

POWERLINK[®] AS

Lighting Control System Catalog

Class 1210



SQUARE D
GRUPE SCHNEIDER

Table of Contents

- Lighting Control System
 - Introduction Page 4
- POWERLINK AS Systems
 - Overview Page 5
 - Soft Split System Page 6
 - LV Switching System Page 6
 - Time Clock System Page 6
 - System Components (exploded & applied views) Page 8
- Electronic Components
 - QO(B)-AS and EHB-AS Circuit Breakers Page 9
 - Control Bus Strips Page 15
 - Power Interface Module Page 17
 - Class 2 Barrier Kit Page 19
 - Control Modules Page 20
- Panelboards
 - General Information Page 27
 - Series Ratings Page 28
 - Dimensions Page 29
- Accessories
 - Desktop Power Supply Page 35
 - Input Expansion Cabinet Page 36
- Network Options
 - General Information Page 38
 - LonWorks Gateway Page 39
- Software
 - Overview Page 40
 - Features (PLK/CMS) Page 41
- Power Management Services Page 42
- Compliance Certification
 - Codes and Standards Page 43
 - Year 2000 Compliance Page 44
- Suggested Specifications Page 45



Lighting Control System Introduction

POWERLINK AS systems provide the easiest means possible of adding automatic control of electrical power—for lighting control and other applications—to new or existing buildings.

Controlling electrical loads—turning them off during unoccupied periods—conserves energy, saves money, and helps the environment. This is not only cost effective, but is often required by federal and state laws in new or renovated buildings.

POWERLINK AS systems use innovative circuit breaker technology, and fit into conventional panelboard enclosures. Because no additional enclosures are needed and existing conduits remain undisturbed, POWERLINK AS systems are easily retrofitted into existing facilities and typically have a lower installed cost than conventional contactor or relay-based solutions.

The POWERLINK AS lighting control system combines remote switching capabilities and thermal-magnetic overcurrent protection in standard Square D NQOD and NEHB panelboards.

The POWERLINK AS system offers the capability to control lighting and other loads to preset time schedules or from external control devices such as wall switches, occupancy sensors, or building management systems. POWERLINK panelboards can also be networked together, set up, and monitored from a remote location.

Standard components of the POWERLINK AS system include remotely operated circuit breakers, control bus strips, a power interface module, and Class 2 barrier kit. Optional network and display components include a control module with an internal time clock, Windows®-based software for remote setup and monitoring, and various components for remote communications.

The POWERLINK AS system features modular “plug and play” component construction that simplifies design, specifications, and installation. It minimizes wiring and wiring errors, thereby reducing installation time and costs, while enhancing reliability and offering expanded functionality.

The modular design also eliminates the need for separate interface cabinets, interposing relays, external control voltage circuits, external time clocks, or contactor devices typically associated with lighting control systems. This is made possible by the integration of remote power switching capability, thermal-magnetic circuit breakers, an internal power supply, communications, an optional internal time clock, and control functions in a single panelboard.

The POWERLINK AS system can be configured to meet specific needs for remote power switching and branch circuit overcurrent protection. This makes it ideal for a variety of energy and load management applications.

It allows building owners, operators, and plant managers to efficiently manage lighting, as well as many other types of electrical loads, including:

- Displays
- Interior/exterior signage
- Water heaters
- Water coolers
- HVAC units
- Electric strip heaters
- Exhaust fans
- Power drops
- Appliances
- Audio/video equipment

Square D has the right lighting control solution, from simple to the sophisticated lighting control applications. Where flexibility and maximum energy savings are important, the POWERLINK AS system is the answer.



POWERLINK AS Panelboard



POWERLINK AS Systems Overview

Saving Time and Money

POWERLINK AS systems are substantially less expensive to design and install compared to traditional relay or contactor technology. Design and layout of the POWERLINK AS system are as simple as those of any other panelboard.

The POWERLINK AS system can do many things that contactors cannot do, even with elaborate control wiring and auxiliary components.

POWERLINK AS capabilities include:

- Independent branch circuit control is easy to set and change through software settings.
- 42-channel time clock with seven-day repeating schedule and 365-day calendar, including 32 holiday periods, daylight savings adjustment, and astronomical sunrise/sunset capabilities. In short, a full-featured time clock at a very low price.
- Automatic time off sweeps—very effective for saving energy.
- Central monitoring and control provided by the communications network, which can be industry standard RS-485 or LONWORKS[®], or both.
- Blink notice—lets you know when lights are about to turn off.
- Low voltage Class 2 wiring used for switch inputs—usually does not require conduit and is easy to move.
- Easy to change inputs and timed event schedules—a plus for retailers and commercial facilities that frequently change their facility layouts. Reconfiguration is done in minutes, rather than by time-consuming rewiring.
- Set up either at the front panel or remotely over the RS-485 network.
- Advanced system features, such as telephone override and master switch override and configured input timers. Features like these are difficult and expensive to hard-wire with contactors.
- Downloadable firmware for new features.



The modular components of the POWERLINK AS system simply plug into Square D panelboards for ease of installation and operation. There are no wiring harnesses or pigtails. Branch circuit conductors do not have to be routed through other enclosures.

POWERLINK AS Systems Overview

Soft-Split System (no control module)

- ❑ Factory pre-configured—No field setup is required
- ❑ External devices control up to three pre-configured zones and 42 circuits
- ❑ All breakers in the zone will be controlled by the pre-mapped input
- ❑ Master input controls all switched circuits
- ❑ Functionality of a split bus panelboard or contactor system—but “soft” splits can be changed with a control module
- ❑ External control wiring connects in power interface module
- ❑ Standard circuit breakers can be intermixed with remotely operated breakers

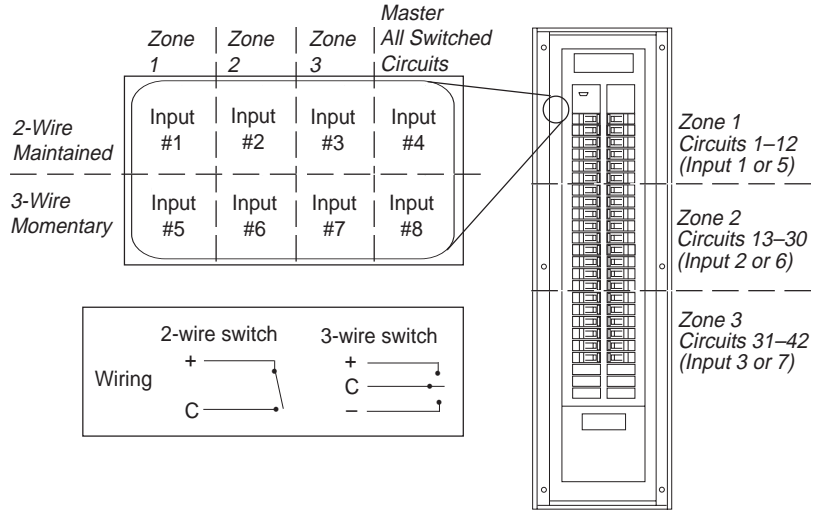


Figure 1—Soft-Split System

Low Voltage Matrix Switching System (simple-input based control)

- ❑ All POWERLINK AS systems can perform low voltage matrix switching
- ❑ Each system supports up to 16 low voltage inputs, expandable to 64 inputs
- ❑ Mapping of inputs to switch specific branch circuits is performed using a control module
- ❑ Any circuit can be logically connected (mapped) to any input
- ❑ Easy setup with graphic control module—reconfiguring to accommodate facility changes is easy and involves no rewiring
- ❑ After programming, the control module can be removed, and the POWERLINK AS systems will continue to switch circuits from input connections

Table 1 Sample Control Map

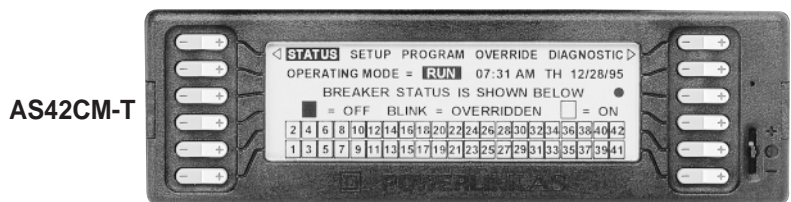
External Inputs	Control Circuits							
	1	2	3	4	5	10...18	19...42	
1	On	On		On		On	On	
2							On	
3			On				On	
4					On			
5	Off	Off	Off	Off	Off	Off	Off	

Time Clock System using control module

- ❑ Same features as low voltage matrix switching
- ❑ Individual schedules for each circuit or zone
- ❑ 7-day repeating schedules
- ❑ Special holiday schedules
- ❑ 365-day calendar
- ❑ Configure up to 256 events
- ❑ Sunrise/sunset astronomical clock eliminates the need for photocells
- ❑ Blink notice
- ❑ Daylight savings time
- ❑ Access codes for security
- ❑ Breaker status shown on graphic display



AS42C-T



AS42CM-T

Standard control module (top) and graphic display control module



POWERLINK AS Systems Overview

POWERLINK AS systems support a wide variety of network options to allow remote communications with the POWERLINK panel either via a workstation or from a third-party building automation system.

Network Topology and Compatibility

Network options for the POWERLINK AS system are as follows:

RS-485

- An optional RS-485 network communications port for integration into a power monitoring and control system.
- Up to 32 panelboards can be connected on a multi-drop network directly to a personal computer via an RS-232/485 port.
- To optimize system performance with multi-drop networks, the POWERLINK AS system can communicate over the Square D SY/NET network. This network supports communications speeds up to 500K Baud, distances up to 15,000 feet, and practically limitless device connections.

LonWorks

- Takes advantage of the latest industry standard technology to provide high-speed, peer-to-peer communications.
- Allows the POWERLINK AS system to operate on the same network as other devices supporting the LonWorks protocol.
- POWERLINK AS panelboards are fully LonMark compliant.
- Adds capabilities to the POWERLINK AS system, such as the ability to create global zones or shared inputs.
- Provides vast flexibility in configuring unique control solutions. Examples include the following:
 - An input switch in one panel can control circuit breakers in any panel on the network.
 - A time-of-day control module in one panel can control circuit breakers in many panels.
 - Third party I/O and software can interface directly with POWERLINK AS inputs and breakers.

Ethernet

- Allows the POWERLINK AS system to communicate on new or existing networks
- Provides high speed, high bandwidth communication

Powerful Software Solutions

Square D offers a full line of simple to advanced, system-wide WINDOWS[®]-based software packages. POWERLINK AS application software automatically integrates real-time panelboard and system information into organized and usable formats.

Application Engineering Services

The Square D Power Management Operation Engineering Services Group provides a complete range of commercial and industrial facility design and engineering services.

Table 2
POWERLINK AS Systems — Components

POWERLINK System Types	Components			
	Control Bus Strips	Power Interface Module	Class 2 Barrier Kit	Graphical Control Module with Clock
Soft-Split System	X	X	X	
LV Matrix Switching System	X	X	X	X*
Time Clock System	X	X	X	X

* Only one graphical control module is required to program all panelboards on the job site.

POWERLINK AS Systems Overview

Exploded View

The diagram to the right shows an exploded view of the POWERLINK AS system. The system components feature several advantages over components of conventional systems:

- Modular design
- Simple and quick installation
- All components snap into place (plug and play)
- No wiring harnesses or pigtails

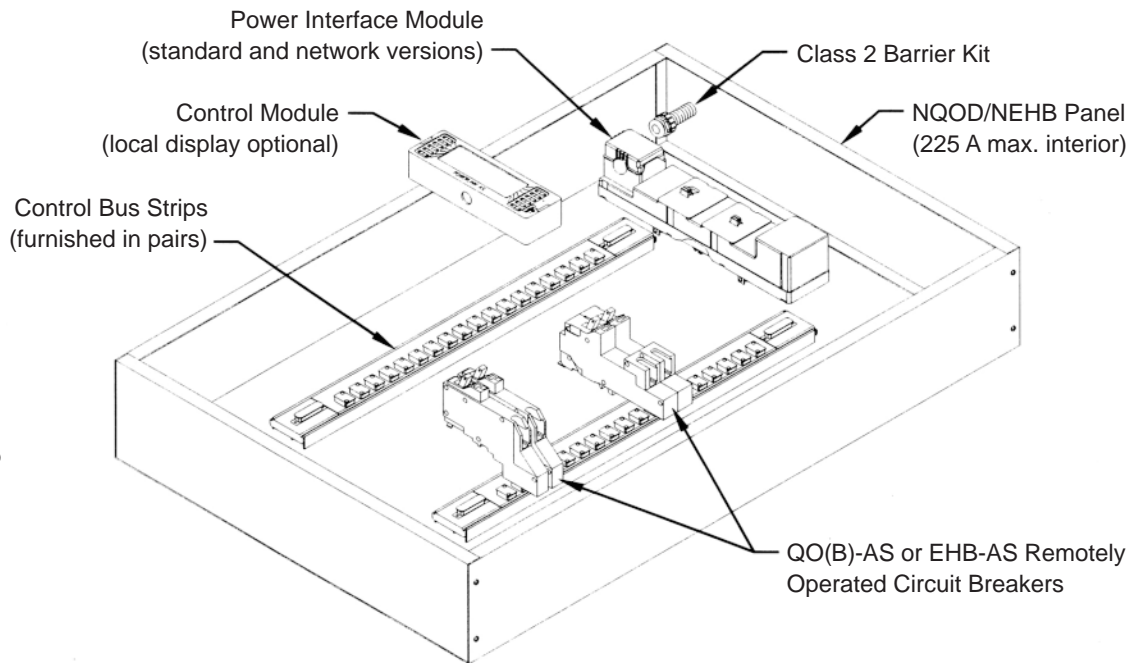


Figure 2—POWERLINK AS System (Exploded View of Components)

Complete System

The photo to the right shows a complete NQOD panelboard system.

POWERLINK AS systems use standard NQOD and NEHB panelboards as foundations. All enclosures, interiors, deadfronts, and accessories are standard off-the-shelf items.

The POWERLINK AS system components are discussed in detail in the following sections.

