PROLON

HARDWARE GUIDE

FlexIO Controller C1000 Series

Specifications and Operational Guide

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REV. 7.2.1
PL-HRDW-FLX-C1000-EN

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PL-C1000 FLX Controller

Description

The C1000 FlexIO is a general purpose HVAC controller whose inputs and outputs can be individually configured for use in various applications. Unlike most ProLon controllers, the FlexIO is not aimed at a specific HVAC sequence or piece of equipment, and instead can be used to perform any outlying functions that are not usually covered by existing ProLon devices. Outputs can be configured to respond to a variety of standard HVAC input signal types, ranging from temperatures, pressure, gas and more.

Features

- Many input types available: Temperature, Dry Contact, Pressure, Gas, Humidity
- Configurable names and display options for each input and output
- Configurable scales for pressure and gas inputs accommodates any sensor
- Outputs can act based on any local input, or on data received from a network master
- Can receive up to 5 different occupancy states from an NC2000, allowing for versatile lighting control
- Various output logic sequences are available: ON/OFF, PI Loop, Direct or Reverse acting, Pulsed
- Outputs can be interlocked with each other
- Outputs can be automatically overridden based on outside temperature and/or occupancy
- Operates standalone or can be integrated into a ProLon network

Components

Components Identification

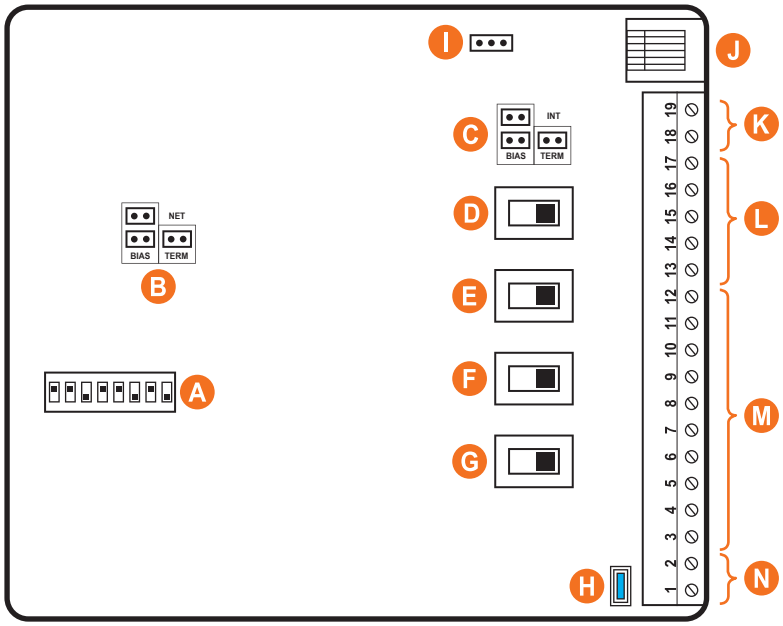

Figure 1 - Component Identification

Legend:

A - Addressing dipswitch
B - Jumpers for terminating and bias resistors for the NET port (see K)
C - Jumpers for terminating and bias resistors for the INT port (see J)
D - SOURCE/SINK dipswitch for Output 4
E - SOURCE/SINK dipswitch for Output 3
F - SOURCE/SINK dipswitch for Output 2
G - SOURCE/SINK dipswitch for Output 1
H - Reset Button
I - Jumper to supply voltage to INT port (see **J**)
J - INT port for RS485 communication (RJ45 jack)
K - NET port for RS485 communication (terminal block)
L - Inputs (4 total)
M - Terminal Blocks for Outputs 1 to 5
N - Terminal Blocks for 24 VAC

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.

