HARDWARE GUIDE
DIMENSIONS & SPECIFICATIONS

REV. 5.2.0

VC1000
INTELLIGENT ZONE CONTROL SYSTEM

VAV CONTROLLER
(INDEPENDENT OR NETWORK)

info@prolon.net

www.prolon.net

PROLON

1-877-9PROLON

Montréal

1989 rue Michelin Laval,
QC H7L 5B7
TEL:(450) 973-7765 FAX: (450) 973-6186
1-800-461-1381

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GENERAL INFORMATION

PL-VC1000: Independent or Networked Intelligent Zone Controller

Description

The PL-VC1000 series ProLon zone controllers use a microprocessor with proportional and integral action. This action allows for a precise set-up of the variable air volume box, either in a network or independently.

General Behaviour

The ProLon VC1000 controllers are programmable, thus every parameter may be optimized to obtain the best results for each zone. It is possible to modify the action of each output (heating/cooling (and/or) On-or-Off/pulsed), the proportional bands, the integration times, the differentials, the operational ranges and the setpoints. The opening time of the damper can also be configured, thus avoiding any overuse once fully opened or closed. This also means that the damper can be controlled by more powerful motors with different opening times. Also, the damper can now be controlled by a self-configuring Halomo motor, enabling accurate positioning of the damper. The various programming options also allow a person to modify the unoccupied mode setpoints, the deadbands, the maximum and minimum setpoints for each zone, as well as the minimum damper position in ventilation mode and in heating mode for each zone. All these parameters can be modified using the ProLon Focus software or with the ProLon digital interface (T1000 series).

Operation Sequence

General

The ProLon controller, located on the ventilation box, receives the zone temperature and setpoints from the room sensor, and optionally the duct temperature from a duct temperature sensor. The controller then analyzes the received information and commands the damper motor and the different outputs to respond accordingly.

Occupied Mode

When there is a cooling demand in the zone and the supply temperature is colder than the zone temperature, the damper opens proportionally to the demand. Once the demand is satisfied, the damper returns to its minimum ventilation position.

When there is a heating demand in the zone, the controller activates the designated auxiliary heating outputs. If the zone has a terminal duct heater, the damper opens first to the minimum heating position and the designated auxiliary heating outputs activate. If the supply temperature is warmer than the zone temperature, the damper is used as the first heating output and opens proportionally to the demand. Once the demand is satisfied, the damper returns to the minimum ventilation position.

When the controller has no cooling or heating demand (deadband), and the supply temperature is also within this deadband, the controller opens the damper to 100% to allow maximum ventilation of the zone.

The user can modify the setpoints by adjusting the room temperature sensor at all times.

Unoccupied Mode

In unoccupied mode, the damper can be configured to fully open or to operate in a fashion similar to that of occupied mode. The room temperature setpoints in the unoccupied mode are adjustable.

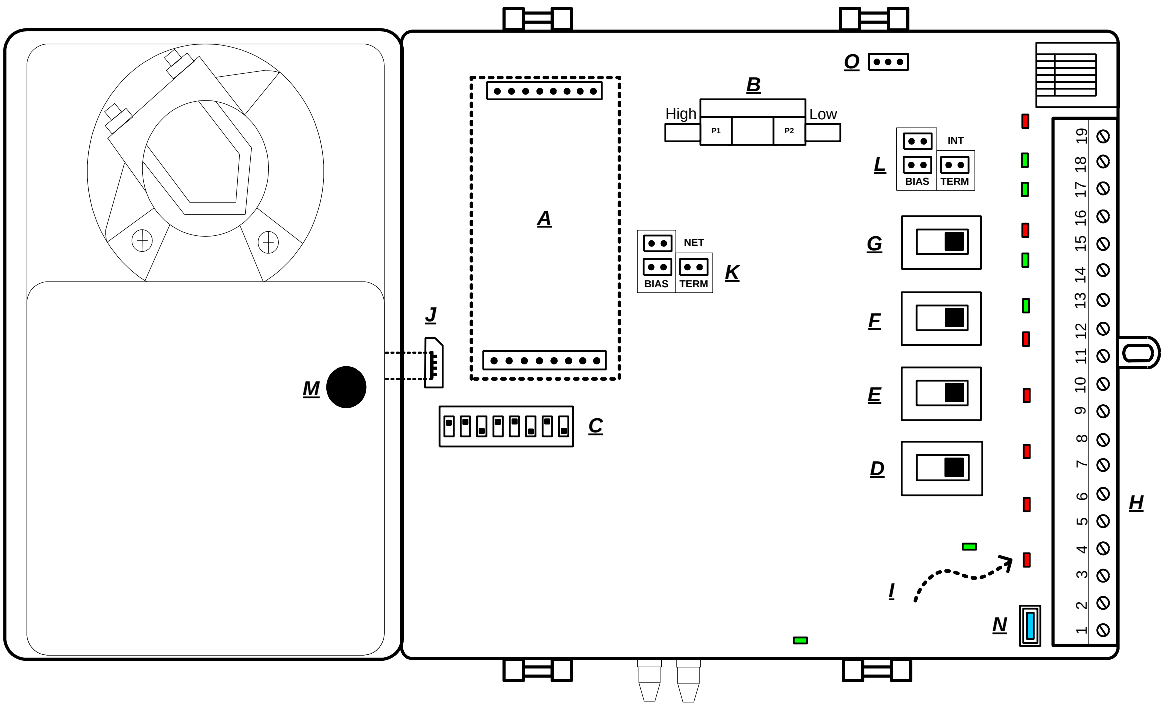
The Override button located on the room thermostat bypasses the unoccupied mode for a specified length of time.

