PROLON

HARDWARE GUIDE

Humidifier Controller C1000 Series

Specifications and Operational Guide

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REV. 7.1.1
PL-HRDW-HU-C1000-C/F-EN

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PL-C1000 Humidity Controller

Description

The PL-C1000 humidity controller is a microprocessor-based controller designed to regulate the relative humidity level in a room or return duct. Both humidification and dehumidification sequences are available. It features a variety of control strategies, including outdoor temperature reset, unoccupied mode setpoint offsets, safety limits and more.

General Behaviour

Although fully configurable, the ProLon C1000 humidity controller monitors dedicated inputs and uses pre-established control sequences to drive dedicated outputs to control standard humidification or dehumidification equipment. These sequences can be fully optimized to obtain the best results for each type of system. The various configuration options allow the user to modify the outside temperature reset scale, the dehumidification control points, the high humidity limits in the supply and more. A sequence to request fan reactivation in night mode is also available. All these parameters can be accessed and modified by using the ProLon Focus software.

Operating Sequence

Humidification

The C1000 humidity controller obtains an outside air temperature reading from either a connected sensor or transmitted from a network master. The current outside temperature determines the relative humidity setpoint to maintain in the zone or return using a configurable reset scale. Proof of fan operation is required to enable humidification. The C1000 has a dedicated input for the proof of fan, but it can also be transmitted to the C1000 from a network master.

The C1000 has two outputs available for humidification: a digital ON or OFF (differential) triac output and an analog (0-10VDC) modulating or pulsing output, which uses a proportional and integral control loop to maintain the setpoint.

A humidity sensor can optionally be installed in the supply duct, which then enables high humidity limit control. Humidification also stops when the outside temperature becomes too warm.

In unoccupied mode, the C1000 can request that the network master restarts the fan if the humidity gets too low.

Dehumidification

The C1000 request dehumidification when the humidity level goes beyond its user-configurable setpoint. Proof of fan operation is required to enable dehumidification. The C1000 has a dedicated input for the proof of fan, but it can also be transmitted to the C1000 from a network master.

The C1000 has two different means of requesting dehumidification. The first is a digital ON or OFF (differential) triac output which is activated based on a request for dehumidification. The second is a by sending a network based signal to any ProLon Rooftop controller. The ProLon Rooftop controller will then take the necessary steps to begin dehumidification.

A humidity sensor can optionally be installed in the supply duct, which then enables high humidity limit control. Humidification also stops when the outside temperature becomes too warm.

In unoccupied mode, the C1000 can request that the network master restarts the fan if the humidity gets too high.

Components

Component Identification

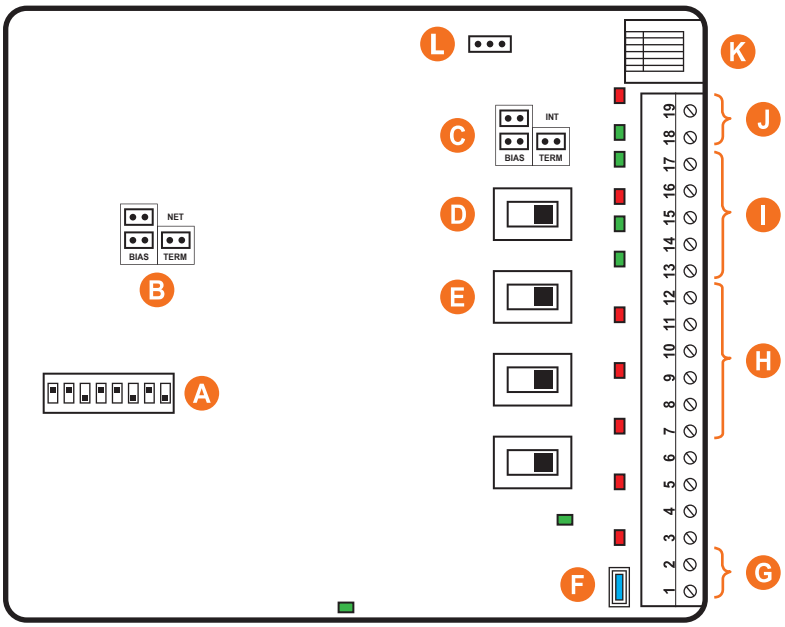

Figure 1 - Component Identification

Legend:

