



Mag-Break Motor Circuit Protectors^②

Mag-Break motor circuit protectors were specifically developed to provide accurate and fast clearing of low-level faults, the type most prevalent in motor circuits. Because they are designed expressly for motor circuits in combination with overload relays, they minimize damage to motors and motor-control apparatus in addition to protecting motor branch-circuit conductors. Continuous-current ratings and adjustable instantaneous trip ranges have been designed to meet NEC code requirements concerning motor full-load and locked-rotor current. The instantaneous-trip point can be set low and precisely (just above motor inrush) assuring fault protection and eliminating nuisance tripping.

To minimize circuit damage, select precise, optimum trip points. Each pole of the Mag-Break breaker contains a current sensing element to trip the breaker instantaneously when the pre-selected current setting is exceeded. Mag-Break's unique magnetic system permits independent factory calibration of both HI and LO ends of the trip range. This feature provides field adjustability with superior accuracy and repeatability at all Mag-Break trip scale positions.



Mag-Break is field adjustable by means of simple screwdriver adjustments on the front of each breaker. The field-adjustable setting is continuous over the entire range from HI to LO and each breaker rating label contains a table converting setting position to amperes. An overcurrent on

any pole will cause all three poles to trip simultaneously, thus preventing costly single phasing problems.

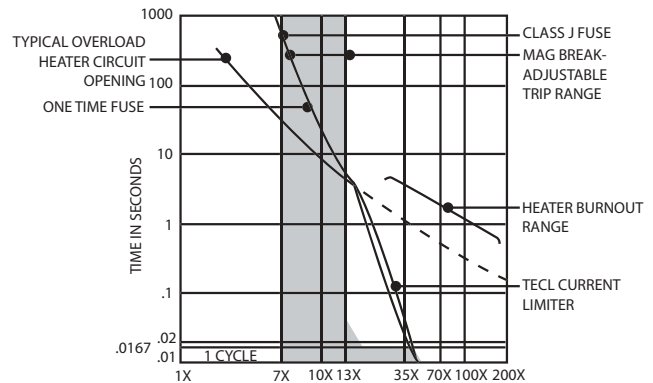
Features of Mag-Break motor circuit protectors include:

- No costly equipment modifications are required. Mag-Break motor circuit protectors are mechanically interchangeable in all respects with conventional circuit breakers of the same frame size.
- Conventional circuit breaker accessories such as undervoltage release, shunt trip and auxiliary switches can be used.
- Mag-Breaks include the Verifier™-Twist-to-trip – permitting the mechanical simulation of overcurrent tripping through actuation of linkages and latch surfaces not operated by the ON-OFF handle.



Experience has shown that protective devices in industrial applications better maintain their original protective characteristics when regularly exercised.

- Widest trip setting ranges in the industry-specifically designed to meet control flexibility demands of modern motor installations.
- Highly accurate calibration over the entire range of trip settings.
- “Designed in” withstandability for use with slow trip overload relays – meets “6 times rated current for 30 seconds” criteria.
- Mag-Break covers an area of motor circuit protection not provided by any other class of device. In the range of 7-35X rated current, the region where most motor circuits failures begin. Mag-Break acts instantly to remove the fault from the system. At 13X (the maximum setting allowed by the NEC) other devices take 50 to 400 times as long.^①



Times Rated Current

- Current Limiter (optional feature) – The Type TECL is a fusible current-limiter attachment that bolts to the load end of the Type Mag-Break motor circuit protector. The limiter provides for up to 100,000 amperes IC at 600 volts AC and is coordinated with the TEC so that normal short circuits will be cleared in the usual fashion. Only the unusual circumstances of a high fault will cause the limiter to function. Type TBC Mag-Break motor circuit protectors provide 100,000 amperes IC on 225 ampere and larger frame sizes. Type TBC protectors are similar in size and operation to Tri-Break circuit breakers and employ current limiters integral to the frame as opposed to an add-on limiter such as the Type TECL. TECL is used for 600V applications.



^① All data based on NEC requirements and manufacturer's recommendation.

^② See Section J for application information.



Spectra RMS – Mag-Break Motor Circuit Protectors



Interchangeable Rating Plug. Spectra RMS Mag-Break motor circuit protectors use the same snap-in rating plugs as fully configured (long-time trip function) Spectra RMS circuit breakers. Each rating plug defines the range of instantaneous-trip settings available to the circuit breaker through its trip setting adjustment.

Trip Setting Adjustment. The solid-state instantaneous-trip circuitry of the Spectra RMS Mag-Break motor circuit protectors has a single, multi-position adjustment at the front of each breaker. Changes in settings vary the instantaneous-trip and tracking short-time characteristics. The Mag-Break motor circuit protectors differ from a fully configured circuit breaker by providing only an instantaneous and tracking short-time trip function.

Accessory Pockets. Spectra RMS Mag-Break motor circuit protectors have the same accessory pockets and use the same internal accessories as Spectra RMS circuit breakers. This important capability allows field modification of Mag-Break units with shunt trip, undervoltage release, bell alarm or auxiliary switch accessories, in any combination, without affecting UL Listing status.

Spectra RMS Rating Plugs

Use of the same UL Listed interchangeable rating plugs for both Mag-Break and fully configured Spectra RMS circuit breakers expands the flexibility of the entire Spectra RMS family of products. The advantages of interchangeable rating plugs with Spectra RMS circuit breakers are inherent to Spectra RMS Mag-Break units, which permit wider ranges of motor ratings to be protected by a given breaker frame size.

Spectra RMS Mag-Break Trip Unit Characteristics

Spectra RMS Mag-Break motor circuit protectors provide positive, reliable, and cost-effective instantaneous, with short-time tracking, overcurrent protection to those circuits where long-time overload protection is supplied by thermal or solid-state overload devices.

Motor Circuit Short-Circuit Protection

When a squirrel-cage induction motor is first energized, a high value of magnetizing inrush current flows for the first few cycles, followed by a substantially reduced current flow while the motor accelerates to its rated speed. Typically, the magnetizing inrush current may be 10 times rated full-load current, for normal efficiency motors and as high as 14 times rated full-load current for high-efficiency motors prior to the first five to eight cycles. Magnetizing inrush current is followed by a “locked rotor” current of 5 to 6 times rated full-load current during 0.1 to 10 second acceleration phase – with current rapidly declining to full load amperes as the motor nears rated speed.

Optimum instantaneous protection would have a two-tiered tripping characteristic. A high value of current would be tolerated for a few cycles, followed by a lower, sustained trip setting.

That is exactly what is found in the Mag-Break tripping characteristic.

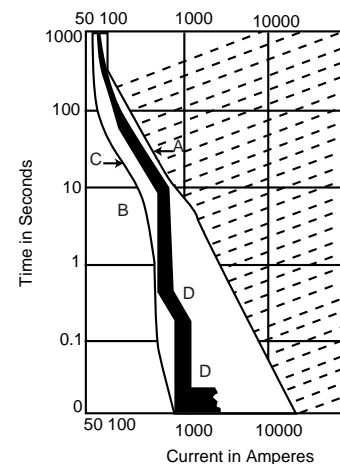
Use of this two-tiered time-current curve prevents nuisance tripping due to magnetizing inrush current, without compromising superior short-circuit protection during motor acceleration as indicated on page H3.

The figure below illustrates the most popular application of Mag-Break motor circuit protectors. This time-current curve shows a plot of motor current versus time (Curve C) for a three-phase squirrel cage induction motor. The shaded portion of the time-current curve (above Curve A) indicates a region of operation that could produce permanent damage to either the motor, its feeder conductors, or both. The trip characteristics of the motor starter’s overload relay is shown as Curve B. The overload relay provides both long-term overload and stall protection. However, the overload relay does not protect the system from short circuits in either the motor or its feeder conductors.

Curve C is a plot of motor current during a worst-case start (e.g., low line voltage, highest anticipated required load torque, etc.). Curve D is a plot of the Spectra RMS Mag-Break motor circuit protector’s tripping characteristic.

With the addition of the Mag-Break motor circuit protector, the motor circuit now has protection against short circuits. Stall and long-term overload protection is provided, in this example, by the motor starter’s overload relay.

Motor Circuit Protection using Mag-Break Motor Circuit Protectors



Spectra RMS Mag-Break Motor Circuit Protector and Rating Plug Current Ratings

Circuit Breaker Frame	Maximum Frame Amperes	Available Rating Plugs, Amperes
SE-Frame	7	3 & 7
	30	15, 20, 25 & 30
	60	40, 50 & 60
	100	70, 80, 90 & 100
	150	110, 125 & 150
SF-Frame	250	70, 90, 100, 110, 125 150, 175, 200, 225 & 250
	400	125, 150, 175, 200, 225, 250, 300, 350 & 400
SG-Frame	600	250, 300, 350, 400, 450, 500 & 600
	800	300, 400, 500, 600, 700 & 800
SK-Frame	1200	600, 700, 800, 1000 & 1200



Spectra RMS Molded Case Switches

Construction. The family traditions of ruggedness and dependability are continued in the Spectra RMS molded case switch line. These units provide a circuit disconnect function using the compactness of molded case circuit breaker construction. The operating handle actuates all three poles of the switch using the same common trip bar of Spectra RMS circuit breakers and Mag-Break units.

Termination Lugs. Snap-in termination lugs used with SE- and SF-Frame Spectra RMS circuit breakers are used interchangeably in Spectra RMS molded case switches. SG- and SK-Frame molded case switches use the same bolt-on termination lugs used with Spectra RMS circuit breakers.

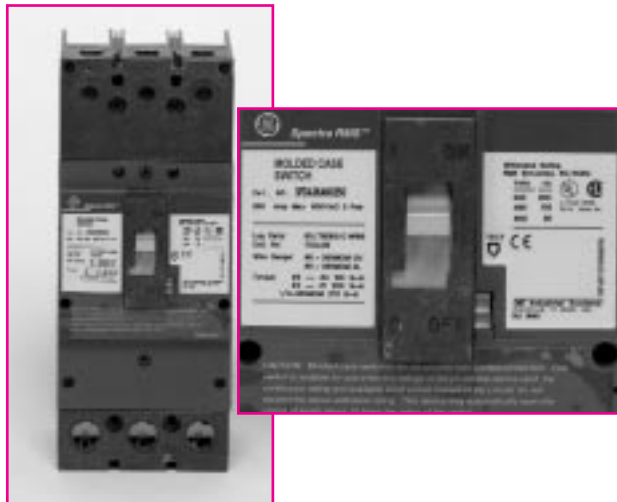
External Accessories. The full range of external circuit breaker accessories offered for use with Spectra RMS circuit breakers and Mag-Break motor circuit protectors, are available for molded case switches. In addition, plug-in bases, motor-operated mechanisms, mechanical interlocks, and the full complement of external handle operators (STDA, TDR and TDM) are available for use with Spectra RMS molded case switches.

Fixed-Trip Setting. The Spectra RMS molded case switches are equipped with a fixed Hi-set instantaneous trip setting whose values are shown in the table below.

