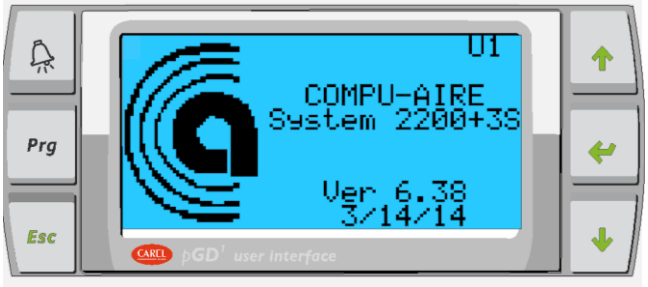
COMPU-AIRE INC.
Specialized Environmental Air Conditioning Systems

SYSTEM 2200+3S
PROGRAMMABLE CONTROLLER
-USER MANUAL-



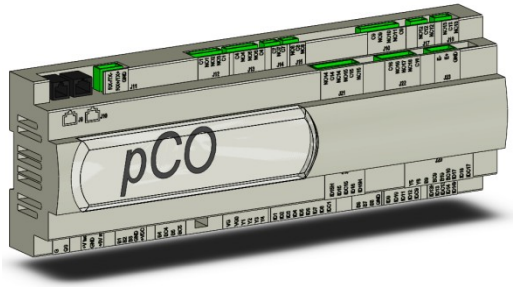


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Table of Contents

Table of Figures

1.0 INTRODUCTION

The System 2200+3S is a programmable controller based on a double microprocessor, designed for precise "Smart" control of an air conditioning system. The System 2200+3S 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 2200+3S 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 2200+3S basic parameters. The controller is linked to a graphic display terminal via standard three wire cable.

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.
- For remote mounted controllers, make sure the **UNIT ID** is matching with the **Tag ID** number.

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 programmable delays to meet demand for cooling and dehumidification
- 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

- Press the Power button ON/OFF key once to turn it ON and press it again to turn it OFF
- The System Status screen should indicate the current system operating mode
- Default time delay 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 – p-LAN Network

System 2200+ series controllers can be set for n+ redundancy setup. A maximum of 16 units can be linked together on the p-LAN network. The p-LAN networked units are identified with unit ID numbers. The p-LAN software resides in the unit ID# U01 which is also called as a MASTER unit. All the other units on that network are considered as SLAVE units. Each controller is self-dependent with necessary sensors and it can be used as a stand-alone unit. When used on the p-LAN Network, each unit must have the same software revision and set to maintain the same set points and safety alarms. The unit U01 must be set for the total units on the network.

When more than one unit are connected through p-LAN network for lead/lag operation, the first controller, unit ID# U01 is defined as the “Master” and the rest (U02, U03 ….U16) are define as

"Slave". The Master always starts first to maintain the temperature and humidity set points. The Slave is kept on standby as long as the Master is able to achieve the set points within the dead band. When the Master fails to do so, it calls in the Slave to assist. Then both units will be running towards the targets set on the Master (set points on the Slave is irrelevant in this situation). The Slave drops out when set points are achieved. When the Master fails by any of the selectable failures (such as compressor high/low pressure failure and fire alarm), the Master drops off and the Slave comes in to work independently according to its own set points until the Master is recovered. When the system is reset and restarted, the Master comes in first and follows the above rules.

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 PCO3 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 bellow 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 filed 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 filed 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 is 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 2200+3S 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 System Information

SYSTEM INFORMATION: selecting this function displays information on the software loaded and on the size of the RAM and Flash installed. The screen displayed is similar to the one below.

B	O	O	T		V		4	.	0	0		1	0	/	0	1	/	0	6
B	I	O	S		V		4	.	0	0		0	3	/	0	2	/	0	6
>	2	+	2	M	B			<											
A	P	P	.		C	R	C		:		3	3	5	D			2	M	B

The first row displays the BOOT version and date. In the example shown in the figure, the pCO is working with BOOT 4.00 of 10 January 2006.

The second row displays the BIOS version and date. In the example shown in the figure, the pCO is working with BIOS 4.00 of 3 February 2006.

The third row indicates the size of the Flash on board and, on the pCO1 and pCO2, also the size of the Flash in the parallel key or on the expansion board, if featured. The “>” and “<”characters indicate the starting Flash used by the pCO: to the left if the pCO starts from the Flash on board, to the right if the pCO starts from the key. In the example, the pCO is running the BOOT, BIOS and application loaded on the board, and there is no key or memory expansion.

The fourth row displays the CRC of the application and the amount of Flash it occupied. In the example, the CRC of the application is 335D and it requires 2 MB of memory to run. If this row shows 1 MB, a pCO with 1 MB Flash can run the program.

The CRC is a number that summarizes the application loaded in the flash memory on the pCO, as well as some other system information. Consequently, the version of the application can be recognized using the corresponding screen.

5.0 TECHNICAL SPECIFICATIONS

5.1 Controller and Display

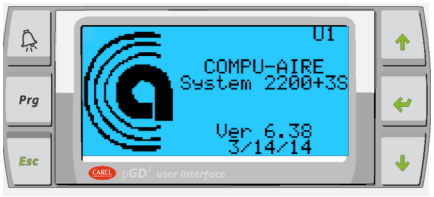


Figure 1 - External PGD1 display

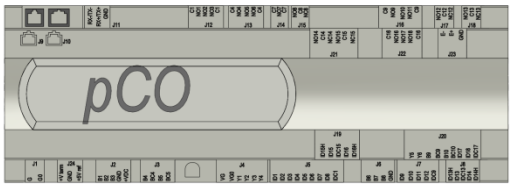


Figure 2 - Controller

Figure 3 - Controller with built in Internal display

5.2 General Characteristics

PCO3 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. PCO3 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 E2promfor safe keeping even in the event of power failures (without requiring a backup battery). PCO3 also allows connection to the pLAN (pCO Local Area Network) and can be connected, as well as to other pCO3 controllers. All the controllers in the pLAN can exchange information (variables, digital or analogue, depending on the application software used) at high transmission speed. Up to 32 units can be connected, including pCO controllers and terminals, so as to share the information effectively. The connection to the supervisor serial line, via the CAREL or Modbus™ communication protocol over the RS485 standard, is performed by inserting an optional serial board in the pCO3. Other optional cards can be used to connect to a supervisor via standards other than RS485. Finally, the serial field bus interface, using the optional board, ensures connection to the field devices controlled.

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 mm2 - max 2.5 mm2
CPU	H8S2320, 16 bit, 24 MHz
Memory	2+2 MB
Clock	Built in with battery backup

5.5 Digital Inputs

Type	optically-isolated			
Maximum number		no. optically-isolated inputs at 24 Vac 50/60 Hz or 24Vdc	no. optically-isolated inputs at 24 Vac/Vdc or 230 Vac 50/60 Hz	Total
	SMALL	8	None	8
	MEDIUM	12	2	14
Minimum digital input pulse detection time	*Normally open* (open-closed-open)		200 ms	
	Normally closed (closed-open-closed)		400 ms	
Power supply to the inputs	external	230 Vac or 24 Vac (50/60 Hz)	+10/-15%	
		24Vdc	+10/-20%	

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 Analog inputs

A/D conversion	10 bit
Type	Universal: (inputs B1, B2, B3, B6, B7, B8) CAREL NTC temperature sensor (-50T90°C; R/T 10 kΩ at 25°C), HT NTC 0T150°C, voltage: 0 to 1 Vdc, 0 to 5 V ratiometric or 0 to 10 Vdc, current: 0 to 20 mA or 4 to 20 mA, selectable via software. Input resistance in 0 to 20 mA= 100Ω passive: (inputs B4, B5, B9, B10) CAREL NTC temp. sensor (see universal type), PT1000 (-100T200°C; R/T 1000 Ω at 0°C) or voltage-free digital input (5 mA), selectable via software
Delay	0.5s
Precision	± 0.3 % of full scale

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

Number I/O	5
Type	0-10V
Resolution	8bit
Max load	8 ohm
Precision	± 2 % of end scale on outputs: Y1, Y2, Y3 and Y4 -2%/+5% of end scale on: Y5 and Y6

5.8 Digital Outputs

Type	Relay
Max I/O	8

5.9 P-LAN Network Terminal

Type	RS485 half duplex asynchronous
Speed	62.5kbps or 115.2kbps
Terminal	6-pin telephone (J10)
P-LAN	3-pin plugin (J11)

5.10 Cable Length

Cable Type	Power Supply Distance	Power Supply
Telephone	50m	150mA from PCO3
AWG24 shielded cable	200m	150mA from PCO3
AWG20/22 shielded cable	500m	Separate power via TCONN6J000

The maximum cable length between the two PCO3 controllers using AWG20/22 shielded cable is 500 meters.

Note:

- A maximum of one terminal (pCOT, pCOI, pGD0, pGD1) can be connected, or two terminals but without using use the backlighting on display. One version of the pCO3 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.

5.11 Standard Input / Outputs

The following table defines standard I/O ports for the PCO3 controller. Refer to the electrical wiring diagram for actual wiring.