A - Addressing dipswitch
B - Jumpers for terminating and bias resistors for the NET port (see J)
C - Jumpers for terminating and bias resistors for the INT port (see K)
D - Output 4 (Humidification) SOURCE/SINK dipswitch
E - Output 3 (Dehumidification) SOURCE/SINK dipswitch
F - Reset Button
G - Terminal Blocks for 24 VAC
H - Terminal Blocks for Outputs 3, 4, 5
I - Inputs (4 total)
J - RS485 NET port for network communication
K - RS485 INT port for interface communication
L - Jumper to supply voltage to INT port (see K)

LEDs

The C1000 has various LEDs which are linked to different functions and outputs of the controller. Each LED is individually identified to help the user make a quick visual diagnostic of the controller's activity and status.

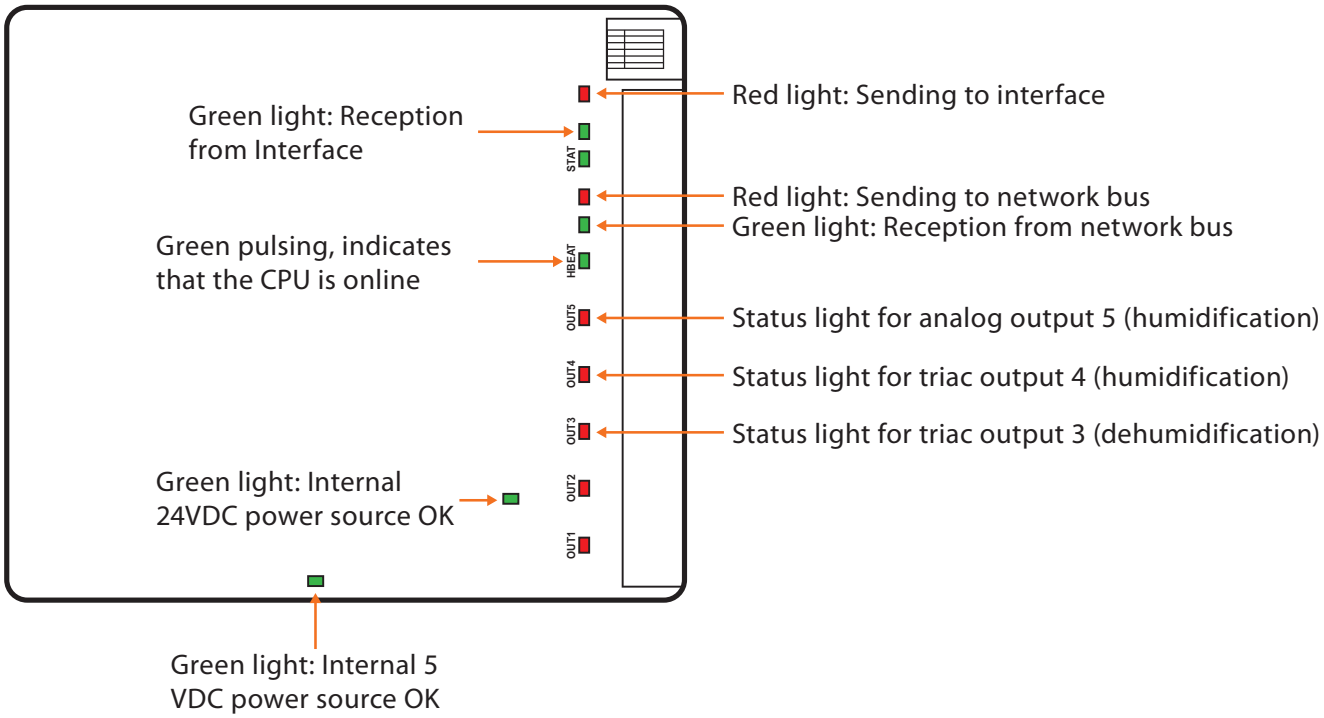

Figure 2 - LEDs Identification

Address Configuration for Networking

A unique address on each controller must be configured by setting the first 7 switches on the addressing dipswitch to the desired value.

