ELECTROMAGNETIC INDUSTRIES
DIVISION OF OLYMPIC CONTROLS CORPORATION

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E510552

ARC REDUCTION / GROUND FAULT RELAY (WITHOUT FUSE PROTECTION)
Model AFGF2 Relay

The AFGF system is designed for electrical equipment protection, not specifically for personnel protection.

Application: Arc Reduction and Ground Fault Protection

Ground Fault Trip Currents: Ranging from 100-1200A adjustable settings.

Ratings Switch Use: 400A, 600A, 800A,1200A,1600A, 2000A, 2500A, 3000A, 3500A, 4000A, 5000A, 6000A

Arc Reduction Section: The Arc Reduction section is designed to minimize damage due to Arc Flash events when unit is in Maintenance Mode.

- The Arc Reduction section is not designed to prevent the condition, but to minimize the incident energy release and damage due to current spikes.
- Solid State Contacts to provide faster trip signal (optional).
- Positive visual trip indicator.
- System “Push to Test” function.

Ground Fault Section: These Class 1 Ground Fault relays with the proper CT/Sensors, are used for detecting Ground Fault Current in a grounded AC power system.

- See page 4 for available CT/Sensors sold separately and produced under Electromagnetic Industries LLP Instrument Transformers UL File E238872.
- Use of any other CTs void the warranty of this product and may result in damage to equipment and the relay.
- For systems requiring only Ground Fault Protection, please see our ***Model GFP Ground Fault Relay***.
- For systems requiring Ground Fault and Voltage Monitoring Protection, please see our ***Model GFPV Ground Fault/Voltage Monitor Relay.***
- Positive visual trip indicator.
- Real time fault current level indicator.
- See page 5 for discrete current and time delay threshold settings with optional time delay characteristics.
- “Push to Test” pushbuttons for proper testing of CT and the relay.
- “Shunt Trip Bypass” with the ability to trip or not trip the shunt trip coil.
- Optional Zone Interlock (also compatible with our GFP and GFPV relays)

Input Power Options: 120 Vac

Frequency: 50/60 Hz.

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

Ambient Temperature Range: -30 Deg C. to 60 Deg C.

- Meets NEC service entrance equipment standards.
- Power Indication
- Maintenance Mode Select Switch (w/ connections for remote switch)
- Maintenance Mode Indication
- Separate Ground Fault and Arc Reduction trip contacts
- Contact ratings: Normally open, Dry Type, 120Vac, 5A (Make and carry 0.2 sec, 30A)
- Operates with molded case power circuit breakers, bolted pressure switches, or fusible disconnect switches.

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Model AFGF2 Relay

Maintenance *Mode*:

- If the AFGF2 detects a Ground Fault while in the Maintenance Mode, the relay will trip instantaneously when the Pick-Up Amps setting is reached, regardless of the time delay setting.
- While in Maintenance mode, the relay trips instantaneous at 250% of switch rating.
- Both the Mode switch on the panel and the remote switch (if used) must be in the “Off” or “Closed” position for the unit to be in “Normal Mode”. If the remote switch is not used, a jumper must be placed across the terminals.
- Indications:
  - Mode LED (Red) = Unit in Maintenance Mode
  - Mode LED (Green) = Unit in Normal Mode

Overcurrent Protection Response Curves

Reduction Section: (Only enabled when in Maintenance Mode)

The Arc Reduction section is not designed to prevent, but to minimize damage due to current spikes. See page 4 for CTs/Sensor’s selection.

Switch Rating (Amps)	Maintenance Mode
	Time Delay Instantaneous 250%
400A	1000A
600A	1500A
800A	2000A
1200A	3000A
1600A	4000A
2000A	5000A
2500A	6250A
3000A	7500A
3500A	8750A
4000A	10000A
5000A	12500A
6000A	15000A

Ground Fault Section:

The ground fault section has the adjustable time delay, adjustable pick-up amps setting, one “Push to Test” button for the CT, a “Shunt Trip Bypass”, an LED bar graph to indicate GF Level, and a positive trip indication switch that must be reset manually after the trip.