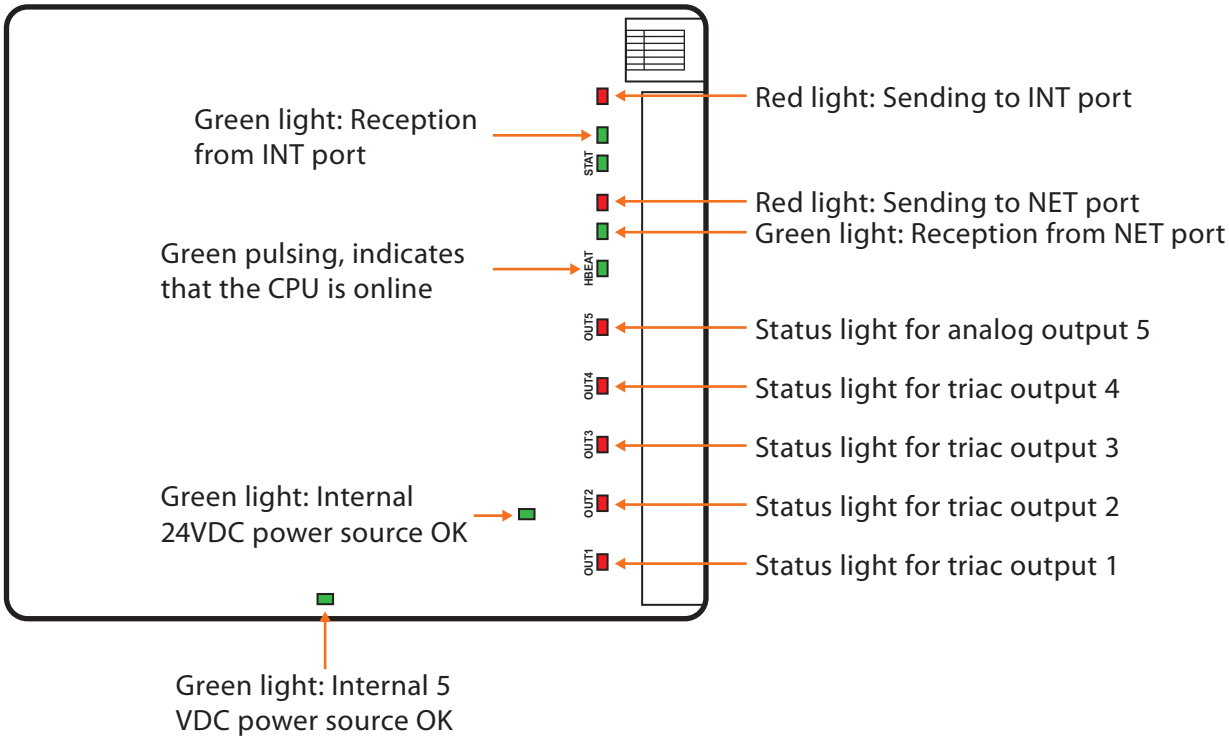

Figure 2 - LEDs Identification

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 below 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 a 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 - RJ45 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 FlexIO Controller has two 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.