These switches are numbered from 1 to 7 and represent a binary value from 1 to 64 (1, 2, 4, 8, 16, 32, 64 respectively). The value of each switch that is in the ON position is added together to form the numerical address of the controller.

The example on Figure 3 shows the switches 1, 2 and 4 on the ON position. So the corresponding values are 1, 2 and 8, giving an address sum of 11. (1+2+8=11)

The ProLon network allows a maximum of 127 addresses, therefore 127 controllers.

Figure 3 - Addressing Dipswitches

Jumper to Supply Power to the RJ45 Plug

The RJ45 jumper lets the user select the voltage that will appear on pin #7 of the RJ45 plug. This can be used to power a device attached to the RJ45 plug, such as the digital sensor or interface. ***NOTE***: If multiple C1000 controllers are connected together through the RJ45 plug, ***only one*** C1000 should be supplying power onto the RJ45, otherwise you will be mixing your supply sources and possibly cause damage. The jumper setups are as follows:

Figure 4 - Jumper

Input and Output Identification

All the inputs and outputs of the C1000 use pluggable screw type terminal blocks with elevator style clamping, which make connections easier and more secure.

The C1000 Humidity Controller has 2 separate communication ports offering the same functionality on each. Both act as ports for incoming Modbus communications from other ProLon devices or interfaces, such as a Network Controller or remote computer with ProLon Focus software.

The "INT" Port (see below) uses an RJ45 type connector. The RJ45 connector allows the use of premade CAT5 cables for simple plug-and-play RS485 communication. This RJ45 connector follows the Modbus pinout specification for RS485 communication.

