



GE VERNOVA

Multilin™ 3 Series Retrofits

from M & MII Family, 239, 735/737, MLJ, & TOV relays



Retrofit Guide

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3 Series Retrofit Guide.

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For further assistance

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

GE VERNOVA

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@gevernova.com

Europe e-mail: multilin.tech.euro@gevernova.com

Website: <https://www.gevernova.com/grid-solutions/multilin>

Safety words and definitions

The following symbols used in this document indicate the following conditions:



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.



Indicates general information and practices, including operational information and practices, that are not related to personal injury.

General Cautions and Warnings

The following general safety precautions and warnings apply.



Disassembly of this unit will void the warranty. Do not attempt to open or repair the retrofit enclosure. All repairs are to be conducted by the factory.



Before attempting to use the equipment, it is important that all danger and caution indicators are reviewed.

If the equipment is used in a manner not specified by the manufacturer or functions abnormally, proceed with caution. Otherwise, the protection provided by the equipment may be impaired and can result in impaired operation and injury.



Hazardous voltages can cause shock, burns or death.



Installation/service personnel must be familiar with general device test practices, electrical awareness and safety precautions must be followed.

Before performing visual inspections, tests, or periodic maintenance on this device or associated circuits, isolate or disconnect all hazardous live circuits and sources of electric power.

Failure to shut equipment off prior to removing the power connections could expose you to dangerous voltages causing injury or death.

Ensure that all connections to the product are correct to avoid accidental risk of shock and/or fire, for example from high voltage connected to low voltage terminals.

Follow the requirements of this manual, including adequate wiring size and type, terminal torque settings, voltage, current magnitudes applied, and adequate isolation/clearance in external wiring from high to low voltage circuits.

Use the device only for its intended purpose and application.

Ensure that all ground paths are un-compromised for safety purposes during device operation and service.

All recommended equipment should be grounded and must have a reliable and un-compromised grounding path for safety purposes, protection against electromagnetic interference and proper device operation.

Equipment grounds should be bonded together and connected to the facility's main ground system for primary power.

Keep all ground leads as short as possible.

In addition to the safety precautions mentioned all electrical connections made must respect the applicable local jurisdiction electrical code.

It is recommended that a field external switch, circuit breaker be connected near the equipment as a means of power disconnect. The external switch or circuit breaker is selected in accordance with the power rating.

Ensure that the control power applied to the device, the AC current, and voltage input match the ratings specified on the relay nameplate. Do not apply current or voltage in excess of the specified limits.

Only qualified personnel are able to operate the device. Such personnel must be thoroughly familiar with all safety cautions and warnings in this manual and with applicable country, regional, utility, and plant safety regulations.

Hazardous voltages can exist in the power supply and at the device connection to current transformers, voltage transformers, control, and test circuit terminals. Make sure all sources of such voltages are isolated prior to attempting work on the device.

Hazardous voltages can exist when opening the secondary circuits of live current transformers. Make sure that current transformer secondary circuits are shorted out before making or removing any connection to the current transformer (CT) input terminals of the device.

For tests with secondary test equipment, ensure that no other sources of voltages or currents are connected to such equipment and that trip and close commands to the circuit breakers or other switching apparatus are isolated, unless this is required by the test procedure and is specified by appropriate utility/plant procedure.

When the device is used to control primary equipment, such as circuit breakers, isolators, and other switching apparatus, all control circuits from the device to the primary equipment must be isolated while personnel are working on or around this primary equipment to prevent any inadvertent command from this device.

NOTICE

Use external disconnect equipment to isolate the mains voltage supply.

NOTICE

To ensure the settings file inside the relay is updated, wait 30 seconds after a setpoint change before cycling power.

This product is rated to Class A emissions levels and is to be used in Utility, Substation Industrial environments. Not to be used near electronic devices rated for Class B levels.

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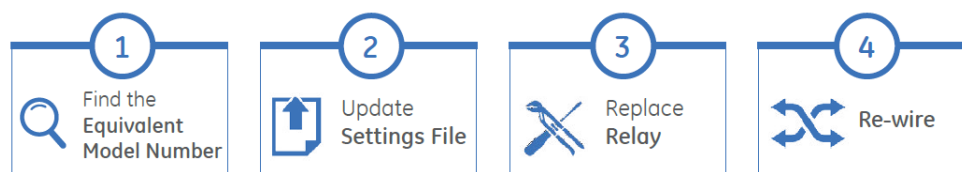
3 Series Retrofit

Chapter 1: Overview

1.1 Introduction

As the Multilin MII Family, Multilin 239, and Multilin 735/737 digital relays age, the Multilin 3 Series (SR3) family of protection relays provide updated functional and economical protection solutions for feeders, motors and transformers. The 3 Series family, including the 350, 345, and 339, provide extensive diagnostic information allowing users to troubleshoot and minimize downtime. 3 Series relays streamline work flow processes and simplify engineering tasks such as configuration, wiring, testing, commissioning, and maintenance.

The Multilin™ 3 Series Retrofit Instruction Manual offers a solution to upgrade previously installed Multilin relays, providing detailed order code equivalencies, mechanical details, and wiring diagrams. For common MII Family Digital relays a software conversion tool provides conversion of existing settings files and Modbus Maps. This manual also provides retrofit suggestions for Multilin M Family, MLJ, and TOV relays in less detail.



The Multilin™ 3 Series Retrofit takes place in four general steps, as follows.

1. Select a replacement relay - see the summary tables and the specific order code comparisons for the MII Family relays shown in this chapter. If you need to determine your MII relay order code, refer to section 1.10 *Finding your M and MII Family relay order code*.
2. Convert the existing settings file if applicable; MIF II, and MIV II file conversion is currently supported for most models - see Chapter 2: *Converting Settings Files*.
3. Install the new 3 Series Retrofit - see Chapter 3: *Installing the 3 Series Relay*.
4. Wire the new 3 Series Retrofit - see Chapter 4: *Electrical Installation*.

3 Series relays have an IP54 rating, superior to that of the MII Family relays which have an IP52 rating. In addition, vibration tests for 3 Series relays have been passed for both the 4-screw mount (as used in the MII Family retrofit) and 8-screw mount (as used for new installations).

1.2 MIF and MIF II relays

Installed Relay	Retrofit Relay
MIFII Digital Feeder Relay MIF Digital Feeder Relay 	350 Feeder Protection System 

MIF and MIF II features are available in 350 relays as described in the table below:

Feature	MIF	MIF II	350 ¹
Protection & Control	Thermal Overload: 49, IOC: 50PH, 50PL, 50GH, 50GL, 50NH, 50NL TOC: 51G, 51N, 51P Cold Load Pickup: CLP Breaker Failure: 50BF	Thermal Overload: 49(1) IOC: 50P (2), 50G(2) TOC: 51G(1), 51P(1) Autoreclose: 79 Cold Load Pickup: CLP Breaker Failure to Open	Thermal Overload: 49 IOC: 50P(2), 50N(2), 50_2, 50G/SG(2) TOC: 51P, 51N, 51_2, 51G/SG Other protection: 67G/SG, 32N, VTFF, 27_1, 27X, 59X, 67P, 67N, 46BC, 32, 27P, 59P, 59_2, 59N, 81U(2), 81O(2), Arc Flash Autoreclose: 79 Cold Load Pickup: CLP Breaker Failure: 50BF Other control: 60CTS, 86, 25
Monitoring & Metering	Breaker Health Event Recording	Breaker Health Event Recording	Breaker Health Event Recording
Oscillography	8 samples/cycle maximum length 24 cycles	8 samples/cycle maximum length 24 cycles	up to 32 samples per cycle (user-selectable) maximum length 192 cycles
Communications	Serial (RS232, RS485) protocols: Modbus RTU	Serial (RS232, RS485) protocols: Modbus RTU, IEC 60870-5- 103	USB Serial (RS485) protocols: Modbus RTU, DNP 3.0, IEC 60870-5-103 Ethernet protocols: Modbus TCP/IP, DNP 3.0, IEC 60870-5-104, IEC 61850 GOOSE, IEC 61850, OPC-UA
Hardware	2 digital inputs 6 relay outputs Configurable I/O Configurable Logic 4 configurable LEDs 2 fixed LEDs	2 digital inputs 6 digital outputs Configurable I/O Configurable Logic 4 configurable LEDs 2 fixed LEDs	10 inputs 7 outputs (2 Form A, 5 Form C) Configurable I/O Configurable Logic 10 LEDs (non-programmable LEDs) 12 LEDs (programmable LEDs)

1. For additional features, refer to the *350 Instruction Manual*.

The following table describes MIF and MIF II options, and the equivalent 350 options and order codes. In some cases the 350 options have changed from those available for MIF and MIF II relays, so read the descriptions carefully.



NOTE

Order codes are subject to change without notice. See the GE Multilin website at: <http://www.gegridsolutions.com/multilin> for up-to-date order codes.

Feature	MIF order code options	MIF II order code options	350 order code options
Application	MIF-P-A11E100F00C P: 3 Phase and Ground N: Single Phase	MIFIIP-A11E00HI00 P: 3 Phase and Ground N: Single Phase	All 350 relays come with 3 phase and ground standard.
Curves	MIFP-A-11E100F00C A: ANSI Curves I: IEC Curves U: IAC Curves C: EPTAR-C Curves (single phase only)	MIFIIP-A-11E00HI00 A: ANSI Curves I: IEC Curves U: IAC Curves C: EPTAR-C Curves (single phase only)	All 350 relays come with ANSI, IEC, and IAC curves standard.
Phase CT Range	MIFPA-1-1100F00C 0: N models (single phase) 1: Phase CT = 1 A (0.1 - 2.4 A) 5: Phase CT = 5 A (0.5 - 12 A)	MIFIIPA-1-1E00HI00 0: Phase CT = 1/5 A 1: Phase CT = 1 A 5: Phase CT = 5 A	350E-P0-G0HEENNSNNN P0: user selectable 1/5 A three-phase current inputs (0.02 - 20 × CT)
Ground CT Range	MIFPA1-1-E100F00C 1: Ground CT In = 1 A (0.1 - 2.4 A) 5: Ground CT In = 5 A (0.5 - 12 A) N: Sensitive Ground (0.005 - 0.12 A)	MIFIIPA1-1-E00HI00 1: Ground CT In = 1 A (0.1 - 2.4 A) 5: Ground CT In = 5 A (0.5 - 12 A) L: Extremely Sensitive Ground In = 1 A (0.002 - 0.048 A) N: Sensitive Ground (0.005 - 0.12 A)	350EP0-G0-HEENNSNNN G0: user selectable 1/5 A Ground current input (0.02 - 20 × CT) S0: user selectable 1/5 A Sensitive Ground current input (0.002 - 3 × CT)
Language	All MIF relays come with English standard.	MIFIIPA11-E-00HI00 E: English F: French T: Turkish	All 350 relays come with English standard.
Options	MIFPA11E-1-00F00C 0: Basic Model (I) 1: Option 1 (Configurable I/O, Event Recording, and Oscillography) 2: Option 2 (Option 1 and Cold Load Pickup, Breaker Failure Protection, Breaker Health, and Configurable Logic)	MIFIIPA11E-0-0HI00 0: Basic Model (I) 1: Option 1 (Event Recording, Oscillography, Configurable I/O and LEDs) 2: Option 2 (Option 1 and Cold Load Pickup, Breaker Failure Protection, Breaker Health, Configurable Logic, and Circuit Breaker Control)	350EP0G0HEE-N-NSNNN N: CLP, Lockout (86) C: CLP, 50BF, Autoreclose (79) All 350 relays come with Event Recording, Oscillography, Configurable I/O and LEDs, Configurable Logic (up to 16), Breaker Health, and Circuit Breaker Control standard. ¹
Recloser	n/a	MIFIIPA11E0-0-HI00 0: without Recloser R: with Recloser	350EP0G0HEE-N-NSNNN N: CLP, Lockout (86) C: CLP, 50BF, Autoreclose (79)
Power Supply	MIFPA11E100-F-00C H: 110 - 250 VDC (Range: 88~300 VDC) 110 - 230 VAC (Range: 88~264 VAC) F: 24 - 48 VDC (Range: 19~58 VDC)	MIFIIPA11E00-HI-00 HI: 110 - 250 VDC (Range: 88~300 VDC) 110 - 230 VAC (Range: 88~264 VAC) LO: 28 - 48 VDC (Range: 19~58 VDC)	350EP0G0-H-EENNSNNN H: 110 - 250 VDC 110 - 230 VAC L: 28 - 48 VDC
Protocol	All MIF relays come with Modbus RTU standard.	MIFIIPA11E00HI-0-0 0: Standard model (Modbus RTU) C: IEC60870-5-103 with 2 Comms ports	350EP0G0HEENN-SN-NN SN: Standard: Front USB, Rear RS485: Modbus RTU, DNP3.0, IEC60870-5-103 ²
Environmental Option	n/a	MIFIIPA11E00HI0-0 0: None H: Conformal Coating	350EP0G0HEENNSNN-N N: None H: Harsh Environment Conformal Coating

1. Some features are implemented or configured somewhat differently in the 350 relay. See the *350 Instruction Manual* for details.
2. For details of 350 communications implementation, see the *3 Series Communications Guide*.

1.3 MIV and MIV II relays

Installed Relay	Retrofit Relay
MIV II Voltage/Frequency Relay MIV Voltage/Frequency Relay 	350 Feeder Protection System 

MIV and MIV II features are available in 350 relays as described in the table below:

Feature	MIV	MIV II	350 ¹
Protection & Control	UV: 27(2) OV: 59(2), 59N(2) Underfrequency: 81U(2) Overfrequency: 81O(2) Phase reversal: 47(1)	UV: 27P(4) OV: 59P(4), 59N(4) Underfrequency: 81U(4) Overfrequency: 81O(4) Phase reversal: 47(1) Note: the number of elements differs for different MIV II options. Maximum numbers are shown.	UV: 27P(4), 27X(1), 27P_1(1) OV: 59P(4), 59N(4), 59X(1), 59_2(2) Underfrequency: 81U(4) Overfrequency: 81O(4) Other Protection: 25(1), VTFF(1), 24(1) Volt/Hz
Oscillography	8 samples/cycle maximum length 24 cycles	MIV 1000 & 3000: 8 samples/cycle maximum length 24 cycles MIV 2000: 2 samples per cycle maximum length 432 cycles	up to 32 samples per cycle (user-selectable) maximum length 192 cycles
Communications	Serial (RS232, RS485) protocols: Modbus RTU	Serial (RS232, RS485) protocols: Modbus RTU	USB Serial (RS485) protocols: Modbus RTU, DNP 3.0, IEC 60870-5-103 Ethernet protocols: Modbus TCP/IP, DNP 3.0, IEC 60870-5-104, IEC 61850 GOOSE, IEC 61850, OPC-UA
Hardware	2 digital outputs 6 relay outputs Configurable I/O Configurable Logic 2 fixed LEDs 4 configurable LEDs	2 digital inputs 6 digital outputs Configurable I/O Configurable Logic 2 fixed LEDs 4 configurable LEDs	10 inputs 7 outputs (2 Form A, 5 Form C) Configurable I/O Configurable Logic 10 LEDs (non-programmable LEDs) 12 LEDs (programmable LEDs)

1. For additional features, refer to the *350 Instruction Manual*.

The following table describes MIV II options, and the equivalent 350 options and order codes. In some cases the 350 options have changed from those available for MIV II relays, so read the descriptions carefully.

Feature	MIV order code options	MIV II order code options	350 order code options
Function	MIV-1-000E000F00C 1: Voltage Functions 2: Frequency Functions 3: Voltage and Frequency Function	MIVII-1-010E00HI00 1: Voltage Functions 2: Frequency Functions 3: Voltage and Frequency Function	350E- PXGX -HE- N -N-V-SNNN V: Voltage Metering - 27P(4), 27X(1), 27P_1(1), 59P(4), 59N(4), 59X(1), 59_2(2), 81O(4), 81U(4), 25(1), VTFF(1)
Voltage Range	MIV10-0-0E000F00C 0: 10 - 250 V Setting Range 1: 2 - 60 V Setting Range	MIVII10-1-0E00HI00 0: 10 - 250 V Setting Range 1: 2 - 60 V Setting Range	All 350 models with the VT module: Primary VT range: 0.15 to 550kV VT Secondary range: 50 to 220V
Language	All MIV relays come with English standard.	MIVII1010- E -00HI00 E: English F: French T: Turkish	All 350 relays come with English standard.
Power Supply	MIV1000E000-F-00C H: 110 - 250 VDC (Range: 88~300 VDC) 110 - 230 VAC (Range: 88~264 VAC) F: 24 - 48 VDC (Range: 19~58 VDC)	MIVII1010E00- HI -00 HI: 110 - 250 VDC (Range: 88~300 VDC) 110 - 230 VAC (Range: 88~264 VAC) LO: 28 - 48 VDC (Range: 19~58 VDC)	350EPXGX- H -ENNVSNNN H: 110 - 250 VDC 110 - 230 VAC L: 28 - 48 VDC
Environmental Option	n/a	MIVII1010E00HI- 00 00: None 0H: Conformal Coating	350EPXGXHENNVSN-N N: None H: Harsh Environment Conformal Coating



NOTE

Order codes are subject to change without notice. See the GE Multilin website at: <http://www.gegridsolutions.com/multilin> for up-to-date order codes.

1.4 MIG and MIG II relays

Installed Relay	
MIG II Generator Protection System MIG Machine Protection Relay	
Retrofit Relay	
350 Feeder Protection System, 345 Transformer Protection System, 339 Motor Protection System, 850 Feeder Protection System, or P40 Agile P14D Relay	

Most MIG and MIG II features are available in 350, 345, or 339 relays as described in the tables below. In some cases an 8 Series or P40 Agile relay may be required to replace full functionality. For additional information, refer to the *P40 Technical Manual* or *850 Instruction Manual*.

1.4.1 MIG and MIG II P to 350 or 345

For the MIG II P being used as a transformer, when 87R is not required, the 350 relay is an option. When 87R is required, the 345 relay with 87G is an option.

For the MIG II P being used as a generator, the 350 relay is an option.