Spectra RMS Molded-Case Switch Fixed-Trip Setting

Molded Case Switch Frame	Maximum Ampere Rating	Fixed-Trip Setting RMS Amperes Nominal $\pm 20\%$
SE-Frame	100	2100
	150	
SF-Frame	250	2450
	400	
SG-Frame	600	6000
	1200	
SK-Frame	800	12,750
	1200	

Spectra RMS Molded Case Switch



Spectra RMS Molded Case Switch Applications

Molded case switches are inherently horsepower-rated. By virtue of the UL489 six-times rated-current overload test, they can be used as motor circuit disconnects where overload and short-circuit protection are provided by other protective devices.

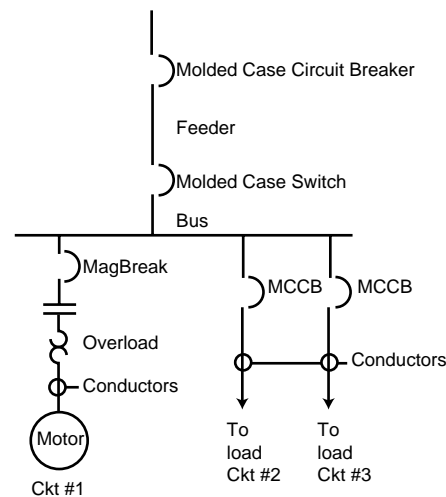
A common application of Spectra RMS molded case switches is illustrated below. The figure shows a system containing three branch circuits.

Branch circuit 1 uses a Spectra RMS Mag-Break motor circuit protector, in conjunction with the overload devices of the motor starter, to protect the motor and the conductors of that branch circuit. Branch circuits 2 and 3 use fully configured Spectra RMS circuit breakers to provide instantaneous, short-time and long-time protection for both branch-circuit conductors and loads.

Spectra RMS molded case switches are excellent circuit disconnect devices for those applications where both the advantages of molded case switch construction are desired, and where the available short-circuit current is less than the switch withstand rating.

All Spectra RMS molded case switches are UL Listed and tested per UL Standard 1087 for molded case switches. The short-circuit withstand ratings are based upon three cycle tests. Thus the UL Listed upstream overcurrent protective devices (i.e., low-voltage circuit breaker equipped with instantaneous-trip functions, insulated-case circuit breakers, molded case circuit breakers or fuses) can be used in conjunction with molded case switches.

Spectra RMS Molded Case Switch Application



Spectra RMS Molded-Case Switch Current Ratings

Molded Case Switch Frame	Maximum Ampere Rating
SE-Frame	100 & 150
SF-Frame	250
SG-Frame	400 & 600
SK-Frame	800 & 1200



HPC High-Pressure Contact Switches

Construction Features

GE Type HPC switches are UL Listed in accordance with Standard 977, Fused Power Circuit Devices. The over-center toggle mechanism provides stored energy, quick-make/quick-break operation. Multiple spring-loaded high-pressure current-carrying contact arms and an arcing contact arm provide excellent current carrying capability without sacrificing high interrupting fault performance. These switches can interrupt, on a make and break basis, a minimum of 12 times their nameplate rating without fuse assistance at 600 volts AC. Complete HPC switch and Class L fuse coordination is therefore achieved for all levels of fault current up to 200,000 RMS amperes symmetrical at 600 volts AC maximum. Type HPC switches used as service disconnects comply with the National Electrical Code Article 230-98 and Article 230-95 for adequate short-circuit current and ground-fault protection. HPC switches with integral ground fault, when provided with 120 volts AC external control power, permit compliance with NEC Article 230-95, which requires ground-fault protection system testing when first installed.

- High Durability—Safety of Operation—High dielectric strength, glass reinforced insulating case.
- High Interrupting capability—Arc chute of unique construction suppresses arcs and cools gases rapidly, providing quick arc interruption and extended switch life.
- High Transient Voltage withstandability— Interphase partitions mesh with switch cover to completely isolate each pole.
- Extended switch life—Preloaded constant pressure pivot eliminates braid whip and fraying on high short-circuit currents and repeated operations.
- Positive “ON-OFF” indication—Green (OFF), Red (ON), eliminates any question about the position of the switch contacts.
- Easy operation—Quick Make—Extra-heavy-duty, low-torque rotary-operated closing mechanism. L-handle 800-1600 amperes; T-handle 2000 amperes.
- Emergency open—Quick Break—Finger-tip “OFF” button instantly opens the breaker contacts.
- Positive Door and switch interlocking—Separate fuse access door is not required.
- Fuse mounting bolts with captive washers—For ease of mounting fuses.

Product Forms

- Top feed—Line terminals at top of switch.
- Bottom Feed—Line terminals at bottom of switch; fuses are de-energized when switch is in OFF position. Same size as top feed.

Options Available

- Manual Operation—For manual, high-interrupting capacity disconnects not requiring remote tripping and/or ground-fault protection.
- Integral ground fault—Incorporates a solid-state, inverse-time and fixed-time response. Ground-fault function is self-powered and has field-adjustable ground-fault current and delay time settings for maximum coordination and selectivity. Through 3000 amperes, switches with integral ground fault are the same size as manual switches.



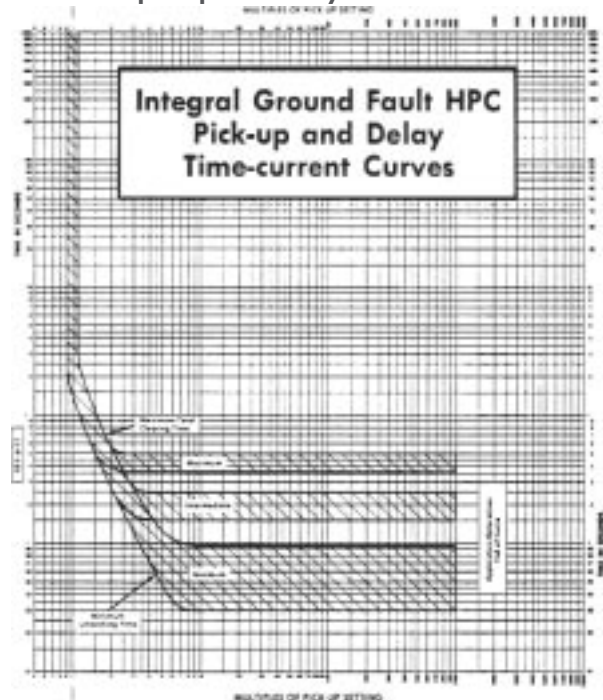
HPC switch with integral ground fault

Manual HPC switch

- Electric Trip—For remote tripping or for use with Ground-Break® components. All 800-2000 ampere electric trip switches are the same size as manual devices.
- Blown-Fuse Protector—Provides single-phase protection by tripping switch when a fuse blows or when switch is closed with a blown fuse or no fuse installed. Suitable for system voltage of 208 to 480 volts AC. Mounted internally. Does not provide protection of single-phasing of the power source.
- Auxiliary switch—Provides remote indication of main contact position.

Switch elements are Type “AB,” single-pole, double-throw. Switch element ratings are 0.25 amperes at 250 volts DC; 0.5 amperes at 125 volts DC; 6.0 amperes at 240 volts AC.

Ground-fault pickup and Delay Time-current curves





Power Break II Insulated Case Circuit Breakers

General Description

The GE line of Power Break II insulated case circuit breakers offers the rugged, reliable type of system protection critical for heavy-duty applications. Power Break circuit breakers are rated up to 200,000 amperes RMS symmetrical interrupting capacity without fuses or current limiters. The Power Break II design consists of two physical envelope sizes: 800, 1600, 2000, 2500; and 3000, 4000 Amp. frame sizes.

Power Break II is a versatile breaker, designed for a wide variety of applications with features such as temperature insensitive trip units, push-to-open and -close buttons, standard padlocking provision, maximum three-cycle closing time, field installable rating plugs to change ampere ratings, UL listing, plug in field installable accessories, and easy-to-operate two stage pumphandle, stored-energy operating mechanism capable of change after close.

MicroVersaTrip Plus Trip Unit

The enhanced MicroVersaTrip Plus trip units utilize a digital, LCD display with a five-button keypad to provide local set-up and read-out of trip settings. A built-in battery allows cold set-up (no phase or control power required). A three-phase ammeter and trip indicators are standard, as is a hinged plastic cover with provisions for sealing to allow tamper-resistant installation. The trip unit digitally measures the current waveform in each phase to determine the true RMS value of the current, regardless of the waveshape. MicroVersaTrip Plus trip units provide accurate, predictable overload and short circuit protection for distribution systems that include variable speed drives, rectifiers, induction heating, and other loads that cause high harmonic distortion as well as standard circuits. They provide maximum breaker-to-breaker selectivity and custom load protection. Short-time and ground fault functions include the flexibility of coordination with or without an I²t ramp and are also available with high range instantaneous.

Standard

- 3-phase Ammeter with $\pm 2\%$ accuracy.
- Adjustable Long-Time (L) pickup, 0.5-1.0X, with four delay bands.
- Adjustable instantaneous (I) pickup, 1.5-10X without short time, 15X with short time—thru 2500A and 13X for 2500A.
- Local Overload, Short Circuit, and Short-Time Trip Indicators with overload pickup warning.
- Test set initiated trip indication.

Options

- Adjustable Short-Time (S) pickup, 1.0-9.0C, and delay (3 bands) with I²t ON/OFF selection and trip indicator
- Adjustable Ground Fault (G) pickup, 0.2-0.6S, and delay (3 bands) with I²t ON/OFF selection and trip indicator.
- Adjustable High range instantaneous (H) multiples of short-time rating.
- Zone Selective Interlocking for ground fault (Z1) or ground fault and short time (Z2).



MicroVersaTrip PM Trip Unit

The MicroVersaTrip PM trip unit adds power management system capability, including advanced metering, and protective relays to the basic functions of the MicroVersaTrip Plus. MicroVersaTrip PM trip units communicate directly on the GE Power Leader communications bus (commnet).

Options

- Power Leader Communication System Link with user-selectable address assignment for Commnet communications.
- Metering.
- 3-phase Voltmeter, $\pm 1.5\%$ @ 1X, configurable for Wye and Delta systems.
- Frequency Meter, ± 1 Hz.
- kW Meter, $\pm 3.5\%$
- kVa Meter, $\pm 3.5\%$
- kWh Meter, $\pm 3.5\%$
- Protective Relaying—User selectable in any combination from 1 to 5 relays
 - Current Unbalance Relay
 - Adjustable pickup, 10-50%
 - Adjustable delay, 1-15 seconds, OFF
 - Undervoltage Relay
 - Adjustable pickup, 10-50%
 - Adjustable pickup, 1-15 seconds, OFF
 - Overvoltage Relay
 - Adjustable pickup, 10-50%
 - Adjustable pickup, 1-15 seconds, OFF
 - Voltage Unbalance Relay
 - Adjustable pickup, 10-50%
 - Adjustable delay, 1-15 seconds, OFF
 - Power Reversal Relay
 - Adjustable pickup, .01-3.00 per unit
 - Adjustable delay, 1-15 seconds, OFF



Spectra RMS Circuit Breakers and THED/TEDL Circuit Breakers

Features

Spectra RMS

SE150, SF250, SG600 and SK1200 circuit breaker frames have a digital, solid state, RMS sensing trip system with field installable, front-mounted rating plugs to establish or change the breaker ampere rating. Adjustable instantaneous with tracking short-time is standard on all frames including SE150.

