

# Multilin DGPR



## Instruction Manual

GE publication code: 1601-0410-A2



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Multilin DGPR Instruction Manual using schematic GPRP000002.

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# DGPR

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# DGPR

## Chapter 1: Introduction

This chapter outlines safety and technical support information.

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### Safety symbols and definitions

Before attempting to install or use the device, review all safety indicators in this document to help prevent injury, equipment damage, or downtime.

The following safety and equipment symbols are used in this document.



Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



Indicates practices not related to personal injury.

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### For further assistance

For product support, contact the information and call center as follows:

GE Grid Solutions  
650 Markland Street  
Markham, Ontario  
Canada L6C 0M1  
Worldwide telephone: +1 905 927 7070  
Europe/Middle East/Africa telephone: +34 94 485 88 54  
North America toll-free: 1 800 547 8629  
Fax: +1 905 927 5098  
Worldwide e-mail: [multilin.tech@ge.com](mailto:multilin.tech@ge.com)

Europe e-mail: [multilin.tech.euro@ge.com](mailto:multilin.tech.euro@ge.com)

Website: <http://www.gegridsolutions.com/multilin>

# DGPR

## Chapter 2: Product description

This chapter outlines the product, order codes, and specifications.

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### Product description

The Multilin DGPR is a retrofit solution for the Digital Generator Protection (DGP) Relay. The DGPR is a one-to-one replacement of a DGP relay and includes a G60 Generator Protection System, which is part of the GE Universal Relay (UR) series of products.

The G60 is a microprocessor-based relay that measures generator conditions directly via CT and VT inputs and via other sources of information, such as analog, communication, and contact inputs. The G60 protects, controls, and monitors the operation of generators driven by steam, gas, or hydraulic turbine.

One of the benefits of the DGPR is ease of wiring. Simply disconnect the wires from the back of the DGP and connect them to the back of the DGPR.

**Figure 1: DGP (left) replaced by DGPR (right)**



The DGPR solution includes

- G60 relay with redundant power supply
- Five test switches for CT, VT, Trip, and DC circuit isolation on the front of the unit
- Eight 14-pin terminal blocks at the back of the unit to replicate DGP terminals

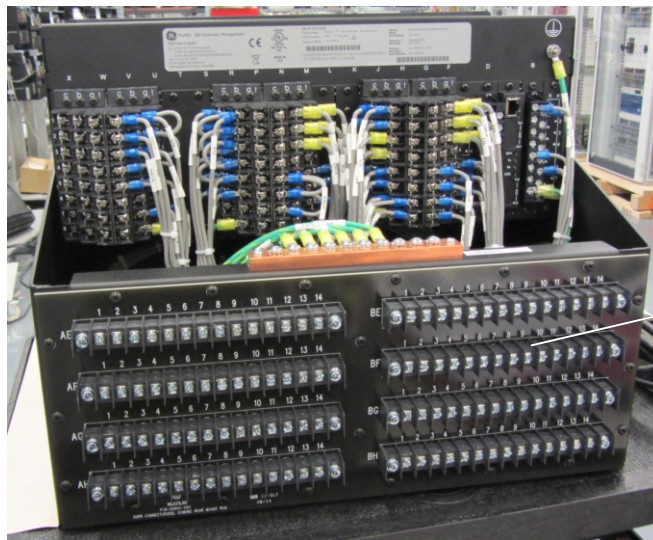
The DGPR is pre-wired for all connections between the G60, test switches, and terminal blocks.

Figure 2: Front of DGPR



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Figure 3: Back of DGPR



14-pin terminal blocks

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The following items are included in the DGPR package:

- DGPR unit
- DGPR instruction manual
- DGPR schematic drawing (GPRP000002)
- DGP settings as installed, converted and installed on G60 (optional item)

In addition to the DGP, the following devices and functionalities can be integrated in the DGPR unit as optional features:

- Backup 21/78 (LPS-O)
- 50RE
- 50/62 BF



## Order codes

This section lists the order codes for the Multilin DGPR.

The G60 order code provided in the package is

G60-UA4-HKH-F8M-H6P-M8M-P6M-U6C-WRH

For more information, see the Order Codes section in the G60 instruction manual.

Order codes are subject to change without notice. See the ordering page at <https://store.gegridsolutions.com/> for the latest options.

Table 1 outlines order codes. As an example, with DGPR-S-D1-RE0-BF0-GS1-DS0-RES0-BFS0-DWG0-GPM0-64S0, the D1 option means that a Line Protection System (LPS-O) cover plate is included, while the GS1 options means that DGP settings are to be converted to the G60 settings. That is, GE converts DGP settings and uploads them to the G60. The LPS-O cover plate is mounted in the replacement of the LPS-O unit when it is removed from the panel.

**Table 1: DGPR order codes**

DGPR	-	*	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	
DGPR	S																				Standard with G60
	C																				Custom with G60 order code specified
21/78 (LPS-O) Integration		D0																			None
		D1																			3 RU cover plate for LPS-O
50RE Integration			RE0																		None
			RE1																		Cover plate for 50RE relay
50/62BF Integration				BF0																	None
				BF1																	Cover plate for 50/62 BF relay
DGP to G60 Setting conversion					GS0																None
					GS1																DGPR settings required, converted from original DGP settings
21/78 to G60 Setting conversion						DS0															None
						DS1															21/78 as installed settings to be integrated with G60 settings
50RE to G60 Setting conversion							RES0														None
							RES1														50RE as installed settings to be integrated with G60 settings
50/62BF to G60 Setting conversion								BFS0													None
								BFS1													50/62 BF as installed settings to be integrated with G60 settings
GPP Drawing update									DWG0												None
									DWG1												Generator protection panel (GPP) and layout drawings update for DGPR replacement
GPM-S Option										GPM0											None
										GPM1											GPM-S (GPMMSG + GPMSSB + 204-SD-43737 CT) to be included as ship loose items
64S Settings											64S0										None
											64S1										64S settings to be integrated with G60 settings

## Specifications

Specifications are subject to change without notice.

### G60 CONTROL POWER

high range 125 to 250 V AC/DC                      300 V = Max 10 mA

low range 24 to 48 V DC                                      300 V = Max 10 mA

### CT INPUTS-SECONDARY RATING

\_\_\_\_\_/5A

\_\_\_\_\_/1A

CT MODULES WITH SENSITIVE GROUND

**APPROVALS**

<b>Compliance</b>	<b>Applicable council directive</b>	<b>According to</b>
CE	Low voltage directive	EN 60255-5
		EN 60255-27
	EMC directive	IEC 60255-26
		IEC/TS 61000-6-5
C-UL-US	---	UL 508
		C22.2 No. 14-13

# DGPR

## Chapter 3: Installation

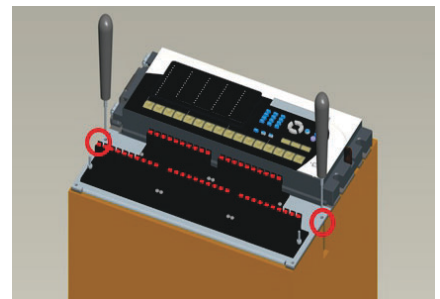
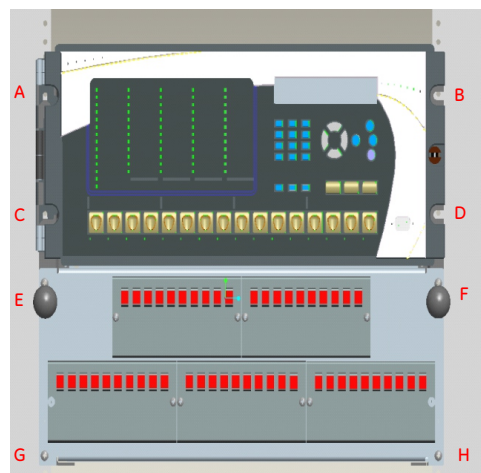
This chapter outlines installation of hardware and software.

### Unpack and inspect

Two people are required to unpack, lift, and place the unit.

1. Before removing the DGPR unit from the shipping carton, screw the installation tools provided into threaded holes E and F on the front of the unit, as shown.

