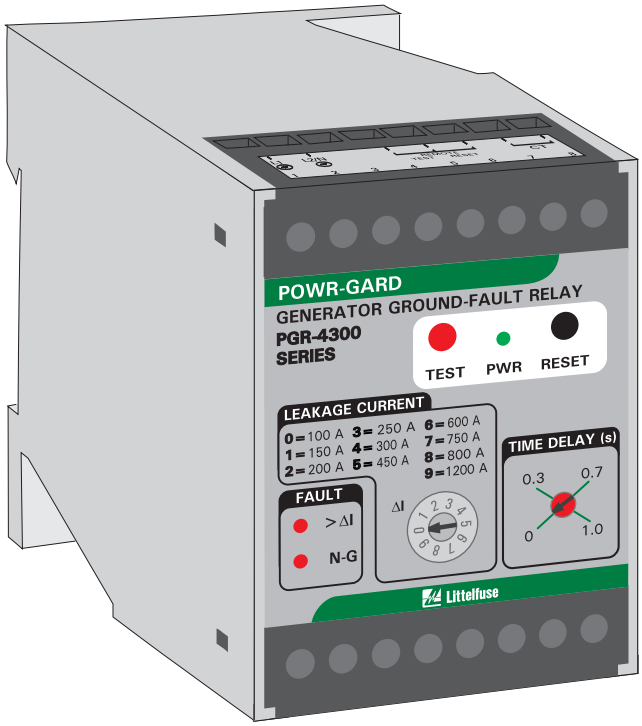
Littelfuse
Expertise Applied | Answers Delivered

Generator Ground-Fault Relay
PGR-4300

PGR-4300 MANUAL

GENERATOR GROUND-FAULT RELAY

REVISION 3-A-073115



Document Number: PM-1030-EN
Printed in Canada.

This page intentionally left blank.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

DISCLAIMER

Specifications are subject to change without notice. Littelfuse, Inc. is not liable for contingent or consequential damages, or for expenses sustained as a result of incorrect application, incorrect adjustment, or a malfunction.

This page intentionally left blank.

1. GENERAL

The PGR-4300 Generator Ground-Fault Relay provides a simple method for detecting a ground-fault condition on a generator-supplied system, without the need for a current transformer. It continuously monitors for ground-fault current and neutral-to-ground continuity. It can be applied on a three phase system with a three-pole or four-pole transfer switch and can be used in a dedicated generator application.

In a three-pole transfer-switch application, the generator neutral and system neutral are connected to ground at the service entrance. The connection between the generator neutral and service-entrance ground is assumed to have a resistance of 2 mΩ and voltage across this conductor is measured to calculate ground-fault current. See Fig. 2. The selection of a neutral-bonding conductor can be made using NEC 250.102(D) and 250.122, and calculating the conductor length needed for a 2 mΩ resistance.

In a four-pole transfer-switch application the ground connection to earth is at the generator. See Fig. 3. The resistance of the bonding cable between the generator neutral and ground is assumed to have a resistance of 0.2 mΩ. The voltage across this conductor is measured to calculate ground-fault current. A 0.9 m (3') length of AWG 3/0 copper cable is recommended per NEC 250.102(C).

In a dedicated generator application, to ensure proper operation of the PGR-4300 there can be only one ground connection to earth. If the earth connection is at the generator, configure the PGR-4300 as a four-pole system. If the earth connection is at the load or service entrance, configure as a three-pole system.

The PGR-4300 has one output relay with normally open / normally closed contacts for use in a control circuit. Additional features include LED trip and power indication, front-panel and remote reset, 0- to 1-mA analog output, a level-selector switch, and a trip-time setting.

An epoxy-filled enclosure provides the PGR-4300 protection against vibration.

The trip level of the ground-fault circuit is switch selectable from 100 to 1,200 A. Trip time is selectable from 0 to 1.0 s.

2. OPERATION

2.1 SYSTEM SELECTION

For a four-pole system, connect terminals 11 and 12. For a three-pole system, leave terminals 11 and 12 open.

2.2 FRONT-PANEL CONTROLS

2.2.1 GROUND-FAULT TRIP LEVEL

The ΔI selector switch is used to set the ground-fault trip level from 100 to 1,200 A. Unbalanced single-phase currents returning through the bonding conductor will appear as ground-fault current. To avoid nuisance tripping, set the trip-level setting above these currents.

2.2.2 GROUND-FAULT TRIP TIME

The PGR-4300 has a definite-time trip characteristic. In tripping systems, the TIME DELAY selector is used to set the ground-fault trip time for coordination with downstream ground-fault devices. Trip time is selectable from 0 to 1.0 s. Coordination requires the same trip level for all ground-fault devices in a system and the trip time to progressively increase upstream. The amount of equipment removed from the system will be a minimum if the first ground-fault device to operate is the one immediately upstream from the fault.

