



CONTENTS

POWERLINK®

Remote Power Switching Systems



SQUARE D
GROUPE SCHNEIDER

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CHAPTER 1

Introduction to the POWERLINK® Remote Power Switching System

The POWERLINK Remote Power Switching System, as shown below, combines Square D's overcurrent protection with an innovative remote switching capability. This combination forms an ideal system for your automated electrical system management applications. With the POWERLINK system, both overcurrent protection and remote switching are combined in a single circuit breaker and mounted into a new or existing panelboard. You only have to specify the remote-controlled breakers, the power supply and the control device. That not only makes designing simpler and easier, it also means fewer components, less wiring time and lower installation costs. The POWERLINK system also offers:

- Compatibility with existing Square D panelboards
- Long lasting, dependable performance
- System reconfiguration or expansion



POWERLINK Remote Switching System

The POWERLINK system typically requires less than 25% of the wall space that a lighting contactor system occupies; yet, POWERLINK lets you efficiently manage not only lighting, but many other types of electrical loads, such as:

- Appliances (such as water heaters, water coolers and ovens)
- Displays and power drops
- Fans
- Strip heaters
- HVAC units

POWERLINK System Components

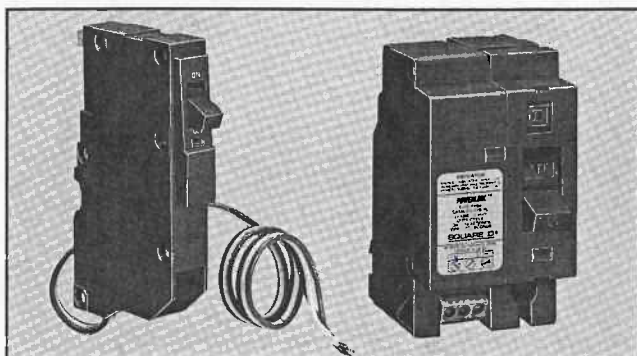
POWERLINK components provide system flexibility by using only the components required for your power switching application. A complete system has the following components:

1. **POWERLINK Remote-Controlled Circuit Breakers.**
These circuit breakers provide a cost-efficient way to remotely switch individual branch-circuits. The QO(B)-PL and the EHB-PL families of remote-controlled circuit breakers are described in Chapter 2, "POWERLINK Remote-Controlled Circuit Breakers."
2. **POWERLINK Power Supplies.**
These supplies provide a 24Vdc voltage source for switching POWERLINK circuit breakers. There are three power supply options:
 - The panel-mounted power supply for switching up to three circuit breakers simultaneously.
 - The System Network Interface for systems containing multiple-branch circuit breakers.
 - User-supplied power supplies.See Chapter 3, "POWERLINK Components" for a full description of each power supply option.
3. **User-Supplied Control Devices.**
You can use POWERLINK remote-controlled circuit breakers with a wide variety of control devices. Some of the common user-supplied control devices are:
 - Time clocks
 - Photocells
 - Programmable logic controllers
 - Push buttons/sensors
 - Momentary or maintenance switches
 - Personal computers

CHAPTER 2

POWERLINK Remote-Controlled Circuit Breakers

POWERLINK circuit breakers combine thermal-magnetic branch-circuit protection and remote-controlled switching capabilities in a single unit.



QO(B)-PL and EHB-PL POWERLINK Circuit Breakers

This combination allows individual branch circuits to be switched remotely without requiring additional, separately mounted relay or contactor panels. As a result, significant savings can be realized in the amount of space and time required to install a remote power switching system. Table 1 highlights the features and ratings for the QO(B)-PL and EHB-PL circuit breakers.

Feature	QO(B)-PL	EHB-PL
Rated Voltage	120/240Vac 1- & 2-pole 240Vac 3-pole	480Y/277Vac
Ampere (A) Ratings	10-30A 1-Pole 10-60A 2-Pole 15-60A 3-Pole	15-30A 1-Pole 15-60A 2- & 3-Pole
UL Listed Interrupting Capacity (rms symmetrical amperes)	10,000 ampere interrupting capacity (AIC) @ 120/240Vac 10,000 AIC @ 240Vac	14,000 AIC @ 480Y/277Vac 65,000 AIC @ 240Vac
Electrical Life (0.8pf)	30,000 operations	100,000 operations
Temperature	-5°C to 40°C (23°F to 104°F)	-5°C to 40°C (23°F to 104°F)
Control Voltage	24Vdc (±10%)	24Vdc (±10%)
UL Listed Enclosures	QO® Load Centers NQOD, NQO, NQOB Panelboards	NEHB, NEHB-LX Panelboards
Mechanically Held	Yes	Yes
UL 489 Listed	Yes	Yes
HID Rated	Yes (15-60A)	Yes (15-30A)
UL Listed HACR Rating	Yes (15-60A)	No
UL Listed SWD Rating	Yes (15-20A)	Yes (15-20A)
Visi-Trip® Indicator	Yes	Yes
Control Voltage Status Indication	No	Yes
Bolt-on Connections	Yes	Yes
Plug-on Connections	Yes	No
Control Connections	Pigtail (3-#18 AWG Cu)	Terminal Strip
Pole Spaces Req'd		
1-Pole Breaker	1	2
2-Pole Breaker	2	3
3-Pole Breaker	3	4

TABLE 1
Features and Ratings for POWERLINK Remote-Controlled Circuit Breakers

Mechanical and Electrical Operation

POWERLINK circuit breakers accomplish remote switching by using an internal 24Vdc motor that is mechanically linked to the circuit breaker contacts. The switching

operation occurs when the motor is energized, which opens or closes the circuit breaker's contacts. An integral clearing switch opens the motor control circuit after

each operation, allowing control power to be pulsed or continuously applied without damaging the motor. The following steps describe the switching operation:

Step 1

Initially, assume the circuit breaker contacts have been closed by operation of the circuit breaker handle, the control device is in the ON position, and the clearing switch has de-energized the motor as shown in Figure 1.

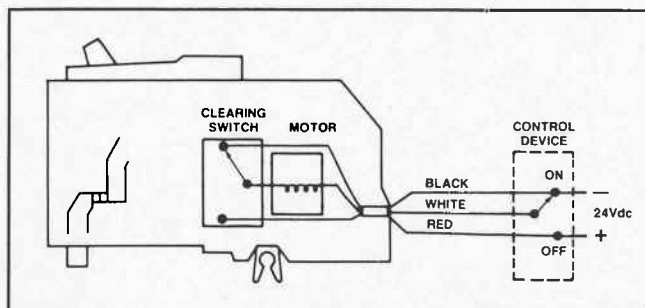


FIGURE 1

Step 2

When the control device is switched to the OFF position, the control circuit is completed and the motor opens the circuit breaker contacts. Note that the circuit breaker handle remains in the ON position as shown in Figure 2.

The switching operation is completed when the motor clearing switch changes position and de-energizes the motor.

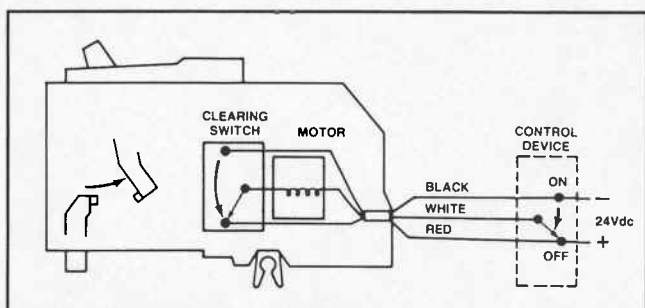


FIGURE 2

Step 3

When the control device is returned to the ON position, the motor closes the circuit breaker contacts as shown in Figure 3.