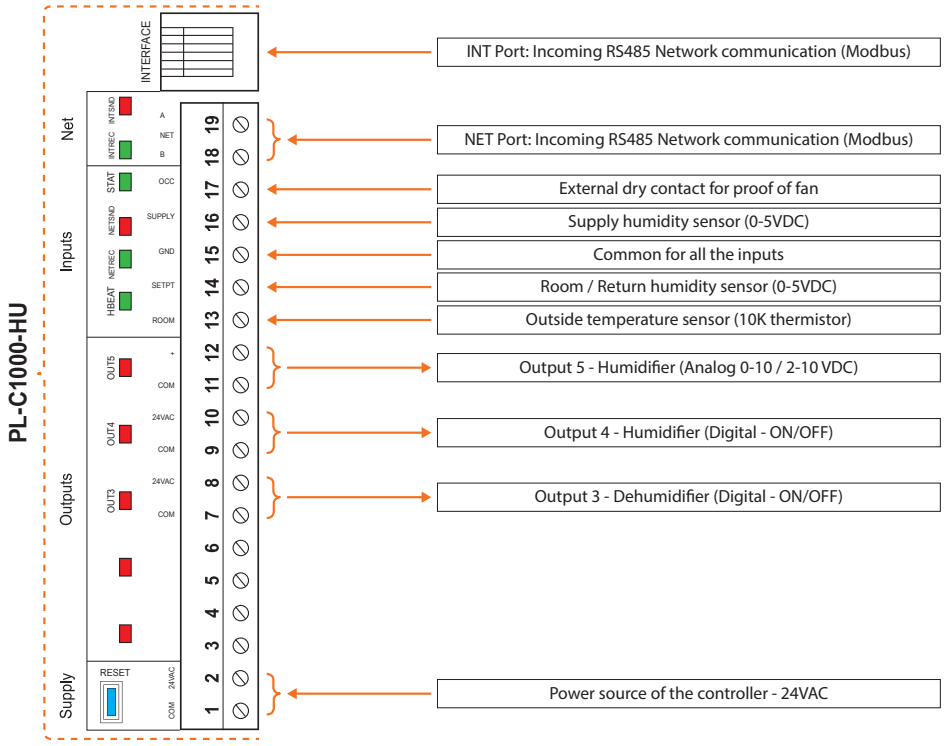

Figure 5 - Input and Output Identification

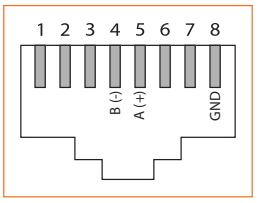

Figure 6 - RJ45 Pinout

Inputs

Outside Temperature Sensor

The C1000 Humidity controller has an analog input dedicated to monitoring outside air temperature (see Figure 7) and will integrate this reading into its control sequence. The sensor used is a standard 10k type 3 thermistor. If the C1000 is connected to a ProLon network, it can instead receive the outside temperature from another device on the network.

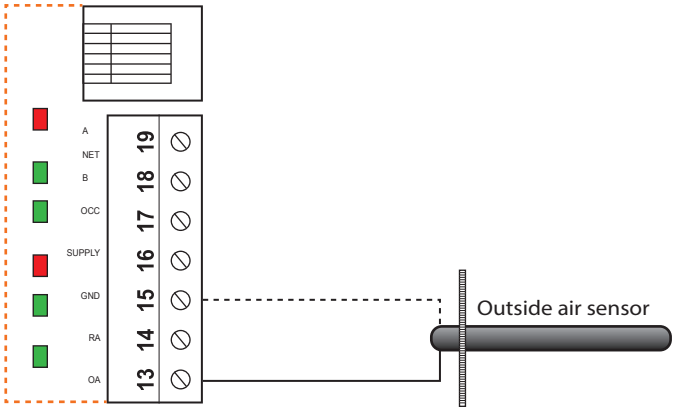

Figure 7 - Connecting the Outside Air Sensor

Relative Humidity Sensors

The C1000 Humidity controller has two inputs dedicated the relative humidity readings in the room (or return duct) and the supply (optional). This information is then integrated into its control sequences. The sensors used must provide a 0-5VDC signal (see Figure 8).

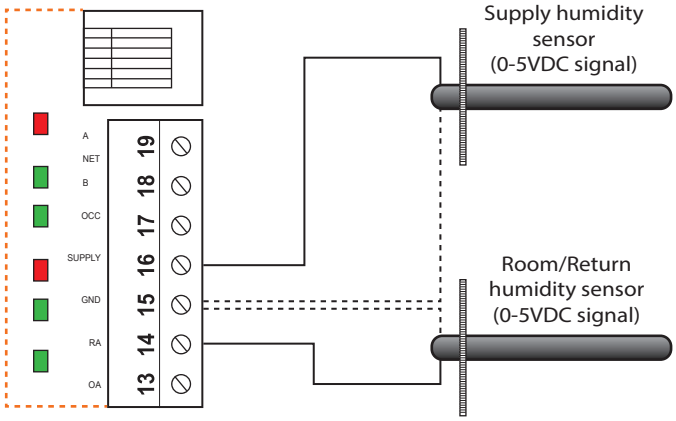

Figure 8 - Connecting the Humidity Sensors

Proof of Fan

The C1000 Humidity controller has an input dedicated for a proof of fan contact (see Figure 9). To confirm that there is a proof of fan, the contact must be closed. If the C1000 is connected to a network, the network master can transmit the proof of fan information through the network instead. However, if no proof of fan signal is available, the dedicated input must be short-circuited to ground (terminal #15).

