SAIA BURGESS CONTROLS

PCD7.LRxx
BACnet Room Controller

GENERAL

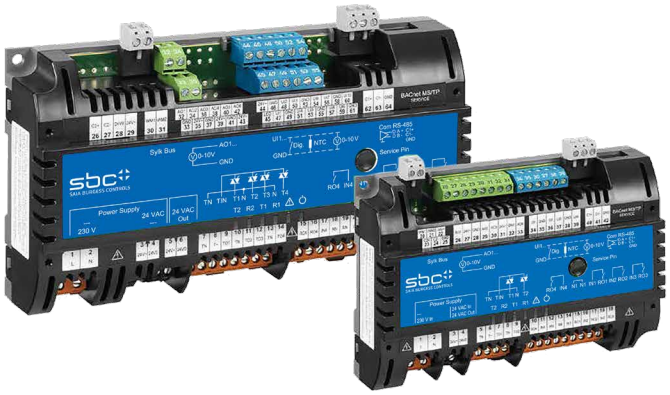

Fig. 1.
PCD7.LRxx (without optional covers)

BEFORE INSTALLATION

IMPORTANT

It is recommended that the unit be kept at room temperature for at least 24 hours before applying power; this is to allow the evaporation of any condensation resulting from low shipping / storage temperatures.

CAUTION

To avoid electrical shock or equipment damage, you must switch OFF the power supply before attaching / removing connections to/from any terminals.

Table 1. Overview of models

Article number	Housing	Power supply	Analogue outputs AOs	Universal inputs UIs	Relays	Triacs (24/230 VAC)	Total no. of I/O	24 VAC output for field devices and Triac outputs	Comment
PCD7.LRL2	Large	230 VAC	2	6	4	4	16	max 300 mA	fixed terminals, except BACnet MS/TP, Sylk and 24 VAC power supply terminals which are removable
PCD7.LRS4	Small	230 VAC	4	4	4	2	14	max 300 mA	
PCD7.LRS5	Small	24 VAC	4	4	4	2	14	max 600 mA	

DIMENSIONS AND MOUNTING

Housings

The controller is available in two housing sizes, both conforming to IP20:

- PCD7.LRL2 (large housing):
  W × L × H = 110 × 198 × 59 mm and
- PCD7.LRSx (small housing):
  W × L × H = 110 × 162 × 59 mm

See also Fig. 2 and Fig. 3.

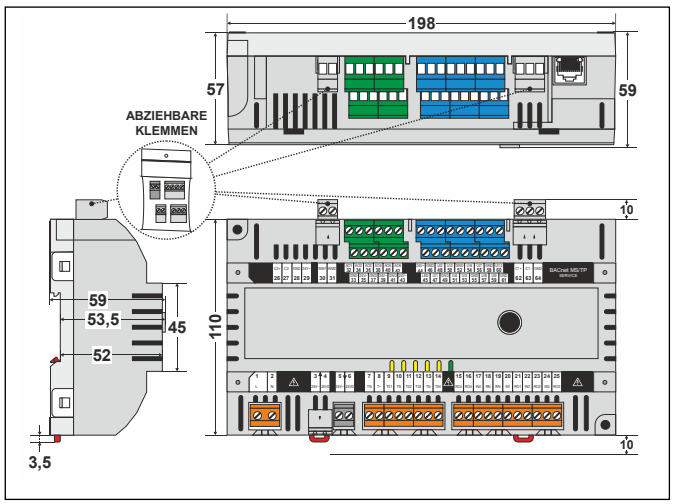

Fig. 2. PCD7.LRL2 dimensions (in mm)

NOTE: In the case of the LRL5, all of the terminal blocks are removable.

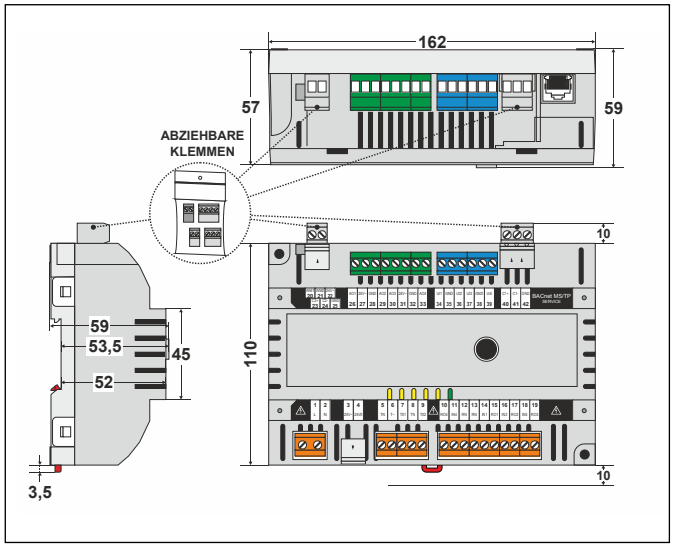

Fig. 3. PCD7.LRSx dimensions (in mm)

Terminal Protection Covers for IP30

In the case of controllers mounted outside of a cabinet, before applying power to the device, Terminal Protection Covers (10-pc. bulk packs, order no.: IRM-RLC for large housings and IRM-RSC for small housings) must be mounted so as to provide IP30.

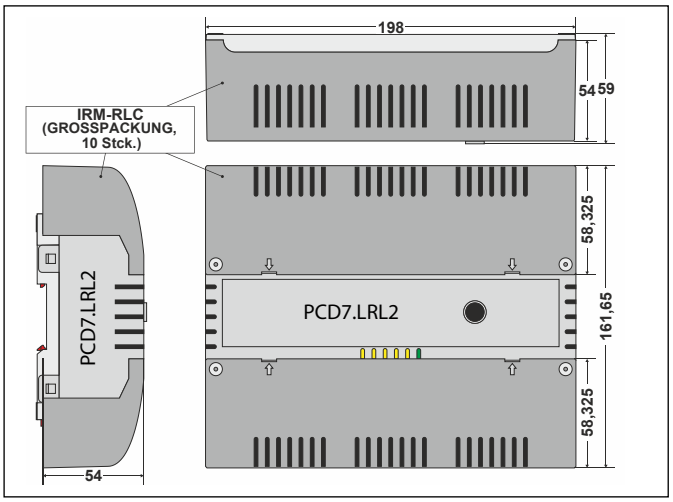

Fig. 4. Large housing, with terminal protection covers, dimensions (in mm)

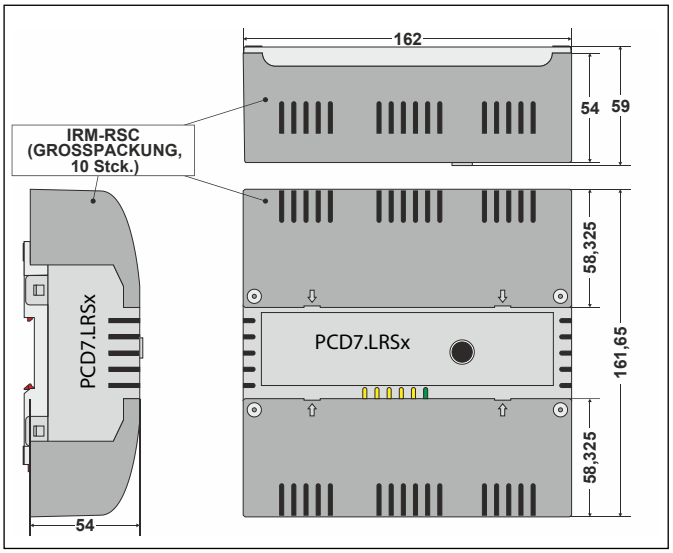

Fig. 5. Small housing, with terminal protection covers, dimensions (in mm)

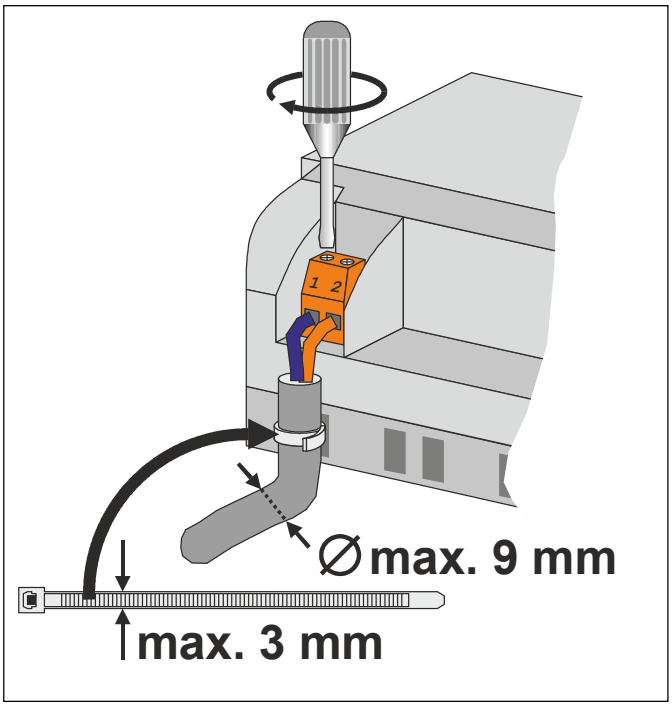

Fig. 6. Cable binders

DIN Rail Mounting/Dismounting

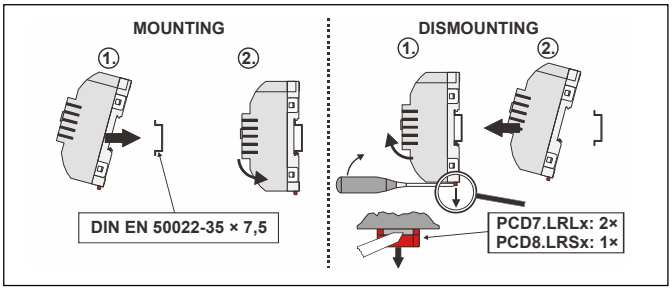

Fig. 7. Mounting and dismounting

The unit can be mounted onto the DIN rail simply by snapping it into place. It is dismounted by gently pulling the stirrup(s) located at the base of the housing (see Fig. 7). When mounted vertically on a DIN rail, the unit must be secured in place with a stopper to prevent sliding.

Wall Mounting/Dismounting

The unit can be mounted on floors, walls, and ceilings in any desired orientation. (See also section "Ambient Environmental Limits" on pg. 18 for temperature range restrictions with floor/ceiling mounting.)
The unit is mounted by inserting optional screws (recommended: DIN EN ISO 7049 – ST4,2x22 – C - H) through the corresponding screwing noses.

