

# PC-Series

## Ground Fault Circuit Protection

The PC-Series, AC Residual Current Circuit Breaker with Overcurrent Protection (RCBO), combines the ground fault protection of a GFCI with the familiar overcurrent tripping characteristics of a normal circuit breaker.

The PC-series utilizes the hydraulic magnetic principle which provides precise operation and performance even when exposed to extremely hot and/or cold application environments.

### Features:

- ♦ Overload, short circuit and ground fault protection in a single package
- ♦ Handle style actuators and rocker style "acuguard"
- ♦ Wiping Contacts - Mechanical linkage with two-step actuation – cleans contacts, provides high, positive contact pressure & longer contact life
- ♦ A trip-free mechanism, a safety feature, makes it impossible to manually hold the contacts closed during overload or fault conditions.
- ♦ A common trip linkage between all poles, another safety feature, ensures that an overload in one pole will trip all adjacent poles.
- ♦ Front panel mounting
- ♦ Integral push-to-test button
- ♦ Two integrated LED indicators distinguish if a breaker is closed with Line Voltage present, or has opened due to leakage current, or has opened due to over current, or is closed with no Line Voltage present.
- ♦ Optional Hot/Neutral reversal detection and protection



### Benefits:

- ♦ Increases safety around boats and marinas
- ♦ Protects against electrical shock hazards in areas near water
- ♦ Protects against defects in the wires & conductors
- ♦ Reduces fire and shock hazards from defects in
- ♦ Detects low level ground faults, which do not trip ordinary circuit breakers, that can lead to fires and shock hazards for boating occupants



**Carling Technologies™**

Innovative Designs. Powerful Solutions.

Innovative Designs. Powerful Solutions.

**Carling Technologies, Inc.**  
60 Johnson Avenue • Plainville, CT 06062-1177  
Phone: (860) 793-9281 • Fax: (860) 793-9231  
Email: [sales@carlingtech.com](mailto:sales@carlingtech.com) • [www.carlingtech.com](http://www.carlingtech.com)

## Electrical Tables

**Table A:** Lists UL Listed configurations as a Ground Fault Circuit Interruptor

| PC SERIES TABLE A : LISTS UL LISTED CONFIGURATIONS AS A GROUND FAULT CIRCUIT INTERRUPTOR |             |           |       |                |                        |                         |                                                             |
|------------------------------------------------------------------------------------------|-------------|-----------|-------|----------------|------------------------|-------------------------|-------------------------------------------------------------|
|                                                                                          | VOLTAGE     |           |       | CURRENT RATING | SHORT CIRCUIT CAPACITY | GROUND FAULT TRIP LEVEL |                                                             |
| CIRCUIT CONFIGURATION                                                                    | MAX. RATING | FREQUENCY | PHASE | AMPS           | AMPS                   | MILLIAMPS               | NOTES                                                       |
| SERIES                                                                                   | 120         | 50 / 60   | 1     | 1 - 50         | 5000                   | 6                       | 1 or 2 Poles. One pole of a two pole unit must be Neutral   |
|                                                                                          | 120/240     | 50 / 60   | 1     | 1 - 50         | 5000                   | 6                       | 2 or 3 Poles. One pole of a three pole unit must be Neutral |

**Table B:** Lists UL Listed and Recognized as an Earth Leakage Circuit Interruptor - 120 and 120/240V

| PC SERIES TABLE B : LISTS UL LISTED AND RECOGNIZED CONFIGURATIONS AS AN EARTH LEAKAGE CIRCUIT INTERRUPTOR - 120 and 120/240V |             |           |       |                |                        |                         |                                                             |
|------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|-------|----------------|------------------------|-------------------------|-------------------------------------------------------------|
|                                                                                                                              | VOLTAGE     |           |       | CURRENT RATING | SHORT CIRCUIT CAPACITY | GROUND FAULT TRIP LEVEL |                                                             |
| CIRCUIT CONFIGURATION                                                                                                        | MAX. RATING | FREQUENCY | PHASE | AMPS           | AMPS                   | MILLIAMPS               | NOTES                                                       |
| SERIES                                                                                                                       | 120         | 50 / 60   | 1     | 1 - 50         | 5000                   | 30                      | 1 or 2 Poles. One pole of a two pole unit must be Neutral   |
|                                                                                                                              | 120/240     | 50 / 60   | 1     | 1 - 50         | 5000                   | 30                      | 2 or 3 Poles. One pole of a three pole unit must be Neutral |
| SERIES<br>IGNITION PROTECTED                                                                                                 | 120         | 50 / 60   | 1     | 1 - 50         | 3000                   | 30                      | 1 or 2 Poles. One pole of a two pole unit must be Neutral   |
|                                                                                                                              | 120/240     | 50 / 60   | 1     | 1 - 50         | 5000                   | 30                      | 2 or 3 Poles. One pole of a three pole unit must be Neutral |

