



GE VERNOVA

339

Motor Protection System

Motor protection and control



Quick Start Guide

339 revision: 2.5x

Manual P/N: 1601-9104-AD

Publication code: GEK-113564N



© 2025 GE VERNOVA . All rights reserved.

GE VERNOVA 339 Motor Protection System QuickStart Guide for revision 2.5x.

339 Motor Protection System, EnerVista, EnerVista Launchpad, and EnerVista 3 Series Setup are registered trademarks of GE VERNOVA .

The contents of this manual are the property of GE VERNOVA . This documentation is furnished on license and may not be reproduced in whole or in part without the permission of GE VERNOVA . The content of this manual is for informational use only and is subject to change without notice.

Storage

Store the unit indoors in a cool, dry place. If possible, store in the original packaging. Follow the storage temperature range outlined in the Specifications.

NOTICE

To avoid deterioration of electrolytic capacitors, power up units that are stored in a de-energized state once per year, for one hour continuously.

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.gevernova.com/grid-solutions/multilin/warranty.htm> For products shipped before 1 October 2013, the standard 24-month warranty applies.

Repairs

The firmware and software can be upgraded without return of the device to the factory. For issues not solved by troubleshooting, the process to return the device to the factory for repair is as follows:

- Contact a GE VERNOVA Grid Solutions Technical Support Center. Contact information is found in the first chapter.
- Obtain a Return Materials Authorization (RMA) number from the Technical Support Center.
- Verify that the RMA and Commercial Invoice received have the correct information.
- Tightly pack the unit in a box with bubble wrap, foam material, or styrofoam inserts or packaging peanuts to cushion the item(s). You may 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.

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 VERNOVA Grid Solutions service department. Use the detailed return procedure outlined at https://www.gevernova.com/grid-solutions/multilin/support/ret_proc.htm

The current warranty and return information are outlined at

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



GENERAL SAFETY PRECAUTIONS - 339

- Failure to observe and follow the instructions provided in the equipment manual(s) could cause irreversible damage to the equipment and could lead to property damage, personal injury and/or death.
- 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.
- Caution: 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.
- All recommended equipment that 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.
- At all times, equipment ground terminal must be grounded during device operation and service.
- In addition to the safety precautions mentioned all electrical connections made must respect the applicable local jurisdiction electrical code.
- Before working on CTs, they must be short-circuited.
- LED transmitters are classified as IEC 60825-1 Accessible Emission Limit (AEL) Class 1M. Class 1M devices are considered safe to the unaided eye. Do not view directly with optical instruments.

This product cannot be disposed of as unsorted municipal waste in the European Union. For proper recycling return this product to your supplier or a designated collection point. For more information go to www.recyclethis.info.

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.

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>

Table of Contents

INTRODUCTION	Overview	1
	Description of the 339 Motor Protection System	2
	339 order codes	6
	Specifications	8
	Password security	8
	Protection	8
	Metering	13
	Data capture	13
	Control	14
	Monitoring	16
	Inputs	16
	Outputs	17
	Power supply	18
	Communications	18
	Testing and certification	20
	Physical	22
	Environmental	22

INSTALLATION	Mechanical installation	23
	Dimensions	24
	Product identification	26
	Mounting	26
	Standard panel mount	26
	Drawout unit withdrawal and insertion	31
	IP20 Cover (optional)	32
	Electrical installation	32
	Typical Wiring Diagrams	33
	339 terminals	36
	Terminal identification - Input/Output "E"	38
	Terminal identification - Input/Output "R"	42
	Wire range	44
	RMIO module installation	45
	Internal RTD installation	47
	Phase sequence and transformer polarity	47
	Current inputs	48
	Ground and CBCT inputs	48
	Zero sequence CT installation	49
	Voltage inputs	49
	Control power	50
	Contact inputs	51
	Trip and Close output relays	51
	Serial communications	54
	IRIG-B	55

INTERFACES	Front control panel interface	58
	Description	60
	Display	60
	Working with the Keypad	60

LED status indicators - Front panel with non-programmable LEDs	62
LED status indicators - Front panel with programmable LEDs	63
Relay messages	64
Default message	64
Target messages	65
Self-test errors	65
Flash messages	67
Software setup	68
Quick setup - Software interface	68
EnerVista 3 Series Setup Software	68
Hardware and software requirements	69
Installing the EnerVista 3 Series Setup software	69
Upgrading the software	72
Connecting EnerVista 3 Series Setup to the relay	72
Configuring serial communications	72
Using the Quick Connect feature	73
Configuring Ethernet communications	74
Connecting to the relay	75
Working with setpoints and setpoint files	76
Engaging a device	76
Entering setpoints	76
Setting programmable LEDs	78
File support	79
Using setpoint files	79
Downloading and saving setpoint files	80
Adding setpoint files to the environment	80
Creating a new setpoint file	81
Upgrading setpoint files to a new revision	81
Printing setpoints and actual values	82
Printing actual values from a connected device	83
Loading setpoints from a file	84
Uninstalling files and clearing data	84
Upgrading relay firmware	85
Loading new relay firmware	85
Advanced EnerVista 3 Series Setup features	87
Flexcurve editor	87
Data logger	88
Motor start data logger	90
Transient recorder (Waveform capture)	91
Protection summary	94
Password security	96

QUICK SETUP - FRONT CONTROL PANEL

Quick Setup settings	100
----------------------------	-----

MAINTENANCE

General maintenance	104
In-service maintenance	104
Out-of-service maintenance	104
Unscheduled maintenance (system interruption)	104

339 Motor Protection System

Chapter 1: Introduction

Overview

The 339 Motor Protection System is a microprocessor based relay providing suitable protection of medium voltage motors. The small footprint and the withdrawable option make the 339 relay ideal for panel mounting on either new or retrofit installations. The combination of proven hardware, a variety of protection and control features, and communications, makes the relay ideal for total motor protection and control. Equipped with serial (RS485), USB, and Ethernet ports, and a wide selection of protocols such as Modbus, DNP3.0, IEC 60870-5-103, 60870-5-104, GOOSE, the 339 relay is the best-in-class for MCCs, SCADA and inter-relay communications. The 339 relay provides excellent transparency with respect to power system conditions and events, through its four-line 20-character display, as well as the EnerVista 3 Series Setup program. Conveniently located LEDs provide indication of overall relay operation, as well as alarm, pickup, and motor status.

The 339 relay provides the following key benefits:

- Withdrawable small footprint – saves on rewiring and space.
- Fast setup (Quick Setup) menu provided, to guide users through a wide range of motor management applications.
- Large four-line LCD display, LEDs, and an easy-to-navigate keypad.
- Multiple communication protocols for simultaneous access when integrated into monitoring and control systems.

Description of the 339 Motor Protection System

CPU

Relay functions are controlled by two processors: a Freescale MPC5554 32-bit microprocessor measures all analog signals and digital inputs and controls all output relays; a Freescale MPC520B 32-bit microprocessor controls all the Ethernet communication protocols.

Analog Input and Waveform Capture

Magnetic transformers are used to scale-down the incoming analog signals from the source instrument transformers. The analog signals are then passed through a 960 Hz low pass anti-aliasing filter. All signals are then simultaneously captured by sample and hold buffers to ensure there are no phase shifts. The signals are converted to digital values by a 12-bit A/D converter before finally being passed on to the CPU for analysis.

Both current and voltage are sampled thirty-two times per power frequency cycle. These 'raw' samples are scaled in software, then placed into the waveform capture buffer, thus emulating a fault recorder. The waveforms can be retrieved from the relay via the EnerVista 3 Series Setup software for display and diagnostics.

Frequency

Frequency measurement is accomplished by measuring the time between zero crossings of the Bus VT phase A voltage. The signals are passed through a low pass filter to prevent false zero crossings. Sampling is synchronized to the V_a -x voltage zero crossing which results in better co-ordination for multiple 339 relays on the same bus.

Phasors, Transients, and Harmonics

Current waveforms are processed four times every cycle with a DC Offset Filter and a Discrete Fourier Transform (DFT). The resulting phasors have fault current transients and all harmonics removed. This results in an overcurrent relay that is extremely secure and reliable; one that will not overreach.

Processing of AC Current Inputs

The DC Offset Filter is an infinite impulse response (IIR) digital filter, which removes the DC component from the asymmetrical current present at the moment a fault occurs. This is done for all current signals used for overcurrent protection; voltage signals bypass the DC Offset Filter. This filter ensures no overreach of the overcurrent protection.

The Discrete Fourier Transform (DFT) uses exactly one sample cycle to calculate a phasor quantity which represents the signal at the fundamental frequency; all harmonic components are removed. All subsequent calculations (e.g. RMS, power, etc.) are based upon the current and voltage phasors, such that the resulting values have no harmonic components.

Protection Elements

Protection elements are processed up to four times every cycle to determine if a pickup has occurred or a timer has expired. The protection elements use RMS current/voltage, based on the magnitude of the phasor. Hence, protection is impervious to both harmonics and DC transients.

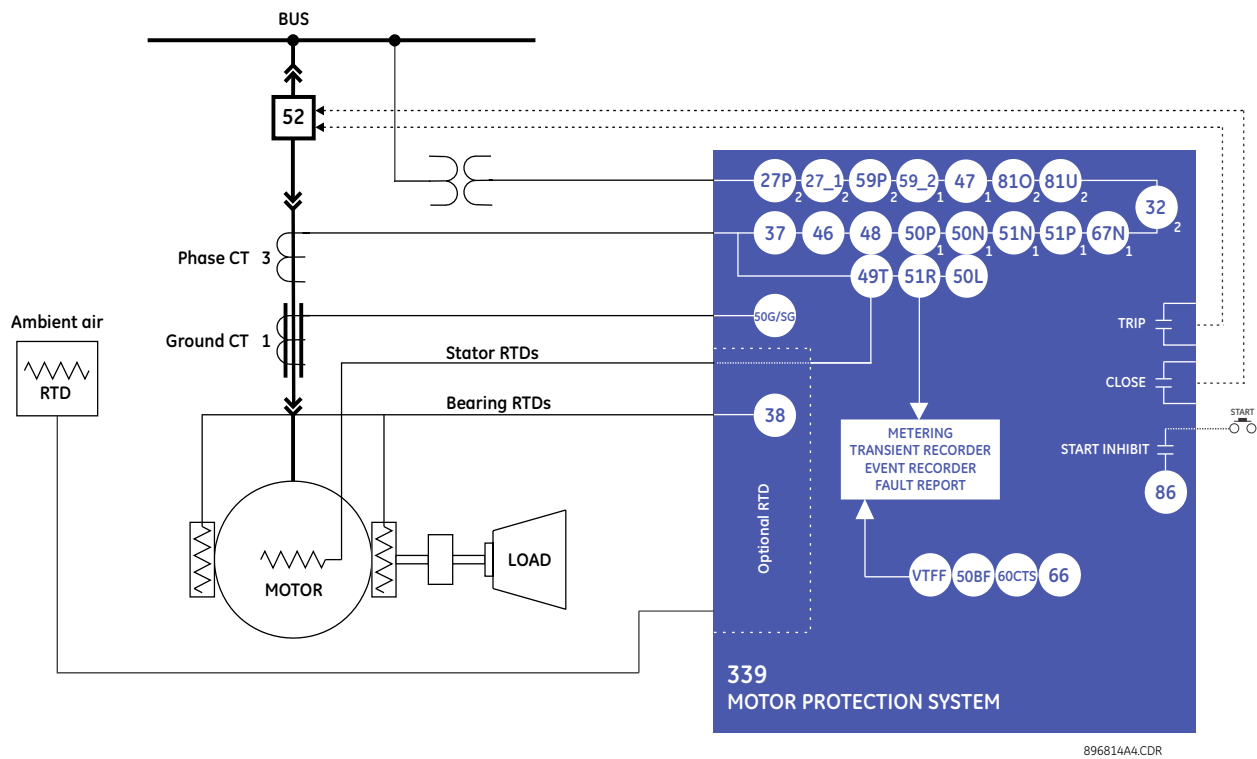


Figure 1-1: Functional block diagram

Table 1-1: ANSI device numbers and functions

ANSI Code	61850 Logical Node	Description
27_1	psseqPTUV1, psseqPTUV2	Positive Sequence Undervoltage
27P	phsPTUV1, phsTUV2	Phase Undervoltage
32	PDOP1, PDOP2	Directional Power
37	PTUC1	Undercurrent
37P	PDUP1	Underpower
38/49T	rtdGGIO6	Bearing RTD
		Stator/Ambient/Other
		RTD Trouble Alarm
46	unbalPTOC1	Current Unbalance
47	phsrevPTOV1	Voltage Phase Reversal
48	accelPTOC1	Acceleration Time
49	PTTR1	Thermal Protection/Stall Protection
50BF	RBRF1	Breaker Failure / Welded Contactor
50G/SG	gndPIOC1	Ground Fault/Sensitive Ground Fault (CBCT)
50L	ldincPTOC1	Load Increase Alarm
50N	ndPIOC1	Neutral Instantaneous Overcurrent
50P	scPIOC1	Short Circuit
51N	ndPTOC1	Neutral Timed Overcurrent
51P	phsPTOC1	Phase Timed Overcurrent
51R	jamPTOC1	Mechanical Jam
59_2	ngseqPTOV	Negative Sequence Overvoltage

ANSI Code	61850 Logical Node	Description
59P	phsPTOV1, phsPTOV2	Phase Overvoltage
60CTS	-	CT Supervision
66	PMRI1	Starts per Hour & Time Between Starts
		Restart Block
		Thermal Inhibit
67N	ndRDIR1	Neutral Directional Element
81O	PTOF1, PTOF2	Overfrequency
81U	PTUF1, PTUF2	Underfrequency
86	-	Lockout
VTFF (60VTS)	-	VT Fuse Failure
-	MMXU1	Voltage, Power, Energy Metering
-	MSQI1	Current, Voltage Sequences

Table 1-2: Other device functions

Description
2nd Harmonic Blocking
2-speed Motor (thermal, short circuit, undercurrent, acceleration)
Ambient Temperature
Breaker Control
Breaker Health
Breaker Maintenance
CT Failure Detection
Demand (in metering)
Digital Counters
DNP 3.0 Communications
Event Recorder
Fault Report
Flexcurves
IEC 60870-5-103 Communications
IEC 60870-5-104 Communications
IEC 61850 Communications
IEC 61850 GOOSE Communications
Logic Elements
Metering: current, voltage, power, PF, energy, frequency, harmonics, THD
Modbus User Map
Modbus RTU Communications
Modbus TCP Communications
Non-volatile Latches
Output Relays
PRP Communications
Relay Maintenance
Remote Inputs (32)
Setpoint Groups (2)
Test Mode
Transient Recorder (Oscillography)
Trip and Close Coil Monitoring

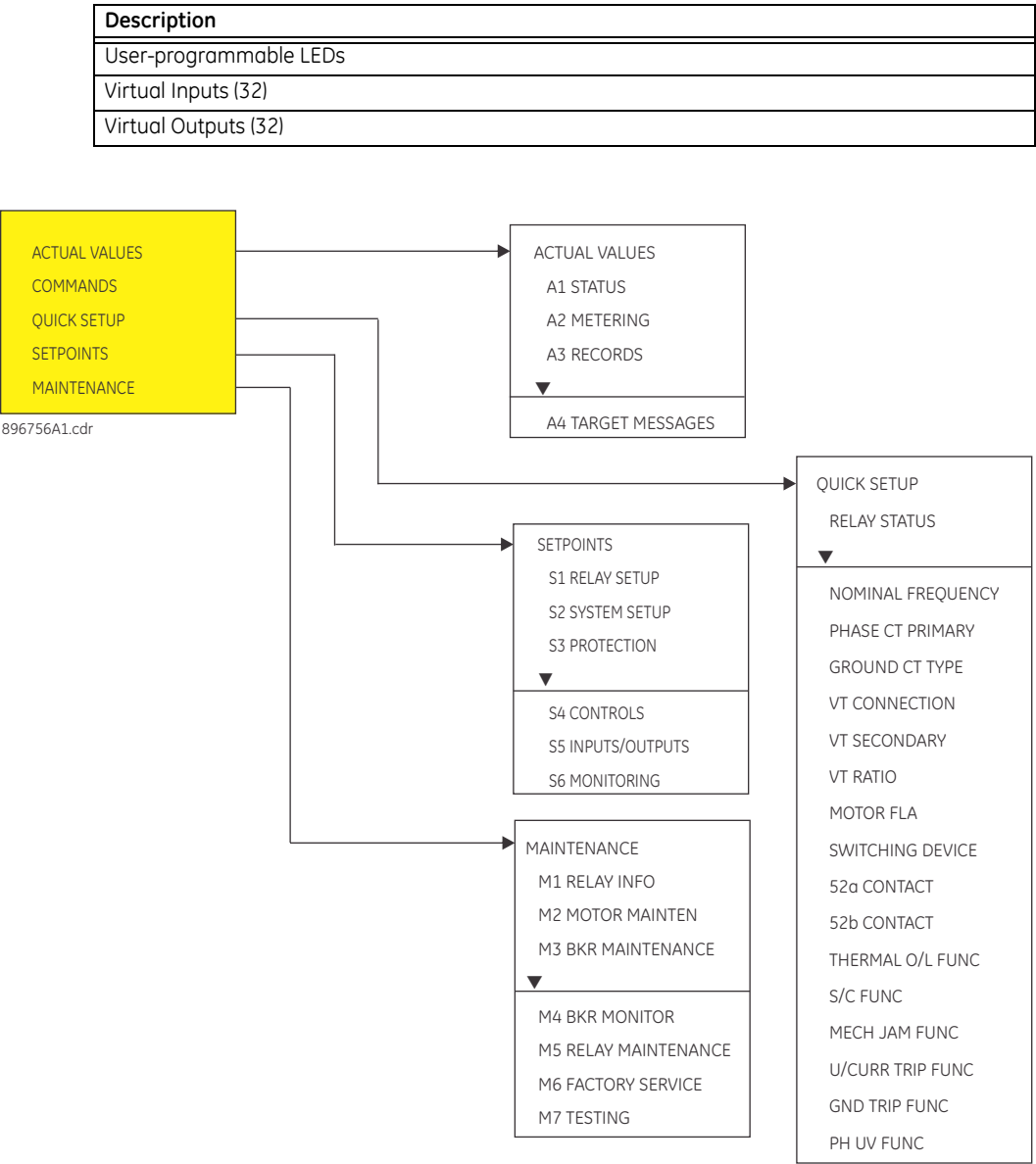


Figure 1-2: Main Menu structure

339 order codes

The information to specify a 339 relay is provided in the following order code table.

	339	-	*	*	*	*	*	S	N	*	*	*	*	*	*
Interface	339														339 Motor Protection System
User Interface	E														English without programmable LEDs
	L														English with programmable LEDs
Phase Currents ^a	P0														1 A and 5 A configurable phase current inputs
	P1														1 A 3-phase current inputs
	P5														5 A 3-phase current inputs
Ground Currents ^b	G0														1 A and 5 A configurable ground current input
	G1														1 A ground current input
	G5														5 A ground current input
Power Supply	L														24 to 48 V DC
	H														110 to 250 V DC/110 to 230 V AC
Input/Output ^c	E														10 Contact Inputs, 7 Outputs (2 Form A, 5 Form C)
	R														10 Contact Inputs, 4 Outputs (1 Form A, 3 Form C), 3 100 Ohm Platinum RTD Inputs
Current Protection	S														Standard configuration: 37, 46, 48, 49, 50P(1), 50G/SG(1), 50N(1), 50L, 51R, 66, 86, 51N(1), 51P(1), 50BF
Other Options	N														No Selection
	M														Voltage, Power, Energy Metering, VTFF (1), 60CTS
	P														Voltage Protection: 37P, 27P(2), 27P_1(2), 47(1), VTFF(1), 59P(2), 81O(2), 81U(2), 59_2(1), 67N(1), 32(2), 60CTS
Communications	S	N													Standard: Front USB, Rear RS485: Modbus RTU, DNP3.0, IEC60870-5-103
	1	E													Standard + Ethernet (Copper + Fiber - MTRJ) Modbus TCP/IP, DNP3.0, IEC 60870-5-104
	3	E													Standard + Ethernet (Copper + Fiber - MTRJ) Modbus TCP/IP, DNP3.0, IEC 60870-5-104, IEC 61850
Case Design ^d	D														Protection Relay with drawout design
	N														Protection Relay with non-drawout design
	X														Protection Relay (drawout design) with no chassis
Harsh Environment	N														None
	H														Harsh Environment Conformal Coating

- a. Phase current "P0" requires Case Design "N". Phase current "P1/P5" requires Case Design "D" or "X".
- b. Ground currents "G0/G1/G5" must match the corresponding "P0/P1/P5" Phase current.
- c. Input/Output "R" requires Case Design "D". The 339 does not support both internal RTDs and RMIO RTDs simultaneously.
- d. Case Design option "X" is for ordering purposes only. The relay will show Case Design option "D" in the order code viewed through the HMI or Enervista 3 Series Setup software.

896800A8.PDF

Figure 1-3: Order Codes



NOTE

Features related to each order number are subject to change without notice.

Empty chassis

The 339 protection relay chassis used with a drawout relay is available separately, for use as a partial replacement or in test environments. Many features are supported by the cards and ports within the chassis, as is reflected in the chassis order code.



NOTE

The chassis order code and drawout relay order code must match exactly.

NOTICE

A drawout relay cannot be used in a chassis with different order code options.

339 - CH - * * S N * * * *									
Phase Currents	P1								1 A 3-phase current inputs
	P5								5 A 3-phase current inputs
Ground Currents ^a	G1								1 A ground current input
	G5								5 A ground current input
Other Options	N								No Selection
	M								Voltage, Power, Energy Metering, VTFF (1), 60CTS
	P								Voltage Protection: 37P, 27P(2), 27P_1(2), 47(1), VTFF(1), 59P(2), 81O(2), 81U(2), 59_2(1), 67N(1), 32(2), 60CTS
Communications	S	N							Standard: Front USB, Rear RS485: Modbus RTU, DNP3.0, IEC60870-5-103
	1	E							Standard + Ethernet (Copper + Fiber - MTRJ) Modbus TCP/IP, DNP3.0, IEC 60870-5-104
	3	E							Standard + Ethernet (Copper + Fiber - MTRJ) Modbus TCP/IP, DNP3.0, IEC 60870-5-104, IEC 61850
Harsh Environment	N								None
	H								Harsh Environment Conformal Coating

a. Ground current options "G1/G5" must match the corresponding "P1/P5" Phase currents

896800CH-A2.fm

Figure 1-4: 350 chassis order codes

Remote Module I/O

The remote RTD Module provides additional protection.

RMIO - * G G * *									
Power Supply	L								24 - 48 V DC
	H								110 - 250 V DC / 110 - 230 V AC
I/O Module 1	G								Remote Module I/O (3 - 100 Ohm Platinum RTDs)
I/O Module 2	G								Remote Module I/O (3 - 100 Ohm Platinum RTDs)
I/O Module 3 ^a	G								Remote Module I/O (3 - 100 Ohm Platinum RTDs)
	X								None
I/O Module 4	G								Remote Module I/O (3 - 100 Ohm Platinum RTDs)
	X								None

a. RMIO comes standard with 6 RTDs (Modules 1 and 2). The 9 and 12 RTD options (Modules 3 and 4) require firmware 1.40 or greater.

896800RMIO-A1.fm

Other Accessories

- 18L0-0075 3 Series Depth reducing collar - 1.375"
- 18L0-0076 3 Series Depth reducing collar - 3.00"
- 18L0-0080 3 Series IP20 Kit
- 3S-NDO-STCONKIT 3 Series NDO straight terminal block kit
- 0804-0458 USB A-B configuration cable - 3'



Refer to the *3 Series Retrofit Instruction Manual* for the retrofit of Multilin MI, MII, MLJ, and TOV relays.

Specifications



NOTE

Specifications are subject to change without notice.



NOTE

All accuracies defined below are at nominal frequency (50Hz or 60Hz) unless otherwise stated.



NOTE

To obtain the element operating time delay, i.e. from fault injection until operation, add the operate time to the curve time.

To obtain the total element operating time, i.e. from the presence of a trip condition to initiation of a trip, add 8 ms output relay time to the operate times listed below.



NOTE

For multi-phase protection elements, the trip delay setting applies to the first trip phase. The remaining phases trip instantaneously if the first phase is tripped.



NOTE

Specifications are subject to the VFD function being disabled or bypassed.

Password security

PASSWORD SECURITY

Master Password: 8 to 10 alpha-numeric characters
Settings Password: 3 to 10 alpha-numeric characters for local and remote access
Control Password: 3 to 10 alpha-numeric characters for local and remote access

Protection

PHASE/NEUTRAL TIMED OVERCURRENT (51P/51N)

Pickup Level: 0.05 to 20.00 x CT in steps of 0.01 x CT
Dropout Level: 97% of Pickup @ $I > 1 \times CT$
Pickup - 0.02 x CT @ $I < 1 \times CT$
Curve Shape: ANSI Extremely/Very/Moderately/Normally Inverse
Definite Time (0.1 s base curve)
IEC Curve A/B/C and Short Inverse
IAC Extremely/Very/-/Short Inverse
FlexCurve C/D (programmable curves)
Curve Multiplier: 0.05 to 50.00 in steps of 0.01
Reset Time: Instantaneous, Linear
Curve Timing Accuracy: $\pm 3\%$ of expected inverse time or 1 cycle, whichever is greater, from pickup to operate
Level Accuracy: per CT input

DIRECTIONAL POWER (32)

Measured power:	3-phase
Characteristic angle:	0° to 359° in steps of 1°
Power pickup range:	-1.200 to 1.200 x Rated Power in steps of 0.001
Pickup level accuracy:	2.5% or 0.01 pickup, whichever is greater
Hysteresis:	2% of pickup
Pickup time delay:	0.0 to 600.0 s in steps of 0.1 s
Operate time:	< 55 ms at 1.1 x pickup at 60 Hz < 65 ms at 1.1 x pickup at 50 Hz
Timer accuracy:	± 3% of delay setting or ± ¼ cycle (whichever is greater) from pickup to operate

NEUTRAL INSTANTANEOUS OVERCURRENT (50N)

Pickup Level:	0.05 to 20.00 x CT in steps of 0.01 x CT
Dropout Level:	97% of Pickup @ $I > 1 \times CT$ Pickup - 0.02 x CT @ $I < 1 \times CT$
Time Delay:	0.00 to 300.00 sec in steps of 0.01
Operate Time:	<30 ms @ 60Hz ($I > 2.0 \times PKP$), 0 ms time delay <35 ms @ 50Hz ($I > 2.0 \times PKP$), 0 ms time delay
Time Delay Accuracy:	1% to 1 cycle, whichever is greater
Level Accuracy:	per CT input
Elements:	Trip or Alarm

NEUTRAL DIRECTIONAL OVERCURRENT (67N)

Directionality:	Co-existing forward and reverse
Polarizing:	Voltage, Current, Dual
Polarizing Voltage:	- V_0 calculated using phase voltages (VTs must be connected in "Wye")
Polarizing Current:	I_G
MTA:	From 0° to 359° in steps of 1°
Angle Accuracy:	±4°
Operation Delay:	20 to 30 ms



The selection of "P" option from "339 OTHER OPTIONS" in the Order Code table, will enable the Neutral Directional element with voltage polarizing V_0 computed from the measured phase voltage inputs.

UNDERCURRENT (37)

Pickup Level:	0.1 to 0.95 x FLA in steps of 0.01 x FLA
Dropout Level:	102% of Pickup
Time Delay:	1.00 to 60.00 s in steps of 0.01 s
Block from Start:	0 to 600 s in steps of 1 s
Pickup Accuracy:	as per phase current inputs
Timing Accuracy:	±0.5 s or ± 0.5% of total time
Elements:	Trip and Alarm

CURRENT UNBALANCE (46)

Unbalance:	See equations below
Unbalance Pickup Level:	4.00 to 40.00% in steps of 0.01%
Trip Curves:	Definite time, Inverse time (see equations below)
Trip TDM:	1.00 to 100.00 s in steps of 0.01 s
Trip Maximum Time:	1.00 to 1000.00 s in steps of 0.01 s
Trip Minimum Time:	1.00 to 1000.00 s in steps of 0.01 s
Trip Reset Time:	1.00 to 1000.00 s in steps of 0.01 s
Alarm Time Delay:	1.00 to 60.00 s in steps of 0.01 s
Single Phasing Pickup Level:	unbalance level > 40% or when $I_{avg} \geq 25\%FLA$ and current in any phase is less than the cutoff current
Single Phasing Time Delay:	2 sec
Dropout Level:	Pickup - 1
Pickup Accuracy:	$\pm 2\%$
Timing Accuracy:	± 0.5 s or $\pm 0.5\%$ of total time
Unbalance Elements:	Trip and Alarm
Single Phasing Elements:	Trip

Table 1-3: Current Unbalance equations

$$\frac{I_2}{I_1} \times 100\% \text{ if } I_{avg} \geq FLA$$

$$\frac{I_2}{I_1} \times \frac{I_{avg}}{FLA} \times 100\% \text{ if } I_{avg} < FLA$$

Definite Time: $T = TDM \text{ sec}$

$$\text{Inverse Time } T = \frac{TDM}{[Unbal]^2} \text{ sec}$$

RTD (38/49T)

Pickup:	1 to 250°C in steps of 1°C
Pickup Hysteresis:	2°C
Time Delay:	3 sec
Elements:	Trip and Alarm

RTD TROUBLE ALARM (38/49T)

RTD Trouble Alarm:	<-50°C or >250°C
--------------------------	------------------

LOAD INCREASE ALARM

Pickup Level:	50 to 150% FLA in steps of 1% FLA
Dropout Level:	Pickup - 2
Alarm Time Delay:	1.00 to 60.00 s in steps of 0.01 s
Pickup Accuracy:	as per phase current inputs
Timing Accuracy:	± 0.5 s or $\pm 0.5\%$ of total time

SHORT CIRCUIT

Pickup Level:	1.00 to 20.00 $\times$ CT in steps of 0.01 $\times$ CT
Dropout Level:	97% of Pickup @ $I > 1 \times CT$ Pickup - 0.02 $\times$ CT @ $I < 1 \times CT$
Alarm Time Delay:	0.00 to 60.00 s in steps of 0.01 s
Pickup Accuracy:	as per phase current inputs
Operate Time:	<30 ms @ 60Hz ($I > 2.0 \times PKP$), 0 ms time delay <35 ms @ 50Hz ($I > 2.0 \times PKP$), 0 ms time delay
Timer Accuracy:	0 to 1 cycle
Elements:	Trip or Alarm

MECHANICAL JAM TRIP (50R)

Pickup Level:	1.01 to 4.50 × FLA in steps of 0.01 × FLA, blocked from start
Dropout Level:	98% of pickup (pickup > 0.50) Pickup - 0.01 (pickup ≤ 0.50)
Trip Time Delay:	0.10 to 30.00 s in steps of 0.01 s
Pickup Accuracy:	as per phase current inputs
Timing Accuracy:	±0.5 s or ±0.5% of total time

GROUND FAULT/SENSITIVE GROUND FAULT (CBCT) (50G/SG)

Pickup Level:	0.03 to 1.00 × CT in steps of 0.01 × CT 0.50 to 15.00 A in steps of 0.01 A (CBCT)
Dropout Level:	Pickup - 0.01 × CT Pickup - 0.03 × CT (CBCT)
Alarm Time Delay on Run:	0.00 to 60.00 s in steps of 0.01 s
Alarm Time Delay on Start:	0.00 to 60.00 s in steps of 0.01 s
Trip Time Delay on Run:	0.00 to 5.00 s in steps of 0.01 s
Trip Time Delay on Start:	0.00 to 10.00 s in steps of 0.01 s
Pickup Accuracy:	as per ground current inputs
Operate Time:	<30 ms @ 60Hz (I > 2.0 × PKP), 0 ms time delay <35 ms @ 50Hz (I > 2.0 × PKP), 0 ms time delay
Timing Accuracy:	0 to 1 cycle
Elements:	Trip and Alarm

THERMAL PROTECTION (49)

Locked Rotor Current:	2.0 to 11.0 × FLA in steps of 0.1 × FLA
Safe Stall Time:	1.0 to 600.0 s in steps of 0.1 s
Curve Multiplier:	1 to 15 in steps of 1
Pickup Level:	1.01 to 1.25 × FLA in steps of 0.01 × FLA
Curve Biasing:	Phase unbalance Hot/cold biasing Stator RTD biasing Exponential Running and Stopped Cooling Rates
TCU Update Rate:	3 cycles
Pickup Accuracy:	per phase current inputs
Timing Accuracy:	±200 ms or ±2% of total time
Elements:	Trip and Alarm

PHASE/POSITIVE SEQUENCE UNDERVOLTAGE (27P, 27_1)

Minimum Voltage:	Programmable from 0.00 to 1.25 × VT in steps of 0.01
Pickup Level:	0.00 to 1.25 × VT in steps of 0.01 × VT
Dropout Level:	102% of pickup for pickup > 0.1 × VT Pickup + 0.02 × VT for pickup < 0.1 × VT
Curve:	Definite Time, Inverse Time
Time Delay:	0.00 to 600.00 s in steps of 0.01
Operate Time:	Time delay ±30 ms @ 60 Hz (V < 0.85 × PKP) Time delay ±40 ms @ 50 Hz (V < 0.85 × PKP)
Time Delay Accuracy:	at V < 0.85 PKP: ±3% of expected time, or 1 cycle, whichever is greater
Level Accuracy:	Per voltage input

UNDERPOWER (37)

Pickup Level:	1 to 100% Hz MNR in steps of 1%
Dropout Level:	102% of pickup for pickup > 50 Pickup + 1 for pickup ≤ 50
Time Delay:	1.0 to 60.0 s in steps of 0.1
Pickup Accuracy:	as per power monitoring specification
Timing Accuracy:	±0.5 s or ±0.5% of total time
Elements:	Trip and Alarm

NEGATIVE SEQUENCE/PHASE OVERVOLTAGE (59_2, 59P)

Pickup Level:	0.00 to $1.25 \times VT$ in steps of 0.01
Dropout Level:	98% of pickup for pickup $> 0.1 \times VT$ Pickup - $0.02 \times VT$ for pickup $< 0.1 \times VT$
Time Delay:	0.00 to 600.00 s in steps of 0.01
Operate Time:	Time delay ± 30 ms @ 60 Hz ($V > 1.1 \times PKP$) Time delay ± 40 ms @ 50 Hz ($V > 1.1 \times PKP$)
Time Delay Accuracy:	$\pm 3\%$ of expected time, or 1 cycle, whichever is greater
Level Accuracy:	Per voltage input

PHASE REVERSAL (47)

Configuration:	ABC or ACB phase rotation
Time Delay:	100 ms
Timing Accuracy:	± 0.5 s
Elements:	Trip or Alarm

UNDERFREQUENCY (81U)

Minimum Voltage:	0.00 to $1.25 \times VT$ in steps of 0.01
Voltage DPO:	6% of minimum voltage setting
Pickup Level:	40.00 to 70.00 Hz in steps of 0.01
Dropout Level:	Pickup +0.05 Hz
Time Delay:	0.1 to 600.0 s in steps of 0.01
Timing Accuracy:	± 0.5 s or $\pm 0.5\%$ of total time
Level Accuracy:	± 0.03 Hz
Elements:	Trip and Alarm

OVERFREQUENCY (81O)

Minimum Voltage:	$0.3 \times VT$
Pickup Level:	40.00 to 70.00 Hz in steps of 0.01
Dropout Level:	Pickup - 0.05 Hz
Time Delay:	0.1 to 600.0 s in steps of 0.01
Timing Accuracy:	± 0.5 s or $\pm 0.5\%$ of total time
Level Accuracy:	± 0.03 Hz
Elements:	Trip and Alarm

ACCELERATION TIME TRIP (48)

Pickup Level:	Motor start condition
Dropout Level:	Motor run, trip, or stop condition
Timers for single-speed:	Stopped to running
Timers for two-speed:	Stopped to high speed, stopped to low speed, low to high speed
Time Delay:	1.0 to 250.0 s in steps of 0.1
Timing Accuracy:	± 200 ms or $\pm 1\%$ of total time

Metering

PARAMETER	ACCURACY (full scale for CT Input is 3 x CT)	RESOLUTION	RANGE
3-Phase Real Power (MW or kW)	±1% of full scale	0.1 MW	± 100000.0 kW
3-Phase Reactive Power (Mvar or kvar)	±1% of full scale	0.1 Mvar	± 100000.0 kvar
3-Phase Apparent Power (MVA or kVA)	±1% of full scale	0.1 MVA	± 100000.0 kVA
3-Phase Positive Watthour (MWh)	±1% of full scale	±0.001 MWh	50000.0 MWh
3-Phase Negative Watthour (MWh)	±1% of full scale	±0.001 MWh	50000.0 MWh
3-Phase Positive Varhour (Mvarh)	±1% of full scale	±0.001 Mvarh	50000.0 Mvarh
3-Phase Negative Varhour (Mvarh)	±1% of full scale	±0.001 Mvarh	50000.0 Mvarh
Power Factor	±0.05	0.01	-0.99 to 1.00
Frequency	±0.05 Hz	0.01 Hz	40.00 to 70.00 Hz



Negative values (-) represent lead and positive values (+) represent lag.