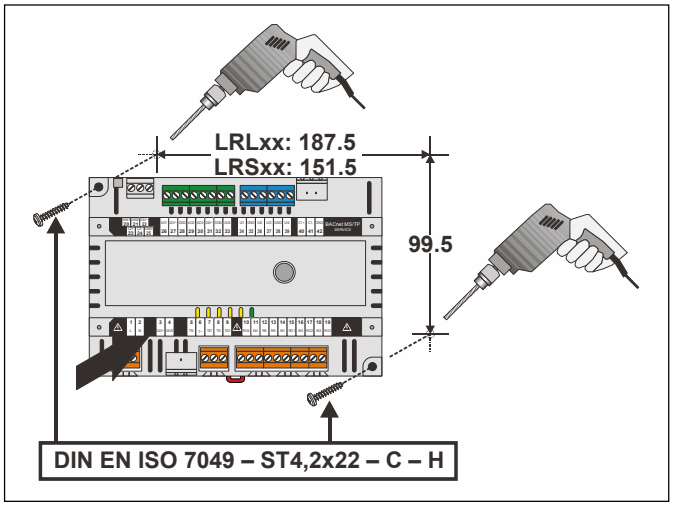

Fig. 8. Drilling template (view from above)

After mounting the unit onto the wall, snap the appropriate terminal protection covers (see Fig. 5 on pg. 2 and Fig. 6 on pg. 3) into place onto the housing by hand.

NOTE: In the case of wall-mounting, optional terminal protection covers (in the case of the PCD7.LRLx [large housings]: IRM-RLC; in the case of the PCD7.LRSx [small housings]: IRM-RSC) must be installed in order to comply with IP30.

The covers can be fixed into place using optional screws (recommended: DIN EN ISO 7049 – ST2,9x9,5 – C (F) – H).
To remove a cover, place a screwdriver in the two leverage slots (marked with arrows) and pry it loose.

TERMINAL ASSIGNMENT

General

For a complete list of all terminals and a description of their functions, see Table 2 and Table 6.

NOTE: All terminal blocks capable of carrying either low voltage or line voltage are orange-colored.

The delivery includes a plastic bag containing additional, removable terminal blocks for BACnet MS/TP and Sylk interfaces.
The controller is powered by 230 VAC, and is equipped with differing numbers of triac outputs, relay outputs, etc. capable of being configured in a variety of ways. See Table 1 on page 1.
Every controller features a terminal assignment label on the top of the housing.

Power Supply Terminals

- Power is supplied via an orange-colored fixed screw-type terminal block (terminals 1+2).
- In the case of the 24-VAC models, power is supplied via a removable terminal plug (terminals 3+4).

See also section "Power Supply" on pg. 10.

Input / Output Terminals

The controller features rows of terminal blocks on the top and bottom.

- In the case of the PCD7.LRLx (large housing), the controller has double rows of analog outputs (AOs) and universal inputs (UIs) at the top and a single row of binary outputs (BOs) - triacs (TRs) and relay outputs (ROs) - at the bottom.
- In the case of the PCD7.LRSx (small housing), the controller has a single row of analog outputs (AOs) and universal inputs (UIs) at the top and a single row of binary outputs (BOs) - triacs (TRs) and relay outputs (ROs) - at the bottom.

NOTE: According to VDE guidelines, it is not allowed to mix low-voltage and high-voltage signals on the relays and triacs.

See also section "I/O Terminals" on pg. 14.

Communication Interfaces

All models of the controller feature the following communication interfaces:

- A Sylk Bus interface (removable plug; PCD7.LRSx: terminals 20 and 21; PCD7.LRLx: terminals 30 and 31), for connection to TR40x/42x Wall Modules;
- A BACnet MS/TP interface (removable plug; PCD7.LRSx: terminals 40, 41, and 42; PCD7.LRLx: terminals 62, 63, and 64);
- An RJ45 connector for connection of the BACnet WiFi Adapter.

Table 2. PCD7.LRSx Room Controller: Overview of terminals and functions

term.	printing	function	RS4	RS5
1, 2	„L“,„N“	230-V power supply	X	---
3, 4	„24V~“,„24V0“	Removable 24-V power supply input	---	X
3, 4	„24V~“,„24V0“	Aux. output voltage (24 VAC) for all triacs	X	---
5	„TN“	Aux. term. for triac neutral wiring (internally connected with terminal 8)	X	X
6	„T~“	Triac input voltage (24 VAC / 230 VAC) for all triacs; triac-switched	X	X
7	„T01“	Triac-switched output	X	X
8	„TN“	Aux. term. for triac neutral wiring (internally connected with terminal 5)	X	X
9	„T02“	Triac-switched output	X	X
10, 11	„RO4“,„IN4“	Output of Relay 4, Input for Relay 4	type 2	type 2
12, 13	„RN“,„RN“	Aux. terminals for relay neutral wiring	X	X
14, 15	„IN1“,„RO1“	Input for Relay 1, Output of Relay 1	type 1	type 1
16, 17	„IN2“,„RO2“	Input for Relay 2, Output of Relay 2	type 1	type 1
18, 19	„IN3“,„RO3“	Input for Relay 3, Output of Relay 3	type 1	type 1
20, 21	„WM1“,„WM2“	Removable interface for Sylk Bus	X	X
22, 23, 24, 25	„24V~“,„C2+“,„C2-“, „24V0“	Not used	---	---
26	„AO1“	Analog Output 1	type 2	type 2
27	„24V~“	24 VAC power for field devices	X	X
28	„GND“	Ground for AOs	X	X
29	„AO2“	Analog Output 2	type 1	type 1
30	„AO3“	Analog Output 3	type 1	type 1
31	„24V~“	24 VAC power for field devices	X	X
32	„GND“	Ground for AOs	X	X
33	„AO4“	Analog Output 4	type 1	type 1
34	„UI1“	Universal Input 1	X	X
35	„GND“	Ground for UIs	X	X
36	„UI2“	Universal Input 2	X	X
37	„UI3“	Universal Input 3	X	X
38	„GND“	Ground for UIs	X	X
39	„UI4“	Universal Input 4	X	X
40, 41, 42	„C1+“,„C1-“,„GND“	Removable BACnet MS/TP interface and corresponding GND	X	X

Relay output types: See Table3. Universal input types: See Table 4. Analog output types: See Table 5

Table 3. Relay output types and characteristics

	type 1 (standard)	type 2 (high in-rush current)
corresponding ROs of PCD7.LRSx	RO1, RO2, RO3	RO4
corresponding ROs of PCD7.LRLx	RO2, RO3	RO1, RO4
contact	N.O.	N.O.
min. load	5 VAC, 100 mA	24 VAC, 40 mA
switching voltage range	15…253 VAC	15…253 VAC
max. continuous load at 250 VAC (cos φ = 1)	4 A	10 A
max. continuous load at 250 VAC (cos φ = 0.6)	4 A	10 A
in-rush current (20 ms)	---	80 A
usage	fan motor	light switching and fan motor

NOTE: The max. sum load of all relay currents at the same time is 14 A.

Table 4. Universal input types and characteristics

	UI1, UI2, UI3, UI4, UI5, UI6
pull-up voltage: 10 V	X
NTC10kΩ	X
NTC20kΩ	X
dry contact (closed: res. <10 kΩ; open: res. > 20 kΩ; max. 0.2 Hz; pull-up voltage: 10 V)	X
fast binary (=counter) input (max. 30 Hz; pulse ON = min. 16 ms; pulse OFF = min. 16 ms; closed: voltage < 1 V; open: voltage > 5 V; pull-up voltage: 10 V)	X
SetPoint and FanSpdSW (from PCD7.L63x, Q.RCU-A-Txxx and T7460x)	X

Table 5. Analog output types and characteristics

	type 1	type 2	type 3
output voltage	0…11 V		
output current	0…1 mA	0…5 mA	0…10 mA
min. accuracy	±150 mV		
max. ripple	±100 mV		
accuracy at zero point	0…200 mV		

Table 6. PCD7.LRL2 Room Controllers: Overview of terminals and functions (by model)

term.	printing	function	RL2
1, 2	"L", "N"	230-V power supply	X
3, 4	"24V~", "24V0"	Removable 24-V power supply input	---
5, 6	"24V~", "24V0"	Aux. output voltage (24 VAC) for all triacs	X
7	"TN"	Aux. terminal for triac neutral wiring (internally connected with terminals 10 + 13)	X
8	"T~"	Triac input voltage (24 VAC / 230 VAC) for all triacs; triac-switched	X
9	"T01"	Triac-switched output	X
10	"TN"	Aux. terminal for triac neutral wiring (internally connected with terminals 7 + 13)	X
11	"T02"	Triac-switched output	X
12	"T03"	Triac-switched output	X
13	"TN"	Aux. terminal for triac neutral wiring (internally connected with terminals 7 + 10)	X
14	"T04"	Triac-switched output	X
15	"RC4"	Triac-switched output	---
16, 17	"RO4", "IN4"	Output of Relay 4, Input for Relay 4	type 2
18	"RN"	Aux. terminal for relay neutral wiring	X
19	"RN"	Aux. terminal for relay neutral wiring	X
20, 21	"IN1", "RO1"	Input for Relay 1, Output of Relay 1	type 2
22, 23	"IN2", "RO2"	Input for Relay 2, Output of Relay 2	type 1
24, 25	"IN3", "RO3"	Input for Relay 3, Output of Relay 3	type 1
26, 27, 28, 29	"C2+", "C2-", "24V0", "24V~"	RS-485 Modbus interface, corr. GND, + aux. power (24 VAC ±20%, 50/60 Hz)	---
30, 31	"WM1", "WM2"	Removable interface for Sylk Bus	X
32	"AO1"	Analog Output 1	type 3
33	"GND"	Ground for AOs	X
34	"AO2"	Analog Output 2	type 3
35	"24V~"	24 VAC power for field devices	X
36	"AO3"	Analog Output 3	---
37	"GND"	Ground for AOs	---
38	"AO4"	Analog Output 4	---
39	"24V~"	24 VAC power for field devices	---
40	"AO5"	Analog Output 5	---
41	"GND"	Ground for AOs	---
42	"AO6"	Analog Output 6	---
43	"24V~"	24 VAC power for field devices	---
44	"24V~"	24 VAC power for field devices	X
45	"LED"	Output to LED of PCD7.L632, Q.RCU-A-TSOx and T7460C,E,F	X
46	"GND"	Ground for UIs	X
47	"UI1"	Universal Input 1	X
48	"UI2"	Universal Input 2	X
49	"GND"	Ground for UIs	X
50	"UI3"	Universal Input 3	X
51	"UI4"	Universal Input 4	X
52	"GND"	Ground for UIs	X
53	"UI5"	Universal Input 5	X
54	"UI6"	Universal Input 6	X
55	"GND"	Ground for UIs	X
56	"UI7"	Universal Input 7	---
57	"UI8"	Universal Input 8	---
58	"GND"	Ground for UIs	---
59	"UI9"	Universal Input 9	---
60	"UI10"	Universal Input 10	---
61	"GND"	Ground for UIs	---
62, 63, 64	"C1+", "C1-", "GND"	Removable BACnet MS/TP interface and corresponding GND	X