The switching operation is complete when the clearing switch changes position and de-energizes the motor.

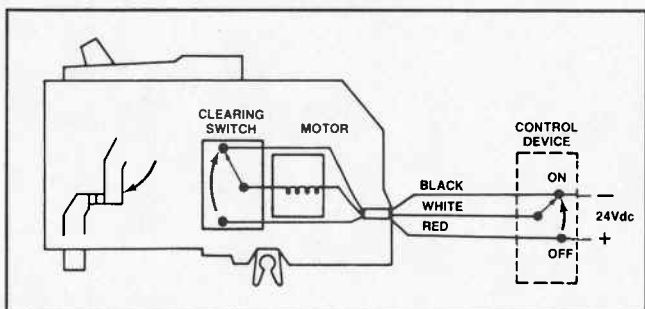


FIGURE 3

The handle must be in the ON position for the POWERLINK circuit breakers contacts to close. The handle does not indicate contact status when switching remotely. With the circuit breaker handle in the OFF or "tripped" position, remote operation changes the state of the remote mechanism but does not close the circuit breaker contacts or reset a tripped breaker. To reset a tripped breaker, the circuit breaker handle must be moved manually to the extreme OFF position and then to the ON position. All POWERLINK circuit breakers are shipped with the remote controlled mechanism in the ON position.

Each EHB-PL circuit breaker is equipped with a light emitting diode (LED) which indicates control voltage status. If the LED is on, the motor was signaled to close the breaker contacts. If the LED is off, the motor was signaled to open the breaker contacts.

Electrical Endurance

QO(B)-PL circuit breakers have an electrical life of 30,000 remote operations (at 0.8 load power factor). EHB-PL circuit breakers have an electrical life of 100,000 remote operations (at 0.8 load power factor). Table 2 shows the number of years each breaker yields based on the number of operations per day.

CALCULATED ENDURANCE (YEARS)		
No. operations/day	QO(B)-PL	EHB-PL
1	82	273
2	41	137
3	27	91
4	21	69
5	16	55
6	14	46
7	12	39
8	10	34
9	9	30
10	8	27
11	7	25
12	7	23
13	6	21
14	6	20
15	6	18
16	5	17
17	5	16
18	5	15
19	4	14
20	4	13

One operation = from closed to open to closed
= from open to closed to open

TABLE 2
Calculated Endurance of POWERLINK Circuit Breakers

CHAPTER 3

POWERLINK Components

This chapter describes the POWERLINK panel-mounted power supplies, POWERLINK System Network Interface, POWERLINK Breaker Interface Modules and user-supplied power supplies. Panel-mounted power supplies provide remote switching for applications where not more than three branch circuits are switched as a group. The System Network Interface and Breaker Interface Modules provide 24Vdc power for switching multiple branch circuits remotely and where zone control and overrides are desired. Information on user-supplied power supplies is also furnished for OEMs and users who control POWERLINK breakers from a custom designed control system.

Panel-Mounted Power Supplies

These power supplies provide a convenient 24Vdc voltage source for switching POWERLINK circuit breakers. They are mounted in the same manner as standard circuit breakers and occupy two adjacent pole spaces.

POWERLINK power supplies control only a few branch circuits as a group. To provide 24Vdc power when several branch circuits are switched together, or when complex control schemes are required, see "POWERLINK System Network Interface and Breaker Interface Modules" on page 6.

These power supplies are UL Listed as energy management accessories for branch circuit use only. They are internally protected and are not user-serviceable. A line side disconnect is required ahead of the power supply.

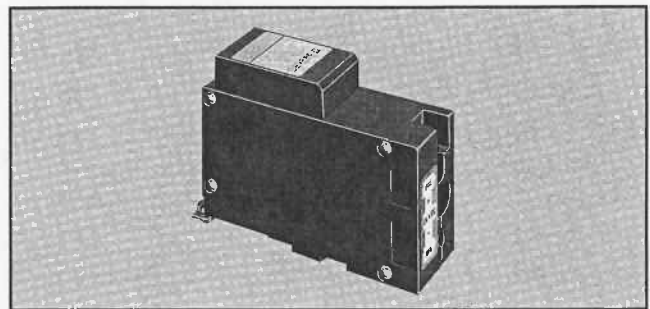
The power supplies include a capacitive discharge circuit requiring two seconds to recharge between switching operations. An electronic protection circuit is incorporated to prevent switching onto a partially charged circuit. If the secondary circuit has been shorted or the secondary voltage drops below 12Vdc, the unit shuts off. When the short is removed or the secondary voltage reaches 22Vdc, the protective circuit turns the unit back on.

Note: The intermittent output of these power supplies makes them unsuitable for use with loads other than POWERLINK circuit breakers.

QO® Power Supply

Use QO power supplies with POWERLINK QO(B)-PL circuit breakers. These plug-on power supplies are UL Listed for use in QO load centers and NQO and NQOD panelboards that meet National Electrical Code (NEC) Paragraphs 373 "wiring space" and 384 "wire bending space" requirements.

Bolt-on power supplies are UL Listed for use in NQOD panelboards that meet the same NEC requirements.



QO Power Supply

Figure 4 shows a diagram of a single QO(B)-PL circuit breaker and power supply connection.

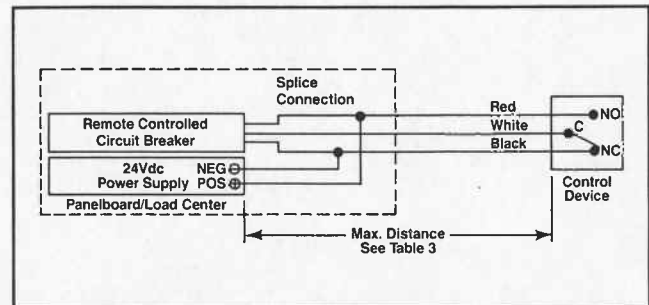


FIGURE 4
QO(B)-PL Circuit Breaker and Power Supply
Connection Wiring Diagram

Figure 4 also shows a control device that can be either a NO (Normally Open) NC (Normally Close) relay, SPDT (Single-Pole, Double-Throw) maintained or momentary switch or other 3-wire control device. In this figure, the QO(B)-PL circuit breaker is remotely switched off when the

NO contact is closed. The maximum lengths for control wires from the control device to the circuit breaker are shown in Table 3.

Circuit Breaker Type	Wire Size (Copper)	Max. Distance in Feet		
		Number of Breakers Operating Simultaneously		
		1	2	3
QO(B)-PL One-Pole	#18 AWG	275	275	225
	#16 AWG	400	400	350
	#14 AWG	650	650	550
QO(B)-PL Two- and Three-Pole	#18 AWG	240	120	100
	#16 AWG	360	180	120
	#14 AWG	600	300	200

TABLE 3
Maximum Control Wire Length

As shown in Table 4 the available system voltage determines the maximum number of QO(B)-PL circuit breakers which can be operated simultaneously.