Figure 4: Screw installation tools into holes E and F



2. Lift and place the unit on a bench in a standing position. Do not lay the unit on the back terminal blocks.

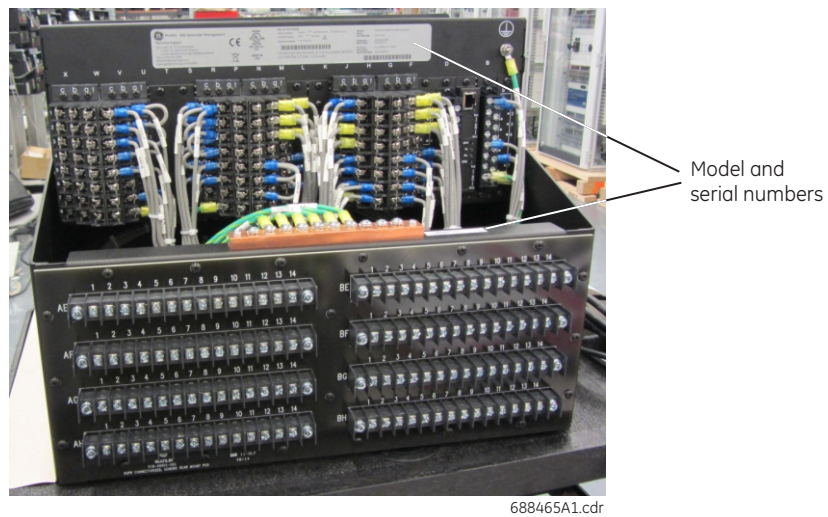
### **NOTICE**

Laying the unit on the back terminal blocks can break the insulators.

3. Leave the installation tools inserted in the holes. They are required to mount the unit in the rack.

4. Check that the following items have been delivered:
  - DGPR unit
  - Lexan cover
  - Multilin DGPR Instruction Manual
  - Schematic drawings
  - Mounting instructions with installation tools and screws
  - Certificate of Calibration
  - Test Report
  - EC Declaration of Conformity
5. Inspect the unit for physical damage.
6. Check the G60 and DGPR nameplates on the back of the unit, as shown in the figure, to verify that the correct models have been delivered.

**Figure 5: G60 and DGPR nameplates**



7. For any issues, contact GE Grid Solutions as outlined in the [For further assistance](#) section on page 1.
8. Obtain the G60 instruction manual from <https://www.gegridsolutions.com/multilin/manuals/index.htm>

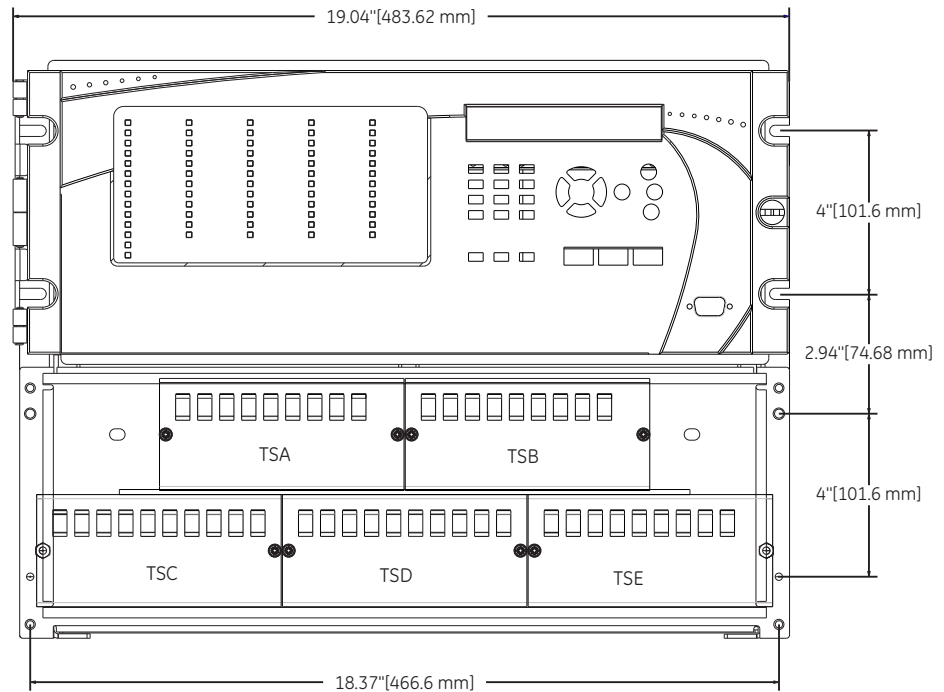
The warranty is included at the end of this instruction manual and on the GE Grid Solutions website.

Any updates to the DGPR instruction manual are at <https://www.gegridsolutions.com/app/viewfiles.aspx?prod=pkgsol&type=3>

## Dimensions

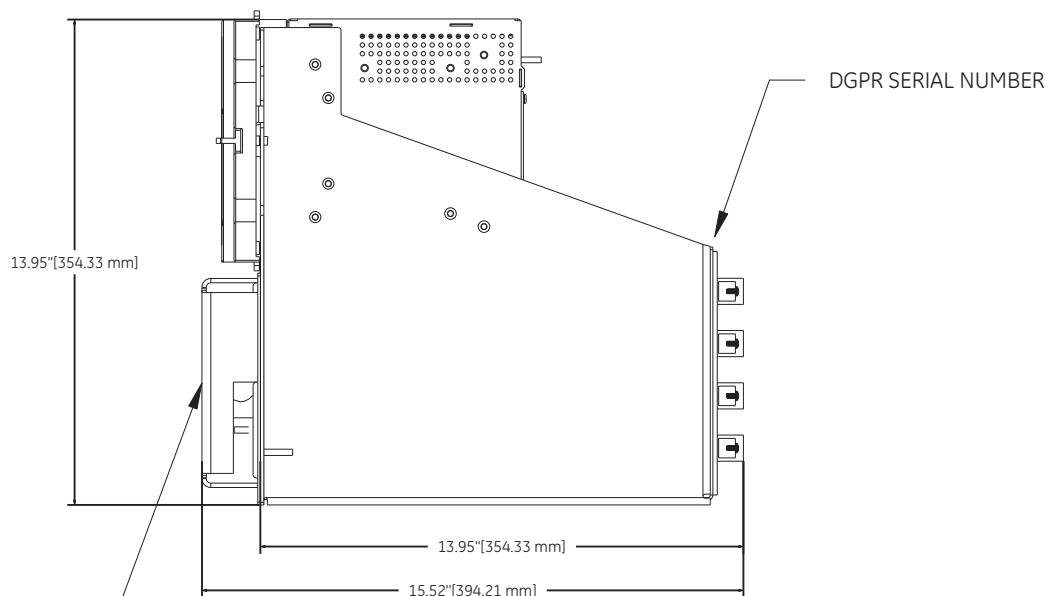
The DGPR dimensions are 14" (height) × 19" (width) × 14" (depth). The following figures show the front, side, rear, and dimensions of the DGPR and G60.

**Figure 6: Front view and dimensions**



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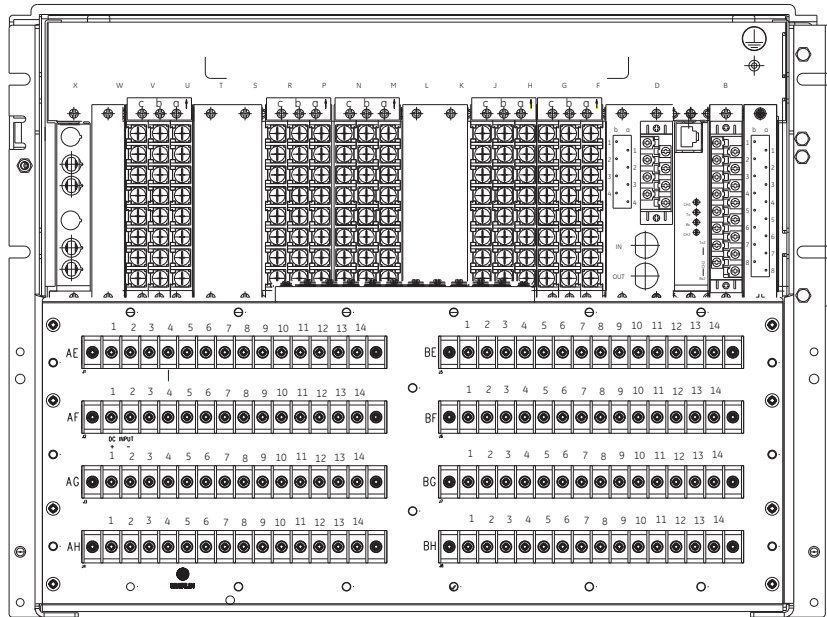
**Figure 7: Right side view and dimensions**