Data capture

TRANSIENT RECORDER

Buffer size:	3 s
No. of buffers:	1, 3, 6
No. of channels:	14
Sampling rate:	4, 8, 16, or 32 samples per cycle
Triggers:	Manual Command Contact Input Virtual Input Logic Element Element Pickup/Trip/Dropout/Alarm
Data:	AC input channels Contact input state Contact output state Virtual input state Logic element state
Data storage:	RAM - battery backed-up

FAULT RECORDER

Number of records:	1
Content:	Date and Time, first cause of fault, phases, Currents: I_a, I_b, I_c, I_g/I_{sg}, I_n - magnitudes and angles Voltages: V_{an}, V_{bn}, V_{cn}, V_{ab}, V_{bc}, V_{ca}, V_{aux} - magnitudes and angles System frequency

DATA LOGGER

Number of Channels: 10
Parameters: Any available analog actual value
Sampling Rate: 1 cycle, 1 second, 1 minute, 1 hour
Trigger Source: All logic elements, Logic operand: Any Trip PKP/OP/DPO, Any Alarm PKP/OP/DPO
Mode: Continuous or triggered

MOTOR START DATA LOGGER

Length:	6 buffers, containing a total of 30 seconds of motor starting data
Trigger:	Motor start status
Trigger Position:	1-second pre-trigger duration
Logging Rate:	1 sample/200 ms

EVENT RECORDER

Number of events:	256
Content:	event number, date of event, cause of event, per-phase current, ground current, sensitive ground current, neutral current, per-phase voltage (VTs connected in "Wye"), or phase-phase voltages (VTs connected in "Delta"), system frequency, power, power factor, thermal capacity, motor load, current unbalance
Data Storage:	Non-volatile memory

LEARNED DATA RECORDER

Number of events:	250
Header:	Date, number of records
Content:	learned acceleration time, learned starting current, learned starting capacity, last starting current, last starting capacity, last acceleration time, average motor load learned, average run time after start (days), average run time after start (minutes)
Data Storage:	Non-volatile memory

CLOCK

Setup:	Date and time Daylight Saving Time
IRIG-B:	Auto-detect (DC shift or Amplitude Modulated) Amplitude modulated: 1 to 10 V pk-pk DC shift: 1 to 10 V DC Input impedance: 40 kOhm $\pm$ 10% IRIG formats accepted: B001, B002, B003, B004
Accuracy with IRIG-B:	$\pm$ 1 ms
Accuracy without IRIG-B:	$\pm$ 1 min / month

Control**LOGIC ELEMENTS**

Number of logic elements:	16
Trigger source inputs per element:	2 to 8
Block inputs per element:	2 to 4
Supported operations:	AND, OR, NOR, NAND, XOR, XNOR, Pickup / Dropout timers
Pickup timer:	0 to 60000 ms in steps of 1 ms
Dropout timer:	0 to 60000 ms in steps of 1 ms

BREAKER CONTROL

Operation:	Asserted Contact Input, Logic Element, Virtual Input, Manual Command, Remote Input
Function:	Opens/closes the motor breaker

START INHIBIT

Thermal Start Inhibit:	Thermal Inhibit Margin: 0 to 25 % in steps of 1%
Starts per Hour Inhibit:	Maximum: 1 to 5 starts in steps of 1
Time Between Starts Inhibit:	Time Between Starts: 1 to 3600 s in steps of 1 s
Restart Inhibit:	Restart Inhibit Delay: 1 to 50000 s in steps of 1 s

BREAKER FAILURE/WELDED CONTACTOR (50BF)

Current Supervision:	Phase Current
Current Supervision Pickup:	0.05 to 20.00 x CT in steps of 0.01 x CT
Time Delay 1:	0.03 to 1.00 s in steps of 0.01 s
Time Delay 2:	0.00 to 1.00 s in steps of 0.01 s
Current Supervision Dropout:	97 to 98% of pickup
Current Supervision Accuracy:	per CT input
Timing Accuracy:	0 to 1 cycle (Timer 1, Timer 2)
Reset Time:	<14 ms typical at 2 x pickup at 60 Hz <16 ms typical at 2 x pickup at 50 Hz

CT FAILURE

Inputs:	Neutral Current IN, Neutral Current VN (from three-phase VTs) Ground Current Ig
Time Delay:	0.00 to 60.00 s in steps of 0.01 s
3IO level accuracy:	per CT inputs
3VO level accuracy:	per VT inputs
GND current level accuracy:	see the specifications for phase and ground current inputs
Operate Time:	30 ms at 60 Hz 35 ms at 50 Hz

BREAKER TRIP COUNTER

Trip Counter Limit (Pickup):	1 to 10000 in steps of 1
------------------------------	--------------------------

EMERGENCY RESTART

Function:	Defeats all motor start inhibit features, resets all trips and alarms, and discharges the thermal capacity to zero so that a hot motor can be restarted in the event of an emergency
Operation:	Contact Input 1 to 10, Virtual Input 1 to 32, Logic Element 1 to 16, Remote Input 1 to 32

LOCKOUT RESET

Function:	Reset any lockout trips when this feature is configured.
Operation:	Contact Input 1 to 10, Virtual Input 1 to 32, Logic Element 1 to 16, Remote Input 1 to 32

RESET

Function:	Resets any alarms and non-lockout trips when LOCKOUT RESET is configured, or resets any alarms and trips (lockout and non-lockout trips) when LOCKOUT RESET is not configured.
Operation:	Contact Input 1 to 10, Virtual Input 1 to 32, Logic Element 1 to 16, Remote Input 1 to 32

FUSE FAIL (VTFF)

Time Delay:	1 s
Timing Accuracy:	±0.5 s
Elements:	Trip or Alarm

AMBIENT TEMPERATURE

High Temperature Pickup:	20°C to 80°C in steps of 1°C
Low Temperature Pickup:	-40°C to 20°C in steps of 1°C
Time Delay:	1 to 60 min in steps of 1 min
Temperature Dropout:	Configurable 90 to 98% of pickup
Temperature Accuracy:	±10°C
Timing Accuracy:	±1 second

Monitoring

BREAKER HEALTH

Timer Accuracy: $\pm 3\%$ of delay setting or ± 1 cycle (whichever is greater) from pickup to operate

DEMAND

Measured Values: Phase A/B/C present and maximum current, three-phase present and maximum real/reactive/apparent power

Measurement Type: Thermal Exponential, 90% response time (programmed): 5, 10, 15, 20, 30 minutes
Block Interval / Rolling Demand, time interval (programmed): 5, 10, 15, 20, 30 minutes

Current Pickup Level: 10 to 10000 in steps of 1 A

Real Power Pickup Level: 0.1 to 300000.0 in steps of 0.1 kW

Reactive Power Pickup Level: 0.1 to 300000.0 in steps of 0.1 kVar

Apparent Power Pickup Level: 0.1 to 300000.0 in steps of 0.1 kVA

Dropout Level: 96-98% of Pickup level

Level Accuracy: $\pm 2\%$ (current demand only)

Inputs

CONTACT INPUTS

Inputs: 10

Selectable thresholds: 17, 33, 84, 166 VDC
 $\pm 10\%$

Recognition time: 1/2 cycle

Debounce time: 1 to 64 ms, selectable, in steps of 1 ms

Maximum input voltage & continuous

current draw: 300 VDC, 2 mA, connected to Class 2 source

Type: opto-isolated inputs

External switch: wet contact

PHASE & GROUND CURRENT INPUTS

CT Primary: 30 to 1500 A

Range: 0.02 to $20 \times$ CT

Input type: 1 A or 5 A (must be specified with order)

Nominal frequency: 50/60 Hz

Burden: <0.1 VA at rated load

Accuracy at nominal frequency: 3%
 ± 10 mA or $\pm 20\%$ of reading from 0.02 to $0.19 \times$ CT, whichever is greater

CT withstand: 1 second at 100 A (1 A option)
1 second at 400 A (5 A or universal CT option)
2 seconds at $40 \times$ rated current
continuous at $3 \times$ rated current

CBCT INPUT (50:0.025)

CT Primary: 0.5 to 15.0 A

Nominal frequency: 50 or 60 Hz

Accuracy (CBCT) at nominal frequency: ± 0.1 A (0.5 to 3.99 A)
 ± 0.2 A (4.0 A to 15 A)

FREQUENCY

Accuracy: ± 0.05 Hz

Resolution: 0.01 Hz

Range: 40.00 to 70.00 Hz

PHASE VOLTAGE INPUTS

Source VT:.....	100 to 20000 V
VT secondary range:.....	50 to 240 V
VT ratio:.....	1.0 to 300.0 in steps of 0.1
Nominal frequency:.....	50/60 Hz
Relay burden:.....	<0.25 VA at 120 V
Accuracy at nominal frequency:.....	±1.0% throughout range
Voltage withstand:.....	260 VAC continuous

RTD INPUTS

RTD Type:.....	100 Ohm platinum (DIN.43760)
RTD Sensing Current:.....	5 mA
Isolation:.....	2 kV from base unit (RMIO only)
Distance:	250 m maximum
Range:	-50 to +250°C
Accuracy:.....	±3°C
Lead Resistance:.....	25 Ohm max per lead
RTD Trouble Alarm:.....	<-50 or >250°C
RTD Inputs Available:.....	3 with INPUT/OUTPUT option 'R' installed OR 12 maximum with the RMIO option connected

Outputs

FORM-A RELAYS

Configuration:.....	2 (two) electromechanical
Contact material:	silver-alloy
Operate time:.....	<8 ms
Continuous current:.....	10 A
Make and carry for 0.2s:.....	30 A per ANSI C37.90
Break (DC inductive, L/R=40 ms):.....	24 V / 1 A 48 V / 0.5 A 125 V / 0.3 A 250 V / 0.2 A
Break (DC resistive):.....	24 V / 10 A 48 V / 6 A 125 V / 0.5 A 250 V / 0.3 A
Break (AC inductive):	720 VA @ 240 VAC Pilot duty A300
Break (AC resistive):	250 VAC / 10 A

FORM-A VOLTAGE MONITOR

Applicable voltage:.....	20 to 250 VDC
Trickle current:.....	1 to 2.5 mA

FORM-C RELAYS

Configuration:	5 (five) electromechanical
Contact material:	silver-alloy
Operate time:	<8 ms
Continuous current:	10 A
Make and carry for 0.2s:	30 A per ANSI C37.90
Break (DC inductive, L/R=40 ms):	24 V / 1 A
	48 V / 0.5 A
	125 V / 0.3 A
	250 V / 0.2 A
Break (DC resistive):	24 V / 10 A
	48 V / 6 A
	125 V / 0.5 A
	250 V / 0.3 A
Break (AC inductive):	720 VA @ 250 VAC Pilot duty A300
Break (AC resistive):	277 VAC / 10 A

TRIP / CLOSE SEAL-IN

Relay 1 trip seal-in:	0.00 to 9.99 s in steps of 0.01
Relay 2 close seal-in:	0.00 to 9.99 s in steps of 0.01

Power supply

HIGH RANGE POWER SUPPLY

Nominal:	120 to 240 VAC
	125 to 250 VDC
Range:	60 to 300 VAC (50 and 60 Hz)
	84 to 250 VDC
Ride-through time:	35 ms

LOW RANGE POWER SUPPLY

Nominal:	24 to 48 VDC
Range:	20 to 60 VDC

ALL RANGES

Voltage withstand:	2 × highest nominal voltage for 10 ms
Power consumption:	15 W nominal, 20 W maximum
	20 VA nominal, 40 VA maximum
Fuse rating:	5A fuse; time lag, slow blow, 350V 4.5 O.D. X 14.5mm

Communications

SERIAL

RS485 port:	Opto-coupled
Baud rates:	up to 115 kbps
Response time:	1 ms typical
Parity:	None, Odd, Even
Protocol:	Modbus RTU, DNP 3.0, IEC 60870-5-103
Maximum distance:	1200 m (4000 feet)
Isolation:	2 kV

ETHERNET (COPPER)

Modes:	10/100 MB (auto-detect)
Connector:	RJ-45
Protocol:	Modbus TCP, DNP3.0, IEC 60870-5-104, IEC 61850 GOOSE, IEC 61850

ETHERNET (FIBER)

Fiber type: 100 MB Multi-mode
Wavelength: 1300 nm
Connector: MTRJ
Protocol: Modbus TCP, DNP3.0, IEC 60870-5-104, IEC 61850 GOOSE,
IEC 61850
Transmit power: -20 dBm
Receiver sensitivity: -31 dBm
Power budget: 9 dB
Maximum input power: -11.8 dBm
Typical distance: 2 km (1.25 miles)
Duplex: half/full
Product type: Class 1 Laser product

USB

Standard specification:Compliant with USB 2.0
Data transfer rate:.....115 kbps

CAN (RMIO)

Maximum distance: 250 m (820 feet)
Cable type: Shielded or unshielded twisted pair
Cable gauge: Belden 9841 or similar 24 AWG for distances up to 100 m; 22 AWG for distances up to 250 m

Testing and certification

TYPE TESTS

TEST	REFERENCE STANDARD	TEST LEVEL
Dielectric voltage withstand (high voltage power supply*)	60255-27	2200 VAC for one second
(low voltage power supply*)	60255-27	550 VAC for one second
* Test level is based on basic insulation principle (Power supply I/P terminals tested to Chassis ground).		
Impulse voltage withstand	EN60255-27	5 kV
Damped Oscillatory	IEC 60255-26 / IEC61000-4-18	2.5 kV CM, 1 kV DM
Electrostatic Discharge	IEC 60255-26 / IEC 61000-4-2	15 kV / 8 kV
RF immunity	IEC 60255-26 / IEC 61000-4-3	80 MHz - 1 GHz, 1.4 GHz - 2.7 GHz, 10 V/m
Fast Transient Disturbance	IEC 60255-26 / IEC 61000-4-4	2 kV / 4 kV
Surge Immunity	IEC 60255-26 / IEC 61000-4-5	0.5, 1 & 2 kV
Conducted RF Immunity	IEC 60255-26 / IEC 61000-4-6	150 kHz - 80 MHz, 26 MHz - 68MHz, 10V/m
Voltage interruption and Ripple DC	IEC 60255-26 / IEC 60255-4-11	15% ripple, 200ms interrupts
Radiated & Conducted Emissions	CISPR11 / CISPR22/ IEC 60255-26: Section 7.1.2 & 7.1.3	Class A
Sinusoidal Vibration	IEC 60255-21-1	Class 1
Shock & Bump	IEC 60255-21-2	Class 1
Seismic	IEC 60255-21-3	Class 2
Power magnetic Immunity	IEC 60255-26 / IEC 61000-4-8	1000 A/m, 100 A/m, 30A/m 300 A/m
Voltage Dip & interruption	IEC 60255-26 / IEC 61000-4-11	0, 40, 70, 80% dips, 250/ 300 cycle interrupts
Power frequency	IEC 60255-26 / IEC 61000-4-16	Level 4
Voltage Ripple	IEC 60255-26 / IEC 61000-4-17	15% ripple
Ingress Protection	IEC 60529	IP54 front
Environmental (Cold)	IEC 60068-2-1	-40°C 16 hrs
Environmental (Dry heat)	IEC 60068-2-2	85°C 16hrs
Relative Humidity Cyclic	IEC 60068-2-30	6 day variant 2
EFT	IEEE / ANSI C37.90.1	4KV, 2.5Khz
Damped Oscillatory	IEEE / ANSI C37.90.1	2.5KV, 1Mhz
RF Immunity	IEEE / ANSI C37.90.2	35V/m (max field), (80 MHz-1 GHz with 1 KHz sine and 80% AM modulation)
ESD	IEEE / ANSI C37.90.3	8KV CD/ 15KV AD
	UL 508	e83849 NKCR
Safety	UL C22.2-14	e83849 NKCR7
	UL 1053	e83849 NKCR

APPROVALS

	Applicable Council Directive	According to:
CE compliance	Low voltage directive	2014/35/EU
	EMC Directive	2014/30/EU
North America	cULus	UL 508
		UL 1053
EAC	Machines and Equipment	C22.2. No 14
Lloyd's Register	Rules and Regulations for the Classifications of Ships	TR CU 010/2011
IEC 61850	IEC 61850 Certificate Level B	Marine Applications: ENV2, ENV3
ISO	Manufactured under a registered quality program	IEC 61850-10
		ISO9001

EAC

The EAC Technical Regulations (TR) for Machines and Equipment apply to the Customs Union (CU) of the Russian Federation, Belarus, and Kazakhstan.

Item	Description
Country of origin	Spain or Canada; see label on the unit
Date of manufacture	See label on the side of the unit
Declaration of Conformity and/or Certificate of Conformity	Available upon request

Physical

DIMENSIONS

Refer to Chapter 2 for details



NON-DRAWOUT UNIT

Height: 7.98" (202.7 mm)
Width: 6.23" (158.2 mm)
Length: 9.35" (237.5 mm)

DRAWOUT UNIT

Height: 7.93" (201.51 mm)
Width: 6.62" (138.2 mm)
Length: 9.62" (244.2 mm)

WEIGHT

NON-DRAWOUT UNIT

Weight (net): 2.9 kg (6.4 lbs)
Weight (gross): 4.0 kg (8.6 lbs)

DRAWOUT UNIT

Weight (net): 3.9 kg (8.6 lbs)
Weight (gross): 5.0 kg (11.0 lbs)

Environmental

OPERATING ENVIRONMENT	
Ambient temperatures:	
Storage/Shipping:	-40°C to 85°C
Operating:	-40°C to 60°C
Humidity:	Operating up to 95% (non condensing) @ 55°C (As per IEC60068-2-30 Variant 2, 6 days)
Altitude:	2000 m (max)
Pollution Degree:	II
Overvoltage Category:	III
Ingress Protection:	IP54 Front, IP20 cover (optional)
Noise:	0 dB

339 Motor Protection System

Chapter 2: Installation

Mechanical installation

This section describes the mechanical installation of the 339 system, including dimensions for mounting and information on module withdrawal and insertion.

This equipment is **Suitable for mounting on the flat surface of a Type 1 Enclosure**

Dimensions

The dimensions of the 339 are on the following pages. Additional dimensions for mounting and panel cutouts are shown in the following sections.

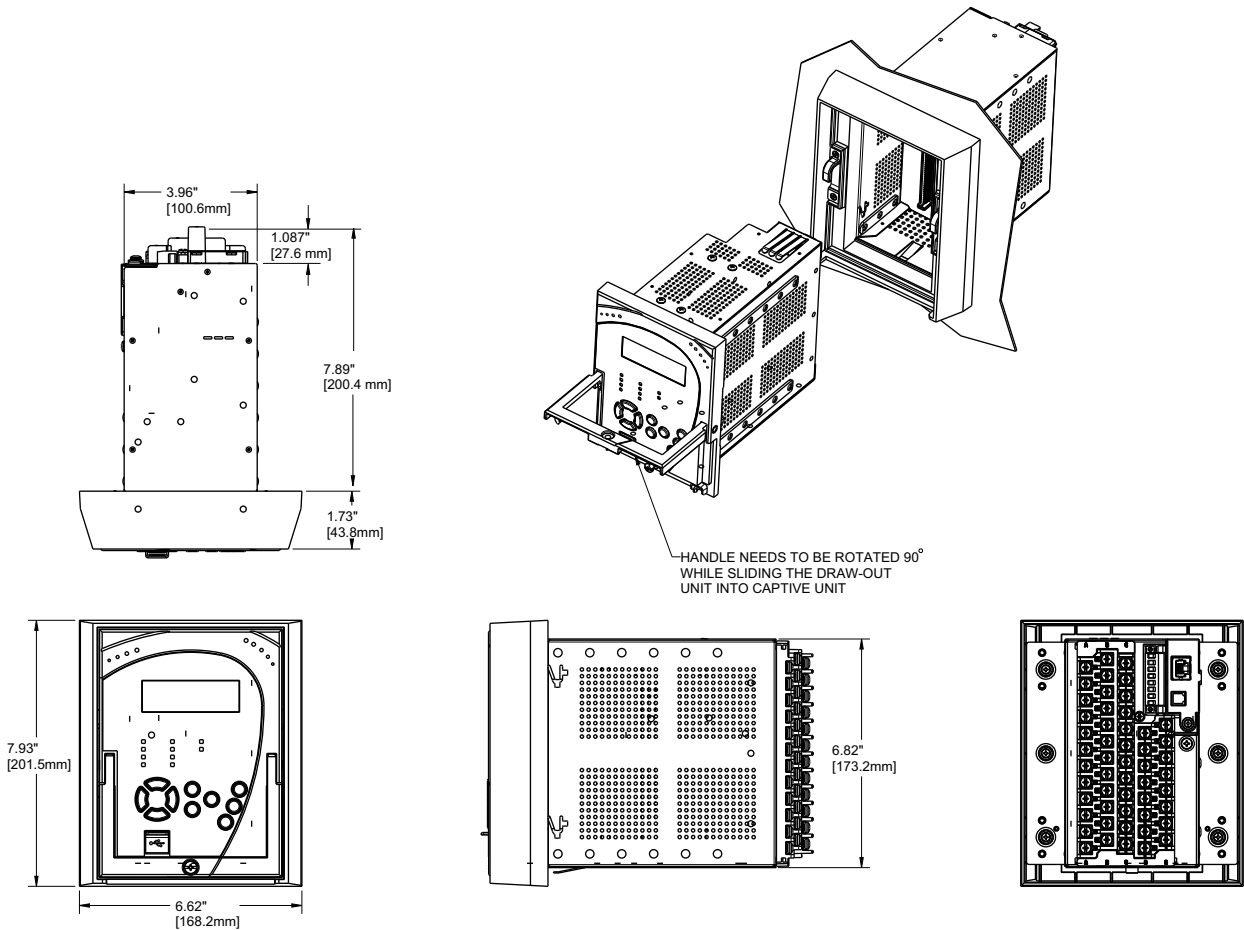


Figure 2-1: 339 dimensions - Drawout unit

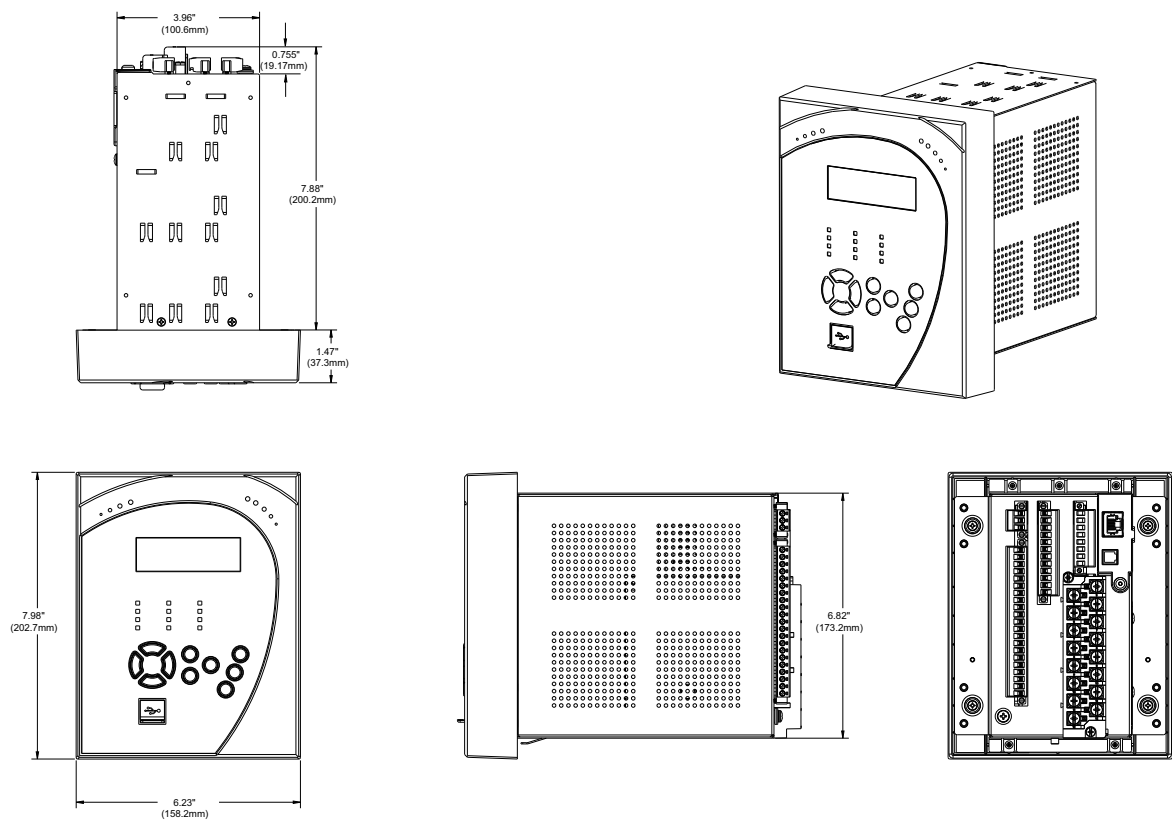


Figure 2-2: 339 dimensions - Non-drawout unit

Product identification

The product identification label is located on the side panel of the 339. This label indicates the product model, serial number, and date of manufacture.

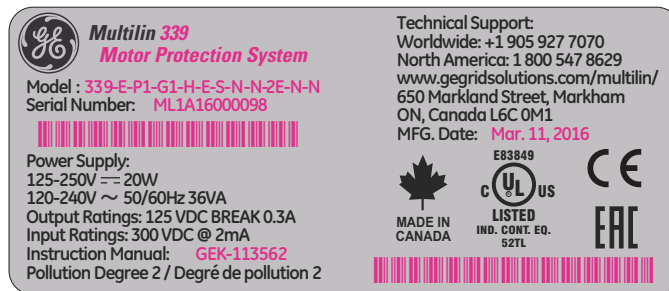


Figure 2-3: 339 Product Identification label



The pink color text (i.e. Model, Serial Number, Instruction Manual, MFG Date) is for reference only. The text can vary.

Mounting

Standard panel mount



The standard panel mount and cutout dimensions are illustrated below.

To avoid the potential for personal injury due to fire hazards, ensure the unit is mounted in a safe location and/or within an appropriate enclosure.

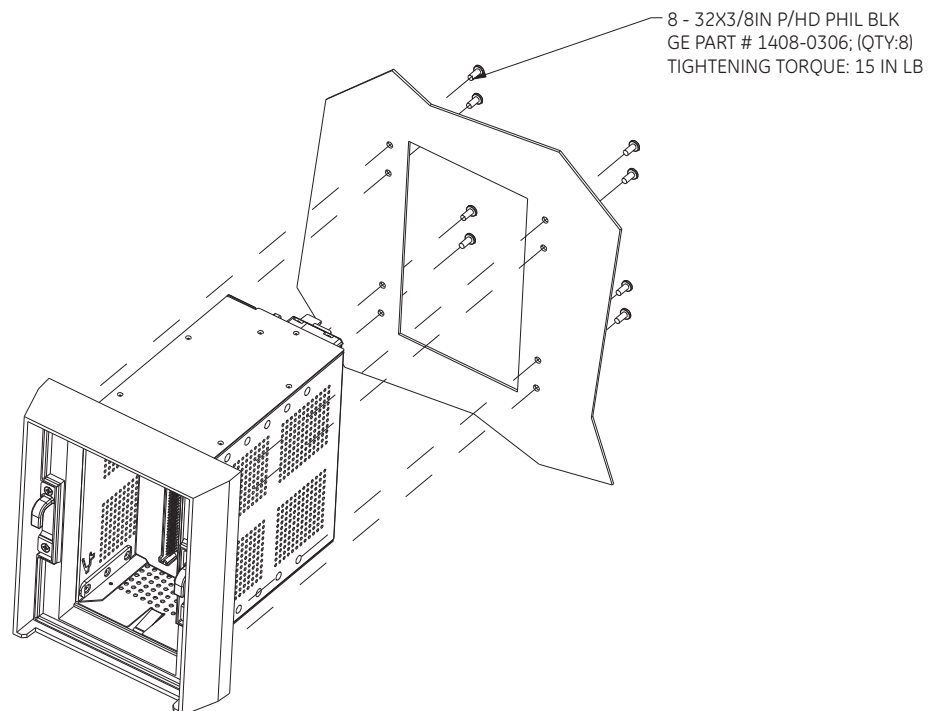


Figure 2-4: Standard panel mounting - Drawout

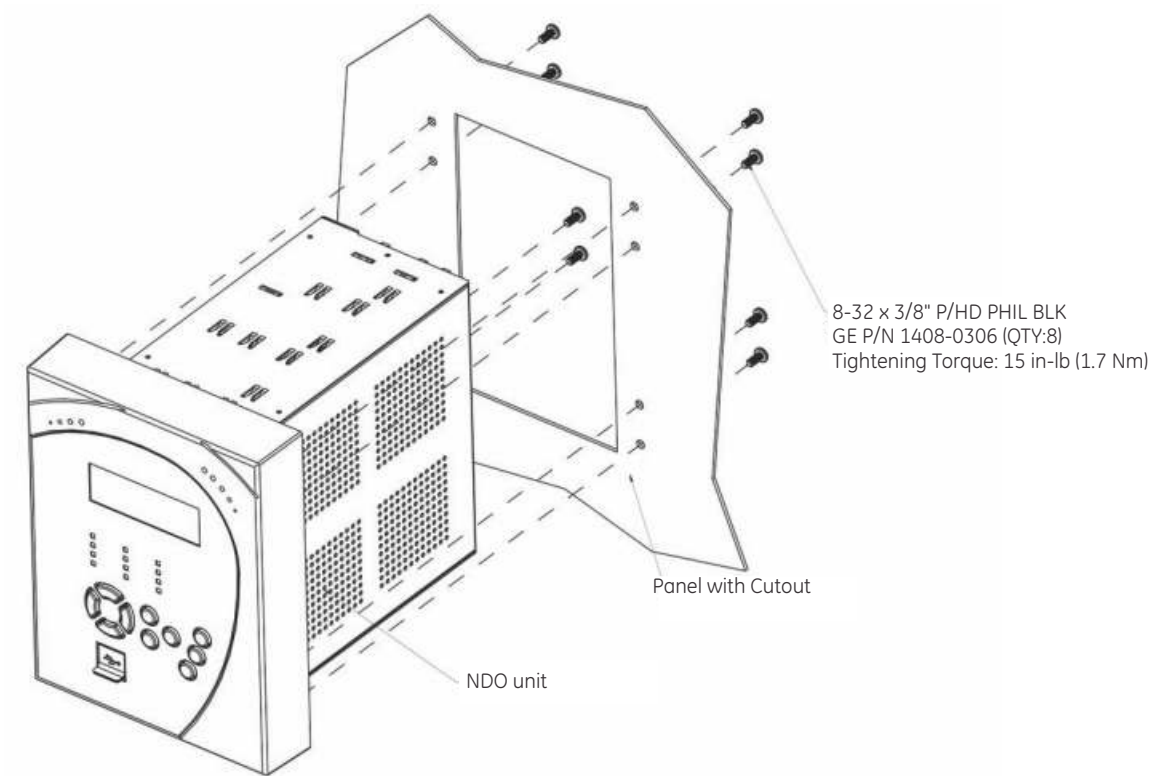


Figure 2-5: Standard Panel mounting - Non-drawout

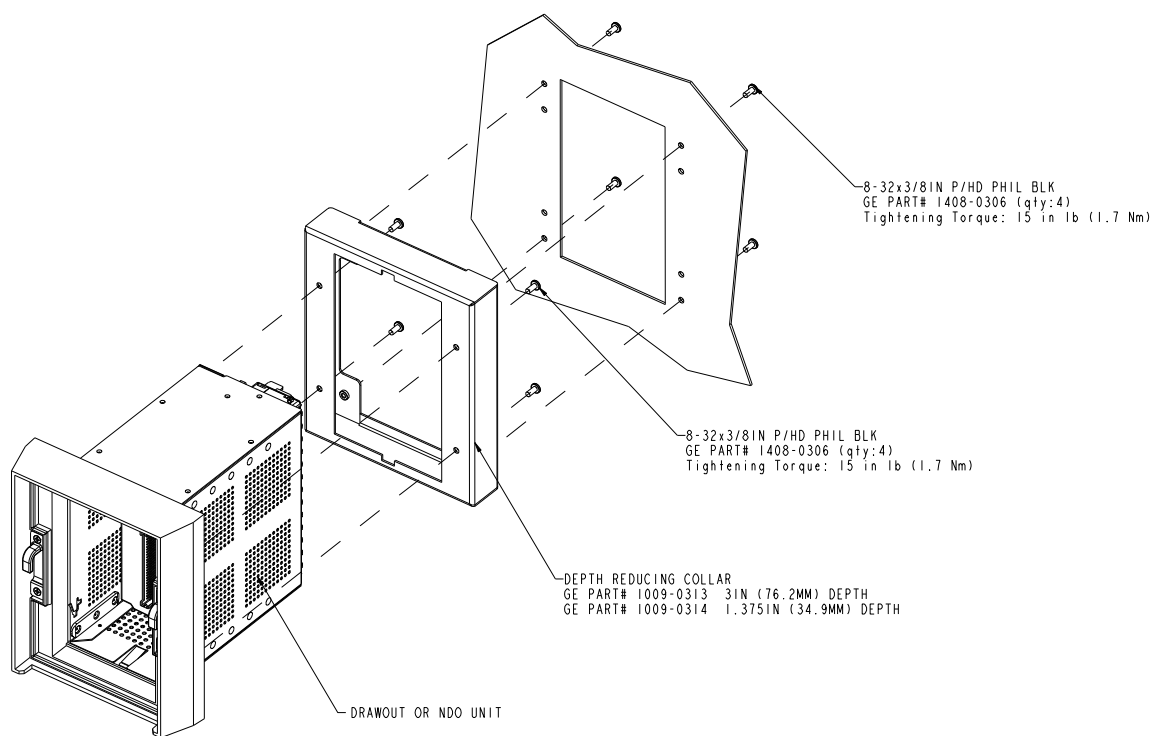


Figure 2-6: Depth Reducing collar (optional)

Panel mounting with depth reducing collar:

1. Mount the collar of required depth (1.375" or 3") to the unit (captive or non-drawout) using 4 screws (see above).
2. Mount the combination of unit and collar to the panel using 4 screws as shown above.

