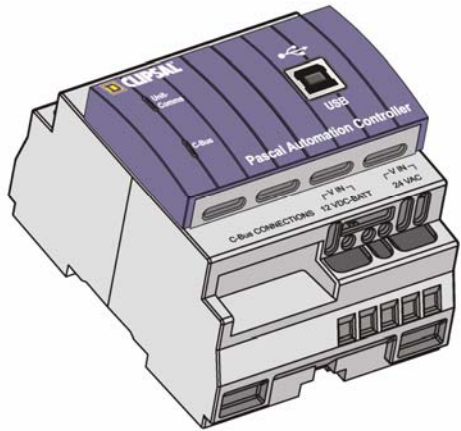


Square D® Clipsal® Pascal Automation Controller

SLC5500PACA For Use with Wired
C-Bus™ Networks

Instruction Bulletin
Retain for future use.



HAZARD CATEGORIES AND SPECIAL SYMBOLS

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

Danger indicates an immediately hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Warning indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.

CAUTION

Caution indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury.

CAUTION

Caution, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, can result in property damage or improper operation.

NOTE: Provides additional information to clarify or simplify a procedure.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. This document is not intended as an instruction manual for untrained persons. No responsibility is assumed by Square D for any consequences arising out of the use of this manual.

Class B FCC Statement

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.

INTRODUCTION

The SLC5500PACA Pascal Automation Controller (PAC) provides advanced control of a C-Bus system. It can be programmed to perform various control operations in response to events, schedules, and logical computations. For example, the PAC can be programmed to switch on a heater in the bathroom, at 7:00am during the week and 9:00am on weekends, but only when the temperature is below 68°F (20°C) and when someone is at home.

The PAC also provides a USB interface through which a PC can communicate with a C-Bus installation (like a PC Interface).

Capabilities

The PAC provides C-Bus control capabilities such as scheduling, scene control, switching, and dimming of lights and other electrical devices on a C-Bus network. It includes a real time clock.

The unit can read and write data across two independent RS-232 serial ports, allowing it to interface with external (non-C-Bus) devices. This gives the PAC the potential to control equipment such as computers, modems, audio-visual equipment, and security systems. It also enables the PAC to formulate specific actions in response to information received from such equipment.

The PAC provides a USB communication interface between a PC and a C-Bus installation. This can be used by the C-Bus Toolkit software when configuring a C-Bus installation.

Before You Begin

Before installing the Pascal Automation Controller, verify that your order is complete by comparing the contents of the package with the appropriate items in the table below. Also verify that the catalog number on the box label matches your order.

Table 1: Contents of the Box

Part Number	Description	Quantity
SLC5500PACA	Pascal Automation Controller	1
	USB cord	1
	C-Bus cable	1
	RJ45 terminal plug	3

NETWORK CONSIDERATIONS

Network Considerations

The Pascal Automation Controller can draw 32 mA from the C-Bus network. Determine the total network current load and verify that there will be enough C-Bus power to support all connected devices. Also verify that the amount of available power per C-Bus network is no more than 2A.

Programming Requirements

Unit Address

Program the PAC with a unique identification address (Unit Address) using the C-Bus Toolkit software. The C-Bus Toolkit software is also used to enable the C-Bus system clock and burden, if required.

Logic Programming

The PAC must be configured with a logic project that has been customized for a particular C-Bus installation. Such a project is produced using the Programming Interface for C-Bus Embedded Devices (PICED) software.

Once the PAC project is developed, the PICED software is used to transfer the project to the PAC.

Software Downloads

The C-Bus Toolkit software and the PICED software are both available from the downloads section of the Clipsal Integrated Systems website (<http://www.clipsal.com/cis>).

Project Files

Both the PAC and C-Bus Toolkit project files should be saved to disk and kept in an archive at your premises. It is also recommended to give a copy to the customer.

C-Bus System Clock

The Pascal Automation Controller incorporates a software selectable C-Bus System Clock. The System Clock is used to synchronize data communications waveforms on a C-Bus Network. At least one active C-Bus System Clock is required on each C-Bus network for successful communications. No more than three units on any C-Bus Network should have Clock circuitry enabled, so this option should normally be disabled using the C-Bus Toolkit Software.

If a System Clock is required, it can be enabled from the C-Bus Toolkit.

Network Burden

One network burden is required for proper C-Bus operation, network termination, and biasing.

CAUTION

HAZARD OF IMPROPER OR UNSTABLE OPERATION

C-Bus networks require only one burden.

