EngA® ENGINEERED AIR®

TECHNICAL REFERENCE MANUAL

FOR

CAREL CONTROLLERS

Contents Page

WARNING: This manual shows options, features, and/or components that your equipment may not have. Refer to unit wiring diagram for your equipment's configuration.

FUNCTIONAL LAYOUT

The figure below shows the functional layout of an air handling unit. Damper actuators and valve actuators are field devices that communicate through Fieldbus 1 (ref. C). Fieldbus 2 (ref. E) is the medium through which the serial probes communicate the values measured, and through which the humidifier control board and the fans exchange data and receive setpoints from the controller. The built-in terminal and the remote terminal, which communicate via pLAN (ref. A), are used for installing the application program and for commissioning the system. The PGD touchscreen terminal, intuitive and simple to use, can be used while the unit is normally working to set switch-on and switch-off times, to enter the main parameters, to perform other advanced functions of the application program and to view any alarms triggered. In this case the data is communicated through the BMS2 serial port (ref. D). The system can be connected to a supervision system (Konnex®, LON®, BACnet™, etc.) after installing the relative BMS1 expansion card (ref. B).

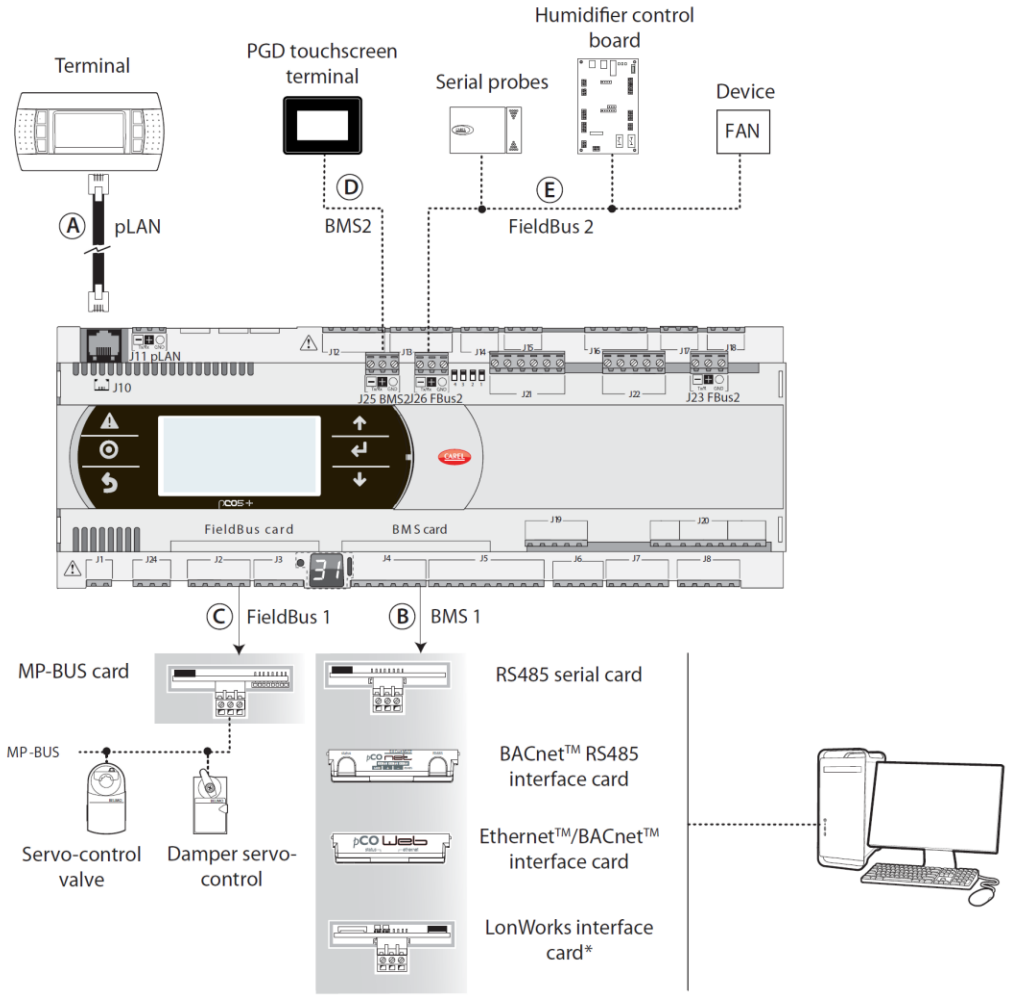
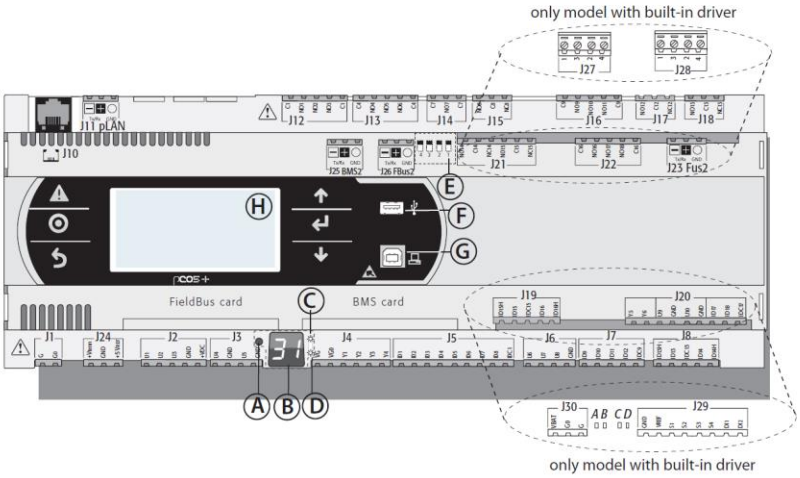


Fig. 1.a

Ref.	Serial port/Connectors	Connection to:
A	pLAN/J10, J11	up to 3 terminals up to 32 devices in a pLAN network (pCO controllers, EVD Evolution valve drivers, terminals)
B	BMS 1 Serial Card	a building automation system, after installing the relative BMS card (see par. 1.4)
C	FieldBus 1 Serial Card	sensors, actuators, etc., on a Fieldbus, after installing the relative card (see par. 1.5)
D	BMS 2 / J25*	pGD Touch terminals, GPRS connection modules (built-in card)
E	Fieldbus 2/J26 (and J23 on Large and Extralarge versions)	sensors, actuators, etc., on a Fieldbus (built-in card)

pCO5+ DESIGN



Key:

A	pLAN address selection button
B	pLAN address display(*)
C	Power LED
D	Overload LED
E	J26 port Fieldbus/BMS microswitches(*)
F	Host USB port (master)(*)
G	Slave USB port (device)(*)
H	Main display

(*) available on P+5... models; not available on P+3... models; see par. 8.3.

Fig. 2.a

Each controller is provided with connectors for the inputs/outputs (see chap. 5) and the secondary display, which has a button and a LED for setting the pLAN address. Depending on the model, it can be supplied with a built-in terminal and USB ports.

Keypad

Button	Descr.	Backlighting	Functions
⚠	Alarm	White/Red	• press together with UP while providing power to change the controller's address (see par. 6.3). • press together with Enter to access the screens managed by the BIOS (see par. 6.6).
⊙	Prg	White/Yellow	-
↩	Esc	White	go up one level
↑	UP	White	• press together with DOWN and ENTER to change the terminal's address (only for PGDE terminal - see par. 6.4). • press to increase value.
↵	Enter	White	press to confirm value.
↓	DOWN	White	• press together with UP and ENTER to change the terminal's address (only for PGDE terminal - see par. 6.4). • press to reduce value.
○	pLAN address selection	-	• pressed briefly: displays the pLAN address. • long press (>5 s): procedure for changing pLAN address (see par. 6.3).

Note: Once the application program is installed, all button functions depend on the program and do not necessarily correspond to the descriptions above.

Display

The controller is provided with two displays:
- the main display on the built-in terminal (if included);
- the secondary display showing the controller's pLAN address.

LED

The more complete models are provided with 6 LEDs:
- 1 yellow LED indicating that the device is powered;
- 1 red LED indicating an overload on the +VDC (J2-5) terminal;
- 4 LEDs indicating valve status (only on pCO5+ built-in driver models). Flashing LEDs mean the valve is moving; steadily-on LEDs mean the valve is completely open or closed.

LED	Colour	Description
A	Yellow	close valve A (connector J27)
B	Green	open valve A (connector J27)
C	Yellow	close valve B (connector J28)
D	Green	open valve B (connector J28)

Microswitches

Four microswitches are provided to configure port J26 as a Fieldbus or BMS port (see "Port J26 configuration").

USB ports

On the models where they are included, there are 2 USB ports which can be accessed after removing the cover:
- a "host" USB port for connecting pendrives;
- a "slave" USB port for direct connection to the USB port of a computer on which pCO Manager is installed, which can be used to upload the application program, commissioning the system, etc.

SERIAL PORTS

Compared to the pCO3, pCO5+ (and pCO5) controllers have a second BMS serial port on connector J25 (BMS2) and a second Fieldbus port on connector J26 (FBus2). pCO5+ Large and Extra large boards still have connector J23, which is marked FBus2 like connector J26. With reference to management under 1Tool, this is the same serial line, so different addresses must be used for devices connected to both connectors, while from the electrical point of view the ports are independent (an electrical fault on port J26 does not affect port J23). See the “Technical Specifications” table.

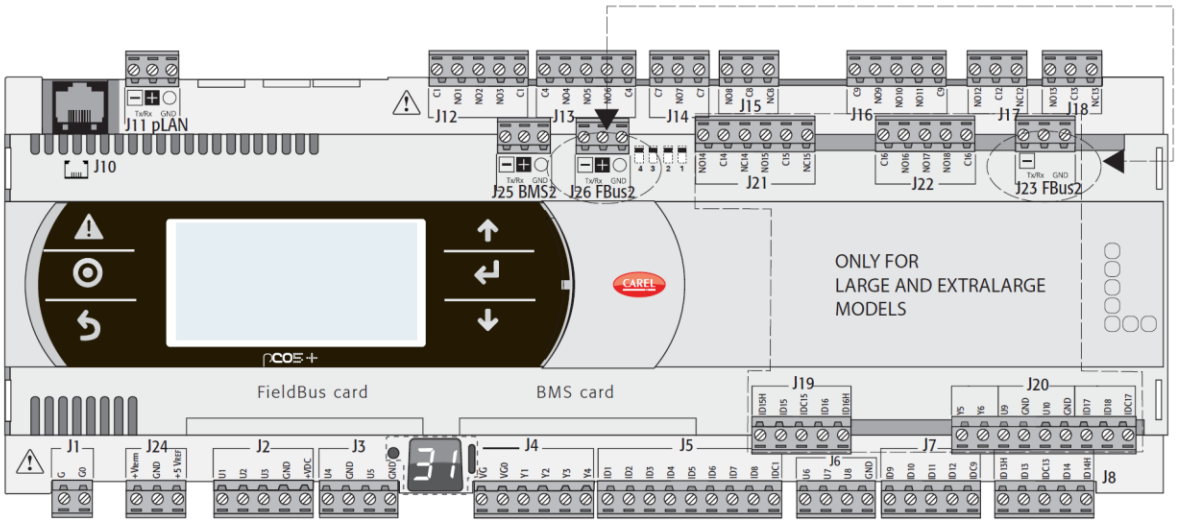


Fig. 3.a

Serial	Type/Connector	Features
Serial ZERO	pLAN/J10, J11	• Built into main board • HW driver: asynchronous half duplex RS485 pLAN • Not optically isolated • Connectors: telephone jack + 3-pin plug-in connector
Serial ONE	BMS 1 Serial Card	• Not built into main board • HW driver: not present • Can be used with all the BMS expansion cards of the pCO family
Serial TWO	FieldBus 1 Serial Card	• Not built into main board • HW driver: not present • Can be used with all Fieldbus expansion cards of the pCO family
Serial THREE	BMS 2 / J25	• Built into main board • HW driver: asynchronous half duplex RS485 slave • Optically-isolated/non-optically-isolated serial • 3-pin plug-in connector
Serial FOUR	FieldBus 2 / J26 (and J23 on Large and Extralarge versions)	• Built into main board • HW driver: asynchronous half duplex RS485 Master or Slave (see par. 3.2) • J23: not optically isolated • J26: optically isolated/not optically isolated • 3-pin plug-in connector • J23 and J26 are both managed by the same protocol as serial 4, with the advantage of being electrically independent.