**Table C:** Lists UL Listed and Recognized as an Earth Leakage Circuit Interruptor - 240V

| PC SERIES TABLE C : LISTS UL LISTED AND RECOGNIZED CONFIGURATIONS AS AN EARTH LEAKAGE CIRCUIT INTERRUPTOR - 240V |             |           |       |                |                        |                         |                                                                        |
|------------------------------------------------------------------------------------------------------------------|-------------|-----------|-------|----------------|------------------------|-------------------------|------------------------------------------------------------------------|
|                                                                                                                  | VOLTAGE     |           |       | CURRENT RATING | SHORT CIRCUIT CAPACITY | GROUND FAULT TRIP LEVEL |                                                                        |
| CIRCUIT CONFIGURATION                                                                                            | MAX. RATING | FREQUENCY | PHASE | AMPS           | AMPS                   | MILLIAMPS               | NOTES                                                                  |
| SERIES                                                                                                           | 240         | 50 / 60   | 1     | 1 - 30         | 5000                   | 30                      | 2 or 3 Poles. One pole of a three pole unit must be Neutral. Suffix 11 |
| SERIES IGNITION PROTECTED                                                                                        | 240         | 50 / 60   | 1     | 1 - 50         | 3000                   | 30                      | 2 or 3 Poles. One pole of a three pole unit must be Neutral. Suffix 12 |

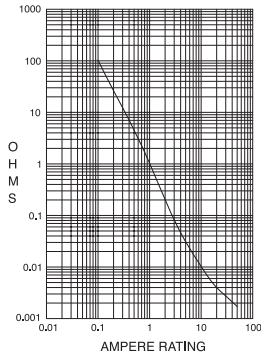
\*Manufacturer reserves the right to change product specification without prior notice.

## Electrical

|                     |                                                                                                                                                                                                         |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Current Ratings     | 1 - 50 Amps maximum                                                                                                                                                                                     |
| Voltage Rating      | 120VAC, 120/240VAC, 240VAC                                                                                                                                                                              |
| Current Trip Level  | 30mA & 6mA                                                                                                                                                                                              |
| Current Trip Time   | For 30mA leakage trip:<br>≤ 22.2mA, shall not trip<br>30mA, shall trip within .10 seconds<br>The above complies with UL-1053 & ABYC E11. For 6mA leakage trip: ≤25ms<br>The above complies with UL-943. |
| Operating Frequency | 50/60 Hz for 30mA leakage trip<br>60 Hz for 6mA leakage trip                                                                                                                                            |
| Interrupt Capacity  | 5,000 Amps                                                                                                                                                                                              |

### Impedance

RESISTANCE, IMPEDANCE VALUES  
from Line to Load Terminals  
(Values Based on Series Trip Circuit Breaker)



| CURRENT (AMPS) | TOLERANCE (%) |
|----------------|---------------|
| 0.10 - 5.0     | 15%           |
| 5.1 - 20.0     | 25%           |
| 20.1 - 50.0    | 35%           |

## Innovative Features

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Indicator          | Two integrated LEDs, Red & Green<br>♦ <b>Green LED On, Red LED Off</b><br>Line Voltage is present, the breaker is closed, and the device is protecting the circuits against over current and leakage current.<br>♦ <b>Green LED Off, Red LED On</b><br>The device has detected leakage current and has opened the circuit breaker.<br>♦ <b>Green LED Flashing, Red LED Off</b><br>The circuit breaker has opened due to over current or has been turned off manually<br>♦ <b>Green LED Off, Red LED Off</b><br>Line Voltage is not present<br>♦ <b>Green LED Flashing, Red LED Off, Amber LED ON</b><br>Indicates Hot & Neutral are reversed and the circuit breaker is open |
| Neutral Protection | When neutral is grounded on load side of circuit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Test Button        | Located on Ground Fault Module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Mechanical

|           |                                                                                                                 |
|-----------|-----------------------------------------------------------------------------------------------------------------|
| Endurance | 10,000 ON-OFF operations @ 6 per minute; with rated Current and Voltage.                                        |
| Trip Free | Trips on short circuit, overload or leakage to ground, even when actuator is forcibly held in the "On" position |