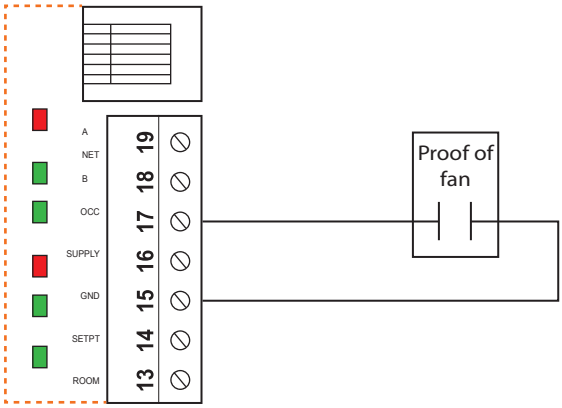

Figure 9 - Connecting the Proof of Fan

Outputs

The C1000 Humidity controller contains 3 configurable outputs. Two of the outputs are dedicated to humidification (Output 4 and Output 5). Output 4 is an ON-OFF triac output and Output 5 is an analog 0-10VDC modulating or pulsing output, which follows a proportional and integral algorithm (PI). This PI function is fully customizable via the ProLon Focus software.

The remaining output (Output 3) is dedicated to dehumidification. Output 3 is an ON-OFF triac output.

An integrated resettable fuse protects ***each*** of the outputs of the C1000 against current surges and short circuits. This protection will cut the current to the output as soon as an overload condition is detected. The fuse is round and yellow-colored which, upon a short circuit condition, will heat up and change to orange. When the faulty wiring or circuit is fixed, the fuse will automatically reset and allow current to flow through the output again.

Output Specifications

Output	Type	Action	Application
3	Triac Source: 24VAC MAx Current: 300 mA	On-or-Off	Dehumidification in differential mode
4	Triac Source: 24VAC MAx Current: 300 mA	On-or-Off	Humidification in differential mode
5	Configurable Analog Output: - 0 to 10 VDC - 2 to 10 VDC Max Current: 40 mA	Modulating Proportional/ Pulsed	Humidification with proportionnal and integral action

Configuration of Outputs 3 and 4

The digital triac outputs are configurable (SOURCE/SINK) via a switch located on the board. Simply move the switch to obtain either a SOURCE active output (1) or a SINK passive output (2).

1) Switch position to obtain a SOURCE ***active output*** (see Figure 10):

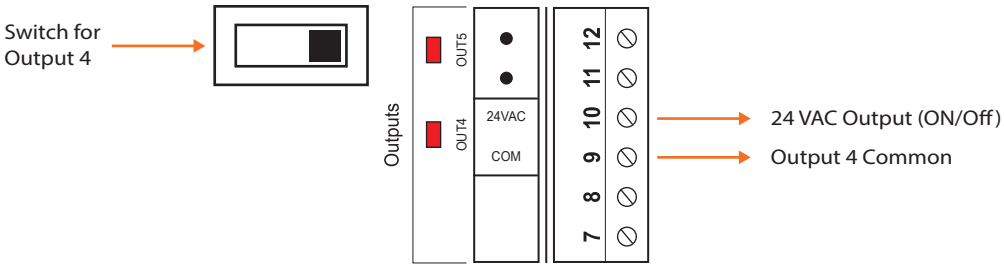

Figure 10 - Output in SOURCE mode

2) Switch position to obtain a SINK ***passive output*** (see Figure 11):

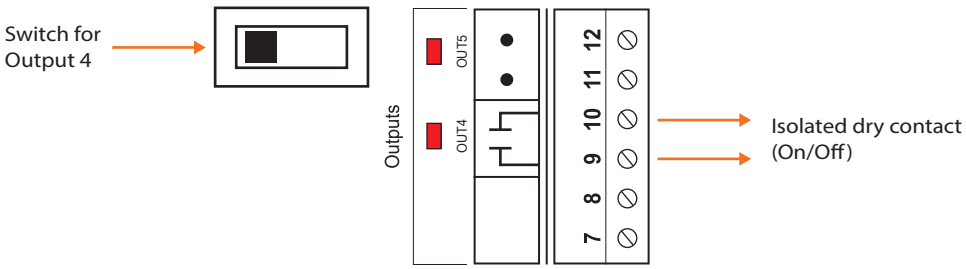

Figure 11 - Output in SINK mode

Typical Connection of the Triac Outputs 3 and 4

Two types of configurations are possible:

1) Active output (SOURCE). The C1000 is actively powering the load. (see Figure 12)