Tab. 3.a

MOUNTING, DIMENSIONS & INSTALLATION

The controller is designed to be mounted on a DIN rail. The figure below shows the dimensions for each size.
Mounting:
• place the controller on the DIN rail and press it down gently. The tabs at the back will snap into place and lock the controller.
Removing:
• lift the tabs using a screwdriver applied to their release slots. The tabs are kept in place by springs.

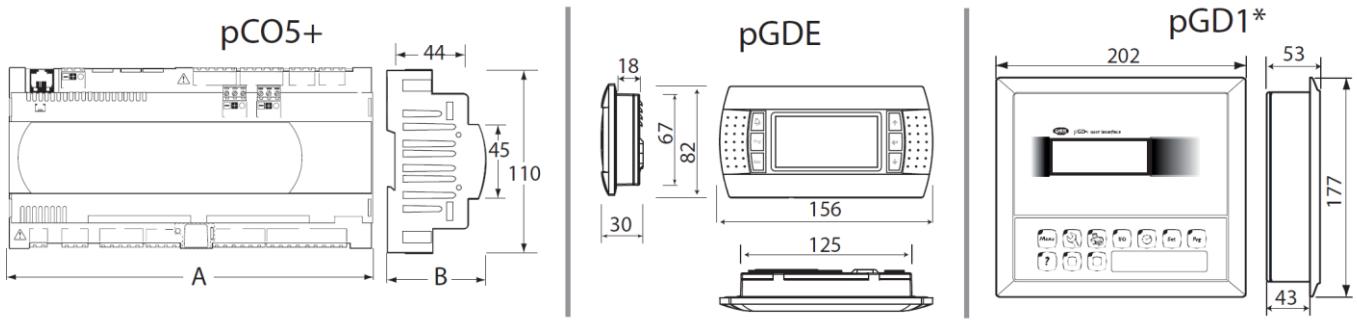


Fig. 4.a

DIMENSIONS (mm)

	Small	Medium	Buit-in driver	Large	Extralarge
A	227,5	315	315	315	315
B	60	60	60	60	60
B - with USB port/built-in terminal	70	70	70	70	70
B - with ULTRACAP module	-	-	75	-	-

Tab. 4.a

Installation

Environmental conditions

Avoid installing the controller and the terminal in places with:

- exposure to direct sunlight and to the elements in general;
- temperature and humidity outside the product's range of operation (see "Technical Specifications");
- large, rapid fluctuations in room temperature;
- strong magnetic and/or radio frequency interference (avoid installing near transmitting antennas);
- strong vibrations or knocks;
- presence of explosives or flammable gas mixtures;
- exposure to aggressive and polluting atmospheres (e.g. sulphur and ammonia vapours, salt mist, fumes) that can cause corrosion and/or oxidation;
- exposure to dust (formation of a corrosive patina with possible oxidation and reduced insulation);
- exposure to water.

Positioning the controller inside the electrical panel

Install the controller inside an electrical panel in a position where it cannot be reached and is protected from knocks or impacts. The controller should be placed inside the panel in a position where it is physically separated from power components (solenoids, contactors, actuators, inverters, etc.) and their respective cables. The ideal solution is to house these two circuits in two separate cabinets. Proximity to such devices/cables may cause random malfunctions that are not immediately evident. The panel's **casing must allow an adequate flow** of cooling air.

GENERAL CONNECTION DIAGRAM

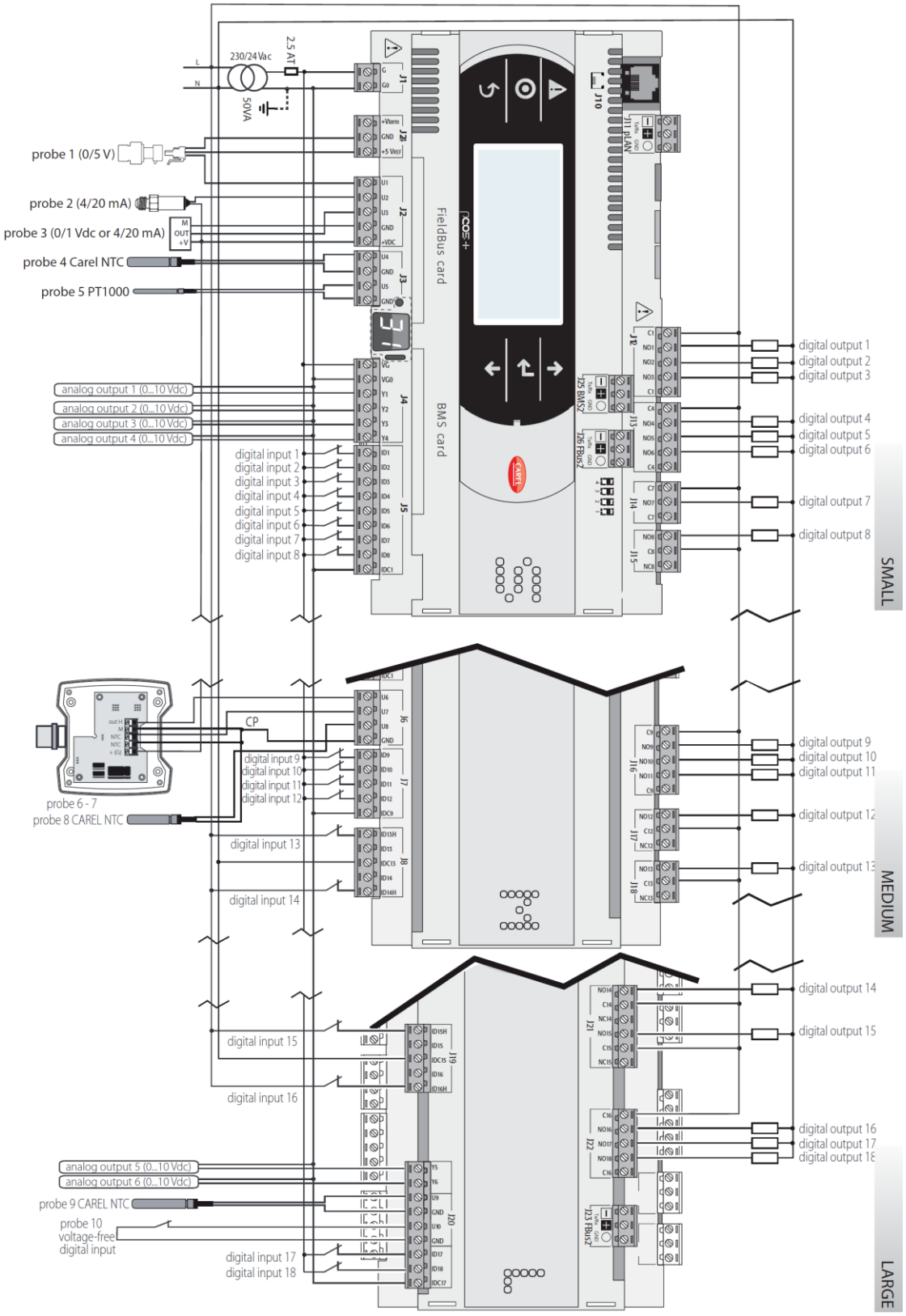


Fig. 5.y

SMALL & MEDIUM pCO5+ CONNECTING TERMINALS

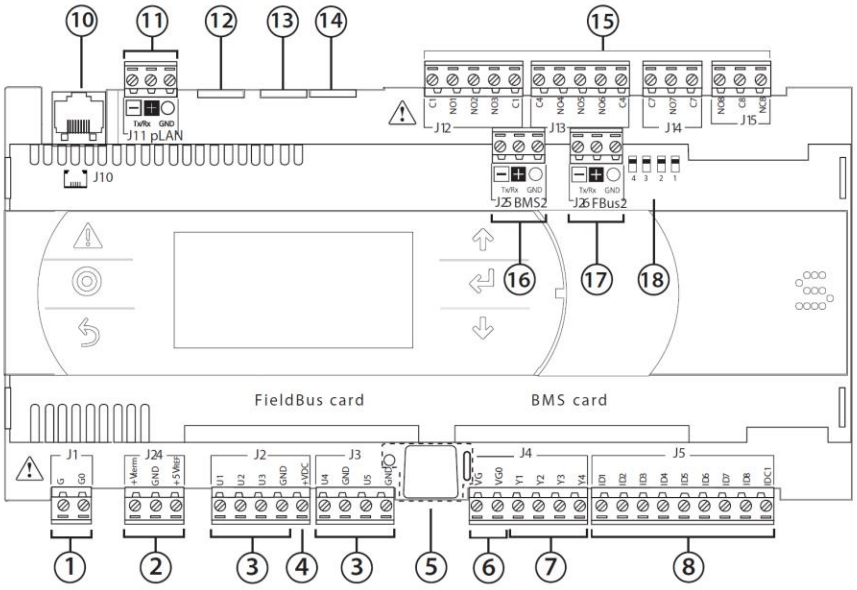


Fig. 4.q

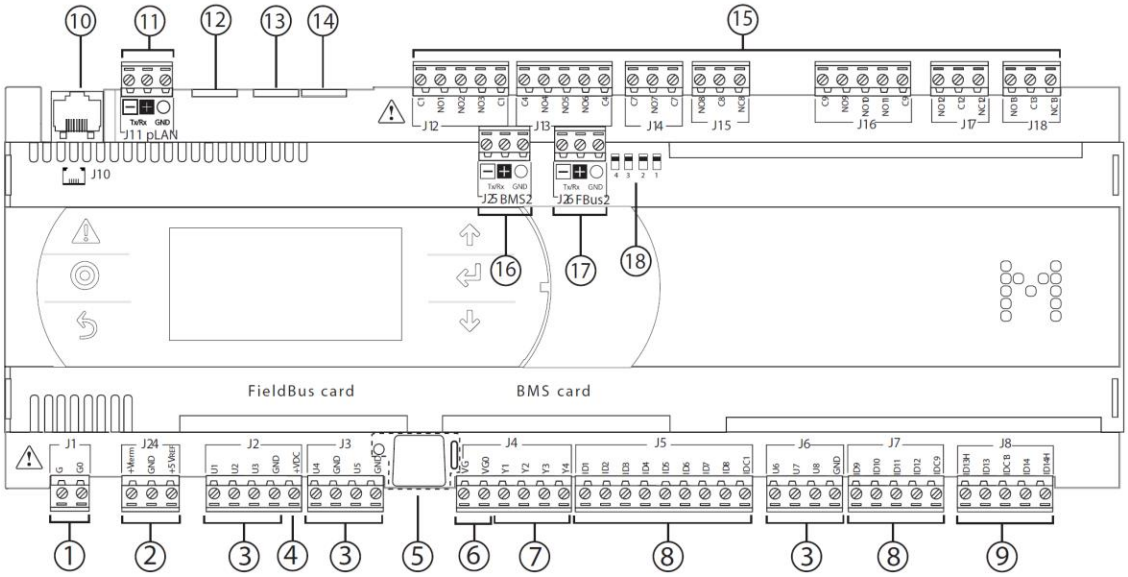


Fig. 4.r

Ref.	Description
1	POWER CONNECTOR [G(+), G0(-)]
2	+Vterm: power to additional terminal +5 VREF power to ratiometric probes
3	Universal inputs/outputs
4	+VDC: power to active probes
5	Button for setting pLAN address, secondary display, LEDs
6	VG: voltage A(*) to optically-isolated analogue output VG0: power to optically-isolated analogue output, 0 Vac/Vdc
7	Analogue outputs
8	ID: digital inputs at voltage A(*)
9	ID..: digital inputs at voltage A(*) IDH..: digital inputs at voltage B(**)
10	pLAN telephone connector for terminal/downloading application program

Ref.	Description
11	pLAN plug-in connector
12	Reserved
13	Reserved
14	Reserved
15	Relay digital outputs
16	BMS2 connector
17	Fieldbus2 connector
18	Fieldbus/BMS selector microswitch

(*) Voltage A: 24 Vac or 28 to 36 Vdc; (**) Voltage B: 230 Vac - 50/60 Hz.