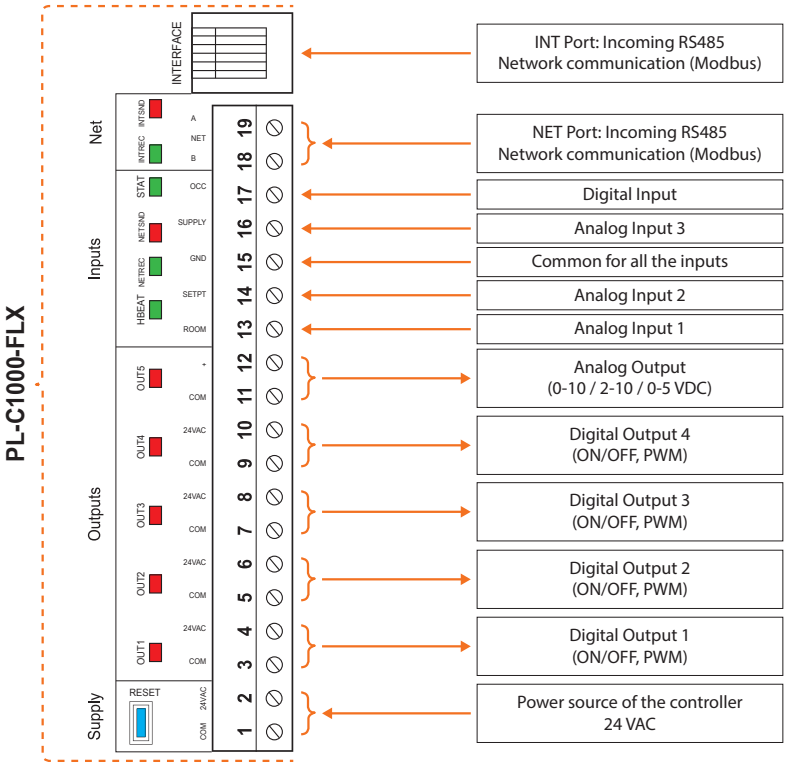

Figure 5 - Input and Output Identification

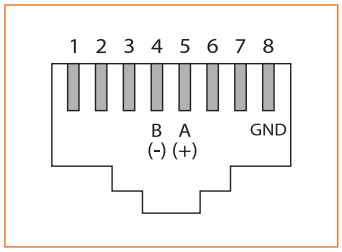

Figure 6 - RJ45 Pinout

Inputs

The C1000 FlexIO controller's inputs can be configured to accept a wide range of signal types. It is important to note that if the chosen signal type is 4-20mA, an external 250 Ohm resistor will be required (see p.10).

For the C1000 Digital Input, it can only accept contact signals.

Displayed below are examples of input wiring for most signal types. It is important to also configure the input appropriately in the controller's software configuration.

Signal: Thermistor

The C1000 FlexIO controller inputs can be used to monitor temperatures. The temperature sensors used are standard 10kΩ type 3 thermistors (see figure 7).

The outside air temperature and supply air temperature can optionally be provided by an alternate source, such as a network master. If a network controller is present on the network, it can retrieve the outside temperature reading from one controller and distribute it to any other controllers on the network.

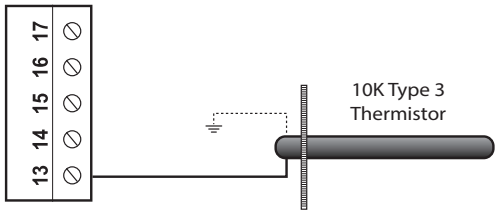

Figure 7 - Connecting a temperature sensor to analog input 1

Signal: Contact

The C1000 FlexIO controller inputs can be used to monitor digital contacts. Please refer to Figure 8 to see how to correctly connect them.

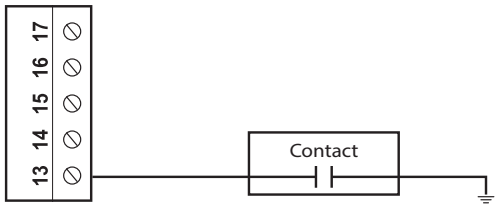

Figure 8 - Connecting a dry contact to analog input 1

Signal: Voltage

The C1000 FlexIO controller inputs can be used to monitor the voltage signal produced by a variety of transducers (such as pressure, gas, humidity and more). Please refer to Figure 9 for correct wiring.

Note: When nothing is connected, the input will read the maximum possible reading.

It is important to ensure that the sensor shares the ***same common*** as the C1000 so that there is no 24 VAC feedback sent back to the controller, which can interfere with the controller's ability to maintain accurate analog input readings.

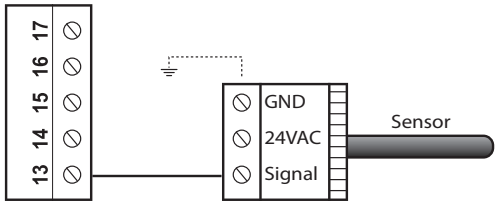

Figure 9 - Connecting voltage based sensors

Signal: Current

The C1000 FlexIO controller inputs can be used to monitor the current signal produced by a variety of transducers (such as pressure, gas, humidity and more). The C1000 requires a 250 Ohm resistor in parallel with the COMMON. Please refer to Figure 10 for correct wiring.

It is important to ensure that the sensor shares the ***same common*** as the C1000 so that there is no 24 VAC feedback sent back to the controller, which can interfere with the controller's ability to maintain accurate analog input readings.

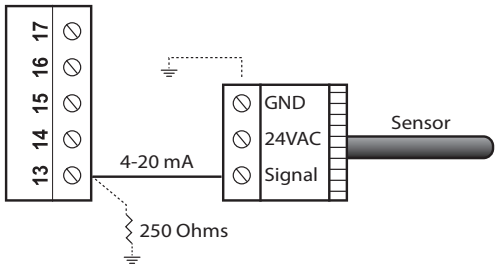

Figure 10 - Connecting current based sensors

Outputs

The C1000 FlexIO controller contains 5 customizable outputs; four triac ON/OFF outputs (24VAC) and one analog output (0-10VDC). Output configuration is performed via the ProLon Focus software.

