Digitrip® OPTIM™ Trip Unit System for Switchboards

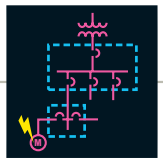
For Cutler-Hammer Pow-R-Line™ C and Pow-R-Line *i* Switchboards 240, 480, 600 V Ac, 250 V Dc

The world's most advanced programmable trip unit system for the next generation of electrical distribution systems.

Cutler-Hammer

EATON

Digitrip OPTIM Trip Unit System in Cutler-Hammer Pow-R-Line Switchboards



The Problem

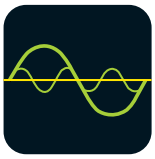
How to Achieve Complex System Coordination, Flexibility, and Closer Thermal Protection of Your Electrical Distribution System

Consider this possibility. A compressor motor fails phase-to-ground due to overheating, age, or a bearing failure. The resulting short circuit could temporarily shut down your entire facility, costing from a few thousand to hundreds of thousands of dollars per hour in lost production and related costs…unless the protective devices have been selectively coordinated and/or are able to send an early warning alarm to prevent such shutdowns.

For years, electrical engineers have struggled to coordinate protective devices within an electrical distribution system. Achieving selective overcurrent protection has been a compromise between too much protection and too little. This delicate balance is further complicated by specific application requirements or changes to the electrical distribution system.

The Need

Increases in factory automation, microprocessors, and energy management demand more sophisticated levels of protection, coordination, and electrical system monitoring to minimize downtime, enhance productivity, and reduce energy costs through greater efficiency in power utilization.



The Solution

Digitrip OPTIM Trip Unit System Incorporated into Pow-R-Line C and Pow-R-Line i Switchboards

Digitrip OPTIM is the programmable communicating microprocessor-based low voltage electronic trip unit system for Cutler-Hammer Series C® Molded Case Breakers and low voltage power breakers.

Unique Programmable Protection and Coordination

OPTIM Trip Units provide the capability to create custom overcurrent protection to meet the exact load requirements of your electrical distribution system…a feature unavailable in any other trip unit. We've also added I^4t curve shaping to provide closer coordination with upstream fuses and transformer damage curves. This high level of selectivity allows your system to be matched more closely, bringing "trip" and "don't trip" margins closer than previously possible.

The many benefits of programmability include more settings, better accuracy, faster configuration, remote accessibility, and higher system security…plus the ability to incorporate software programs.

But there's more. OPTIM Trip Units also provide: state-of-the-art advanced warning capability, system diagnostics, monitoring, communications, power and energy monitoring, and harmonics analysis.

Real World Solutions

By integrating OPTIM Trip Units into industry leading Cutler-Hammer low voltage Pow-R-Line Panelboards and Switchboards, engineers can now specify protective devices that deliver real world solutions to today's complex electrical distribution systems.

Pow-R-Line C Switchboards feature a space saving design with the capability of breakers and fusible switches being installed in the same chassis.

Pow-R-Line *i* Switchboards feature a compartmentalized design for applications where a greater degree of safety is required.

A Complete Low Voltage System for All Applications

Cutler-Hammer has integrated OPTIM Trip Units into the Pow-R-Line family of low voltage panelboards and switchboards …expanding their design flexibility to utilize the complete family of Cutler-Hammer molded case breakers, low voltage air power breakers, encased power breakers, and fusible switches.

Digitrip OPTIM Trip Units are available in Series C Molded Case Circuit Breaker L-, N-, and R-frames down to a 70 ampere rating plug…and for Type SPB encased power breakers and Type DSII/DSLII low voltage air power breakers.

A Digitrip OPTIM system includes:

- An OPTIM 750 or 1050 Trip Unit…with
  - A hand held OPTIMizer programmer and/or;
  - A panel mounted Breaker Interface Module and/or;
  - IMPACC software to set, configure, diagnose, monitor, and test the system.

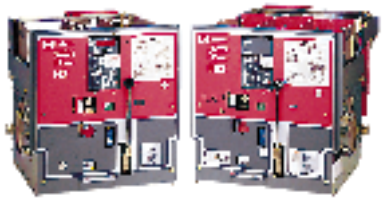
Programmable Trip Technology for the World's Most Reliable Family of Low Voltage Circuit Breakers

Series C Molded Case Circuit Breakers

Continuous ampere ratings from 70 to 2,500 amperes in L-, N-, and R-frames.