## Physical

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of Poles (Breakers only) | 1-pole (1 Circuit Breaker + 1 GFCI Sensor Module), 120V<br>2-pole (2 Circuit Breakers + 1 GFCI Sensor Module), 120/240V or 120V with Neutral Break. 240VAC two pole 3-pole 120/240V with Neutral Break (Sensor module has 2 pole width)<br>Circuit Breaker Line Side: #10-32, threaded stud.<br>GFCI Sensor Module Load Side: #10-32 threaded stud. Neutral pigtail.<br>Front Panel, #6-32 and M3 threaded inserts. |
| Termination                     | Handle, Flat Rocker, Curved Rocker (with or without rocker guard), Push-to-Reset Rocker                                                                                                                                                                                                                                                                                                                             |
| Mounting                        |                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Actuator                        |                                                                                                                                                                                                                                                                                                                                                                                                                     |

## Environmental

Designed and tested in accordance with requirements of specification MIL-PRF- 55629 and MIL-STD-202G as follows:

|                       |                                                                                                                                                                                             |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Shock                 | Withstands 100 G, 6ms, sawtooth at rated current per Method 213, Test Condition "I".                                                                                                        |
| Vibration             | Withstands 0.06" excursion from 10-55 Hz, and 10 G 55-500 Hz, at rated current per Method 204C, Test Condition A. Instantaneous and ultrashort curves tested at 90% of rated current.       |
| Moisture Resistance   | 93% RH at 30°C for 168 Hours.                                                                                                                                                               |
| Operating Temperature | -35°C to +66°C                                                                                                                                                                              |
| Corrosion             | UL-943-6.21, 3 weeks<br><b>Humidity:</b><br>30±2°C, 70±2% relative humidity<br><b>Mixed Flowing Gases:</b><br>100 ppb H <sub>2</sub> S, 20 ppb Cl <sub>2</sub> , 200±50 ppb NO <sub>2</sub> |

## Agency Certifications

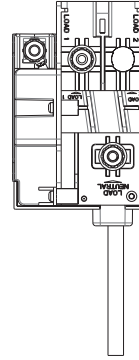
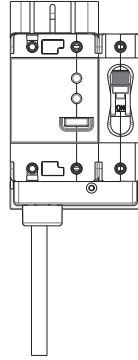
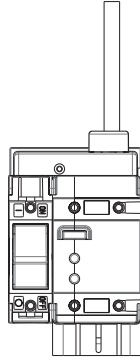
|                  |                                                           |
|------------------|-----------------------------------------------------------|
| <b>UL Listed</b> |                                                           |
| UL Standard 489  | Circuit Breakers, Molded Case, (Guide DIVQ, File E129899) |
| UL Standard 1077 | Supplementary Protectors                                  |
| UL Standard 943  | Class A Ground Fault Circuit Interruptors                 |
| UL Standard 1053 | Ground Fault Sensing and Relaying Equipment               |
| UL Standard 1500 | Ignition Protection                                       |

INDICATE OFF / SINGLE COLOR  
ROCKER ACTUATOR

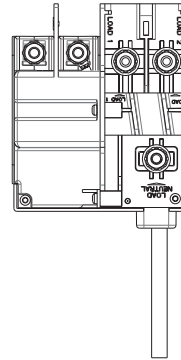
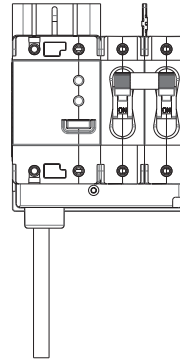
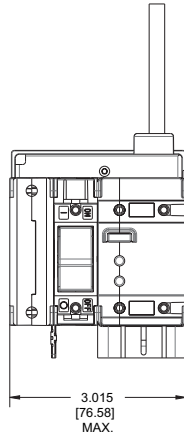
HANDLE / INDICATE ON  
ROCKER ACTUATOR