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
DO 1	Triac source 24VAC, Max Current: 300 mA	On-or-Off / Pulse Width Modulation
DO 2	Triac source 24VAC, Max Current: 300 mA	On-or-Off / Pulse Width Modulation
DO 3	Triac source 24VAC, Max Current: 300 mA	On-or-Off / Pulse Width Modulation
DO 4	Triac source 24VAC, Max Current: 300 mA	On-or-Off / Pulse Width Modulation
AO	Configurable Analog Output: - 0 to 10 VDC - 2 to 10 VDC - 0 to 5 VDC Max Current: 40 mA	On-or-Off / Pulse Width Modulation / Modulating Proportional

Configuration of Digital Outputs

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 11):

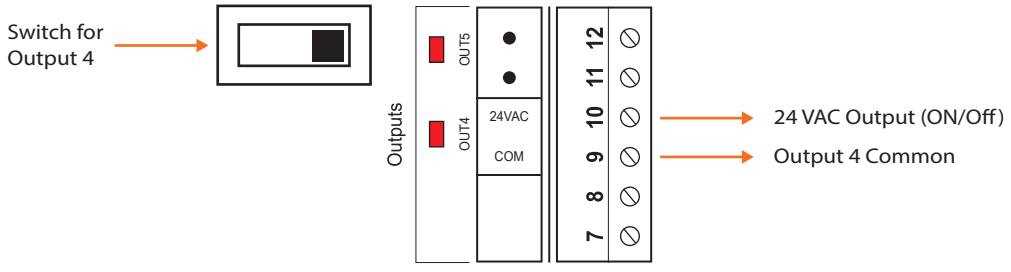

Figure 11 - Output in SOURCE mode

2) Switch position to obtain a SINK ***passive output*** (see Figure 12):

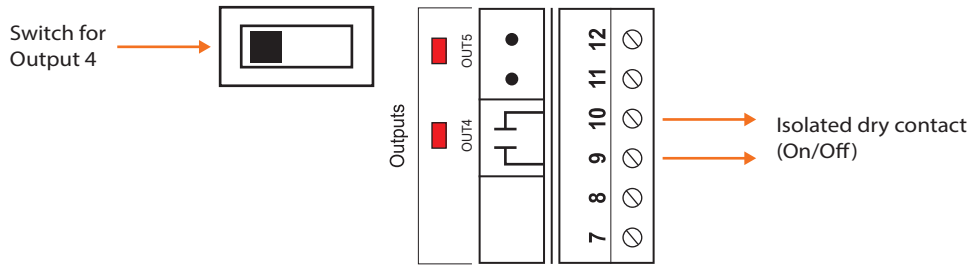

Figure 12 - Output in SINK mode

Typical Connection of Digital Outputs

Two types of configurations are possible:

1) Active output (SOURCE). The C1000 is actively powering the load. (see Figure 13)

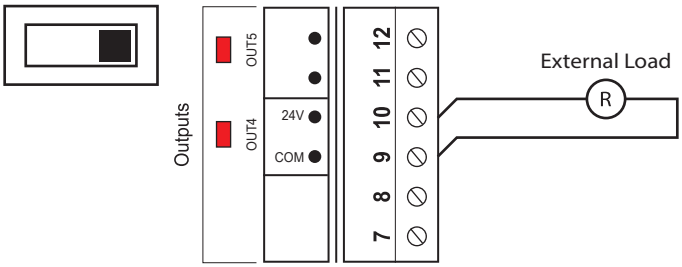

Figure 13 - Connection of active outputs 3 and 4

2) Passive output (SINK). The C1000 opens and closes a contact to allow an external source to power the load (see Figure 14).