Type SPB Systems Pow-R™ Circuit Breakers

Continuous ampere ratings from 200 to 5,000 amperes.



Type DSII and DSLII Air Power Circuit Breakers

Continuous ampere ratings from 100 to 5,000 amperes.

Three Programming and Monitoring Methods Provide OPTIMum Flexibility

Stand Alone

OPTIMizer

A hand held programmer, used to program and monitor individual trip units. It plugs directly into the trip unit and accesses, displays, and configures information from the OPTIM Trip Unit. An operator can:

- Complete initial system setup.
- Configure the system.
- Display information.
- Test trip unit performance.
- Set system password.

Sub-Network

Breaker Interface Module

The panel mounted Breaker Interface Module (BIM) is used to program and monitor OPTIM Trip Units at the assembly…and access, display, and configure information from OPTIM Trip Units. Any combination of OPTIM Trip Units and/or Digitrip RMS 810 and 910 Trip Units* and/or IQ Energy Sentinels™ can communicate with the BIM. It duplicates OPTIMizer capabilities while providing these additional features:

- Expanded energy monitoring. An operator can set addresses for group energy monitoring and group energy readings.
- Local and remote indication and alarming.
- Expanded communications capabilities with OPTIM Trip Units, Digitrip RMS Trip Units, and IQ Energy Sentinels.

* Refer to page 11 for additional information.

IMPACC Communications

The IMPACC System

It provides programming and monitoring capabilities from a personal computer.

- All OPTIM programming, configuration, advance warning, diagnostic, monitoring, and control capabilities can be accessed from a PC using IMPACC Series III software.
- A coordination software package that displays, configures, and coordinates time-current protection curves.
- Energy Billing Software (stand alone application specific package) provides capabilities to determine energy usage data by individual departments or tenants in a facility…and then creates "electric bills."
- Waveform and harmonic display software allows displays of captured waveforms for phase-to-phase, phase-to-neutral, and neutral-to-ground voltages. The display can also include total harmonic distortion (THD) and individual harmonic currents of phase currents A, B, C, neutral, and ground.

Programmability, A New Level of Technology

Superior rms Sensing for Accuracy and Reliability

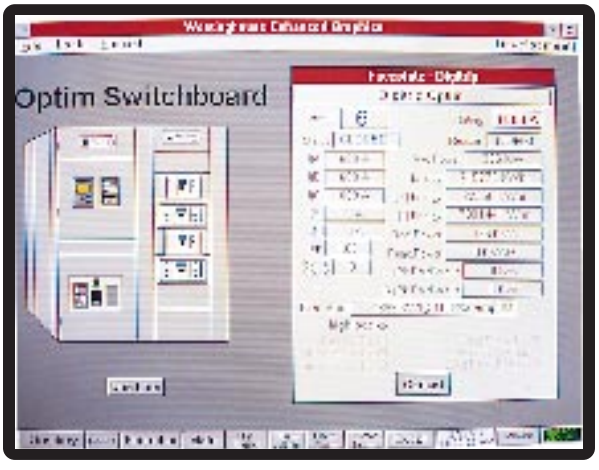
Digitrip OPTIM Trip Units utilize the proprietary SuRE Plus™ Chip microprocessor that provides unparalleled accuracy for protection, system diagnostics, monitoring, and communications.

OPTIM technology builds upon the original, front adjustable Digitrip RMS Trip Units to provide high reliability and increased functionality to meet the sophisticated demands of today's and tomorrow's electrical distribution systems.

OPTIM 750	OPTIM 1050
	
Digitrip OPTIM 750 Features ■ rms Sensing ■ Programmable ■ 10 Curve Shaping Adjustments ■ Load Monitoring ■ Diagnostics ■ Communications	**Digitrip OPTIM 1050 Features** ■ rms Sensing ■ Programmable ■ 10 Curve Shaping Adjustments ■ Load Monitoring ■ Diagnostics ■ Communications ■ Power and Energy Monitoring ■ Harmonics

Programming and Monitoring Methods

Programming and trip unit monitoring can be completed at the trip unit with the hand held OPTIMizer while the Breaker Interface Module provides programming and monitoring at the assembly. With IMPACC Communications, programming and monitoring can be accomplished remotely from a personal computer.