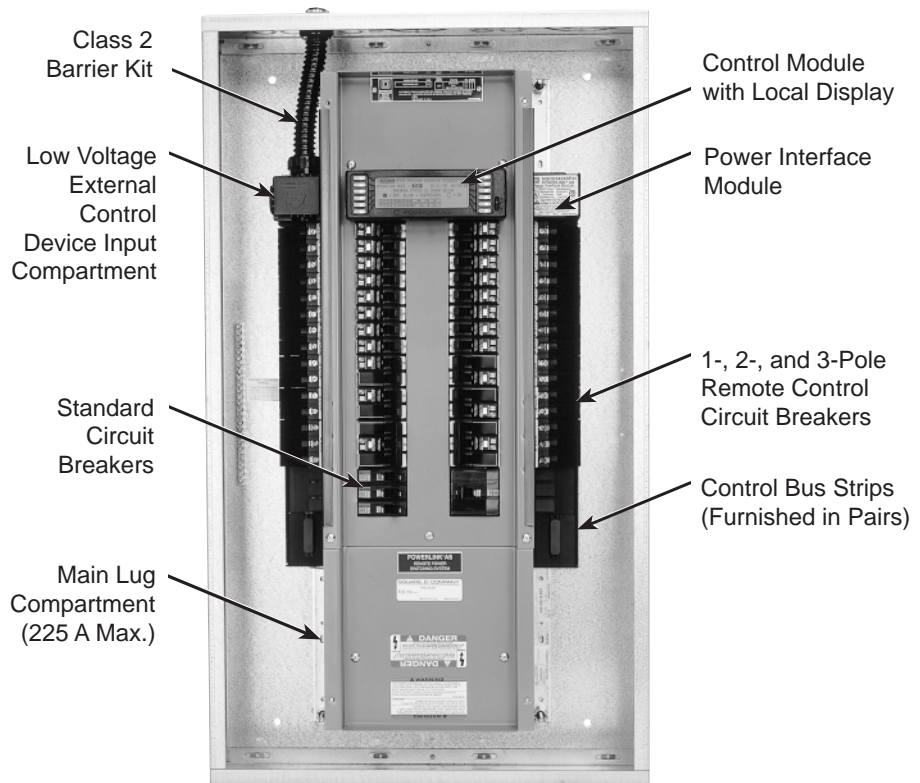
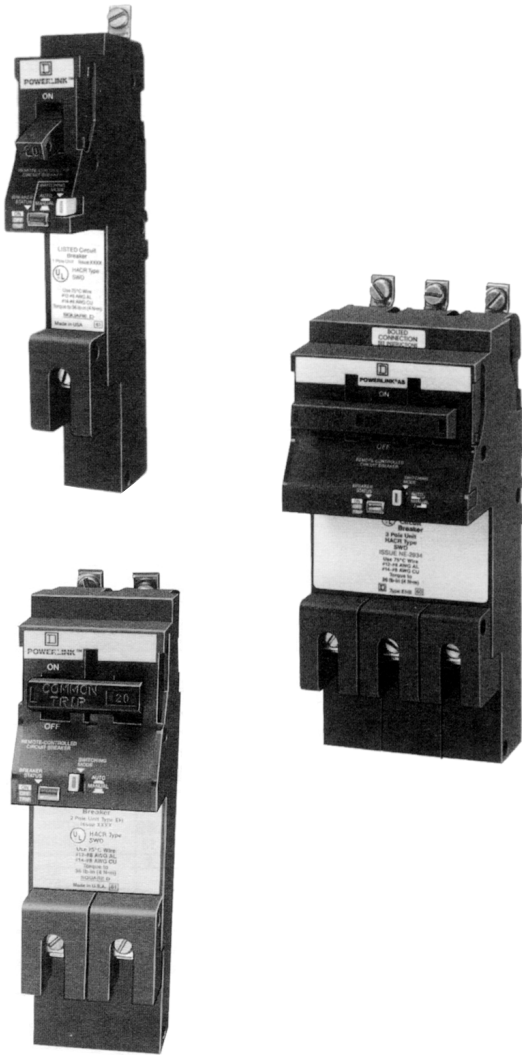


Figure 3—POWERLINK AS Components in Assembled NQOD Panelboard



Electronic Components

Remotely Operated Circuit Breakers



EHB-AS Circuit Breakers

POWERLINK AS circuit breakers are an integral part of the POWERLINK lighting control system.

These compact devices perform both overcurrent protection and remote switching functions. Circuit breakers feature rugged contacts rated for 200,000 load operations and can be series rated for use with systems capable of providing 200,000 rms symmetrical fault current.

Features

- **Overcurrent protection.** POWERLINK AS circuit breakers provide the same overload and short circuit protection as standard QO(B) and EHB circuit breakers.
- **High interrupting.** Series connected ratings up to 200,000 rms symmetrical amperes with integral or remote mounted main breakers.
- **Multi-pole switching.** Single-, two-, and three-pole circuits can be switched.
- **Position indication.** An integral *on/off/trip* status flag indicates the actual state of breaker contacts.
- **Up to 30 amperes.** 15, 20, and 30 ampere ratings are available.
- **Rugged contacts.** POWERLINK AS circuit breakers can handle the high loads found in buildings today. They are rated for full life with inductive loads (0.8 power factor). They are also rated for HACR (heating, air conditioning, and refrigeration) service, as well as HID (high intensity discharge) lighting loads.
- **Switch duty rated.** 15 A and 20 A circuit breakers are SWD (switch duty) rated for use with 120 V fluorescent lighting loads.
- **Long life.** At 200,000 electrical load operations, they last up to *six times longer than* other common power switching devices.
- **Manual override.** Each circuit breaker has a mechanical override that has priority over remote operation. The circuit can be turned *off* or *on* in a crisis.
- **Plug and play control connector.** Wiring mistakes are eliminated by modular connectors. There is no exposed wiring.

Principles of Operation

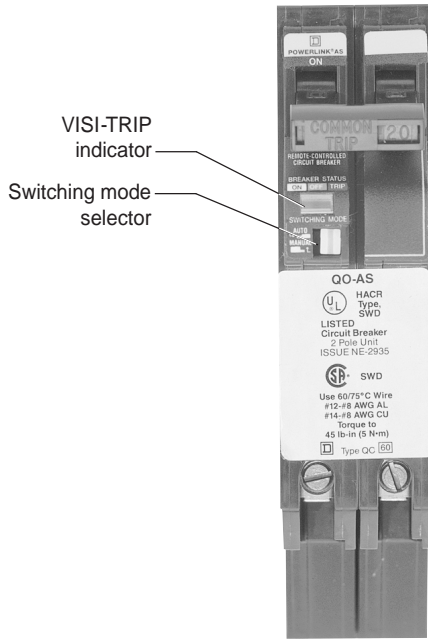
The core of a POWERLINK AS circuit breaker is the highly effective Square D trip mechanism. A 24 Vdc motor, along with a drive train and linkage, provides remote operation capability. This motor is located in the left pole of the 2-pole circuit breaker and the center pole of the 3-pole circuit breaker.

When the circuit breaker handle is in the *on* position, the motor and drive train can open and close the contacts. When the handle is in the *off* position or the circuit breaker is tripped, the contacts cannot be closed remotely.

The auto/manual switching mode selector on the front of the circuit breaker provides mechanical override capability. In manual mode, the motor drive train is disconnected from the contacts. The circuit breaker handle then operates the contacts like a conventional circuit breaker.

A sensing device determines the presence or absence of voltage on the loadside terminal, and reports circuit breaker contact position back to the control system. Thus, a true-positive-closed-loop feedback of actual contact status is achieved.

Electronic Components Remotely Operated Circuit Breakers



QO(B)-AS Circuit Breaker

General

POWERLINK AS remotely operated, thermal-magnetic circuit breakers (hereafter referred to as POWERLINK AS circuit breakers) are designed to provide remote switching and overcurrent protection on ac voltage systems. They are available in 1-, 2-, and 3-pole construction. The 2- and 3-pole circuit breakers are common trip. An overcurrent condition on any given pole of the circuit breaker will cause all poles of the circuit breaker to open.

POWERLINK AS circuit breakers are UL Listed and CSA Certified. They are manufactured and tested according to the following standards:

- UL Standard 489
- NEMA Standard AB-1-1986
- Canadian Standards Association (CSA) Standard 22.5 (QO(B) only)
- Federal Specification W-C-375B/GEN, Class 11a, 11b; 12a, 12b; and 13a, 13b
- NOM 117 (pending final testing)

Tripping System

POWERLINK AS circuit breakers have a permanent trip unit that contains a factory preset thermal (overload) trip element and a magnetic (short circuit) trip element in each pole. The thermal trip element is true rms sensing and is calibrated to carry the continuous current rating of the breaker at 40°C (140°F) free air ambient temperature. In accordance with the National Electrical Code, POWERLINK AS circuit breakers are intended to be applied at up to 80 percent of their continuous current rating.

Operating Mechanism

POWERLINK AS circuit breakers have an over-center toggle mechanism that provides quick-make, quick-break operation and Square D's unique VISI-TRIP® circuit breaker trip indicator. The operating mechanism is trip-free. This means the circuit breaker will trip even though the operating handle may be restricted to the ON position. Without any restrictions, the operating handle moves to a position between ON and OFF when the circuit breaker is tripped. An internal cross-bar provides common tripping of all poles on 2- and 3-pole POWERLINK AS circuit breakers.

Circuit Breaker Status Indicator with VISI-TRIP

POWERLINK AS circuit breakers are equipped with Square D's unique VISI-TRIP circuit breaker trip indicator. The indicator window displays one of three colors to show circuit breaker contact status.

<u>Indicator Color</u>	<u>Circuit Breaker Contact Status</u>
White	Circuit breaker contacts are closed
Green	Circuit breaker contacts are open
Red	VISI-TRIP indicator, circuit breaker is tripped

Load Terminations

All load lugs are UL Listed to accept solid or stranded and copper or aluminum conductors. Lugs are suitable for use with wire rated for 75°C (sized according to the 1993 National Electrical Code 75°C temperature rating) QO(B)-AS circuit breakers are rated for 60°/75°C, and EHB-AS circuit breakers are rated for 75°C.



Electronic Components Remotely Operated Circuit Breakers

Ratings for POWERLINK AS Circuit Breakers

The following POWERLINK AS circuit breaker ratings must meet or exceed the parameters of the electrical system on which the breakers are used.

Continuous Current Ratings

POWERLINK AS circuit breakers have continuous current ampere ratings, as established by the 1993 NEC, Paragraph 240-6a, for 15A, 20A, and 30A devices.

POWERLINK AS circuit breakers are to be applied in accordance with the NEC for 80 percent continuous current ratings in the intended enclosure. The continuous current ratings is indicated on the operating handle of each circuit breaker.

Interrupting Ratings

POWERLINK AS circuit breakers have interrupting ratings for each specific type: QO(B) or EHB, as shown in Table 3. The ampere interrupting rating of a circuit breaker is the highest current at rated voltage that the circuit breaker is intended to interrupt under standard test conditions and is expressed in rms symmetrical amperes. The interrupting rating is stamped into each POWERLINK AS circuit breaker case for each voltage rating.

POWERLINK AS circuit breakers have series connected ratings, like standard QO(B) and EHB breakers. The series connected ratings apply to either an integral main located in the same enclosure, or a remote main located in a separate enclosure. For more information on NQOD and NEHB panelboard series ratings, see page 28.

Table 3

UL Listed Interrupting Ratings for POWERLINK AS Circuit Breakers

Catalog Number Prefix	Number of Poles	Continuous Current Rating	Maximum Voltage Rating	Ampere Interrupting Rating
QO(B)-AS	1	15A, 20A, 30A	120/240Vac	10,000A
QO(B)-AS	2		120/240Vac	10,000A
QO(B)-AS	3		240Vac	10,000A
EHB-AS	1	15A, 20A, 30A	120Vac 277Vac	65,000A 14,000A
EHB-AS	2	15A, 20A	120/240Vac 480Y/277Vac	65,000A 14,000A
EHB-AS	3	15A, 20A	240Vac 480Y/277Vac	65,000A 14,000A

Frequency Rating

The rated frequency for POWERLINK AS circuit breakers is 50/60Hz. Applying POWERLINK AS circuit breakers at frequencies above or below the rated frequency may possibly damage the circuit breaker electronic components or system electronics.

UL HACR Rating

All POWERLINK AS circuit breakers are UL Listed for use with heating, air conditioning, and refrigeration equipment having motor group combinations and marked for use with HACR-type circuit breakers.

Electronic Components Remotely Operated Circuit Breakers

UL HID Rating

All POWERLINK AS circuit breakers have a UL Listed rating for use with high intensity discharge lighting. These lighting systems, which include high pressure sodium, metal halide, and mercury vapor, have inherently high inrush current characteristics, which require circuit breakers rated for such applications.

UL Switching Duty Rating

POWERLINK QO(B)-AS and EHB-AS circuit breakers are UL Listed for Switching Duty (SWD), making them suitable for switching 120Vac fluorescent lighting loads. This switching duty rating applies only to QO(B)-AS and EHB-AS 15A and 20A circuit breakers in 1-, 2-, and 3-pole versions.

Switching Mode Selector Switch

On the front of POWERLINK AS circuit breakers is a switching mode selector switch that places the circuit breaker in either AUTO or MANUAL switching mode. When the switching mode selector is in the down position (or AUTO mode) and the circuit breaker operating handle is in the ON position, the circuit breaker contacts may be remotely opened or closed via the internal 24Vdc motor and circuit breaker electronics. If the switching mode selector is in the out position (or MANUAL mode), the remote switching mechanism is disengaged, and the circuit breaker contacts default to the position as indicated by the circuit breaker operating handle. If the switching mode selector is initially in MANUAL mode, then depressed into the AUTO mode, the circuit breaker contacts default to the last state (open or closed) issued by the POWERLINK AS system control module. In the MANUAL mode, all POWERLINK AS circuit breakers are physically disengaged from the remote mechanism, which causes them to disregard signals from the POWERLINK AS system control module and operate the same as standard circuit breakers. When the circuit breaker operating handle is in the OFF or TRIPPED position and the switching mode selector is in either the AUTO or MANUAL mode, the circuit breaker cannot be remotely turned on or reset. When tripped, the circuit breaker must be reset using the circuit breaker operating handle.

The following table describes switching conditions of POWERLINK AS circuit breakers.

Table 4 POWERLINK AS Circuit Breaker Switching Conditions

CIRCUIT BREAKER INITIAL STATUS			ACTION	CIRCUIT BREAKER FINAL STATUS	
Switching Mode Selection Position	Circuit Breaker Handle Position	Initial Position of Circuit Breaker Contacts	Input Command from Controller	Final Position of Circuit Breaker Contacts	Resulting Action
AUTO or MANUAL	OFF	OPEN	ON or OFF	OPEN	None
AUTO	ON	OPEN	OFF	OPEN	None
AUTO	ON	OPEN	ON	CLOSED	Load ON
AUTO	ON	CLOSED	ON	CLOSED	None
AUTO	ON	CLOSED	OFF	OPEN	Load OFF
MANUAL	ON	OPEN	ON or OFF	CLOSED	Load ON
MANUAL	ON	CLOSED	ON or OFF	CLOSED	None
AUTO or MANUAL	TRIPPED	OPEN	ON or OFF	OPEN	None

Electronic Components Remotely Operated Circuit Breakers

Remote Circuit Breaker Endurance

QO(B)-AS and EHB-AS circuit breakers have an electrical life of 200,000 remote operations (at 80% load and 0.8 power factor). The number of years the circuit breakers yield based on the number of operations per day.

Table 5
Calculated Electrical Endurance (Years)

QO(B)-AS and EHB-AS Circuit Breakers	
Number of Operations per Day	Estimated Endurance in Years
18	30
22	25
27	20
37	15
55	10
110	5
548	1

Note: One operation is defined as either from closed to open to closed, or from open to closed to open. Numbers are calculated estimates, based on operating 365 days per year.

Construction Standards for POWERLINK AS Circuit Breakers

The POWERLINK AS system uses a remotely operated, thermal-magnetic circuit breaker to provide remote switching and overcurrent protection. For more detailed information on Square D thermal-magnetic circuit breakers, refer to the Distribution Product Catalog Class 601, Thermal-Magnetic/Magnetic Only Molded Case Circuit Breakers.

