PROLON

HARDWARE GUIDE

Fan Coil Controller C1050 Series

Specifications and Operational Guide

www.proloncontrols.com | info@proloncontrols.com
17 510, rue Charles, Suite 100, Mirabel, QC, J7J 1X9

REV. 7.4.1
PL-HRDW-FCU-C1050-C/F-EN

Table of Contents

Table of Figures

PL-C1050 Fan Coil Controller

Description

The Prolon C1050-FCU Fan Coil Controller is a microprocessor-based controller designed to operate Two-Pipe or Four-Pipe hydronic systems. It uses PI (Proportional-Integral) control loops to optimize HVAC management and offers a variety of functions such as Two-Pipe automatic mode-change based on supply water temperature, periodic purge cycles, secondary backup heat control and more.

General Behaviour

The Prolon C1050 Fan Coil controller monitors dedicated inputs and uses pre-established control sequences to drive Fan Coil equipment using dedicated outputs. The main goal of this controller is to keep the zone temperature within the user-defined setpoints by driving valves, allowing hot or cold water to flow through heat exchanger coils as required, and then circulating air past these coils into the zone via a fan. The FCU controller supports both On-Off and Modulating valves in either Two-Pipe or Four-Pipe configurations. Additional backup reheat and preheat sequences can activate to heat the air as required. When networked with other Prolon devices, the FCU controller can periodically share its status to a Master controller and help drive the direction of the whole system.

Operating Sequence

Fan

The Fan can operate in Single Speed or Two Speed Mode. The first speed is primarily occupancy based, but can be configured to activate on a call for heat or cool. The user can define how the fan reacts based on various states of occupancy, which can be received via the Prolon Network from a Network or Master controller. If no Prolon Network is present, the C1050-FCU operates in standalone mode and always assumes a state of occupancy.

The second speed, if enabled, responds to valve activity. When a valve opens past a configurable threshold, the second fan speed is activated.

Note that valves require a call for the first fan speed before they can open.

Two-Pipe System

In a Two-Pipe setup, the FCU controller constantly monitors the water supply mode and can then react intelligently to calls for heat or cool by opening the valve only if the water supply is favorable. The water supply temperature can be obtained via a local thermistor input, a dry contact or shared via the Prolon Network. In the case of a local thermistor, a purge cycle is available to periodically flush out stagnant water and update the water supply mode.

The valve requires a call for fan (but not proof) before it can open.

A reheat sequence is available to heat the air in case the water supply is not in heating mode, or if an alarm condition occurs.

Additionally, a supplemental heat sequence is available even if the water supply is in heating mode. This sequence is activated when the supply air temperature fails to rise following extended use of the valve and no improvement in the zone.

Configurable outside air and supply air temperature limits are also in place to establish safeguards on operation.

Four Pipe System

The Prolon C1050-FCU controller can support a Four-Pipe system with two *On-Off* valves, but on the other hand cannot support a Four-Pipe system with two *Modulating* valves, since there is only a single analog output available on the controller. Fortunately, a Four-Pipe sequence using one *Modulating* valve for heating and one *On-Off* valve for cooling is possible. Alternatively, upgrading to the M2000 hardware platform will provide two analog outputs if both valves absolutely need modulation.

In a Four-Pipe setup, the FCU controller does not need to track the water supply temperatures since it is assumed that the heating and cooling valves will have continuous access to adequate sources of hot and cold water, and they will simply open respectively on a call for heating or cooling.

The valves require a call for fan (but not proof) before they can open.

A reheat sequence is available to heat the air in case an alarm condition occurs.

Additionally, a supplemental heat sequence is available, which activates when the supply air temperature fails to rise following extended use of the heating valve and no improvement in the zone.

Configurable outside air and supply air temperature limits are also in place to establish safeguards on operation.

