Crestron **PAC2**®

Professional Automation Control System

Operations Guide

CRESTRON®

Regulatory Compliance

As of the date of manufacture, the PAC2 has been tested and found to comply with specifications for CE marking and standards per EMC and Radiocommunications Compliance Labelling.

$$C \epsilon \ \mathcal{C}$$

Federal Communications Commission (FCC) Compliance Statement

CAUTION: Changes or modifications not expressly approved by the manufacturer responsible for compliance could 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 (IC) Compliance Statement

CAN ICES-3(B)/NMB-3(B)

Contents

Professional Automation Control System: PAC2

Introduction

The PAC2® from Crestron® is a professional dual bus control system designed to serve as the central processor for Crestron Green Light® systems. Fast performance, rigorous construction and extreme flexibility provide a truly powerful automation solution for today's most demanding residential and commercial environments.

Features and Functions

- 2-Series engine | Dual bus architecture
- 4 GB Compact Flash memory card slot
- Built-in Cresnet® distribution and hub/repeater
- 10/100 Ethernet capable | SSL encryption
- e-Control® 2 and RoomView® enabled
- SNMP support | Built-in firewall, NAT and router
- Eight Versiport I/O ports and eight relay ports built-in
- Two Y-Bus / 1 Z-Bus control card expansion slots
- Internal power supply | CAEN enclosure installation
- Configurable via Crestron D3 Pro® software

2-Series Control System

Built upon Crestron's reliable 2-Series control engine, the PAC2 is extensively programmable using Crestron's suite of powerful development software and vast database of drivers and software modules. The PAC2 works seamlessly with Crestron's entire line of lighting dimmers and shade controls, keypads, touch screens, thermostats, wireless gateways, control cards and expansion modules.

Whole House Integration

The PAC2 provides for the integration of non-Crestron devices and subsystems through a host of control interfaces. Eight isolated relays and eight I/O Versiports are built in to accommodate motion sensors, contactors, door strikes and other low voltage controls. Additional relays, I/O ports, RS-232, RS-422, RS-485, IR and

MIDI interfaces can be added by installing up to two Y-Bus control cards. Crestron also offers a full line of expansion modules to facilitate the placement of serial COM ports, relays, DTMF interfaces and shade controllers at any location throughout a residence or commercial facility.

Modular Enclosure Installation

The PAC2 mounts in any CAEN or CAENIB automation enclosure and connects directly to the CLX-Series lighting modules. Every Crestron lighting system is completely modular and scalable, allowing virtually unlimited configuration and expansion flexibility.

Cresnet Distribution

Cresnet® is the communications backbone for Crestron lighting modules, wall box dimmers, thermostats, keypads and many other devices. The flexible 4-wire bus streamlines the wiring of a complete Crestron lighting system. With 32 separate Cresnet ports, the PAC2 provides extensive connectivity for numerous Cresnet devices on multiple homeruns. Its built-in Cresnet hub provides eight isolated segments, each supporting 3000 feet (~915 meters) of cabling and approximately 20 Cresnet devices. The Cresnet ports are arranged into four separate power groups providing a clean, flexible 24 Vdc power distribution solution utilizing internal or external power supplies as needed.

Ethernet and e-Control

A choice of single or dual port Ethernet cards facilitates secure high speed network connectivity, enabling extensive capabilities for remote system maintenance and control and providing an interface to other Crestron control systems. Native features include built-in email client to report system troubles and other functions to the owner or service company via instant email notification. An onboard Web server provides the foundation for Crestron's exclusive e-Control® 2 XPanel technology, providing secure IP-based remote control.

RoomView and SNMP

For large facilities utilizing multiple PAC2 units and other control systems, Crestron's exclusive RoomView® Help Desk software delivers a comprehensive solution for remote monitoring and asset management. Also, built-in SNMP support enables similar capability using third-party network management software, allowing full control and monitoring from the IT Help Desk or NOC in a format that is familiar to IT personnel.

NAT

The PAC2's onboard NAT (Network Address Translator) acts as a firewall and router to facilitate the configuration of a private control LAN for Crestron touch screens and other Ethernet devices, with a single point connection to the client's LAN (Dual port Ethernet card required).

NOTE: For specific details on NAT, including setup and configuration, refer to the latest version of the Crestron NAT Reference Guide (Doc. 6001), which is available from the Crestron Web site (www.crestron.com/manuals).

Backup Processor

For applications demanding ultimate reliability, a second backup PAC2 may be employed. An internal watchdog circuit constantly monitors the PAC2's processor, transferring control of the complete system in the event of a failure. An override input is also provided to allow an external contact closure to bypass the PAC2 and activate a preset override state in each connected lighting module.

Memory Expansion

A memory card slot allows for easy expansion of the PAC2's internal memory using any Type II Compact Flash memory card up to 4 GB.

D3 Pro Software

Crestron D3 Pro® software eliminates the need for custom programming, providing a complete design, development and documentation solution for the lighting professional.

Specifications

Specifications for the PAC2 are listed in the following table.

PAC2 Specifications

SPECIFICATION	DETAILS
Processor	
CPU	32-bit Freescale ColdFire® Microprocessor
Memory	
SDRAM	64 MB
NVRAM	256 kB
Flash	4 MB
Compact Flash	Expandable up to 4 GB (not included)
Operating System	Real time, preemptive multithread/multitasking kernel; FAT32 file system with long file names; supports SIMPL Windows and SIMPL+®
Ethernet	
With C2ENET-1	10/100BASE-T, auto-negotiating, full/half duplex, static IP or DHCP/DNS, SSL, TCP/IP, UDP/IP, CIP, SMTP, SNMP, built-in Web server and email client; supports Crestron e-Control 2 XPanel and RoomView applications
With C2ENET-2	All above features plus built-in firewall, router and Network Address Translator (NAT)
Power Requirements	
Main Power Consumption	2.4 amps, 100-250 Vac, 50/60 Hz
Available Cresnet Power	50 watts (shared with control card expansion slots)
Environmental	
Temperature	41º to 113º F (5º to 45º C)
Humidity	10% to 90% RH (non-condensing)
Enclosure	Black and gray metal, surface mount box with two integral mounting flanges; Occupies one module space in a single width CAEN or CAENIB enclosure or two side-by-side module spaces in a double width enclosure
Dimensions	
Height	8.00 in (204 mm)
Width	14.00 in (356 mm)
Depth	3.75 in (96 mm)
Weight	8.0 lb (3.7 kg) with line cord

Physical Description

This section provides information on the connections, controls and indicators available on the PAC2.