LEXAN 19" FT UNIVERSAL COVER

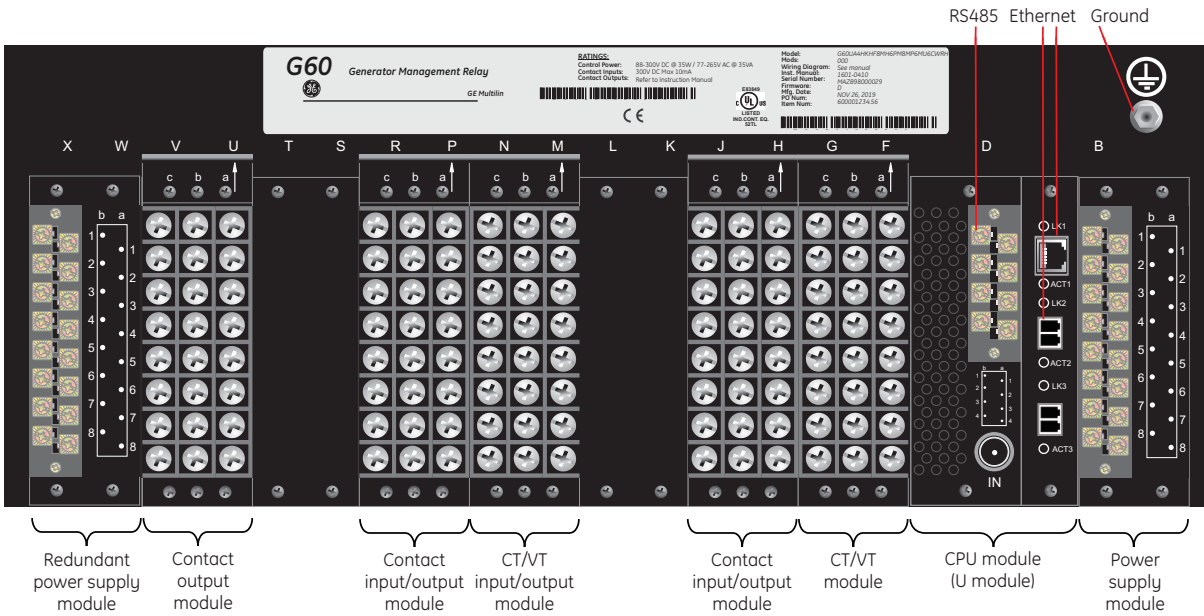
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Figure 8: Rear view



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Figure 9: G60 rear view



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## Wiring

Figure 10 is the DGPR G60 wiring diagram.

DGPR design (drawing GPRP000002) is the same as DGP, which means that field wires are to be disconnected from the DGP and then connected to the same terminal blocks at the back of DGPR, except for the power supply alarm connections. See DGPR drawing GPRP000002 for details.

Figures 11 and 12 show DGPR AC and DC schematics.

Figure 10: DGPR G60 wiring diagram (drawing GPRP000002)

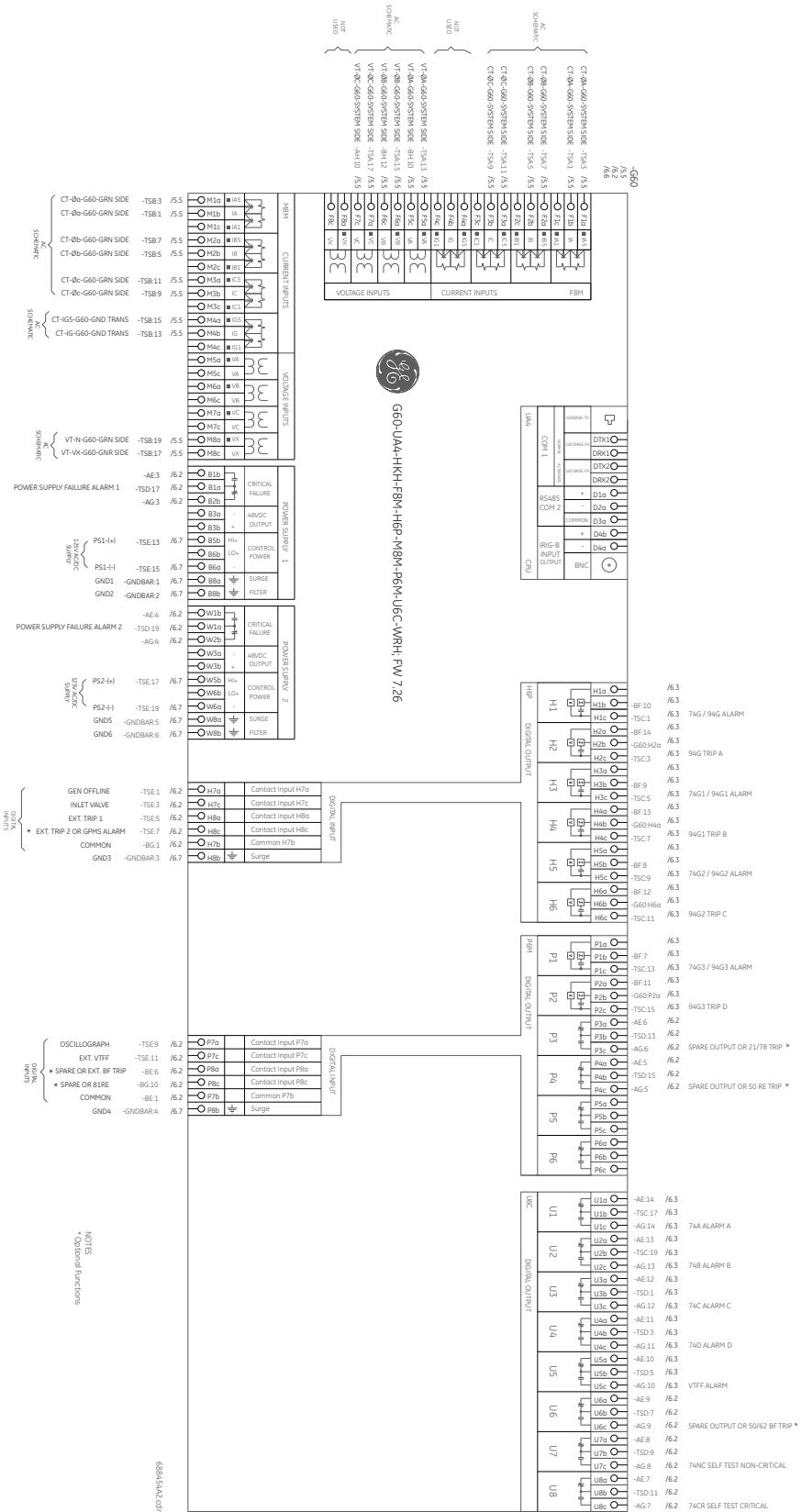
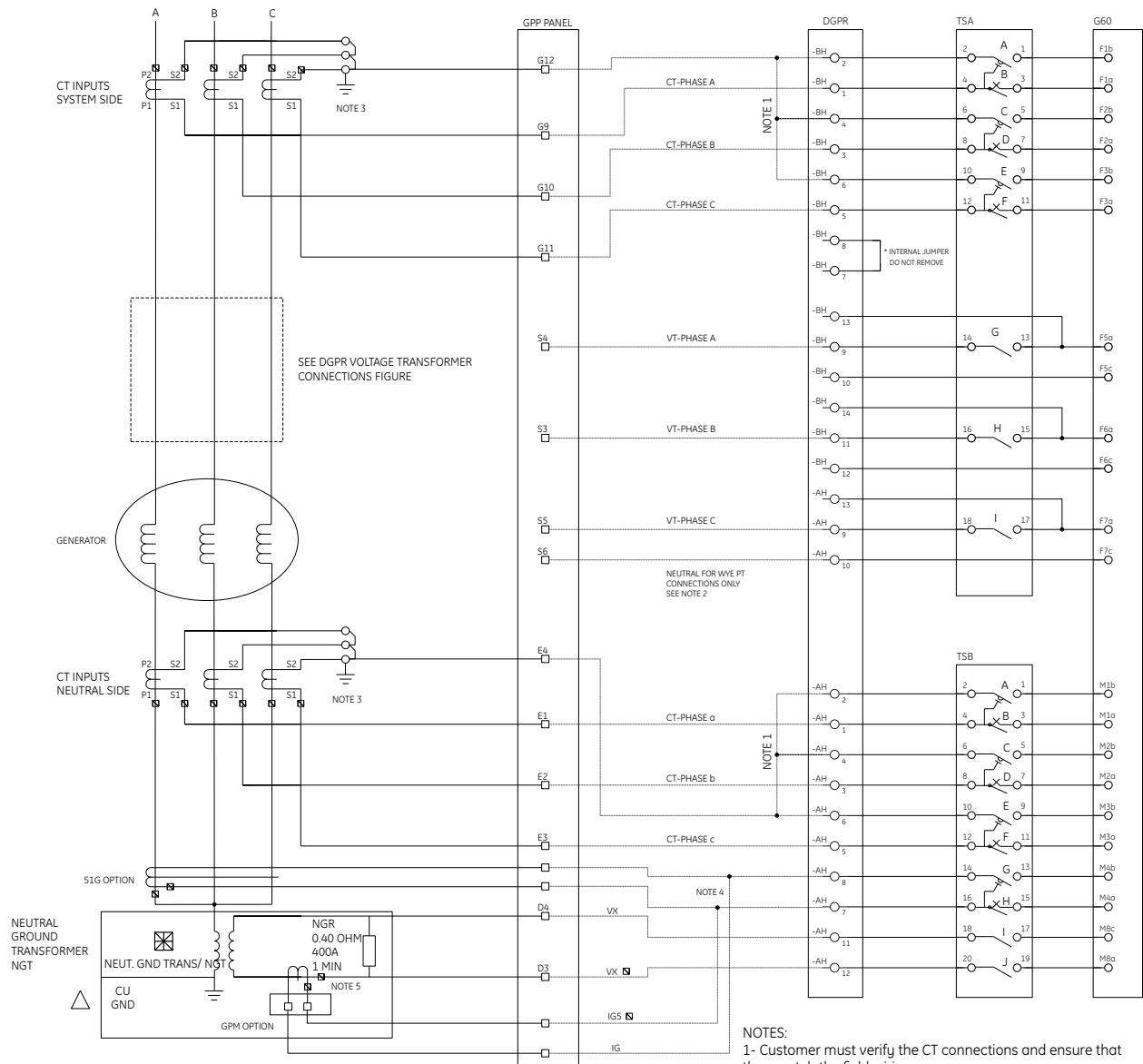