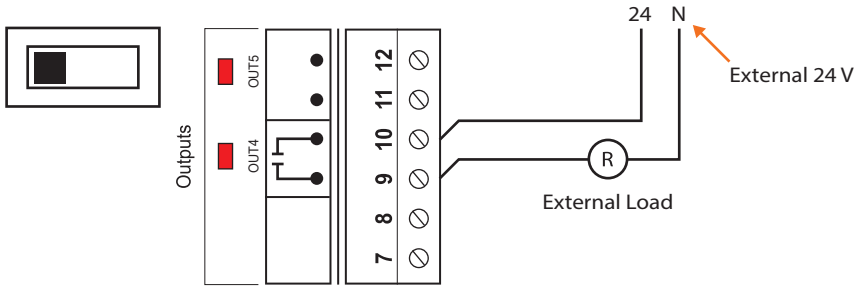

Figure 14 - Connection of passive outputs 3 and 4

Typical Connection of Analog Outputs

Two types of configuration are possible:

1) The C1000 powers the load and provides a control signal (see Figure 15)

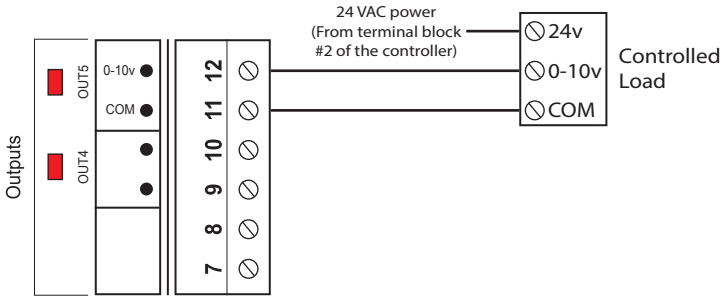

Figure 15 - Connecting the analog output (controller powered)

2) The C1000 only provides the control signal to the load, which is powered by an external source (see Figure 16)

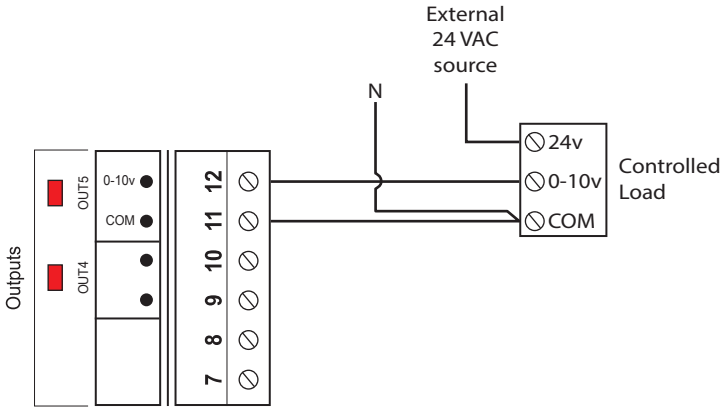

Figure 16 - Connecting the analog output (external power)

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 17). 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.

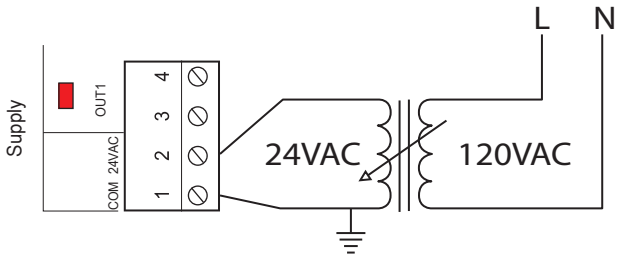

Figure 17 - Connecting the 24VAC power source

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 board (see Figure 3). The network connections are made using the NET terminal block located on the ProLon C1000 controller (see Figure 18).

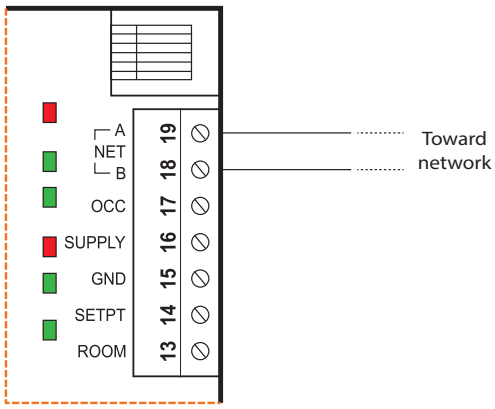

Figure 18 - Connecting to the network

Technical Specifications

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

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

Inputs: 3 analog inputs with individually configurable signal ranges (thermistor, dry contact, 0-5 VDC, 1-5 VDC, 0.5-4.5 VDC), and 1 digital input

Digital outputs: 4 triac outputs, 10-30 VAC source or sink, 300 mA max (resettable fuse)

