



Instrument Transformers, Inc.

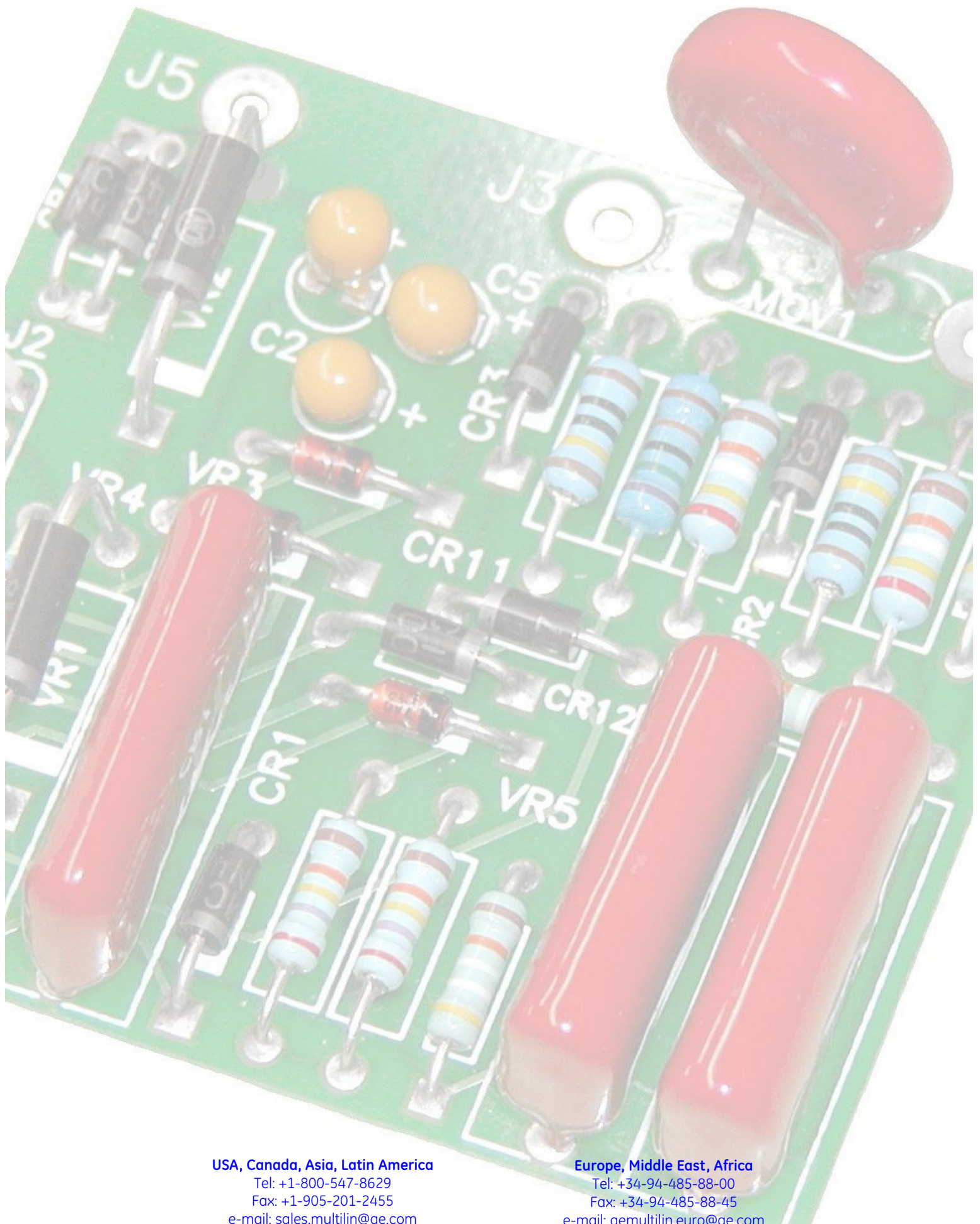
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# Electronic Products

## Ground Fault Systems





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## GROUND FAULT SYSTEMS

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Self Powered, Fixed Response

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10 to 75 Amp,  
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Output: 5 Vdc

### Model 10ACV

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Output: 10 Vdc

### Model PCL

AC Current Transducers ..... Page 24

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Output: 4-20 mA dc

### Model PCL

AC Current Transducers ..... Page 25

Input: 0-600A ac  
Output: 4-20 mA dc

### Model PCM

AC Current Transducers ..... Page 26

Input: 5, 10, 20, 30, 50, 75, 100, 150, 200, 300A ac  
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## CAPACITOR TRIP DEVICES

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APPLICATION:  
ENERGY SOURCE FOR BREAKER &  
SWITCH TRIP COILS DURING LOSS OF CONTROL POWER

Model CTD-3      Capacitor Trip Device .....Page 31  
Power: 330 $\mu$ F/1500mf

APPLICATION:  
ENERGY SOURCE FOR BREAKER &  
SWITCH TRIP COILS DURING LOSS OF CONTROL POWER

Model CTD-4      Capacitor Trip Device .....Page 32  
Power: 4500  $\mu$ F/990  $\mu$ F

APPLICATION:  
ENERGY SOURCE FOR BREAKER &  
SWITCH TRIP COILS DURING LOSS OF CONTROL POWER

Model CTD-5      Capacitor Trip Device With Alarm .....Page 33  
Power: 4500  $\mu$ F/990  $\mu$ F

APPLICATION:  
ENERGY SOURCE FOR BREAKER &  
SWITCH TRIP COILS DURING LOSS OF CONTROL POWER

Model CTDA-6      Capacitor Trip Device ..... Page 34  
Power: 4500  $\mu$ F/990  $\mu$ F

APPLICATION:  
ENERGY SOURCE FOR BREAKER &  
SWITCH TRIP COILS DURING LOSS OF CONTROL POWER

Model CTDB-6      Capacitor Trip Device .....Page 35  
Power: 4500  $\mu$ F/990  $\mu$ F

APPLICATION:  
ENERGY SOURCE FOR BREAKER &  
SWITCH TRIP COILS DURING LOSS OF CONTROL POWER



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# Ground Fault Current Detection Systems

## Model GFA (Relay)

### 10 to 75 Amp Trip Currents

#### OPERATING RANGE:

Trip currents of 10,15, 20 & 75 Amperes.  
Time delay from 0.01 to 20 seconds.

**INPUT POWER:** Self powered.

**FREQUENCY:** 50/60 Hz.

#### AMBIENT TEMPERATURE RANGE:

-30°C to +60°C

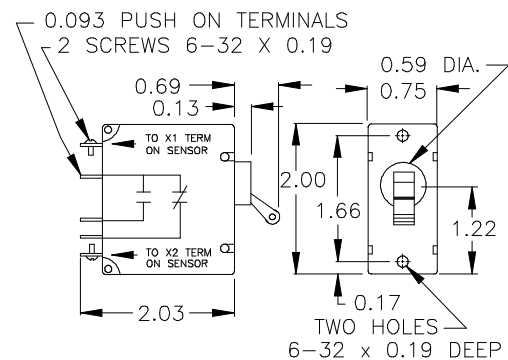
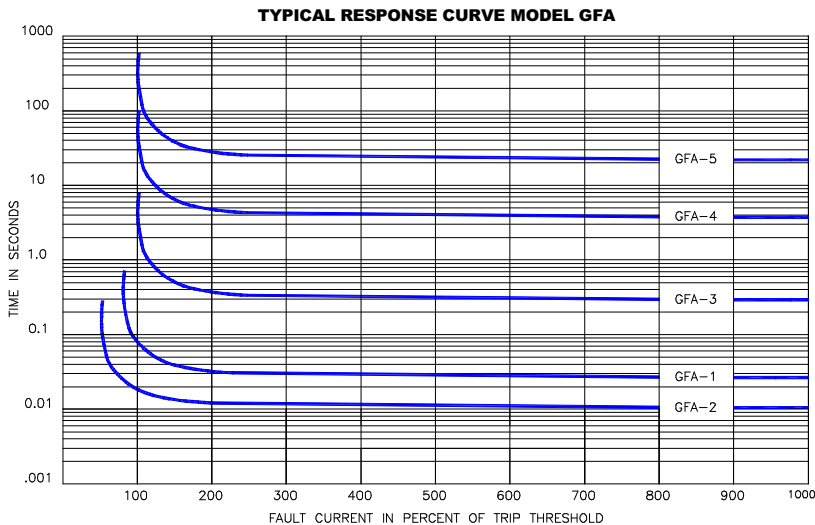
SPDT contacts Form C, rated 10 Amps.  
at 250 Volts ac, 1/4 H.P., 125 Vac.

Contacts shown with the relay in the tripped position.

Dielectric strength: GFA protectors withstand 1500 Volts 60 Hz for 60 seconds between all electrically isolated terminals.

Insulation Resistance:  
Insulation resistance of GFA Protectors exceed 100 megohms when tested at 500 Vdc.

Only for use with GFA sensors.



| RELAY MODEL NUMBER | HANDLE COLOR | DELAY TYPE    |
|--------------------|--------------|---------------|
| GFA-1              | WHITE        | INSTANTANEOUS |
| GFA-2              | RED          | INSTANTANEOUS |
| GFA-3              | YELLOW       | SHORT DELAY   |
| GFA-4              | BLUE         | MEDIUM DELAY  |
| GFA-5              | GREEN        | LONG DELAY    |

# Ground Fault Current Detection Systems

## Model GFA (Sensor) 10 to 75 Amp Trip Currents

REGULATORY AGENCY APPROVALS



E33504



LR26229

### OPERATING RANGE:

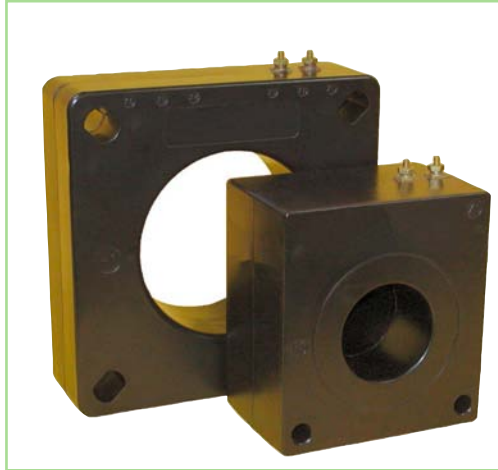
Trip currents of 10,15,20 & 75 Amperes.  
Trip current tolerance is  $\pm 20$  percent.

### FREQUENCY: 50/60 Hz.

### INSULATION LEVEL:

600 Volt, 10 kV BIL full wave.  
Terminals are brass studs  
No. 8-32.

Only for use with GFA relay.

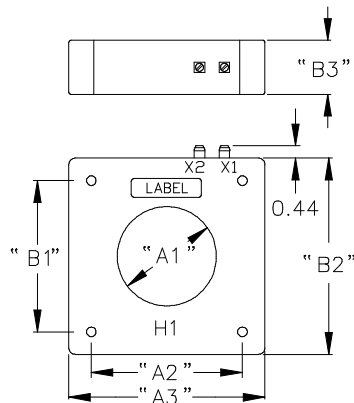


TOROIDAL SENSORS

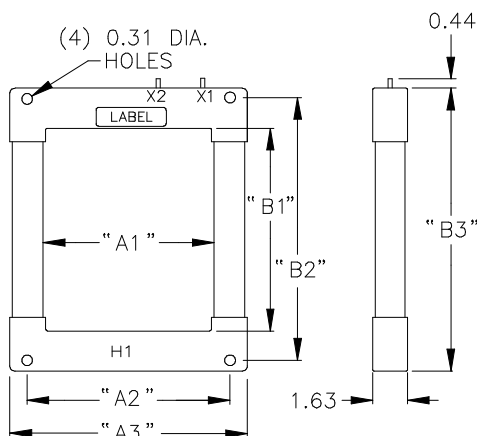


RECTANGULAR SENSORS

- The Combination of any of the sensors below and the **GFA** relay offers low cost ground fault protection in a self-powered, reliable system. When ordering specify sensor model number and relay part number.
- Mounting bracket kits are available for all toroidal sensors except the **Model GFA 156** which has molded mounting feet.



| TRIP CURRENT | MODEL NUMBER | "A1" | "A2" | "A3" | "B1" | "B2" | "B3" |
|--------------|--------------|------|------|------|------|------|------|
| 10 AMP       | GFA 200      | 2.00 | 3.75 | 4.63 | N/A  | 5.10 | 3.00 |
| 15 AMP       | GFA 400      | 4.00 | 5.62 | 7.00 | 5.62 | 7.00 | 2.17 |
| 20 AMP       | GFA 156      | 1.56 | N/A  | 4.08 | N/A  | 4.56 | 2.10 |
| 20 AMP       | GFA 213      | 2.13 | 3.50 | 4.50 | N/A  | 4.88 | 2.19 |
| 20 AMP       | GFA 425      | 4.25 | 5.44 | 6.73 | 5.43 | 6.73 | 1.28 |



| TRIP CURRENT | MODEL NUMBER | "A1" | "A2" | "A3" | "B1" | "B2" | "B3" |
|--------------|--------------|------|------|------|------|------|------|
| 75 AMP       | GFA 041X 071 | 4.1  | 6.4  | 7.3  | 7.1  | 10.0 | 10.9 |
| 75 AMP       | GFA 051X 071 | 5.1  | 7.2  | 8.3  | 7.1  | 10.0 | 10.9 |
| 75 AMP       | GFA 058X 071 | 5.8  | 7.0  | 9.0  | 7.1  | 10.0 | 10.9 |
| 75 AMP       | GFA 080X 071 | 8.0  | 9.5  | 11.1 | 7.1  | 10.0 | 10.9 |

| MODEL   | BRACKET KIT |
|---------|-------------|
| GFA 200 | 0221B00541  |
| GFA 400 | 0221B00185  |
| GFA 213 | 0221B00777  |
| GFA 425 | 0221B00187  |

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# Ground Fault Current Detection Systems

## Model GFM (Relay)

### 1.5 to 65 Amp Trip Currents



110395



LR80793

#### ADJUSTABLE OPERATING RANGE:

Trip currents from 1.5 to 65 Amperes.

Time delay from instantaneous to 36 cycles.

**INPUT POWER:** Self powered.

**FREQUENCY:** 50/60 Hz.

#### AMBIENT TEMPERATURE RANGE:

-30°C to +60°C

Positive "ON" (Green)

and "OFF" (Red) condition indication, manual reset.

SPDT contacts:

Form C, rated 10 Amps

continuous, 23 Amps inrush,

250 volts ac.



Model GFM - 252 & Model 262

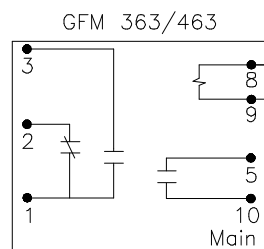
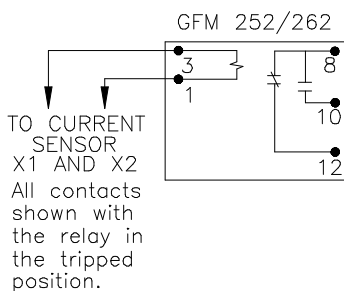
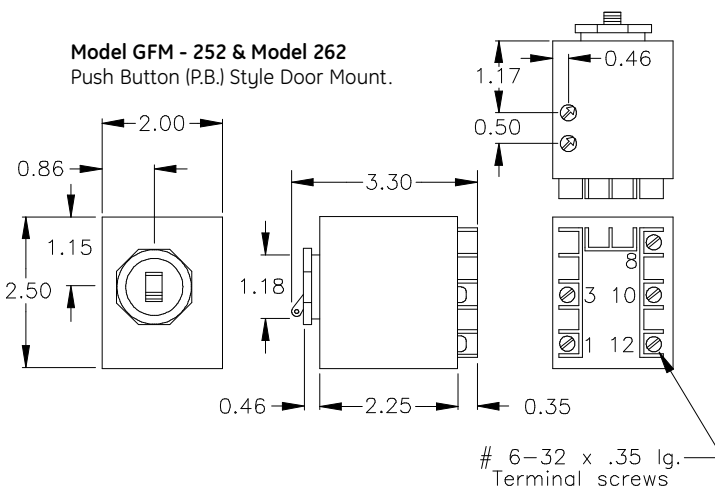


Model GFM - 353, 363, 453, and 463

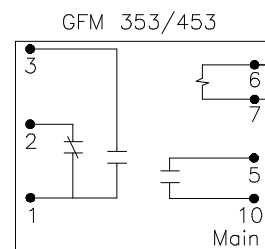
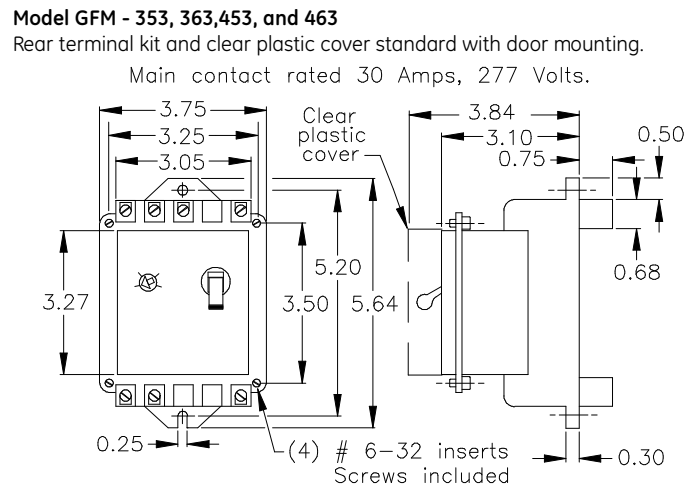
Only for use with GFM sensors.

- The class 1 model **GFM** Ground Fault protection systems are designed to minimize damage or loss to equipment caused by destructive arcing ground faults. This GFM systems is designed for all polyphase applications and is ideally suited for motor control, motor control centers, and high voltage starters. System can be wye or delta, ground or resistance grounded. When the ground fault current exceed a pre-selected condition (current and time setting) the relay trips.

The relay contacts can be connected in the control circuit of a motor starter, to the shunt trip of a circuit breaker or similar disconnecting or alarm devices. The system has an inverse time characteristic to prevent nuisance tripping. The relay tripping current value is field settable over the trip current range of the sensor. The adjustable trip time delay relay is field settable up 36 cycle.



TO CURRENT SENSOR X1 AND X2  
All contacts shown with the relay in the tripped position.



TO CURRENT SENSOR X1 AND X2  
All contacts shown with the relay in the tripped position.

# Ground Fault

## Model GFM (Sensor)

### 1.5 to 65 Amp Trip Currents

#### OPERATING RANGE:

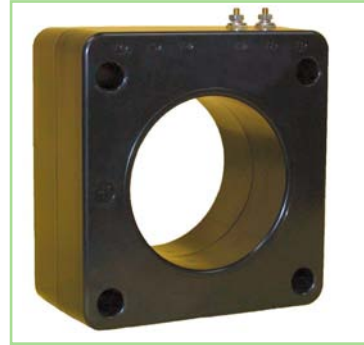
Trip currents from  
1.5-7.5 to 15 - 65 Amperes.

#### INSULATION LEVEL:

600 Volt, 10 kV BIL full wave.  
Terminals are brass studs  
No. 8-32.

#### FREQUENCY: 50/60 Hz.

Only for use with GFM relays.



TOROIDAL SENSORS



RECTANGULAR SENSORS

- Ground Fault Current Sensors type **GFM**, are available in three different case styles, a variety of sizes and trip current ranges - to match the **GFM** Relay. The physical size of the sensor window should be carefully determined by the physical size and configuration of the power conductors. The Ground Fault Sensor will respond only to ground faults which occur between the position of the sensor and the load.

| MODEL NUMBER | TRIP CURRENT | SENSOR DIMENSIONS |      |       |      |       |      |
|--------------|--------------|-------------------|------|-------|------|-------|------|
|              |              | "A1"              | "A2" | "A3"  | "B1" | "B2"  | "B3" |
| GFM 094      | 2.0 TO 8.5   | 0.94              | N/A  | 2.67  | N/A  | 2.75  | 2.38 |
| GFM 125      | 2.7 TO 14    | 1.25              | N/A  | 2.67  | N/A  | 2.75  | 2.38 |
| GFM 156      | 4.5 TO 18    | 1.56              | N/A  | 3.53  | N/A  | 3.77  | 2.15 |
| GFM 200      | 3.5 TO 14.5  | 2.00              | 3.19 | 4.00  | N/A  | 4.00  | 1.75 |
| GFM 250      | 3.5 TO 11    | 2.50              | 3.75 | 4.63  | N/A  | 5.10  | 3.00 |
| GFM 350      | 4 TO 12      | 3.75              | 4.75 | 5.96  | 4.75 | 6.31  | 3.00 |
| GFM 375D     | *            | 3.75              | 4.75 | 5.96  | 4.75 | 6.31  | 3.00 |
| GFM 425      | 5 TO 18      | 4.25              | 5.44 | 6.73  | 5.43 | 6.73  | 1.28 |
| GFM 462      | 4 TO 12      | 4.62              | 5.75 | 7.00  | 5.75 | 7.12  | 4.00 |
| GFM 813      | 4 TO 12      | 8.13              | 8.50 | 11.10 | 8.50 | 11.47 | 3.00 |

\*Dual trip current ranges 3.5 to 11 and 10 to 36.