Superior Protection and Coordination, Systems Monitoring, Energy Management, and Communications

Programmability Increases Protection and Coordination Capabilities

- **Virtual Infinite Settings.** Setting increments are increased by a factor of 10 as compared with conventional front adjustable trip units.
- **Improved Accuracy and Reliability.** Time-current pick-up setpoints are shown in actual amperes, not multiples. True rms sensing prevents nuisance trips caused by nonsinusoidal waveforms.
- **System Security.** Programmable password protection.
- **Thermal Memory.** Selectable powered and unpowered thermal memory prevents cumulative overheating due to repeated overloads, eliminating nuisance trips.
- **Selectable Sure Start Discriminator.** Provides protection when closing a breaker on startup if no instantaneous setting has been programmed.
- **I^4t Curve Shaping.** This long delay time slope provides better coordination with fuses and transformer damage curves.
- **Short Delay and Ground Delay Zone Selective Interlocking.** Provides positive selectivity on ground fault and short time protection without time delays…down to a 70 ampere breaker.

Extensive Monitoring Capabilities and Early Warning Alarms Keep the System Operating and Productive

- **Programmable High Load Phase and Neutral Alarm and Ground Fault Alarm.** Alert the user to an impending trip condition without tripping the breaker. Monitored locally at the breaker or remotely.
- **Field Testing.** Trip or no trip testing can be done to verify performance and operation.
- **Trip Event Information.** Four LEDs on the trip unit are complemented by trip event information stored in the OPTIM Trip Unit memory after a trip condition. This information can be used to develop reports which analyze patterns of system alarms, system loadings, power flow, peak demand, and kWh usage.

Data You Can Use to Manage Energy Costs and Enhance Power Quality

- **Power and Energy Monitoring** of peak demand, present demand in kW, forward, reverse, and total energy in kWh.
- **Energy Alarming** such as 90% of peak demand exceeded.
- **Power Quality Monitoring** of THD and harmonic content (first through 27th) in phases A, B, C, neutral, and ground.
- **THD Alarming** to detect a change in power quality.
- **Power Factor Monitoring.**

System Communications and Software

The Cutler-Hammer IMPACC monitoring, protection, and control communications system is the most highly reliable and cost effective communications system available. From a master control PC, either on-site or off-site, the plant operator, facilities engineer, and/or maintenance personnel can monitor and/or control the entire power distribution system. Information can be made available to other PCs at different locations within a facility.

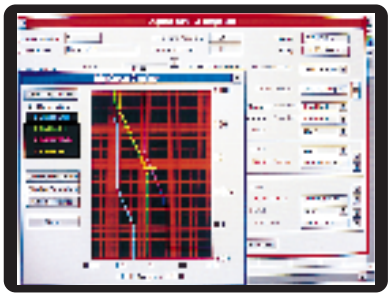
All OPTIM programming, configuration, advance warning, diagnostic, monitoring, and control capabilities can be accessed from a central PC using IMPACC Series III software.

Additional IMPACC software packages include:

- **Circuit Breaker Configuration and Trip Curve Package** that displays, configures, and coordinates time-current protection curves for OPTIM Trip Units and other devices that can be included on an IMPACC System. Multiple trip curves can be displayed on the screen to show how these devices coordinate.
- **Energy Billing Software** (stand alone application specific package) provides capabilities to determine energy usage data by individual departments or tenants in a facility… and then creates "electric bills."
- **Waveform Capture and Harmonic Display Software** performs a waveform capture of phase currents A, B, and C as well as neutral and ground. In addition, total harmonic distortion (THD) and individual harmonic currents of phase currents A, B, C, neutral, and ground can be displayed.

Highly Reliable, Comprehensive Communications that Will Improve the Operating Effectiveness of Your Facility

PROTECTION AND COORDINATION



Provides Data to Improve Power System Reliability

ENERGY MONITORING

Provides Data to Help Control Energy Costs

POWER QUALITY

Provides Data to Reduce Downtime and Equipment Damage

OPTIM Trip Units in Pow-R-Line C Group Mounted Switchboards

Pow-R-Line C Group Mounted Switchboards feature a standardized, cost effective design that makes them easy to install and maintain. They utilize the full family of Cutler-Hammer molded case circuit breakers and fusible switches.