Component Identification

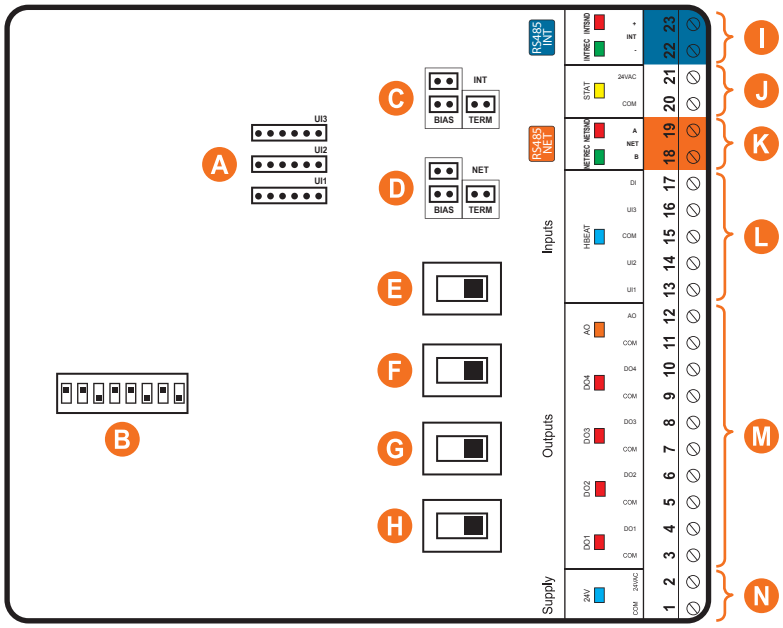

Figure 1 - Component Identification

Legend:

A - Analog Input Signal Mode Jumpers

B - Addressing dipswitch

C - Jumpers for terminating and bias resistors for the INT port (see **I**)

D - Jumpers for terminating and bias resistors for the NET port (see **K**)

E - SOURCE/SINK dipswitch for Output 4

F - SOURCE/SINK dipswitch for Output 3

G - SOURCE/SINK dipswitch for Output 2

H - SOURCE/SINK dipswitch for Output 1

I - INT port for RS485 communication (terminal block)

J - Alternate terminal blocks for 24 VAC (provides power to an optional digital sensor)

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 C1050 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.

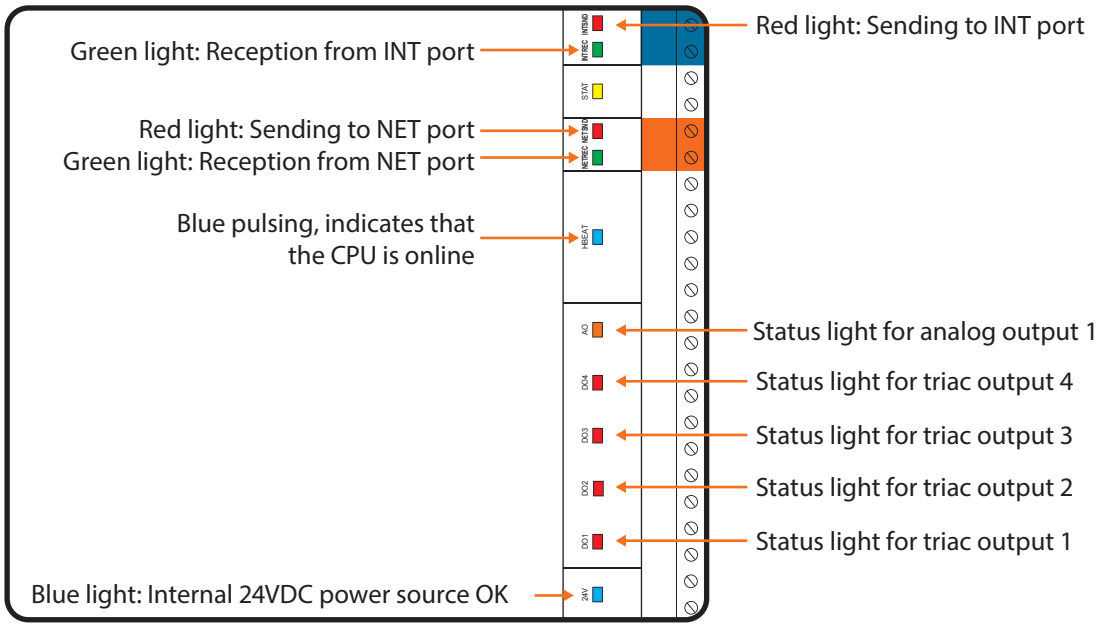

Figure 2 - LEDs Identification

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

Input and Output Identification

All the inputs and outputs of the C1050 use pluggable screw type terminal blocks with elevator style clamping, which make connections easier and more secure.

The C1050 Fan Coil 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.