MicroVersaTrip Plus Trip System

SG600 and SK1200 are optionally available with the MicroVersaTrip Plus trip system which offers expanded functionality in the same space-saving size of standard Spectra RMS breakers:

Standard

- 3-phase Ammeter with $\pm 4\%$ accuracy.
- Adjustable Long Time (L) pickup, 0.5-1.0X, and delay (3-4 bands).
- Adjustable Instantaneous (I) pickup, 1.5-10X.
- Local Overload and Short Circuit Trip Indicators (T) with overload pickup warning.
- Interchangeable trip rating plugs with test set jack for TVRMS test set.
- Digital LCD display with four-button keypad for function selection and set point adjustment and sealable, clear Lexan® cover for tamper-resistant settings.
- True RMS sensing for accurate response to high harmonic content waveforms.
- EMI immunity per ANSI C37.90.

Optional

- Adjustable Short Time (S) pickup, 1.0-9.0C, and delay (4 bands) with I^t ON/OFF selection.
- Adjustable Ground fault (G) pickup, 0.2-1.0S, and delay (4 bands) with I^t ON/OFF selection and trip indicator. The 4 short time and ground fault delay bands provide broader system selectivity.

A complete circuit breaker consists of a UL Listed circuit breaker frame and a rating plug (UL Listed interchangeable trip breaker unit). Terminal lugs for cable connection are available if required.

- All frames use the same UL listed, field installable internal accessories (auxiliary switch, shunt trip, undervoltage release and bell alarm).
- All frame sizes have maximum UL listed interrupting ratings of 200 kA @ 240 volts AC and 100 kA @ 480 volts AC with 600 volts AC ratings to 65 kA depending on frame size. UL listed current limiting versions are provided through the SG600 frame for the 65 kA @480 volts AC and the 100 kA @ 480 volts AC models, with no increase in physical frame size.
- Spectra RMS Mag-Break instantaneous-only motor circuit protectors also use the same digital, solid state trip unit and rating plugs as the circuit breakers. The interchange-

able rating plug establishes the instantaneous pickup range (with tracking short-time) but does not change the frame ampere rating.

- Spectra RMS molded case switches have a fixed, high-set instantaneous trip (without tracking short-time function) and have short circuit withstand ratings equal to their equivalent breaker frame size interrupting rating in most cases.
- RMS breakers are ambient insensitive. Trip times will not vary over the range 10-50° breaker ambient.
- Spectra RMS breakers contain no parts that would support fungus growth and are, therefore, inherently fungusproof.

Other MCCB Features

- Broad product line to meet virtually any application need.
- Reduced downtime. A tripped breaker is easily spotted and can be immediately reset after the fault has been corrected.
- Eliminates single phasing. A common trip bar disconnects all poles simultaneously on both overloads and short circuits.
- Offers application flexibility through the use of a wide variety of accessory devices and special attachments.
- Repetitive operation — no fuses to replace.
- Breakers can be repetitively tested. Fuses must be destroyed to confirm calibration accuracy.

Reference – GET-7002 for further application information.

THED/TEDL Circuit Breakers

Made similar to the Mag-Break TEC with TECL limiter, the THED with appropriate TEDL limiter provides a thermal magnetic breaker, UL listed with 100 kAIC short circuit ratings through 600 Volts.

The add-on limiter coordinates with the THED's thermal magnetic trip to allow normal tripping functions at standard ratings with backup limiting at high short-circuit levels.

THED Trip	TEDL
15	TEDL36015
20	TEDL36020
30-60	TEDL36060
70-100	TEDL36100



Ground Break Systems

Type TGSR Protective Equipment

Description

The Ground Break system of solid-state ground fault signaling relays, sensors and monitor panels provides a new dimension in power-system protection. These components can be combined to operate at lower magnitudes of ground-fault current and shorter time delays than conventional over-current protective devices. The built-in memory function integrates intermittent faults with time providing protection against low-level arcing faults. The components which comprise a complete system are:

Solid-State Relay

Used in conjunction with devices having an electric trip, or shunt trip, this relay will sense ground currents and cause the interrupter to open when these currents reach a preselected value for a preselected length of time. Optional zone selecting interlocking is available for a fully coordinated system. This type of relay initiates an instantaneous trip when a fault occurs in its own zone. In addition, it will block upstream zone selective relays for a pre-set delay time to allow the downstream breaker to clear the fault.

Monitor Panel

Provides a ground fault indicator, control power indicator and TEST and RESET buttons. The control circuitry offers the ability to test the complete Ground Break system with or without tripping the interrupter.

Current Sensor

Solid- or split-core construction for easy installation, includes an integral test winding for checkout of the complete system. A large variety of window sizes are available.

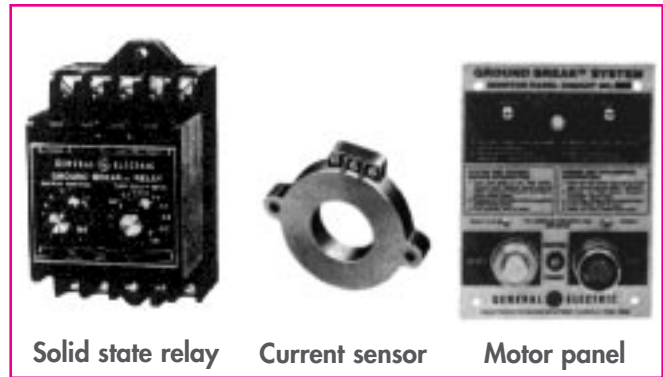
System Selection Guide

Sensors may be used 1 per phase or any other combination. For this type of use all outputs except "T" should be connected in parallel. When sensors are used more than 1 per circuit the thermal rating (current) must not be less than the maximum phase current.

- Maximum ground and phase fault current withstanding ratings
200,000 amperes for 0.1 second
60,000 amperes for 1.0 second
- Thermal ratings (maximum continuous current which can exist without overheating the sensor)
TGM Sensors—600 amperes
TGS0002—1600 amperes
TGS0005—2500 amperes
- Dielectric withstand:
Windings to mounting bushings—1.5 kV
Windings to CT window surface—2.2 kV
Mounting bushings to CT window surface—2.2 kV
- Current Transformer Ratio—800:1 except type TGM
- Integral Test Winding Ratio—1:700 except type TGM

Features

- Current Transformer Insulation—cast Epoxy all sizes
- UL recognized, File E51048
- Instantaneous zone-selective trip for optimum system coordination and protection.
- Heavy-duty design permits direct operation of electric trip and alarm devices without external relays.
- Dependable operation—solid-state relay, cast insulated sensor.



Solid state relay Current sensor Motor panel

- Two NO contacts, one of which is electrically isolated from the electronic device.
- Output contact rating 5 amperes continuous, 30 amperes inrush, up to 240 volts AC or 125 volts DC.
- Adjustable pickup and delay time.
- Memory function for system protection against intermittent arcing faults.

Relays

Control Voltage	Adjustable Trip Range		Standard Catalog Number	Zone Selective Catalog Number
	Amperes			
	LO	HI		
120 VAC	5	60	TGSR06	TGR06Z
125 VDC	5	60	TGSR06	TGSR06Z
48 VDC	5	60	TGSR06B	TGSR06BZ
36 VDC	5	60	TGSR06C	TGSR06CZ
24 VDC	5	60	TGSR06D	TGSR06DZ
120 VAC	100	1200	TGSR12	TGSR12Z
125 VDC	100	1200	TGSR12	TGSR12Z
48 VDC	100	1200	TGSR12B	TGSR12BZ
36 VDC	100	1200	TGSR12C	TGSR12CZ
24 VDC	100	1200	TGSR12D	TGSR12DZ

Monitor Panels^①

Control Voltage	With GP Indicator Light	With Mechanical Target GF Indicator
	Catalog Number	Catalog Number
120 VAC	TGSMP	TGSMA
125 VDC	TGSMPA
48 VDC	TGSMPB
36 VDC	TGSMPD
24 VDC	TGSMPD

① Monitor panel requires 120 volts AC for system test function.

Current Sensors

Window Diameter (Inches)	Catalog Number	Construction	Test Winding
2 1/2	TGS0002	Round-Solid Core	Yes
5	TGS0005		
8	TGS0008		
4 X 8	TGS0408	Rectangular-Split Core	Yes
4 X 18	TGS0418		
4 X 24	TGS0424		
4 X 32	TGS0432		
8 X 8	TGS0808		
8 X 10	TGS0810		
8 X 18	TGS0818		
8 X 24	TGS0824		
8 X 32	TGS0832		
8 X 38	TGS0838		
11 X 13	TGS1113		



Ground Break Systems

Type GFM Ground Fault System

U.L. Listed File no. E110395

Self powered.

Temperature Range: -30°C. to +75°C.

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

Instantaneous only (GFM-252)-standard

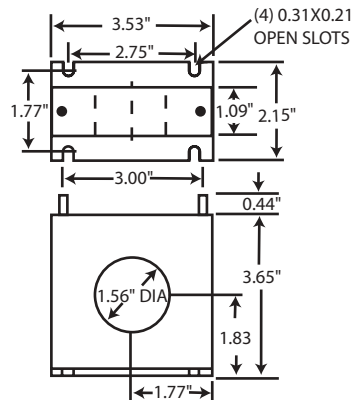
Time delay from instantaneous to 36 cycles (GFM-262).

Trip currents from 3.8 to 18 amperes (size 1 to 4 starters)
5 to 20 amperes (size 5, 6, 7 starters)

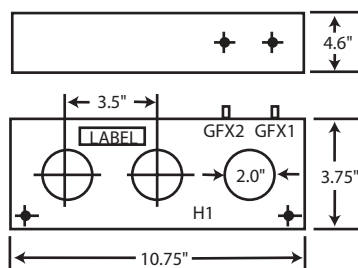
General

These 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 system is designed for all polyphase applications and is ideally suited for motor control, motor control centers, and high voltage starters. Systems can be wye or delta, grounded or resistance grounded. When the ground fault current exceeds a preselected condition (current only, or current and time settings) 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 adjustable over the trip current range of the sensor. The adjustable trip time delay relay, when specified, is field settable up to 36 cycles.