PAC2 Physical View (Without Optional Y and Z Bus Cards)

PAC2 Physical View
(Top with Optional Jumpered 3-Pin Mini Connector Installed in POWER 1 Port)
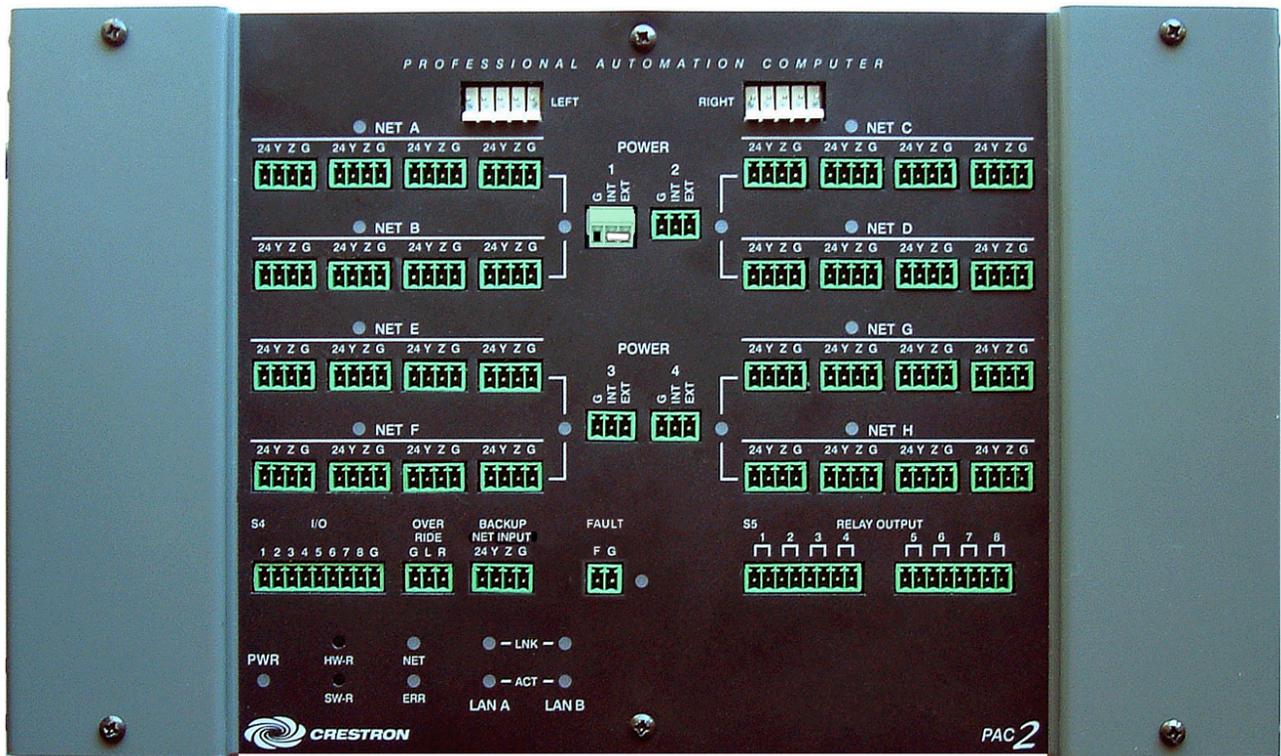
PAC2 Overall Dimensions (Front View)

14.00 in
(356 mm)

8.00 in
(204 mm)
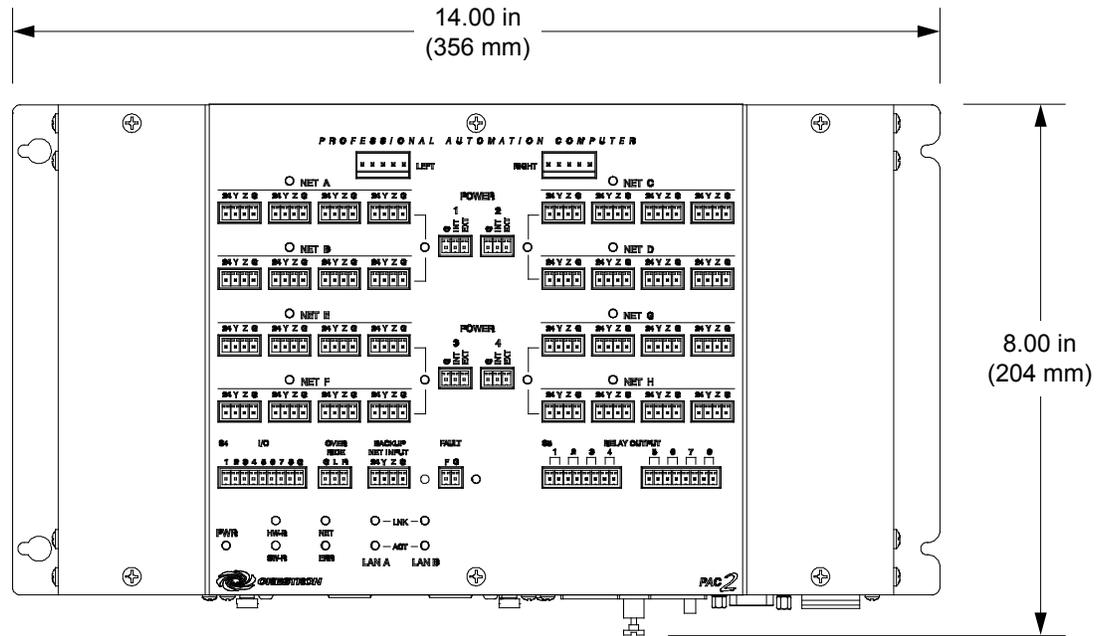
Refer to "Built-In Cresnet Hub/Repeater" which starts on page 10 for wiring details and power requirements for the PAC2 **NET** connectors.

PAC2 Overall Dimensions (Bottom View)

3.75 in
(96 mm)