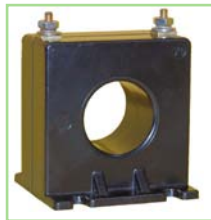
| MODEL NUMBER      | TRIP CURRENT | SENSOR DIMENSIONS |      |      |      |      |      |
|-------------------|--------------|-------------------|------|------|------|------|------|
|                   |              | "A1"              | "A2" | "A3" | "B1" | "B2" | "B3" |
| GFM 041 X 071     | 6 TO 30      | 4.1               | 6.4  | 7.3  | 7.1  | 10.0 | 10.9 |
| * GFM 080 X 117SC | 15 TO 65     | 8.0               | 9.5  | 11.1 | 11.7 | 14.5 | 15.4 |
| GFM 080 X 141     | 9 TO 39      | 8.0               | 9.5  | 11.1 | 14.1 | 17.0 | 17.9 |

\* Model **GFM 080 X 117SC** is split core (take-apart style) for assembly to existing electrical installations without the need for dismantling the primary bus or cables.

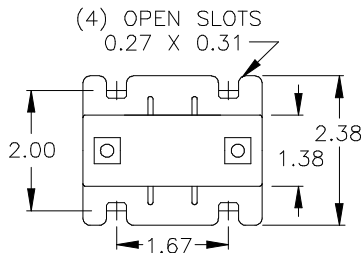
#### CAUTION:

Proper safety precautions must be followed during installation by a trained electrician. It is recommended that the incoming power de-energized before installation. The sensor must have its secondary terminals short circuited or the relay connected, before energizing the primary circuit.

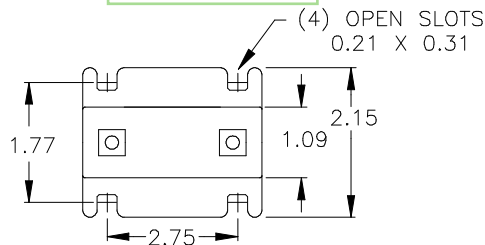
Mounting bracket kits are available for all toroidal sensors except the Model GFM 094, GFM 125, and GFM 156, which have molded mounting feet.



3 HOLE SENSORS

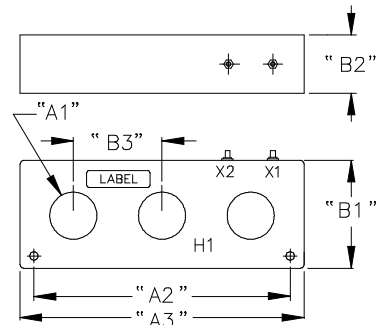


GFM 094  
GFM 125



GFM 156

| MODEL NUMBER | BRACKET KIT |
|--------------|-------------|
| GFM 200      | 0221B01976  |
| GFM 250      | 0221B00541  |
| GFM 375      | 0221B00259  |
| GFM 375D     | 0221B00259  |
| GFM 425      | 0221B00187  |
| GFM 462      | 0221B01525  |
| GFM 813      | 0221B00259  |



| MODEL NUMBER    | TRIP CURRENT | SENSOR DIMENSIONS |       |       |      |      |      |
|-----------------|--------------|-------------------|-------|-------|------|------|------|
|                 |              | "A1"              | "A2"  | "A3"  | "B1" | "B2" | "B3" |
| GFM 3P205 X 050 | 4.5 TO 16    | *                 | 7.60  | 8.50  | 3.70 | 2.00 | 2.75 |
| GFM 3P208       | 5 TO 20      | 2.08              | 8.24  | 9.00  | 3.94 | 2.00 | 2.75 |
| GFM 3P212       | 7 TO 25      | 2.12              | 11.72 | 12.80 | 4.87 | 2.63 | 4.00 |

\* The Model GFM 3P205 X 050 has a rectangle window 2.05 " X 0.50".

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## Pick-Up and Time Delay Characteristics

ITI GFM sensors are assigned a current range to indicate a pick-up current level.

The GFM relay has a range select from "A" to "D". "A" is the lowest current magnitude pick-up and "D" is the highest. The pick up level is dependent on the energy in a ground fault wave shape; therefore tripping initiation depends on the wave shape and regularity of the fault current.

In general, the relay will pick up before 150% of the low end of the sensor current range on the "A" setting with a sinusoidal signal, and will pick up before 150% of the high end of the sensor range on the "D" setting. The relay is adjustable continuously from "A" to "D" so that identical sensors can be coordinated.

The ITI GFM ground fault system has inverse time current trip characteristics. As the fault current increases, the trip time delay gets shorter. The GFM-252, GFM-353, GFM-453 relays do not have adjustable trip time delay, while the GFM-262, GFM-363, GFM-463 relays have adjustable trip time delay.

Trip time on Models with fixed time delay, may exceed a one second delay at the pick up threshold. Trip time on Models with adjustable time delay, may exceed a one second delay at the pick up threshold, however the inverse time curve can be modified to vary trip time at multiples of over current with an ordinal "1" to "4" is scale where "1" is faster and "4" is slower.

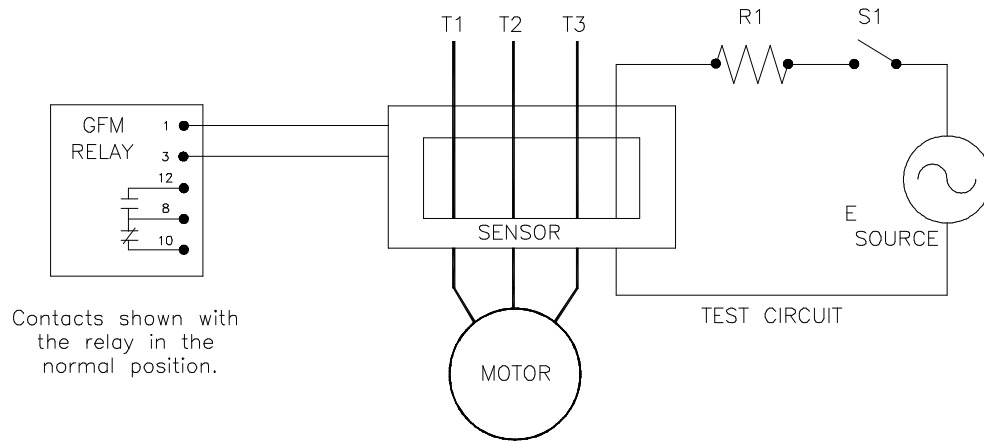
The pick up time delay on the fixed time delay relays can be as fast as 0.02 seconds on the "A" setting, and 0.1 seconds on the "D" setting at high fault currents.

For the adjustable time delay relays, a time delay of "1" in the "A" scale can produce a time delay of under 0.15 seconds at a 600% sinusoidal fault. A time delay setting of "4" will result in a time delay approximately 0.2 seconds slower than the "1" setting. Time delay will be greater for smaller fault current.

Similarly, a time delay setting of "1" in the "D" scale can produce a time delay of under 0.4 seconds at a 600% sinusoidal fault. A time delay setting of "4" will result in a time delay approximately 0.2 seconds slower than the "1" setting. Time delay will be greater for smaller fault current.

# FIXED DELAY TYPES

## GFM Test Procedure

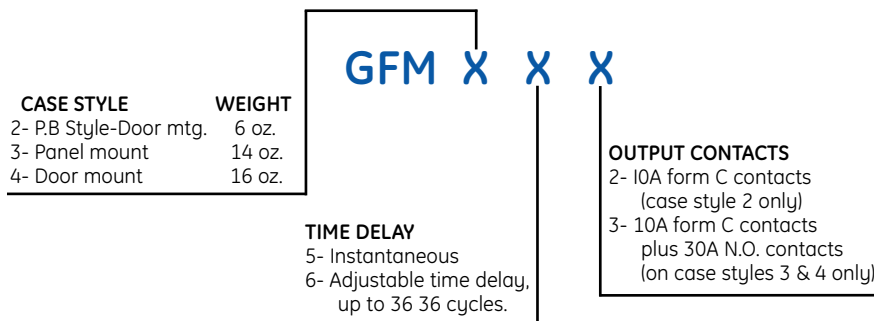


A Simulated fault current can be applied by the above test circuit.  
An appropriate value of R1 should be selected to apply a minimum of 1.5 times maximum trip rating of the sensor.

1. Assure that the GFM relay is in "NORMAL" (reset) position.
2. Close switch S1, and check for reset for response. Relay handle will move to the tripped position.
3. Open S1, reset the relay and remove the test circuit from the system. System is now back to normal.

**THE ABOVE TEST PROCEDURES SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.**

## HOW TO ORDER RELAYS



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Electronic Products



# Ground Fault Current Detection Systems

## Model BGFL (Relay)

### Trip Currents 5- 60, 30- 360, or 100 -1200A



110395



LR80793



#### OPERATING RANGE:

Trip currents of 5-60, 30-360, or 100-1200A. Time delay from 0.10 to 1 second. (Adjustable)

#### INPUT POWER:

2 VA plus shunt coil requirements. Rated @ 120 Vac.

#### INPUT WITHSTAND:

200,000 Amperes RMS for 3 cycles, 50/60 Hz.

#### NOMINAL INPUT VOLTAGE:

120 Volts ac, 125 Volts dc, 24 Volts dc, 48 Volts dc.

#### FREQUENCY:

50/60 Hz.

#### AMBIENT TEMPERATURE RANGE:

-30°C to +60°C

Only for use with GFL sensors.

Approximate weight 1.5 lbs.

These Class 1 Model **BGFL** Ground Fault Relays and Sensors are designed to form a system for detecting a ground fault current on a ground ac power system. When a ground fault exceeds a pre-selected Current level and Time Delay setting, the relay initiates a trip signal for a shunt trip disconnect device to open and clear the fault. This **BGFL** system is designed to provide protection for electrical equipment, not protection for personnel.

| CONTACT RATING     |        |       |
|--------------------|--------|-------|
| DEVICE INPUT POWER | INRUSH | CONT. |
| 120 Volts ac       | 10 A   | 3 A   |
| 125 Volts dc       | 1 A    | 1 A   |
| 48 Volts dc        | 4 A    | 4 A   |
| 24 Volts dc        | 8 A    | 8 A   |

- Meets NEC service entrance equipment standards.
- Available in three basic styles, "Standard", "Form C", or "Zone Interlocking" for coordination of single or multiple ground fault devices in system.
- Integral test panel with Push To Test and Shunt Trip Bypass pushing for ease in proper operational testing of the system, with or without tripping the protective device.
- "Power On" LED indicator in cover.
- Positive visual trip indicator, manual reset.
- Infinitely adjustable Time Delay.
- Discrete current threshold adjustment.
- Panel or door mounting.
- Rear terminal kit and clear plastic cover standard with door mounting.
- Electromechanical relay output, positive "ON" and "OFF".
- Operates with molded case and power circuit breakers, bolted pressure switches, fusible disconnect switches.

## HOW TO ORDER RELAYS

Aux. Supply Voltage  
5=120V ac, 50/60Hz  
4=125V dc  
3=24V dc  
2=48V dc

Internal Circuit Options  
4=Isolated Internal "Form C" \*  
7=With Zone Interlocking  
9=Without Zone Interlocking

**BGFL X X X - XXXX**

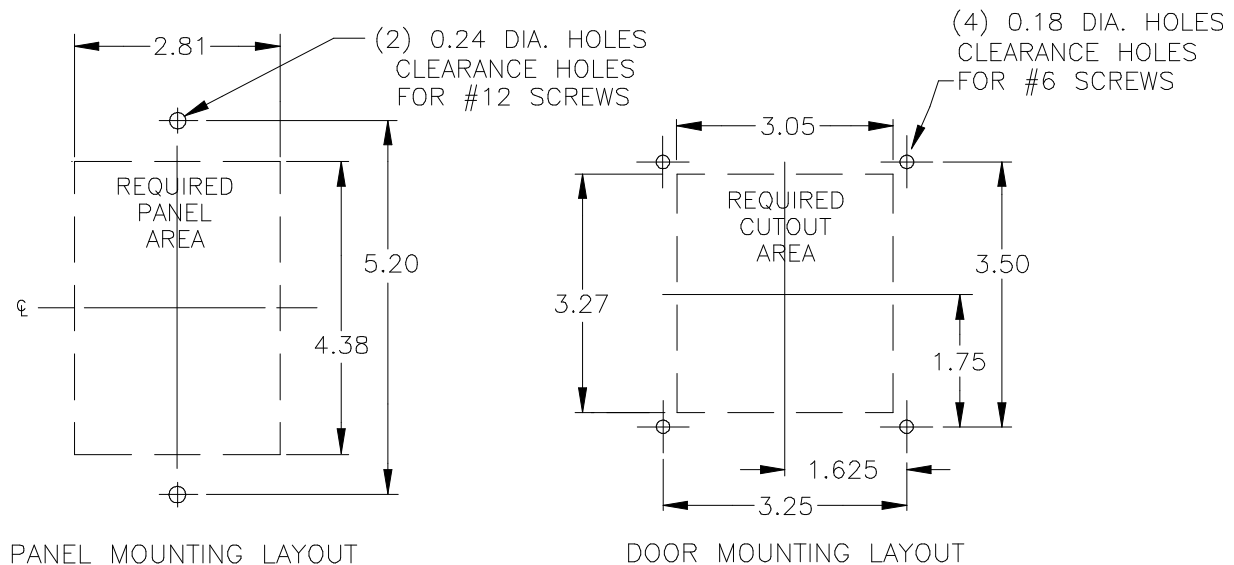
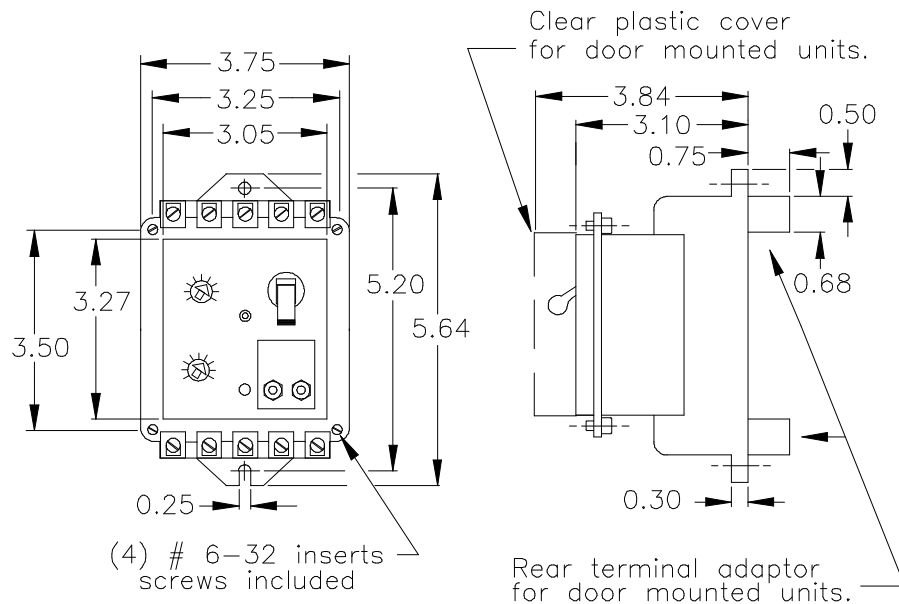
Mounting  
1=Panel mount  
2=Door mount

Current Range  
60=5 to 60A  
360=30 to 360A  
1200=100 to 1200A

\* Not Available with zone Interlocking option

# Ground Fault Current Detection Systems

## Model BGFL (Outlines)



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Electronic Products



# Ground Fault Current Detection Systems

## Model GFL (Sensor)

**Trip Currents 5- 60, 30- 360, or 100 -1200A**



110395



LR80793

Ground Fault Current Sensors, type GFL, are available in three different styles, a variety of sizes and current ranges - to match the BGFL relay ranges. The physical size of the sensor window should be carefully determined by the physical size and configuration of the power conductors. The Ground Fault Sensor will respond only to ground faults which occur between the position of the sensor and the load. Each sensor has two sets of windings one for test and one for normal operation.



**Toroidal Sensors**

### OPERATING RANGE:

Trip currents from 5- 60,  
30-360, or 100-1200A.  
Trip current tolerance  $\pm 15$  percent.

### FREQUENCY:

50/60 Hz.

### INSULATION LEVEL:

600 Volt, 10 kV BIL full wave.

Terminals are brass studs No. 8-32.

Only for use with BGFL relays.

| MODEL<br>NUMBER | SENSOR DIMENSIONS |      |      |      |      |      |
|-----------------|-------------------|------|------|------|------|------|
|                 | "A1"              | "A2" | "A3" | "B1" | "B2" | "B3" |

#### TRIP CURRENT 5-60 AMPS

|           |      |      |       |      |       |      |
|-----------|------|------|-------|------|-------|------|
| GFL156T-1 | 1.56 | *    | 3.53  | *    | 3.77  | 2.15 |
| GFL250T-1 | 2.50 | *    | 4.56  | *    | 4.71  | 2.13 |
| GFL325T-1 | 3.25 | 4.70 | 5.73  | 4.70 | 5.73  | 1.15 |
| GFL425T-1 | 4.25 | 4.86 | 5.92  | **   | 6.17  | 1.15 |
| GFL631T-1 | 6.31 | 6.75 | 8.50  | 6.75 | 8.50  | 1.28 |
| GFL825T-1 | 8.25 | 8.50 | 10.48 | 8.50 | 10.48 | 1.53 |

#### TRIP CURRENT 30-360 AMPS

|           |      |      |       |      |       |      |
|-----------|------|------|-------|------|-------|------|
| GFL156T-3 | 1.56 | *    | 3.53  | *    | 3.77  | 2.15 |
| GFL250T-3 | 2.50 | *    | 4.56  | *    | 4.71  | 2.13 |
| GFL325T-3 | 3.25 | 4.70 | 5.73  | 4.70 | 5.73  | 1.15 |
| GFL425T-3 | 4.25 | 4.86 | 5.92  | **   | 6.17  | 1.15 |
| GFL631T-3 | 6.31 | 6.75 | 8.50  | 6.75 | 8.50  | 1.28 |
| GFL825T-3 | 8.25 | 8.50 | 10.48 | 8.50 | 10.48 | 1.53 |

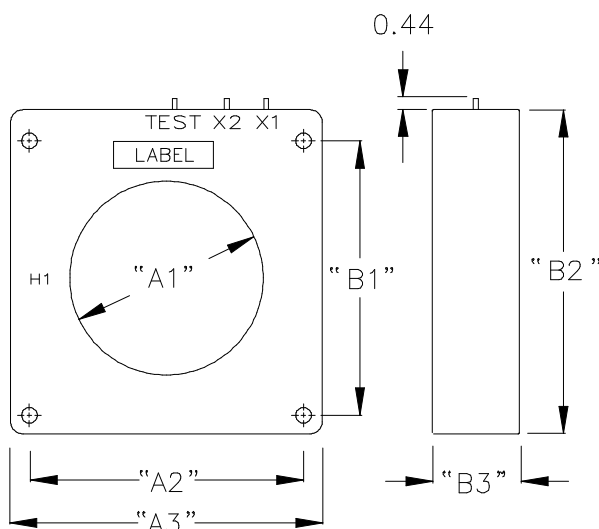
#### TRIP CURRENT 100-1200 AMPS

|           |      |      |       |      |       |      |
|-----------|------|------|-------|------|-------|------|
| GFL325T-2 | 3.25 | 4.70 | 5.73  | 4.70 | 5.73  | 1.15 |
| GFL425T-2 | 4.25 | 4.86 | 5.92  | **   | 6.17  | 1.15 |
| GFL631T-2 | 6.31 | 6.75 | 8.50  | 6.75 | 8.50  | 1.28 |
| GFL825T-2 | 8.25 | 8.50 | 10.48 | 8.50 | 10.48 | 1.53 |

\* The Model GFL156T-1, GFL156T-3, GFL250T-1, and GFL250T-3 have molded mounting feet.