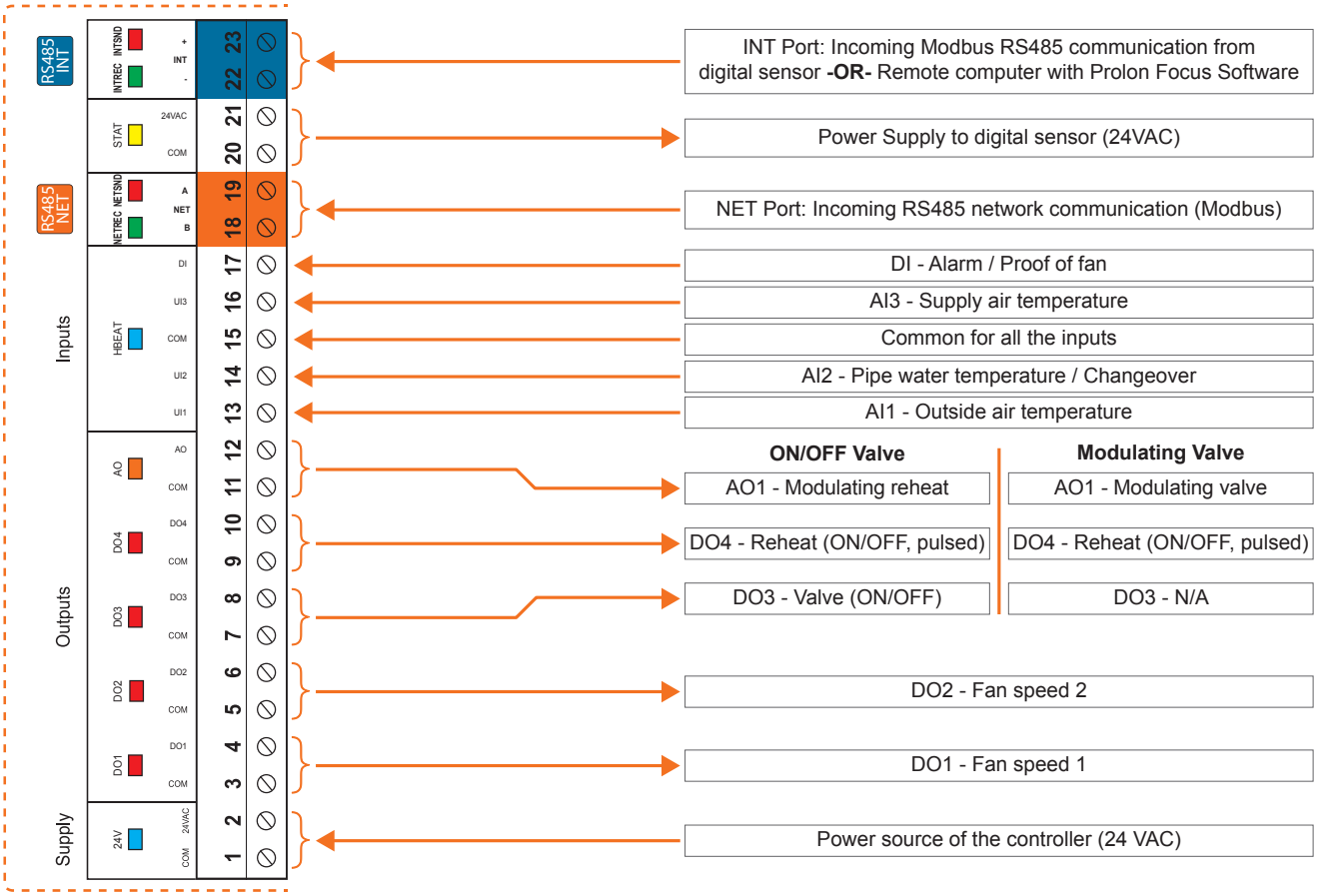

Figure 4 - Input and Output Identification (Two-Pipe System)