Selection Table

Table of Models		
Model	Description	Inputs / Outputs
PL-VC1000F	Intelligent Controller Pressure Dependant	1 Input for the Prolon Interface
		4 Dedicated Inputs
		4 Configurable Digital Outputs (DO)
		1 Configurable Analog Output (AO)
PL-VC1000F-PIL	Intelligent Controller Pressure Independant Low Velocity (0 - 1000 ft/min)	1 Input for the Prolon Interface
		4 Dedicated Inputs
		4 Configurables Digital Outputs (DO)
		1 Configurable Analog Output (AO)
		1 Airflow Input
PL-VC1000F-PIH	Intelligent Controller Pressure Independant High Velocity (0 - 2600 ft/min)	1 Input for the Prolon Interface
		4 Dedicated Inputs
		4 Configurable Digital Outputs (DO)
		1 Configurable Analog Output (AO)
		1 Airflow Input
PL-VC1000LT	Intelligent Controller Pressure Dependant	1 Input for the Prolon Interface
		4 Dedicated Inputs
		1 Configurable Digital Output (DO)
		1 Configurable Analog Output (AO)

COMPONENTS

Component Identification



Legend:

A = Communication Card (optional)

*** *B*** = Airflow sensor (optional)

C = Addressing Dipswitch

*** *D*** = Output 1 Dipswitch

*** *E*** = Output 2 Dipswitch

*** *F*** = Output 3 Dipswitch

G = Output 4 Dipswitch

H = Connector for Inputs and Outputs

I = LEDs

J = Connector for Halomo Motor

K = Jumpers for NET network resistors

L = Jumpers for INTERFACE (RJ45) network resistors

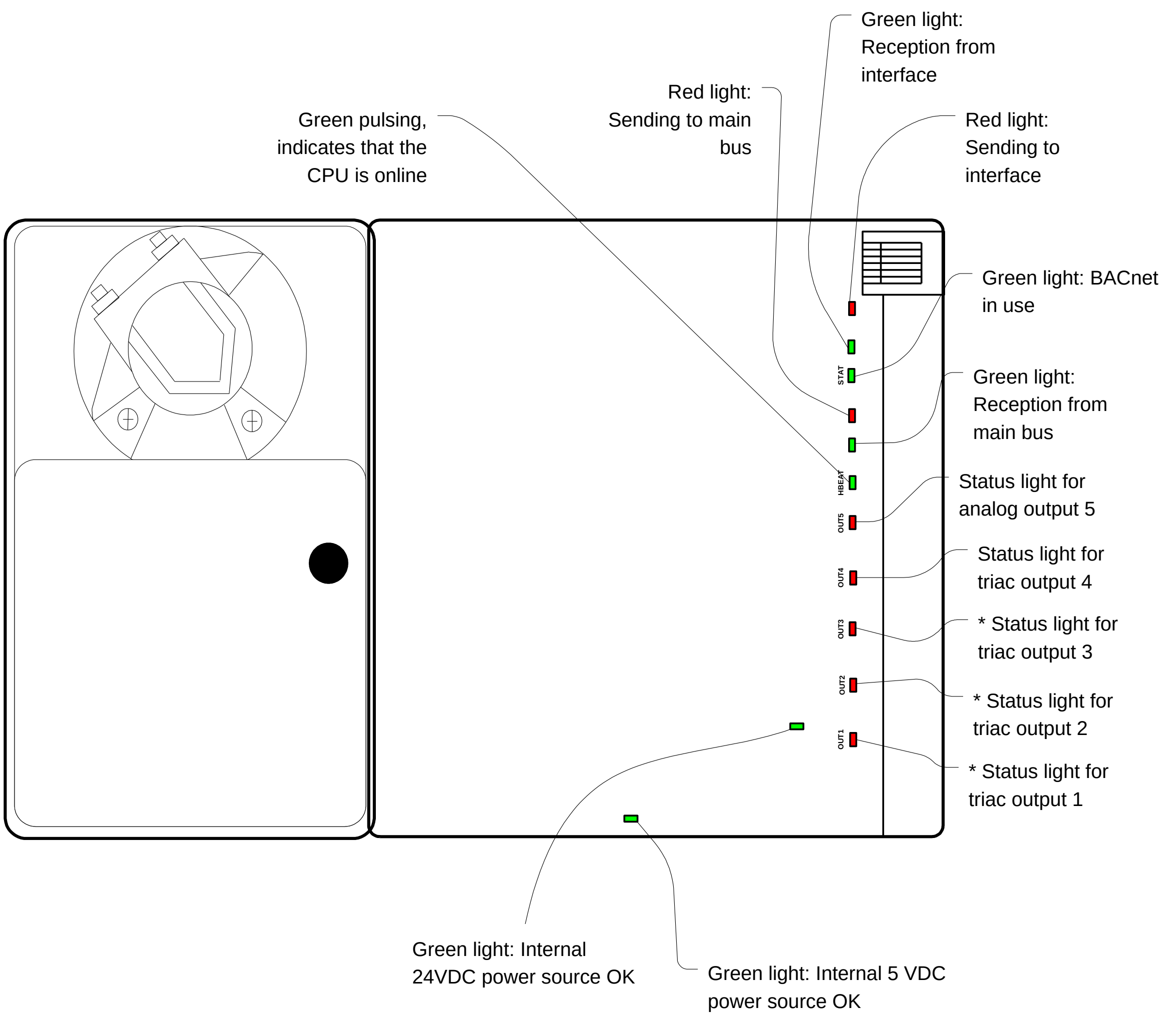
M = Damper Motor Clutch

N = Reset Button

O = Jumper to supply voltage to RJ45 port

* Absent on the PL-VC1000-LT models

LEDs



* Absent on the PL-VC1000-LT models

Communication Cards

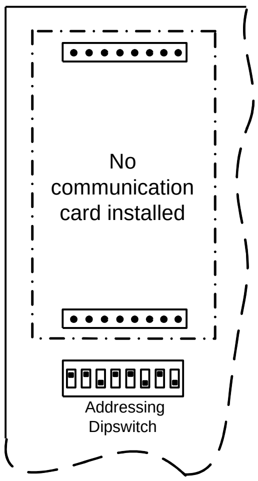


Figure 1: No communication card

The network communication protocol of the ProLon PL-VC1000 Controller is adjustable to fit your needs. When there is no communication card installed, the ProLon controller automatically uses Modbus RTU over RS485 as the default protocol. The addressing of each card is done by using the seven first small switches on the addressing dipswitch (see Figure 1). A maximum of 127 units can be addressed on the same network.

