

Powerlink[®] G3 Controller

NF3000G3C for use with Powerlink G3 Systems

Addendum to Controller Instruction Bulletin 63249-401-205

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 imminently 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.

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 Schneider Electric for any consequences arising out of the use of this manual.

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.

U.S. Patent Statement

The products described herein are protected under one or more of the following U.S. Patents: D317,906; 4,623,859; 4,901,219; 4,940,903; 4,964,058; 4,965,694; 5,028,853; 5,083,103; 5,180,051; 5,184,278; 5,231,565; 5,233,511; 5,249,115; 5,253,159; 5,315,499; 5,323,307; 5,455,760; 5,532,660; 5,892,449; 5,909,180; 6,055,144; 6,612,873; and 6,813,525. Additional issued and pending patents may apply.

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CHAPTER 1—INTRODUCTION

INTRODUCTION

The Powerlink® G3 NF3000G3C controller provides a data interface to Square D® Clipsal® products that use the C-Bus™ network protocol. The C-Bus network extends the capabilities of Powerlink by providing a low cost, peer-to-peer interface to Clipsal lighting control devices. Since the C-Bus network is optimized for lighting applications, integrated solutions with dimming, daylight harvesting, and network keypads are possible.

Devices operating on the C-Bus network are logically interconnected via groups. A controller input is simply assigned to a C-Bus network group for operation.

STANDARD FEATURES

The NF3000G3C controller is a variation of the standard 3000 level controller. As part of the Powerlink controller family, it provides both input and time of day control. Standard features include:

- Front panel keypad/LCD for configuration and status monitoring
- Ethernet network communications for remote monitoring, control, and configuration
- Embedded web server
- E-mail messages for alarm notification
- Ability to control up to 168 remotely operable circuit breakers in up to 8 panelboards (can control up to 336 breakers by adding a second power supply)
- 64 lighting zones
- 16 on-board time schedules with 32 special day periods
- Up to 16 individually configurable local switch inputs with timers for local override
- Up to 64 input channels for use with network switches

C-BUS NETWORK FEATURES

In addition to the standard 3000 level features, the NF3000G3C controller includes:

- Full-duplex serial protocol driver to communicate to a C-Bus network interface device (PCI)
- Association of inputs to C-Bus groups from the front panel, configuration software, or a web browser
- Learn mode for configuration of C-Bus network devices without software
- C-Bus network monitor with group copy feature
- Ethernet pass-through mode for C-Bus device configuration via C-Bus Toolkit software
- Bi-directional group control extends time schedules and other controller features to C-Bus network devices

BEFORE YOU BEGIN

This document focuses on the C-Bus aspect of the NF3000G3C controller. Knowledge of the Powerlink G3 architecture and components, Powerlink G3 system configuration, and the specific project application requirements are assumed. For more information about the standard NF3000G3 controller, refer to instruction bulletin 63249-401-205. If you have questions concerning system installation or configuration, see the *Technical Support* section below.

USING WITH PCS SOFTWARE

As a member of the Powerlink G3 family, the NF3000G3C is fully compatible with PCS101 configuration software. PCS v. 5.5 or higher is required for access to the C-Bus features.

The PCS software uses Modbus serial or Ethernet communications to interact with the controller. The use of Ethernet communications is recommended. If you are using Modbus serial communications, please consider the following:

- The controller has only one serial port, which is used for both Modbus serial and C-Bus network communications.
- A front panel RS232 connection is provided on every Powerlink G3 controller for Modbus serial communications. The front panel port is shared with the RS232 port in the wiring compartment. To use the front panel port, you must do the following:
 - Disconnect the controller from the C-Bus network interface device (PCI) either at the controller or at the interface to prevent communications conflicts.
 - Use the front panel to change the communications mode to Modbus (RTU/ASCII).
 - After using PCS, return the communications mode to C-Bus.

NOTE: The controller will reboot when you change to or from C-Bus communications mode. When the reboot is complete, the controller will display the Home screen.

Ethernet communications is recommended because it eliminates the need to temporarily disconnect the C-Bus interface and provides the ability to remotely configure or monitor the system via a network.

TECHNICAL SUPPORT

For technical assistance, please contact your local sales representative, or contact a Square D Lighting Control technical support specialist through one of the following methods:

Phone: 888-778-2733

E-mail: lightingcontrol.support@us.schneider-electric.com

Fax: 615-287-3405

Normal support hours are 7:30 AM to 5:00 PM CST, Monday through Friday, except holidays. If a telephone support specialist is unavailable, leave a voice mail message. If your request is urgent, you can also speak to an operator who will process your request.

For voice mail, e-mail, and fax requests, please include your name, company, address, phone number, type(s) of Square D lighting control products, and a detailed description of your problem. The support center normally responds to these requests within two business hours.

You may also find helpful information on our web site:

- www.SquareD.com/Powerlink

CHAPTER 2—SAFETY PRECAUTIONS

This chapter contains important safety precautions that must be followed before attempting to install, service, 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 only by qualified personnel.
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm that power is off.
- Replace all devices, doors, and covers before turning on the power to this equipment.
- Before energizing panelboard, fill all unused spaces with blank fillers.

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

CHAPTER 3—INSTALLATION

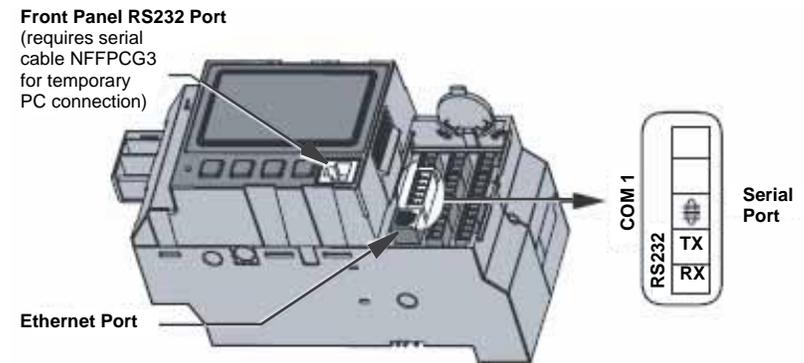
INSTALLING THE CONTROLLER

A copy of the standard NF3000G3 instruction bulletin (63249-401-205) is supplied with the NF3000G3C controller. Refer to that document for information and safety instructions regarding the installation and wiring of the the NF3000G3C controller.