Electronic Components Remotely Operated Circuit Breakers

SELECTION DATA

QO/QOB-AS Plug-on or Bolt-on Remotely Operated Circuit Breakers—UL Listed

Ampere Rating	One-Pole 120/240Vac - 10,000 AIR		Two-Pole 120/240Vac - 10,000 AIR		Three-Pole 240Vac - 10,000 AIR		Lug Wire Size▼
	Plug-on Catalog No.	Bolt-on Catalog No.	Plug-on Catalog No.	Bolt-on Catalog No.	Plug-on Catalog No.	Bolt-on Catalog No.	
15	QO115AS ●▲	QOB115AS ●▲	QO215AS ●▲	QOB215AS ●▲	QO315AS ●▲	QOB315AS ●▲	(1) #12-8 Al (1) or (2) #14-10 Cu
20	QO120AS ●▲	QOB120AS ●▲	QO220AS ●▲	QOB220AS ●▲	QO320AS ●▲	QOB320AS ●▲	
30	QO130AS ●	QOB130AS ●	QO230AS ●	QOB230AS ●	QO330AS ●	QOB330AS ●	

All are UL Listed as HACR type for use with air conditioning, heating, and refrigeration equipment having motor group combinations and marked for use with HACR type circuit breakers.

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

● UL Listed as HID rated for use with high intensity discharge lighting systems.

▼ Suitable for use with 60°C or 75°C conductors.

POWERLINK QO(B)-AS Circuit Breakers UL Listed Mechanical Accessories—Class 690

Handle Accessories

Breaker Prefix	Number of Poles	Catalog Number
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Handle Lock-off

QO(B)	1, 2, 3	HLO1
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Handle Padlock Attachment

QO(B)	1, 2, 3	QOASPA
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EHB-AS Bolt-on Remotely Operated Circuit Breakers—UL Listed

Ampere Rating	One-Pole 277Vac - 14,000 AIR 120Vac - 65,000 AIR	Two-Pole 480Y/277Vac - 14,000 AIR 120/240Vac - 65,000 AIR	Three-Pole 480Y/277Vac - 14,000 AIR 240Vac - 65,000 AIR	Lug Wire Size▼
	Catalog No.	Catalog No.	Catalog No.	
15	EHB14015AS ●▲	EHB24015AS ●▲	EHB34015AS ●▲	(1) #12-8 Al (1) or (2) #14-10 Cu
20	EHB14020AS ●▲	EHB24020AS ●▲	EHB34020AS ●▲	
30	EHB14030AS ●			

All are UL Listed as HACR type for use with air conditioning, heating, and refrigeration equipment having motor group combinations and marked for use with HACR type circuit breakers.

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

● UL Listed as HID rated for use with high intensity discharge lighting systems.

▼ Suitable for use with 75°C conductors.

POWERLINK EHB-AS Circuit Breakers UL Listed Mechanical Accessories—Class 690

Handle Accessories

Breaker Prefix	Number of Poles	Catalog Number
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Handle Lock-off

EHB	1, 2, 3	HLO1
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Handle Padlock Attachment

EHB	1, 2, 3	EHASPA
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Electronic Components Control Bus Strips



NQOD Control Bus (furnished in pairs)

Control bus strips, used in conjunction with the other POWERLINK AS modular components, eliminate external control wiring between POWERLINK AS circuit breakers and the power interface module, which simplifies installation and troubleshooting procedures.

The POWERLINK AS system uses NQOD-ASB and NEHB-ASB control bus strips. The control bus strips provide interconnect wiring between POWERLINK AS circuit breakers and the power interface module. Specifically, they conduct 24Vdc switching power and control signals from the power interface to switch individual circuit breakers, and report circuit breaker status back to the control module.

Features

- Internal interconnect wiring meets NEC and UL requirements for Class 1 control circuits.
- Control bus strips meet NEC and UL requirements for maximum allowable gutter fill.
- Installation is simplified since control bus strips reside on panelboard interior mounting channels without fasteners.
- Alignment tool is included to speed installation. Control bus alignment tool holds two control bus strips in place on panelboard interior mounting channel, while POWERLINK circuit breakers are attached to interior. Tool may be removed after first circuit breakers are installed.
- Top and bottom 25-pin connectors provide flexibility in mounting power interface modules.
- External Class 1 control wiring is eliminated between circuit breakers and the power interface module, reducing installation time.
- 6-pin connectors provide secure plug-in connections for circuit breakers and ensure that proper connections are made.
- Each connector comes with a cover to protect the connection until needed.
- Furnished in bi-directional identical pairs. No "left" or "right" devices to cause installation problems.

Electronic Components
Control Bus Strips



NEHB Control Bus (furnished in pairs)

SELECTION DATA

**Type NQOD-ASB Control Bus
for NQOD Panelboards**

Single Phase 100A and 225A

Max. No. of Control Circuits	Required Panel Space (Interior)	Control Bus Catalog Number
14	20 Poles	NQOD214ASB
24	30 Poles	NQOD224ASB
36	42 Poles	NQOD236ASB
42	54 Poles	NQOD242ASB

Three Phase 100A and 225A

Max. No. of Control Circuits	Required Panel Space (Interior)	Control Bus Catalog Number
18	20 Poles	NQOD218ASB
24	30 Poles	NQOD224ASB
36	42 Poles	NQOD236ASB
42	54 Poles	NQOD242ASB

Control bus type NQOD-ASB is not suitable for use with NQOD 400A or 600A panels, NQOD column-width panels, panelboard interiors with 14" wide enclosures, or QO load centers.

**Type NEHB-ASB Control Bus
for NEHB Panelboards**

Three Phase 100A and 225A

Max. No. of Control Circuits	Required Panel Space (Interior)	Control Bus Catalog Number
12	20 Poles	NEHB412ASB
24	30 Poles	NEHB242ASB
36	42 Poles	NEHB436ASB
42	54 Poles	NEHB442ASB

Control bus type NEHB-ASB is not suitable for use with NEHB 400A, 600A, or NEHB column-width panels.



Electronic Components Power Interface Module



NEHB Power Interface Module

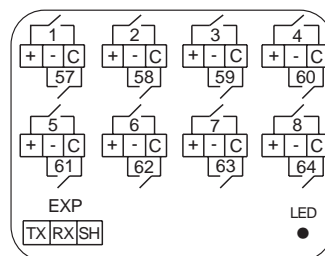
The power interface module provides voltage sources for POWERLINK AS circuit breakers and system electronics, and reports the status to the control module.

In addition, the module contains input and communications terminations for connecting to external control devices.

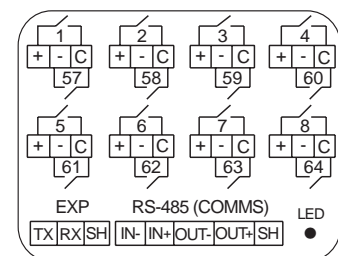
Features

- One power supply furnishes 24Vdc power for remote circuit breaker switching and 5Vdc power for the control module system electronics.
- Sequencing operation with programmable stagger delay eliminates voltage sags when multiple circuit breakers are switched as a group.
- On-board EEPROM retains input map, even in the event of a power outage.
- Input terminal board accepts up to 16 external dry contact inputs with the following characteristics:
 - 2-wire maintained (16)
 - 2-wire momentary (16)
 - 3-wire momentary (8)
- An RS-232 port provides the means for interfacing to an optional input expansion cabinet, LonWorks gateway, or remote dial-up connections.
- RS-485 network option for connection to SY/LINK networks.
- Module can be mounted at either the top or bottom of the panelboard interior.
- Plugs directly to the panelboard interior; occupies only six pole spaces.
- Only one wire to connect: the neutral wire.

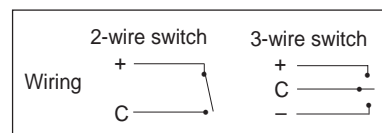
The power interface module has capability for up to 16 two-wire inputs, 8 three-wire inputs, or a combination of these types of inputs. These are numbered 1 through 8 [plus (+) to common (C)] and 57 through 64 [minus (-) to common (C)] on the interface module. Inputs 9 through 56 are available when the expansion cabinet is used.



Input Terminal Compartment
Power Interface Module
(Standard)

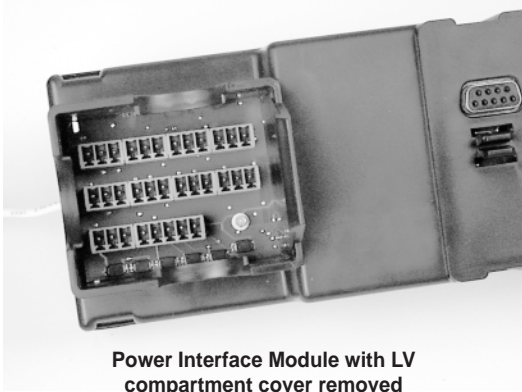


Input Terminal Compartment
Power Interface Module
(Network)



Wiring Diagram

Electronic Components
Power Interface Module



Power Interface Module with LV compartment cover removed

SELECTION DATA

Power Interface Modules for NQOD Panelboards

Module Type	Voltage Range	Catalog Number
Standard	208Vac, 240Vac	NQOD242ASP
Network	208Vac, 240Vac	NQOD242ASP-N

Power Interface Modules for NEHB Panelboards

Module Type	Voltage Range	Catalog Number
Standard	208Vac, 240Vac	NEHB242ASP*
Standard	380Y/220Vac	NEHB342ASP
Standard	480Y/277Vac	NEHB442ASP
Network	208Vac, 240Vac	NEHB242ASP-N*
Network	380Y/220Vac	NEHB342ASP-N
Network	480Y/277Vac	NEHB442ASP-N

* Special order only.

SPECIFICATIONS

Operating Voltage:

	<u>Nominal Voltage</u>	<u>Max. Operating Range</u>
NQOD242ASP(N) & NEHB242ASP(N)	208 to 240Vac	187 to 264Vac (60Hz)
NEHB342ASP(N)	380Y/220Vac	342 to 418Vac (50/60 Hz)
NEHB442ASP(N)	480Y/277Vac	432 to 528Vac (60 Hz)

Wire Connections—Inputs:

Number of Inputs 16 points independent, expandable to 64 points

Input Types 2-wire maintained, 3-wire momentary, or 2-wire momentary. No external control voltage required. Mechanical contact input or solid state equivalent.

Input Terminals 3 per input

Terminal Wire Range #22-18 AWG Cu

#18 AWG Maximum of 3000 feet

#22 AWG Maximum of 1000 feet

NEC Circuit Classification Class 2 Remote Control

External control voltage None required

Network Port Specifications:

Network Port Type [ASP(N) Models] One RS-485 (Belden 8723)

Number of Terminals Five

Terminal Wire Range #22-18 AWG Cu

NEC Circuit Classification Class 2 Remote Control

Input Expansion Port Specifications:

Port Type One RS-232

Number of Terminals Three

Terminal Wire Range #22-18 AWG Cu

NEC Circuit Classification Class 2 Remote Control

Environmental Specifications:

Operating Temperature (ambient) -5°C to +40°C

Storage Temperature (ambient) -20°C to +85°C

Operating Humidity 5% to 95% (non-condensating)

Diagnostics LED:

Blinking Normal operation

On (no blink) Program requires firmware download

Off Check power



Electronic Components Class 2 Barrier Kit



Class 2 Barrier Kit

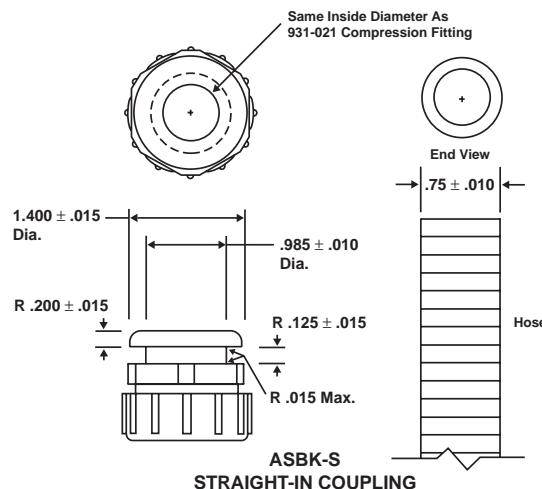
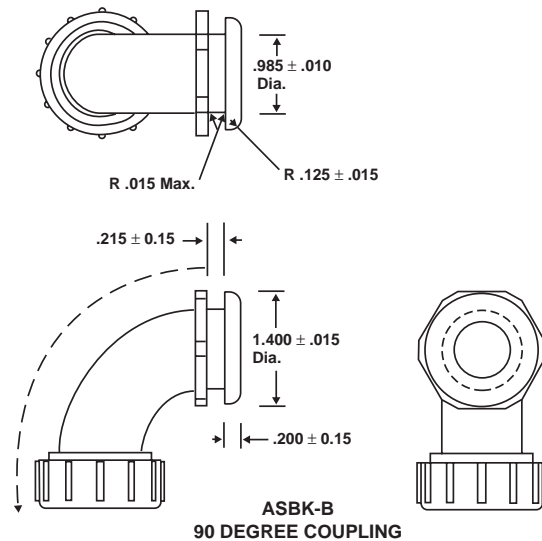
The Class 2 barrier kit includes a flexible, UL Listed barrier tube that separates Class 2 low-voltage external control wiring from line voltage conductors within the panelboard gutter.

Features

- UL Listed barrier tubing allows Class 2 conductors to occupy same gutter area as line-voltage conductors.
- Accommodates Class 2 wiring from external control devices and RS-485 network cable in a common raceway.
- Barrier tubing extends from panelboard tub endwall to the input terminal compartment on the power interface module.
- No special mounting tools or fasteners.
- Kits include:
 - 0.75" tube in six-foot lengths
 - 0.75" box coupling compression fitting
 - Choice of straight-in or 90° power interface module fittings
- The six-foot tube may be cut to desired length and the compression fittings may be re-attached to the end of the tube.
- Up to two barriers, one straight-in and one 90 degree, may be attached to input terminal compartment on power interface module. Meets requirements for 1996 NEC article 725-52.

SELECTION DATA

Description	Catalog Number
Barrier with straight-in coupling	ASBK-S
Barrier with 90 degree coupling	ASBK-B



Electronic Components Control Modules



**Standard control module (top)
and graphical display control module**

The intelligence of the POWERLINK AS system comes from its resident microprocessor-based control module, which directs and simplifies the operation of the system. An optional time-of-day control module makes it possible to schedule automatic switching of lighting and electrical equipment for individual circuits.

The control module provides optional network communications, multi-channel time clock functions, 365 day calendar control, and optional local display operations. Each POWERLINK AS panelboard requiring any of these functions needs a control module.

The control module serves as a programming tool for input-based control such as LV matrix switching. For these applications, only one control module is required to program all the POWERLINK panels on a job site.

Control modules are easy to install and do not require any tools. Simply open the trim front door and plug the control module onto the power interface module.

The control module can be configured at your desk by using a small AC adapter. Once the panelboard is in service, the configuration can be completed at the panel or over the communications network.

There are two types of control modules: the graphical display control module (models AS42CM and AS42CM-T) and the standard control module (AS42C and AS42C-T). Both are described in the following pages.