LARGE & EXTRA LARGE pCO5+ CONNECTING TERMINALS

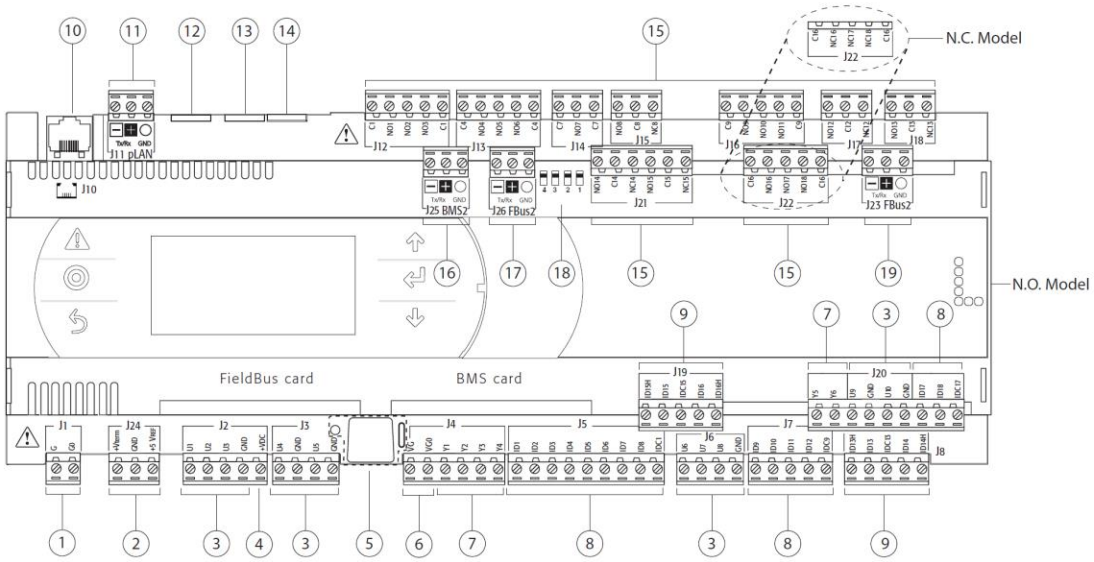


Fig. 4.s

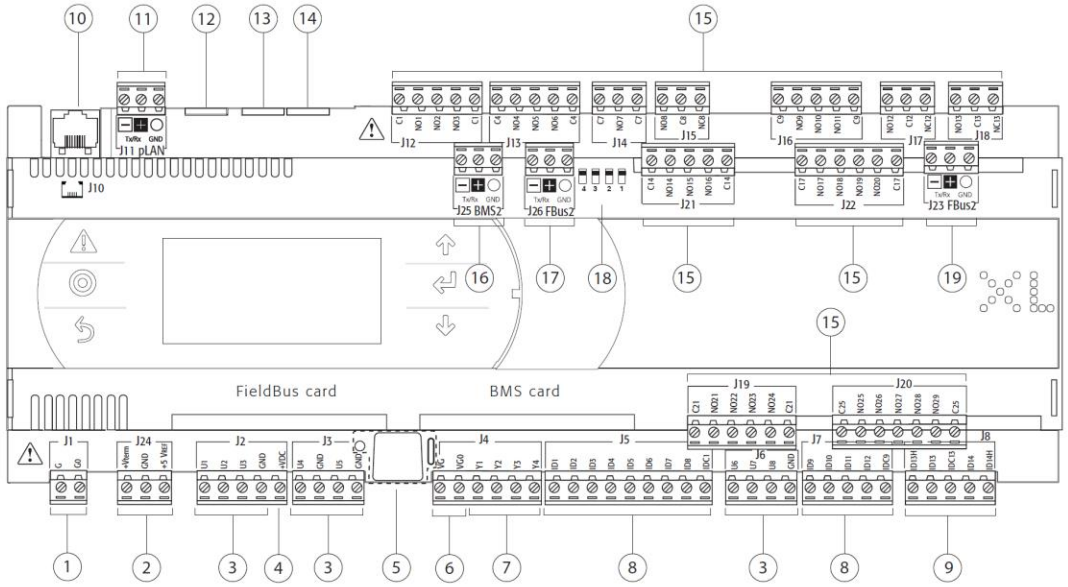


Fig. 4.t

Ref.	Description
1	POWER CONNECTOR [G(+), G0(-)]
2	+Vterm: power to additional terminal +5 VREF power to ratiometric probes
3	Universal inputs/outputs
4	+VDC: power to active probes
5	Button for setting pLAN address, secondary display, LEDs
6	VG: voltage A(*) to optically-isolated analogue output VG0: power to optically-isolated analogue output, 0 Vac/Vdc
7	Analogue outputs
8	ID: digital inputs at voltage A(*)
9	ID..: digital inputs at voltage A(*) IDH..: digital inputs at voltage B(**)
10	pLAN telephone connector for terminal/downloading application program

Ref.	Description
11	pLAN plug-in connector
12	Reserved
13	Reserved
14	Reserved
15	Relay digital outputs
16	BMS2 connector
17	Fieldbus2 connector
18	Fieldbus/BMS selector microswitch
19	Fieldbus2 connector

(*) Voltage A: 24 Vac or 28 to 36 Vdc; (**) Voltage B: 230 Vac - 50/60 Hz.

pCO5+ TERMINALS DESCRIPTIONS

Please refer to the figures in the preceding pages regarding the pCO5+.

Ref.	Term.	Label	Description
1	J1-1	G	Supply voltage A(*)
	J1-2	G0	Power supply reference
2	J24-1	+Vterm	Power to additional terminal
	J24-2	GND	Power supply common
	J24-3	+5 VREF	Power to 0 to 5 V ratiometric probes
3	J2-1	U1	Universal input/output 1
	J2-2	U2	Universal input/output 2
	J2-3	U3	Universal input/output 3
	J2-4	GND	Common for universal inputs/outputs 1, 2, 3
3	J3-1	U4	Universal input/output 4
	J3-2	GND	Common for universal input/output 4
	J3-3	U5	Universal input/output 5
	J3-4	GND	Common for universal input/output 5
3	J6-1	U6	Universal input/output 6
	J6-2	U7	Universal input/output 7
	J6-3	U8	Universal input/output 8
	J6-4	GND	Common for universal inputs/outputs 6, 7, 8
3	J20-3♦	U9	Universal input/output 9
	J20-4♦	GND	Common for universal input/output 9
	J20-5♦	U10	Universal input/output 10
	J20-6♦	GND	Common for universal input/output 10
4	J2-5	+VDC	Power to active probes
5	Button for setting pLAN address, secondary display, indicator LEDs		
6	J4-1	VG	Voltage A(*) to optically-isolated analogue output
	J4-2	VG0	Power to optically-isolated analogue output, at 0 Vac/Vdc
7	J4-3	Y1	Analogue output 1, at 0 to 10 V
	J4-4	Y2	Analogue output 2,at 0 to 10 V
	J4-5	Y3	Analogue output 3, at 0 to 10 V
	J4-6	Y4	Analogue output 4, at 0 to 10 V
7	J20-1♦	Y5	Analogue output 5, at 0 to 10 V
	J20-2♦	Y6	Analogue output 6, at 0 to 10 V
8	J5-1	ID1	Digital input 1, at voltage A(*)
	J5-2	ID2	Digital input 2, at voltage A(*)
	J5-3	ID3	Digital input 3, at voltage A(*)
	J5-4	ID4	Digital input 4, at voltage A(*)
	J5-5	ID5	Digital input 5, at voltage A(*)
	J5-6	ID6	Digital input 6, at voltage A(*)
	J5-7	ID7	Digital input 7, at voltage A(*)
	J5-8	ID8	Digital input 8, at voltage A(*)
	J5-9	IDC1	Common for digital inputs 1 to 8 (negative pole for DC power supply)
8	J7-1	ID9	Digital input 9, at voltage A(*)
	J7-2	ID10	Digital input 10, at voltage A(*)
	J7-3	ID11	Digital input 11, at voltage A(*)
	J7-4	ID12	Digital input 12, at voltage A(*)
	J7-5	IDC9	Common for digital inputs 9 to 12 (negative pole for DC power supply)
8	J20-7♦	ID17	Digital input 17, at voltage A(*)
	J20-8 ♦	ID18	Digital input 18, at voltage A(*)
	J20-9♦	IDC17	Common for digital inputs 17 and 18 (negative pole for DC power supply)
9	J8-1	ID13H	Digital input 13, at voltage B(**)
	J8-2	ID13	Digital input 13, at voltage A(*)
	J8-3	IDC13	Common for digital inputs 13 and 14 (negative pole for DC power supply)
	J8-4	ID14	Digital input 14, at voltage A(*)
	J8-5	ID14H	Digital input 14, at voltage B(**)
9	J19-1♦	ID15H	Digital input 15, at voltage B(**)
	J19-2♦	ID15	Digital input 15, at voltage A(*)
	J19-3♦	IDC15	Common for digital inputs 15 and 16 (negative pole for DC power supply)
	J19-4♦	ID16	Digital input 16, at voltage A(*)
	J19-5♦	ID16H	Digital input 16, at voltage B(**)
10	J10	-	pLAN telephone cable connector
11	J11-1	Tx-/Rx-	Tx-/Rx- pLAN RS485 port
	J11-2	Tx+/Rx+	Tx+/Rx+ pLAN RS485 port
	J11-3	GND	GND pLAN RS485 port
12	-	-	Reserved
13	-	-	Reserved
14	-	-	Reserved

Ref.	Term.	Label	Description
15	J12-1	C1	Common for relays 1, 2, 3
	J12-2	NO1	Normally open contact, relay 1
	J12-3	NO2	Normally open contact, relay 2
	J12-4	NO3	Normally open contact, relay 3
	J12-5	C1	Common for relays 1, 2, 3
15	J13-1	C4	Common for relays 4, 5, 6
	J13-2	NO4	Normally open contact, relay 4
	J13-3	NO5	Normally open contact, relay 5
	J13-4	NO6	Normally open contact, relay 6
	J13-5	C4	Common for relays 4, 5, 6
15	J14-1	C7	Common for relay 7
	J14-2	NO4	Normally open contact, relay 7
	J14-3	C7	Common for relay 7
15	J15-1	NO8	Normally open contact, relay 8
	J15-2	C8	Common for relay 8
	J15-3	CO8	Normally closed contact, relay 8
15	J16-1	C9	Common for relays 9, 10, 11
	J16-2	NO9	Normally open contact, relay 9
	J16-3	NO10	Normally open contact, relay 10
	J16-4	NO11	Normally open contact, relay 11
	J16-5	C9	Common for relays 9, 10, 11
15	J17-1	NO12	Normally open contact, relay 12
	J17-2	C12	Common for relay 12
	J17-3	NC12	Normally closed contact, relay 12
15	J18-1	NO13	Normally open contact, relay 13
	J18-2	C13	Common for relay 13
	J18-3	NC13	Normally closed contact, relay 13
15	J21-1♦	NO14	Normally open contact, relay 14
	J21-2♦	C14	Common for relay 14
	J21-3♦	NC14	Normally closed contact, relay 14
	J21-4♦	NO15	Normally open contact, relay 15
	J21-5♦	C15	Common for relay 15
	J21-6♦	NC15	Normally closed contact, relay 15
	J22-1♦	C16	Common for relays 16, 17, 18
	J22-2♦	NO16	Normally open contact, relay 16
	J22-3♦	NO17	Normally open contact, relay 17
	J22-4♦	NO18	Normally closed contact, relay 18
	J22-5♦	C16	Common for relays 16, 17, 18
15	J21-1♦♦	C14	Common for relays 14, 15, 16
	J21-2♦♦	NO14	Normally open contact, relay 14
	J21-3♦♦	NO15	Normally open contact, relay 15
	J21-4♦♦	NO16	Normally open contact, relay 16
	J21-5♦♦	C14	Common for relays 14, 15, 16
	J22-1♦♦	C17	Common for relays 17, 18, 19, 20
	J22-2♦♦	NO17	Normally open contact, relay 17
	J22-3♦♦	NO18	Normally open contact, relay 18
	J22-4♦♦	NO19	Normally open contact, relay 19
	J22-5♦♦	NO20	Normally open contact, relay 20
	J22-6♦♦	C17	Common for relays 17, 18, 19, 20
15	J19-1♦♦	C21	Common for relays 21, 22, 23, 24
	J19-2♦♦	NO21	Normally open contact, relay 21
	J19-3♦♦	NO22	Normally open contact, relay 22
	J19-4♦♦	NO23	Normally open contact, relay 23
	J19-5♦♦	NO24	Normally open contact, relay 24
	J19-6♦♦	C21	Common for relays 21, 22, 23, 24
15	J20-1♦♦	C25	Common for relays 25, 26, 27, 28, 29
	J20-2♦♦	NO25	Normally open contact, relay 25
	J20-3♦♦	NO26	Normally open contact, relay 26
	J20-4♦♦	NO27	Normally open contact, relay 27
	J20-5♦♦	NO28	Normally open contact, relay 28
	J20-6♦♦	NO29	Normally open contact, relay 29
	J20-7♦♦	C25	Common for relays 25, 26, 27, 28, 29
16	J25-1	Tx-/Rx-	Tx-/Rx- BMS2 RS485 port
	J25-2	Tx+/Rx+	Tx+/Rx+ BMS2 RS485 port
	J25-3	GND	GND BMS2 RS485 port
17	J26-1	Tx-/Rx-	Tx-/Rx- Fieldbus 2 RS485 port
	J26-2	Tx+/Rx+	Tx+/Rx+ Fieldbus 2 RS485 port
	J26-3	GND	GND Fieldbus 2 RS485 port
18	Port J26 configuration microswitches		
19	J23-1	Tx-/Rx-	Tx-/Rx- Fieldbus 2 RS485 port
	J23-2	Tx+/Rx+	Tx+/Rx+ Fieldbus 2 RS485 port
	J23-3	GND	GND Fieldbus 2 network RS485 port