System Voltage	Max. QO(B)-PL Breakers
176 to 208Vac	2
209 to 240Vac	3

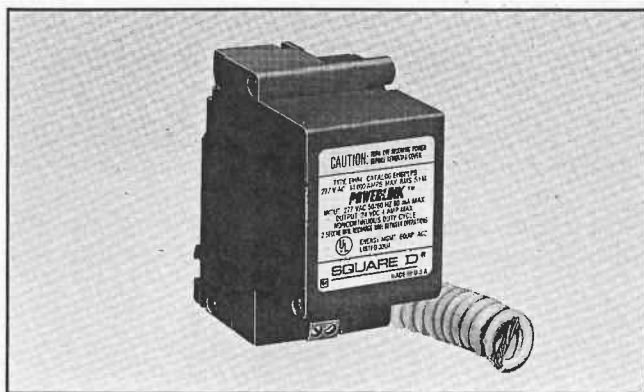
TABLE 4
Maximum Number of QO(B)-PL Circuit Breakers

For non-simultaneous operation, a two-second recharge time is required between operations.

The QO power supply has a 22,000A short circuit withstand rating and accepts #14-#8AWG Al/Cu 60°C/75°C conductors.

EHB Power Supply

The EHB power supply can be used to switch up to three POWERLINK EHB-PL circuit breakers simultaneously. For non-simultaneous operation a two-second recharge time is required between operations. These circuit breakers can be mounted in any Square D NEHB or NEHB-LX panelboard. Because this power supply is powered at 277Vac, a white pigtail on the device must be connected to the panelboard neutral. Figure 5 shows a diagram of a 1-pole EHB-PL circuit breaker connected to an EHB power supply.



EHB Power Supply

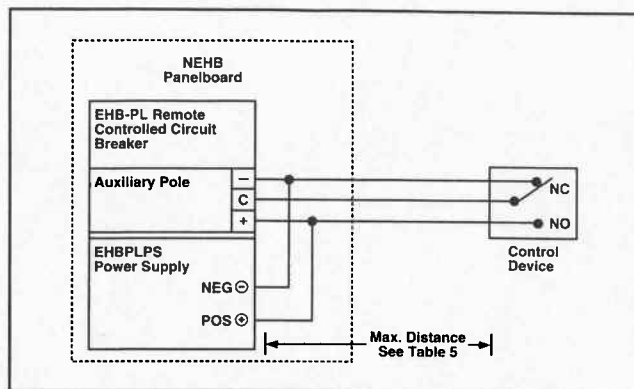


FIGURE 5
EHB-PL Circuit Breaker and Power Supply Connection Wiring Diagram

The control device can be either a NO/NC relay, a SPDT switch or other 3-wire control device. Figure 5 shows the EHB-PL circuit breaker remotely switched off when the NO contact is closed. The maximum lengths of the control wires running from the control device to the circuit breaker are shown in Table 5 below.

Circuit Breaker Type	Wire Size (Copper)	Max. Distance in Feet		
		Number of Breakers Operating Simultaneously		
		1	2	3
EHB-PL One- and Two-Pole	#18 AWG	400	270	180
	#16 AWG	650	400	275
	#14 AWG	1000	625	425
EHB-PL Three-Pole	#18 AWG	240	120	100
	#16 AWG	360	180	120
	#14 AWG	600	300	200

TABLE 5
Maximum Control Wire Length

The EHB power supply has a 14,000A short circuit withstand rating at 277Vac and accepts #18-#14AWG Cu conductors.

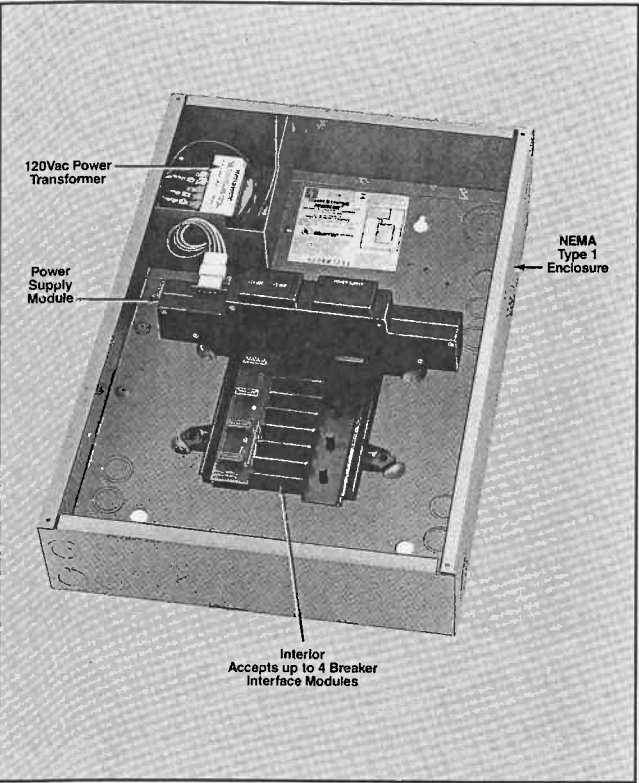
POWERLINK System Network Interface and Breaker Interface Modules

The POWERLINK System Network Interface and Breaker Interface Module, combine to provide both a 24Vdc power source and a convenient interface for controlling up to 64 POWERLINK circuit breakers from external inputs. This system provides an effective alternative to individual panel-mounted power supplies when a large number of circuits are to be controlled. Typical applications include retail, industrial and commercial buildings where several

branch circuits need to be controlled as a group via wall switches, occupancy sensor, photocell or where an energy management system is used.

System Network Interface

The System Network Interface consists of a NEMA Type 1 enclosure, a power supply and an interior for mounting POWERLINK Breaker Interface Modules. Incoming 120Vac power is converted into regulated 24Vdc and 5Vdc power and distributed via a low voltage control bus to the individual Breaker Interface Modules. Up to four Breaker Interface Modules can be mounted in the System Network Interface.

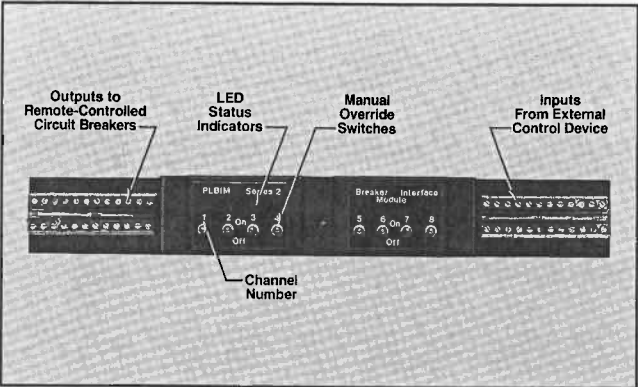


System Network Interface Enclosure, Power Supply Module and Interior

Breaker Interface Module

The POWERLINK Breaker Interface Module as shown below, provides an interface between POWERLINK remote-controlled circuit breakers and external control devices. A contact closure on an input causes the Breaker Interface Module to switch a POWERLINK circuit breaker on or off, depending on the desired state.

Each Breaker Interface Module contains eight inputs and eight associated outputs with each output capable of controlling two POWERLINK circuit breakers, as shown in Table 6. Each input is also provided with an override and status indicator.