C-BUS COMMUNICATIONS WIRING

Serial communications wiring terminals for permanent connections are located in the low-voltage wiring compartment of the controller. Connect a serial communications cable to the 5-pin connector labeled COM1 which is found in this compartment. Connect the other end of the cable to the C-Bus network interface device. The connector legend is found on the wiring compartment cover.

Figure 1: Controller Communication Wiring Terminals



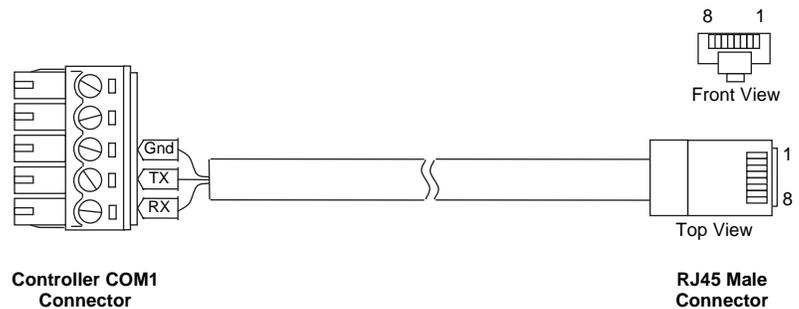
NOTE: The permanent RS232 connection in this compartment is shared with the front panel RS232 port. Disconnect the serial cable between the controller and the C-Bus network interface device (PCI) before using the front panel port.

The RS485 port supported on the standard controller is not functional on the NF3000G3C controller. Do not make any connections to these terminals.

Table 1: Cable Wiring Reference

Controller COM1 Connector	RJ45 Pin No.	Name	Description
	1	DSR/RI	Data set ready/ring indicator
	2	DCD	Data carrier detect
	3	DTR	Data terminal ready
Gnd	4	SGND	Signal ground
TX	5	RD	Receive data
RX	6	SD	Send data
	7	CTS	Clear to send
	8	RTS	Ready to send

Figure 2: Cable Diagram



CHAPTER 4—OPERATION

OPERATION OVERVIEW

The Powerlink G3 controller is modeled around the concept of lighting zones. Control sources are assigned to each zone. Control sources can be inputs, schedules, other zones, or sources from another controller. Configuration of the zone depends on the desired control functionality. For more information on controller configuration, refer to the standard NF3000G3 instruction bulletin (63249-401-205).

The controller has a 64 channel input capability which can be associated to C-Bus groups. This allows the use of C-Bus network keypads to control remotely operable circuit breakers. These network inputs can be used in place of, or in conjunction with, the 16 physical controller inputs. The controller provides bi-directional communications to the C-Bus network so that controller inputs or schedules can also be used to control C-Bus network devices.

INTRODUCTION TO C-BUS

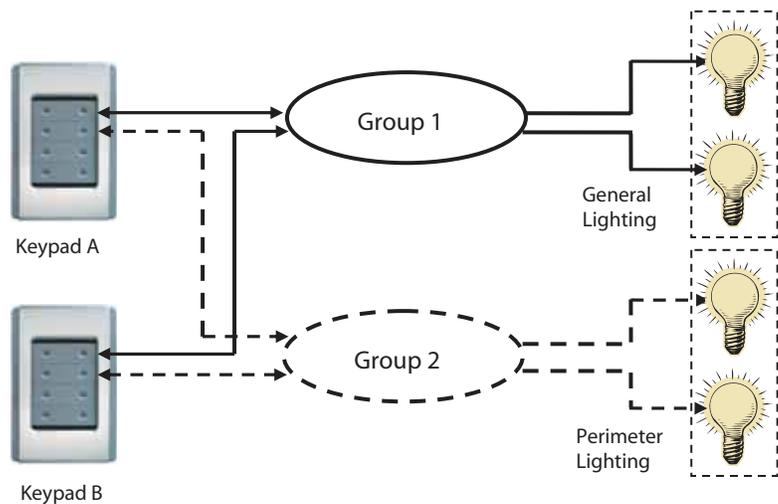
What is C-Bus?

C-Bus is a low-cost, high performance, networking technology that is optimized for control. It uses unshielded, twisted pair, CAT5 data cable. The C-Bus network allows free topology wiring in which devices can be connected in a daisy chain, star, tee, or any combination. Units connected to the C-Bus network directly share control information using peer-to-peer messages, eliminating the need to rely on a central processor.

C-Bus Group Operation

Lighting applications use groups to associate inputs (keypads) and outputs (load control devices). When an input changes the level of a group, all outputs assigned to the same group will respond to the change.

