



Model AFGF Relay

ARC FLASH / OVERCURRENT / GROUND FAULT RELAY

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

Application: Arc Flash, Overcurrent and Ground Fault Protection (with Fuse Conservation).

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

For use in Switches with ratings of: 400A, 600A, 800A, 1200A, 1600A, 2000A, 2500A, 3000A, 3500A, 4000A, 5000A, 6000A

Arc Flash & Overcurrent Relay Section: The Arc Flash/Overcurrent section is designed to minimize damage due to overcurrent/Arc Flash events.

Note: The Arc Flash/Overcurrent section is not designed to prevent the condition, but to minimize the incident energy release and damage due to current spikes.

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.

Note: The CT/Sensors are sold separately. (See Page 4) CT/Sensors are 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](#)

Input Power Options: 120 Vac

Frequency: 50/60 Hz

Ground Fault: Trip currents ranges available: 100-1200A, 200-1200A and 300-1200A

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
- Test Selection (Select Push to Test between Ground Fault and Overcurrent)
- Separate Ground Fault and Overcurrent 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.

- Overcurrent Section:
 - Solid State Contacts to provide faster trip signal (Optional)
 - Inverse Time Delay Curve
 - Positive visual trip indicator
 - System "Push to Test" function

- Ground Fault Section:
 - Positive visual trip indicator.
 - Real time fault current level indicator.
 - Discrete current and time delay threshold settings with optional time delay characteristics. (See sheet 5)
 - "Push to Test" pushbuttons for proper testing of each individual 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)



Maintenance Mode:

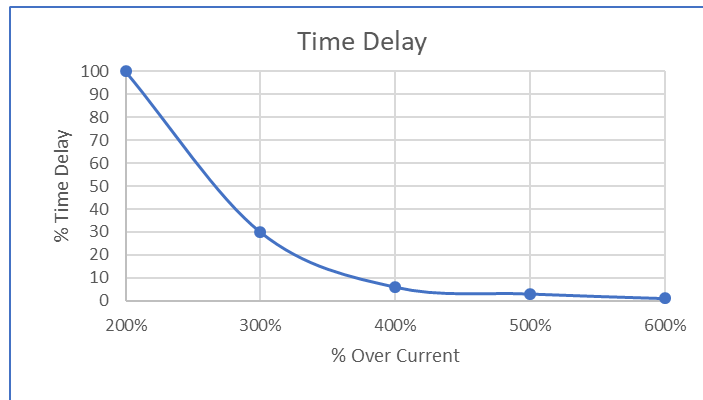
- If the AFGF detects a Ground Fault while in the Maintenance Mode, the relay will trip instantaneously when the Pick-Up Amps setting is reached, regardless of the time delay setting.
- While in Maintenance mode, the Overcurrent trip setting is reduced to instantaneous trip at 250% of switch rating.
- 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 Relay Section: The Arc Flash/Overcurrent section is not designed to prevent, but to minimize damage due to current spikes.

- For the AFGF3 unit selection see page 4
- For CTs/Sensors selection see page 4

Overcurrent Protection Response Curves

Switch Rating (Amps)	Normal Mode					Maintenance Mode
	(0 - 300 sec) 100% Time Delay 200%	30% Time Delay 300%	6% Time Delay 400%	3% Time Delay 500%	Instantaneous Trip 600%	Time Delay Instantaneous 250%
400A	800A	1200A	1600A	2000A	2400A	1000A
600A	1200A	1800A	2400A	3000A	3600A	1500A
800A	1600A	2400A	3200A	4000A	4800A	2000A
1200A	2400A	3600A	4800A	6000A	7200A	3000A
1600A	3200A	4800A	6400A	8000A	9600A	4000A
2000A	4000A	6000A	8000A	10000A	12000A	5000A
2500A	5000A	7500A	10000A	12500A	15000A	6250A
3000A	6000A	9000A	12000A	15000A	18000A	7500A
3500A	7000A	10500A	14000A	17500A	21000A	8750A
4000A	8000A	12000A	16000A	20000A	24000A	10000A
5000A	10000A	15000A	20000A	25000A	30000A	12500A
6000A	12000A	18000A	24000A	30000A	36000A	15000A





Ground Fault Section:

The ground fault section has the adjustable time delay, adjustable pick-up amps setting, one “Push to Test” button for each 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 relays for 400A – 2000A have Pick Up Amps settings of 100, 200, 300, 400, 500, 600, 700, 800, 1000 & 1200Amps
- The relays for 2500A – 4000A have Pick Up Amps settings of 200, 400, 600, 800, 1000 & 1200 Amps
- The relays for 5000A – 6000A have Pick Up Amps settings of 300, 600, 900 & 1200 Amps

The AFGF 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 AFGF will continue to indicate the level of the ground fault current at the time of the trip.