Series II Breaker Interface Module

Inputs	Outputs	Breaker Interface Module Maximum Breakers	Maximum Branch Circuits
8	8	16 1-pole 16 2-pole 16 3-pole	16 32 48

Inputs	Outputs	Complete System Network Interface (Four Breaker Interface Modules) Maximum Breakers	Maximum Branch Circuits
32	32	64 1-pole 64 2-pole 64 3-pole	64 128 192

TABLE 6
Maximum Circuit Breakers

A stagger feature is incorporated into each Breaker Interface Module. If multiple inputs are connected together the module will internally sequence each respective output. The time delay between switching outputs is factory preset to 100 ms.

Inputs

The Breaker Interface Module is designed to respond to either 2-wire maintained or 3-wire momentary signals from an external control device. A DIP selector switch located on the rear of the module selects the desired input signal type. Typical external control devices include time clocks, wall switches, photocells, occupancy sensors and building control systems.

When configured for maintained operation (the default setting) the Breaker Interface Module will remotely switch a POWERLINK circuit breaker on when a contact closure occurs, as shown in figure 6a. The breaker will remain in the remote on state until the contact closure is removed. The Breaker Interface Module can also be wired to remotely switch a breaker on when a contact is opened, as shown in figure 6b.

In momentary operation, the Breaker Interface Module will remotely switch the breaker on when a momentary contact closure is detected across its ON/# terminals and off when a momentary contact closure is detected across its OFF/# terminals. Typical external 3-wire momentary control device configurations are illustrated in Figures 6c and 6d. A maintained input can also be used when the Breaker Interface Module is configured for momentary operation. Figure 6e shows the input connection. In this configuration, the breaker will be remotely switched on when a contact closure is made and will remain on until the contact closure is removed.

Note: External voltage must not be applied to the Breaker Interface Module input terminals. A 5V control voltage source is provided within the Breaker Interface Module that eliminates the need for an external control voltage source. Connecting external voltage to the input terminals may damage the Breaker Interface Module.

Master Input On/Off Control

Input number 8 can be configured to operate as an individual input or as a master input in either a maintained or momentary mode. A master input will switch all breakers connected to the module while allowing inputs 1-7 to individually control breakers connected to their respective outputs. For instance, when a master off command is given, all breakers will be remotely switched off. However, individual breakers can be turned on from their associated inputs.

Overrides

The Breaker Interface Module provides individual ON/OFF overrides which may be configured for either **continuous** or **temporary** operation. When the module is configured in the **continuous** override mode (default mode), circuit breakers can be remotely switched to the desired override state via the override switches located on

the face of the module. They will remain in the desired override state regardless of input condition. When the override is manually removed, the breakers will respond to the last input command.

When the module is set for **temporary** operation, circuit breakers can be manually overridden on or off. However, when the Breaker Interface Module detects an input change, it will automatically remove the override and remotely switch the breaker to input command state.

Note: In addition to the overrides located on the Breaker Interface Module, the handle on the POWERLINK circuit breaker can also serve as a continuous override. If the handle is moved to the OFF position or if the circuit breaker has tripped, the circuit breaker contacts will open and remain open regardless of the remote command. When the circuit breaker handle is moved to the ON position or if the breaker is reset and turned on, the breaker contacts will move to the last remote command state.

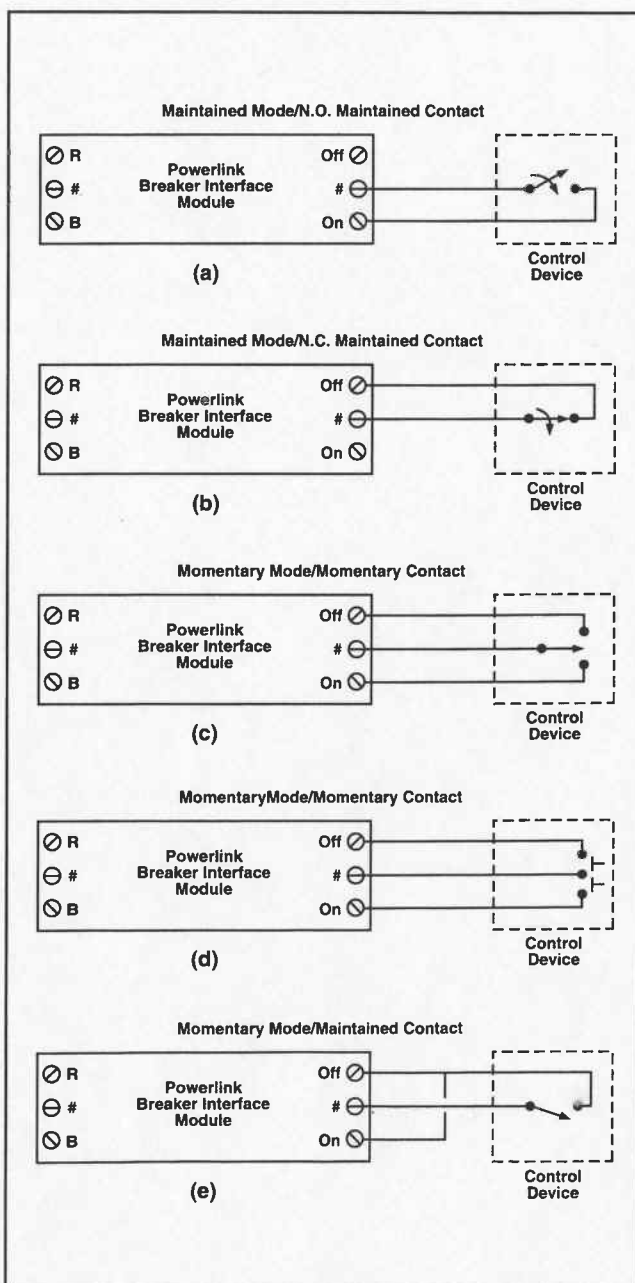


FIGURE 6
External Control Device Wiring

Input Status Indication

The input status is indicated by an LED. The list below shows the corresponding LED indication for each input condition.

- Input has detected an on command—LED on
- Input has detected an off command—LED off
- Breaker has been overridden on—LED on with short off flash
- Breaker has been overridden off—LED off with short on flash

Electrical Connections

Input connections to the POWERLINK Breaker Interface Module from an external control device are made to the terminals on the right end of the module. Output connections to POWERLINK remote-controlled circuit breakers are made to the terminals on the left end of the Breaker Interface Module. Wiring between the external control device and the Breaker Interface Module can be Class 2 wiring when installed in accordance with NEC Article 725. A low voltage control type contact (gold plated or equivalent) or solid state switch is recommended for the external control contact. Maximum wire distance shall not exceed 10,000 ft. using #18 AWG conductors. Wiring between the Breaker Interface Module and the circuit breaker shall be Class 1, installed in accordance with NEC Article 725. Maximum wiring distances are shown in table 7.

Circuit Breaker Type	Wire Size (Copper)	Maximum Length
QO(B)-PL Single Pole	#18 AWG	275 Ft.
	#16 AWG	400 Ft.
	#14 AWG	650 Ft.
EHB-PL Single and Two Pole	#18 AWG	400 Ft.
	#16 AWG	650 Ft.
	#14 AWG	1000 Ft.
QO(B)-PL Two and Three Pole EHB-PL Three Pole	#18 AWG	240 Ft.
	#16 AWG	360 Ft.
	#14 AWG	600 Ft.