2.2.3 RESET

The front-panel RESET button is used to reset latching trips. When remote-reset terminals 4 and 5 are connected, a trip remains latched until the RESET button is pressed or the remote-reset terminals are opened. Cycling the supply voltage will also reset the PGR-4300. If the remote-reset terminals are not connected, the PGR-4300 operates in the non-latching mode and a trip will reset when the fault is removed.

2.2.4 TEST

The TEST button is used to test the ground-fault circuit, the indication, and the output relay. When the TEST button is pressed, the circuit will trip, the >ΔI LED will light, the output relay will energize, and the analog output will indicate full scale (1 mA).

2.3 FRONT-PANEL INDICATION

2.3.1 POWER

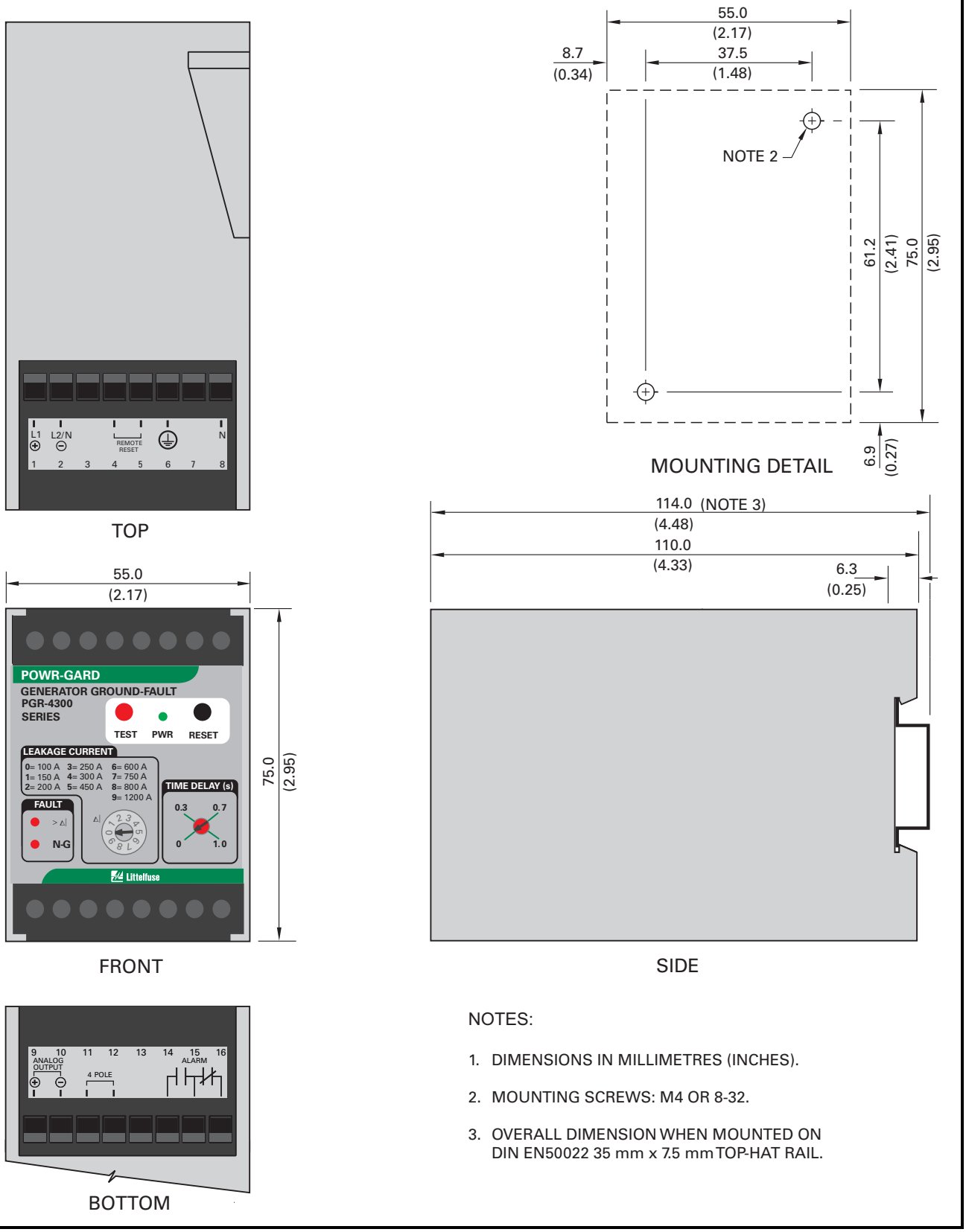
The green LED labelled PWR indicates the presence of supply voltage.

2.3.2 >ΔI

The red LED labelled >ΔI indicates a ground-fault trip. It also lights when the neutral connection is open.