The 350 Feeder Protection System does not support Restricted Ground Differential 87R. To replace MIG and MIG II P relays when Restricted Ground Fault protection is required, the 345 relay with 87G can be used. a P40 Agile P14D relay or 850 Feeder Protection System can also be used.

Feature	MIG	MIG II P	350 ¹	345 ²
Protection & Control	Current Unbalance: 46 Thermal Protection: 49 IOC: 50P, 50G, 51G TOC: 51P Undercurrent: 37 66 Restricted Ground Differential: 87R	Current Unbalance: 46 Thermal Protection: 49 IOC: 50N, 50P, 50G TOC: 51G, 51N, 51P Restricted Ground Differential: 87R	Current unbalance: 51_2 or 46(1), 50_2 (1) or 46(1) Thermal Protection: 49 IOC: 50P(2), 50G/SG(2), 50N(2), TOC: 51P(1), 51G/SG(1), 51N(1), Other Protection: I1/I2(46BC)	Current unbalance: 51_2 or 46(1), 50_2 (1) or 46(1) Thermal Protection: 49 IOC: 50P(2), 50G/SG(2), 50N(2), TOC: 51P(1), 51G/SG(1), 51N(1), Restricted Ground Fault: 87G/RGF(2)

Feature	MIG	MIG II P	350 ¹	345 ²
Metering & Monitoring	Metering Event Recording	Metering Event Recording	Metering Event Recording	Metering Event Recording
Oscillography	8 samples/cycle maximum length 24 cycles	8 samples/cycle maximum length 24 cycles	up to 32 samples per cycle (user-selectable) maximum length 192 cycles	up to 32 samples per cycle (user-selectable) maximum length 192 cycles
Communications	Serial (RS232, RS485) protocols: Modbus RTU	Serial (RS232, RS485) protocols: Modbus RTU	USB Serial (RS485) protocols: Modbus RTU, DNP 3.0, IEC 60870-5-103 Ethernet protocols: Modbus TCP/IP, DNP 3.0, IEC 60870-5- 104, IEC 61850 GOOSE, IEC 61850, OPC-UA	USB Serial (RS485) protocols: Modbus RTU, DNP 3.0, IEC 60870-5-103 Ethernet protocols: Modbus TCP/IP, DNP 3.0, IEC 60870-5- 104, IEC 61850 GOOSE, IEC 61850, OPC-UA
Hardware	2 digital outputs 6 relay outputs Configurable I/O Configurable Logic 2 fixed LEDs 4 configurable LEDs	2 digital inputs 6 digital outputs Configurable I/O Configurable Logic 2 fixed LEDs 4 configurable LEDs	10 inputs 7 outputs (2 Form A, 5 Form C) Configurable I/O Configurable Logic 10 LEDs (non-programmable LEDs) 12 LEDs (programmable LEDs)	10 inputs 7 outputs (2 Form A, 5 Form C) Configurable I/O Configurable Logic 10 LEDs (non-programmable LEDs) 12 LEDs (programmable LEDs)

1. For additional features, refer to the 350 *Instruction Manual*.

2. For additional features, refer to the 345 *Instruction Manual*.

The following table describes MIG II P options, and the equivalent 350 and 345 options and order codes. In some cases the 350/345 options have changed from those available for MIG II relays, so read the descriptions carefully.

Feature	MIG order code options	MIG II P order code options	350/345 order code options
Application	n/a	MIGII-P-A11E00HI00 P: Generator Protection Elements	350EP0G0HE-M-NNSNNN M: Advanced configuration: User selectable 49, 50P(2), 50G/SG(2), 50N(2), 51P(1), 51G/SG(1), 51N(1), 51_2 or 46(1), 50_2 (1) or 46(1), I1/I2(46BC) 345EP0G0HE-M-NNSNNN M: Advanced configuration: 87T, 87T-50, 51P(2), 51N(2), 51G(2), 50P(2), 50G(2), 50N(2), 49P, 46 (51_2/50_2)(2), 86, 50BF(2), 87G/RGF(2)
Curves	MIGPA-A-11E000F00C A: ANSI Curves I: IEC Curves	MIGIIP-A-11E00HI00 A: ANSI Curves I: IEC Curves	All 350 and 345 relays come with ANSI, IEC, and IAC curves standard.
Phase CT Range	MIGPA-1-1E000F00C 1: Phase CT = 1 A (0.1 - 2.4 A) 5: Phase CT = 5 A (0.5 - 12 A)	MIFIIPA-1-1E00HI00 0: Phase CT = 1/5 A 1: Phase CT = 1 A 5: Phase CT = 5 A	3xxE-P0-G0HEMNNNSNNN P0: P0 user selectable 1/5 A three-phase current inputs
Ground CT Range	MIGPA1-1-E000F00C 1: Ground CT In = 1 A (0.1 - 2.4 A) 5: Ground CT In = 5 A (0.5 - 12 A) N: Sensitive Ground CT In = 1 A (0.005 - 0.12 A)	MIGIIPA1-1-E00HI00 1: Ground CT In = 1 A (0.1 - 2.4 A) 5: Ground CT In = 5 A (0.5 - 12 A) N: Sensitive Ground (0.005 - 0.12 A)	3xxEP0-G0-HEMNNNSNNN G0: user selectable 1/5 A Ground current input (0.02 - 20 × CT) S0: user selectable 1/5 A Sensitive Ground current input (0.002 - 3 × CT)

Feature	MIG order code options	MIG II P order code options	350/345 order code options
Power Supply	MIGPA11E000-F-00C H: 110 - 250 VDC (Range: 88~300 VDC) 110 - 230 VAC (Range: 88~264 VAC) F: 24 - 48 VDC (Range: 19~58 VDC)	MIGIIPA11E00-HI-00 HI: 110 - 250 VDC (Range: 88~300 VDC) 110 - 230 VAC (Range: 88~264 VAC) LO: 28 - 48 VDC (Range: 19~58 VDC)	3xxEP0G0-H-EENNSNN H: 110 - 250 VDC 110 - 230 VAC L: 28 - 48 VDC



Order codes are subject to change without notice. See the GE Multilin website at: <http://www.gegridsolutions.com/multilin> for up-to-date order codes.

1.4.2 MIG and MIG II Q to 339

Feature	MIG	MIG II Q	339 ¹
Protection & Control	Current Unbalance: 46 Thermal Protection: 49 IOC: 50P, 50G, 51G TOC: 51P Undercurrent: 37 66 Restricted Ground Differential: 87R	Current Unbalance: 46 Acceleration Time: 48 Thermal Protection: 49 IOC: 50N, 50P, 50G TOC: 51G, 51N, 51P Undercurrent: 37 66	Current Unbalance: 46 Acceleration Time: 48 Thermal Protection: 49 IOC: 50G/SG(1), 50L, 50N(1), 50P(1) TOC: 51N(1), 51P(1), 51R Undercurrent: 37 66 Other Protection: 86, 50BF
Metering & Monitoring		Metering Event Recording	Metering Event Recording
Oscillography	8 samples/cycle maximum length 24 cycles	8 samples/cycle maximum length 24 cycles	up to 32 samples per cycle (user-selectable) maximum length 192 cycles
Communications	Serial (RS232, RS485) protocols: Modbus RTU	Serial (RS232, RS485) protocols: Modbus RTU	USB Serial (RS485) protocols: Modbus RTU, DNP 3.0, IEC 60870-5-103 Ethernet protocols: Modbus TCP/IP, DNP 3.0, IEC 60870-5-104, IEC 61850 GOOSE, IEC 61850
Hardware	2 digital outputs 6 relay outputs Configurable I/O Configurable Logic 2 fixed LEDs 4 configurable LEDs	2 digital inputs 6 digital outputs Configurable I/O Configurable Logic 2 fixed LEDs 4 configurable LEDs	10 inputs 7 outputs (2 Form A, 5 Form C) Configurable I/O Configurable Logic 10 LEDs (non-programmable LEDs) 12 LEDs (programmable LEDs)

1. For additional features, refer to the 339 *Instruction Manual*.

The following table describes MIG and MIG II Q options, and the equivalent 339 options and order codes. In some cases the 339 options have changed from those available for MIG and MIG II relays, so read the descriptions carefully.

Feature	MIG order code options	MIG II Q order code options	339 order code options
Application	n/a	MIGII-Q-A11E00HI00 Q: Motor Protection Elements	339EP0G0HE-S-NNSNNN S: Standard configuration: 37, 46, 48, 49, 50P(1), 50G/SG(1), 50N(1), 50L, 51R, 66, 86, 51N(1), 51P(1), 50BF
Curves	MIGP-A-11E000F00C A: ANSI Curves I: IEC Curves	MIGIIQ-A-11E00HI00 A: ANSI Curves I: IEC Curves	All 339 relays come with ANSI, IEC, and IAC curves standard.
Phase CT Range	MIGPA-1-1E000F00C 1: Phase CT = 1 A (0.1 - 2.4 A) 5: Phase CT = 5 A (0.5 - 12 A)	MIGIIQA-1-1E00HI00 1: Phase CT = 1 A (0.1 - 2.4 A) 5: Phase CT = 5 A (0.5 - 12 A)	339E-P0-G0HESNNSNNN P0: user selectable 1/5 A three-phase current inputs (0.02 - 20 × CT)
Ground CT Range	MIGPA1-1-E000F00C 1: Ground CT In = 1 A (0.1 - 2.4 A) 5: Ground CT In = 5 A (0.5 - 12 A) N: Sensitive Ground CT In = 1 A (0.005 - 0.12 A)	MIGIIQA1-1-E00HI00 1: Ground CT In = 1 A (0.1 - 2.4 A) 5: Ground CT In = 5 A (0.5 - 12 A) N: Sensitive Ground CT In = 1 A (0.005 - 0.12 A)	339EP0-G0-HESNNSNNN G0: user selectable 1/5 A Ground current input (0.02 - 20 × CT) All 339 relays come with CBCT (50:0.025) standard.
Power Supply	MIFPA111-F-C H: 110 - 250 VDC (Range: 88~300 VDC) 110 - 230 VAC (Range: 88~264 VAC) F: 24 - 48 VDC (Range: 19~58 VDC)	MIFIIQA11E00-HI-00 HI: 110 - 250 VDC (Range: 88~300 VDC) 110 - 230 VAC (Range: 88~264 VAC) LO: 28 - 48 VDC (Range: 19~58 VDC)	339EP1G1-H-ESNNSNNN H: 110 - 250 VDC 110 - 230 VAC L: 28 - 48 VDC



Order codes are subject to change without notice. See the GE Multilin website at: <http://www.gegridsolutions.com/multilin> for up-to-date order codes.

1.5 MIN and MIN II relays

Installed Relay	Retrofit Relay
MIN II Ground Protection System MIN Digital Ground Protection 	350 Feeder Protection System, or P40 Agile Relay 

Most MIN and MIN II features are available in 350 relays as described in the table below:

Feature	MIN	MIN II ¹	350 ²
Protection & Control	Directional: 67N1, 67N2 IOC: 50GH, 50GL TOC: 51GH, 51GL Cold Load Pickup: CLP Breaker Failure: 50BF	67G1, 67G2, 67PC1, 67PC2 50G1, 50G2 51G1, 51G2	Directional: 67P(1), 67N(1), 67G/SG(1) IOC: 50P(2), 50N(2), 50_2, 50G/SG(2) TOC: 51P(1), 51G/SG(1), 51N(1) Cold Load Pickup: CLP Breaker Failure: 50BF Other: 49, 32N(2), VTFF + Voltage, Power, and Energy Metering, 60CTS
Metering & Monitoring	Metering Breaker Health Event Recording	Metering Event Recorder	Metering Breaker Health Event Recording
Oscillography	8 samples/cycle maximum length 24 cycles	8 samples/cycle maximum length 24 cycles	up to 32 samples per cycle (user-selectable) maximum length 192 cycles
Communications	Serial (RS232, RS485) protocols: Modbus RTU	Serial (RS232, RS485) protocols: Modbus RTU	USB Serial (RS485) protocols: Modbus RTU, DNP 3.0, IEC 60870-5-103 Ethernet protocols: Modbus TCP/IP, DNP 3.0, IEC 60870-5-104, IEC 61850 GOOSE, IEC 61850, OPC-UA
Hardware	2 digital outputs 6 relay outputs Configurable I/O Configurable Logic 2 fixed LEDs 4 configurable LEDs	2 digital inputs 6 digital outputs Configurable I/O Configurable Logic 2 fixed LEDs 4 configurable LEDs	10 inputs 7 outputs (2 Form A, 5 Form C) Configurable I/O Configurable Logic 10 LEDs (non-programmable LEDs) 12 LEDs (programmable LEDs)

1. For a detailed example of converting the MIN II Option "S" 67IG1 function to the 350 32N function, see *Converting MIN II 67IG1 to 350 32N* on page 29.
2. For additional features, refer to the *350 Instruction Manual*.

The following table describes MIN and MIN II options, and the equivalent 350 options and order codes. In some cases the 350 options have changed from those available for MIN and MIN II relays, so read the descriptions carefully.

Feature	MIN order code options	MIN II order code options	350 order code options
Function	MIN-N-A0E000H00C N: Ground directional relay L ¹ : Ground directional relay for teleprotection schemes	MINII-N-A0EE00HI00 N: Ground directional relay L: Ground directional relay for teleprotection schemes	350EP0G0HE-E-N-R-SNNN Current Protection E: Extended configuration: User selectable 49, 50P(2), 50G/SG(2), 50N(2), 51P(1), 51G/SG(1), 51N(1) Other Options R: Phase, Neutral, and Ground Directional Overcurrent Protection: 67P(1), 67N(1), 67G/SG(1), 32N(2), VTFF + Voltage, Power, and Energy Metering, 60CTS
Curves	MINN-A-0E000H00C A: ANSI Curves I: IEC Curves	MINIIN-A-0EE00HI00 A: ANSI Curves I: IEC Curves	All 350 relays come with ANSI, IEC, and IAC curves standard.
Ground CT Range	MINNA0-E-000H00C E: Ground CT In = 1 A or 5 A (10-240% of CT rating) S ² : Isolated ground and Peterson coil	MINIINA0-E-E00HI00 E: Ground CT In = 1 A or 5 A (10-240% of CT rating) S ² : Isolated ground ³ and Peterson coil	350EP0-G0-HEENRSNNN G0: user selectable 1/5 A Ground current input (0.02 - 20 × CT) S0: user selectable 1/5 A Sensitive Ground current input (0.002 - 3 × CT)
Power Supply	MINNA0E000-H-00C H: 110 - 250 VDC (Range: 88~300 VDC) 110 - 230 VAC (Range: 88~264 VAC) F: 24 - 48 VDC (Range: 19~58 VDC)	MINIINA0EE00-HI-00 HI: 110 - 250 VDC (Range: 88~300 VDC) 110 - 230 VAC (Range: 88~264 VAC) LO: 28 - 48 VDC (Range: 19~58 VDC)	350EP0G0-H-EENRSNNN H: 110 - 250 VDC 110 - 230 VAC L: 28 - 48 VDC
Environmental Option	n/a	MINIINA0EE00HI-00 00: None 0H: Conformal Coating	350EP0G0HEENRSNN-N N: None H: Harsh Environment Conformal Coating

- Option L is not available in the 3 Series.
- Option S is not directly replaced in the 350 Feeder Protection System, however the Wattmetric Ground Fault element (32N) is a substitute for MINII option S and detects feeder/line ground faults in solidly grounded, ungrounded, resistance grounded and resonance grounded networks. It provides equivalent functionality to the Isolated Ground and Petersen Coil elements of the MIN II relay.
Option S directional ground fault for Isolated or Peterson Coil grounded networks may also be replaced by P40 Agile P14D relays. The P40 Agile P14D relay uses different algorithms to achieve more accurate High Impedance Fault detection; refer to the *P14D Technical Manual*, Chapter 6, Section 18.
- For a detailed example of converting the MIN II Option "S" 67IG1 Isolated Ground function to the 350 32N function, see *Converting MIN II 67IG1 to 350 32N* on page 29.



NOTE

Order codes are subject to change without notice. See the GE Multilin website at: <http://www.gegridsolutions.com/multilin> for up-to-date order codes.

1.6 MIW and MIW II relays

Installed Relay	Retrofit Relay
MIW II Directional Power Protection System 	350 Feeder Protection System or 889 Generator Protection System 

Most MIW and MIW II features are available in 350 relays as described in the table below. In some cases an 8 Series relay may be required to replace full functionality.

Feature	MIW	MIW II	350 ¹
Protection & Control	Directional Power: 32RP, 32FP, 32LF 40 60	Directional Power: 32(4) 40 60	Directional Power: 32(2) Other Protection: 27P(2), 27X(1), 27P_1 (1), 59P(2), 59N(1), 59X(1), 59_2(1), 81O(2), 81U(2), 67P(1), 67N(1), 67G/SG(1), VTFF(1), 25(1), 60CTS
Metering & Monitoring		Metering Event Recording Configurable IO and LEDs Configurable Logic	Metering Breaker Health Event Recording Programmable Logic Elements ...
Oscillography	8 samples/cycle maximum length 24 cycles	8 samples/cycle maximum length 24 cycles	up to 32 samples per cycle (user-selectable) maximum length 192 cycles
Communications	Serial (RS232, RS485) protocols: Modbus RTU	Serial (RS232, RS485) protocols: Modbus RTU	USB Serial (RS485) protocols: Modbus RTU, DNP 3.0, IEC 60870-5-103 Ethernet protocols: Modbus TCP/IP, DNP 3.0, IEC 60870-5-104, IEC 61850 GOOSE, IEC 61850, OPC-UA
Hardware	2 digital outputs 6 relay outputs Configurable I/O Configurable Logic 2 fixed LEDs 4 configurable LEDs	2 digital inputs 6 digital outputs Configurable I/O Configurable Logic 2 fixed LEDs 4 configurable LEDs	10 inputs 7 outputs (2 Form A, 5 Form C) Configurable I/O Configurable Logic 10 LEDs (non-programmable LEDs) 12 LEDs (programmable LEDs)

1. For additional features, refer to the 350 Instruction Manual.

The following table describes MIW and MIW II options, and the equivalent 350 options and order codes. In some cases the 350 options have changed from those available for MIW and MIW II relays, so read the descriptions carefully.