TABLE 7
Maximum Wiring Distance Between Circuit Breakers
and Breaker Interface Module

User-Supplied Power Supplies

POWERLINK remote-controlled circuit breakers require a control device capable of delivering at least 2A at 24Vdc for a minimum of 100 ms. These circuit breakers have one internal motor and the power requirements are the same for 1-, 2- and 3-pole circuit breakers regardless of the number of poles and the ampere ratings. The average voltage value of the power supply must be maintained within $\pm 10\%$ of the rated 24Vdc at the circuit breaker. The required power supply ampacity is determined by the number of circuit breakers that switch simultaneously. For example, a panel with four QO(B)-PL circuit breakers being switched simultaneously would require a power supply capable of supplying at least 8A.

Note: Care must be exercised when selecting the control device to ensure it can supply the proper ampacity and voltage.

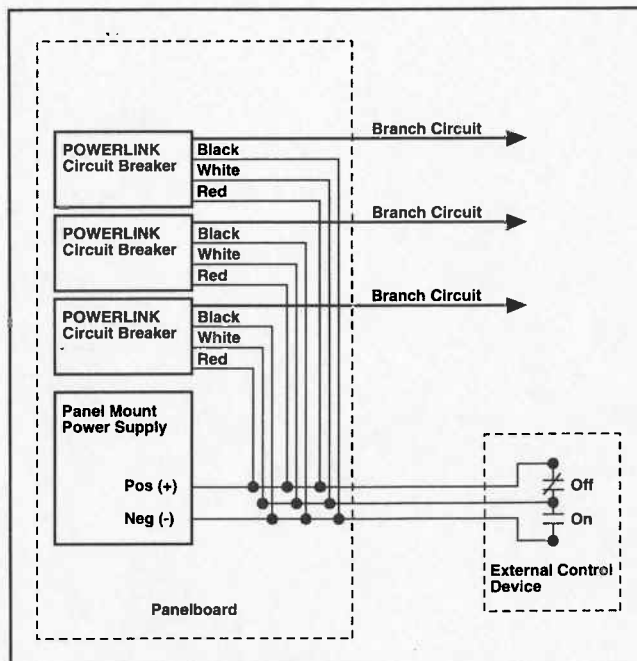
Warning: An undersized power supply may damage the POWERLINK circuit breaker motor.

CHAPTER 4

Wiring Diagrams

Panel Mount Power Supply With One Control Device

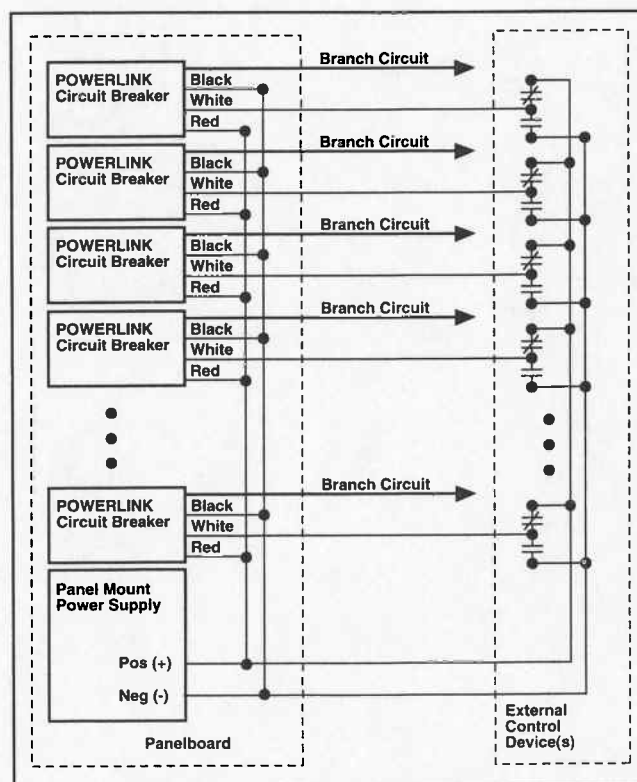
Up to three POWERLINK circuit breakers (refer to Tables 3 and 5 for maximum number of circuit breakers) can be connected to one power supply and switched as a group.



Panel Mount Power Supply
With One Control Device

Panel Mount Power Supply With One Multi-Channel Control Device

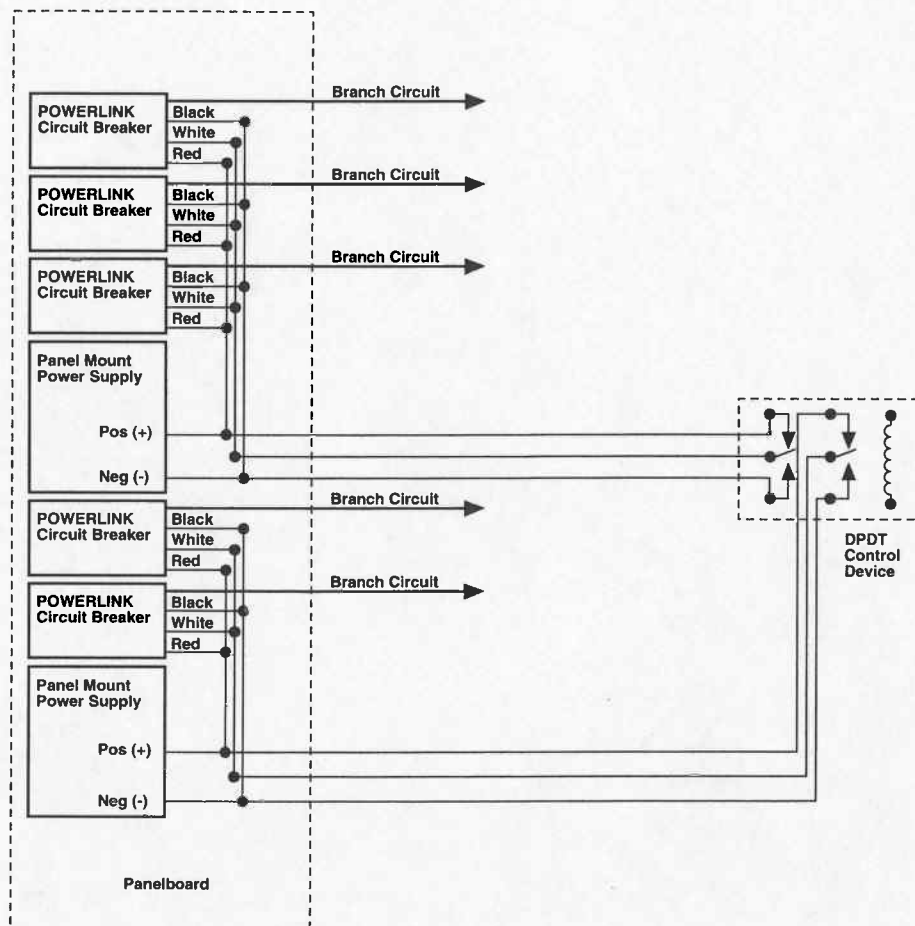
One panel mount power supply can be used to switch up to 42 breakers provided not more than three breakers are switched as a group (see Tables 3 and 5). In the example the control contacts must be interlocked or programmed so that not more than three contacts can be switched at one time while maintaining a two second minimum delay between switching operations.