Figure 3: Group Operations



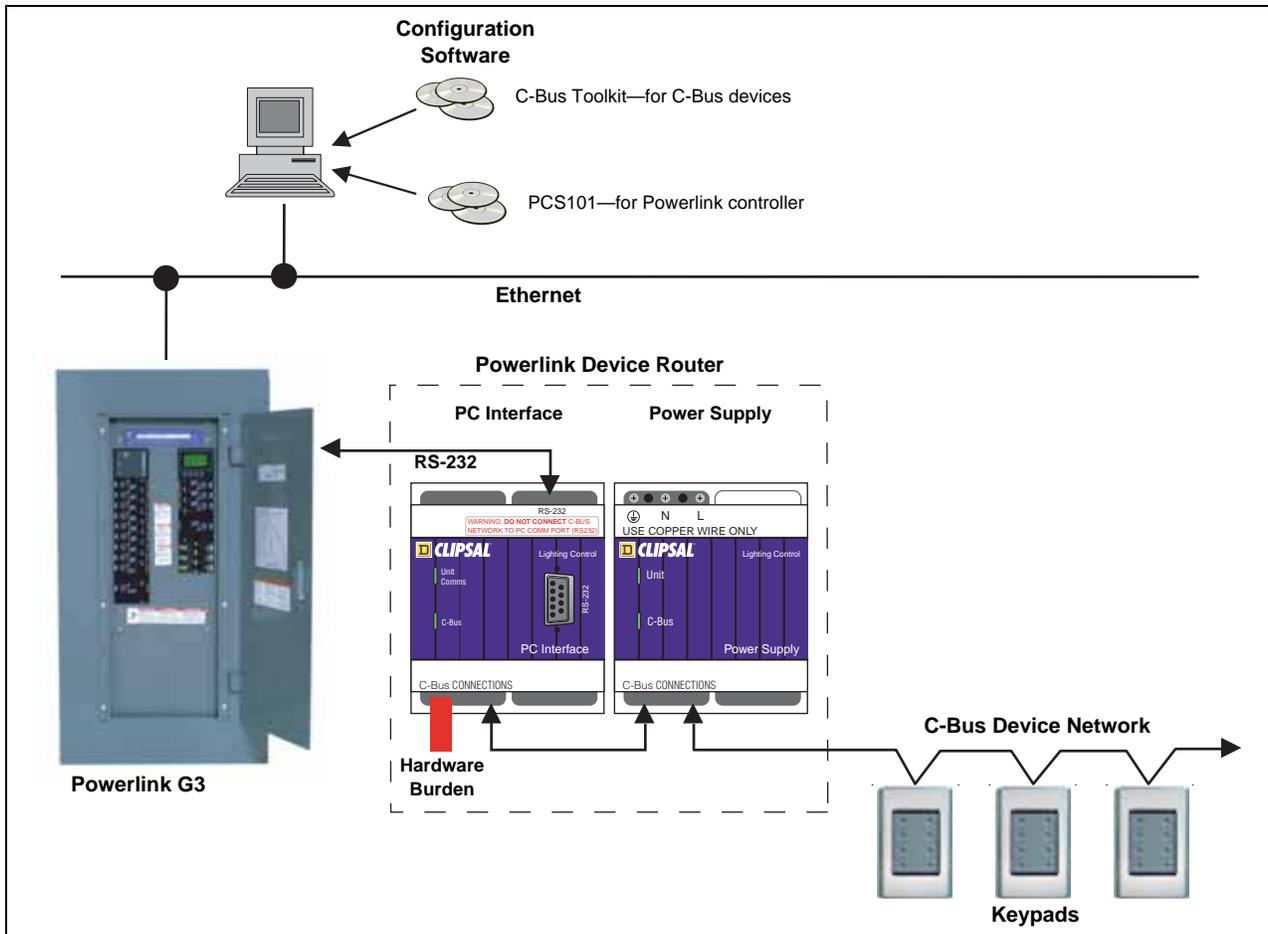
For example, keypads and output devices are all interconnected by a C-Bus network. Two keypads, A and B, are provided to control lights from the two entrances of a meeting room. The room has both general lighting and perimeter lighting. It is desired to operate the lighting independently, so the top set of buttons on both keypads is assigned to group 1. The second set of buttons on both keypads is assigned to group 2. Output devices controlling the power to the general lighting fixtures are assigned to group 1. Output devices controlling the power to the perimeter lighting fixtures are assigned to group 2. Pressing the top buttons on either keypad will send a signal to all

devices assigned to group 1. The output devices will respond accordingly and will change the general lighting in the room. Since a keypad also listens to group changes, it will turn its status indicators ON or OFF to stay in synchronization with the other keypad.

Powerlink G3 Operation with C-Bus Network Devices

The C-Bus network adds powerful expansion capability to a Powerlink G3 system. Network keypads, occupancy sensors, light level sensors, and dimming can be connected to create comprehensive lighting control solutions. C-Bus groups can be associated with any of the controller's 64 input channels.

Figure 4: System Diagram



A unique attribute of the Powerlink controller is the ability to act as both an input and output device to a C-Bus network. For example, the controller can accept input signals from a C-Bus network keypad to control remotely operable circuit breakers. A controller schedule can trigger output commands to a C-Bus group to set a dimming scene.

Since C-Bus is a powered, 2-wire network, the controller does not connect directly to the C-Bus network. A serial interface which converts serial messages to C-Bus network messages is required. A power supply is also required to provide DC voltage to energize devices connected to the C-Bus network. A power supply and C-Bus network interface are available packaged together as a Powerlink Device Router: NFPDR120G3 (120V) and NFPDR277G3 (277V).

C-Bus networks require termination via a burden device. A hardware burden is pre-installed in the device router. Remove this device only if the software burden inside a C-Bus unit has been enabled.

CONFIGURATION

Configuration Overview

To use Powerlink with a C-Bus network, there are two basic configuration steps:

- Assigning controller inputs to C-Bus groups
- Assigning C-Bus network devices to C-Bus groups

Assigning Controller Inputs to C-Bus Groups

A controller input can be assigned to any C-Bus group. Controllers can be configured using one of two methods:

- The controller front panel can be used to configure all controller functions, including the setup of C-Bus parameters. The front panel can be accessed locally, or remotely from a web page.
- Powerlink Configuration Software (PCS101 v. 5.5 or higher) can be used to create configurations either off-line or on-line with a controller.