Feature	MIW order code options	MIW II order code options	350 order code options
Function	n/a	MIWII-1-000E00HI00 1 ¹ : 3x Directional Power, 1x Loss of Field, 1x Fuse Failure 2: 4x Directional Power	350EP0G0HEEN- W -SNNN W: Advanced Protection: 27P(2), 27X(1), 27P_1 (1), 59P(2), 59N(1), 59X(1), 59_2(1), 81O(2), 81U(2), 67P(1), 67N(1), 67G/SG(1), VTFF(1), 25(1), 60CTS, 32(2)
Power Supply	MIW1000E000- F -00C H: 110 - 250 VDC (Range: 88~300 VDC) 110 - 230 VAC (Range: 88~264 VAC) F: 24 - 48 VDC (Range: 19~58 VDC)	MIWII1000E00- HI -00 HI: 110 - 250 VDC (Range: 88~300 VDC) 110 - 230 VAC (Range: 88~264 VAC) LO: 28 - 48 VDC (Range: 19~58 VDC)	350EP0G0- H -EENWSNNN H: 110 - 250 VDC 110 - 230 VAC L: 28 - 48 VDC

1. To replace model MIW II 1000 and the Loss of Excitation protection function, refer to the 889 *Instruction Manual*.



Order codes are subject to change without notice. See the GE Multilin website at: <http://www.gegridsolutions.com/multilin> for up-to-date order codes.

1.7 239 relays

Installed Relay	Retrofit Relay
239 Motor Protection Relay 	339 Motor Protection System 

239 features are available in 339 relays as described in the table below:

Feature	239 ¹	339 ²
Protection & Control	Undercurrent/minimum load: 37 Motor/load bearing, Overtemperature: 38 Mechanical jam: 39 Current unbalance: 46 Stator winding overtemperature: 49 Phase short circuit: 50 Timed overload: 51 Ground fault instantaneous or definite time: 50G/50N Alarm relay: 74 Lockout and trip relay: 86/94	Undercurrent: 37 Current Unbalance: 46 Acceleration Time: 48 Thermal Protection: 49 IOC: 50G/SG(1), 50L, 50N(1), 50P(1) TOC: 51N(1), 51P(1), 51R Other Protection: 66, 86, 50BF
Monitoring & Metering	Metering Event Recording	Metering Event Recording
Communications	RS485 port	USB Serial (RS485) protocols: Modbus RTU, DNP 3.0, IEC 60870-5-103 Ethernet protocols: Modbus TCP/IP, DNP 3.0, IEC 60870-5-104, IEC 61850 GOOSE, IEC 61850
Hardware	2 inputs and 3 fixed inputs. 4 Form C contacts 6 Fixed LEDs	10 inputs 7 outputs (2 Form A, 5 Form C) Configurable I/O Configurable Logic 8 configurable and 4 fixed LEDs 10 fixed LED (drawout unit) 12 fixed LEDs (non-drawout unit)

1. The 239 relay with MOD 509 is designed to provide ground directional protection. Similar protection can be obtained using the 339 relay neutral instantaneous protection using either the current, voltage, or both.
2. For additional features, refer to the *339 Instruction Manual*.

The following table describes 239 options, and the equivalent 339 options and order codes. In some cases the 339 options have changed from those available for 239 relays, so read the descriptions carefully.



Order codes are subject to change without notice. See the GE Multilin website at: <http://www.gegridsolutions.com/multilin> for up-to-date order codes.

Feature	239 order code options	339 order code options
Application	239RTD-AN-H AN: Single isolated, analog output: 0 – 1, 0 – 20, 4 – 20 mA Programmable output parameters: thermal capacity, % full load, phase current, RTD1, RTD2, RTD3 temperature	339EP0GOHE-S-NNSNNH S: Standard configuration: 37, 46, 48, 49, 50P(1), 50G/SG(1), 50N(1), 50L, 51R, 66, 86, 51N(1), 51P(1), 50BF
Phase CT Range	239 standard phase CT input: 1 A and 5 A secondary Range: 0.1 to 11 x phase CT primary	339E-P0-G0HESNNSNNH P0: user selectable 1/5 A three-phase current inputs (0.02 – 20 x CT)
Ground CT Range	239 standard ground CT input: 5 A secondary and 50:0.025 Range: 0.03 to 1.4 x CT primary (5 A CT) 0.05 to 16.0 A (50:0.025 CT)	339EP0-G0-HESNNSNNH G0: user selectable 1/5 A Ground current input (0.02 – 20 x CT) All 339 relays come with CBCT (50:0.025) standard.
Power Supply	239 standard power supply: 90 – 300 VDC or 70 – 265 VAC, 50 / 60 Hz	339EP1G1-H-ESNNSNNH H: 110 – 250 VDC 110 – 230 VAC L: 28 – 48 VDC
Harsh Environment	239RTDAN-H H: Harsh Environment Conformal Coating	339EP1G1HESNNSNN-H H: Harsh Environment Conformal Coating
RTDs	239-RTD-ANH 3 RTDs: stator/bearing; programmable type: platinum, nickel, copper	The 339 can support 3 – 100 ohm Pt RTDs. The RMIO module supports up to 12 – 100 ohm Pt RTDs.

1.8 735/737 relays

Installed Relay	Retrofit Relay
735/737 Feeder Protection System 	350 Feeder Protection System 

735 and 737 features are available in 350 relays as described in the table below.

Feature	735/737	350 ¹
Protection & Control	50/51, 50G/51G	50P(2), 50G/SG(2), 50N(2), 51P(1), 51G/SG(1), 51N(1) User selectable 49, 86
Metering & Monitoring	Current Metering shown in %	Metering Breaker Health Event Recording Programmable Logic Elements ...
Communications	RS485 2-wire communications or RS422 4-wire communications	USB Serial (RS485) protocols: Modbus RTU, DNP 3.0, IEC 60870-5-103 Ethernet protocols: Modbus TCP/IP, DNP 3.0, IEC 60870-5-104, IEC 61850 GOOSE, IEC 61850, OPC-UA
Hardware	8 LED trip indicators 4 LED status indicators 3 standard outputs 737 has 8 additional output relays to provide separate dry contact outputs for each overcurrent protection element.	10 inputs 7 outputs (2 Form A, 5 Form C) Configurable I/O Configurable Logic 8 configurable and 4 fixed LEDs 10 fixed LED (drawout unit) 12 fixed LEDs (non-drawout unit)

1. For additional features, refer to the *350 Instruction Manual*.

The following table describes 735 and 737 options, and the equivalent 350 options and order codes. In some cases the 350 options have changed from those available for 735/737 relays, so read the descriptions carefully.

Feature	735/737 order code options	350 order code options
Function	735-55HI485 735: Standard 735 Relay with 50/51, 50G/51G protection 737: 737 Relay (same as 735 with 8 additional output relays)	350EP0G0HE- E -NNSNDN E: Extended configuration: User selectable 49, 50P(2), 50G/SG(2), 50N(2), 51P(1), 51G/SG(1), 51N(1)
Phase CT Range	735-5-5HI485 1: 1 A Phase CT Secondaries 5: 5 A Phase CT Secondaries	350E- P0 -G0HEENNSNDN P0: P0 user selectable 1/5 A three-phase current inputs
Ground CT Range	7355-5-HI485 1: 1 A Ground CT Secondaries 5: 5 A Ground CT Secondaries	350EP0- G0 -HEENNSNDN G0: user selectable 1/5 A Ground current input (0.02 - 20 × CT)
Power Supply	73555-HI-485 HI: 90 to 300 V DC; 70 to 265 V AC at 50/60 Hz LO: 20 to 60 V DC; 20 to 48 V AC at 50/60 Hz	350EP0G0- H -EENNSNDN H: 110 - 250 VDC 110 - 230 VAC L: 28 - 48 VDC
Comms	73555HI-485 485: RS485 2-wire communications (standard) 422: RS422 4-wire communications (optional)	350EP0G0HEENN- SN -DN SN: Standard: Front USB, Rear RS485: Modbus RTU, DNP3.0, IEC 60870-5-103



NOTE

Order codes are subject to change without notice. See the GE Multilin website at: <http://www.gegridsolutions.com/multilin> for up-to-date order codes.

1.9 MLJ and TOV relays

Installed Relay	Retrofit Relay
MLJ Digital Synchronism Check Relay 	350 Feeder Protection System, option V or P40 Agile P14D Relay  
TOV Modular Voltage Relay 	350 Feeder Protection System, option V, or P40 Agile P14D Relay  

Most MLJ and TOV features are available in 350 relays as described in the table below:

Feature	MLJ	TOV	350 ¹
Protection & Control	UV: 27 Synchrocheck: 25	UV: 27 OV: 59	UV: 27P(4), 27X(1), 27P_1(1) OV: 59P(4), 59N(4), 59X(1), 59_2(2) Underfrequency: 81U(4) Overfrequency: 81O(4) Synchrocheck: 25(1) Voltage Fuse Failure: VTFF(1)
Communications	Serial (RS232, RS485, fiber) protocols: GEPCE		USB Serial (RS485) protocols: Modbus RTU, DNP 3.0, IEC 60870-5-103 Ethernet protocols: Modbus TCP/IP, DNP 3.0, IEC 60870-5-104, IEC 61850 GOOSE, IEC 61850, OPC-UA
Hardware	2 digital outputs 6 relay outputs Configurable I/O Configurable Logic 3 fixed LEDs	2 digital inputs 6 digital outputs Configurable I/O Configurable Logic 3 fixed LEDs	10 inputs 7 outputs (2 Form A, 5 Form C) Configurable I/O Configurable Logic 8 configurable and 4 fixed LEDs 10 fixed LED (drawout unit) 12 fixed LEDs (non-drawout unit)

1. For additional features, refer to the *350 Instruction Manual*.

For voltage and frequency functionality, P40 Agile P94V Voltage and Frequency IEDs are another option. Refer to the *P40 Agile P94V Technical Manual* for details.

The following table describes MLJ and TOV options, and the equivalent 350 options and order codes. In some cases the 350 options have changed from those available for MLJ and TOV relays, so read the descriptions carefully.

Feature	MLJ order code options	TOV 4 order code options	350 order code options
Application	n/a	TOV-4-013I030F00C 4: 3 Phase voltage relay 5: Single Phase	All 350 relays come with 3 phase and ground standard.
Function	n/a	TOV4013-I-030F00C I: Undervoltage M: Overvoltage	350E- PXGX -HE- N -N-V-SNNN V: Voltage Metering - 27P(4), 27X(1), 27P_1(1), 59P(4), 59N(4), 59X(1), 59_2(2), 81O(4), 81U(4), 25(1), VTFF(1)
Protocol	MLJ100-5-B010F00C 5: RS485 communications 6: RS485 + RS232 + plastic fiber optics communications 7: RS485 + RS232 + glass fiber optics communications	n/a	350EPXGXHENENV- SN -NN SN: Standard: Front USB, Rear RS485: Modbus RTU, DNP3.0, IEC60870-5-103 ¹
Power Supply	MLJ1005B010-F-00C H: 110/250 VDC input and auxiliary voltage F: 24/48 VDC input and auxiliary voltage	TOV4013I030-F-00C F: Aux voltage 24 - 48 VDC/VAC G: Aux voltage 48 - 125 VDC/VAC H: Aux voltage 110 - 240 VDC, 110 - 220 VAC	350EPXGX- H -ENNVSNNN H: 110 - 250 VDC 110 - 230 VAC L: 28 - 48 VDC

1. For details of 350 communications implementation, see the *3 Series Communications Guide*.

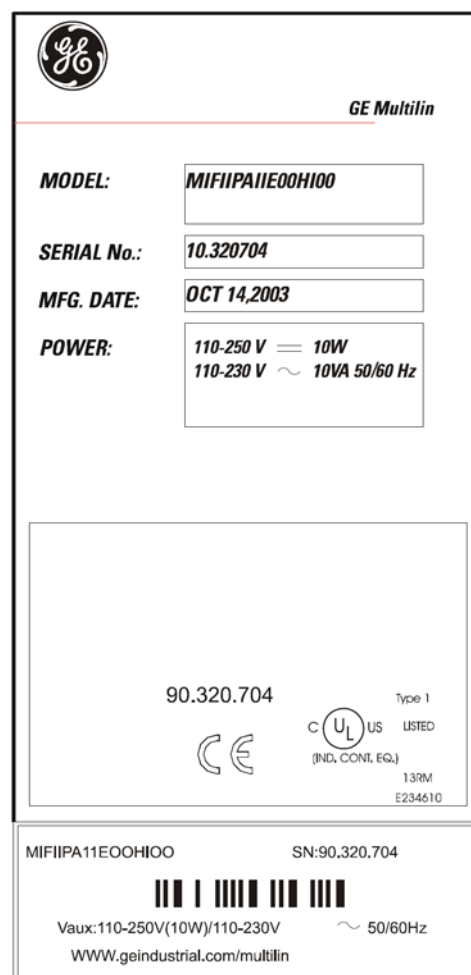


Order codes are subject to change without notice. See the GE Multilin website at: <http://www.gegridsolutions.com/multilin> for up-to-date order codes.

1.10 Finding your M and MII Family relay order code

M Family (MIF, MIG, MIN, MIV, and MIW) relay order codes are in the format MIFPA111FC, and are shown on the faceplate of the relay. The order code is also shown on the relay display from the Information menu, and can be found in the Enervista MII Setup software under **File > Properties**.

MII Family (MIF II, MIG II, MIN II, MIV II, MIW II, and MIB) relay order codes are in the format MIFIIPA11E00HI00. To find the order code for your existing MII relay, check the label on the side of the relay. The model listed on the label is the complete order code. The order code is also shown on the relay display, and can be found in the Enervista MII Setup software under **File > Properties**.



3 Series Retrofit

Chapter 2: Converting Settings Files

Before any mechanical or electrical changes are made, the settings file from the Multilin MII relay in use must be backed up. The existing settings file can then be converted to a 3 Series settings file. All converted settings and new settings (set to default values) must be carefully reviewed before the file is uploaded to the new 3 Series relay.



Settings file conversion is currently available for converting most MIF II and MIV II relay settings files to EnerVista 3 Series Setup software version 2.3x files.

**Table 2-1: File conversion support
for 3 Series release 2.3x**

MII models	FW versions
MIFP	V2.14
MIFIIP	V301 V401 V402 V403 V404
MIFIIP	V502 V503 V504 V505 V506 V507
All MIV II models	V310 V401 V402 V403 V404 V405

2.1 Downloading and saving MIF II or MIV II setpoint files

Use the following procedure to download and save MIF II or MIV II setpoint files to a local PC.

4. Note the location of the saved setpoint file. Two files will be generated, *.txt and *.ajs, and both are necessary for converting to *.sr3 setting file.

1. Start the EnerVista MII Setup software.



Only MIF II or MIV II setpoint files from EnerVista MII Setup version 2.70 and firmware versions listed at the beginning of this chapter are supported for conversion. Older file versions must be converted to the latest version using the latest EnerVista MII Setup software.

To download the latest MII setup software, see <http://www.gegridsolutions.com>

Ensure that the site and corresponding device(s) have been properly defined and configured. (Refer to the *MIF II Instruction Manual* for more information on the EnerVista MII Setup software.)

2. Obtain settings information from the connected relay using **File > Get info from relay**.
3. The EnerVista MII Setup software prompts for the name and destination path of the setpoint file. The corresponding file extension is automatically assigned (*.ajs). Press **Save** to complete the process. After a few seconds of data retrieval the file is saved.
4. Note the location of the saved setpoint file. Two files will be generated: *.txt and *.ajs. Both files are needed for conversion to a *.sr3 setting file.

2.2 Converting a saved MIF II or MIV II setpoint file

The EnerVista 3 Series Setup software allows the user to create new setpoint files based on existing MII setpoint files. These can be uploaded to a relay at a later date. The following procedure illustrates how to convert existing MII setpoint files.



Only MIF II and MIV II setpoint files from EnerVista MII Setup version 2.70 and firmware versions listed at the beginning of this chapter are supported for conversion.

1. Install and start the latest version of the EnerVista 3 SeriesSetup software (available from the GE EnerVista CD or Website). (See the 350 Feeder Protection Instruction Manual for more information.)
2. Select **Offline > New Settings File** from the top menu bar. The following box appears, allowing for the configuration of the setpoint file for the correct firmware version and relay order code.

Create New Settings File

Create Settings File

File Name: D:\Users\Public\Documents\GE Power Manag ...

Version: 2.3x

Description:

Serial # Lock:

Order Code: 350-EP1G1LSSNNSNDN

Ordercode Options

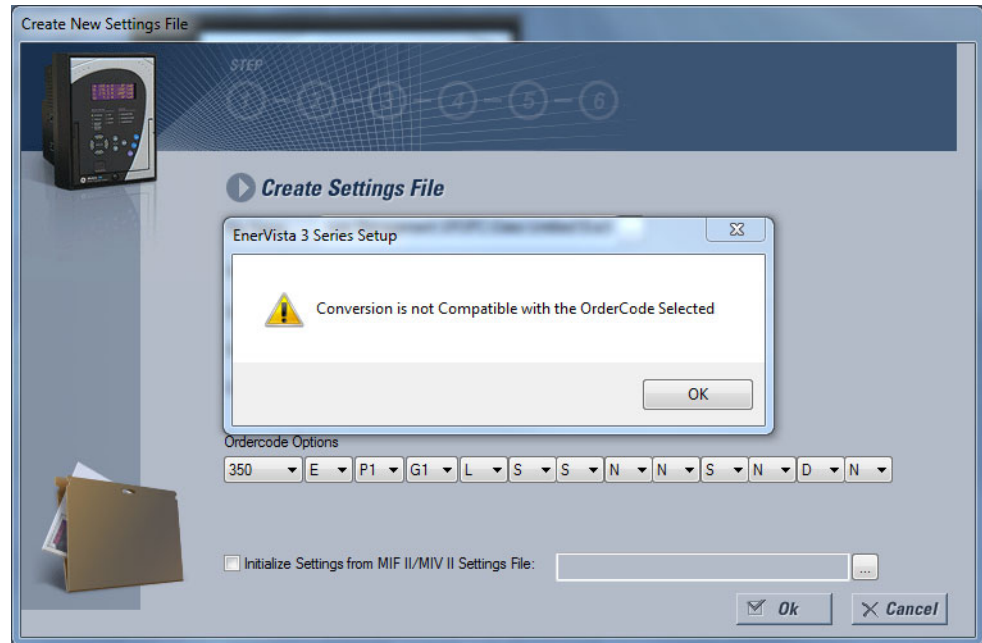
350 E P1 G1 L S S N N S N D N

☒ Initialize Settings from MIF II/MIV II Settings File: C:\GE Power Management\MIIPC\files\Setting ...