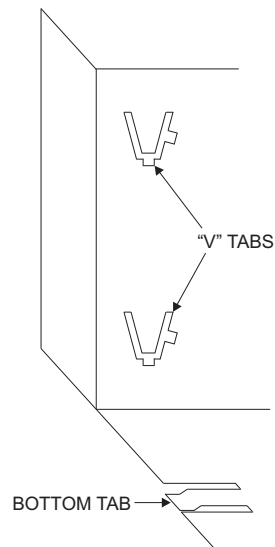


Figure 2-7: Mounting tabs (optional)

1. From the front of the panel, slide the empty case into the cutout until the bottom tab clicks into place (see above).
2. From the rear of the panel screw the case into the panel at the 8 screw positions shown above.
3. If added security is required, bend the retaining "V" tabs outward, to about 90°. These tabs are located on the sides of the case and appear as shown above.

The relay can now be inserted and can be panel wired.

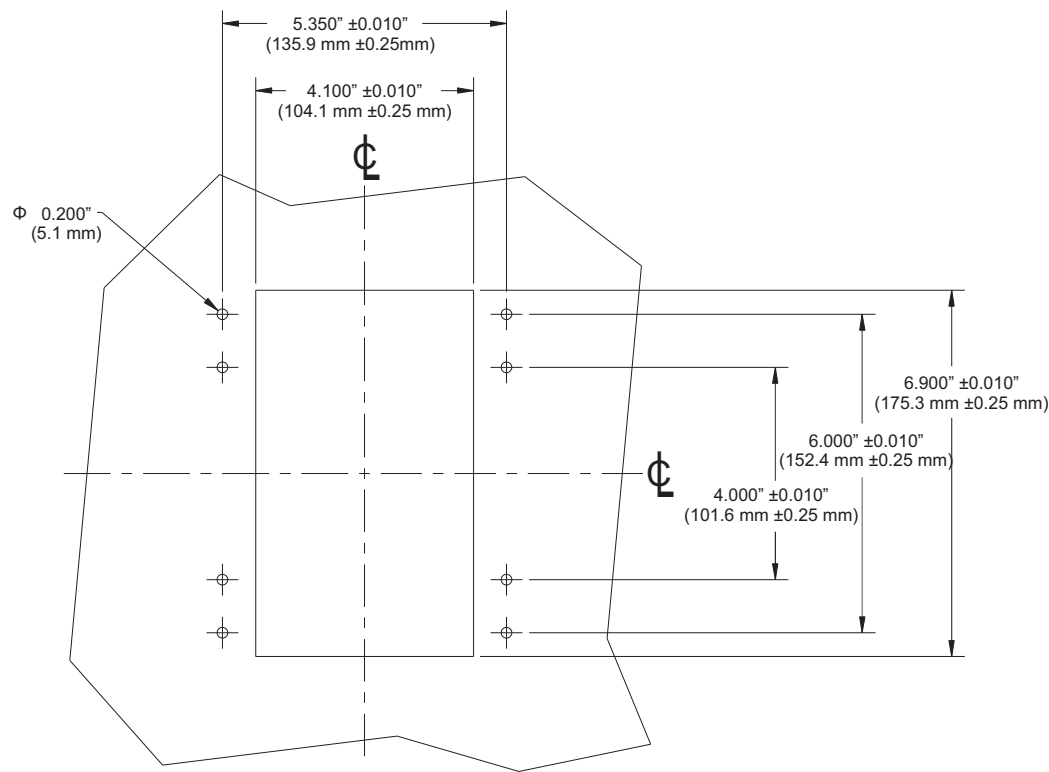
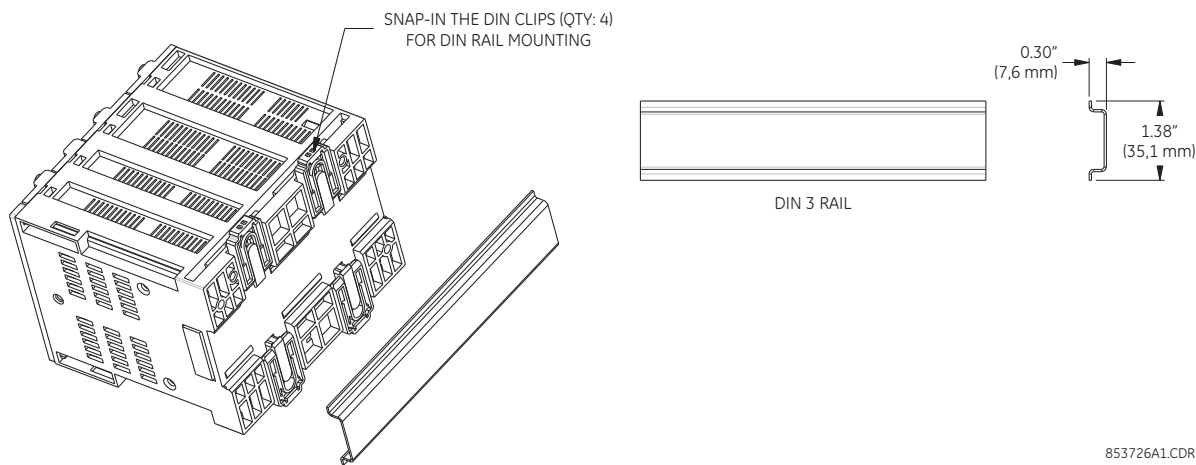


Figure 2-8: Panel cutout dimensions



853726A1.CDR

Figure 2-9: RMIO - DIN rail mounting - Base & Expansion units

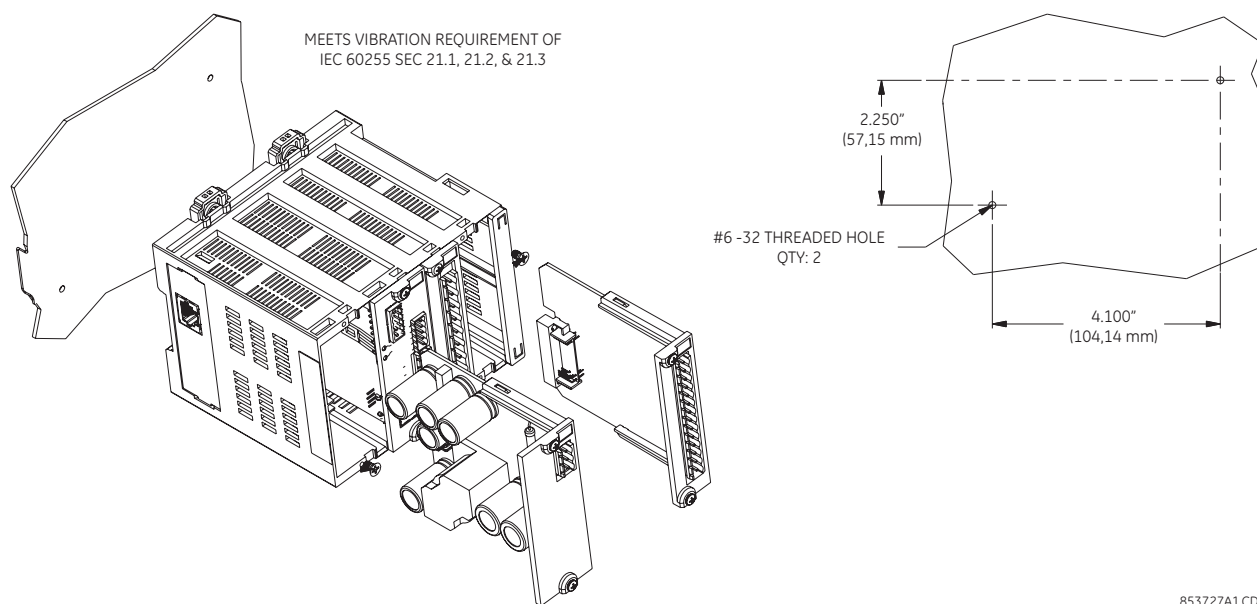


Figure 2-10: RMIO - Base Unit screw mounting

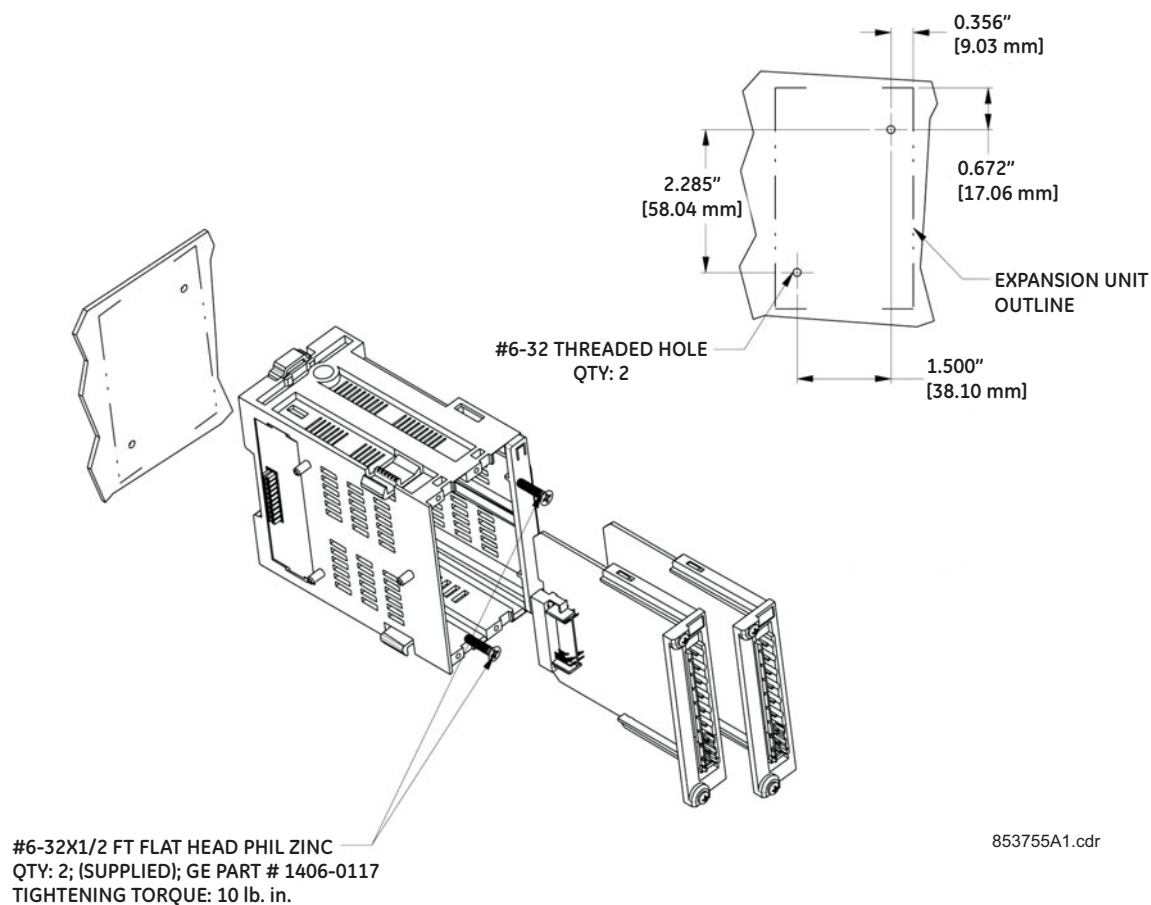


Figure 2-11: RMIO - Expansion Unit screw mounting

Drawout unit withdrawal and insertion

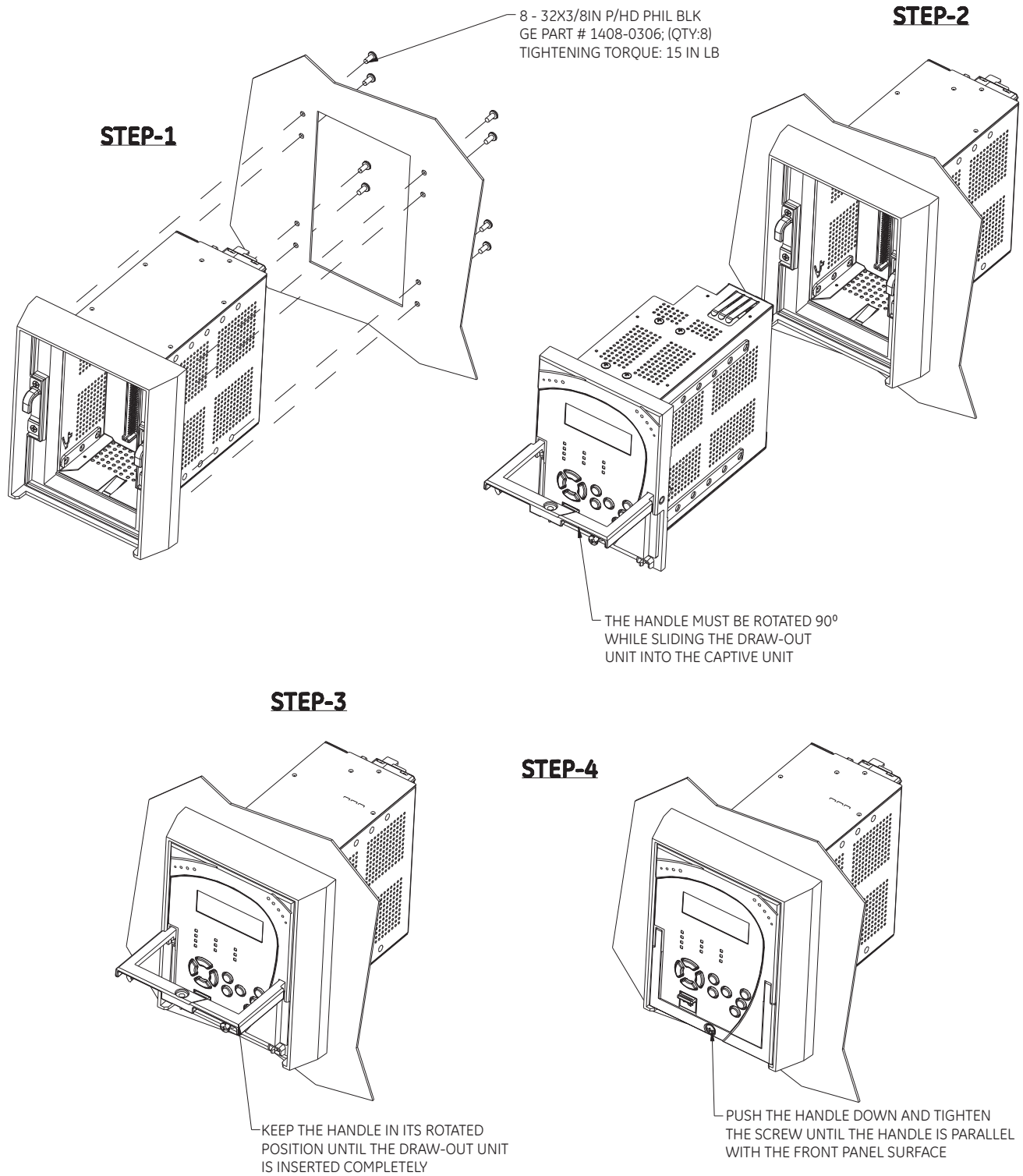


Figure 2-12: Unit withdrawal and insertion diagram

IP20 Cover (optional)

The IP20 cover minimizes potential dangers to users by preventing finger contact with electrical connections at the back of the 3 Series drawout units.

Attaching the cover

The steps for attaching the IP20 cover (optional) to the drawout unit are as follows:

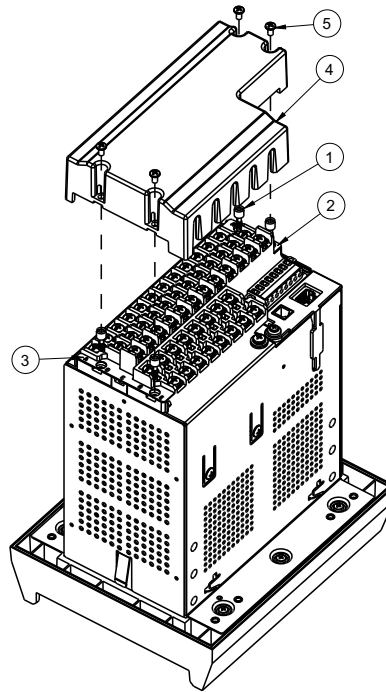


Figure 2-13: IP20 Cover mounting - Drawout unit only

1. Place 4 custom standoffs (item#1) using the suggested tightening torque of 8lb-in in the following order:
 - A. Remove the 2 mounting screws near letters A and C, of label ABC (item#2), and mount 2 standoffs.
 - B. Remove the 2 mounting screws near the letters B and E, of label ABCDE (item#3), and mount 2 standoffs.
2. Place the IP20 cover (item#4) and secure it with 4 screws (item#5) using the suggested tightening torque of 8lb-in.



NOTE

Make sure the device terminals are wired before placing the cover. Use the 5 slots located on each side of the cover to guide the wires outside of the cover.

Retrofit kit for IP20

Before attaching the cover, remove the old labels from the device (see item#2 and item#3) and replace them with the new labels from the retrofit kit. Attach the cover as described in the previous section.

Electrical installation

This section describes the electrical installation of the 339 system, including typical wiring diagrams and terminal identification.

Typical Wiring Diagrams

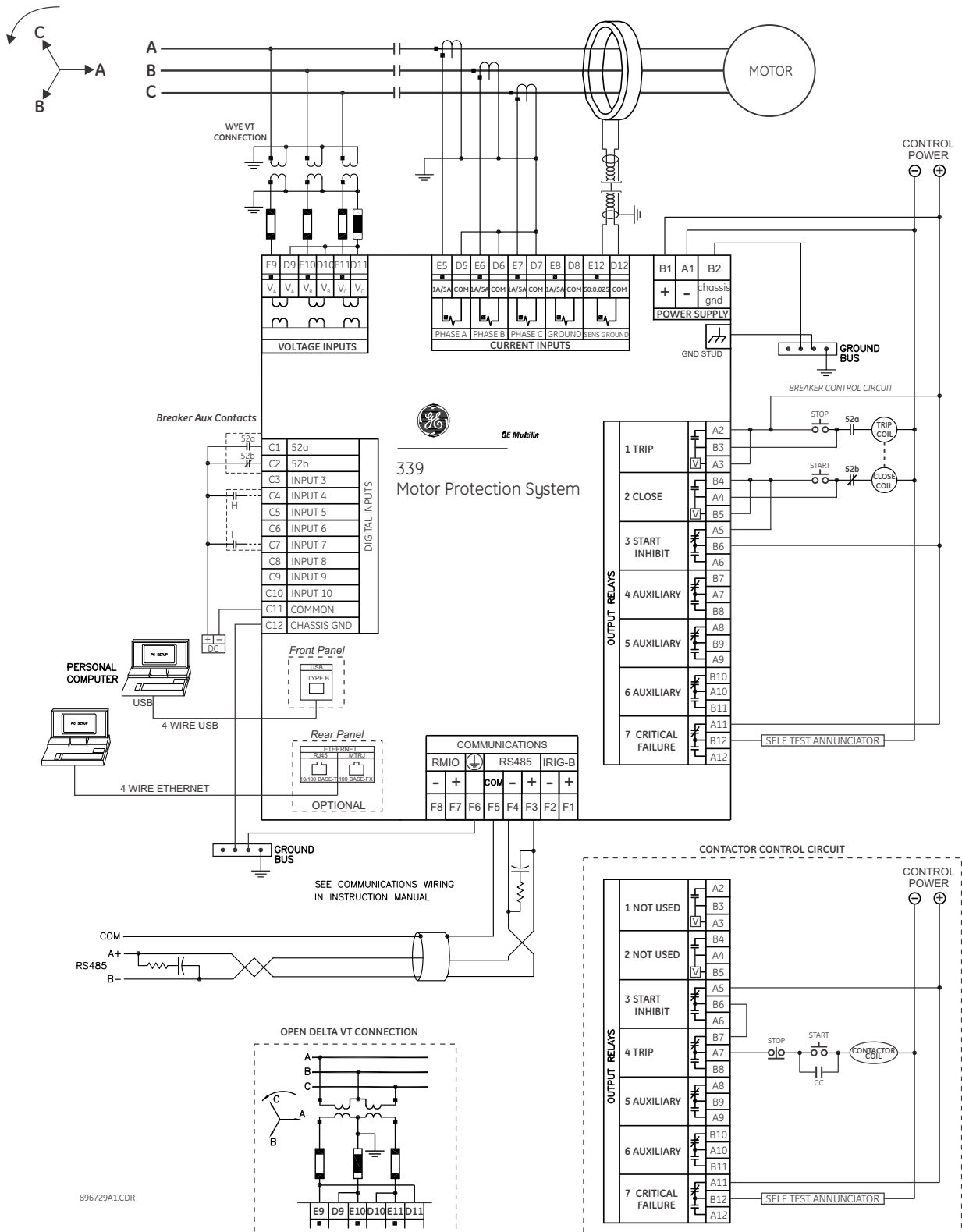


Figure 2-14: Typical Wiring Diagram - Drawout - Input/Output Option "E"

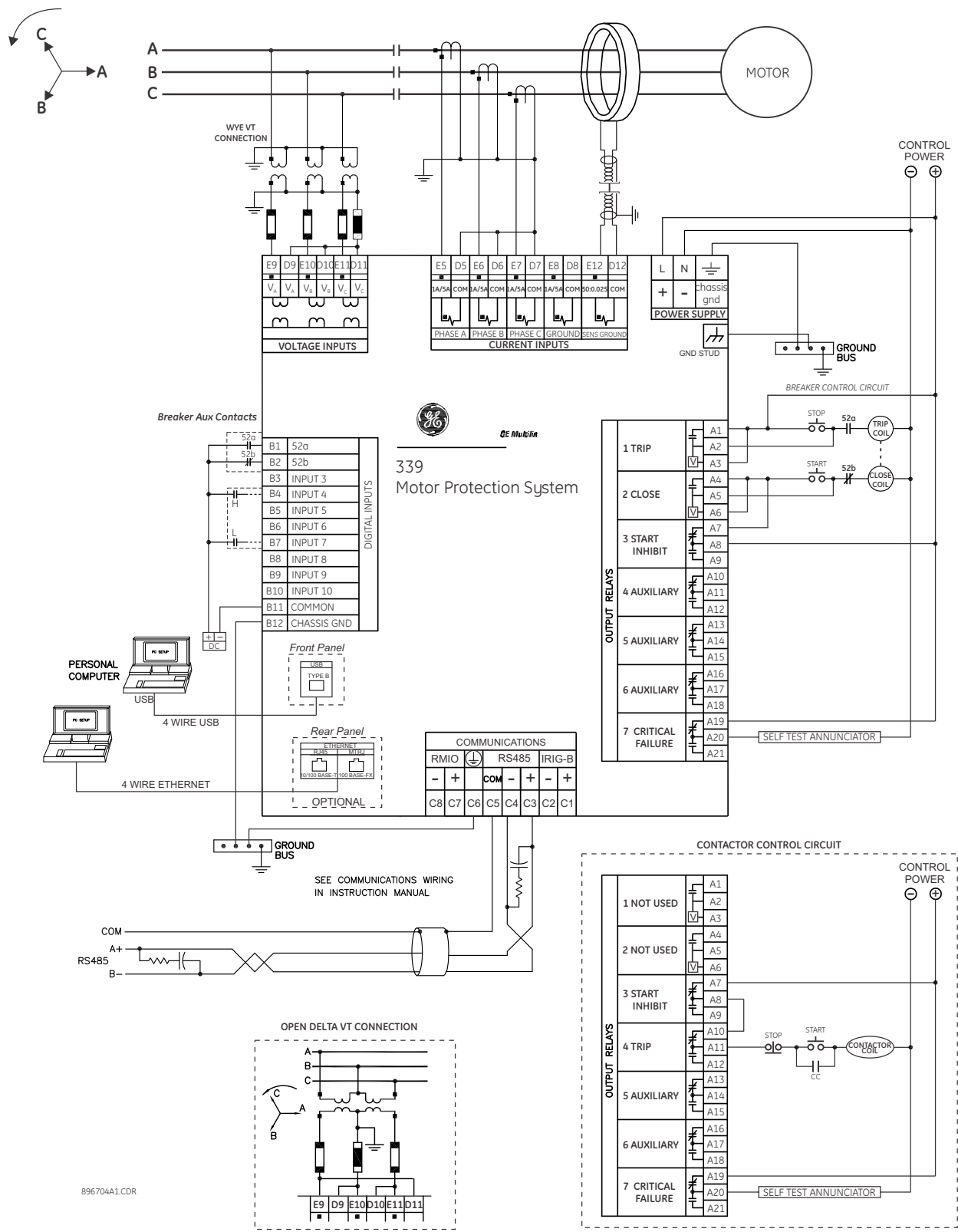


Figure 2-15: Typical Wiring Diagram - Non-drawout - Input/Output Option "E"

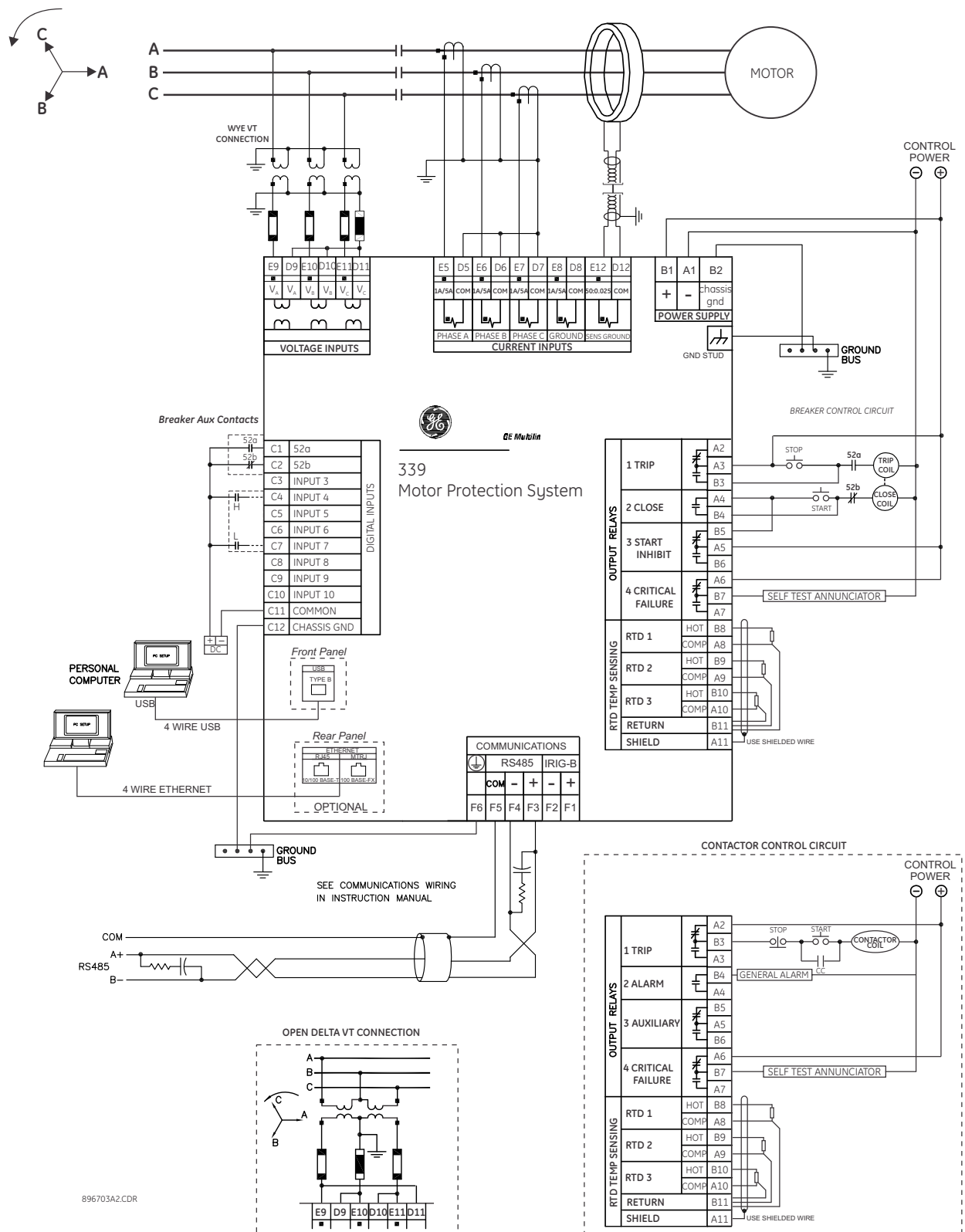


Figure 2-16: Typical Wiring Diagram - Input/Output Option "R"

339 terminals



When installing two lugs on one terminal, both lugs should be "right side up" as shown in the pictures below. This is to ensure the adjacent lower terminal block does not interfere with the lug body.

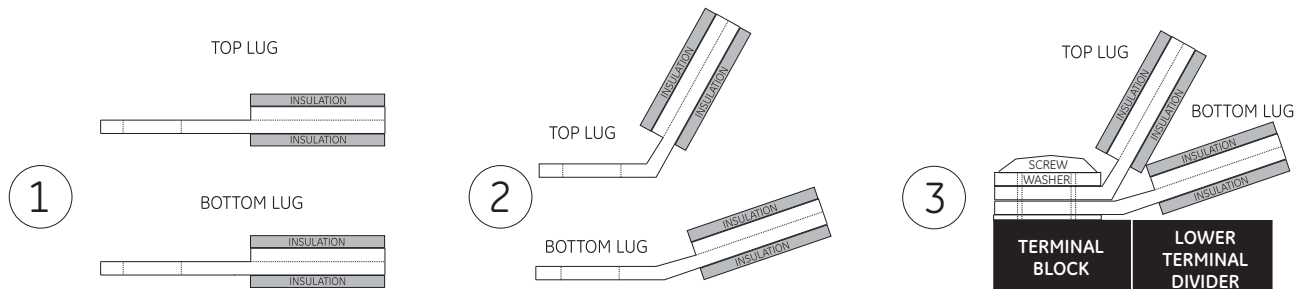


Figure 2-17: Orient the Lugs correctly...