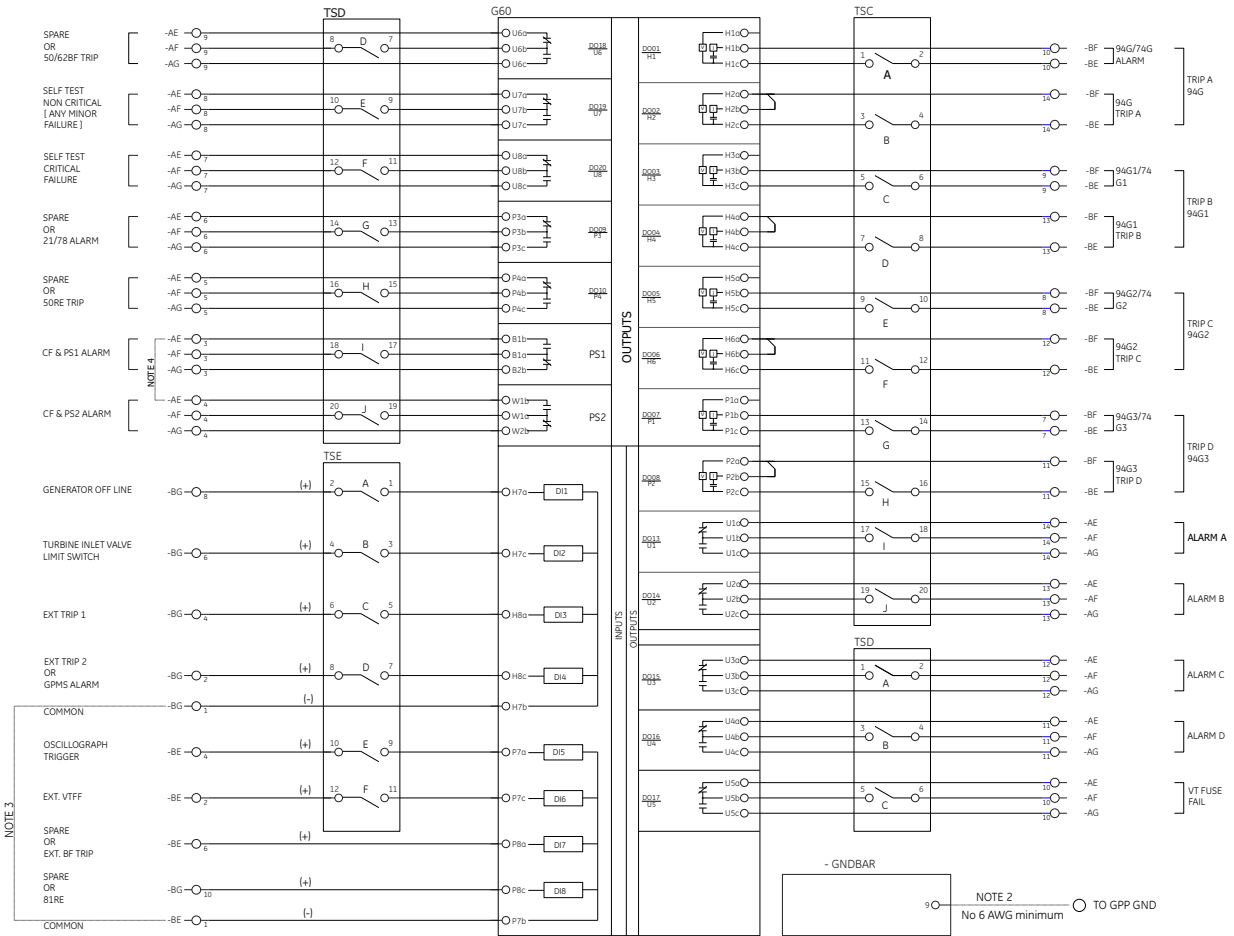
Figure 11: DGPR AC schematic (drawing GPRP000002)



- NOTES:
- 1- Customer must verify the CT connections and ensure that they match the field wiring.
  - 2- VT jumpers will be installed by the customer in DGPR terminal blocks based on VT connection type (see DGPR Voltage Transformer Connections figure).
  - 3- CTs and PTs shall be grounded at the field side.
  - 4- DGPR can be connected to 51G or GPM.
  - 5- Customer must verify the polarity of GND CT.

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Figure 12: DGPR DC schematic (drawing GPRP000002)



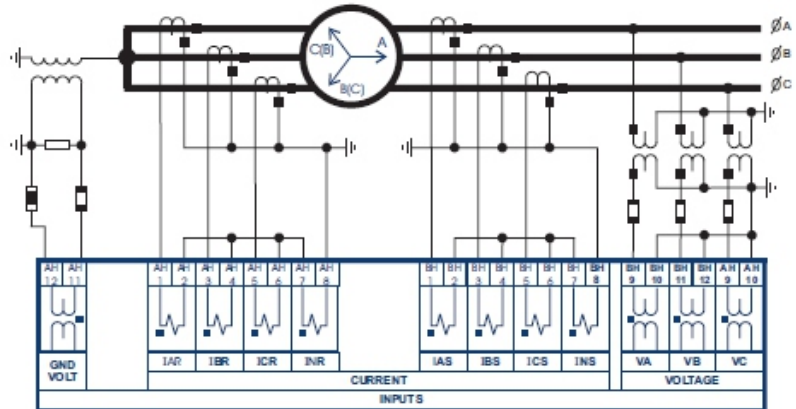
- NOTES:
- 1- The relay power supply contacts are shown in de-energize status.
  - 2- The DGPR ground bar should be connected directly to GPP ground bar.  
Minimum size recommended for the grounding connector is 6 AWG.
  - 3- The common returns must be connected to NEGATIVE (-) side of power source.
  - 4- The power supply jumpers will be installed by the customer in the DGPR TB if it is required.  
Refer to DGPR-Instruction Manual chapter 3 (Connect the power supply).
  - 5- For additional information refer to DGPR-Instruction Manual.

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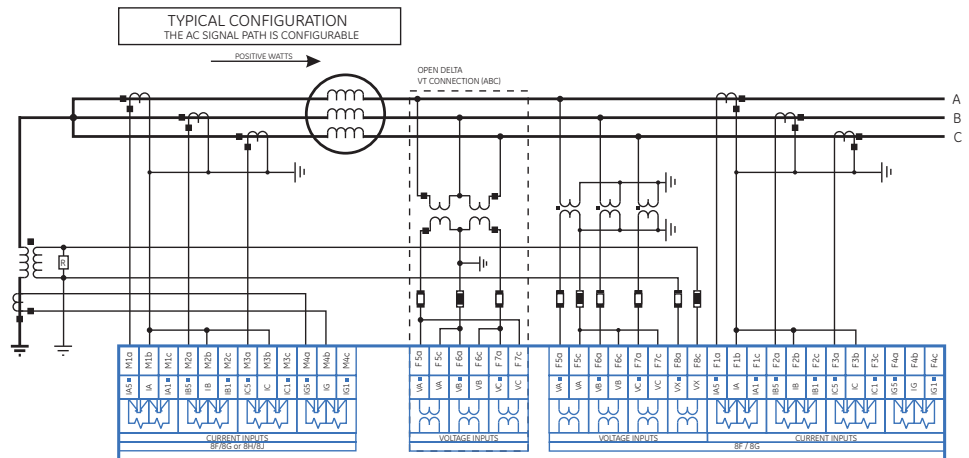
## Difference between CT connections of DGP and DGPR

Although the DGPR is a retrofit solution for the DGP and the attempt was made to maintain as much similarity as possible, there are some differences. Figure 13 shows the difference in the CT connections.