Ok Cancel

It is important to define the correct firmware version and order code to ensure that only available setpoints are downloaded into the relay.

If the MIF II or MIV II setpoint file cannot be converted due to an incompatible 350 order code, the following message is shown.



3. Select the Firmware Version, and Order Code options for the new setpoint file.
4. For future reference, enter some useful information in the Description box to facilitate the identification of the device and the purpose of the file.
5. To select a file name and path for the new file, click the button beside the **File Name** box.
6. Select the file name and path to store the file, or select any displayed file name to replace an existing file. All 3 Series setpoint files should have the extension 'sr3' (for example, '350 1.sr3').



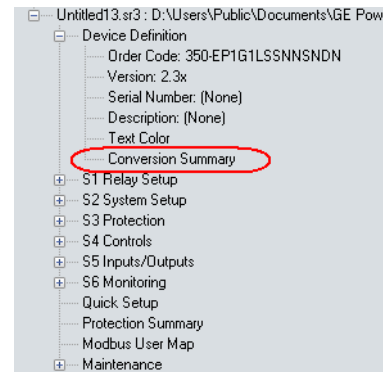
File names for setting files cannot have a decimal point other than the one that is added in front of sr3.

7. Click the box beside **Initialize Settings from MIF II or MIV II Settings File**.
8. To select an existing MIF II or MIV II file, click the button beside the **Initialize Settings from MIF II/MIV II Settings File** box and navigate to the file.
9. Click **OK** to complete the process. Once this step is completed, the new file, with a complete path, is added to the 3 Series software environment. In addition a Conversion Report is generated, as described in the following section.

For more information on the EnerVista 3 Series Setup software, refer to the *350 Feeder Protection System Instruction Manual* at <http://www.gegridsolutions.com>

2.3 Conversion report

Once the file conversion process is complete, the conversion results are summarized in a Conversion Report. The report is found under **Device Definition** in the **Offline** pane of the EnerVista 3 Series Setup software.



The Conversion Report can be printed using the **File/Print** command in the EnerVista taskbar or can be printed from the "GUI" print button.

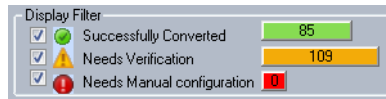


All Conversion Reports are removed when the converted file is edited in the EnerVista 3 Series Setup software. Save the conversion report promptly after each conversion.

Display Filter			
☒	Successfully Converted	85	
☒	Needs Verification	109	
☒	Needs Manual configuration	0	

SettingName	SettingValue	Original SettingName	Original SettingValue
File			
Relay Information			
ProductName	350-EP1G1LSSNNSNDN	ProductName	MIFIIPA11E00**00
Version	230	Version	303
Notes			
Rest Of the settings are defaulted	.		
Setpoints			
S1 Relay Setup			
Communications			
RS485			
RS485 Baud Rate	19200 baud	Comm Baud Rate	2
RS485 Comm Parity	None		
Rear 485 Protocol	Modbus		
Modbus Protocol			
Slave Address	254		
Event Recorder			
Recording of Pickup Events	Disabled		
Recording of Dropout Events	Disabled		
Recording of Trip Events	Enabled		
Recording of Alarm Events	Enabled		
Recording of Control Events	Enabled		
Recording of Contact Input Events	Enabled		
Transient Recorder			
Number of Records	1		
Transient Sampling Rate	8		
Trigger Mode	Overwrite		
Trace Memory Trigger Position	8 %		
Trigger On Pickup	Off		
Trigger On Trip	Off		
Trigger On Alarm	Off		
Trigger On Input 1	Off		
Front Panel			
Breaker Open LED Color	Green		
Breaker Close LED Color	Red		

- The Display Filter checkboxes at the top of the conversion report can be used to change the setpoint display to include or exclude Successfully Converted (green), setpoints that Need Verification (orange), and setpoints that Need Manual Configuration (red).



- Save a copy of the Conversion Report immediately after the conversion, to use for future reference. All Conversion Reports are removed and become inaccessible if the user removes or modifies the converted file from the EnerVista 3 Series Setup software.
- Only settings converted from the original MIF II/MIV II setpoint file are shown in the Conversion Report. All other settings available in the new setpoint file are set to the default value, and must be verified by the user before putting the relay into service.



The settings file conversion process is provisioned to reduce the effort of manually converting settings. This conversion process does not guarantee settings accuracy. Each successfully converted setting must be reviewed before putting the relay in service.

Settings in the Conversion Report window are linked to the appropriate settings screens. Use the Conversion report window to navigate to the corresponding settings window to review converted settings.

2.4 Loading setpoints from a file

Once the converted settings file has been thoroughly reviewed, it can be uploaded to the 3 Series Relay.



An error message occurs when attempting to upload a setpoint file with a revision number that does not match the relay firmware. If the firmware has been upgraded since saving the setpoint file, see the 3 Series Instruction Manual for instructions on changing the revision number of a setpoint file.

The following procedure illustrates how to load setpoints from a file.

1. Start the latest version of the EnerVista 3 Series Setup software.
2. Select the previously saved setpoints file from the **File** pane of the 3 Series software main window.
3. Select the **Offline > Edit Settings File Properties** menu item and verify that the corresponding file is fully compatible with the hardware and firmware version of the target relay. If the versions are not identical, see Upgrading Setpoint Files to a New Revision for details on changing the setpoints file version.
4. Right-click on the selected file and select the **Write Settings File** to Device item.
5. Select the target relay from the list of devices shown and click **Send**.

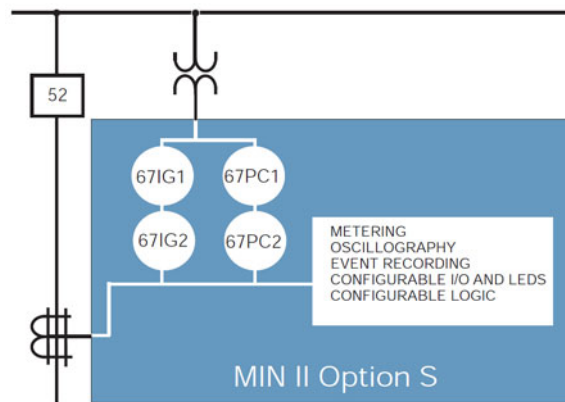
If there are no incompatibilities between the target device and the settings file, the data is transferred to the relay. An indication of the percentage completed is shown in the bottom of the main window.

2.5 Converting MIN II 67IG1 to 350 32N

The 67IG function in MIF II, Option "S", is overcurrent protection specifically designed for detecting ground faults for isolated ground systems.

Isolated Ground Directional Control in the MIN II relay provides directional protection for ungrounded systems. In this type of system the neutral is completely isolated from the ground, as a result of this the ground fault current value is minimum and produced only by the line capacitive coupling. The relay operation is based on the presence of this capacitive current plus the detection of an overvoltage condition.

Figure 2-1: MIN II functional block diagram, option S



This same protection can be provided by the 350 relay using the Wattmetric Ground Fault (32N) element. The Wattmetric ground fault element, also called the Wattmetric Zero-sequence Directional element, responds to power derived from zero-sequence voltage and zero-sequence current in a direction specified by the element characteristic angle. The angle can be set within all four quadrants, so the measured power can be active or reactive or some combination thereof. Therefore the element can be used to sense either forward or reverse ground faults in either inductively, capacitively, or resistively grounded networks.

In order to convert the settings from MIN II 67IG to 350 32N, the settings must be transferred using the Enervista Setup software, and the Power pickup must be calculated.

2.5.1 Mapping settings

Figure 2-2: Sample settings screens

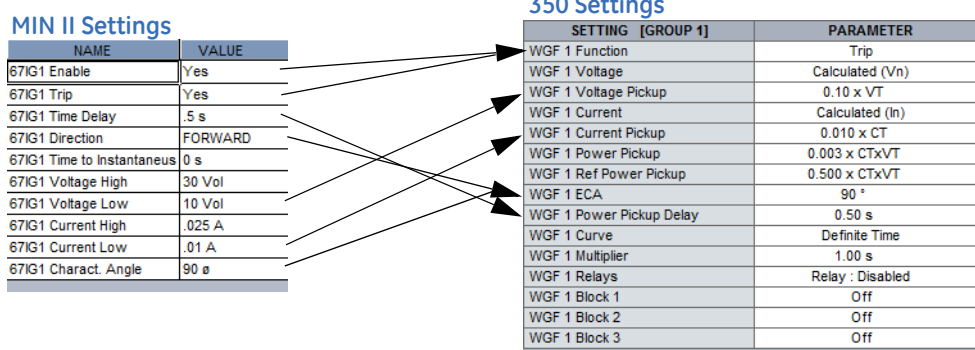


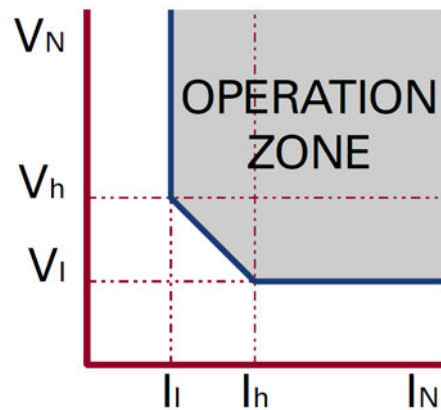
Table 2-2: Enervista setting conversion

67IG1 (MIN II)	67IG1 (MIN II)	32N WGN1 (350)	32N WGN1 (350)	Notes
67IG1 Enable	Ready	WGN 1 Function	Trip	
67IG1 Trip	Ready			
		WGN 1 Voltage	Calculated (Vn)	
67IG1 Voltage Low	10 Volts	WGN 1 Voltage PKP	0.1 x VT	convert V to x VTn (for example, if Vn = 100 V, the new setting is 0.1 x VT)
		WGN 1 Current	Calculated (In)	
67IG1 Current Low	0.01 A	WGN 1 Current PKP	0.01 x CT	convert 0.01 A to x CTn (for example: if CTn = 1 A the new setting is 0.01 x CT)
		WGN 1 Power PKP	0.003 x CTxVT	enter in x CTxVT as explained below
		WGN 1 Ref Power PKP	0.500 x CTxVT	Applicable only if Curve is selected under WGN 1 Curve
67IG1 Direction	Forward	WGN 1 ECA	90°	setting the ECA angle to 90 deg. provides for FORWARD direction (positive power)
67IG1 Charact. Angle	90°			
67IG1 Time Delay	0.5 s	WGN 1 Power PKP Delay	0.5 s	
		WGN 1 Curve	Definite Time	Applicable only if Curve is selected under WGN 1 Curve
		WGN 1 Multiplier	1 s	Applicable only if Curve is selected under WGN 1 Curve
		WGN 1 Relays	Relay: Disabled	
		WGN 1 Block 1	Off	
		WGN 1 Block 2	Off	
		WGN 1 Block 3	Off	

2.5.2 Calculation of power pickup

To achieve the same operation zone with the 32N function, we need to calculate the minimum power for the WGN 1 Power PKP setpoint.

1. Compute the average point between Voltage High (V_h) and Voltage Low (V_l) from the MIN 67IG1 settings.
2. Compute the average point between Current High (I_h) and Current Low (I_l) settings from 67IG1
3. Compute the power corresponding to the middle point from the line between V_h/I_l and V_l/I_h points, as indicate din the figure below. Express the result in $x CT \times VT$. This will be the setting for WGN 1 Power PKP.



Example: (matching screenshots above)

$$\text{Voltage average} = (0.1 + 0.3)/2 = 0.2 \times VT$$

$$\text{Current average} = (0.025 + 0.01)/2 = 0.0175 \times CT$$

$$\text{Compute average power: } 0.2 \times VT * 0.0175 \times CT = 0.0035 \times CT \times VT$$

Since the relay allows only three decimal places, select $0.003 \times VT \times CT$ as the more sensitive setting. If a more conservative setting is required, select $0.004 \times CT \times VT$

The 32N function operates if the computed neutral current is bigger than the Current PKP level, the computed neutral voltage is bigger than the Voltage PKP level, the computed power is bigger than the Power PKP level, and the direction of the power is detected in the Forward direction.

3 Series Retrofit

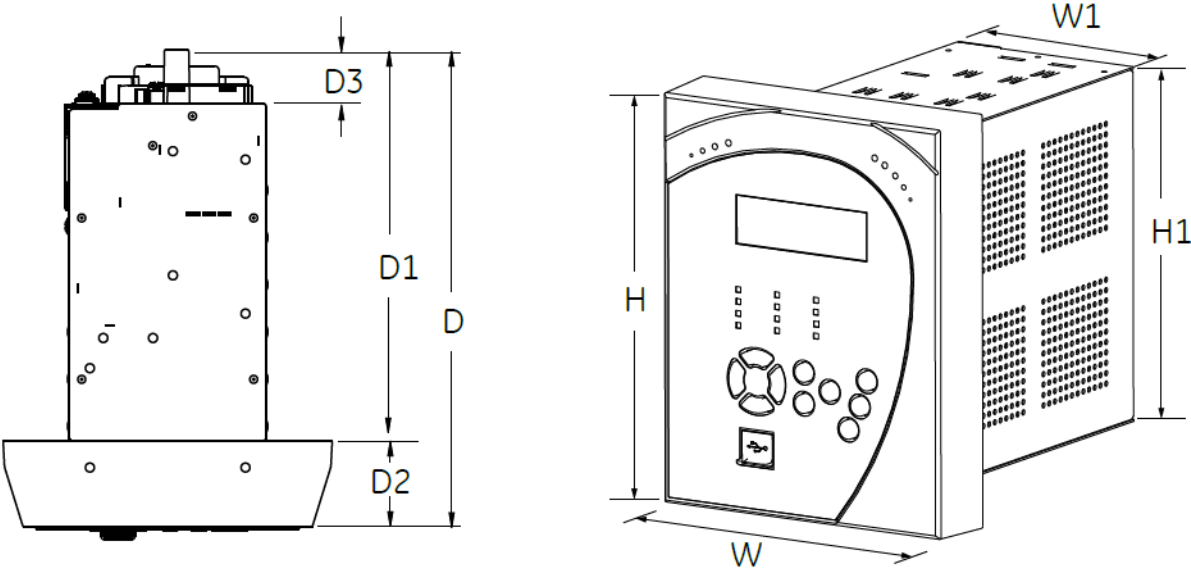
Chapter 3: Installing the 3 Series Relay

This chapter describes the mechanical installation of the 3 Series Retrofit for various installed Multilin relays.

3.1 3 Series dimensions and mounting

All 3 Series relays (350, 345, and 339) have the same dimensions, with small differences between the drawout and non-drawout models.

Figure 3-1: 3 Series Dimensions



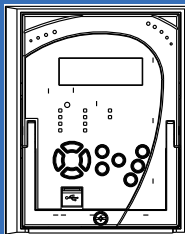
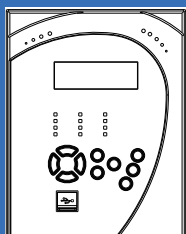
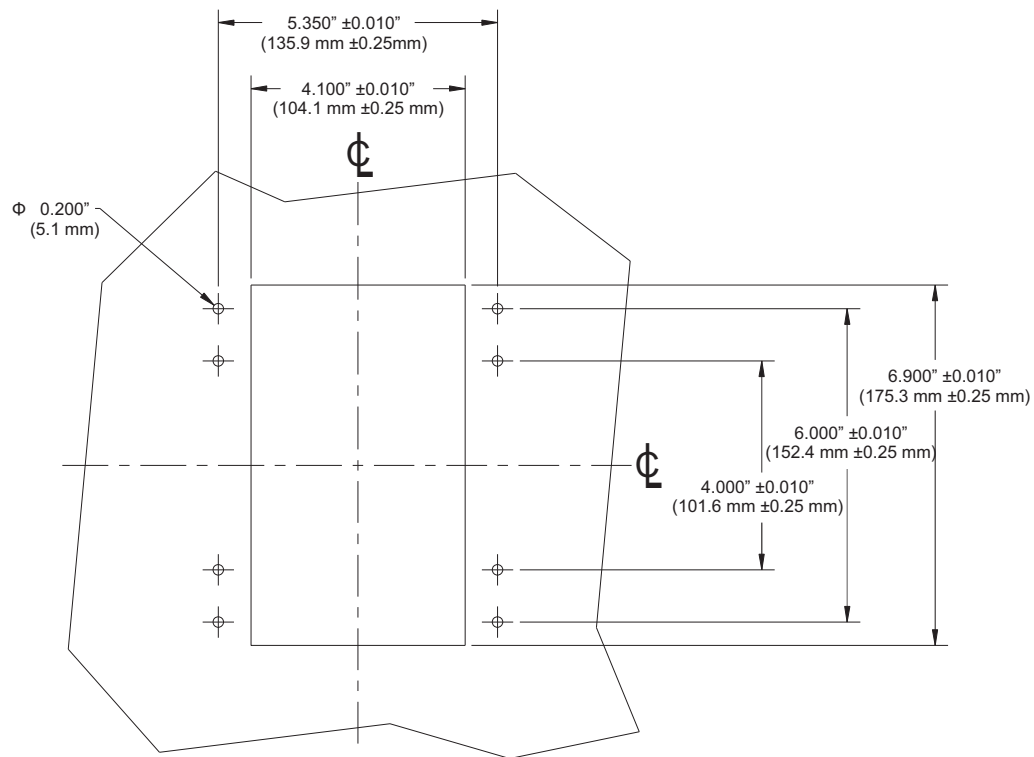
	Drawout		Non-drawout	
				
	in	mm	in	mm
H	7.93	201.5	7.98	202.7
W	6.62	168.2	6.23	158.2
D	9.62	244.2	9.35	237.5
W1	3.96	100.6	3.96	100.6
D1	7.89	200.4	7.88	200.2
D2	1.73	43.8	1.47	37.3
D3	1.087	27.6	0.755	19.17
H1	6.82	173.2	6.82	173.2

Figure 3-2: 3 Series panel cutout



The panel cutout used to mount the 3 Series relays is the same for the 350, 345, and 339 models. Eight screws are used to mount the relay from the back of the cutout panel.