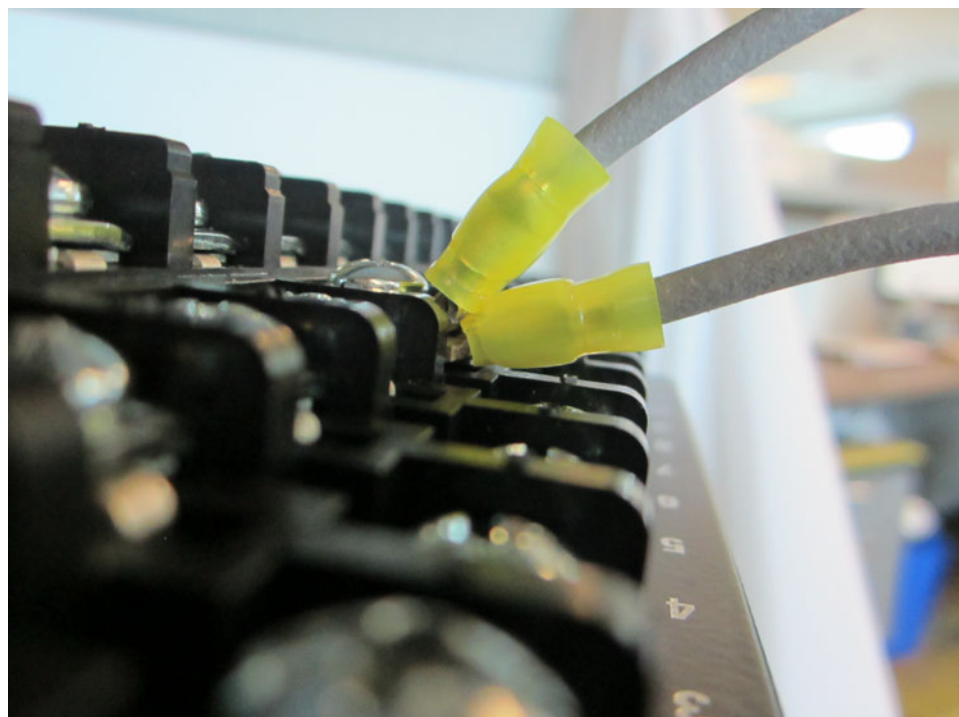


Figure 2-18: CORRECT INSTALLATION METHOD

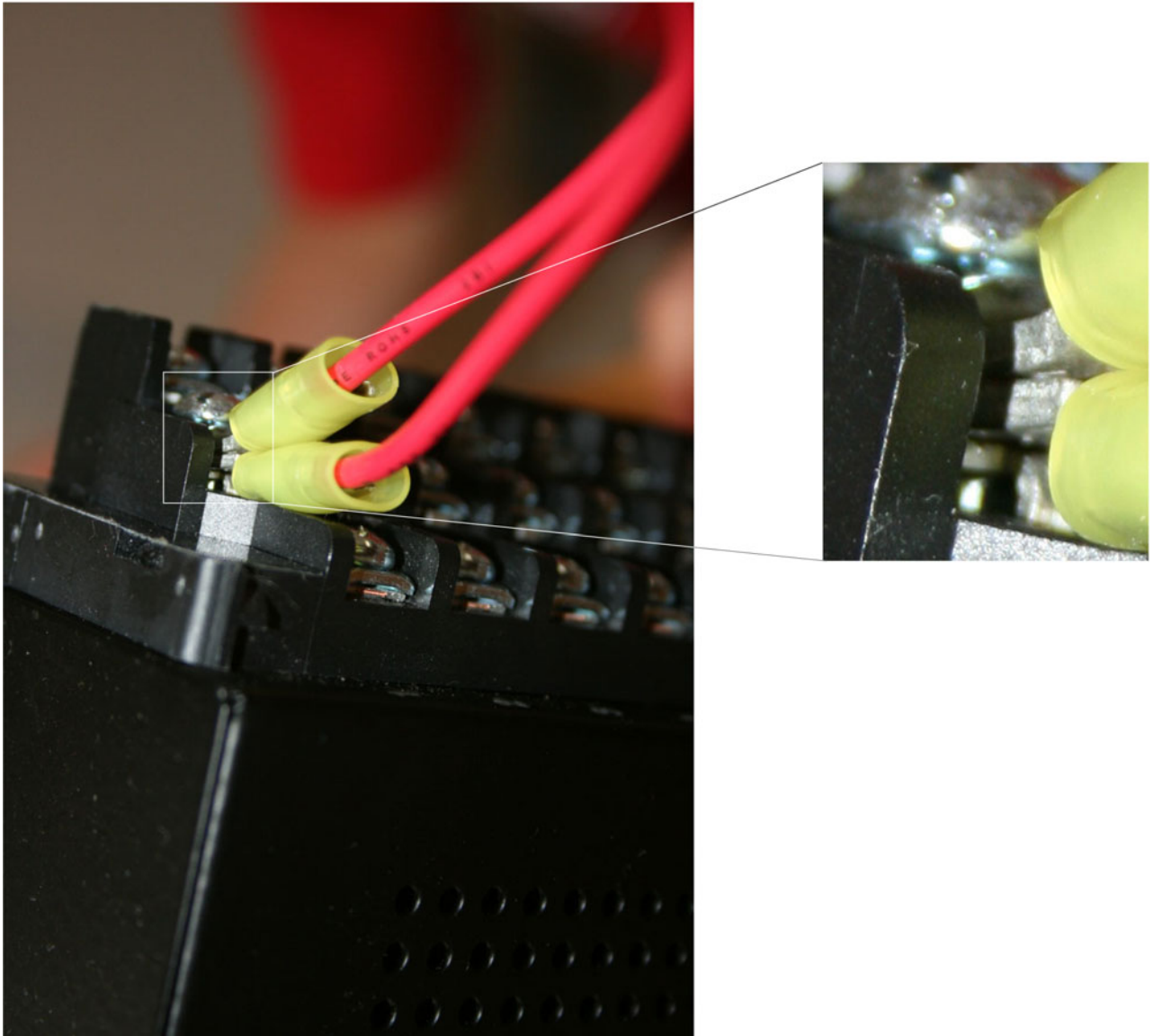


Figure 2-19: INCORRECT INSTALLATION METHOD (lower lug reversed)

Terminal
identification - Input/
Output “E”

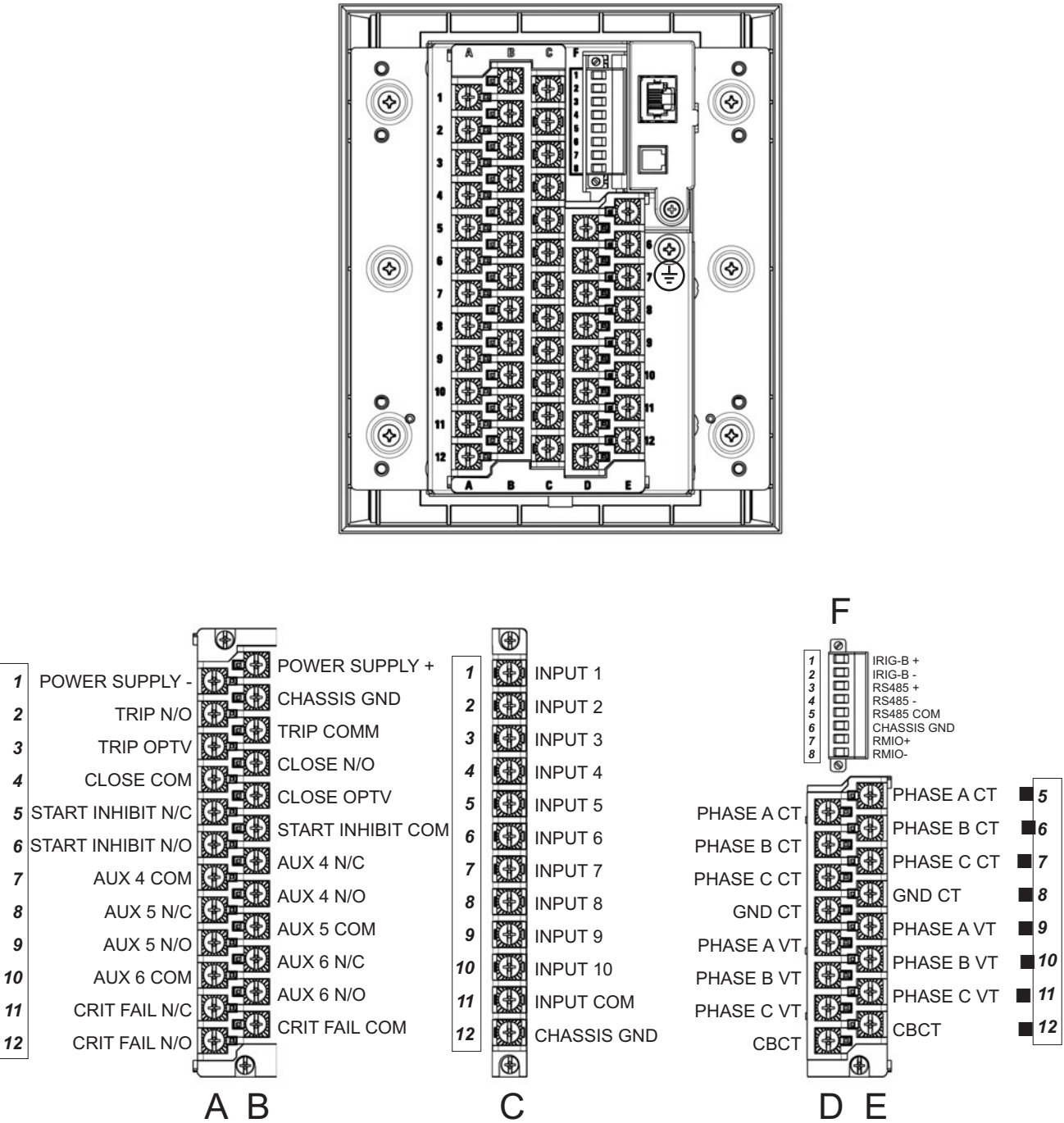


Figure 2-20: 339 Terminal identification with switching device as BREAKER - Drawout

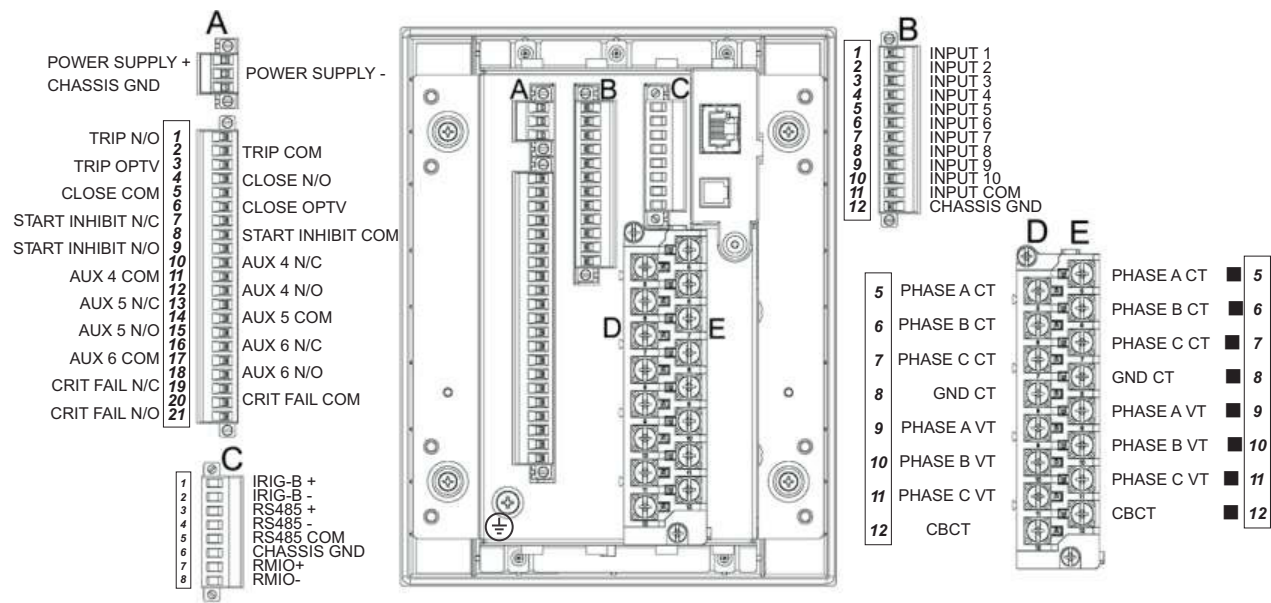


Figure 2-21: Terminal identification with switching device as BREAKER - Non-drawout

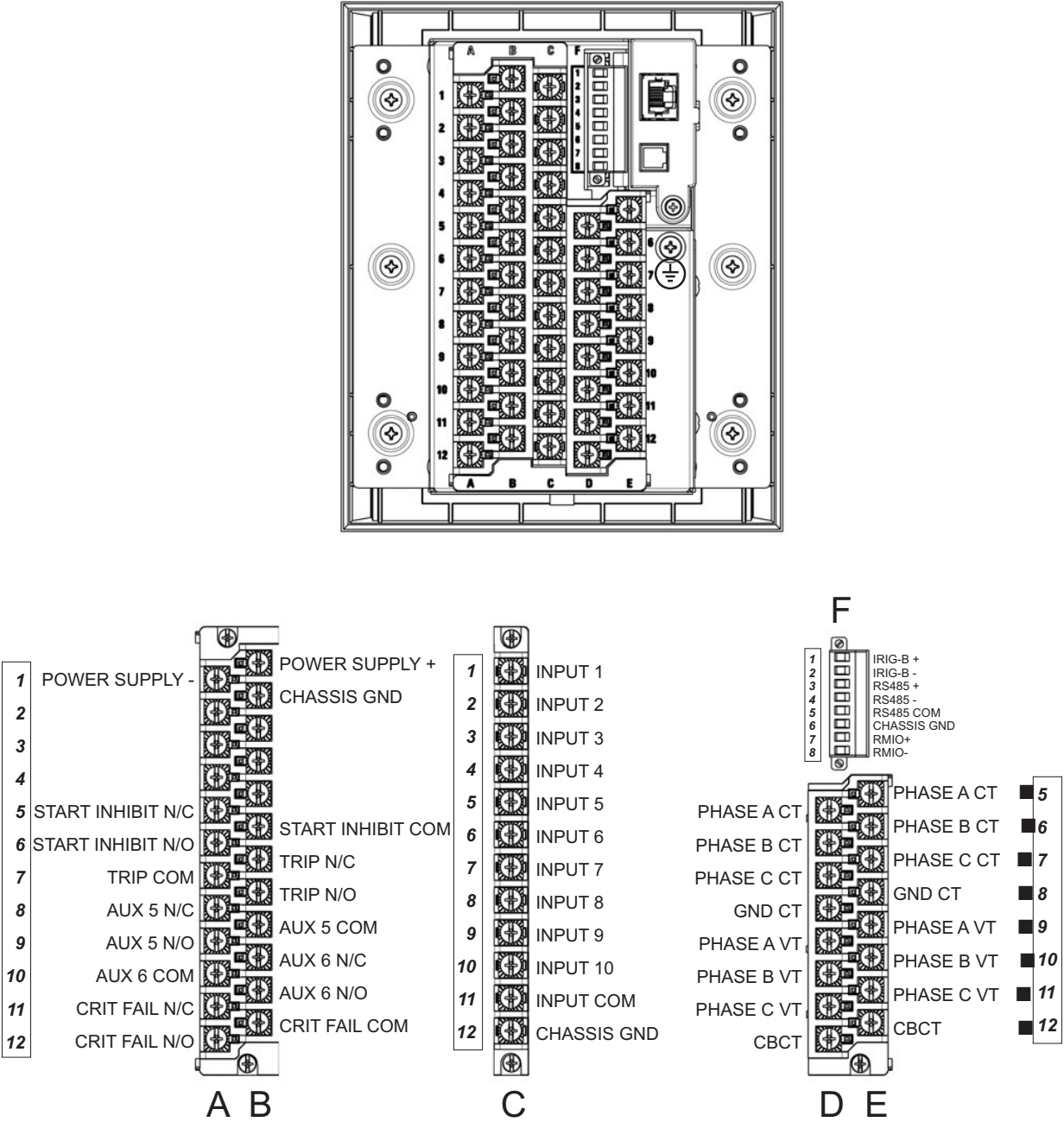


Figure 2-22: Terminal identification with switching device as CONTACTOR - Drawout

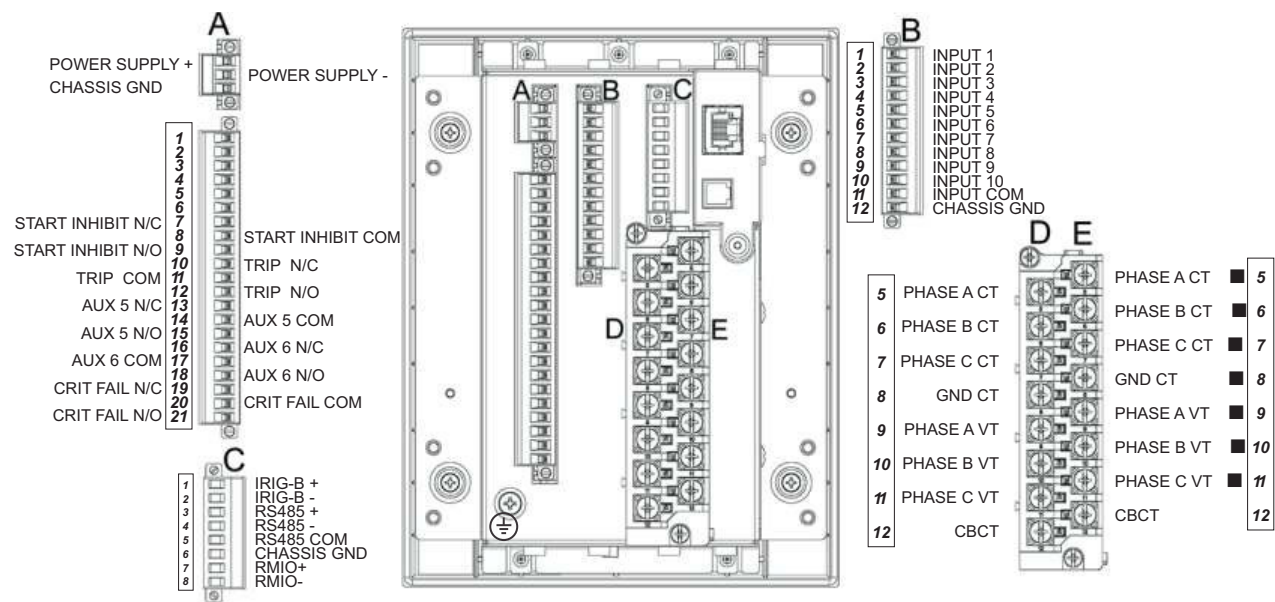


Figure 2-23: Terminal identification with switching device as CONTACTOR - Non-drawout

Terminal
identification - Input/
Output "R"

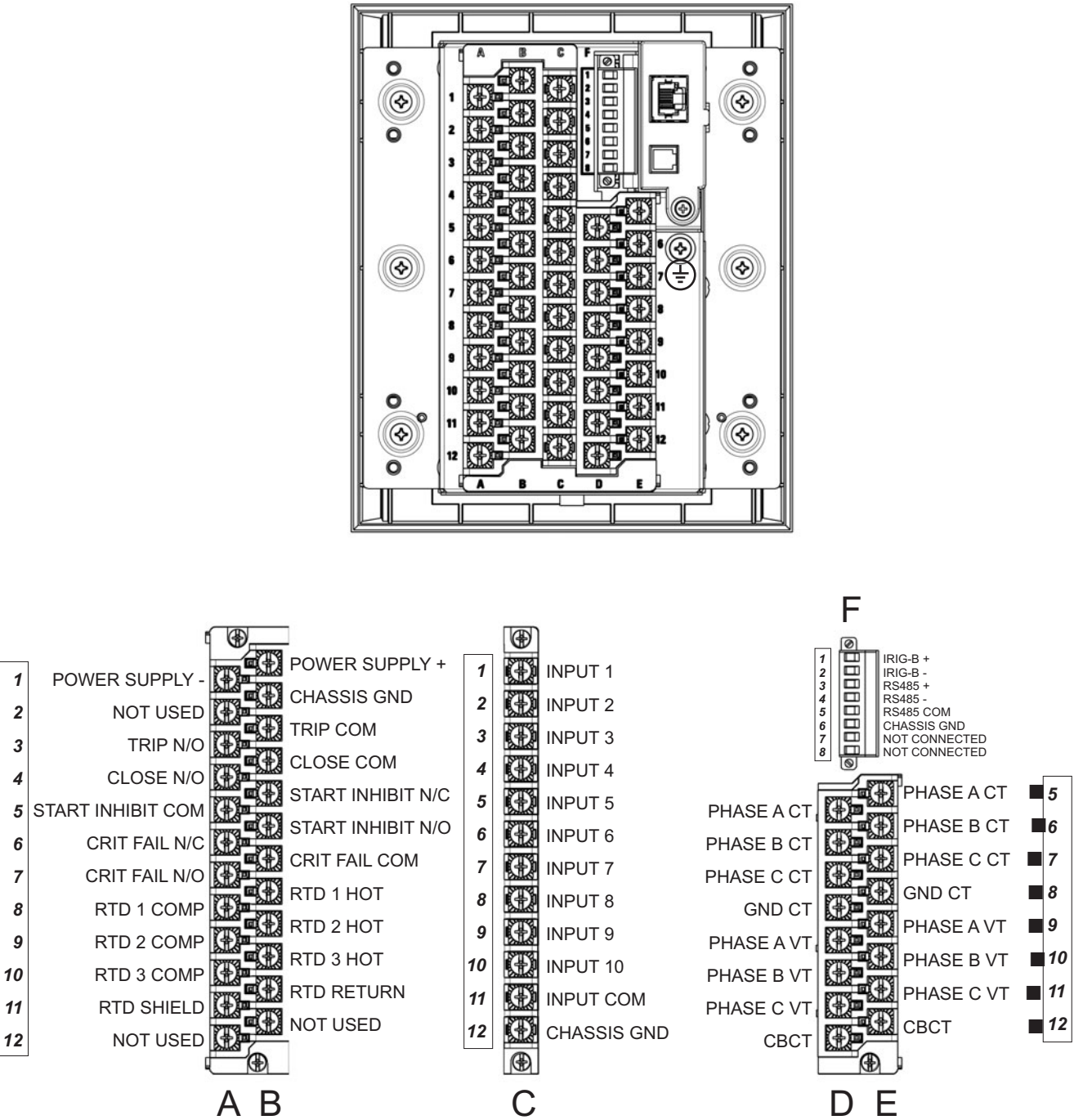


Figure 2-24: 339 Terminal identification with switching device as BREAKER

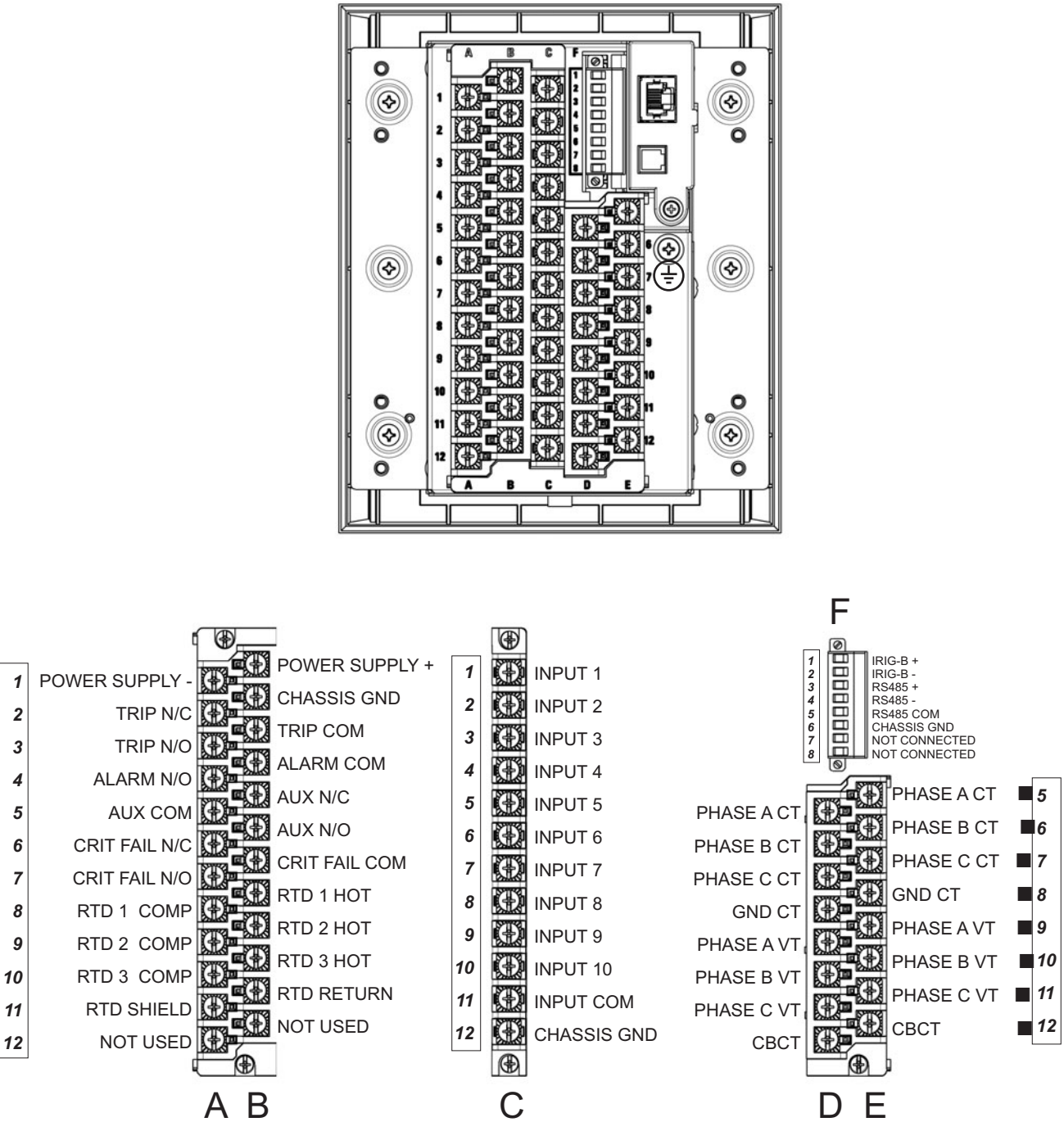


Figure 2-25: Terminal identification with switching device as CONTACTOR

Wire range

Use the following guidelines when selecting wires or lugs to connect to terminal blocks A,B,C,D,E (Drawout case design), and terminal blocks D,E (Non-drawout case design):

- 12 AWG to 22 AWG (3.3 mm^2 to 0.3 mm^2): Single wire termination with/without 9.53 mm (0.375") maximum diameter ring terminals (#8).
- 14 AWG to 22 AWG (2.1 mm^2 to 0.3 mm^2): Multiple wire termination with matching wire sizes and stranding. Two wires maximum per circuit.
- 14 AWG to 22 AWG (2.1 mm^2 to 0.3 mm^2): Multiple wire termination with 9.53 mm (0.375") maximum diameter ring terminals (#8). Two ring terminals maximum per circuit.
- Suggested wiring screw tightening torque, tighten to 12 in-lb (1.35 N-m).
- Minimum suggested temperature rating for the conductors is 75C.

Use the following guidelines when selecting wires to connect to terminal strip F (Drawout case design), and terminal strips A,B,C (Non-drawout case design):

- 12 AWG to 24 AWG (3.3 mm^2 to 0.2 mm^2)
- Suggested wiring screw tightening torque: 4.5 in-lbs (0.5 N-m)
- The uncovered communications cable shield connected to the common terminal should not exceed 1" (2.5 cm) for proper EMC shielding of the communications cable.

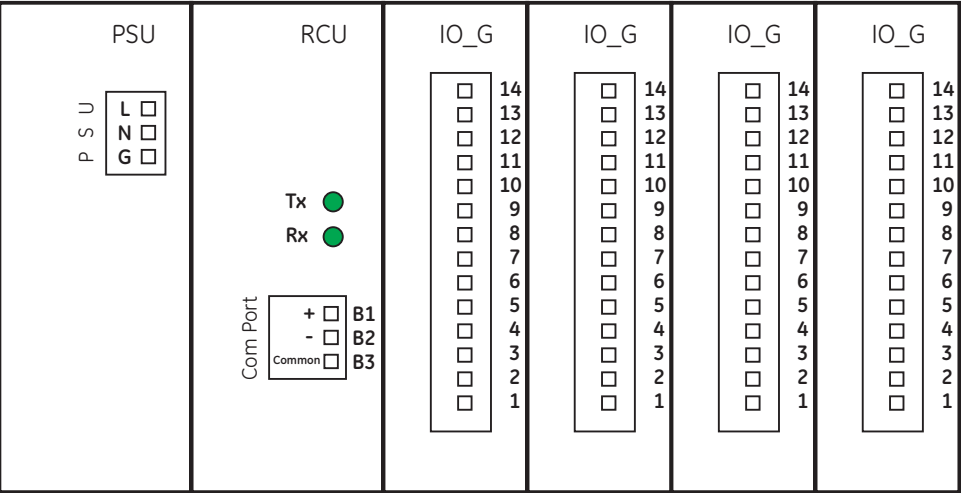
RMIO module installation

The optional remote module (RMIO) is designed to be mounted near the motor. This eliminates the need for multiple RTD cables to run back from the motor, which may be in a remote location, to the switchgear.

Although the RMIO is internally shielded to minimize noise pickup and interference, it should be mounted away from high current conductors or sources of strong magnetic fields.



Figure 2-26: RMIO unit showing 2 IO_G modules



896750.cdr

Figure 2-27: RMIO terminal identification with 4 IO_G modules

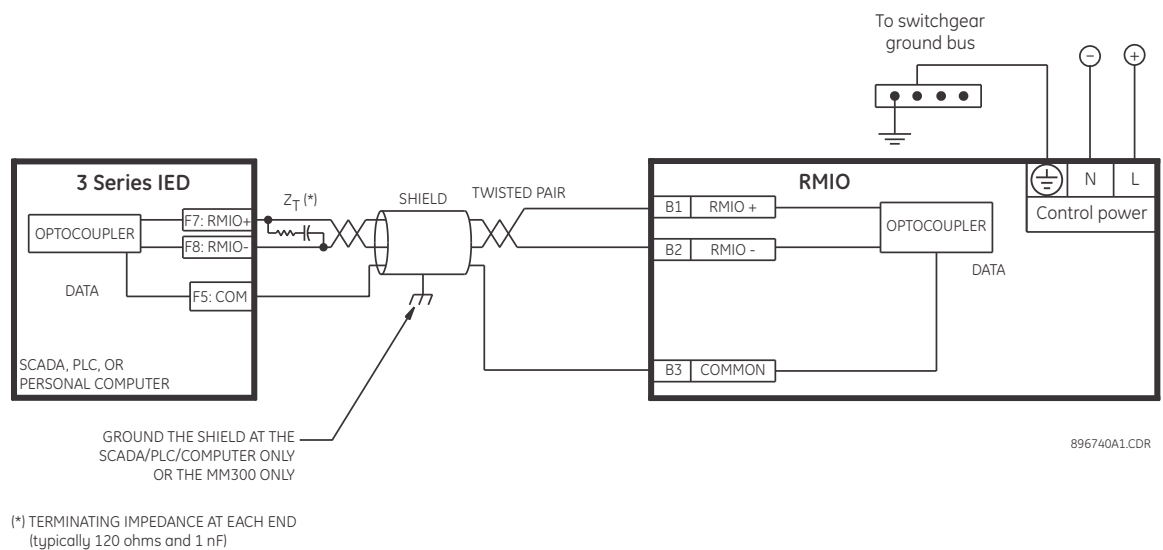


Figure 2-28: RMIO wiring diagram



F5, F7, and F8 refer to terminals shown on the above 339 Terminal Identification diagrams.

339 Motor Protection System

N/C		~14
Surge ground		~13
RTD3	Shield	~12
	Compensation	~11
	Return	~10
	Hot	~9
RTD2	Shield	~8
	Compensation	~7
	Return	~6
	Hot	~5
RTD1	Shield	~4
	Compensation	~3
	Return	~2
	Hot	~1

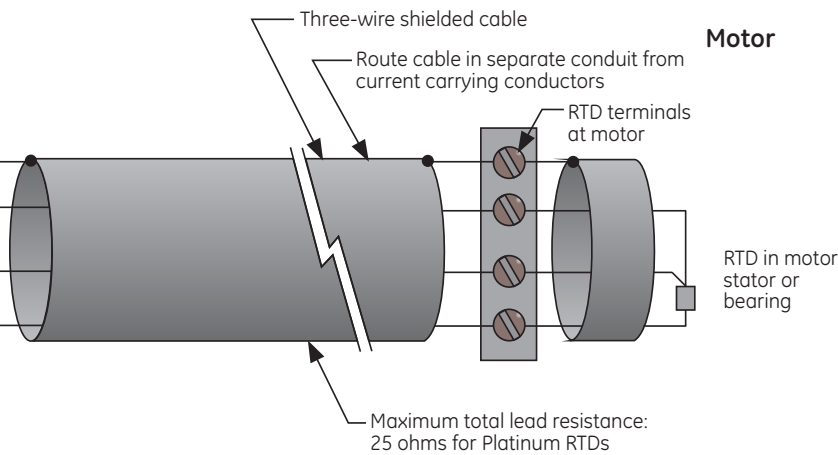


Figure 2-29: RTD wiring

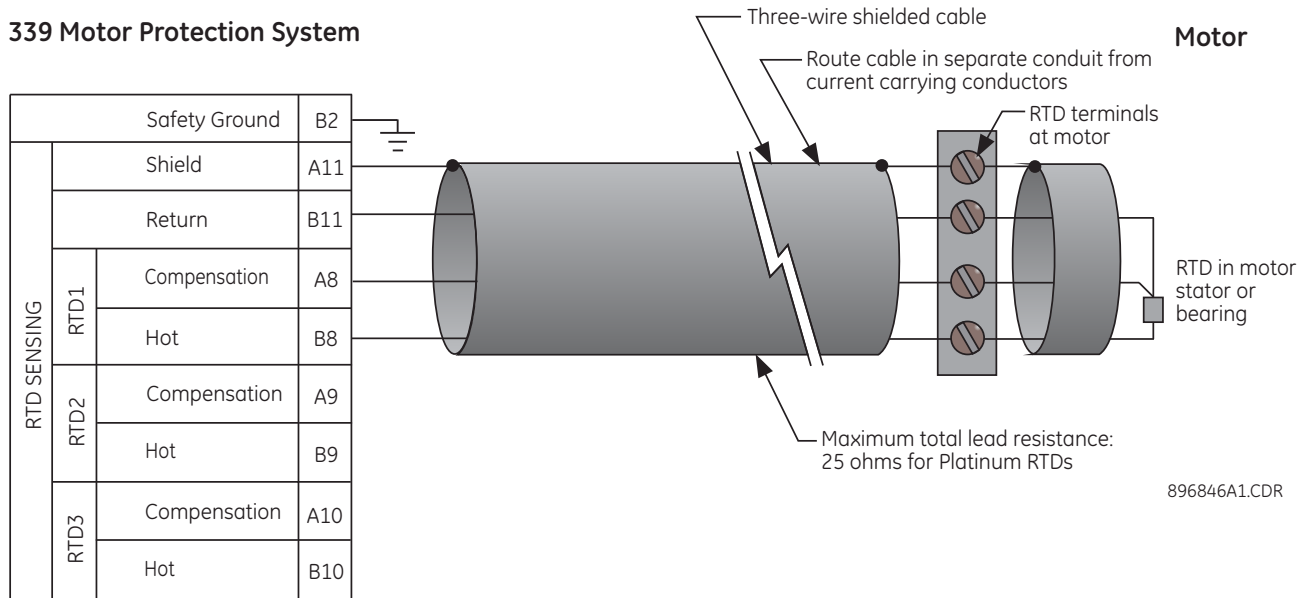
Internal RTD installation

Three resistance temperature detectors (RTDs) can be supplied internally with the 339 if the INPUT/OUTPUT option 'R' is installed (refer to Order Code). With the internal RTD option, the 100 ohm platinum DIN 43760 type is supported. Up to 3 RTDs may be used for motor stator and bearing temperature monitoring. All 3 RTDs share a common Return and Shield terminal.