TERMINAL  
LOCATIONS

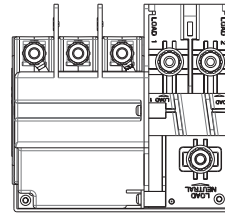
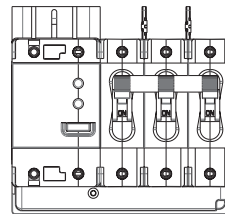
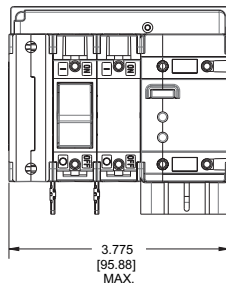
PCA  
120 VAC  
VERSION



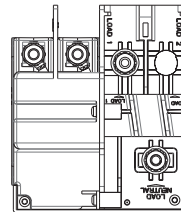
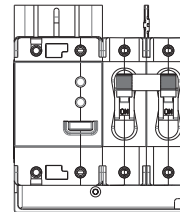
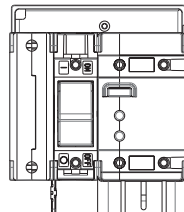
PCB  
120/240 VAC  
VERSION



PCC  
120/240 VAC  
VERSION  
W/ NEUTRAL BREAK



PCD  
120 VAC  
VERSION  
W/NEUTRAL BREAK

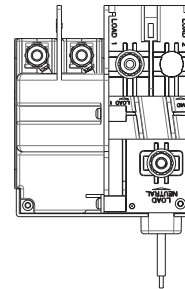
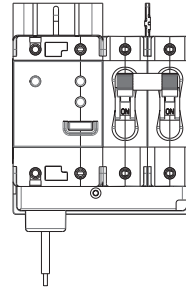
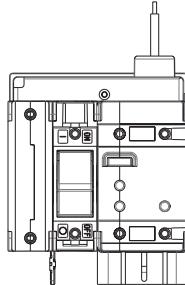


INDICATE OFF / SINGLE COLOR  
ROCKER ACTUATOR

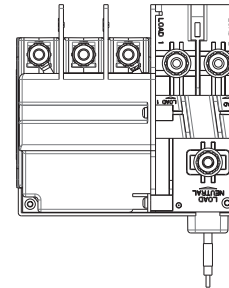
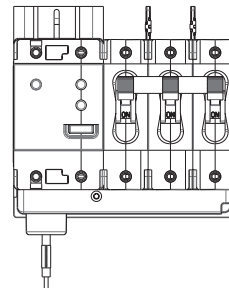
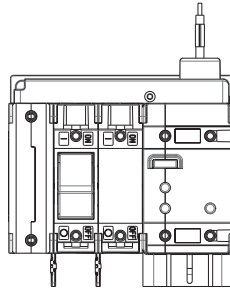
HANDLE / INDICATE ON  
ROCKER ACTUATOR

TERMINAL  
LOCATIONS

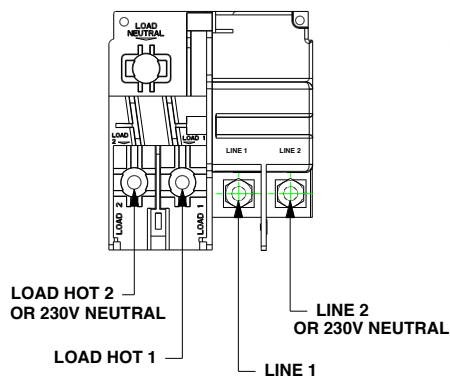
PCE  
120 VAC VERSION  
W/ REVERSE POLARITY  
INDICATOR



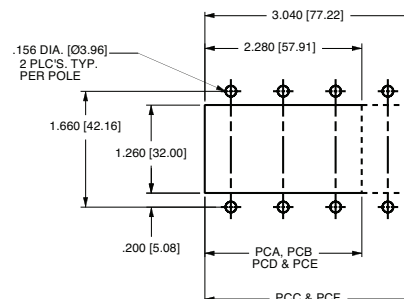
PCF  
120/240 VAC VERSION  
W/ REVERSE POLARITY  
INDICATOR