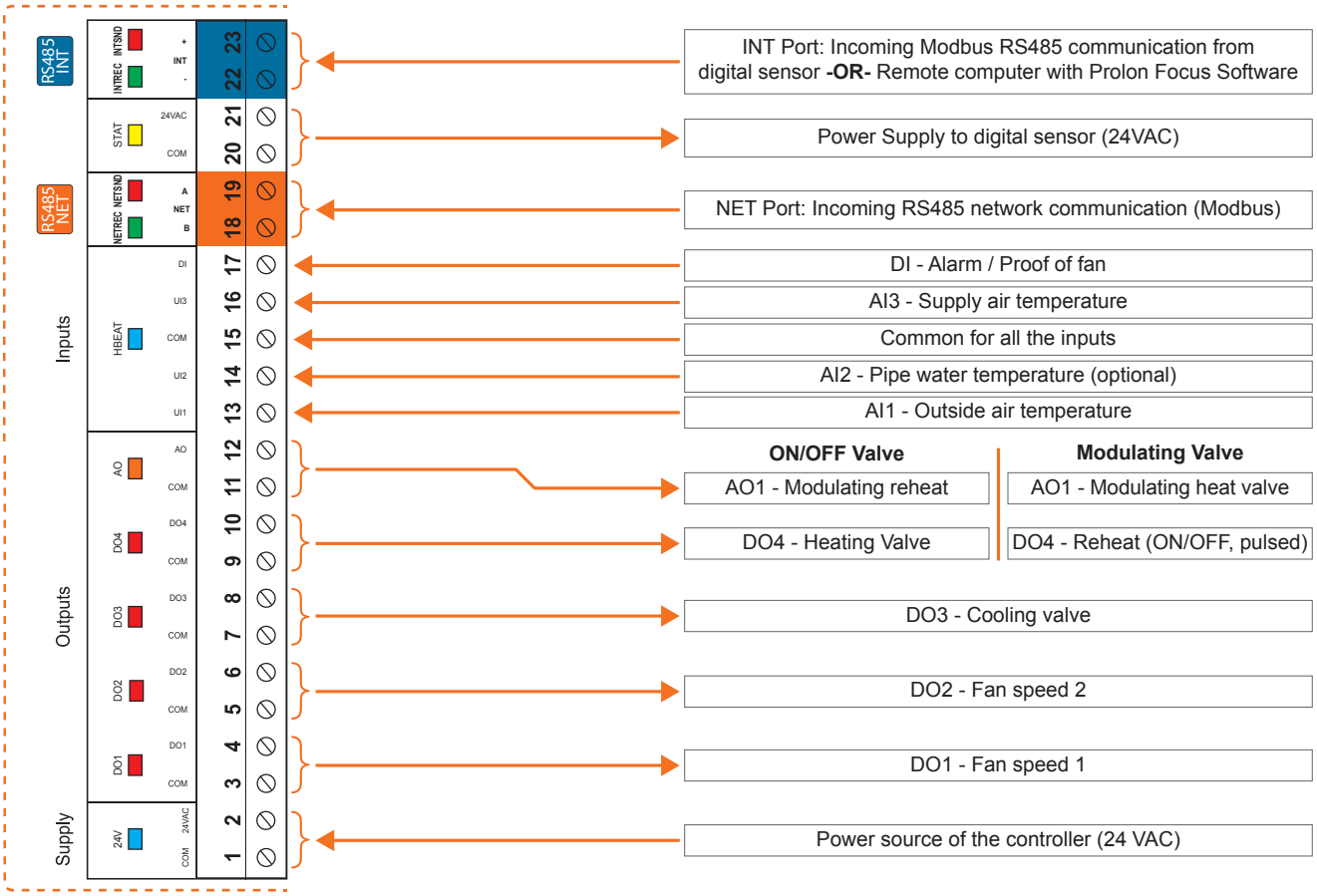

Figure 5 - Input and Output Identification (Four Pipe System)

Inputs

Analog Input

The C1050 series controllers are equipped with three general purpose analog inputs. These inputs can be configured to receive signals of the following types:

- Thermistor (Ω)
- 4 -20mA
- 0-5V
- 0-10V

When a thermistor is used, the thermistor must be 10KΩ TYPE 3.

Each C1050 analog input is equipped with a fast-switching barrier diode to protect against surges and short circuits.

By default, the C1050-FCU analog inputs are set up for thermistor mode. The input signal mode can be changed by setting jumpers U1, U2 and U3, situated inside the casing, in the desired position:

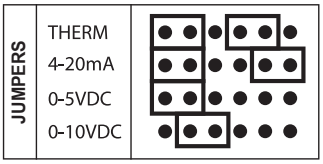

Figure 6 - Analog input

Temperature Sensors

The C1050 Fan Coil has three analog inputs that can monitor outside air, coil water supply and supply air temperatures and will integrate these readings into its control sequence. The sensors used are standard 10k type 3 thermistors that share a single common connection.

The outside air and coil water supply temperatures can also be provided by an alternate source on the Prolon network. If a network or master controller is present, they can relay these reading from one controller to another.