Design capabilities are enhanced by the wide range of available main devices, utility provisions, and customer metering arrangements.

1 Customer Metering
- Full family of IQ metering and protective devices available.
- Conventional meters and switches available.

2 Utility Metering
- Built to specific utility requirements for all service areas.

3 Main Devices, Individually Mounted
- Series C Breaker; 400-2,500 amperes, fixed mounted or drawout.
- Insulated Case Power Breaker; SPB, 800-5,000 amperes, fixed mounted.
- Insulated Case Power Breaker; SPB, 800-4,000 amperes, drawout.
- Power Circuit Breaker; DSII/DSLII, 800-4,000 amperes, fixed mounted or drawout.
- Digitrip RMS 310, 510, 610, 810, 910, and OPTIM 750 and 1050 Trip Units available.
- Bolted pressure contact switch; 800-6,000 amperes, fixed mounted.
- Fusible switches; FDPW, 400-1,200 amperes, fixed mounted.
- Main lugs only; mechanical or compression, 400-6,000 amperes.
- Incoming busway or transformer connection available.

4 Feeder Devices, Panel Mounted
- Series C Breaker; 15-1,200 amperes.
- Digitrip RMS 310, OPTIM 750, and OPTIM 1050 Trip Units available.
- Fusible switches; FDPW, 30-1,200 amperes.
- Ability to mix circuit breakers and fusible switches.
- Optional 11X compartment for customer mounted devices available.
- Optional customer metering compartment available; maximum 38X space.

Construction Features

- Meets NEMA Standard PB-2 and UL 891.
- Front and rear accessible.
- 6,000 ampere main bus ampacity.
- 65 kAIC standard bus bracing. Optional 100 kAIC or 200 kAIC.
- Standard aluminum bus bar. Optional copper or silver-plated copper bus bar.
- A full range of device modifications.
- ANSI 61 powder coat paint finish.
- NEMA Type 1 or Type 3R enclosures.
- Seismically tested, seismically qualified, and exceeds requirements of the Uniform Building Code (UBC) and the California Building Code (CBC).

1. Branch wiring gutters.
2. Optional hinged gutter covers to provide easy access to branch wiring.
3. Unique chassis design accommodates a variety of Cutler-Hammer breakers, trip units, and accessories.
4. Fully rated cross bus (never tapered) is predrilled to accept future Pow-R-Line C sections.
5. Optional IQ Energy Sentinel mounted on a K-frame breaker. This device allows the customer to monitor energy usage (kWh) through a BIM, IMPACC, or a personal computer. IQ Energy Sentinels are available on standard F-, J-, or K-frame breakers.
6. Ability to twin mount K-frame (400 ampere) breakers.
7. L-frame breaker with a Digitrip OPTIM 1050 Trip Unit factory wired for communications, ground fault, energy monitoring, and harmonics monitoring.
8. All OPTIM Trip Unit wiring is marked and securely bound with wire ties and accessible for customer inspection. The Cutler-Hammer reputation for quality and attention to detail is typified by the wiring, consistently characterized as “superior.”

Optional hinged gutter covers to provide easy access to branch wiring.

Five L- or N-frame breakers with Digitrip OPTIM Trip Units and one Breaker Interface Module can be mounted in a single 45-inch (1143.00-mm) wide distribution structure. Six L- or N-frame breakers can be mounted when the Breaker Interface Module is mounted in another section or is not required.

Digitrip OPTIM Trip Units can be easily programmed and monitored at the switchboard using the Breaker Interface Module. A hinged compartment houses the BIM and a 30 V Dc power supply for communications capability. For OPTIM 1050 Trip Units, a potential transformer module is supplied to provide voltage for power and energy monitoring.

OPTIM Trip Units in Pow-R-Line *i* Compartmentalized Switchboards

Pow-R-Line *i* compartmentalized switchboards are engineered for applications where a greater degree of safety is required. These switchboards are rear accessible and utilize the full family of Cutler-Hammer molded case circuit breakers and fusible switches.