The AFGF2 relay will indicate the level of the ground fault on the bar graph. If the ground fault exceeds the set level, “Pick Up Amps”, the GF time delay will begin. If the ground fault level exceeds the setpoint for the duration of the time delay, the ground fault contacts will change state. If power is still available, the AFGF2 will continue to indicate the level of the ground fault current at the time of the trip.

Typical Response Curve (Ground Fault)

OPTION 1 - Standard: With the standard Time Delay Curve, the ground fault must be present for the full length of the time delay. The ground fault amperage level does not affect the time delay. (i.e. The time delay will always be as set regardless of the amperage of the ground fault.)

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Model AFGF2 Relay

Relay Selections

Model	Switch Rating	Solid State Relay Options	Ground Fault Response Curves	Zone Interlock	Fuse Curve Option
AFGF-2	A = 400A	1 = w/ Solid State	1 = Standard	1 = With	N/A
	B = 600A	2 = w/o Solid State		2 = Without	
	C = 800A				
	D = 1200A				
	F = 1600A				
	G = 2000A				
	H = 2500A				
	J = 3000A				
	K = 3500A				
	M = 4000A				
	N = 5000A				
	P = 6000A				

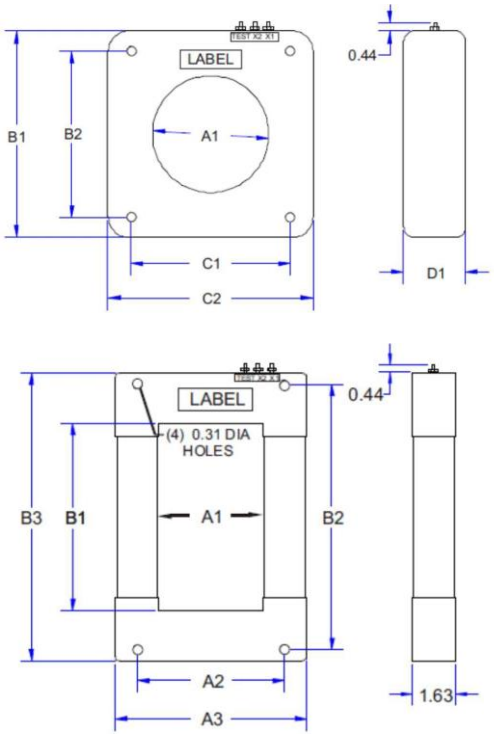
Example:

P/N AFGF-2G112NA = Arc Reduction/Ground Fault Relay, for a 2000A switchgear/pressure switch, with solid state relay. Standard GF Trip time delay, w/o interlock and no overcurrent trip curve.

CT Selection/CT Requirements* (*Switch Rating must match the sensors being used.*)
CT/Sensors are produced under ***Electromagnetic Industries*** UL File E238872.
Use of any other CTs void the warranty of this product and may result in damage to equipment and the relay.

E238872

Other CT/Sensor configurations available, contact *Electromagnetic Industries* for more options.



Switch Rating	Relay Series Number	CT Part Number	A1	B1	B2	C1	C2	D1
400	AFGF-2A- - - -	194-162-1-T-3	2.50"	4.88"	N/A	3.50"	4.50"	2.19"
600	AFGF-2B- - - -	194-242-1-T-3	2.50"	4.88"	N/A	3.50"	4.50"	2.19"
800	AFGF-2C- - - -	100-322-1-T-3	4.00"	7.00"	5.60"	5.60"	7.00"	2.20"
1200	AFGF-2D- - - -	100-482-1-T-3	4.00"	7.00"	5.60"	5.60"	7.00"	2.20"