The RTD circuitry compensates for lead resistance, provided that each of the three leads is the same length. Lead resistance should not exceed 25 ohms per lead. Shielded cable should be used to prevent noise pickup in the industrial environment. RTD cables should be kept close to grounded metal casings and away from areas of high electromagnetic or radio interference. RTD leads should not be run adjacent to or in the same conduit as high current carrying wires.

The shield connection terminal of the RTDs is grounded in the 339 and should not be connected to ground at the motor or anywhere else to prevent noise pickup from circulating currents.

339 Motor Protection System



Phase sequence and transformer polarity

For correct operation of the relay features, the user must follow the instrument transformer polarities, shown in the Typical Wiring Diagram. Note the solid square markings shown with all instrument transformer connections. When the connections adhere to this drawing, the arrow shows the direction of power flow for positive watts and the positive direction of lagging vars. The phase sequence is user programmable for either ABC or ACB rotation.

Current inputs

The 339 relay has three (3) channels for phase current inputs, each with an isolating transformer. There are no internal ground connections on the current inputs. Current transformers with 10 to 1500 A primaries may be used.



Verify that the relay's nominal input current of 1 A or 5 A matches the secondary rating of the connected CTs. Unmatched CTs may result in equipment damage or inadequate protection.



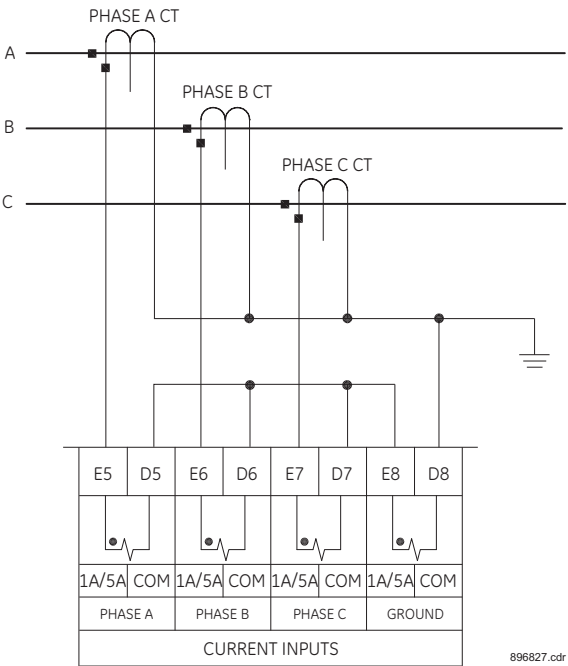
Before working on CTs, they MUST be short circuited.

Ground and CBCT inputs

The 339 has two isolating transformers with separate terminals for the 1A/5A secondary and the CBCT (50:0.025). Only one ground terminal type can be used at a time. There are no internal ground connections on the ground current inputs.

The maximum ground CT primary for the 1 A and 5 A taps is 1500 A. Alternatively the sensitive ground input, 50:0.025, can be used to detect ground current on high resistance grounded systems.

The ground CT connection can either be a zero sequence (core balance) installation or a residual connection. Note that only 1 A and 5 A secondary CTs may be used for the residual connection. A typical residual connection is illustrated below. The zero-sequence connection is shown in the typical wiring diagram. The zero-sequence connection is recommended. Unequal saturation of CTs, CT mismatch, size and location of motor, resistance of the power system, motor core saturation density, etc. may cause false readings in the residually connected ground fault circuit.



896827.cdr

Figure 2-30: Residual ground CT connection

Zero sequence CT installation

The various CT connections and the exact placement of a Zero Sequence CT, for ground fault current detection, are shown in the figure below. If the CT is placed over a shielded cable, capacitive coupling of phase current into the cable shield during motor starts may be detected as ground current unless the shield wire is also passed through the CT window. Twisted pair cabling on the Zero Sequence CT is recommended.

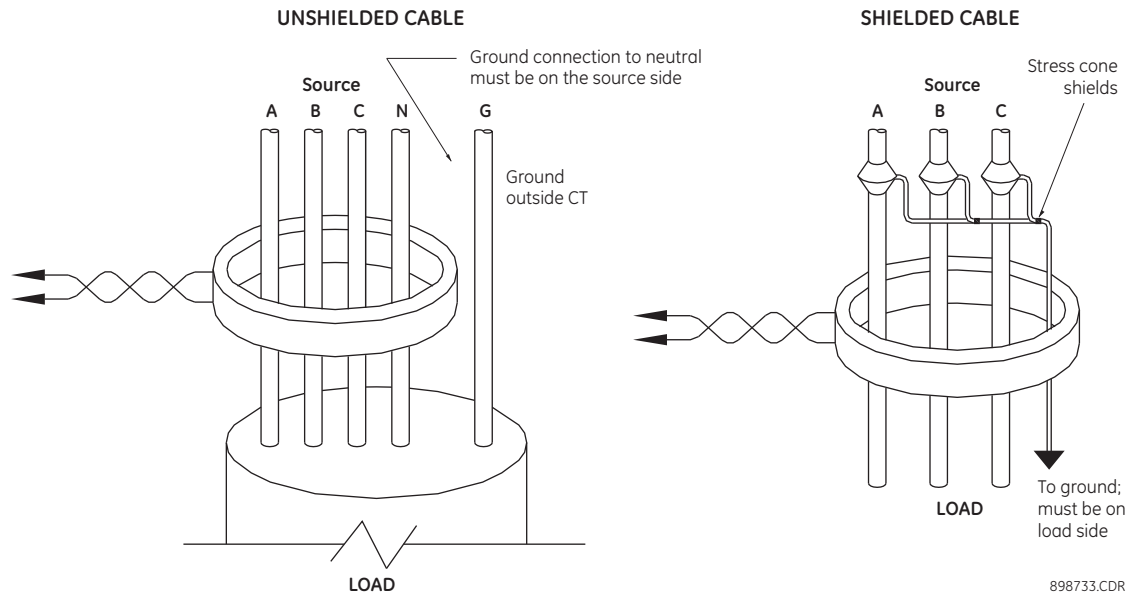


Figure 2-31: Zero sequence core balance (CT) installation

Voltage inputs

The 339 relay has three channels for AC voltage inputs, each with an isolating transformer. Voltage transformers up to a maximum 300:1 ratio may be used. The nominal secondary voltage must be in the 50 to 240 V range. The three phase inputs are designated as the "bus voltage". The Bus VT connections most commonly used, wye and delta (or open delta), are shown in the typical wiring diagram.



If Delta VTs are used, the zero sequence voltage (V_0) will be zero. Also, with the Delta VT connection, the phase-neutral voltage cannot be measured and will not be displayed.



The 339 relay can be applied to both metering and protection feeders with up to 20 kV phase-to-phase voltage. Please ensure that the selected VT ratio and VT secondary do not result in a primary voltage exceeding 20 kV.

Control power

⚠ CAUTION

Control power supplied to the relay must match the installed power supply range. If the applied voltage does not match, damage to the unit may occur. All grounds **MUST** be connected for safe, normal operation regardless of control power supply type.

The label found on the relay specifies its order code or model number. The installed power supply's operating range will be one of the following:

LO: 24 to 48 V DC (Range: 20 to 60 V DC)

HI: 125 to 250 V DC/120 to 240 V AC (Range: 84 to 250 V DC/60 to 300 V AC (50 and 60 Hz))

⚠ CAUTION

The relay should be connected directly to the ground bus, using the shortest practical path. A tinned copper, braided, shielding and bonding cable should be used. As a minimum, 96 strands of number 34 AWG should be used. Belden catalog number 8660 is suitable.

⚠ CAUTION

Isolate power prior to servicing.



An external switch, circuit breaker, or other protective device **must** be connected near to the equipment.

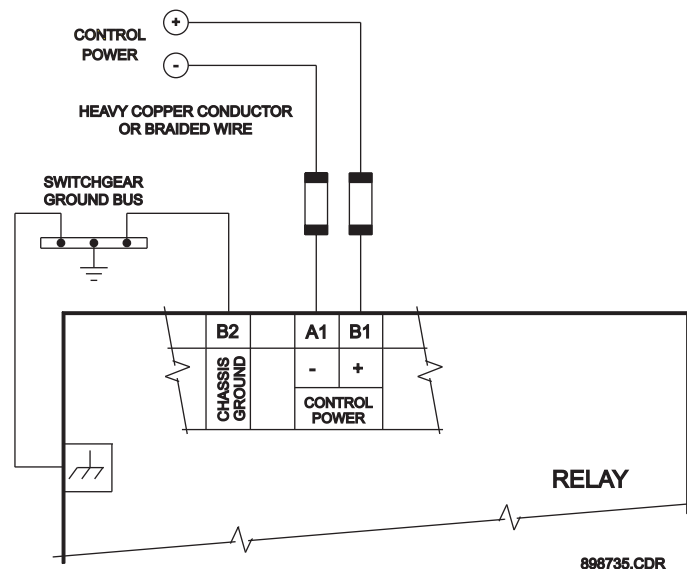


Figure 2-32: Control power connection

Contact inputs

External contacts can be connected to the relay's ten (10) digital inputs. These contacts are wet only.

The inputs can be programmed to different thresholds depending on the DC voltage (17, 33, 84, 166).



Ensure correct polarity on contact input connections and do not connect any contact input circuits to ground or else relay hardware may be damaged.

A wet contact has one side connected to the positive terminal of an external DC power supply. The other side of this contact is connected to the required contact input terminal. In addition, the negative side of the external source must be connected to the relay's DC negative rail at Terminal C11. The maximum external source voltage for this arrangement is 300 V DC.

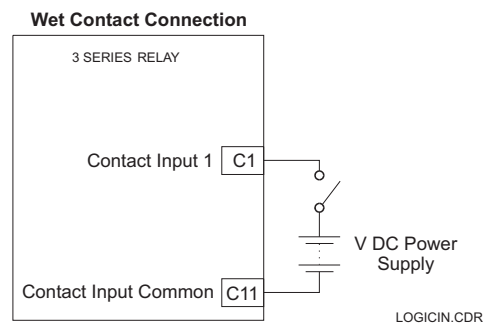


Figure 2-33: Wet contact connections

Trip and Close output relays

The 339 relay is equipped with seven electromechanical output relays: 2 Form A (Relay 1, Relay 2), and 5 Form C (Relays 3 to 7).

When SWITCHING DEVICE is selected as BREAKER:

Output Relays:

- For special purpose:
 - Output Relay 1 (non-failsafe, seal-in): Breaker Trip
 - Output Relay 2 (non-failsafe, seal-in): Breaker Close
 - Output Relay 3 (non-failsafe, self-reset): Start Inhibit
 - Output Relay 7 (fail-safe, self-reset): Critical Failure
- For general purpose:
 - Output Relays 4 to 6 - non-failsafe; can be programmed as self-reset or latched.

Operation of the Trip and Close output relays is designed to be controlled by the state of the circuit breaker as monitored by a 52a or 52b contact.

- The Trip and Close relays reset after the breaker is detected in a state corresponding to the command. When a relay feature sends a command to one of these special relays, it will remain operational until the requested change of breaker state is confirmed by a breaker auxiliary contact and the initiating condition has reset.
- If the initiating feature resets, but the breaker does not change state, the output relay will be reset after a default interval of 2 seconds.
- If neither of the breaker auxiliary contacts, 52a nor 52b, is programmed to a contact input, the Trip Relay is de-energized after either the delay programmed in the Breaker

Failure feature, or a default interval of 100 ms after the initiating input resets. The Close Relay is de-energized after 200 ms.

- If a delay is programmed for the Trip or Close contact seal-in time, then this delay is added to the reset time. Note that the default setting for the seal-in time is 40 ms.

52a Contact Configured	52b Contact Configured	Relay Operation
Yes	Yes	Trip Relay remains operational until 52b indicates an open breaker. Close Relay remains operational until 52a indicates a closed breaker.
Yes	No	Trip Relay remains operational until 52a indicates an open breaker. Close Relay remains operational until 52a indicates a closed breaker.
No	Yes	Trip Relay remains operational until 52b indicates an open breaker. Close Relay remains operational until 52b indicates a closed breaker.
No	No	Trip Relay operates until either the Breaker Failure delay expires (if the Breaker Failure element is enabled), or 100 ms after the feature causing the trip resets. Close Relay operates for 200 ms.

Breaker monitoring (Trip and Close coil monitoring) is performed by a built-in voltage monitor on Form A output relays: #1 Trip, and #2 Close. The voltage monitor is connected across each of the two Form A contacts, and the relay effectively detects healthy current through the circuit. In order to do this, an external jumper must be connected between terminals A2 and A3 for Trip coil monitoring, or/and B4, and B5 for Close coil monitoring. As long as the current through the Voltage Monitor is above the threshold of the trickle currents (see Technical Specification for Form A output relays), the circuit integrity for the Trip (Close) coil is effectively normal. If the Trip (Close) coil circuit gets disconnected, or if in general a high resistance is detected in the circuitry, a Trip (Close) alarm will be set and the "ALARM" and "MAINTENANCE" LEDs will be on provided the corresponding Coil Monitor feature is enabled.

Example: The figures below show the two different connections of the breaker trip (close) coil to the relay's trip output #1 terminals (close output #2 terminals) for both no voltage monitoring and voltage monitoring of the trip (close) circuit integrity.



To monitor the trip coil circuit integrity, use the relay terminals A2 and B3 to connect the Trip coil, and provide a jumper between terminals A2 and A3 (optional voltage).



To monitor the close coil circuit integrity, use the relay terminals B4 and A4 to connect the Close coil, and provide a jumper between terminals B4 and B5 (optional voltage).

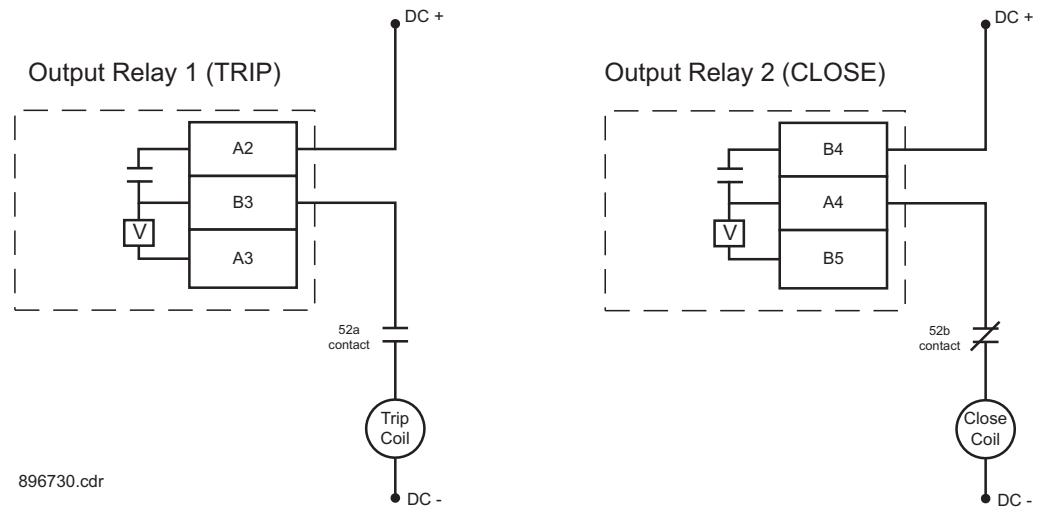


Figure 2-34: Trip and Close Coil circuits with no voltage monitoring



All AUX contacts are shown when the breaker is open.

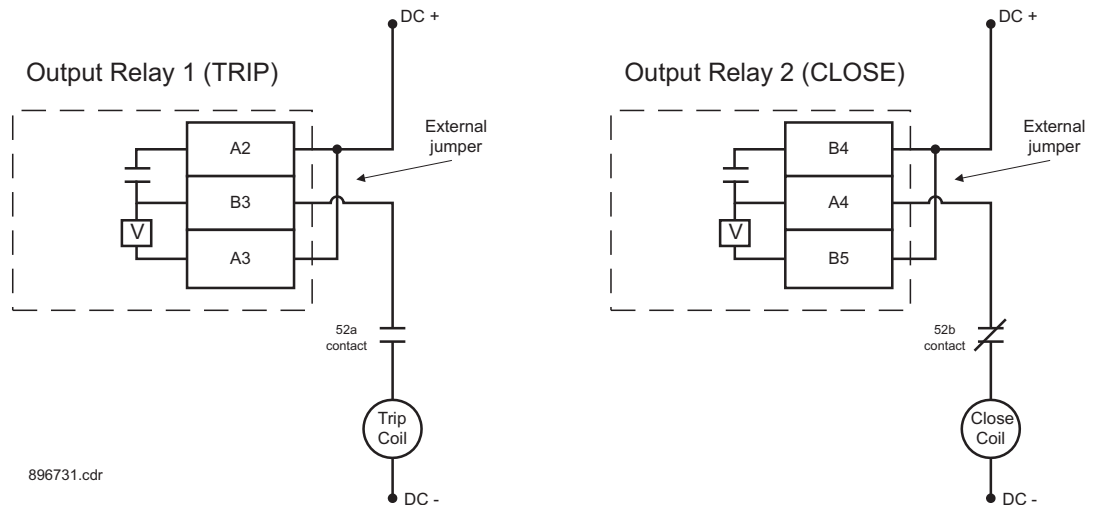


Figure 2-35: Trip and Close Coil circuits with voltage monitoring

When SWITCHING DEVICE is selected as CONTACTOR

Output Relays:

- Not Used:
 - Output Relay 1
 - Output Relay 2
- For special purpose:
 - Output Relay 3 (self-reset): Start Inhibit
 - Output Relay 4 (fail-safe, non-fail-safe): Trip
 - Output Relay 7 (fail-safe, self-reset): Critical Failure
- For general purpose:
 - Output Relays 5 to 6: Can be programmed as fail-safe or non-failsafe, as well as self-reset or latched.

Serial communications

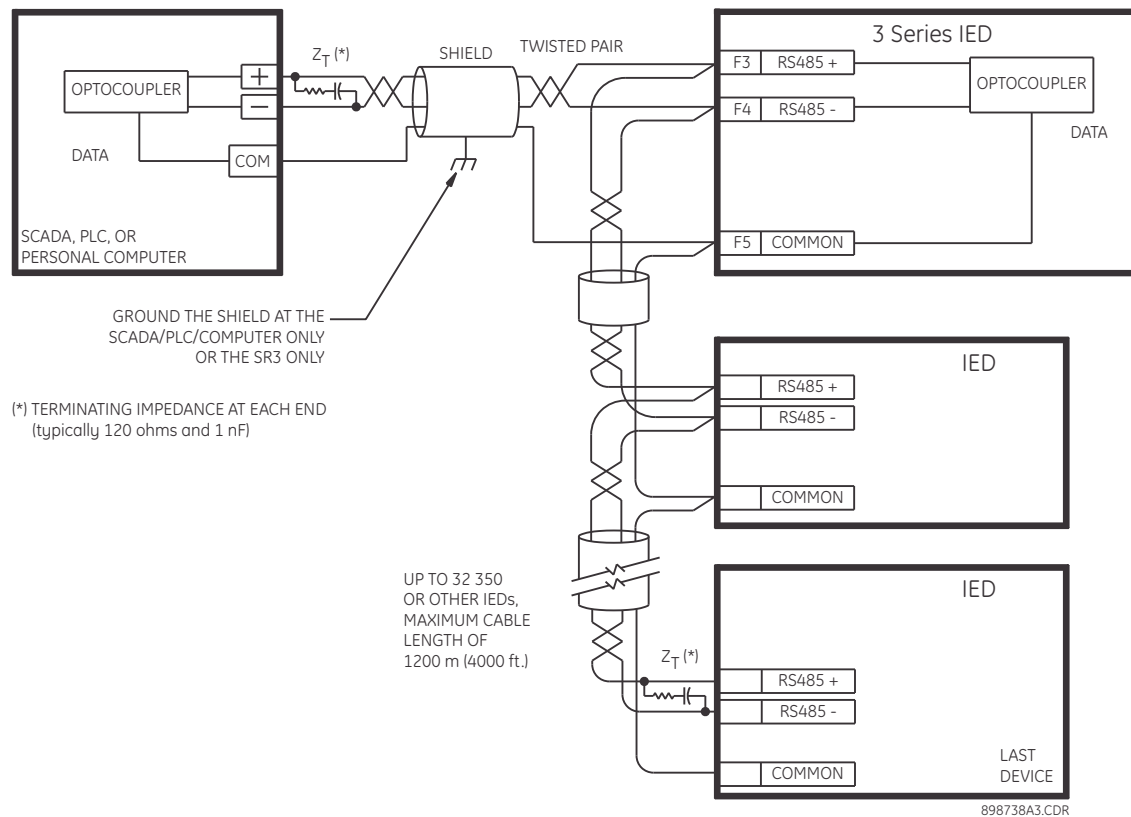


Figure 2-36: RS485 wiring diagram

One two-wire RS485 port is provided. Up to 32 339 IEDs can be daisy-chained together on a communication channel without exceeding the driver capability. For larger systems, additional serial channels must be added. Commercially available repeaters can also be used to add more than 32 relays on a single channel. Suitable cable should have a characteristic impedance of 120 ohms (for example, Belden #9841) and total wire length should not exceed 1200 meters (4000 ft.). Commercially available repeaters will allow for transmission distances greater than 1200 meters.

Voltage differences between remote ends of the communication link are not uncommon. For this reason, surge protection devices are internally installed across all RS485 terminals. Internally, an isolated power supply with an optocoupled data interface is used to prevent noise coupling.

NOTICE

To ensure that all devices in a daisy-chain are at the same potential, it is imperative that the common terminals of each RS485 port are tied together and grounded only once, at the master or at the 339. Failure to do so may result in intermittent or failed communications.

The source computer/PLC/SCADA system should have similar transient protection devices installed, either internally or externally. Ground the shield at one point only, as shown in the figure above, to avoid ground loops.

Correct polarity is also essential. The 339 IEDs must be wired with all the positive (+) terminals connected together and all the negative (-) terminals connected together. Each relay must be daisy-chained to the next one. Avoid star or stub connected configurations. The last device at each end of the daisy-chain should be terminated with a 120 ohm ¼

watt resistor in series with a 1 nF capacitor across the positive and negative terminals. Observing these guidelines will ensure a reliable communication system immune to system transients.

The uncovered communications cable shield connected to the common terminal should not exceed 1" (2.5 cm) for proper EMC shielding of the communications cable.

IRIG-B

IRIG-B is a standard time code format that allows time stamping of events to be synchronized among connected devices within 1 millisecond. The IRIG time code formats are serial, width-modulated codes which can be either DC level shift or amplitude modulated (AM) form. The type of form is auto-detected by the 339 relay. Third party equipment is available for generating the IRIG-B signal; this equipment may use a GPS satellite system to obtain the time reference so that devices at different geographic locations can also be synchronized.

The uncovered communications cable shield connected to the common terminal should not exceed 1" (2.5 cm) for proper EMC shielding of the communications cable.

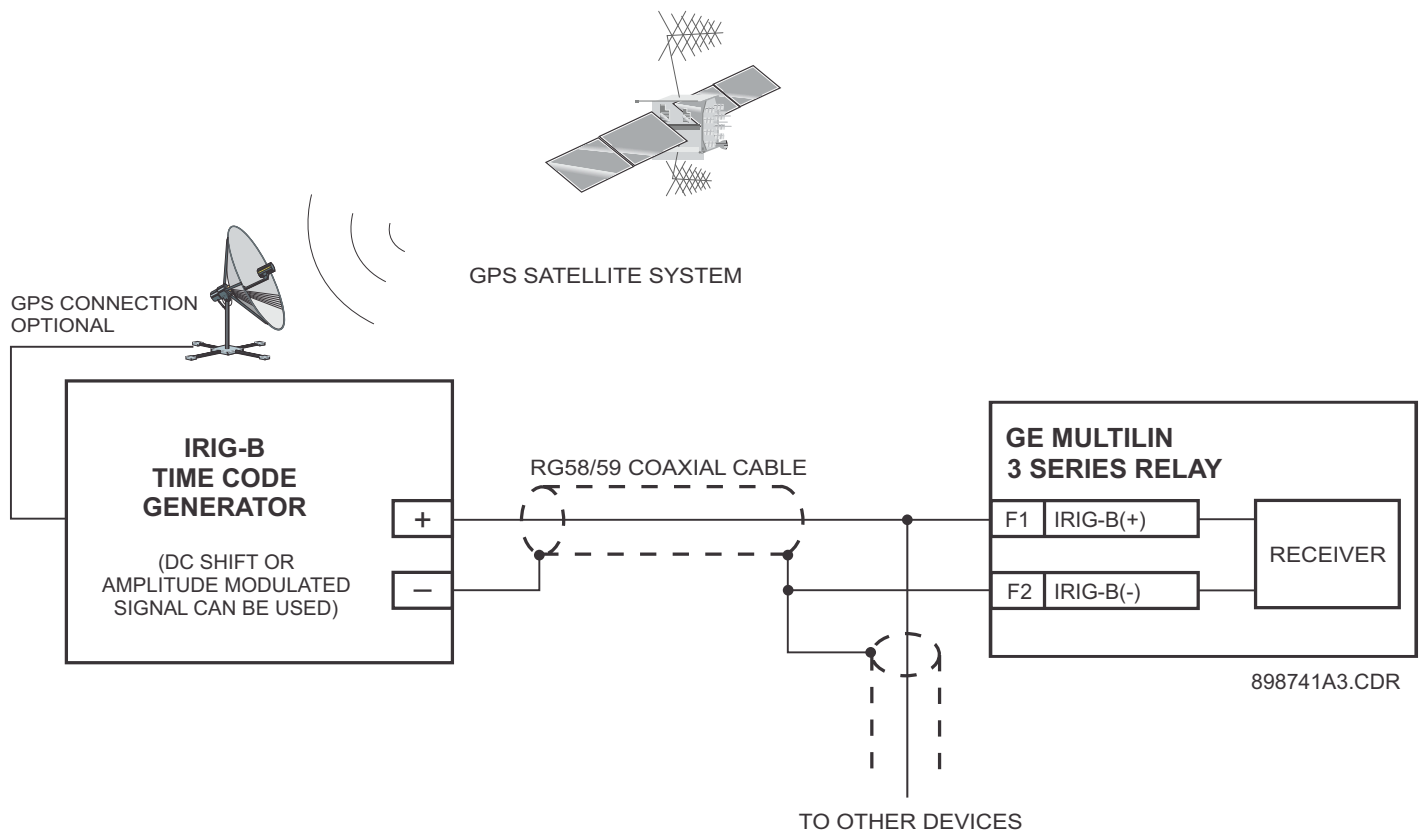


Figure 2-37: IRIG-B connection

339 Motor Protection System

Chapter 3: Interfaces

There are two methods of interfacing with the 339 Feeder Protection System.

- Interfacing via the relay keypad and display.
- Interfacing via the EnerVista 3 Series Setup software.

This section provides an overview of the interfacing methods available with the 339 using the relay control panels and EnerVista 3 Series Setup software. For additional details on interface parameters (for example, settings, actual values, etc.), refer to the individual chapters.

Front control panel interface

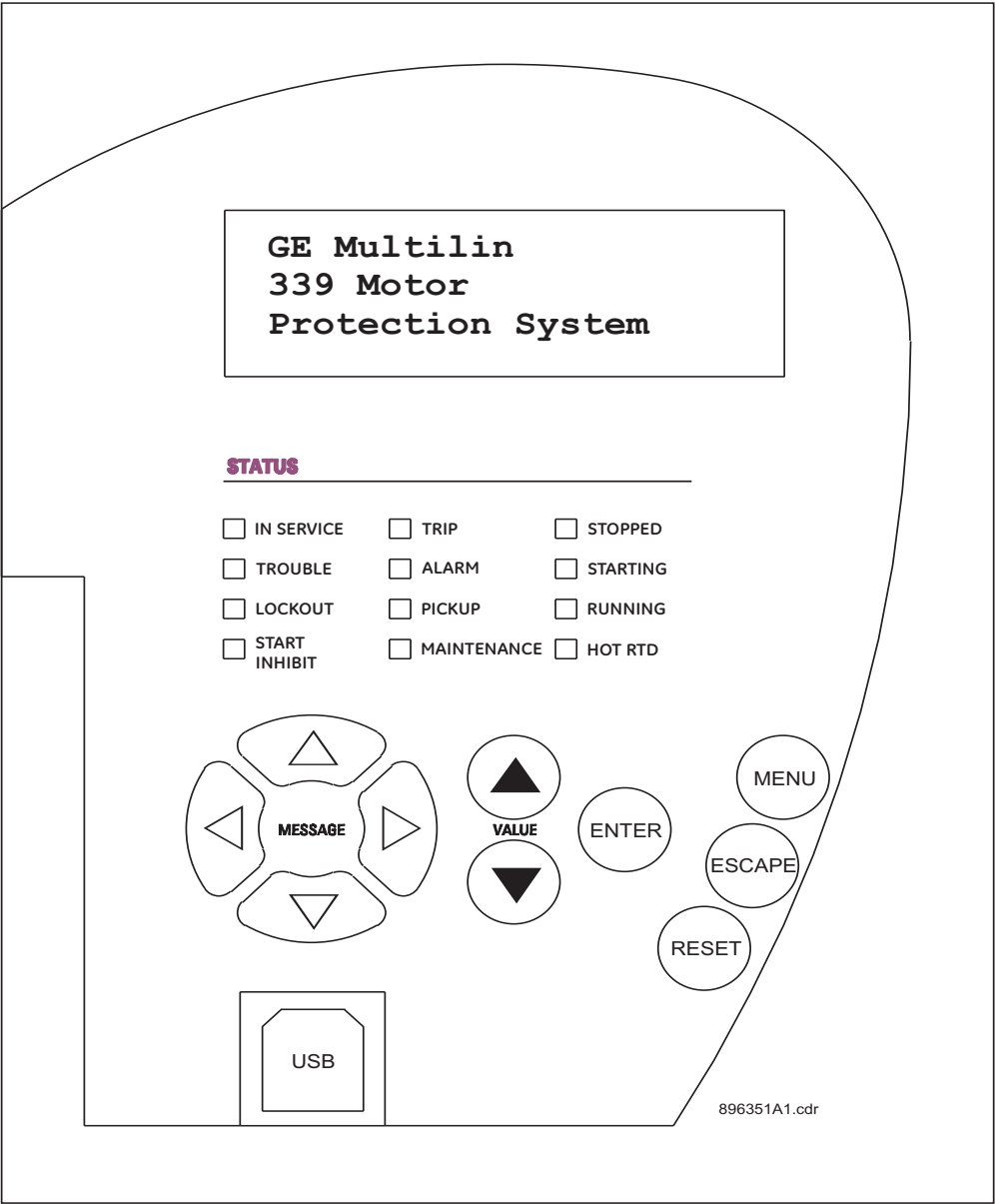


Figure 3-1: 339 Motor Protection System front panel

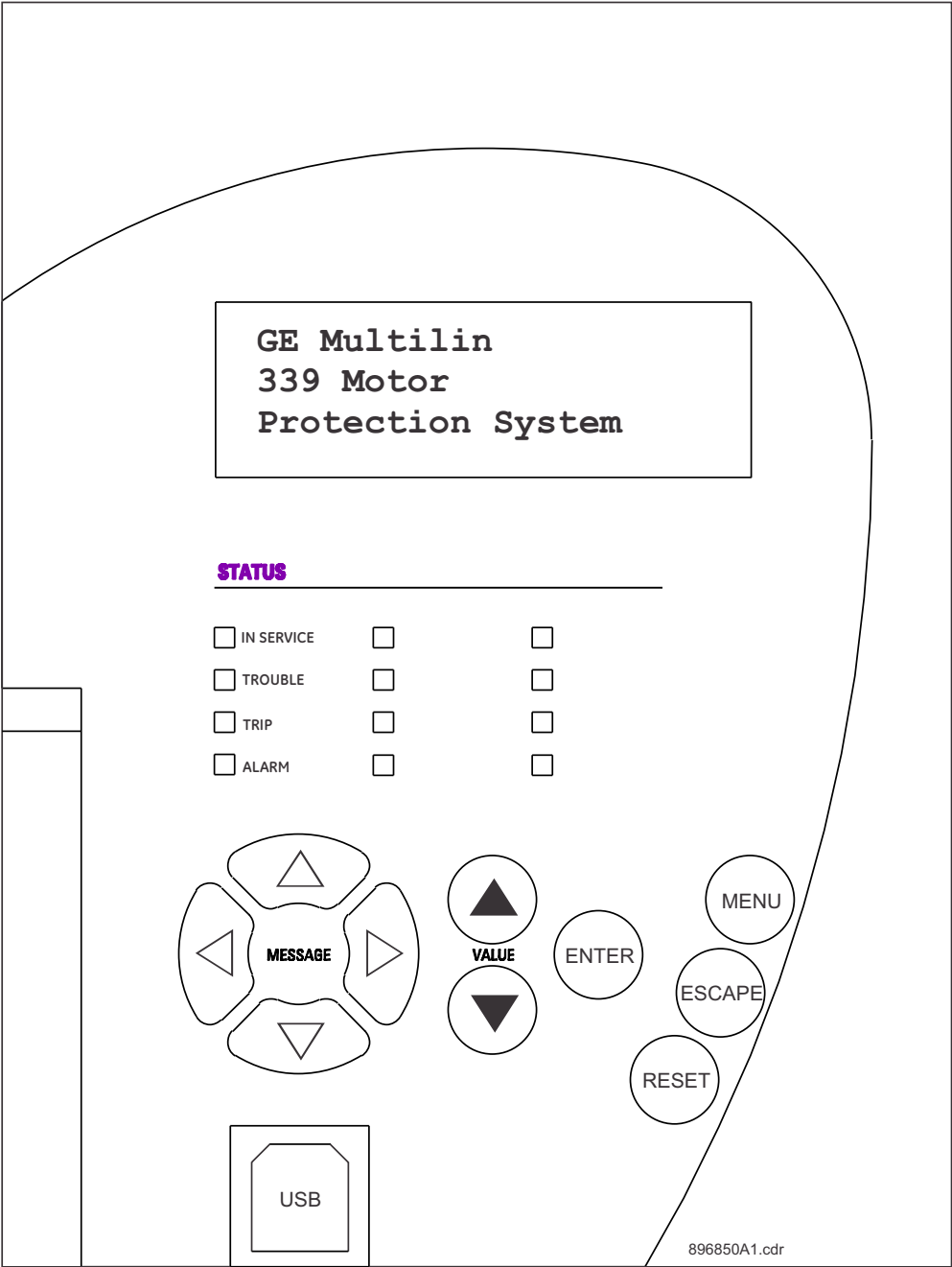


Figure 3-2: 339 Feeder Protection System Front Panel - Programmable LEDs

Description

The relay front panel provides an interface with a liquid crystal display, LED status indicators, control keys, and a USB program port. The display and status indicators show the relay information automatically. The control keys are used to select the appropriate message for entering setpoints or displaying measured values. The USB program port is also provided for connection with a computer running the EnerVista 3 Series Setup software.