SPECIFICATIONS

General:

Screen LCD with contrast adjustment
(graphical display modules only)

Environmental:

Operating Temperature (ambient) -5°C to +40°C
Storage Temperature (ambient) -20°C to +85°C
Operating Humidity 5% to 95% (non-condensating)

Memory:

EEPROM For configuration/command storage
Super Capacitor For 30 days time clock and status backup

Port:

DB-9 For communication with power interface module
(or receive power from desktop power supply)

Serial One RS-232 for connection to IBM-compatible PC



Electronic Components
Control Modules

Features

System Features	Standard		Graphic Display	
	AS42C	AS42CT	AS42CM	AS42CMT
Hardware				
Graphics display with contrast adjustment			X	X
LED screen	X	X		
24 button keypad			X	X
RS232 programming port	X	X	X	X
RS-485 Network port	X	X	X	X
EEPROM for configuration/ program storage	X	X	X	X
Super capacitor for 30 days time clock & status backup		X		X
Manual reset	X	X	X	X
Monitor Mode				
Breaker status			X	X
Setup Mode				
Input/breaker assignments	X*	X*	X	X
12/24 hour clock format		X*		X
7 day repeating calendar		X*		X
365 day calendar with leap year correction		X*		X
Daylight savings		X*		X
Sunrise/Sunset with select offset		X*		X
Zone setup	X*	X*	X	X
Password			X	X
Input type	X*	X*	X	X
Panel data	X*	X*	X	X
Communications settings	X	X	X	X
Adjustable stagger delay		X*		X
Blink notice		X*		X
Input time		X*		X
Program Mode				
Time-based programming		X*		X
Input-based programming		X*		X
Special date programming		X*		X
Override Mode				
Breaker override	X*	X*	X	X
Zone override	X*	X*	X	X
Run/Stop/Hold modes	X*	X*	X	X
Diagnostic Mode				
Memory	X*	X	X	X
Communications	X*	X*	X	X
Event log		X*		X
Access log		X*		X
Reset	X*	X*	X	X
Clear program	X*	X*	X	X
Downloadable firmware	X	X	X	X

SELECTION DATA

Description	Catalog Number
Standard	AS42C
Standard time of day	AS42C-T
Graphic Display	AS42CM
Graphic Display Time of day	AS42CM-T

* Requires POWERLINK software for configuration

Electronic Components Control Modules

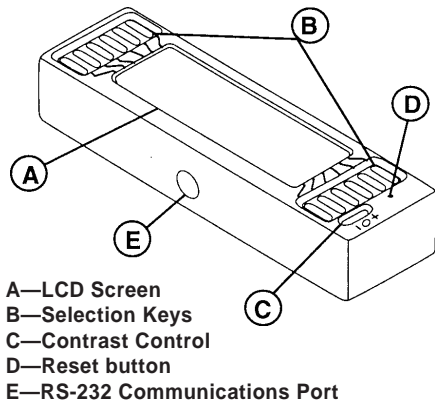


Figure 4—Graphical display control module

Graphical Display Control Module

The *graphical display control module* (AS42CM and AS42CM-T), shown in figure 4, displays system status and program information using an LCD screen (A). System configuration and programming are performed using the module selection keys (B). Screen contrast can be adjusted to the desired value using the module's contrast control (C). The control module can be reset manually by depressing the reset button (D) with a paper clip or similar tool. This will restart operation without affecting system configuration. In addition to the network connection, a temporary link is available using the RS-232 (serial) communications port (E).

Note: If using the RS-232 port on the control module, serial communications cable #AS42CM-SC is required.

Entering the Program

You can program the graphical display control module in one of three ways:

1) Local desktop mode (see page 35):

Requires: Power supply—AS42CM-DPK
Procedure: Use the 24-button keypad on the control module to enter setup information.

2) Local desktop mode (see page 35):

Requires: Power supply—AS42CM-DPK
Serial cable—AS42CM-SC
Software—PLK-101 or CMS 1000 installed on a personal computer or workstation.
Procedure: Use AS42CM-SC cable to connect a personal computer to the RS-232 communication port on the control module. You can then download configuration information from POWERLINK software to the control module.

3) Network mode:

Requires: Power supply—A control module plugged into an energized POWERLINK panelboard.
Software—POWERLINK PLK 101 or CMS 1000 installed on a remote personal computer or workstation.
Procedure: Set up the communications options in the control module (i.e., network address and baud rate). Connect the personal computer and the POWERLINK panelboard to the network. Then use POWERLINK software to download configuration information to the control module.

Events

Circuit breakers are turned on or off based on an event. A control module will accept up to 256 programmed events. Events can be on automatic control, such as time-of-day, or signalled by an input change (e.g., moving a light switch from on to off). Output signals are sent from the control module to the circuit breakers via the power interface module.

Overrides

An override changes the state of an output independent of the control module program. Three types of overrides may be initiated from the control module:

- Override Breaker—selects an individual circuit breaker
- Override Zone—selects a group of circuit breakers
- Override All Breakers—selects all POWERLINK AS circuit breakers



Electronic Components Control Modules

Override conditions may be selected as temporary, which will be in effect until the next event, or continuous, which remains in effect until released. Individual circuit breakers have the switching mode selector switch, which takes priority over overrides initiated from the control module.

Operating Modes

There are three modes of operation:

1. Run—System responds automatically to events. All system features and functions are working. Single-event, on-line programming is allowed.
2. Manual—All circuit breakers are turned on, and events are not processed. All remote and network data is ignored.
3. Hold—Control signals are not processed, but events are logged. Outputs are updated when the mode of operation is returned to RUN. Overrides, diagnostics, and local programming are allowed.

Access Codes

The control module uses a four-digit access code to control program security. There are three levels of security, each level requiring its own access code. If no key is pressed for five minutes, an access code will “time out,” and it must be re-entered.

Table 6 Access Codes

Main Screen	Sub Screen	Permissible Access Level			
		None	Operator	Supervisor	Master
Status		■	■	■	■
Setup	Clock/Calendar (AS42CM-T)		■	■	■
	Define Zones			■	■
	Access Codes		■	■	■
	Sunrise/Sunset (AS42CM-T)			■	■
	Input Type				■
	Panel Data				■
	Communications				■
	Global Values				■
Program	View	■	■	■	■
	Program			■	■
	Delete			■	■
Override	Breakers			■	■
	Zones			■	■
	All Breakers			■	■
	Operating Mode			■	■
Diagnostic	Control Module		■	■	■
	Interface Module		■	■	■
	Expansion Unit		■	■	■
	Non-Responding Breaker		■	■	■
	Software Versions		■	■	■
	Clear Memory				■

Electronic Components

Control Modules

Names

For control modules programmed with a PC, an operational 12-character alphanumeric name tag can be assigned to individual circuit breakers or zones of circuit breakers within a panelboard. Name tags will not actually appear unless a name has been entered for that item, using a PC and PLK-101 or CMS-1000 software.

Priorities

In cases of conflicting commands, such as a time-based event telling a circuit breaker to turn on and an input event telling a circuit breaker to turn off, a priority system is used. Higher priority commands override lower priority commands. Refer to Table 7 to see how the POWERLINK AS system assigns priorities.

Screen Organization

The control module organizes screens under five headings: Status, Setup, Program, Override, and Diagnostic. These are listed across the top of the screen (A) on all five main screens (see figure 5).

1. Status screen—shows the position, pole number, and status of all circuit breakers, indicating if the circuit breaker is on, off, or overridden. The screen also displays present operating mode, and time of day and date, (time-of-day control module only). This is the default screen on power-up.
2. Setup screens—used to set up the system configuration, communications, and global values. This must be completed before any programming functions can be performed.
3. Program screens—used to program the system for desired operation.
4. Override screens—used to override breaker position.
5. Diagnostic screens—used to evaluate system performance, and for troubleshooting.

Selection Keys

The selection keys (B) on either side of the LCD are used for entering the program choices. The keys operate only if there is an arrow next to them.

Solid arrows indicate that the key will modify a choice on that screen.

- ◀▶ Hollow arrows indicate that the key will advance you to a new screen.
- ◁▷ The keys will stay in a neutral position until actuated and can be moved to a minus (-) or plus (+) position.

Access Codes Screens

The control module displays the access code screen as necessary. If a screen with restricted access is requested by a user without access authorization, the module prompts the user to enter an access code before it displays the requested screen.

Global Values

Global values are set to affect all POWERLINK AS circuit breakers and all program items.

BLINK NOTICE—sets the number of minutes prior to a change that the program will blink the lights, prior to a pending timed OFF event. Default value is 00 minutes prior to a change, (no blink notice), and blink notice may be user configured from 0–60 minutes.

Table 7 Access Codes

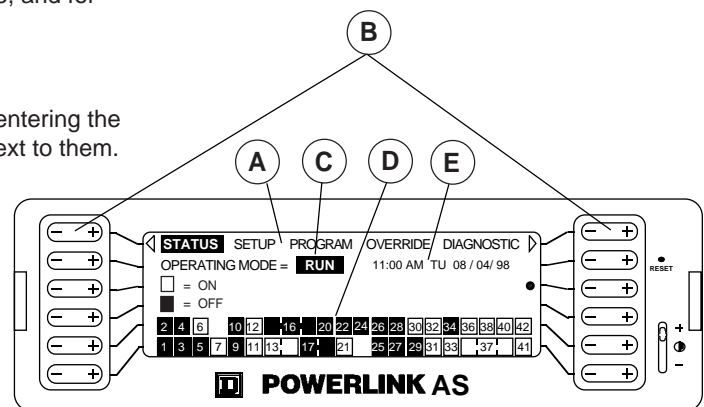
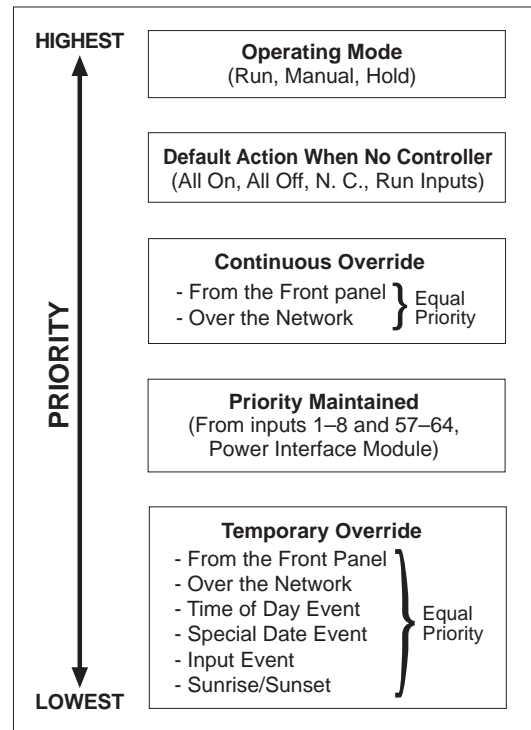


Figure 5—Control Module Status Screen

Electronic Components Control Modules

SEQUENCE TIME—sets the time period between circuit breaker switching operations, when multiple circuit breakers are switch simultaneously with an event. Default value is 0.25 seconds, and sequence time may be user configured to either 0.25, 0.5, 1.0, 5.0, or 10.0 seconds.

DEFAULT ACTION IF NO CONTROL MODULE—defines the action by the system if control module is removed. Default action takes effect if the control module is removed from the system for more than one minute, or if no control module is present upon power-up.

The available user-defined default actions are:

ALL ON—All circuits forced on; no programs will execute.







ALL OFF—All circuits forced off; no programs will execute.

NO CHANGE—All circuits remain in current state; no programs will execute.



RUN INPUTS—Circuits will continue to respond to input-based programs; time-based programs, special date programs, and input timers will not execute. This is the system default.

Circuit Breaker Status

Circuit breaker status is indicated at the bottom of many screens. All circuit breakers available to the system are shown as numbers (refer to figure 3).

-  A white number in a black box indicates that the circuit breaker is in the *off* position.
-  A black number in a white box indicates that the circuit breaker is in the *on* position.
-  A white number in a blinking black box indicates that the circuit breaker is in the *continuous off* position.
-  A black number in a blinking white box indicates that the circuit breaker is in the *continuous on* position.
-  A white number in a dotted blinking black box indicates the breaker is commanded by a priority maintained input to turn off.
-  A dotted blinking black number in a dotted blinking white box indicates the breaker is commanded by a priority maintained input to turn on.

Multi-pole circuit breakers are indicated by connected boxes:

-  A two-pole circuit breaker has two boxes with one number.
-  A three-pole circuit breaker has three boxes with one number.

Numbers represent the pole containing the internal 24Vdc motor and the 6-pin plug-on control bus connector.

Status Screen

The status screen is the default screen, which is displayed whenever the system is active. The control module returns to the status screen after five minutes of no activity.

The status screen displays (refer to figure 2 on previous page):

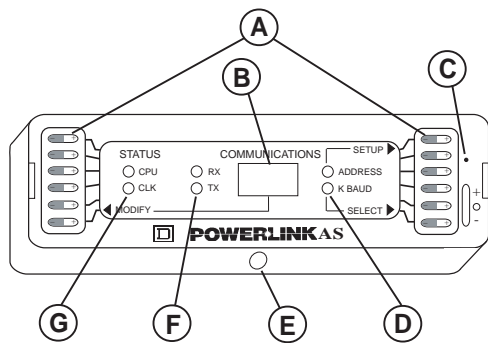
- Circuit breaker status (C), indicating if the circuit breaker is *on* (a black number in a white box), *off* (a white number in a black box), *overridden on* (a black number in a blinking white box), *overridden off* (a white number in a blinking black box), *commanded by a priority maintained input to turn off* (a white number in a dotted blinking black box), or *commanded by a priority maintained input to turn on* (a dotted blinking black number in a dotted blinking white box).

Electronic Components Control Modules

- The overridden legend (blinking white box) will appear only if one or more of the circuit breakers is overridden.
- The operating mode (D) of the system (run, manual, or hold).
- Internal time and date (E) (appears with optional time-of-day control modules only). If time does not include AM or PM, then the internal clock is using a 24-hour display.

Standard Control Module

The *standard control module* (AS42C and AS42C-T), shown in figure 6, displays status and communication parameters using indicators (D, F, G) and an LED display (B). System configuration is done using selection keys (A). In addition to the network connection, a temporary link is available using the RS-232 (serial) communications port (E). The control module can be reset manually by depressing the reset button (C) with a paper clip or similar tool. This will restart operation without affecting system configuration.



- A—Selection Keys
- B—LED Display
- C—Reset Button
- D—Display Mode Indicators
- E—RS-232 Communications Port
- F—Communications Activity Indicators
- G—Status Indicators

Figure 6—Standard control module

Entering the Program

You can program the standard control module in one of two ways:

1) Local desktop mode (see page 35):

- Requires: Power supply—AS42CM-DPK
 Serial cable—AS42CM-SC
 Software—PLK-101 or CMS 1000 installed on a remote personal computer or workstation.
- Procedure: Use AS42CM-SC cable to connect a personal computer to the RS-232 communication port on the control module. You can then download configuration information from POWERLINK software to the control module.

2) Network mode:

- Requires: Power supply—A control module plugged into an energized POWERLINK panelboard.
 Software—POWERLINK PLK 101 or CMS 1000 installed on a remote personal computer or workstation.
- Procedure: Set up the communications options in the control module (i.e., network address and baud rate). Connect the personal computer and the POWERLINK panelboard to the network. Then use POWERLINK software to download configuration information to the control module.



Panelboards General Information

NQOD Panelboard Features:

- Industrially-proven rugged construction.
- Circuit breakers are multi-pole, multi-amp, HACR, HID, and SWD rated.
- Maximum voltage: 240 Vac.
- Maximum mains ampacity: 225 A main lug; 250 A main circuit breaker.
- Maximum branch ampacity:
 - 30 A QO(B)-AS POWERLINK breaker.
 - 125 A QO plug-on standard breaker.
 - 150 A QO(B) bolt-on standard breaker.
 - (1) 225 A sub-feed breaker.