The ProLon PL-VC1000 controller offers you a choice of communication protocols. It is as simple as choosing the communication card that corresponds to your desired protocol. For example, plugging in the Lon card enables Lon communication. Other cards can be made available upon request.

When a communication card is installed, the default Modbus communication protocol is bypassed (see Figure 2).

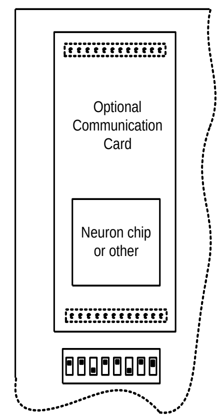


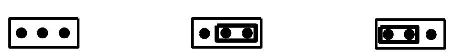
Figure 2: Activating other communication protocols

BACnet

To enable BACnet communication, no additional communication card is required! Simply move switch #8 of the addressing dipswitch to the 'ON' position to start BACnet MS/TP (RS485) communication.

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 PL-HNI digital interface. <u>NOTE</u>: If multiple VC1000 controllers are connected together through the RJ45 plug, <u>*only one*</u> VC1000 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:



No power 24 VAC 24 VDC

Airflow Sensor (Optional)

Adding an airflow sensor to the ProLon controller lets it regulate the temperature and the airflow into a zone, independently of the static pressure variations of the system. Two different airflow sensors are offered (see Figure 3):

- Low velocity sensor (0 - 1000 ft/min)
- High velocity sensor (0 - 3000 ft/min)

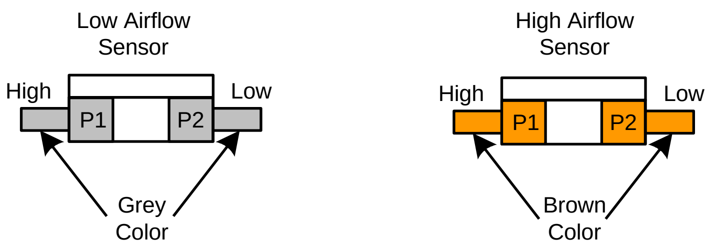


Figure 3: Airflow Sensors

Address Configuration for Networking

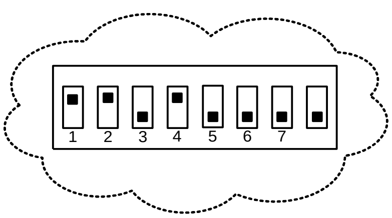


Figure 4: Addressing Dipswitches

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 4 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.