Model Number	Trip ^① Current
GFM 156	3.8 to 18

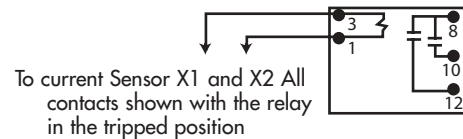
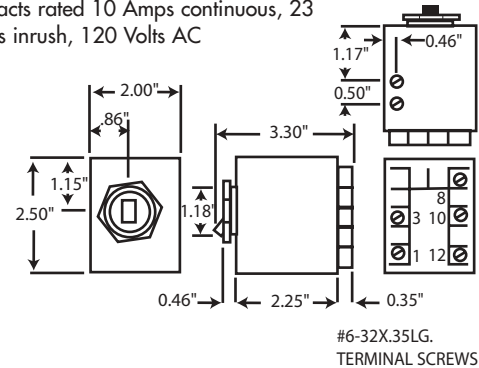


Model Number	Trip ^① Current
GFM 3P208	5 to 20

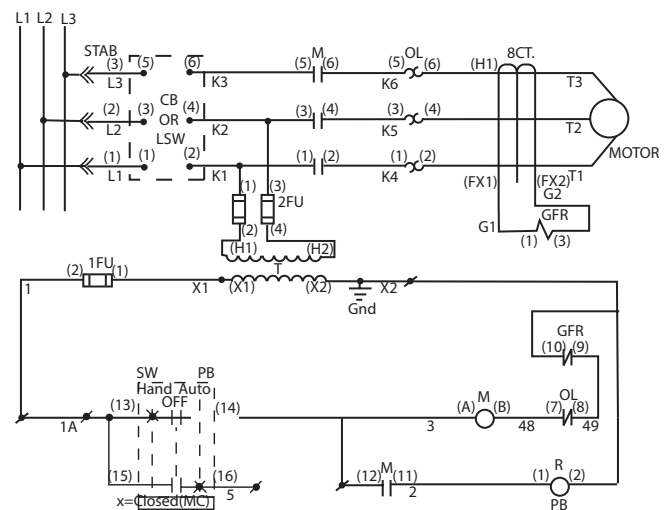


Model GFM-252, 262

Contacts rated 10 Amps continuous, 23 Amps inrush, 120 Volts AC



Typical Circuit



① Trip current tolerance is ± 15 percent.



Spectra Series™ and 8000-Line Motor Control Centers

Components

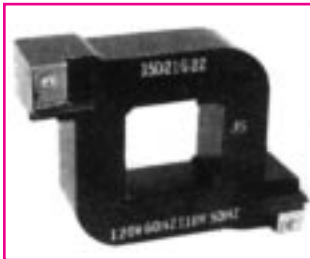
300-Line Motor Starters

The 300-Line starter is a full-voltage, magnetic motor starter with encapsulated coil and three-leg block overload relay with visual trip indicator, manual reset and manual weld check. It incorporates all the features and benefits most asked for by users and has received standard specification approval by many major manufacturers. In addition to the basic non-reversing form, the 300-Line is available in reversing, two-speed and combination forms in NEMA Sizes 00-5.

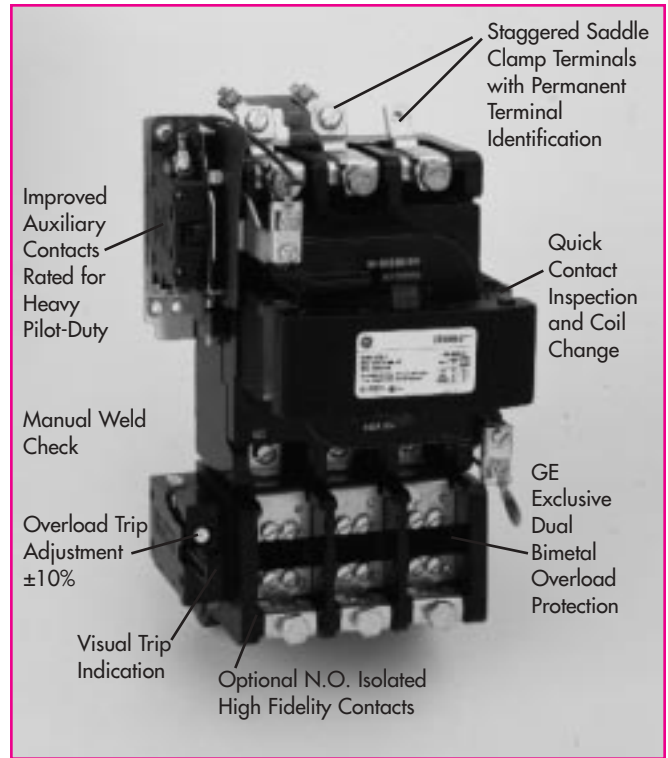
The 300-Line's toolless contactor disassembly allows quick access for inspection and maintenance. Simply release two coil retainers and pull the spring clip from the "I" magnet to gain access to the magnet, coil and contacts. No need to remove any wiring.



Optional terminals can be provided to permit the easy connection of power factor correction capacitors for energy conservation.

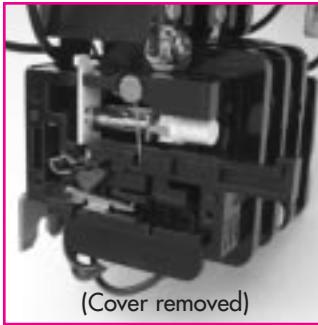


The molded coil is impervious to moisture, dirt and oil. It is highly resistant to mechanical damage and high-humidity failure. Retaining clips engage detents encapsulated in the coil to hold it securely in place.



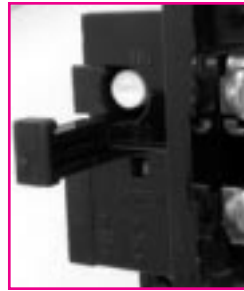


300-Line Motor Starters



(Cover removed)

Where it's essential to monitor performance or diagnose faults, a 300-Line starter may be ordered with an additional isolated, high-fidelity, normally-open contact on the overload relay. This contact may be used for direct input to a programmable controller or direct interface with a computer.



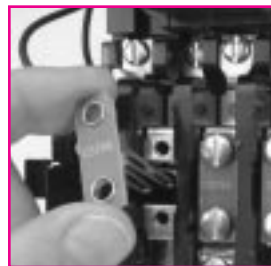
Overriding is eliminated because overload reset occurs only when the reset arm is released on the standard manual-reset form.

A bright yellow visual trip indicator tells operators at a glance if the overload has tripped. An optional automatic-reset overload relay is available for special applications upon request.

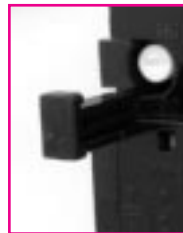


All line and load terminals on NEMA Size 00, 0 and 1 starters have saddle clamps to accommodate all types of terminations—ring, spade and stripped-wire. Terminal numbering is permanently stamped,

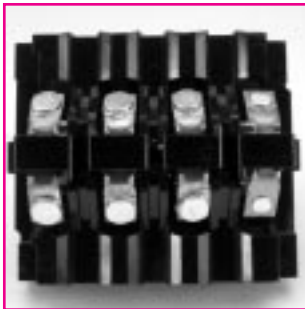
and terminals are staggered to help prevent shorting. NEMA Size 2, 3 and 4 starters are also available with provision for ring terminations with staggered terminals. Size 5 starters are available with provision for ring terminations. In-line terminals for spade and stripped-wire connections are standard.



Overload relay heaters are completely interchangeable with heaters for 200- and 100-Line starters, eliminating the need to stock different heaters.

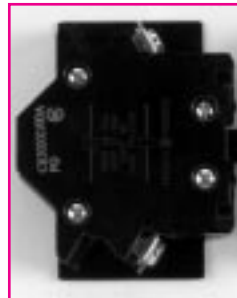


Relay trip points are factory calibrated at given currents for high accuracy. For added flexibility, the trip current of the relay is adjustable ± 10 percent to allow tuning the protection to any given motor and to eliminate nuisance tripping. A single calibration adjusts all three legs. The overload relay is available in standard or ambient-compensated forms.



On NEMA Size 1 starters and larger, contact tips are weld-resistant with cool operation and extended life. The contacts have a wedge-shaped configuration for positive make with minimum bounce. They can be easily changed from normally open to normally closed without additional parts on Sizes 0 and 1.

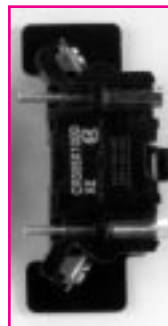
Magnet provides long life and is specially treated to resist rust.



Each auxiliary contact is rated 10 amperes AC, continuous current (NEMA A600), and is suitable for either right or left side mounting. All necessary parts are supplied in the modification kit for easy installation. An insulating shield is also provided for use between each auxiliary contact unit and the starter.



The overload relay can be manually tripped deliberately as a convenient way to check against contact welding. Depressing the manual weld check arm trips the relay. Then a welded contact can be detected with a simple continuity check.



Auxiliary contact kits offered include one with a basic contact block and one with an adder block. The basic block is supplied with either a single circuit (one normally open contact or one normally closed contact) or a double circuit (one normally open and one normally closed contact). The adder block must be used in conjunction with a basic block. It may be ordered with either one normally open or one normally closed contact.



Spectra Series™ and 8000-Line Motor Control Centers

Components

300-Line Motor Starters

	CR324 Thermal Overload Relay	CR324X Electronic Overload Relay	Spectra RMS Electronic Control Module
Description	Standard factory assembled 8000-Line MCCs use GE NEMA 300-Line Starters, which utilize CR324 Thermal bimetal overload relays and fused or circuit breaker protective devices. Bimetal overload relays use interchangeable match overload relays to motor amps. A ± 10 trip adjustment dial is used to fine tune the motor overload relays. Overload relay features include trip test, manual reset on upstroke, weld check visible trip indicator and an optional normally - open signal contact.	The CR324C advanced electronic overload relay replaces the traditional CR324 bimetal overload relays in motor control centers. The electronic overload relay eliminates the need for heater elements, providing a broader amperage adjustment range. Other phase loss protection, adjustable phase unbalance, selectable class range, and higher accuracy and repeatability. Provisions for increased diagnostic capabilities permit automation control via auxiliary contacts and remote reset open collector. Mounting dimensions are identical to the CR324 Thermal Overload Relays and permit fast, simple upgrading in the field.	The Electronic Control Module uses Spectra RMS E, F, G, & K circuit motor protectors with a module to provide advanced motor protection. The module features phase loss unbalance, selectable ground fault, selectable phase unbalance, communications, unit accuracy and compatibility with GE Power Leader System Modules. Adjustment range is accomplished merely by changing the table without removing the power wiring. The Electronic Control Module is compatible with all existing MCC Spectra RMS installations. For Display and Keypad, see H-12
NEMA Size	1-6	1-6	1-6
Type	Thermal bimetal	Electronic	Electronic
Protection Class	20	10, 20, 30 (selectable)	10, 20, 30 (selectable)
Ambient Compensation	Optional	Ambient insensitive	Ambient insensitive
Phase loss protection	No	Standard (fixed)	Selectable (On-Off)
Phase unbalance	No	Adjustable 20-50%	Selectable (On-Off) Fixed at 25%
Ground Fault	No	No	Yes (5A, Zero sequence)
Self Powered	Yes	Yes	No (120V source required)
Accuracy	$\pm 5\%$	$\pm 2\%$	$\pm 2\%$
Repeatability	$\pm 3\%$	$\pm 2\%$	$\pm 1\%$
Thermal Memory	Yes	Yes	Yes
FLA Adj. Range	1.25:1	2:1	2:1
Reset Mode	Manual (auto optional)	Manual	Manual
Trip Test	Yes	Yes	Yes, with commnet (digital self-diagnostics)
Trip Indication	Yes	Yes	Yes, with commnet (last fault diagnostics)
FVNR, FVR	Yes	Yes	Yes
2 Speed, 1 & 2 Winding	Yes	Yes	No
Operating Temp. Range	0° to 55°C	-20° to 70°C	-20° to 80°C
Communications	No	No	Yes, with commnet
Addressable	No	No	Yes
Power Leader Compatible	No	No	Yes
Heater Required	Yes	No	No
PFC Terminals	Yes (optional through NEMA Size 2)	Yes (optional through NEMA Size 2)	No
PLC Compatible Contacts	No	Yes	Yes, with commnet
Aux. Contacts	NC (NO optional)	NO, NC	NO, NC
Reference Publication	—	DEA-015	DET-069



Spectra ECM™ Electronic Control Module

Module & Accessories for Motor Protection and Control



Spectra ECM Control Module with rating plug harness connection for Spectra RMS molded-case circuit breaker

Overview

The Spectra ECM is a microprocessor-based digital device which provides advanced motor protection, control and communications capability for full-voltage non-reversing (FVNR) and reversing (FVR) combination starter applications.