Display

The 80-character liquid crystal display (LCD) allows visibility under varied lighting conditions. When the keypad and display are not being used, system information is displayed after a user-defined period of inactivity. Pressing the Menu key during the display of default message returns the display to the last message shown before the default message appeared. Any trip, alarm, or pickup is displayed immediately, automatically overriding the default message.

Working with the Keypad

The 339 display messages are organized into a Main Menu, pages, and sub-pages. There are four main menus labeled Actual Values, Quick Setup, Setpoints, and Maintenance. Pressing the MENU key followed by the MESSAGE key scrolls through the five Main Menu headers, which appear in sequence as follows:

ACTUAL VALUES
COMMANDS
QUICK SETUP
SETPOINTS
MAINTENANCE

Figure 3-3: The five Main Menu headers

Pressing the **MESSAGE ►** key or the **ENTER** key from these Main Menu pages will display the corresponding menu Page. Use the MESSAGE ▲ and MESSAGE ▼ keys to scroll through the Page headers.

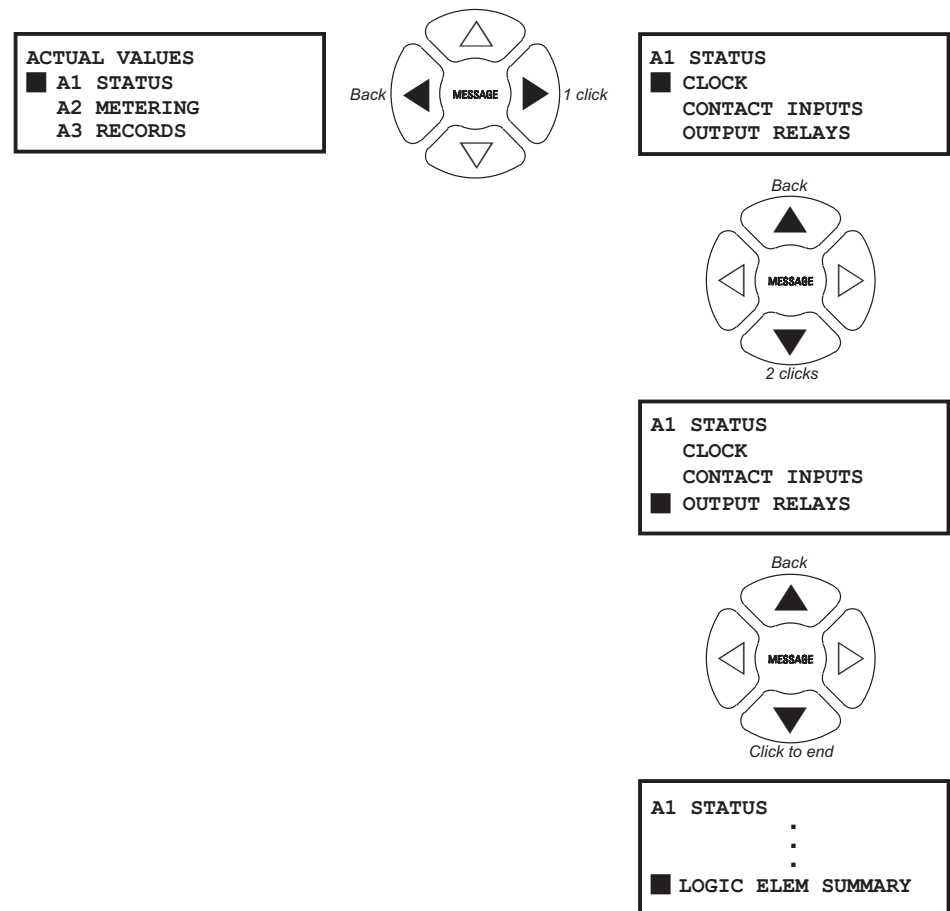


Figure 3-4: Typical paging operation from Main Menu selection

When the display shows **SETPOINTS**, pressing the **MESSAGE ►** key or the **ENTER** key will display the page headers of programmable parameters (referred to as setpoints in the manual). When the display shows **ACTUAL VALUES**, pressing the **MESSAGE ►** key or the **ENTER** key displays the page headers of measured parameters (referred to as actual values in the manual).

Each page is broken down further into logical sub-pages of messages. The **MESSAGE ▲** and **MESSAGE ▼** keys are used to navigate through the sub-pages. A summary of the setpoints and actual values pages can be found in the Chapters : Setpoints and Actual Values, respectively.

The **ENTER** key is dual purpose. It is used to enter the sub-pages and to store altered setpoint values into memory to complete the change. The **MESSAGE ►** key can also be used to enter sub-pages but not to store altered setpoints.

The **ESCAPE** key is also dual purpose. It is used to exit the sub-pages and to cancel a setpoint change. The **MESSAGE ◀** key can also be used to exit sub-pages and to cancel setpoint changes.

The **VALUE** keys are used to scroll through the possible choices of an enumerated setpoint. They also decrement and increment numerical setpoints.

The **RESET** key resets any latched conditions that are not currently active. This includes resetting latched output relays, latched Trip LEDs, breaker operation failure, and trip / close coil failures. The Autoreclose Scheme is also reset with the shot counter being returned to zero and the lockout condition being cleared.

The **MESSAGE ▲** and **MESSAGE ▼** keys scroll through any active conditions in the relay. Diagnostic messages are displayed indicating the state of protection and monitoring elements that are picked up, operating, or latched.

LED status indicators - Front panel with non-programmable LEDs

- **IN SERVICE: Green**

This LED will be continuously "ON", when the relay is set to "Ready" under **S1 RELAY SETUP > INSTALLATION > RELAY STATUS**, and no major self-test errors have been detected.

- **TROUBLE: Orange**

This LED will turn "ON", when the relay is in the not programmed (Not Ready) state under **S1 RELAY SETUP > INSTALLATION > RELAY STATUS**, or upon detection of a major self-test error. The relay will turn back to "IN-SERVICE" if no major self-test error is present.

- **LOCKOUT: Green**

This LED is lit when any of the following elements is activated:

- Thermal Overload
- Short Circuit
- Mechanical Jam
- Ground Fault

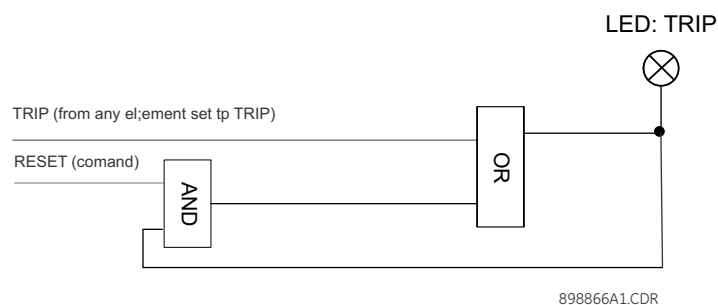
This LED can be reset either by emergency restart or by lockout reset if these are enabled. If none of them is enabled, a normal reset can be used.

- **START INHIBIT: Red**

This LED turns "ON" when the Start Inhibit element is activated. The LED self-resets when the inhibit is no longer present.

- **TRIP: Red**

This indicator turns on when the relay detects a fault and sends a trip command to the trip output relay. The LED will reset by initiating a reset command from either the RESET pushbutton Breaker Control, or communications; in all cases after the fault condition has cleared.



- **ALARM: Orange**

This LED will flash upon detection of an alarm condition, with element functions selected as "alarm". The LED will automatically turn off if the alarm condition clears. The LED will remain steady "ON", if the function of the operated protection was selected as "latched alarm".

- **PICKUP: Orange**

This indicator will light ON upon pickup condition generated by any of the relay features. The indicator will turn off if no pickup condition is detected.

- **MAINTENANCE: Orange**

This LED may indicate both breaker or relay maintenance depending on the programmed maintenance elements. The LED will turn on upon operation of a maintenance element.

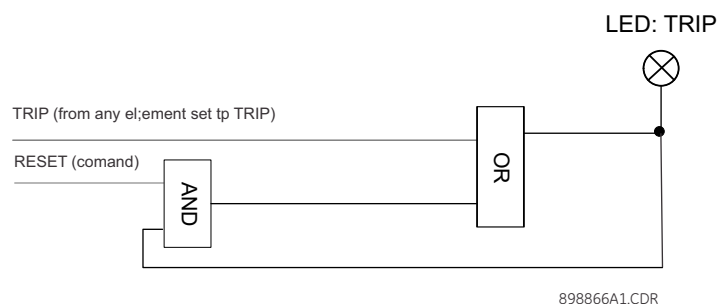
- **STOPPED: Red/Green/Orange/Off – programmable color, default Red**
This LED turns on when the motor status is detected "Stopped".
- **STARTING: Red/Green/Orange/Off – programmable color, default Orange**
This LED turns on when the motor status is detected "Starting".
- **RUNNING: Red/Green/Orange/Off – programmable color, default Green**
This LED turns "ON" when the motor status is detected "Running".
- **HOT RTD: Orange**
This LED turns "ON" when either RTD Alarm or Trip has been activated. This LED is self-resetting when the fault is no longer present.



Refer to M7 Testing for information on testing LED status indicators.

LED status indicators - Front panel with programmable LEDs

- **IN SERVICE: Green**
This LED will be continuously "ON", when the relay is set to "Ready" under **S1 RELAY SETUP > INSTALLATION > RELAY STATUS**, and no major self-test errors have been detected.
- **TROUBLE: Orange**
This LED will turn "ON", when the relay is not programmed (Not Ready) state under **S1 RELAY SETUP > INSTALLATION > RELAY STATUS**, or upon detection of a major self-test error. The relay will turn back to "IN-SERVICE" if no major self-test error is present.
- **TRIP: Red**
This indicator turns on when the relay detects a fault and sends a trip command to the trip output relay. The LED will reset by initiating a reset command from either the RESET pushbutton Breaker Control, or communications; in all cases after the fault condition has cleared.



- **ALARM: Orange**
This LED will flash upon detection of an alarm condition, with element functions selected as "alarm". The LED will automatically turn off if the alarm condition clears. The LED will remain steady "ON", if the function of the operated protection was selected as "latched alarm".
- **LED 1: Red - programmable source signal and type**
- **LED 2: Orange - programmable source signal and type**
- **LED 3: Orange - programmable source signal and type**
- **LED 4: Orange - programmable source signal and type**

- LED 5: Red/Orange/Green/Off - programmable source signal, type, and color
- LED 6: Red/Orange/Green/Off - programmable source signal, type, and color
- LED 7: Red/Orange/Green/Off - programmable source signal, type, and color
- LED 8: Red/Orange/Green/Off - programmable source signal, type, and color



NOTE

Refer to M7 Testing for information on testing LED status indicators.

Relay messages

Default message

VT is connected as Wye

MOTOR LOAD 0.00xFLA			
TCU 0 %			
CURR UNBAL 0 %			
AVG PH CURR 0 A			
Ia	0.0 A	Van	0 V
Ib	0.0 A	Vbn	0 V
Ic	0.0 A	Vcn	0 V
Ig	0.00A	Vav	0 V
3ϕ REAL POWER: 0.0 kW			
3ϕ REACTIVE POWER: 0.0 kvar			
3ϕ APPARENT POWER: 0.0 kVA			
3ϕ POWER FACTOR: 0.00 Lag			
FREQUENCY 0.00 Hz			
HOTTEST RTD 0° C			

VT is connected as Delta

MOTOR LOAD 0.00xFLA			
TCU 0 %			
CURR UNBAL 0 %			
AVG PH CURR 0 A			
Ia	0.0 A	Vab	0 V
Ib	0.0 A	Vbc	0 V
Ic	0.0 A	Vca	0 V
Ig	0.00A	Vav	0 V
3ϕ REAL POWER: 0.00 kW			
3ϕ REACTIVE POWER: 0.00 kvar			
3ϕ APPARENT POWER: 0.00 kVA			
3ϕ POWER FACTOR: 0.00 Lag			
FREQUENCY 0.00 Hz			
HOTTEST RTD 0° C			

Figure 3-5: Relay default messages



NOTE

HOTTEST RTD indicates the hottest stator RTD.

Target messages

Target messages are automatically displayed for any active condition on the relay such as pickups, trips, or alarms.

The relay displays the most recent event first, and after 5 seconds will start rolling up the other target messages until the conditions clear and/or the RESET command is initiated. The Target Messages can be reviewed by pressing either the MESSAGE UP or MESSAGE DOWN key. If a RESET command is not performed but any of the other faceplate pushbuttons is pressed, the display will not show the target messages unless the user navigates to **ACTUAL VALUES > A4 TARGET MESSAGES**, where they can be reviewed. If the target messages have not been cleared before the user presses a pushbutton different from "RESET", they will reappear on the screen after the time specified under the **SETPOINTS > S1 RELAY SETUP > FRONT PANEL > MESSAGE TIMEOUT** setting, that will start timing out from the last pressed pushbutton. The following shows the format of a typical Target Message:

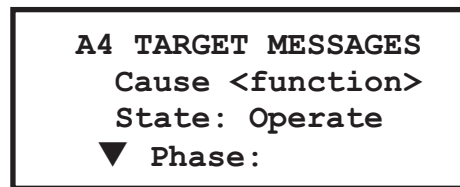
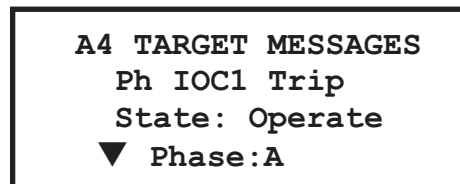


Figure 3-6: Typical target message

Example of a Phase IOC1 operation - phase A:

Phase IOC1 function: Trip



Cause <Function>

The first line contains information of the cause of operation (the name of the operated element), and the element function.

State: Operate

This line from the display shows the state of the element: Pickup, Operated, Alarm.

Phase: A

The last line from the display shows the phase that picked up or operated.

Self-test errors

The relay performs self diagnostics at initialization (after power up), and continuously as a background task to ensure that the hardware and software are functioning correctly. There are two types of self-test warnings indicating either a minor or major problem. Minor problems indicate a problem with the relay that does not compromise protection of the power system. Major errors indicate a problem with the relay which takes it out of service.



Self-Test Warnings may indicate a serious problem with the relay hardware!

Upon detection of a **minor** problem, the relay will:

- Turn on the "TROUBLE" LED at the same time as the "IN SERVICE" LED is on.
- Display the error on the relay display.
- Record the minor self-test error in the Event Recorder.

Upon detection of a **major** problem, the relay will:

- De-energize critical failure relay (Output Relay 7).
- Inhibit operation of all other output relays (1 to 6).
- Turn off the "IN SERVICE" LED; turn on the "TROUBLE" LED.
- Flash the "ALARM" LED.
- Display the cause of major self-test failure.
- Record the major self-test failure in the Event Recorder.

A4 TARGET MESSAGES
UNIT FAILURE:
Contact Factory:
Error code:1

Figure 3-7: Typical Self-test warning

Table 3-1: Minor Self-test Errors

Self-test Error Message	Latched Target Message?	Description of Problem	How Often the Test is Performed	What to do
MAINTENANCE ALERT: IRIG-B Failure	No	A bad IRIG-B input signal has been detected.	Every 5 seconds*	Ensure IRIG-B cable is connected, check cable functionality (i.e. physical damage or perform continuity test), ensure IRIG-B receiver is functioning, and check input signal level (it may be less than specification). If none of these apply, contact the factory.
MAINTENANCE ALERT: Clock Not Set	No	Clock time is the same as the default time.	Every 5 seconds*	Set the date and time in S1 RELAY SETUP.
MAINTENANCE ALERT: Comm Alert 1, 2, or 3	No	Communication error between CPU and Comms board.	Every 5 seconds*	If alert doesn't self-reset, then contact factory. Otherwise monitor recurrences as errors are detected and self-reset.
MAINTENANCE ALERT: Ethernet Link Fail	No	Communication error between 339 and Network.	Detected Instantaneously	Check Ethernet cable and Ethernet connection. Check health of the network. Check status of external routers and switches. Check that IP settings are not 0.0.0.0
MAINTENANCE ALERT: High Ethernet Traffic	No		Every 5 seconds*	
MAINTENANCE ALERT: High Ambient Temperature	No	The ambient temperature is above 80°C.	Every 1 hour	Increase ventilation to the surroundings.

Self-test Error Message	Latched Target Message?	Description of Problem	How Often the Test is Performed	What to do
MAINTENANCE ALERT: Daughter Error	No	The rear Communications daughter board type does not match the order code.	Every 5 seconds*	Replace the rear communications daughter board with the correct board.
MAINTENANCE ALERT: Comms Serial Invalid	No	The internal communications board does not match the order code.	Every 5 seconds*	Contact factory.
MAINTENANCE ALERT: RMIO Mismatch	No	RMIO Module is not validated; communications with the RMIO module are lost or interrupted.	Every 5 seconds*	Validate the RMIO Module; check CANBUS communication.

* Failure is logged after the detection of 5 consecutive failures - that is after 25 seconds

Table 3-2: Major Self-test Errors

Self-test Error Message	Latched Target Message?	Description of Problem	How Often the Test is Performed	What to do
UNIT FAILURE: Contact Factory (XXXX)	Yes	This warning is caused by a unit hardware failure. Failure code (XXXX) is shown.	Every 5 seconds*	Contact the factory and provide the failure code.
RELAY NOT READY: Check Settings	No	PRODUCT SETUP INSTALLATION setting indicates that relay is not in a programmed state.	On power up and whenever the PRODUCT SETUP INSTALLATION setting is altered.	Program all required settings then set the PRODUCT SETUP INSTALLATION setting to "Programmed".

* Failure is logged after the detection of 5 consecutive failures - that is after 25 seconds

Flash messages

Flash messages are warning, error, or general information messages displayed in response to pressing certain keys. The factory default flash message time is 4 seconds.

**S3 SHORT CIRCUIT
BLOCK 1
Logic Element 8
<SETPOINT STORED>**

Figure 3-8: Typical Flash message

SETPOINT STORED

This flash message is displayed in response to the **ENTER** key while on any setpoint message (see example above). The edited value was stored as entered.

COMMAND EXECUTED

This flash message is displayed in response to executing a command: ON, OFF, YES, NO, etc.

INVALID PASSWORD

This flash message appears upon an attempt to enter an incorrect password, as part of password security.

Software setup

Quick setup - Software interface

Quick Setup SR339 Relay(Device Offline)

Quick Setup

Relay Status: Not Ready Nominal Frequency: 60 Hz

Current Sensing

Phase CT Primary: 100 A Motor FLA: 100.0 A
 Ground CT Type: 50:0.025 Switching Device: Breaker
 52a Contact: Disabled 52b Contact: Disabled

Voltage Sensing

VT Connection: Wye VT Secondary: 120 V
 VT Ratio: 1

Protection Elements

Thermal Overload Function: Disabled	Short Circuit Function: Disabled	Ground Trip Function: Disabled
Thermal Protection Start: Off	Short Circuit Pickup: 6.00 x CT	Ground Trip Pickup: 10.00 A
Locked Rotor Current: 6.0 x FLA	Short Circuit Delay: 0.00 s	Ground Trip On Run: 0.00 s
Safe Stall Time Cold: 10.0 s	Mechanical Jam Function: Disabled	Ground Trip On Start: 0.00 s
Thermal Overload Pickup: 1.01 x FLA	Mechanical Jam Pickup: 4.50 x FLA	Phase UV1 Function: Disabled
Unbalance K Factor: 0	Mechanical Jam Delay: 0.10 s	Phase UV1 Pickup: 0.75 x VT
Cool Time Constant Running: 15 min	UnderCurrent Trip Function: Disabled	Phase UV1 Delay: 2.0 s
Cool Time Constant Stopped: 30 min	UnderCurrent Trip Pickup: 0.60 x FLA	
Hot/Cold Ratio: 0.85 %	UnderCurrent Trip Delay: 1.00 s	

- **The Quick Setup** window allows you to configure important settings from different screens in the relay by adding them to a common window.
- **Quick Setup** window options are available for a single device or a file.
- **The Quick Setup** Window option is accessed from the "Tree" which launches on clicking.

EnerVista 3 Series Setup Software

Although settings can be entered manually using the control panel keys, a PC can be used to download setpoints through the communications port. The EnerVista 3 Series Setup software is available from GE Multilin to make this as convenient as possible. With EnerVista 3 Series Setup running, it is possible to:

- Program and modify settings
- Load and save setting files to and from a disk
- Read actual values
- Monitor status
- Read pre-trip data and event records
- Get help on any topic

- Upgrade the 339 firmware

The EnerVista 3 Series Setup software allows immediate access to all 339 features with easy to use pull down menus in the familiar Windows environment. This section provides the necessary information to install EnerVista 3 Series Setup , upgrade the relay firmware, and write and edit setting files.

The EnerVista 3 Series Setup software can run without a 339 connected to the computer. In this case, settings may be saved to a file for future use. If a 339 is connected to a PC and communications are enabled, the 339 can be programmed from the setting screens. In addition, measured values, status and trip messages can be displayed with the actual value screens.

Hardware and software requirements

The following requirements must be met for the EnerVista 3 Series Setup software.

- Pentium 4 (Core Duo recommended)
- Windows XP with Service Pack 2 (Service Pack 3 recommended) , Windows 7 (32-bit or 64-bit), Windows 8.1 (32-bit or 64-bit), Windows 10 (32-bit or 64-bit)
- 1 GB of RAM (2 GB recommended)
- 500 MB free hard drive space (1 GB recommended)
- 1024 x 768 display (1280 x 800 recommended)

The EnerVista 3 Series Setup software can be installed from the GE Multilin website at <http://www.gegridsolutions.com/multilin>

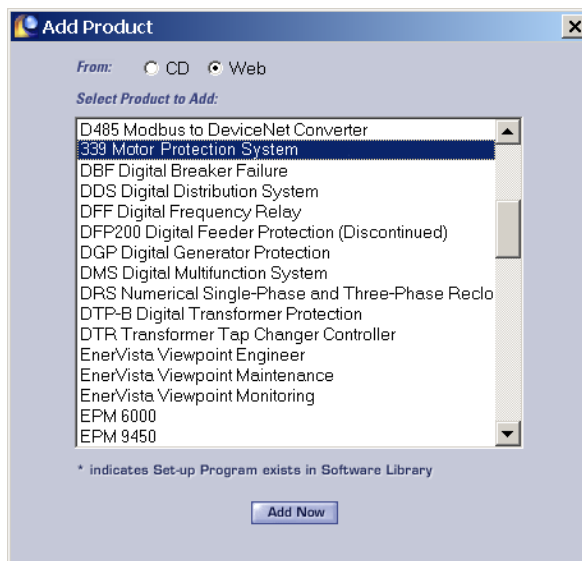
Installing the EnerVista 3 Series Setup software

After ensuring the minimum requirements indicated earlier, use the following procedure to install the EnerVista 3 Series Setup software from the GE Multilin website using EnerVista Launchpad. The no-charge EnerVista Launchpad software provides easy installation of Multilin software, notification of new software and document releases, and manages configuration files for different Multilin devices.

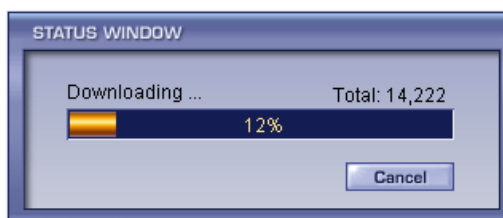
1. Navigate to: <http://www.gegridsolutions.com/multilin/enervista/launchpad>.
2. Click **Software** on the left menu and download the latest EnerVista Launchpad package.
3. Double-click the downloaded file to start the installation.
4. When installation is complete, start the EnerVista Launchpad application.
5. Click the **IED Setup** section of the LaunchPad toolbar.



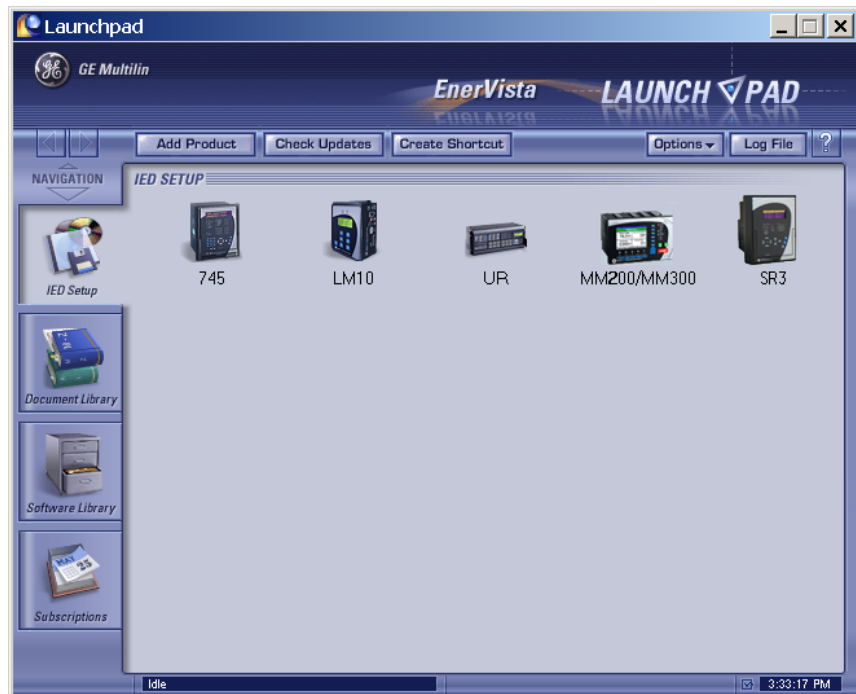
6. In the EnerVista Launchpad window, click the **Add Product** button and select the 339 Feeder Protection System as shown below. Select the Web option to ensure the most recent software release, then click the **Add Now** button to list software items for the 339 .



7. EnerVista Launchpad will obtain the latest installation software from the Web and automatically start the installation process. A status window with a progress bar will be shown during the downloading process.

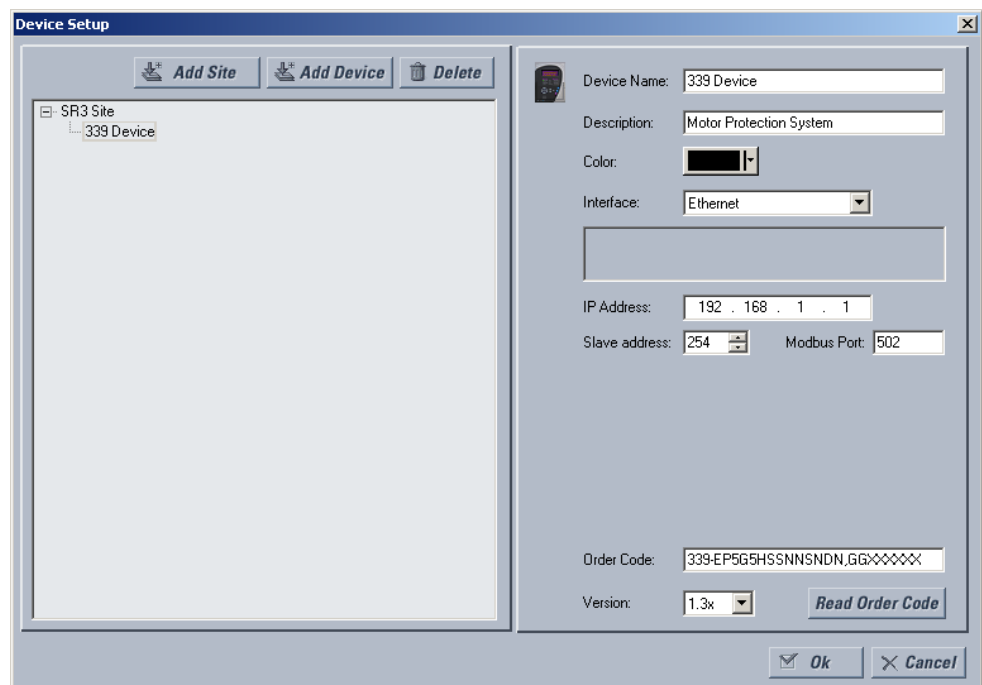


8. Select the complete path, including the new directory name, where the EnerVista 3 Series Setup software will be installed.
9. Click on **Next** to begin the installation. The files will be installed in the directory indicated, the USB driver will be loaded into the computer, and the installation program will automatically create icons and add EnerVista 3 Series Setup software to the Windows start menu.
10. The 339 device will be added to the list of installed IEDs in the EnerVista Launchpad window, as shown below.



If you are going to communicate from your computer to the 339 Relay using the USB port:

11. Plug the USB cable into the USB port on the 339 Relay then into the USB port on your computer.
12. Launch EnerVista 3 Series Setup from LaunchPad.
13. In **EnerVista > Device Setup**:



14. Select **USB** as the Interface type.
15. Select **339 Relay** as the USB device.

Upgrading the software

The latest EnerVista software and firmware can be downloaded from:

<https://www.gegridsolutions.com/>

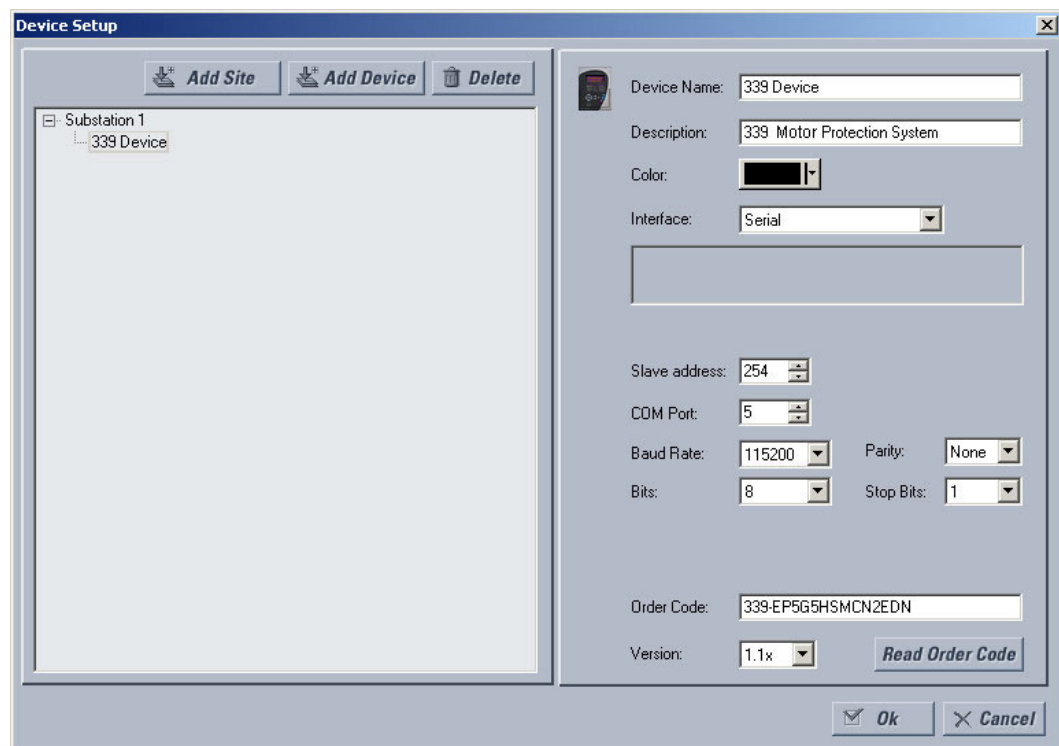
After upgrading, check the version number under **Help > About**. If the new version does not display, try uninstalling the software and reinstalling the new versions.