Assigning C-Bus Network Devices to C-Bus Groups

There are two methods to assign a C-Bus device to a group. The method used typically depends on the size and complexity of the project.

- A learn mode, built into most C-bus devices, allows the device to automatically learn a group assignment. Association using the learn mode is preferred for simple projects.
- A device can also receive group assignments manually using C-Bus Toolkit software. The C-Bus Toolkit software can also access advanced configuration parameters that are not accessible using the learn mode.

Quick Start

This section provides the basic steps for associating C-Bus keypad devices to Powerlink inputs. See the “Configuration Reference” section starting on page 12 for more detailed information.

Before You Begin

- Verify that a connection exists between the controller and the C-Bus network interface device (PCI).
- Verify that all C-Bus devices are connected.
- Configure Powerlink G3 zones as described in the NF3000G3 instruction bulletin (63249-401-205). This includes assigning circuit breakers and control sources to zones. Be sure to assign an input 1–64 to any zone to be controlled by a C-Bus network device.

Configuration Steps

1. Go to the controller's C-BUS INPUT screen to associate a C-Bus group to the Powerlink input. (Main>Source>Inputs>C-Bus)
2. Assign a group number to each input. Group numbers must be unique unless you want more than one input to respond to the same group.
3. Learn the group relationship. Go to the controller's C-BUS LEARN MODE screen. (Main>Source>Inputs>C-Bus>Learn)
 - a. Enable learn mode for the selected group by pressing the controller's + or - button to change DISABLED to ENABLED.
 - b. Choose each keypad button that will control the group by pressing the button one time. Associated buttons will illuminate to show membership in the group.
To remove an unwanted keypad button from the group, press it one time. The button will no longer be illuminated.
 - c. Change ENABLED back to DISABLED.
4. Push each keypad button ON/OFF to test.

CONFIGURATION REFERENCE

Screen Access Levels

The following table lists the access levels for each controller screen.

Main Screens		Sub-Screens		Access Level				
				1	2	3		
Main Menu	Access Login		X	X	X			
	Status Menu	Breaker Status	Breaker Details	X	X	X		
			<i>Clear Breaker Details Counter</i> ¹		X			
			Status By Bus	X	X	X		
			Status By Zone	X	X	X		
		Zone Status	Zone Details (1)	Zone Details (2)	X	X	X	
			Status By Source	View Source Zones	X	X	X	
			Status By Brkr	View Brkr Zones	X	X	X	
			Schedule Status		X	X	X	
		Source Status	Input Status	Input Details	X	X	X	
				<i>Direct Input Control</i> ²		X	X	X
				Input Sync	X	X	X	
			Remote Src Status		X	X	X	
		Comms State	<i>Clear Remote Source Offline Counter</i> ¹		X			
			Serial Status		X	X	X	
			<i>Clear Serial Comms Counter</i> ¹		X			
	Ethernet Status		Modbus TCP Status	X	X	X		
	<i>Clear Ethernet Comms Counter</i> ¹		<i>Clear Modbus TCP Status Counter</i> ¹	X				
	Sub-net Status			X	X	X		
	System Status	<i>Clear Sub-net Comms Counter</i> ¹		X				
		Controller Status		X	X	X		
		Ctrl Bus Status		X	X	X		
	Source Menu	Schedules	Schedule Name	X	X			
			Clear Schedule	X	X			
			+ Special Day(s)	X	X			
		Inputs	Input Setup	Input Name	X			
			Input Sync		X			
			C-Bus Input	C-Bus Advanced	X			
				C-Bus Learn Mode	X			
		Remote Sources	Remote Src Name	X				
		Zone Menu	Zone Sources	COMBO	X			
				LAST EVENT	X			
	Zone Priority			X				
	Zone Breakers		View/Edit Brkrs		X			
			Test Brkrs		X			
			Clear Brkrs		X			
			Learn Breakers	Add Breakers	X			
	Delete Breakers			X				
	Zone Name			X				
	Controller Menu		Time/Date	Time Sync (1)	Time Sync (2)	X	X	
		Clock Setup		DST Setup	X	X		
		Special Days	Special Day Name		X	X		
			Start/End Dates		X	X		
		Breakers	Blink Type		X			
			Circuit Name		X			
			Timing		X			
		Control Buses	Control Bus Name		X			
		Communications	Serial Comms		X			
			Ethernet Comms		X			
Comms Loss Action	Comms Loss Zone		X					
Tools Menu	Zone Override		X	X				
	Direct Brkr Control		X	X				
	Operating Mode		X	X				
	Access Codes		X					
	Controller Name		X					
	Service Tools	Clear Memory		X				
View Subscribers			X					

¹ The Clear function is not an individual screen, but is listed because of the different login level required.

² The Control function is not an individual screen, but is listed because of the different login level required.

Home Screen

When the controller is powered on, the Home screen displays. The “C” at the end of the model number (NF3000G3C) indicates that this controller is compatible with C-Bus network devices.



Setting Up C-Bus Network Communications

To configure the controller for C-Bus network communications:

1. Navigate to the SERIAL COMMS screen
(Main>Controller>Communications>Serial Comms)



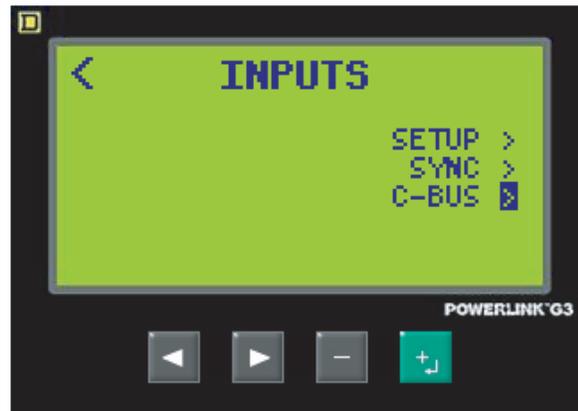
2. Scroll to the Mode field. Serial mode choices for the NF3000G3C controller are:
 - C-Bus (default)
 - RTU/ASCII
 - 7-bit ASCII
3. Select the C-Bus mode to enable C-Bus communications from the controller serial port.
When C-Bus is selected, the other parameters on the SERIAL COMMS screen are fixed and shown for reference only. Settings are effective after exiting the screen.

