 password is required to gain access to the Factory Menu. Changes to the factory settings are crucial and only recommend for a well-trained technician or under factory guidance.

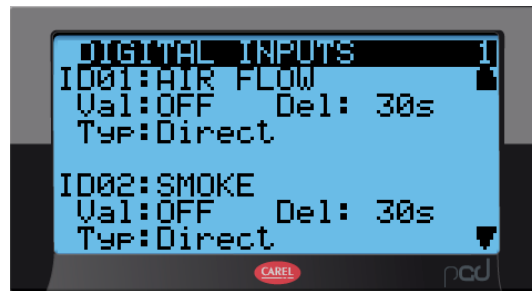
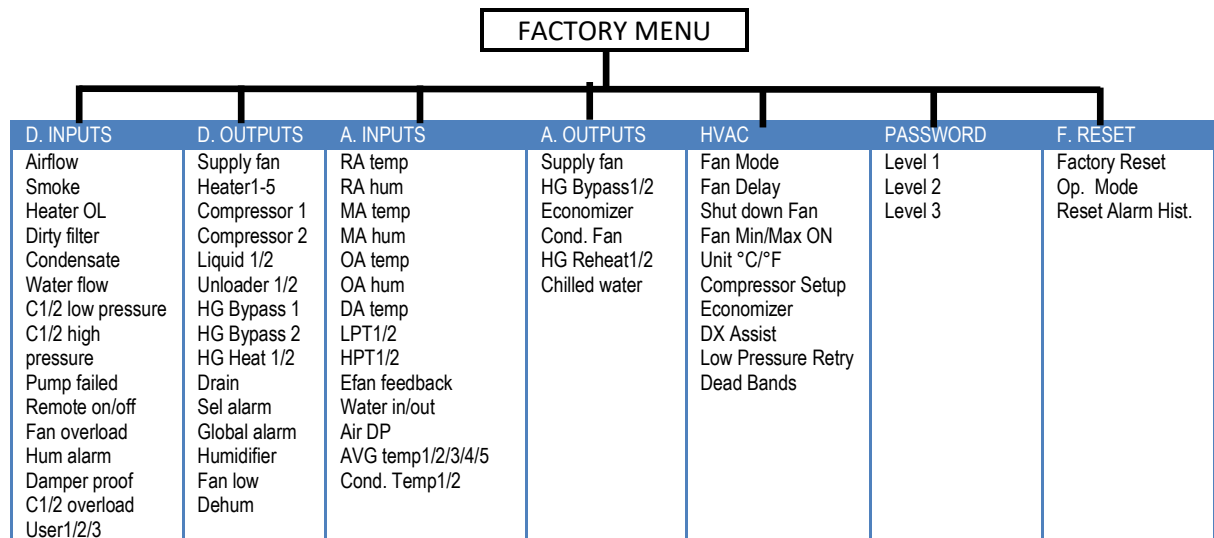


Figure 39 - Factory Setting

12.1 Factory Setting Menu Tree



12.1.1 Digital Inputs and Digital Outputs

All digital inputs and outputs are predefined and governed by the electrical wiring diagram. All settings are pre-configured at the factory prior to shipping. Changes are not recommended unless suggested by the factory. Consult the factory for more detail.

In general, the controller works with a 24VAC input from the normally opened relay. The internal relay from the controller sends out a 24VAC on the digital output terminals to designated coils in order to energize the high voltage components.

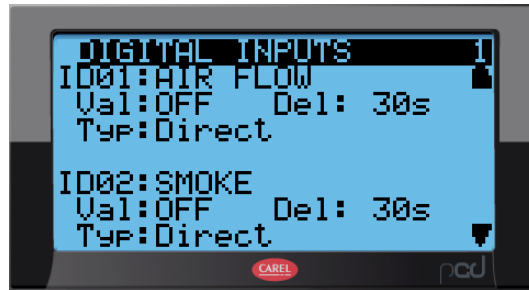


Figure 40. Digital inputs



Figure 41. Digital outputs

12.1.2 Analog Inputs and Analog Outputs

Analog input terminals on the controllers are used for a wide variety of analog sensors. The majority of input sensors are used for monitoring room temperature and humidity. NTC and transducers are also supported.

Analog output terminals are primarily used for economizer systems where modulating output signals are required. Consult the factory for any special equipment use request.



Figure 42. Analog inputs

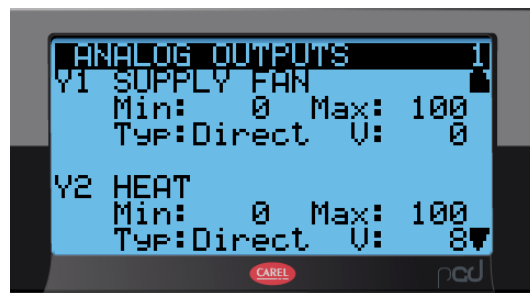


Figure 43. Analog outputs

Warning: Consult the manufacturer prior making any changes.

12.1.3 Changing Passwords

Default passwords are defined by the factory. See Entering a password for more detail. Adjustment to the default password is sometime required by the end user. Password is protected and not retrievable. Changes to the default password must be stored in a safe place. The factory cannot retrieve the lost or forgotten password.

Menu->Settings->Pwd change

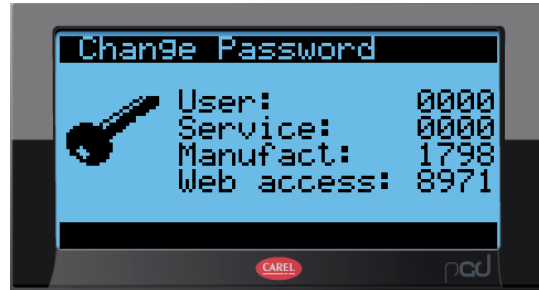


Figure 44. Password management

User:	Access to status and setpoints
Service:	Access to technician menu
Manufact:	Access to factory settings
Web access:	Access to web based interface

12.2 Factory Reset

Factory reset is used to reset the controller to its default setting. Not all default settings are applicable to all units.