\*\* The Models GFL425T-1, GFL425T-2, and GFL425T-3 have no top mounting holes. Order the following mounting bracket kits:

| MODEL<br>NUMBER       | BRACKET<br>KIT |
|-----------------------|----------------|
| GFL 325T-1, -2 and -3 | 0221B00183     |
| GFL 425T-1, -2 and -3 | 0221B00183     |
| GFL 631T-1, -2 and -3 | 0221B00231     |
| GFL 825T-1, -2 and -3 | 0221B01529     |



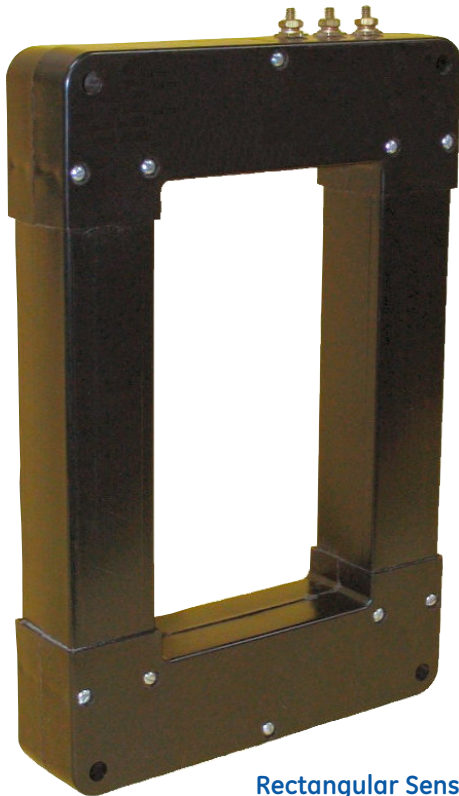
# Ground Fault Current Detection Systems

Model GFL (Sensor)

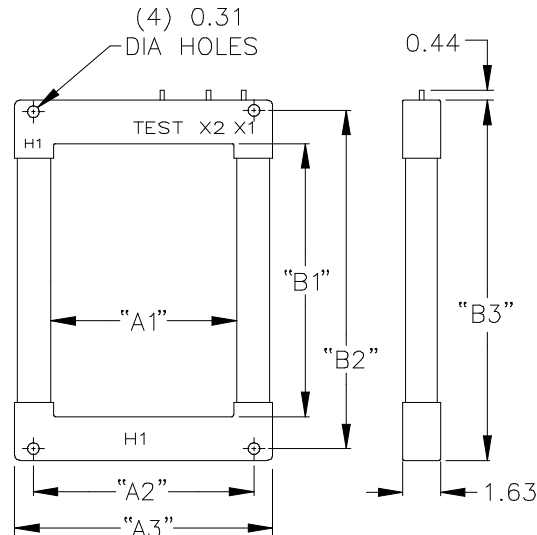
Trip Currents 5- 60, 30- 360, or 100 -1200A



110395 LR80793



Rectangular Sensors



| RECTANGULAR SENSORS |      |      |      |      |      |
|---------------------|------|------|------|------|------|
| "A1"                | "A2" | "A3" | "B1" | "B2" | "B3" |
| 4.1                 | 6.4  | 7.3  | 7.1  | 10.0 | 10.9 |
| 5.1                 | 7.2  | 8.3  | 11.7 | 14.5 | 15.4 |
| 5.8                 | 7.0  | 9.0  | 14.1 | 17.0 | 17.9 |
| 8.0                 | 9.5  | 11.1 | 18.1 | 21.0 | 21.9 |
| 10.1                | 11.6 | 13.2 | 24.0 | 27.0 | 27.9 |
| -                   | -    | -    | 30.1 | 33.0 | 33.9 |
| -                   | -    | -    | 36.0 | 38.9 | 39.8 |

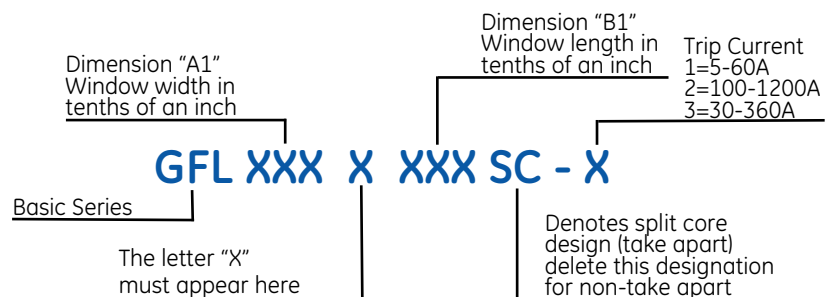
Rectangular sensors are available for the following trip currents: 5-60A, 30-360A and 100-1200A. The table above lists the available sensors sizes. Any window width (A1) may be combined with any window length. (B1)

Rectangular sensors are also available as a split core (take-apart) style for assembly to existing electrical installation without the need for dismantling the primary bus or cables.

## CAUTION:

Proper safety precautions must be followed during installation by a trained electrician. It is recommended that the incoming power de-energized before installation. The sensor must have its secondary terminals short circuited or the relay connected, before energizing the primary circuit.

## HOW TO ORDER RECTANGULAR SENSORS



Example: To order a rectangular sensor with a 4.1 X 7.1 window and a 5-60A trip current, the catalog number would be GFL 041 X 071-1.

USA, Canada, Asia, Latin America

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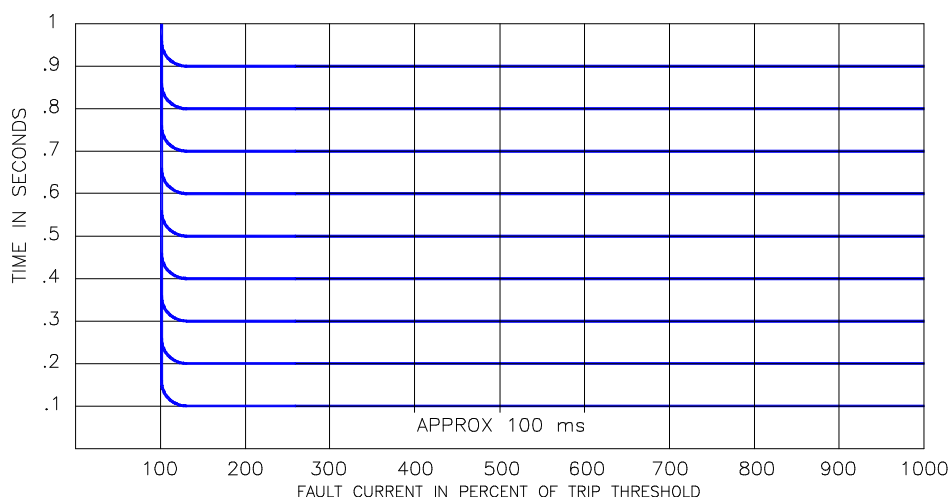
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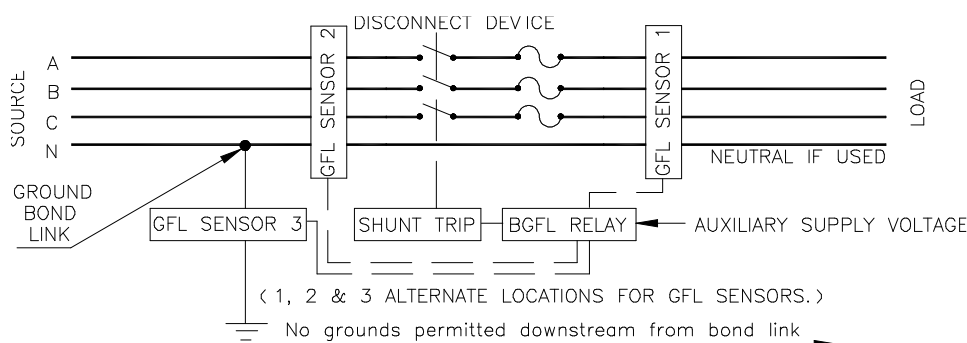
## Typical Response Curves

Cardinal points are shown for clarity only.

The actual time delay adjustment is continuously variable between instantaneous and 1 second. The time delay tolerance is  $\pm 15\%$  of setting.



## Test Procedure



To determine if the neutral is grounded in only one place at the service entrance (in accordance with The National Electrical Code):

1. Disconnect power.
2. Remove ground bond link.
3. With a "megger", measure the resistance of each phase and neutral to ground. The resistance should be 1 megohm in accordance with NEC requirements. Reading as low as 100 ohms will pass a minimal current so as not to affect BGFL calibration on the 100 - 1200A relay. The 5-60A and 30-360A relay calibration will be affected if set at the lowest setting.
4. Reconnect bond link, reconnect power and check power LED for illumination.

To test the entire system including the disconnect device:

1. Check for control power, the LED should be illuminated.
2. Press the "Push To Test" switch on the relay. The trip indicator will go to the tripped position and disconnect device will open.
3. Reset the relay and the disconnect device. System is now back to normal.

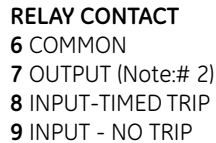
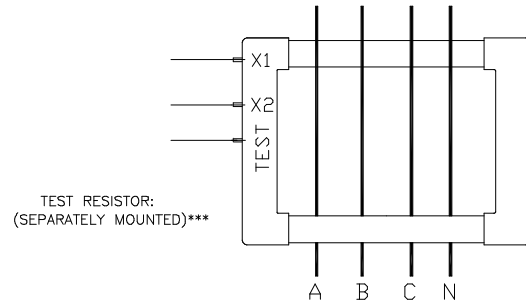
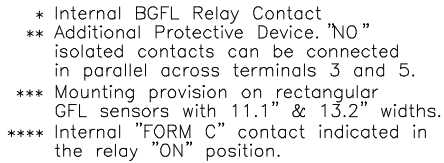
To test the ground Fault Relay and Sensor only (The sensor will trip the relay in this test).

1. Check for control power, the LED should be illuminated.
2. Press and HOLD the "Shunt Trip Bypass" switch on the relay.
3. Press the "Push To Test" switch. The Ground Fault Relay will trip.
4. Reset the relay, then release the "Shunt Trip Bypass" switch. System is now back to normal.

**THE ABOVE TEST PROCEDURES SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.**

| Response | Percentage |
|----------|------------|
| Yes      | 80         |
| No       | 20         |

### TYPICAL WIRING DIAGRAM FOR "FORM C" CIRCUITRY (BGFLXX4-XXXX)



- NOTES:**
- 1) All zone interlocking wiring should be twisted pair, 20 AWG or large.
  - 2) No more than 10 upstream units should be connected to a single output.
  - 3) For relays with dc input voltage, connect 120V ac test circuit to the 24" long black lead and terminal #2.

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# Three Phase Voltage Monitor Model SPVRA



103039, CANADIAN



103039

## STANDARD FEATURES

- Phase Unbalance: 8 %
- Adjustable Trip Delay 1 to 10 seconds after failure occurs.
- Output Relay: normally de-energized: Form C contacts for easy circuit configuration.
- Electro - Mechanical Indicator: retains memory of fault until manually reset.
- Door or Panel mounting.
- Status Indicator: bi-colored LED  
Green: Output Relay De-energized (Normal Condition)  
Red: Output Relay Energized (Fault Condition)  
Dark: Output relay De-energized (Input Power Off).
- Single Phase, Phase Reversal, Phase Unbalance and Phase Loss Protection: Operates the output relay after a preselected time.
- Overvoltage and Undervoltage Protection: Operates when voltage exceeds 115% or goes below 80% after a preselected time.
- Automatic or Manual -  
Automatic Reset to Normal: upon removal of fault conditions.  
Manual Reset: Operations from a local pushbutton in cover or from a remote contact.

## APPLICATION:

Protection of three phase electric equipment sensitive to damage from a phase loss or phase unbalance. Phase reversal, phase sequence, undervoltage & overvoltage protection.

## NORMAL INPUT VOLTAGES:

120 to 600Vac, 60Hz., 380 to 415Vac, 50Hz.

## AMBIENT TEMPERATURE RANGE:

Operation: - 30°C to +60°C.

Storage - 40°C to + 85°C.

Terminals screws are #6-32 nickel plated brass.

Shipping weight 2.0 lbs.

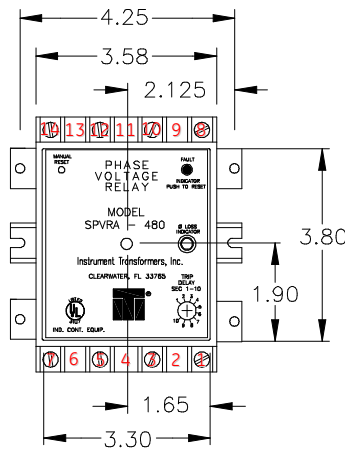
## AVAILABLE MODELS

| MODEL NUMBER | NOMINAL Vac | Hz. |
|--------------|-------------|-----|
| SPVRA-120    | 120         | 60  |
| SPVRA-208    | 208         | 60  |
| SPVRA-240    | 240         | 60  |
| SPVRA-480    | 480         | 60  |
| SPVRA-575    | 575         | 60  |
| SPVRA-380    | 380         | 50  |
| SPVRA-415    | 415         | 50  |

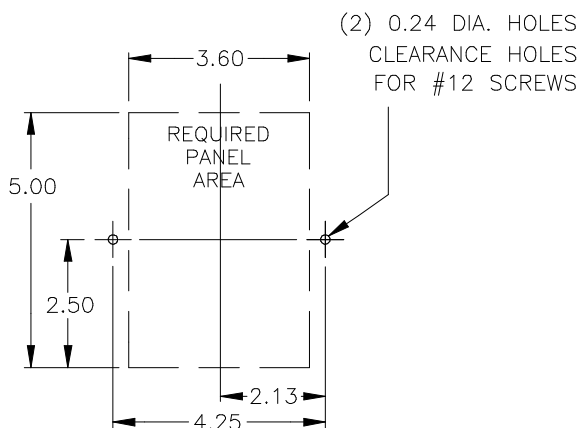
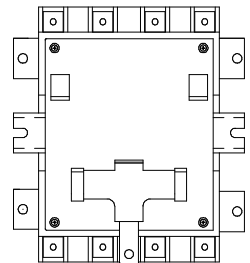
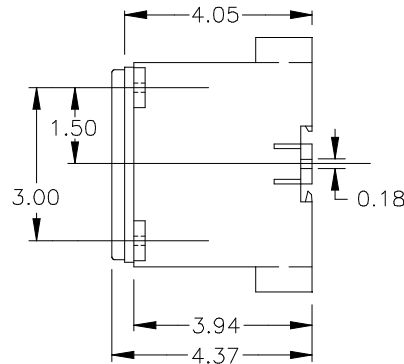
## CONTACT RATING

|                          |
|--------------------------|
| 10A, 1/3 H.P. AT 120 VAC |
| 10A, 1/2 H.P. AT 240 VAC |
| 3A, 1/2 H.P. AT 600 VAC  |

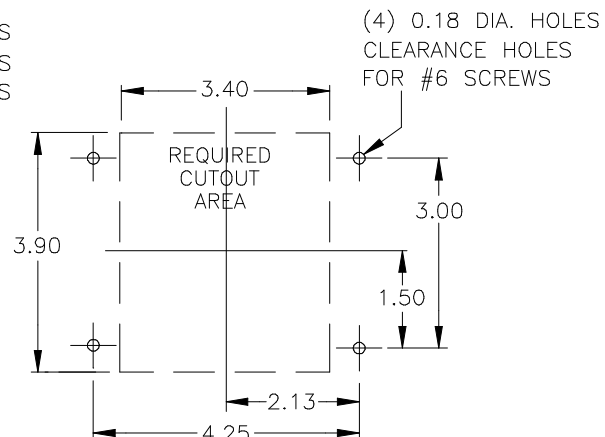
• The Model **SPVRA** Voltage Sensing Relay is designed to protect against single phase, phase loss, phase unbalance, phase reversal, and under or over voltage in a power system. The output contacts change their normal state only when a phase loss, phase unbalance, phase reversal, under or overvoltage occurs for longer than the preset trip delay. A total power loss de-energization of the **SPVRA** relay will not change the output contact position. Recommended for manually reset switches and breakers applications. The **SPVRA** is suitable for loss of phase with motor loads.



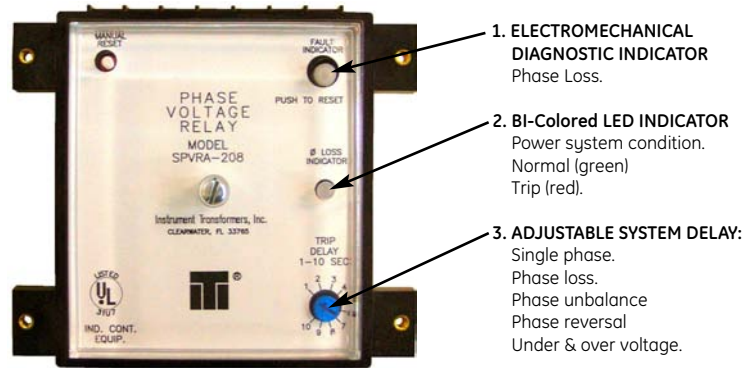
DOOR LAYOUT



PANEL MOUNTING LAYOUT



DOOR MOUNTING LAYOUT



## SPVRA Operation with Options

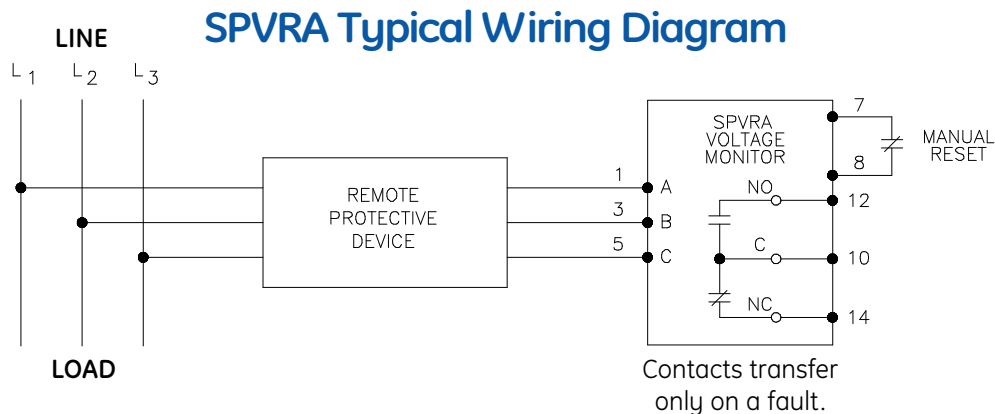
A correctly installed **SPVRA** Voltage Sensing Relay will protect a power system against damage due to single phase and phase loss, phase reversal, phase unbalance, and under and over voltage. When operating under normal power conditions, the bi-colored LED Relay Status will be green indicating the de-energized state of the output relay.

If a single phase, phase sequence, phase reversal, phase loss or unbalance of 8% occurs for longer than the preselected time delay of 1 to 10 seconds, the output relay is energized and changes state. If the voltage level dips below 80% but is above 60% after the preselected time, or if the voltage exceeds 115% for a preselected time the the output relay changes state. This output relay returns to its normal de-energized state when undervoltage returns to 90% or the overvoltage reduces to 107%. Whenever the output relay contacts are energized indicating a fault, the bi-colored LED "Relay Status" will be red.

With the manual reset, a local reset push-button is provided on the front of the relay. Two terminals provide can be used for a normally close remote reset button. When the main power is restored, the output relay is energized immediately if a reset button has not been operated.

The output relay has single Form C contact.

The **SPVRA** relay is package is in a high impact thermoplastic enclosed which can be either panel or door mounted. The terminal hardware is set for panel or door mounted. The terminal hardware is set for panel mounting but is easily reversed for door mounting. A clear cover is provided to prevent accidental mechanical indicator changes.



## HOW TO ORDER RELAYS

### SPVRA - XXX

Input Voltage  
120, 208, 240, or 575Vac (60 Hz)  
380 or 415Vac (50 Hz)

**USA, Canada, Asia, Latin America**

Tel: +1-800-547-8629

Fax: +1-905-201-2455

e-mail: [sales.multilin@ge.com](mailto:sales.multilin@ge.com)

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Electronic Products



# Three Phase Voltage Monitor

## Model SPVRB



103039, CANADIAN



103039

- Phase Unbalance: 8 %
- Adjustable Trip Delay 1 to 10 seconds after failure occurs.
- Output Relay: normally de-energized: Form C contacts for easy circuit configuration.
- Electro - Mechanical Indicator: retains memory of fault until manually reset.
- Door or Panel mounting.
- Status Indicator: bi-colored LED  
Green: Output Relay De-energized (Normal Condition)  
Red: Output Relay Energized (Fault Condition)  
Dark: Output relay De-energized (Input Power Off).
- Single Phase, Phase Reversal, Phase Unbalance and Phase Loss Protection: Operates the output relay after a preselected time.
- Automatic or Manual mode:  
Automatic mode: Upon removal of fault conditions, relay automatically resets to normal.  
Manual mode: Upon removal of fault conditions, relay resets to normal after local or remote reset button has been pressed.

### APPLICATION:

Protection of three phase electric equipment sensitive to damage from a phase loss or phase unbalance. Phase reversal, phase sequence.

### NORMAL INPUT VOLTAGES:

120 to 600Vac, 60Hz., 380 to 415Vac, 50Hz.

### AMBIENT TEMPERATURE RANGE:

Operation: - 30°C to +60°C.

Storage - 40°C to + 85°C.

Terminals screws are #6-32 nickel plated brass.

Shipping weight 2.0 lbs.

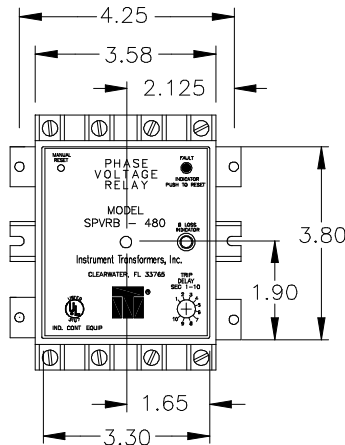
### AVAILABLE MODELS

| MODEL NUMBER | NOMINAL Vac | Hz. |
|--------------|-------------|-----|
| SPVRB-120    | 120         | 60  |
| SPVRB-208    | 208         | 60  |
| SPVRB-240    | 240         | 60  |
| SPVR B-480   | 480         | 60  |
| SPVRB-575    | 575         | 60  |
| SPVRB-380    | 380         | 50  |
| SPVRB-415    | 415         | 50  |

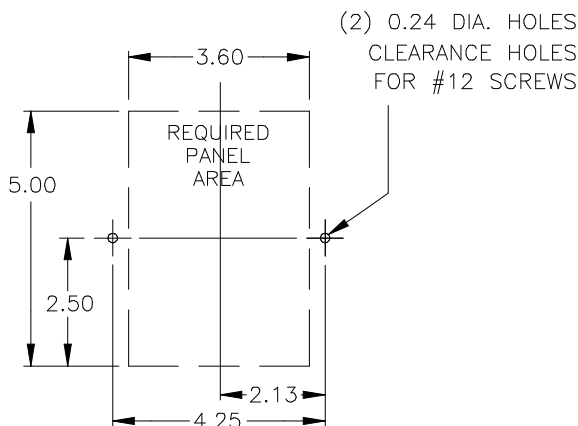
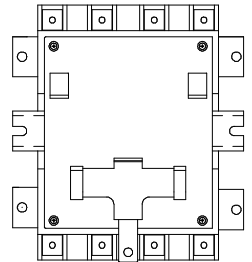
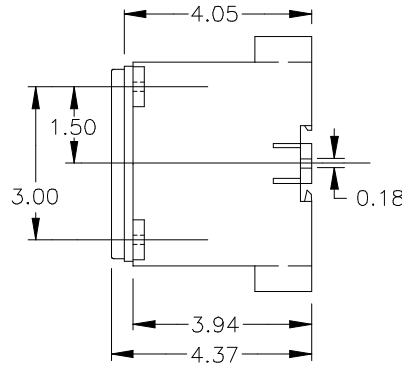
### CONTACT RATING

|                          |
|--------------------------|
| 10A, 1/3 H.P. AT 120 VAC |
| 10A, 1/2 H.P. AT 240 VAC |
| 3A, 1/2 H.P. AT 600 VAC  |

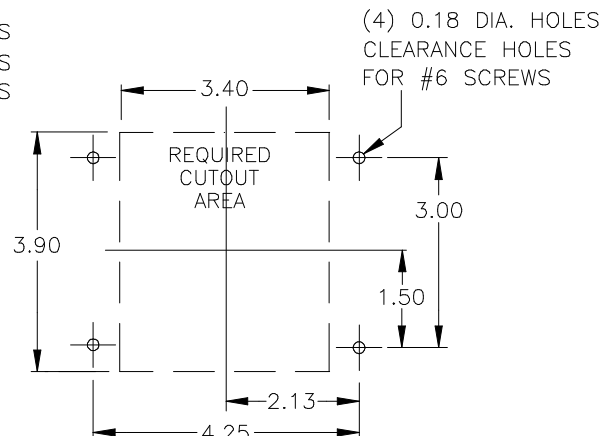
- The Model **SPVRB** Voltage Sensing Relay is designed to protect against single phase, phase loss, phase unbalance, phase reversal, in a power system. The output contacts change their normal state only when a single phase, phase loss, phase unbalance, phase reversal, occurs for longer than the preset trip delay. A total power loss de-energization of the **SPVRB** relay will not change the output contact position. Recommended for manually reset switches and breakers applications. The **SPVRB** is suitable for loss of phase with motor loads.