	CAREL pCO3 Large		Analog Input	NTC Probe	PT 1000	ON/OFF	0-1V	0-10V	0-20 mA	4-20 mA	Digital Input	24 Vac/Vdc	110/230 Vac	Analog Output	0-10 V	Digital Output	Relay (250Vac 8A res.)	Switching (24Vac/dc 10W)
	Analog Inputs																	
AI-1	Room/Return humidity	B1					X											
AI-2	Outside air humidity	B2					X											
AI-3	Room/Return temperature	B3	X															
AI-4	Discharge temperature	B4	X															
AI-5	Coil 1, OA, Water temperature	B5	X															
AI-6	Coil/Water temperature	B6																
AI-7	User input 1	B7																
AI-8	User input 2	B8																
AI-9	User input 3	B9																
AI-10	User input 4	B10																
	Digital Inputs																	
DI-1	Air Flow switch										X							
DI-2	Smoke Detector or Firestat										X							
DI-3	High limit heat										X							
DI-4	Compressor 1 low pressure										X							
DI-5	Compressor 1 high pressure										X							
DI-6	Condensate alarm										X							
DI-7	Filter alarm										X							
DI-8	Water flow switch										X							
DI-9	Compressor 2 low pressure										X							
DI-10	Compressor 2 high pressure										X							
DI-11	Standby Pump/Fan OL/ Humidifier alarm										X							
DI-12	Manual override/fan overload/remote on										X							
DI-13	Compressor 3 low pressure										X							
DI-14	Compressor 3 high pressure										X							
DI-15	Compressor 4 low pressure										X							
DI-16	Compressor 4 high pressure										X							
DI-17	User, Hum Lockout										X							
DI-18	User, Reheat Lockout										X							
	Analog Output																	
AO-1	None,cool/heat/hum/econ													X				
AO-2	None,cool/heat/hum/econ													X				
AO-3	None,cool/heat/hum/econ													X				
AO-4	None,cool/heat/hum/econ													X				
AO-5	None,cool/heat/hum/econ													X				
AO-6	None,cool/heat/hum/econ													X				
	Digital Outputs																	
DO-1	System Blower															X		
DO-2	Heat 1 / H Pump Valve 1															X		
DO-3	Heat 2 / H Pump Valve 2															X		
DO-4	Heat 3, Humidifier															X		
DO-5	Heat 4 , Humidifier, Condensor Fan, DH Fan, Alarm															X		
DO-6	Humidifier, Selected Alarms															X		
DO-7	Compressor 1															X		
DO-8	Compressor 2															X		
DO-9	Unloader 1															X		
DO-10	Unloader 2															X		
DO-11	Bypass 1															X		
DO-12	Bypass 2															X		
DO-13	Drain, Alarm, Selected Alarms															X		
DO-14	Compressor 3															X		
DO-15	Compressor 4															X		
DO-16	Bypass 3															X		
DO-17	Bypass 4															X		
DO-18	Off, Drain, Alarm, Selected Alarms															X		

5.12 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

5.13 Functional characteristics

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

PCO3 controller is available as a factory-installed assembly. Remote console box with graphic touch sensitive display wall-mount version is available for remote operation and monitoring of cooling units.

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

5.14 Building Management System

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

6.0 CONTROLLER INTERFACE

Figure 4 – Graphical user interface

6.1 Navigation Buttons

Key Name	Function
Up	Navigate up to previous entry
Down	Navigate down to next entry
Enter	Execute current selection
Alarm	View and Reset active alarms
Program	View Setup Menu
Escape	Exit and return to previous screen

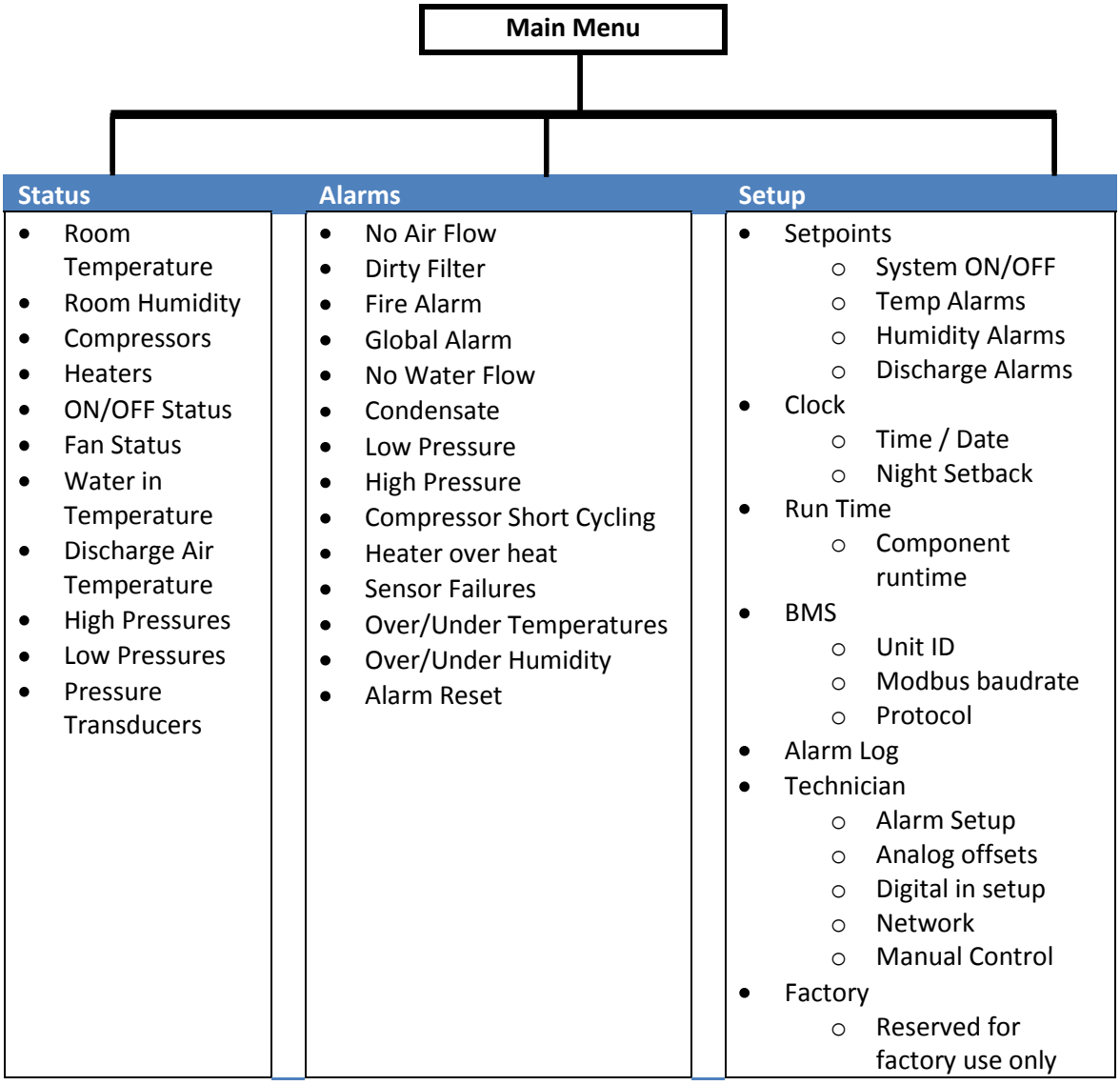
Table 1 - Navigating buttons

7.0 Navigation Menu

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

Figure 5 - Initial boot up screen

7.1 Menu Tree


Main Menu
Status
Room Temperature
Room Humidity
Compressors
Heaters
ON/OFF Status
Fan Status
Water in Temperature
Discharge Air Temperature
High Pressures
Low Pressures
Pressure Transducers
Alarms
No Air Flow
Dirty Filter
Fire Alarm
Global Alarm
No Water Flow
Condensate
Low Pressure
High Pressure
Compressor Short Cycling
Heater over heat
Sensor Failures
Over/Under Temperatures
Over/Under Humidity
Alarm Reset
Setup
Setpoints
System ON/OFF
Temp Alarms
Humidity Alarms
Discharge Alarms
Clock
Time / Date
Night Setback
Run Time
Component runtime
BMS
Unit ID
Modbus baudrate
Protocol
Alarm Log
Technician
Alarm Setup
Analog offsets
Digital in setup
Network
Manual Control
Factory
Reserved for factory use only

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* ***Leve2 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 2 - Main menu description for Figure 7

7.4 Unit Status

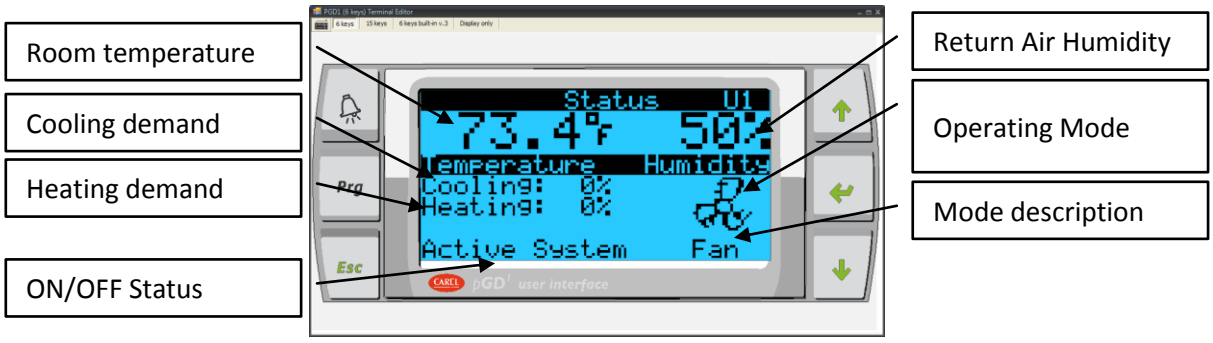
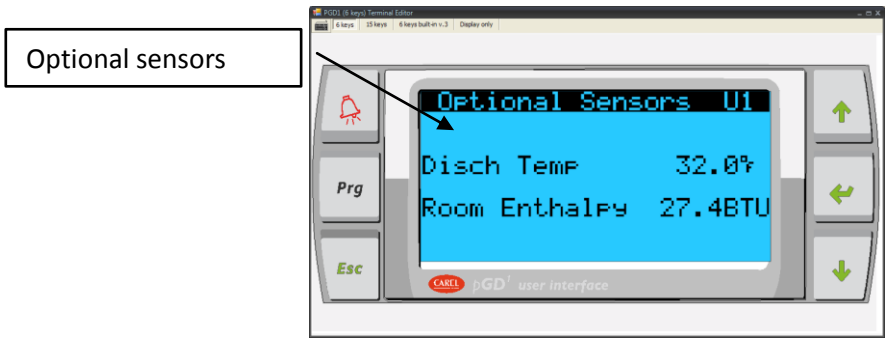


Figure 6 - System Status



General unit status shows the current room temperature, humidity, heating, and cooling demands. Additional sensors are listed by pressing the (up↑) or (down↓) buttons as shown in **Figure 8**. Pressing the (help?) button brings up the help screen as shown in **Figure 9**.