Failure to follow this instruction can result in improper C-Bus network operation.

The C-Bus system clock must be enabled in order to apply the network burden.

Hardware Burden

The hardware burden can be used in one of two ways.

1. Install the hardware burden temporarily in order to enable the software burden, and then to remove the hardware burden.
2. Install the hardware burden and leave it installed as the network burden.

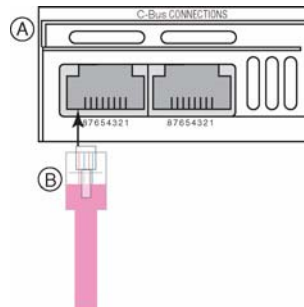
To install the hardware burden device, simply plug it into the C-Bus network RJ-45 receptacle.

NOTE: Plug the hardware burden device only into C-Bus receptacles.

Figure 1: Hardware Burden Connection on the Unit

KEY:

- A. RJ-45 C-Bus receptacle on the unit
- B. Hardware burden



SAFETY PRECAUTIONS

This section contains important safety precautions that must be followed before attempting to install or maintain electrical equipment. Carefully read and follow the safety precautions below.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This equipment must be installed and serviced by qualified electrical personnel.
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Turn off all electrical power supplying this equipment before working on or inside the equipment.
- Always use a properly rated voltage sensing device to confirm that power is off.
- Replace all devices, doors, and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

INSTALLATION

Follow the procedures in this section to properly install a C-Bus Pascal Automation Controller.

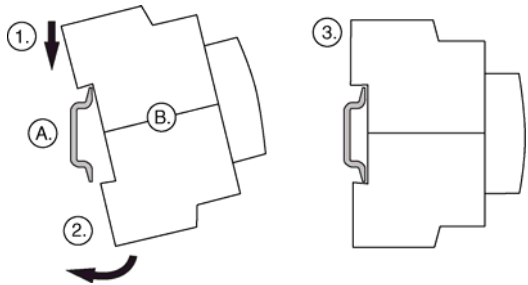
Mounting the Pascal Automation Controller onto the DIN Rail

The DIN-rail units are designed to be installed onto a standard 1.38 in. (35 mm) DIN rail. To mount (i.e., attach) the DIN unit, hook it onto the top of the DIN rail. Swing the bottom of the unit down until it clicks into place.

KEY:

- A. DIN rail
- B. DIN-rail unit

1. Hook the unit onto the top of the DIN rail
2. Swing the bottom of the unit down
3. Mounted unit



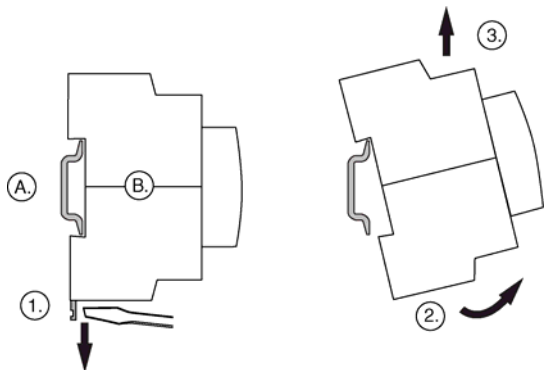
Removing the Pascal Automation Controller from the DIN Rail

Use a small flat-blade screwdriver to pull either the upper or lower slide release out and disengage the unit from the DIN rail.

KEY:

- A. DIN rail
- B. Unit

1. Pull out the slide release
2. Pull the unit away from the DIN rail
3. Lift the unit away from the rail



WIRING GUIDELINES

Follow the guidelines below when working with Pascal Automation Controller.

- Verify that the power supplying the system is turned OFF before handling electrical power conductors.
- Observe national and local electrical codes.
- Verify that incoming electrical power lines are held in place according to local regulations, for example, using cable ties to attach power lines to an enclosure.
- Verify the number and types of units that can be connected to this network (see the "Network Considerations" section).
- Prevent wire cuttings and debris from entering the unit.
- Follow the wiring diagram shown in the "Wiring Connections" figure.