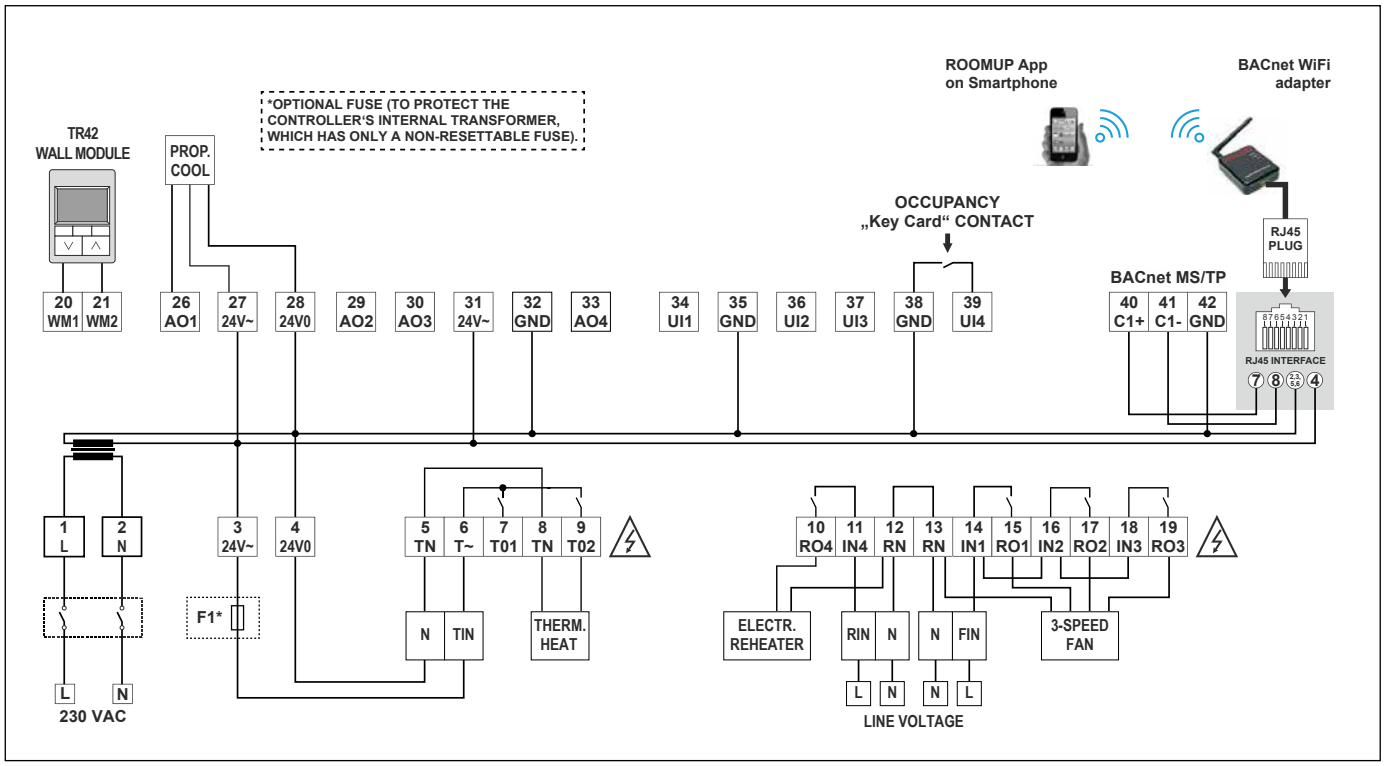

Fig. 9. PCD7.LRS4 example wiring

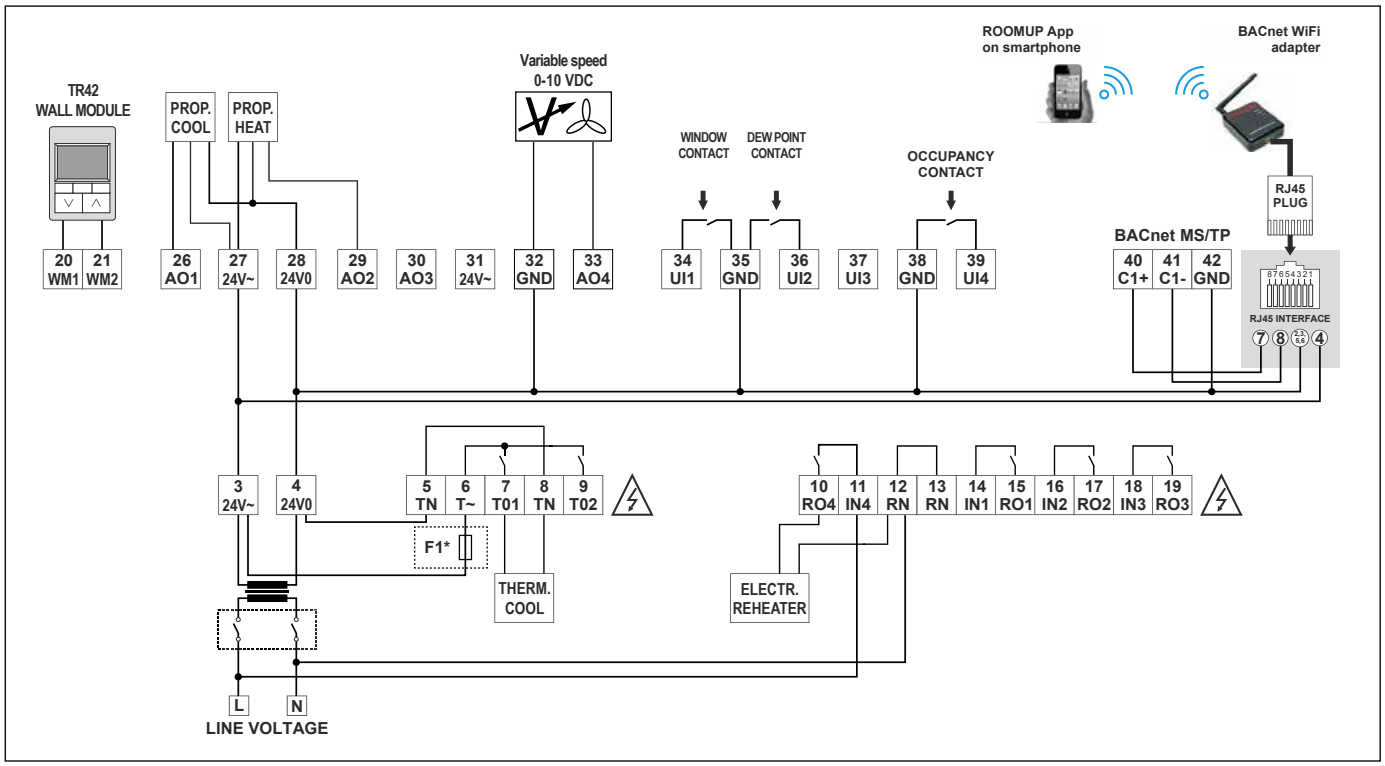

Fig. 10. PCD7.LRS5 example wiring

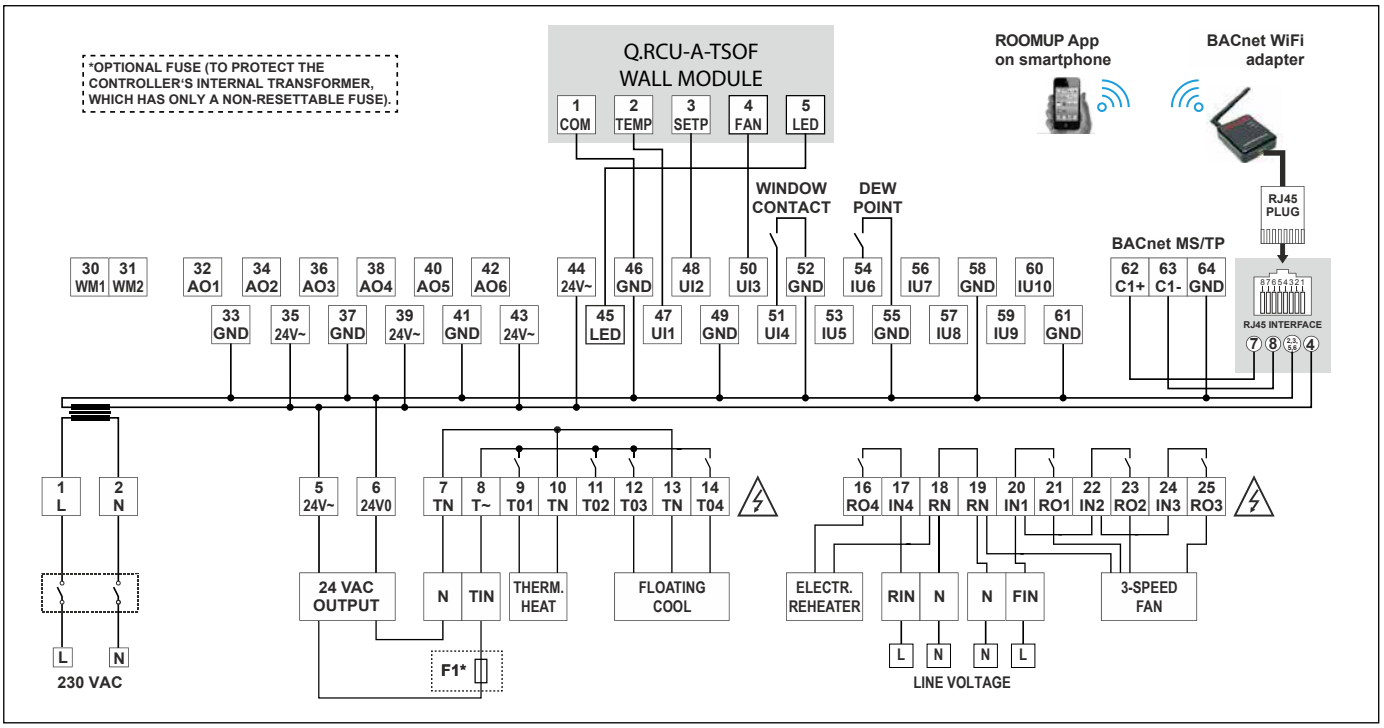

Fig. 11. PCD7.LRL2 example wiring

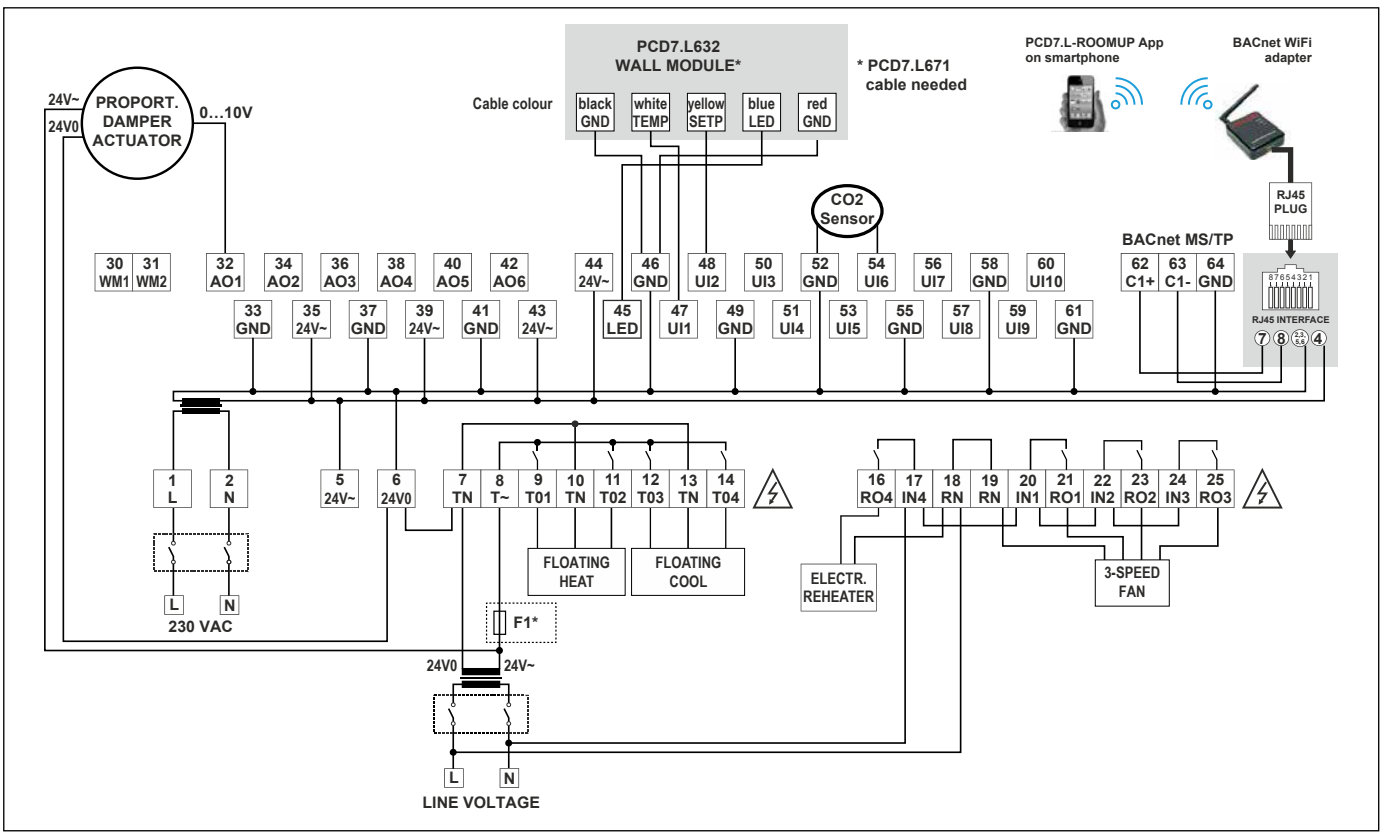

Fig. 12. PCD7.LRL2 example wiring (with actuator powered by extra transformer)

POWER SUPPLY

General Information

CAUTION

To prevent a risk of injury due to electrical shock and/or damage to device due to short-circuiting, low-voltage and high-voltage lines must be kept physically separate from one another. Further, to prevent a risk of short-circuiting and damage to your unit, do not reverse the polarity of the power connection cables, and avoid ground loops (i.e., avoid connecting one field device to several controllers).

NOTE: All wiring must comply with applicable electrical codes and ordinances. Refer to job or manufacturers' drawings for details. Local wiring guidelines (e.g., IEC 364-6-61 or VDE 0100) may take precedence over recommendations provided in these installation instructions.

NOTE: To comply with CE requirements, devices having a voltage of 50...1000 VAC or 75...1500 VDC but lacking a supply cord, plug, or other means for disconnecting from the power supply must have the means of disconnection incorporated in the fixed wiring. This means of disconnection must have a contact separation of at least 3 mm at all poles.

Wiring

The 230-VAC models

Controllers are powered via an orange fixed screw-type terminal block (terminals 1+2). See also Fig. 13.
These terminals support 1 × 4 mm² or 2 × 2.5 mm² wiring.

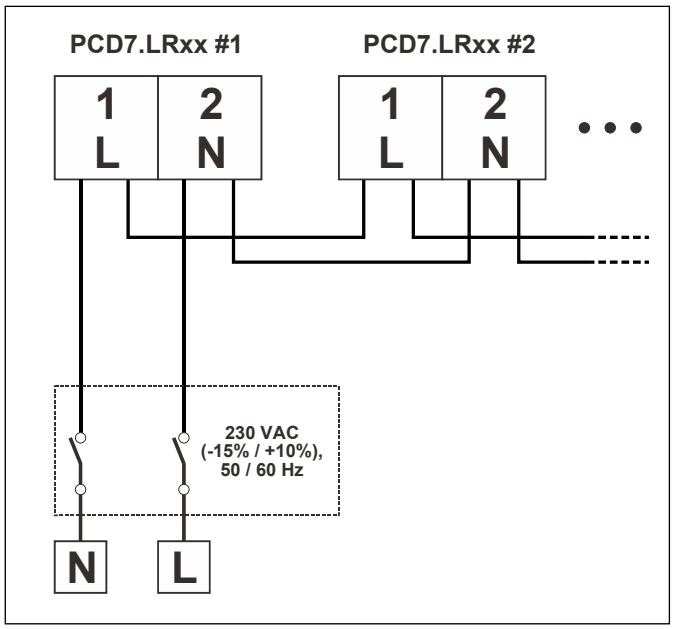

Fig. 13. Multiple 230-VAC controllers connected to single power supply

24 VAC Models

The 24-VAC models are powered via a black rmovable terminal plug (terminals 3+4), thus allowing daisy chain wiring of the power supply. See also Fig. 14. These terminals support 1controllers are powered via an orange fixed screw-type terminal block (terminals 1+2). See also Fig. 14.
These terminals support 1 × 2.5 mm² or 2 × 1.5 mm² wiring.

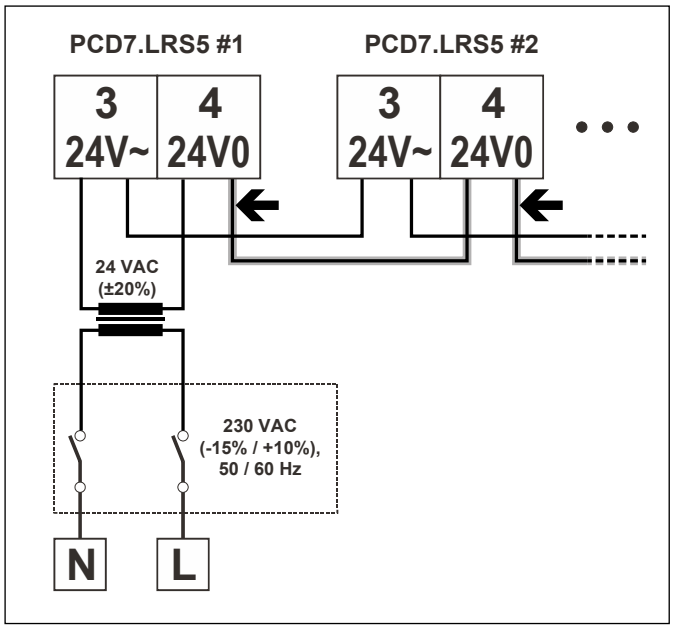

Fig. 14. Multiple 24-VAC controllers connected to single power supply

24-VAC Terminals for Auxiliary or Field Devices

All 24-VAC auxiliary power supply terminals support 1 × 2.5 mm² or 2 × 1.5 mm² wiring.

Communication / Signal Terminals

All other (i.e.: communication / signal) terminals (except for the Sylk Bus – see Table 12) support 1 × 2.5 mm² or 2 × 1.5 mm² wiring. Two wires with a total thickness of 2.5 mm² (14 AWG) can be twisted together and connected using a wire nut (include a pigtail with this wire group and attach the pigtail to the individual terminal block). Deviations from this rule can result in improper electrical contact. Local wiring codes may take precedence over this recommendation.

Electrical Data

PCD7.LRL2 and PCD7.LRS4 (230-VAC models)

Power supply via terminals 1 + 2:
230 VAC +10% / -15%, 50/60 Hz.
Max. power consumption (when unloaded): 8 W.