The ECM is available exclusively with Spectra RMS E-, F-, G-, and K-Frame molded-case circuit breakers. Integral to the system is a special rating plug harness connecting the rating plug of the Spectra RMS circuit breaker to the ECM, providing the module with three-phase RMS current sensing capability.

Enhanced Product Functionality

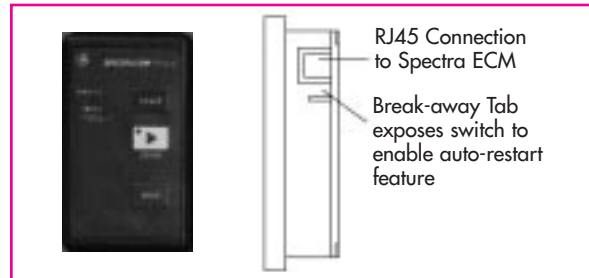
Capable of one or two contactor control, elapsed run time monitoring, enhanced trip notification, and undervoltage protection. Compatible with both POWER LEADER™ and SDS™ communications systems.

Product Features

- Available for NEMA Starter Sizes 1 through 6 in three-phase FVNR and FVR applications.
- Electronic overload protection with 3:1 current adjustability.
- User selectable motor protection classes 10, 20, 30.
- Phase current unbalance/loss protection.
- Undervoltage protection.
- Equipment ground fault protection with external zero sequence current transformer.
- Thermal model tracks motor heating characteristics.
- Built-in self-test digital electronics.
- Supports both local/remote control interfaces.
- DeviceNet[®], POWER LEADER and SDS compatible

Spectra ECM Display Accessory

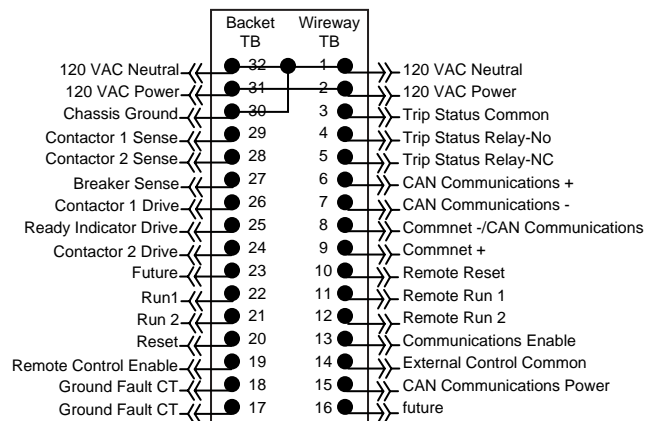
- 2 line 16 character alphanumeric LCD local display showing:
 - ECM settings—overload, ground fault, and phase loss/unbalance protection settings, communications address.
 - Motor and ECM status information (START/STOP/RUN etc.)
 - Trip indication and pre-trip current information.
 - Metering—individual and average phase currents, elapsed motor run time, motor load, phase unbalance, ground current, control voltage.



Spectra ECM Control

- Five controllers for FVNR and FVR applications:
 - HAND/OFF/AUTO
 - START/STOP
 - HAND/OFF/AUTO/START/STOP
 - FWD/REV/STOP
 - FWD/REV/AUTO/OFF
- Motor status and trip indication LEDs.
- Maintained or Instantaneous selection.

Spectra ECM Pin Assignments



External wiring notes:

- Pin 19 Auto must have 120V to enable the remote control (Key Pad in Auto)
- Pin 14 is common neutral for 10, 11, 12 & 13, jumper pin 14 to 1 if common source.
- Pins 2 & 13 need to be connected to enable communication control (120V input)
- SECMOD02 has Commnet communication use Pins -8 & +9, selfpowered
- SECMOD03 has SDS/CAN Communication use Pins +6 & -7, (requires 24V DC, Pins 8 Neg. & 15 Plus)
- SECMOD04 has DeviceNet/CAN Communication use Pins+6 & -7, (requires 24V DC, Pin 8 is Neg. & 15 Plus)

Factory defaults: FLA = Minimum, Class = 20, Phase Unbalance = ON, GF=OFF unless ordered with GF sensor, Communication address = 000.

Reference: GEH-6435A, DEH-40125, DEH-035

① ODVA approved.



Spectra Series™ and 8000-Line Motor Control Centers

Components

Mini-Contactors

C-2000™ Control Relays



The C-2000 Control Relay is a compact, industrial style relay designed for heavy-duty applications where reliability and versatility are required.

Basic forms: 4 NO; 3NO-1NC; 2NO-2NC; 4 NC
 Max front mounted aux. contacts: 4 (NO or NC)
 Contact Rating: A600; P600
 Aux. Contact Rating: A600; Q600; P300
 Timer Contact Rating: A600; P600

Coil Data

	AC Voltage	DC Voltage
Burden		
Inrush	45 VA	5.5 W
Holding	6 VA	5.5 W
Pickup Voltage (% of Coil Volts)	85-110	80-110
Drop-Out Voltage (% of Coil Volts)	40-55	20-40
Switching Delay (ms)		
Switching Delay on		
Coil Voltage at +10% to -20%	6-25	35-65
Coil Voltage at Rated Value	8-20	40-45
Switching Delay off		
Coil Voltage at +10% to -20%	6-13	30-60
Coil Voltage at Rated Value	6-13	30-60
Maximum Operations per Hour		
No Load	9000	3600
Rated load	1200	1200

Coil Rating

AC Coil Rating		DC Coil Rating
24V/60 Hz	24V/50 Hz	24VDC
48V/60 Hz	42V/50 Hz	48VDC
120V/60 Hz	110V/50 Hz	125VDC
208V/60 Hz	190V/50 Hz	250VDC
240V/60 Hz	220V/50 Hz	
240V/60 Hz	220V/50 Hz	
277V/60 Hz	240V/50 Hz	
-	380V/50 Hz	
-	415V/50 Hz	
480V/60 Hz	440V/50 Hz	
600V/60 Hz	550V/50 Hz	

Contact Ratings

	A600	P600	Q600	P300
Continuous Thermal Current	10A	5A	2.5A	5A
Max. VA/Amps Making	7200VA/60A	138VA	69VA	138VA
Max. VA/Amps Breaking	720VA/6A	138VA	69VA	138VA
Max. Operating Voltage	600VAC	600VDC	600VDC	300VDC

Front-Mount Auxiliary Contact Blocks



1NO or 1NC

Front-mount auxiliary contact blocks clip into front face of control relay.

Pneumatic Timers



Pneumatic timers are adjustable time-delayed auxiliary contacts. They come equipped with two time-delayed contacts: 1NO or 1 NC, electrically separated. Setting is scaled over a 350° rotation by means of a knurled

knob with timing guide marks. To mount a pneumatic timer, simply clip it on front face of control relay.

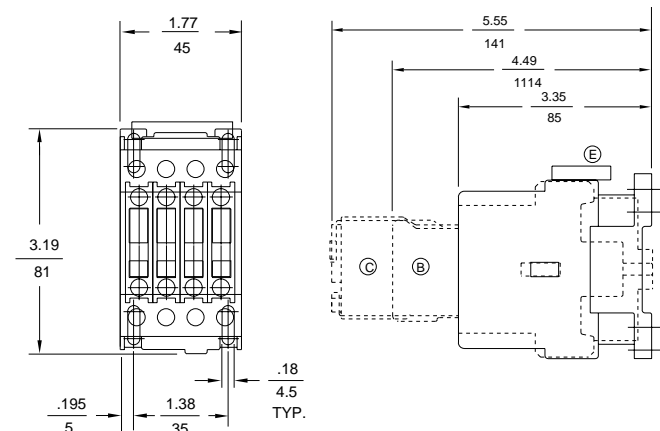
Type	Range	Contacts
Time	.1-30 sec	1NO-1NC
Delay On	1-60	1NO-1NC
Time	.1-30 sec.	1NO-1NC
Delay Off	1-60 sec	1NO-1NC

Surge Suppressor



For suppression of disturbances on electronic circuits due to the coil transient voltage occurring on opening of the contactor.

Control Relay - Front View AC Control Relay - Side View





CR120B Machine Tool and Industrial Relays

The CR120B and CR120BL, Series A, multi-circuit industrial relays are designed to meet most panel application requirements. They are available as standard or latched relays.

All forms of the relay mount on the same base and in the same small panel-mounting area. Relays may be arranged in any configuration or modified on a panel without altering the mounting area.

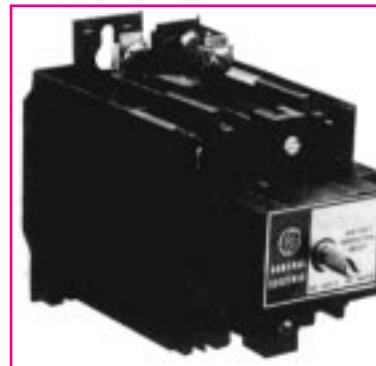
Features

- Bifurcated contacts assure positive make—unique bifurcated contacts assure positive make at all voltages and give excellent fidelity even in harsh environments.
- Transparent Lexan contact cartridges—allow inspection of contacts.
- Convertible contacts—allow conversion from normally open to normally closed, or vice versa. Just change the terminal screws and invert the contact module.
- Quick-change coil—can be changed without removing any screws.

Latch Attachment

The latch attachment mounts on any standard CR120B relay in the same manner as a deck adder.

	Inrush VA	Sealed VA	Sealed Watts
AC Relay coil	120	15	7
AC Unlatch coil	31	15	9.2
DC Relay coil	235	2.8	2.8



CR120B standard AC relay

Contact Ratings

Type of Contacts	Max. AC Voltage	Max. Continuous Rating Amps	Max. AC Voltampere Rating		Max. AC Rating Amps		Max. DC Rating Amps		Max. DC Voltampere Rating 300V or less
			Make	Break	Make	Break	125V	250V	
Inst. ①	600	10	7200	720	60	6	1.1	0.55	138
Delay	600	5	3600	360	30	3	0.5	-	-

① Use for CR120B and CR122BT contact rating.