Switch Rating	Relay Series Number	CT Part Number	A1	A2	A3	B1	B2	B3
800	AFGF-2C- - - -	550T041X071-322-001T-3	4.10"	6.40"	7.30"	7.10"	10.0"	10.9"
1200	AFGF-2D- - - -	550T041X071-482-001T-3	4.10"	6.40"	7.30"	7.10"	10.0"	10.9"
1600	AFGF-2F- - - -	550T041X071-322-002T-3	4.10"	6.40"	7.30"	7.10"	10.0"	10.9"
2000	AFGF-2G- - - -	550T041X071-402-001T-3	4.10"	6.40"	7.30"	7.10"	10.0"	10.9"
2500	AFGF-2H- - - -	550T041X071-502-001T-3	4.10"	6.40"	7.30"	7.10"	10.0"	10.9"
3000	AFGF-2J- - - -	550T058X071-602-001T-3	5.80"	7.00"	9.00"	7.10"	10.0"	10.9"
3500	AFGF-2K- - - -	550T058X071-702-001T-3	5.80"	7.00"	9.00"	7.10"	10.0"	10.9"
4000	AFGF-2M- - - -	550T080X117-802-001T-3	8.00"	9.50:	11.1"	11.7"	14.5"	17.9"
5000	AFGF-2N- - - -	550T080X141-103-001T-3	8.00"	9.50:	11.1"	14.1"	17.0"	19.0"
6000	AFGF-2P- - - -	550T080X141-123-001T-3	8.00"	9.50:	11.1"	14.1"	17.0"	19.0"

Note: It is recommended that both ends (terminal end and non-terminal end) are supported when installed horizontally to prevent twisting of the case and/or separation on the internal lamination steel.

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RECTANGLE GROUND FAULT CURRENT SENSOR

Model GFL [100 - 1200A]

The GFL (Zero Sequence Sensors) are UL Recognized parts built under *Electromagnetic Industries* UL File E238418.

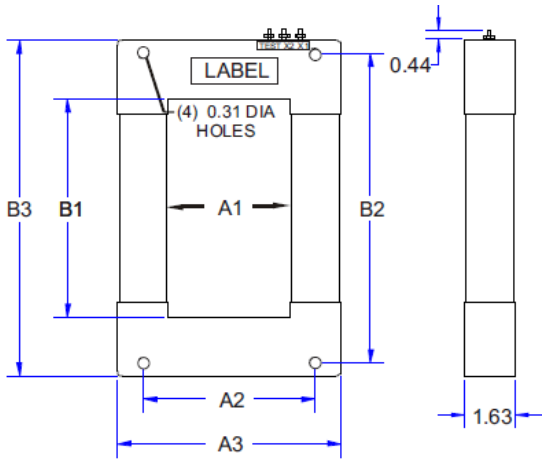
Application: These Ground Fault Sensors (type GFL) are available in a variety of sizes. Care should be taken when determining the physical size of the senor window. The ground fault sensor will only respond to ground faults that occur between the position of the sensor and the load. Each sensor comes with both normal and test windings.

Operating Range: Trip Currents models are available for 100-1200A. (tolerance +/- 8%)

Frequency: 50/60 Hz.

Insulation Level: 600 Volt, 10 kV BIL full wave.

- No. 8-32 brass terminals with flat washer, lock washer, and nut.
- Rectangular sensors are also available with take apart option allowing installation without disassembly of the primary bus or cables.



CAUTION: All appropriate safety precautions must be followed for the installation of these devices including de-energizing the incoming power prior to installation. It is recommended the sensor be installed by a trained electrician.

This sensor must have its secondary terminals shorted, or have the relay connected prior to energizing the primary windings.

How to Order: The table lists the available standard sensor sizes.

Any window length can be combined with any window width. Custom sizes are also available.

- To order a rectangular sensor, use the Sensor Size Table and the Part Number Table below.
- Example: For a 10.1" x 24" window with a current trip range of 100-1200 and a split core, the part number would be "101x240SC1200"

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

GFL	Width Dimension "A1" (in 1/10"). See Table.	by	Length Dimension "B1" (in 1/10"). See Table.	Split Core	Trip Current (1200A Ground Fault)
GFL-	XXX	X	XXX	"SC" or blank	1200

Note: It is recommended on the GFL Rectangle Sensors that both ends (Terminal end and non-terminal end) are supported when installed horizontally to prevent twisting of the case and/or separation on the internal lamination steel.