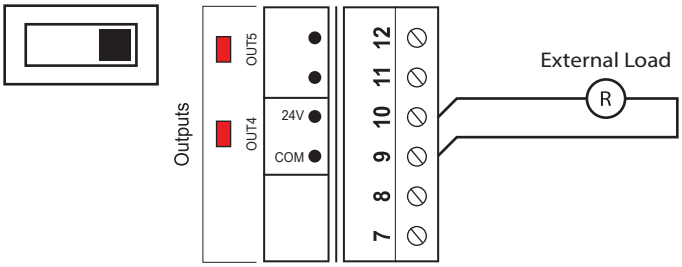

Figure 12 - Connection of Active Outputs 3 and 4

2) Passive output (SINK). The C1000 opens and closes a contact to allow an external source to power the load (see Figure 13).

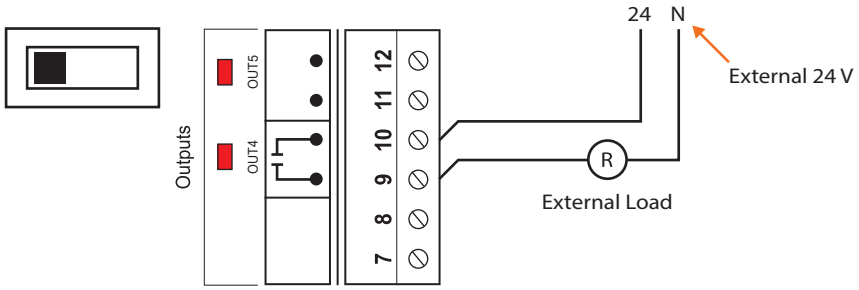

Figure 13 - Connection of Passive Outputs 3 and 4

Typical Connection of the Analog Output

Two types of configuration are possible:

1) The C1000 powers the load and provides a control signal (see Figure 14).

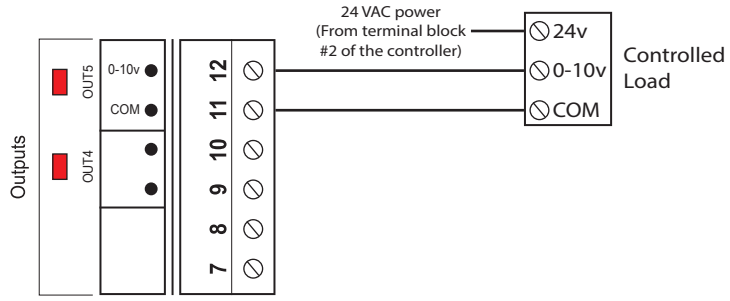

Figure 14 - Connecting the Analog Output (Controller Powered)

2) The C1000 only provides the control signal to the load, which is powered by an external source (see Figure 15)

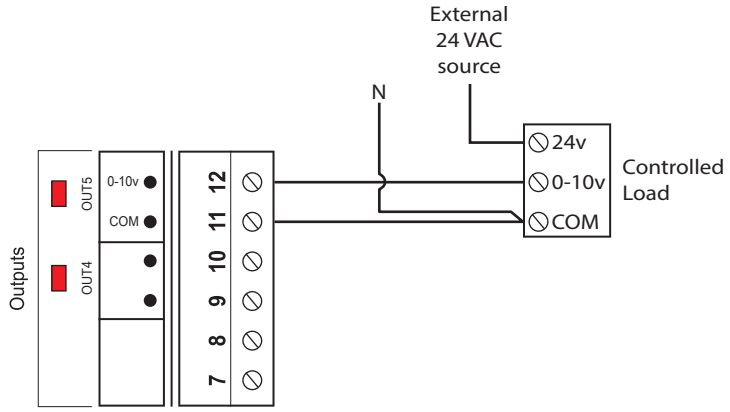

Figure 15 - Connecting the Analog Output (External Power)

Power Source / Network

Power Source

The ProLon C1000 controller is powered by a 24 VAC power source connected using the "COM" terminal and the "24 VAC" terminal (see Figure 16). The common for all inputs and outputs are the same as the power source's common (exception: when an output is set to passive, the common for this output will not correspond to the power source common). All output power sources also originate from the controller's power source.