Design capabilities are enhanced by a wide range of available main devices, utility provisions, and customer metering arrangements.

1 Customer Metering
- Full family of IQ metering and protective devices available.
- Conventional meters and switches available.

2 Utility Metering
- Built to specific utility requirements for all service areas.

3 Main Devices, Individually Mounted
- Series C̄ Breaker; 400-2,500 amperes, fixed mounted or drawout.
- Insulated Case Power Breaker; SPB, 800-5,000 amperes, fixed mounted.
- Insulated Case Power Breaker; SPB, 800-4,000 amperes, drawout.
- Power Circuit Breaker; DSII/DSLII, 800-4,000 amperes, fixed mounted or drawout.
- Digitrip RMS 310, 510, 610, 810, 910, and OPTIM 750 and 1050 Trip Units available.
- Bolted pressure contact switch; 800-6,000 amperes, fixed mounted.
- Fusible switches; FDPW, 400-1,200 amperes, fixed mounted.
- Main lugs only; mechanical or compression, 400-6,000 amperes.
- Incoming busway or transformer connection available.

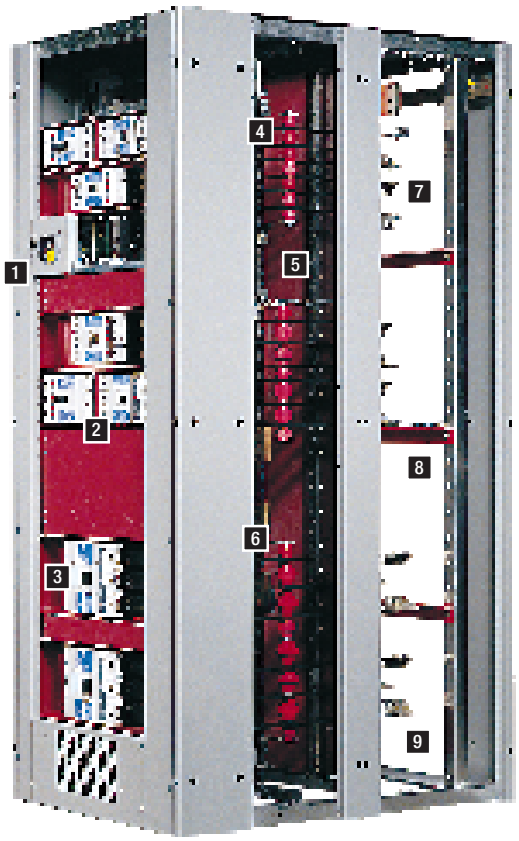
4 Feeder Devices, Compartmentalized
- Series C̄ Breaker; 15-1,200 amperes.
- Digitrip RMS 310, OPTIM 750, and OPTIM 1050 Trip Units available.
- Fusible switches; FDPW, 30-1,200 amperes.
- Ability to mix circuit breakers and fusible switches.
- Optional 11X compartment for customer mounted devices available.
- Optional customer metering available; maximum 38X space.

Construction Features

- Meets NEMA Standard PB-2 and UL 891.
- Rear accessible.
- 6,000 ampere main bus ampacity.
- 65 kAIC standard bus bracing. Optional 100 kAIC or 200 kAIC.
- Standard aluminum bus. Optional copper or silver-plated bus bar.
- A full range of device modifications.
- ANSI 61 powder coat paint finish.
- NEMA Type 1 or Type 3R enclosures.
- Seismically tested, seismically qualified, and exceeds requirements of the Uniform Building Code (UBC) and the California Building Code (CBC).

Increased Safety Features

- Compartmentalized design for use where a greater degree of safety is required.
- Individual compartments for branch devices – glass polyester for breakers and steel for fusible switches. Compartments help eliminate possible contact with the main bus and reduce fault propagation.
- Three section construction with each barriered from the other.
  - Device Section. Each device is mounted in its own compartment.
  - Bus Bar Section. Contains both horizontal and vertical busses.
  - Rear Cable Compartment. Completely isolated from the bus bars.
- Insulated copper runback. Power taken from the protective device by the runback through a standard full height glass polyester barrier to the rear cable compartment, virtually eliminating the possibility of accidental contact with the main busses during installation or maintenance.