Figure 13: Typical CT connections



Typical DGP connection

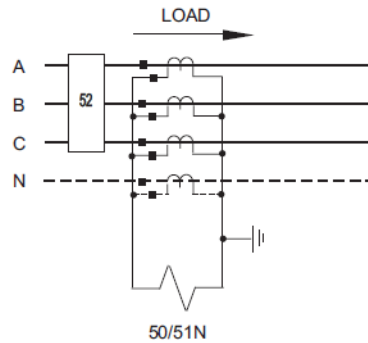


Typical G60 (DGPR) connection

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DGPR and DGP use residual connections. DGP uses a hard-wire approach to sum all of the current in INS or INR, while the 51N element in the DGPR is connected in the common neutral connection of the current transformer, which is the most common connection arrangement. On four-wire circuits, the fourth current transformer is connected in the neutral circuit, shown with a dotted line in the Figure 14.

Figure 14: DGP 50/51N element

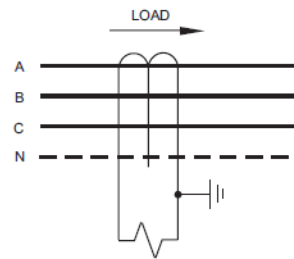


The protection response to the residual current is

$$I_n = 3I_0 = I_a + I_b + I_c \tag{Eq. 1}$$

For those models that uses Core Balance (Zero Sequence) CT only in the DGP relay, where the conductor cables pass through the center hole of the core balance CT (Figure 15), the GE application team can verify customer requirements and modify the default configuration of the DGPR. This type of connection is considered a custom order.

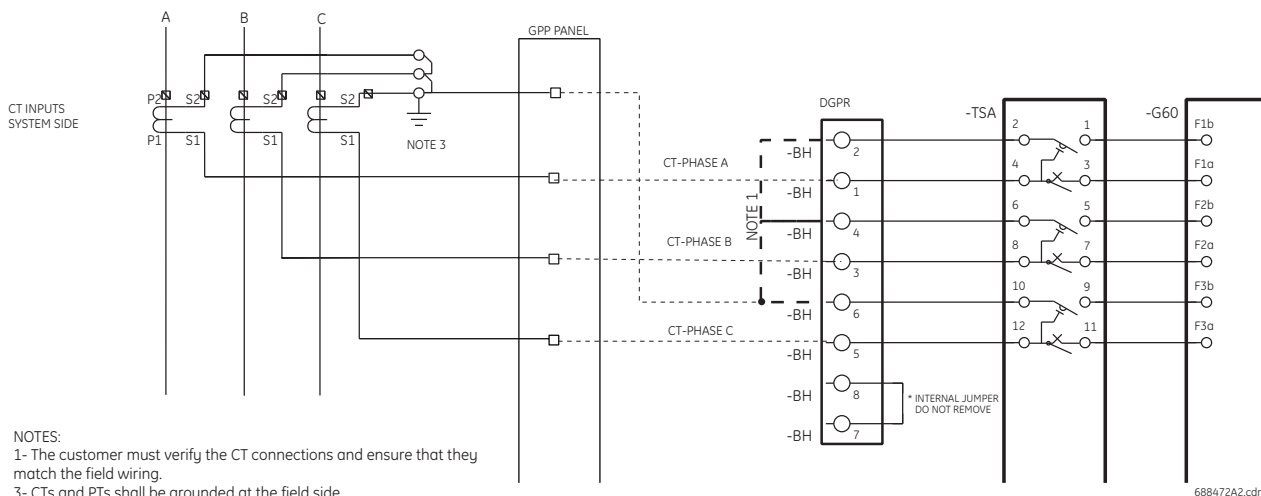
Figure 15: Custom configuration



### CT inputs system side

Figure 16 shows DGPR CT connections for the system side. BH1, BH3, and BH5 are for current inputs, while BH2, BH4, and BH6 are for common return. BH7 and BH8 are used for INS in the DGP, but they are not used in the DGPR.

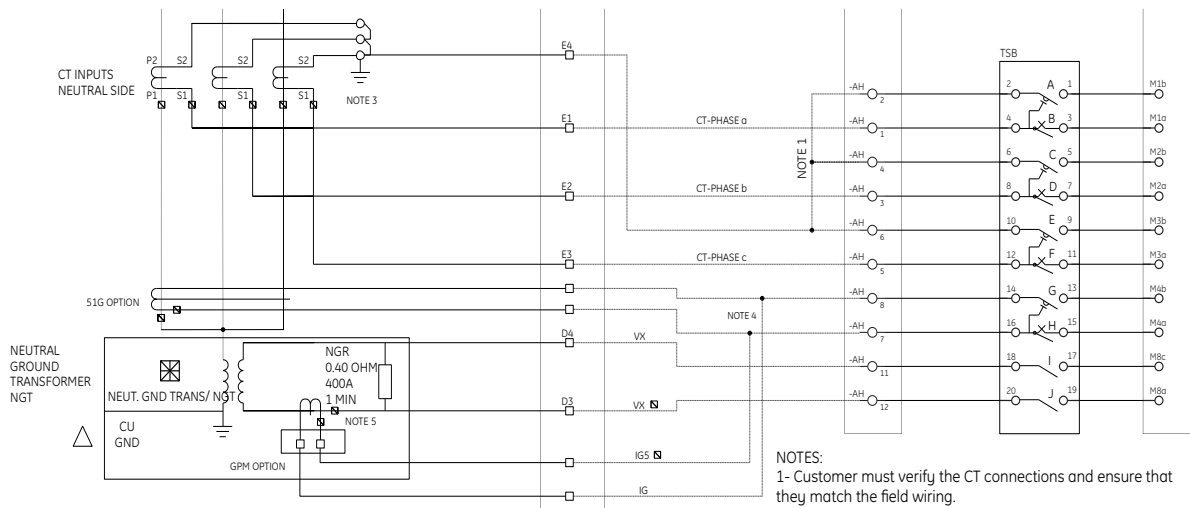
Figure 16: DGPR CT connections system side (drawing GPRP000002)



## CT inputs neutral side

Figure 17 shows DGPR CT connections for the neutral side. AH1, AH3, and AH5 are for current inputs, while AH2, AH4, and AH6 are for common return. AH7 and AH8 are used for INR in the DGP, but they are used for 51G or GPM connection in the DGPR.

**Figure 17: DGPR CT connections neutral side (drawing GPR000002)**



- NOTES:
- 1- Customer must verify the CT connections and ensure that they match the field wiring.
  - 2- VT jumpers will be installed by the customer in DGPR terminal blocks based on VT connection type (see DGPR Voltage Transformer Connections figure).
  - 3- CTs and PTs shall be grounded at the field side.
  - 4- DGPR can be connected to 51G or GPM.
  - 5- Customer must verify the polarity of GND CT.

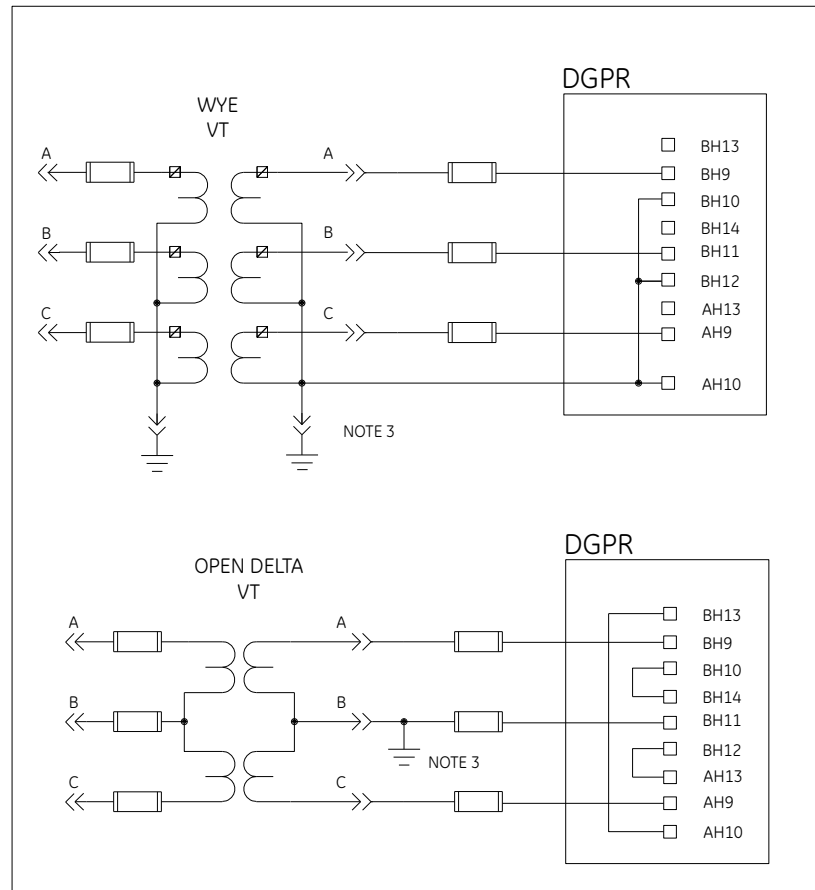
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## Voltage inputs

Figure 18 shows DGPR VT connections for WYE and Open Delta connected VTs. The DGPR phase voltage inputs and Vx are derived from the generator terminal voltage and generator neutral ground transformer, respectively.