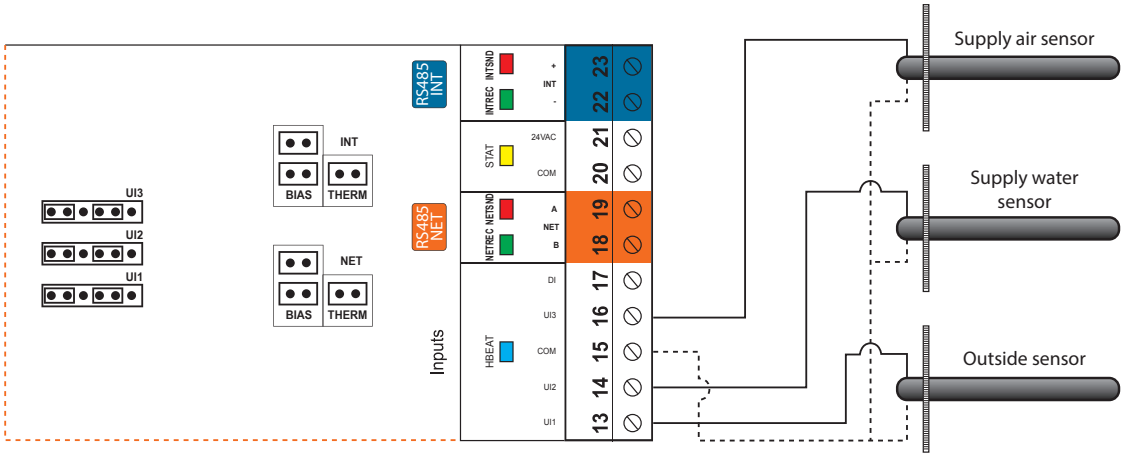

Figure 7 - Connecting the Temperature Sensors

Alarm Input

The C1050 Fan Coil controller can receive an input from an external leak alarm. The alarm can be configured as normally open or normally closed to match the alarm output type. When activated, the alarm input will cause all water valves to close and indicate an active “alarm” when the controller is viewed in the Focus software. If the unit has an auxiliary heat source connected, heating demands will be met using auxiliary heat.

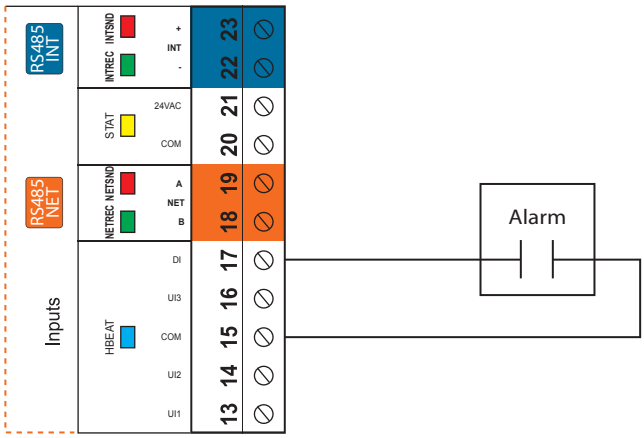

Figure 8 - Connnecting the Alarm Contacts to the Controller

Proof of Fan

The C1050 has a digital input that can be used to receive the proof of fan signal. Please refer to Figure 9 to see how to correctly connect it. To indicate proof of fan, the contact must be closed.

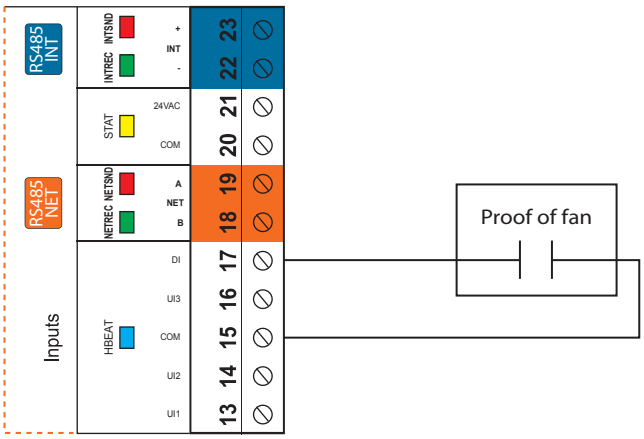

Figure 9 - Connecting the Proof of Fan Contact to the Controller

Digital Room Sensors

Prolon offers various digital communicating sensors that can provide the C1050 with room temperature, room setpoint, and schedule override (T1000, T500, T200 sensors).

