

POWERLINK™ RS232 to 485 Converter for use with POWERLINK G3 Systems

INTRODUCTION

The POWERLINK™ G3 Controllers are used to control the operation of a POWERLINK G3 lighting and control system. The controller uses remotely operated circuit breakers to control up to 168 remotely operated branch circuits. Control signals originate externally from dry-contact inputs, from the internal time scheduler, or from commands received via the communications network. Typical control devices include low voltage pushbutton wall switches, occupancy sensors, photocell controllers, and security and building management systems.

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

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must be installed and serviced by qualified electrical personnel.
- 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.

CLASS A FCC STATEMENT

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designated to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

AUTOMATION NETWORK COMMUNICATIONS

All POWERLINK G3 controllers feature an automation network for communication. Two serial communication ports are available on all controllers: RS-232, and RS-485. The NF2000, NF3000, and NF3000C controllers have a third communication port for Ethernet. Refer to the "Ports on the Controller" figure.

The RS-232 and RS-485 ports are connected internally to the same controller serial communication port. Therefore, only one master device can be connected through one of the ports to the controller. For example, you cannot simultaneously connect a computer to the RS-485 port and a computer to the RS-232 serial port. Attempting to do so may result in improper operation.

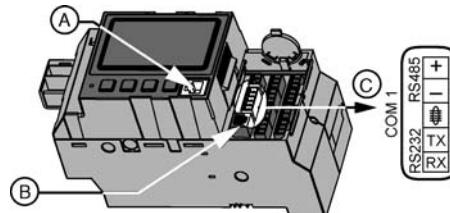
The Ethernet port, on applicable controllers, is also located internally. It is used to permanently connect multiple NF2000, NF3000, or NF3000C controllers to an existing ethernet LAN or a dedicated lighting control LAN.

An internal RS-232 communication port also is available externally. The NFFPCG3 front panel serial cable is required to temporarily connect the controller to a computer. Refer to the "Controller Front Panel Serial Cable" instruction bulletin 63249-405-01 for the serial cable installation procedures.

Figure 1: Ports on the Controller

KEY:

- A. RS-232 Port (requires serial cable NFFPCG3 for temporary PC connection)
- B. Ethernet Port (for NF2000, NF3000, and NF3000c Controllers only)
- C. Serial Port



RS-485 Communications

Multiple controllers can be networked together by wiring the system using the RS-485 port on the controllers. The "RS-485 Automation Level Communications Wiring" figure illustrates a typical configuration where three master panels are shown (each controlling its own independent subnet.)

A maximum of 247 controllers can be connected together. Use a line repeater for each group of 32 controllers. The maximum cable distances at various baud rates are listed in the "Maximum Communication Cable Distance" table.

Figure 2: RS-485 Automation Level Communications Wiring

KEY:

- A. Personal Computer or Modem
- B. RS-232 to RS-485 Converter
- C. Power Supply
- D. RS-232 Port
- E. RS-485 Daisy Chain, 2-Wire, Twisted Pair Belden 9841 or equivalent
- F. Master Panel
- G. Slave Panel