Only for pCO5+ built-in driver:			
20	J27-1	1	Electronic expansion valve 1 control (see "Electronic valve connection").
	J27-2	3	
	J27-3	2	
	J27-4	4	
21	J28-1	1	Electronic expansion valve 2 control (see "Electronic valve connection").
	J28-2	3	
	J28-3	2	
	J28-4	4	
22	J30-1	VBAT	Power from external Ultracap module
	J30-2	G0	
	J30-3	G	
23	J29-1	GND	Common for power supply to probes
	J29-2	VREF	Power to driver probes
	J29-3	S1	Probe 1
	J29-4	S2	Probe 2
	J29-5	S3	Probe 3
	J29-6	S4	Probe 4
	J29-7	DI1	Digital input 1
	J29-8	DI2	Digital input 2
24	A, B	Valve A status LED	
	C, D	Valve B status LED	

Tab. 4.f

(*): Voltage A: 24 Vac or 28 to 36 Vdc;
(**): Voltage B: 230 Vac - 50/60 Hz.

♦: Large model; ♦♦: Extralarge model.

INPUT/OUTPUT LABELS

pCO5+ controllers are distinguished by size and provided with inputs and outputs and power supplies for the active probes most suitable for various applications.
The features that depend on the model are:

- maximum number and type of inputs/outputs;
- availability of built-in driver for expansion valves.

Label	Type of signal
U...	Universal inputs/outputs, configurable via software as: Analogue inputs: - NTC, PTC, PT500, PT1000 sensors - PT100 sensors - 0 to1 Vdc or 0 to 10 Vdc signals - 0/4 to 20 mA signals - 0 to 5 V signals for ratiometric probes Digital inputs (not optically isolated): - potential-free contacts (not optically isolated) - fast digital inputs Analogue outputs (not optically isolated): - 0 to 10 Vdc signals - PWM signals
Y...	0 to 10 Vdc analogue outputs, PWM outputs
ID...	24 Vac/24 Vdc digital input
ID...H	230 Vac digital input
NO...	Relay output, normally open contact
NC...	Relay output, normally closed contact
C...	Relay output, common
Tx/Rx, GND	Serial port

Tab. 4.d

I/O TABLE

		pCO5+ Controllers								pCOE I/O expansion card			
		Small	Medium	Large	Extra Large	Built-in driver	Label	In/Out	Tipo	PCOE*	Label	In/Out	Type
Universal inputs/ outputs	NTC input	5	8	10	8	8	U	In	Universal I/O	4	B	In	Analogue input(*)
	PTC input	5	8	10	8	8	U	In	Universal I/O	-	-	-	-
	PT500 input	5	8	10	8	8	U	In	Universal I/O	-	-	-	-
	PT1000 input	5	8	10	8	8	U	In	Universal I/O	-	-	-	-
	PT100 input	max 2	max 3	max 4	max 3	max 3	U	In	Universal I/O	-	-	-	-
	0 to 1 Vdc/0 to 10 Vdc input (**) (powered by controller)	Tot. max 5: 5	Tot. max 8: max 6	Tot. max 10: max 6	Tot. max 8: max 6	Tot. max 8: max 6	U	In	Universal I/O	4	B	In	Analogue input(*)
	0 to 1 Vdc/0 to 10 Vdc input (**) (external power supply)	Tot. max 5: 5	Tot. max 8: 8	Tot. max 10: 10	Tot. max 8: 8	Tot. max 8: 8	U	In	Universal I/O	4	B	In	Analogue input(*)
	0 to 5 Vdc input	-	-	-	-	-	-	-	-	4	B	In	Analogue input(*)
	0 to 20 mA/4 to 20 mA input (powered by controller)	Tot. max 4: max 4	Tot. max 7: max 6	Tot. max 9: max 6	Tot. max 7: max 6	Tot. max 7: max 6	U	In	Universal I/O	4	B	In	Analogue input(*)
	0 to 20 mA/4 to 20 mA input (external power supply)	Tot. max 4: max 4	Tot. max 7: max 7	Tot. max 9: max 9	Tot. max 7: max 7	Tot. max 7: max 7	U	In	Universal I/O	-	-	-	-
	0 to 5 V input for ratiometric probe (+5Vref)	max 5	max 6	max 6	max 6	max 6	U	In	Universal I/O	4	B	In	Analogue input(*)
	Voltage-free contact digital input	5	8	10	8	8	U	In	Universal I/O	-	-	-	Digital input
	Fast digital inputs	max 2	max 4	max 6	max 4	max 4	U	In	Universal I/O	-	-	-	Digital input
	Non-optically-isolated 0 to 10 Vdc output	5	8	10	8	8	U	Out	Universal I/O	-	-	-	Analogue output
	Non-optically-isolated PWM output	5	8	10	8	8	U	Out	Universal I/O	-	-	-	Analogue output
		max tot 5	max tot 8	max tot 10	max tot 8	max tot 8							
Digital inputs	Optically-isolated 24 Vac/Vdc input	8	12	14	12	12	ID	In	Digital input	4	ID	In	Digital input
	24 Vac/Vdc or 230 Vac (50/60 Hz) input	-	2	4	2	2	ID	In	Digital input	-	-	-	
		max tot 8	max tot 14	max tot 18	max tot 14	max tot 14							
Analogue outputs	Optically-isolated 0 to 10 Vdc output	4	4	6	4	4	Y	Out	Analogue output	1	Y	Out	
	Optically-isolated PWM output	2	2	2	2	2	Y3, Y4	Out	Analogue output	-	-	-	
	Output for two-pole stepper motor	-	-	-	-	1/2	1-3-2-4	Out	Analogue output	-	-	-	
		max tot 4	max tot 4	max tot 6	max tot 4	max tot 6							
Digital outputs	NO/NC relay output	1	3	5	3	3	NO/NC	Out	Digital output	4	NO/NC	Out	Digital output
	NO relay output	7	10	13	26	10	NO	Out	Digital output	-	-	-	
	24 V SSR output	1	2	3/4	2	2	NO/NC	Out	Digital output	-	-	-	
	230 V SSR output	1	13	3/4	2	2	NO/NC	Out	Digital output	-	-	-	
		max tot 8	max tot 13	max tot 18	max tot 29	max tot 13							
		25	**39**	**52**	**55**	**41**					**Total I/O**		
Power to terminal		1	1	1	1	1	J10						Telephone conn. (pLAN) J10
		1	1	1	1	1	+Vterm						Add'l power to terminal
Power to probes		1	1	1	1	1	+VDC						Power to active probes
		1	1	1	1	1	+5 VREF						Power to ratiometric probes
Power to analogue outputs		1	1	1	1	1	VG, VG0			1	VG,VG0		
pLAN ports		1	1	1	1	1	J10						Signal and power
		1	1	1	1	1	J11						Signal only
Built-in Fieldbus ports		1	1	2	2	1	J23/ J26						
Accessory Fieldbus ports		1	1	1	1	1	Fbus card						
Built-in BMS ports		1	1	1	1	1	J25						
Accessory BMS ports		1	1	1	1	1	BMS card						
Host USB port (if included)		1	1	1	1	1							
Slave USB port (if included)		1	1	1	1	1							

(*) On the pCOE expansion board the inputs can be selected two by two (B1, B2 and B3, B4) via software
(**) pCOE board: only 0...1V inputs

Tab. 4.e

pCO CONNECTIVITY

PGD1 Communication Connection

Connecting the pGD1 to any of the pCO family of controllers is quick and easy through the use of Carel's proprietary communication cable EAC0NN***. Through this cable, the controller power up the pGD1 and communicate. These cables appear to resemble a standard telephone cable; but the internal structured wiring is very different.

Figure A

Figure B

Figure 'A' represents a standard telephone cable. Note pin 1 on end 'A' is white, but on end 'B', pin 1 is blue. Do not use this style cable between the pGD1 and pCO controller.

Figure 'B' shows the internal wire structure of the Carel communication cable. Note pin 1 on end 'A' is white, and on end 'B' pin 1 is also white. This is the correct cable to use.

The EAC0NN*** communication cable comes in several lengths to choose from. Consult the chart below for more details. The maximum distance between a pC03 controller and a pGD1 is 150 ft using a standard EAC0NN*** type communication cable.

Model	Length
EAC0NN002	2.5 FT
EAC0NN000	5 FT
EAC0NN001	10 FT
EAC0NN003	20 FT
EAC0NN004	35 FT
EAC0NN005	50 FT
EAC0NN006	75 FT
EAC0NN007	150 FT

PGD3 Communication Connection

The communication connection between the pCO family controllers and a pGD3, is done via RS485 protocol using a standard shielded two conductor cable. Ensure the Rx-/Tx- and Rx+/Tx+ terminals are paired correctly between the pGD3 and the pCO controller. A separate power cable will be required to power up the pGD3.

CONNECTING THE TERMINAL

The controller and the terminal are connected to a pLAN network.

1: One pCO controller
When connecting the controller to the terminal, the following restrictions should be kept in mind:

1. the overall length of the pLAN network should not exceed 500 m. Consequently, if the terminal is installed remotely the length of the terminal cable must be included in the total length;
2. the unshielded telephone cable can be used for a max. length of 50 m. Beyond this length use a 3-pole shielded cable (see table below);
3. in case of lengths greater than 200 m, the power supply for the terminal must be provided separately;
4. no more than 3 terminals can be connected to the same pCO controller. The terminals must be of the same type (e.g. all PGD1). One terminal is powered by the controller, and the other two by an external power supply;
5. except for PGD0/PGD1/PGDE, the other terminals should be powered by separate power supplies.

Important:

- In domestic installations, standard EN55014 requires the connection cable between the controller and the terminal to be shielded, with the shield earthed at both ends;
- In industrial installations with length >10 m, the connection cable between the controller and the terminal must be shielded and the shield must be earthed.

Case A: 1 terminal
A.1: Distance L < 50 m.
The typical connection for one terminal (e.g. PGD1) is made using a 6-pin telephone cable available from CAREL as an accessory (code S90CONN00*). The telephone connector provides both data transmission and the power supply for the terminal.

To make the connection:
- slip the connector into terminal J10 until it clicks.

To remove the connector:
- press lightly on the plastic catch on the connector and slip it out.

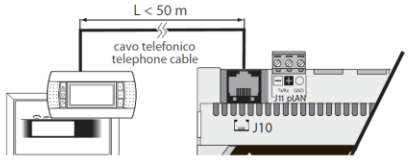


Fig. 4.j

A.2: Distance 50< L< 200 m.
Lengths greater than 50 m require using two TCONN6J000 boards connected with a 4-pin shielded cable, as shown in the figure. The terminal is powered by the controller.