Z-Bus Slot   Y-Bus Slots
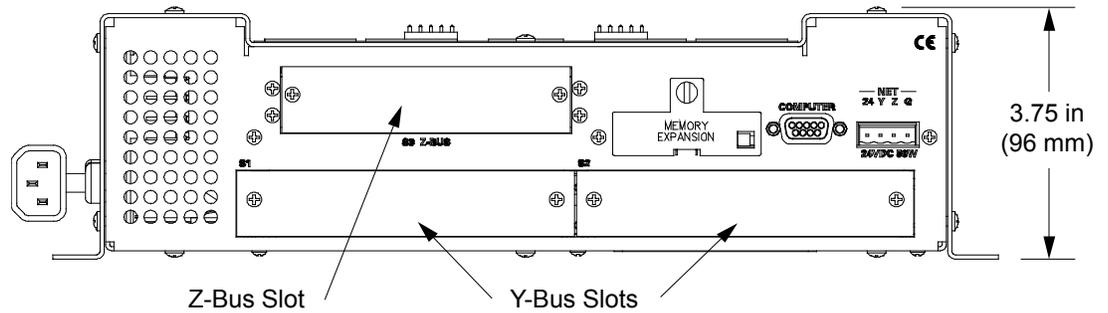
PAC2 (Left Side View)
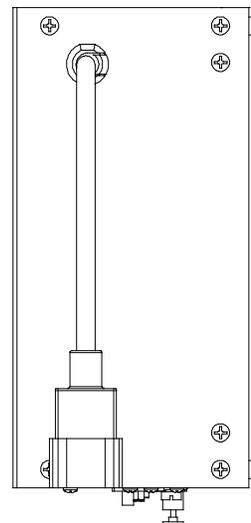
PAC2 Connectors & Indicators (Front View)
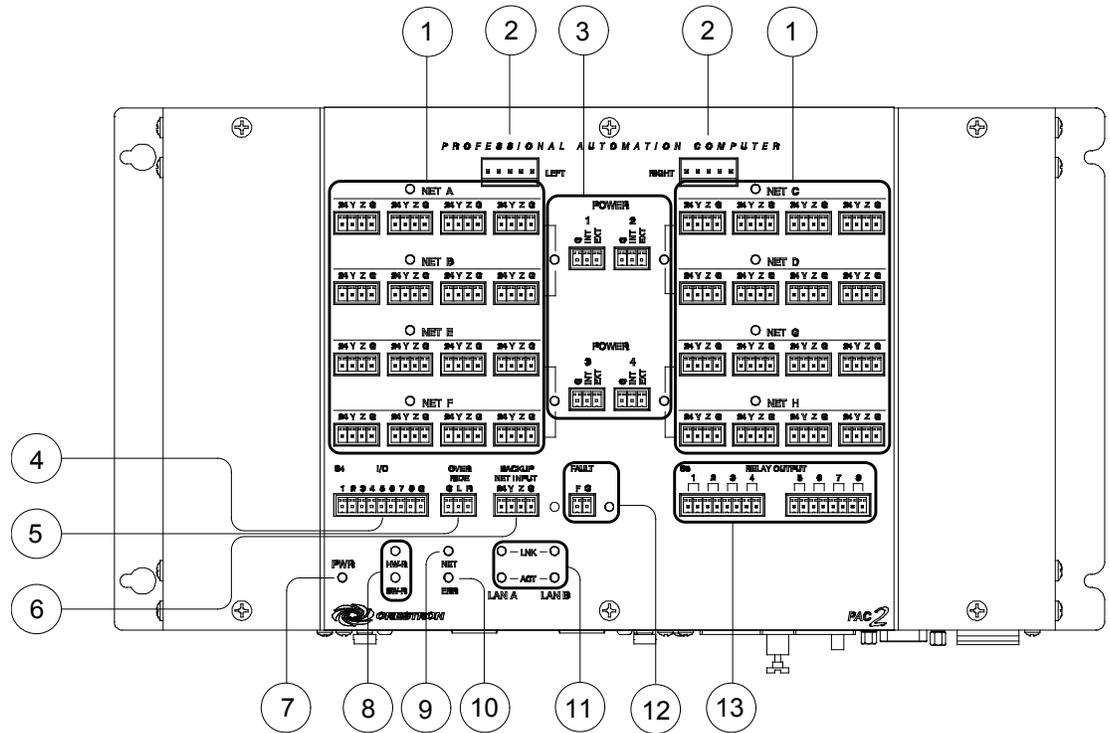
PAC2 Connectors (Bottom View)
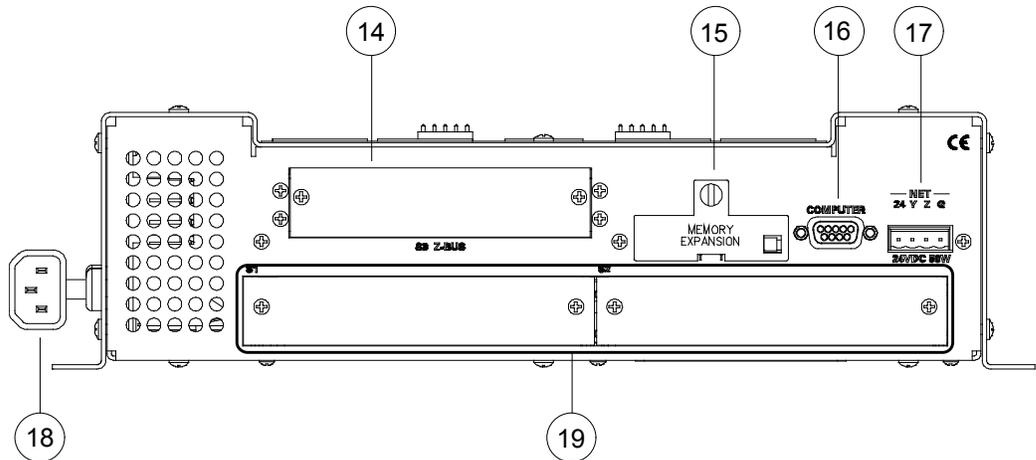
Connectors, Controls & Indicators

#	CONNECTORS[1], CONTROLS & INDICATORS	DESCRIPTION
1	NET (and LEDs) (A – H) **24 Y Z G**	(32) 4-pin 3.5 mm detachable terminal blocks comprising (4) Cresnet ports (paralleled) per each of (8) segments **24**: Power (24 Vdc) **Y**: Data **Z**: Data **G**: Ground (8) Yellow LEDs indicate Cresnet communications on each respective segment
2	LEFT, RIGHT	(2) 5-pin 0.156 inch headers; Module interconnect ports, connect to CLX-Series lighting control modules using included interconnect cables
3	POWER (and LEDs) (1 - 4) **G INT EXT**	(4) 3-pin 3.5 mm detachable terminal blocks comprising (1) Cresnet power selection connecter per each of (4) power groups; Connect to external Cresnet power supply or to internal power supply via jumpers, to power Cresnet devices connected to the **NET** ports; Maximum load per power group using external supply: 75 watts (3.125 amps @ 24 Vdc); Maximum total load using internal supply: 50 watts (2 amps @ 24 Vdc); (4) Green LEDs indicate 24 Vdc power present at each respective power group
4	I/O (1 - -8) **1 2 3 4 5 6 7 8 G**	(1) 9-pin 3.5 mm detachable terminal block comprising (8) "Versiports" – digital input/output or analog input ports; Digital input: Rated for -024 Vdc; input impedance 20 kΩ; logic threshold 1.24 Vdc; Digital output: 250 mA sink from maximum 24 Vdc; catch diodes for use with "real world" loads; Analog input: Rated for 0-10 Vdc, protected to 24 Vdc maximum; input impedance 20 kΩ; Programmable 5 volts, 2 kΩ pull-up resistor per pin; All ports referenced to ground
5	OVERRIDE **G L R**	(1) 3-pin 3.5 mm detachable terminal block comprising (2) inputs from external contact closures to trigger the preset override state in CLX-Series modules connected to the module interconnect ports; Maximum input: 1- mA at 5 volts

(Continued on following page)

Connectors, Controls & Indicators (Continued)

#	CONNECTORS[1], CONTROLS & INDICATORS	DESCRIPTION
6	BACKUP NET INPUT **24 Y Z G**	(1) 4-pin 3.5 mm detachable terminal block backup Cresnet port; Connects to the **NET** port of a backup control system and power supply **24**: Power (24 Vdc) **Y**: Data **Z**: Data **G**: Ground
7	PWR LED	(1) Green LED, indicates power supplied to unit via AC line or **BACKUP NET INPUT**
8	Reset Buttons	**HW-R** – Hardware reset (reboots the control system) **SW-R** – Pressing this in combination with **HW-R** button performs a system restart without loading the program. Pressing it alone momentarily while the system is running restarts the program
9	NET LED	(1) Yellow LED, indicates Cresnet bus activity
10	ERR LED	(1) Red LED, indicates control system has generated an error message
11	LAN (A – B) LEDS[2]	**LNK** – Indicate the Ethernet card has established a valid Ethernet connection **ACT** – Indicate communication (activity) at the respective port on the Ethernet card
12	FAULT (and LED) **F G**	(1) 2-pin 3.5 mm detachable terminal block; Contract closure output; Relay closed when PAC become inactive; Connects to digital input of backup control system; (1) Red LED, indicates PAC2 has become inactive, **FAULT** output is active (relay closed)
13	RELAY OUTPUT (1 – 8)	(2) 8-pin 3.5 mm detachable terminal blocks comprising (8) normally open, isolated relays; Rated 1 amp, 30 volts ac/dc; MOV arc suppression across contacts
14	S3 Z-BUS	(1) Z-Bus expansion slot; Accepts all Z-Bus control cards
15	MEMORY EXPANSION	(1) Type II Compact Flash card slot for memory expansion (up to 4 GB)
16	COMPUTER	(1) DB9 female' RS-232 computer console port
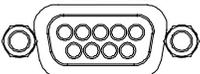
(Continued on following page)