NOTE: The controller will reboot when you change to or from C-Bus communications mode. When the reboot is complete, the controller will display the Home screen.

Assigning Inputs to C-Bus Groups

To access input-specific C-Bus settings:

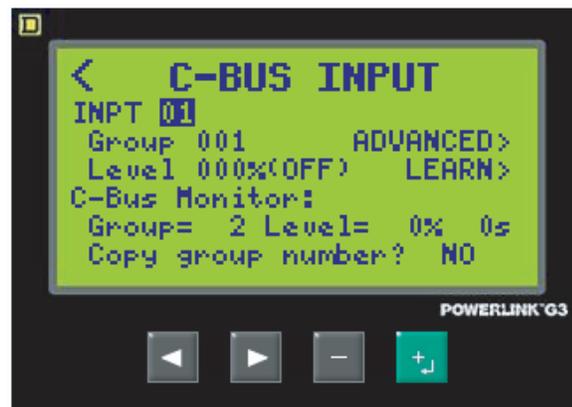
1. Navigate to the INPUTS screen (Main>Source>Inputs)



2. Scroll to the C-BUS field and press the + button.

NOTE: The C-Bus choice will not appear on the INPUTS screen unless the serial communications mode is set to C-Bus.

3. The C-BUS INPUT screen displays.



The C-BUS INPUT screen provides access to the primary controller parameters when operating with C-Bus network devices. This screen allows assigning a C-Bus group to a controller input and provides paths to other C-Bus parameters and functions. It also provides status information that may be useful in commissioning.

NOTE: A controller input type of "Momentary Toggle" (default) is recommended for any controller input that is assigned to a C-Bus group. The controller will synchronize to maintained inputs on power up. This may cause unexpected behavior when C-Bus inputs are being used as the primary control device.

Assigning an Input

To assign a controller input to a C-Bus group:

1. Position the cursor over the input number field. Using the + and - buttons, scroll to select a controller input number, 1–64. The input nametag, if configured, will display for reference.
2. Move the cursor to the group number field. Scroll to select the desired group number, 0–254. This same group may be assigned to more than one controller input, if desired.

Set the group number to “N/A” (default) if you don’t want to assign inputs to C-Bus groups.

Viewing C-Bus Status

The C-BUS INPUT screen provides C-Bus status information, based on the latest C-Bus information received by the controller. The level field displays the present level for this group, translated to percent. The present input state, ON or OFF, is displayed for reference.

The C-BUS INPUT screen also provides a real-time C-Bus monitor which displays interpreted C-Bus messages as they occur on the C-Bus network. This line will display information received in the last C-Bus message. Messages are:

Table 2: C-Bus Messages

C-Bus Command Type	Message
ON	Group=xxx ¹ Level=100%
OFF	Group=xxx ¹ Level=0%
Ramp to Level	Group=xxx ¹ Level=aaa ² % ttt ³
Terminate Ramp	Group=xxx ¹ Terminate Ramp
Learn	Group=xxx ¹ Learn Initiate
	Group=xxx ¹ Learn Cancel
	Group=xxx ¹ Learn Exit
Other messages	Unknown message type
Other applications	Unknown application

¹ xxx = group number (0–254)
² aaa = level, converted to percent (0–100%)
³ ttt = time, in seconds or minutes (0 sec–17 min)

Using the Group Copy Function

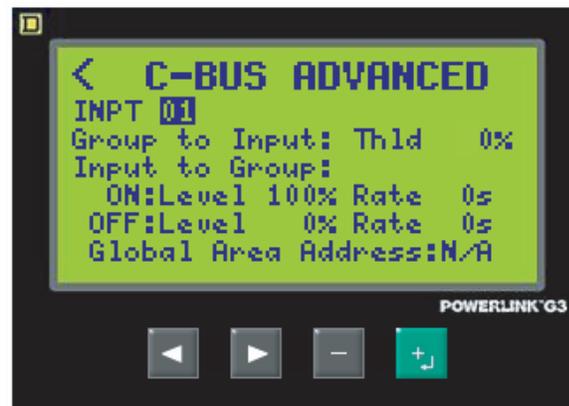
The C-BUS INPUT screen provides a function to copy the group number from the last C-Bus message, as shown in the C-Bus monitor message, to the group number for the selected input. This is useful for assigning an input to an existing C-Bus group.

To use the group copy function:

1. Position the cursor on the YES/NO field located next to “Copy group number?”
2. Change NO to YES by pressing the + or - button. Move the cursor off of the field. The last detected group number in the monitor field will be copied to the group setup field, and YES will automatically change back to NO.
3. To stop the copy function, change YES back to NO before moving the cursor off the YES/NO field. No copy will occur.

Advanced C-Bus Settings

To configure advanced C-Bus settings, navigate to the C-BUS ADVANCED screen (Main>Source>Inputs>C-Bus Input>C-Bus Advanced)



The C-BUS ADVANCED configuration screen provides access to additional configuration information related to C-Bus. The input chosen on the C-BUS INPUT screen is automatically selected, but may be changed from this screen if configuring advanced settings for multiple inputs.

NOTE: The default configuration values of the C-BUS ADVANCED screen are suitable for most applications. Changes to these parameters are only required for advanced applications.

