“lighting” control systems
**Lighting Control Systems**

Why focus on lighting control

Typical energy profile: Office Building

- Lighting: 43%
- Office Equip: 24%
- Ventilation: 8%
- Cooling: 14%
- Space Heating: 3%
- Other: 8%

Source: Energy Information Administration, 1995 Commercial Energy Buildings Energy Consumption Survey

Operational savings from the installation of an intelligent lighting control system frequently exceeds 15% of the total electrical bill.
Market Trends

- Increasing awareness of energy costs (via Powerlogic or observed)
- Increasing pressure to reduce costs (increasingly limited resources)
  - Private initiatives to introduce energy savings
  - State/Federal laws requiring energy saving technologies
  - State/Federal incentives promoting energy saving technologies
Product Trends

- Increase in microprocessor based control
- Increase in web enabled control (and management software)
- Increase in level of integration between building systems
- Increase in new features, functions, benefits
- Increased ease of installation and maintenance
Cost of neglecting lighting control

For panels, leaving the lights ON is the same as allowing 10 ovens to operate continuously!!!
Savings Calculator

This spreadsheet is only a guide to be used in estimating potential savings. Your actual conditions will vary. While reasonable assumptions are made, no guarantee of results is offered or implied.
Intelligent lighting control

- Watts over Time
  - Build on existing energy saving products
- Growing focus on reducing run-time via Scheduling, Sensing, Switching
- Growing focus on payback
  - Direct energy cost (with demand)
  - Additional maintenance benefits
  - Additional life cycle benefits
  - Additional HVAC benefits
Control Parameters

- Basic Control
  - Flexible Scheduling
  - Flexible Switching
- Adaptable Control
  - Demand Control
  - Global Data Sharing
  - Integrate/Interface w/BAS

*Automatically control lighting according to preset schedule, override request, or load shed command.*
Basic Scheduling

- Time and Calendar Events
  - Daily, Weekly, Monthly, Yearly repeating schedule.
  - Automatic daylight savings correction.
  - Sunrise/sunset feature automatically adjust on/off periods to compensate for seasonal changes.
  - Special event/holiday schedules.
- Timer Events
  - RunTime
  - Blink, Dual Blink, Delay

*The special events scheduler allows single events to be programmed in advance.*
Basic Switching

- Inputs provide ‘local’ override control typically from low voltage wall switches, photo sensors, card access controllers or other control devices.
- Inputs work in conjunction with time schedules to energize circuits, only when lighting is required.

*Inputs can be used to provide timed override control during non-occupied scheduled periods (e.g. weekends)*
Demand control

- Respond to pre-set energy demand limits.
- Coordinate with on-site generation to assure proper loading for equipment.
- Schedule critical periods based on occupancy requirements.
- Sequence restoration of loads at the end of a demand period.

An intelligent lighting control can assure non-critical loads are shed during peak-power conditions when utility rates are at their highest.
Global data sharing

- Global data sharing allows one controller to control any breaker or group of breakers connected to the system.
- Eliminates ‘hard wire’ connections between switching devices by utilizing the local area network (LAN).
- Typical applications include:
  - A single photocell controls every parking lot branch circuit in a large shopping mall.
  - An intrusion alarm switches every branch circuit ON in a large bank.
  - An override panel controls banks of lights at a stadium.

Global data sharing is ideal for sports arena’s, parking lots, egress area’s, and convention centers.
Integrate/Interface with BAS

- **Interface** via dry contact closures
  - Control wiring like contactor systems
- **Integrate** via 3rd party serial communications
  - Gateway processor communication to POWERLINK G3 Control Module
Capable of controlling other loads

- Other loads can be easily controlled with an intelligent lighting control center

Applications include:
- Fans
- Fractional HP motors
- Water coolers & heaters
- Baseboard electric heaters
- Water pumps

An intelligent lighting control system provides a low cost alternative to motor control centers when feeding small fractional HP motors and other loads.
Controllable Breaker considerations...