The jumpers for both VT connection types are labeled and provided with the DGPR unit. Verify the VT connection type and fix the jumpers accordingly.

Figure 18: DGPR voltage transformer connections (drawing GPRP000002)



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## Digital inputs and outputs

### Inputs

Eight digital inputs, also referred to as contact inputs, can be connected to the DGPR.

- DI1 - Generator Offline
- DI2 - Turbine Inlet-valve-close indication
- DI3 - External Trip 1
- DI4 - External Trip 2 (or GPMS Alarm: Option)
- DI5 - Oscillography Trigger
- DI6 - External VTFF
- DI7 - Spare (or Ext. BF Trip: Option)
- DI8 - Spare (or 81RE: Option)

## Outputs

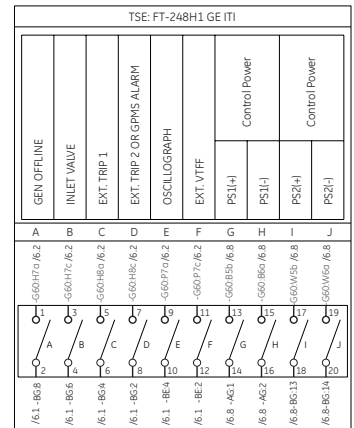
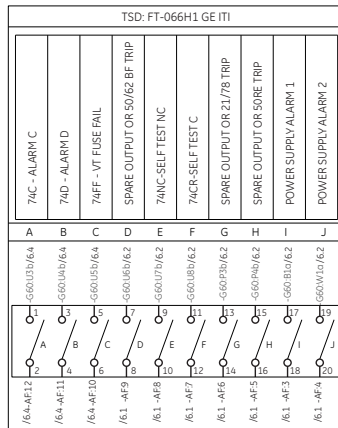
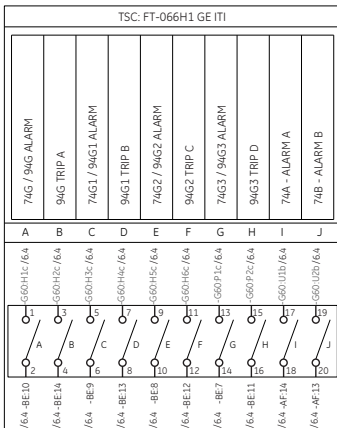
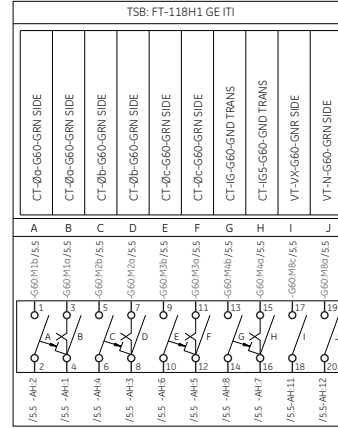
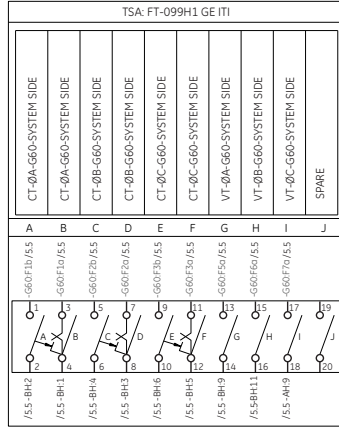
The DGPR has 18 digital outputs, also referred to as contact outputs.

- DO01 — Trip A (74G)
- DO02 — Trip A (94G)
- DO03 — Trip B (74G1)
- DO04 — Trip B (94G1)
- DO05 — Trip C (74G2)
- DO06 — Trip C (94G2)
- DO07 — Trip D (74G3)
- DO08 — Trip D (94G3)
- DO09 — Spare (or 21/78 Alarm: Option)
- DO10 — Spare (or 50RE Trip: Option)
- DO11 — Not used
- DO12 — Not used
- DO13 — Alarm A (74A)
- DO14 — Alarm B (74B)
- DO15 — Alarm C (74C)
- DO16 — Alarm D (74D)
- DO17 — VTFF (74FF)
- DO18 — Spare (or 50/62 BF Trip: Option)
- DO19 — Self-Test Non-Critical -Any Minor Failure (74NC)
- DO20 — Self-Test Critical Failure (74CR)

## Test switches

Figure 19 shows five FT test switches provided for trip, CT, VT, and DC isolation.

Figure 19: DGPR test switch configuration (drawing GPR000002)



688474A2.cdr



**Do not switch the test switches under load or similar conditions. Do not touch any open blade when the system is energized. Death or serious injury can result.**



## Install hardware

The DGPR panel is accessible from the front. The G60 device, pushbuttons, and test switches are mounted on the front. The terminal blocks for connections are mounted at the back.

Figure 20 shows the front and back of the pre-wired unit with the Lexan cover over the test switches.

Figure 20: Pre-wired unit with Lexan cover for test switches



**WARNING**

Perform installation without power to the DGP and DGPR, else death or serious injury can result.

### Disconnect DGP

1. Note the locations of the wires.
2. Disconnect all wires from the DGP and remove the DGP unit from the panel. The same wires disconnected from the DGP will be connected to the terminals at the back of DGPR, except for power supply alarm connections. The DGPR will be installed in the same location as the DGP in the rack.

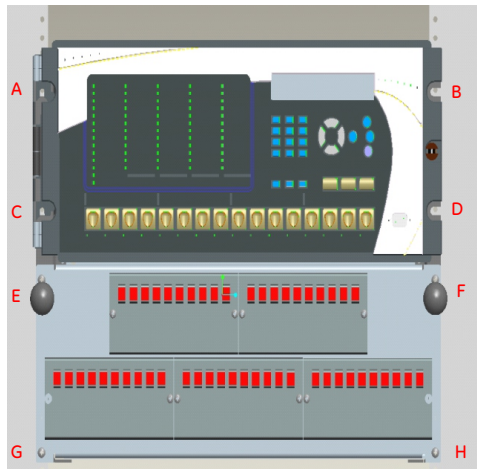
### Mount the unit

The DGPR is a 19-inch rack-mount unit. Figure 21 shows the DGPR mounting holes.

Two people are required to mount the unit.

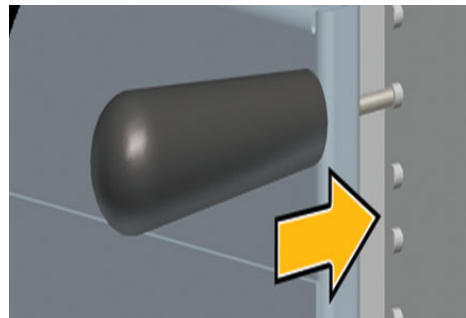
1. Define the two holes on the 19-inch rack that match with pins E and F. Mark these two holes on the rack.
2. Lift the unit while each person holds one of the installation tools inserted in holes E or F with one hand and the bottom surface of the DGPR with the other hand.

**Figure 21: DGPR mounting holes**



3. As shown in Figure 22, insert the two pins of the installation tools into the marked holes on the 19-inch rack. Leave the installation tools inserted.

**Figure 22: Insert the installation tool pins in the rack**



4. Check that the other mounting holes of the DGPR align with the holes in the rack.
5. Install four screws in holes A, B, C, and D.
6. Remove the installation tools, and install two screws in holes E and F.
7. Apply two nuts in locations G and H.
8. Install the two screws for the Lexan cover on the test switch faceplate, as shown in Figure 23.