Group-To-Input Threshold

The group-to-input threshold is the percentage level at which an input changes from OFF to ON. When the threshold is set to 0%, any percentage value above 0% will be ON. To change the group-to-input threshold:

1. Position the cursor over the threshold (Thld) field.
2. Scroll to the desired threshold value, from 0–100%. (default=0%)

Input-To-Group

The input-to-group settings determine what is sent out to the C-Bus network when a change in the selected input occurs. C-Bus messages can be generated in response to an ON event, an OFF event, or both. To configure the input-to-group settings:

1. Position the cursor over the ON field.
2. Toggle the value to either “ON” or “-”. When “ON” is selected, a C-Bus message will be sent in response to an ON event affecting this input. When “-” is selected, no message will be sent.
3. Move the cursor to the level field. Scroll to the desired level, 0–100%. This is the group level that will be sent when the ON event, if selected, occurs. (default=100%)
4. Move the cursor to the rate field. Select a rate (0s, 4s, 8s, 12s, 20s, 30s, 40s, 60s, 90s, 2m, 3m, 5m, 7m, 10m, 15m, 17m). This rate will be used in conjunction with the level to ramp the group to the selected level over a period of time. (default=0s)
5. Move cursor to the OFF field and repeat the input-to-group configuration for OFF events. (defaults=0%, 0s)

Global Area Address

The global area address is used to set a C-Bus area address for the controller. Select a value, 0 - 254. Choose "N/A" (default) if no area address is desired.

The level of the group assigned to the area address will be applied to all controller inputs that are assigned to a C-Bus group. The group level of any assigned input will be updated any time the global area address level changes.

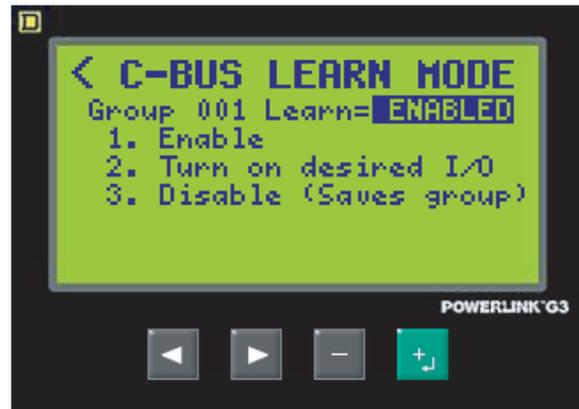
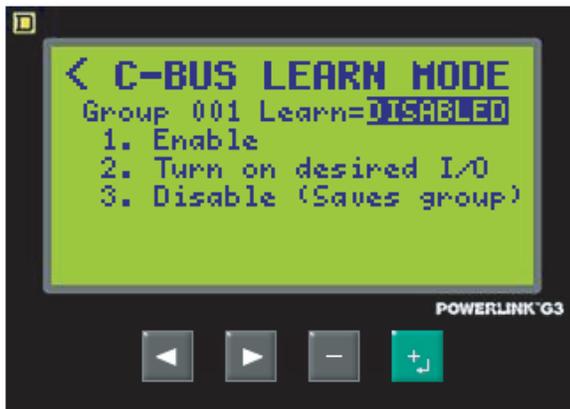
NOTE: The global area address setting affects all inputs and will be the same for any selected input. The use of an area address is an advanced C-Bus application topic and is not required in most applications.

Using C-Bus Learn Mode

The C-Bus learn mode provides a method for associating C-Bus devices to groups without using the C-Bus Toolkit software. In general, any button on a C-Bus keypad that is manually operated while in learn mode is automatically assigned to the selected group. Follow these steps to associate a keypad button or C-Bus output channel to a controller input.

NOTE: The controller ignores learn mode when initiated from a C-Bus network device.

1. From the C-BUS INPUT screen, map an input to a C-Bus group.
2. From the C-BUS INPUT screen, position the cursor over the LEARN path arrow and press the controller's + key to enter the C-BUS LEARN MODE screen.



3. From the C-BUS LEARN MODE screen, position the cursor over the DISABLED field and press the + key. A learn command containing the group address is sent to the C-Bus network. The field value will change to ENABLED to indicate that the C-Bus network is now in the learn mode.

NOTE: The learn mode is automatically cancelled when exiting the screen, or if the screen times out while ENABLED. No learned associations will be saved. Timeout is approximately five minutes.

4. LEDs on any keypad button already associated with this group will light. LEDs on any output channels associated with this group will also light.

5. With learn mode ENABLED, select keypad buttons or output channels for this group:

Keypads

- a. Press a keypad button to assign it to the group. The LED on the keypad button will light to show it is assigned to the group.
- b. Press the keypad button again to un-assign it from the group. The LED on the keypad button will turn OFF to show it is not assigned to the group.

NOTE: If two buttons are assigned on the same keypad, the first button pressed will be the ON (or ramp up) button. The second button pressed will be the OFF (or ramp down) button.

If a second button is not pressed before the learn mode is DISABLED, then the first button will be a toggle ON/OFF (or ramp up/down) button.

Output Units (such as relays or dimmers)

- a. Press the channel button to assign it to the group. The LED on the channel button will light to show it is assigned to the group.
 - b. Press the channel button again to un-assign it from the group. The LED on the channel button will turn OFF to show it is not assigned to the group.
6. After all group assignments are made, press the controller's + key. The field value will change to DISABLED to indicate that the C-Bus network is no longer in learn mode. If no keypad or output buttons were pressed while in learn mode, then the group assignments remain unchanged.

NOTE: Learn mode will automatically time out five minutes after it is enabled. Changes will not be saved unless Learn mode is intentionally disabled by the user before the time-out occurs.

Learn mode is automatically disabled when the C-Bus Toolkit software is active via the controller Ethernet port. This allows complete control of the C-Bus network by the Toolkit. The cursor can not be moved to the ENABLED/DISABLED field when the Toolkit is active.