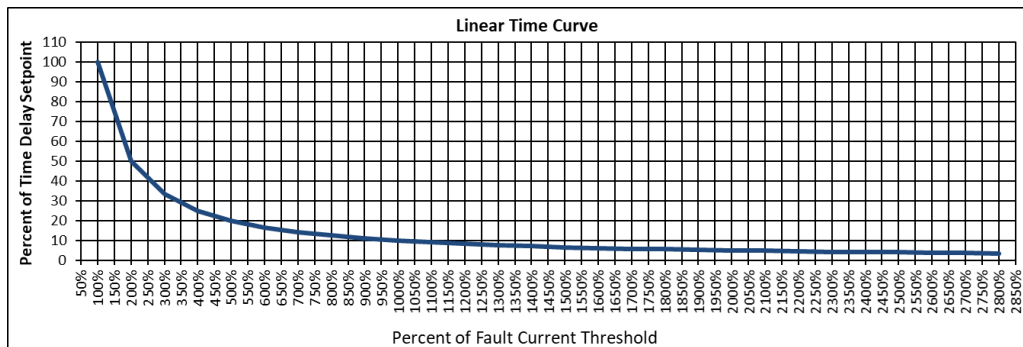
TYPICAL RESPONSE CURVES (Ground Fault)

(OPTION 1)

With the Option 1 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.)

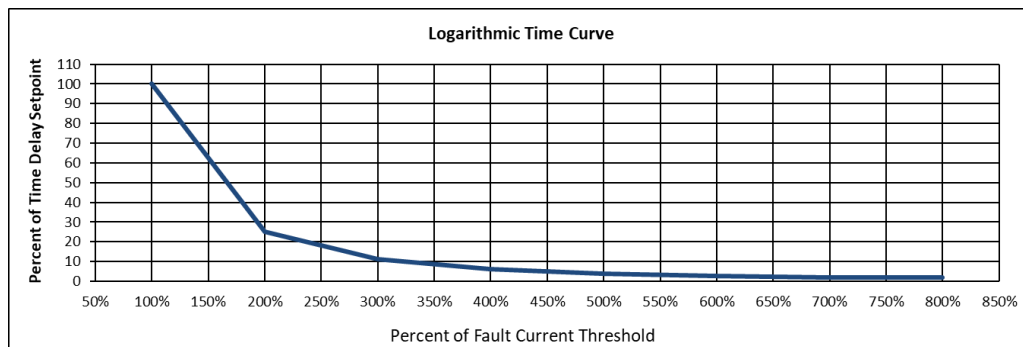
(OPTION 2)

With the Option 2 Time Delay Curve, the ground fault level will affect the time delay. The higher the ground fault level above the set-point, the faster the AFGF will trip. For every 100% above the threshold set-point, the time delay is reduced to ½ of the setting.



(OPTION 3)

With the Option 3 Time Delay Curve, the ground fault level will affect the time delay. The higher the ground fault level above the set-point, the faster the AFGF will trip. For every 100% above the threshold set-point, the time delay is reduced to ¼ of the setting.





Relay Selection

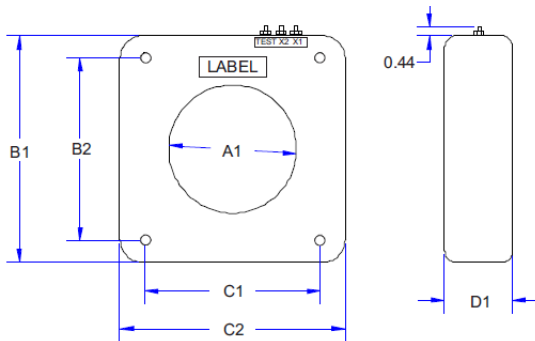
Model	Switch Rating	Solid State Relay Option	Ground Fault Response Curves	Zone Interlock	Fuse Curve Option
AFGF-3	A = 400A	1 = w/ Solid State	1 = Standard	1 = With	A-Z
	B = 600A	2 = w/o Solid State	2 = Linear Inverse	2 = Without	
	C = 800A		3 = Logarithmic Inverse		
	D = 1200A				
	F = 1600A				
	G = 2000A				
	H = 2500A				
	J = 3000A				
	K = 3500A				
	M = 4000A				
	N = 5000A				
	P = 6000A				