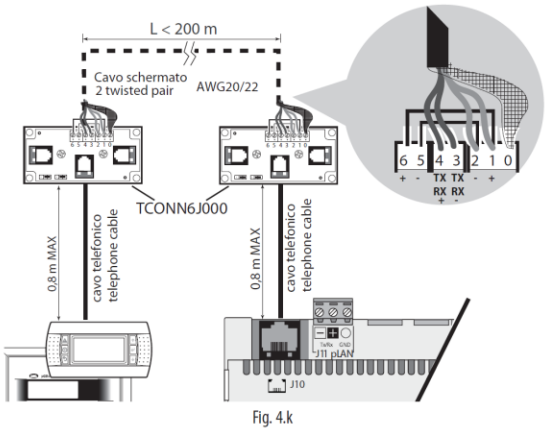


Fig. 4.k

Note: For information on the position of the jumpers on board TCONN6J000, see instructions sheet code +050002895.

A.3: Distance 200< L< 500 m.
The terminal must be powered by an external power supply. Connect a 3-pole shielded cable to connector pLAN J11. Provide a separate power supply for board TCONN6J000, as shown in the figure.

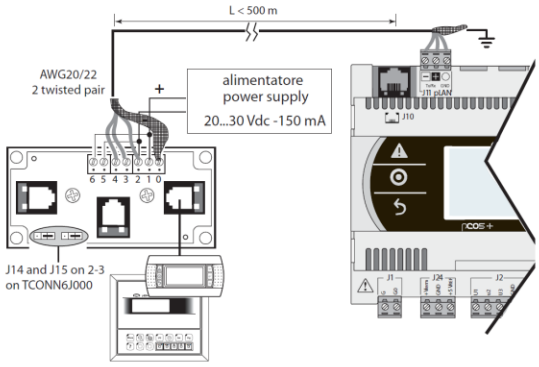


Fig. 4.l

Note: To reach the maximum length of the network use a bus layout with branches not exceeding 5 m.

Case B: 2 terminals
Two terminals can be directly connected only on a Small model. Models of other sizes require the second terminal to be powered separately. On Medium/Large/Extralarge controllers apply the known configuration A.1 or A.2 + A.3.

B.1: Distance L <50 m
Use 1 TCONN6J000 board connected as shown in the figure.

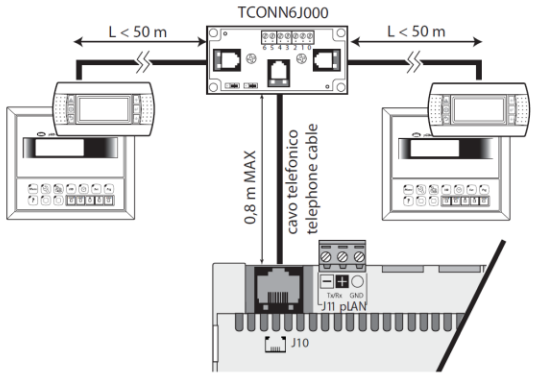


Fig. 4.m

B.2 Distance 50< L< 200 m.

Use 3 TCONN6J000 boards connected as shown in the figure.

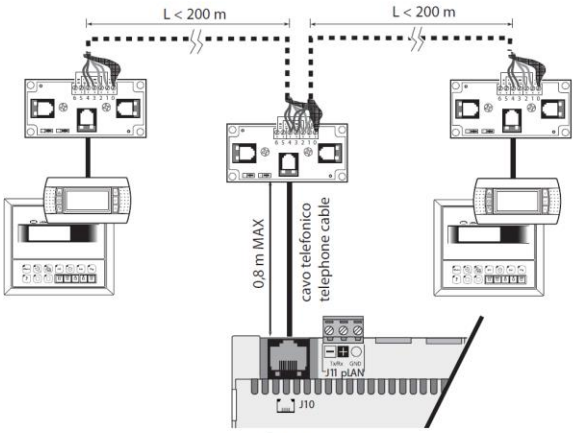


Fig. 4.n

B.3 Distance 200< L< 500 m.

If one of the terminals is connected at a distance >200 m, connect it according to the layout described in A.3. Connect the other terminal as described in A.1 or A.2. If both terminals are close to a distance >200 m, connect them as shown in the layout below.

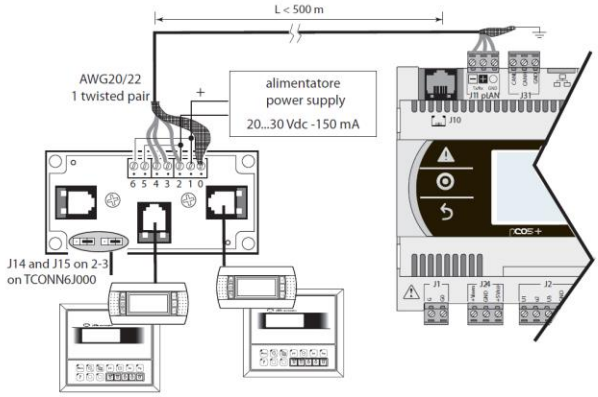


Fig. 4.o

Case C: 3 terminals

For the first 2 terminals refer to Case B. For the third terminal use one of connections A.1, A.2 or A.3.

Important:

- except for pGD1, the other terminals should be always powered by separate power supplies;
- the 24 Vdc on the +Vterm (J24) terminal can be used only in alternative to connector J10 to power an external terminal, with maximum current 1.5 W;
- in networks with star layout, if the cable is longer than 5 m connect the terminal only to the first or last pCO5+ in the network (to avoid branches).

The following table applies.

	Type of cable	MAX distance controller-terminal (m)	Power supply	Board TCON-N6J000 used
1	Telephone	50	Provided by controller (150 mA)	NO
2	AWG24 shielded	200	Provided by controller (150 mA)	YES
3	AWG20/22 shielded	500	Separate	YES

Tab. 4.c

2: pCO controller in pLAN network

If a terminal is connected to a pCO controller which is itself connected to other controllers in a pLAN network, the terminal is directly powered by the controller. Be sure to avoid the terminal being powered by two power supplies. For that purpose, set jumpers J14 and J15 on board TCONN6J000 to interrupt the supply current.

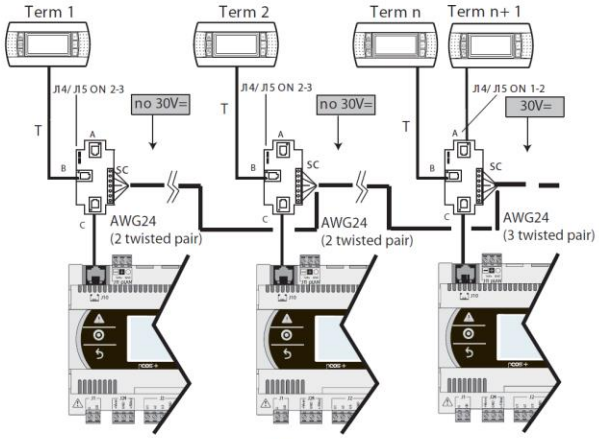


Fig. 4.p

When setting up a pLAN network with pCO controllers and terminals, each pCO5+ controller can power only 1 PGD1/E terminal (except for the Small model, which can power 2 terminals). When you need to connect more than one terminal, you will have to provide an independent power supply. See instructions sheet code +050002895.

4.6 Input/output labels

pCO5+ controllers are distinguished by size and provided with inputs and outputs and power supplies for the active probes most suitable for various applications.

The features that depend on the model are:

- maximum number and type of inputs/outputs;
- availability of built-in driver for expansion valves.

Label	Type of signal
U...	Universal inputs/outputs, configurable via software as: Analogue inputs: - NTC, PTC, PT500, PT1000 sensors - PT100 sensors - 0 to1 Vdc or 0 to 10 Vdc signals - 0/4 to 20 mA signals - 0 to 5 V signals for ratiometric probes Digital inputs (not optically isolated): - potential-free contacts (not optically isolated) - fast digital inputs Analogue outputs (not optically isolated): - 0 to 10 Vdc signals - PWM signals
Y...	0 to 10 Vdc analogue outputs, PWM outputs
ID...	24 Vac/24 Vdc digital input
ID...H	230 Vac digital input
NO...	Relay output, normally open contact
NC...	Relay output, normally closed contact
C...	Relay output, common
Tx/Rx, GND	Serial port

Tab. 4.d

PRIVATE AND SHARED TERMINALS

All pCO5+ controllers can be connected to each other and to other CAREL devices in a pCO local area network (pLAN) without requiring optional devices, allowing the communication of data and information from one location (node) to another. The terminals can show the variables (temperature, humidity, pressure, I/O, alarms) from just one controller at a time. The terminal does not need to be connected to the controller during normal operation, but can be used just for the initial programming of the main parameters. If one or more terminals are disconnected or malfunctioning, the application program continues to work correctly on each controller. Generally, the application program can monitor the status of the network and intervene as necessary to ensure the continuity of control functions. The figure below shows a possible pLAN network connection diagram.

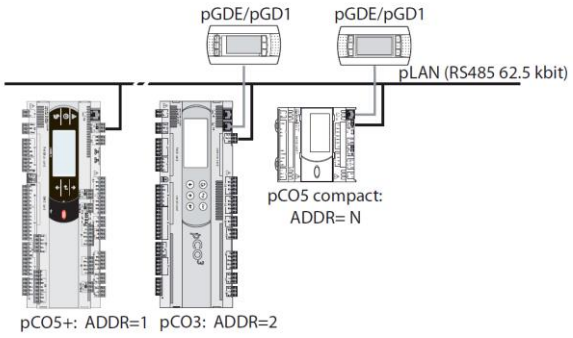


Fig. 6.a

All the terminals and controllers in the network must communicate at the same speed. The speed is adjusted automatically.
A maximum of 32 units can be connected, including:

- pCO controllers, which run the control program;
- external modules, which provide extended functionality (such as the EVD Evolution driver);
- terminals.

Every device belonging to a pLAN network is identified by an address, i.e. a number from 1 to 32. The number 32 can be assigned only to a terminal. Programs for different applications (e.g. chillers, air-conditioners, compressor racks, etc.) cannot be automatically integrated into a local network – they must be configured according to the system's architecture using the CAREL development tool.
Each controller connected to the network can simultaneously manage up to 3 terminals in the pLAN network. The values are displayed on the terminals at the same time and not independently, as if the keypads and the displays were connected in parallel. Because of that, the controller cannot drive different kinds of terminals at the same time.

Each terminal associated with a certain controller is defined as:
- private ("Pr") if it displays only the output of that controller;
- shared ("Sh") if either automatically or from the keypad it can be switched between various controllers.

Each pCO constantly updates the displays on the private terminals, while the shared terminals (if present) are updated only by the pCO that is controlling the terminal at that time.

The figure below illustrates the logic of the relations.

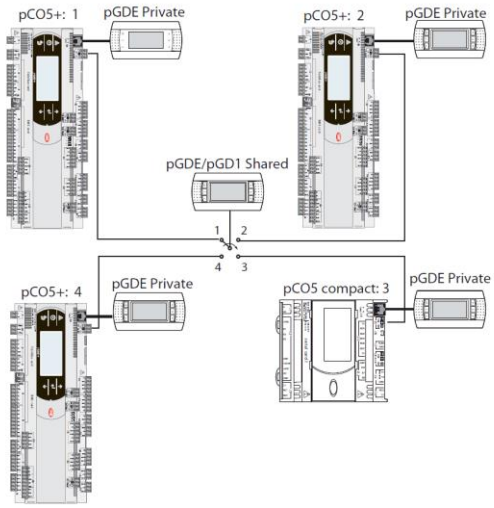


Fig. 6.b

In this example the shared terminal is associated with 4 pCO controllers, but at this instant only controller 1 can display data and receive commands from the keypad. Switching between controllers occurs in sequence (1->2->3->4->1...) by pressing a button defined by the application program; however it can also be done automatically when requested by the program. For example, a pCO may request control of the shared terminal to display alarms or, vice-versa, relinquish control to the next pCO after a set time (cyclical rotation).
Data on the number and type of terminals is determined during initial network configuration and saved in the permanent memory of each pCO controller. Details of the configuration procedure are described below. See the "Installation" chapter for information on the cables to use for the electrical connections.