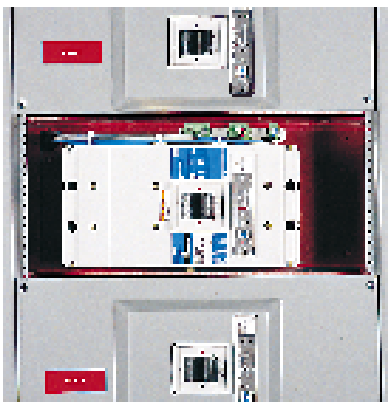


Compartmentalized Design for Rear Construction

Distribution Section
– Front and Side View

1. Available zero sequence ground fault.
2. Tandem mounted breakers through 400 amperes.
3. Glass polyester breaker compartment.
4. Insulated copper load side runbacks.
5. Full length barrier isolating the bus and cable compartments.
6. Horizontal cross bus.
7. Anti-turn lugs.
8. Movable cable brace.
9. Generous conduit space.

Five L- or N-frame breakers with Digitrip OPTIM Trip Units and one Breaker Interface Module can be mounted in a single 36-inch (914.40-mm) wide distribution structure. Six L- or N-frame breakers can be mounted when the Breaker Interface Module is mounted in another section or is not required.



Digitrip OPTIM Trip Units are wired at the factory to customer specifications and are shipped ready for customer programming.

Digitrip OPTIM Trip Units can be easily programmed and monitored at the switchboard using the hand held OPTIMizer.

Typical Digitrip OPTIM Trip Unit Applications

Protection and Coordination

Problem

An automotive plant needs to increase production capacity on an existing assembly line but wants greater reliability and reduced "downtime" to support the investment.

Solution

OPTIM Trip Units support zone interlocking. The plant engineer is able to extend this protection throughout the assembly line to provide better isolation and greater reliability. Also, with built-in communications and alarm capability, the whole system can be monitored to provide the plant engineering staff with critical data to reduce "downtime."

Problem

A manufacturing facility built in 1990 is required to replace several process lines with a more advanced automated manufacturing line. The new protection requirements are quite different from the old protection settings, and now, the original 600 ampere circuit breaker does not coordinate well with the distribution system.

Solution

OPTIM Trip Units are programmable and provide virtual infinite settings. Setting increments are increased by a factor of ten as compared to conventional front adjustable trip units. As your distribution system changes, you simply reprogram (reshape) the trip curve, to guarantee selectivity.

Problem

A major university has always used fusible switches for their power distribution systems, but would like to utilize molded case circuit breakers on their next project due to the advantages circuit breakers provide. The problem lies with coordinating the switchboard's feeder breakers with this upstream fuse.

Solution

OPTIM Trip Units support an I^4t long delay versus the traditional I^2t for allowing close coordination with fuses. Now customers can mix circuit breakers and fuses while assuring selectivity.

Energy Monitoring

Problem

A manufacturing facility continues to set new peak kWh demand levels with the utility. New machinery, increased production on several manufacturing lines, and increases in HVAC usage, are thought to be the reason. The main switchboard already has a meter to monitor and measure kWh, but this will not alert the customer when the system is approaching the peak demand threshold or "break out" those areas responsible for the increases.

Solution

OPTIM 1050 Trip Units monitor and measure power and energy. Specific loads (production lines, machinery, HVAC, etc.) can now provide power and energy information. This unique feature allows a customer to analyze and allocate actual energy usage on a department or production line basis rather than as percentage of the total energy bill. Also, energy alarming allows the customer to receive an alarm whenever a preset kWh level is reached, allowing the customer to shed some noncritical loads or adjust their energy usage so that peak kWh is not exceeded.

Power Quality

Problem

A consultant is upgrading a waste water treatment facility where several variable frequency drives are being added to the existing distribution system. This site has experienced harmonic problems in the past. Knowing that the variable frequency drives may create harmonics on the system, the consultant would like the ability to monitor their harmonics, in the event preventative measures are needed.

Solution

OPTIM 1050 Trip Units monitor and measure harmonics. THD alarming will detect a change in power quality and alert the customer. Their sensitivity, up to the 27th harmonic, will identify the harmonic content and help the customer solve even the most demanding applications where power quality is an issue.