For your convenience, an additional set of 24 VAC and COM pins are provided to simplify the wiring and powering of a digital sensor. Please note that since the digital sensor pulls its power from the C1050, it is important to take the power requirements of the digital sensor into account when selecting a power source for the C1050. Typical wiring is as follows:

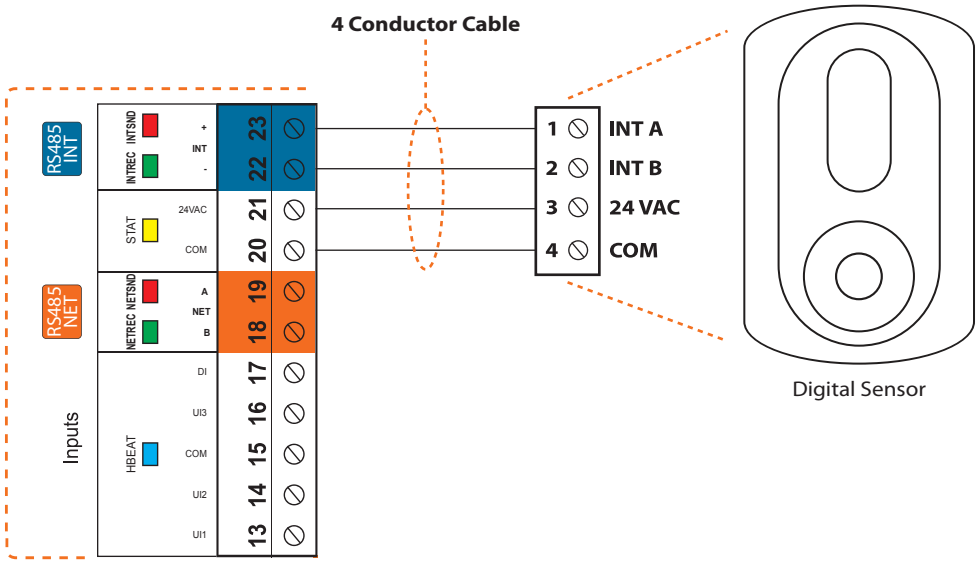

Figure 10 - Connecting the Digital Sensor to the Controller

Outputs

The C1050 Fan Coil controller has 5 configurable outputs: 4 Triac type 24VAC outputs and one 0-10VDC analog modulating / pulsed / On-or-Off output. Output configuration is performed via the Prolon Focus software.

An integrated resettable fuse protects ***each*** of the outputs of the C1050 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
DO 2	Triac Source 24VAC Max Current: 300 mA	On-or-Off
DO 3	Triac Source 24VAC Max Current: 300 mA	On-or-Off
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 / Voltage modulation

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***:

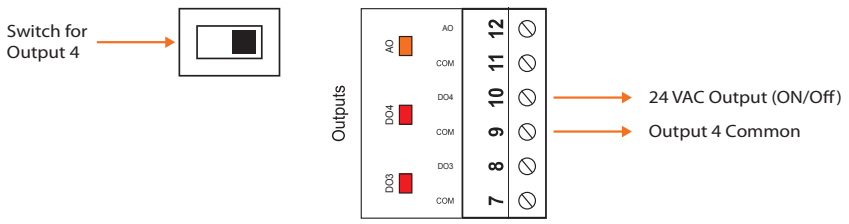

Figure 11 - Output in SOURCE mode

2) Switch position to obtain a SINK ***passive output***:

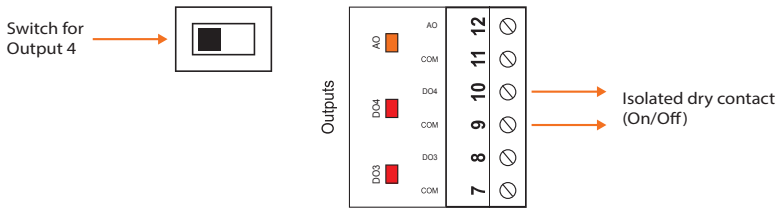

Figure 12 - Output in SINK mode

Typical Connection of Digital Outputs

Two types of configurations are possible:

1) Active output (SOURCE). The C1050 is actively powering the load:

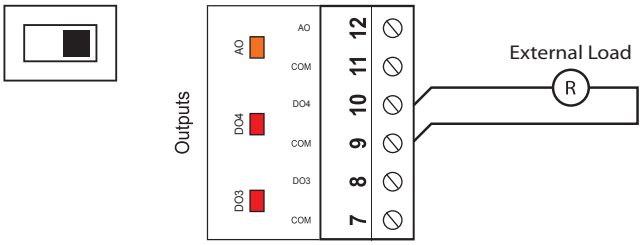

Figure 13 - Connection of Active Outputs 3 and 4

2) Passive output (SINK). The C1050 opens and closes a contact to allow an external source to power the load:

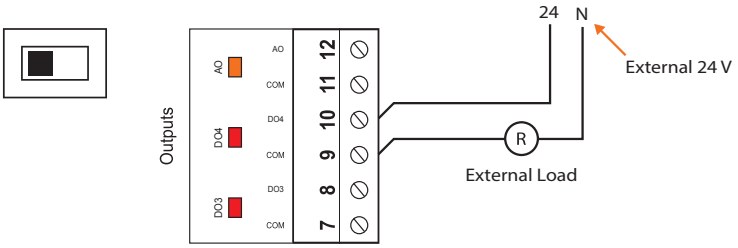

Figure 14 - Connection of Passive Output 3 and 4

Typical Connection of the Analog Output

Two types of configuration are possible:

1) The C1050 powers the load and provides a control signal:

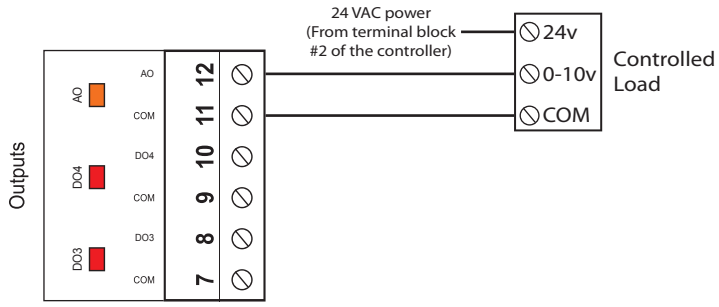

Figure 15 - Connecting the Analog Output (Controller Powered)

2) The C1050 only provides the control signal to the load, which is powered by an external source:

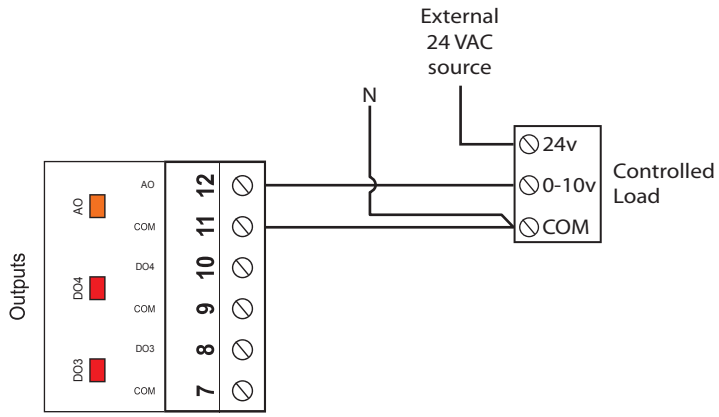

Figure 16 - Connecting the Analog Output (External Power)

Power Source

The Prolon C1050 controller is powered by a 24 VAC power source connected using the "COM" terminal and the "24 VAC" terminal. 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.

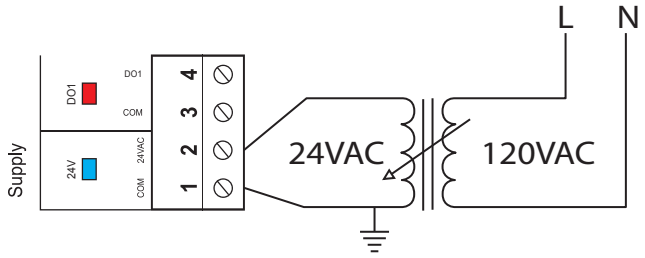

Figure 17 - Connecting the 24VAC Power Source

Network Communication

The Prolon C1050 controller works autonomously or networked. When networked, it will communicate in real-time with other controllers. The C1050 controller's default communication protocol is Modbus RTU over RS485. The addressing is done with the addressing dipswitch located on the C1050 card (see Figure 3). The network connections are made using the NET terminal block located on the Prolon C1050 controller.

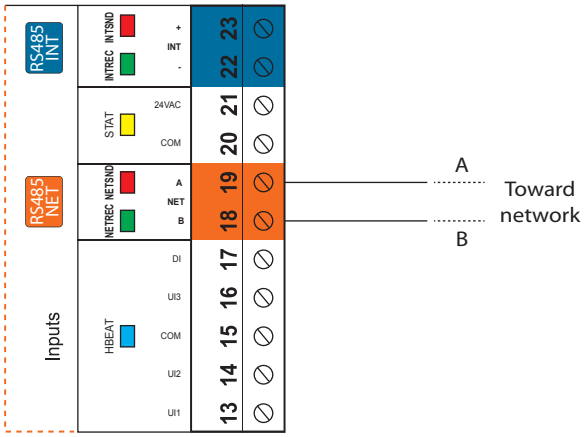

Figure 18 - Connecting to the Network

Technical Specifications

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

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

Inputs: Outside Air Temperature – 10K Thermistor
Supply Water Temperature – 10K Thermistor
Supply Air Temperature – 10K Thermistor
Proof of Fan / Alarm – Dry Contact