2.3.3 N-G

The red LED labelled N-G indicates a neutral-to-ground trip. When continuity between the generator neutral and ground is broken, the N-G and >ΔI LED's will be on and the output relay will be energized.



NOTES:

1. DIMENSIONS IN MILLIMETRES (INCHES).
2. MOUNTING SCREWS: M4 OR 8-32.
3. OVERALL DIMENSION WHEN MOUNTED ON DIN EN50022 35 mm x 7.5 mm TOP-HAT RAIL.

FIGURE 1. PGR-4300 Outline and Mounting Details.

2.4 Analog Output

A non-isolated, 0- to 1-mA output (terminals 9 and 10) indicates ground-fault current. Full-scale corresponds to the ground-fault level setting. For example, if the ground-fault level setting is 300 A, then 1 mA output will be indicated when the measured current is 300 A. The output is linear between zero and full scale. See Figs. 2, 3 and 4 for PGA-0500 meter details.

2.5 Remote Reset

Terminals 4 and 5 are used for remote reset. A normally closed contact switch is required to configure the PGR-4300 for latching operation. See Section 2.2.3 and Figs. 2 and 3.

2.6 Relay Operating Mode

The output relay operates in the non-fail-safe mode only; it energizes when a trip occurs.

3. Installation

NOTE: Mounting, terminal block connections and wiring must conform to applicable local electrical codes. Check all applicable codes prior to installation.

This ground-fault monitoring system consists of a PGR-4300 Generator Ground-Fault Relay connected as shown in Figs. 2 and 3.

A PGR-4300 can be surface, DIN-rail, or panel mounted. Panel mounting requires a PMA-55 or PMA-60 Panel-Mount Adapter. See Figs. 1, 5, and 6.

Use terminal 1 (L1) as the line terminal on ac systems or the positive terminal on dc systems. Use terminal 2 (L2/N) as the neutral terminal on ac systems or the negative terminal on dc systems.

For a three-pole system, connect terminal 8 to the generator neutral, and terminal 6 to the local ground. See Fig. 2.

For a four-pole system, connect terminals 11 and 12, connect terminal 8 to the generator neutral, and terminal 6 to the ground side of the bonding conductor. See Fig. 3.

Use AWG 14 wire to make connections from the PGR-4300 to the bonding conductor, neutral and ground.