Max. power consumption (when loaded): 18 W.
The controller is "unloaded" when it has no external load. Thus, the only load on the controller is the inherent load (8 W) of the electronics, themselves. The heat dissipation then amounts to 8 W. The controller is "loaded" when – besides the inherent load – an additional sum load of max. 300 mA is applied to the 24 VAC output terminals. The max. unloaded output voltage at terminals 3 and 4 is 33 VAC (typically: 29.5 VAC).

PCD7.LRS5 (24-VAC models)
Power supply via terminals 3+4: 24 VAC ±20 %, 50/60 Hz. Max. power consumption (when unloaded): 300 mA.
Max. power consumption (when loaded): 900 mA.
The controller is "unloaded" when it has no external load. The heat dissipation then amounts to 7 W. The controller is "loaded" when – besides the inherent load (300 mA) – an additional sum load of max. 600 mA is applied to the 24 VAC output terminals.

COMMISSIONING

Configurable Application

All three models can be used with the configurable application already included in the controller.
The configurable application has the advantage that it is proven and quickly commissioned using the ROOMUP commissioning tool running on an Android Smart device.
Configuration and commissioning can be performed using the ROOMUP commissioning tool available in the Google Playstore (URL: https://play.google.com/store). To activate the downloaded RoomUp app, it need to be ordered a RoomUp Licence-Key with ordering number PCD7.L-ROOMUP.

NOTE: Before configuring, if as yet no WLAN is present,the commissioning engineer will require a BACnet WiFi Adapter (order no.: BACA-A) to establish wireless communication between his Android Smart device and the controller.

Automatic MAC Addressing

In contrast to other controllers, the PCD7.LRxx Controller features automatic MAC addressing.
The MAC addresses which the individual PCD7.LRxx controllers on the BACnet MS/TP bus assign to themselves are not assigned in sequential order.
They assign those numbers (MAC ID) between 1…30 currently not in use by another device on the BACnet MS/TP bus. All PCD7.LRxx controllers are BACnet MS/TP masters. Every master performs periodic polling for the possible appearance of new masters. Each master "knows" the identity of the "next" master (i.e., that PCD7.LRxx controller with the next-highest MAC ID) on the BACnet MS/TP bus and to which it must therefore pass the token. The polling process includes a search for new masters which might have MAC addresses lying between its own MAC address and that of the "next" master. The value of the property Max Master specifies the highest-allowable address for master nodes. Max Master is set to 35 by default, thus guaranteeing that, on a BACnet MS/TP bus with, e.g., 30 PCD7.LRxx controllers, all of the other PCD7.LRxx controllers will be found. Both the property Max Master and the property MAC ID are writeable properties that can be changed using BACnet-compliant engineering tools. See also PG5 User Guide.