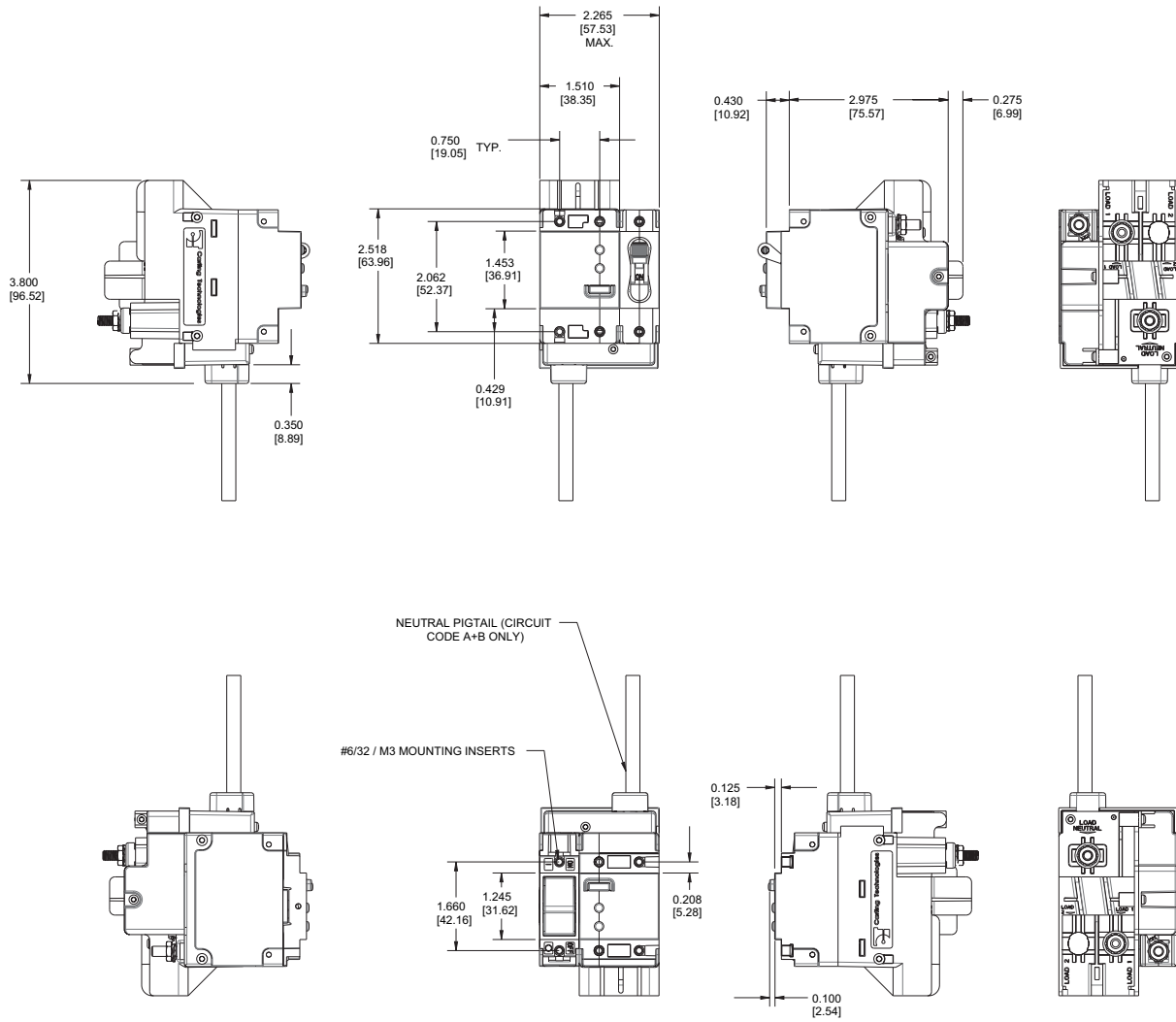
NOTE: NEUTRAL & GROUND PIGTAIL WIRES - SUPPLIED 12" LONG MIN. (CIRCUIT CODES A,B,E & F)