Depth reducing collars are available in two widths as accessories:

- 18L0-0076 3 Series depth reducing collar - 1.375" (34.92 mm)
- 18L0-0075 3 Series depth reducing collar - 3.00" (76.20 mm)

Straight terminal block connectors are available for the non-drawout (NDO) 3 Series relays, providing screws parallel to the wires for easier access when space is limited.

- 3S-NDO-STCONKIT 3 Series NDO straight terminal block kit

3.2 M and MII Family relays

The 3 Series relays have a smaller depth than the M and MII Family relays, so no depth adjustment should be required. If the installed M or MII relay is using a depth-reducing collar, one is also required for the replacement 3 Series unit. Refer to section 3.1 *3 Series dimensions and mounting* for details.

All MII Family panel cutouts and most M Family panel cutouts (MIF, MIG, MIN, and MIW) can be reused to install new 3 Series relays. (The MIV cutout is a different size.)

- The four screw holes in the MII/M cutout have identical spacing to those in the 3 Series relays.
- The small difference in size of the panel cutout (<6 mm) does not affect the relay mount.
- M4 Din9021 zinc plated washers must be used to compensate for the slightly wider screw holes in the MII/M cutout panel.
- Four screws (#8 - 32 x 3/8) must be used to secure the 3 Series relay from the back (instead of the front as for the MII/M relays).



NOTE

Using four mounting screws instead of eight does not affect the stability of the relay mount. The 4-screw 3 Series relay mount has passed the same vibration tests as the 8-screw 3 Series relay mount used for new installations, as listed below.

Table 3-1: 3 Series vibration tests, 4-screw and 8-screw mounts

IEC 60255-21-1	Class 1	Vibration, Bump and Seismic Test. Section 1: Vibration Test
IEC 60255-21-2	Class 1	Vibration, Bump and Seismic Test. Section 2: Shock and Bump Test
IEC 60255-21-3	Class 2	Shock, Bump, and Seismic Test. Section 3: Seismic

3.2.1 M Family of relays

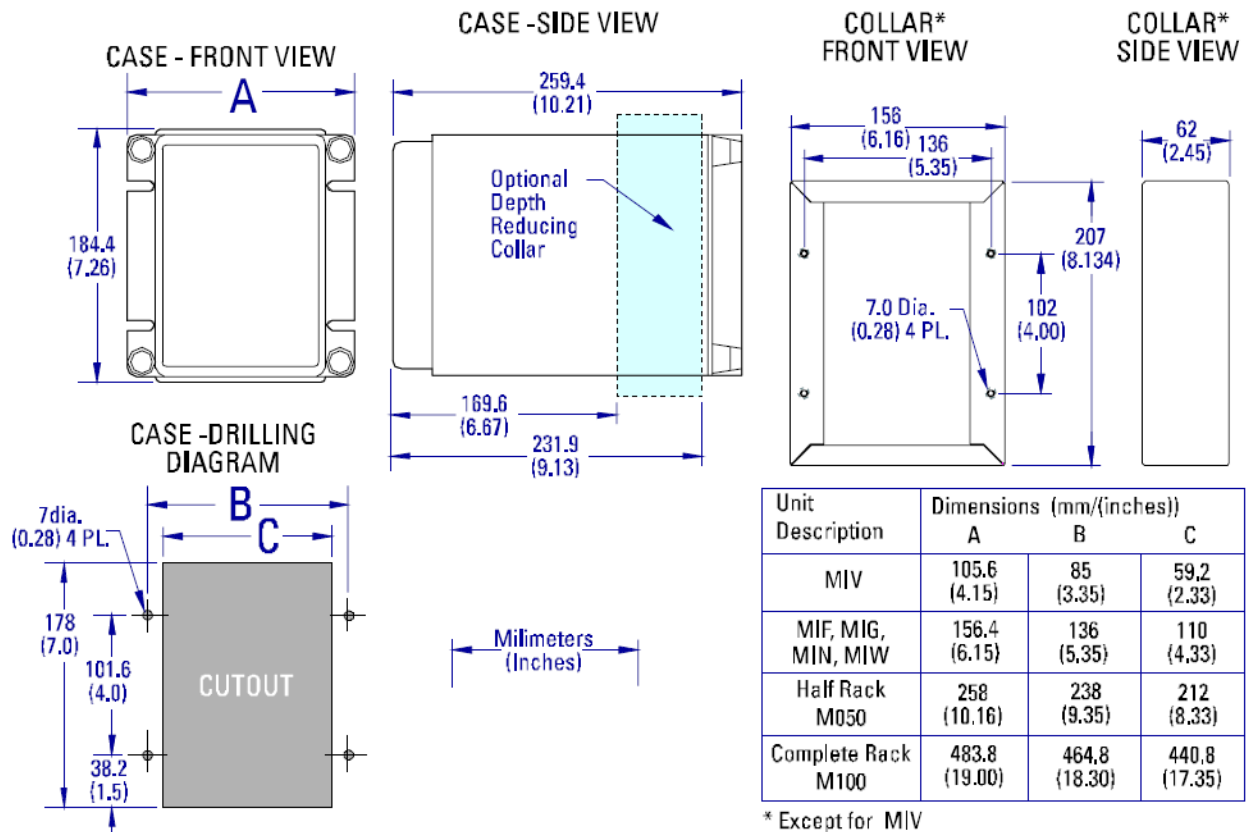
Most of the M Family of relays (MIF, MIG, MIN, and MIW), like the MII Family, have a slightly larger cutout panel than the 3 Series relays, and uses four mounting screws from the front to secure the relay.

The MIV relay has a smaller cutout panel than the 3 Series relays.



Replacing an MIV relay with a 3 Series relay requires panel modification.

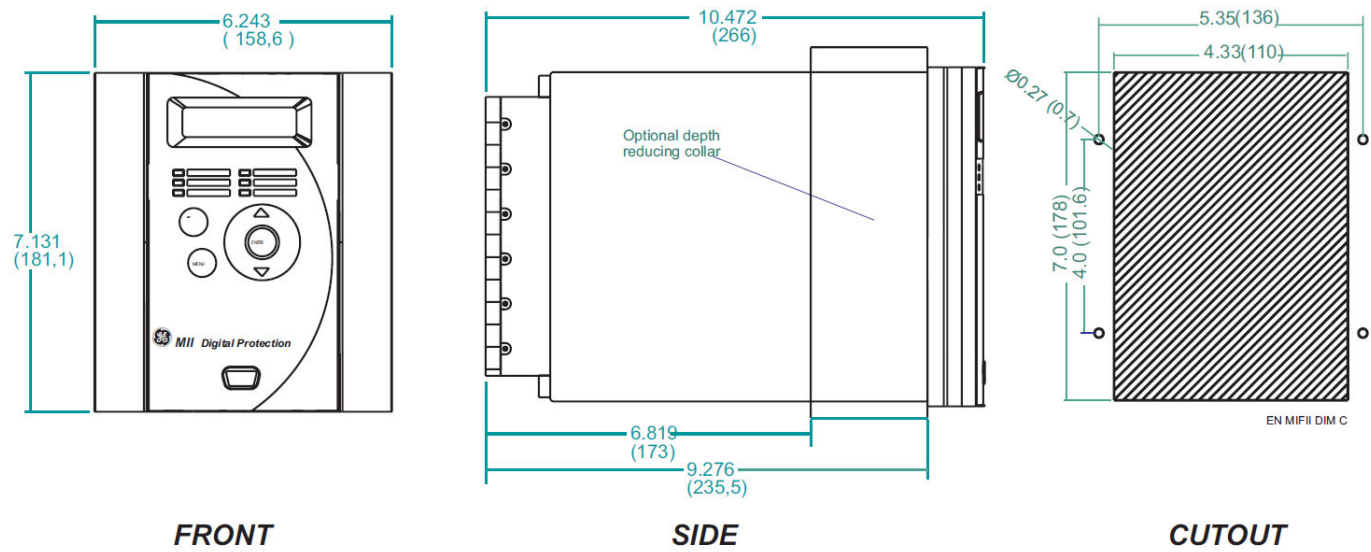
Figure 3-3: M Family: MIF, MIG, MIN, MIW, MIV (note MIV is smaller)



3.2.2 MII Family of relays

The MII Family of relays (MIF II, MIG II, MIN II, MIW II, and MIB) has a slightly larger cutout panel than the 3 Series relays, and uses four mounting screws from the front to secure the relay.

Figure 3-4: MII Family: MIF II, MIG II, MIN II, MIV II, MIW II, MIB



3.2.3 Replacing an M or MII relay

To replace an MII or M Family relay with a 3 Series relay, follow these steps.



Four M4 Din9021 zinc plated washers are required (not included) to install a 3 Series relay in an existing MII or M cutout.



Ensure the MII settings file has been saved before disconnecting an installed MII relay.

The pictures show an MII relay, however the same steps also apply to an M relay (with the exception of the MIV) unless otherwise noted.

1. Disconnect power and unplug all wires from the installed MII or M unit.
2. For an MII relay, pull open the sides to access the screw heads.



3. Unscrew the four mounting screws.



4. Carefully remove the MII relay.



5. Remove the mounting clips from the screw holes.



6. Insert the 3 Series relay into the empty panel cutout.



7. To complete the installation, go around to the back of the panel.



8. From the back of the relay, secure the relay with the new 3 Series screws and M4 Din9021 zinc plated washers (not included) with a torque of 18 in/lb.



The M and MII screws cannot be reused for the 3 Series relay installation, as they are a different size.

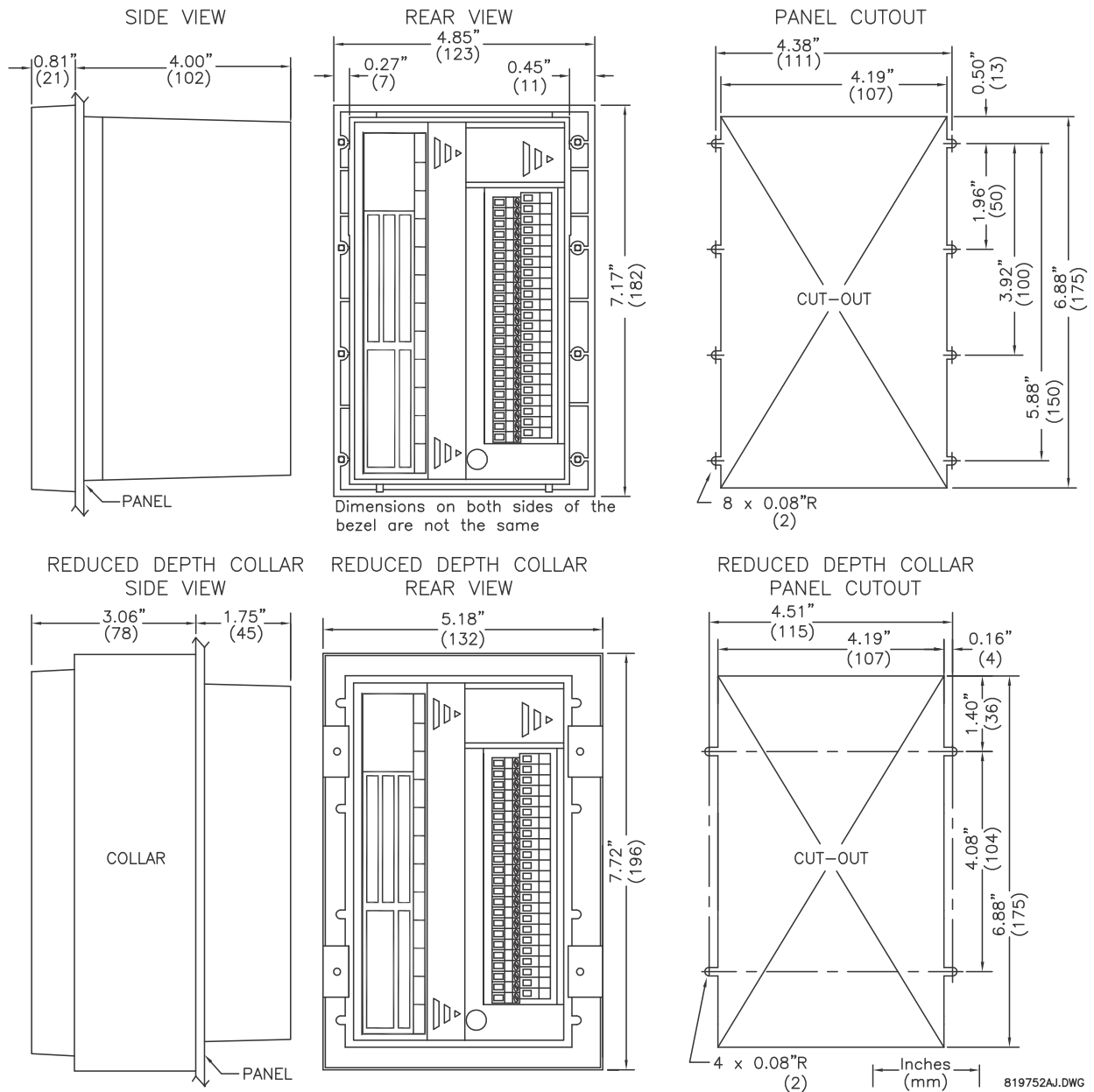
9. Wire the 3 Series relay, referring to the table provided in Chapter 4: *Electrical Installation*, and to the complete product instruction manual if needed.
10. Load the converted settings file if applicable, as described in 2.4 *Loading setpoints from a file*.



3.3 239 dimensions

Multilin 239 relays do not have panel cutouts compatible with the 3 Series relays, and require panel modification in order to retrofit with 3 Series relays. Depth reducing collars are available for the 3 Series relays if space is limited. Refer to section 3.1 *3 Series dimensions and mounting* for details.

Figure 3-5: 239 dimensions and cutout



3.4 735/737 dimensions and 350 retrofit mount

Multilin 735/737 relays do not have panel cutouts compatible with the 3 Series relays. A retrofit kit containing an adapter plate is available in order to retrofit 3 Series relays.

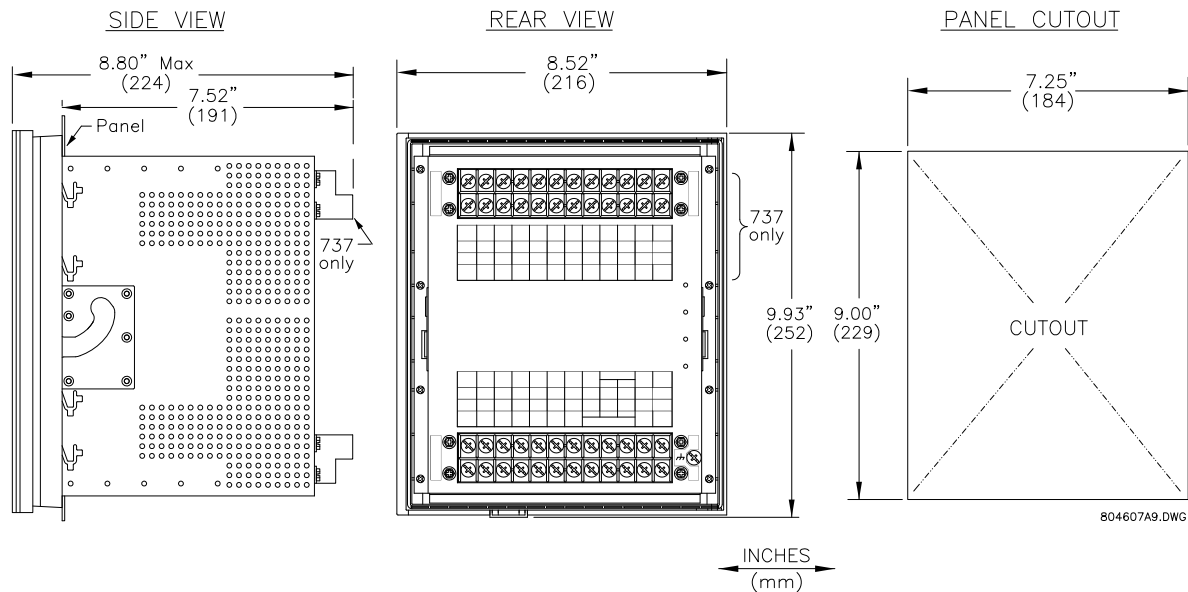
735/737 to 350 Retrofit Kit Part number: 1819-0103

Contents:

- Adapter Plate: 1463-0012
- Washer Lock (8): 1430-0003
- Machine Screws (8): 1408-0015
- Flat Washers (4): 1430-0039
- Screws with ext. Lock Washers (4): 1410-0112

The 350 unit is deeper than the 735/737, and may require a depth reducing collar if space is limited. Existing 735/737 relays installed with a depth reducing collar may also need a reduced-depth replacement. Refer to section 3.1 *3 Series dimensions and mounting* for details.

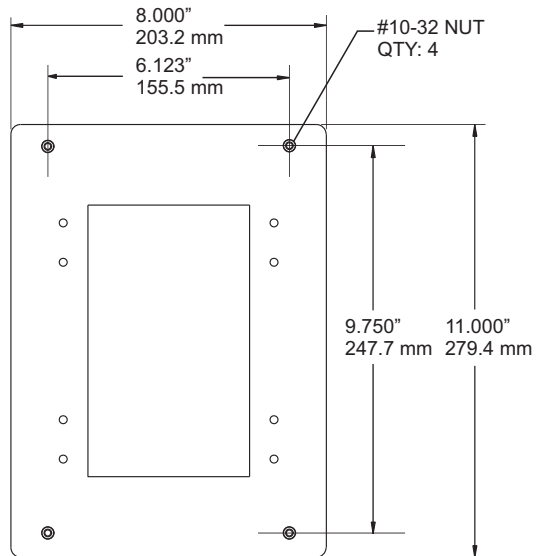
Figure 3-6: 735/737 dimensions and cutout



To install a 350 relay using the 735/737 to 350 Retrofit Kit, do the following:

1. Power down, unplug, and remove the existing 735 or 737 relay.

Figure 3-7: 735/737 to 350 retrofit adapter plate



2. Drill or punch 4 holes on the existing panel at the #10-32 nut locations, as indicated on the adapter plate drawing above.
3. Mount the adapter plate in the correct orientation (front surface outside; the surface with flush nuts is the front surface of the adapter plate).