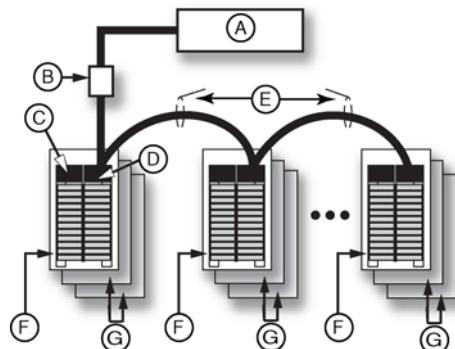


Table 1: Maximum Communication Cable Distances

Baud Rate	Maximum Distances		
	1-8 Controllers	9-16 Controllers	17-32 Controllers
*76,800	4,000 ft (1,219 m)	4,000 ft (1,219 m)	3,000 ft (914 m)
38,400	4,000 ft (1,219 m)	4,000 ft (1,219 m)	3,000 ft (914 m)
19,200	5,000 ft (1,524 m)	4,000 ft (1,219 m)	4,000 ft (1,219 m)
9,600	5,000 ft (1,524 m)	5,000 ft (1,524 m)	4,000 ft (1,219 m)
4,800	5,000 ft (1,524 m)	5,000 ft (1,524 m)	4,000 ft (1,219 m)
2,400	5,000 ft (1,524 m)	5,000 ft (1,524 m)	4,000 ft (1,219 m)
1,200	5,000 ft (1,524 m)	5,000 ft (1,524 m)	4,000 ft (1,219 m)

*NOTE: BACnet MS/TP only

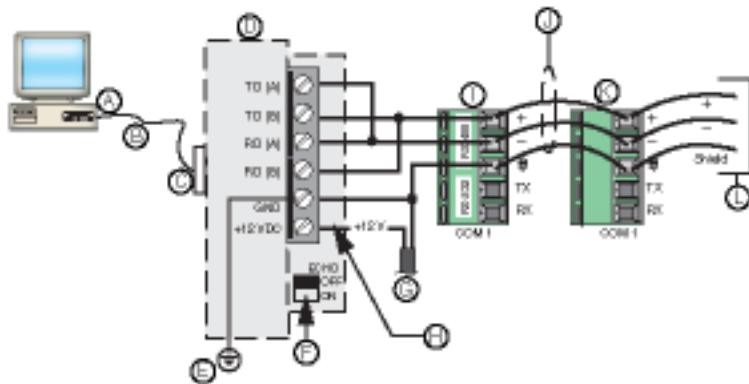
RS-485 Controller Connections Using a RS-232/485 Converter

Connection from the network to a personal computer, modem, or a building management system with the appropriate interface drivers often requires the use of a converter that will convert the RS-485 signal to an RS-232 signal. When the automation network is connected to the serial port (comms port) on the computer, the POWERLINK Controller Software (PCS-101) can be used. A female DB9 to female DB9 cable is required for the connection from the computer serial port to the converter. Square D offers a standard RS-232/485 converter kit that includes the converter, power supply, and serial cable (Square D catalog number 6382RS485G3KIT). Connection of this kit to the automation network is shown in the "2-Wire, RS-485 Connection Using a Converter Kit" figure. The communication wires are daisy-chained from one controller RS-485 port to the next in the following manner: positive to positive (+ to +), negative to negative (- to -), and shield to shield.

Figure 3: 2-Wire, RS-485 Connection Using a Converter Kit

KEY:

- A. RS-232 Female DB-9
- B. Serial Cable
- C. RS-232 Female DB-9
- D. RS-485 Converter Comms Terminal
- E. Ground shield in one place only.
- F. Jumper ON, ECHO OFF
- G. Power Supply
- H. Black/White Stripe
- I. Controller 5-pin Comms Terminal in Master Panel (1)
- J. RS-485 Daisy Chain, 2-Wire, Twisted Pair, Belden 9841 or equivalent
- K. Controller 5-pin Comms Terminal in Master Panel (n)
- L. To Next Controller Master Panel



Other types of third-party converters are available, depending on the application needs. When using a third-party converter, make sure it has biasing configurable by the user.

Automation Communications Wiring Specifications

The National Electric Code (NEC) classifies automation communications wiring as a Class 2 circuit. Conductors may range in size from 24 to 18 AWG and consist of a single set of twisted pair conductors with a shield (Belden 9841 or equal). Maximum wiring distance should not exceed 5000 ft (1524 m) at 19,200 baud for eight controllers. See the "Maximum Communication Cable Distances" table for the maximum communication cable distances at various baud rates.

Shielding and Grounding

The automation network shield should be grounded in one place only, typically at the RS-232/485 converter as shown in the "Alternate Controller Communications Wiring Detail for 3-Wire, RS-485 Systems" figure.