1-Phase 240VAC



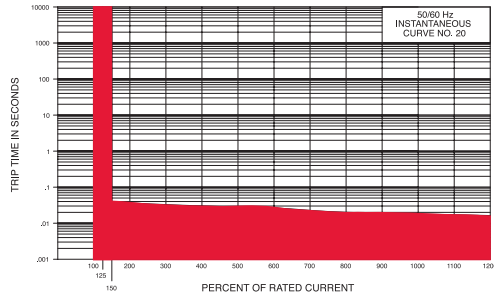
ROCKER ACTUATOR



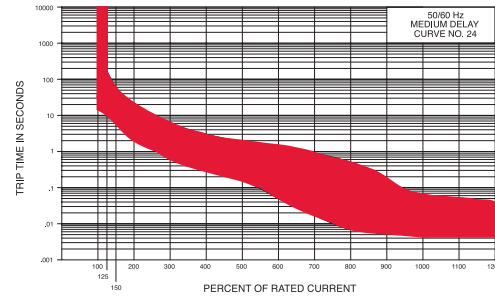
Notes:  
For additional circuit breaker dimensions, reference the C-Series Breakers in the Carling Circuit Protection catalog

## Time Delay Curves

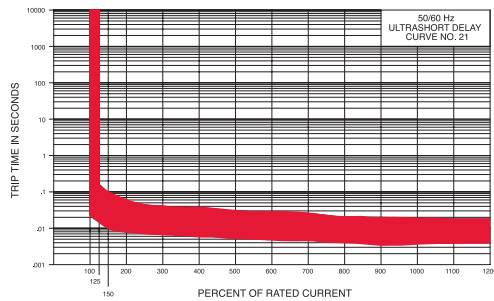
### Instantaneous



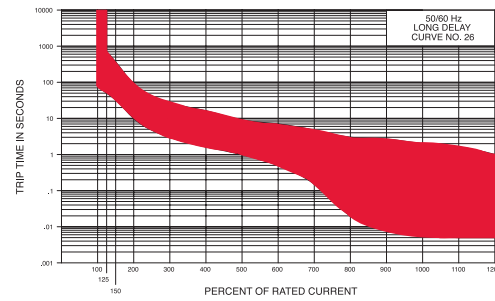
### Medium



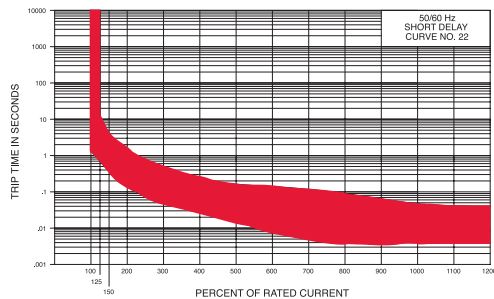
### Ultra Short



### Long



### Short



| TIME DELAY VALUES        |         |             |             |             |             |             |             |             |             |
|--------------------------|---------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| PERCENT OF RATED CURRENT |         |             |             |             |             |             |             |             |             |
| DELAY                    | 100%    | 125%        | 150%        | 200%        | 400%        | 600%        | 800%        | 1000%       | 1200%       |
| 20                       | No Trip | May Trip    | .040 MAX    | .035 MAX    | .030 MAX    | .025 MAX    | .020 MAX    | .017 MAX    | .015 MAX    |
| 21                       | No Trip | .014 - .150 | .011 - .095 | .008 - .055 | .006 - .035 | .005 - .027 | .005 - .021 | .004 - .018 | .004 - .017 |
| 22                       | No Trip | .700 - 12.0 | .350 - 4.00 | .130 - 1.30 | .027 - .220 | .008 - .130 | .004 - .090 | .004 - .045 | .004 - .040 |
| 24                       | No Trip | 10.0 - 160  | 6.00 - 60.0 | 2.20 - 20.0 | .300 - 3.00 | .050 - 1.30 | .007 - .500 | .005 - .060 | .005 - .040 |
| 26                       | No Trip | 50.0 - 700  | 32.0 - 350  | 10.0 - 90.0 | 1.50 - 15.0 | .500 - 7.00 | .020 - 3.00 | .006 - 2.00 | .005 - 1.00 |

#### Notes:

Other time delay values available, consult factory.

Delay Curves 21,22,24,26: Breakers to hold 100% and must trip at 125% of rated current and greater within the time limit shown in this curve.