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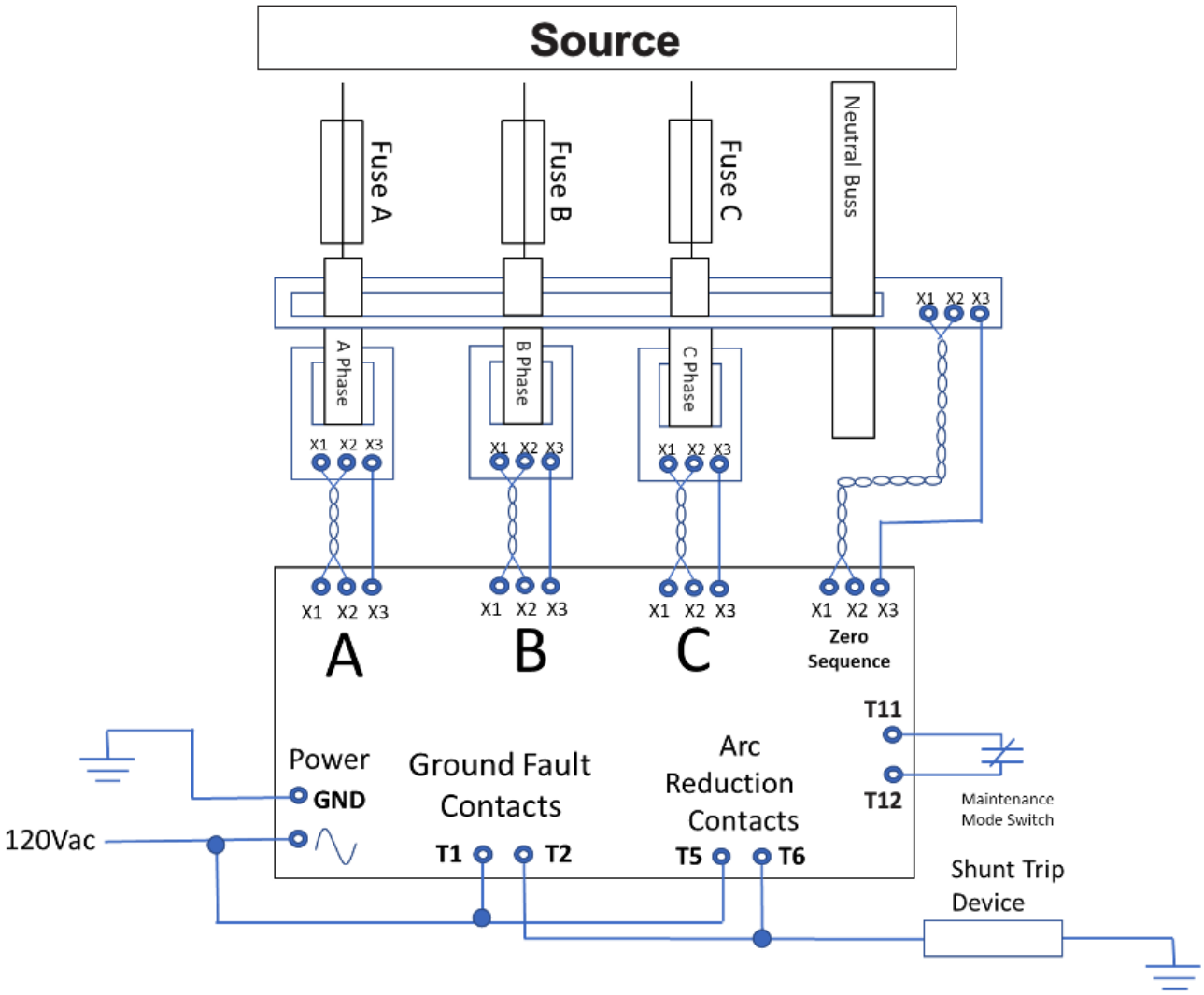
RECTANGLE GROUND FAULT CURRENT SENSOR

Model GFL [100 - 1200A]

Ground Fault Current Sensor Typical Installation



Note: It is recommended that both ends (terminal end and non-terminal end) are supported when installed horizontally to prevent twisting of the case and/or separation on the internal lamination steel.