Setting the Controller's Address

The controller's pLAN address is factory-set as 1.
There are two ways to set a controller's address:

1. using the A button (see figure below) located on the left of the 7-segment display. It can be accessed using the tip of a screwdriver (ø<3 mm);
2. using a terminal connected to the pLAN network.

1. Displaying the pLAN address

Procedure:

- briefly press the A button (no more than 5 s) to display the controller's current pLAN address. Five seconds after releasing the button the display is cleared.

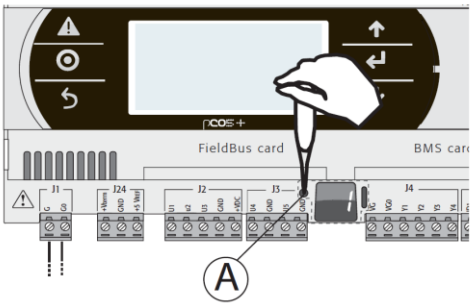


Fig. 6.c

Setting the pLAN address

Procedure:

1. Press button A for 5 seconds; the pLAN address starts flashing.
2. Press repeatedly or hold the button until reaching the desired address (e.g. 7), then remove the screwdriver.
3. Wait until the address starts flashing quickly. The address is now saved but is not yet active for the application program.
4. Power off the controller.
5. Power on the controller. The address is now active.

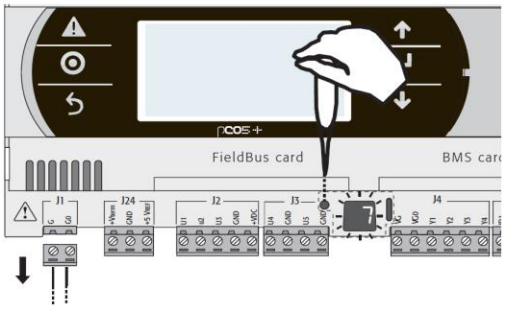


Fig. 6.d

2. Setting the address using an external terminal

The controller is assigned a private (Pr=private) or shared (Sh=shared) terminal with address 32. The external terminal can be given an address from 0 to 32. Addresses between 1 and 32 are used by the pLAN protocol, while address 0 identifies the Local Terminal protocol, used for point-to-point connections and to configure the controller (this can be done with a single pGD terminal and a single pCO).

If the controller with default setting (address=1) is connected to an external terminal (address=32), communication is established and the external terminal replicates the display on the built-in terminal, if featured. If however the controller has a different address (e.g. 7) and the terminal is not set to communicate with the controller at this address, once the connection is established the terminal will display a blank screen.

In this case, proceed as follows.

Procedure:

1. Press the UP, DOWN and Enter buttons together to go to the screen for setting the terminal address.

Fig. 6.e

2. Set the display's address to 0 to set the point-to-point connection. Press Enter to confirm.

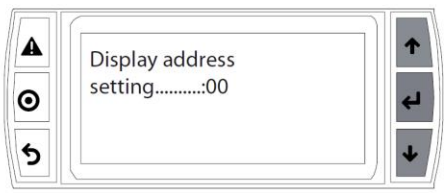


Fig. 6.f

3. Power off the controller.

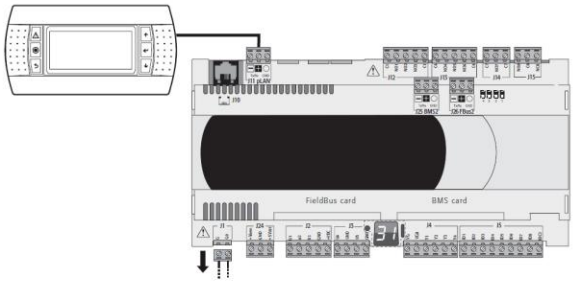


Fig. 6.g

4. Power on the controller while pressing the Alarm and Up buttons together until the following screen appears.

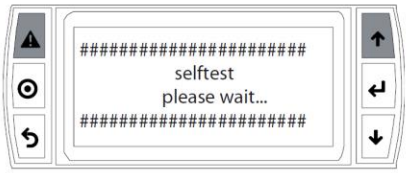


Fig. 6.h

5. Using the UP and DOWN buttons, set the controller's pLAN address to 7 and press Enter to confirm.

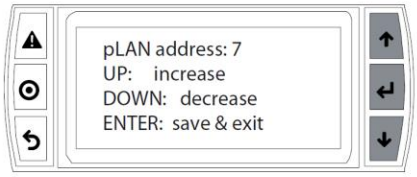


Fig. 6.i

6.4 Setting the terminal's address and connecting the controller to the terminal

After setting the controller's network address (see previous paragraph), to establish connections between the controller and the terminal you need to set the terminal's address.

Procedure:

1. Press the UP, DOWN and Enter buttons together. The screen for setting the terminal's address is displayed. Set the address to 2 and press Enter to confirm.

Fig. 6.j

2. Press the UP, DOWN and Enter buttons together. Press Enter twice and set the controller's address: 7. Press Enter to confirm.

Fig. 6.k

3. Press Enter to confirm.

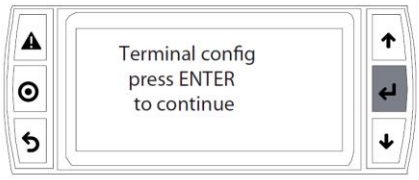


Fig. 6.l

4. Set terminal 1 (Trm1) with address 2 as private (Priv) or shared (Shared) according to the application and confirm to exit. The connection is established after a few seconds.

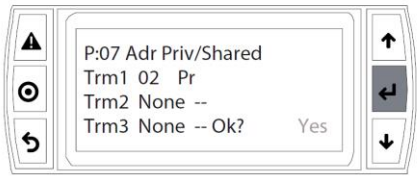


Fig. 6.m

5. To add a second terminal repeat steps 1 to 4.

pCO5+ TECHNICAL SPECIFICATIONS

Physical specifications	Dimensions	SMALL	13 DIN modules	110 X 227,5 X 60 mm
		MEDIUM, LARGE, EXTRALARGE	18 DIN modules	110 X 315 X 60 mm
		BUILT-IN DRIVER	18 DIN modules	110 X 315 X 75 mm
	Plastic case	Mounting	Can be mounted on DIN rail in accordance with DIN 43880 and IEC EN 50022	
		Material	Technopolymer	
		Flame retardancy	V2 (standard UL94) and 850 °C (standard IEC 60695)	
		Temperature for the ball pressure test	125 °C	
		Creeping current resistance	≥ 250 V	
		Colour	White RAL 9016	
	Built-in terminal	PGD1 (132x64 pixel) with backlit keypad		
	Other characteristics	Operating conditions	P+(3, 5)*******0** (no built-in terminal): -40T70 °C, 90% RH non-condensing(*)	
			P+(3, 5)*******E** (with built-in terminal): -20T60 °C, 90% RH non-condensing	
			(*) with Ultracap module installed: -40T60°C	
		Storage conditions	P+(3, 5)*******0** (no built-in terminal): -40T70 °C, 90% RH non-condensing	
			P+(3, 5)*******E**(with built-in terminal): -30T70 °C, 90% RH non-condensing	
		Protection rating	Models with USB port and/or Ultracap module: IP20 (front panel only)	
			Models without USB port and without Ultracap module: IP40 (front panel only)	
		Control pollution situation	2	
		Class of protection against electric shocks	to be integrated into Class I and/or II units (on versions without valve driver), and Class I units (on versions with valve driver)	
		PTI of insulating materials	PCB: PTI 250 V; insulating material: PTI 175	
		Period of electrical stress across insulating parts	long	
		Type of action	1C; 1Y in SSR versions	
		Type of disconnection or microswitching	microswitching	
		Category of resistance to heat and fire	Category D (UL94-V2)	
		Ageing characteristics (operating hours)	80.000	
		No. of automatic operating cycles	100.000 (EN 60730-1); 30.000 (UL60730)	
		Rated impulse voltage	2500V	
Electrical specifications	Power supply	SMALL, MEDIUM, LARGE, EXTRALARGE: Use a dedicated, class 2, 50 VA safety isolating transformer		
		BUILT IN DRIVER: Use a dedicated, class II, 100 VA safety isolating transformer		
			Vac	P (Vac) / Vdc / P (Vdc)
		SMALL	24 Vac (+10/-15%), 50/60 Hz to be protected by 2.5 A T external fuse	45 VA / 28 to 36 Vdc (-20/+10%) to be protected by 2.5 A T external fuse / 30 W
		MEDIUM		
		LARGE		
		EXTRALARGE		
		BUILT-IN DRIVER (BUILT-IN VALVE DRIVER)		90 VA / Not allowed
	Attention: the pCO5+ with built-in driver must be powered with alternating current and the secondary winding of the power supply transformer (G0) must be earthed.			
	Terminal block	With plug-in male/female connectors		
	Cable section	min 0.5 mm^2 - max 2.5 mm^2		
	CPU	32 bit, 100 MHz		
	Non-volatile memory (FLASH)	P+3**********: 5 MB (2 MB BIOS + 3 MB application program + 2MB memory log file)		
		P+5**********: 9 MB (2 MB BIOS + 7 MB application program + 4MB memory log file)		
	Data memory (RAM)	3.2 MB (1.76 MB BIOS + 1.44 MB application program)		
	Buffer memory T (EEPROM)	13 kB		
	Parameter memory P (EEPROM)	32 kB (not visible from pLAN)		
	Working cycle duration (medium complexity applications)	0.2 s (typical)		
	Clock with battery	Supplied, accuracy 100 ppm		
	Buzzer	Can be software-enabled only via built-in terminal		
	Battery	3 Vdc lithium button battery (24x3 mm), code CR2430		
	Software class and structure	Class A		
	Voltage surge immunity category (IEC EN 61000-4-5)	Category III		
	The device is not designed to be hand-held when powered			

Universal inputs/ outputs U...	Analogue inputs, Lmax = 30 m (max. no.)		SMALL		MEDIUM/ BUILT-IN DRIVER/ EXTRALARGE		LARGE			
		- CAREL NTC probes (-50T90°C; R/T 10 kΩ±1% at 25°C) - NTC HT (0T150°C) - PTC (600Ω to 2200Ω) - PT500 (-100T300°C) - PT1000 (-100T400°C)	5		8		10			
		- PT100 probes (-100T400°C)	2		3 (2 on U1 to U5, 1 on U6 to U8)		4 (2 on U1 to U5, 1 on U6 to U8, 1 on U9 to U10)			
		- 0 to 1 Vdc/0 to 10 Vdc signals from controller-powered probes (*)	Tot. max. 5	5	Tot. max. 8	6	Tot. max. 10	6		
		- 0 to 1 Vdc/0 to 10 Vdc signals from externally powered probes (*)		5		8		10		
		- 0 to 20 mA/4 to 20 mA inputs from controller-powered probes (*)	Tot. max. 4	4	Tot. max. 7	6 : (max. 4 on U1 to U5, 3 on U6 to U8)	Tot. max. 9	6 (max. 4 on U1 to U5, 3 on U6 to U8, 2 on U9 to U10)		
		- 0 to 20 mA/4 to 20 mA inputs from externally powered probes (*)		4		7 : (max. 4 on U1 to U5, 3 on U6 to U8)		9 : (max. 4 on U1 to U5, 3 on U6 to U8, 2 on U9 to U10)		
		- 0 to 5 V signals from controller-powered ratiometric probes (*)	5		6		6			
		Input accuracy: ±0.3% fs								
		Time constant for each input: 0.5 s								
		Classification of measuring circuits (IEC EN 61010-1): Category I								
	Non-optically-isolated digital inputs, Lmax = 30 m (max. no.)		SMALL		MEDIUM/ BUILT-IN DRIVER/ EXTRALARGE		LARGE			
		- Voltage-free contacts	5		8		10			
		- Fast digital inputs Type: voltage-free contact Max. current: 10 mA Max. frequency 2 kHz and resolution ±1 Hz	max 2		4 (max. 2 on U1 to U5, max. 2 on U6 to U8)		6 (max. 2 on U1 to U5, max. 2 on U6 to U8, 2 on U9 to U10)			
	Attention: • To avoid irreparably damaging the controller, externally powered active probes (0 to 1 V, 0 to 10 V, 0 to 20 mA, 4 to 20 mA) should be provided with adequate current protection and the current should be <100 mA. • Ratiometric probes can be powered by the controller only. • at power on, universal inputs/outputs are short circuited to GND for about 500ms up to the end of the configuration.									
	Non-optically-isolated analogue outputs (max. no.), Lmax = 30 m		SMALL		MEDIUM/ BUILT-IN DRIVER/ EXTRALARGE		LARGE			
		0 to 10 Vdc (*) (max. current 2 mA)	5		8		10			
		PWM (0/3.3 Vdc output, max. current 2 mA, frequency: 2 kHz asynchronous, 100 Hz asynchronous)	5		8		10			
Power supply for probes and terminals	+Vdc	Active probes can be powered by the 24/21 Vdc ±10% (*) (P+5*/P+3*) available on terminal +VDC (J2). The max. available current is 150 mA, protected against short-circuits.								
	+5Vref	To power the 0 to 5 V ratiometric probes use the 5 Vdc (*) (±5%) available on terminal +5VREF(J24). The max. available current is 60mA.								
	Vterm	P+3**********: 21 Vdc ± 10% (*); P+5**********: 24 Vdc ± 10% (*) To be used to power an external terminal in alternative to the one connected to J10, Pmax = 1.5 W								
	Attention: For lengths greater than 10 m use a shielded cable with earthed shield. In any case the max. allowable length is 30 m.									
Digital inputs ID... IDH...	Type	Optically-isolated								
	Lmax	30 m								
			no. opto-isolated inp. 24 Vac or 24 Vdc				no. opto-isolated inp. @ 24 Vac/Vdc or 230 Vac - 50/60 Hz			
	Maximum number	SMALL	8				None			
		MEDIUM/ BUILT-IN DRIVER/EXTRALARGE	12				2			
		LARGE	14				4			
	Min. pulse detection time on digital inputs	Normally open (open-closed-open)	200 ms							
		Normally closed (closed-open-closed)	400 ms							
	Power supply to inputs	External	IDH...: 230 Vac (+10/-15%) 50/60 Hz							
			ID...: 24 Vac (+10/-15%) 50/60 Hz o 28...36 Vdc (+10/-20%)							
	Classification of measuring circuits (IEC EN 61010-1)	Category I: 24 Vac/Vdc (J5, J7, J20) Category III: 230 Vac (J8, J19)								
	Current draw on 24 Vac/Vdc digital inputs		5 mA							
	Current draw on 230 Vac digital inputs		5 mA							