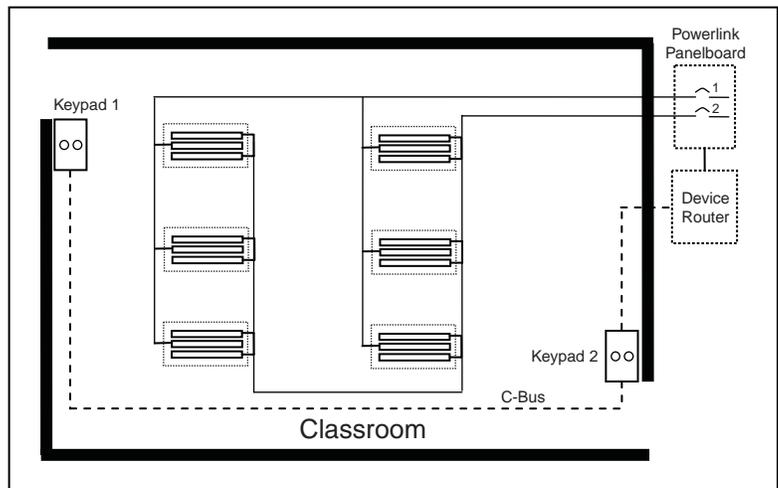
CHAPTER 5—APPLICATION EXAMPLES

NETWORKED LIGHT SWITCHES

Many applications are possible using C-Bus network devices in conjunction with Powerlink G3. This section describes just a few of these applications. Familiarity with controller programming is assumed. See instruction bulletin 63249-401-205 for detailed information on controller programming.

The lights in a classroom are wired for multi-level switching. Circuit 1 provides power for 1/3 of the lights; circuit 2 provides power for the other 2/3. A 2-button, C-Bus network keypad is provided by each entrance. The lighting system is configured so that each button on the keypad toggles one circuit, allowing multi-level illumination (all OFF, 1/3 ON, 2/3 ON, or all ON).

Figure 5: Classroom Example



Part 1—Controller Configuration

1. Assign breakers to zones.
 - a. Assign circuit 1 to zone 1.
 - b. Assign circuit 2 to zone 2.
2. Assign sources to zones.
 - a. Assign input 1 as a source to zone 1.
 - b. Assign input 2 as a source to zone 2.
3. Assign inputs to C-Bus groups.
 - a. Assign input 1 to C-Bus group 1.
 - b. Assign input 2 to C-Bus group 2.

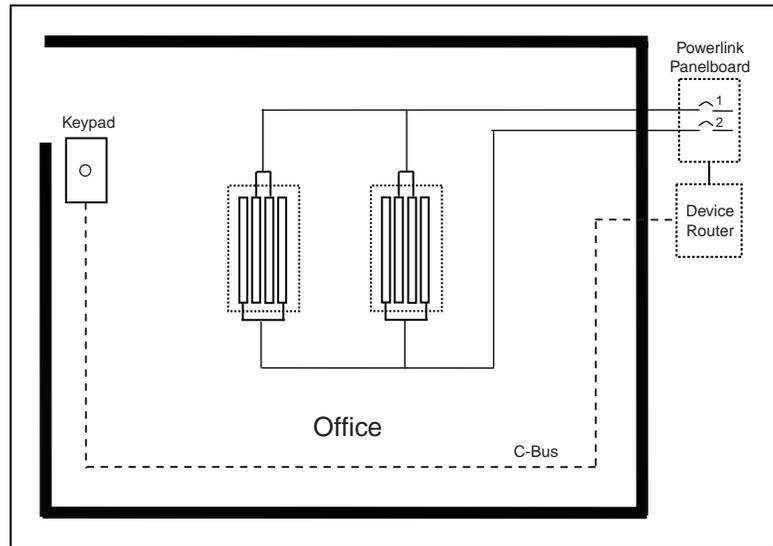
Part 2—C-Bus Configuration

1. Learn group 1 buttons.
 - a. Enable learn mode for group 1 (input 1).
 - b. Press left button on keypad 1.
 - c. Press left button on keypad 2.
 - d. Disable learn mode.
2. Learn group 2 buttons.
 - a. Enable learn mode for group 2 (input 2).
 - b. Press right button on keypad 1.
 - c. Press right button on keypad 2.
 - d. Disable learn mode.

BI-LEVEL CONTROL FROM ONE KEYPAD BUTTON

Simple task tuning is wanted for an individual office space. A single button is provided to control multiple levels of illumination (all OFF, 1/2 ON, all ON). A short press of the button toggles the lights ON/OFF. A long press of the button will ramp the group level up or down, effectively turning the lights on in stages (either 1/2 ON or all ON).

Figure 6: Single Office Example



Part 1—Controller Configuration

1. Assign breakers to zones.
 - a. Assign circuit 1 to zone 1.
 - b. Assign circuit 2 to zone 2.
2. Assign sources to zones.
 - a. Assign input 1 as a source to zone 1.
 - b. Assign input 2 as a source to zone 2.
3. Assign inputs to C-Bus groups.
 - a. Assign input 1 to C-Bus group 1.
 - b. Assign input 2 to C-Bus group 1.
4. Set group-to-input thresholds (advanced C-Bus configuration).
 - a. Set input 1 threshold at 25%.
 - b. Set input 2 threshold at 50%.