Damper Direction Configuration

The default damper opening direction of a VC1000 VAV controller is counter clockwise (CCW). This parameter can be modified in two different ways. The first is by using a digital interface or ProLon Focus software to manually change the setting. The second is to use the following method**:**

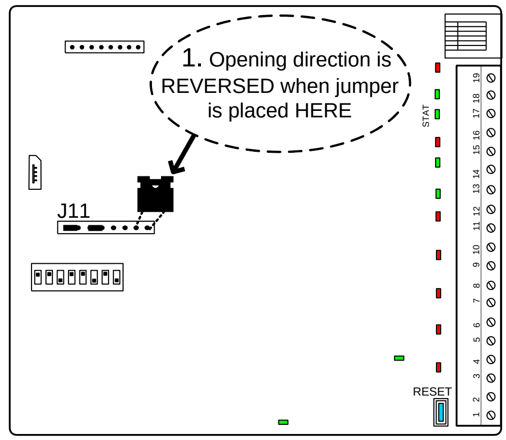
1. Reversing the Damper Direction

Whenever a VC1000 resets and a jumper is placed on the last two pins on the far most right of port J11, the damper opening direction will be inverted (see adjacent image).

A VC1000 can be **reset** in one of the following ways:

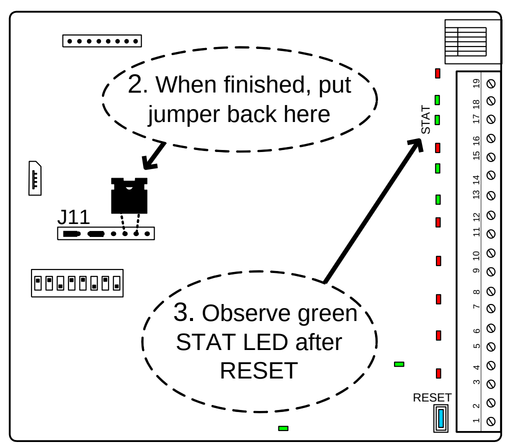
- Pressing on the physical RESET button
- Cycling power to the device

Please note that in the event of a device reset, a VC1000 VAV controller always performs a damper recalibration first, where it moves the damper completely to one side and then completely to the other side. Even if you invert the damper opening direction, the change will not take effect until after the calibration period.



2. Once you have finished configuring the damper opening direction to the setting of your choice, ***do not forget to REMOVE the jumper*** from the last two pins, or the damper direction will invert itself *again and again* upon any subsequent resets of the controller.

To ensure that the damper direction will no longer change, move the jumper one pin to the left, as depicted in this image:



3. Confirming Damper Direction

The damper opening direction can be visually confirmed by observing the green "STAT" LED on the VC1000 board after performing a **reset**:

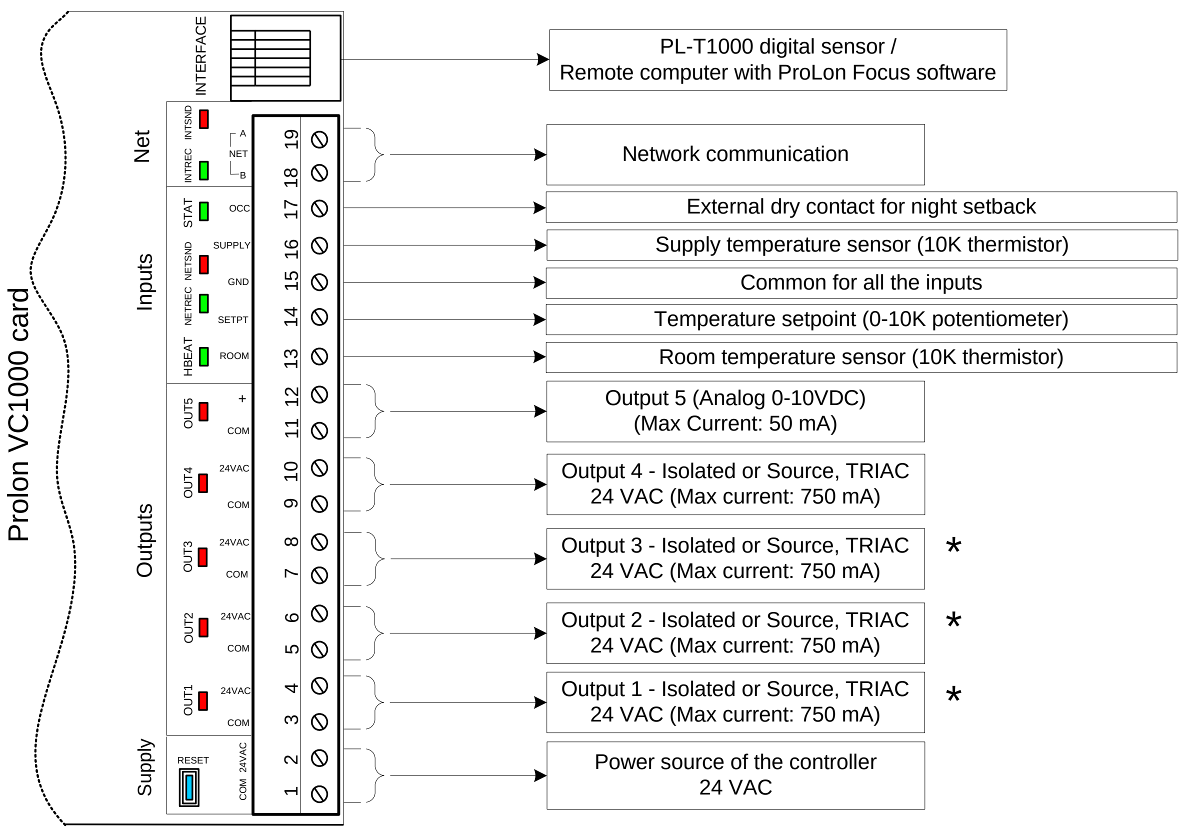
- "STAT" LED STEADY ON for 3 seconds = COUNTER CLOCKWISE (CCW) OPENING
- "STAT" LED PULSES 3 TIMES (ON/OFF) over 3 seconds = CLOCKWISE (CW) OPENING