- Compact design utilizes less wall space (sized similar to typical lighting panels); results in reduced installation cost and allows full range of typical panelboard options
- Limited wiring requirement results in little chance for error and provides easy fix via flexible configuration
- Fully rated controllable breakers result in code compliant installation
- Additionally, there are...
  - Less design time
  - Powerful control capabilities
  - Reliable operation
  - Easy to modify
Traditional Solutions

- Wall Space
- Inter-Wiring
- Code concerns
- Limited versatility
- Maintenance issues
Traditional Retrofit Solutions

Before

- Additional space required
- Disruption of existing conduits/wire
- No standard design

After

- Intensive labor requirements
- Multiple manufacturer’s products
- Long payback period

Cut conduit, splice and re-route branch circuits through contactors

Control logic, time clock, and communications

Contactor or relay panel mounted in available open wall space

Conventional panelboard

Wire Gutter
Controllable Breaker Retrofit Solutions

**Before**

- Conventional panelboard

**POWERLINK G3**

- Fits existing enclosures
- Less downtime; no disruption of existing conduit/wire
- Pre-engineered solution
- Reduced labor
- Single Manufacturer responsibility
- Shorter payback periods

**After**
The diagram illustrating the cost benefit of Powerlink is shown below. The diagram uses a grid format to indicate the number of branch circuits switched and the number of zones.

### Rule of Thumb for Powerlink:

- **Powerlink becomes more cost effective beyond 16 controlled branch circuits and/or 3 zones.**
- **Powerlink should be considered for areas with changing patterns or schedules for occupancy and/or light levels.**
- **Powerlink should be considered for any project with networking and/or time based requirements.**
- **Powerlink should be considered for any retrofit projects.**
Powerlink is the only lighting control system that utilities standard panelboard boxes. Branch wiring and conduits remain undisturbed for retrofit applications.
Powerlink Variations

- Standard NF interiors, boxes and covers
- Mains through 600A
- Interior 30, 42, 54 circuit
- Enclosure NEMA 1, 3R, 5 and 12 construction
- Column Wide panels
- Dual-voltage panels
- MPS/IPC
- Wide variety of options (non-linear, tvss, hinged trim, double tub, etc.)
Powerlink Breaker Design Criteria

- Robust, Reliable design
- UL listed SWD, HID, HACR ratings
- Proven 200,000 cycles.
- Auto/Manual Override
- Mechanical Status Indication
- AIR: 120/208V: 65kA
  277/480V: 14kA
- Series ratings available to 200kA
- Meets NEC 110-10 requirements
- IEC 1000 certified for surge/emissions
- UL listed 50, 67, 916
- High temperature electronics.

Powerlink G3 circuit breakers are the only remote switching devices, UL tested and rated for use with many of today’s high fault systems.
Powerlink Breaker Cutaway View
## Powerlink Breaker Series Ratings (240V)

<table>
<thead>
<tr>
<th>System Voltage (Maximum)</th>
<th>UL Series Connected Ratings (AIR)</th>
<th>Main</th>
<th>Branch</th>
</tr>
</thead>
<tbody>
<tr>
<td>240Vac</td>
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<tr>
<td>65,000</td>
<td>EGB</td>
<td>125A</td>
<td>ECB-G3</td>
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<tr>
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<td>FC</td>
<td>100A</td>
<td>15-30A</td>
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<tr>
<td></td>
<td>KC</td>
<td>250A</td>
<td>15-30A</td>
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<td></td>
<td>IK</td>
<td>250A</td>
<td>15-30A</td>
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<tr>
<td></td>
<td>Class J/T Fuse</td>
<td>200A</td>
<td>15-30A</td>
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<td>15-30A</td>
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</tbody>
</table>

Notation: EGB, ECB-G3, and 15-30A indicate the type and current ratings of the breakers or fuses.
## Powerlink Breaker Series Ratings (480V)