Connectors, Controls & Indicators (Continued)

#	CONNECTORS[1], CONTROLS & INDICATORS	DESCRIPTION
17	NET (24 VDC 50W) **24 Y Z G** **24VDC 50W**	(1) 4-pin 5 mm detachable terminal block; Cresnet port, Master/Slave selectable' Expandable via C2N-NPA8 Network Poll Accelerator (sold separately) **24**: Power (24 Vdc) **Y**: Data **Z**: Data **G**: Ground
18	Line Power	(1) Attached input power cable, ~1 foot (~305 mm) long, with inline IEC320 socket; Connects to ac power source using grounded pigtail cable and DIN rail terminal block (both included)
19	S1, S2	(2) Y-Bus expansion slots; Accept all Y-Bus control cards
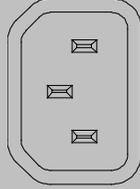
1. Interface connectors for **NET**, **LEFT/RIGHT**, **POWER**, **I/O**, **OVERRIDE**, **BACKUP NET INPUT**, **FAULT**, **RELAY OUTPUT** and **NET (24VDC 50W)** ports are provided with the unit.
2. LAN LEDs are active only if a single port or dual port Ethernet card (which is field installed) occupies the Z-Bus slot.

Built-In Cresnet Hub/Repeater

The built-in Cresnet Hub/Repeater serves as a repeater, splitter and wiring block. The hub allows for 256 or more devices; 32 per segment (A-H) and distribution up to 3000 feet (~914 meters) per segment.

There are eight independent segments, each with four Cresnet connectors wired in parallel. Each segment has a dedicated driver/receiver for Cresnet communication. In addition, there is a master **NET** port on the front panel. The eight **NET (A-H)** activity LEDs illuminate when a device on the respective segment transmits data.

Segments that are not in use or have devices that are not polled by a Crestron Studio™ (or SIMPL Windows) program are logically "disconnected" from the other segments in operation. The LEDs for these segments are not illuminated.

CAUTION: Use only Crestron power supplies for Crestron equipment. Failure to do so could cause equipment damage or void the Crestron warranty.

Power for the hub is supplied through **POWER** ports **1**, **2**, **3**, and **4**, to segment pairs, as shown in the illustration on the following page. When power is applied, the LED adjacent to the port is illuminated.

Powering a Hub Segment Pair
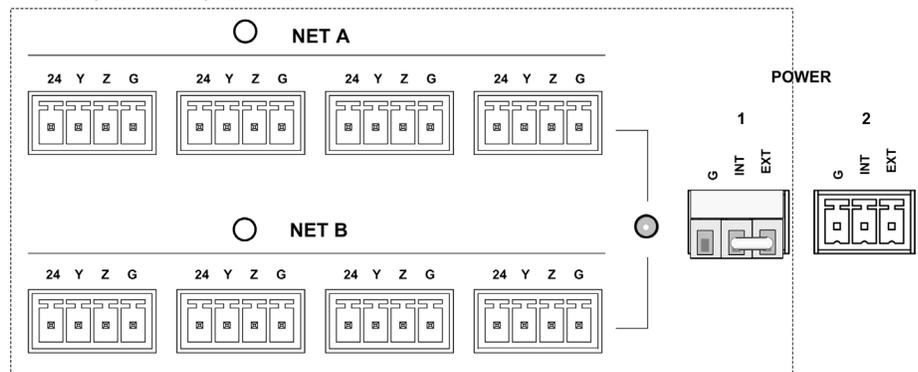
In the illustration above, one of the supplied 3-pin mini connectors with installed jumper wire is plugged into the **POWER 1** port. The PAC 2's internal power supply is connected to the **INT** pin; the port's **EXT** pin is connected to the **24** pin of each connector in the segment pair. Since the jumper connects the **INT** and **EXT** pins of the port, 24Vdc is supplied to each connector and the external network devices.

If the power needed for a hub segment exceeds the power available from the internal supply (50 watts, maximum), remove the jumper from the supplied 3-pin mini connector to disconnect the internal power supply, then connect the 24Vdc and ground wires from an external source (such as a Crestron 24 Vdc regulated power supply) to the **EXT** and **G** pins.

NOTE: If a device or Cresnet network connected to a hub segment has its own power source, do not make any connection to the applicable **POWER** port. Although equipment damage is unlikely, Crestron does not recommend applying two power sources to the same circuit.

Setup

Network Wiring

When wiring the Cresnet network, consider the following:

> Use Crestron Certified Wire.
>
> Use Crestron power supplies for Crestron equipment.
>
> Provide sufficient power to the system.

> **CAUTION:** Insufficient power can lead to unpredictable results or damage to the equipment. Use the Crestron Power Calculator to help calculate how much power is needed for the system (www.crestron.com/calculators).

For networks with 20 or more devices, use a Cresnet Hub/Repeater (CNXHUB) to maintain signal quality.

For more details, refer to "Check Network Wiring" which starts on page 23.

Installation

Ventilation

The PAC2 should be used in a well-ventilated area. The venting holes should not be obstructed under any circumstances.

To prevent overheating, do not operate this product in an area that exceeds the environmental temperature range listed in the table of specifications. Consider using forced air ventilation or incrementing the spacing between units to reduce overheating. Consideration must be given if installed in a closed or multi-unit rack assembly since the operating ambient temperature of the environment may be greater than the room ambient temperature. Contact with thermal insulating materials should be avoided on all sides of the unit.

Mounting in a CAEN

CAUTION: The Crestron Automation Enclosure (CAEN) houses equipment that needs to be air-cooled. Therefore, mount in a well-ventilated area. The ambient temperature range must be 41° F to 113° F (5° C to 45° C). The relative humidity must range from 0% to 90% (non-condensing). Allow adequate clearance in front of the vented cover for servicing and ventilation.

NOTE: The CAEN is intended for indoor use only.

NOTE: Reliable earth grounding of equipment mounted in a CAEN should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (for example, use of power strips).

The PAC2 has two flanges that allow the unit to be mounted in a CAEN. For more information about the CAEN, refer to the latest version of the CAEN – Automation Enclosures Installation Guide (Doc. 5940). The following procedure assumes two CLX-Series modules have been installed in a double-wide CAEN. Complete the procedure below to attach the PAC2 to the CAEN. A #2 Phillips screwdriver is required.

1. Using a #2 Phillips screwdriver, attach the four supplied self-tapping pan Phillips screws (8B x 1/4") by screwing them in partially (to allow room to mount the PAC2) below the modules. (Refer to the illustration below.)