Montréal
1989 rue Michelin Laval,
QC H7L 5B7
TEL:(450) 973-7765 FAX: (450) 973-6186
1-800-461-1381

Input and Output Identification

The inputs and outputs of the VC1000 use "Plug-In" screw type connectors. The connector for the ProLon digital interface (T1000 series) is a network type RJ-45. With these connectors, the wiring is done quickly and much more easily. All outputs are protected by resettable fuses (PTC). Output 5 can be wired in parallel with the output 5 of other VC1000s to obtain a “highest voltage” signal.

Note that if both the PL-RSC room temperature sensor and the PL-T1000 interface are connected to the controller at the same time, the temperature and setpoints from the PL-RSC will have priority. Otherwise the PL-T1000 interface becomes the room temperature sensor, as well as an interface.



* Absent on the PL-VC1000-LT models

INPUTS

Room Sensors

Two models are available:

- PL-RSC: Room temperature sensor with setpoints and override
- PL-T1000: ProLon programming interface and digital sensor

Each zone is managed independently; the setpoint may be set by software or by directly connecting a room sensor.

ProLon Analog Room Sensor (PL-RSC)

The PL-RSC series room sensors provide the VC1000 with a room temperature and setpoint. They are connected using a 3-conductor cable (see Figure 5). Note that if a shielded cable is used to connect the PL-RSC, the shield must be grounded at the GND (pin 1) of the VC1000 to which it is connected. To activate the schedule override from the PL-RSC, hold the override button for 3 seconds.

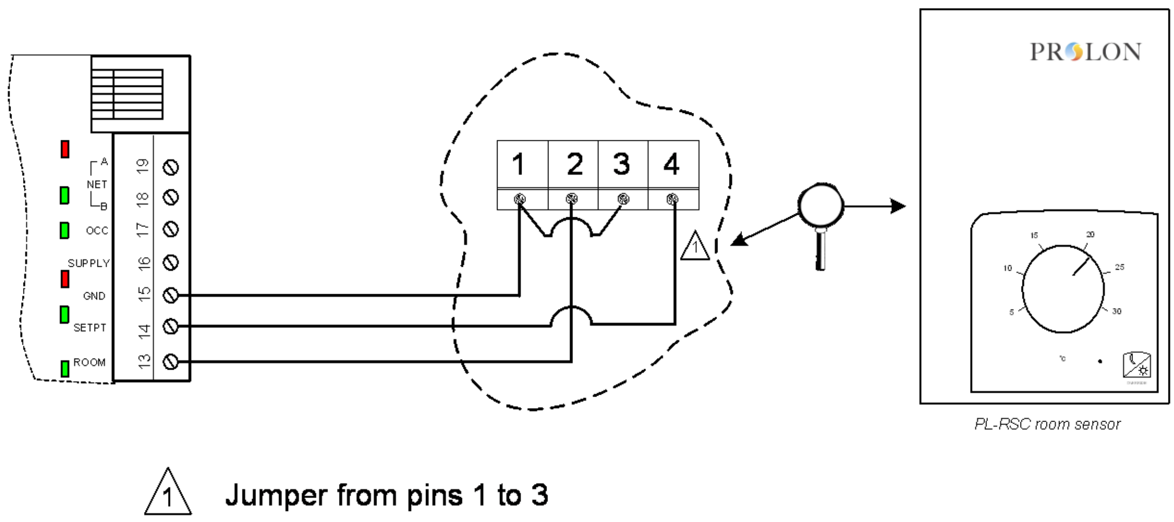


Figure 5: Typical wiring of the PL-RSC room sensor to the controller

ProLon Digital Sensor and Interface (PL-T1000)

The T1000 digital interface provides the VC1000 with a digital temperature and setpoint, as well as giving you access to all configuration parameters of the VC1000. It is directly connected to the VC1000 using a standard Ethernet network cable (see Figure 6). This device can be used as a permanent wall sensor or a portable commissioning tool to let you modify the programming parameters for each controller.