Analog output: 1 output 0-10 VDC / 2-10 VDC / 0-5 VDC, 40 mA max (resettable fuse)

Indication lights (LED): State of each output / Communication / Supply / 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: 6.2" x 5.2" x 2.5" (157 mm x 132 mm x 64 mm)

Weight: 0.85 lbs (0.39 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

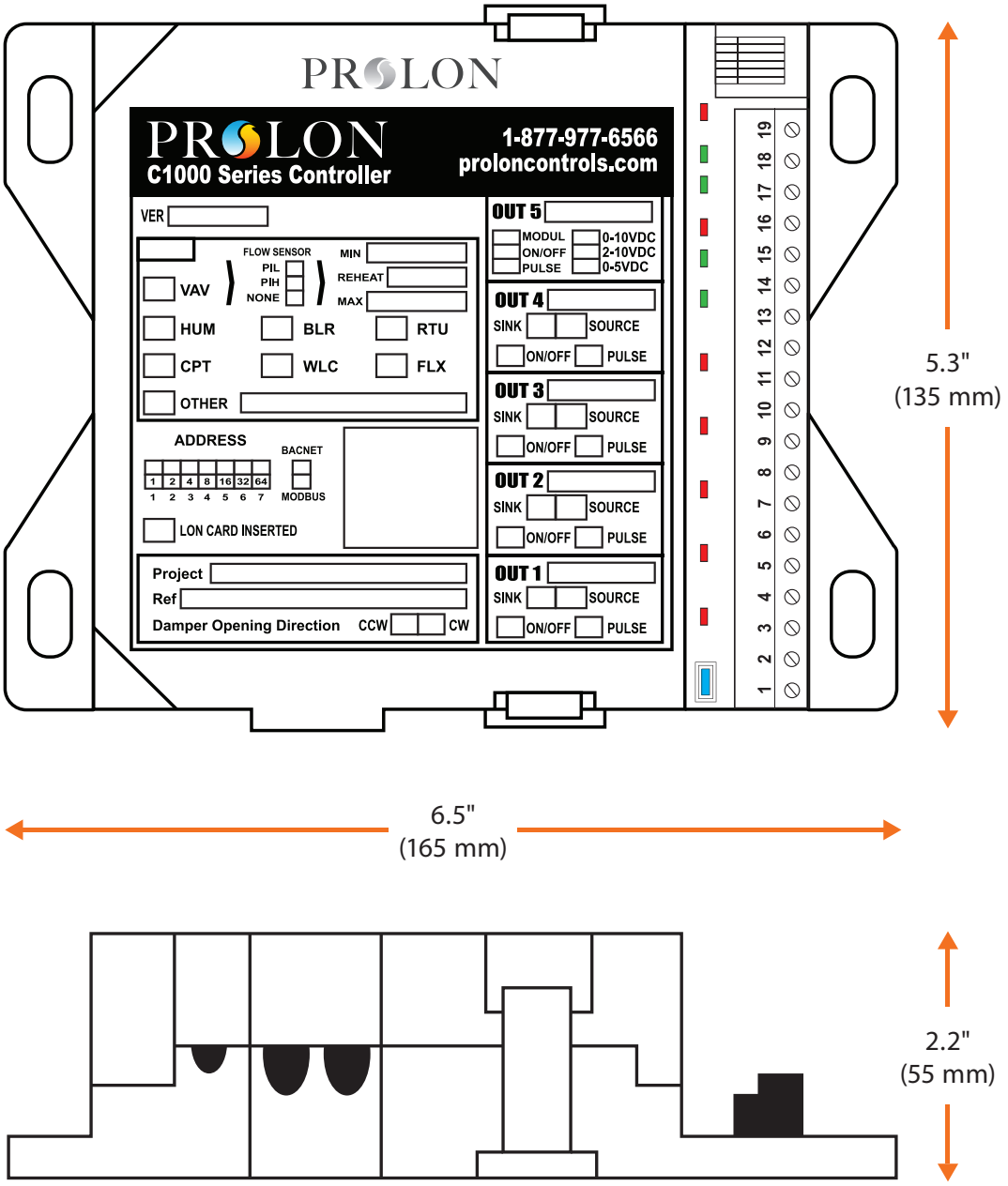

Figure 19 - C1000 Size Diagram

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