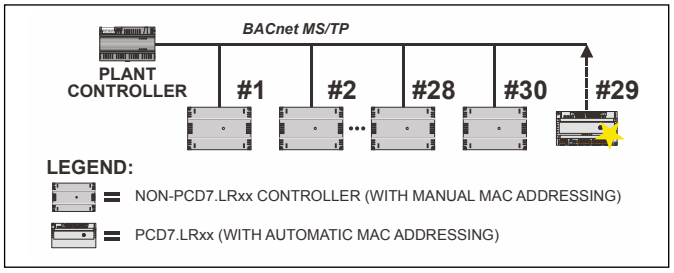

Fig. 15. Automatic MAC addressing (scenario "A")

In scenario "A", 29 controllers with manually-assigned MAC addresses (#1, #2, #3…#27, #28, #30 – MAC address #29 has thus been deliberately skipped) are already up and running on the BACnet MS/TP bus. A single additional PCD7.LRxx is then connected to the bus and powered on.

RESULT: The PCD7.LRxx Controller requires approx. 28-31 sec to automatically assign itself a compatible MAC address (#29), and to complete various other firmware tasks before becoming fully operational.

Scenario "A" and additional scenarios ("B" through "F") are described in Table 7 below.

Table 7. Possible Auto MAC addressing scenarios

scenario	time	remarks
A: PCD7.LRxx start-up time on single BACnet MS/TP bus after power-on (cold boot or reset).	28-31 sec	29 non-PCD7.LRxx controllers (with manual MAC addressing) are running; 1 PCD7.LRxx is then added and powered on.
B: Average start-up time for all PCD7.LRxx controllers on single BACnet MS/TP bus.	1 min. and 34 sec	Like "A," but with 8 non-PCD7.LRxx controllers, 22 PCD7.LRxx controllers are then added and booted.
C: Time to recognize conflicting MAC address of added non-PCD7.LRxx controller.	21 sec	Like "B," but with 7 non-PCD7.LRxx controllers and 22 PCD7.LRxx controllers; an additional non-PCD7.LRxx controller with a conflicting address is then added.
D: Time to recognize conflicting MAC address of added non-PCD7.LRxx controller while auto MAC still in progress.	50 sec	Like "C," but with the additional non-PCD7.LRxx controller having a conflicting MAC address added while auto MAC still in progress.
E: Time for auto MAC when additional PCD7.LRxx controllers are added in stages while auto MAC still in progress.	30 sec	Like "B," but with PCD7.LRxx controllers added in stages.
F: Time for restart of PCD7.LRxx controllers and verification of auto MAC addresses after power down.	17 sec	8 non-PCD7.LRxx controllers and 22 PCD7.LRxx controllers are running; then power down and restart.

OPERATOR INTERFACES LEDs

The controller features the following LEDs:

Fig. 16. Controller LEDs

Table 8. Description of LED behaviors

symbol	color	function, description
T2	yellow	Not used
R2	yellow	Not used
T1	yellow	LED indicating transmission of communication signals via the BACnet MS/TP interface
R1	yellow	LED indicating reception of communication signals via the BACnet MS/TP interface.
⚠	yellow	Status LED indicating firmware problems, hardware problems, etc.
⏻	green	Power LED indicating firmware problems, hardware problems, etc.
	red	Not used

Table 9. Status LED and power LED behaviors

#	Mode	Power LED (green)	Status LED (yellow)
1	Power failure	Stays OFF	Stays OFF
2	Normal operation	ON/OFF (0.5 Hz)	Stays OFF
3	No firmware	ON/OFF (0.5 Hz)	ON/OFF (1 Hz)
4	No valid MAC	ON/OFF (0.5 Hz)	ON/OFF (0.5 Hz)
5	Auto-MAC	ON/OFF (1 Hz)	ON/OFF (0.5 Hz)
6	No application	ON/OFF (0.5 Hz)	ON/OFF (0.25 Hz)
7	Short-circuiting	ON/OFF (0.5 Hz)	Stays ON
8	Broken sensor	ON/OFF (0.25 Hz)	Stays ON
9	Device error*	Stays ON	Stays ON

* Please return the controller for repair (all of the software is missing).

Service Button

The Service Button is used to trigger dedicated events.

Table 10. Use of controller's Service Button

action	result
Button pressed 0.01 to 2 sec. while controller running	Service Pin (UID) broadcast on the BACnet MS/TP bus.
Button pressed > 10 sec. while controller powering up	Password is reset.
Button pressed 0.01 to 5 sec. while controller powering up	Auto MAC addressing procedure reinitiated.

COMMUNICATION INTERFACES

BACnet MS/TP Interface

The controller features an RS485 interface (RLx: terminals 62, 63, and 64; RSx: terminals 40, 41, and 42) suitable for BACnet MS/TP communication. The terminal block containing it is black. The cable length affects the baud rate. See Table 11.

Table 11. Baud rate vs. max. cable length

baud rate	max. cable length (L)
9.6, 19.2, 38.4, 57.6, and 76.8 kbps	1200 m
115.2 kbps	800 m.

For information on wire gauge, max. permissible cable length, possible shielding and grounding requirements, and the max. number of devices which can be connected to a bus, refer to standard EIA-485.

Connecting to BACnet MS/TP Buses

The communicates via its BACnet MS/TP interface with other BACnet MS/TP-capable devices (e.g., other room controllers or plant controllers). In doing so, the following considerations should be taken into account.

- Max. BACnet MS/TP bus length (L): See Table 11.
- Twisted-pair cable, e.g.:
  - AWG 18
  - J-Y-(St)-Y 2 × 2 × 0,8
  - CAT 5,6,7 cable – use only one single pair for one bus
  - Belden 9842 or 9842NH); and daisy-chain topology.
- Must conform to EIA-RS485 cabling guidelines and ANSI/ASHRAE Standard 135-2010.
- Max. no. of BACnet MS/TP devices (including the plant controller, itself) per BACnet MS/TP interface of the plant controller: 30 unit loads.

RJ45 Connector for BACnet WiFi Adapter

A BACnet WiFi Adapter can be connected to the controller's RJ45 connector in order to establish wireless communication with an Android Smart device so that the application engineer can configure the controller (using the ROOMUP configuration tool).

NOTE: When the BACnet WiFi Adapter is connected to the controller's RJ45 connection, it is powered by the controller. It is then prohibited to simultaneously power the BACnet WiFi Adapter via a wall adapter.
When, on the other hand, the BACnet WiFi Adapter is instead connected to the controller's BACnet MS/TP interface, it is prohibited to simultaneously use an RJ45 plug; instead, the BACnet WiFi Adapter must then be powered by a wall adapter (standard 5-V USB wall adapter with micro USB connector).

See also corresponding Technical Literature listed in Table 16 on pg. 18.

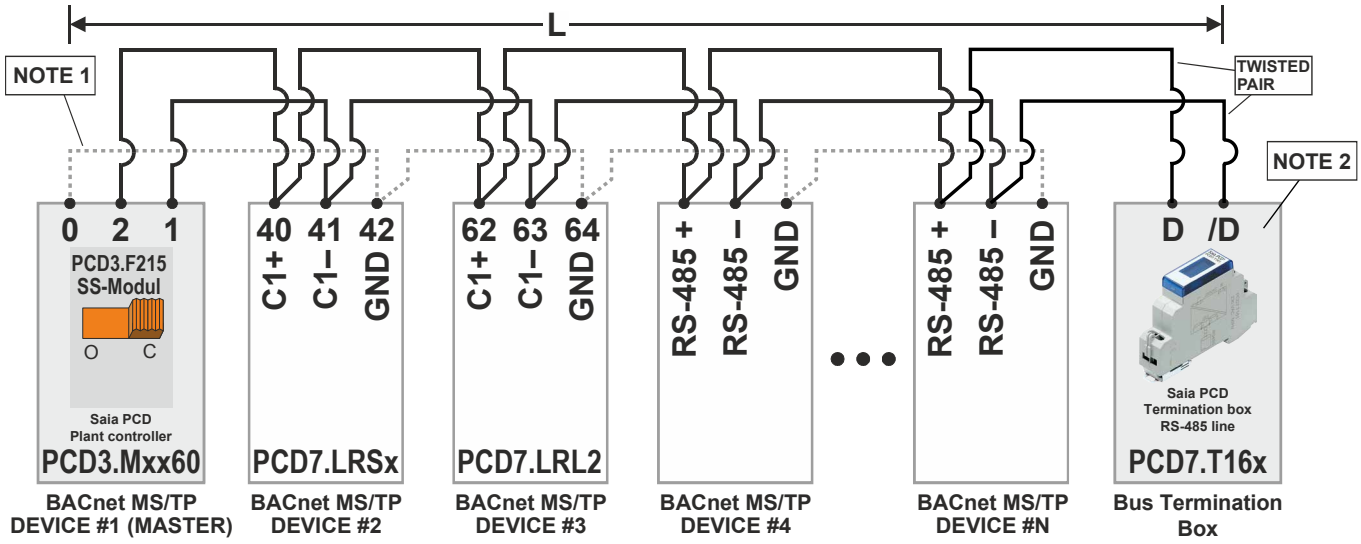

Fig. 17. Connection to a BACnet MS/TP Bus

NOTE 1: If any of the devices are electrically isolated, it is recommended that those devices be connected to signal ground.

NOTE 2: The PCD7.T16x termination box must be connected directly after the last BACnet MS / TP device.

NOTE 3: If shielding is used, the shielding of each individual bus segment should be separately connected at one end to earth.

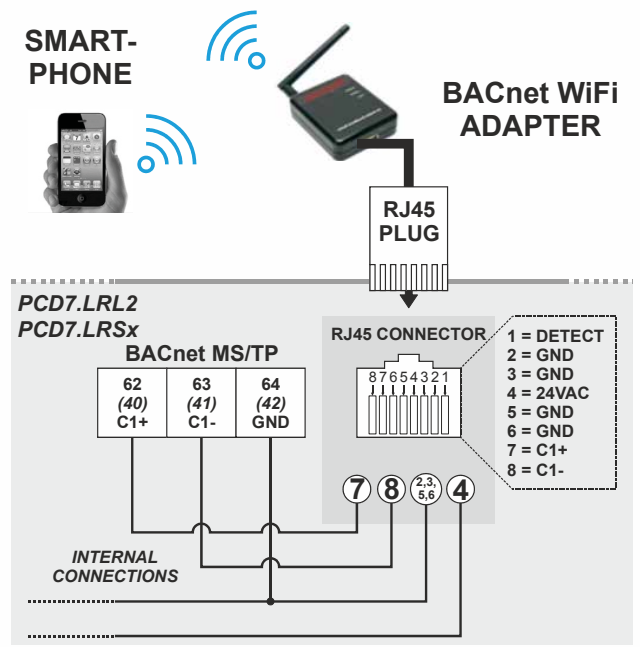

Fig. 18. RJ45 interface and BACnet WiFi Adapter

CAUTION

It is permitted to connect only the BACnet WiFi Adapter to this RJ45 connector. Do not connect IP!