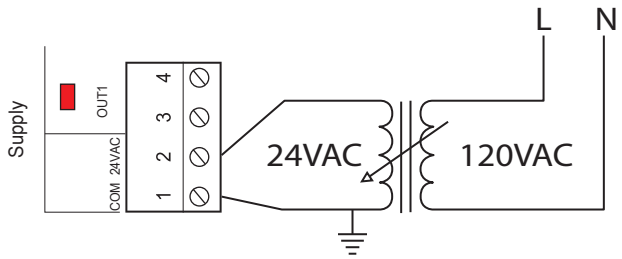

Figure 16 - Connecting the 24VAC Power Source

Network Communication

The ProLon C1000 controller works autonomously or networked. When networked, it will communicate in real-time with other controllers. The C1000 controller's default communication protocol is Modbus RTU over RS485. The addressing is done with the addressing dipswitch located on the C1000 card (see Figure 3). The network connections are made using the NET terminal block located on the ProLon C1000 controller (see Figure 17).

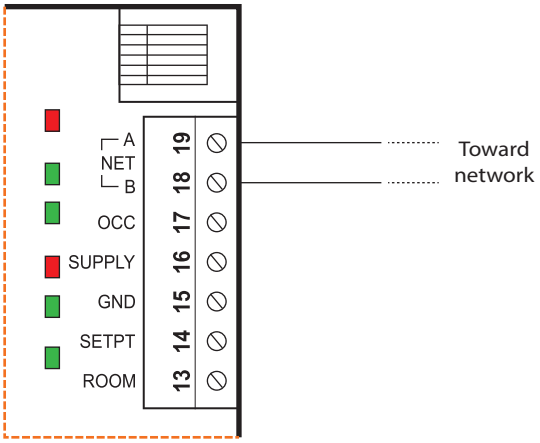

Figure 17 - Connecting to the Network

Technical Specifications

Supply: 24 VAC ±10%, 50/60 Hz, Class 2

Consumption: 2 VA (Consumption), 32 VA (Input)

Inputs:
- Outside air – thermistor 10K
- Return/room humidity – 0-5 VDC
- Supply humidity – 0-5 VDC
- Proof of fan – dry contact

Digital outputs: 2 triac outputs, 10-30 VAC source or sink, 300 mA max (resettable fuse)

Analog output: 1 output 0-10 VDC / 2-10 VDC, 40 mA max (resettable fuse)

Indication lights (LED): State of each output / Communication / Power / State of microprocessor

Microprocessor: PIC18F6722, 8 bits, 40 MHz, 128KB FLASH memory

Casing: Molded ABS, UL94-HB

Communication: Modbus RTU (RS485), up to 127 nodes

Baud rate: 9600, 19200, 38400, 57600, 76800, 115200

Connection: Removable screw-type terminal blocks (16 AWG max) and RJ45 modular jack

Dimensions: 6.5" x 5.3" (165mm x 135mm)

Weight: 0.85 lbs (0.4 kg)

Environment: 32-122 ºF (0-50 ºC) Non-Condensing

Certification: UL916 Energy Management Equipment, CAN/CSA-C22.2, RoHS, FCC part 15: 2012 class B

The performance specifications are nominal and conform to acceptable industry standards. ProLon Inc. will not be liable for damages resulting from misapplication or misuse of its products.

Compliance

- FCC Compliant to CFR47, Part 15, Subpart B, Class B
- Industry Canada (IC) Compliant to ICES-003, Issue 5: CAN ICES-3 (B)/NMB-3(B)
- RoHS Directive (2002/95/EC)

FCC User Information

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Caution: Any changes or modifications not approved by ProLon can void the user's authority to operate the equipment.

Note: 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 radio frequency 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.

Industry Canada

This Class (B) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment regulations.

Cet appareil numérique de la Classe (B) respecte toutes les exigences du Réglement sur le matériel brouilleur du Canada.