Warning: Do not perform this function. It will wipe out all the default settings and return the controller settings back to its default values. A reconfiguration is required to set it back to its specifications.

Menu->Setting->Initialization

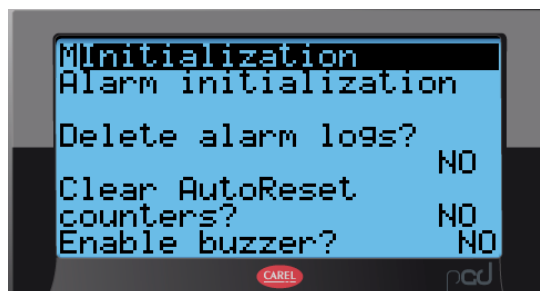


Figure 45. Factory reset

13.0 TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE	REMEDY
Black screen	Loss of power	Check 24Vac at controller and display
No link	Wrong unit ID	Check Unit ID. See “ CLAN setup ” for instruction.
	Incorrect wires	Check wiring on J11 from the controller to the display.
	Loss of communication link between controller & display	Make sure the controller and display get proper 24Vac voltage.
	Cable length	Check to make sure cables meets specification and not exceeding 200 meters for 24AWG.
Buzzer ON	Alarm events	Press the Alarm button to view the alarm. Press up/down arrow key to view next alarm.
	Alarm reset	Press the alarm button following by pressing the down arrow key until “Reset” shows on the screen. Tap the Reset button on the screen to clear the alarm.
Screen nonresponsive	Missed calibration	See “Screen Calibration” for detail on recalibration.
Modbus not communicating	Cabling	Check to make sure cable is comply with standard and not exceeding 1000 meters .
	Speed	Make sure computer and controller are set to the same speed. Default speed on the CONTROLLER controller is 19.2k .
	Add-on card not installed properly	Verify that the card is installed properly. Check the matting connectors with a flash light. Check for status light.
LONTalk not responding	Cabling	Verify the physical wires between the controller and the BMS system. A parallel cable should be in used.
	Not commission	Decommission and commission the card. Use a Wink command to check response.
	Wrong speed configured	Verify that the speed is set to 4800 from the controller under “ Supervisor Setup ”. Check for LED status error code.
	BMS not accessible	Verify that the card is setup properly
PCOWeb fails communication	Wrong cable	A crossed over cable is required for direct connection from PC to controller
	Add-on card not installed properly	Check for proper matting connectors between the controller and the add-on card
	Incorrect IP	Check DHCP server for correct IP. Boot up in factory setting for default IP: 172.16.0.1 to assign static IP. See PCOWeb setup for detail

Wrong Temperature or Humidity reading or sensor fail	Wrong jumper setting	Pop open the sensor module and verify that the setting on the temp/hum sensor board is set to 0-1V
	Power supply	Check for proper 24VDC coming on +G and GND at the sensor board
	Water damage	Check for water condensation on the probe. Dry it out for any moisture. Relocate the sensors if necessary.
	Wrong offset / Calibration	Check for sensor offset and recalibrate against a reference point if necessary.
Alarm not reset	Alarm source not rectified	Check for the cause of the alarm. The alarm cannot be cleared if the cause of the alarm still persists.
Stuck in Manual Mode	Force components ON	Set all components under "Manual Ctrl" screen to Auto mode
Compressor not ON	Incorrect setpoint	Check system setpoint for cooling temperature. Compressor only runs when temperature drops below room setpoint.
Reheat Lockout	Over amp protection	System incorporate a reheat lockout if cooling and humidifier are ON
High Temperature	Temperature rises above max setpoint	Room is too hot. Check sensor and reset alarm after fixing the problem.
Low Temperature	Temperature drops below min setpoint	Room is too cold. Check sensor and reset alarm after fixing the problem.
High Humidity	Humidity rises above max setpoint	Too much moisture in the air. Check and reset the alarm after fixing the problem.
Low Humidity	Humidity drops below min setpoint	Room is too dry. Check and reset the alarm after rectify the problem.
No Air Flow	Static pressure drop	Check motor, duct work, and filter. Reset the alarm after rectifying the problem.
	Sensitive switch	Check and recalibrate the switch if necessary. Consult the electrical wiring for more detail.
Dirty Filter	Clogged filter	Check and replace filter if necessary
	Sensitive switch	Check the dirty air filter switch and recalibrate the sensitivity level if necessary. Consult the electrical wiring for more detail.
High Pressure	Refrigerant pressure rises above limit	Check the high head pressure and reset the alarm after a manual reset on the pressure switch.
Low Pressure	Refrigerant pressure drops below limit	Check for low pressure switch. Change low pressure bypass time out and reset the alarm after rectifying the problem.
Compressors short cycling	Compress ON/OFF too frequent	Check discharge and return air temperature. Adjust compressor Max ON if needed.
Heater Overheat	Heater overload	Check if heater is overloading. Check and reset alarm after rectifying the problem

	Incorrect trigger level	Verify setting under "Technician->DI Setup->Heater Overheat" Alarm IF=Closed
Smoke Alarm	Smoke detected	Check for fire hazard and reset alarm after rectifying the problem.
Condensate Alarm	Water detected	Check for water level on the bottom tray. Check drain valve and reset alarm after rectifying the problem.
Pump failed	Condensate pump failed	Check pump for proper voltage and wiring. Check pump's floaters for consistency. Check if water still resides in pump's reservoir. Reset alarm after rectifying the problems.



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