Sylk Bus

Sylk Bus-capable devices (e.g., the TR40x/T42x) can be connected to the controller's Sylk Interface (PCD7.LRSx: terminals 20 and 21; PCD7.LRLx: terminals 30 and 31). Specifically:

- A max. of one wall module can be connected.
- The Sylk Bus is single pair, and polarity-insensitive.
- Max. current provided at the Sylk Bus interface: 96 mA.

Table 12. Recommended max. distances from controller to TR40x/TR42x wall modules

no.	single twisted pair, nonshielded, stranded or solid[A]		standard non-twisted thermostat wire, shielded or non-shielded, stranded or solid[B], [C]
	0.33…0.82 mm² (18…22 AWG)	0.20 mm² (24 AWG)	0.20…0.82 mm² (18…24 AWG)
2	150 m (500 ft)	120 m (400 ft)	30 m (100 ft)

A) As a rule of thumb, single twisted pair (two wires per cable, only), thicker gauge, non-shielded cable yields the best results for longer runs.
B) The 30 m (100 ft) distance for standard thermostat wire is conservative, but is meant to reduce the impact of any sources of electrical noise (incl. but not limited to VFDs, electronic ballasts, etc.). Shielded cable recommended only if there is a need to reduce the effect of electrical noise.
C) These distances apply also for shielded twisted pair.

I/O TERMINALS

Relay Outputs

CAUTION

Mixing of different voltages (e.g., 24 V and 230 V) within the relay block is not allowed.

The terminal blocks containing the controller's relay outputs are orange. Relay output types: **See table 3**

NOTE: If inductive components are to be connected to the relays and if these relays switch more often than once every two minutes, these components must be prevented from causing harmful interference to radio or television reception (conformance with EN 45014).

Triac Outputs

NOTE: Recommended fuse (F1): 1.25 A time-lag fuse (IEC). User must consider the correct voltage and max. breaking capacity / interrupting rate (line voltage urgently requires high breaking capacity / interrupting rate).

The terminal blocks containing the controller's triac outputs are orange.

These triac outputs can be configured (using, e.g., the ROOMUP configuration tool) for a variety of different functions, e.g., for connection to either a floating drive or to a thermal actuator. Once the triac outputs have been configured, the corresponding devices can then be connected to them directly.

NOTE: The VC6983 actuator is intended for use at relay outputs, only and must not be used at the controller's triac outputs.

Triac Current Limitations

In the case of the 230-VAC versions of the controller, when the triacs are to be supplied with 24-VAC power from the con¬troller's internal transformer, then the following applies:

- Max. 300 mA (or 320 mA for max. 2 minutes), i.e., a max. of one thermal actuator for heating and one thermal actuator for cooling can be operated (provided that heating and cooling are not operated at the same time).

CAUTION

The max. permissible power output of all 24 VAC terminals combined is 300 mA (or 320 mA for max. 2 minutes)! If the triacs, alone, are loaded with 300 mA (320 mA), then it is not permitted to connect a load at any other 24 VAC output terminal.

In all other cases, when the triacs are to be supplied with power (24 VAC or 230 VAC) from an external source, then the following applies:

- 700 mA (peak) and 600 mA (max.), i.e., two to three thermal actuators can be operated in parallel (depending upon the current consumption of the given actuator).

Universal Inputs

The terminal blocks containing the controller's universal inputs are blue.

Universal input types: See Table 4.

The universal inputs are protected against voltages of max. 29 VAC and 30 VDC (due to, e.g., miswiring).

Bias Resistors

Each universal input is equipped with one bias resistor.

See Fig. 19.

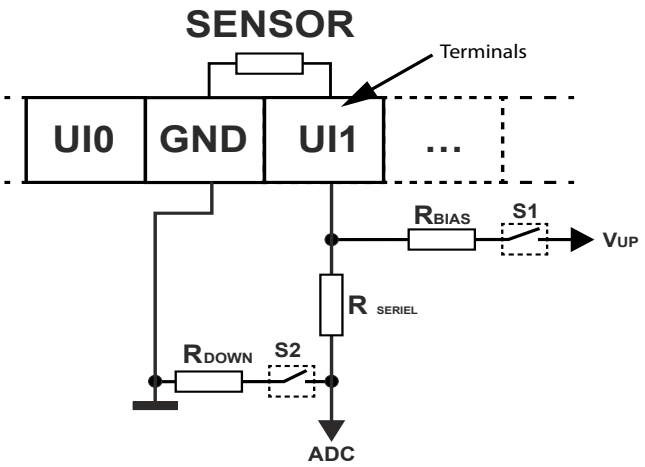

Fig. 19. Schematic of universal inputs and bias resistors

LEGEND:

V_{UP} =	10 V
R_{BIAS} =	Bias resistor (with a resistance of 24.9 kΩ in the case of NTC10kΩ and NTC20kΩ sensor); can be switched OFF via software by S1 to support 0…10 V inputs without bias current ("high impedance")
R_{SER} =	Series resistor for voltage dividing and filtering (with a resistance of 150 kΩ).
R_{DOWN} =	An internal load resistor (with a resistance of 49 kΩ); depending upon the given type of connected sensor, the firmware may switch this resistor OFF.

Analog Outputs

The terminal blocks containing the controller's analog outputs are green.

Analog output types: See Table 5.

The analog outputs of the PCD7.LRLxx controllers (large housing) are protected against voltages of max. 29 VAC and 30 VDC (due to, e.g., miswiring).

NOTE: Connecting 24 VAC to any analog output of the PCD7. LRSxx controller (small housing) will damage the hardware.

Free I/O Option

Of those PCD7.LRxx inputs/outputs not used by the configurable application, a maximum of 18 are available for use by the plant controller as free I/Os (i.e., like the I/Os of an I/O module). The limitations – including model-dependent limitations – set forth in Table 2, Table 3, Table 4, Table 5 still apply. Further limitations are explained below.

Free Universal Inputs

Max. 5 BACnet Analog Input Objects

Under the free I/O option, a maximum of five of the PCD7.LRxx controller's unused UIs are available for use as analog inputs by the plant controller.

Max. 5 BACnet Binary Input Objects

Under the free I/O option, a maximum of five of the PCD7.LRxx Controller's unused UIs are available for use as binary inputs by the plant controller.

Max. 2 BACnet Accumulator Objects

Under the free I/O option, a maximum of two of the PCD7.LRxx Controller's unused UIs are available for use as accumulators by the plant controller.
These accumulators can have up to 30 Hz
(pulse ON ≥ 16 ms; pulse OFF ≥ 16 ms;
closed: voltage < 1 V; open: voltage > 5 V).
These accumulators can be used, e.g., for energy meters which create pulses when energy is consumed.

Free Outputs

Max. 4 BACnet Analog Output Objects

Under the free I/O option, a maximum of ten of the PCD7.LRxx Controller's unused outputs are available for use as four analog outputs (specifically: Analog Output Object Types) by the plant controller. Possible characteristics are as follows:

- analog output: 0(2)…10 V outputs;
- floating output: triac or relay outputs (2 outputs);
- PWM: triac outputs;
- 1-, 2-, 3-stage output: triac / relay outputs (1…3 outputs).

Max. 4 BACnet Binary Output Objects

Under the free I/O option, a maximum of four of the PCD7.LRxx Controller's unused relays and triacs are available for use as binary outputs by the plant controller. However, they can be used only as ON / OFF binary outputs.

Example:

The customer wants the plant controller to use some of the I/Os of the PCD7.LRL2 not used by the application as free I/Os, and therefore hardwires the free inputs/outputs as follows:

UI1, 2:	used as 0…10 V inputs
UI3:	used as an NTC20k temperature input
UI4, 5:	used as binary inputs
UI6:	used as a counter
AO1:	used as an 0…10 V output
AO2:	used as an 0…10 V output
Triac 1, 2:	used as floating actuator outputs
Triac 3, 4:	used as floating actuator outputs
Relay 1, 2, 3, 4:	used as binary outputs

In the above example, the customer has used the maximum of four analog characteristics.
No further analog characteristic can be assigned; e.g. relays 1, 2 could not be used as multistate outputs.

CAUTION

In the case of triacs supplied by the internal transformer: The max. permissible combined power output of all 24 VAC terminals is 300 mA! If the triacs, alone, are loaded with 300 mA, then it is not permitted to connect a load at any other 24 VAC output terminal.
In the case of triacs supplied by external transformers: The max. permissible combined power output of all triacs terminals is 600 mA!

WALL MODULES

The TR40, TR40-CO2, TR42, TR42-CO2 and PCD7.L63x, Q.RCU-A-Txxx and T7460x Wall Modules can be used in conjunction with the controller to perform room temperature sensing, setpoint adjustment, fan speed manual override, and occupancy override.

Further, the LED of the PCD7.L632, Q.RCU-A-TSOF, T7460C and T7460F and the LCD of the TR42x can be configured to provide information about:

- any override of the controller by, e.g., pressing the "occupancy" button of the wall module or receipt by the controller of a BACnet MS/TP network command (see section "LED of WM Configured to Display Info on Overrides" below);
- the controller's effective occupancy mode (see section "LED of WM Configured to Display Info on Occupancy" below).

NOTE: The intended use of the wall module's buttons must be configured using the ROOMUP configuration tool.

Table 14. Supported Q.RCU-A-Txxx wall module functions

	temperature sensor [A)]	setpt. adjustment [A)]	bypass [A)]	fanspeed override	LED	Required UI inputs
Q.RCU-A-T	×	---	---	---	---	1
Q.RCU-A-TS	×	×	---	---	---	2
Q.RCU-A-TSO	×	×	×	---	×	3
Q.RCU-A-TSOF	×	×	×	auto-0-1,2,3	×	3

Table 13. Supported T7460x wall module functions

	temperature sensor [A)]	setpt. adjustment [A)]	bypass [A)]	fanspeed override [A)]	LED	Required UI inputs
T7460A1001	×	---	---	---	---	1
T7460B1009	×	×	---	---	---	2
T7460C1007	×	×	×	---	×	3
T7460D1005	×	×	---	auto-0-1,2,3	---	3
T7460F1000	×	×	×	auto-0-1,2,3	×	3

Table 15. Supported PCD7.L63x wall module functions

	temperature sensor [A)]	setpt. adjustment [A)]	bypass [A)]	fanspeed override	LED	Required UI inputs
PCD7.L630	×	---	---	---	---	1
PCD7.L631	×	×	---	---	---	2
PCD7.L632	×	×	×	---	×	3

See also corresponding Technical Literature listed in Table 16 on pg. 18.

[A)] Requires one UI supporting NTC.

Configuration of Wall Module LED / LCD

The LED of a PCD7.L632, Q.RCU-A-TSOF, T7460C and T7460F Wall Module can be configured (using the ROOMUP configuration tool) to provide information about, e.g., overrides or effective occupancy modes. The LCD of the TR42x can likewise be configured to display such information.