The Digitrip Family of Low Voltage Electronic Trip Units

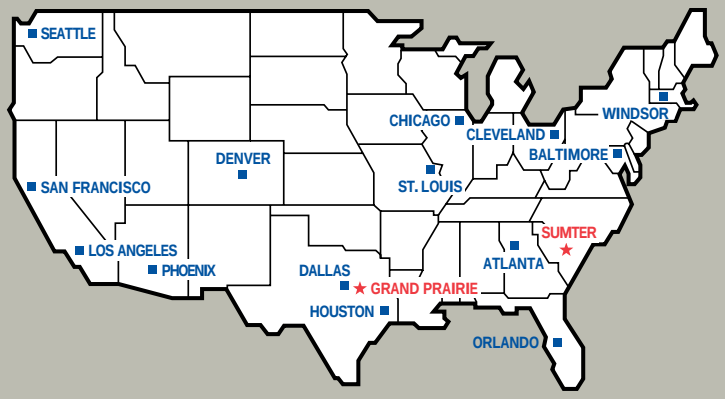
		RMS 310		RMS 510	RMS 610	OPTIM 750	RMS 810	RMS 910	OPTIM 1050
									
BREAKER TYPE									
Frame(s)		Series C K-, L-, N-, R-Frames		Series C R-Frame, SPB, DSII, and DSLII	Series C R-Frame, SPB, DSII, and DSLII	Series C L-, N-, R-Frames, SPB, DSII, and DSLII	Series C R-Frame, SPB, DSII, and DSLII	Series C R-Frame, SPB, DSII, and DSLII	Series C L-, N-, R-Frames, SPB, DSII, and DSLII
Ampere Range		70A-2500A		100A-5000A	100A-5000A	100A-5000A	100A-5000A	100A-5000A	100A-5000A
Interrupting Rating @ 480V		35,65, 100 kA		30 thru 200 kA	30 thru 200 kA	35 thru 200 kA	30 thru 200 kA	30 thru 200 kA	35 thru 200 kA
PROTECTION AND COORDINATION									
Protection	Ordering Options	LS, LSG	LSI, LSIG	LI, LS, LSI, LIG LSG, LSIG	LI, LSI, LIG LSG, LSIG	LSI(A), LSIG	LI, LS, LSI, LIG LSG, LSIG	LI, LS, LSI, LIG LSG, LSIG	LSI(A), LISG
	Fixed Rating Plug (I_n)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Overtemperature Trip	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Long Delay	Adjustable Rating Plug (I_n)	Yes	Yes	No	No	No	No	No	No
	Long Delay Setting	0.5-1.0 (I_n)①	0.5-1.0 (I_n)①	0.5-1.0 (I_n)	0.5-1.0 x (I_n)	0.4-1.0 x (I_n)	0.5-1.0 x (I_n)	0.5-1.0 x (I_n)	0.4-1.0 x (I_n)
	Long Delay Time I^2t	12 Seconds	12 Seconds	2-24 Seconds	2-24 Seconds	2-24 Seconds	2-24 Seconds	2-24 Seconds	2-24 Seconds
	Long Delay Thermal Memory	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	High Load Alarm	No	No	No	0.85 x I_r	0.5-1.0 x I_r	0.85 x I_r	0.85 x I_r	0.5-1.0 x I_r
Short Delay	Short Delay Setting	200-800% x (I_n)	200-800% x (I_n)	200-600% S1 & S2 x (I_r)	200-600% S1 & S2 x (I_r)	150-800% x (I_r)	200-600% S1 & S2 x (I_r)	200-600% S1 & S2 x (I_r)	150-800% x (I_r)
	Short Delay Time I^2t	100 ms	No	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms
	Short Delay Time Flat	No	I-300 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms
	Short Delay Time ZSI	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Instantaneous	Instantaneous Setting	No	200-800% x (I_n)	200-600% M1 & M2 x (I_n)	200-600% M1 & M2 x (I_n)	200-800% x (I_n)	200-600% M1 & M2 x (I_n)	200-600% M1 & M2 x (I_n)	200-800% x (I_n)
	Discriminator	No	No	Yes④	Yes④	Yes	Yes④	Yes④	Yes
	Instantaneous Override	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ground Fault	Ground Fault Setting	Var/Frame③	Var/Frame③	25-100% x (I_n)③	25-100% x (I_n)③	20/25-100%③	25-100% x (I_n)③	25-100% x (I_n)③	20/25-100%③
	Ground Fault Delay I^2t	No	No	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms
	Ground Fault Delay Flat	I-500 ms	I-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms	100-500 ms
	Ground Fault ZSI	No	No	Yes	Yes	Yes	Yes	Yes	Yes
	Ground Fault Thermal Memory	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SYSTEM DIAGNOSTICS									
Cause of Trip LEDs		No	No	Yes	Yes	Yes	Yes	Yes	Yes
Magnitude of Trip Information		No	No	No	Yes	Yes	Yes	Yes	Yes
Remote Signal Contacts		No	No	No	Yes	Yes	Yes	Yes	Yes
SYSTEM MONITORING									
Digital Display		No	No	No	Yes	Yes⑥	Yes	Yes	Yes⑥
Current		No	No	No	Yes	Yes	Yes	Yes	Yes
Voltage		No	No	No	No	No	No	Yes	Yes
Power and Energy		No②	No②	No②	No②	No	Yes	Yes	Yes
Power Quality – Harmonics		No	No	No	No	No	No	Yes	Yes
Power Factor		No	No	No	No	No	Yes⑤	Yes	Yes
SYSTEM COMMUNICATIONS									
IMPACC		No	No	No	No	Yes	Yes	Yes	Yes
FIELD TESTING									
Testing Method①		Test Set	Test Set	Integral	Integral	OPTIMizer, BIM, IMPACC	Integral	Integral	OPTIMizer, BIM, IMPACC