NEHB Panelboard Features:

- Industrially-proven rugged construction.
- Circuit breakers are multi-pole, multi-amp, HACR, HID, and SWD rated.
- Maximum voltage: 480Y/277 Vac.
- Maximum mains ampacity: 225 A main lug; 250 A main circuit breaker.
- Maximum branch ampacity:
 - 30 A EHB-AS POWERLINK breaker.
 - 60 A EH plug-on standard breaker.
 - 100 A EHB bolt-on standard breaker.
 - (1) 225 A sub-feed breaker.
- UL listed, Class CTL panelboard meets paragraph 384-15 of the NEC.
- Distributed phase bussing. Branch circuit breakers may be mounted in any position.

Interiors:

- Will accept plug-on or bolt-on branch circuit breakers.
- Suitable for use as a service entrance (statement found on wiring diagram).
- Top or bottom feed.
- 65k AIR maximum standard branch circuit breakers (fully rated).
- 200k AIR maximum when supplied by remote I-LIMITER[®] circuit breaker (series rated).
- 100 A and 225 A are suitable for use as service entrance with back-fed QO(B) circuit breaker.
- Field installable sub-feed lug kits for 100–225 A interiors.
- Factory installed main lugs on all interiors.
- 225 A main lug interiors are convertible to main circuit breaker by adding a main circuit breaker and adapter kit.
- Available with silver-plated copper or tin-plated aluminum bus (aluminum is standard). Tin-plated copper bus is an available option. Branch connector fingers are all tin-plated copper; silver-plated branch connector fingers are optional.

Main Circuit Breakers:

- 100 A main circuit breaker interiors consist of factory installed back-fed QO(B) main circuit breaker.
- 225 A main circuit breaker interiors use:
 - Standard main lug interiors.
 - Main circuit breaker adapter kit.
 - Appropriate Q2L, Q2L-H, Q2LH, KAL, KHL, KDL, KGL, KCL, or KIL circuit breaker.

Enclosures (NEMA Type 1)

Boxes:

- Galvanized steel with removable endwalls. One endwall is provided with knockouts and the other endwall is blank.
- Size: 20 in. (508 mm) wide x 5.75 in. (146 mm) deep.
- Box and interior mounting instructions are found in the information manual shipped with the interior.
- Interiors mount directly to studs in the boxes. No interior mounting brackets are required.

Fronts:

- Finished with gray baked enamel electrodeposited over cleaned phospho-tized steel (ANSI 49).
- Flush or surface mounted.
- Door with flush lock. Uses NSR-251 key.
- Directory card is located on the inside of the door.
- MONO-FLAT[®] fronts on 100–225 A interiors mount to the interior trim with trim screws. Both trim screws and door hinges are concealed. Fronts are not removable with the door closed and locked.
- Fronts 56 in. (1422 mm) high or more have sliding vault locks and 3-point latching.

Enclosure Options for NQOD and NEHB Panelboards

Types	Environment	Provides Protection Against
NEMA Type 1	Indoor	Contact with enclosed equipment
NEMA Type 3R	Outdoor	Rain, sleet, ice
NEMA Type 5	Indoor	Dust, dirt, liquids
NEMA Type 12	Indoor	Dust, dirt, liquids

Panelboards
Series Ratings



POWERLINK AS panelboard with 1-, 2-, and 3-pole series-rated circuit breakers with high interrupting 250 amp main circuit breaker.

UL Certified Series Connected Ratings

This page contains UL tested and certified series combination ratings for panelboards. These ratings apply to either an integral main located in the same enclosure or a remote main located in a separate enclosure.

Table 8 NQOD Series Ratings

System Voltage (Maximum)	UL Series Connected Rating (AIR)	Main		Branch		
		Type	Max. Amperes	Type	Amperes	Poles
240Vac	22,000	QOB-VH	150	QO-AS, QOB-AS	15-30 15-30 15-30	1 2 3
		Q2-H	225	QO-AS, QOB-AS	15-30 15-30 15-30	1 2 3
	100,000	FC	100	QO-AS, QOB-AS	15-30 15-30 15-30	1 2 3
		KC	250	QO-AS, QOB-AS	15-30 15-30 15-30	1 2 3
	200,000	FI	100	QO-AS, QOB-AS	15-30 15-30 15-30	1 2 3
		KI	250	QO-AS, QOB-AS	15-30 15-30 15-30	1 2 3

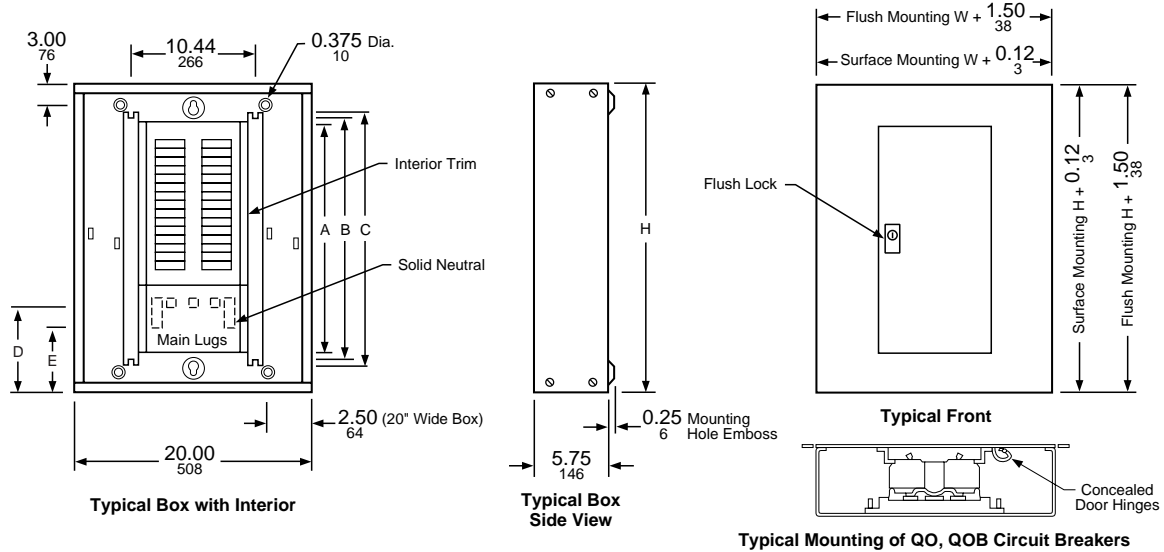
Table 9 NEHB Series Ratings

System Voltage (Maximum)	UL Series Connected Rating (AIR)	Main		Branch		
		Type	Max. Amperes	Type	Amperes	Poles
240Y/ 277Vac	65,000	FC	100	EHB-AS	15-30 15-20 15-20	1 2 3
		KC	250	EHB-AS	15-30 15-20 15-20	1 2 3
		FI	100	EHB-AS	15-30 15-20 15-20	1 2 3
		KI	250	EHB-AS	15-30 15-20 15-20	1 2 3
480Y/ 277Vac	100,000	Class J Fuse	200	EHB-AS	15-30 15-20 15-20	1 2 3



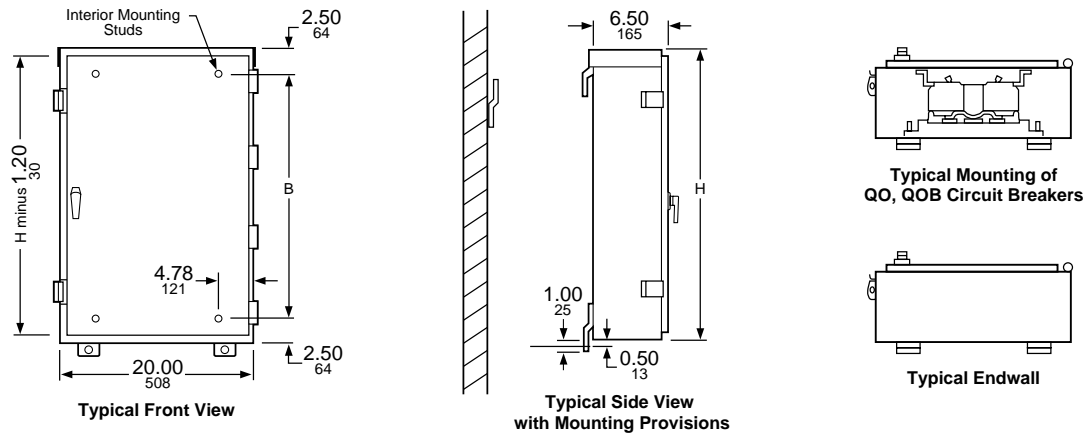
Dimensions
20 in. (508 mm) Wide Enclosures

NQOD Main Lug Panelboards (225 Ampere Maximum Main Lugs)



Indoor—NEMA Type 1

Outdoor—NEMA Type 3R



Note: Refer to page 34 for keyhole and endwall detail.

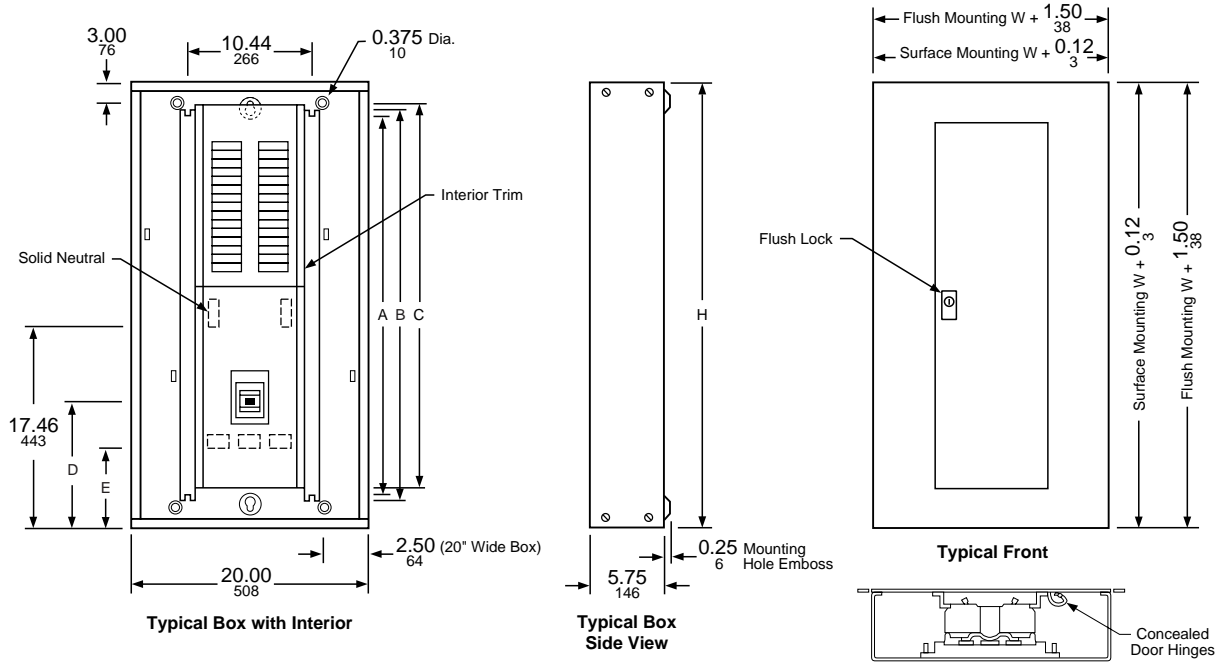
Dimensions: INCHES
mm

Maximum Main Lug Ampere Rating	Maximum Number of PowerLink Circuits	Required Panel Interior Size	H Box Height		A Deadfront Length		B Mounting Studs		C Mounting Holes		D MLO Wire Bending		E S/N Wire Bending	
			IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm
100	14	20▲	23.00	584	17.90	455	18.00	457	18.88	480	6.89	175	5.46	139
	18	24■	23.00	584	17.90	455	18.00	457	18.88	480	6.89	175	5.46	139
	24	30■	26.00	660	20.90	531	21.00	533	21.88	556	6.89	175	5.46	139
225	24	30	32.00	813	26.90	683	27.00	686	27.88	708	11.43	290	10.00	254
	36	42	35.00	889	29.90	759	30.00	762	30.88	784	8.43	214	7.00	178
	42	54	41.00	1041	35.90	912	36.00	914	36.88	937	8.43	214	7.00	178

▲ 1φ3W only.
■ 3φ4W only.

Dimensions
20 in. (508 mm) Wide Enclosures

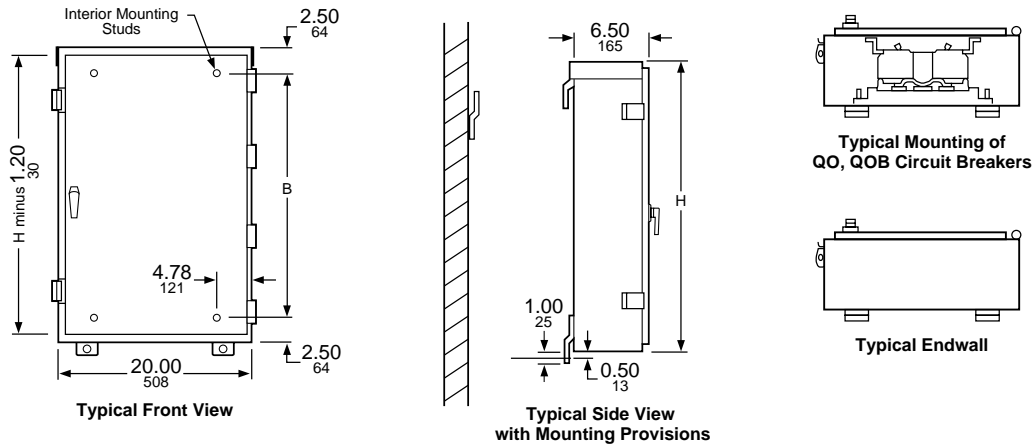
NQOD Main Circuit Breaker Panelboards (100 Ampere Maximum Main Circuit Breaker)



Indoor—NEMA Type 1

Typical Mounting of QO, QOB Breakers

Outdoor—NEMA Type 3R



Note: Refer to page ___ for keyhole and endwall detail.