LED of WM Configured to Display Info on Overrides

The LED of a PCD7.L632, Q.RCU-A-TSOF, T7460C and T7460F Wall Module connected to the controller can be configured to indicate if an override has been activated because either the wall module's override button has been pressed or the controller has received a BACnet MS/TP network command. Specifically, the following modes are supported:

- NO OVERRIDE: If the wall module's LED is OFF, then no override is currently in effect.
- OVERRIDE OCCUPANCY: If the wall module's LED is ON continuously, then the wall module's override button or a BACnet MS/TP network command has placed the controller into the "occupied" or "override" mode (but if the override button is again pushed or if a cancellation network command is received or if the override time expires, the controller will return to its scheduled occupancy mode, and the wall module's LED will behave accordingly).
- OVERRIDE HOLIDAY: If the wall module's LED flashes 2 sec OFF and 1 sec ON, then the controller has received a network command and been placed in the "holiday" mode.
- OVERRIDE UNOCCUPIED: If the wall module's LED flashes once per sec, then the wall module's override button or a network command has placed the controller into the "unoccupied" mode (however, if the override button is again pushed or if a cancellation BACnet MS/TP network command is received, the controller will return to its scheduled occupancy mode, and the wall module's LED will behave accordingly).
- If the wall module's LED flashes twice per sec, then a BACnet MS/TP network command has placed the controller into either the "standby" or the "occupied" mode.

LED of WM Configured to Display Info on Occupancy

The LED of a PCD7.L632, Q.RCU-A-TSOF, T7460C and T7460F Wall Module connected to the controller can also be configured to indicate the controller's effective occupancy mode. Specifically, the following modes are supported:

- UNOCCUPIED: If the wall module's LED is OFF, then the controller is in the "unoccupied" mode.
- STANDBY: If the wall module's LED flashes once per sec, then the controller has received a network command and been placed in the "standby" mode.
- OCCUPIED: If the wall module's LED is ON, then the controller is in the "occupied" mode.
- BYPASS: If the wall module's LED is ON continuously, then the controller has received a network command and been placed in the "bypass" mode.
- HOLIDAY: If the wall module's LED is OFF, then the controller has received a network command and been placed in the "holiday" mode.

LCD of a TR42x Configured to Display Info on Occupancy

The LCD of a TR42x connected to the controller can be configured to display various symbols to indicate the effective occupancy mode of the controller. The following then applies.

Occupied Mode

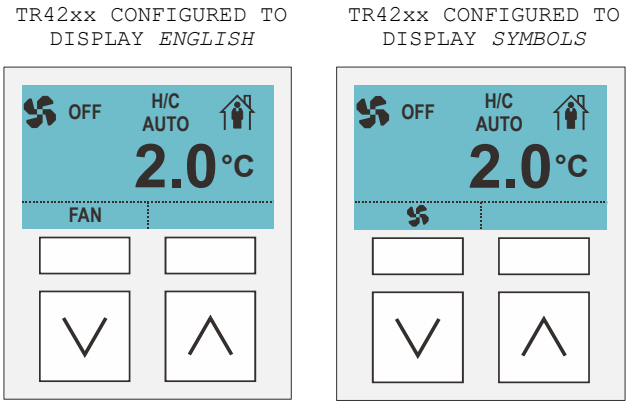

Fig. 20. Example "occupied" display

If  is displayed, the controller is in the "occupied" mode.

Unoccupied Mode

Fig. 21. Example "unoccupied" displays

If  is displayed, the controller is in the "unoccupied" mode. The user can override the "unoccupied" mode by touching the right softkey. An intermediate screen will then flash for a few seconds, allowing the user to either cancel (left softkey) or confirm (right softkey). If the user neither cancels nor confirms, this will be considered a confirmation, and the controller will be placed in the "overridden to bypass" mode. If, on the other hand, the user cancels, the controller will revert to the "unoccupied" mode.

Standby Mode

Fig. 22. Example "standby" displays

If  is displayed, the controller is in the "standby" mode. The user can override the "standby" mode by touching the right softkey. An intermediate screen will then flash for a few seconds, allowing the user to either cancel (left softkey) or confirm (right softkey). If the user neither cancels nor confirms, this will be considered a confirmation, and the controller will be placed in the "overridden to bypass" mode. If, on the other hand, the user cancels, the controller will revert to the "standby" mode.

LCD of a TR42x Configured to Display Info on Fan

If  is displayed, the fan is switched OFF. Depending upon the given application configuration, the effective control mode for underfloor heating, radiator, ceiling heating, and ceiling cooling can then be switched OFF as well.

TROUBLESHOOTING

All units feature a Service Button, Status LED, Power LED, and two additional LEDs (T1 and R1) for commissioning and troubleshooting. See also Table 8 and Table 9 and section "Service Button".
Check if the Status LED's behavior is changed if you switch the power OFF/ON. Please contact Honeywell if this does not solve the problem.
Further, the test function of the ROOMUP commissioning and configuration tool can also be used to carry out general application and wiring checks. ROOMUP also features a BACnet Object Browser which can prove very helpful in analyzing the controller's function and communication.

ACCESSORIES

Terminal Protection Cover; required for wall mounting. Bulk pack, set of ten covers.

- For large controllers, order no.: IRM-RLC
- For small controllers, order no.: IRM-RSC

APPROVALS, CERTIFICATIONS, ETC.

Approvals and Certifications

- UL 60730-1, Standard for Automatic Electric Controls for Household and Similar Use, Part 1: General Requirements;
- CAN/CSA-E60730-1:02, Standard for Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements;
- Complementary listing for UL916, CSA C22.2 No. 205;
- BTL-listed, BACnet AAC profile;
- SASO-approved;
- CE-approved;
- FCC part 15B-compliant: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radiofrequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
  - Reorient or relocate the receiving antenna.
  - Increase the separation between the equipment and receiver.
  - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
  - Consult the dealer or an experienced radio/TV technician for help.

Classification according to EN 60730-1

EN 60730 sub part:	EN 60730-2-9
Environmental conditions:	For use in home (residential, commercial, and light-industrial) environments
Construction:	independently mounted control, for panel-mounting
Action:	type 1.C
Rated impulse voltage:	2500 V at 230 V; 500 V at 24 V
Pollution degree:	2
Protection against shock:	Class 0 (without terminal covers) Class II (with terminal covers)
Software class:	Class A

Classification according to EN 60529
(Degree of protection provided by enclosures)

IP20. In the case of controllers mounted outside of a cabinet, before applying power to the device, Terminal Protection Covers (10-pc. bulk packs, order no.: IRM-RLC for large housings and IRM-RSC for small housings) must be mounted so as to provide IP30.

Ambient Environmental Limits
(5…90% r.H., non-condensing)

Operating temperature (floor/ceiling mounting):	0 … +40 °C
Operating temperature (wall/rail mounting):	0 … +50 °C
Storage temperature:	–20 … +70 °C

RELATED TECHNICAL LITERATURE

Table 16. Related Technical Literature

Title	Product Literature no.
PCD7.LRxx Room Controller – Mount. Instr.	MU1B-0610GE51
PCD7.LRxx Room Controller – Data Sheet	PP31-400
PCD7.LRxx Room Controller – Inst.&Comm. Instr.	PP31-401
Honeywell CPO IRM Controller PICS*	EN0B-0748GE51
T7460A,B,C,D,E,F – Product Data	EN0B-0236GE51
T7460A,B,C,D,E,F – Installation Instructions	EN1B-0291GE51
TR40x/TR42x – Specification Data	63-1389
Q.RCU-A-xxxx - Product Data	PP31-049
PCD7.L63x - Manual	26-859

* Protocol Implementation Conformance Statement

APPENDIX: SENSOR CHARACTERISTICS

Sensor Input Accuracy

The controller's internal sensor inputs support NTC10kΩ and NTC20kΩ sensors. The following table lists the typical minimum accuracies of the hardware and software for these temperature sensors.

Table 17. Accuracies of internal NTC10kΩ and NTC20kΩ sensor inputs of the PCD7.LRxx

range	measurement error (excluding sensor characteristics)	
	NTC10kΩ [1]	NTC20kΩ
–20 … 0 °C (–4 … +32 °F)	≤ 1.0 K	≤ 1.0 K
0 … 30 °C (32 … 86 °F)	≤ 0.5 K	≤ 0.3 K
30 … 70 °C (86 … 158 °F)	≤ 0.5 K	≤ 0.5 K

[1] NTC10kΩ specified for -30 … +100 °C, only.

NOTE: This is the accuracy of the internal sensor input (hardware + software [linearization]), only. This table does not include the characteristics of the sensors, themselves (see section "Sensor Characteristics" below). If a different sensor or sensor accuracy is required, one may instead use the inputs of, e.g., a connected Panel I/O module.

Recognition of Sensor Failure of Sensor Inputs

The thresholds at which sensor failures – i.e., sensor breaks (SB) and short-circuits (SC) – are recognized depends upon the given sensor type. In the event of a recognized sensor failure, the sensor inputs assume the safety values configured in CARE. Table 18 lists the measurement ranges and the corresponding thresholds for the recognition of sensor failure for the various different sensor types:

Table 18. Thresholds for short-circuit (SC) and sensor-break (SB) recognition

I/O configuration	measurement range	recognition thresholds
2…10 V	2…10 V / 4…20 mA (without pull-up)	SC: < 1.5 V / 3 mA; SB: no recognition
NTC10kΩ	–50 … +100 °C	SC: < 20 Ω; SB: < –70 °C
NTC20kΩ	–50 … +150 °C	SC: < 20 Ω; SB: < –70 °C

NOTE: In the case of temperatures lying outside the aforementioned ranges, the lowest/highest value within the range, instead, will be communicated. Thus a temperature of –51 °C will be communicated as "–50 °C."

Sensor Characteristics

The characteristics (resistance in relation to temperature) of the sensors and the resultant voltage are listed on the following pages. The stated values do not include failures due to: sensor failures; wiring resistance or wiring failures; misreadings due to a meter connected to measure resistance or voltage at the input.