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 3 – Unit general status

7.5 Alarms

PCO3 controller provides both audible and visual alarm event log. Up to 100 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.

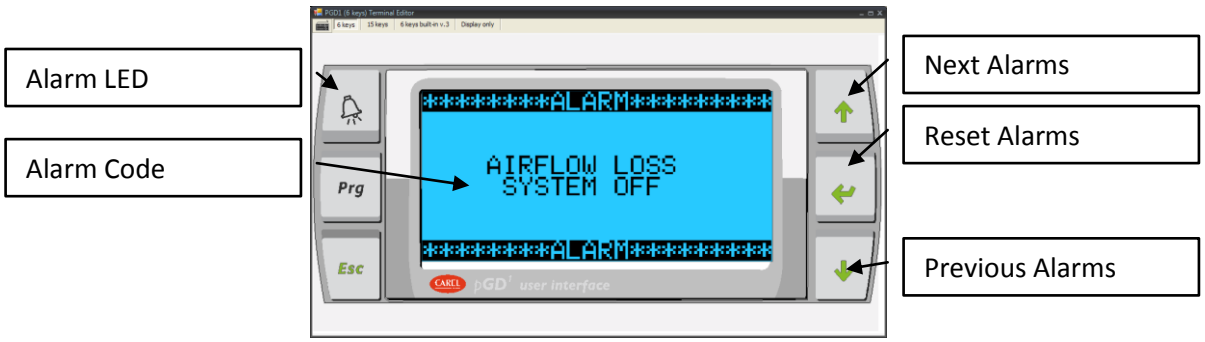


Figure 7 - Alarms Message

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	Clears out active alarms and turns off the alarm LED

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 2200+ series controller is already programmed, configured, and tested for your application. The system can be turned ON by using the ON/OFF button. The operating mode (Active System, System OFF, or Standby) is indicated under System Status screen. Minor tweaking might be required.

8.1 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.

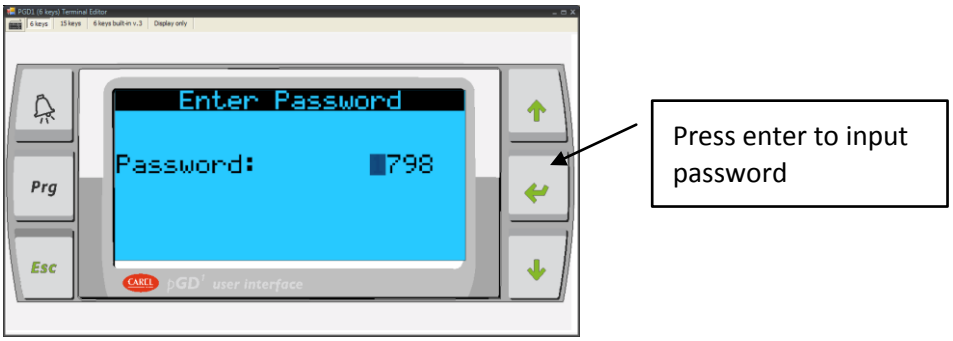


Figure 8–Password prompt

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

Table 4 - Default Passwords

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

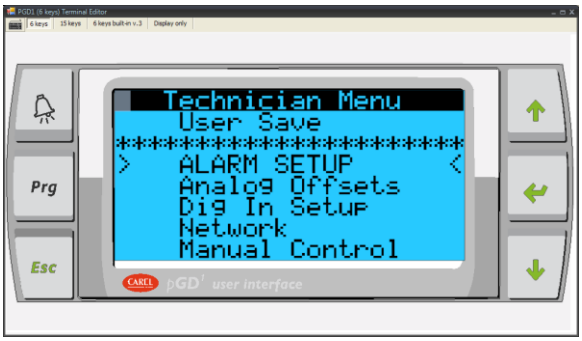


Figure 9 - Technician menu

8.2 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 Setting:

Temperature: 72°F Humidity: 50%

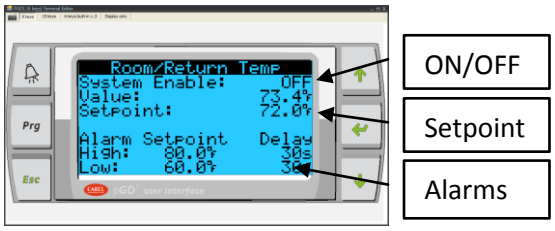


Figure 10 - Room temperature setpoints

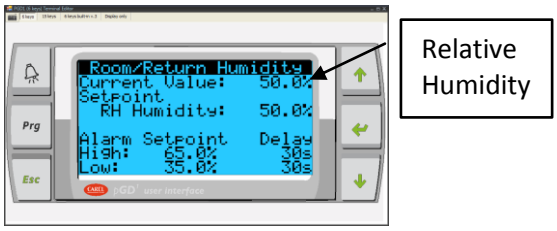


Figure 11 - Room humidity setpoints

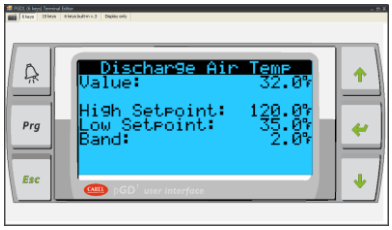


Figure 12 - Discharge temperature

8.2.1 Changing Setpoints

- Tap the Temperature/Humidity display
- Enter a new value from the virtual keyboard
- Tap on the enter button once done

8.2.2 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.

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

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.*

8.3 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.

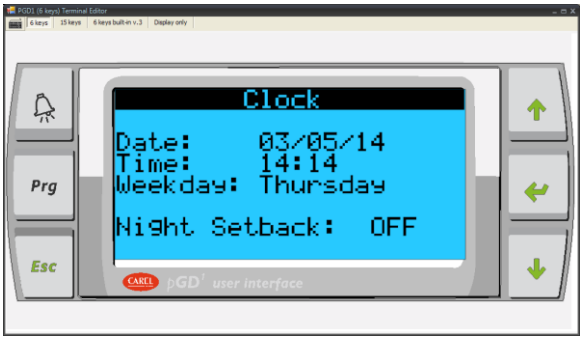


Figure 13 - Clock setup

8.3.1 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.

8.3.2 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.

Default Setting:
Night Setback: NO

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.

Setting Timer

- Change the Reset setting from “NO” to “YES”
- Press Enter from the virtual screen
- The run time hour is reset immediately
- Repeat the same process for other components

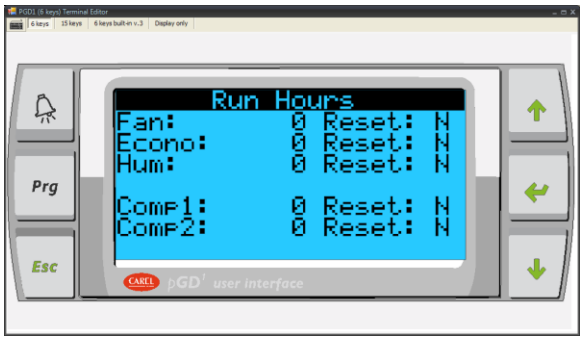


Figure 14 - Component run time meters

10.0 BUILDING MANAGEMENT SYSTEM (BMS)

PCO3 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 15 - Building management system

Figure 16 - 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

PCO3 controller also features an alternative method of networking multiple cooling unit in a built in standalone p-LAN 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 PCO3 controller supports an optional RS-485 card, which allows you to interface directly the pCO3 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 pCO3 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.