① Set by adjustable rating plug.
② Yes, with addition of IQ Energy Sentinel.
③ Not to exceed 1200A.
④ LS, LSG only.
⑤ Over IMPACC only.
⑥ By OPTIMizer/BIM.

I_n = Rating plug rating.
I_r = LDPU setting.
I_s = Sensor rating.
BIM = Breaker Interface Module.

Cutler-Hammer Pow-R-Line C Panelboards and Switchboards are custom built to your requirements at our world class manufacturing plants in Sumter, SC and Grand Prairie, TX.

In addition, Cutler-Hammer has 14 regional Satellite Plants located across the country that are specifically oriented to providing Pow-R-Line C Panelboards and Switchboards to meet your fast service needs.



Main Manufacturing Plants

Sumter
11 Corporate Circle
Sumter, SC 29150
(803) 481-3131

Grand Prairie
1102 Avenue T
Grand Prairie, TX 75050
(214) 606-5900

Satellite Locations

Atlanta
7990-A 2nd Flag Drive
Six Flags Industrial Park
Austell, GA 30001
(770) 944-1022

Baltimore
6671 Santa Barbara Court
Elkridge, MD 21227
(410) 796-7777

Chicago
1951 Touhy Avenue
Elk Grove Village, IL 60007
(847) 439-3070

Cleveland
4711 Hinckley Industrial Parkway
Cleveland, OH 44109
(216) 485-1940

Dallas
1100 Avenue T
Grand Prairie, TX 75050
(972) 988-3339

Denver
14101 E. 33rd Place
Suite F
Aurora, CO 80011
(303) 371-7844

Houston
2523 Fairway Park Drive
Suite 516
Houston, TX 77092
(713) 688-8430

Los Angeles
2021 Locust Court
Ontario, CA 91761
(909) 923-2040

Orlando
3827 St. Valentine Way
Orlando, FL 32811
(407) 843-3863

Phoenix
7160 South Harl Avenue
Tempe, AZ 85283
(602) 777-3957

San Francisco
20919 Cabot Boulevard
Hayward, CA 94545
(510) 784-8981

Seattle
18657 72nd Avenue, South
Kent, WA 98032
(206) 251-9081

St. Louis
12947 Gravois Road
St. Louis, MO 63127
(314) 842-7662

Windsor
625 Day Hill Road
Windsor, CT 06095
(860) 688-5330

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