Delay Curve 20: Breakers to hold 100% and must trip at 150% of rated current and greater within the time limit shown in this curve.

All Curves: Curve data shown represents breaker response at ambient temperature of 77°F (25°C) with no preloading. Breakers are mounted in standard wall-mount position.

The minimum inrush pulse tolerance handling capability is 12 times the rated current. These values are based on a 60 Hz 1/2 cycle, 8.33 ms pulse.

|             |                              |          |              |               |          |                           |          |                     |          |               |                        |                            |          |                  |                          |
|-------------|------------------------------|----------|--------------|---------------|----------|---------------------------|----------|---------------------|----------|---------------|------------------------|----------------------------|----------|------------------|--------------------------|
| <b>PC</b>   | <b>B</b>                     | <b>—</b> | <b>B</b>     | <b>A</b>      | <b>—</b> | <b>24</b>                 | <b>—</b> | <b>620</b>          | <b>—</b> | <b>1</b>      | <b>B</b>               | <b>A</b>                   | <b>—</b> | <b>A</b>         | <b>10</b>                |
| 1<br>Series | 2<br>System<br>Voltage/Poles |          | 3<br>Circuit | 4<br>Actuator |          | 5<br>Frequency<br>& Delay |          | 6<br>Current Rating |          | 7<br>Terminal | 8<br>Actuator<br>Color | 9<br>Mounting/<br>Barriers |          | 10<br>Trip Level | 11<br>Agency<br>Approval |

### 1 SERIES PC

### 2 SYSTEM VOLTAGE / POLES

- A** 120 VAC single phase, one pole  
**B** 120/240 VAC single phase, two pole  
**C** 120/240 VAC single phase with switched neutral, three pole  
**D** 120 VAC single phase with switched neutral, two pole  
**E** 120 VAC single phase with reversed polarity indicator, two pole  
**F** 120/240 VAC single phase with reversed polarity indicator, three pole  
**G** 240 VAC single phase, two pole

### 3 CIRCUIT

- B** Series Trip (Current)

### 4 ACTUATOR

#### Handle

- A** one per pole  
**B** one per multipole unit

#### Two Color Curved Visi-Rocker

- C** Indicate ON, vertical legend  
**D** Indicate ON, horizontal legend  
**F** Indicate OFF, vertical legend  
**G** Indicate OFF, horizontal legend

#### Single Color Curved Rocker

- J** Vertical legend  
**K** Horizontal legend

#### Two Color Curved Visi-Rocker

#### Push-to-Reset

- N** Vertical legend  
**O** Horizontal legend

#### Single Color Curved Rocker

#### Push-to-Reset

- R** Vertical legend  
**U** Horizontal legend

#### Two Color Flat Visi-Rocker

- 1** Indicate OFF, vertical legend  
**2** Indicate OFF, horizontal legend

#### Single Color Flat Rocker

- 3** Vertical legend  
**4** Horizontal legend

#### Two Color Flat Visi-Rocker

#### Push-to-Reset

- 5** Indicate OFF, vertical legend  
**6** Indicate OFF, horizontal legend

#### Single Color Flat Rocker

#### Push-to-Reset

- 7** Vertical legend  
**8** Horizontal legend

| ROCKER STYLE DESCRIPTIONS |               |                |               |               |                |
|---------------------------|---------------|----------------|---------------|---------------|----------------|
| VERTICAL STYLE            | INDICATE "ON" | INDICATE "OFF" | SINGLE COLOR  |               | INDICATE "OFF" |
|                           | CODE "1"      | CODE "1", "N"  | CODE "2", "R" | CODE "1", "R" | CODE "3", "R"  |
| HORIZONTAL STYLE          | CODE "1"      | CODE "1", "O"  | CODE "1", "U" | CODE "2", "U" | CODE "4", "U"  |
|                           | LINE          | LINE           | LINE          | LINE          | LINE           |

### 5 AUXILIARY/ALARM SWITCH

- 20** 50/60Hz Instantaneous  
**21** 50/60Hz Ultra Short  
**22** 50/60Hz Short  
**24** 50/60Hz Medium  
**26** 50/60Hz Long