Figure 23: Screw locations for Lexan cover



9. Install the Lexan cover (GE part number 1502-0052), aligning the thumb nuts to the installed screws.
10. Hand-tighten the thumb nuts to secure the Lexan cover. Figure 24 shows the Lexan cover installed and tightened.

Figure 24: Lexan cover installed



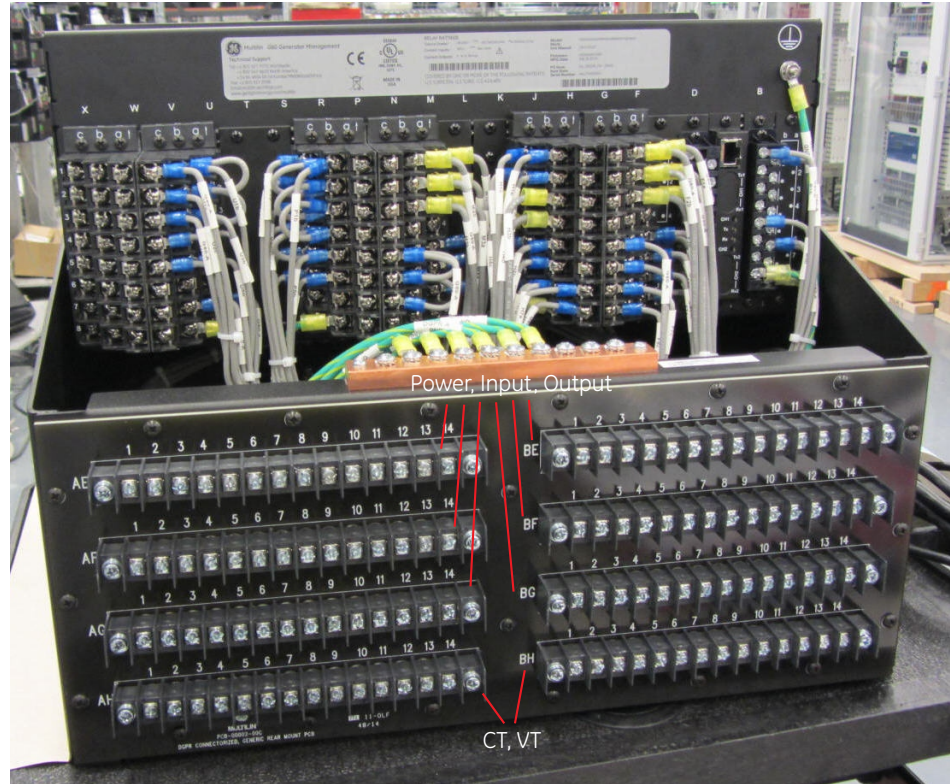
## Connect wires

After DGPR unit mounting is completed, the wires disconnected from the DGP need to be connected to the terminal blocks at the back of DGPR unit. This section outlines how to connect wires to these terminals.

Figure 25 shows the eight 14-pole terminal blocks at the back of the unit, designated as follows:

- AH, BH — CT and VT connections
- AE, AF, AG, BE, BF, BG — Power supply, contact input, and contact output connections

**Figure 25: DGPR eight 14-pole terminal blocks (bottom)**

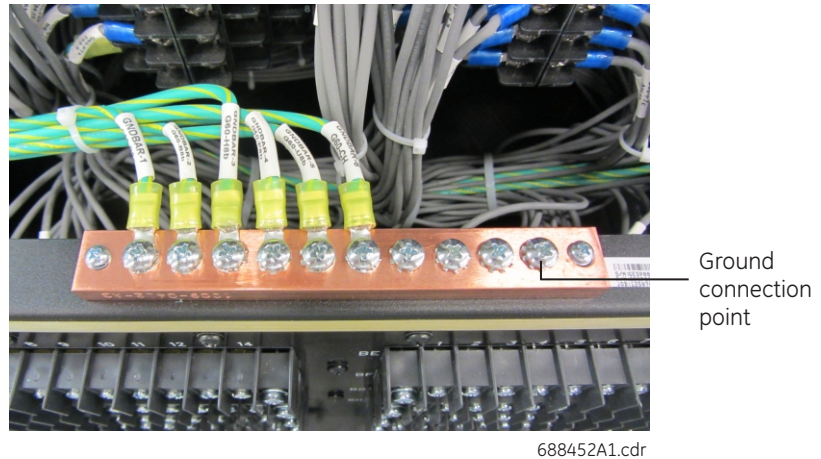


To connect the wires, follow these steps and the "DGPR wiring/schematic drawing GPR000002":

1. Ensure that power to the DGPR is off.
2. Connect the CT and VT input wires to the same terminal blocks as the DGP (AH, BH) at the back of the DGPR unit.
3. Connect contact Input and Contact Output wires to the same terminal blocks as the DGP (AE, AF, AG, BE, BF, BG) at the back of the DGPR unit.
4. For grounding, the DGPR unit is equipped with a ground bar with 10 connection points to ground G60 modules including the power supply modules, as shown in Figure 26. Connect the DGPR ground bar directly to the generator protection panel ground bus. The recommended wire gauge to connect DGPR ground bar to GPP ground bus is 6 AWG.
5. For power supply, the DGPR has redundant power supply. Slots B and W on the G60 are main and redundant power supplies, respectively. To connect power wires to the terminals at the back of DGPR, use one of these two options:
  - Two sources of power are available in the rack — Connect first power supply wires to AG1(+) and AG2(-) and second power supply wires to BG13(+) and BG14(-) as shown in Figure 27.

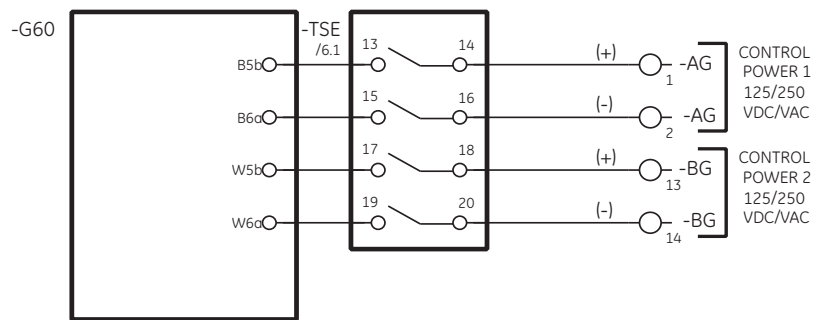
- One source of power is available in the rack – Connect power supply wires to AG1(+) and AG2(-) and fix jumpers "AG1-BG13" and "AG2-BG14" as shown in Figure 28.

Figure 26: DGPR ground bar with 10 connection points



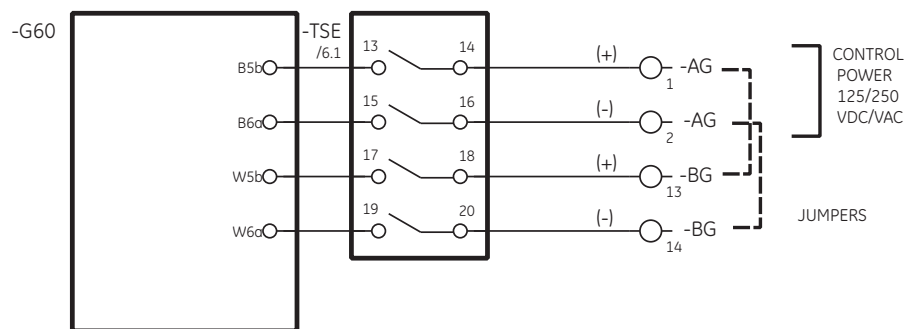
688452A1.cdr

Figure 27: DGPR two power sources connections



688475A1.cdr

Figure 28: DGPR single power source connections



688476A1.cdr



**WARNING**

Consider relay contacts unsafe to be touched when the unit is energized. Death or serious injury can result from touching live relay contacts.

Do not switch the test switches under load or similar conditions. Do not touch any open blade when the system is energized. Death or serious injury can result.

---

## Activate G60 relay

The G60 needs to be activated by setting it to "Programmed" mode. This can be done on the front panel of the G60 or in the EnerVista UR Setup software. The path is **SETTINGS PRODUCT SETUP > INSTALLATION > RELAY SETTINGS**. For more information, see the G60 instruction manual.

---

## Install software

Communication with the DGPR unit can be done via the front panel or a computer with EnerVista UR Setup software.

The G60 includes EnerVista UR Setup software that needs to be installed on a computer. Follow the procedure in the G60 instruction manual to install the software. There is no additional software for the DGPR or its test switches.