Dimensions: INCHES
mm

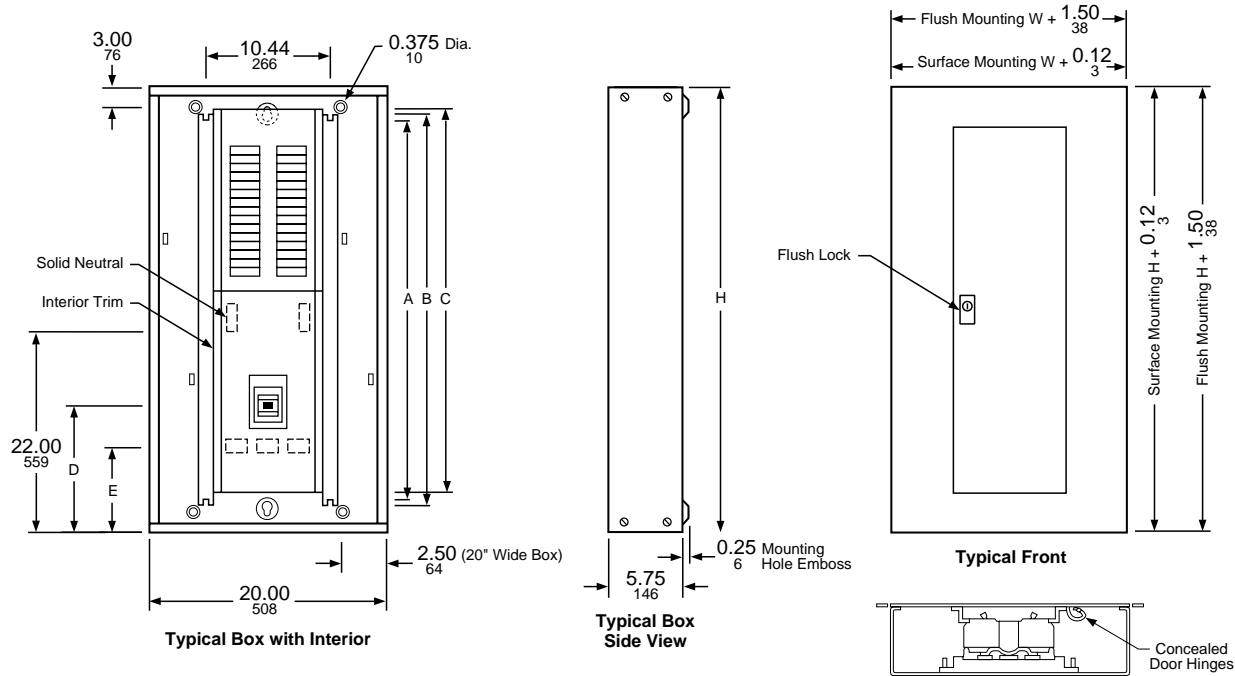
Maximum Main Circuit Breaker Ampere Rating	Maximum Number of PowerLink Interior Circuits	Required Panel Interior Size	H Box Height		A Mounting Studs		B Mounting Holes		C Deadfront Length		D (from Center Line of CB) Top Feed		E (from Line Lugs of CB) Top Feed		Bottom Feed				
			IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm			
			100 FAL ★, FHL ★	14	20▲	35.00	889	30.00	762	30.88	784	29.90	759	11.82	300	10.06	256	8.08	205
	18	24■	35.00	889	30.00	762	30.88	784	29.90	759									
	24	30■	38.00	965	33.00	838	33.88	860	32.90	836									
100 FIL ★	14	20▲	35.00	889	30.00	762	30.88	784	29.90	759	10.08	256	10.08	256	7.08	180	7.08	180	
		18	24■	35.00	889	30.00	762	30.88	784	29.90									759
		24	30■	38.00	965	33.00	838	33.88	860	32.90									836

▲ 1φ3W only. ■ 3φ4W only. ★ Factory assembled only.



Dimensions
20 in. (508 mm) Wide Enclosures

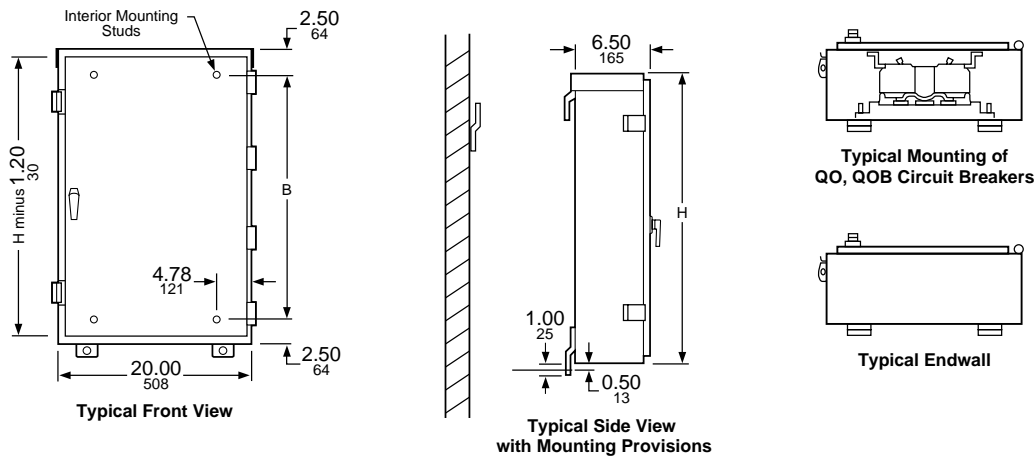
NQOD Main Circuit Breaker Panelboards (250 Ampere Maximum Main Circuit Breaker)



Indoor—NEMA Type 1

Typical Mounting of QO, QOB Circuit Breakers

Outdoor—NEMA Type 3R



Note: Refer to page 34 for keyhole and endwall detail.

Dimensions: INCHES
mm

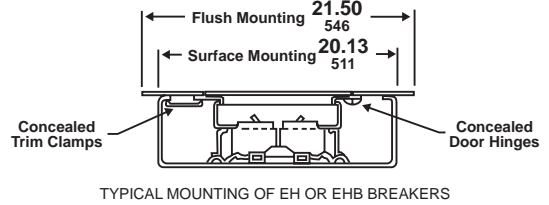
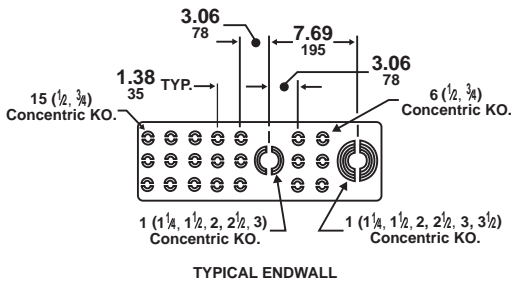
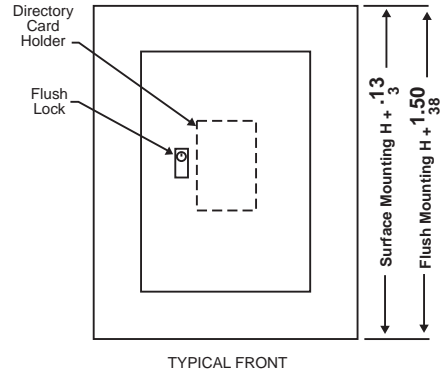
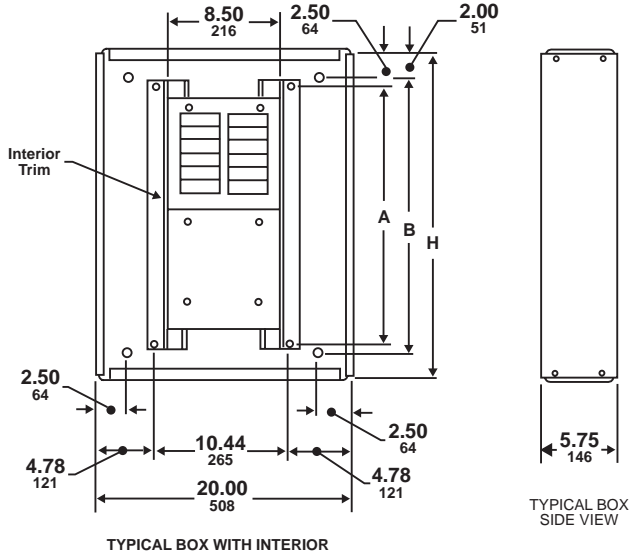
Maximum Main Circuit Breaker Ampere Rating	Maximum Number of PowerLink Circuits	Required Panel Interior Size	H Box Height		A Mounting Studs		B Mounting Holes		C Deadfront Length		D (from Center Line of CB) Top Feed		E (from Line Lugs of CB) Top Feed		E (from Line Lugs of CB) Bottom Feed				
			IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm	IN	mm			
			225 Q2L	24	30	44.00	1118	39.00	991	39.88	1013	39.90	1013	16.89	432	15.88	393	13.66	347
Q2L-H, Q2LH	36	42	50.00	1270	45.00	1143	45.88	1165	44.75	1137									
	42	54	56.00	1422	51.00	1295	51.88	1318	50.75	1289									
225/250▲ KAL, KHL, KDL KGL, KIL	24	30	44.00	1118	39.00	991	39.88	1013	39.90	1013	15.66	398	15.66	398	12.05	306	12.05	306	
		36	42	50.00	1270	45.00	1143	45.88	1165	44.75									1137
		42	54	56.00	1422	50.00	1295	51.88	838	50.75									1289

▲ 250 A available factory-assembled only.



Dimensions
20 in. (508 mm) Wide Enclosures

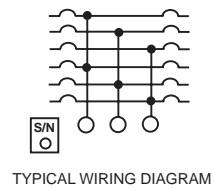
NEHB Main Lug Panelboards (225 Ampere Maximum Main Lugs)



Note: Refer to page 34 for keyhole and endwall detail.

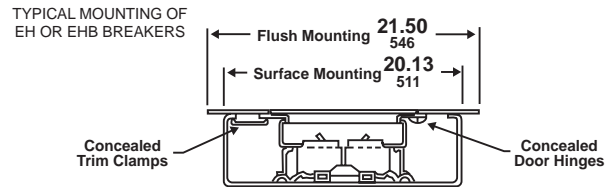
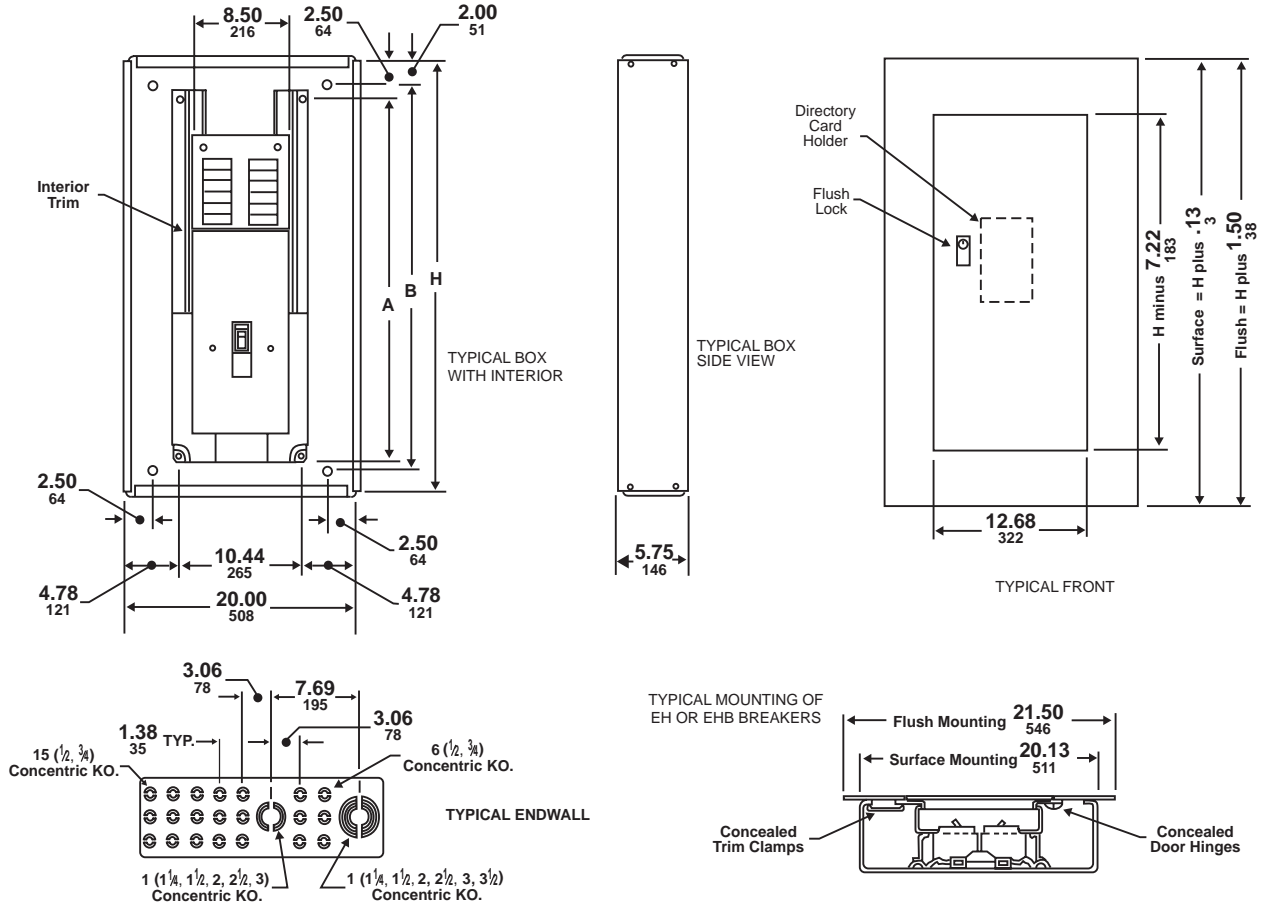
Dimensions: INCHES
mm

Maximum Main Lug Ampere Rating	Maximum Number of PowerLink Circuits	Required Panel Interior Size	H Box Height		A Mounting Studs		B Mounting Holes	
			IN	mm	IN	mm	IN	mm
125	12	18	29.00	737	24.00	610	25.00	635
	24	30	35.00	889	30.00	762	31.00	787
225	24	30	35.00	889	30.00	762	31.00	787
	36	42	41.00	1041	36.00	914	37.00	940
	42	54	47.00	1194	42.00	1067	43.00	1092



Dimensions 20 in. (508 mm) Wide Enclosures

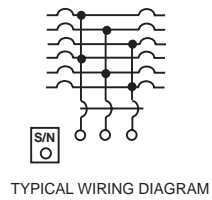
NEHB Main Circuit Breaker Panelboards (250 Ampere Maximum Main Breaker)



Note: Refer to page 34 for keyhole and endwall detail.

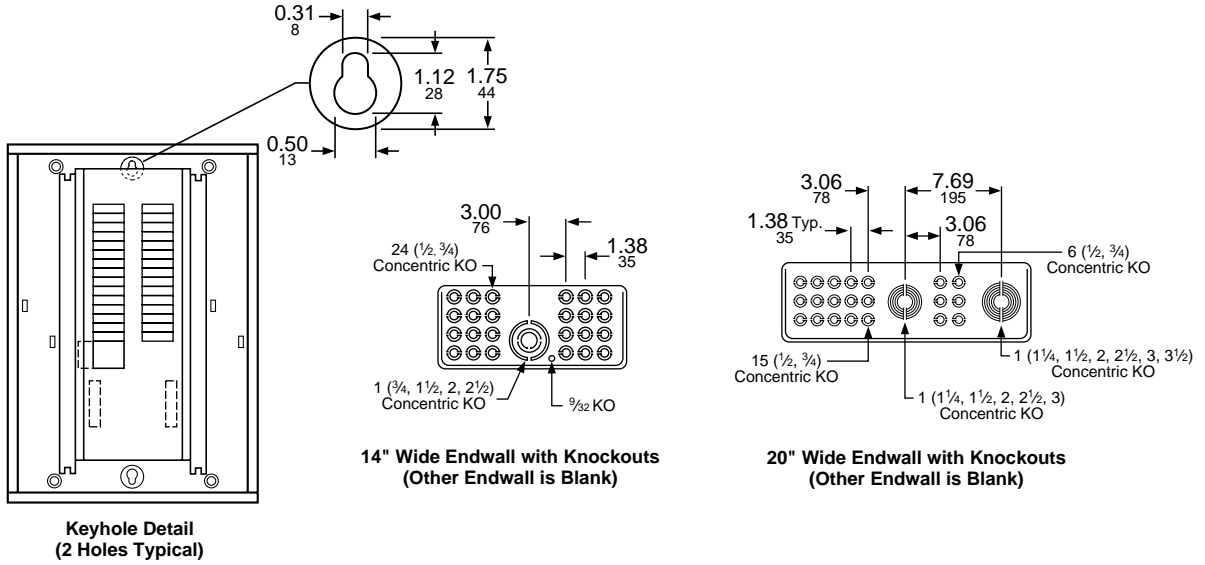
Dimensions: INCHES
mm

Maximum Main Circuit Breaker Ampere Rating	Maximum Number of PowerLink Circuits	Required Panel Interior Size	H Box Height		A Mounting Studs		B Mounting Holes	
			IN	mm	IN	mm	IN	mm
125	12	18	38.00	965	33.00	838	34.00	864
	24	30	44.00	1118	39.00	991	40.00	1016
250	24	30	47.00	1194	42.00	1067	43.00	1092
	36	42	53.00	1346	48.00	1219	49.00	1245
	42	54	59.00	1449	54.00	1372	55.00	1397



Dimensions
20 in. (508 mm) Wide Enclosures

NQOD and NEHB Keyhole and Endwall Detail



Dimensions: INCHES
mm

Accessories Desktop Power Supply



Desktop power supply connected to control module



Control module connected to PC via AS42CM-SC cable



AS42CM-SC Cable

POWERLINK AS desktop programming power supplies allow POWERLINK AS control modules to be programmed without being installed in the panel. The desktop power supply operation is very similar to a standard calculator type power supply. Simply plug the power supply into a standard 120V, 60 Hz wall outlet, and insert the 9-pin connector into the back of the module.