The controller circuitry and associated Class 2 wiring is electrically isolated from all system voltages and earth ground. Maintaining the integrity of this isolation is important for proper operation and performance.

The controller's input terminals and auxiliary power source are part of the Class 2 circuitry. External devices connected to the controller must meet the isolation requirements and other Class 2 wiring standards. Do not connect the controller to external voltage sources or earth ground.

The RS-485 network communications circuit is also part of the Class 2 circuitry. In most applications, the shield of each communications cable will be interconnected at the center terminal of the communications connector. This connection ensures networked controllers are tied together to a common reference potential. The shield must be grounded at only one point in the system. Grounding the shield at multiple points will create a "ground loop" that may disrupt communications or cause damage to the controller circuitry.

Alternate RS-485 Wiring

An alternate RS-485 wiring scheme that uses a third reference wire is preferred in certain applications:

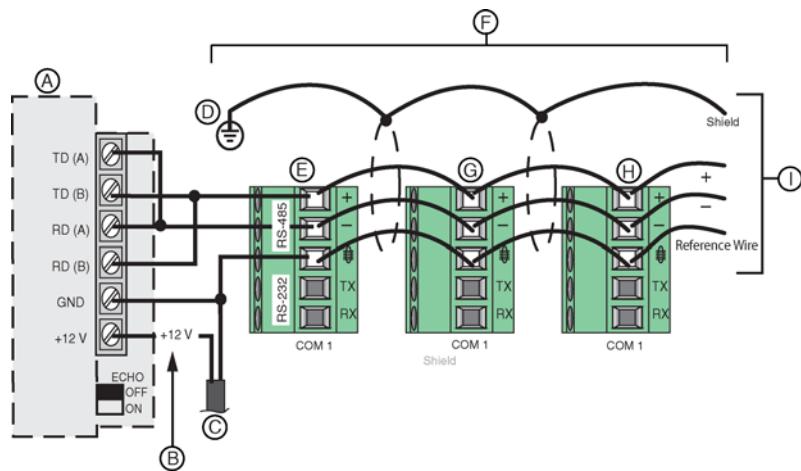
- When you cannot avoid connecting the Class 2 input circuitry to earth ground.
- When an external device's isolation from ground is minimal.
- When the controller is installed on a network with non-isolated devices.

This 3-wire method uses a separate reference wire, or pair of wires, to interconnect the center terminal of all communications connectors. Refer to the "Alternate Controller Communications Wiring Detail for 3-Wire, RS-485 Systems" figure. The shield should remain isolated from the controller and should not be connected to this point. Instead, interconnect the shields using a wire nut. Connect the shield to ground at only one point.

Figure 4: Alternate Controller Communications Wiring Detail for 3-Wire, RS-485 Systems

KEY:

- A. RS-485 Converter Terminal
- B. Black/White Stripe
- C. Power Supply
- D. Ground shield in one place only
- E. Controller Comms Terminal in Master Panel 1
- F. RS-485 Daisy Chain, 3-Wire, Twisted Pair, Belden 8723 or equivalent
- G. Controller Comms Terminal in Master Panel 2
- H. Controller Comms Terminal in Master Panel (n)
- I. To next Controller



**POWERLINK™ RS232 to 485 Converter
Instruction Bulletin**

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 for repairs or service to your network.

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

Schneider Electric, USA
320 Tech Park Drive
La Vergne, TN, 37086
1-888-SquareD (1-888-778-2733)
www.squaredlightingcontrol.com

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800 Federal Street
Andover, MA 01810 USA
888-778-2733
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Av. Ejército Nacional No. 904
Col. Palmas, Polanco 11560 México, D.F.
55-5804-5000
www.schneider-electric.com.mx

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Schneider Electric Canada, Inc.
5985 McLaughlin Road
Mississauga, ON L5R 1B8 Canada
800-565-6699
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