Figure 2: Wiring Connections

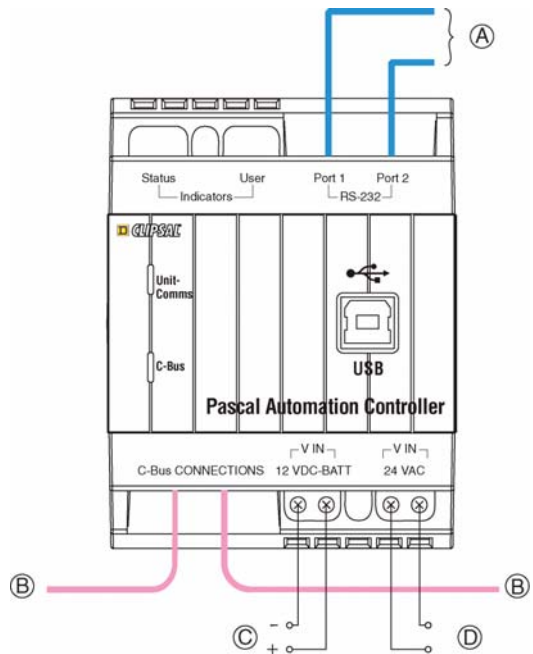
KEY:

A. RS-232 Ports

B. C-Bus Network

C. Battery Backup for Real Time Clock

D. AC Power for RS-232 Ports (Refer to the "Connecting RS-232 Devices" section)



Megger® Testing Guidelines

Do not Megger® test C-Bus data cabling or terminals. Megger testing of data cabling or terminals can degrade the performance of the C-Bus network.

It will not harm the units if electrical power terminals only are Megger tested. But because units contain electronic components, the Megger readings will not be correct. To obtain valid readings, disconnect the power lines from the units.

CAUTION

HAZARD OF EQUIPMENT DAMAGE

Do not Megger® test C-Bus data cabling or terminals as it can degrade the performance of the C-Bus network.

Failure to follow this instruction will result in damage to the C-Bus network.

BATTERY BACKUP

The Pascal Automation Controller includes terminals for the connection of an external 12 V DC battery backup. The real time clock has an internal capacitor backup that maintains the time for 24 hours during a power outage. The external battery backup is optional and provides backup for the real time clock during an extended power outage.

Please reference "Electrical Specifications" section for optional battery backup requirements.

CONNECTING RS-232 DEVICES

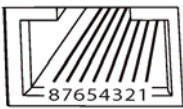
The PAC has two independent serial RS-232 ports that allow the unit to interface with external (non-C-Bus) serial devices. They are not used for C-Bus programming.

The RS-232 ports require power in order to function. The source of this power may come from the external device through the DTR and RTS handshaking lines by having one high and one low. To find out if the serial device you are connecting has control over the handshaking lines, simply try the device to see if it works.

If the external device does not supply power to the RS-232 ports, connect a 24 V AC power supply (not provided) according to the figure Wiring Connections. Please reference "Electrical Specifications" section for optional battery backup requirements.

Pinouts are provided in the table RS-232 Pinouts.

NOTE: If using the RS-232 port to connect external devices, verify that you use a suitably shielded data cable. Cable length should be limited to 49.2 feet (15 meters) for communication at up to 19,2000 bps, or 24.6 feet (7.5 meters) at 38,400 bps.

	Pin	Name	Description
	1	DCD	Data Carrier Detect*
	2	DSR	Data Set Ready*
	3	DTR	Data Terminal Ready*
	4	GND	Ground
	5	RD	Receive Data
	6	TD	Transmit Data
	7	CTS	Clear To Send*
	8	RTS	Request To Send*

*optional

CAUTION

HAZARD OF UNSTABLE OPERATION OR EQUIPMENT DAMAGE

- Do not connect C-Bus network to a PC communications port.
- Do not Megger® test C-Bus or RS232 data cabling or terminals.

Failure to follow these instructions can cause instability or damage to the C-Bus network or other equipment communicating with the C-Bus network.

CONNECTION TO THE C-BUS NETWORK

The C-Bus network is connected to the Pascal Automation Controller through two polarity sensitive RJ45 inputs located on the Pascal Automation Controller. Connect the unit to the C-Bus network with Category 5 unshielded twisted pair C-Bus network cable, and a wired RJ45 plug. Refer to the "Wiring Connections Key Diagram" figure, and the "RJ45 Pin Connections" table for wiring and pin connection information.

NOTE: To clearly distinguish C-Bus from other UTP Cat5 cables, it is recommended to use a different colored cable, or clearly label the C-Bus UTP Cat5 cable.

NOTE: The Category 5 unshielded twisted pair C-Bus network cable and the wired RJ45 plug are provided by the installer.

WARNING

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Do not connect line voltage to any C-Bus terminal.

Failure to follow this instruction can result in personal injury or equipment or property damage.