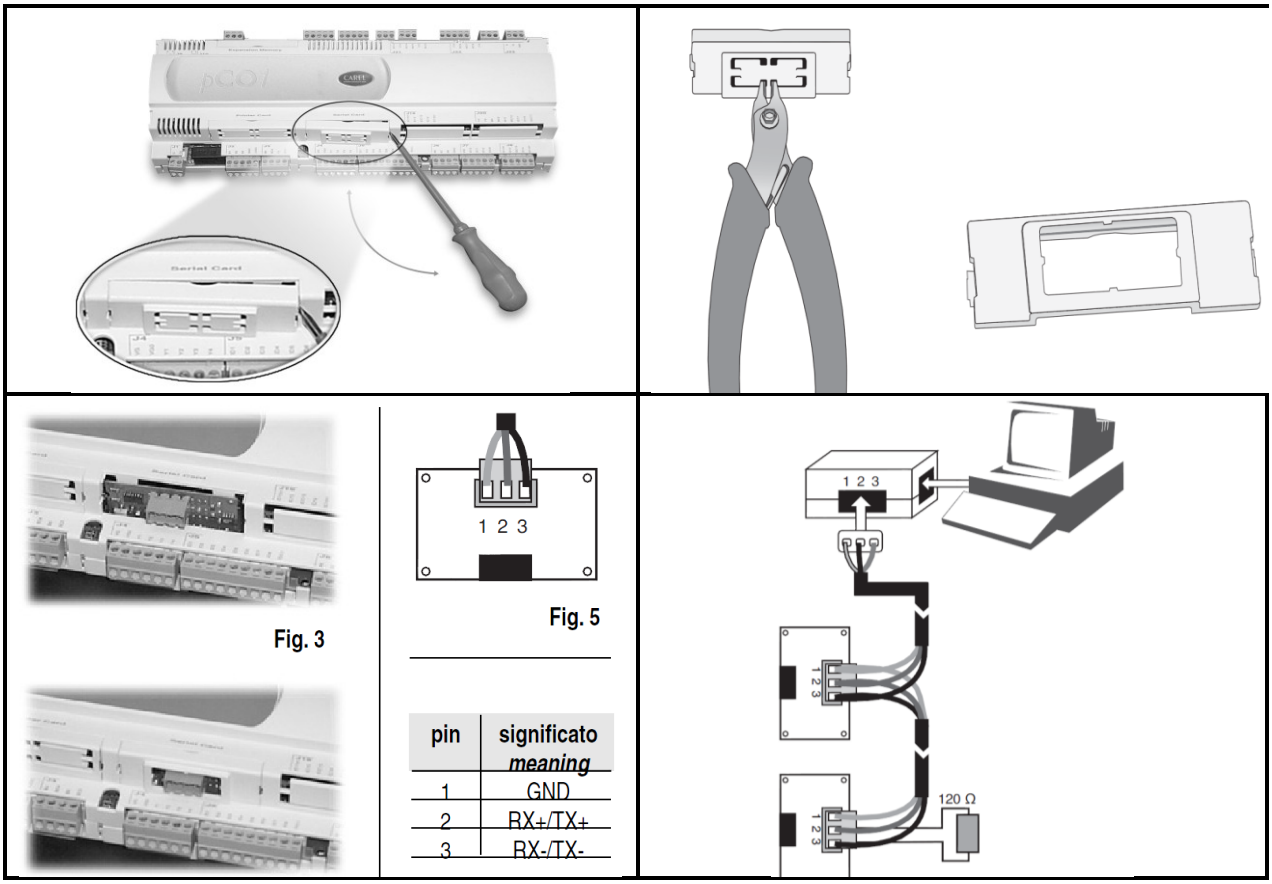


Fig. 3

Fig. 5

pin	significato *meaning*
1	GND
2	RX+/TX+
3	RX-/TX-

Table 5 - 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 POINTLIST

The following point list is available for LONWORKS, Modbus, and BACnet communication card. Use the corresponding register or index value to monitor it from the remote BMS system.

Carel		LONworks		Modbus	BACnet		
Type	**Index pCO**	**Name NV**	**Type NV**	**Register**	**Analog Value**	**Direction**	**Description**
ANL	1	nvoTmpSet/nviTmpSet	105	40002	1	R/W	Temperature set point
ANL	2	nvoTmpBand/nviTmpBand	105	40003	2	R/W	Temperature band
ANL	3	nvoHighTmpSet/nviHighTmpSet	105	40004	3	R/W	Temperature High alarm set point
ANL	4	nvoLowTmpSet/nviLowTmpSet	105	40005	4	R/W	Temperature Low alarm set point
ANL	5	nvoHumSet/nviHumSet	81	40006	5	R/W	Humidity set point / Dewpoint set point
ANL	6	nvoHighHumSet/nviHighHumSet	81	40007	6	R/W	Humidity High alarm set point
ANL	7	nvoLowHumSet/nviLowHumSet	81	40008	7	R/W	Humidity Low alarm set point
ANL	8	nvoHumBand/nviHumBand	81	40009	8	R/W	Humidity band
ANL	9	nvoTemperature	105	40010	9	R	Temperature reading
ANL	10	nvoHumidity	81	40011	10	R	Humidity reading
ANL	11			40012	11	R	Outside Air Humidity
ANL	12			40013	12	R	Discharge Temperature
ANL	13			40014	13	R	Outside Air Temperature
ANL	14			40015	14	R	Water Temperature
ANL	15			40016	15	R	User Sensor 1
ANL	16			40017	16	R	User Sensor 2
ANL	17			40018	17	R	User Sensor 3
ANL	18			40019	18	R	User Sensor 4
ANL	19	nvoHighPr_1		40020	19	R	High Pressure 1 (For pressure tranducer)
ANL	20	nvoLowPr_1		40021	20	R	Low Pressure 1 (For pressure tranducer)
ANL	21	nvoHighPr_2		40022	21	R	High Pressure 2 (For pressure tranducer)
ANL	22	nvoLowPr_2		40023	22	R	Low Pressure 2 (For pressure tranducer)
ANL	23	nvoCondPr_1		40024	23	R	Condenser Pressure 1 (For pressure tranducer)
ANL	24	nvoCondPr_2		40025	24	R	Condenser Pressure 2 (For pressure tranducer)
ANL	25	nvoOAEcono_Set		40026	25	R/W	Outside Air Economizer Setpoint
ANL	26			40027	26	R/W	Discharge Air Economizer Setpoint
ANL	27			40028	27	R/W	Water Economizer Setpoint
ANL	28			40029	28	R	Water Out Temperature
ANL	29			40030	29	R/W	Outside Air Humidity From BMS
ANL	30			40031	30	R/W	Outside Air Temperature From BMS
ANL	31			40032	31	R	Coil 1 Temperature Reading
ANL	32			40033	32	R	Coil 2 Temperature Reading
ANL	33			40034	33	R/W	Room Humidity From BMS
ANL	34			40035	34	R/W	Room Temperature From BMS
ANL	35			40036	35	R/W	Analog Out Y1 Signal From BMS
ANL	36			40037	36	R/W	Analog Out Y2 Signal From BMS
ANL	37			40038	37	R/W	Analog Out Y3 Signal From BMS
ANL	38			40039	38	R/W	Analog Out Y4 Signal From BMS
ANL	39			40040	39	R/W	Analog Out Y5 Signal From BMS
ANL	40			40041	40	R/W	Analog Out Y6 Signal From BMS

Carel		LONworks		Modbus	BACnet		
Type	**Index pCO**	**Name NV**	**Type NV**	**Register**	**Integer Value**	**Direction**	**Description**
INT	1	nvoTmpInt/nviTmpInt	8	40130	1001	R/W	Temperature control Integration time
INT	2	nvoHumInt/nviHumInt	8	40131	1002	R/W	Humidity control Integration time
INT	3	nvoStatus	8	40132	1003	output	0=System off, 1=system on, 2=active,3=standby,4=override,5=Remote Shutdown by digital Input, 6=Manual Control from Technician menu, 7=BMS Offline default manual contro, 8=Sensor failed, system override with default controlled values, 9=BMS Offline, system
INT	4	Analog Out Y1	81	40133	1004	R	Analog Out Y1
INT	5	Analog Out Y2	81	40134	1005	R	Analog Out Y2
INT	6	Analog Out Y3	81	40135	1006	R	Analog Out Y3
INT	7	nvoHumStatus	81	40136	1007	R	Humidity demand (0-100%)
INT	8			40137	1008	R	Analog Out Y4
INT	9			40138	1009	R	Analog Out Y5
INT	10			40139	1010	R	Analog Out Y6
INT	11			40140	1011	R	Current Day
INT	12			40141	1012	R	Current Hour
INT	13			40142	1013	R	Current Minute
INT	14			40143	1014	R	Current Month
INT	15			40144	1015	R	Current Second
INT	16			40145	1016	R	Current Weekday
INT	17			40146	1017	R	Current Year
INT	18			40147	1018	R/W	0 = NO ECONOMIZER 1= AIR 2= WATER 3= CHILLED WATER VALVE (HVAC)
INT	19			40148	1019	R	0 = Off 1= Vent 2 = Heat 3 = Cool 4 = Humidify 5 = Dehumidify 6 = Economizer 7 = Defrost