Coil Data

60 Hz	24V	115V	120V	200V	208V	230V	460V	575V	600V
50 Hz	24V		110V		220V	380V	440V	550V	
DC	12V		24V		48V		54V	125V	

CR7R Industrial Timing Control Relay

The CR7R industrial control timing relay is a compact relay designed for heavy-duty industrial control applications where reliability and versatility are required.

- Compact mounting dimensions
- Mounted on vertical plane
- Straight-through wiring
- Easy coil replacement
- Long contact life
- High operating speed
- Silver alloy contacts
- Tropicalized throughout
- Captive terminals
- Rated 600 volts
- UL Listed
- Pull-in volts
- Drop-out volts
- Mechanical Life
- Contact Life

Min. 85% Rated Voltage
50% or less Rated Voltage
In excess of 10 Mill. OPS
In excess of 1 Mill. OPS

Relay Contacts

Contact Arrangement
4 NO
3 NO, 1 NC
2 NO, 2 NC

Timer Contacts

NO, 1 NC Time-Delay Contacts	
Delay (Convertible)	Range (Seconds)
TDE/TDD	0.3-30
TDE/TDD	10.0-180

Contact Ratings – For Relay Contacts and Timer Contacts

Max. AC Voltage	Max. Continuous Amperes	Max. AC Voltamperes		Max. AC Amperes		Max. DC Amperes – Break or Make					
		Make	Break	Make	Break	Relay			Timer		
600	10	7200	720	60	6	24V	125V	250V	24V	125V	250V
						5.0	1.1	0.55	2.5	.55	.27

Coil Ratings

AC Coil Rating		DC Coil Rating
24V/60 Hz	24V/50 Hz	24 VDC
48V/60 Hz	48V/50 Hz	48 VDC
120V/60 Hz	110V/50 Hz	125 VDC
208V/60 Hz	190V/50 Hz	250 VDC
240V/60 Hz	220V/50 Hz	
277V/60 Hz	240V/50 Hz	
.....	380V/50 Hz	
.....	415V/50 Hz	
480V/60 Hz	440V/50 Hz	
600V/60 Hz	550V/50 Hz	

AC Inrush VA	Holding VA
55	9
DC Inrush W	Holding W
8.5	8.5



CR104P Pilot Devices

Description

Newly-designed nameplates with chrome-plated octagonal rings project an attractive, quality appearance. Positive feel selector switches give a quality touch in all illuminated, solid color, spring return, and maintained units.

Standard and illuminated push buttons and selector switches are available. Both push button and selector switches are available with key or for conventional operation. The CR104P push-button line also includes press-to-test and standard indicating lights, mushroom-head, joy stick, push-pull and push-push operators.

Application

Especially adapted to machine-tool service or any application where oil or coolant is present. The convenient one-hole mounting makes this line suitable for general purpose use in equipment of all kinds where panel mounting is possible. This line is ideal for applications where oil tightness, watertightness and long life are essential.

All units are suitable for use in Type 1, 3, 3R, 4, 12 and 13 environments when mounted in enclosures rated for those same applications.^①

Features

- Ease of assembly—One screw contact block mounting. Octagonal ring provides ease in front panel mounting and enclosure applications.
- Greater torque—Due to the eight-sided ring design, greater torque can be developed during assembly and installation to provide oil tightness.
- Stocking inventories reduced—Forms may be furnished as complete units or as components, allowing building block construction from a minimum of stock.
- Color Coded—Colored knobs and caps are available in kit forms for easy field conversion.

CR104P pilot lights

Pilot lights match appearance of switches above. Standard applications use full voltage or transformer type lights. Optional nameplates match those used with switches, neon lights are available (with limited lens colors).

Type	STD	Push-To-Test	Bulb	Color
Full Voltage (120 VAC)	X	X	#120PSB	Red Green Amber
Transformer (6 VAC Secondary)	X	X	#755	Blue White Clear
Neon	X	N/A	Neon	Red White Amber Clear
LED (Transformer Type only)	X	X	LED (6 Volt)	Red Green Blue Amber



Contact Ratings

AC Ratings, NEMA A600 Heavy Pilot Duty

Max. Ac	Continuous Current Amps	AC Voltamperes @ 60/50 Hz ^②	
		Make	Break
600	10	7200	720

DC Ratings, NEMA P600

Max. Make or Break Amps		
125V	250V	600V
1.1	0.55	0.2

^① CR104PTP units are suitable for Type 1, 12, and 13 applications only.

^② Maximum make and break currents are 60 and 6 amperes respectively for voltages of 120 and below.

C-2000 Pilot Device



Standard for 1/2X Starter. See GEP-1260, Section 9.



Solid-State Motor Winding Heater

Description

The motor winding heater is designed for use with 3-phase ac motors to guard against damage caused by condensation build-up on motor windings, which can occur in high-humidity environments during motor idle periods. With the heater connected as indicated in the connection diagram, and the motor not running, an SCR controlled current flows in the motor windings, producing enough heat to maintain the temperature inside the motor above the ambient temperature. The motor winding heater is automatically energized after the starter contacts (M) open, and de-energized when the starter contacts close. Fuses are included for SCR overcurrent protection and protection for wiring.

If desired, a pilot light can be connected as shown ("Fuse Condition Indicator") to visually monitor the condition of the fuses. With the starter contacts open, the light will be On if current paths through FU1 and FU2 are complete. The pilot light should have a line voltage rating.

Specifications

Output Voltage Regulation: Voltage applied to motor winding will vary $\pm 2\%$ maximum for line voltage variations of +10%, -15%.

Operating Temperature Range: -20°C to +50°C.

Fusing: FU1—Fast-acting semiconductor fuse for SCR overcurrent protection. FU2—Class RK-5 rejection type fuse with time delay for wiring protection.

Additional SCR Protection: Metal oxide varistor protects against voltage surges. RC snubber circuit limits rate of change of circuit voltage.

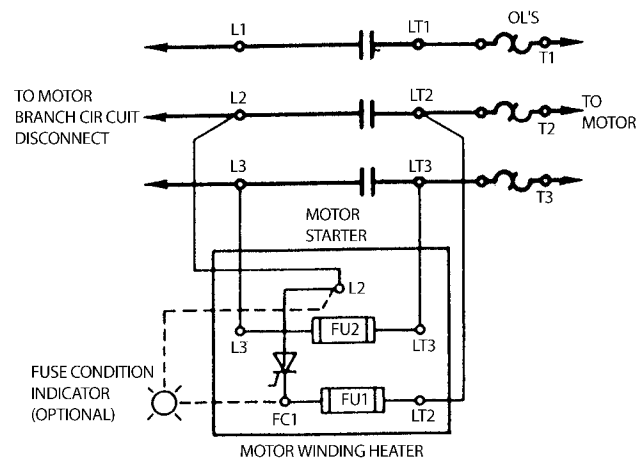
Motor Voltage +10%, -15% 3-Phase 60 Hz	Motor Horsepower Range
230/460V	15-400 Hp
575V	25-400 Hp

Heater is UL Listed in MCC Construction

Applications

50 Hertz Applications: The 230/460 volt device can be used at 220/440 volts, 50 Hertz. The 575 volt device can be used at 550 volts, 50 Hertz.

Typical Wiring Diagram



Note: Since voltage is present at motor terminals at all times, cautionary information sent with the device must be observed.



Spectra Series™ and 8000-Line Motor Control Centers

Components

Power Leader EPM

General

The Power Leader EPM is a microprocessor based device that displays a full range of over 50 metered values with revenue class accuracy of 0.5%. The PLEPM is available with a communication option that is factory- or field-installable so that all data can be transmitted to a remote host computer.

Features

The PLEPM comes in a panel mount version standard or an optional S1 case. Metered values cover a full range of parameters.

Revenue Class accuracy of 0.5%.

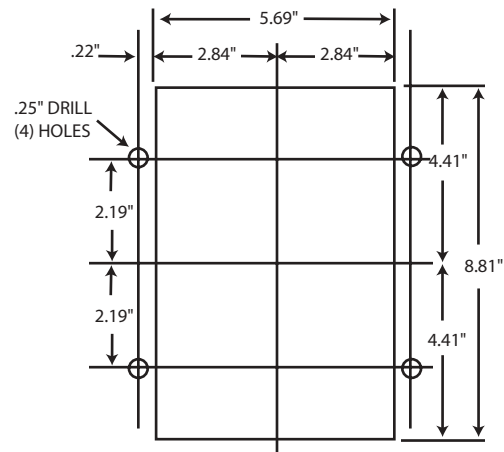
Optional communications provides connectivity to POWER LEADER network (commnet) and Modbus RTU.

Pulse initiation option with programmable outputs.

	(kwh, kvarh, kvah, kqh)
Amps	3 phase and neutral (0.25% accuracy)
Volts	L-L & L-N (0.25% accuracy)
Watts	(per phase, 3 phase total, peak watts, watt demand, & watts at maximum KVA)
Energy	(kwh, kvah, kvarh lag and lead, and KQH)
Volt-Amps	(per phase, 3 phase total, peak KVA, & KVA demand)
KVARs	(per phase, 3 phase total, peak KVAR, peak KVAR lead, KVAR demand, KVAR demand lead)
Power Factor	(per phase, 3 phase total, average, power factor at previous interval, power factor at maximum KVA)
Frequency	(60 Hz only)

Inputs

The PLEPM requires CT inputs with a 5A secondary current. The meter can accept direct input voltages up to 600V and is self-powered from the voltage inputs. Three CTs are required for four wire (Y) systems and two CTs are required for three wire (Δ) system.