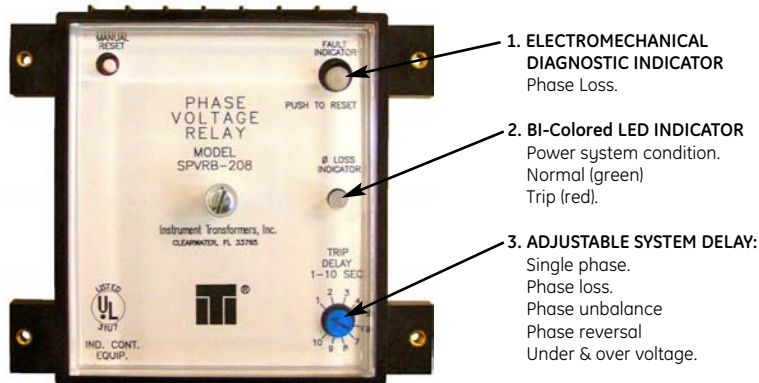
DOOR LAYOUT



PANEL MOUNTING LAYOUT



DOOR MOUNTING LAYOUT



## SPVRB Operation with Options

A correctly installed **SPVRB** Voltage Sensing Relay will protect a power system against damage due to single phase and phase loss, phase reversal, phase unbalance. When operating under normal power conditions, the bi-colored LED "Relay Status" will be green indicating the de-energized state of the output relay.

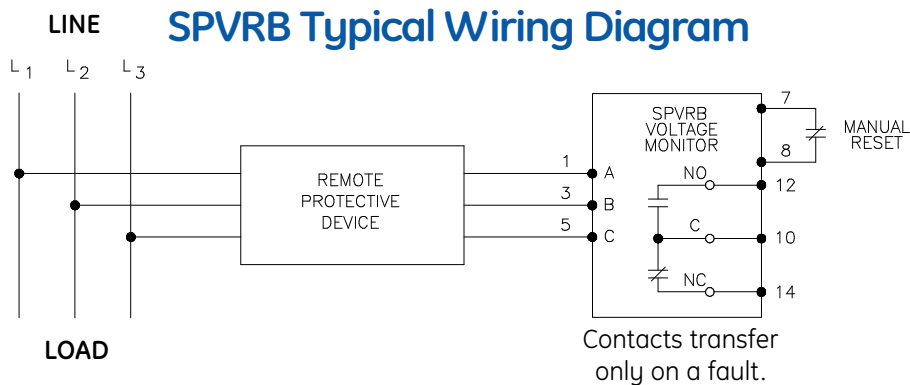
If a single phase, phase sequence, phase reversal, phase loss or unbalance of 8% occurs for longer than the preselected time delay of 1 to 10 seconds, the output relay is energized and changes state. Whenever the output relay contacts are energized indicating a fault, the bi-colored LED "Relay Status" will be red.

In automatic mode (no connection between 7 & 8), the relay automatically resets when power is restored.

In manual mode (jumper or N/C contact placed between 7 & 8) when power is restored, the relay does not reset until either the manual reset button has been pushed or the N/C contact has been opened and reclosed. The manual reset button is on the front of the relay.

The output relay has single Form C contact.

The **SPVRB** relay is package is in a high impact thermoplastic enclosed which can be either panel or door mounted. The terminal hardware is set for panel or door mounted. The terminal hardware is set for panel mounting but is easily reversed for door mounting. A clear cover is provided to prevent accidental mechanical indicator changes.



## HOW TO ORDER RELAYS

### SPVRB - XXX

Input Voltage  
120, 208, 240, or 575Vac (60 Hz)  
380 or 415Vac (50 Hz)

**USA, Canada, Asia, Latin America**

Tel: +1-800-547-8629

Fax: +1-905-201-2455

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Electronic Products



# Three Phase Voltage Monitor

## Model LPVRB

### Protects 3-power system loads from:

- Loss of any Phase
- Low Voltage
- High Voltage
- Voltage Unbalance
- Phase Reversal
- Rapid Cycling

### Additional Features:

- Compact Design
- UL and cUL listed
- CE Compliant
- Finger Safe terminals
- Standard Surface or DIN Rail Mount
- Standard 1-500 Sec. Variable Restart Delay
- Standard 2-8% Variable Voltage Unbalance
- One 10 Amp General purpose Form C relay
- Standard 1-30% Variable Trip Delay
- Optional Manual Reset

### Trip Delay Time:

- Low, high and Unbalance Voltage:
  - 1-30 seconds adjustable
- \* Note 50 Hz will increase all delay timers by 20%

### Restart Delay Time:

- After fault - 1 - 500 seconds
- After a Complete Power loss  
(When manual reset pins are shorted)

### Output Contact Rating:

- 10 A General purpose @240 VAC
- Pilot Duty 480VA @ 240 VAC, B300

### Power Consumption:

6 Watts (max)

### Enclosure:

Polycarbonate

### Wire Type:

Stranded or solid 12-20 AWG,  
one per terminal

### Specifications:

- 3-phase Line Voltage: 190 - 480 VAC
- Frequency: 50\* or 60Hz
- Low Voltage (% of set Point) \*
- Trip:  $90\% \pm 1\%$
- Reset:  $93\% \pm 1\%$
- High Voltage (% of set Point)
- Trip:  $110\% \pm 1\%$
- Reset:  $107\% \pm 1\%$
- Voltage Unbalance (NEMA)
- Trip: 2-8%
- Reset: Trip setting minus 1% (5-8%)  
Trip setting minus .5% (2-4%)

### Standard Passed:

- Electrostatic Discharge (ESD)

### Radio Frequency Immunity, Radiated:

- 150 MHz V/m, 10V/m

### Fast Transient Burst:

- Level 3, 3.5 kV input power & controls

### Surge:

- IEC 1000-4-5, Level 3, 4kV line-to-line, Level 4, 4kV line-to-ground

### Weight:

14 oz.

### Terminal Torque:

6 in. lbs.

### ANSI/IEEE:

- C62.41 Surge and Ring Wave

- Compliance to a level of 6kV line-to-line

### Hi-Potential Test:

- Meets UL508 (2 x rated V +1000V for 1 minute)

### Class Protection:

IP20, NEMA 1 (Finger Safe)

## FEATURES

Four adjustment pots provide versatility for all kinds of applications.

Provides the versatility needed to handle global applications.

Diagnostic LEDs indicate trip status and provide simple trouble shooting.

Microcontroller based based circuitry provides better accuracy and higher than analog designs.

Transient protected to meet IEEE and IEC standards and operate under tough conditions.

Will detect single phase condition regardless of regenerated voltages.

### Environmental:

- Ambient Operating:  $-20^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  (-4 to  $+158^{\circ}\text{F}$ )
- Ambient Storage:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  (-4 to  $+176^{\circ}\text{F}$ )
- Relative Humidity: 10-95%, non-condensing per IEC 2-3

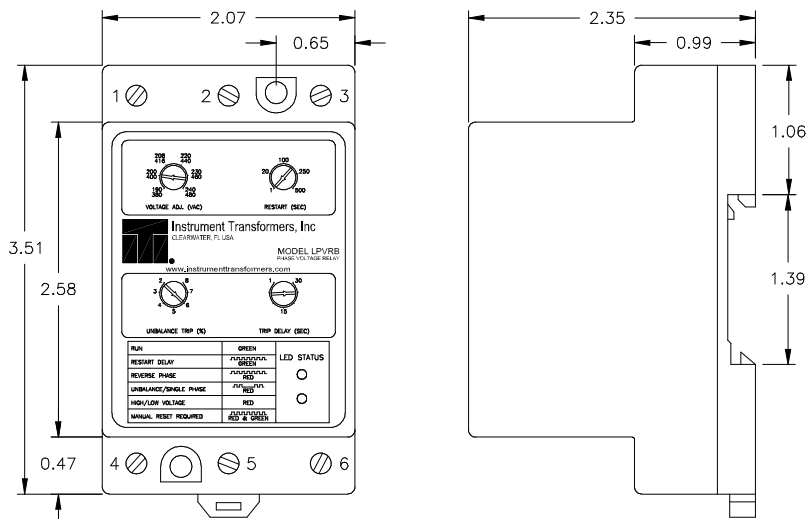
### Special Options:

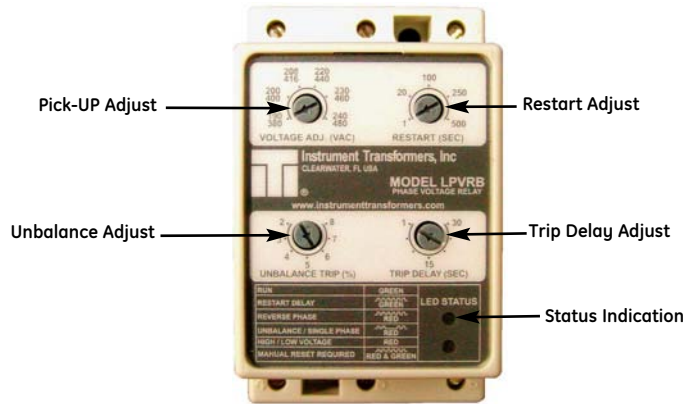
- Manual Reset: External momentary push button required

### Safety Marks:

UL508, IEC 60947-6-2

- The Model LPVRB is designed to protect 3-phase loads from damaging power conditions. Its wide operating range combined with UL and CE compliance insures worldwide acceptance.





| MODEL NUMBER | NOMINAL V <sub>ac</sub> | Hz. |
|--------------|-------------------------|-----|
| LPVRB        | 480V/120V               | 60  |
| LPVRB        | 380V/416V               | 50  |
| LPVRB-120    | 120V                    | 60  |

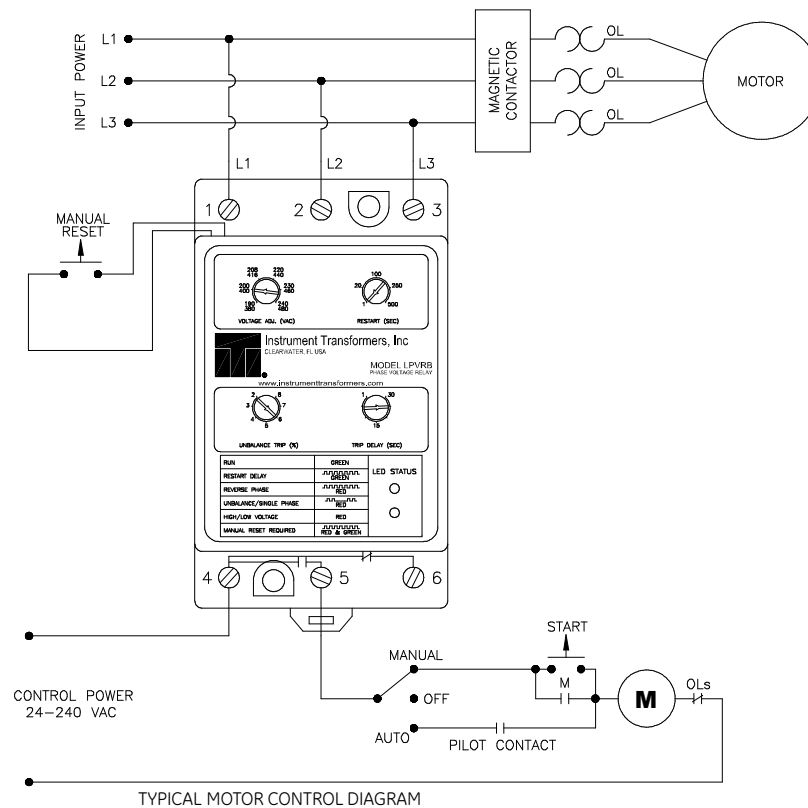
## LPVRB Operation with Options

A unique microcontroller-based voltage and phase sensing circuit constantly monitors the three phase voltages to detect harmful power line conditions. When a harmful condition is detected, the LPVRB's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to an acceptable level for a specified amount of time (Restart Delay) or after a manual reset. The trip and restart delays prevent nuisance tripping due to rapidly fluctuating power line conditions.

The Model **LPVRB** automatically senses whether it is connected to a 190 to 240V 60 Hz system, a 440 to 480V 60 Hz system, or a 380 to 416V 50 Hz system. An adjustment is provide to set the normal line voltage from 190-240 or 380-480 VAC. Other adjustments include a 1-30 second trip delay, a 1-500 second restart delay, and a 2-8% voltage unbalance trip adjustment.

Two LEDs indicate the status of the Model LPVRB; Run Light, Under Voltage, Over Voltage, Phasing Fault/Reverse Phase, and Manual Reset. The LPVRB ships with a jumper installed for automatic restart. A connector with 12" wires is included for manual reset switch.

## LPVRB Typical Wiring Diagram



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Electronic Products



# Phase Loss Phase Sequence Detection System Model APVR



103039, CANADIAN



103039

## SPECIFICATIONS

- Failsafe: Trip free contacts will not operate if a fault is present.
- Automatic reset. (Configurable to manual reset, See applications notes.)
- Fixed undervoltage trip point: approx. 90% pick up, 80% dropout.
- Operates at 6% phase unbalance.
- Operates green LED indicator.
- Isolated Form "C" output contacts.
- Output contact rating: 250V ac, 5 amps, (general use).
- Input voltages up to 575V ac.
- 3 second drop-out delay to avoid nuisance tripping.

## APPLICATION:

Protection of three phase electrical equipment sensitive to damage due to loss of phase, phase unbalance or improper phase sequence.

**NOMINAL INPUT VOLTAGES:** 120V, 208V, 240V, 380V, 415V, 480V, 575V

**FREQUENCY:** 50 Hz, 60 Hz.

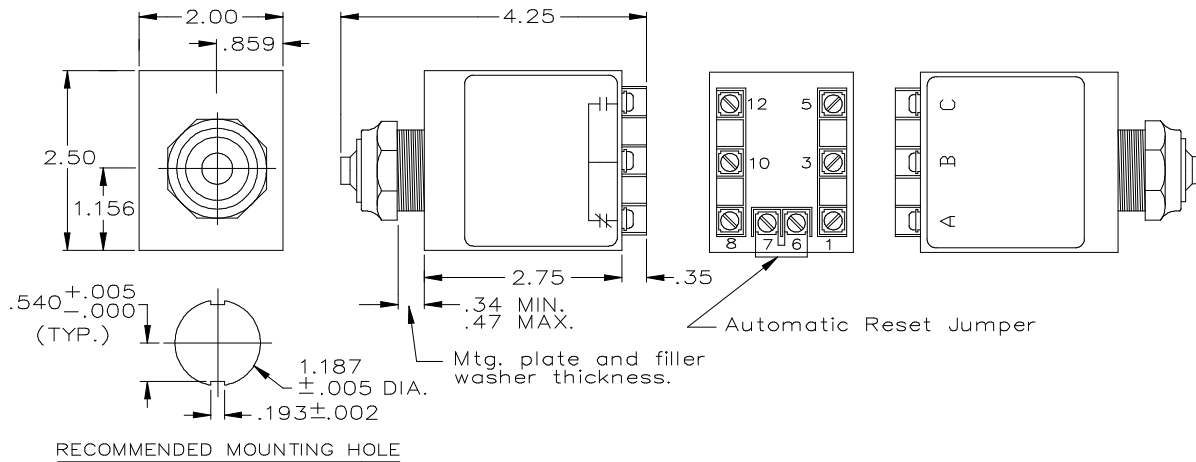
## AMBIENT TEMPERATURE RANGE:

Operation: -30°C to +60°C

Storage: -55°C to +85°C

Terminal screws are #6-32 nickel plated brass.

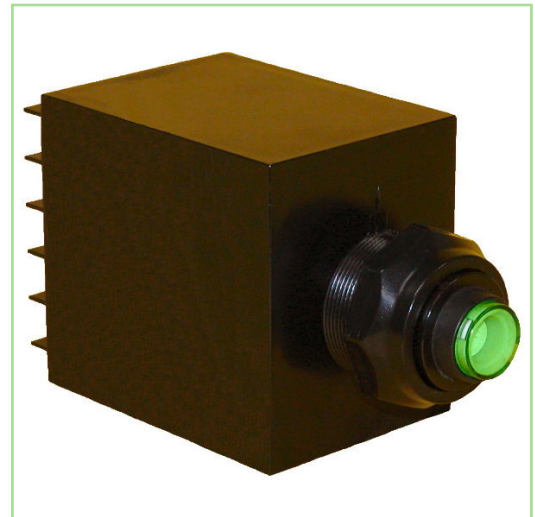
Shipping weight 0.6 lb.



RECOMMENDED MOUNTING HOLE

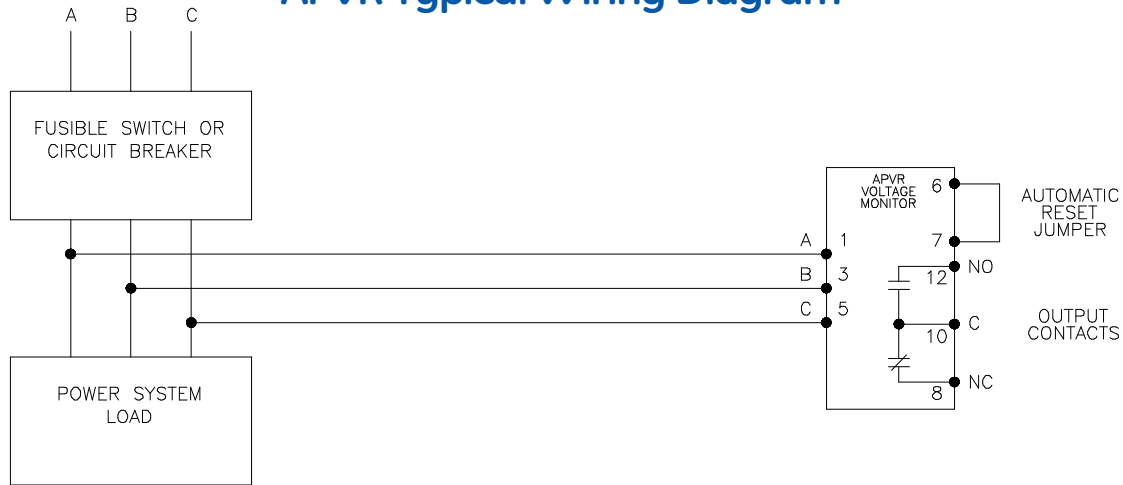
## AVAILABLE FOR THE FOLLOWING 3 PHASE VOLTAGES

| MODEL NUMBER | NOMINAL RATING | VOLTAGE RATING | FREQUENCY |
|--------------|----------------|----------------|-----------|
| APVR 120     | 120V           | 90 - 125       | 60 Hz     |
| APVR 208     | 208V           | 165 - 234      | 60 Hz     |
| APVR 240     | 240V           | 190 - 270      | 60 Hz     |
| APVR 480     | 480V           | 380 - 530      | 60 Hz     |
| APVR 575     | 575V           | 455 - 600      | 60 Hz     |
| APVR 380     | 380V           | 300 - 425      | 50 Hz     |
| APVR 415     | 415V           | 328 - 466      | 50 Hz     |



## Model APVR

### APVR Typical Wiring Diagram



### UNBALANCE CALCULATION

$$\frac{\text{MAX DEVIATION FROM AVERAGE}}{\text{AVERAGE}} \times 100 = \% \text{ UNBALANCE}$$

EXAMPLE:

$\phi A - \phi B = 240V$ ;  $\phi B - \phi C = 220V$ ;  $\phi C - \phi A = 215V$ ; AVERAGE = 225V

MAX DEVIATION FROM AVERAGE =  $240 - 225 = 15V$

$\% \text{ UNBALANCE} = \frac{15}{225} \times 100 = 6.67\%$

### Applications Notes

If the power conditions are normal, 3 seconds after power is supplied to the APVR the contacts will transfer, permitting operation. In normal applications, this power will already be applied to the APVR and there is no time delay in operating.