When powering up, the control module will follow its initialization sequence, and then display the status screen. Since the control module is not installed in a panel, it will assume that 42 1-pole POWERLINK AS circuit breakers are present. This permits all 42 circuit breaker locations to be programmed. Multi-pole breakers can be programmed by selecting the pole number corresponding to the motor location (see figure 7 below).

Desktop programming of the control module can be done by either of the methods listed below:

Using application software:

- Connect a PC directly to the RS-232 port on the control module via the AS42CM-SC cable.
- Download programs from either PLK 101 or CMS 1000 software.

From control module:

- Program the control module by manually selecting the desired functions using the module's 24-button keypad. (For more information, see the control module section on page 20.

After the control module is programmed, it is ready for installation in the panelboard.

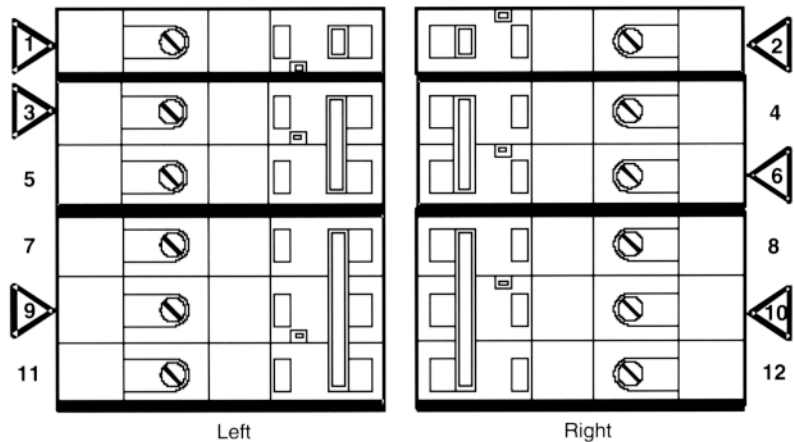


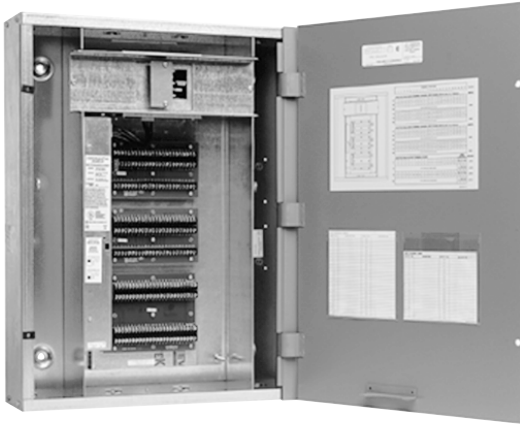
Figure 7—Motor Location (“▷” Indicates motor pole)

SELECTION DATA

Description	Catalog Number
Desktop Power Supply	AS42CM-DPK
RS-232 Download Cable	AS42CM-SC

Accessories

Input Expansion Cabinet



Input Expansion Cabinet

The input expansion cabinet provides 42 additional outputs and 48 additional inputs over the 16 inputs available within the POWERLINK AS system. It's a simple and low cost way to multiply your system's capabilities.

The POWERLINK system input expansion cabinet allows you to multiply the benefits of the POWERLINK AS remote power switching system without complicated installation or operation procedures. It provides as many as 48 additional inputs over the 16 inputs available within the POWERLINK AS system.

The POWERLINK system input expansion cabinet is ideal for new or retrofit lighting applications. Its efficient design significantly reduces installation and maintenance time, while its low voltage switching (24V) provides safe and easy operation.

Installation costs are reduced because the system accepts low voltage Class 2 wiring, which typically requires no conduit. Inputs used with Class 2 wiring include low voltage switches, motion detectors, and photo cells, which can be 2-wire maintained, 2-wire momentary, or 3-wire momentary. In most lighting applications, low voltage switches operating at 24Vdc will be used. These switches can be conveniently programmed to provide a variety of tasks, including simple on/off switching, overriding a programmed event, or acting as a simple timer.

The POWERLINK system input expansion cabinet is easily reprogrammed to meet a facility's changing requirements without rewiring. Each of the 48 inputs can be individually activated by input control devices. And with the system's superior design flexibility, there can be as few as one or as many as 48 inputs per zone.

If your objective is to reduce energy costs and take advantage of remote low voltage switching, the POWERLINK system input expansion cabinet is your best solution.

COMPONENTS

AS48EXP

- Input/output expansion cabinet
- Accepts (2) AS24IN and (1) AS42OUT modules
- Sources control power for dry contact type inputs and outputs

AS24IN

- Provides for 24 additional 2-wire maintained or 3-wire momentary contact inputs

AS48OUT

- Provides for 42 additional outputs
- 115 mA maximum current per output
- Total current load not to exceed 1.65 A on all outputs



Accessories

Input Expansion Cabinet

SELECTION DATA

Description	Catalog Number
Input Expansion Chassis — accepts up to two AS24IN and one AS42OUT Modules	AS48EXP*
Input Module — contains provisions for 24 inputs	AS24IN**
Output Module — contains provisions for 42 outputs	AS42OUT
Expander Enclosure	MH26-BEPL
Surface Cover for AS48EXP	MHC26PL-S
Flush Cover for AS48EXP	MHC26PL-F

* Input Expansion Cabinet includes power supply, interior, and serial communication board for connection to the power interface module.

** AS24IN accepts either 2-wire maintained, 2-wire momentary, or 3-wire momentary input signals.

Selection Criteria

Mounting Options

- Expander can be mounted as a stand-alone cabinet up to 50 feet away from a POWERLINK panel.
- Expander can also be mounted directly above or below the POWERLINK panel.

Covers

- Choice of flush or surface covers

Modular Construction

- Allows unit to be configured as needed. Either one or two input modules and be provided for 24 or 48 inputs.
- Optional output card can also be easily installed.

POWERLINK Input Expansion Cabinet Enclosure Dimensions NEMA Type 1 Enclosure (Indoor)

W	H	D
20*	26*	5.75*

* Dimensions in inches

Network Options General Information

Individual POWERLINK AS panelboards can be easily integrated into a single system, using a variety of flexible network options. Such systems combine the power of network communications with personal computers to provide centralized setup, monitoring, and control. POWERLINK AS panelboards can easily be integrated with Square D POWERLOGIC circuit monitors to form a complete power monitoring and control system. In addition, a number of third party building automation companies, including Honeywell, Johnson Controls, Landis & Stafa, and Siebe, have developed interface modules that will allow POWERLINK panels to be remotely operated directly from their systems.

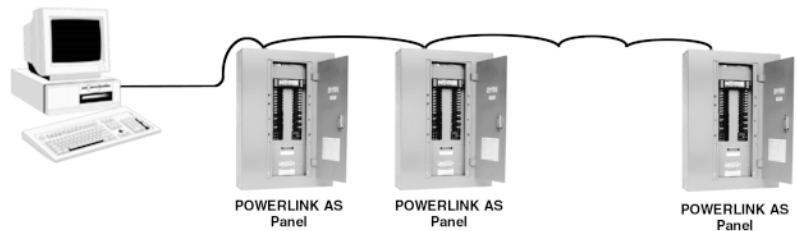


Figure 8—Configuration example: POWERLINK lighting control system using RS-485

Square D panelboards are designed to operate using either of two distinct protocols. The POWERLOGIC network provides an excellent system for controlling POWERLINK panels from Square D Circuit Manager or System Manager software. POWERLOGIC networks can support both POWERLINK AS panelboards and other POWERLOGIC compatible products. For additional information on POWERLOGIC networks, refer to the Power Monitoring and Control System Planning Guide Bulletin #3000CT9601.

The POWERLINK AS lighting control system offers connection to Ethernet TCP/IP networks to make lighting control available over new and existing local and wide area networks. From a central location, you can now better manage your energy cost using Ethernet technology as well as the internet. Additional information on using Ethernet networks can be found in the Power Monitoring and Control System Catalog Bulletin 3000CT9701.

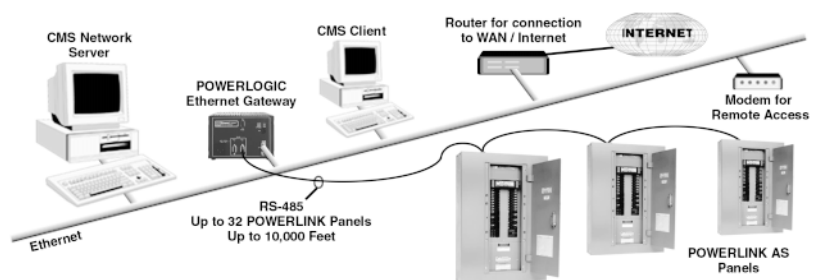


Figure 9—Configuration example: POWERLINK lighting control system using Ethernet

The POWERLINK AS system also supports LONWORKS communications. This peer-to-peer protocol is quickly becoming the industry standard for building controls, as it ensures system flexibility and interoperability between devices connected to the network. Refer to page 39 for additional information on the LonWorks Gateway.



Network Options LonWorks Gateway



LONWORKS Communication Module

The high speed peer-to-peer nature of LONWORKS makes many things possible. For example, an input switch in one panel can control circuit breakers in any panel on the network. A time-of-day control module in one panel can control breakers in many panels. And third party I/O and software can interface directly with POWERLINK AS inputs and breakers.

What is LONWORKS?

LONWORKS represents the future of field bus communication between intelligent devices.

Past means of communicating between devices were usually developed by manufacturers of specific hardware products, and were highly proprietary. Equipment from one manufacturer usually could not communicate well with equipment made by another. In addition, older protocols were generally slow and often did not allow different pieces of equipment to communicate directly with each other as peers.

In contrast, LONWORKS was independently developed and is completely open to all manufacturers. And LONWORKS takes advantage of the latest technology to provide high-speed, peer-to-peer communications.

The open LONWORKS protocol allows users to select and integrate the best equipment from each manufacturer. It allows manufacturers to concentrate on their expertise, rather than be diverted making proprietary interfaces, modems, and software.

LONWORKS Connections

All new and existing POWERLINK AS panels can operate with the LONWORKS communication module, which connects directly to the POWERLINK AS power interface module's RS-232 expander port. A POWERLINK AS control module may be needed for panel setup, but not for routine operation with LONWORKS.

Network Setup/Programming

Logically connecting I/O and circuit breakers in different panels or devices is done through a process called "binding." This process is accomplished using any number of third party software tools.

Setup and programming within a POWERLINK AS panel is still performed using POWERLINK PLK-101 or CMS 1000 software, or the optional display control module.

POWERLINK AS panels equipped for network communication can use the network for monitoring and programming while connected to LONWORKS for control.

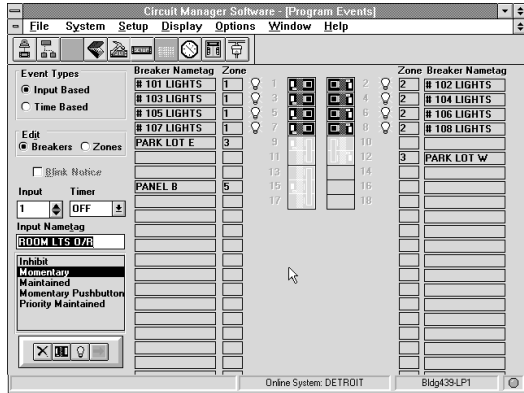
Configuration

The remote-control circuit breakers and dry-contact switch inputs of the POWERLINK AS system are available for use as LONWORKS objects through the POWERLINK AS-to-LONWORKS network interface.

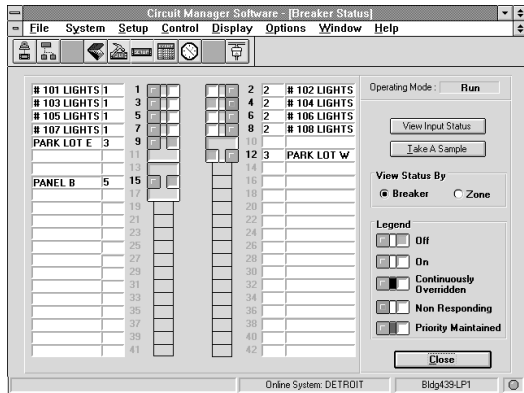
SELECTION DATA

Description	Catalog Number
LONWORKS Communication Module	ASLCM-F

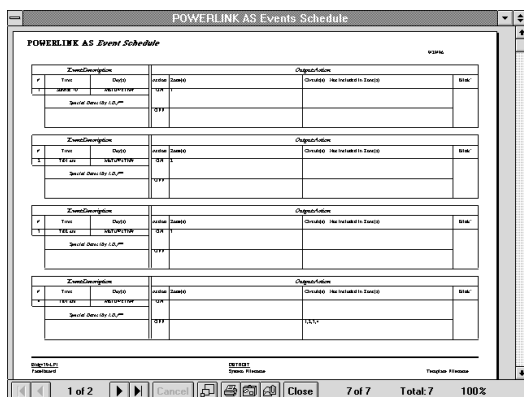
Software Overview



Point-and-click graphical screens make programming a cinch, especially for nonexperts.



Better than being there! Monitor circuit breaker, input, and panel status from a remote PC with CircuitManager or PLK software. Operate single circuit breakers or entire zones for temporary or permanent changes.



CircuitManager software allows you to print out all of your panel schedules, and system configuration information. In addition, PLK and CircuitManager software can store all of your data on a floppy disk.

POWERLINK AS software makes controlling lighting and power intuitive and easy to understand. From small, stand-alone applications to complete power monitoring and control installations, graphical software from Square D helps you save time and money.

Ease of Use

The two levels of POWERLINK AS system software are PLK 101 or Circuit Manager Software (CMS). Simple point-and-click icons and graphical panels mean that you do not need to understand lighting industry jargon. Just change the picture until it shows what you want to happen.

POWERLINK AS software runs on a personal computer under either Windows[®] 3.1, 95, 98, or NT. A cable that comes with the software is used to connect the serial port of the PC directly to a control module's RS-232 port. Or, for larger systems, the PC can be connected to the panels via a POWERLOGIC network.