2. Mount the PAC2 in the CAEN (where the screws were attached in step 1), slide the unit to the right to ensure the screws fully engage the slots in the flanges, then tighten the screws.

NOTE: For a single-wide CAEN, attach screws on right (screw them in partially), mount the PAC2 (where the screws were attached in step 1), attach screws on left and fully tighten all screws.

Mounting the PAC2 in a CAEN
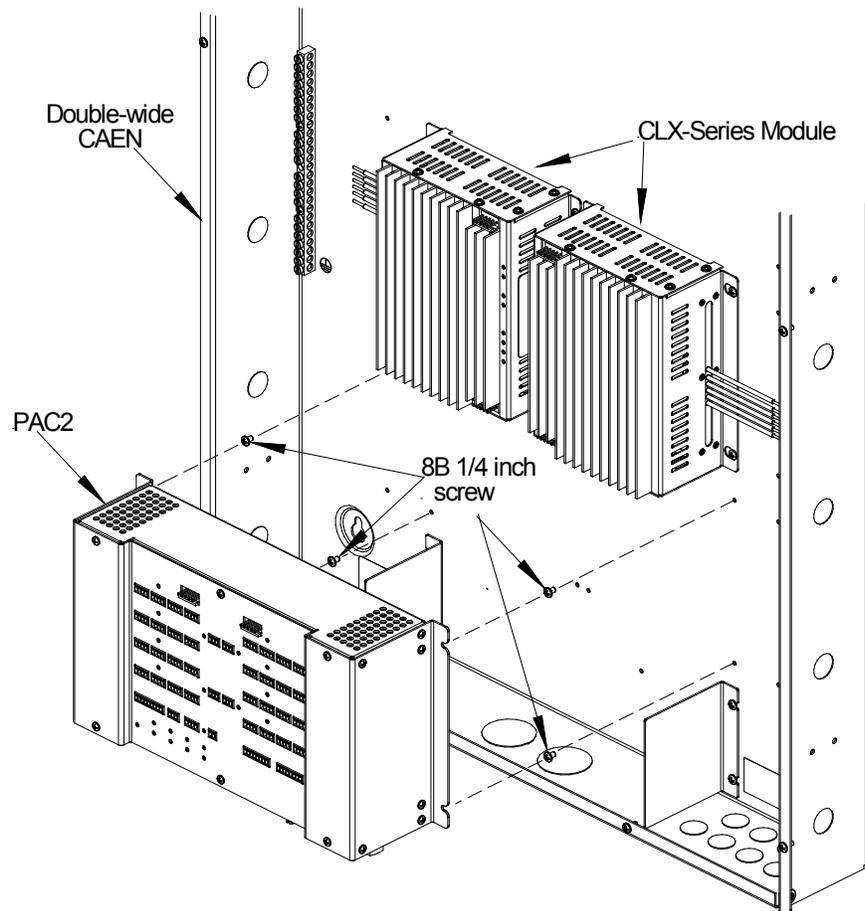
Bussing Strip Installation   The PAC2 is supplied with two brass bussing strips to facilitate commoning (linking) of the **RELAY OUTPUT** terminal block connections. The bussing strips are constructed with four terminal block positions, and may be trimmed to size for various applications or different devices. One strip is supplied for each 8-position terminal block.

1. To utilize the bussing strip, determine the number of relays to be commoned for the equipment being installed. If less than four, the strip can be trimmed to size with a pair of scissors or wire snips.

2. Loosen the terminal block screws and insert the first leg of the bussing strip into the first common position on the terminal block. The strip engages the other common positions automatically.

3. Remove approximately 1/8" of the jacket from the common wire and insert the conductor into one of the terminal block common positions. Tighten the terminal block screws to lock the wire and bussing strip into place. Insulate the strip by folding a piece of 3/4" wide vinyl electrical tape over the spine and as much of the individual legs as possible. Excess tape at each end of the strip should be pressed closed, then trimmed to within approximately 1/16" of the end of the strip.

4. When wiring the remaining conductors, remove approximately 1/8" of the jacket and insert the wires into the proper terminal block positions. To prevent the possibility of electrical shorts, it is essential that these conductors do not touch any uninsulated portion of the bussing strip.

5. Secure the wires connected to the terminal block with a tie wrap around the bussing strip to provide strain relief.

Hardware Hookup

Make the necessary connections as called out in the illustrations on the following page. Refer to "Network Wiring" on page 12 before attaching the 4-position terminal block connectors. Apply power after all connections have been made.

When making connections to the PAC2, use Crestron power supplies for Crestron equipment.

Hardware Connections for the PAC2 (Front)

LEFT:
To CLX-Series Module
(for Single and
Double-Wide CAEN)

RIGHT:
To CLX-Series Module
(for Double-Wide CAEN)

NET:
To Cresnet
Network Devices

POWER:
24 Vdc to Hub
from Internal
or External Power

NET:
To Cresnet
Network Devices

I/O:
To Controllable Devices
From Device Outputs
-Contact Closures
-Solid State Closures

BACKUP NET INPUT:
To Control System
for Backup Cresnet Power

RELAY OUTPUT:
To controllable devices

OVERRIDE:
To Override Switch

FAULT:
To control system
(I/O port)

Hardware Connections for the PAC2 (Bottom)

COMPUTER:
To Serial Port on PC
Using DB9 RS-232 Cable

Line Power:
From AC
Power Source

MEMORY EXPANSION:
For Optional
Compact Flash Memory Card

NET:
To Any Cresnet Device
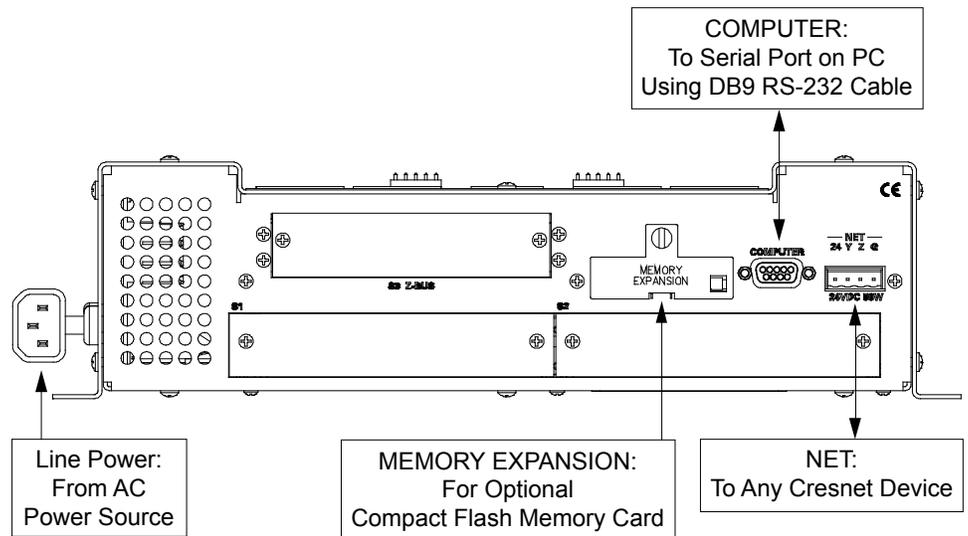
NOTE: Ensure the unit is properly grounded by connecting the chassis ground lug to an earth ground (building steel).