The correct phase sequence must be established upon initial installation for proper operation of the relay. Any subsequent change in phase will cause the relay to trip. If the relay is re-energized and the phase sequence is incorrect the relay will not operate.

The device is shipped from the factory in the automatic reset mode with a jumper on terminals 6 & 7. Operation can be changed from automatic reset to manual reset by removing the external jumper. Automatic reset means that upon fault removal the device reset automatically to perform is mounting function. For manual reset simply remove the jumper and connect a normally open pushbutton across terminals 6 and 7.

Upon application of power the green LED indicator will illuminate. If a fault exists the green LED will remain illuminated for these three seconds and then go out. This is normal and indicates that line power is present but a fault condition has been detected. The output contacts will remain in their de-energized failsafe state.

If no fault exists upon application of power the green LED indicator illuminates and three seconds later the relay contacts transfer. Upon detection of a fault, the green indicator light will go out and three seconds later the relay contacts revert to their de-energized state. This three second delay prevents nuisance tripping of the APVR.

In service the line voltage to the device may be interrupted on various occasions. In the automatic reset mode the device will resume its monitoring function approximately three seconds after power is restored. In the manual reset mode the reset pushbutton must be pressed.

"Failsafe" operation is achieved by the following features:

- 1) The relay is energized and the output contacts are transferred under "normal" conditions only.
- 2) Should the output relay itself fail or in the event of internal circuit failure, the relay will revert to the de-energized position.

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# Voltage Transducers

## Model LLV & PNV

**APPLICATION:** 3 Phase voltage measurement.

### NOMINAL INPUT VOLTAGES:

120V, 240V, 277V, 480V

**FREQUENCY:** 50/60 Hz.

**ACCURACY:**  $\pm 0.5\%$  Full scale.

### AMBIENT TEMPERATURE RANGE:

Effect on accuracy:  $\pm 0.3\%$  /  $^{\circ}\text{C}$ .

Operating:  $-30^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$

Storage:  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

Power supply: 24 V dc  $\pm 10\%$

Max. continuous input voltage: 600V

Output: Load range: 0-600 ohms.

Load range: 4 to 20mA dc.

Ripple:  $<1\%$ .

Response time:  $< 1.5$  sec. (10% to 90%)

Approx. shipping weight 1.3 lbs.

### ORDERING INFORMATION

MODEL  $\rightarrow$  XXX - XXX  $\leftarrow$  NOMINAL

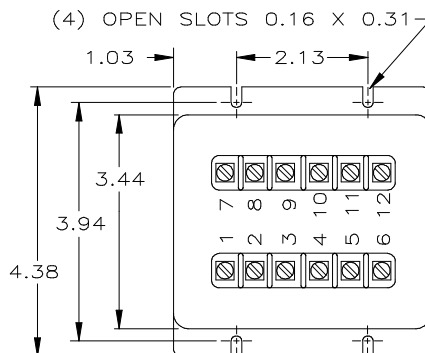
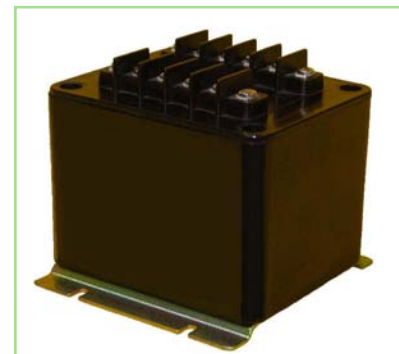
LLV

120

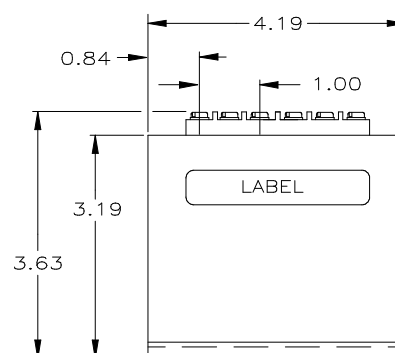
PNV

277 [ PNV Model only]

480 [ LLV [Dual Range] Model only]



TOP VIEW

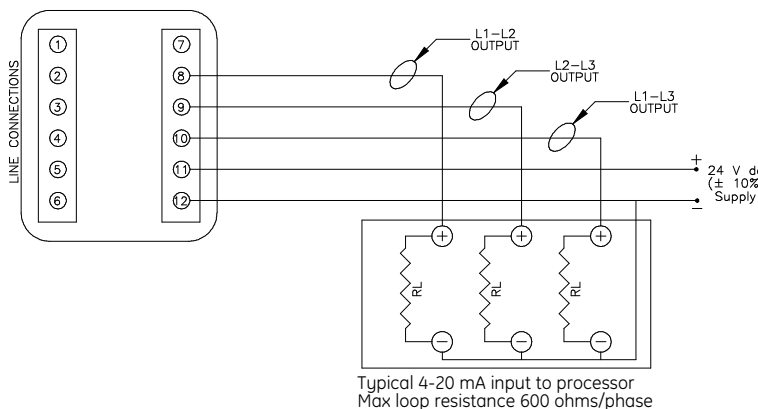


SIDE VIEW

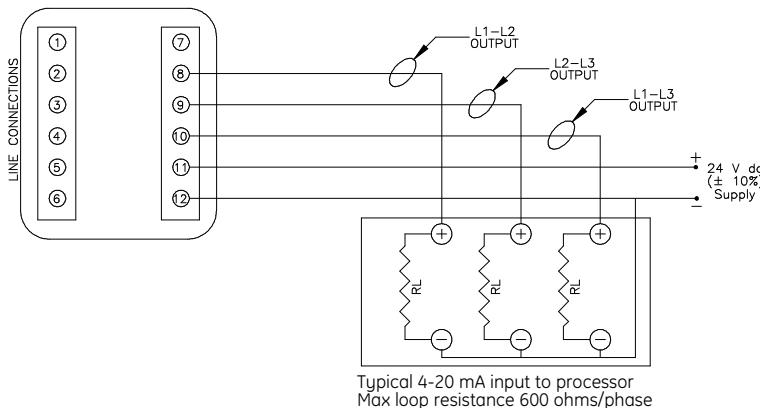
|                              | LINE-TO-LINE VOLTAGE |                     |                    | PHASE-TO-NEUTRAL VOLTAGE |                     |
|------------------------------|----------------------|---------------------|--------------------|--------------------------|---------------------|
|                              | LLV                  | LLV (Dual Range)    |                    | PNV                      |                     |
| Nominal Input Voltage        | 120V                 | 240V                | 480V               | 120V                     | 277V                |
| Voltage Input Range          | 90V to 150V          | 180V to 300V        | 360V to 600V       | 90V to 150V              | 180V to 300V        |
| Burden (Max.)                | 0.1VA at 120V        | 0.1VA at 265V       | 0.1VA at 530V      | 0.1VA at 150V            | 0.1VA at 300V       |
| Ripple On Output             | 250 UA ac            |                     |                    |                          |                     |
| Dielectric Test (1Min)       | 1300 Volts           | 1600 Volts          | 2200 Volts         | 1300 Volts               | 1600 Volts          |
| Transfer function $E_{in} =$ | (3.75) (mA out) +75  | (7.5) (mA out) +150 | (15) (mA out) +300 | (3.75) (mA out) +75      | (7.5) (mA out) +150 |

- The model **LLV** and **PNV** series of voltage transformers are expanded scale instruments which are designed to accurately measure voltages on three phase systems. The **LLV** series is designed to meter line to line voltages and the **PNV** series is designed to meter phase to neutral voltages. The transducers provide three discrete 4 to 20mA outputs that are proportional to the three phase input voltages. The input voltages scale does not meter down to zero Volts, instead it is limited to the normal useful range of input voltages for a particular system. For example: The model **PNV**-120 has an input signal range from 90 to 150 V ac and will yield an output of 4 to 20 mA dc for that range. The output is true constant current driver and is unaffected by resistance variations from 0-600 ohms in the output loop. An external 24Vdc supply is needed to provide power for the internal solid state circuitry. The power supply input has reverse polarity protection to prevent damage from an accidental miswire. The high accuracy solid state circuitry is average responding calibrated to read RMS. This device is an ANSI/ISO 50.1 Class L3 transmitter.

### LLV (Line-To-Line) Connection Diagram



### PNV (Phase-To-Neutral) Connection Diagram



It is recommended that the installation conform to NEC and any local codes.



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# AC Current Transducer

## Model ACV 0-200A to produce 0-5 Volts dc



142298, CANADIAN



142298

### OPERATING RANGE:

Primary: 5 to 200 Amps ac.

Secondary: 0 to 5 Volts dc.

**FREQUENCY:** 50/60 Hz.

### INSULATION LEVEL:

600 Volts, 10 kV BIL full wave.

**RESPONSE TIME:** 0.25 Seconds.

### AMBIENT TEMPERATURE RANGE:

-30°C to +60°C

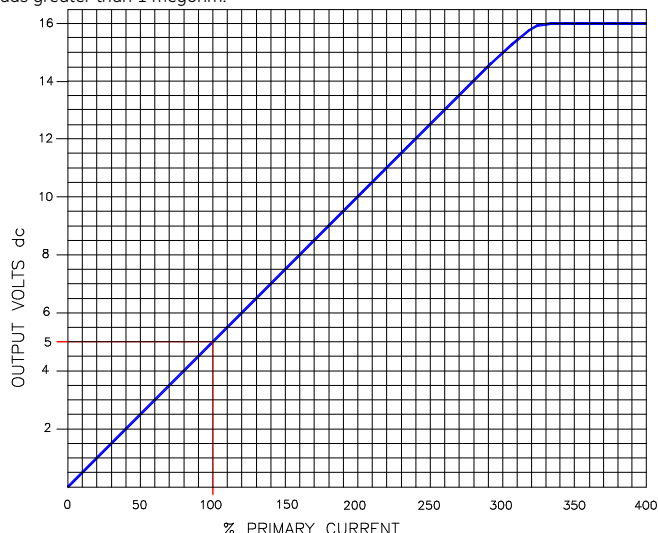
1% max. peak ripple on output at 1 megohm or greater.

Secondary terminals are brass screws No. 8-32 with one flatwasher and lockwasher.

Approximate weight 1.5 lbs.

| MODEL NUMBER | PRIMARY AMPS | ACCURACY % F.S.* |
|--------------|--------------|------------------|
| ACV - 5      | 0 - 5        | 1.0              |
| ACV - 10     | 0 - 10       | 0.75             |
| ACV - 15     | 0 - 15       | 0.75             |
| ACV - 20     | 0 - 20       | 0.5              |
| ACV - 30     | 0 - 30       | 0.5              |
| ACV - 50     | 0 - 50       | 0.5              |
| ACV - 75     | 0 - 75       | 0.5              |
| ACV - 100    | 0 - 100      | 0.5              |
| ACV - 150    | 0 - 150      | 0.5              |
| ACV - 200    | 0 - 200      | 0.5              |

\* For loads greater than 1 megohm.



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**DESCRIPTION:** The model **ACV** series of current transducers will produce a 0-5V dc output signal that is directly proportional to the input current. The transducers internal circuitry is average sensing, calibrated for RMS.

### APPLICATION:

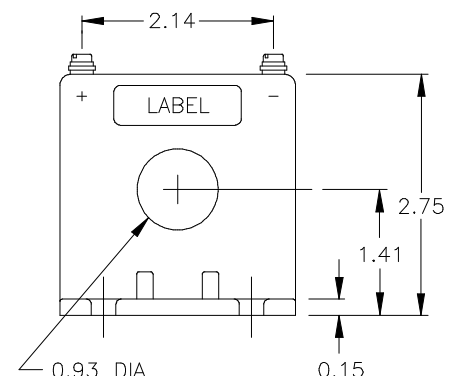
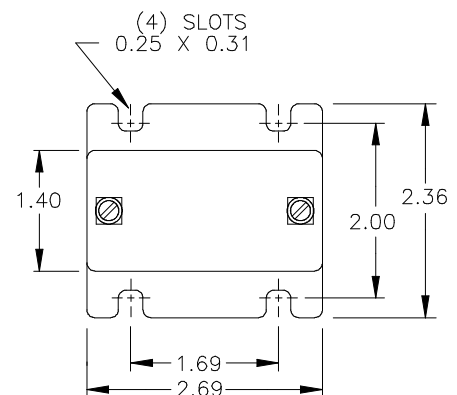
These transducers are intended for use with process control or industrial measuring equipment. The D.C. output signal can be connected directly to high impedance A/D input of a computer without any additional signal conditioning basis.

These transducers can accurately measure up to 200% of full scale on a short time basis (1min. or less), and 150%, on a continuous basis.

To protect external circuits from damage caused by a short circuit or motor inrush current the output is limited to approx.16 V. If its necessary to accurately measure motor overload currents then a model must be selected so that the expected overload will fall within the transducer's 200% accuracy range.

**Example:** A Motor with FLA of 6A

During lock rotor condition the current could rise to 36A. In order to accurately measure the 36A inrush current a model ACV-20 should be used. The ACV-20 will accurately measure up to and including 40 Amps.



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# AC Current Transducer

## Model 10ACV 0-200Amps to produce 0-10 Volts dc

### OPERATING RANGE:

Primary: 5 to 200 Amps ac.  
Secondary: 0 to 10 Volts dc.

**FREQUENCY:** 50/60 Hz.

### INSULATION LEVEL:

600 Volts, 10 kV BIL full wave.

**RESPONSE TIME:** 0.25 Seconds.

### AMBIENT TEMPERATURE RANGE:

-30°C to +60°C  
1% max. peak ripple on output  
at 150 K ohms or greater.

Secondary terminal are brass  
screws No. 8-32 with one  
flatwasher and lockwasher.

Approximate weight 1.5 lbs.

**DESCRIPTION:** The Model **10ACV** series of current transducers will produce a 0-10V dc output signal that is directly proportional to the input current. The transducers's internal circuitry is average sensing, calibrated for RMS.

### Application:

These transducers are intended for use with process control or industrial measuring equipment. The D.C. output signal can be connected directed to a high impedance A/D input of a computer with out any additional conditioning components.

These transducers can accurate measure up to 200% of full scale on a short time basic (1min. or less), and 150% on a continuous basis.

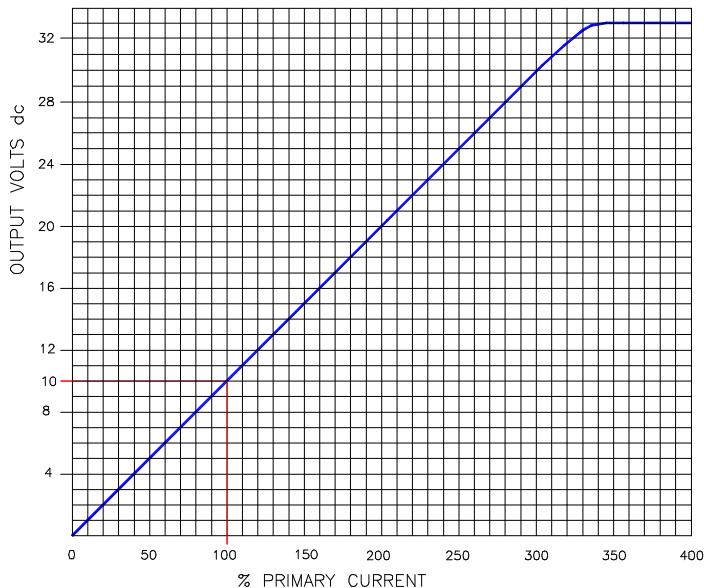
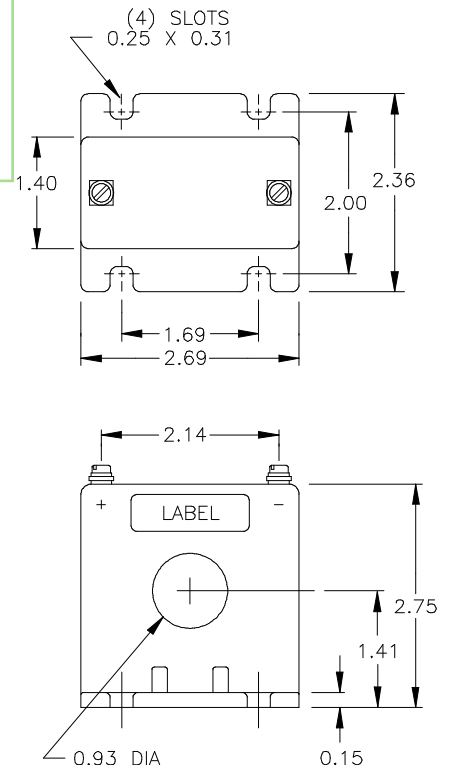
To protect external circuits from damage caused by a short circuit or motor inrush current the output is limited to approx. 33V. If it is necessary to accurately measure motor overload currents then a model must be selected as that the expected overload will fall within the transducers's 200% accuracy range.

### EXAMPLE: A Motor with FLA of 6A

During lock rotor condition that current could rise to 36A. In order to accurately measure the 36A inrush current a model 10ACV-20 should be used. The 10ACV-20 will accurately measure up to and including 40 Amps.

| MODEL NUMBER | PRIMARY AMPS | ACCURACY % F.S. * |
|--------------|--------------|-------------------|
| 10ACV - 5    | 0 - 5        | 1.0               |
| 10ACV - 10   | 0 - 10       | 0.75              |
| 10ACV - 15   | 0 - 15       | 0.75              |
| 10ACV - 20   | 0 - 20       | 0.5               |
| 10ACV - 30   | 0 - 30       | 0.5               |
| 10ACV - 50   | 0 - 50       | 0.5               |
| 10ACV - 75   | 0 - 75       | 0.5               |
| 10ACV - 100  | 0 - 100      | 0.5               |
| 10ACV - 150  | 0 - 150      | 0.5               |
| 10ACV - 200  | 0 - 200      | 0.5               |

\* FOR LOADS GREATER THAN 150 K OHMS





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# AC Current Transducer

## Model PCL 0-75 Amps ac to produce 4-20mA dc

### OPERATING RANGE:

Input 5 thru 75 Amps ac.

Output: 4-20 mA dc.

### FREQUENCY: 50/60 Hz.

### AMBIENT TEMPERATURE RANGE:

Effect on accuracy  $\pm 0.02\%/^{\circ}\text{C}$

Operating:  $-30^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$

Storage:  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

### INSULATION LEVEL:

600 Volts, 10 kV BIL full wave.

### ACCURACY: $\pm 0.5\%$ F.S. maximum.

1% max. peak ripple on output.

Response Time:  $<150\text{ms}$  (10% to 90%)

Output load ( $R_L$ ): 0-1000 ohms.

Maximum output: 30 mA dc.

Supply Voltage Range: 120 Vac  $\pm 10\%$ .

Terminal are brass screws No. 10-32 with one flatwasher, lockwasher and regular nut.

Approximate weight 1.0 lbs.



142298, CANADIAN

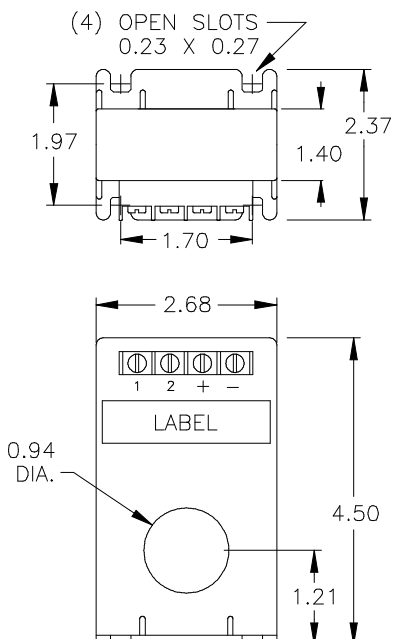


142298



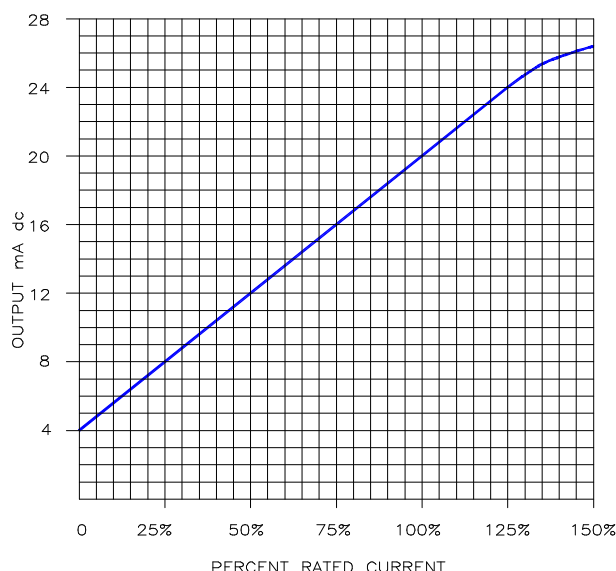
| MODEL                              | INPUT CURRENT          |
|------------------------------------|------------------------|
| PCL 5                              | 0 - 5                  |
| * PCL 20                           | 0 - 10, 0 - 15, 0 - 20 |
| * PCL 75                           | 0 - 25, 0 - 50, 0 - 75 |
| See Next Page for 0-100 thru 0-600 |                        |

\* Switch selectable current ranges.