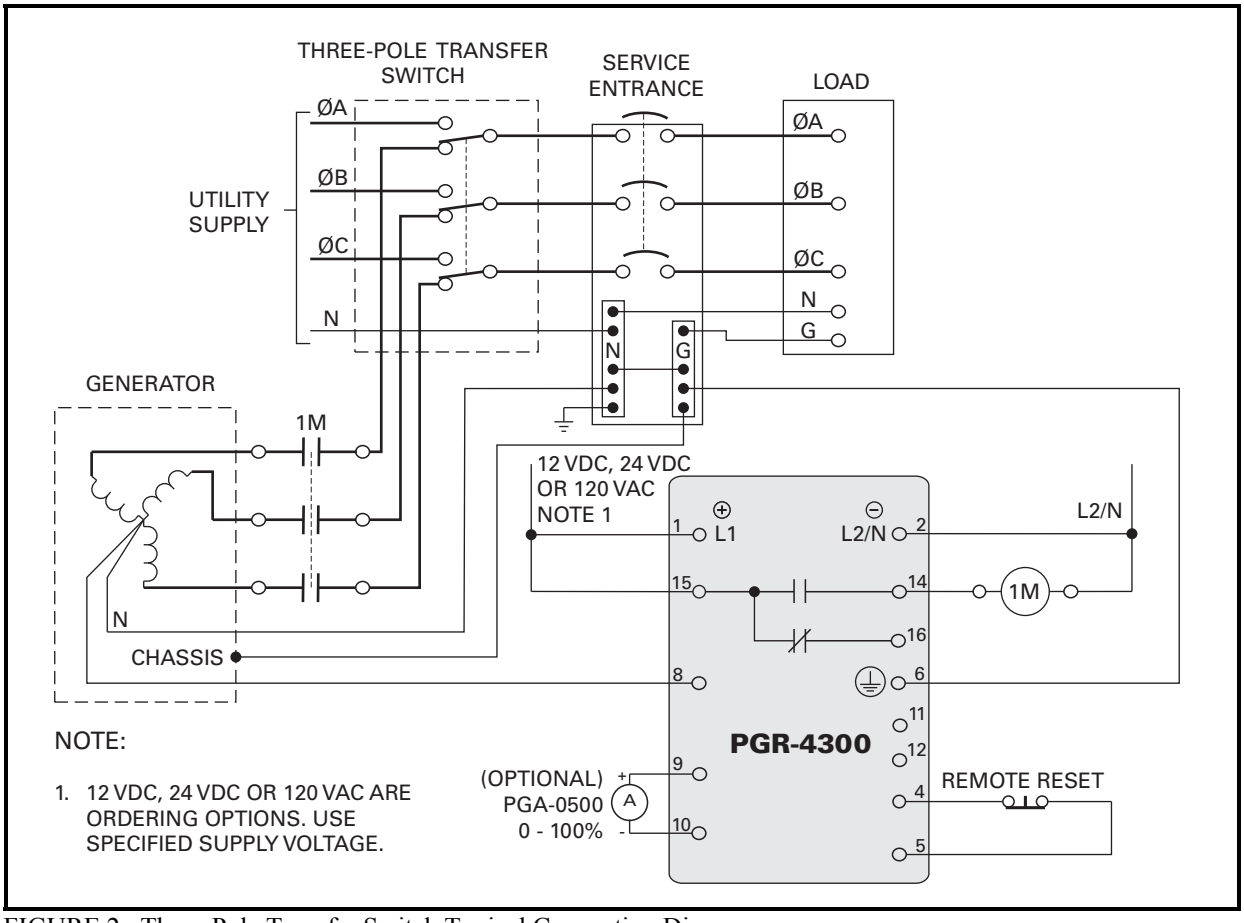


FIGURE 2. Three-Pole Transfer Switch Typical Connection Diagram.

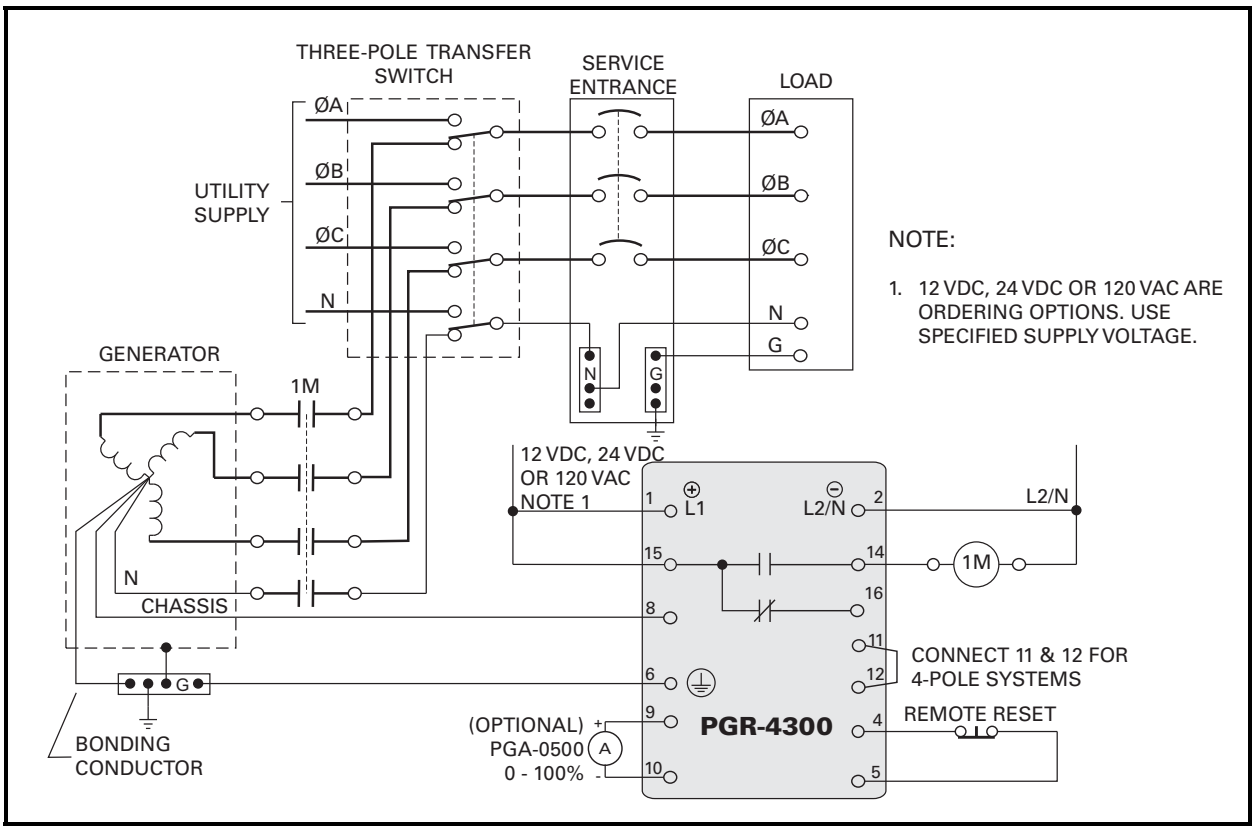


FIGURE 3. Four-Pole Transfer Switch Typical Connection Diagram.