NOTE: To prevent overheating, do not operate this product in an area that exceeds the environmental temperature range listed in the table of specifications.

NOTE: Since the plug on the power supply cord is used to disconnect power from the unit, the socket-outlet shall be installed near the equipment and shall be easily accessible.

AC Power Connection

The PAC2 requires ac power for operation. This can be accomplished using the materials listed in the following table. This involves adding the terminal blocks and associated parts to the lower left terminal rail in a double-wide CAEN enclosure, or the lower terminal rail in a single-wide enclosure, and making the necessary wiring connections. The power cable and hardware required for connection are supplied with the PAC2.

Supplied Parts for PAC2 AC Connection

QUANTITY/DESCRIPTION	PART #
One (1) White, 1-Position Terminal Block	JTTB01-4
One (1) Black, 1-Position Terminal Block	JTTB01-6
One (1) Terminal Block Partition Plate	JTHWXX-3
One (1) Terminal Block End Plate	JTHWXX-2
One (1) Terminal Block End Bracket	JTHHXW-1
One (1) Power Cord	CAXXIPC-65008A-1

Refer to the illustration on the following page and perform the associated procedures.

WARNING: Verify ac power to the CAEN assembly is turned off before performing any of these assembly or wiring procedures.

PAC2 AC Power Source Assembly and Connection Diagram
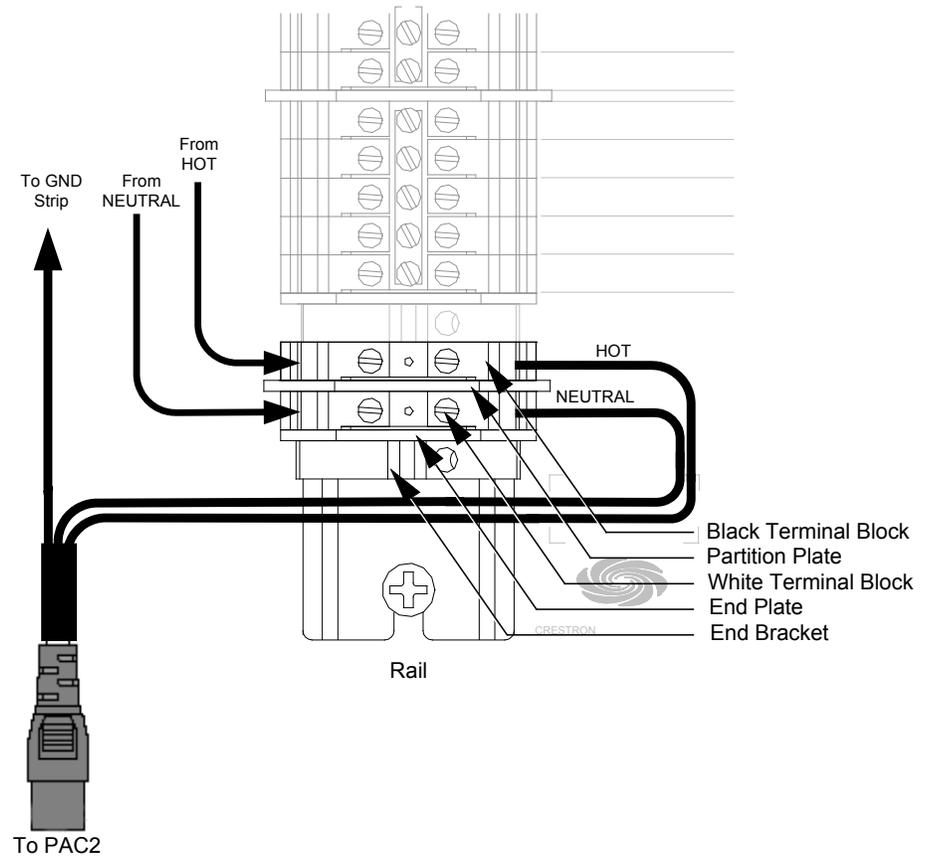
1. Assemble the supplied terminal blocks, partition plate, end plate and end bracket to the power rail, as shown. Ensure the parts are snug against the existing hardware and tighten the end bracket screw to secure the parts in place.

2. Connect HOT and NEUTRAL power to the added terminal blocks, as shown.

3. Attach the supplied 3-wire power cord, as shown.

Uploading and Upgrading

Crestron recommends using the latest programming software and that each device contains the latest firmware to take advantage of the most recently released features. However, before attempting to upload or upgrade it is necessary to establish communication. Once communication has been established, files (for example, programs or firmware) can be transferred to the control system (or device). Finally, program checks can be performed (such as changing the device ID or creating an IP table) to ensure proper functioning.

NOTE: Crestron software and any files on the Web site are for authorized Crestron dealers and Crestron Service Providers (CSPs) only. New users must register to obtain access to certain areas of the site (including the FTP site).

Establishing Communication

Use Crestron Toolbox for communicating with the PAC2; refer to the Crestron Toolbox help file for details. There are two methods of communication: direct serial, and TCP/IP.

Direct Serial

Direct Serial Communication
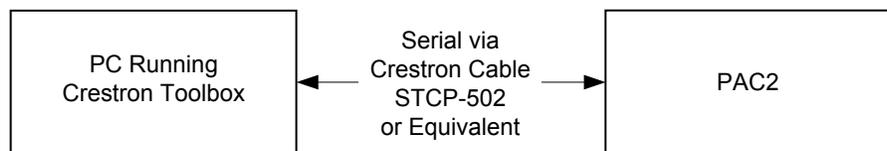
The **COMPUTER** port on the PAC2 connects to the serial port on the PC via a serial cable (Crestron STCP-502 or equivalent):

1. Use the Address Book in Crestron Toolbox to create an entry using the expected serial communication protocol (RS-232, auto-detect baud rate, no parity, 8 data bits, 1 stop bit, XON/XOFF disabled, RTS/CTS enabled).

2. Display the PAC2's "System Info" window (click the [i] icon); communications are confirmed when the device information is displayed.

TCP/IP

NOTE: Required for operation with a Crestron control system.

Ethernet Communication
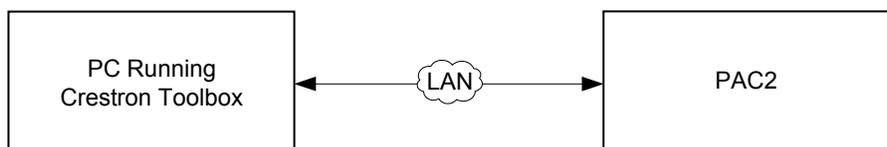
The PAC2 connects to PC via Ethernet:

1. Establish serial communication between PAC2 and PC.

2. Confirm Ethernet connection between PAC2 and PC. If connecting through a hub or router, use CAT5 straight through cables with 8-pin RJ-45

connectors. Alternatively, use a CAT5 crossover cable to connect the two **LAN** ports directly without using a hub or router.

3. Use the Device Discovery Tool in Crestron Toolbox to detect all Ethernet devices on the network and their IP configuration. The tool is available in Toolbox version 1.15.143 or later.

4. Use the Address Book in Crestron Toolbox to create an entry for the PAC2 with the PAC2's TCP/IP communication parameters.

5. Display the "System Info" window (click the $\mathbf{i}$ icon) and select the PAC2 entry from the Address Book or the Address Book drop-down list.