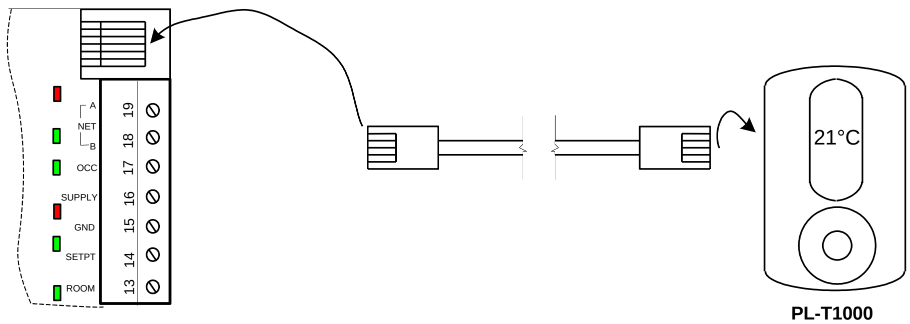


Figure 6: Connecting the PL-T1000 to the controller

Montréal

1989 rue Michelin Laval,
QC H7L 5B7
TEL:(450) 973-7765 FAX: (450) 973-6186
1-800-461-1381

Damper Control Mode Changeover

Duct Temperature Sensor (PL-CODS)

When a zone controller works autonomously, a supply air temperature sensor may be connected to it in order to invert the damper control method upon detection of hot or cold air (see Figure 7). However, if that controller is part of a network using a Master unit, individual sensors are unnecessary because all zone controllers share the supply temperature reading sent on the network by that Master. If no Master is present and no sensor is available, the controller will assume there is cold air in the supply. Alternatively, by shorting the supply temperature input (pins 15 and 16), the controller will instead assume there is hot air in the supply.

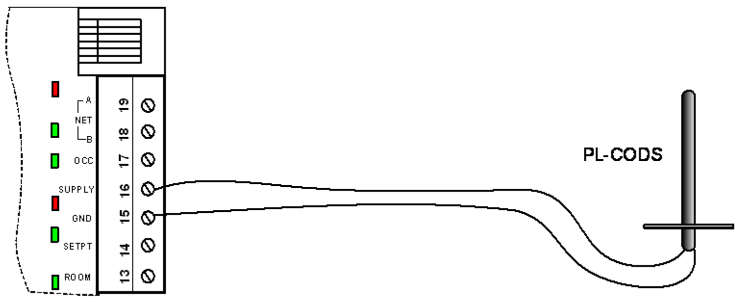


Figure 7: Wiring of the supply sensor to the controller

Radiant Floor Control

Slab Temperature Sensor

When the VC1000 is configured to work as a radiant floor controller, the function of the supply temperature input pin changes to become a slab temperature input pin. Therefore, a radiant floor slab thermistor (10 kΩ type 3) can then be connected to the VC1000 on pins 15 and 16. Note that if a T1000 companion thermostat is connected to the VC1000, the slab thermistor can instead be wired to the T1000, and the T1000 will then send the slab temperature to the VC1000, cutting down wiring costs.

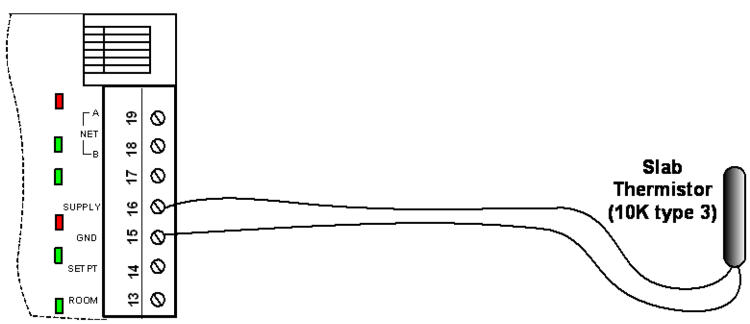


Figure 8: Wiring of the slab sensor to the controller

Montréal

1989 rue Michelin Laval,
QC H7L 5B7
TEL:(450) 973-7765 FAX: (450) 973-6186
1-800-461-1381

Night Setback

Dry Contact originating from an External Timer

When using a dry contact originating from an external timer to switch from the occupied mode to the unoccupied mode, the contact must be connected to the "Setback" (17) and the "GND" (15) pins. See Figure 9 to see how to wire the timer correctly. To indicate occupied mode, the contact must be open. To indicate unoccupied mode, the contact must be closed. However, if that controller is part of a network using a Master unit, an individual contact is unnecessary because all zone controllers share the occupancy status sent on the network by that Master.