1. This relay is designed to be used on switches with Class L fuses. Use of other Class fuses does not affect the operation of the relay; however, the relay may not protect the fuses.
2. The sensors can be installed upstream or downstream of the fuses and switch blades.
3. Recommend use of twisted pair for X1–X1 and X2–X2 connections.
4. Optional remote Mode Select Switch (N/C) must be replaced w/ jumper if not used.
5. Polarity of the Sensors is not critical if they are all facing the same direction. *(Typically, H1 faces Source)*

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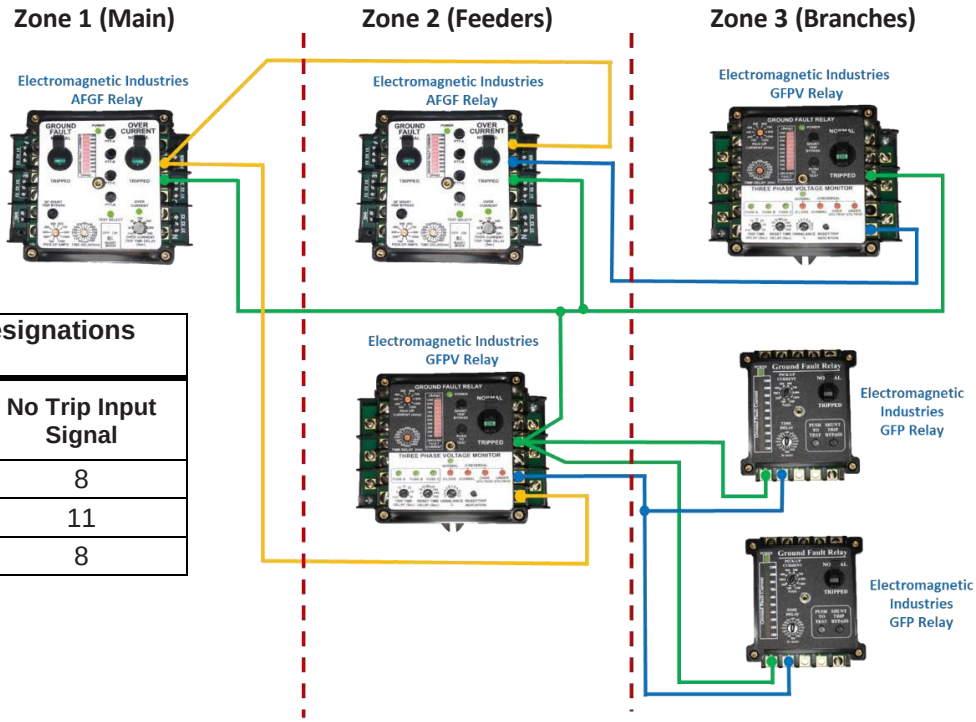
GROUND FAULT RELAY ZONE INTERLOCK

Model GFL [100 - 1200A]

Note: The GFP, GFPV and AFGF Model Relays with interlock are all compatible with each other. When Interlock option is installed and wired correctly the units will work in any configuration.
See page 7 for typical operation.

Zone



Ground Fault Relay Terminal Designations for Interlock			
	Common	No Trip Output Signal	No Trip Input Signal
AFGF	9	7	8
GFPV	9	12	11
GFP	6	7	8

Interlock Operation

Example: When a branch relay sees a Ground Fault, the associated feeders and main relays will see it at the same time. The time delay will begin on all the relays'; however, the branch unit will send a "No Trip" signal to the upstream feeder relay. The feeder relay will send a "No Trip" signal to the main relay. Once the branch relay time delay has expired, the unit will trip and remove the "No Trip" signal from the upstream units. If the ground fault is still present and the time delay has expired, the feeder unit will trip and remove the "No Trip" signal from the main relay. If the Ground Fault is still present, and the main relays time delay has expired, the main relay will trip.

Notes:
1. All Zone Interlock wiring must be wire size 16AWG – 20 AWG twisted pair.
2. A limit of 10 upstream units is to be used to a single output.

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GROUND FAULT RELAY DIMENSIONS

Model GFL [100 - 1200A]