### 6 CURRENT RATING (AMPERES)

| CODE | AMPERES |     |       |     |        |
|------|---------|-----|-------|-----|--------|
| 210  | 0.100   | 285 | 0.850 | 450 | 5.000  |
| 215  | 0.150   | 290 | 0.900 | 455 | 5.500  |
| 220  | 0.200   | 295 | 0.950 | 460 | 6.000  |
| 225  | 0.250   | 410 | 1.000 | 465 | 6.500  |
| 230  | 0.300   | 512 | 1.250 | 470 | 7.000  |
| 235  | 0.350   | 415 | 1.500 | 475 | 7.500  |
| 240  | 0.400   | 517 | 1.750 | 480 | 8.000  |
| 245  | 0.450   | 420 | 2.000 | 485 | 8.500  |
| 250  | 0.500   | 522 | 2.250 | 490 | 9.000  |
| 255  | 0.550   | 425 | 2.500 | 495 | 9.500  |
| 260  | 0.600   | 527 | 2.750 | 610 | 10.000 |
| 265  | 0.650   | 430 | 3.000 | 710 | 10.500 |
| 270  | 0.700   | 435 | 3.500 | 611 | 11.000 |
| 275  | 0.750   | 440 | 4.000 | 711 | 11.500 |
| 280  | 0.800   | 445 | 4.500 | 612 | 12.000 |
|      |         |     |       | 650 | 50.000 |

### 7 TERMINAL

- 1** Stud, 10-32 threaded

### 8 ACTUATOR COLOR & LEGEND

| Actuator Color | I-O      | ON-OFF   | Dual     | Legend Color |
|----------------|----------|----------|----------|--------------|
| White          | <b>A</b> | <b>B</b> | <b>1</b> | Black        |
| Black          | <b>C</b> | <b>D</b> | <b>2</b> | White        |
| Red            | <b>F</b> | <b>G</b> | <b>3</b> | White        |
| Green          | <b>H</b> | <b>J</b> | <b>4</b> | White        |
| Blue           | <b>K</b> | <b>L</b> | <b>5</b> | White        |
| Yellow         | <b>M</b> | <b>N</b> | <b>6</b> | Black        |
| Gray           | <b>P</b> | <b>Q</b> | <b>7</b> | Black        |
| Orange         | <b>R</b> | <b>S</b> | <b>8</b> | Black        |

### 9 MOUNTING/BARRIERS

|          | MOUNTING STYLE                                           | BARRIERS |
|----------|----------------------------------------------------------|----------|
| <b>A</b> | <b>Threaded Insert, 2 per pole</b>                       |          |
|          | 6-32 X 0.195 inches                                      | yes      |
| <b>B</b> | <b>ISO M3 x 5mm</b>                                      | yes      |
|          | <b>Rockerguard Bezel</b>                                 |          |
| <b>C</b> | <b>Threaded Insert, 2 per pole</b>                       |          |
|          | 6-32 X 0.195 inches                                      | yes      |
| <b>D</b> | <b>ISO M3 x 5mm</b>                                      | yes      |
|          | <b>Standard Bezel with Recessed Off-Side Flat Rocker</b> |          |
| <b>E</b> | <b>Threaded Insert, 2 per pole</b>                       |          |
|          | 6-32 X 0.195 inches                                      | yes      |
| <b>F</b> | <b>ISO M3 x 5mm</b>                                      | yes      |
|          | <b>Push-to-Reset Bezel</b>                               |          |
| <b>G</b> | <b>Threaded Insert, 2 per pole</b>                       |          |
|          | 6-32 X 0.195 inches                                      | yes      |
| <b>H</b> | <b>ISO M3 x 5mm</b>                                      | yes      |

### 10 LEAKAGE CURRENT TRIP LEVEL - MAX. TRIP CURRENT

- A** 5 MA (CLASS A GFCI)<sup>2</sup>  
**E** 30 MA (ELCB)<sup>1,3</sup>

### 11 AGENCY APPROVAL

- AA** W/O Approvals  
**10** UL 943<sup>2</sup>  
**11** UL 1053<sup>1,3</sup>  
**12** UL 1053 & UL 1500<sup>1,3,4</sup>

#### Notes:

- 1 This device meets the requirements of ABCY E11.  
2 6mA per UL943, available with agency approval code 10.  
3 30mA per UL1053, available with agency approval codes 11 & 12.  
4 AIC Rating at 120 VAC 3kA, at 120/240 VAC 5kA