Panel drilling for Semi-Flush Mounting (front view)



Power Leader Modbus Monitor

- Convenient, in-equipment viewing of data from local and remote power management devices — breakers, relays, meters, controllers
- Critical alarms and events can be quickly and easily viewed at one location
- Easy-to-use, menu-driven interface
- Customizable data display adapts to specific needs
- Compatible with GE's Power Management Control System software (Version 5.1 or greater)
- Upgradeable firmware
- Free configuration and download tool included

Standard Features

- Remote viewing of device data
- Supports up to 31 Modbus devices and 215 commnet power management devices
- View up to 50 events
- High-speed communications via RS-485 network
- Customizable data display
- Flash-ROM upgradeable to support future enhancements and new devices
- Compatible with GE's Power Management Control System for remote viewing of PMCS event log
- Universal power supply accepts 100-240Vac, 125-250Vdc
- Password protection prevents unauthorized configuration changes

Optional Features

- Single- and dual-port RS-485 Modbus versions available

Large, high-temperature, high visibility display provides wide (160°) viewing angle



Keypad controls menu-driven user interface

RS-232 port simplifies configuration and firmware download with Windows-based software

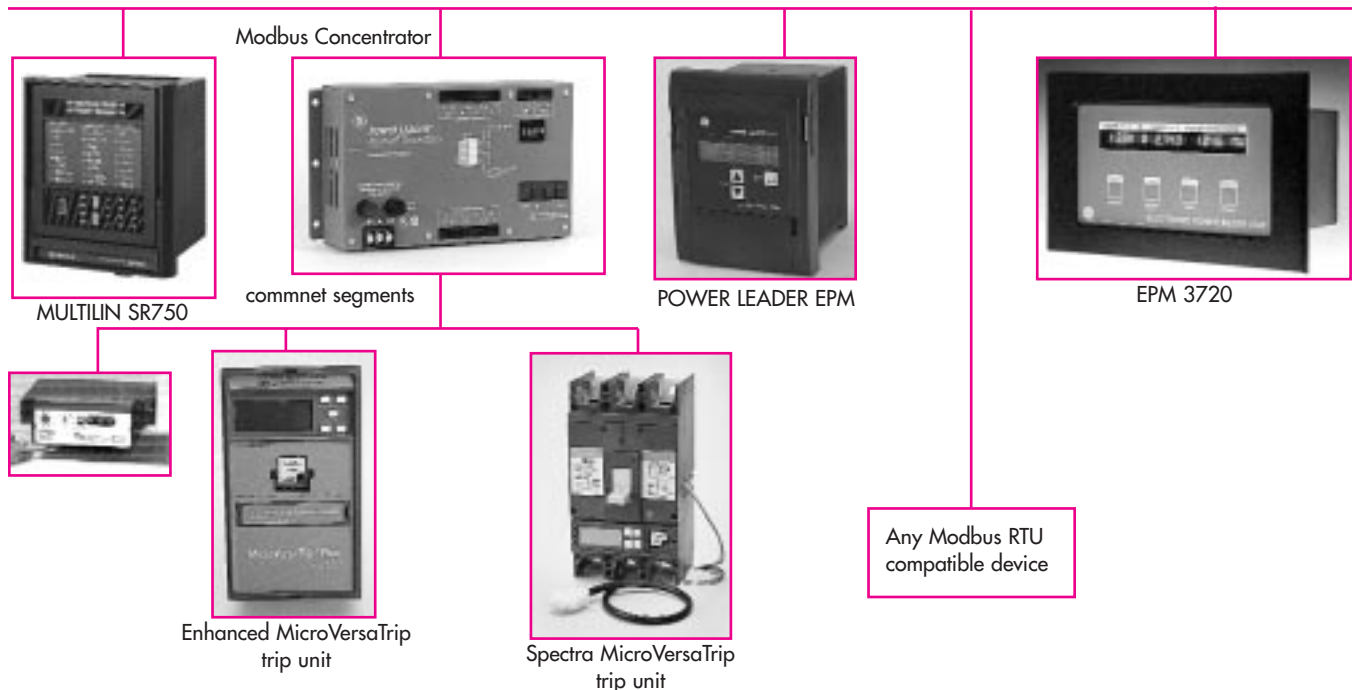
Standards

- UL Listed
- CSA Certified

In addition, the Modbus Monitor supports any third-party device with register-based Modbus RTU communications over RS-485 networks.

The Modbus Monitor is not certified to be compatible with any Modbus master other than GE's PMCS version 5.1 or greater.

RS-485 Modbus LAN



H



Power Leader Modbus Concentrator

Product Overview

GE's recent introduction of the POWER LEADER Modbus Concentrator brings performance and compatibility to users of GE's Power Leader communication network (commnet) family of power management devices. Used in conjunction with GE's Power Management Control System (PMCS) software, the Modbus Concentrator allows you to integrate your existing base of commnet devices into the faster Modbus Remote Terminal Unit (RTU) based PMCS network, improving overall system performance while retaining the full functionality of each commnet device.

Modbus RTU is an industry-standard communications protocol that operates on an RS485 network. The Modbus RTU protocol is widely supported for supervisory control and data acquisition (SCADA) systems, building management systems (BMS) and distributed control systems, (DCS). Industry leaders such as Multilin, Power Measurements Limited and GE Fanuc produce Modbus RTU-compatible devices and programmable logic controllers.

Modbus open architecture provides a high level of flexibility while reducing the risks associated with proprietary communications protocols. Key benefits of the modbus RTU protocol include:

- Devices and systems can be upgraded easily.
- A wide range of compatible devices from a variety of manufacturers is supported.
- Communications are extremely flexible, both upstream (to DCS, SCADA and BMS systems) and downstream (to meters and trip units).



Standard Features

- One-piece steel case construction
 - Simple installation (no cut-outs)
- Ease of operation
 - Four-character alphanumeric high-contrast LED display
 - Simple four-button keypad
 - All setup done via faceplate keypad and display; no confusing DIP switches
 - Quick automatic setup capability
 - Remote setup capability allows automated configuration from host PC
- Communications
 - Communicates on POWER LEADER commnet communications protocol
 - Communicates on Modbus RTU communications protocol
 - Each Modbus Concentrator supports up to 32 commnet devices (maximum 215 Commnet devices per RS485 network possible with multiple Concentrators)



Power Leader PQM

Description

The PQM is an ideal choice when continuous monitoring of a three phase system is required. It provides metering for current, voltage, real and reactive power, energy use, cost of power, power factor and frequency. Programmable setpoints and 4 assignable output relays allow control functions to be added for specific applications. This includes basic alarm on over/under current or voltage, unbalance, demand based load shedding and capacitor power factor correction control. More complex control is possible using the 4 switch inputs which also can be used for status such as breaker open/closed, flow information etc.

The PQM may be used as a data gathering device for a plant automation system that integrates process, instrument and electrical requirements. All monitored values are available via two digital RS485 communication ports running the Modbus protocol. If analog values are required for direct interface to a PLC, any of the monitored values can be output to one of 4 isolated analog outputs. A process variable can be measured using an analog input. A front panel RS232 communication port can be connected to a PC for simultaneous access of information by other plant personnel.

The quality of the power system is important with increasing use of electronic loads such as computers, ballasts or variable frequency drives. With the PQM's power analysis, any phase current or voltage can be displayed and the harmonic content calculated. By knowing the harmonic distribution, action can be taken to prevent overheated transformers, motors, capacitors, neutral wires and nuisance breaker trips. Redistribution of system loading can also be determined. Waveform and chart recorder printouts available from the PQM assist in problem diagnosis.

Applications

- Metering of distribution feeders, transformers, generators, capacitor banks and motors
- Medium and low voltage systems
- Commercial, industrial, utility
- Flexible control for demand load shedding, power factor, etc.
- Power quality analysis

Metering/Control

- AVW var VA varh Wh PF Hz unbalance
- AW can VA demand
- Load shedding
- Power factor control
- Pulse input totalizing
- Pulse output based on kWh, kvarh or kVah



Monitoring

- Harmonic analysis through 63rd with THD and TIF
- Event recorder
- Waveform capture
- Data logger
- Triggered trace memory

Communication

- Ports: RS232 front, dual RS485 rear
- Modbus RTU protocol
- Mini RTU: digital 4 in / 4 out
- Analog 1 in / 4 out
- Local/remote display of all values

GEPQMT20CA See GE Multilin Products Catalog and www.ge.com/edc/pmsys



Three-Phase Voltage Monitors

Model SPVR

General

UL Listed file No. E103039

The model SPVR is a three-phase voltage monitor which uses negative phase sequence monitoring to protect against phase loss and phase unbalance in a three phase system. It is recommended for main breaker applications since the output relay only changes state when the unbalance is detected. Note that when the optional over/under voltage functions are included, the output relay is energized when conditions are correct and de-energizes on fault, similar to the model LPVR.

Standard Features

- Phase unbalance: 12% (6% recommended for motor load protection)
- Phase loss protection
- Adjustable Trip Delay: 1 to 10 seconds after failure occurs
- Automatic Reset to Normal: upon removal of fault conditions
- Output Relay: normally de-energized, form C contacts
- Electro-mechanical fault indicator: manually reset
- Status Indicator: bi-colored LED

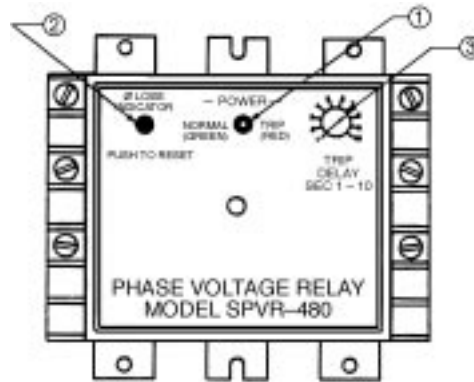
Green: Output relay de-energized (normal state)

Red: Output relay energized (fault condition)

Dark: Loss of power

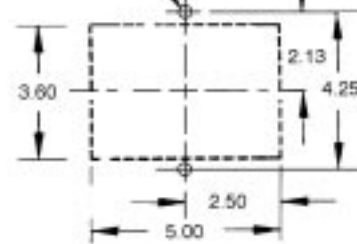
Optional Features

- Phase Reversal Protection: operates output relay instantaneously, has LED indicator
- Phase Sequence Protection: (same as phase reversal)
- Overvoltage and Undervoltage Protection: output relay de-energizes after preset time delay, if system voltage is over 115% or under 80%. (reset values are 107% and 90% respectively)
- Phase Unbalance: 6% (recommended for motor loads)



- ① Bi-Colored LED Indicator
 - Power system condition Normal (Green), Trip (Red)
- ② Electromechanical Diagnostic Indicator
 - Phase loss
- ③ Adjustable System Delay
 - Phase loss
 - Phase unbalance

(2) 0.24 Dia. Holes
Clearance holes for #12 screws



Panel Mounting Layout

SPVR — XXX — XXXXX	
Input Voltage: 120/208/240/480 or 600 Vac, (60 Hz) 380 or 415 Vac, (50 Hz)	Optional Features: M — Manual Reset with local Push Button O — Over and Under Voltage protection R — Phase Reversal/Sequence protection U — Phase Unbalance 6%

Available Models

Model No.	Nominal Vac	Vac Range	Freq.
SPVR 120	120	96-138	60
SPVR 240	240	192-276	60
SPVR 480	480	384-552	60
SPVR 575	575	460-661	60
SPVR 380	380	304-437	50
SPVR 415	415	332-477	50

Output Contact Ratings

Voltage	Continuous	Make	Break
120 Vac	10 A	3160 VA	316 VA
240 Vac	10 A	4800 VA	480 VA
380 Vac	3 A	4800 VA	480 VA
600 Vac	3 A	4800 VA	480 VA

10 A, 28 Vdc/120 Vac/240 Vac, 80% pf

3 A, 480 Vac/600 Vac, 80% pf



Three-Phase Voltage Monitors

Model LPVR

General



U.L. Listed file No. E103039
The model LPVR is a three-phase voltage monitor which uses negative phase sequence monitoring to protect against phase loss, phase reversal, and undervoltage on the power system. Electro-mechanical diagnostic indicators (manually reset) show trip condition due to phase unbalance, phase loss, and undervoltage. A green led indicates that the power system has no faults present and that the phases are in sequence.