Example: Part Number AFGF-3G112A = Overcurrent/Ground Fault Relay, for a 2000A switchgear/pressure switch, with solid state relay, standard GF Trip time delay, w/o interlock and the standard overcurrent trip curve.

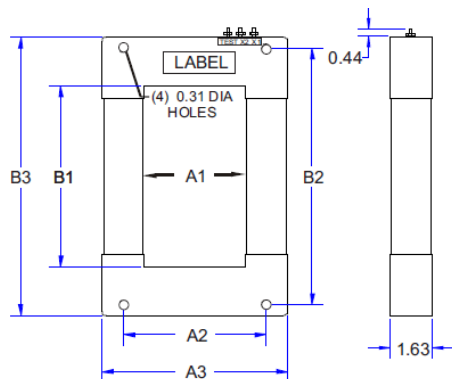
CT Selection/CT Requirements * The Switch Rating must match the sensors being used.

CT/Sensors are 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.

Other CT/Sensor configurations available, Contact Electromagnetic Industries for options.



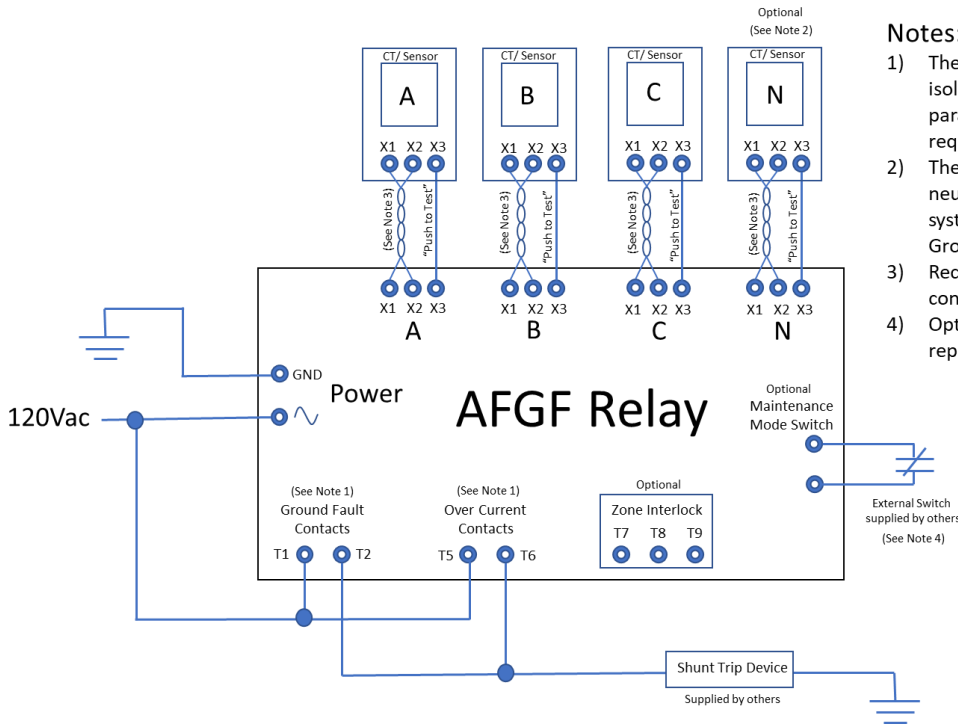
Switch Rating	Relay Series Number	CT Part Number	A1	B1	B2	C1	C2	D1
400	AFGF-3A- ---	194-162-1-T-3	2.50"	4.88"	N/A	3.50"	4.50"	2.19"
600	AFGF-3B- ---	194-242-1-T-3	2.50"	4.88"	N/A	3.50"	4.50"	2.19"
800	AFGF-3C- ---	100-322-1-T-3	4.00"	7.00"	5.60"	5.60"	7.00"	2.20"
1200	AFGF-3D- ---	100-482-1-T-3	4.00"	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-3C- ---	550T041X071-322-001T-3	4.10"	6.40"	7.30"	7.10"	10.0"	10.9"
1200	AFGF-3D- ---	550T041X071-482-001T-3	4.10"	6.40"	7.30"	7.10"	10.0"	10.9"
1600	AFGF-3F- ---	550T041X071-322-002T-3	4.10"	6.40"	7.30"	7.10"	10.0"	10.9"
2000	AFGF-3G- ---	550T041X071-402-001T-3	4.10"	6.40"	7.30"	7.10"	10.0"	10.9"
2500	AFGF-3H- ---	550T041X071-502-001T-3	4.10"	6.40"	7.30"	7.10"	10.0"	10.9"
3000	AFGF-3J- ---	550T058X071-602-001T-3	5.80"	7.00"	9.00"	7.10"	10.0"	10.9"
3500	AFGF-3K- ---	550T058X071-702-001T-3	5.80"	7.00"	9.00"	7.10"	10.0"	10.9"
4000	AFGF-3M- ---	550T080X117-802-001T-3	8.00"	9.50"	11.1"	11.7"	14.5"	17.9"
5000	AFGF-3N- ---	550T080X141-103-001T-3	8.00"	9.50"	11.1"	14.1"	17.0"	19.0"
6000	AFGF-3P- ---	550T080X141-123-001T-3	8.00"	9.50"	11.1"	14.1"	17.0"	19.0"