NTC 10 kΩ

Temp. [°C]	Resistance [kΩ]	Terminal voltage [V]
–30	177	7.904
–29	166.35	7.848
–28	156.413	7.790
–27	147.136	7.730
–26	138.47	7.666
–25	130.372	7.601
–24	122.8	7.534
–23	115.718	7.464
–22	109.089	7.392
–21	102.883	7.318
–20	97.073	7.241
–19	91.597	7.161
–18	86.471	7.080
–17	81.667	6.996
–16	77.161	6.910
–15	72.932	6.821
–14	68.962	6.731
–13	65.231	6.639
–12	61.723	6.545
–11	58.424	6.448
–10	55.321	6.351
–9	52.399	6.251
–8	49.648	6.150
–7	47.058	6.047
–6	44.617	5.943
–5	42.317	5.838
–4	40.15	5.732
–3	38.106	5.624
–2	36.18	5.516
–1	34.363	5.408
0	32.65	5.299
1	31.027	5.189
2	29.494	5.079
3	28.047	4.969
4	26.68	4.859
5	25.388	4.750
6	24.166	4.641
7	23.01	4.532
8	21.916	4.423
9	20.88	4.316
10	19.898	4.209
11	18.968	4.103
12	18.087	3.998
13	17.252	3.894
14	16.46	3.792
15	15.708	3.690
16	14.995	3.591
17	14.319	3.492
18	13.678	3.396
19	13.068	3.300
20	12.49	3.207
21	11.94	3.115
22	11.418	3.025
23	10.921	2.937
24	10.449	2.850
25	10	2.767
26	9.572	2.684
27	9.165	2.603
28	8.777	2.524
29	8.408	2.447
30	8.057	2.372
31	7.722	2.299
32	7.402	2.228
33	7.098	2.159
34	6.808	2.091
35	6.531	2.025
36	6.267	1.962
37	6.015	1.900
38	5.775	1.840
39	5.546	1.781
40	5.327	1.724
41	5.117	1.669
42	4.917	1.616
43	4.726	1.564
44	4.543	1.514
45	4.369	1.465
46	4.202	1.418
47	4.042	1.373
48	3.889	1.329
49	3.743	1.286
50	3.603	1.244
51	3.469	1.204
52	3.34	1.166
53	3.217	1.128
54	3.099	1.092
55	2.986	1.057
56	2.878	1.023
57	2.774	0.990
58	2.675	0.959
59	2.579	0.928
60	2.488	0.898
61	2.4	0.870
62	2.316	0.842
63	2.235	0.815
64	2.158	0.790
65	2.083	0.765
66	2.011	0.740
67	1.943	0.718
68	1.877	0.695
69	1.813	0.673
70	1.752	0.652
71	1.694	0.632
72	1.637	0.612
73	1.583	0.593
74	1.531	0.575
75	1.481	0.557
76	1.433	0.541
77	1.387	0.524
78	1.342	0.508
79	1.299	0.493
80	1.258	0.478
81	1.218	0.464
82	1.179	0.450
83	1.142	0.436
84	1.107	0.423
85	1.072	0.411
86	1.039	0.399
87	1.007	0.387
88	0.976	0.375
89	0.947	0.365
90	0.918	0.354
91	0.89	0.344
92	0.863	0.334
93	0.838	0.324
94	0.813	0.315
95	0.789	0.306
96	0.765	0.297
97	0.743	0.289
98	0.721	0.280
99	0.7	0.276
100	0.68	0.265

NTC 20 kΩ

Temp. [°C]	Resist-ance [kΩ]	Terminal voltage [V]
–50.0	1659	8.78
–49.0	1541	8.77
–48.0	1432	8.76
–47.0	1331	8.75
–46.0	1239	8.74
–45.0	1153	8.72
–44.0	1073	8.71
–43.0	1000	8.70
–42.0	932	8.69
–41.0	869	8.67
–40.0	811	8.66
–39.0	757	8.64
–38.0	706	8.62
–37.0	660	8.60
–36.0	617	8.58
–35.0	577	8.56
–34.0	539	8.54
–33.0	505	8.52
–32.0	473	8.49
–31.0	443	8.47
–30.0	415	8.44
–29.0	389	8.41
–28.0	364	8.38
–27.0	342	8.35
–26.0	321	8.32
–25.0	301	8.28
–24.0	283	8.25
–23.0	266	8.21
–22.0	250	8.17
–21.0	235	8.13
–20.0	221	8.08
–19.0	208	8.04
–18.0	196	7.99
–17.0	184	7.94
–16.0	174	7.89
–15.0	164	7.83
–14.0	154	7.78
–13.0	146	7.72
–12.0	137	7.66
–11.0	130	7.60
–10.0	122	7.53
–9.0	116	7.46
–8.0	109	7.39
–7.0	103	7.32
–6.0	97.6	7.25
–5.0	92.3	7.17
–4.0	87.3	7.09
–3.0	82.6	7.01
–2.0	78.2	6.93
–1.0	74.1	6.85
0.0	70.2	6.76
1.0	66.5	6.67
2.0	63.0	6.58
3.0	59.8	6.49
4.0	56.7	6.40
5.0	53.8	6.30
6.0	51.1	6.20
7.0	48.5	6.10
8.0	46.0	6.00
9.0	43.7	5.90
10.0	41.6	5.80
11.0	39.5	5.70
12.0	37.6	5.59
13.0	35.7	5.49
14.0	34.0	5.38
15.0	32.3	5.28
16.0	30.8	5.17
17.0	29.3	5.07
18.0	27.9	4.96
19.0	26.6	4.85
20.0	25.3	4.75
21.0	24.2	4.64
22.0	23.0	4.53
23.0	22.0	4.43
24.0	21.0	4.32
25.0	20.0	4.22
26.0	19.1	4.12
27.0	18.2	4.01
28.0	17.4	3.91
29.0	16.6	3.81
30.0	15.9	3.71
31.0	15.2	3.62
32.0	14.5	3.52
33.0	13.9	3.43
34.0	13.3	3.33
35.0	12.7	3.24
36.0	12.1	3.15
37.0	11.6	3.06
38.0	11.1	2.97
39.0	10.7	2.89
40.0	10.2	2.81
41.0	9.78	2.72
42.0	9.37	2.64
43.0	8.98	2.57
44.0	8.61	2.49
45.0	8.26	2.42
46.0	7.92	2.34
47.0	7.60	2.27
48.0	7.29	2.20
49.0	7.00	2.14
50.0	6.72	2.07
51.0	6.45	2.01
52.0	6.19	1.94
53.0	5.95	1.88
54.0	5.72	1.82
55.0	5.49	1.77
56.0	5.28	1.71
57.0	5.08	1.66
58.0	4.88	1.61
59.0	4.69	1.56
60.0	4.52	1.51
61.0	4.35	1.46
62.0	4.18	1.41
63.0	4.03	1.37
64.0	3.88	1.32
65.0	3.73	1.28
66.0	3.59	1.24
67.0	3.46	1.20
68.0	3.34	1.16
69.0	3.21	13
70.0	3.10	1.09
71.0	2.99	1.06
72.0	2.88	1.02
73.0	2.78	0.991
74.0	2.68	0.960
75.0	2.58	0.929
76.0	2.49	0.900
77.0	2.41	0.872
78.0	2.32	0.844
79.0	2.24	0.818
80.0	2.17	0.792
81.0	2.0	0.767
82.0	2.02	0.744
83.0	1.95	0.720
84.0	1.89	0.698
85.0	1.82	0.676
86.0	0 1.76	0.655
87.0	1.70	0.635
88.0	1.65	0.616
89.0	1.59	0.597
90.0	1.54	0.578
91.0	1.49	0.561
92.0	1.44	0.544
93.0	1.40	0.527
94.0	1.35	0.511
95.0	1.31	0.496
96.0	1.27	0.481
97.0	1.23	0.466
98.0	1.19	0.452
99.0	1.15	0.439
100.0	1.11	0.425
101.0	1.08	0.413
102.0	1.05	0.401
103.0	1.01	0.389
104.0	0.98	0.378
105.0	0.95	0.367
106.0	0.92	0.356
107.0	0.90	0.346
108.0	0.87	0.336
109.0	0.84	0.326
110.0	0.82	0.317
111.0	0.79	0.308
112.0	0.77	0.299
113.0	0.75	0.290
114.0	0.73	0.282
115.0	0.70	0.274
116.0	0.68	0.266
117.0	0.66	0.259
118.0	0.64	0.252
119.0	0.63	0.245
120.0	0.61	0.238
121.0	0.59	0.231
122.0	0.57	0.225
123.0	0.56	0.219
124.0	0.54	0.213
125.0	0.53	0.207
126.0	0.51	0.201
127.0	0.50	0.196
128.0	0.49	0.191
129.0	0.47	0.186
130.0	0.46	0.181
131.0	0.45	0.176
132.0	0.43	0.171
133.0	0.42	0.167
134.0	0.41	0.162
135.0	0.40	0.158
136.0	0.39	0.154
137.0	0.38	0.150
138.0	0.37	0.146
139.0	0.36	0.142
140.0	0.35	0.139
141.0	0.34	0.135
142.0	0.33	0.132
143.0	0.32	0.128
144.0	0.32	0.125
145.0	0.31	0.122
146.0	0.30	0.119
147.0	0.29	0.116
148.0	0.29	0.113
149.0	0.28	0.110
150.0	0.27	0.107

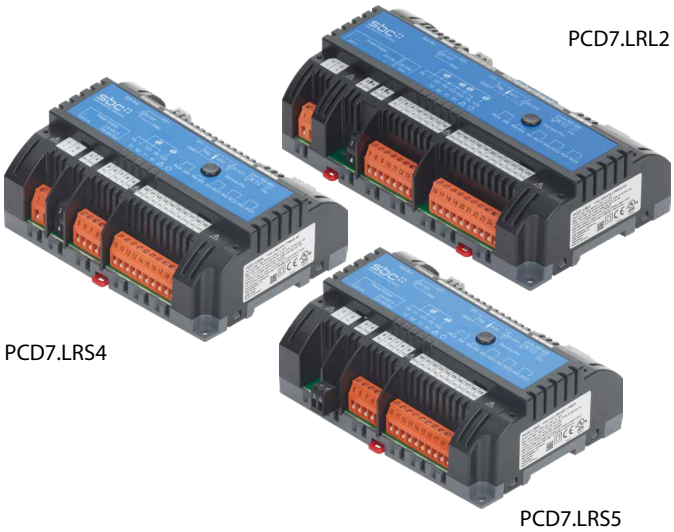

Fig. 23.
PCD7.LRxx without optional covers

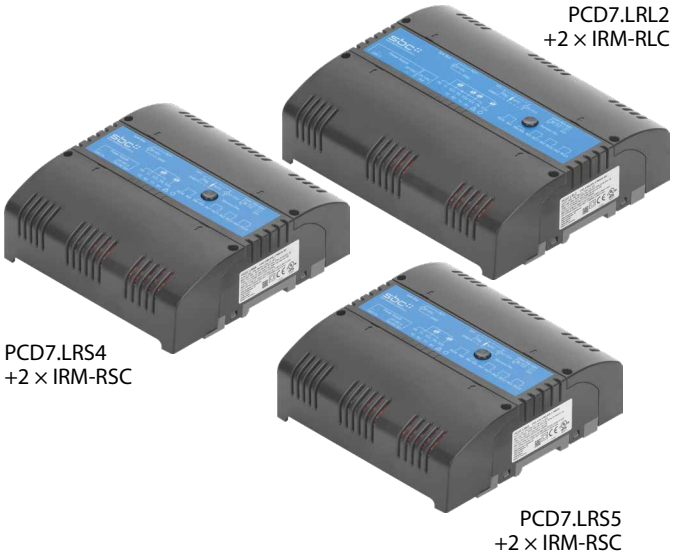

Fig. 24.
PCD7.LRxx with optional covers
(covers come in sets of 10)

Trademark Information
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