Carel		LONworks		Modbus	BACnet		
Type	**Index pCO**	**Name NV**	**Type NV**	**Register**	**Digital Value**	**Direction**	**Description**
DGT	1	nvoOnOffStat/nviOnOffStat	95	2	1	R/W	Unit ON/OFF Control (0=Off, 1=ON)
DGT	2	nvoTmpCntr/nviTmpCntr	95	3	2	R/W	Temperature control type 0=P 1=PI
DGT	3	nvoHuCntr/nviHuCntr	95	4	3	R/W	Humidity control type 0=P 1=PI
DGT	4	nvoAirflowAlm	95	5	4	R	no airflow alarm
DGT	5	nvoHighHtAlm	95	6	5	R	High heat Alarm
DGT	6	nvoSmokeAlm	95	7	6	R	Smoke alarm
DGT	7	nvoC1LPAlm	95	8	7	R	Compressor 1 low pressure alarm
DGT	8	nvoC1HPAlm	95	9	8	R	Compressor 1 high pressure alarm
DGT	9	nvoC2LPAlm	95	10	9	R	Compressor 2 low pressure alarm
DGT	10	nvoC2HpAlm	95	11	10	R	Compressor 2 high pressure alarm
DGT	11	nvoC1CycAlm	95	12	11	R	Compressor 1 short cycle alarm
DGT	12	nvoC2CycAlm	95	13	12	R	Compressor 2 short cycle alarm
DGT	13	nvoDrainAlm	95	14	13	R	Drain/Condensate/Leak detector alarm
DGT	14	nvoHighTmpAlm	95	15	14	R	High Temperature alarm
DGT	15	nvoLowTmpAlm	95	16	15	R	Low Temperature alarm
DGT	16	nvoHighHuAlm	95	17	16	R	High Humidity alarm
DGT	17	nvoLowHuAlm	95	18	17	R	Low Humidity alarm
DGT	18	nvoWtrFlAlm	95	19	18	R	Water Flow alarm
DGT	19	nvoFireAlm	95	20	19	R	Fire alarm
DGT	20	nvoHeat1Out	95	21	20	R	Heat1 output status
DGT	21	nvoHeat2Out	95	22	21	R	Heat 2 output status
DGT	22	nvoHeat3Out	95	23	22	R	Heat 3 output status
DGT	23	nvoHeat4Out	95	24	23	R	Heat 4 output status
DGT	24	nvoC1Out	95	25	24	R	Compressor 1 output status
DGT	25	nvoC2Out	95	26	25	R	Compressor 2 output status
DGT	26	nvoC3Out	95	27	26	R	Compressor 3 output status
DGT	27	nvoC4Out	95	28	27	R	Compressor 4 output status
DGT	28			29	28	R	humidifier alarm
DGT	29			30	29	R	
DGT	30			31	30	R	
DGT	31			32	31	R	standby unit on
DGT	32			33	32	R	filter alarm
DGT	33			34	33	R	discharge heat did not raise alarm
DGT	34			35	34	R	discharge cool did not fall alarm
DGT	35			36	35	R	fan overload
DGT	36			37	36	R/W	BMS Control Unit ON/OFF (Legacy, Need to Enable Under HVAC Option)
DGT	37			38	37	R/W	BMS Online Heart Beat (Write Digital 1 every 15 second)
DGT	38			39	38	R	Compressor 4 low pressure / User
DGT	39			40	39	R	Compressor 4 hi pressure / User
DGT	40			41	40	R	User with Humidify Lockout
DGT	41			42	41	R	User with Reheat Lockout
DGT	42			43	42	R/W	Emergency Economizer Off By BMS
DGT	43			44	43	R	
DGT	44			45	44	R	a unit is off pLAN network
DGT	45			46	45	R	user1 low alarm
DGT	46			47	46	R	user1 high alarm
DGT	47			48	47	R	user2 low alarm
DGT	48			49	48	R	user2 high alarm
DGT	49			50	49	R	user3 low alarm
DGT	50			51	50	R	user3 high alarm
DGT	51			52	51	R	user4 low alarm
DGT	52			53	52	R	user4 high alarm
DGT	53			54	53	R	Fan Output
DGT	54			55	54	R	Heater 1 Output
DGT	55			56	55	R	Heater 2 Output
DGT	56			51	56	R	Bypass 4 Output
DGT	57			58	57	R	Humidifier Output
DGT	58			59	58	R	Dehumidifier Output
DGT	59			60	59	R	
DGT	60			61	60	R/W	Reset Alarm Command
DGT	61			62	61	R	Unloader 1 Output
DGT	62			63	62	R	Unloader 2 Output
DGT	63			64	63	R	Bypass 1 Output
DGT	64			65	64	R	Bypass 2 Output
DGT	65			66	65	R	System Alarm
DGT	66			67	66	R	Remote On command via digital input
DGT	67			68	67	R	
DGT	68			69	68	R	Bypass 3 Output
DGT	69			70	69	R	Alarm 2
DGT	70			71	70	R	Condenser Fan Output

10.3 LONWORKS

The serial interface boards for LonWorks® networks are optional accessories for the PCO3 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.

10.3.1 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.

10.3.2 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.

10.3.3 Physical Circuit Board Layout

1. Connector to the PCO3 Controller
2. Terminal block for LonWorks® network (GND, A, B)
3. Service pin
4. Green service LED
5. Red fault LED

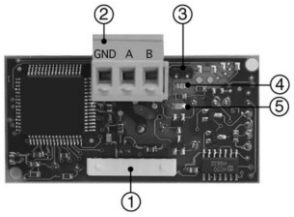


Figure 17 - LONTalk Card

Note: *The ground wire (GND) is not requires in some application.*

10.3.4 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.

10.3.5 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)

10.3.6 Connection to the PCO3 Controller

With reference to **Figures 25-28** below, insert the board in the pCO3 as follows:

1. Disconnect the power supply to the pCO3 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 PCO3
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.

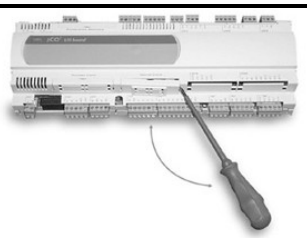


Figure 18 - Remove plastic cover

Figure 19- Cut out window

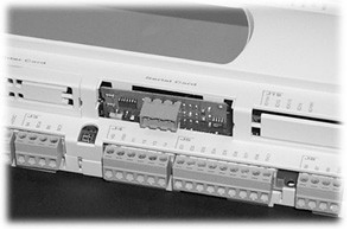


Figure 20 - Installing plugin card

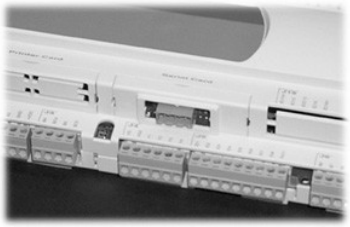


Figure 21 - Replacing windows cover

10.3.7 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.

10.3.8 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.

10.3.9 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.

10.4 BACNET OVER TCP/IP

10.4.1 Installation

The board is installed in the PCO3 controller, when off, as follows

1. Remove the “Serial Card” cover from the PCO3 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 PCO3. 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 PCO3, 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.

10.4.2 Functions

The pCOWeb board is used to connect the pCO3 controller to an Ethernet network and consequently perform the following functions.

- Access the information on the pCO3 (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

10.4.3 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: fhttpadmin**
- **“guest” user password: fguest**

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

When the pCOWeb is off:

- switch on the pCO3 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)*

10.4.4 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.

10.4.5 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 pCO3 will be connected to.

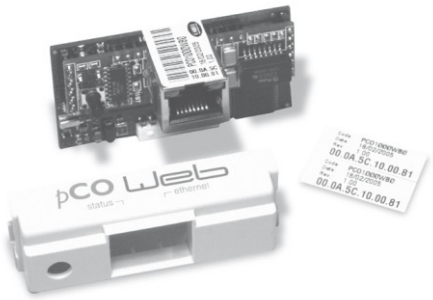


Figure 22 - PCOWeb

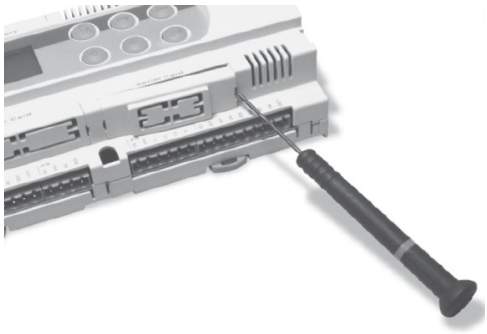


Figure 23 - Window cover

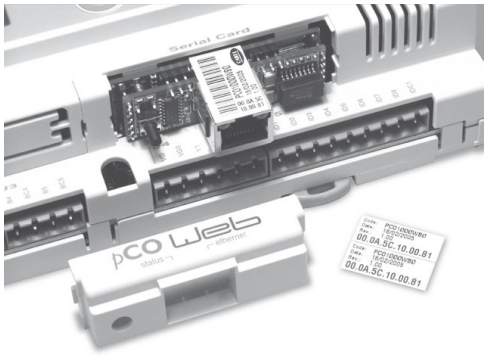


Figure 24 - Installing PCOWeb

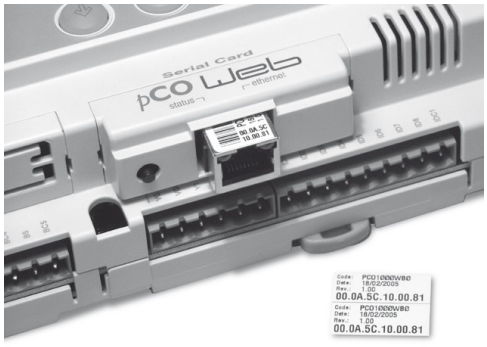


Figure 25 - Installing plastic cover

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.*

10.4.6 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 pCO3 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).

10.4.7 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 6 - 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.*

10.4.8 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.

10.4.9 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 pCO3.

PCOWeb manages some standard traps and allows a trap to be defined for each digital variable on the pCO3. The parameters relating to the management of the SNMP protocol can be set using the administrator configuration pages.

10.4.10 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 pCO3. The parameters relating to the management of the BACnet protocol are set using the administrator configuration pages.

10.4.11 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).

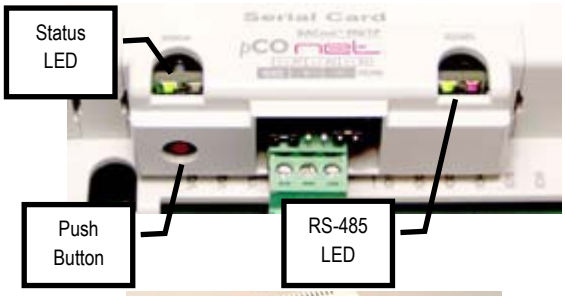
10.5 BANET over MS/TP

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

10.5.1 Installation

1. Disconnect the power supply from the pCO3 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 pCO3. 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 G0 on the PCO3 board must be grounded. The board cannot be installed in direct contact with the metal panel on the electrical panel.*



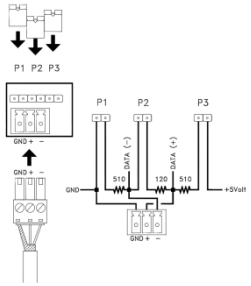


Table 7- Installation guide

10.5.2 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.