Ensure that the mounting screws do not penetrate through the adapter plate front surface.

4. Mount the 350 captive unit (chassis) using the adapter plate.
5. Slide and lock the drawout unit into the chassis if applicable.

3.5 MLJ and TOV dimensions and mounting

The MLJ and TOV relays do not have panel cutouts compatible with the 3 Series relays. Both the large MLJ models with communications (1006 and 1007, shown below) and the smaller MLJ and TOV models shown on the following pages require panel modification in order to retrofit with 3 Series relays. Refer to section 3.1 *3 Series dimensions and mounting* for details.

Figure 3-8: MLJ 1006 and 1007 (226B6086H2)

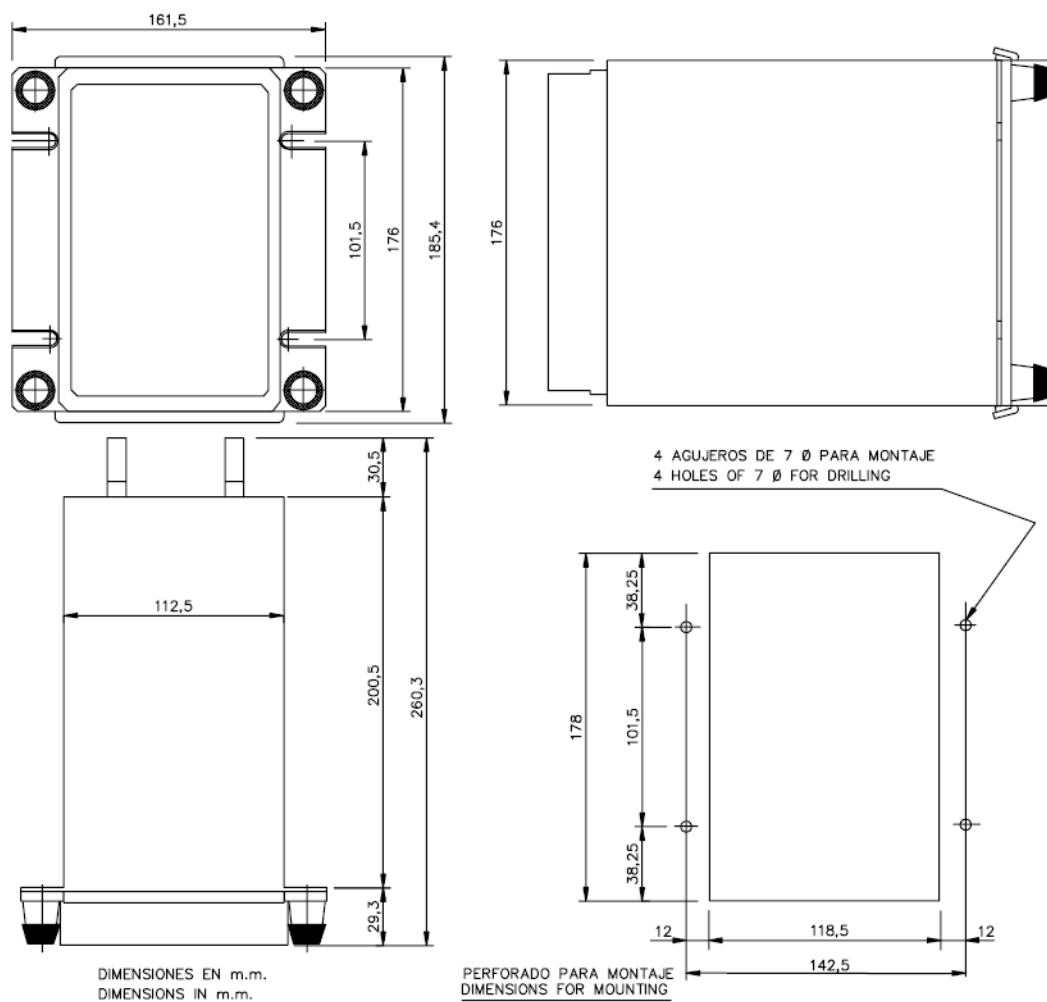


Figure 3-9: MLJ 1000 and 1005 (226B6086H1)

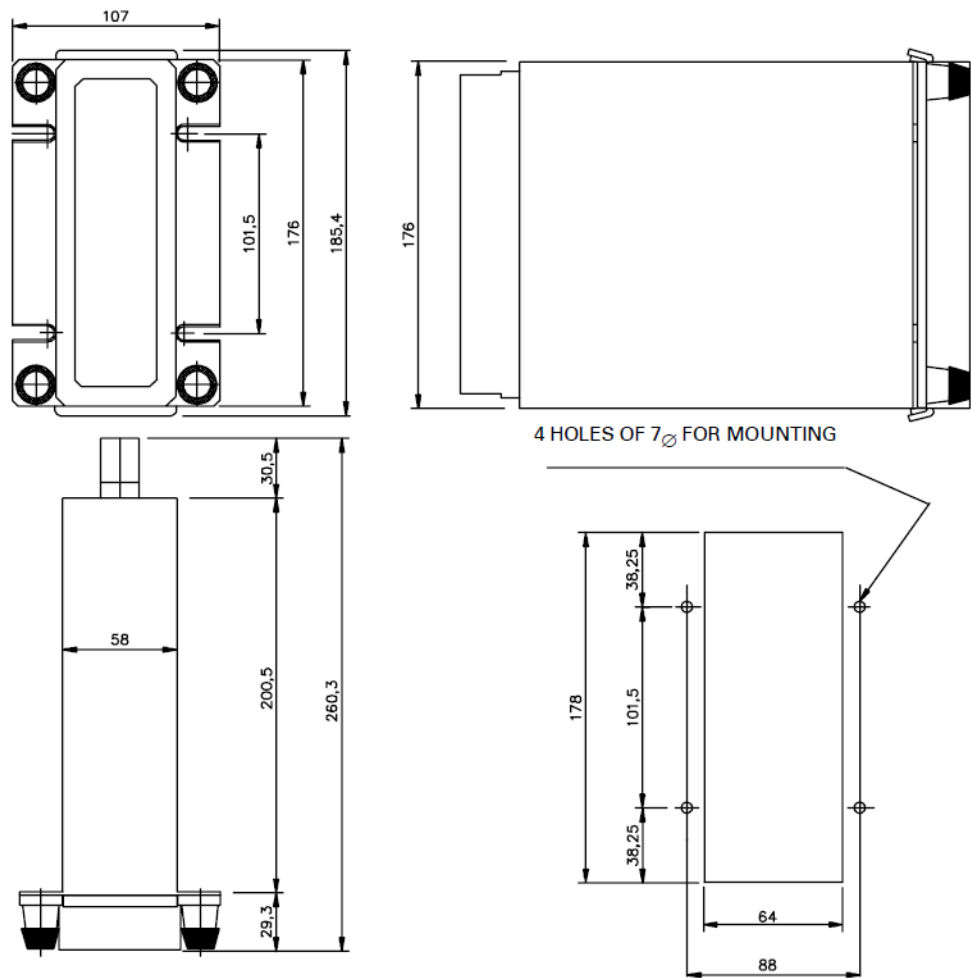
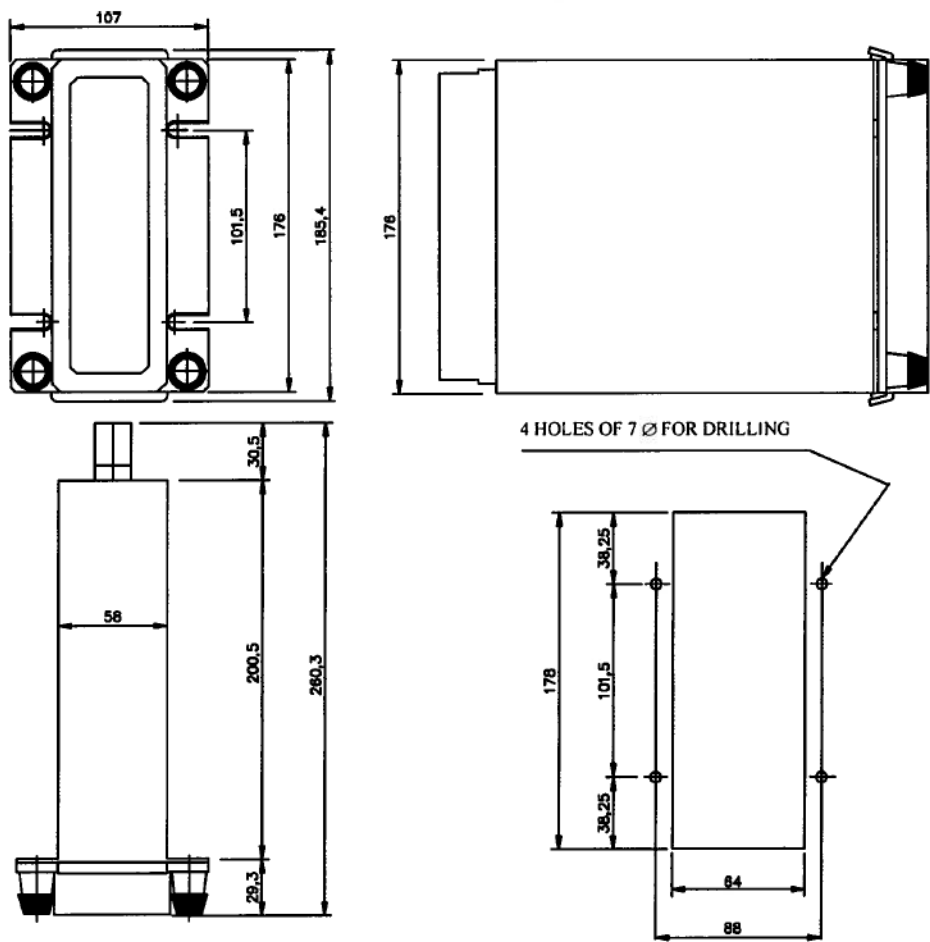


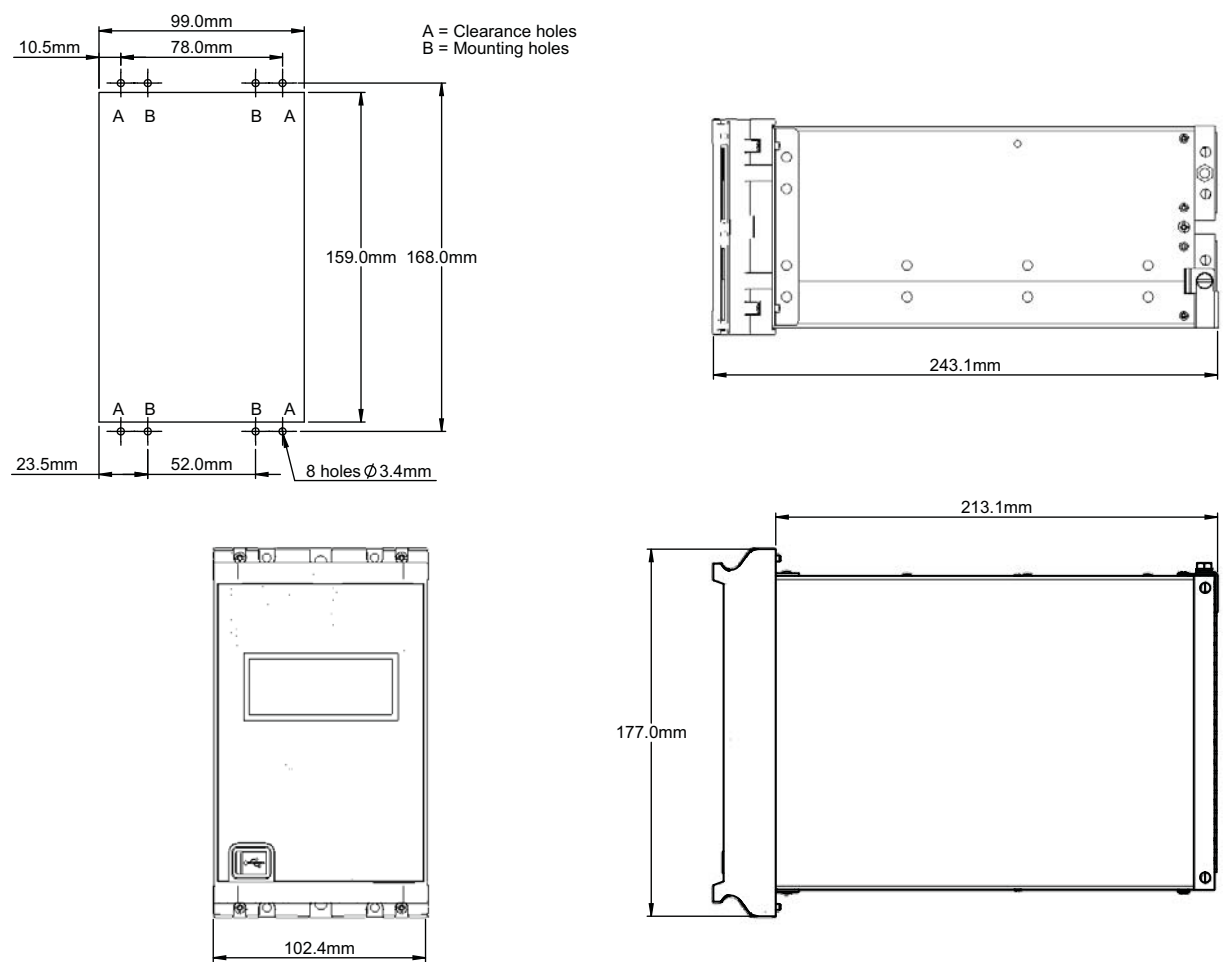
Figure 3-10: TOV (226B6086H1)



3.6 P40 Agile Dimensions

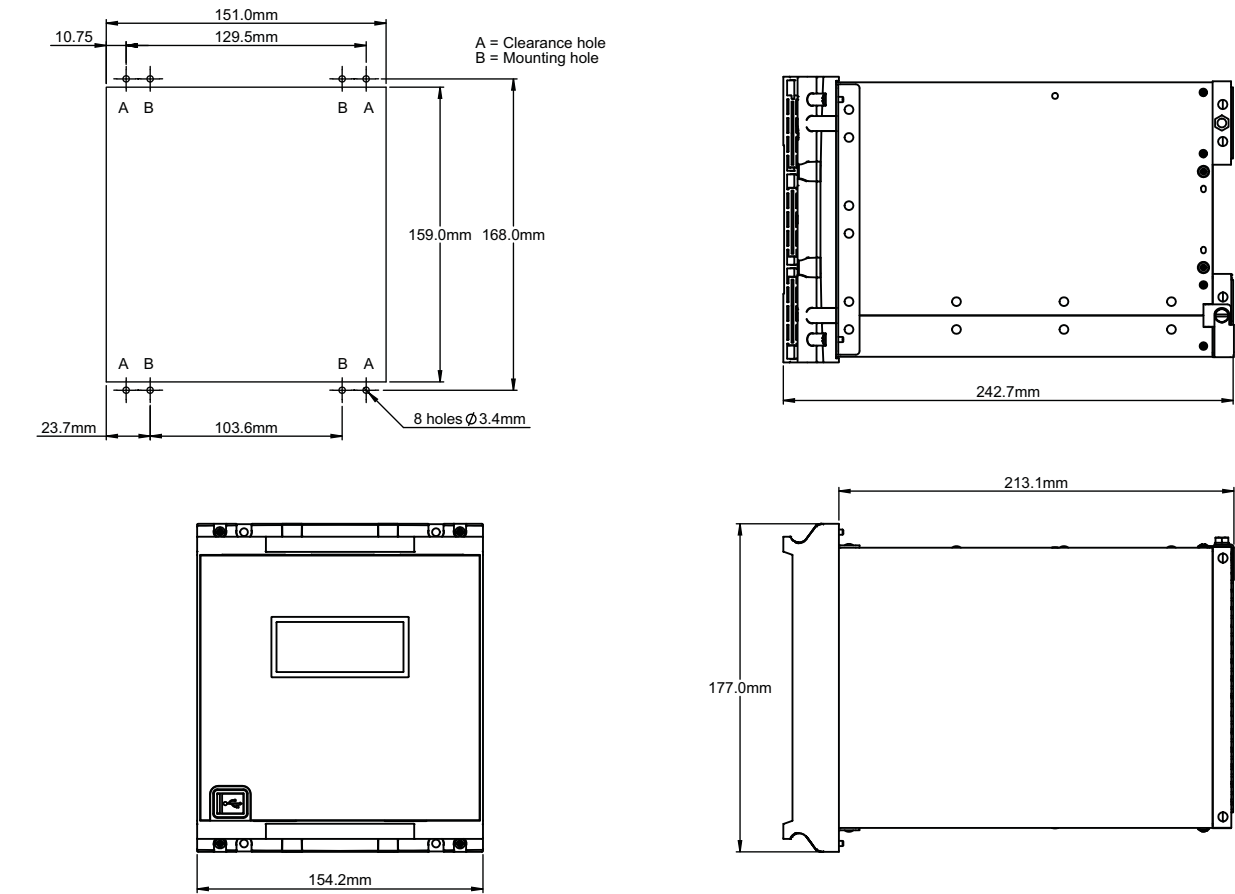
In some cases a P40 Agile P14x relay may be the preferred replacement option. Dimensions of the two P40 Agile P14x case sizes are provided for reference. For additional information, refer to the *P40 Technical Manual*.