Figure 3: Wiring Connections Key Diagram

KEY:

- A. C-Bus positive (+): blue + orange
- B. C-Bus negative (-): blue/white + orange/white
- C. Remote OFF: brown + brown/white*
- D. Remote ON: green + green/white*

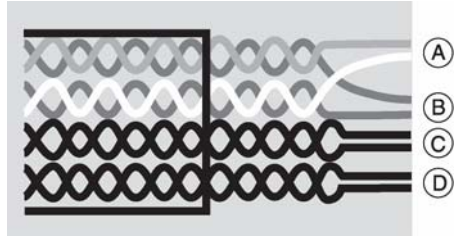
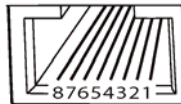


Table 2: RJ45 Pin Connections

RJ Pin	C-Bus Connection	Color
1	Remote ON*	Green/White
2	Remote ON*	Green
3	C-Bus Neg (-)	Orange/White
4	C-Bus Pos (+)	Blue
5	C-Bus Neg (-)	Blue/White
6	C-Bus Pos (+)	Orange
7	Remote OFF*	Brown/White
8	Remote OFF*	Brown



*Not internally connected.

INDICATORS

Unit/Comms Indicator

"The Unit/Comms" indicator shows the status of the PAC unit.

Indicator Status	Meaning
On (continuous orange light)	Normal operation; C-Bus power is present
Irregular flash	Data exchange (over the USB port) in progress
Off	No C-Bus power is connected

C-Bus Indicator

The "C-Bus" indicator shows the status of the C-Bus network at the unit. If a network is connected that has a higher current load than the power supplies support, the indicator flashes to show a marginal network voltage.

Indicator Status	Meaning
On (continuous orange light)	Power is on and functional; sufficient network voltage and valid C-Bus clock signal present
Flashing	There is insufficient power to support the C-Bus network
Off	No C-Bus clock signal is present

Status Indicator

The "Status" indicator provides a guide to what the PAC is doing internally.

Indicator Status	Meaning
On	User configuration data is corrupt. A new configuration file must be transferred.
Rapid constant flash (approx. 5 Hz)	The firmware is corrupt. New firmware and a new configuration must be transferred.
Irregular flash (approx. 1 Hz)	Logic is running. The indicator state is toggled when logic is run.

User Indicator

The "User" indicator is controlled by the unit's logic. Its state will vary depending on how the project is programmed.

SPECIFICATIONS

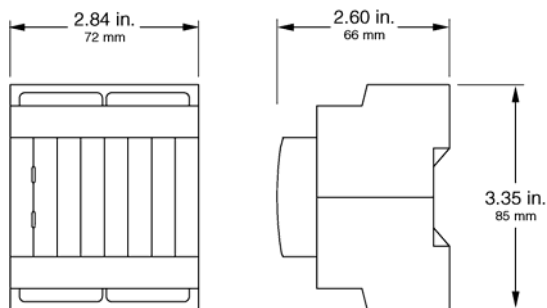
Electrical Specifications

Parameter	Description
Input voltage	15 to 36 V DC
Current drawn	32 mA
RS-232 supply voltage	24 V AC @ 20 mA
Battery backup supply voltage	12 V DC @ 30 mA
Connections	2 x C-Bus (RJ45) 2 x RS-232 (RJ45) 1 x USB type B socket Screw terminals for DC battery and 24 V AC power
C-Bus system clock	software selectable
Network burden	software selectable
Operating temperature range	32 to 113 °F (0 to 45 ° C)
Operating humidity range	10 to 95% RH

Mechanical Specifications

Parameter	Description
Dimensions (WxHxD)	2.84 x 3.35 x 2.60 inches (72 x 85 x 66 mm)
Weight	5.3 ounces (150 g)
C-Bus Connections	2 x RJ45 sockets (in parallel)




Figure 4: Unit Dimensions



STANDARDS

The Pascal Automation Controller complies with the following Standards:

Table 3: U.S. and Canadian Product Safety Standards and U.S. FCC Regulations

Standards/Regulations	Title
 CSA C22.2 No. 205	Signal Equipment
 UL916	Energy Management Equipment
 FCC Part 15	Class B Digital Device for Home or Office Use

SUPPORT AND SERVICE


Contact the Square D Customer Information Center for technical support by phone at 1-888-Square D (1-888-778-2733) or e-mail at lightingcontrol.support@us.schneider-electric.com.

Contact your local Square D service representative or Square D® Clipsal® certified installer for repairs or service to your network.

You may also find helpful information on our web site at www.squaredlightingcontrol.com.

Schneider Electric, USA
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