Notes:

- to avoid electromagnetic interference, separate as much as possible the probe and digital input cables from the cables carrying inductive loads and the power cables. Never run power cables and probe signal cables in the same conduits (including the ones in the electrical panels);
- the two 230 Vac or 24 Vac/Vdc inputs on terminals J8 (ID13, ID14) or J19 (ID15, ID16) have the same common pole and must therefore be powered at the same voltage (230 Vac or 24 Vac/Vdc). The two inputs are provided with basic insulation; reinforced insulation is provided between the inputs and the rest of the controller;
- ID1 to ID8, ID9 to ID12, ID17, ID18 are functionally isolated from the rest of the controller;
- for DC digital inputs (24 Vdc), either the + or the - can be connected to the common terminal;
- the rating of the external contact connected to the digital inputs must be at least 5 mA;.

Analogue outputs Y...	Type	0 to 10 V optically-isolated on Y1 to Y6		
	Lmax	30 m		
	Maximum number	SMALL, MEDIUM/ BUILT-IN DRIVER/EXTRALARGE	4	Y1...Y4 a 0...10 V
		LARGE	6	Y1...Y6 a 0...10 V
	Power supply	External	24 Vac (+10/-15%) or 28 to 36 Vdc on VG(+), VG0(-) (*)	
	Accuracy	Y1...Y6	±2% full scale	
	Resolution	8 bit		
	Settling time	Y1...Y6	from 1 s (slew rate 10 V/s) to 20 s (slew rate 0.5 V/s) selectable via SW	
	Maximum load	1 kΩ (10 mA)		

Warnings:
- for lengths greater than 10 m use a shielded cable with earthed shield;
- a 0 to 10 Vdc analogue output can be connected in parallel to other outputs of the same kind, or alternatively to an external source of voltage. The higher voltage will be considered. Correct operation is not guaranteed if actuators with voltage inputs are connected;
- power the VG-VG0 analogue outputs at the same voltage on G-G0: connect G to VG and G0 to VG0. This applies in case of both alternating or direct current power supplies.

Digital outputs NO..., NC...	Type	Relay. Min. contact current: 50 mA											
	Maximum number	8: SMALL; 13: MEDIUM/ BUILT-IN DRIVER; 18: LARGE; 29: EXTRALARGE											
	Insulation distance	The relay outputs have different features depending on the controller model. The outputs can be divided into groups. Relays belonging to the same group (individual cell in the table) have operational insulation and must therefore be powered at the same voltage. Between groups (between cells in the table) there is reinforced insulation, so the relays can be powered at different voltages. There is also reinforced insulation between each terminal of the digital outputs and the rest of the controller.											
		Relays with same insulation											
			Group										
	Composition of groups	Model	1	2	3	4	5	6	7	8	9	10	11
		SMALL Type of relay	1...3 Type A	4...6 Type A	7 Type A	8 Type A	- -	- -	- -	- -	- -	- -	- -
		MEDIUM/BUILT-IN DRIVER Type of relay	1...3 Type A	4...6 Type A	7 Type A	8 Type A	9...11 Type A	12 Type A	13 Type A	- -	- -	- -	- -
		LARGE NO Type of relay	1...3 Type A	4...6 Type A	7 Type A	8 Type A	9...11 Type A	12 Type A	13 Type A	14...15 Type A	16...18 Type A	- -	- -
		EXTRALARGE Type of relay	1...3 Type A	4...6 Type A	7 Type A	8 Type A	9...11 Type A	12 Type A	13 Type A	14...16 Type B	17...20 Type B	21...24 Type B	25...29 Type B
	Number of change-over contacts	1: SMALL (relè 8) 3: MEDIUM e EXTRALARGE (relays 8, 12, 13) 5: LARGE NO (relays 8, 12, 13, 14 e 15)											

Note: The output relays have different features depending on the model of pCO5+.

	Switchable power	Type A relay	Nameplate information	SPDT, 2000 VA, 250 Vac, 8A resistive	
			Certification	UL60730	2A resistive, 250Vac, 30.000 cycles Pilot duty C300, 240Vac, 30.000 cycles
				EN 60730-1	2(2)A, 250Vac, 100.000 cicli
		Type B relay	Relay nameplate information	SPST, 1250 VA, 250 Vac, 5A resistive	
			Certification	UL60730	1A resistive, 250Vac, 30.000 cycles Pilot duty C300, 240Vac, 30.000 cycles
				EN 60730-1	1(1), 250Vac, 100.000 cicli
SSR outputs (on models where provided)	Maximum number	1: SMALL (output 7); 2: MEDIUM and EXTRALARGE (outputs 7 and 12); 3 or 4: LARGE (outputs 7, 12, 14 or 7, 12, 14, 15)			
	Working voltage	24 Vac/Vdc		230Vac	
	Load current (MAX)	1 A		70mA	
	Pulse load current (MAX)	1,2 A		150mA	

Warnings:
- if the load requires a higher current, use an external SSR;
- to power external loads, use the same power supply as the pCO (connected to terminals G-G0); this must always be dedicated and not in common with the power supply to other devices (e.g. contactors, coils, etc.);
- to simplify wiring, the groups of digital outputs have two common pole terminals;
- make sure that the current running through the common terminals does not exceed the rated current of each terminal, i.e. 8A.

(*) class 2

Serial ports
for +/- use AWG 20-22 twisted pair shielded cable

Serial	Type/Connectors	Characteristics
Serial 0	pLAN/J10, J11	• Built into main board • HW driver: asynchronous half duplex RS485 pLAN • Not optically isolated • Connectors: 6-pin telephone jack + 3-pin plug-in connector p. 5.08 • Max. length: 500 m • Max. data rate: 115200 bit/s • Max. number of devices connectable: 32
Serial ONE	BMS 1 Serial Card	• Not built into main board • HW driver: not present • Can be used with all optional BMS cards of the pCO family
Serial TWO	FieldBus 1 Serial Card	• Not built into main board • HW driver: not present • Can be used with all optional Fieldbus cards of the pCO family
Serial THREE	BMS 2 / J25	• Built into main board • HW driver: asynchronous half duplex RS485 slave • Optically-isolated/non-optically-isolated serial(*) • 3-pin plug-in connector p. 5.08 • Max. length: 1000 m • Max. data rate: 384000 bit/s • Max. number of devices connectable: 16
Serial FOUR	Fieldbus 2/J26 (and J23 on Large and Extralarge versions)	• Built into main board • HW driver: asynchronous half duplex RS485 master/slave(**) • J23: not optically isolated • J26: optically isolated/not optically isolated • 3-pin plug-in connector p. 5.08 • J23 and J26 are both managed by the same protocol as serial 4, with the advantage of being electrically independent.

(*): both models are available;(**): configurable port J26: see par. 3.2.

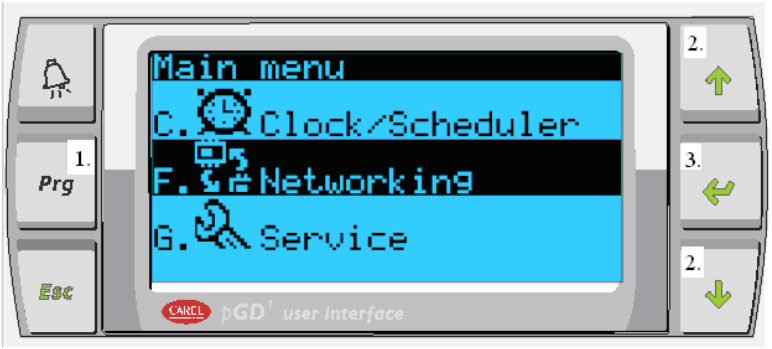
Note: In industrial/residential applications with distances greater than 10 m, use shielded cable with earthed shield.
In domestic applications (EN 55014), regardless of cable length, in versions without valve driver, the connection cable between controller and terminal and the serial cable must be shielded and earthed on both sides.

Model with driver for electronic expansion valve

Valve compatibility	CAREL: E*V****			
	ALCO: EX4; EX5; EX6; EX7; EX8 330 Hz (recommended by CAREL); EX8 500 Hz (as per ALCO specifications)			
	SPORLAN: SEI 0.5-11; SER 1.5-20; SEI 30; SEI 50; SEH 100; SEH175			
	Danfoss: ETS 12.5-25B; ETS 50B; ETS 100B; ETS 250; ETS 400			
	CAREL: Two CAREL EXVs as for EVD EVOLUTION TWIN			
	SPORLAN: SER(I) G, J, K			
Motor connection	Shielded 4-wire cable CAREL code E2VCABS*00, or AWG22 shielded 4-wire cable Lmax =10 m, or AWG14 shielded 4-wire cable Lmax = 50 m			
Digital input connection	Digital input to be activated with voltage-free contact or transistor to GND. Making current 5mA; max. length <10 m.			
Probes	Max. length 10 m or up to 30 m with shielded cable			
	S1	Ratiometric pressure probe (0 to 5 V)	Resolution 0,1 % fs	Measurement error: 2% fs maximum; 1% typical
		Resolution 0.1% fs	Resolution 0,5 % fs	Measurement error: 8% fs maximum; 7% typical
		Measurement error: 2% fs maximum; 1% typical	Resolution 0,1 % fs	Measurement error: 2% fs maximum; 1% typical
		Electronic pressure probe (4 to 20 mA)	Resolution 0,5 % fs	Measurement error: 8% fs maximum; 7% typical
	S2	Low temperature NTC	10 kΩ a 25 °C, -50T90 °C	errore di misura: 1°C nel range -50T50 °C; 3°C nel range +50T90 °C
		High temperature NTC	50 kΩ a 25 °C,-40T150 °C	Measurement error: 1.5 °C in the range -20T115°C, 4 °C in the range outside of -20T115 °C
		Combined NTC	10 kΩ a 25 °C,-40T120 °C	Measurement error: 1°C in the range -40T50 °C; 3°C in the range +50T90 °C
		0 to 10 V input (max. 12 V)	Resolution 0,1 % fs	Measurement error: 9% fs maximum; 8% typical
	S3	Ratiometric pressure probe (0 to 5 V)	Resolution 0,1 % fs	Measurement error: 2% fs maximum; 1% typical
		Electronic pressure probe (4 to 20 mA)	Resolution 0,5 % fs	Measurement error: 9% fs maximum; 8% typical
		Combined ratiometric pressure probe (0 to 5 V)	Resolution 0,1 % fs	Measurement error: 2% fs maximum; 1% typical
		4 to 20 mA input (max. 24 mA)	Resolution 0,5 % fs	Measurement error: 9% fs maximum; 8% typical
	S4	Low temperature NTC	10 kΩ a 25 °C,-50T105 °C;	Measurement error: 1 °C in the range -50T50 °C; 3°C in the range 50T90 °C
		High temperature NTC	10 kΩ a 25 °C,-40T150 °C	Measurement error: 1.5 °C in the range -20T115 °C; 4 °C in the range outside of -20T115 °C
		Combined NTC	10 kΩ a 25 °C, -40T120 °C	Measurement error 1 °C in the range -40T50 °C; 3°C in the range +50T90 °C
Power to active probes (VREF)	Programmable output: +5 Vdc ±2% or 12 Vdc ±10%, Imax = 50 mA			
Emergency power supply	Optional Ultracapacitor module (PCOS0WUC20 or EVD0000UC0). If the controller works constantly at temperatures near the upper limit of 60°C it is recommended to use the external module code EVD0000UC0, if possible placed in the coolest point of the panel. Modules PCOS0WUC20 and EVD0000UC0 can be connected to the same controller at the same time, thereby doubling the energy available for closing the valves. Important: The module only powers the valve driver and not the controller.			