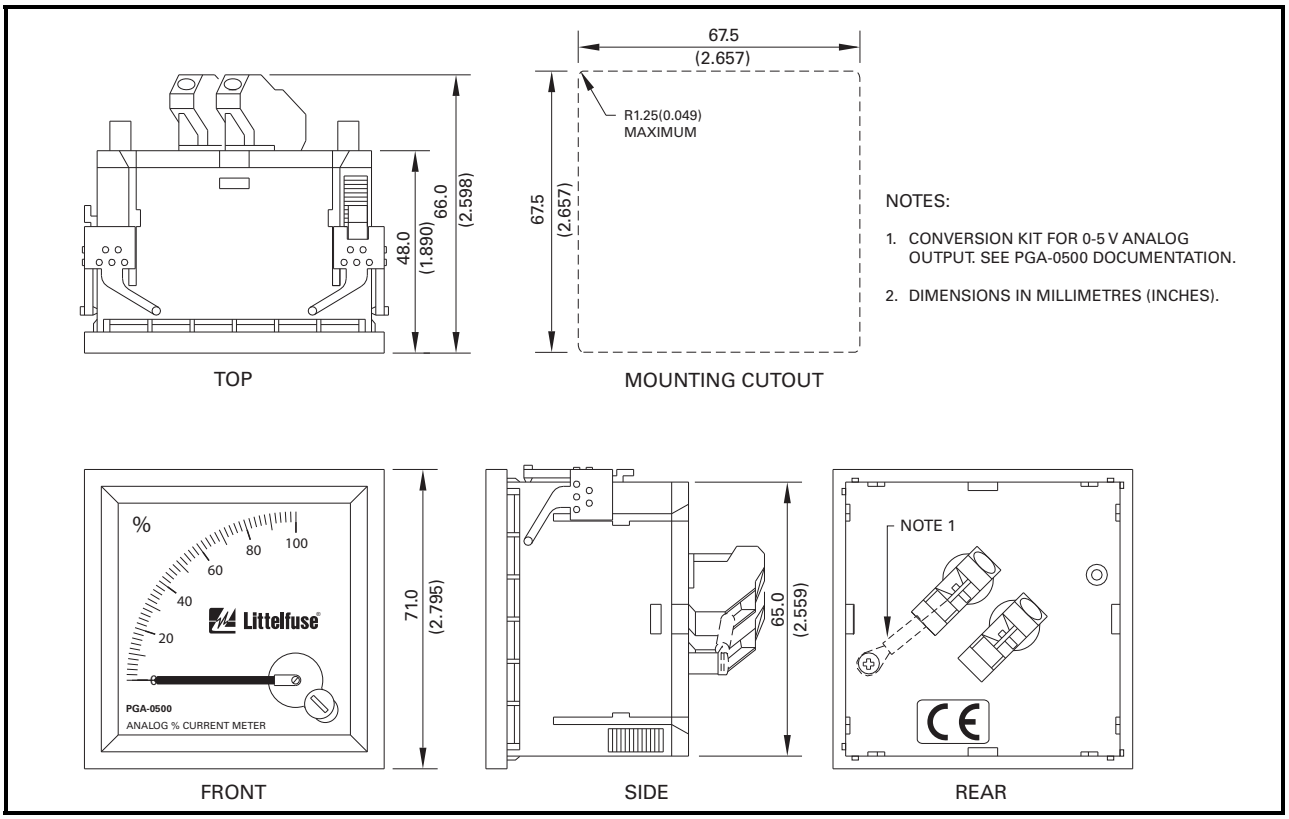
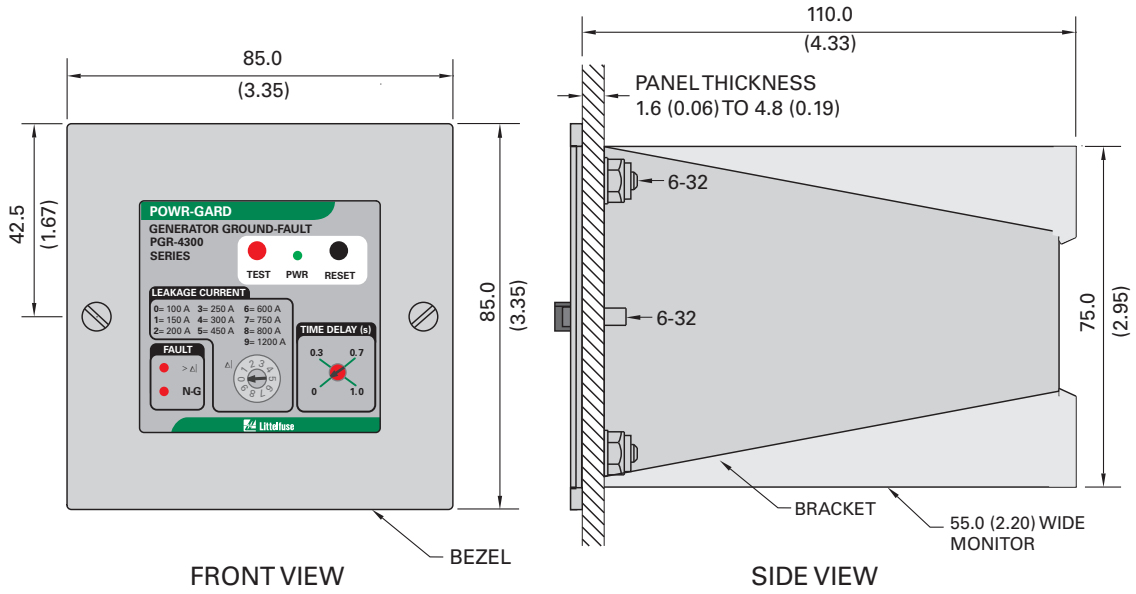
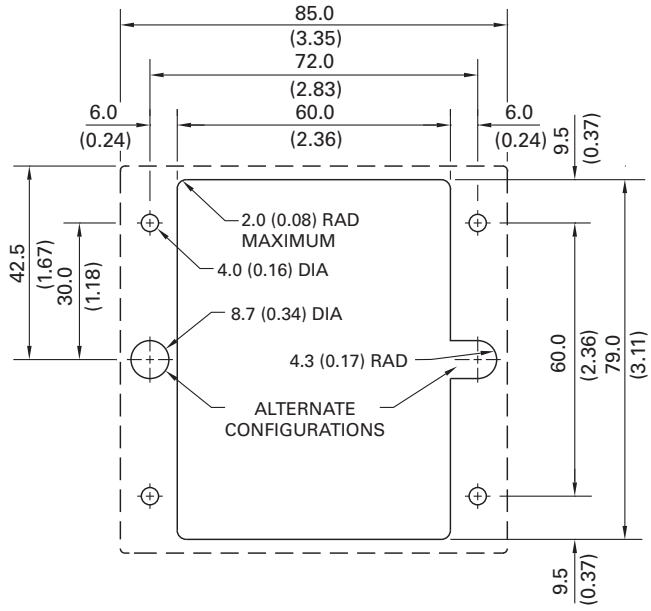