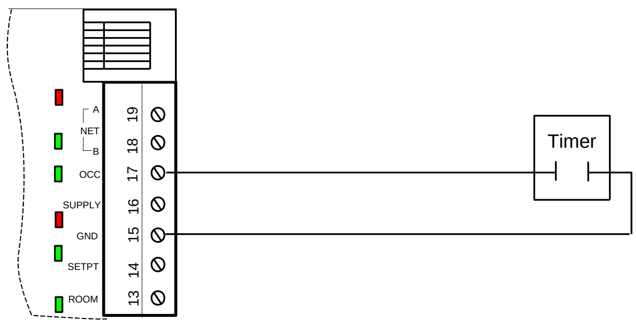


Figure 9: Connecting an external timer to the controller

OUTPUTS

The VC1000 series controllers contain 4 fully customizable Triac outputs and a 0-10VDC output to drive components. All outputs are fully programmable and follow a proportional and integral algorithm (PI) to ensure precise control. This PI function is fully customizable via the ProLon Focus software or the ProLon PL-T1000 digital interface.

An integrated resettable fuse protects **each** of the outputs of the VC1000 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	Heating	Cooling
1 *	Triac source 24VAC Passive Triac (dry contact) On-or-Off Pulsed Max Current: 750 mA	Damper Valve Relay Triac	Damper Valve Relay
2 *	Triac source 24VAC Passive Triac (dry contact) On-or-Off Pulsed Max Current: 750 mA	Damper Valve Relay Triac	Damper Valve Relay
3 *	Triac source 24VAC Passive Triac (dry contact) On-or-Off Pulsed Max Current: 750 mA	Valve Relay Triac	Valve Relay
4	Triac source 24VAC Passive Triac (dry contact) On-or-Off Pulsed Max Current: 750 mA	Valve Relay Triac	Valve Relay
5	Modulating Output On-or-Off Max Current: 50 mA Configurable signal: - 0 to 10 VDC - 2 to 10 VDC - 0 to 5 VDC	Modulating Damper Modulating Valve SCR Relay Triac	Modulating Damper Modulating Valve Relay

* Absent on PL-VC1000-LT models

Configuration of Outputs 1 to 4

Outputs 1 to 4 are configurable via switches located on the ProLon card. Simply move the switch to obtain either an active output (1) or a passive output (2). Note that outputs 1 to 3 are absent on PL-VC1000-LT models.

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

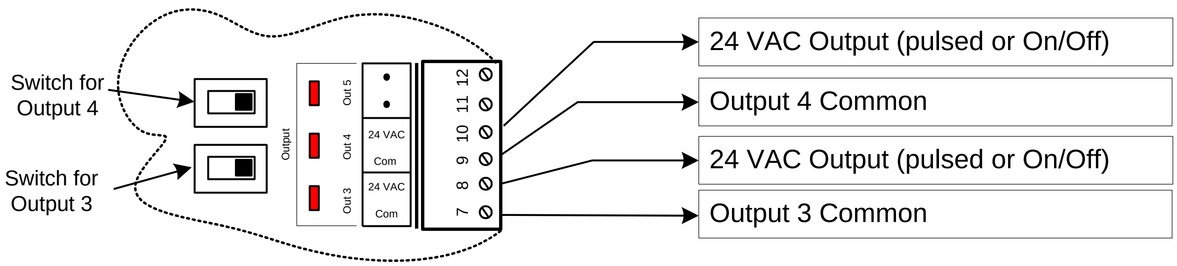


Figure 10: Outputs 3 and 4 active

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

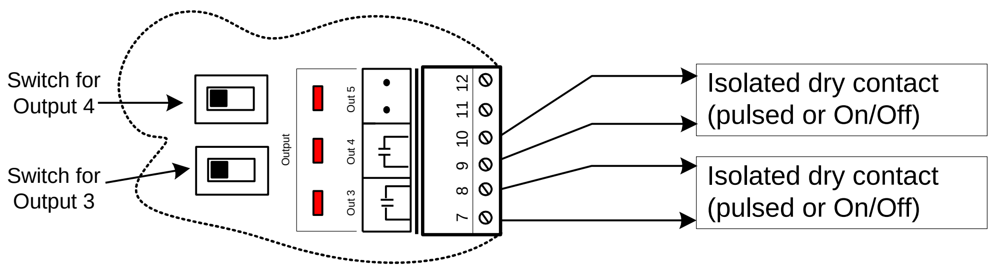


Figure 11: Outputs 3 and 4 passive

Typical Connection of the Triac Outputs 1 to 4

Two types of configurations are possible:

1) Active outputs. The VC1000 is actively powering the load. (see Figure 12)

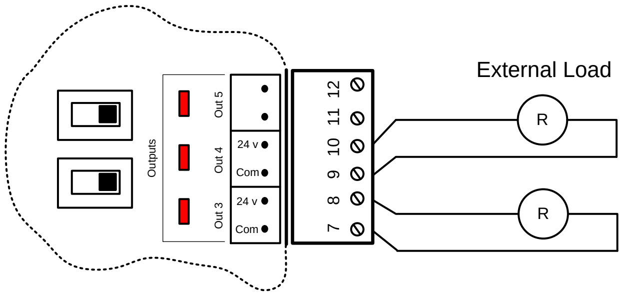


Figure 12: Connection of active outputs 3 and 4

2) Passive outputs. The VC1000 opens and closes a contact to allow an external source to power the load (see Figure 13).