WARNING: When connecting to any network, the network connection must first be connected before turning on the power to the controller to ensure the network card communicates to your network

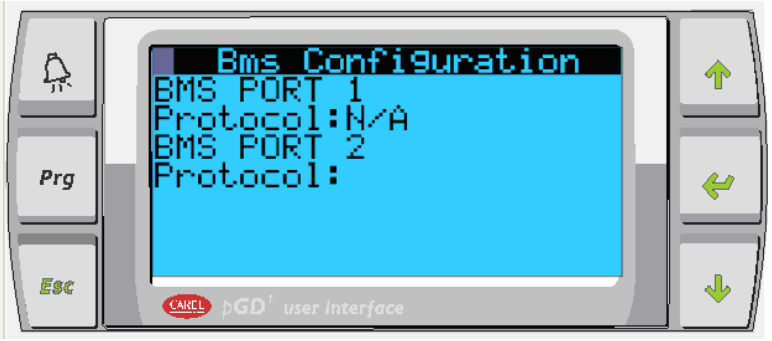
ACCESSING NETWORK MASKS



1. HIT PRG BUTTON TO MOVE TO MAIN MENU
2. HIT UP/DOWN ARROW KEYS TO NAVIGATE AND HIGHLIGHT NETWORKING
3. HIT ENTER TO ACCESS NETWORKING MARKS

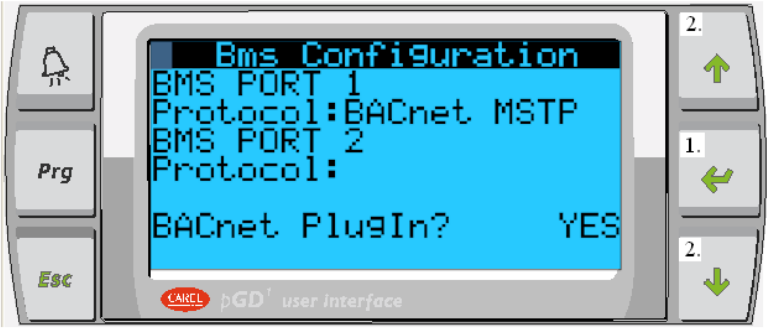
CALL ENGA SERVICE FOR NETWORK PASSWORD

1. HIT ENTER TO MOVE TO PASSWORD AND TO NAVIGATE THROUGH EACH PASSWORD DIGIT
2. HIT THE UP/DOWN ARROW KEYS TO CHANGE EACH DIGIT OF THE PASSWORD WHEN DONE HIT ENTER TO SAVE AND ALLOW YOU TO MAKE CHANGES IN NETWORKING



ONCE IN THE NETWORKING MASK, YOU WILL BE TAKEN TO THIS PAGE WHERE YOU MAY CONFIGURE THE BMS CONFIGURATIONS:
1. BACNET MS/TP
2. BACNET IP/ETHERNET

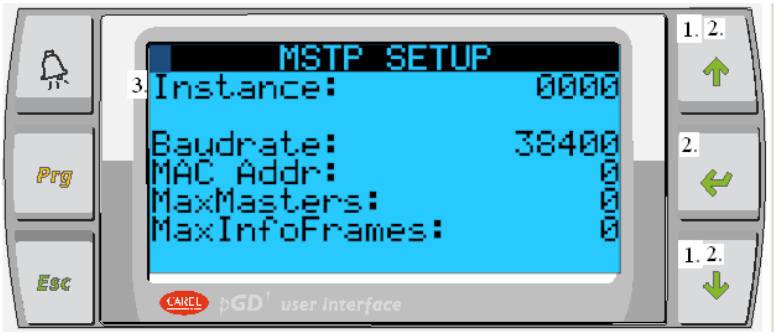
CONFIGURING BACNET MS/TP



1. HIT ENTER TO HIGHLIGHT PROTOCOL FOR SELECTED BMS PORT
2. HIT THE ARROW KEYS TO CHANGE THE PROTOCOL TO BACNET MS/TP

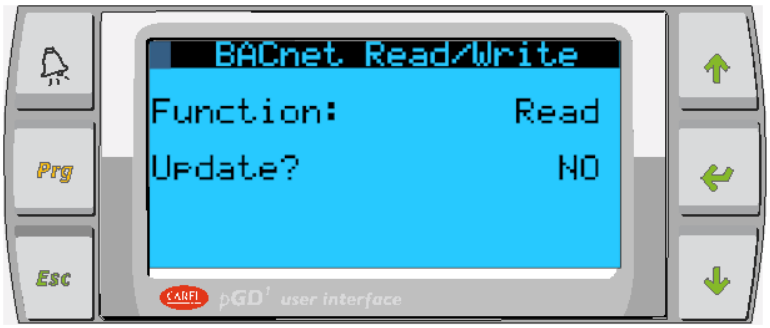
SET MASK AS SHOWN

ONCE DONE PROCEED TO THE NEXT MASK BY HITTING DOWN ARROW



1. HIT THE ARROW KEYS TO ADVANCE TO THIS MASK
2. HIT ENTER TO ADVANCE THROUGH EACH PARAMETER AND USE THE ARROW KEYS TO CHANGE THE VALUES OF PREFERENCE
3. EACH CONTROLLER MUST HAVE A UNIQUE INSTANCE #

WHEN FINISHED MAKING CHANGES PROCEED TO NEXT MASK



1. HIT ENTER TO HIGHLIGHT READ
2. HIT THE ARROW KEY TO CHANGE THE READ TO WRITE
3. HIT ENTER TO ADVANCE TO "NO"
4. HIT THE UP ARROW KEY TO CHANGE THE "NO" TO "YES" (YES WILL APPEAR FOR 4 SEC THEN CHANGE BACK TO NO). YOU HAVE JUST UPDATED YOUR CHANGES TO THE CONTROLLER. AFTER THIS YOU MUST CYCLE THE POWER ON THE CONTROLLER TO SAVE CHANGES
5. NOW GO BACK TO THE NETWORKING MASK AND CONFIRM THAT YOUR CHANGES ARE CORRECT AND SAVED

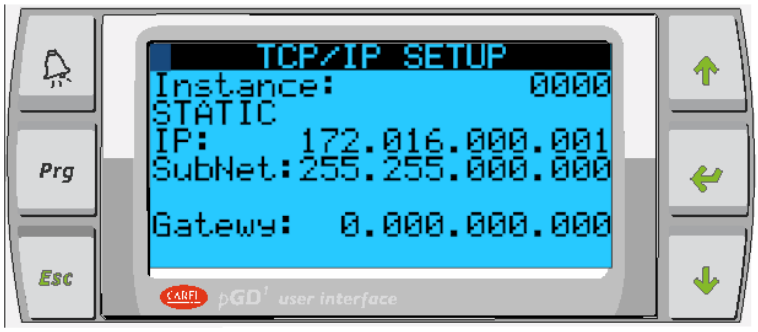
Note: When cycling the power to the controller, ensure all network connections are connected, wait 30 sec before you power the controller again and then wait 3 minutes for the BACnet card (MS/TP or IP) to come online with the controller. After these delays go to the above mask to read the changes that were just made. Change the function to READ and change the update to YES and hit the enter key. To exit this mask hit the PRG button and re-enter the network mask to view the changes.

CONFIGURING BACNET IP/ETHERNET

1. HIT ENTER TO HIGHLIGHT PROTOCOL FOR SELECTED BMS PORT
2. HIT THE ARROW KEYS TO CHANGE THE PROTOCOL TO BACNET IP/ETHERNET

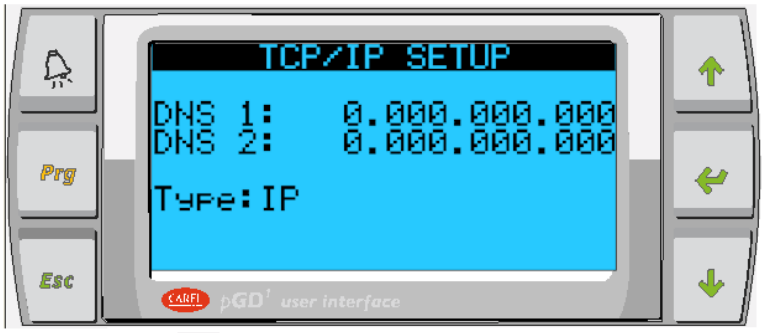
SET MASK AS SHOWN

ONCE DONE PROCEED TO THE NEXT MASK BY HITTING DOWN ARROW



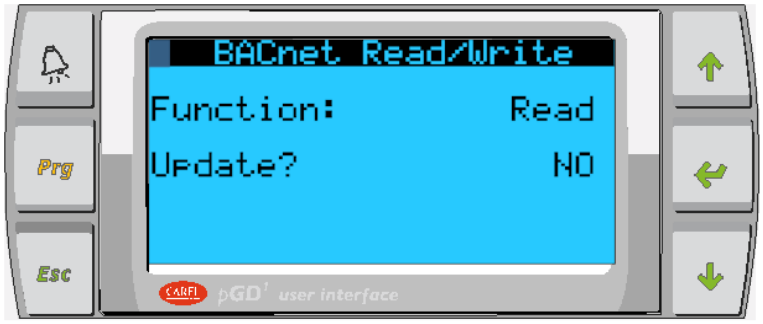
1. HIT THE ARROW KEYS TO ADVANCE TO THIS MASK
2. HIT ENTER TO ADVANCE THROUGH EACH PARAMETER AND USE THE ARROW KEYS TO CHANGE THE VALUES OF PREFERENCE
3. EACH CONTROLLER MUST HAVE A UNIQUE INSTANCE # AND IP

WHEN FINISHED MAKING CHANGES PROCEED TO NEXT MASK



1. USE THE ARROW KEYS AND ENTER BUTTON TO NAVIGATE AND CHANGE THE DNS ADDRESSES
2. SELECT TYPE TO IP OR ETHERNET

WHEN FINISHED MAKING CHANGES PROCEED TO NEXT MASK



1. HIT ENTER TO HIGHLIGHT READ
2. HIT THE ARROW KEY TO CHANGE THE READ TO WRITE
3. HIT ENTER TO ADVANCE TO "NO"
4. HIT THE UP ARROW KEY TO CHANGE THE "NO" TO "YES" (YES WILL APPEAR FOR 4 SEC THEN CHANGE BACK TO NO). YOU HAVE JUST UPDATED YOUR CHANGES TO THE CONTROLLER. AFTER THIS YOU MUST CYCLE THE POWER ON THE CONTROLLER TO SAVE CHANGES
5. NOW GO BACK TO THE NETWORKING MASK AND CONFIRM THAT YOUR CHANGES ARE CORRECT AND SAVED