FIGURE 4. PGA-0500 Analog Percent Current Meter.





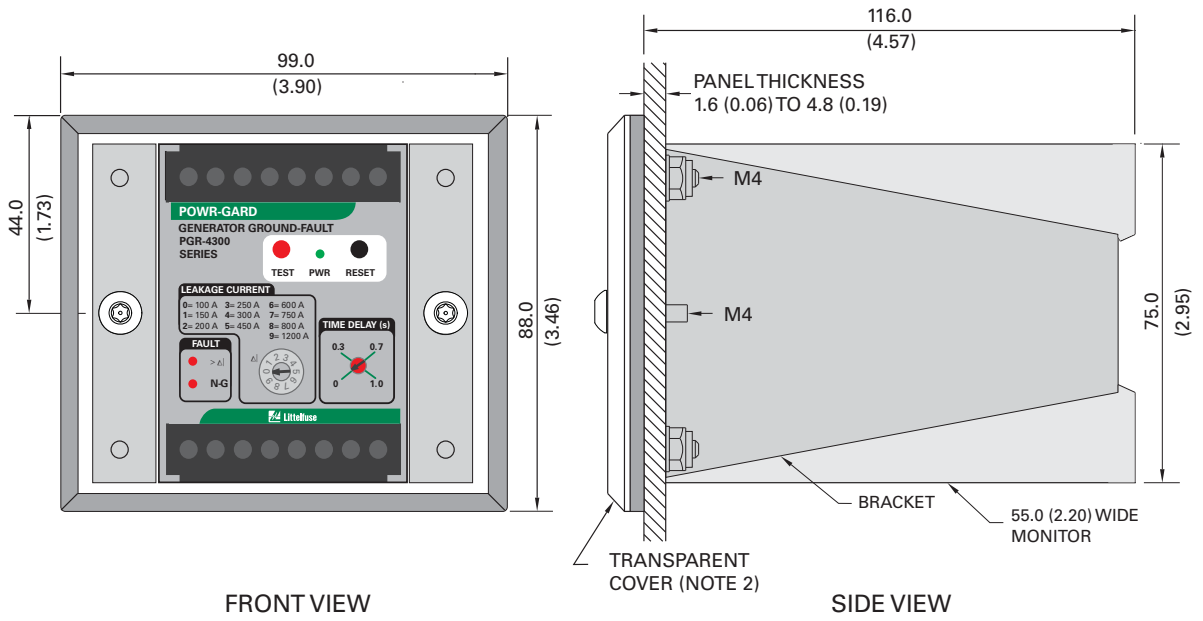
INSTALLATION INSTRUCTIONS:

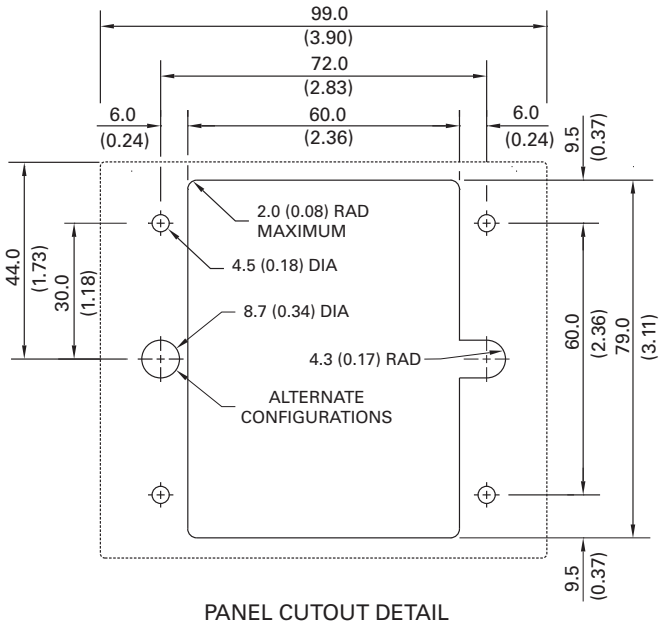
1. REMOVE BEZEL AND LATCH RELAY ON BRACKET.
2. INSERT BRACKET THROUGH FRONT OF PANEL CUTOUT AND SECURE WITH FLAT WASHERS AND LOCKNUTS PROVIDED.
3. CONNECT WIRING TO TERMINALS.
4. INSTALL BEZEL USING 6-32 x 0.31 SCREWS PROVIDED.

NOTE:

1. DIMENSIONS IN MILLIMETRES (INCHES).

FIGURE 5. PMA-55 Panel-Mount Adapter.





INSTALLATION INSTRUCTIONS:

1. WITH COVER REMOVED LATCH RELAY TO BRACKET.
2. INSERT BRACKET THROUGH FRONT OF PANEL CUTOUT AND SECURE WITH FLAT WASHERS AND LOCKNUTS PROVIDED.
3. CONNECT WIRING TO TERMINALS.
4. ATTACH COVER USING SECURITY SCREWS OR THUMB SCREWS PROVIDED.

NOTES:

1. DIMENSIONS IN MILLIMETRES (INCHES).
2. MEETS NEMA3, IP53.
3. INCLUDES TWO TR20 TAMPER-RESISTANT TORX SCREWS (M4-0.7x16 mm, INSTALLED) AND TWO THUMB SCREWS.

FIGURE 6. PMA-60 Panel-Mount Adapter.

4. TECHNICAL SPECIFICATIONS

Supply:
- 12 Option .....3 W, 12 Vdc, (+16, -25%)
- 24 Option .....3 W, 24 Vdc, (+37, -25%)
- 120 Option .....4 VA, 120 Vac, (+10, -15%) 50/60 Hz

Trip-Level Settings.....100, 150, 200, 250, 300, 450, 600, 750, 800, and 1,200 A

Trip-Time Settings.....0 to 1.0 s

Accuracies:
- Trip Level[1] .....±10%
- Trip Time[2] .....10% of Setting, 40 ms minimum

Analog Output:
- Mode .....% of Trip Level
- Range .....0 to 1 mA dc

Reset.....Front-Panel Button, Remote Momentary Open Contact

Test.....Front-Panel Button

Output Relay:
- Contact Configuration .....Form C
- Operating Mode.....Non-Fail-Safe
- UL rating.....5 A, 125 Vac Resistive
- Supplemental Contact Ratings:
  - Carry Continuous .....5 A

Trip Mode .....Latching or Autoreset

Terminals .....Wire Clamping, 22 to 12 AWG (0.3 to 3.3 mm^2) Conductors
- Tightening Torque .....0.40 N-m (3.54 in-lb)

Vibration Protection .....Fibreglass-reinforced Epoxy

Dimensions:
- Height.....75 mm (3.0”)
- Width .....55 mm (2.2”)
- Depth.....115 mm (4.5”)

Shipping Weight.....0.45 kg (1 lb)

Environment:
- Operating Temperature.....-10 to 60°C (14 to 140°F)
- Storage Temperature .....-40 to 80°C (-40 to 176°F)
- Humidity .....85% Non-Condensing

Certification .....UL Listed

c UL us LISTED SWITCHES, IND CONT 19PF NRNT, NRNT7, E183688

UL508 Industrial Control Equipment

FCC

NOTES:
(1) Based on generator-neutral to service-entrance conductor resistance of 2 mΩ (three-pole transfer-switch application) or 0.2 mΩ (four-pole transfer-switch application).
(2) At 3x trip-level setting.