<table>
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<th>UL Series Connected Ratings (AIR)</th>
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<th>Branch</th>
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Powerlink Control Bus and Power Supply

**Control Bus**
- Distributes commands and monitors breaker/system data
- Attaches directly to NF interior for positive breaker alignment

**Power Supply**
- Powers controller & eight control busses
- Protected with integral surge protection
Powerlink Subnet Design

Master panel

Slave panels

One master panel controls up to 168 branch circuits in up to eight different panelboards.
# Powerlink Controllers

<table>
<thead>
<tr>
<th>Level System</th>
<th>Features</th>
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</table>
| **500 Level System** | - Dry-contact I/O interface  
|                  | - Front keypad  
|                  | - Remote comm’s |
| **1000 Level System** | - Same features as 500 level  
|                  | - Time scheduler  
|                  | - LCD blacklit display |
| **2000 Level System** | - Same features as 1000  
|                  | - Global input controller  
|                  | - Ethernet comm’s/Web setup |

[Schneider Electric Logo]
NF500G3 Input Driven Control

- Security System
- Time Clock
- Photocell control
- Switch Override

Modem

B: On/delay Off
A

C + D
D (timed On)

NF500G3 Master Panel

- A-Sales lights
- B-Stocking lights
- C-Parking lot lights
- D-Signage lights
NF1000G3 Stand-Alone, Time-Based Control

Typical commercial building application
RS485 Network Communications
NF2000G3 Comprehensive control/monitoring
Ethernet Network Communications
Web Enabled Features (to name a few…)

Embedded Web Pages

- Breaker/Panelboard/System status
- Range of Graphical User Interfaces Available

Email Notification

- Notification of non-responding breakers, busses, controllers, etc.
- Notification of runtime (based on time presets)
Web Enabled Features

Run-Time

- Monitor breaker ON-Time
- Compares to setpoint for re-lamping notification (preventative maintenance)

Communication Loss Action

- Separate timers for Ethernet and serial
- Use as part of an integrated control strategy (especially when not set to RUN)
New Features

Time Synchronization
- Controller can automatically sync clock to a Network Time Server
- Public or private servers; firewalls
- Windows XP
- Network Appliances available for “island” mode applications

Input Synchronization
- Adds “soft-wiring” of control sources back to inputs
- You can automatically:
  - Change the state of an input (sweep)
  - Enable/Disable an input (sales floor)
  - Enable/Disable an input timer (night overrides)
New Features

Event Log - saves last 512 events

- Schedule Object State (1 – 16)
- Input Object State (1 – 64)
- Zone State (1 – 64)
- Remote Source State (1 – 32)
- Remote Source Time-Out (1 – 32)
- Zone Override Enable (1 – 64)
- Zone Override Type (1 – 64)
- Override Time-Out Enable (1 – 64)
- Timer Inhibit (1 – 64)
- Input Inhibit (1 – 64)
- Latched Input State (1 – 64)
- Non-Responding Breaker State
- Breaker Present
- Bus Present
- Communications Time-out
- Halt Mode
- Front Panel Access
- Power Outage
Field Commissioning and Support

- Design assistance
- Custom control layout/documentation
- Control wiring verification
- Equipment test
- Computer and software installation
- Programming to owners requirements
- Local training of operators
Factory Support

- Technical Support Center staffed with trained engineers. Unlimited free service.
- Priority Technical Center remote access to customer’s system. Provides program modifications, firmware and software upgrades. Toll free tech support number.
Factory Subnet Testing
Environmental Concerns

- Square D shares your concern for the environment.
- We manufacture products designed to provide comfort yet reduce power consumption and thereby reduce the amount of harmful emissions released to the environment.
- Our goal for 2004 is to ensure that 100% of our manufacturing units comply with ISO 14001.
Thank you for your time and attention!
Questions and comments

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