- The **PCL** transducer accurately converts a sinusoidal ac input current to a proportional dc output current. The high performance integrated circuit amplifiers achieve a constant current output, insensitive to a variable impedance load. This allows the PCL to be easily applied to remote instrumentation, motor control and energy management installations. The output signal (4 to 20mA dc) can be transmitted over long distances with no loss in accuracy. Model numbers **PCL 20** and **PCL 75** have been provided with a range selector switch for customer selectable current ranges. The input circuit is average responding. The output is calibrated to read true RMS for a pure sinus waveform.

TYPICAL CHARACTERISTICS



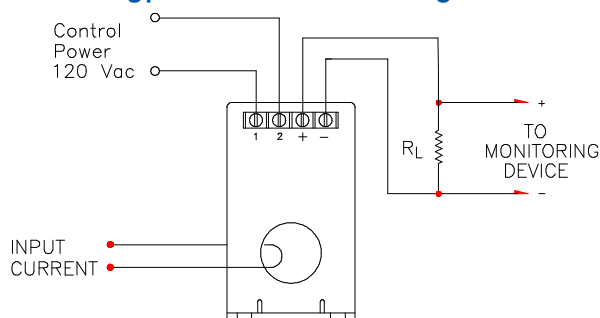
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### Typical Connection Diagram



### Application

Calculating

$I_m$  = ac Amps measured

$I_o$  = mA dc out of PCL

Rated Input

CT primary Rating (when monitoring a CT)

Rated Input

PCL Primary Rating (when monitoring direct)

Where:

$$I_m = \text{Rated input} \times \left( \frac{I_o - 4}{16} \right)$$

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Electronic Products



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# AC Current Transducer

## Model PCL

0-600 Amps ac to produce 4-20 mA dc

### OPERATING RANGE:

Input 0 to 100 thru 600 Amps ac.  
Output: 4-20 mA dc.

### FREQUENCY: 50/60 Hz.

### AMBIENT TEMPERATURE RANGE:

Effect on accuracy  $\pm 0.02\%/^{\circ}\text{C}$   
Operating:  $-30^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$   
Storage:  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

### INSULATION LEVEL:

600 Volts, 10 kV BIL full wave.

### ACCURACY:

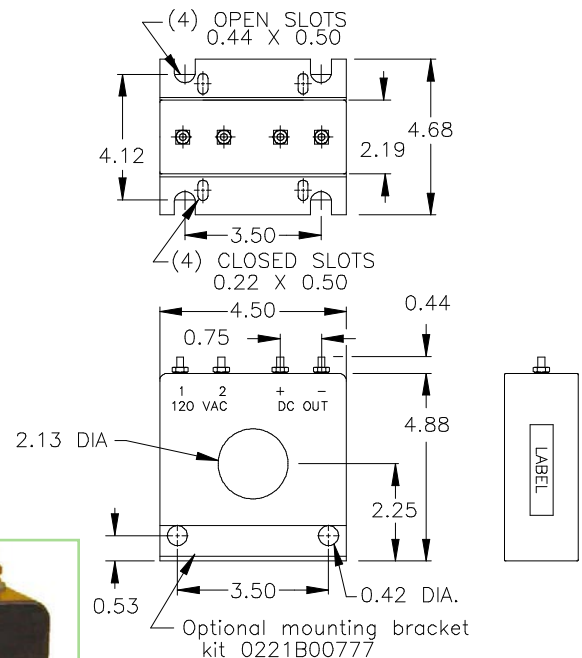
$\pm 0.05\%$  F.S. maximum.

1% max. peak ripple on output.  
Response Time:  $<150\text{ms}$  (10% to 90%)  
Output load ( $R_L$ ): 0-1000 ohms.  
Maximum output: 30 mA dc.  
Supply Voltage Range: 120 Vac  $\pm 10\%$ .  
Terminal are brass studs No. 8-32  
with one flatwasher, lockwasher  
and regular nut.

Approximate weight 3.0 lbs.

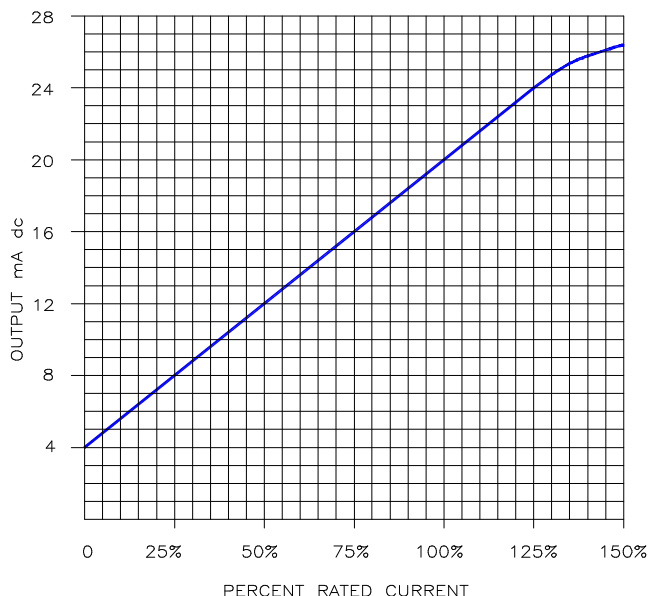
| MODEL NUMBER               | INPUT CURRENT RANGE |
|----------------------------|---------------------|
| Previous for 0-5 thru 0-75 |                     |
| PCL 100                    | 0-100               |
| PCL 150                    | 0-150               |
| PCL 200                    | 0-200               |
| PCL 300                    | 0-300               |
| PCL 400                    | 0-400               |
| PCL 600                    | 0-600               |
| 0221B00777                 | Mtg. Bracket Kit    |

For load currents which are greater than 600A the PCL-5 may be used in conjunction with separate higher ratio C.T.'s having a rated 5A secondary.

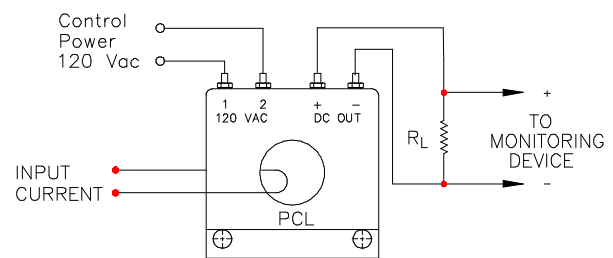


- The PCL transducers accurately converts a sinusoidal ac input current to a proportional dc output current. The high performance integrated circuit amplifiers achieve a content current output, insensitive to a variable impedance load. This allows the PCL to be easily applied to remote instrumentation, motor control and energy management installations. The output signal (4 to 20mA dc) can be transmitted over long distances with no loss accuracy.

TYPICAL CHARACTERISTICS



### Typical Connection Diagram



### Application

Calculating

$I_m$  = ac Amps measured

$I_o$  = mA dc out of PCL

Rated Input  
Rated Input

CT primary Rating (when monitoring a CT)

PCL Primary Rating (when monitoring direct)

Where:

$$I_m = \text{Rated input} \times \left( \frac{I_o - 4}{16} \right)$$



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# AC Current Transducer Model PCM 0-300 Amps ac to produce 4-20 mA dc

## OPERATING RANGE:

Input 0-5 thru 300 Amps ac.  
Output: 4-20 mA dc.

**FREQUENCY:** 50/60Hz.

## AMBIENT TEMPERATURE RANGE:

Effect on accuracy  $\pm 0.04\%/^{\circ}\text{C}$   
Operating:  $-30^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$   
Storage:  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$



142298, CANADIAN



142298

## INSULATION LEVEL:

600 Volts, 10 kV BIL full wave.

## CONTINUOUS THERMAL CURRENT RATING FACTOR:

1.33 at  $30^{\circ}\text{C}$  ambient.\*

\* 6.00 times rated current for 30 seconds.

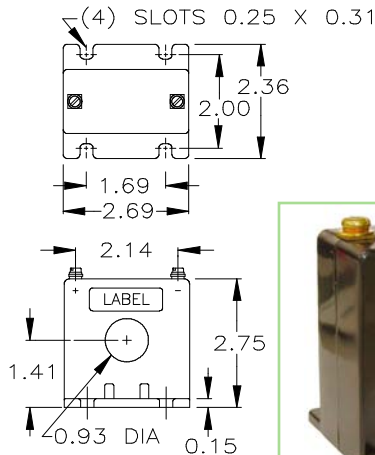
## ACCURACY:

$\pm 0.05\%$  F.S. maximum.

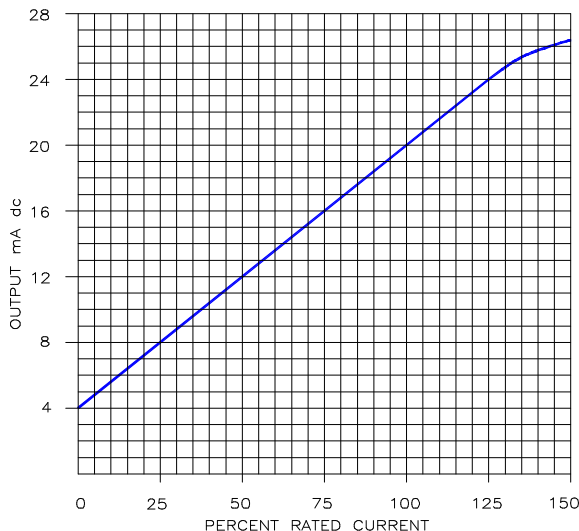
1% maximum to peak ripple on dc out put.  
peak ripple on output.

- Output load ( $R_L$ ): 0-600 ohms.
- Maximum output: 30 mA dc.
- Supply Voltage Range: 24V dc  $\pm 10\%$ .
- Response Time: <200ms (10%-90%)
- Repeatability: <0.1%
- PCM 5- 200 terminal are brass screws No. 10-32 with one flatwasher, lockwasher and regular nut.
- PCM 300 terminal are brass studs No. 8-32 with one flatwasher, lockwasher and nut.

Approximate weight 1.5 lbs.

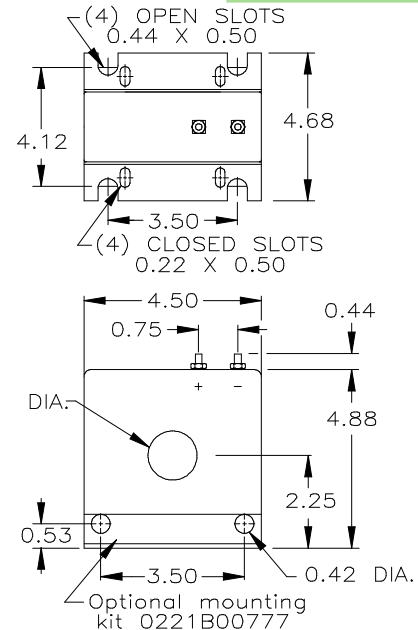


TYPICAL CHARACTERISTICS



| MODEL NUMBER | INPUT CURRENT RANGE |
|--------------|---------------------|
| PCM 5        | 0 - 5               |
| PCM 10       | 0 - 10              |
| PCM 20       | 0 - 20              |
| PCM 30       | 0 - 30              |
| PCM 50       | 0 - 50              |
| PCM 75       | 0 - 75              |
| PCM 100      | 0 - 100             |
| PCM 150      | 0 - 150             |
| PCM 200      | 0 - 200             |
| PCM 300      | 0 - 300             |

For load currents which are greater than 300A the 5 unit may be used in conjunction with separate higher ratio C.T.'s having a rated 5A secondary.



The output require 24V dc to be applied between the (+) terminal and ground. The output load may be inserted in either the (-) line for a negative ground system. Power supply polarity is critical for correct operation, but an accidental reverse polarity connection will not damage the output. Several transducers can be operated from a single power supply with the only limitation being the maximum current available from the supply itself.

(Example: a one Amp supply will support 50 transducers operating at 20mA dc output.) The maximum output is limited to 30mA dc to prevent damage to external components.

## CAUTION:

Some consideration should be given to the ripple content of the external power supply. Any ripple introduced by the power supply will appear at the load resistor.

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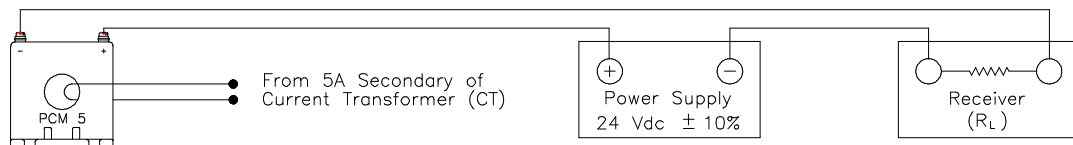
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## Applications Notes

### Application #1 Monitoring Loads 300 Amps or Less



### Application #2 Monitoring Loads from a Current Transformer Secondary

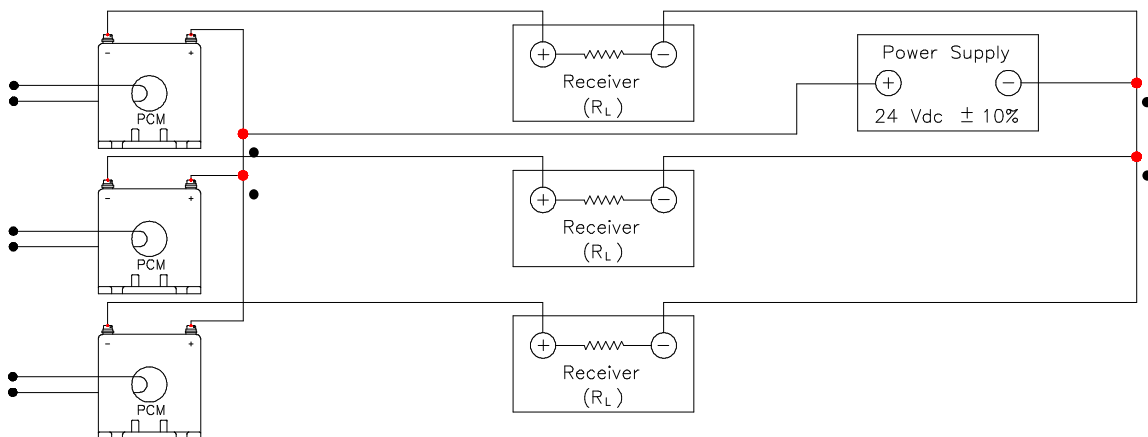


#### Example

$$\text{When used with a } 2000:5 \text{ CT } I_{in} = 2000 \times \left( \frac{I_o - 4}{16} \right)$$

$$\text{If } I_o = 10\text{mA then } I_{in} = 2000 \times \left( \frac{10 - 4}{16} \right) = 750 \text{ amps}$$

### Application #3 Energizing multiple transducers from a single power supply



#### Application

Calculating  $I_{in} = \text{ac Amps measured}$   
 $I_o = \text{mA dc out of PCL}$   
 Rated Input CT Primary Rating (when monitoring a CT)  
 Rated Input PCL Primary Rating (when monitoring direct)

Where:  $I_{in} = \text{Rated input} \times \left( \frac{I_o - 4}{16} \right)$

NOTE: Output current of each PCM is limited to 30mA max. From this the required by using capacity of the D.C. supply can be calculated by multiplying the total number of PCM's times 0.03A to find the maximum requirement output capacity of the supply.

It is possible to achieve an output close to full scale increase output resolution by using multiple turns through the window of the PCM. The following equation would apply:

$$I_{in} = \frac{\text{Rated input Amps}}{\text{No. of Turns}} \times \left( \frac{I_o - 4}{16} \right)$$

**EXAMPLE:** A PCM 5 is used with two turns and is monitoring a 2A load.

$$\text{If } I_o = 16.8 \text{ mA then } I_{in} = \frac{5}{2} \times \left( \frac{16.8 - 4}{16} \right) = 2 \text{ Amps}$$



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# Open Circuit Protectors

## Model OCP



LISTED  
IND. CONT. EQUIP.



FILE NO.  
E103039

### APPLICATION:

Open circuit protection for relay classes through C800 and all classes through C800 and metering classes.

### FREQUENCY:

50-400 Hz.

### AMBIENT TEMPERATURE RANGE:

-30°C to +55°C

### NORMAL SECONDARY CURRENT:

5 Amps. ac.

### SHORT TIME OVERCURRENT:

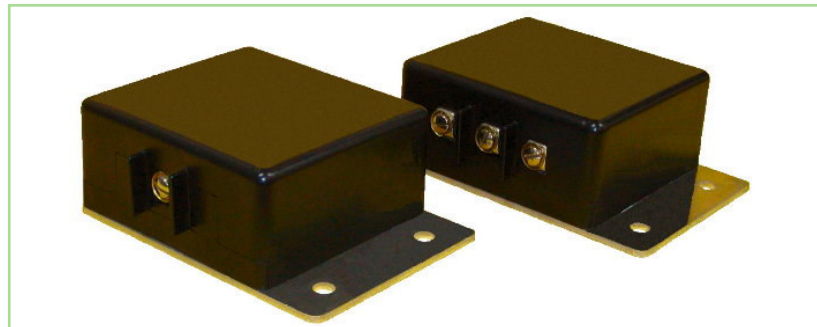
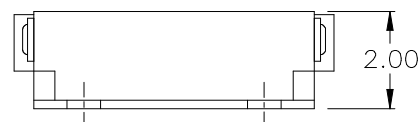
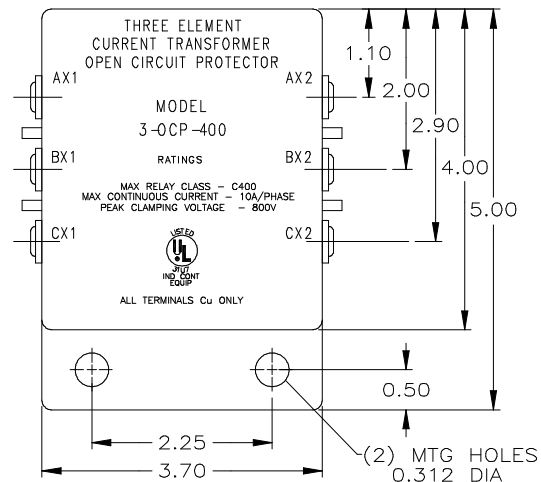
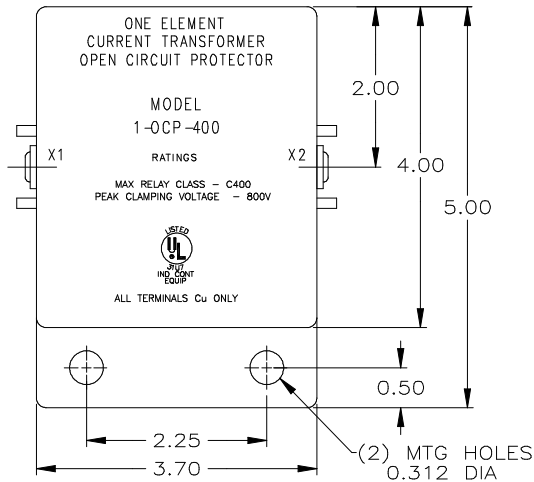
100 Amps for 2 Sec.

### MAX. CONTINUOUS CURRENT:

10 Amps through one element or 7.5 Amps through all three independent elements.

**TERMINALS:** Copper with brass slotted pan head screws, No.8-32 x 1/4, with cupped washers.

Weight 1.2 lbs.



| 1 ELEMENT OPEN CIRCUIT PROTECTOR |                               |                                          |                             |
|----------------------------------|-------------------------------|------------------------------------------|-----------------------------|
| MODEL NUMBER                     | RECOMMENDED CT RELAYING CLASS | CLAMPING PEAK VOLTAGE LIMIT (V peak nom) | STANDARD RELAY BURDEN (OHM) |
| 1-OCP-100                        | THRU C100                     | 200                                      | 1                           |
| 1-OCP-200                        | C200                          | 400                                      | 2                           |
| 1-OCP-400                        | C400                          | 800                                      | 3                           |
| * 1-OCP-800                      | C800                          | 1500                                     | 8                           |

\* NOT U.L. LISTED, SINGLE ELEMENT ONLY

| 1 ELEMENT OPEN CIRCUIT PROTECTOR |                               |                                          |                             |
|----------------------------------|-------------------------------|------------------------------------------|-----------------------------|
| MODEL NUMBER                     | RECOMMENDED CT RELAYING CLASS | CLAMPING PEAK VOLTAGE LIMIT (V peak nom) | STANDARD RELAY BURDEN (OHM) |
| 3-OCP-100                        | THRU C100                     | 200                                      | 1                           |
| 3-OCP-200                        | C200                          | 400                                      | 2                           |
| 3-OCP-400                        | C400                          | 800                                      | 4                           |

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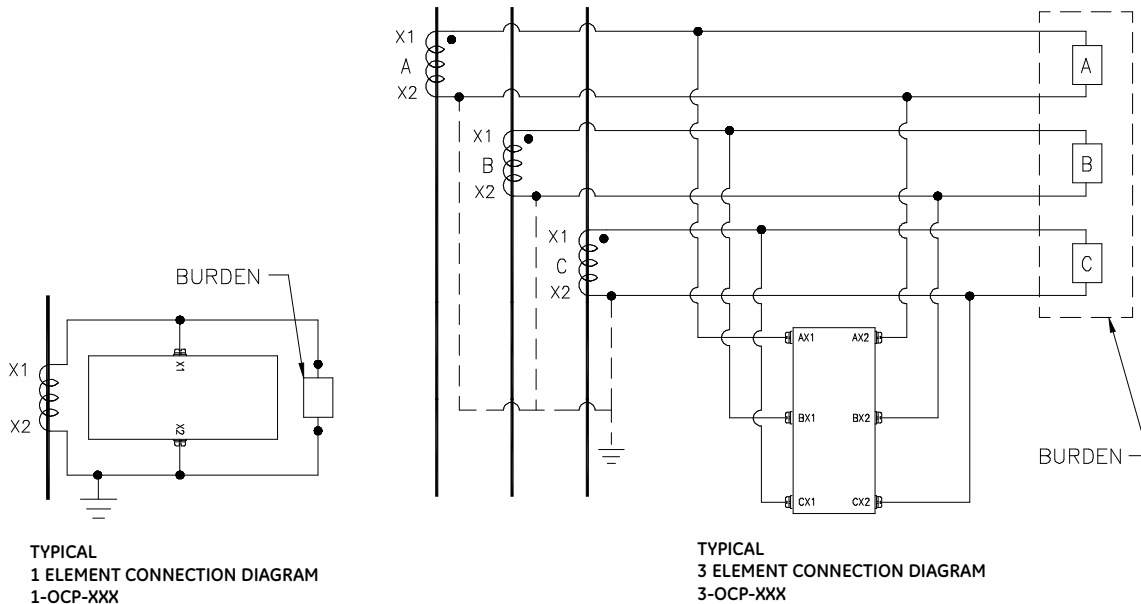
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Please refer to our website [www.GEMultilin.com](http://www.GEMultilin.com) for more detailed contact information

Electronic Products

## Model OCP



A Current Transformer secondary should never be open circuited while the Current Transformer primary circuit is energized. If this situation should occur there is a possibility of developing extremely high voltages which could be dangerous to personnel or cause an insulation breakdown.