10.5.3 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 pCO3) PCOnet-pCO* communication starts.

Status of communication with the pCO3: Once the starting sequence has been completed, the Status LED flashes to indicate the quality of communication with the PCO3:

- Quick green-OFF-green if communication with the pCO3 is OK (pCO* ON-LINE);
- Slow red-OFF-red if communication has not been established with the pCO* (pCO3 OFF-LINE)
- Green-red-green if PCOnet detects errors or a temporary lack of response from the pCO3.

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.

10.5.4 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

10.5.5 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).*

10.5.6 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 8 - 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.

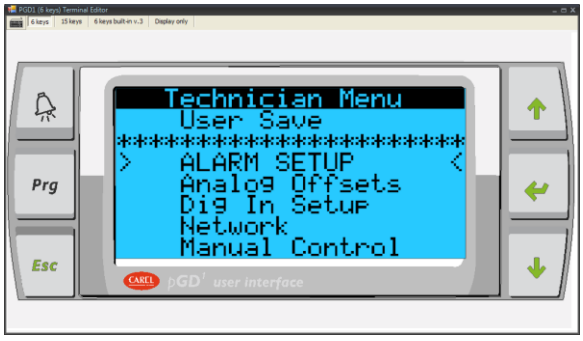


Table 9 - Technician menu

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	P-LAN network setup
Manual Control	Manual control for each components

Table 10 - 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.

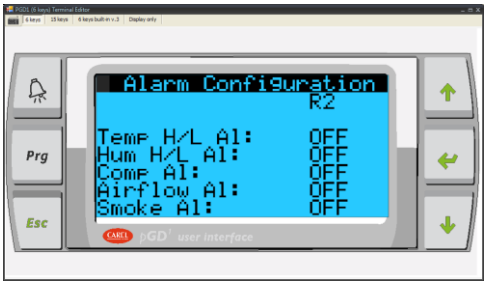


Figure 26 - Alarm setup

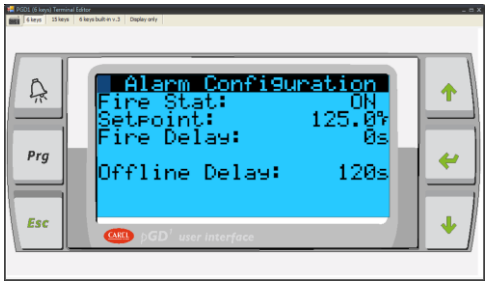


Figure 27 - Alarm Setup

R2 = Selectable alarms

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

Default Setting:

Configuration	R2	SW	Configuration	R2	SW
Temp. H/L Alarm:	OFF	OFF	Dirty Filter Alarm:	OFF	OFF
Hum. H/L Alarm:	OFF	OFF	Sensor Failure Alarm:	OFF	ON
Compressor Alarm:	OFF	ON	Drain Full Alarm:	OFF	OFF
Air Flow Alarm:	OFF	ON	Fire Stat Alarm:	OFF	OFF
Smoke Detect 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 11 - 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.

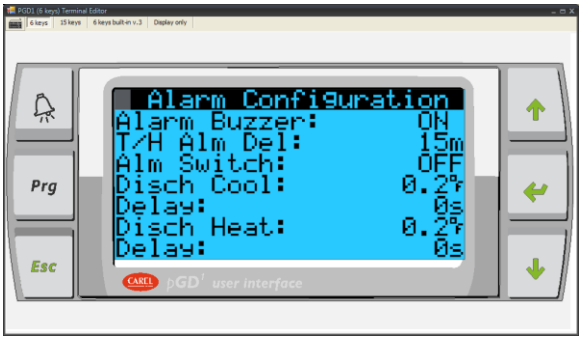


Figure 28 - Alarm delays

The PCO3 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

PCO3 controller provides sensor calibration to match the reading to a reference device. Setting can be positive or negative offset. All adjustments take effect immediately.

Table 12 - Sensor calibration

Default Setting

Offset: 0

11.1.3 Digital Input

Digital setup is reserved for factory used only. If required, adjustment can be made to fine tune the equipment to work with other applications. The controller is designed to recognize a 24VAC signal from the sensor and trigger a corresponding alarm which is commonly used in normally opened relay. In some cases, where a normally opened relay is use, a reverse logic must be set in the controller to get the alarm function to register properly. Available options are closed and open.

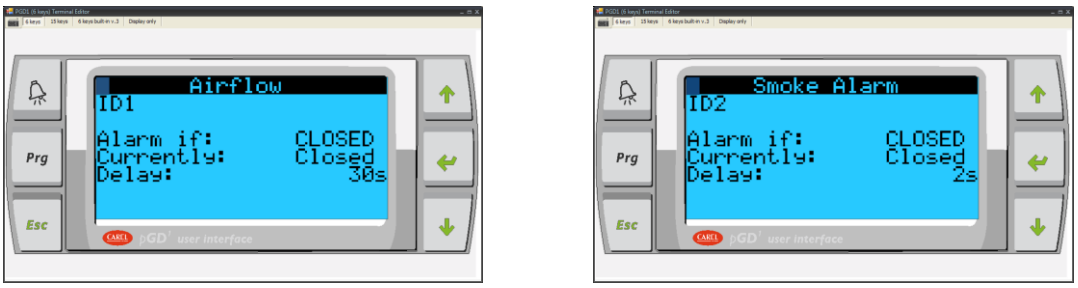


Table 13 - Digital Input Setting

Setting Description

Alarm If: CLOSED: Used for normally open sensor
OPEN: Used for normally closed sensor

Currently: Read only OPEN/CLOSED
Shows the current status of the input relay

Available Options

Smoke Alarm	No Air Flow	Hi Heat Limit
Compressors Low	Compressors High	Dirty Filter
Water Flow		

11.2 Network Setup

The controller supports up to 16 units working together as single unity in a p-LAN network. A P-LAN network composes of one (1) master unit with up to fifteen (15) slave devices. Proper unit identification is required prior to proceeding. See P-LAN setup section for more information.

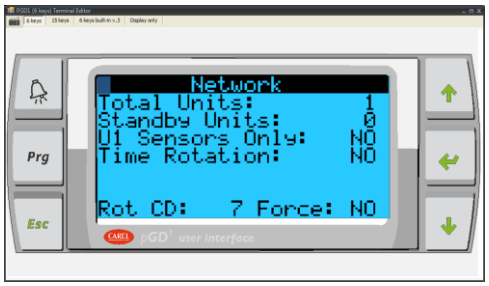


Figure 29 - Network Setup

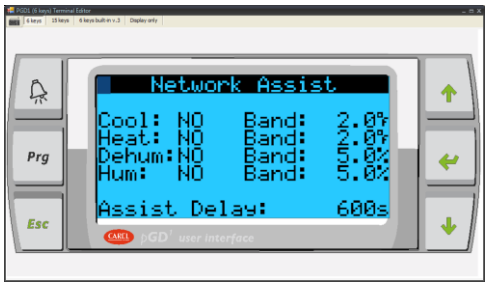


Figure 30 - Network Assist

Note: *A P-LAN network has a minimum of two units and a maximum of sixteen units. Only one master is allowed. The Network Setup screen is accessible by the master unit ID=1. This option is not available on the slave unit.*

11.2.1 Define a Network

Icon	Function
Total Units	**Total unit including the master**
Standby Units	**Number of standby units**
Use U1 Sensors	**Use master unit sensors for every units**
Time Rotation	**Number of day and time to rotate**
Force Rotation	**Force the standby unit to become active**

Table 14 - Setting a P-LAN network

11.2.2 Network Assist

In a P-LAN network, all standby units are capable of assisting the active unit in cooling, heating, dehumidifying, and humidifying mode. The dead band of each individual mode can be set according to **Figure 37**. The delay of assistance is set to 600 seconds by default. After 600s, standby units become active and assist only if the active unit is unable to maintain the setpoints

in the elapsed time. Once the setpoints are satisfied, standby units return to standby and the cycle starts over.

11.3 Manual Control

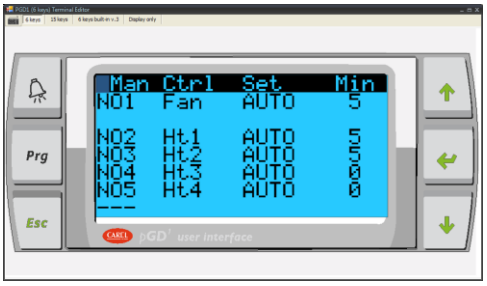
Manual control is designed to turn on necessary components for a fixed amount of time. This function can be used to vacuum and charge the unit, service the unit, or perform a functional test. After an adjustable time out **(defaults to 5 minutes, max 99 minutes)**, the designated component returns back to **AUTO** and resumes its normal operation. Applicable analog/digital outputs are selectable as **ON, OFF,** or **AUTO** mode. The following components are available in the manual setting.

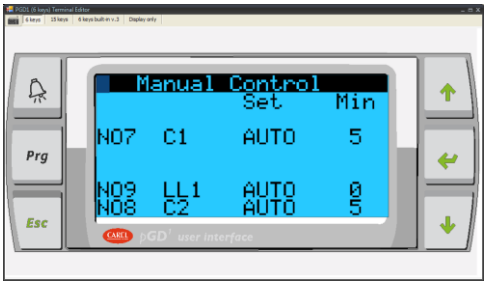
Note: Do not use this option to permanently turn off components such as reheat or humidifier. Refer to Factory->HVAC setting for detail.