Figure 3-11: P40 Agile P14x 20TE case dimensions



E01403

Figure 3-12: P40 Agile P14x 30TE case dimensions



E01404

3 Series Retrofit

Chapter 4: Electrical Installation

This chapter shows the electrical wiring diagram translations for MIV II, MIF II, and 350 relays.



3 Series relays have DC digital inputs while MII Family relays have both AC and DC options. For other relays and for complete wiring diagrams for the relays included in this chapter, refer to the appropriate product Instruction Manuals available on our website:

www.gegridsolutions.com/multilin

4.1 350 Wiring

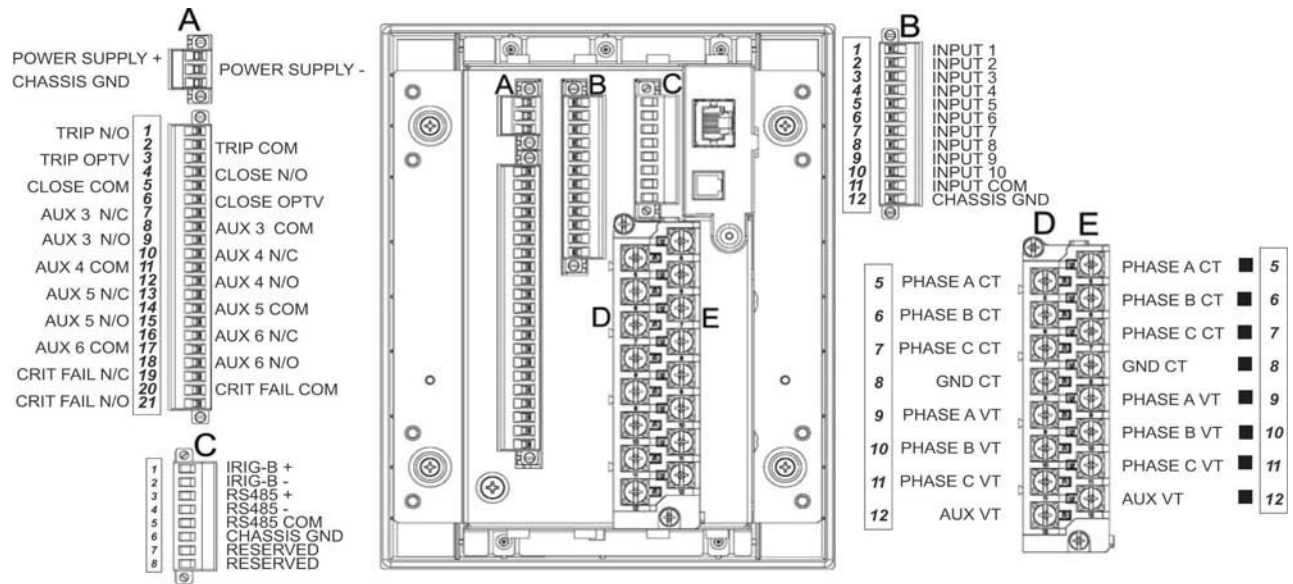


Table 4-1: 350 Terminal Blocks, non-drawout

	Power Supply +	B1	INPUT 1	C1	IRIG-B +	D5	PHASE A CT	E5	PHASE A CT
	Power Supply -	B2	INPUT 2	C2	IRIG-B -	D6	PHASE B CT	E6	PHASE B CT
	Chassis GND	B3	INPUT 3	C3	RS485 +	D7	PHASE C CT	E7	PHASE C CT
A1	TRIP N/O	B4	INPUT 4	C4	RS485 -	D8	GND CT	E8	GND CT
A2	TRIP COM	B5	INPUT 5	C5	RS485 COM	D9	PHASE A VT	E9	PHASE A VT
A3	TRIP OPTV	B6	INPUT 6	C6	CHASSIS GND	D10	PHASE B VT	E10	PHASE B VT
A4	CLOSE N/O	B7	INPUT 7	C7	RESERVED	D11	PHASE C VT	E11	PHASE C VT
A5	CLOSE COM	B8	INPUT 8	C8	RESERVED	D12	AUX VT	E12	AUX VT
A6	CLOSE OPTV	B9	INPUT 9						
A7	AUX 3 N/C	B10	INPUT 10						
A8	AUX 3 COM	B11	INPUT COM						
A9	AUX 3 N/O	B12	CHASSIS GND						
A10	AUX 4 N/C								
A11	AUX 4 COM								
A12	AUX 4 N/O								
A13	AUX 5 N/C								
A14	AUX 5 COM								
A15	AUX 5 N/O								
A16	AUX 6 N/C								
A17	AUX 6 COM								
A18	AUX 6 N/O								
A19	CRIT FAIL N/C								
A20	CRIT FAIL COM								
A21	CRIT FAIL N/O								



NOTE

Refer to the 350 Feeder Protection System Instruction Manual for Arc Flash units.

4.2 345 Wiring

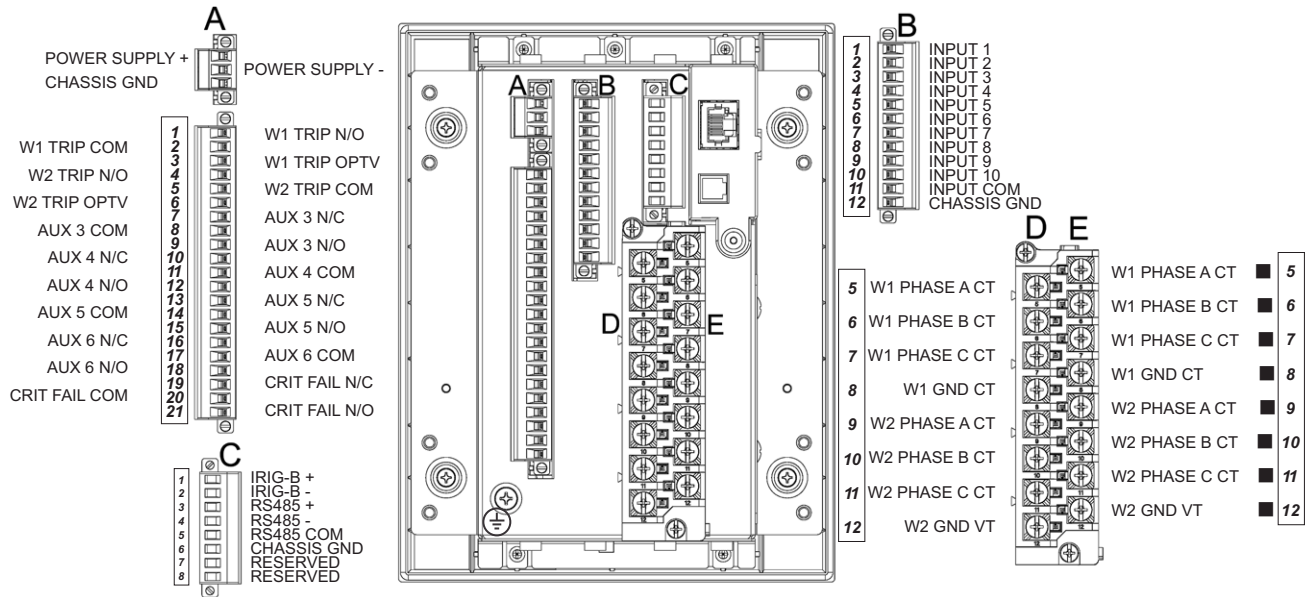


Table 4-2: 350 Terminal Blocks, non-drawout

	Power Supply +	B1	INPUT 1	C1	IRIG-B +	D5	W1 PHASE A CT	E5	W1 PHASE A CT
	Power Supply -	B2	INPUT 2	C2	IRIG-B -	D6	W1 PHASE B CT	E6	W1 PHASE B CT
	Chassis GND	B3	INPUT 3	C3	RS485 +	D7	W1 PHASE C CT	E7	W1 PHASE C CT
A1	W1 TRIP N/O	B4	INPUT 4	C4	RS485 -	D8	W1 GND CT	E8	W1 GND CT
A2	W1 TRIP COM	B5	INPUT 5	C5	RS485 COM	D9	W2 PHASE A CT	E9	W2 PHASE A CT
A3	W1 TRIP OPTV	B6	INPUT 6	C6	CHASSIS GND	D10	W2 PHASE B CT	E10	W2 PHASE B CT
A4	W2 TRIP N/O	B7	INPUT 7	C7	RESERVED	D11	W2 PHASE C CT	E11	W2 PHASE C CT
A5	W2 TRIP COM	B8	INPUT 8	C8	RESERVED	D12	W2 GND VT	E12	W2 GND VT
A6	W2 TRIP OPTV	B9	INPUT 9						
A7	AUX 3 N/C	B10	INPUT 10						
A8	AUX 3 COM	B11	INPUT COM						
A9	AUX 3 N/O	B12	CHASSIS GND						
A10	AUX 4 N/C								
A11	AUX 4 COM								
A12	AUX 4 N/O								
A13	AUX 5 N/C								
A14	AUX 5 COM								
A15	AUX 5 N/O								
A16	AUX 6 N/C								
A17	AUX 6 COM								
A18	AUX 6 N/O								
A19	CRIT FAIL N/C								
A20	CRIT FAIL COM								
A21	CRIT FAIL N/O								

4.3 339 Wiring

Figure 4-1: Terminal identification with switching device as BREAKER - non-drawout

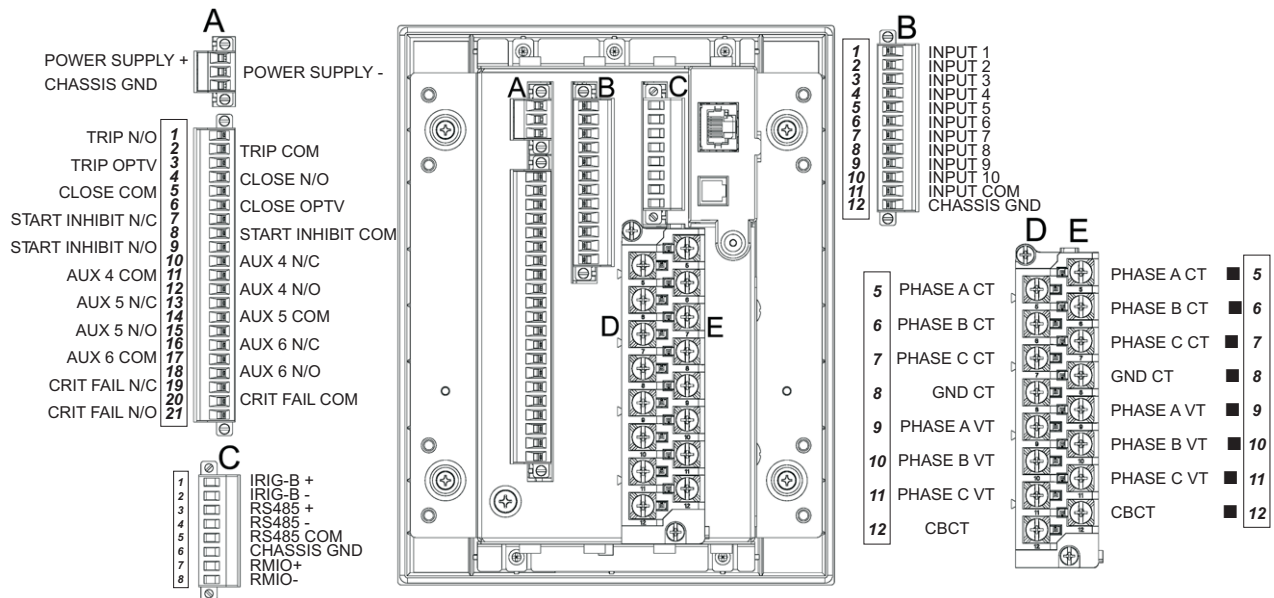


Table 4-3: 339 Terminal blocks with switching device as BREAKER - non-drawout

	Power Supply +	B1	INPUT 1	C1	IRIG-B +	D5	PHASE A CT	E5	PHASE A CT
	Power Supply -	B2	INPUT 2	C2	IRIG-B -	D6	PHASE B CT	E6	PHASE B CT
	Chassis GND	B3	INPUT 3	C3	RS485 +	D7	PHASE C CT	E7	PHASE C CT
A1	TRIP N/O	B4	INPUT 4	C4	RS485 -	D8	GND CT	E8	GND CT
A2	TRIP COM	B5	INPUT 5	C5	RS485 COM	D9	PHASE A VT	E9	PHASE A VT
A3	TRIP OPTV	B6	INPUT 6	C6	CHASSIS GND	D10	PHASE B VT	E10	PHASE B VT
A4	CLOSE N/O	B7	INPUT 7	C7	RMIO+	D11	PHASE C VT	E11	PHASE C VT
A5	CLOSE COM	B8	INPUT 8	C8	RMIO-	D12	CBCT	E12	CBCT
A6	CLOSE OPTV	B9	INPUT 9						
A7	Start Inhibit N/C	B10	INPUT 10						
A8	Start Inhibit COM	B11	INPUT COM						
A9	Start Inhibit N/O	B12	CHASSIS GND						
A10	AUX 4 N/C								
A11	AUX 4 COM								
A12	AUX 4 N/O								
A13	AUX 5 N/C								
A14	AUX 5 COM								
A15	AUX 5 N/O								
A16	AUX 6 N/C								
A17	AUX 6 COM								
A18	AUX 6 N/O								
A19	CRIT FAIL N/C								
A20	CRIT FAIL COM								
A21	CRIT FAIL N/O								

Figure 4-2: Terminal identification with switching device as CONTACTOR - non-drawout

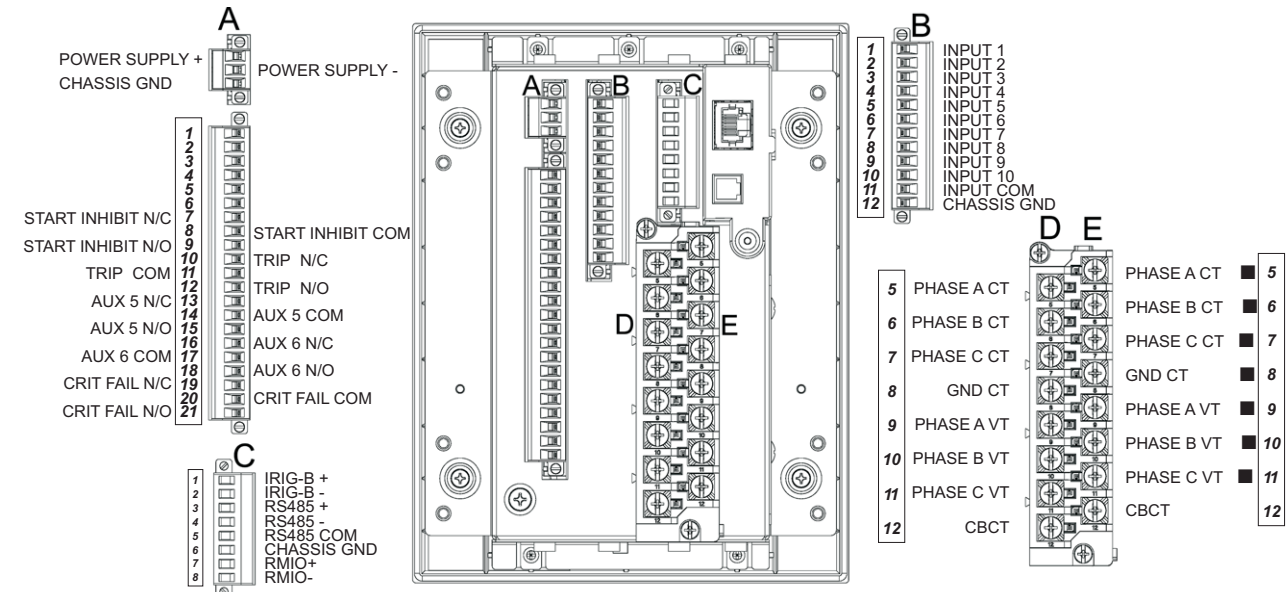


Table 4-4: 339 Terminal blocks with switching device as CONTACTOR - non-drawout

	Power Supply +	B1	INPUT 1	C1	IRIG-B +	D5	PHASE A CT	E5	PHASE A CT
	Power Supply -	B2	INPUT 2	C2	IRIG-B -	D6	PHASE B CT	E6	PHASE B CT
	Chassis GND	B3	INPUT 3	C3	RS485 +	D7	PHASE C CT	E7	PHASE C CT
A1		B4	INPUT 4	C4	RS485 -	D8	GND CT	E8	GND CT
A2		B5	INPUT 5	C5	RS485 COM	D9	PHASE A VT	E9	PHASE A VT
A3		B6	INPUT 6	C6	CHASSIS GND	D10	PHASE B VT	E10	PHASE B VT
A4		B7	INPUT 7	C7	RMIO+	D11	PHASE C VT	E11	PHASE C VT
A5		B8	INPUT 8	C8	RMIO-	D12	CBCT	E12	CBCT
A6		B9	INPUT 9						
A7	Start Inhibit N/C	B10	INPUT 10						
A8	Start Inhibit COM	B11	INPUT COM						
A9	Start Inhibit N/O	B12	CHASSIS GND						
A10	Trip N/C								
A11	Trip COM								
A12	Trip N/O								
A13	AUX 5 N/C								
A14	AUX 5 COM								
A15	AUX 5 N/O								
A16	AUX 6 N/C								
A17	AUX 6 COM								
A18	AUX 6 N/O								
A19	CRIT FAIL N/C								
A20	CRIT FAIL COM								
A21	CRIT FAIL N/O								

4.4 MIF II Wiring

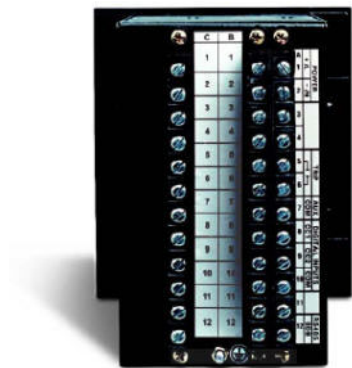


Table 4-5: MIF II Terminal Blocks

A1	+/-L	B1		C1	IA	D1	IA
A2	-/N	B2		C2	N	D2	N
A3		B3		C3	IB	D3	IB
A4		B4		C4	N	D4	N
A5	TRIP	B5		C5	IC	D5	IC
A6	TRIP	B6		C6	N	D6	N
A7	COM (DO)	B7	OUT1 (DO)	C7	IG	D7	IG
A8	CC1 (DI)	B8	OUT2 (DO)	C8	N	D8	N
A9	CC2 (DI)	B9	OUT3 (DO)	C9		D9	
A10	COM (DI)	B10	OUT4 (DO)	C10		D10	
A11		B11	RS485 GND	C11		D11	
A12	RS485 SDB	B12	RS485 SDA	C12		D12	