---

## Connect G60 relay

The G60 is connected typically to a network for communication with other devices, for example using an Ethernet port. It also connects to a computer running the EnerVista software, either on-site using the RS232 port or remotely using an Ethernet port.

There are three ways to connect the G60:

- RS232 port
- Ethernet port
- RS485 port

### Connect using RS232 port

The G60 has a nine-pin RS232 serial port on its front panel, as shown in Figure 29, which makes it useful for connecting the computer to the device in the field.

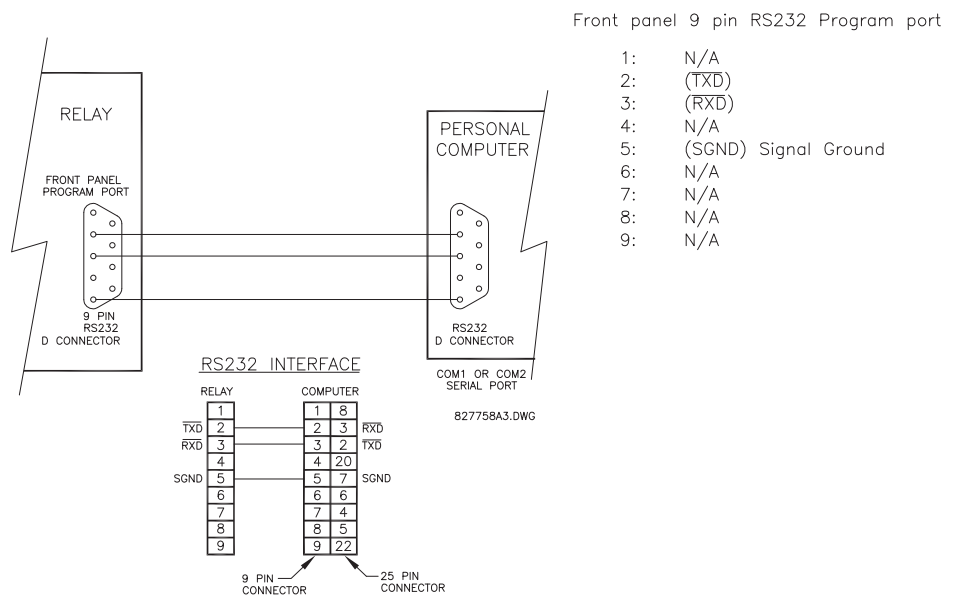
Figure 29: RS232 port on G60 front panel



688455A1.cdr

Figure 30 shows cabling for the RS232 port for both nine-pin and 25-pin connectors. The default baud rate for the RS232 port is 115200 bps, and this can be set to other values.

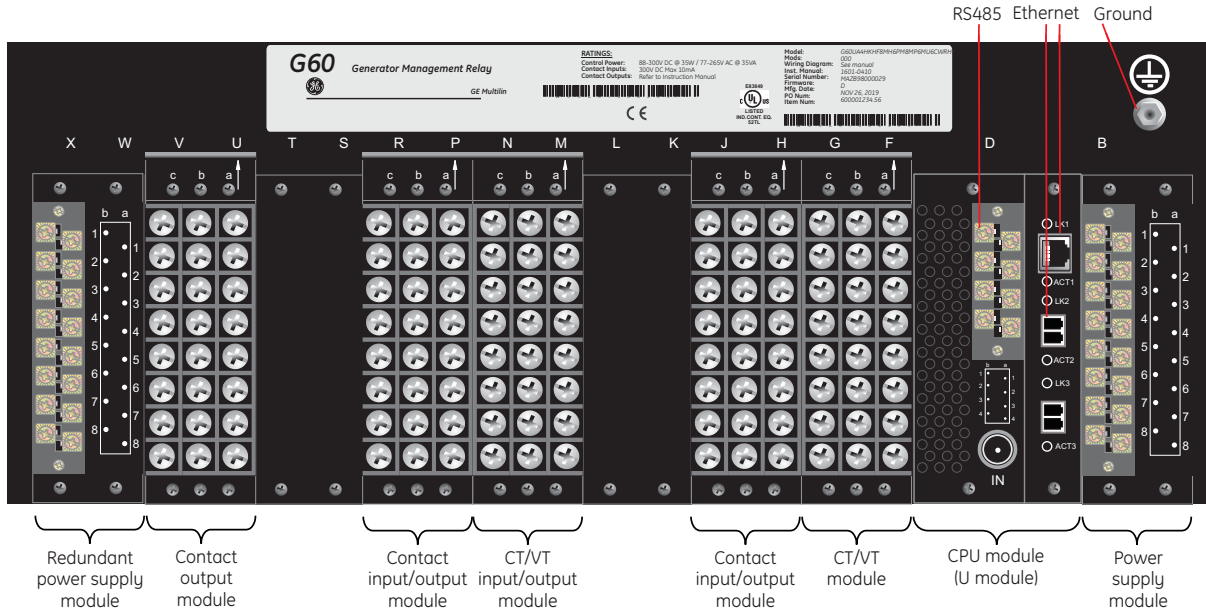
Figure 30: RS232 port connections



## Connect using Ethernet port

The G60 is connected typically with other devices and to the computer by Ethernet. There are Ethernet ports on the CPU module at the back of the G60.

Figure 31: Port locations on rear of G60



688456A2.CDR

## Connect using RS485 port

There is also a serial RS485 port at the back of the G60 that can also be used for communication. It is on the CPU module. See the G60 instruction manual for more information.

RS485 data transmission and reception are accomplished over a single twisted pair with transmit and receive data alternating over the same two wires. Through the use of these ports, continuous monitoring and control from a remote computer, Supervisory Control and Data Acquisition (SCADA) system, or power line carrier (PLC) is possible. To minimize errors from noise, the use of shielded twisted pair wire is recommended. Correct polarity also must be observed.

## IRIG-B

IRIG-B is a standard time code format that allows stamping of events to be synchronized among connected devices. The IRIG-B code allows time accuracies of up to 100 ns. Using the IRIG-B input, the G60 operates an internal oscillator with 1  $\mu$ s resolution and accuracy. The GE MultiSync 100 1588 GPS Clock as well as third-party equipment are available for generating the IRIG-B signal; this equipment can use a global positioning system (GPS) satellite system to obtain the time reference so that devices at different geographic locations can be synchronized. See the G60 instruction manual for more information.



# DGPR

## Chapter 4: Maintenance

This chapter outlines maintenance. For maintenance of the G60, see its instruction manual.

---

### Repairs

For the G60, the battery and modules inside the case can be replaced without return of the device to the factory. The firmware and software can be upgraded without return of the device to the factory. Fuses in the power supply modules are not field-replaceable.

To return the unit to the factory for repair, use the procedure outlined here or the detailed return procedure outlined at

[https://www.gegridsolutions.com/multilin/support/ret\\_proc.htm](https://www.gegridsolutions.com/multilin/support/ret_proc.htm)

The process to return the device to the factory for repair is as follows:

- Contact a GE Grid Solutions Technical Support Center as outlined in the [For further assistance](#) section on page 1.
- Obtain a Return Materials Authorization (RMA) number from the Technical Support Center.
- Verify that the RMA and Commercial Invoice received have the correct information.
- Use the original shipping carton if possible. Otherwise, tightly pack the unit in a box with bubble wrap, foam material, styrofoam inserts, or packaging peanuts to cushion the item(s). You can also use double boxing whereby you place the box in a larger box that contains at least 5 cm of cushioning material.
- Ship the unit by courier or freight forwarder, along with the Commercial Invoice and RMA, to the factory.

GE GRID SOLUTIONS  
650 MARKLAND STREET  
MARKHAM, ONTARIO  
CANADA L6C 0M1  
ATTN: SERVICE DEPT.  
RMA# : \_\_\_\_\_

Customers are responsible for shipping costs to the factory, regardless of whether the unit is under warranty.

- Fax a copy of the shipping information to the GE Grid Solutions service department in Canada at +1 905 927 5098.

# DGPR

## Appendix A: Miscellaneous

This chapter provides the warranty and revision history.

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### Warranty

For products shipped as of 1 October 2013, GE Grid Solutions warrants most of its GE manufactured products for 10 years. For warranty details including any limitations and disclaimers, see the Terms and Conditions at

<http://www.gegridsolutions.com/multilin/warranty.htm>

For products shipped before 1 October 2013, the standard 24-month warranty applies.

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### Revision history

The tables outline the release of this document.

**Table 2: Revision history (English)**

Part number	Product	Release date	ECO
1601-0410-A1	1.0x	19 February 2016	16-2645
1601-0410-A2	1.0x	21 September 2020	20-5749

**Table A-1: Major changes for Multilin DGPR manual version A2 (English)**

Page	Description
---	Major revision, including extending warranty from two to 10 years



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