- Provides pre-start and running protection.
- Fully rated 600 volt contacts.
- Diagnostic indicators continue to show cause of operation after voltage removed.
- Adjustable under voltage trip point settable to 75% of nominal.
- Adjustable trip delay from 50 milliseconds to 10 seconds.
- Adjustable reset delay from 1 second to 5 minutes.
- Operates at 6% phase unbalance.
- Operates with a 12.5% phase voltage loss.
- Automatic or manual reset, local or remote.
- Operational green LED indicator.
- Failsafe—will not operate if fault is present.
- Isolated Form "C" output contacts.
- Terminal screws are #6-32 nickel-plated brass.

Available with the following 3 Phase Voltages

P/N	Nominal Rating	Voltage Range
LPVR 120	120	90-125
LPVR 240	240	180-250
LPVR 480	480	360-500
LPVR 575	575	430-600

Model APVR

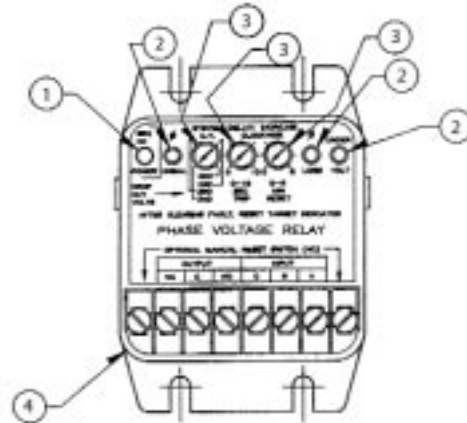
General

103039

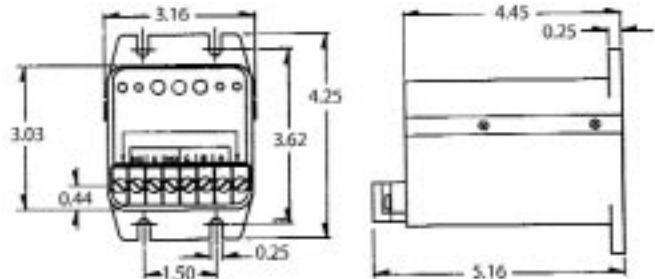
The model APVR phase sensing relay performs the same functions as the model LPVR, except that the relay requires no adjustments. It will fit in the push-button bracket, and thus does not increase the required unit spacing.

Available with the following 3 Phase Voltages

P/N	Nominal	Voltage Range	Frequency
APVR 120	120	95-135	60Hz
APVR 240	240	190-270	60Hz
APVR 480	480	380-530	60Hz
APVR 575	575	455-600	60Hz
APVR 380	380	300-425	50Hz

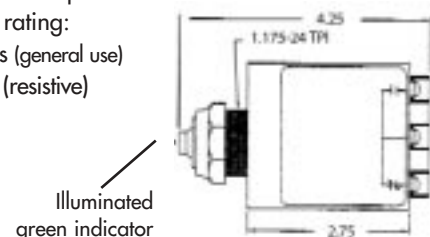


- ① Green LED Indicator
 - Power system condition.
- ② Electromechanical Diagnostic Indicator
 - Phase unbalance.
 - Phase loss.
 - Undervoltage.
- ③ Adjustable System Delay
 - Undervoltage trip point.
 - .05 - 10 second trip delay.
 - 0 - 5 minute reset delay.
- ④ Terminal Block
 - Automatic or manual reset.
 - Input Voltage – 120 to 575 volts.
 - Output Contacts – Form C, 1 NO & 1 NC.



Specifications

- Failsafe—will not operate if a fault is present.
- Manual or Automatic reset.
- Fixed undervoltage trip point: approx. 90% pickup, 80% dropout.
- Operates at 6% phase unbalance
- Operates with 6% phase voltage loss.
- 3 second drop-out delay to avoid nuisance tripping
- Operational green LED indicator.
- Isolated Form "C" output contacts.
- Output contact rating:
 - 250Vac, 5 amps (general use)
 - 30Vdc, 5 amps (resistive)





High-Resistance Grounding Unit

Where to Use

The function of high-resistance grounding equipment is:

1. To provide a ground for neutral of an ungrounded three-phase power system, utilizing the high-resistance method. Using this equipment allows the system to operate basically as an ungrounded system. The equipment is designed to eliminate the danger of high-transient over-voltages during certain types of ground faults.

Note: The use of high-resistance grounding on 600 volt maximum systems precludes line-to-neutral loading.

2. To provide an immediate warning when the first ground fault occurs through an alarm system.
3. To provide a method for quickly locating and removing the fault before another fault develops on another phase, thereby preventing circuit outages due to double line-to-ground faults. This is done by using the pulsing ground current feature and portable detector.

240, 480, or 600 Volt Systems

Equipment Range

Taps are provided on the standard DS9181 grounding resistor to adjust for a system charging current maximum of 3.56 amps or less. Since the normal charging current for most 600 volt or less systems is usually below one ampere, our standard equipment is adequate; however, for systems with greater charging currents refer to the Company for a quotation. Data for estimating the system charging current is shown in GEK-83750.

Description of modifications applicable to all panels.

Mod.	Item	Function
UV	Undervoltage Relay	Drops out on low voltage and provides auxiliary contacts for motor relay failure remote alarm.
TR	Timing Relay	Prevents nuisance tripping on temporary transient faults.
CT	Current Transformer	Detects ground current
AM	Ammeter	Indicates ground current

Specifications

Equipment Included in Standard 240, 480 or 600 volt Wye and Delta Systems

- 1-Line disconnect switch, three phase, interlocked with the door
- 3-Line fuses, 600 volts, 10 amp, interrupt 200,000 amps RMS symmetrical
- 3-Neutral deriving transformers, dry-type (delta system only)
- 1-Control power transformer (CPT)
- 1-Meter relay (double set point)
- 1-Pulsing contactor, set to produce approximately 40 current pulsations per minute
- 1-Neutral-grounding resistor
- 1-Relay for pulsing contactor
- 1-Control relay, with interlocks for remote alarm
- 1-"Ground Fault" red indicating light
- 1-"Normal" green indicating light
- 1-"Normal-Pulse" selector switch
- 1-TEST resistor
- 1-TEST push button (momentary type)
- 1-Instruction plate on door
- 1-Enclosure
- 1-Portable ground-current detector with carrying case (Optional—must be ordered as a separate item)
- X-Control circuit operates from 120 volts supplied by secondary of CPT.
- X-All connections to control and annunciator circuits wired to terminal boards
- X-Cable entry from top or bottom
- X-Optional Modifications (See table below)

Approximate Dimensions and Weights

Equipment Enclosure Type	W x D x H (in inches)	With Pulsor in Pounds		Without Pulsor in Pounds	
		Wye	Delta	Wye	Delta
		NEMA 1	20 x 20 x 90	600	700



High-Resistance Grounding Unit

Standard Equipment Operation

The circuits used for low-voltage systems are shown in Fig. 1 and Fig. 2.

During normal conditions, with no ground fault on the system, only a small magnetizing current (capacitance-charging current) flows in the grounding transformers and no voltage appears across the resistor.

When a ground fault occurs, the resistor limits the ground current to a low value.

Taps are provided on the resistor to adjust the magnitude of the ground current in the range of 0.9 to 3.6 amperes, depending on the size of the system, so that the current supplied by the resistor to a ground fault will be slightly greater than the system's natural capacitance-charging current.

The voltage appearing across the resistor will be sensed by the meter relay. Auxiliary contacts in the control, operated by the meter relay, are available for remote indication and annunciation of a ground.

A green indicating light on the equipment indicates that control voltage is available and that the system is normal. When a fault

develops, a red indicating light on the equipment will light and remain lighted until the ground fault is removed. If no remote annunciator is available to notify the operator, an audible alarm may be added to the equipment as an option. A rotating red signal beacon can be used in noisy or remote installations.

To trace the ground fault, the operator turns the selector switch to the "pulse" position. This initiates cycle timing, alternately energizing and de-energizing a shorting contactor at the secondary resistor, resulting in a rhythmic fluctuation in the magnitude of the ground current.

The portable hook-on detector is then used to trace the fluctuations in ground current through the system to the point of fault. After the ground point has been located and removed from the system, the operator then resets the selector switch to de-energize the pulse-cycle timing circuits.

The ground transformer for delta systems will consist of three single-phase transformers connected wye-delta. For wye systems, where system neutral is available, these grounding transformers are not needed.

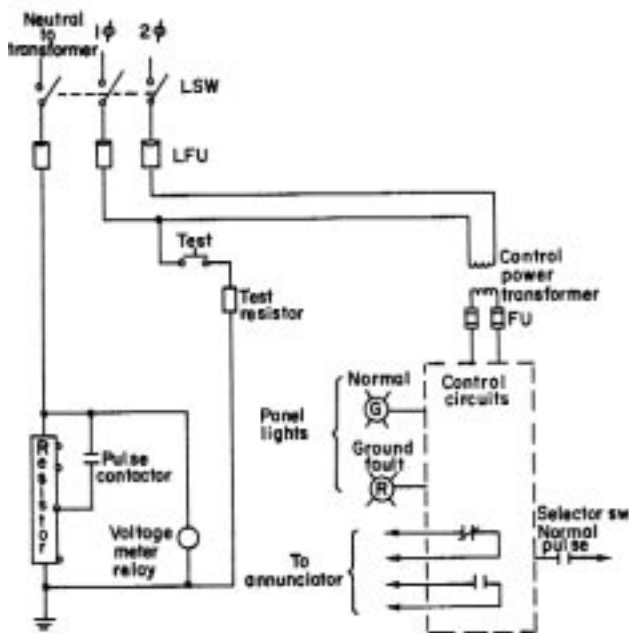


Fig. 1 600-volt maximum wye systems

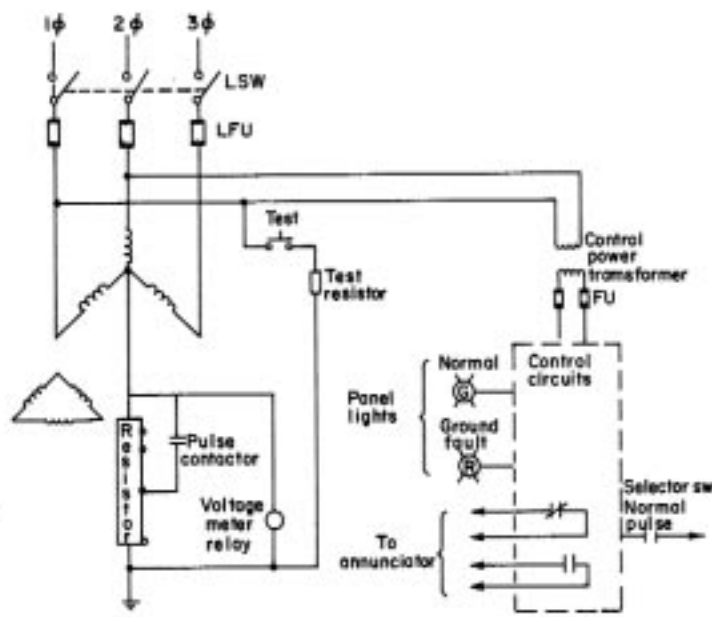


Fig. 2 600-volt maximum delta systems

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