Connecting EnerVista 3 Series Setup to the relay

Configuring serial communications

Before starting, verify that the cable is properly connected to either the USB port on the front panel of the device (for USB communications) or to the RS485 terminals on the back of the device (for RS485 communications). This example demonstrates an USB connection. For RS485 communications, the GE Multilin F485 converter will be required. Refer to the F485 manual for additional details. To configure the relay for Ethernet communications, see *Configuring Ethernet Communications* below.

1. Install and start the latest version of the EnerVista 3 Series Setup software (available from the GE Multilin web site). See the previous section for the installation procedure.
2. Click on the **Device Setup** button to open the Device Setup window and click the **Add Site** button to define a new site.
3. Enter the desired site name in the "Site Name" field. If desired, a short description of the site can also be entered. In this example, we will use "Substation 1" as the site name.
4. The new site will appear in the upper-left list in the EnerVista 3 Series Setup window.
5. Click the **Add Device** button to define the new device.
6. Enter the desired name in the "Device Name" field and a description (optional) of the device.
7. Select "Serial" from the Interface drop-down list.

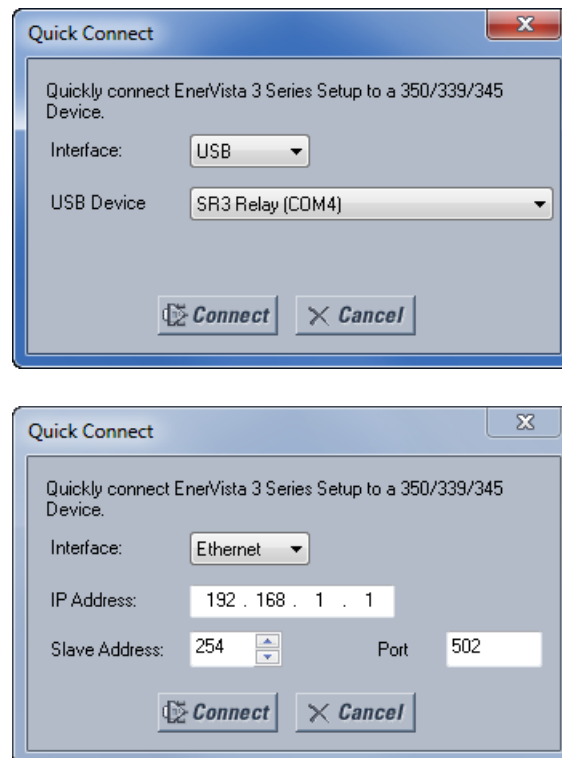


8. Click the **Read Order Code** button to connect to the 339 device and upload the order code.
9. Click **OK** when the relay order code has been received. The new device will be added to the Site List window (or Online window) located in the top left corner of the main EnerVista 3 Series Setup window.

The 339 Site Device has now been configured for USB communications. Proceed to *Connecting to the Relay* below, to begin communications.

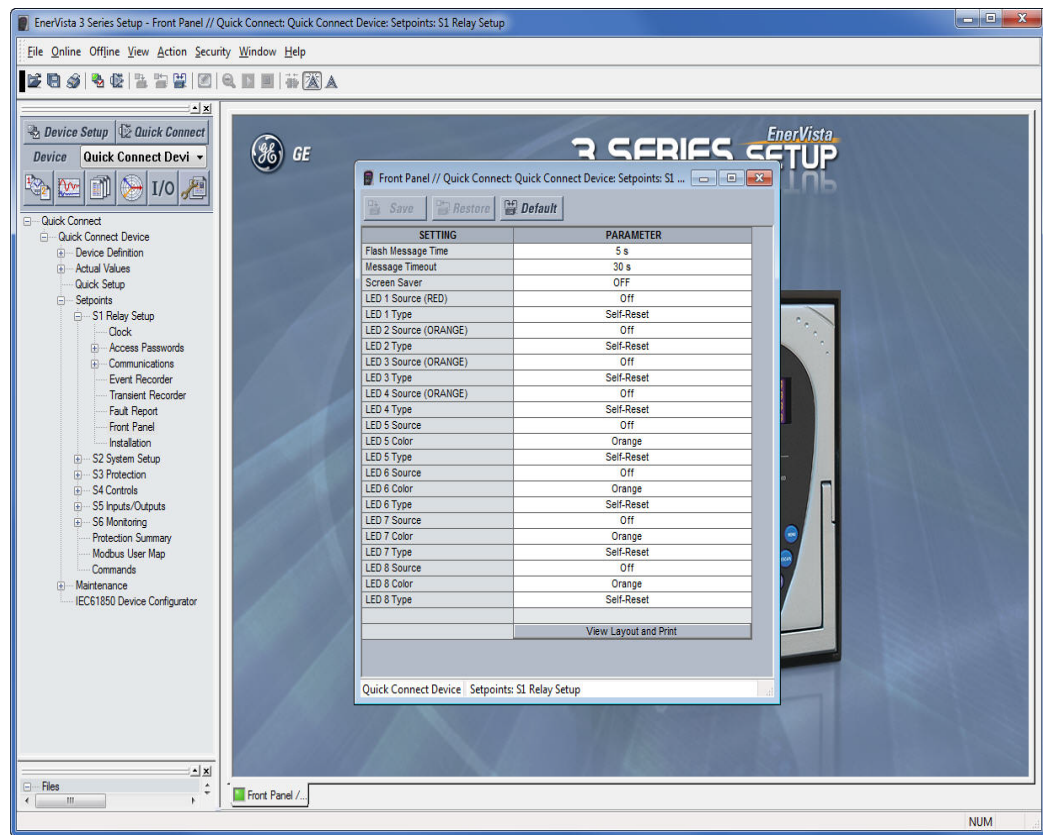
Using the Quick Connect feature

The **Quick Connect** button can be used to establish a fast connection through the front panel USB port of a 339 relay, or through the Ethernet port. The following window will appear when the **QuickConnect** button is pressed:



As indicated by the window, the "Quick Connect" feature can quickly connect the EnerVista 3 Series Setup software to a 339 front port if the USB is selected in the interface drop-down list. Select "SR3 Relay" and press the **Connect** button. Ethernet can also be used as the interface for Quick Connect as shown above.

When connected, a new Site called "Quick Connect" will appear in the Site List window.



The 339 Site Device has now been configured via the Quick Connect feature for either USB or Ethernet communications. Proceed to *Connecting to the Relay* below, to begin communications.

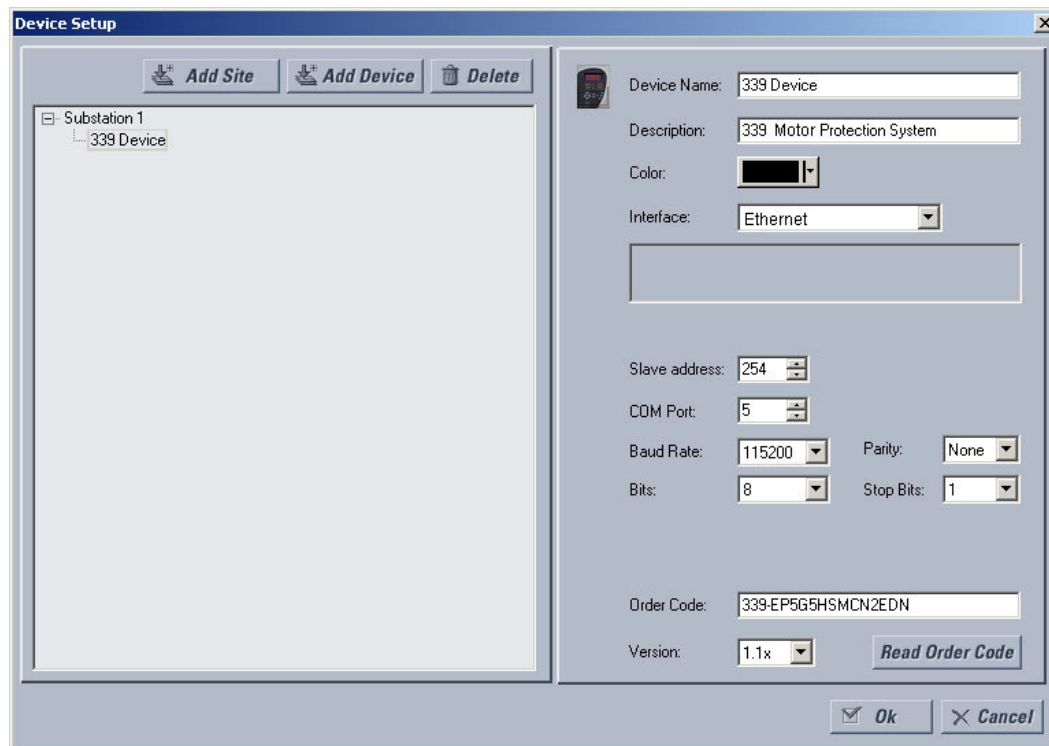
Configuring Ethernet communications



Before starting, verify that the Ethernet cable is properly connected to the RJ-45 Ethernet port.

339 supports a maximum of 3 TCP/IP sessions.

1. Install and start the latest version of the EnerVista 3 Series Setup Setup software. See the previous section for the installation procedure.
2. Click on the **Device Setup** button to open the Device Setup window and click the **Add Site** button to define a new site.
3. Enter the desired site name in the "Site Name" field. If desired, a short description of the site can also be entered. In this example, we will use "Substation 1" as the site name.
4. The new site will appear in the upper-left list.
5. Click the **Add Device** button to define the new device.
6. Enter the desired name in the "Device Name" field, and a description (optional).
7. Select "Ethernet" from the Interface drop-down list. This will display a number of interface parameters that must be entered for proper Ethernet functionality.



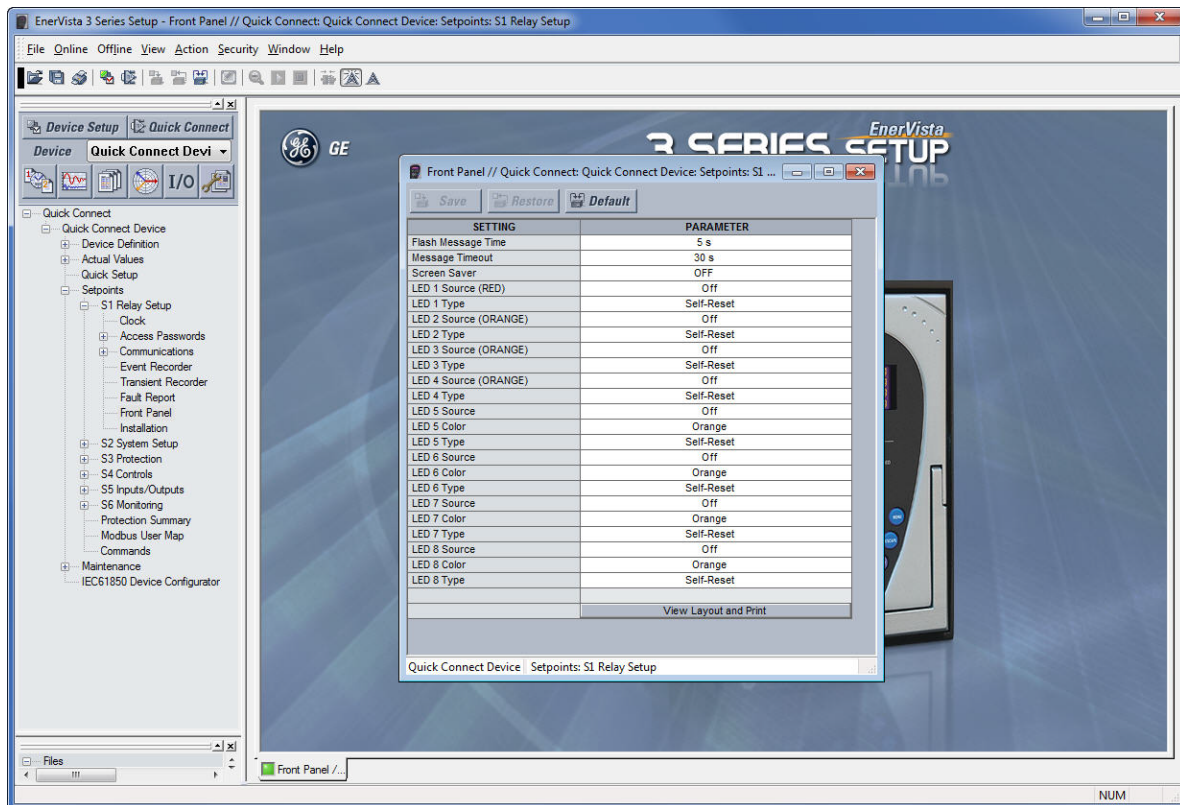
8. Enter the IP address, slave address, and Modbus port values assigned to the 339 relay (from the S1 RELAY SETUP > COMMUNICATIONS > ETHERNET menu).
9. Click the **Read Order Code** button to connect to the 339 and upload the order code. If a communications error occurs, ensure that the Ethernet communication values correspond to the relay setting values.
10. Click **OK** when the relay order code has been received. The new device will be added to the Site List window (or Online window) located in the top left corner of the main EnerVista 3 Series Setup window.

The 339 Site Device has now been configured for Ethernet communications. Proceed to the following section to begin communications.

Connecting to the relay

Now that the communications parameters have been properly configured, the user can easily communicate with the relay.

1. Expand the Site list by double clicking on the site name or clicking on the «+» box to list the available devices for the given site.
2. Desired device trees can be expanded by clicking the «+» box. The following list of headers is shown for each device:
 - Device Definition
 - Actual Values
 - Quick Setup
 - Setpoints
 - Maintenance.
3. Expand the SETTINGS > RELAY SETUP list item and double click on **Front Panel** to open the Front Panel settings window as shown:



- The Front Panel settings window opens with a corresponding status indicator on the lower left of the EnerVista 3 Series Setup window.
- If the status indicator is red, verify that the serial, USB, or Ethernet cable is properly connected to the relay, and that the relay has been properly configured for communications (steps described earlier).

The Front Panel settings can now be edited, printed, or changed. Other setpoint and command windows can be displayed and edited in a similar manner. "Actual Values" windows are also available for display. These windows can be arranged, and resized at will.

Working with setpoints and setpoint files

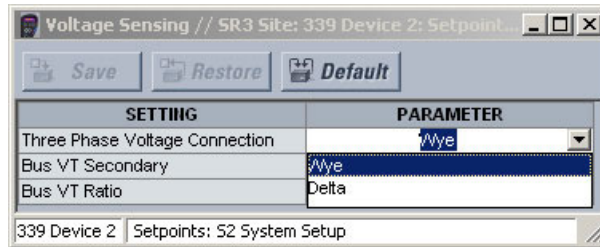
Engaging a device

The EnerVista 3 Series Setup software may be used in on-line mode (relay connected) to directly communicate with a relay. Communicating relays are organized and grouped by communication interfaces and into sites. Sites may contain any number of relays selected from the product series.

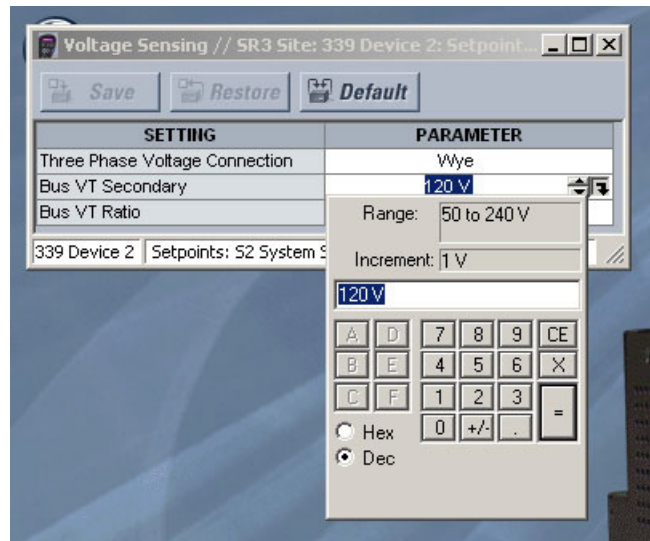
Entering setpoints

The System Setup page will be used as an example to illustrate the entering of setpoints. In this example, we will be changing the voltage sensing setpoints.

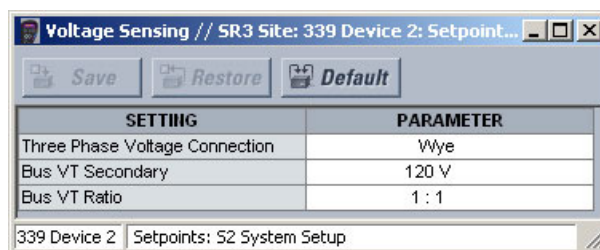
- Establish communications with the relay.
- Select the **Setpoint > System Setup > Voltage Sensing** menu item.
- Select the Bus VT Secondary setpoint by clicking anywhere in the parameter box. This will display three arrows: two to increment/decrement the value and another to launch the numerical keypad.



4. Clicking the arrow at the end of the box displays a numerical keypad interface that allows the user to enter a value within the setpoint range displayed near the top of the keypad: Click = to exit from the keypad and keep the new value. Click on X to exit from the keypad and retain the old value.



5. For setpoints requiring non-numerical pre-set values (e.g. **3-Phase voltage connection** below), clicking anywhere within the setpoint value box displays a drop-down selection menu arrow. Select the desired value from this list.

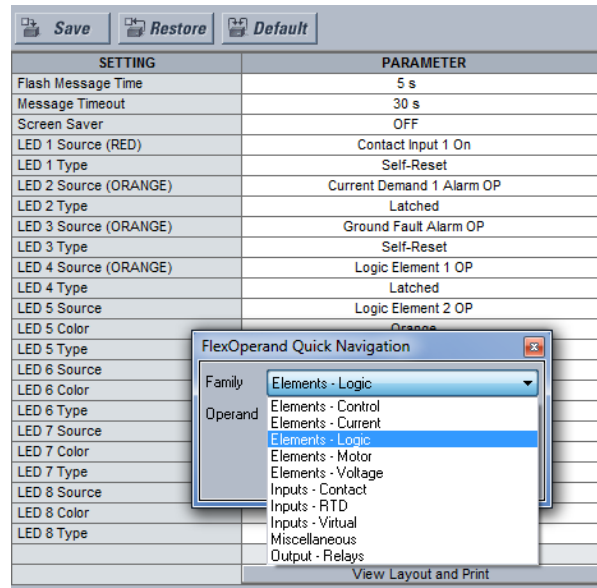


6. For setpoints requiring an alphanumeric text string (e.g. "relay name"), the value may be entered directly within the setpoint value box.
7. In the **Setpoint > System Setup > Voltage Sensing** dialog box, click on **Save** to save the values into the relay339. Click **YES** to accept any changes and exit the window. Click **Restore** to retain previous values. Click **Default** to restore Default values.

Setting programmable LEDs

Front panels with programmable LEDs have eight LEDs that are off by default, and must be set to a source signal and type. Four of these LEDs can also be set to different colors.

1. Establish communications with the relay.
2. Select the **Setpoint > S1 Relay Setup > Front Panel** menu item.
3. Select an LED Source setpoint by clicking anywhere in the parameter box beside an LED Source label. This opens a Quick Navigation window.

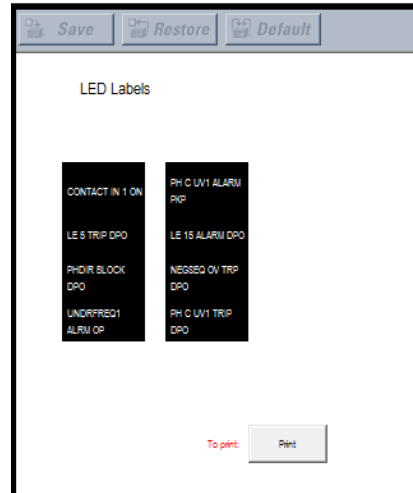


4. Select a Type for the LED (Latched or Self-Reset), and a Color if applicable.
5. Repeat this process for all programmable LED Source, Type, and Color parameters.

The screenshot shows the same software interface as before, but with the 'FlexOperand Quick Navigation' dialog box closed. The table now shows the completed settings for all eight LEDs, including their sources, types, and colors.

SETTING	PARAMETER
Flash Message Time	5 s
Message Timeout	30 s
Screen Saver	OFF
LED 1 Source (RED)	Contact Input 1 On
LED 1 Type	Self-Reset
LED 2 Source (ORANGE)	Current Demand 1 Alarm OP
LED 2 Type	Latched
LED 3 Source (ORANGE)	Ground Fault Alarm OP
LED 3 Type	Self-Reset
LED 4 Source (ORANGE)	Logic Element 1 OP
LED 4 Type	Latched
LED 5 Source	Logic Element 2 OP
LED 5 Color	Orange
LED 5 Type	Latched
LED 6 Source	Emergency Restart
LED 6 Color	Red
LED 6 Type	Self-Reset
LED 7 Source	Off
LED 7 Color	Orange
LED 7 Type	Self-Reset
LED 8 Source	Off
LED 8 Color	Orange
LED 8 Type	Self-Reset

6. In the **Setpoint > S1 Relay Setup > Front Panel** dialog box, click **Save** to save the values into the 339. Click **YES** to accept any changes. Click **Restore** to retain previous values. Click **Default** to restore Default values (all LEDs Off and colors Orange).
7. Click **View Layout and Print** to create a printable label for the front panel showing the programmable LED settings. Edit LED names manually by clicking the LED label and entering up to 20 characters. (Manual edits can be printed, but are not saved.)



8. Click **Print** to print a copy of the customized front panel label.

File support

Opening any EnerVista 3 Series Setup file will automatically launch the application or provide focus to the already opened application. If the file is a settings file (has a 'SR3' extension) which had been removed from the Settings List tree menu, it will be added back to the Settings List tree.

New files will be automatically added to the tree.

Using setpoint files

The EnerVista 3 Series Setup software interface supports three ways of handling changes to relay settings:

- In off-line mode (relay disconnected) to create or edit relay settings files for later download to communicating relays.
- Directly modifying relay settings while connected to a communicating relay, then saving the settings when complete.
- Creating/editing settings files while connected to a communicating relay, then saving them to the relay when complete.

Settings files are organized on the basis of file names assigned by the user. A settings file contains data pertaining to the following types of relay settings:

- Device Definition
- Relay Setup
- System Setup
- Protection
- Control
- Inputs/Outputs

Factory default values are supplied and can be restored after any changes.

The EnerVista 3 Series Setup displays relay setpoints with the same hierarchy as the front panel display.

Downloading and saving setpoint files

Back up a copy of the in-service settings for each commissioned 339 unit, so as to revert to the commissioned settings after inadvertent, unauthorized, or temporary setting changes are made, after the settings default due to firmware upgrade, or when the unit has to be replaced. This section describes how to backup settings to a file and how to use that file to restore settings to the original relay or to a replacement relay.

Setpoints must be saved to a file on the local PC before performing any firmware upgrades. Saving setpoints is also highly recommended before making any setpoint changes or creating new setpoint files.

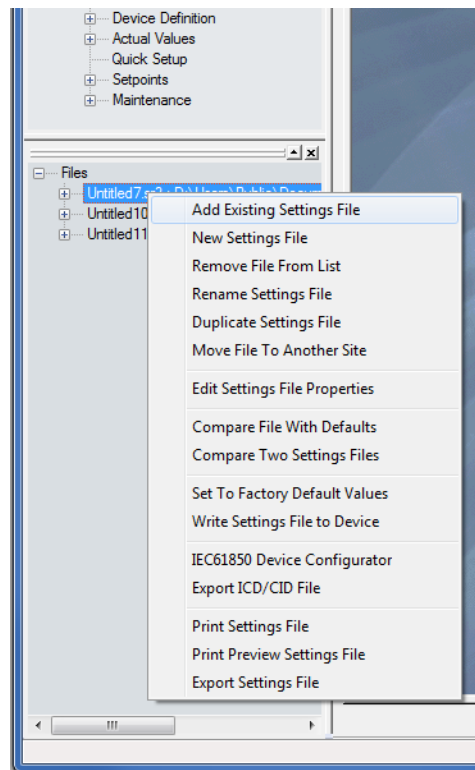
The setpoint files in the EnerVista 3 Series Setup window are accessed in the Files Window. Use the following procedure to download and save setpoint files to a local PC.

1. Ensure that the site and corresponding device(s) have been properly defined and configured as shown in *Connecting EnerVista 3 Series Setup to the Relay*, above.
2. Select the desired device from the site list.
3. Select the **Online > Read Device Settings** from Device menu item, or right-click on the device and select **Read Device Settings** to obtain settings information from the device.
4. After a few seconds of data retrieval, the software will request the name and destination path of the setpoint file. The corresponding file extension will be automatically assigned. Press **Receive** to complete the process. A new entry will be added to the tree, in the File pane, showing path and file name for the setpoint file.

Adding setpoint files to the environment

The EnerVista 3 Series Setup software provides the capability to review and manage a large group of setpoint files. Use the following procedure to add an existing file to the list.

1. In the files pane, right-click on **Files** and select the **Add Existing Setting File** item as shown:



2. The Open dialog box will appear, prompting the user to select a previously saved setpoint file. As for any other MS Windows® application, browse for the file to be added then click **Open**. The new file and complete path will be added to the file list.

Creating a new setpoint file

The EnerVista 3 Series Setup software allows the user to create new setpoint files independent of a connected device. These can be uploaded to a relay at a later date. The following procedure illustrates how to create new setpoint files.

1. In the File pane, right click on **File** and select the **New Settings File** item. The following box will appear, allowing for the configuration of the setpoint file for the correct firmware version. It is important to define the correct firmware version to ensure that setpoints not available in a particular version are not downloaded into the relay.



Discontinued order codes may be included to maintain back-compatibility of setpoint files. For current order codes, refer to the GE Multilin website at <http://www.gegridsolutions.com/multilin>.

2. Select the Firmware Version, and Order Code options for the new setpoint file.
3. For future reference, enter some useful information in the **Description** box to facilitate the identification of the device and the purpose of the file.
4. To select a file name and path for the new file, click the button beside the File Name box.
5. Select the file name and path to store the file, or select any displayed file name to replace an existing file. All 339 setpoint files should have the extension 'SR3' (for example, 'feeder1.SR3').
6. Click **OK** to complete the process. Once this step is completed, the new file, with a complete path, will be added to the EnerVista 3 Series Setup software environment.

Upgrading setpoint files to a new revision

It is often necessary to upgrade the revision for a previously saved setpoint file after the 339 firmware has been upgraded. This is illustrated in the following procedure:

1. Establish communications with the 339 relay.
2. Select the **Maintenance > M1 Relay Info** menu item and record the Firmware Revision.
3. Load the setpoint file to be upgraded into the EnerVista 3 Series Setup environment as described in the section, *Adding Setpoints Files to the Environment*.
4. In the File panel, select the saved setpoint file.

5. From the main window menu bar, select the **Offline > Edit Settings File Properties** menu item and note the File Version of the setpoint file. If this version is different from the Firmware Revision noted in step 2, select a New File Version that matches the Firmware Revision from the pull-down menu.
6. For example, if the firmware revision is SR350_V140.sfd (Firmware Revision 1.40) and the current setpoint file revision is 1.20, change the setpoint file revision to "1.4x".



Discontinued order codes may be included to maintain back-compatibility of setpoint files. For current order codes, refer to the GE Multilin website at <http://www.gegridsolutions.com/multilin>.

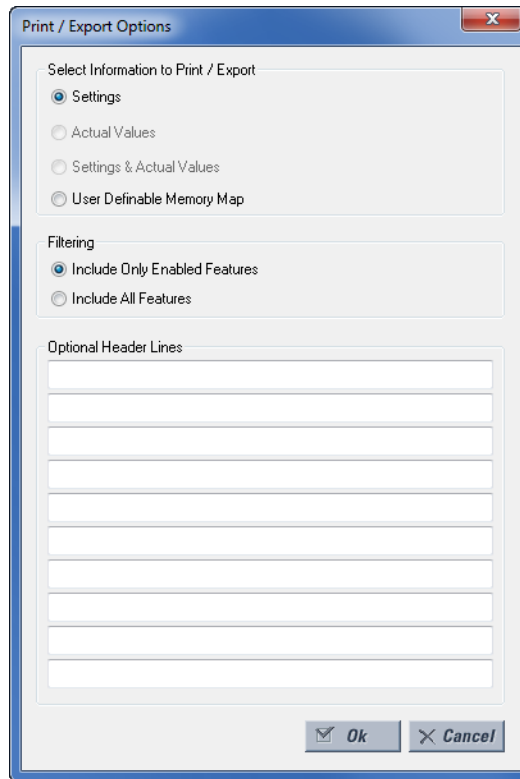
7. Enter any special comments about the setpoint file in the "Description" field.
8. Select the desired firmware version from the "New File Version" field.
9. When complete, click **OK** to convert the setpoint file to the desired revision. See *Loading Setpoints from a File* below, for instructions on loading this setpoint file into the 339.

Printing setpoints and actual values

The EnerVista 3 Series Setup software allows the user to print partial or complete lists of setpoints and actual values. Use the following procedure to print a list of setpoints:

1. Select a previously saved setpoints file in the File pane or establish communications with a 339 device.
2. From the main window, select the **Offline > Export Settings File** menu item.

- The Print/Export Options dialog box will appear. Select **Settings** in the upper section and select either **Include All Features** (for a complete list) or **Include Only Enabled Features** (for a list of only those features which are currently used) in the filtering section and click **OK**.



- The process for **Offline > Print Preview Settings File** is identical to the steps above.
- Setpoint lists can be printed in the same manner by right clicking on the desired file (in the file list) or device (in the device list) and selecting the **Print Device Information** or **Print Settings File** options.

Printing actual values from a connected device

A complete list of actual values can also be printed from a connected device with the following procedure:

- Establish communications with the desired 339 device.
- From the main window, select the **Online > Print Device Information** menu item
- The Print/Export Options dialog box will appear. Select **Actual Values** in the upper section and select either **Include All Features** (for a complete list) or **Include Only Enabled Features** (for a list of only those features which are currently used) in the filtering section and click **OK**.

Actual values lists can be printed in the same manner by right clicking on the desired device (in the device list) and selecting the **Print Device Information** option

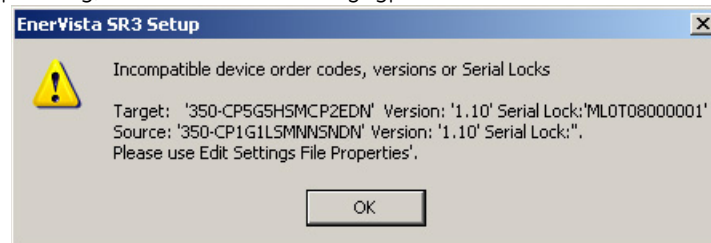
Loading setpoints from a file



An error message will occur when attempting to download 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 for instructions on changing the revision number of a setpoint file.

The following procedure illustrates how to load setpoints from a file. Before loading a setpoints file, it must first be added to the EnerVista 3 Series Setup environment as described in the section, *Adding Setpoints Files to the Environment*.

1. Select the previously saved setpoints file from the File pane of the EnerVista 3 Series Setup software main window.
2. 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.
3. Right-click on the selected file and select the **Write Settings File to Device** item.
4. Select the target relay from the list of devices shown and click **Send**. If there is an incompatibility, an error of the following type will occur:



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

Uninstalling files and clearing data

The unit can be decommissioned by turning off the power to the unit and disconnecting the wires to it. Files can be cleared before uninstalling the EnerVista software or 339 device, for example to comply with data security regulations. On the computer, settings files can be identified by the .sr3 extension.

To clear the current settings file do the following:

1. Create a default settings file.
2. Write the default settings file to the relay.
3. Delete all other files with the .sr3 extension.
4. Delete any other data files, which can be in standard formats, such as COMTRADE or .CSV.

You cannot directly erase the flash memory, but all records and settings in that memory can be deleted. Do this using these commands:

ACTUAL VALUES > RECORDS

- **EVENTS RECORDS > CLEAR**
- **TRANSIENT RECORDS > CLEAR**

Upgrading relay firmware

To upgrade the 339 firmware, follow the procedures listed in this section. Upon successful completion of this procedure, the 339 will have new firmware installed with the factory default setpoints. The latest firmware files are available from the GE Multilin website at <http://www.GEgrid solutions.com/multilin>.



EnerVista 3 Series Setup software prevents incompatible firmware from being loaded into a 339 relay.



Before upgrading firmware, it is very important to save the current 339 settings to a file on your PC. After the firmware has been upgraded, it will be necessary to load this file back into the 339. Refer to *Downloading and Saving Setpoints Files* for details on saving relay setpoints to a file.

Loading new relay firmware

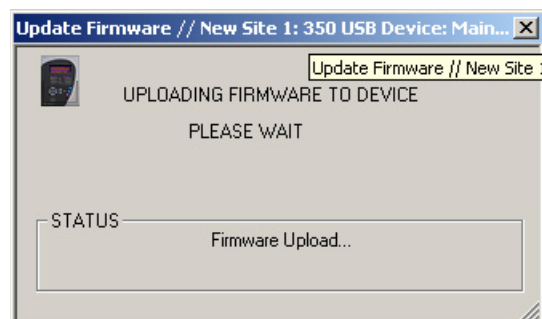
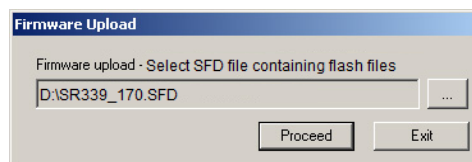
Loading new firmware into the 339 flash memory is accomplished as follows:

1. Connect the relay to the local PC and save the setpoints to a file as shown in *Downloading and Saving Setpoints Files*.
2. Select the **Maintenance > Update Firmware** menu item.
3. The EnerVista 3 Series Setup software will request the new firmware file. Locate the folder that contains the firmware files to load into the 339. The firmware filename has the following format:

SR339_170.SFD

↑
Firmware Rev #

4. EnerVista 3 Series Setup software now prepares the 339 to receive the new firmware file. The 339 front panel will momentarily display "BOOT PROGRAM Waiting for Message," indicating that it is in upload mode.
5. While the file is being loaded into the 339, a status box appears showing how much of the new firmware file has been transferred and the upgrade status. The entire transfer process takes approximately 10 minutes.