5. ORDERING INFORMATION

PGR-4300- □

- 12 – 12-Vdc Supply
- 24 – 24-Vdc Supply
- 120 – 120-Vac Supply

PGA-0500.....Analog Percent Current Meter
PMA-55 .....Panel-Mount Adapter, NEMA 1
PMA-60 .....Panel-Mount Adapter, NEMA 3, IP53
PMA-03 .....Adapter Plate, GEC/MCGG
Consult factory for custom mounting adapters.

6. WARRANTY

The PGR-4300 Generator Ground-Fault Relay is warranted to be free from defects in material and workmanship for a period of five years from the date of purchase.

Littelfuse will (at Littelfuse’s option) repair, replace, or refund the original purchase price of a PGR-4300 that is determined by Littelfuse to be defective if it is returned to Littelfuse, freight prepaid, within the warranty period. This warranty does not apply to repairs required as a result of misuse, negligence, an accident, improper installation, tampering, or insufficient care. Littelfuse does not warrant products repaired or modified by non-Littelfuse personnel.

7. PERFORMANCE TEST

Some jurisdictions require periodic ground-fault performance tests. A test record form is provided for recording the date and the result of the performance tests. The following ground-fault system tests are to be conducted by qualified personnel.

a) Evaluate the interconnected system in accordance with the overall equipment manufacturer's detailed instructions.

b) Press the TEST and RESET buttons to ensure the monitor is functioning properly.

c) Verify proper reaction of the device in response to a simulated ground-fault current. To simulate ground-fault current, set up a voltage-divider circuit as shown in Fig. 7.

   Select 9 kΩ for R_{TEST} resistance and do not connect terminals 11 and 12 for 3-pole systems.

   Select 99 kΩ for R_{TEST} resistance and connect terminals 11 and 12 for 4-pole systems.

   For each leakage current setting (0, 6, 9), verify that the unit trips at each V_{TEST} voltage shown within the selected trip time.

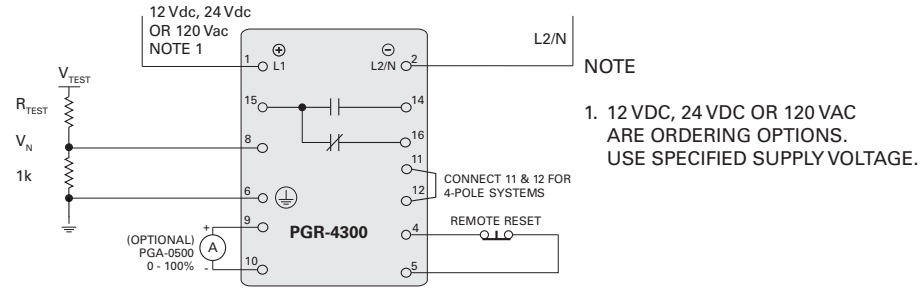
   Voltage V_N represents the voltage at terminal 8 if the actual leakage current was flowing through the bonding cable between the generator neutral and ground; See Section 1.

d) Record the date and the results of the test on the attached test-record form.

TABLE 1. Ground-Fault-Test Record

DATE	TEST RESULTS

Retain this record for the authority having jurisdiction.



	Setting	V_{TEST}	V_N
3-POLE (2 mΩ) R_{TEST} = 9 k	0 = 100 A	2 Vac	0.2 Vac
	6 = 600 A	12 Vac	1.2 Vac
	9 = 1200 A	24 Vac	2.4 Vac
4-POLE (0.2 mΩ) R_{TEST} = 99 k	0 = 100 A	2 Vac	0.02 Vac
	6 = 600 A	12 Vac	0.12 Vac
	9 = 1200 A	24 Vac	0.24 Vac

FIGURE 7. PGR-4300 Performance Test Circuit.

APPENDIX A
PGR-4300 REVISION HISTORY

MANUAL RELEASE DATE	MANUAL REVISION	PRODUCT REVISION (REVISION NUMBER ON PRODUCT LABEL)
July 31, 2015	3-A-073115	00

MANUAL REVISION HISTORY

REVISION 3-A-073115

SECTION 2

Fig. 1 updated.

SECTION 3

Fig. 6 updated.

SECTION 7

Fig. 7 updated.

APPENDIX A

Revision history added.

PRODUCT REVISION HISTORY

PRODUCT REVISION 00

UL Certification.

This page intentionally left blank.