The **OCP** series of Open Protectors are voltage sensing devices using high shunting SCR switches. When the secondary peak voltages exceeds the clamping voltage value, the SCR operates, shorting the C.T. secondary and reducing the voltage to about 2 volts in less than 1/4 cycle. This process repeats each current polarity reversal. The protection is activated each half cycle.

The three element Open Circuit Protector is Protector is provided with six terminals for connection across the secondary of the C.T.'s and parallel with burden. It can also be connected across the current terminals of a protective relay, meter, or other current operated device without affecting the operation of the device. Secondary polarity of the C.T.'s is not critical to the OCP.

The **OCP** also provides protection against high secondary voltage transients, which may damage the burden or secondary winding. If the transient voltage exceeds the voltage clamping limit, the Open Circuit Protector will trigger. After triggering, the voltage will fall to about 2 volts and remain there until the next zero crossing of the current, waveform at which time the device resets and the cycle repeats as necessary. In the transient mode of protection, triggering will occur only on the half cycle where the transient appears. The leakage current of the OCP is insignificant and will not cause a ratio or phase angle error in the Current Transformer accuracy.

Metering class C.T.'s with a rating factor of 2 could operate up to 10 amps on a continuous basis. Relaying class C.T.'s are designed to withstand short time overloads up to 20 times normal (100 amps RMS) for 2 seconds. The **OCP** is designed to tolerate both of these conditions if the burden accidentally opens.

## HOW TO ORDER OPEN CIRCUIT PROTECTORS

**X - OCP - XXX**

Elements  
1 =One Elements  
3 =Three Elements

Relay Class Protection  
100 = C10 Thru C100  
200 = C100 Thru C200  
400 = C200 Thru C400  
800 = C400 Thru C800 (One Element Only)



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# Capacitor Trip Device

## Model CTD-1 & CTD-2

### APPLICATION:

Provides a source of energy for circuit breaker and switch trip coil operation during a loss of AC control voltage.

### NORMAL INPUT:

120 Volts ac,  
125 Volts dc.

### FREQUENCY:

DC to 400Hz.

### Specifications

Max. Input Voltage:  
140 Vac, 125 Vdc surge protected.

Capacitance:  
330 uF, CTD-1  $\pm 20\%$  @ 25°C  
1500 uF, CTD-2  $\pm 20\%$  @ 25°C

Available Energy (\*\*)  
4.72 joules, CTD-1  
 $\pm 20\%$  @ 25°C.

21.5 joules, CTD-2  
 $\pm 20\%$  @ 25°C.

Normal Output Voltage(\*\*)  
170 Vdc (120 Vac input)  
125 Vdc (125 Vac input)

Normal Charge Time (\*)  
170 mSec. CTD-1  
440 mSec. CTD-2



LISTED  
IND. CONT. EQUIP.



FILE NO.  
E103039

Operating Temperature Range:  
-30°C to 60°C

Storage Temp Range:  
-50°C to 80°C

Short Circuit Protection:  
Continuous

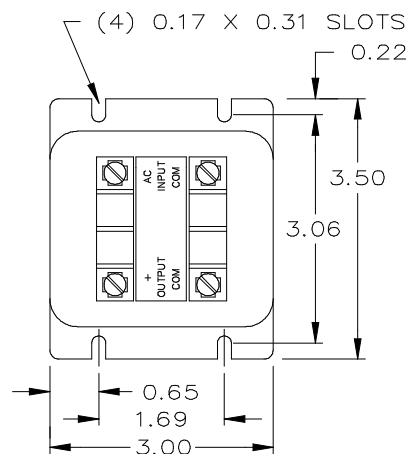
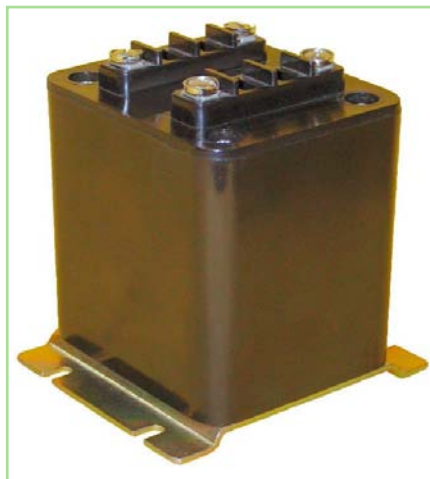
Mounting:  
Vertical or horizontal

Input Surge Protection:  
MOV protected to 65 joules pulse surge

- These devices are protected against inadvertent output short circuit, inductive kickback from the trip coil, and input line voltage surges.

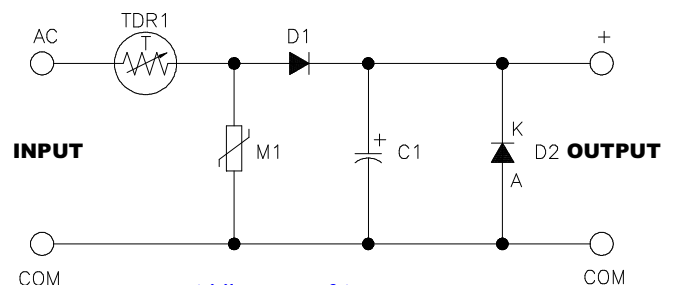
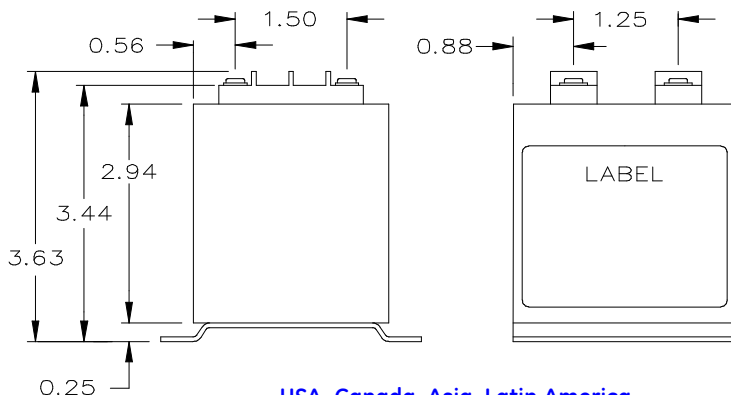
Nominal 120 Volts ac, or 125 Volts dc is applied between the 'AC' and 'COM' terminals. This voltage is half wave rectified and applied across the trip capacitor, giving an output trip voltage. The charge stored in this capacitor (330 uF or 1500 uF) is available between the '+' and 'COM' terminals for breaker trip coil operation. The half wave rectification circuitry provides the advantage of maintaining a common neutral connection from input while still maintaining the charge in the the trip capacitor after control power is lost.

The capacitor is continuously charged when control power is available, providing energy for normal trip coil operation. Because mechanical relays are not involved, energy for the trip coil operation is immediately available with the loss of control power. When the control power returns, the capacitor automatically charges to supply energy for the next trip coil.



\* Charge time from full discharge to 90% of max. capacitor voltage at 25°C.

\*\* Trip capacitor fully charged to nominal ac input voltage.



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# Capacitor Trip Device Model CTD-3



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IND. CONT. EQUIP.



FILE NO.  
E103039

## APPLICATION:

Provides a source of energy for circuit breaker and switch trip coil operation during a loss of AC control voltage.

## NORMAL INPUT:

240 Volts ac

## AMBIENT TEMPERATURE RANGE:

-30°C to +60°C

## FREQUENCY:

DC to 400Hz.

## Specifications

Normal Input Voltage: 240 V

Max. Input Voltage:  
280 Vac

Capacitance:  
330 uF  $\pm$  20% @ 25°C

Temp. Influence on cap.:  
-10% @ -30°C / +5% @ +60°C

Available energy trip capacitor fully  
charged at normal input voltage:  
19 joules  $\pm$  20% @ 25°C

Normal Output Voltage:  
338 Volts DC

Approx charge time to 90% at 60 Hz. / 25°C:  
350ms

Operating Temperature Range:  
-30°C to 60°C

Storage Temp Range:  
-50°C to 80°C

Short Circuit Protection:  
Continuous

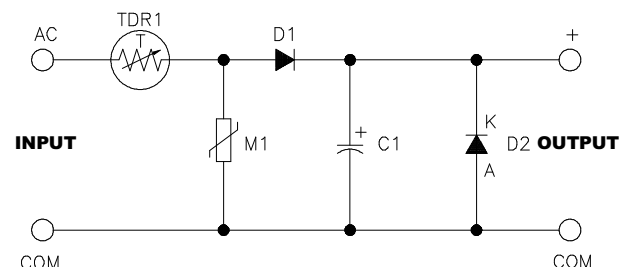
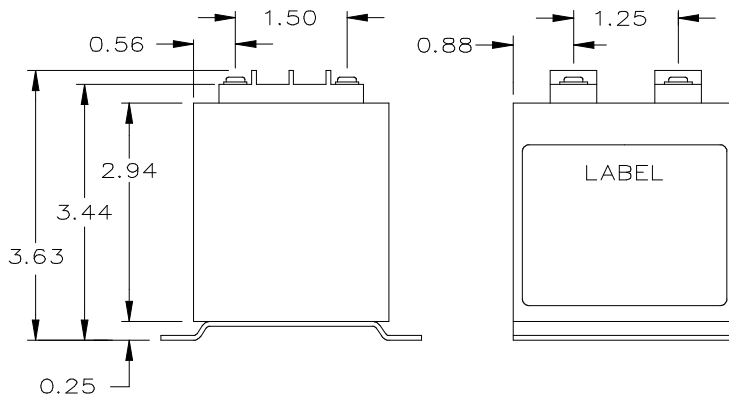
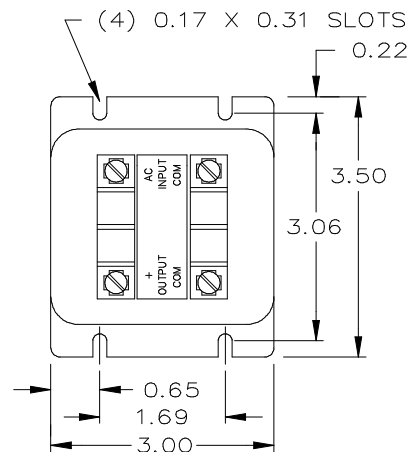
Mounting:  
Vertical or horizontal

Input Surge Protection:  
MOV protected to 65 joules pulse surge

- These devices are protected against inadvertent output short circuit, inductive kickback from the trip coil, and input line voltage surges. Nominal 240 Volts ac, is applied between the 'AC' and 'COM' terminals.

This voltage is half wave rectified and applied across the trip capacitor, giving an output trip voltage. The charge stored in this capacitor is available between the '+' and 'COM' terminals for breaker trip coil operation. The half wave rectification circuitry provides the advantage of maintaining a common neutral connection from input while still maintaining the charge in the trip capacitor after control power is lost.

The capacitor is continuously charged when control power is available, providing energy for normal trip coil operation. Because mechanical relays are not involved, energy for the trip coil operation is immediately available with the loss of control power. When the control power returns, the capacitor automatically charges to supply energy for the next trip coil.





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# Capacitor Trip Device Model CTD-4

## APPLICATION:

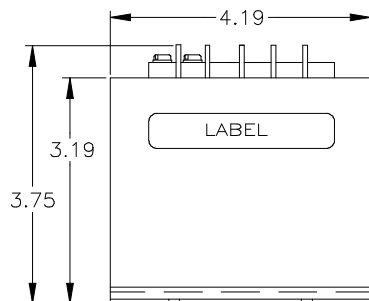
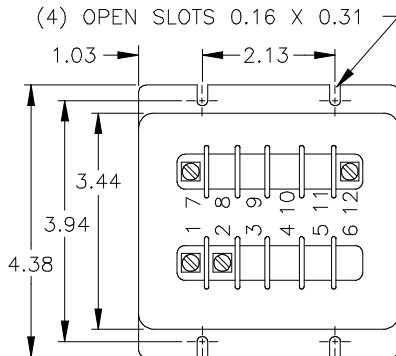
Provides a source of energy for circuit breaker and switch trip coil operation during a loss of AC control voltage.

## NORMAL INPUT:

120 VAC or 240 VAC

## FREQUENCY:

DC to 400Hz.



LISTED  
IND. CONT. EQUIP.



FILE NO.  
E103039

## Specifications

### Normal Output Voltage:

CTD-4-120: 120 V,  
CTD-4-240: 240 V

### Max. Input Voltage:

CTD-4-120: 140Vac, CTD-4-240: 280Vac

### Available energy trip capacitor fully charged at normal input voltage:

CTD-4-120: 64 joules  $\pm$  20% @ 25°C  
CTD-4-240: 57 joules  $\pm$  20% @ 25°C

### Normal Output Voltage:

CTD-4-120: 169 Volts DC,  
CTD-4-240: 338 Volts DC

### Approx charge time to 90% at 25°C

CTD-4-120: 1.4S, CTD-4-240: 570mS

### Capacitance:

CTD-4-120: 4500 uF  $\pm$  20% @ 25°C  
CTD-4-240: 990 uF  $\pm$  20% @ 25°C

### Temp. influence on cap.:

-10% @ -30°C / +5% @ +60°C

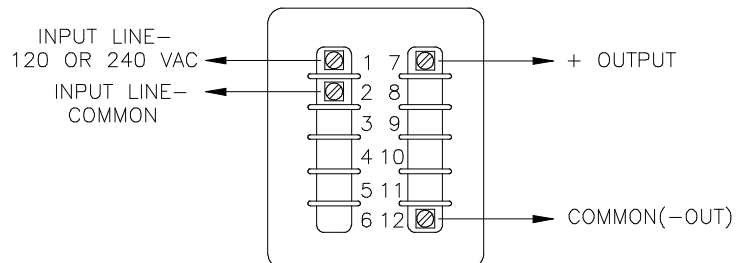
Operating temperature range:  
-30°C to 60°C

Storage temp range:  
-50°C to 80°C

Short Circuit Protection:  
Continuous

Mounting:  
Vertical or horizontal

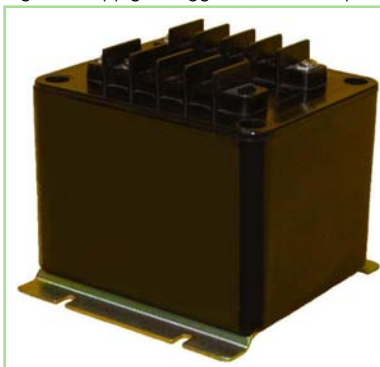
Input Surge Protection:  
MOV protected to 65 joules pulse surge



- These devices are protected against inadvertent output short circuit, inductive kickback from the trip coil, and input line voltage surges.

Nominal 120 Volts ac, or 240 Volts ac is applied between the "INPUT" and "COMMON" terminals. This voltage is half wave rectified and applied across the trip capacitor, giving an output trip voltage. The charge stored in these capacitors is available between the '+' and "COMMON" terminals for breaker trip coil operation. The half wave rectification circuitry provides the advantage of maintaining a common neutral connection from input while still maintaining the charge in the the trip capacitor after control power is lost.

The capacitor is continuously charged when control power is available, providing energy for normal trip coil operation. Because mechanical relays are not involved, energy for the trip coil operation is immediately available with the loss of control power. When the control power returns, the capacitor automatically charges to supply energy for the next trip coil.



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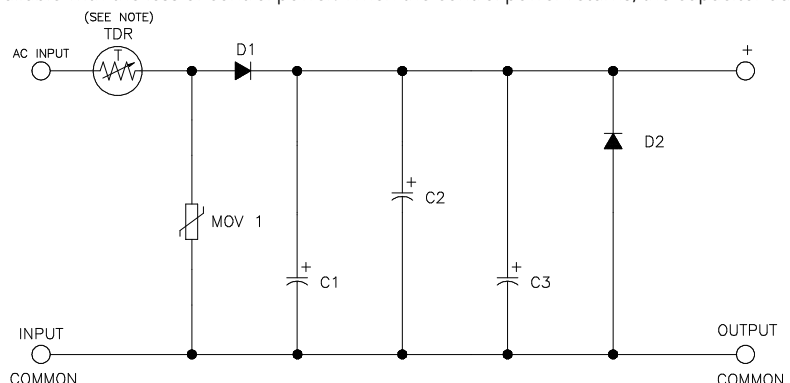
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# Capacitor Trip Device Model CTD-5



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IND. CONT. EQUIP.



FILE NO.  
E103039

## APPLICATION:

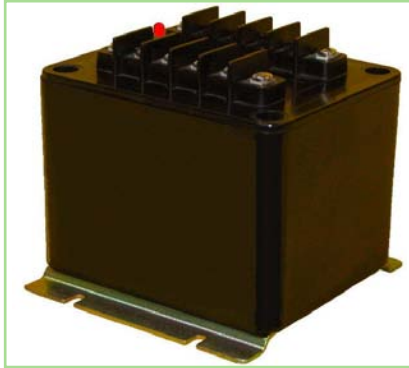
Provides a source of energy for circuit breaker and switch trip coil operation during a loss of AC control voltage.

## NORMAL INPUT:

120/240 Volts ac.

## FREQUENCY:

DC to 400Hz.



## Specifications

### Normal Output Voltage:

CTD-5-120: 120 V,  
CTD-5-240: 240 V

### Max. Input Voltage:

CTD-5-120: 132 Vac,  
CTD-5-240: 264 Vac

### Available Energy:

CTD-5-120: 64 joules  
CTD-5-240: 57 joules

### Normal Output Voltage:

CTD-5-120: 169 Volts DC,  
CTD-5-240: 338 Volts DC

### Approx charge time to 90% at 25°C

CTD-5-120: 1.4S,  
CTD-5-240: 570ms

### Capacitance:

CTD-5-120: 4500 uF  $\pm$  20% @ 25°C  
CTD-5-240: 990 uF  $\pm$  20% @ 25°C

### Temp. influence on cap.:

-10% @ -30°C / +5% @ +60°C

### Operating temperature range:

-30°C to 60°C

### Storage temp range:

-50°C to 80°C

### Short Circuit Protection:

Continuous

### Mounting:

Vertical or horizontal

### Input Surge Protection:

MOV protected to 65 joules pulse surge

### Output contact rating:

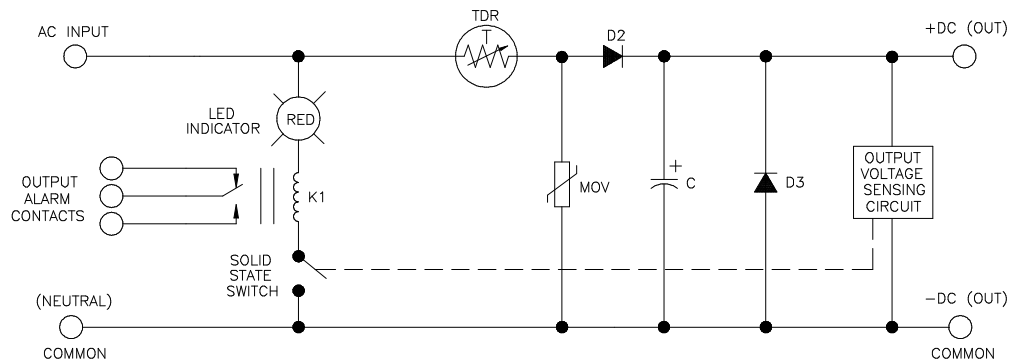
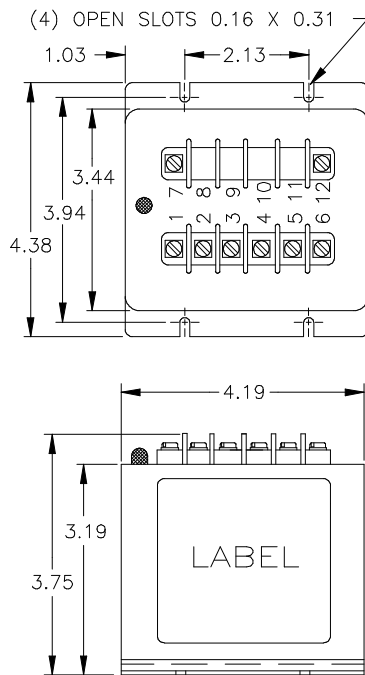
Resistive: 5A, 250VAC 5A, 30VDC

### Inductive:

2A, 250VAC 3A, 30VDC

1/6HP 120 VAC,

1/3HP, 240VAC



- These devices are protected against inadvertent output short circuit, inductive kickback from the trip coil, and input line voltage surges.