4.5 MIV II Wiring



Table 4–6: MIV II Terminal Blocks

A1	+/L	B1	VI
A2	-/N	B2	N
A3	VIII	B3	VII
A4	N	B4	N
A5	TRIP	B5	READY CO
A6	TRIP	B6	READY CO
A7	COM (DO)	B7	OUT1 (DO)
A8	CC1 (DI)	B8	OUT2 (DO)
A9	CC2 (DI)	B9	OUT3 (DO)
A10	COM (DI)	B10	OUT4 (DO)
A11		B11	RS485 GND
A12	RS485 SDB	B12	RS485 SDA

4.6 MIF II/MIV II to 350 Retrofit Wiring

4.6.1 MIV II Terminal Block Mapping

Table 4-7: MIV II Terminal Block Mapping

	1	2	3	4	5	6	7	8	9	10	11	12
A	+/L	-N/	VIII	N	TRIP	TRIP	COM (DO)	CC1 (DI)	CC2 (DI)	COM (DI)		RS485 SDB
B	VI	N	VII	N	READY CO	READY CO	OUT1 (DO)	OUT2 (DO)	OUT3 (DO)	OUT4 (DO)	RS485 GND	RS485 SDA
	1	2	3	4	5	6	7	8	9	10	11	12

4.6.2 MIF II Terminal Block Mapping

Table 4-8: MIF II Terminal Block Mapping

	1	2	3	4	5	6	7	8	9	10	11	12
A	+/L	-N/	VIII	N	TRIP	TRIP	COM (DO)	CC1 (DI)	CC2 (DI)	COM (DI)		RS485 SDB
B							OUT1 (DO)	OUT2 (DO)	OUT3 (DO)	OUT4 (DO)	RS485 GND	RS485 SDA
C	IA	N	IB	N	IC	N	IG	N				
D	IA2	N	IB2	N	IC2	N	IG2	N				
	1	2	3	4	5	6	7	8	9	10	11	12

4.6.3 350 Terminal Block Mapping

Table 4-9: 350 Terminal Block Mapping

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
PS	Power Supply +	Power Supply -	Chassis GND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A	TRIP N/O	TRIP COM	TRIP OPTV	CLOSE N/O	CLOSE COM	CLOSE OPTV	AUX 3 N/C	AUX 3 COM	AUX 3 N/O	AUX 4 N/C	AUX 4 COM	AUX 4 N/O	AUX 5 N/C	AUX 5 COM	AUX 5 N/O	AUX 6 N/C	AUX 6 COM	AUX 6 N/O	CRIT FAIL N/C	CRIT FAIL COM	CRIT FAIL N/O
B	INPUT 1	INPUT 2	INPUT 3	INPUT 4	INPUT 5	INPUT 6	INPUT 7	INPUT 8	INPUT 9	INPUT 10	INPUT COM	CHASSIS GND	NA	NA	NA	NA	NA	NA	NA	NA	NA
C	IRIG-B +	IRIG-B -	RS485 +	RS485 -	RS485 COM	CHASSIS GND	RESERVED	RESERVED	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D	NA	NA	NA	NA	PHASE A CT	PHASE B CT	PHASE C CT	GND CT	PHASE A VT	PHASE B VT	PHASE C VT	AUX VT	NA	NA	NA	NA	NA	NA	NA	NA	NA
E	NA	NA	NA	NA	PHASE A CT	PHASE B CT	PHASE C CT	GND CT	PHASE A VT	PHASE B VT	PHASE C VT	AUX VT	NA	NA	NA	NA	NA	NA	NA	NA	NA
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

4.6.4 350 to MIF II Equivalent Terminal Block Mappings

Table 4-10: 350 to MIF II Terminal Block Mapping

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
PS	A1	A2	GND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 4-10: 350 to MIF II Terminal Block Mapping

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
A	A5	A6					B7*	A7	B7	B8*	A7	B8	B9*	A7	B9	B10*	A7	B10	B6	A7	B5
B	A8	A9											NA	NA	NA	NA	NA	NA	NA	NA	NA
C			B12	A12	B11				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D	NA	NA	NA	NA	C1	C3	C5	C7					NA	NA	NA	NA	NA	NA	NA	NA	NA
E	NA	NA	NA	NA	C2	C4	C6	C8					NA	NA	NA	NA	NA	NA	NA	NA	NA
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

* By default the MIF II relays are on the NO (Normally Open) option. For the NC (Normally Closed) position, the output can be modified by changing the jumper position on the hardware.

4.6.5 350 to MIV II Equivalent Terminal Block Mappings

Table 4-11: 350 to MIV II Terminal Block Mapping

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
PS	A1	A2	GND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A	A5	A6					B7*	A7	B7	B8*	A7	B8	B9*	A7	B9	B10*	A7	B10	B6	A7	B5
B	A8	A9											NA	NA	NA	NA	NA	NA	NA	NA	NA
C			B12	A12	B11				NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D	NA	NA	NA	NA					B1	B3	A3		NA	NA	NA	NA	NA	NA	NA	NA	NA
E	NA	NA	NA	NA					B2	B4	A4		NA	NA	NA	NA	NA	NA	NA	NA	NA
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

* By default the MIV II relays are on the NO (Normally Open) option. For the NC (Normally Closed) position, the output can be modified by changing the jumper position on the hardware.

4.6.6 MIF II and MIV II to 350 by function

Table 4-12: CT connections

Type	Function	MIF II	MIV II	350
Currents	Ia polarity	C1	NA	E5
Currents	Ia non-polarity	C2	NA	D5
Currents	Ib polarity	C3	NA	E6
Currents	Ib non-polarity	C4	NA	D6
Currents	Ic polarity	C5	NA	E7
Currents	Ic non-polarity	C6	NA	D7
Currents	Ig polarity	C7	NA	E8
Currents	Ig non-polarity	C8	NA	D8

Table 4-13: Control Power and Grounding connection

Type	Function	MIF II	MIV II	350
Power Supply	Positive	A1	A1	PS1
Power Supply	Negative	A2	A2	PS2

Table 4-13: Control Power and Grounding connection

Type	Function	MIF II	MIV II	350
Power Supply	Ground	SCREW	SCREW	PS GND and SCREW

Table 4-14: I/O Contact Outputs

Type	Function	MIF II	MIV II	350
Contact Output	TRIP N/O	A5	A5	A1
Contact Output	TRIP COM	A6	A6	A2
Contact Output	TRIP OPTV	NA	NA	A3
Contact Output	CLOSE N/O	NA	NA	A4
Contact Output	CLOSE COM	NA	NA	A5
Contact Output	CLOSE OPTV	NA	NA	A6
Contact Output	AUX 3 N/C	B7 ¹	B7*	A7
Contact Output	AUX 3 COM	A7	A7	A8
Contact Output	AUX 3 N/O	B7	B7	A9
Contact Output	AUX 4 N/C	B8*	B8*	A10
Contact Output	AUX 4 COM	A7	A7	A11
Contact Output	AUX 4 N/O	B8	B8	A12
Contact Output	AUX 5 N/C	B9*	B9*	A13
Contact Output	AUX 5 COM	A7	A7	A14
Contact Output	AUX 5 N/O	B9	B9	A15
Contact Output	AUX 6 N/C	B10*	B10*	A16
Contact Output	AUX 6 COM	A7	A7	A17
Contact Output	AUX 6 N/O	B10	B10	A18
Contact Output	CRIT FAIL N/C	B6	B6	A19
Contact Output	CRIT FAIL COM	A7	A7	A20
Contact Output	CRIT FAIL N/O	B5	B5	A21

1. By default the MIF II and MIV II relays are in the NO (Normally Open) position. For the NC (Normally Closed) position, the output can be modified by changing the jumper position on the hardware.

Table 4-15: VT connections

Type	Function	MIF II	MIV II	350
Voltages	Va polarity	NA	B1	E9
Voltages	Va non-polarity	NA	B2	D9
Voltages	Vb polarity	NA	B3	E10
Voltages	Vb non-polarity	NA	B4	D10
Voltages	Vc polarity	NA	A3	E11
Voltages	Vc non-polarity	NA	A4	D11
Voltages	Vaux polarity	NA	NA	E12
Voltages	Vaux non-polarity	NA	NA	D12

Table 4-16: I/O Contact Inputs

Type	Function	MIF II	MIV II	350
Contact Input	In1	A8	A8	B1
Contact Input	In2	A9	A9	B2

Table 4-16: I/O Contact Inputs

Type	Function	MIF II	MIV II	350
Contact Input	In3	NA	NA	B3
Contact Input	In4	NA	NA	B4
Contact Input	In5	NA	NA	B5
Contact Input	In6	NA	NA	B6
Contact Input	In7	NA	NA	B7
Contact Input	In8	NA	NA	B8
Contact Input	In9	NA	NA	B9
Contact Input	In10	NA	NA	B10
Contact Input	Common	A10	A10	B11
Contact Input	Chassis	NA	NA	B12

Table 4-17: Communications

Type	Function	MIF II	MIV II	350
IRIG-B	+	NA	NA	C1
IRIG-B	-	NA	NA	C2
RS485	+	B12	B12	C3
RS485	-	A12	A12	C4
RS485	COM	B11	B11	C5
Comms	CHASSIS GND			C6
Spare terminal	N/A			C7
Spare terminal	N/A			C8

4.7 239 Wiring

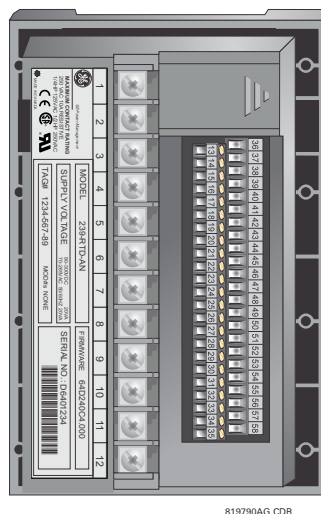


Table 4–18: 239 Terminal Blocks

CT ROW		SIGNAL LOWER ROW		SIGNAL UPPER ROW	
1	Phase A CT 5A	13	Safety ground*	36	Control live (+)
2	Phase A CT 1A	14	Filter ground	37	Control neutral (-)
3	Phase A CT COM	15	RS485 A+	38	Sw com
4	Phase B CT 5A	16	RS485 B-	39	Sw com
5	Phase B CT 1A	17	RS485 ground	40	Sw com
6	Phase B CT COM	18	Analog out +	41	Sw com
7	Phase C CT 5A	19	Analog out -	42	Sw com
8	Phase C CT 1A	20	Analog out shield	43	Access sw +
9	Phase C CT COM	21	Thermistor in +	44	Restart sw +
10	Ground CT 5A	22	Thermistor com	45	Reset sw +
11	Ground CT 50:0.025	23	Trip NO	46	Option 1 sw +
12	Ground CT COM	24	Trip COM	47	Option 2 sw +
		25	Trip NC	48	RTD shield
		26	Alarm NO	49	RTD1 hot
		27	Alarm COM	50	RTD1 comp
		28	Alarm NC	51	RTD1 ret
		29	Auxiliary NO	52	RTD2 hot
		30	Auxiliary COM	53	RTD2 comp
		31	Auxiliary NC	54	RTD2 ret
		32	Service NO	55	RTD3 hot
		33	Service COM	56	RTD3 comp
		34	Service NC	57	RTD3 ret
		35	V1 polarizing (Mod 509 only)	58	Vcom polarizing (Mod 509 only)

4.7.1 239 to 339 Retrofit Wiring

Table 4–19:

239 Terminal	Wiring Connection	339 Terminal
1	Phase A CT 5A	E5
2	Phase A CT 1A	E5
3	Phase A CT COM	D5
4	Phase B CT 5A	E6
5	Phase B CT 1A	E6
6	Phase B CT COM	D6
7	Phase C CT 5A	E7
8	Phase C CT 1A	E7
9	Phase C CT COM	D7
10	Ground CT 5A	E8
11	Ground CT 50:0.025	E8
12	Ground CT COM	D8
13	Safety ground	Chassis Ground/ GND Stud
14	Filter ground	Chassis Ground
15	RS485 A+	C3
16	RS485 B+	C4
17	RS485 ground	C5
18	Analog out +	Not Applicable
19	Analog out -	Not Applicable
20	Analog out shield	Not Applicable
21	Thermistor in +	Not Applicable
22	Thermistor com	Not Applicable
23	Trip NO	A1
24	Trip COM	A2
25	Trip NC	May Use Aux 4 Contact
26	Alarm NO	A12
27	Alarm COM	A11
28	Alarm NC	A10
29	Auxiliary NO	A15
30	Auxiliary COM	A14
31	Auxiliary NC	A13
32	Service NO	A21
33	Service COM	A20
34	Service NC	A19
35	V1 Polarizing (MOD 509)	Note 1
36	Control live (+)	L
37	Control neutral (-)	N
38	Sw com	B11
39	Sw com	B11
40	Sw com	B11
41	Sw com	B11
42	Sw com	B11

Table 4–19:

239 Terminal	Wiring Connection	339 Terminal
43	Access sw +	Programmable from B1 to B10
44	Restart sw +	Programmable from B1 to B10
45	Reset sw +	Programmable from B1 to B10
46	Option 1 sw +	Programmable from B1 to B10
47	Option 2 sw +	Programmable from B1 to B10
48	RTD shield	A11
49	RTD1 hot	B8
50	RTD1 comp	A8
51	RTD1 ret	B11
52	RTD2 hot	B9
53	RTD2 comp	A9
54	RTD2 ret	B11
55	RTD3 hot	B10
56	RTD3 comp	A10
57	RTD3 ret	B11
58	Vcom polarizing (MOD 509)	Note 1

Note 1: The 239 relay with MOD 509 is designed to provide Ground directional protection. Similar protection can be obtained using the 339 relay on neutral instantaneous protection using the either current or voltage or both.

4.8 735/737 Wiring

Figure 4-3: Bottom terminals (735 and 737)

PHASE 1 ●	PHASE 2 ●	PHASE 3 ●	GROUND ●	TRIP NO	AUX NO	SERVICE NO	SERVICE NC	RS422TX OPTION		FILTER GROUND	SAFETY GROUND
								+	-		
G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12
PHASE 1 COM	PHASE 2 COM	PHASE 3 COM	GROUND COM	TRIP COM	AUX COM	SERVICE COM	SHIELD	+	-	CONTROL POWER -	CONTROL POWER +
								RS485 TX/RX RS422 RX OPTION			

Figure 4-4: Top terminals (737 only)

PHASE A TIMED NC	PHASE A TIMED NO	PHASE B TIMED NC	PHASE C TIMED NC	PHASE C TIMED NO	GROUND TIMED NC	PHASE A INST NC	PHASE A INST NO	PHASE B INST NC	PHASE C INST NC	PHASE C INST NO	GROUND INST NC
A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12
PHASE A TIMED COM	PHASE B TIMED NO	PHASE B TIMED COM	PHASE C TIMED COM	GROUND TIMED NO	GROUND TIMED COM	PHASE A INST COM	PHASE B INST NO	PHASE B INST COM	PHASE C INST COM	GROUND INST NO	GROUND INST COM

4.8.1 735/737 to 350 Retrofit Wiring

Table 4-20:

Terminal Description	735/737 Terminal	350 Terminal
Control Power +	H12	B1
Control Power -	H11	A1
Filter Ground	G11	B2
Safety Ground	G12	B2
Phase 1 Current Input o	G1	E5
Phase 1 Current Input	H1	D5
Phase 2 Current Input o	G2	E6
Phase 2 Current Input	H2	D6
Phase 3 Current Input o	G3	E7
Phase 3 Current Input	H3	D7
Ground Current Input o	G4	E8
Ground Current Input	H4	D8
Trip Output	G5	A2
Trip Output	H5	B3
Aux. Trip	G6	B6
Aux. Trip	H6	A6
Service NO	G7	A12
Service COM	H7	B12
Service NC	G8	A11

Table 4-20:

Terminal Description	735/737 Terminal	350 Terminal
RS485 +	H9	F3
RS485 -	H10	F4
RS485 Shield	H8	F5
RS422TX +(Option)	G9	N/A
RS422TX - (Option)	G10	N/A



NOTE

The 737 relay is identical to the 735 relay, with eight additional output contacts that are custom programmable to indicate Pickup and Cause of Trip.

Similar functionality can be achieved with the 350 relay by configuring the four Auxiliary contacts. For details please contact GE Multilin.

3 Series Retrofit

Appendix

Warranty

For products shipped as of 1 October 2013, GE warrants most of its GE manufactured products for 10 years. For warranty details including any limitations and disclaimers, see our Terms and Conditions at <https://www.gegridsolutions.com/multilin/warranty.htm>
For products shipped before 1 October 2013, the standard 24-month warranty applies.

Change notes

Manual Revision history

Table 1: Revision History

MANUAL P/N	RELEASE DATE
1601-0380-A1	August 2016
1601-0380-A2	September 2017

Table 2: Major Updates for A2

Page Number	CHANGES
Cover	Revision to A2

Table 2: Major Updates for A2

Page Number	CHANGES
Chapter 1	Added transformer/generator replacement options for MIG and MIG II P, including 345 87G Added some references to specific sections in the P40 Agile manual Added 239 Added 735/737
Chapter 2	Added MIN II 67IG to 32N 350 mapping section
Chapter 3	Added vibrations test details Added straight terminal block kit Added 239 Added 735/737
Chapter 4	Added note about 3 Series DC digital inputs Added 239 Added 735/737
General	Updated P40 Agile pictures throughout Minor corrections

Table 3: Major Updates for A1

Page Number	CHANGES
	Initial release