Typical Installation:



Notes:

- 1) The Ground Fault and Over Current contacts are isolated from each other internally. They are shown in parallel, but can be used for different devices if required.
- 2) The Neutral sensor is only required when there is a neutral present. Failure to install a Neutral sensor in systems with a Neutral buss will cause the relay to see Ground Faults when they may not be present.
- 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.

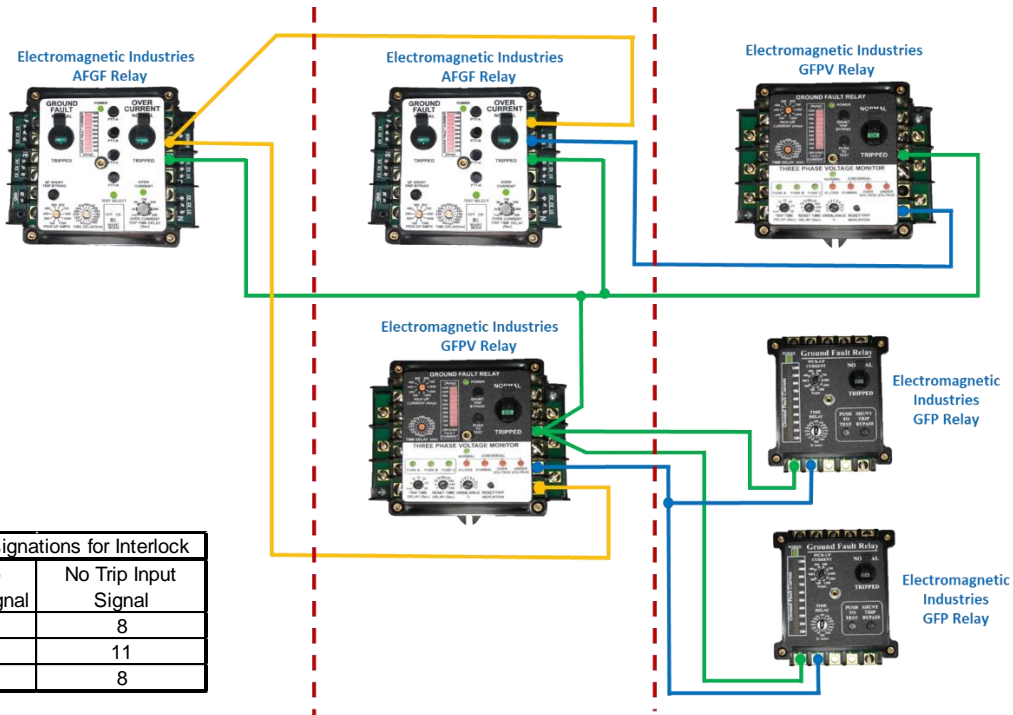
Ground Fault Relay Zone Interlock

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. (For typical operation, see page 7)