Overall Dimensions

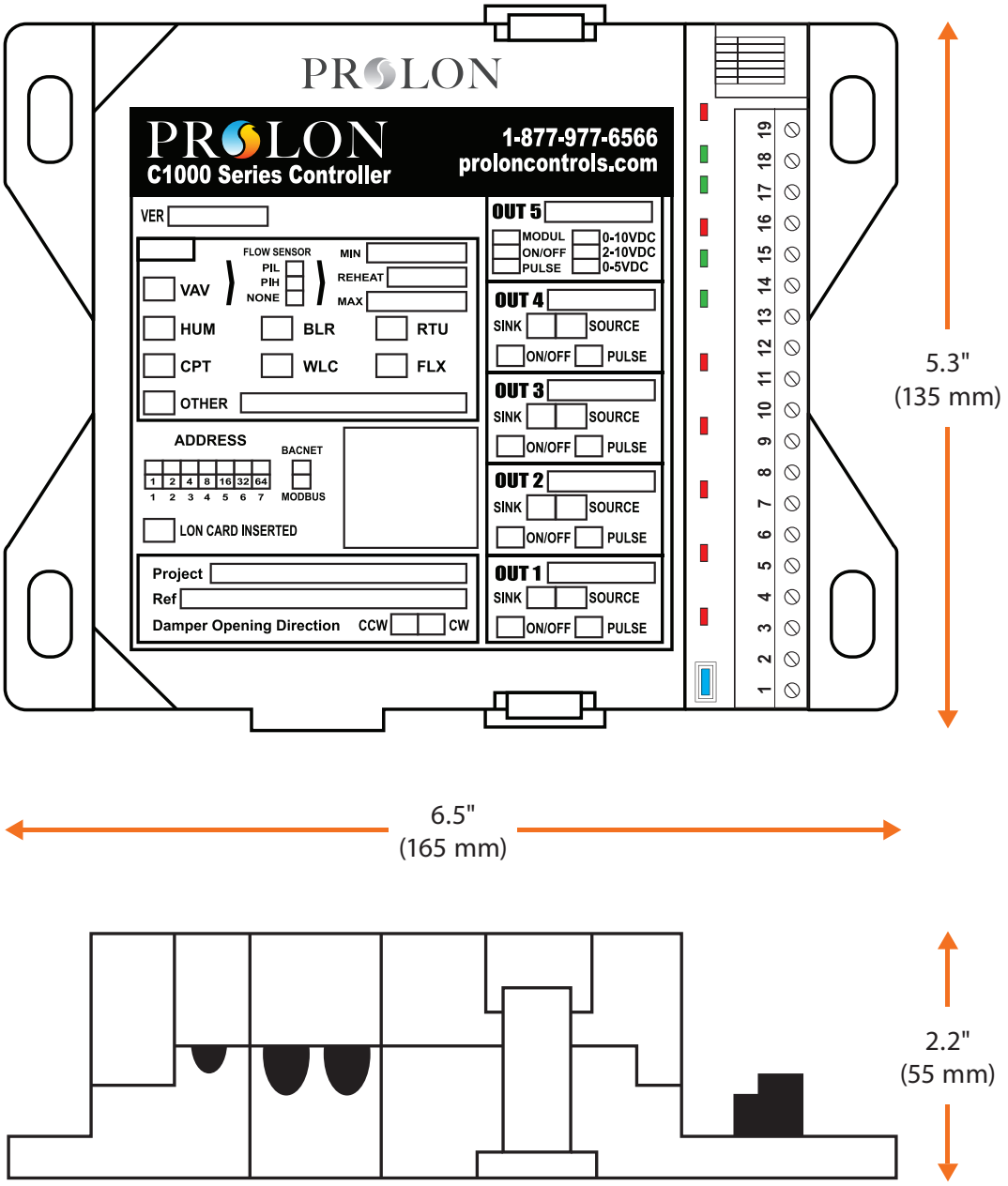

Figure 18 - C1000 Size Diagram

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