Nominal 120 Volts ac, or 240 Volts ac is applied between the "INPUT" and "COMMON" terminals. This voltage is half wave rectified and applied across the trip capacitor, giving an output trip voltage. The charge stored in these capacitors is available between the '+' and "COMMON" terminals for breaker trip coil operation. The half wave rectification circuitry provides the advantage of maintaining a common neutral connection from input while still maintaining the charge in the trip capacitor after control power is lost.

The capacitor is continuously charged when control power is available, providing energy for normal trip coil operation. Energy for the trip coil operation is immediately available with the loss of control power. When the control power returns, the capacitor automatically charges to supply energy for the next trip coil.

An alarm relay is incorporated to continuously monitor the input and output condition of the device. The relay is normally energized when both input and output voltage are present. If either the input voltage is lost or the output voltage falls below 85% of the normal output level the output alarm contacts transfer to their de-energized status state. LED indicates normal operation. The LED goes out when the alarm contacts transfer to their de-energized state.

## NOTES:

1. The output contacts are shown in the de-energized condition. Contacts will pick up when input and output voltage is present. If the output DC voltage drops below 85% of the expected operating level or the input voltage is lost, then the contacts will change state and the LED indicator will no longer illuminate.
2. TDR is temperature dependent resistor.



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# Capacitor Trip Device Model CTDA-6

## APPLICATION:

Provides a source of energy for circuit breaker in the event of a power loss.

Tripping power is available immediately upon energization before capacitors charged.

## NORMAL INPUT:

120/240 Volts ac.



## Specifications

Max. Input Voltage:

2 Va burden continuous  
2 Va burden continuous

Available Energy:

CTDA-6-120: 64 joules  
CTDA-6-240: 57 joules

Normal Output Voltage:

CTDA-6-120: 169 Vdc  
CTDA-6-240: 340Vdc

Capacitance:

CTDA-6-120: 4500 uF  $\pm$  20%  
CTDA-6-240: 990 uF  $\pm$  20%

Approx charge time to 90% at 60Hz. is 8 seconds.

Operating temperature range:

-30°C to 60°C

Storage temp range:

-50°C to 80°C

Short Circuit Protection:

Continuous

Mounting:

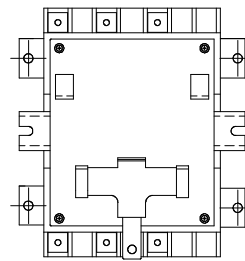
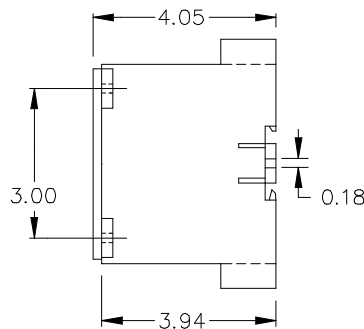
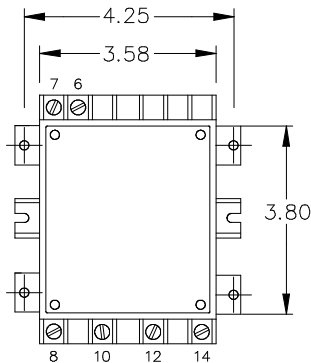
Vertical or horizontal

Input Surge Protection:

MOV protected to 65 joules pulse surge

• The Capacitor Trip Device (CTDA-6) is used to trip circuit breakers and lock out relay when a battery standby source is not available to provide circuit breaker trip power. The CTDA-6 converts ac buss voltage to dc voltage and stores enough energy to operate a lock out relay or trip a circuit breaker. Voltage is available from the ac power supply for tripping immediately upon ac power up. The capacitors charge time is approximately 8 seconds, but full wave bridge rectifier power from the ac line is available immediately for use. Capacitor charge current is limited to protect the control power system from a large current in rush. This feature allows the use of many CTDA-6 units from the same control power voltage source without coordination problems. Additionally, the CTDA-6 is self-protected from short circuit damage on the output. Nominal ac voltage is applied across terminals #8 and # 10. This voltage is full wave bridge rectified and applied across the trip capacitors producing a steady state output trip voltage. The charge stored in these capacitors is available across terminals #12 (positive) and # 14 (negative). Charging time: 8 seconds, 0 to 90% of nominal output voltage, 60 hertz. Operating temperature: -30 deg C to +60 deg C \* Electrical specifications are 25 deg C.

**Notice:** Ac power must be applied continually for minimum of 2 hours before the CTDA-6 is capable of developing full charge on the output capacitors with sustained interruption in ac input. The CTDA-6 capacitor trip device is not intended for ac dc power supply. The self-protecting feature of the unit will severely limit the continuous output current and voltage.



## Servicing:

1. Remove the AC control voltage.
2. Discharge the Capacitor trip device. (A5-watt resistor of approximately 1000 ohms across Terminal #12 and #14 can be used for this purpose).

## Danger!

Lethal voltages are present qualified persons should install, operate, and service this device.

PANEL MOUNTING LAYOUT

DOOR MOUNTING LAYOUT

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Electronic Products



Instrument Transformers, Inc.

a division of GE Multilin



# Capacitor Trip Device With Battery Back-Up Model CTDB-6

## APPLICATION:

Provides a source of energy for circuit breaker and switch trip coil operation during a loss of AC control voltage.

Tripping power is available immediately upon energization before capacitors charged.

## FREQUENCY:

50/ 60 Hz.o 400Hz.

## NORMAL INPUT:

120/240 Volts ac.



## Specifications

### Max. Input Voltage:

2 Va burden continuous  
2 Va burden continuous

### Available Energy:

CTDB-6-120: 64 joules  
CTDB-6-240: 57 joules

### Normal Output Voltage:

CTDB-6-120: 169 Vdc  
CTD-6-240: 340Vdc

### Capacitance:

CTDB-6-120: 4500 uF  $\pm$  20%  
CTDB-6-240: 990 uF  $\pm$  20%

### Operating temperature range:

-30°C to 60°C

### Storage temp range:

-50°C to 80°C

### Short Circuit Protection:

Continuous

### Mounting:

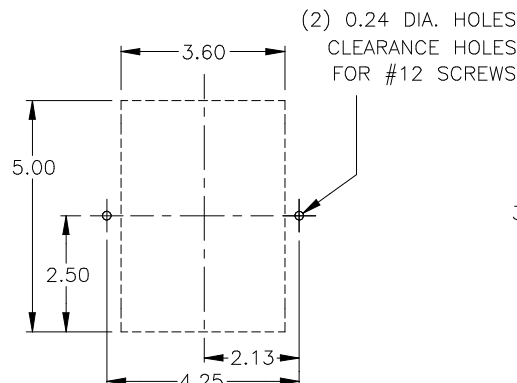
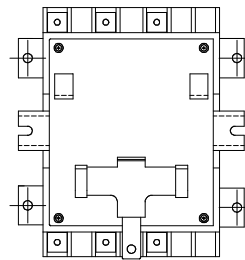
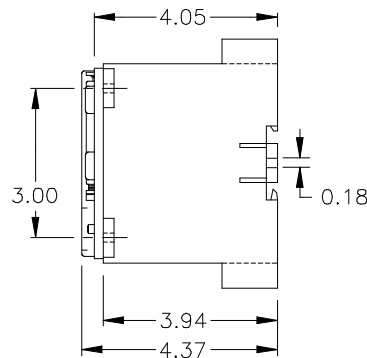
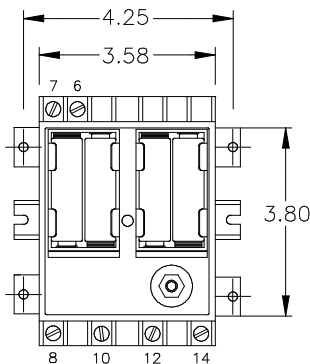
Vertical or horizontal

### Input Surge Protection:

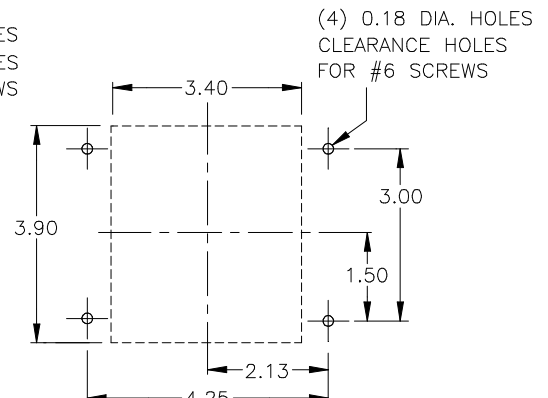
MOV protected to 65 joules pulse surge

• The Automatic Charging Trip Device (CTDB-6) is used to trip circuit breakers and lock out relay when a battery or standby source is not available to provide circuit breaker trip power. The CTDB-6 converts ac bus voltage to dc voltage and stores enough energy to operate a lock out relay or trip a circuit breaker, often more than once. The CTDB-6, when fully charged, will maintain a charge for a minimum of 3 days after the ac power has been interrupted. In normal operation, the batteries are trickle charged from the ac voltage source. Voltage is available from the ac power supply for tripping immediately upon ac voltage power up. Capacitors do not need to be charged to have tripping voltage available on the output of the device, this is because the output is automatically fed from the full wave bridge rectified ac signal or the charged capacitors, which ever is greater. Capacitor charge current is limited to protect the control power system from a large current in-rush. this feature allows the use of many CTDB-6 units from the same control power voltage source without coordination problems. Additionally, the CTDB-6 is self-protected from short circuit damage on the output. Batteries: 4 - rechargeable 1.2 volt Ni-Cad Cells \* Electrical specifications are at 25 deg C

**Notice:** Ac power must be applied continually for minimum of 2 hours before the CTDB-6 is capable of developing full charge on the capacitors with a sustained interruption in ac input. It is highly recommended that batteries be fully charged before installing into the CTDB-6. The CTDB-6 is designed to trickle charge the batteries to hold a charge indefinitely, but the CTDB-6 trickle charge circuit can take as long as 48 hours to charge batteries that are completely discharged. The CTDB-6 capacitor trip device is not intended for use as a dc power supply. The self protecting feature of the unit will severely limit the continuous output current and voltage.



PANEL MOUNTING LAYOUT



DOOR MOUNTING LAYOUT

Servicing: See Next Page

**Danger!**  
Lethal voltages are present qualified persons should install, operate, and service this device.

## Operation:

Nominal ac volts is applied across terminals #8 and #10. This voltage is full wave bridge rectified and applied across the trip capacitors producing a steady state output trip voltage. The charge stored in these capacitor is available across terminals # 12 (positive) and #14 (negative).

A battery operated oscillator circuit will maintain the charge on the capacitors for a minimum period of 3 days provided that terminals #6 is connected to terminal #7 and the batteries are fully charged. Terminals #6 and #7 can be connected with a normally open relay contact operated by the ac power supply so that the oscillator is activated upon power failure. The batteries charge continuously when power applied to the circuit. Since batteries can take up to 48 hours to charge while installed in the CTDB-6, we recommended that fully charged batteries be installed in the CTDB-6 unit prior to putting the unit into service.

A push button and led indicator are used to determine if the CTDB-6 is operationally ready. When the button on the front panel is pushed, the LED will illuminate if the Capacitor has minimum charge of 90 Vdc for the CTDB-6-120, and 200 Vdc for the CTDB-6-240. The push button should only be pressed long enough to observe the illumination of the LED. The push button and LED does not indicate the present of ac voltage.

### Servicing:

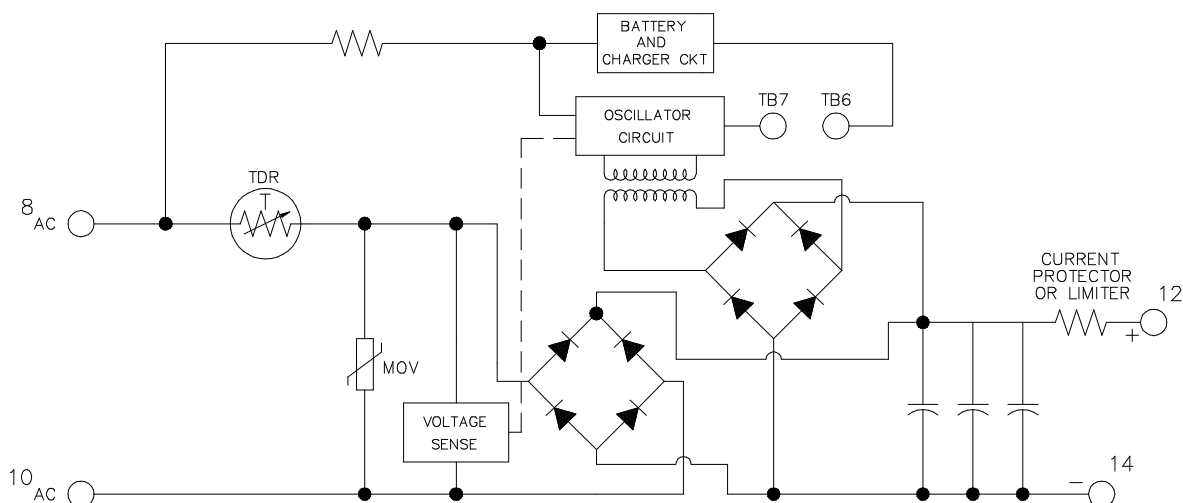
Never remove the clear plastic cover without this discharge procedure:

1. Remove the 120 Vac control power.
2. Remove the jumper, or open the relay contact, across terminals #6 and #7.
3. Discharge the capacitor trip device. (A 5 watt resistor of approximately 500 ohms across Terminal #12 and #14 can be used for this purpose)

Replace the 4 rechargeable 1.2 Volt Ni-Cad Cells according the battery manufactures recommended schedule. Never attempt to change batteries without following the discharge produce. Battery terminals voltages are not isolated from the control and trip power.

The CTDB-6 unit will recharge itself if terminals #6 and #7 remain shorted! Follow the discharge procedure prior to any service or maintenance of the CTDB-6 unit or trip system.

## CTDB-6 Panel Layout



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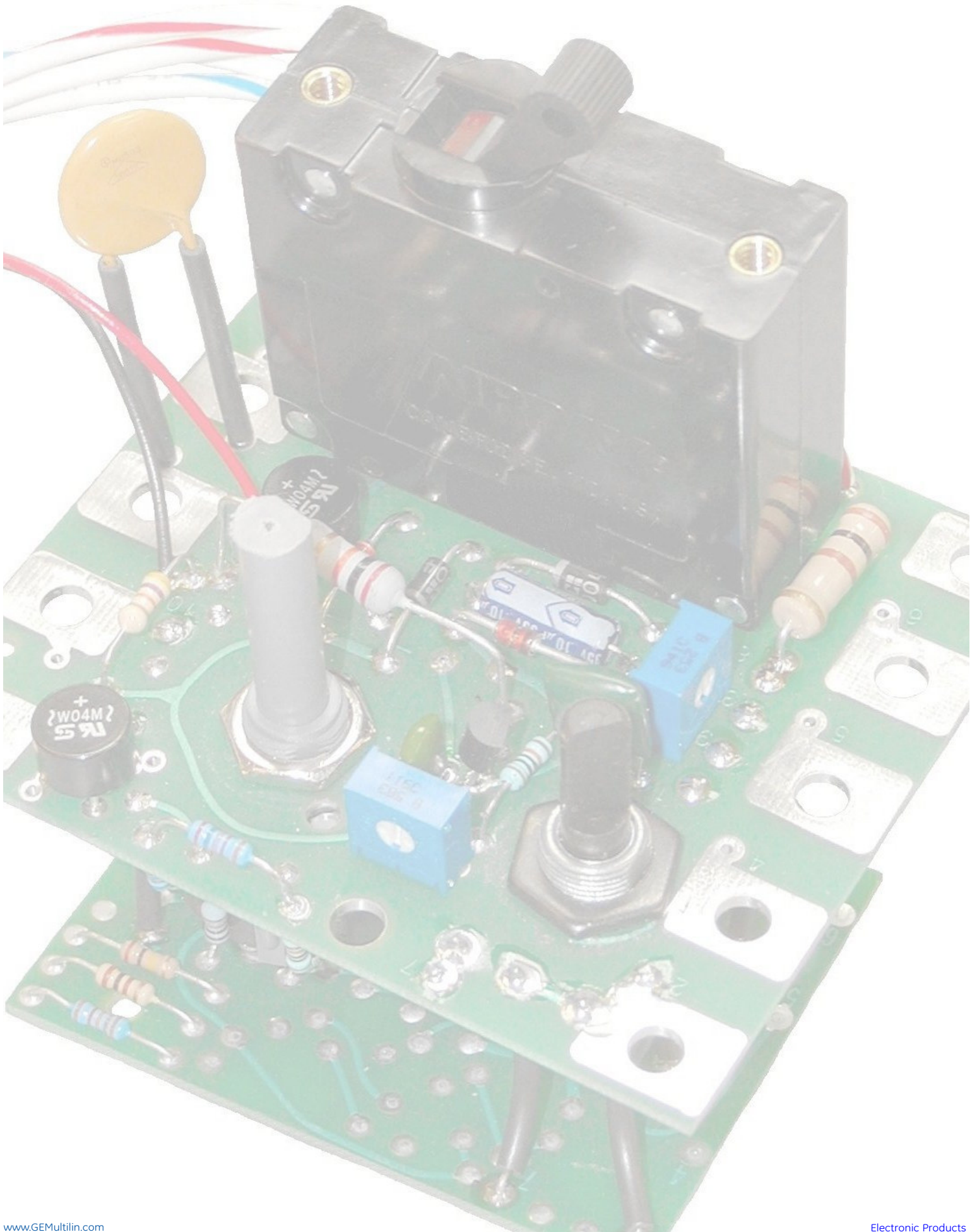
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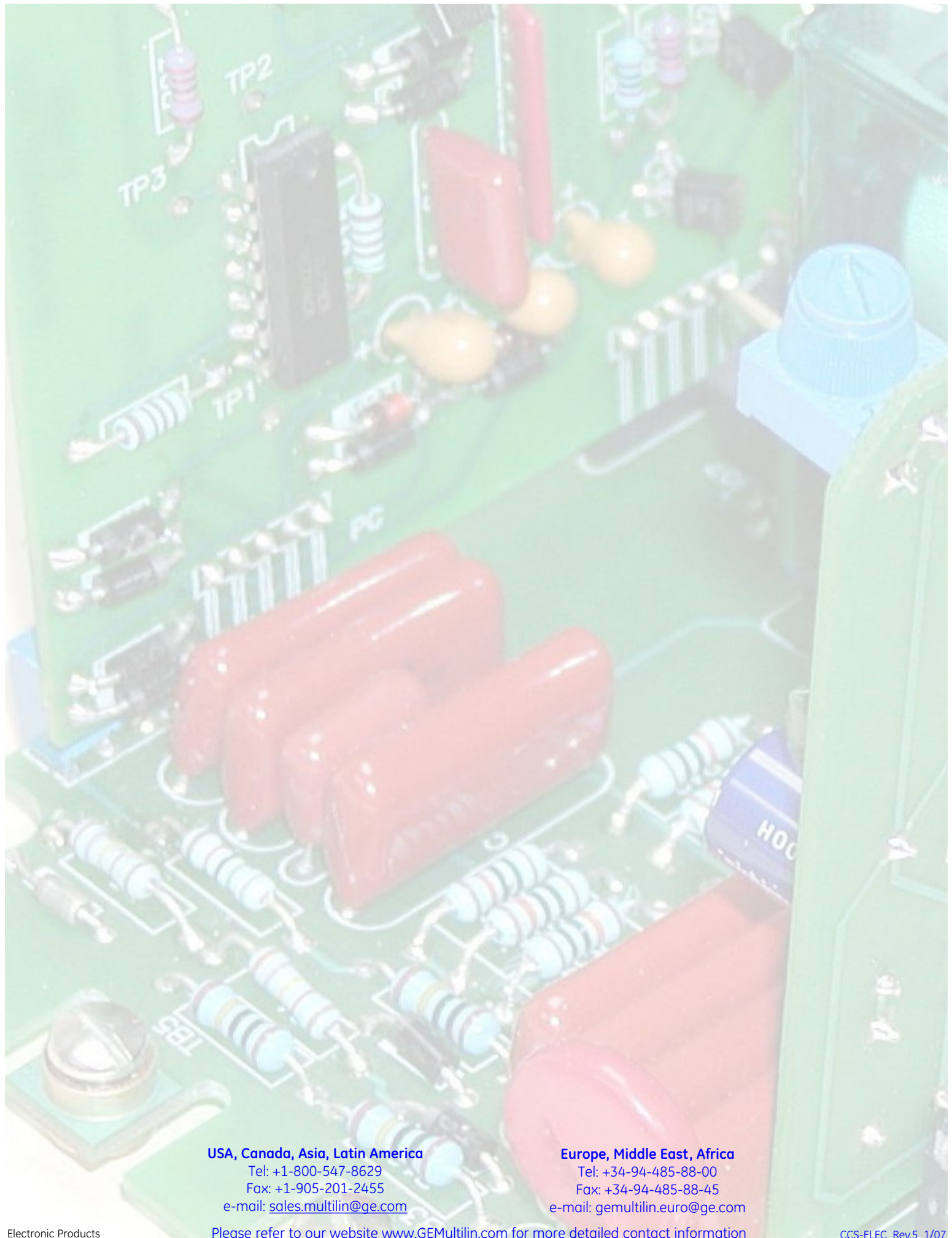
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