Part 2—C-Bus Configuration

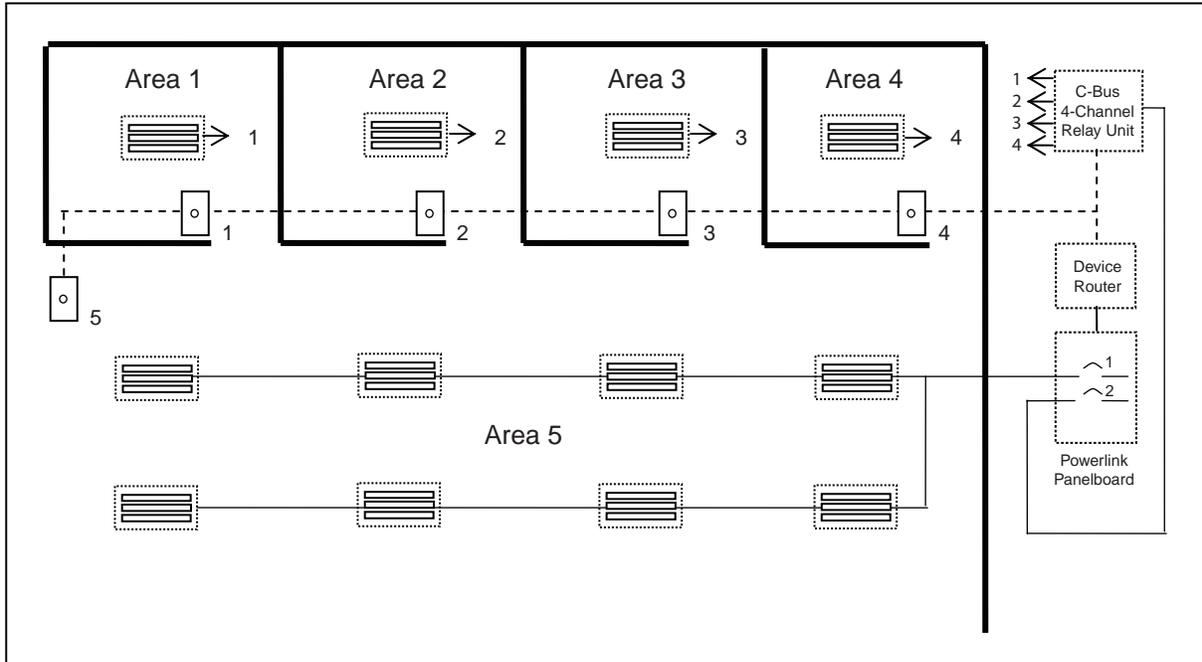
Learn group 1 button.

- a. Enable learn mode for group 1 (input 1 and 2).
- b. Press button on keypad.
- c. Disable learn mode.

COMBINED POWERLINK AND C-BUS RELAY SYSTEMS

C-Bus relay outputs are used in conjunction with a Powerlink system to provide sub-circuit switching to individual offices. The owner wants a lighting schedule that turns only the common area ON in the morning, but turns all areas OFF at the end of the workday. Keypads are provided for local control of all areas.

Figure 7: Multiple Office Example



Part 1—Controller Configuration

1. Assign breakers to zones.
 - a. Assign circuit 1 to zone 1. Circuit 1 is a motorized breaker, supplying power to Area 5.
 - b. Do not assign circuit 2 to a zone. Circuit 2 is a non-motorized breaker, supplying power to Areas 1, 2, 3, and 4.
2. Create a schedule to affect all areas.

Program schedule 1 with desired weekly schedule.
3. Assign sources to zones.
 - a. Assign input 5 as a source to zone 1. Input 5 will be logically connected to C-Bus keypad 5 in a later step.
 - b. Un-assign any schedules that are assigned as sources to zone 1. The schedule will be linked to inputs and C-Bus groups using the input sync feature.
4. Configure input synchronization.

Configure inputs 1 through 5 to sync on ALL events of schedule 1.
5. Assign inputs to C-Bus groups.
 - a. Assign input 1 to C-Bus group 1.
 - b. Assign input 2 to C-Bus group 2.
 - c. Assign input 3 to C-Bus group 3.
 - d. Assign input 4 to C-Bus group 4.
 - e. Assign input 5 to C-Bus group 5.

6. Configure input-to-group settings (advanced C-Bus configuration).
 - a. For inputs 1 through 4, set the OFF event to ramp to 0% in 0 seconds. Set the ON event to have no effect on the C-Bus group.
 - b. For input 5, set the OFF event to ramp to 0% in 0 seconds. Set the ON event to ramp to 100% in 0 seconds.

Part 2—C-Bus Configuration

1. Learn group 1.
 - a. Enable learn mode for group 1 (input 1).
 - b. Press button on keypad located in area 1.
 - c. Press output channel 1 button on relay unit.
 - d. Disable learn mode.
2. Learn group 2.
 - a. Enable learn mode for group 2 (input 2).
 - b. Press button on keypad located in area 2.
 - c. Press output channel 2 button on relay unit.
 - d. Disable learn mode.
3. Learn group 3.
 - a. Enable learn mode for group 3 (input 3).
 - b. Press button on keypad located in area 3.
 - c. Press output channel 3 button on relay unit.
 - d. Disable learn mode.
4. Learn group 4.
 - a. Enable learn mode for group 4 (input 4).
 - b. Press button on keypad located in area 4.
 - c. Press output channel 4 button on relay unit.
 - d. Disable learn mode.
5. Learn group 5.
 - a. Enable learn mode for group 5 (input 5).
 - b. Press button on keypad located in area 5.
 - c. Disable learn mode.

ADDING OVERRIDE TIMERS TO NETWORK KEYPADS

The owner of the facility discussed in the previous application requests that all keypad buttons be configured with a one-hour override timer that is only active during the unscheduled hours. Add the following configuration to the controller inputs:

1. Configure input timers.
 - a. Set timer type for inputs 1 through 5 to Timed ON.
 - b. Set timer duration for inputs 1 through 5 to 1 hour.
2. Configure timer inhibit synchronization.
 - a. Set timer inhibit to Sync on ALL events for inputs 1 through 5.
 - b. Set timer inhibit so that the input timer is disabled when schedule 1 is ON.

**Powerlink® NF3000G3C Controller
Instruction Bulletin**

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