Panel Mount Power Supply
With One Multi-Channel Control Device

Panel Mount Power Supplies With One Control Device

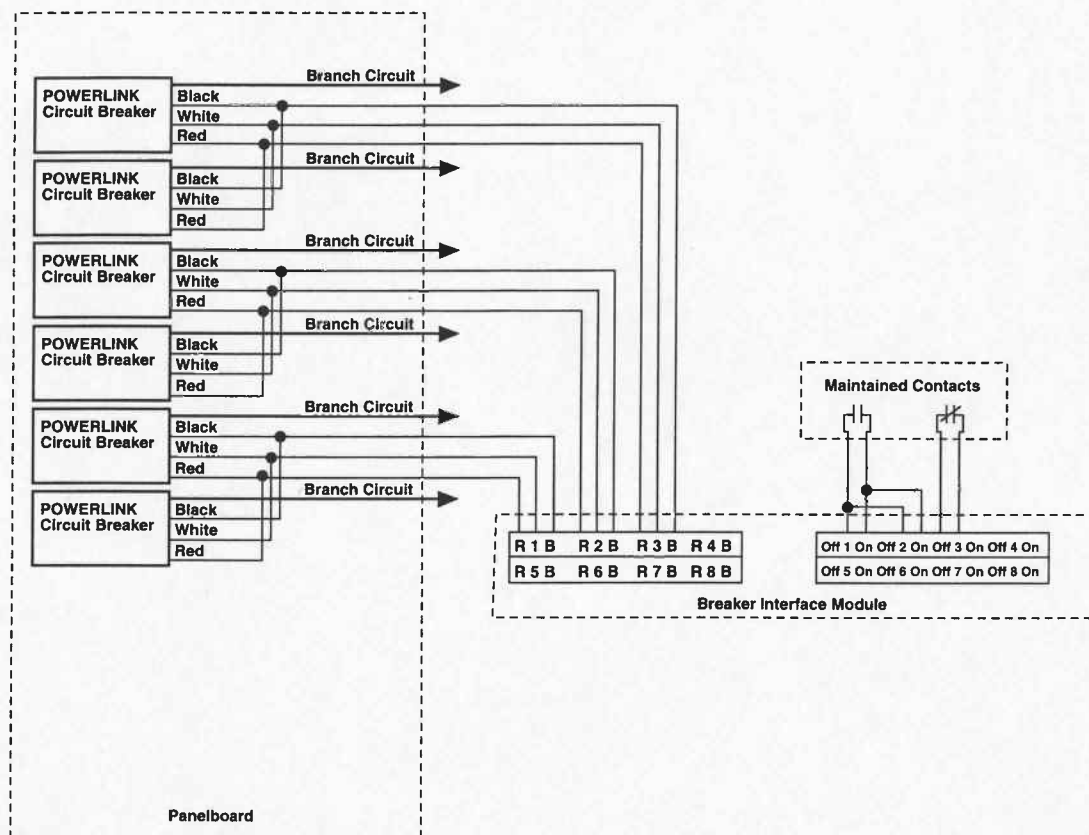
If more than three breakers need to be switched as a group, then multiple power supplies are required. Power supplies must then be isolated via a multi-pole control device or interposing relay.



Panel Mount Power Supplies With One Control Device

Breaker Interface Module Configured for Maintained Inputs

When a contact closure occurs across inputs 1 and 2, the breakers connected to outputs 1 and 2 will be remotely switched on and will remain on until the contact opens. When the contact across input 3 opens, the breakers connected to output 3 will switch off and remain off until the contact is closed.



Breaker Interface Module Configured for Maintained Inputs

Breaker Interface Module Configured for Momentary/ Master Inputs

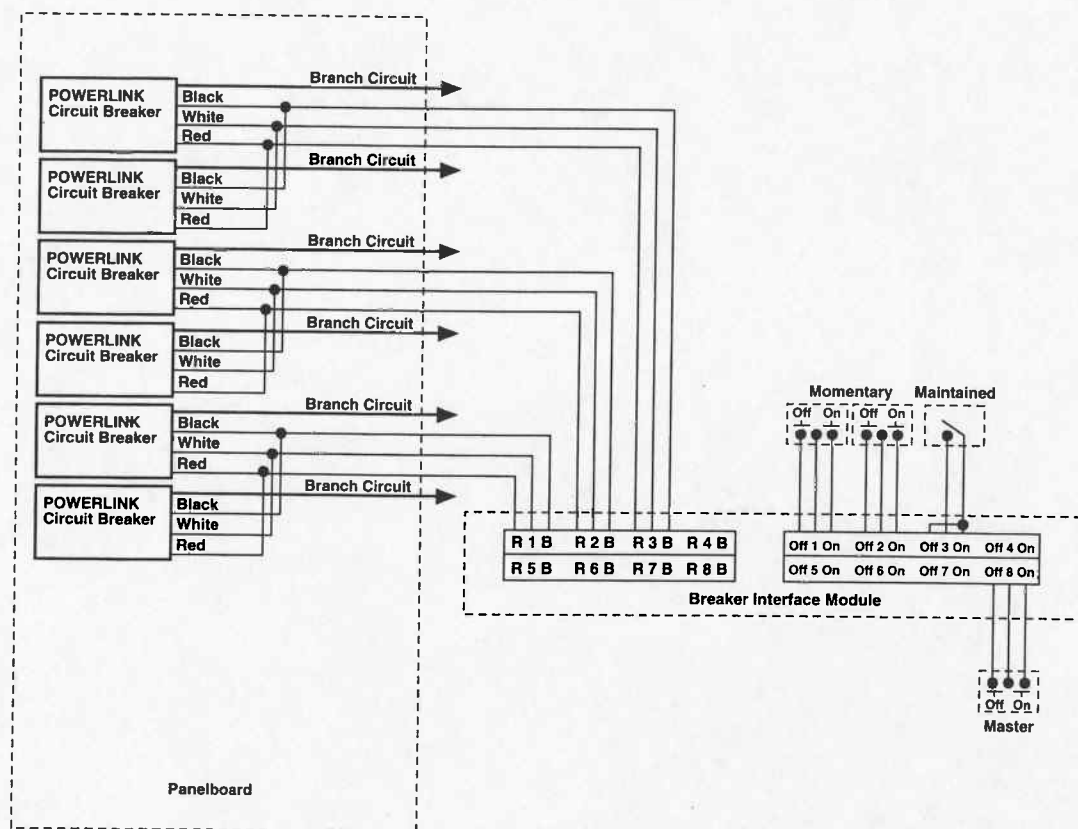
The breakers connected to outputs 1 and 2 can be switched on or off from inputs 1 and 2. Input 3 will switch breakers connected to output 3 on when a contact closure is detected and remain on until the contact is opened. The master input connected to input 8 will switch all breakers on or off regardless of input 1, 2 or 3's status. For instance assume the following condition:

Input Number	Input Status	Breakers Output	Status
1	Open	1	On
2	Open	2	Off
3	Open	3	Off
8	Open		Off

When an on command is received at input 8, all breakers will be switched on.

Input Number	Input Status	Breakers Output	Status
1	Open	1	On
2	Open	2	On
3	Open	3	On
8	Closed		

Breakers can now be switched off as a group by providing an OFF command via master input 8 or by independently pressing the OFF buttons connected to inputs 1 and 2 and switching input 3 on then to off.



Breaker Interface Module Configured for Momentary/Master Inputs

CHAPTER 5

POWERLINK and the National Electrical Code

The POWERLINK remote power switching components meet National Electrical Code (NEC) Article 725 for "Class 1, Class 2 and Class 3 Remote Control, Signalling and Power-Limited Circuits."