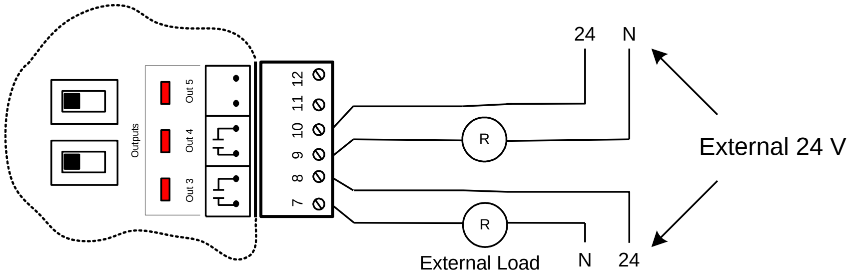


Figure 13: Connection of passive outputs 3 and 4

Typical connection of the analog output

Two types of configuration are possible:

1) The VC1000 powers the load and provides a control signal (see Figure 14)

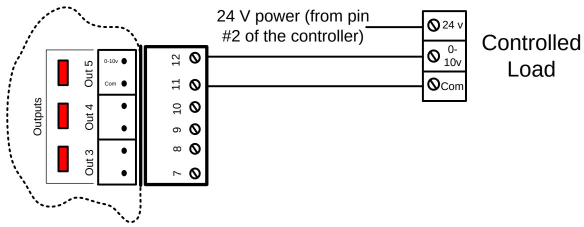


Figure 14: Connecting the analog output (controller powered)

2) The VC1000 only provides the control signal to the load, which is powered by an external source (see Figure 15)

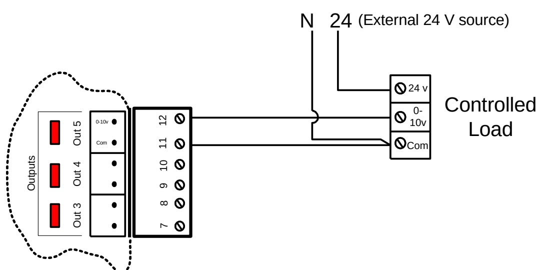


Figure 15: Connecting the analog output (external power)

POWER SOURCE / NETWORK

Power Source

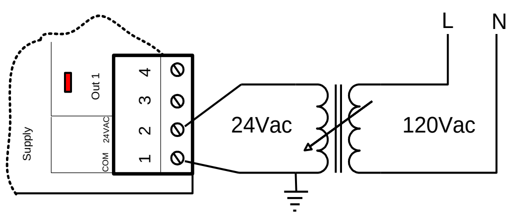


Figure 16: Connecting the 24VAC power source

The ProLon controller is powered by a 24 VAC power source connected using the "COM" pin and the "24 VAC" pin (see Figure 16). The common for all inputs and outputs is 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.

Network Communication

The ProLon controller works autonomously or networked. When networked, it will communicate in real-time with other controllers. Depending on the chosen communication card, the controller can use different protocols. The VC1000 controller's default communication protocol is Modbus RTU over RS485. The addressing is done with the addressing dipswitch located on the VC1000 card (see Figure 4). Default communication is used when no other optional card is connected. For example, if an optional communication card such as the "Lon" card is connected to the VC1000 board, the controller will automatically switch to the "Lon" protocol, with a unique address found on the communication card itself (see Figure 2). This principle is applicable to all communication cards. Please refer to the respective ProLon guides for each protocol. The network connections are made using the NET pins located on the ProLon controller, depending on the chosen network platform (see Figure 17).

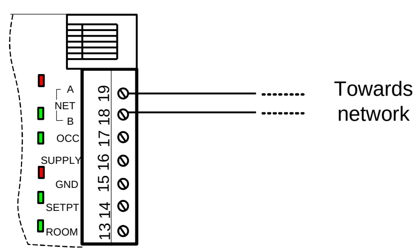


Figure 17: Connecting to the network

"LIGHT" CARD

The VC1000 "Light" card is designed for jobs that do not require all the outputs found on a "Full" VC1000. It is identical to the full card in terms of functionality and configuration, apart from the following elements:

- Outputs 1, 2 and 3 are removed
- The input for the flow sensor is removed

This implies that the VC1000 "Light" card can only function in pressure *dependant* mode.

Also, since outputs 1, 2 and 3 are missing, any damper control *must* be done by the Halomo motor or analog output 5.

Montréal
1989 rue Michelin Laval,
QC H7L 5B7
TEL:(450) 973-7765 FAX: (450) 973-6186
1-800-461-1381

OVERALL DIMENSIONS