6. Use Crestron Toolbox to create the PAC2 IP table.

    a. Select **Functions | IP Table Setup**.

    b. Add, modify or delete entries in the IP table. The PAC2 can have only one IP table entry.

    c. A defined IP table can be saved to a file or sent to the device.

7. When using the PAC2 as a "slave", edit the "master" control system's IP table to include an entry for the PAC2. The entry should list the PAC2's IP ID (specified on the PAC2's IP table) and its IP address.

Programs and Firmware

Program or firmware files may be distributed from programmers to installers or from Crestron to dealers. Firmware upgrades are available from the Crestron Web site as new features are developed after product releases. One has the option to upload programs via the programming software or to upload and upgrade via the Crestron Toolbox. For details on uploading and upgrading, refer to the Crestron Studio help file, SIMPL Windows help file or the Crestron Toolbox help file.

Crestron Studio / SIMPL Windows

If a Crestron Studio (or SIMPL Windows) program is provided, it can be uploaded to the control system using Crestron Studio (or SIMPL Windows) or Crestron Toolbox.

Firmware

Check the Crestron Web site to find the latest firmware. (New users must register to obtain access to certain areas of the site, including the FTP site.)

Upgrade PAC2 firmware via Crestron Toolbox.

1. Establish communication with the PAC2 and display the "System Info" window.

2. Select **Functions | Firmware…** to upgrade the PAC2 firmware.

Program Checks

Using Crestron Toolbox, display the network device tree (**Tools | Network Device Tree View**) to show all network devices connected to the control system. Right-click on the PAC2 to display actions that can be performed on the PAC2.

Problem Solving

Troubleshooting

The following table provides corrective action for possible trouble situations. If further assistance is required, please contact a Crestron customer service representative.

PAC2 Troubleshooting

TROUBLE	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Device does not function.	Device is not communicating with the network.	Use Crestron Toolbox to poll the network. Verify network connection to the device.
	Device is not receiving power from a Crestron power source.	Use the provided Crestron power source. Verify connections.
	Device is not receiving sufficient power.	Use the Crestron Power Calculator to help calculate how much power is needed for the system.
PWR LED does not illuminate.	Device is not receiving power.	Verify power connections.
ERR LED illuminates.	Hardware or software failure, hardware incompatibility with software definitions, programming error or system message.	Verify hardware configuration matches software configuration (that is, card is in proper slot as defined by program). Use Viewport to display the error log.
Compilation error RLCMCVT166 & RLCMCVT177	Poor analog versus serial signal definition in the Crestron Studio (or SIMPL Windows) program	Confirm proper signal definition in program.
Loss of functionality due to electrostatic discharge.	Improper grounding.	Check that all ground connections have been made properly.

Troubleshooting Communications

Use the following checklist if communication cannot be established with the PAC2.

1. Verify the correct cables are being used. An RS-232 connection requires a straight-through serial cable. That is, pin 1 on one end is connected to pin 1 on the other end; pin 2 connects to pin 2 and so on. With a TCP/IP connection, a CAT5 cable with 8-pin RJ-45 connectors must be used.

2. With a serial connection, verify the correct COM port on the PC has been selected. Some computers have more than one COM port; some may be internal (for example, for a modem). Consult the manufacturer's documentation for further information about the COM ports on the PC.

3. Check the **ERR** LED indicator on the front panel of the PAC2. If this LED is illuminated, unplug the unit and reapply power after a few seconds. If the LED illuminates again, contact Crestron customer service.

4. With a serial connection, reset the control system as follows:

   a. Open Viewport and click **Setup | Communications Settings** to display the "Port Settings" window. Choose *RS-232* as the connection type.

   b. Set the baud rate of the PC to *115200*.

   c. Set the baud rate of the PAC2 control system to 115200, as follows:

      i.   Press and release the **HW-R** button on the unit's front panel.

      ii. Press and hold the **SW-R** button for approximately three to five seconds. The Viewport console should display the following message:

Viewport Message

```
PAC2 >
Control Console
Changing to default Comm Specs. 115200 N81 RTS/CTS
 Switch to new settings....
Bypassing Program Load!!!
```

      iii. Release the **SW-R** button.

   d. If communication still cannot be established:

      i.   Turn the control system off.

      ii. Press and hold the **SW-R** button on the front panel of the PAC2.

      iii. Reapply power to the control system.

      iv. The Viewport console should display the message shown above.

      v.   Release the **SW-R** button.

   e. Select **Set Baud Rate** on the Viewport **Functions** menu (or press **F8**) and choose any baud rate from the drop-down list. This attempts to establish a connection at the indicated baud rate. If the connection is successful, both the PC and the control system are set to the new baud rate.

   f. Reinitialize the unit by recycling the power or pressing the **HW-R** button. If the connection is established, the Viewport console should display some text and the **PAC2>** prompt.

   g. If communication still cannot be established, contact Crestron customer service.

Troubleshooting Non-Functioning Units

Perform the following procedure to correct system lock-up problems.

1. Connect a DB9 straight-through RS-232 cable between the PAC2 and a PC. Refer to "Establishing Communication" which starts on page 18 for more information.

2. Open Viewport and select **Setup | Communication Settings** to open the "Port Settings" window.

3. In the window, select *RS-232* (Connection Type), *57600* (Baud Rate), *N* (Parity), *8* (Data Bits) and *1* (Stop Bits), then click **OK**.

4. Power down the PAC2.

5. While powering up the PAC2, press and hold **Alt** and **K** on the keyboard until the following text (or similar) appears in Viewport:

```
System Monitor [v1.001 (0001)]
12-19-01 16:25:23 32 MB RAM, 4MB FLASH

CS>
```

NOTE: After this, the baud rate can be increased to 115200 (for faster communication) by pressing **F8** on the keyboard and then selecting *115200* from the "Set Baud Rate" window.

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6. At the Viewport prompt, type **erase** and press **Enter**. The following text appears in Viewport.

```
CS>erase
->25%->50%->75%->100%
Done
CS>
```

7. Press **Alt** and **O** (not zero) on the keyboard. The "Open" window appears.

8. Find and select the correct firmware file (.CUZ) and click **Open**.

9. Once "Completed Successfully" appears in Viewport, type **quit** at the Viewport prompt and press **Enter**.

Serial Communication Difficulties with Other Devices Connected to the PAC2

It is possible to determine if a communication problem is in the PAC2 or in the device itself by using passthrough mode. Passthrough mode allows data to pass directly from the **COMPUTER** port to the selected COM port on a Cresnet or Ethernet device (such as ST-COM or CEN-COM), effectively "passing through" the control system. While passthrough mode is running, the program currently in memory is suspended and does not execute. When passthrough mode is exited, the program resumes operation.

Entering passthrough mode for one of the internal COM ports reinitializes it, which clears the data for that port. The COM analyzer also functions while the unit is in passthrough mode.

Passthrough mode is accessed from the Crestron Viewport by selecting **Functions | Enter Passthrough Mode (CNX / 2-Series only)**. The window, shown after this paragraph, is used to select the port configuration for passthrough mode. For more information, refer to "Remote Menu" in the Viewport Help files.