POWERLINK Remote-Controlled Circuit Breakers and Power Supplies

Class 1 Power Supplies

The QO and EHB power supplies are Class 1 sources operating at less than 30V and meet the requirements of NEC Section 725-11. They are also provided with internal overcurrent protection per NEC Section 450-3.

Requirements for Class 1 Conductors

NEC Section 725-16 (a) and (b) require that the conductors be a minimum of #18 AWG and have insulation suitable for 600V. Conductors connected to the remote-controlled components must meet these requirements. The QO(B)-PL pigtail which is installed on the circuit breaker consists of three #18 AWG conductors rated 600V, 105°C.

Conductors of Different Circuits in Same Enclosure

The installation of Class 1 conductors and devices in a load center/panelboard is permitted by Section 725-15, which states that "Class 1 circuits shall be permitted to occupy the same enclosure, cable or raceway without regard to whether the individual circuits are alternating current or direct current, provided all conductors are insulated for the maximum voltage of any conductor in the enclosure, cable or raceway. Power supply and Class 1 circuit conductors shall be permitted in the same enclosure, cable or raceway only where the equipment powered is functionally associated."

Conductor Splices Within Wiring Gutters

The exception to NEC Section 373-8 permits splices within the wiring gutter of load centers and panelboards provided that the conductors do not fill the wiring space at any cross section to more than 40% of the cross-sectional area of the space and that the conductors, splices and taps do not fill the wiring space at any cross-section to more than 75% of the cross-sectional area of the space.

POWERLINK System Network Interface and Breaker Interface Modules

Class 1 and Class 2 Sources

The POWERLINK System Network Interface incorporates both Class 1 and Class 2 power sources within its enclosure.

Conductors connected between remote-controlled breakers and the POWERLINK Breaker Interface Module must utilize Class 1 wiring methods (refer to NEC Section 725-16).

Conductors connected to the Breaker Interface Module input terminals may be Class 2.

Class 1/Class 2 in the Same Enclosure

With the introduction of Class 2 circuits within the same enclosure (System Network Interface) as the Class 1 circuits, there are other NEC requirements which must be considered. In the 1990 NEC, Section 725-38 (a)(2) Exception 2 permits the Class 2 conductors to occupy the same enclosure as the Class 1 electric light or power conductors, provided the conductors are routed to maintain at least 1/4" of separation between them. This exception permits both the Class 1 and Class 2 conductors to occupy the same compartment within the POWERLINK System Network Interface enclosure. Wire positioning devices are provided with the System Network Interface to aid in maintaining the required separation.

For areas where previous versions of the NEC are being used, a partition kit (PLPK4) is available to separate the POWERLINK enclosure into Class 1 and Class 2 compartments. Section 725-38 (2) Exception 1 permits this partition as a means of separating the conductors.

APPENDIX A

Suggested Specifications

QO®(B)-PL Remote-Controlled Circuit Breakers

1. Circuit breakers shall be Square D QO(B)-PL remote-controlled circuit breakers.
2. Remote-Controlled Circuit Breakers
 - a. Circuit breakers shall be UL Listed and rated 120/240Vac (1- and 2-pole) and 240Vac (3-pole) with continuous current ratings as shown on the plans.
 - b. Circuit breakers shall have an overcenter, trip-free, toggle type, quick-make/quick-break mechanical action and positive handle indication. Handle shall have on, off, and tripped positions. In addition, trip indication shall include a trip indicator on the face of the breaker case.
 - c. Multi-pole breakers shall have internal crossbars for common trip operation.
 - d. Circuit breaker contacts shall be open when breaker is in the OFF or "tripped" position regardless of remote signal.
 - e. Interrupting capacity shall be 10,000 rms symmetrical amperes.
 - f. All 15A and 20A breakers shall be SWD rated.
 - g. Multipole circuit breakers rated 15-60A shall be UL Listed for HACR applications.
 - h. All circuit breakers shall have contacts suitable for use on HID lighting systems.
 - i. Circuit breakers shall be marked "Remote Controlled" in such a way that the marking is visible with the trim installed.
 - j. Circuit breakers shall have terminals suitable for use with Al/Cu 75°C wire.
 - k. Circuit breakers shall be capable of operating for 30,000 operations at rated voltage and current with an 80% lagging power factor.
 - l. Remote-control shall be accomplished via a 24Vdc high speed motor with clearing switch that clears the motor circuit upon circuit breaker contact opening or closing.
 - m. Motor shall operate no more than 50 milliseconds at rated voltage (24Vdc) $\pm 10\%$ and draw no more than 2A instantaneous. Maintaining the control signal shall have no adverse effect on the breaker.

3. Enclosures

- a. Enclosures shall be either QO load centers, NQOD, NQO or NQOB panelboards rated for use on 240Vac maximum systems.

EHB-PL Remote-Controlled Circuit Breakers

1. Circuit breakers shall be Square D EHB-PL remote-controlled circuit breakers.
2. Remote-Controlled Circuit Breakers
 - a. Circuit breakers shall be UL Listed and rated 277Vac (1-pole) and 480Y/277Vac (2- and 3-pole) with continuous current ratings as shown on the plans.
 - b. Circuit breakers shall have an overcenter, trip-free, toggle type, quick-make/quick-break mechanical action and positive handle indication. Handle shall have on, off, and tripped positions. In addition, trip indication shall include a trip indicator on the face of the breaker case.
 - c. Multi-pole breakers shall have internal crossbars for common trip operation.
 - d. Circuit breaker contacts shall be open when breaker is in the OFF or "tripped" position regardless of remote signal.
 - e. Interrupting capacity shall be 14,000 rms symmetrical at 277Vac (1-pole) and 480Y/277Vac (2- and 3-pole). For 1-pole 120Vac, 2-pole 120/240Vac, and 3-pole 240Vac, the interrupting capacity shall be 65,000 rms symmetrical.
 - f. All 15A and 20A breakers shall be SWD rated.
 - g. Circuit breakers rated 15-30A shall be suitable for use on HID lighting systems.
 - h. Circuit breakers shall be marked "Remote Controlled" in such a way that the marking is visible with the trim installed.
 - i. Breaker shall be capable of operating for 100,000 operations at rated voltage and current with an 80% lagging power factor.
 - j. Remote-control shall be accomplished via a 24Vdc high speed motor with clearing switch that clears the motor circuit upon circuit breaker contact opening or closing.

- k. Motor shall operate no more than 100 milliseconds at rated voltage (24Vdc) $\pm 10\%$ and draw no more than 2A instantaneous. Maintaining the control signal shall have no adverse effect on the breaker.
 - l. A motor status LED shall be visible to indicate the motor has been signalled to close the breaker contacts.
3. Enclosures
- a. Enclosures shall be either on NEHB or NEHB-LX panelboards rated for use on 480Y/277Vac maximum system.

QO(B)PLPS Panel Mount Power Supplies

1. Panel mount power supplies shall be Square D type QO(B)PLPS.
2. Power Supplies
 - a. Power supplies shall be UL Listed as an energy management accessory device and rated for use on 240Vac maximum systems.
 - b. Power supplies shall be plug-on or bolt-on and mount in any two adjacent breaker pole spaces.
 - c. Short circuit withstand rating shall be 22,000 rms symmetrical amperes.
 - d. Control wire terminals shall be capable of accepting #14-#8AWG copper/aluminum wires.
 - e. Power supply shall be capable of delivering 24Vdc to drive up to two QO(B)-PL circuit breakers simultaneously when applied on a system with 176-208Vac line to line and up to three QO(B)-PL circuit breakers simultaneously when applied on systems with 209-264Vac line to line.
 - f. Power supplies shall be suitable for operation in ambient temperatures from -5°C to 40°C .
3. Enclosures
 - a. Enclosures shall be either a NQOD, NQO, NQOB panelboard or type QO load center (plug-on only) rated for use on 240Vac maximum systems.