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.*

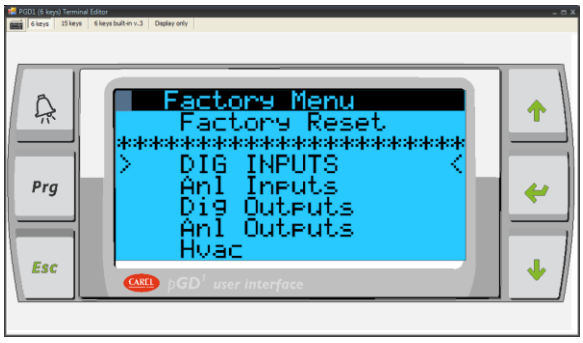
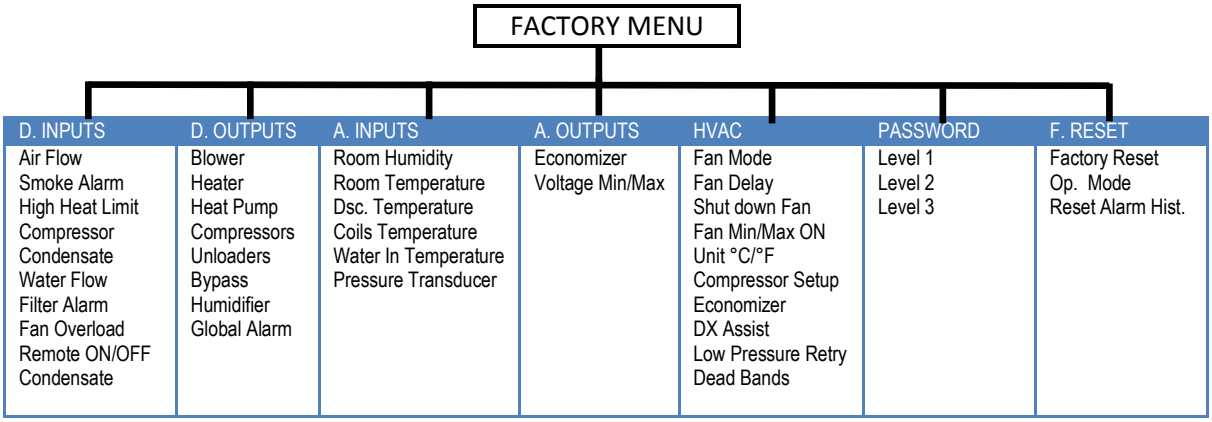


Figure 31 - Factory Setting

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 32 - Digital input configuration

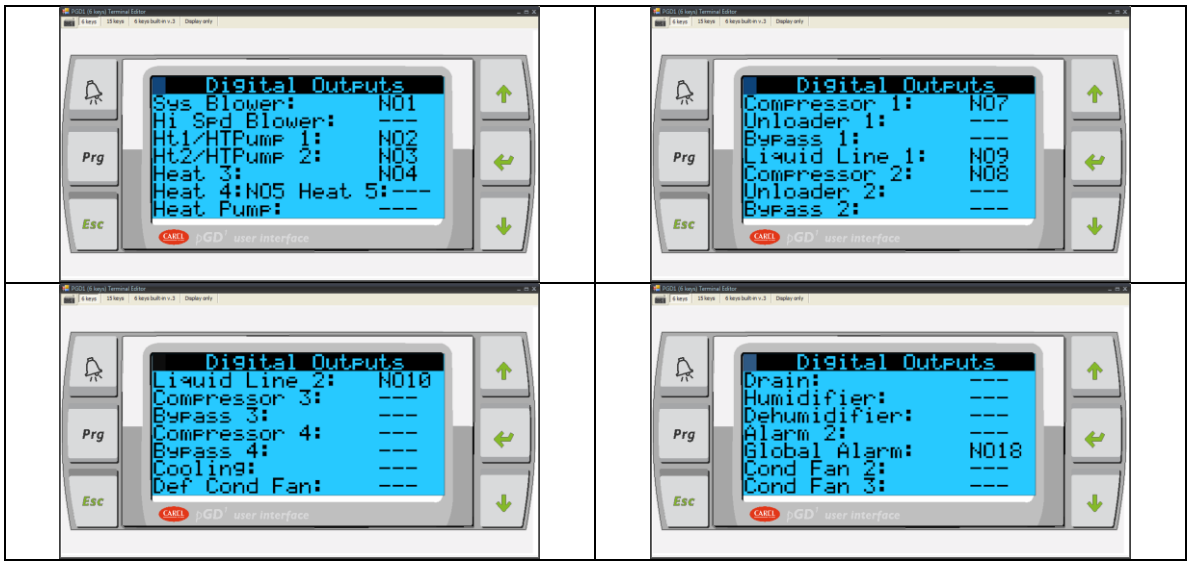


Figure 33 - Digital output configuration

12.1.2 HVAC

The HVAC section contains crucial settings that can have great impact how the system perform. All changes made in this section should be dealt with extra. Consult the factory if assistance is needed. Not all options are available on all units.

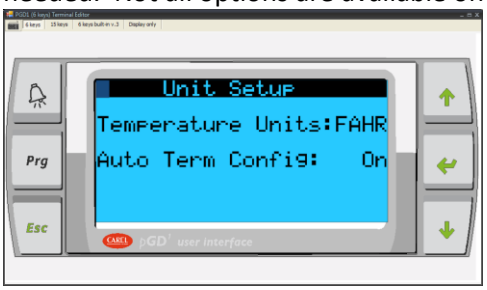


Figure 34 – Unit setup

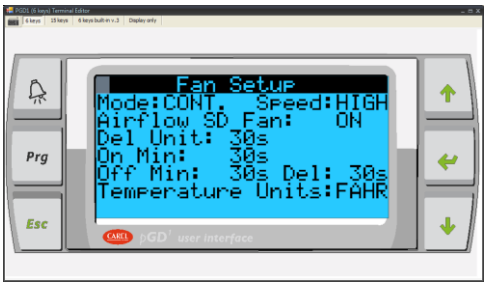


Figure 35 - Fan setup

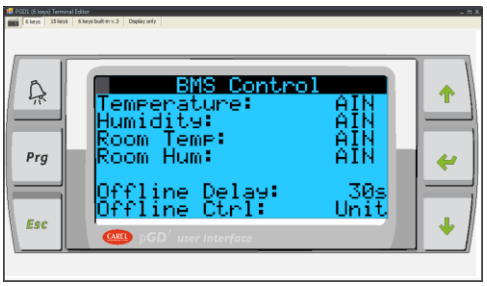


Figure 36 – BMS control

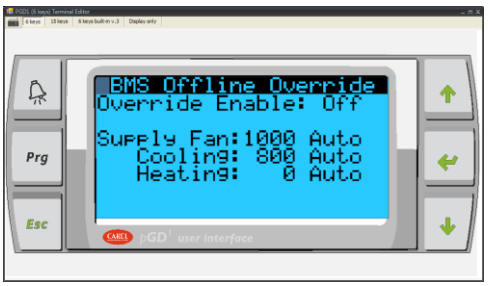


Figure 37 – BMS Offline control

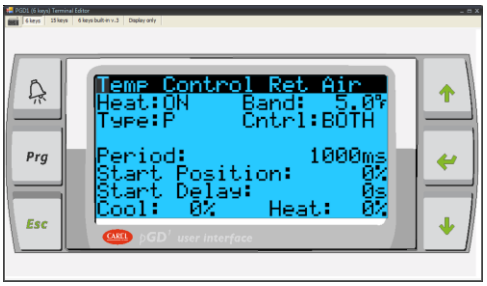


Figure 38 – Temperature control

Figure 39 - Deadband

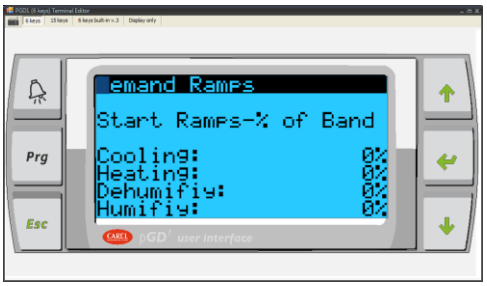


Figure 40 – Ramping

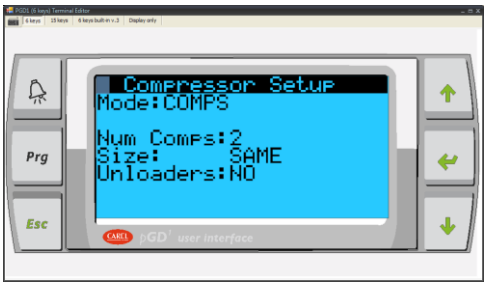


Figure 41 – Compressor setup

*Factory reserved. Do not use.