"Passthrough Mode" Window

Passthrough Mode	☒

Setup

Type: Slot ▾

Slot: 4 ▾   Data Bits: 8 ▾

Port: A ▾   Stop Bits: 1 ▾

Baud Rate: 9600 ▾   Protocol: RS-232 ▾

Parity: None ▾   Handshaking: None ▾

To Exit Passthrough Mode:

Select "Exit Passthrough Mode" from the "Functions" menu

[OK]   [Cancel]

Network Analyzer

To assist with troubleshooting, the unit contains Crestron's patent-pending network analyzer to continuously monitor the integrity of the Cresnet network for wiring faults and marginal system performance or other network errors. For more information on how to use the network analyzer, refer to the SIMPL Windows help file and use the index to search for "Network Analyzer".

NOTE: The PAC2's network analyzer also monitors the networks connected through the built-in hub/repeater.

Battery Replacement

A Lithium battery is used to power the system clock within the PAC2. Under normal conditions, it lasts for approximately 10 years. In the event the clock fails, only an authorized technician should replace it. Refer to caution statement below.

CAUTION: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Check Network Wiring

Use the Right Wire

To ensure optimum performance over the full range of the installation topology, use Crestron Certified Wire only. Failure to do so may incur additional charges if support is required to identify performance deficiencies because of using improper wire.

Calculate Power

CAUTION: Use only Crestron power supplies for Crestron equipment. Failure to do so could cause equipment damage or void the Crestron warranty.

CAUTION: Provide sufficient power to the system. Insufficient power can lead to unpredictable results or damage to the equipment. Use the Crestron Power Calculator to help calculate how much power is needed for the system (www.crestron.com/calculators).

When calculating the length of wire for a particular Cresnet run, the wire gauge and the Cresnet power usage of each network unit to be connected must be taken into consideration. Use Crestron Certified Wire only. If Cresnet units are to be daisy chained on the run, the Cresnet power usage of each network unit to be daisy chained must be added together to determine the Cresnet power usage of the entire chain. If the unit is run from a Crestron system power supply network port, the Cresnet power usage of that unit is the Cresnet power usage of the entire run. The wire gauge and the Cresnet power usage of the run should be used in the following equation to calculate the cable length value on the equation's left side.

Cable Length Equation

$$L < \frac{40,000}{R \times P}$$

Where: L = Length of run (or chain) in feet
        R = 6 Ohms (Crestron Certified Wire: 18 AWG (0.75 mm^2))
             or 1.6 Ohms (Cresnet HP: 12 AWG (4 mm^2))
        P = Cresnet power usage of entire run (or chain)

Make sure the cable length value is less than the value calculated on the right side of the equation. For example, a Cresnet run using 18 AWG Crestron Certified Wire and drawing 20 watts should not have a length of run more than 333 feet (101 meters). If Cresnet HP is used for the same run, its length could extend to 1250 feet (381 meters).

NOTE: All Crestron certified Cresnet wiring must consist of two twisted pairs. One twisted pair is the +24V conductor and the GND conductor and the other twisted pair is the Y conductor and the Z conductor.

Strip and Tin Wire

When daisy chaining Cresnet units, strip the ends of the wires carefully to avoid nicking the conductors. Twist together the ends of the wires that share a pin on the network connector and tin the twisted connection. Apply solder only to the ends of the twisted wires. Avoid tinning too far up the wires or the end becomes brittle. Insert the tinned connection into the Cresnet connector and tighten the retaining screw. Repeat the procedure for the other three conductors.

Add Hubs

Use of a Cresnet Hub/Repeater (CNXHUB) is advised whenever the number of Cresnet devices on a network exceeds 20 or when the combined total length of Cresnet cable exceeds 3000 feet (914 meters).

Reference Documents

The latest version of all documents mentioned within the guide can be obtained from the Crestron Web site (www.crestron.com/manuals).

List of Related Reference Documents

DOCUMENT TITLE
CAEN – Automation Enclosures
Crestron Network Address Translator Reference Guide

Further Inquiries

To locate specific information or resolve questions after reviewing this guide, contact Crestron's True Blue Support at 1-888-CRESTRON [1-888-273-7876] or refer to the listing of Crestron worldwide offices on the Crestron Web site (www.crestron.com/offices) for assistance within a particular geographic region.

To post a question about Crestron products, log onto the Online Help section of the Crestron Web site (www.crestron.com/onlinehelp). First-time users must establish a user account to fully benefit from all available features.

Future Updates

As Crestron improves functions, adds new features and extends the capabilities of the PAC2, additional information may be made available as manual updates. These updates are solely electronic and serve as intermediary supplements prior to the release of a complete technical documentation revision.

Check the Crestron Web site periodically for manual update availability and its relevance. Updates are identified as an "Addendum" in the Download column.

Return and Warranty Policies

Merchandise Returns / Repair Service

1. No merchandise may be returned for credit, exchange or service without prior authorization from Crestron. To obtain warranty service for Crestron products, contact an authorized Crestron dealer. Only authorized Crestron dealers may contact the factory and request an RMA (Return Merchandise Authorization) number. Enclose a note specifying the nature of the problem, name and phone number of contact person, RMA number and return address.

2. Products may be returned for credit, exchange or service with a Crestron Return Merchandise Authorization (RMA) number. Authorized returns must be shipped freight prepaid to Crestron, 6 Volvo Drive, Rockleigh, N.J. or its authorized subsidiaries, with RMA number clearly marked on the outside of all cartons. Shipments arriving freight collect or without an RMA number shall be subject to refusal. Crestron reserves the right in its sole and absolute discretion to charge a 15% restocking fee plus shipping costs on any products returned with an RMA.

3. Return freight charges following repair of items under warranty shall be paid by Crestron, shipping by standard ground carrier. In the event repairs are found to be non-warranty, return freight costs shall be paid by the purchaser.

Crestron Limited Warranty

Crestron Electronics, Inc. warrants its products to be free from manufacturing defects in materials and workmanship under normal use for a period of three (3) years from the date of purchase from Crestron, with the following exceptions: disk drives and any other moving or rotating mechanical parts, pan/tilt heads and power supplies are covered for a period of one (1) year; touch screen display and overlay components are covered for 90 days; batteries and incandescent lamps are not covered.

This warranty extends to products purchased directly from Crestron or an authorized Crestron dealer. Purchasers should inquire of the dealer regarding the nature and extent of the dealer's warranty, if any.

Crestron shall not be liable to honor the terms of this warranty if the product has been used in any application other than that for which it was intended or if it has been subjected to misuse, accidental damage, modification or improper installation procedures. Furthermore, this warranty does not cover any product that has had the serial number altered, defaced or removed.

This warranty shall be the sole and exclusive remedy to the original purchaser. In no event shall Crestron be liable for incidental or consequential damages of any kind (property or economic damages inclusive) arising from the sale or use of this equipment. Crestron is not liable for any claim made by a third party or made by the purchaser for a third party.

Crestron shall, at its option, repair or replace any product found defective, without charge for parts or labor. Repaired or replaced equipment and parts supplied under this warranty shall be covered only by the unexpired portion of the warranty.

Except as expressly set forth in this warranty, Crestron makes no other warranties, expressed or implied, nor authorizes any other party to offer any warranty, including any implied warranties of merchantability or fitness for a particular purpose. Any implied warranties that may be imposed by law are limited to the terms of this limited warranty. This warranty statement supersedes all previous warranties.

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