EHBPLPS Panel Mount Power Supplies

1. Panel mount power supplies shall be Square D type EHBPLPS.
2. Power Supplies
 - a. Power supply shall be UL Listed as an energy management accessory device and rated for use on 480Y/277Vac systems.
 - b. Power supplies shall be bolt-on type and mount in any two adjacent breaker pole spaces.
 - c. Short circuit withstand rating shall be 14,000 rms symmetrical amperes.
 - d. Control wire terminals shall be capable of accepting #18-#14AWG copper wires.

- e. Power supply shall be capable of delivering 24Vdc to drive up to three EHB-PL circuit breakers simultaneously.
 - f. Power supplies shall be suitable for operation in ambient temperatures from -5°C to 40°C .
3. Enclosures
- a. Enclosures shall be either on NEHB or NEHB-LX panelboard rated for use on 480Y/277Vac systems.

System Network Interface and Breaker Interface Modules

1. Components shall be Square D System Network Interface and Breaker Interface Modules.
2. System Network Interface
 - a. System Network Interface shall consist of an enclosure, interior, and power supply.
 - b. Enclosure shall be NEMA Type 1.
 - c. System Network Interface shall be UL Listed and meet NEC Article 725 requirements.
 - d. Transformer shall have input power requirements of 120Vac.
 - e. System shall be suitable for controlling up to 64 POWERLINK remote-controlled circuit breakers.
 - f. System Network Interface shall accept one to four Breaker Interface Modules.
3. Breaker Interface Modules
 - a. Breaker Interface Modules shall be furnished with eight inputs and eight outputs. Each output shall be capable of controlling one or two POWERLINK remote-controlled circuit breakers.
 - b. Breaker Interface Modules shall have output terminals suitable for #18-#14 AWG copper Class 1 control wires. Terminal shall include 3-wire terminations (red, black, channel #) per channel and have eight channels per Breaker Interface Module.
 - c. Breaker Interface Module shall have input terminals suitable for #22-#14 AWG copper Class 2 control wires for connection to external control device. Breaker Interface Module shall be capable of accepting either 2-wire maintained or 3-wire momentary inputs.
 - d. Breaker Interface Module shall provide eight LED status indicators (one for each channel) that show status of each remote-control input.
 - e. Breaker Interface Module shall provide a selectable master input for each Breaker Interface Module.
 - f. Provide ON/OFF override switches for each circuit breaker channel which can be configured for continuous or temporary operation.
 - g. Breaker Interface Module shall internally sequence circuit breakers signalled to switch simultaneously.

APPENDIX B

Ordering Information for POWERLINK System Components

POWERLINK components can be ordered using the catalog numbers listed in the tables below.

Circuit Breaker Ordering Information

QO(B)-PL POWERLINK REMOTE CONTROLLED CIRCUIT BREAKERS
With Remote Switching and VISI-TRIP® Indicator — Requires 24Vdc control source.
Suitable for use on high intensity discharge (HID) lighting.

Ampere Rating	One-Pole 120/240Vac - 10,000 AIC		Two-Pole 120/240Vac - 10,000 AIC		Three-Pole 240Vac - 10,000 AIC		Wire Size (AWG)
	Plug-on Catalog No.	Bolt-on Catalog No.	Plug-on Catalog No.	Bolt-on Catalog No.	Plug-on Catalog No.	Bolt-on Catalog No.	
10	QO110PL	QOB110PL	QO210PL	QOB210PL			All Lugs UL Listed For #14-#2 Al/Cu
15	QO115PL★	QOB115PL★	QO215PL★	QOB215PL★	QO315PL★	QOB315PL★	
20	QO120PL★	QOB120PL★	QO220PL★	QOB220PL★	QO320PL★	QOB320PL★	
25			QO225PL	QOB225PL	QO325PL	QOB325PL	
30	QO130PL	QOB130PL	QO230PL	QOB230PL	QO330PL	QOB330PL	
35			QO235PL	QOB235PL	QO335PL	QOB335PL	
40			QO240PL	QOB240PL	QO340PL	QOB340PL	
45			QO245PL	QOB245PL	QO345PL	QOB345PL	
50			QO250PL	QOB250PL	QO350PL	QOB350PL	
60			QO260PL	QOB260PL	QO360PL	QOB360PL	

★ UL Listed as switching duty (SWD) rated. Suitable for switching 120Vac fluorescent lighting loads.

EHB-PL POWERLINK CIRCUIT BREAKERS
With Remote Switching and VISI-TRIP Indicator — Requires 24Vdc control source.

Ampere Rating	One-Pole Two Spaces Required	Two-Pole Three Spaces Required	Three-Pole Four Spaces Required	Wire Size (AWG)
	277Vac - 14,000 AIC 120Vac - 65,000 AIC	480Y/277Vac - 14,000 AIC 120/240Vac - 65,000 AIC	480Y/277Vac - 14,000 AIC 240Vac - 65,000 AIC	
	Catalog No.	Catalog No.	Catalog No.	
15	EHB14015PL★■	EHB24015PL★■	EHB34015PL★■	(2)#14-#10 CU
20	EHB14020PL★■	EHB24020PL★■	EHB34020PL★■	(2)#14-#10 CU
25	EHB14025PL■	EHB24025PL■	EHB34025PL■	#14-#8 AL/CU
30	EHB14030PL■	EHB24030PL■	EHB34030PL■	#14-#8 AL/CU
40		EHB24040PL	EHB34040PL	#14-#2 AL/CU
50		EHB24050PL	EHB34050PL	#14-#2 AL/CU
60		EHB24060PL	EHB34060PL	#14-#2 AL/CU

★ UL Listed as switching duty (SWD) rated. Suitable for switching fluorescent lighting loads.

■ Suitable for use on high intensity discharge (HID) lighting.

Power Supply Ordering Information

24Vdc POWER SUPPLY For QO/QOB-PL Breakers. Requires 240Vac Input.

Plug-on — Catalog Number	Bolt-on — Catalog Number
QOPLPS	QOBPLPS

Terminal wire range #14-#8AWG AL/CU. Requires two mounting spaces. 22,000A withstand rating.

24Vdc POWER SUPPLY For EHB-PL Breakers. Requires 277Vac Input.

Bolt-on — Catalog Number
EHBPLPS

Terminal wire range #18-#14AWG CU. Requires two mounting spaces. 14,000A withstand rating.

POWERLINK System Network Interface and Breaker Interface Modules

Catalog Number	Component Description
PLSNI120-4▲	System Network Interface - Includes enclosure, transformer, power supply module and interior.
PLC4F	Flush Cover for PLSNI120-4
PLC4S	Surface Cover for PLSNI120-4
PLBIM	Breaker Interface Module 8 inputs / 8 outputs.
PLPK4◆	Partition kit to provide separation of wiring within PLSNI120-4.

▲ PLSNI120-4 will accept up to 4 PLBIM Breaker Interface Modules.
◆ Use PLPK4 where required. See Article 725 of the National Electrical Code.

Note: Individual power supplies not required in systems using the POWERLINK System Network Interface.

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