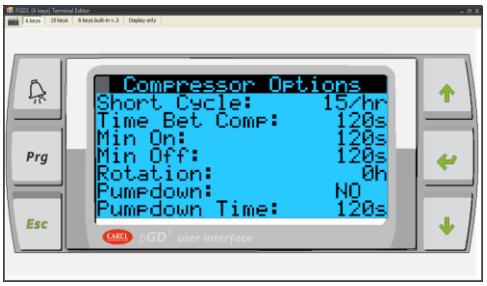


Figure 42 – Compressor options

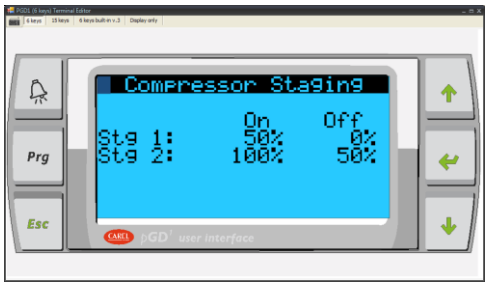


Figure 43 – Compressor staging

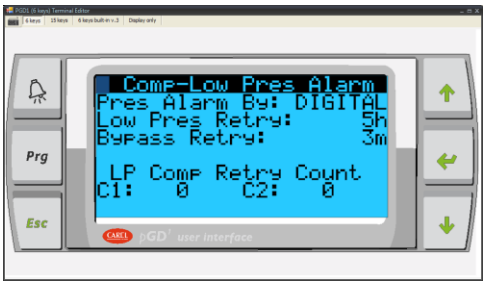


Figure 44 – Low pressure alarm

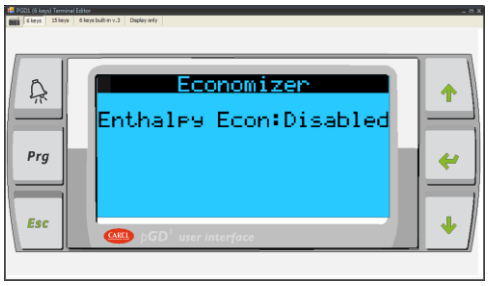


Figure 45 - Economizer

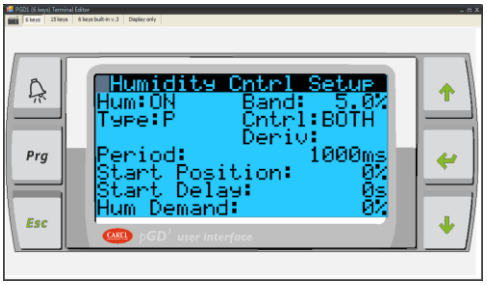


Figure 46 – Humidity control

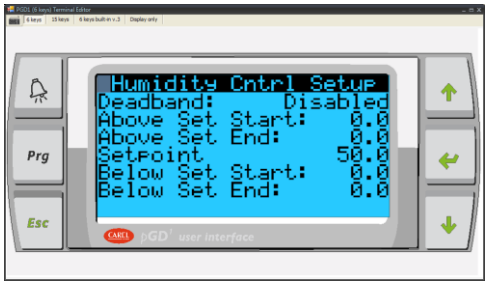


Figure 47 - Humidity deadband

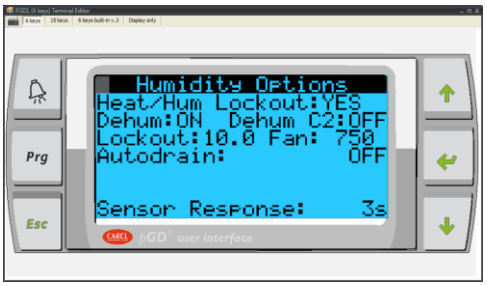


Figure 48 - Dehumidification options

Figure 49 - Heater setup

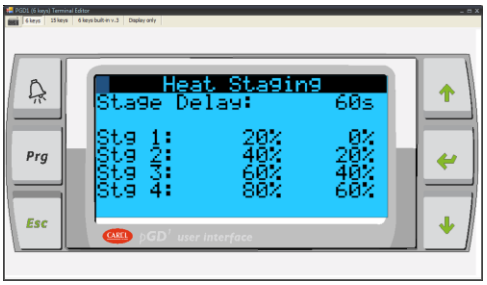


Figure 50 - Heating stages

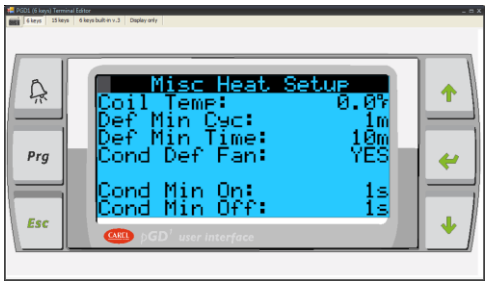


Figure 51 - Misc Heat setup

12.1.3 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.

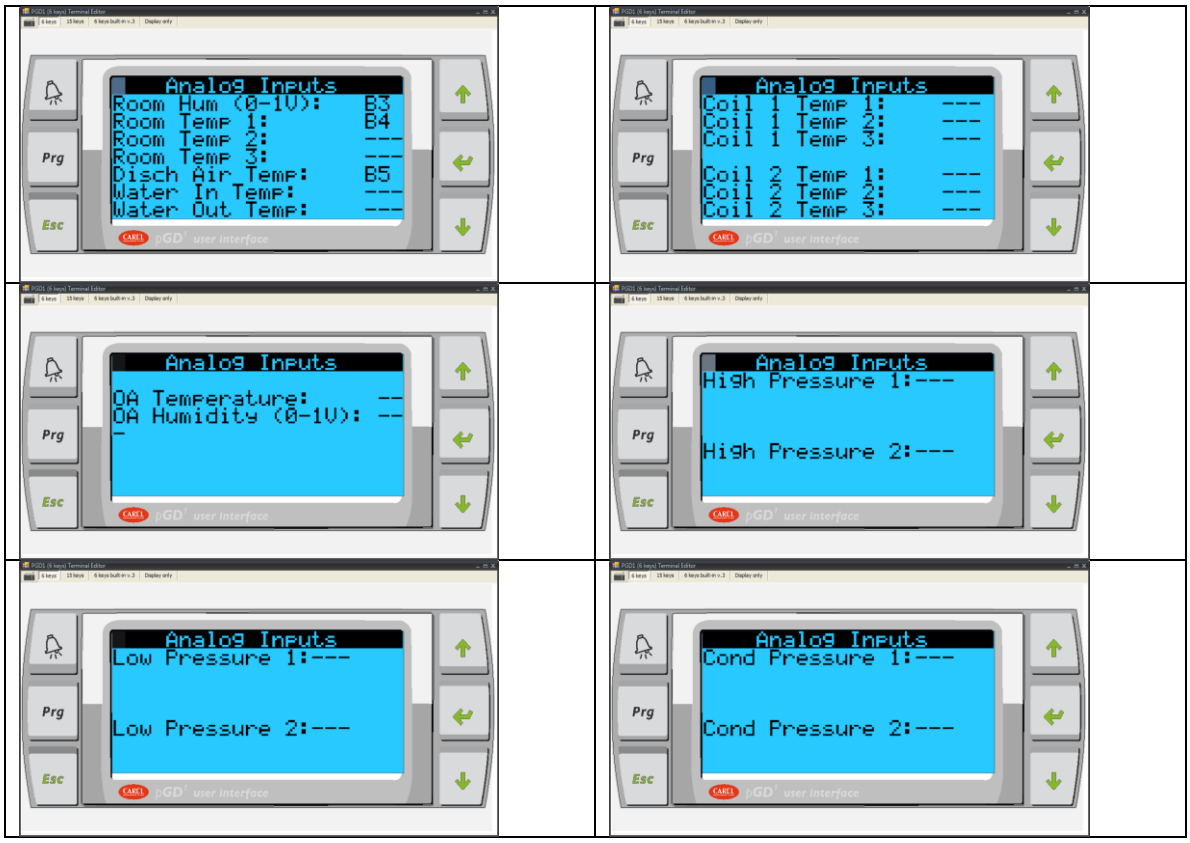


Figure 52 - Analog input configuration

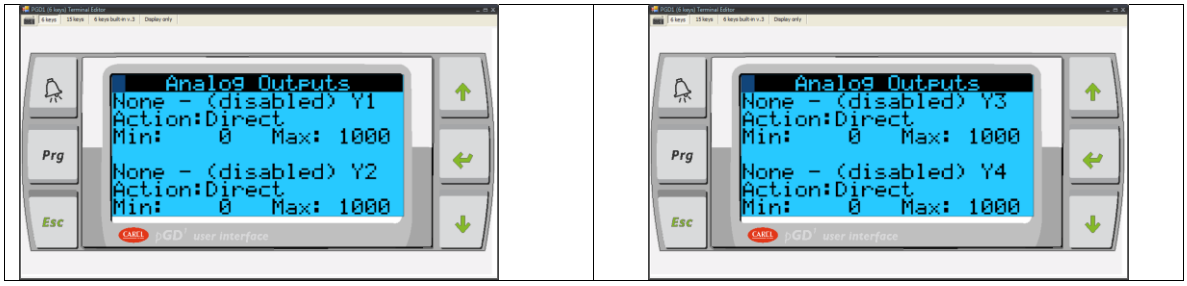


Figure 53 - Analog output configuration

Warning: Consult the manufacturer prior making any changes.

12.1.4 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.

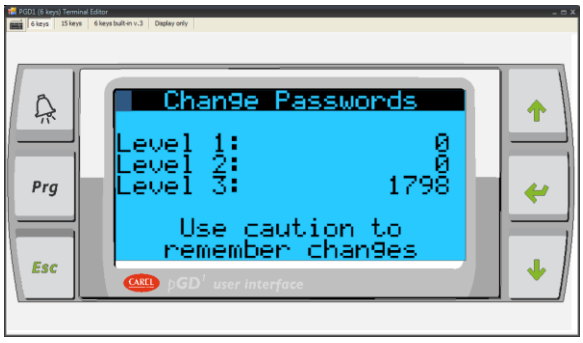


Figure 54 - Changing default password

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.

Figure 55 - Factory reset / Set Unit Mode

13.0 TROUBLESHOOTING GUIDE

SYMTOM	POSSIBLE CAUSE	REMEDY
Black screen	Loss of power	Check 24Vac at controller and display
No link	Wrong unit ID	Check Unit ID. See "**P-LAN 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 PCO3 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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