Of the two software platforms, CMS offers the more advanced functionality. CMS features allow you to:

- View multiple panelboards simultaneously
- Use system approach to panelboard setup
- Remotely verify circuit breaker status
- Remotely override circuit breakers and zones
- Globally synchronize time clocks
- Print panel schedules and directory cards
- Enter password protection

Documenting Your Work

A practical problem with traditional hardwired control is that the wiring diagrams become lost or out of date. When changes later need to be made, the wiring must then be hand traced—or, in frustration, ripped out and new wiring installed.

POWERLINK AS lets you leave those days behind. Square D software lets you save all of your panel configurations on a floppy disk. In addition, CircuitManager software can print out your programs, panel schedules, and more. Lost your program? No problem; just connect your PC to the panel and download it all. Because POWERLINK AS is completely integrated, there is a *single* panel schedule and control setup.



POWERLINK AS offers the most programming options. Desktop mode allows programming to be done in the comfort of an office, with the module and program later snapped into place.



Software
Features (PLK/CMS)

Software Feature Comparison

Features	PLK-101	CircuitManager
Program panel	✓	✓
Panel diagnostics	✓	✓
Save programs on disk	✓	✓
Print programs and schedules		✓
Synchronize panel clocks		✓
Monitor status	✓	✓
Operate circuits	✓	✓
Password protection		✓
Multipanel systems		✓

System Requirements

	PLK-101	CircuitManager
Operating System	Windows 3.1 Windows 95	Windows 3.1 Windows 95
Display Mode	VGA	VGA
Model	386 [486]	386 [486]
RAM	4M [8M]	4M [8M]
Hard Disk	5M free space	5M free space
SY/LINK Card	optional	optional
RS-232 Port	required	required
Sound Card		
3.5" Drive	required	required

Order Information

Class	Type	Description
3080	PLK-101	POWERLINK AS Communications Software
3080	CMS-1000	CircuitManager Software

Power Management Services



Features

- System design and bill of material recommendations
- Remote power switching system design
- Develop specifications, drawings, and documentation
- Automatic control systems/PLC ladder programming, including load shed/peak shaving schemes
- Custom hardware/software solutions
- Third party communications interfaces
- Configured workstations, user software interfaces
- On-site installation assistance, component configuration, and startup
- Panelboard low-voltage wiring verification
- On-site and headquarters-based customer training
- Troubleshooting assistance, support for hardware and software products
- Product upgrades
- Project coordination

Power Management Services provides a complete range of design and operational services, including specifying, developing, installing, commissioning, supporting, and training users of power monitoring and control system and remote power switching systems. Engineers maintain expertise in many areas such as communications, personal computers, protective relaying, automatic control systems, and programmable controllers.

POWERLINK Workstations

Square D offers a complete systems approach to lighting control. Power Management Services provides POWERLINK workstations—tested and approved personal computers completely configured based on the individual system requirements. POWERLINK workstations are designed to handle large amounts of system information, and provide it to those who need it, when they need it. Workstations placed in key locations allow plant engineers allow plant engineers, operators, maintenance personnel, and others to make informed decisions using real-time and historical information.

Power Management Operation Technical Support

There are several ways to receive top quality support on POWERLOGIC and POWERLINK products:

- Phone: 615-287-3400
- Fax: 615-287-3404
- BBS: 615-287-3414
- Email: pмосuprt@squared.com
- D-Fax: 800-557-4556 (PMO index is Document #104)



Compliance Certification Codes and Standards

Square D panelboards are designed, tested, and manufactured to meet the requirements of the latest revisions of the following standards:

- UL 67 — Panelboards
- UL 50 — Enclosures for electrical equipment
- UL 489 — Molded Case Circuit Breakers
- UL 917 — Energy Management Equipment
- CSA C22.2, No. 29 — Panelboards and Enclosed Panelboards
- CSA C22.2, No. 5 — QO(B) Only — Molded Case Circuit Breakers
- NEMA PB-1
- NEMA AB-1 — Molded Case Circuit Breakers
- NFPA 70 — National Electrical Code
- Federal Specification W-P-115C Type 1 Class 1
- Federal Specification W-C-375B/GEN
- NOM 117 (pending final testing)
- California Title 24

Compliance Certification Year 2000 Compliance

POWERLINK AS Remote Power Switching System

Testing has been successfully conducted on currently available POWERLINK AS hardware and software to handle the Year 2000 transition. Testing was conducted using panels with version 4.50 firmware, version 2.00 PLK-101 software and version 1.01 CMS-1000 configuration software. Users are encouraged to make these upgrades to their POWERLINK systems. Registered users may obtain free upgrades by contacting Power Management Operations Technical Support.

Hardware Evaluation

POWERLINK uses year data for calculation of the day of the week only. Tests have verified that operation is correct at the transition into the next millennium. Testing has also verified that the Year 2000 is treated correctly as a leap year.

The year is represented and stored internally in a two-digit format, i.e., 1999 = 99, 2000 = 00. The real-time clock chip used in the device only allows a two-digit year. The program interprets these digits in such a way that any year below 95 is assumed to occur after the year 2000.

HARDWARE	Compliant
AS42C-T v4.52	Yes
AS42CM-T v4.52	Yes

Software Evaluation

The only function of POWERLINK software in regards to the year is to provide the ability to set or review the year data within a POWERLINK panelboard. The year data is not used for any calculations within the software. Testing has verified that operation of PLK-101 and CMS-1000 software packages in conjunction with a POWERLINK panelboard is correct before and after the Year 2000.

The format used in the software is consistent with the two-digit year representation used in the panelboard. The only place a four-digit year appears is where the PC time and date is displayed on the year screen used to set the clock. The first two digits of the PC year are truncated when sent to the panelboard.

SOFTWARE	Compliant
PLK-101 v2.00	Yes
CMS-1000 v1.01	Yes

Additional Evaluation

Testing on POWERLINK panelboards with v3.02 System Manager 3000 software was also conducted. Results of this testing was also successful.



SECTION 16440-1**PANELBOARD LIGHTING CONTROL SYSTEM****PART 1 GENERAL****1.01 SYSTEM DESCRIPTION**

- A. The panelboard lighting control system shall automatically control lighting and other loads within the facility.
- B. The system shall be used as a [stand-alone], [networked] system for controlling loads via external low voltage inputs, and/or from its [internal time-of-day clock].
- C. The system shall include branch circuit overcurrent protection and remote power switching, low voltage switch inputs, control logic functionality and shall all fit within a standard lighting panelboard enclosure.
- D. To assure seamless integration, all major system components shall have a common manufacturer.

1.02 REFERENCES

- A. Required UL Listings: UL 489 for Molded Case Circuit Breakers, UL 67 for Panelboards, UL 50 for Boxes and Enclosures, and UL 916 for Energy Management Equipment.
- B. NEMA Compliance: PB-1 for Panelboards
- C. NEC 110-10 Compliance
- D. FCC Approval: All assemblies are to be in compliance with FCC Emissions Standards specified in Part 15 Subpart J for Class A applications.

1.03 SYSTEM START-UP AND TRAINING [OPTIONAL]

- A. Start-Up: After the system has been installed, and the documentation delivered to the owner, the contractor shall secure the services of a factory trained manufacturer's representative for [] day(s) to verify correct operation of all system components.
- B. Training: At system start-up, the contractor shall arrange for the factory representative to train the owner's personnel.
- C. Factory Support: Factory fax/telephone support shall be available free of charge during normal business hours to answer programming and application questions during the warranty period.

1.04 WARRANTY

Manufacturer shall warrant specified equipment to be free from defects in materials and workmanship for the lesser of one year from the date of installation or eighteen months from date of purchase.

PART 2 PRODUCT**2.01 MANUFACTURERS**

The panelboard lighting control system shall be POWERLINK AS as manufactured by Square D Company [or pre-approved equal; pre-approval shall entail submitting a fully functional sample of the product to the engineer at least 3 weeks prior to bid. The sample shall include all options required to meet the specification].

2.02 PANELBOARD LIGHTING CONTROL SYSTEM

- A. The lighting control system shall consist of a microprocessor-based control electronics with remotely operated circuit breakers.



Suggested Specifications

- B. The circuit breakers shall provide overcurrent protection meeting or exceeding the fault current of the system to which the panelboard is being applied.
- C. The lighting control system shall meet or exceed the following capabilities:
 - 1. Individual remote control for 42 branch circuits.
 - 2. Up to sixteen 2-wire maintained dry-contact inputs for connection to external low voltage (24 VDC or below) switch contacts.
 - 3. Zone creation of multiple branch circuits and control of individual branch circuits or zones.
 - 4. Individual branch circuit and zone override.
 - 5. True closed loop control by monitoring branch circuit breaker status based on actual system voltage at load side terminal.
 - 6. Downloadable firmware that will permit field installation of newest features in existing systems.
- D. All lighting control components shall be installed in a conventional panelboard enclosure. Suitable barriers between Class 1 and Class 2 wiring shall be provided.

2.03 HARDWARE

- A. To minimize installation labor and space requirements, the remote operated circuit breakers, power interface module, and control module shall be integral to the lighting panelboard.
- B. Remotely operated circuit breakers: All remotely operated branch circuit breakers shall provide overload and short circuit protection suitable for that location in the electrical system, as defined in the panelboard schedules. Remotely operated power switching devices shall provide the following:
 - 1. Load switching endurance rating of 200,000 open/close operations at full load and 0.8 lagging power factor.
 - 2. Switching devices with lower endurance ratings may be judged to be acceptable, but must be provided with [100%] [200%] spare switching devices for each circuit to ensure an equivalent total number of operations.
 - 3. 15A, 20A, and 30A current ratings.
 - 4. Integral branch circuit overcurrent protection as required by the National Electrical Code (NEC), and shall be either fully rated or shall have published series connected ratings for providing adequate protection at that point in the system.
 - 5. Available in single-, two-, and three-pole configurations.
 - 6. UL Listing SWD rating on 15A and 20A 1-, 2- and 3-pole branches; UL Listed HACR rating and UL Listed HID rating on all remotely operated power switching devices.
 - 7. Handle that mechanically opens power switching device contacts when moved to the OFF position and disables remote control capabilities of the device.
 - 8. Operating mode selector button on each power switching device shall be provided to enable or disable remote operated function of the device independent of the handle.
 - 9. Visible flag to clearly indicate the status of the circuit breaker contacts.
 - a. Status condition shall include: ON, OFF, TRIPPED.
 - b. The visible flag shall be mechanical in nature, directly tied to the breaker mechanism, and shall be provided in addition to any



Suggested Specifications

- status indicator supplied by the system electronics.
- c. Switching devices not equipped with such an indicator shall be equipped with an alarm and auxiliary contacts [wired to LED or neon pilot lights] [suitable for wiring to external pilot devices].
10. All individual power switching devices rated for 120/240 or 208Y/120 VAC shall have a short circuit interrupting rating of 10,000 rms symmetrical amperes.
 11. All individual power switching devices rated for 277 or 480Y/277 VAC shall have a short circuit interrupting rating of 14,000 rms symmetrical amperes, or 65,000 rms symmetrical amperes at 120 or 208Y/120 VAC.
 12. Power switching devices shall meet all NEC requirements for circuit breakers; shall be UL Listed as circuit breakers.
- C. All electronic modules and circuit breakers in the panelboard shall be mounted in the positions and control the loads as indicated on the panelboard drawings.
 - D. Panelboards shall accept standard circuit breakers for loads not controlled by the system.
 - E. Interconnections: All interconnections between circuit breakers, control buses and power interface modules shall meet NEC and UL requirements for Class 1 control circuits.
 - F. Modular control buses shall be used to provide control power and communications to the remote operated branch breakers.
 - G. Power Interface Module: A Power interface module shall be provided to supply control power for the operation of the remotely operated circuit breakers, power for low voltage inputs, and power for the electronics and communications.
The module shall provide screw type terminals for up to sixteen 2-wire maintained or 2-wire momentary inputs, or eight 3-wire momentary inputs for connection to external low voltage (24 VDC or below) switch contacts.
 - H. Control Module [Optional, Required if using RS-485 network]: A control module shall be provided where indicated.
 1. The control module shall provide time clock, communications, and programming functionality.
 2. There are two front panel display options: [select a. or b. and the respective quantity].
 - a. Standard control module has LEDs that permit setup of communications address and baud rate, and displays basic operating mode and status information. [Provide one (1) standard control module to program all lighting control panelboards on a job site; provide a standard control module for each lighting control panelboard].
 - b. Display control module shall have high-resolution graphics LCD display and keypad that will permit programming of the system, control override of the breaker status, give electronic indication of the breaker status, and display diagnostic information at the front panel. [Provide one (1) display control module to program all lighting control panelboards on a job site; provide a display control module for each lighting control panelboard].
 3. The control module with time-of-day control shall meet or exceed the following capabilities:
 - a. Ability to execute up to 4 daily schedules.
 - b. 365-day calendar with automatic leap year correction, and daylight savings time adjustment.
 - c. Astronomical clock with sunrise/sunset

Suggested Specifications

- d. 7-day repeating schedule
 - e. 12-hour AM/PM or 24-hour military time format
 - f. 32 special holiday/event periods
 - g. Programmable sequence delay of circuit breakers
 - h. Local display of day/date/time (with available LCD display)
 - i. Adjustable timer for inputs (time overrides)
 - j. Priority maintained inputs
 - k. Adjustable flash notice assignable to time-of-day or timed inputs commands
 - l. Capacitor back-up power for time clock back up for 30 days.
4. The control module shall have downloadable firmware so that the latest production features may be added in the future without replacing the module.

2.04 NETWORK [OPTIONAL]

- A. [RS-485 network] option shall enable the panelboard lighting control system to connect with other control systems.
- B. User may set up, monitor, and control any panelboard connected to the network from a remote workstation.
- C. Network shall be configured to support all panelboards and personal computer workstations as required.
- D. [LonWorks] compliant network shall be required to provide interoperability between the lighting control panelboards such that inputs or switching events in one panel may be used to control the switching of breakers in another panel. This interoperability shall not be limited to panelboards, but shall extend to any LonWorks compliant device such as occupancy sensors or network switches.

2.05 SOFTWARE [OPTIONAL]

- A. The software shall provide a user-friendly interface for set-up and maintenance of input-based and time-based schedules.
- B. Software shall provide remote monitoring and control of the system or individual remotely operated circuit breakers.
- C. Operates on a Windows 3.1/Windows 95 platform.

2.06 PERSONAL COMPUTER WORKSTATIONS [OPTIONAL]

- A. The lighting panelboard system shall include personal computer workstations complete with software as specified in section 2.05 of this specification. The workstation(s) shall be pre-configured with all software, configuration files and ready to connect and operate when delivered to the job site.
- B. The panelboard lighting control system shall include [] factory supplied personal computer workstations.
- C. Each workstation shall consist of a Pentium II or higher CPU, color monitor, Windows 3.1, Windows 95, network interface card, CD-ROM, and/or [3.5 in.] floppy drive, [] Mbytes RAM and [] Mbytes hard drive storage.

3.01 EQUIPMENT INSTALLATION AND DOCUMENTATION

INSTALLATION


- A. The panelboard lighting control system with remotely operated circuit breakers shall be installed and wired completely as shown on the plans by the contractor.



Suggested Specifications

- B. All remote control wiring shall be installed in accordance with Article 725, Class 2 of the National Electrical Code and local codes.
- C. Wire size shall be as recommended by manufacturer, but shall not be smaller than #24 AWG.
- D. Install system in accordance with manufacturer's written instructions and the NEC.
- E. Contractor shall coordinate all of the work in this section with all of the trades covered in other sections of the specification to provide a complete and operable system.

END OF SECTION

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Bulletin No. 1210CT9801 September, 1998



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