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) for the valve

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)

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: -4 to 122 °F (-20 to 50 °C) 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

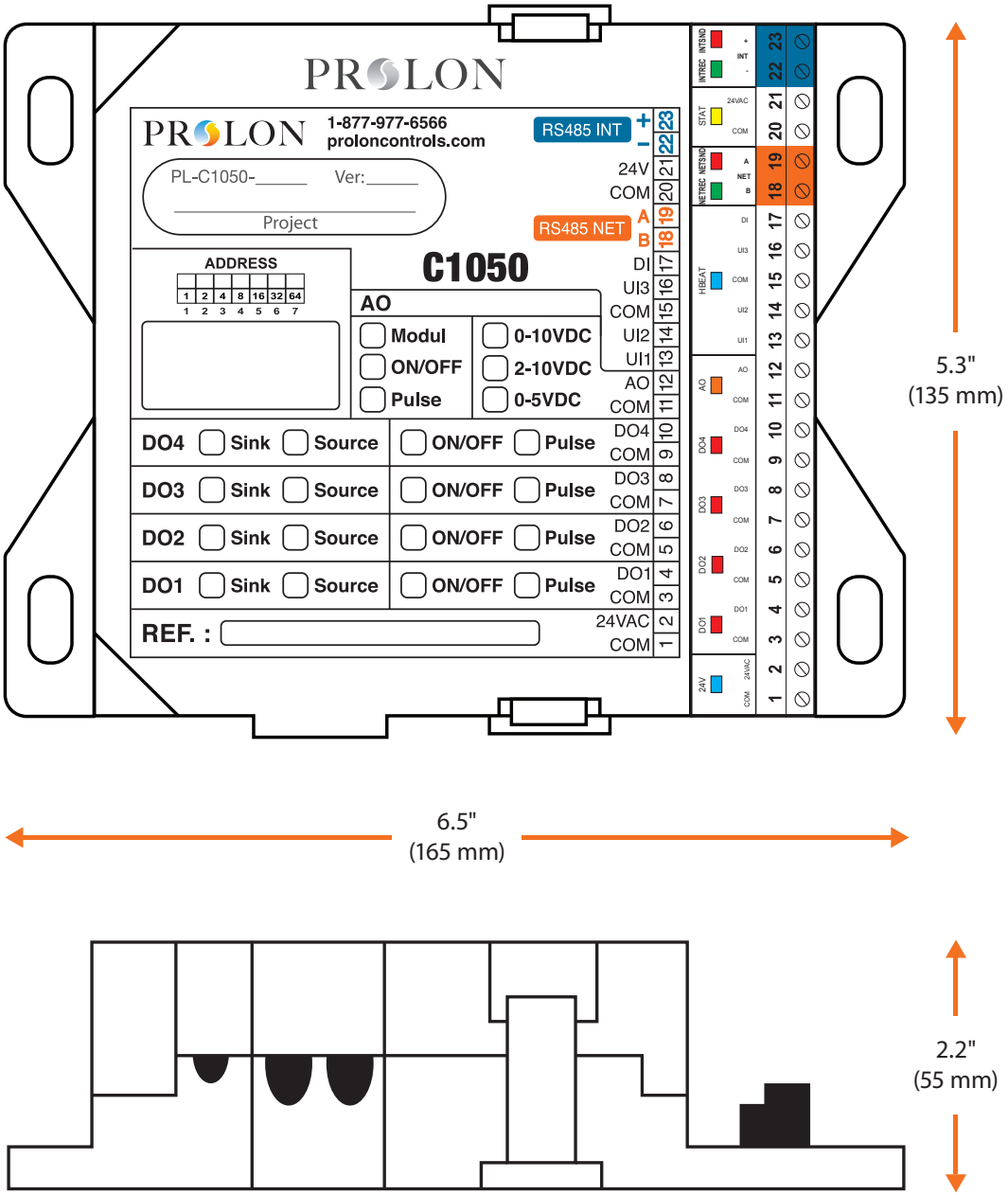

Figure 19 - C1050 Size Diagram

REV. 7.4.1

PL-HRDW-FCU-C1050-C/F-EN

© Copyright 2023 Prolon. All rights reserved.
No part of this document may be photocopied or reproduced by any means, or translated to another language without prior written consent of Prolon. All specifications are nominal and may change as design improvements are introduced. Prolon shall not be liable for damages resulting from misapplication or misuse of its products. All trademarks are the property of their respective owners.