Zone 1 (Main)

Zone 2 (Feeders)

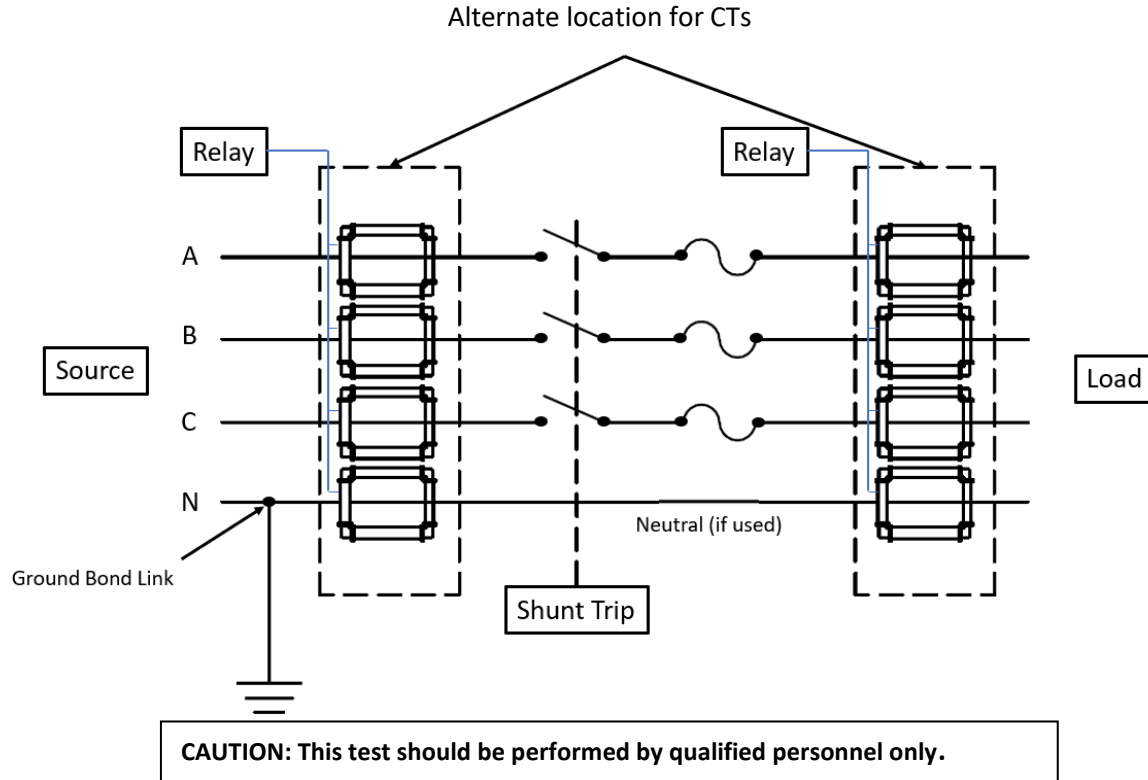
Zone 3 (Branches)



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



Typical Relay and CT Installation



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

1. De-energize equipment. (Disconnect Power)
2. Remove ground bond link
3. Using a megger, measure resistance of each phase and the neutral to ground. (In accordance with NEC requirements, the resistance should be 1 mega ohm.)
4. Reconnect bond link
5. Reconnect power and check power indication (LED)

To test the entire system (including the disconnect device):

Note: For testing the Ground fault section, perform steps 1 – 3. For testing the Overcurrent section, depress and hold the Test Select switch on the Relay while performing steps 1 – 3.

1. Verify control power LED indicator is illuminated.
2. Press the “Push to Test” pushbutton on the AFGF relay for the sensor being tested. (The trip indicator will go to the tripped position and the disconnect device will open)
3. Reset the relay and disconnect device.

To test the Ground Fault CT/Sensor and Relay only:

1. Verify control power LED indicator is illuminated.
2. Press and hold the “Shunt Trip Bypass” pushbutton on the AFGF relay.
3. Press the “Push to Test” pushbutton for the sensor being tested. (The Ground Fault Relay will trip)
4. Reset the relay, and then release the “Shunt Trip Bypass” pushbutton.



Zone 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 are to be used to a single output.

Relay Dimensions