6. The EnerVista 3 Series Setup software will notify the user when the 339 has finished loading the file. Carefully read any displayed messages and click **OK** to return the main screen. **Cycling power to the relay is recommended after a firmware upgrade.**

After successfully updating the 339 firmware, the relay will not be in service and will require setpoint programming. To communicate with the relay, the communication settings may have to be manually reprogrammed.

When communications is established, the saved setpoints must be reloaded back into the relay. See *Loading Setpoints from a File* for details.

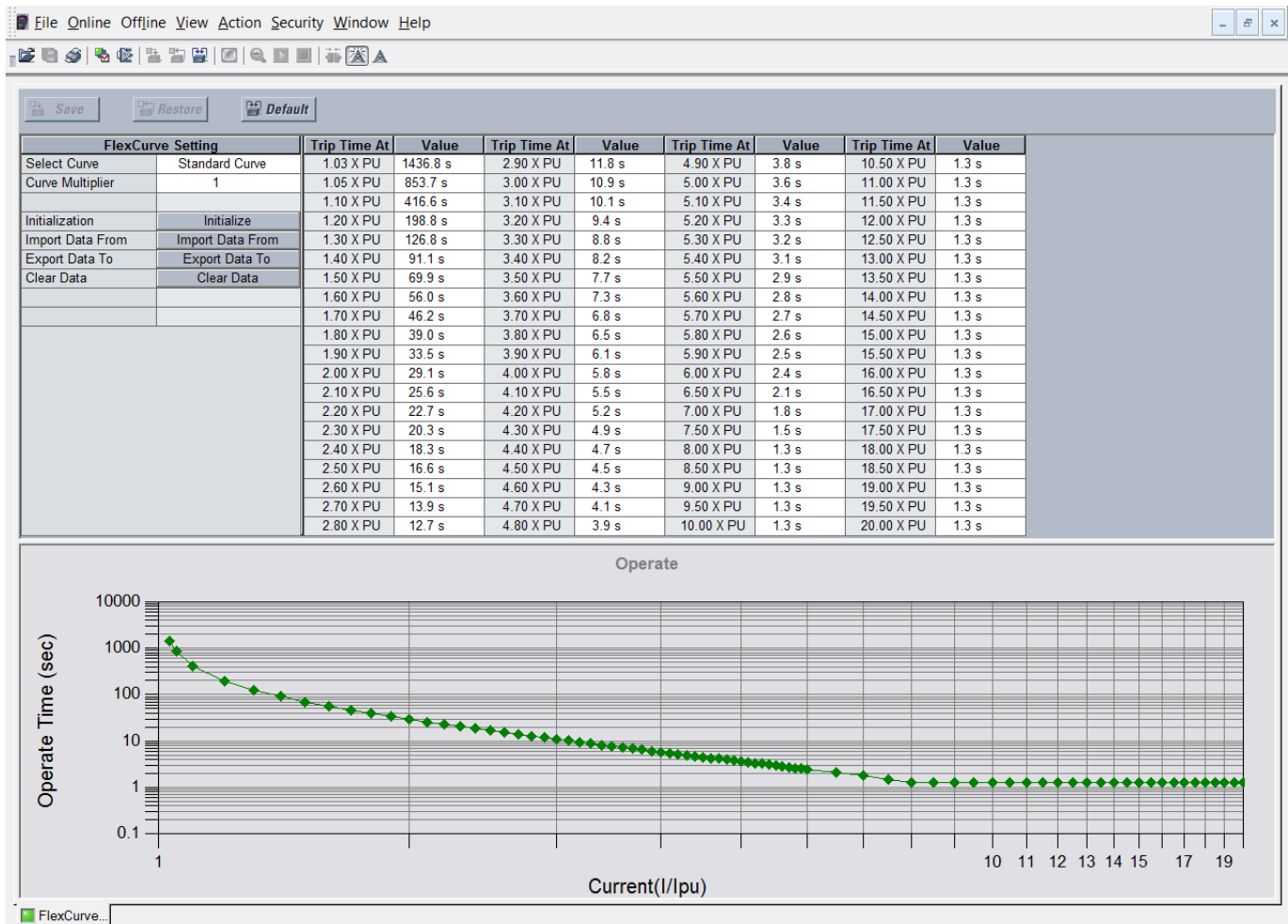
Modbus addresses assigned to firmware modules, features, settings, and corresponding data items (i.e. default values, min/max values, data type, and item size) may change slightly from version to version of firmware.

The addresses are rearranged when new features are added or existing features are enhanced or modified.

Advanced EnerVista 3 Series Setup features

Flexcurve editor

The FlexCurve Editor is designed to allow the user to graphically view and edit the FlexCurve. The Flexcurve Editor screen is shown below:

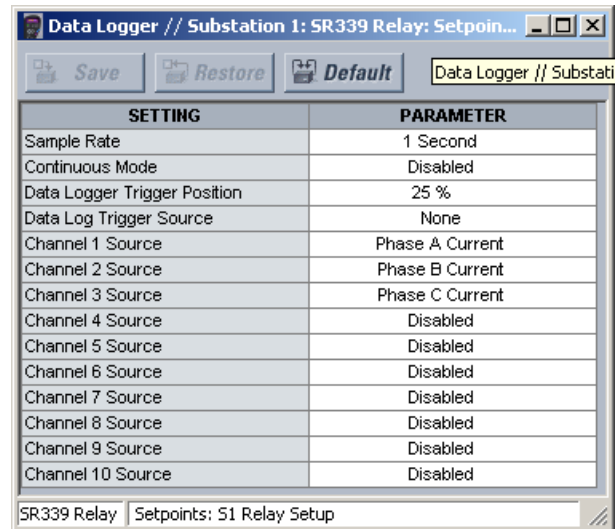


- The Operate Curves are displayed, and can be edited by dragging the tips of the curves
- A Base curve can be plotted for reference, to customize the operating curve. The Blue curve in the picture is a reference curve.
- The Trip Times in the tables and curves work interactively i.e., changing the table value will affect the curve shape and vice versa.
- Configured Trip Times can be saved.
- Configured Trip Times can be exported to a CSV file
- Trip Times can be loaded from a CSV File
- The screen above shows an example of the model followed by 339 for viewing Flexcurves. Select **Initialize** to copy the trip times from the selected curve to the FlexCurve.

Data logger

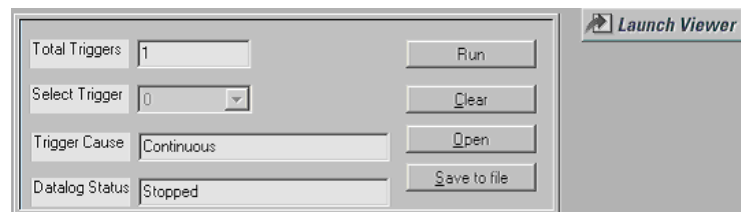
The data logger feature is used to sample and record up to ten actual values at a selectable interval. The datalogger can be run with Continuous mode Enabled, which will continuously record samples until stopped by the user; or with Continuous mode Disabled, which will trigger the datalog once without overwriting previous data.

Select the **Setpoints > S1RelaySetup > Datalogger** menu item to open the Datalogger Setup window.



Viewing and saving of the Datalogger is performed as follows:

1. With EnerVista 3 Series Setup running and communications established, select the **A3 Records > Datalogger** menu item to open the Datalogger Actual Values window:

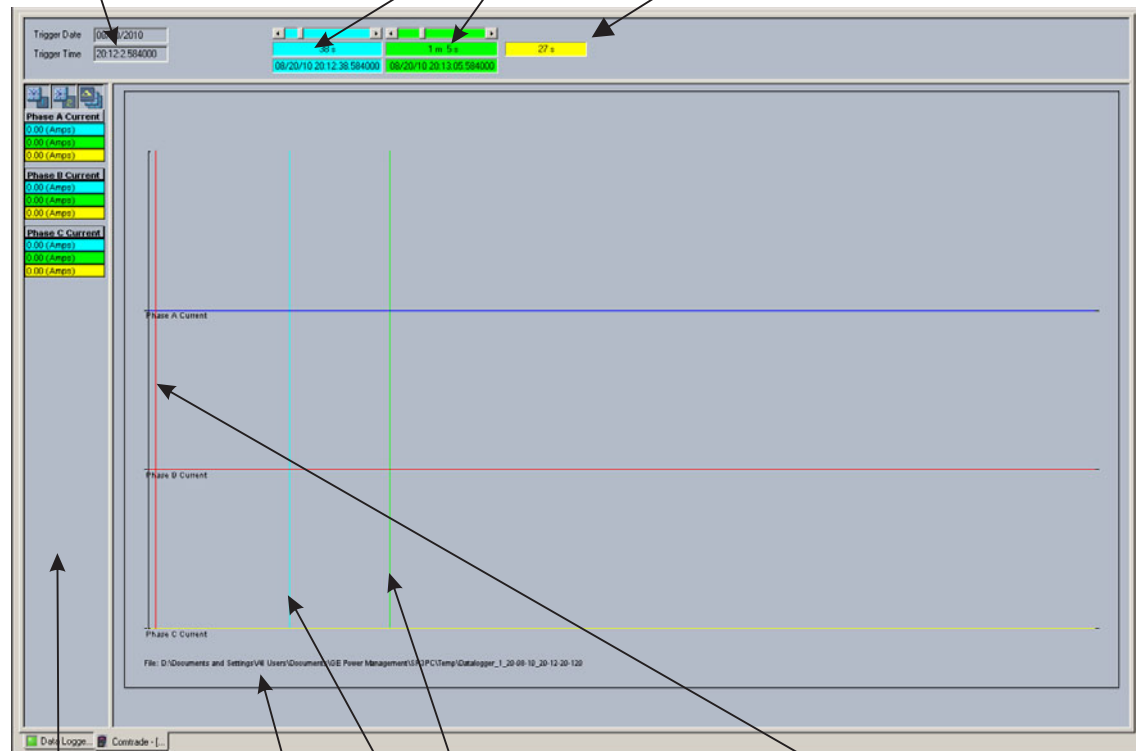


2. If Continuous mode is enabled, click on **Stop** to stop the datalog
3. Click on the **Save to File** button to save the datalog to the local PC. A new window will appear requesting for file name and path.
4. One file is saved as a COMTRADE file, with the extension 'CFG'. The other file is a DAT file, required by the COMTRADE file for proper display of data.
5. To view a previously saved COMTRADE file, click the **Open** button and select the corresponding COMTRADE file.
6. To view the datalog, click the **Launch Viewer** button. A detailed Datalog window will appear as shown below.

TRIGGER TIME & DATE
Display the time & date of the Trigger

CURSOR LINE POSITION
Indicate the cursor line position in time with respect to the trigger time

DELTA
Indicates time difference between the two cursor lines



Display graph values at the corresponding cursor line. Cursor lines are identified by their colors.

FILE NAME
Indicates the file name and complete path (if saved)

CURSOR LINES
To move lines locate the mouse pointer over the cursor line then click and drag the cursor to the new location.

TRIGGER LINE
Indicates the point in time for the trigger

7. The method of customizing the datalog view is the same as the Waveform Capture described below.
8. The datalog can be set to capture another buffer by clicking on **Run** (when Continuous mode is enabled), or by clicking on **Release** (when Continuous mode is disabled).

Motor start data logger

When a motor start status is detected by the 339 relay, a start data logger is triggered and begins to sample and record the following parameters at a rate of 1 sample every 200ms:

- True RMS values of the Phase A, B and C Currents (I_a , I_b , and I_c).
- True RMS value of the Ground current (I_g).
- Current Unbalance (%).
- True RMS values of the Phase A-N, B-N, and C-N voltages (V_{an} , V_{bn} , and V_{cn}) if VT CONNECTION TYPE is set to Wye.
- True RMS values of the Phase A-B, B-C and C-A voltages (V_{ab} , V_{bc} , and V_{ca}) if VT CONNECTION TYPE is set to Delta.
- Thermal Capacity Used (%).
- Frequency.
- Breaker/Contactor Contact Input Status.

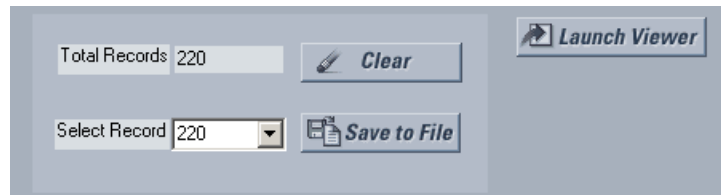
1-second pre-trigger data and 29-second post-trigger data are recorded. The data logger ignores all subsequent triggers and continues to record data until the active record is finished.

A total of 6 logs are stored in the relay. Log # 1 is the baseline log; it is written to only by the first start that occurs after the user clears the motor start data logger. Logs #2 to 6 are a rolling buffer of the last 5 motor starts. A new log automatically shifts the rolling buffer and overwrites the oldest log, #2.

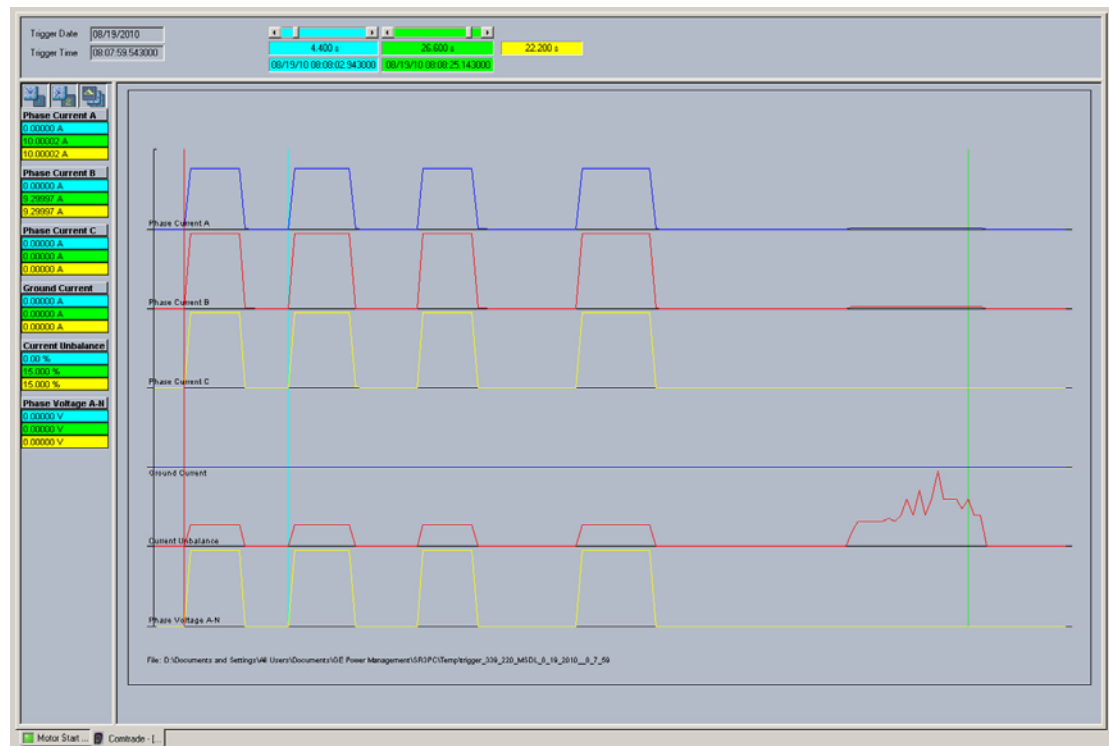
The log files are formatted using CSV (comma delimited values) and the COMTRADE file format per IEEE PC37.111 Draft 7C (02 September 1997). [Please see the details in the user interfaces section.] The files can be downloaded and displayed via EnerVista SR3 Setup software. All the files are stored in non-volatile memory, so that information is retained when power to the relay is lost.

Viewing and saving of the Motor Start Datalogger is performed as follows:

1. With EnerVista 3 Series Setup running and communications established, select the **A3 Records > Motor Start Data Logger** menu item to open the Motor Start datalog setup window:



2. Click on the **Save to File** button to save the datalog to the local PC. A new window will appear requesting for file name and path.
3. One file is saved as a COMTRADE file, with the extension 'CFG'. The other file is a DAT file, required by the COMTRADE file for proper display of data.
4. To view a previously saved COMTRADE file, click the **Open** button and select the corresponding COMTRADE file.
5. To view the datalog, click the **Launch Viewer** button. A detailed Datalog window will appear as shown below. For an explanation of the components of this screen, please refer to the Data Logger section above.

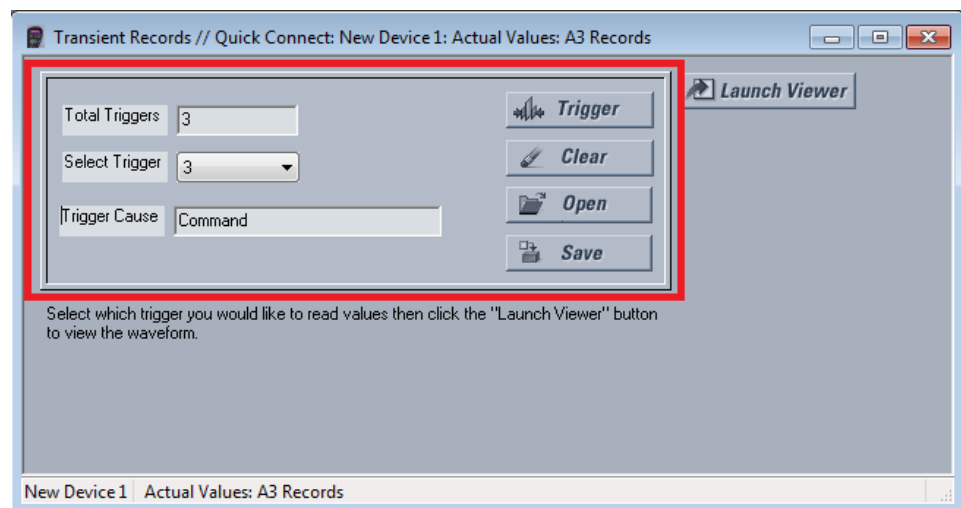


6. The method of customizing the datalog view is the same as the Waveform Capture described below.

Transient recorder (Waveform capture)

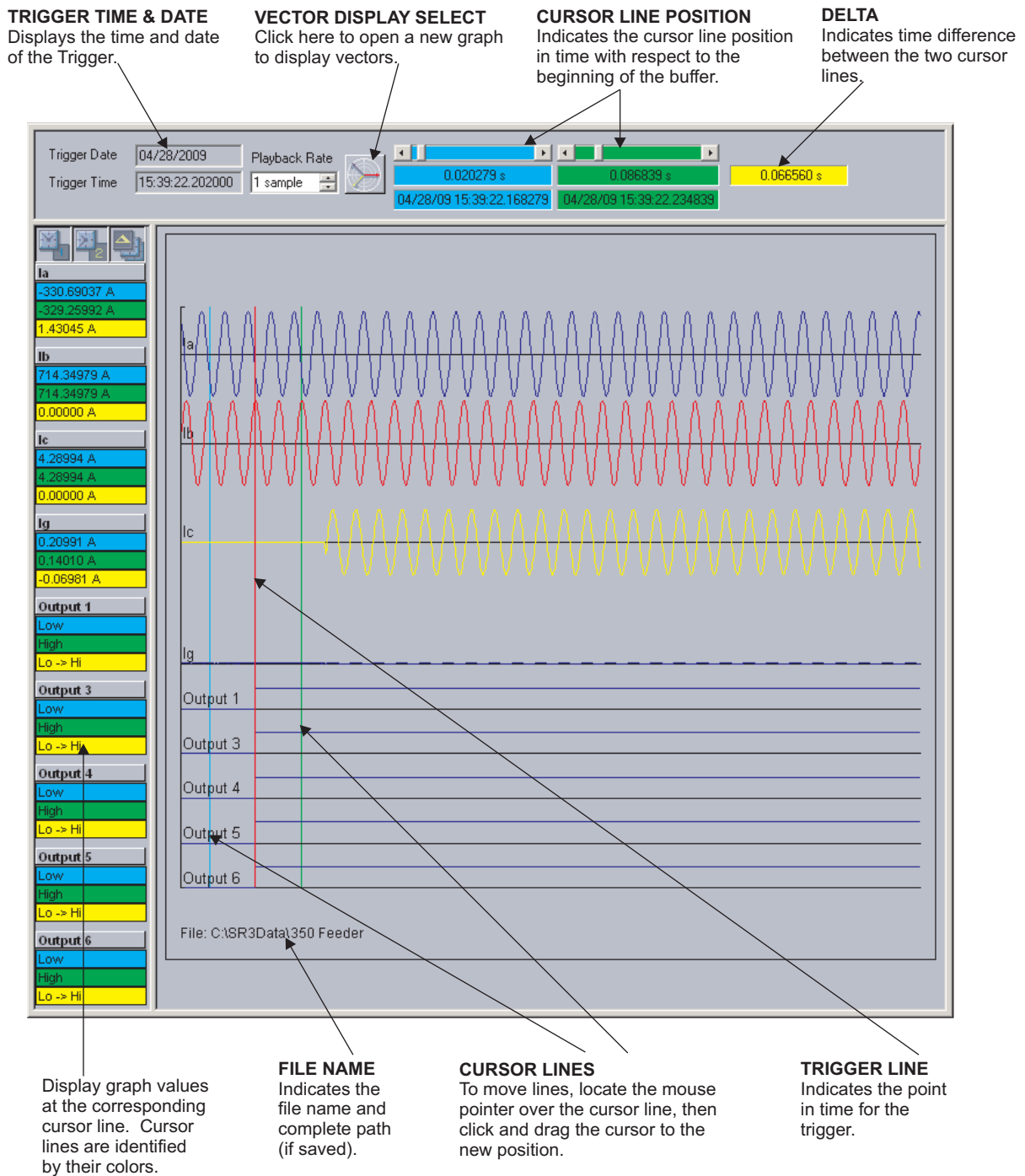
The EnerVista 3 Series Setup software can be used to capture waveforms (or view trace memory) from the relay at the instance of a pickup, trip, alarm, or other condition.

- With EnerVista 3 Series Setup software running and communications established, select the **Actual Values > A3 Records > Transient Records** menu item to open the Transient Recorder Viewer window.

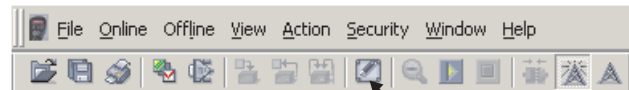


- Click on **Trigger Waveform** to trigger a waveform capture. Waveform file numbering starts with the number zero in the 339 , so that the maximum trigger number will always be one less than the total number of triggers available.

- Click on the **Save to File** button to save the selected waveform to the local PC. A new window will appear, requesting the file name and path. One file is saved as a COMTRADE file, with the extension "CFG" The other file is a "DAT" file, required by the COMTRADE file for proper display of waveforms.
- To view a previously saved COMTRADE file, click the **Open** button and select the corresponding COMTRADE file.
- To view the captured waveforms, click on the **Launch Viewer** button. A detailed Waveform Capture window will appear as shown below.

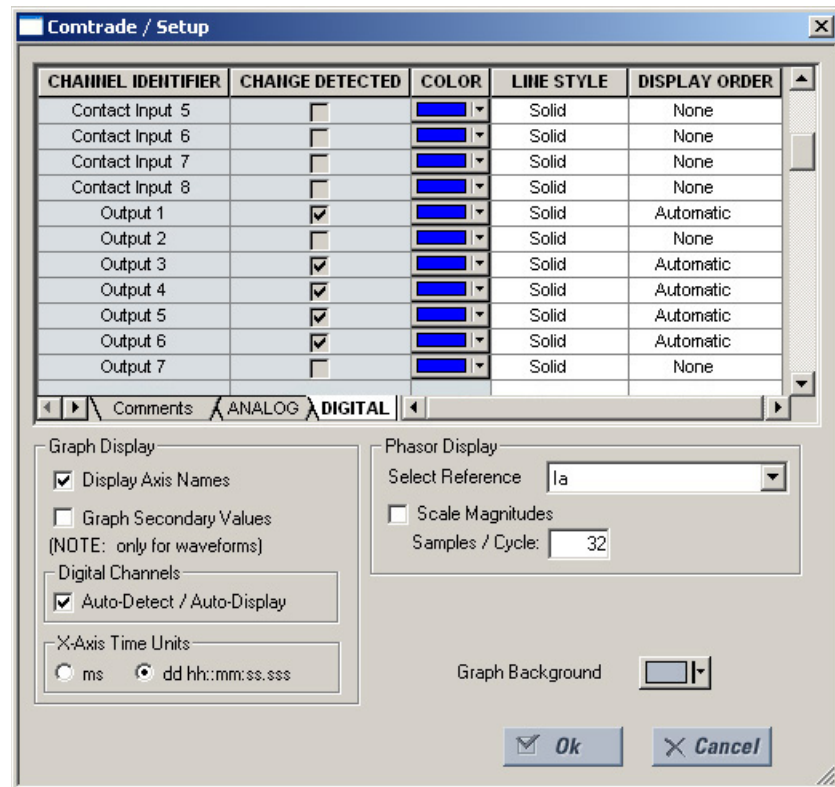


- The red vertical line indicates the trigger point.
- The date and time of the trigger are displayed at the top left corner of the window. To match the captured waveform with the event that triggered it, make note of the time and date shown in the graph, then find the event that matches the same time in the event recorder. The event record will provide additional information on the cause and system conditions at the time of the event.
- From the window main menu bar, press the **Preference** button to open the COMTRADE Setup page, in order to change the graph attributes.



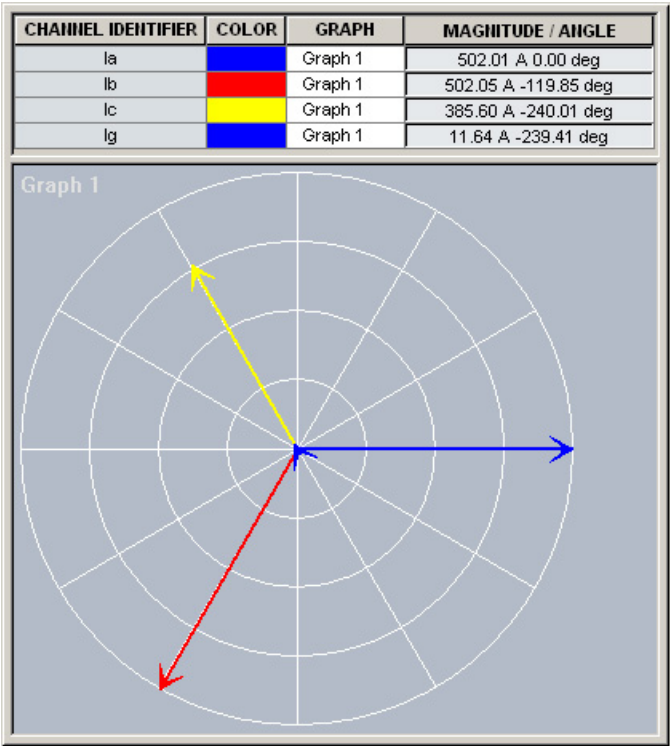
Preference Button

The following window will appear:



Change the color of each graph as desired, and select other options as required, by checking the appropriate boxes. Click **OK** to store these graph attributes, and to close the window. The Waveform Capture window will reappear based on the selected graph attributes.

To view a vector graph of the quantities contained in the waveform capture, press the **Vector Display** button to display the following window:



Protection summary

Protection Summary is a single screen which holds the summarized information of different settings from Grouped Elements, Control Elements and Maintenance screens. Protection Summary Screen allows the user to:

- view the output relay assignments for the elements
- modify the output relay assignments for the elements
- view the enable/disable status of Control Elements
- navigate to the respected Protection Element screen on a button click.

An example of the Protection Summary screen follows:

Save
Restore
Default

Elements to Show

All

Enabled

Click Status to View Settings Information

	OUTPUT RELAYS				
PROTECTION ELEMENTS	R3	R4	R5	R6	STATUS
Thermal Overload (49)	☐	☐	☐	☐	Disabled
Thermal Alarm (49)	☐	☐	☐	☐	Disabled
Short Circuit (50P)	☐	☐	☐	☐	Disabled
Mechanical Jam (51R)	☐	☐	☐	☐	Disabled
Undercurrent Alarm (37)	☐	☐	☐	☐	Disabled
Undercurrent Trip (37)	☐	☐	☐	☐	Disabled
Current Unbalance Alarm (46)	☐	☐	☐	☐	Disabled
Current Unbalance Trip (46)	☐	☐	☐	☐	Disabled
Load Increase Alarm (50L)	☐	☐	☐	☐	Disabled
Ground Fault Alarm (50G/51G)	☐	☐	☐	☐	Disabled
Ground Fault Trip (50G/51G)	☐	☐	☐	☐	Disabled
Neutral IOC1 (50N)	☐	☐	☐	☐	Disabled
Phase UV1 (27P)	☐	☐	☐	☐	Disabled
Phase UV2 (27P)	☐	☐	☐	☐	Disabled
Phase OV1 (59P)	☐	☐	☐	☐	Disabled
Phase OV2 (59P)	☐	☐	☐	☐	Disabled
Under-frequency1 (81U)	☐	☐	☐	☐	Disabled
Under-frequency2 (81U)	☐	☐	☐	☐	Disabled
Over-frequency1 (81O)	☐	☐	☐	☐	Disabled
Over-frequency2 (81O)	☐	☐	☐	☐	Disabled
Underpower Alarm (37P)	☐	☐	☐	☐	Disabled
Underpower Trip (37P)	☐	☐	☐	☐	Disabled
Negative Sequence OV (47(59_2))	☐	☐	☐	☐	Disabled
Phase Reversal (47)	☐	☐	☐	☐	Disabled
Acceleration Time	☐	☐	☐	☐	Disabled
RTD 1 Alarm (RTD)	☐	☐	☐	☐	Disabled
RTD 1 Trip (RTD)	☐	☐	☐	☐	Disabled
RTD 2 Alarm (RTD)	☐	☐	☐	☐	Disabled
RTD 2 Trip (RTD)	☐	☐	☐	☐	Disabled
RTD 3 Alarm (RTD)	☐	☐	☐	☐	Disabled
RTD 3 Trip (RTD)	☐	☐	☐	☐	Disabled
RTD Trouble Alarm (RTD)	☐	☐	☐	☐	Disabled
Neutral Directional (67N)	☐	☐	☐	☐	Disabled
Phase TOC (51P)	☐	☐	☐	☐	Disabled
Neutral TOC (51N)	☐	☐	☐	☐	Disabled
Positive Sequence UV 1 (27P_1)	☐	☐	☐	☐	Disabled
Positive Sequence UV 2 (27P_1)	☐	☐	☐	☐	Disabled
Directional Power 1 (32)	☐	☐	☐	☐	Disabled
Directional Power 2 (32)	☐	☐	☐	☐	Disabled
	OUTPUT RELAYS				
CONTROL ELEMENTS	R3	R4	R5	R6	STATUS
Logic Element 1	☐	☐	☐	☐	Disabled
Logic Element 2	☐	☐	☐	☐	Disabled
Logic Element 3	☐	☐	☐	☐	Disabled
Logic Element 4	☐	☐	☐	☐	Disabled
Logic Element 5	☐	☐	☐	☐	Disabled
Logic Element 6	☐	☐	☐	☐	Disabled
Logic Element 7	☐	☐	☐	☐	Disabled
Logic Element 8	☐	☐	☐	☐	Disabled
Logic Element 9	☐	☐	☐	☐	Disabled
Logic Element 10	☐	☐	☐	☐	Disabled
Logic Element 11	☐	☐	☐	☐	Disabled
Logic Element 12	☐	☐	☐	☐	Disabled
Logic Element 13	☐	☐	☐	☐	Disabled
Logic Element 14	☐	☐	☐	☐	Disabled
Logic Element 15	☐	☐	☐	☐	Disabled
Logic Element 16	☐	☐	☐	☐	Disabled
Breaker Fail (50BF)	☐	☐	☐	☐	Disabled
CT Failure (60CTS)	☐	☐	☐	☐	Disabled
VT Fuse Failure (VTFF)	☐	☐	☐	☐	Disabled
	OUTPUT RELAYS				
MAINTENANCE	R3	R4	R5	R6	STATUS
Breaker Trip Counter	☐	☐	☐	☐	Disabled
Motor Running Hours Alarm	☐	☐	☐	☐	Disabled
Ambient Temperature	☐	☐	☐	☐	Disabled
Breaker Health	☐	☐	☐	☐	Disabled

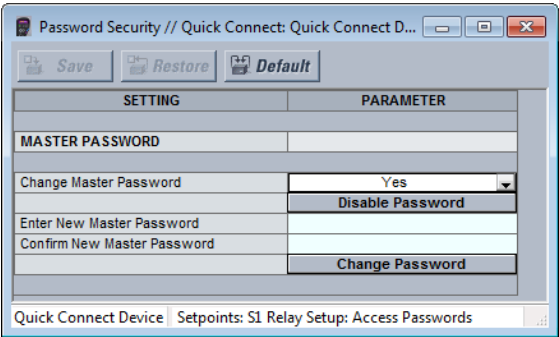
Password security

Password security is an optional feature of the 339 which can be setup using the EnerVista 3 Series Setup software. The password system has been designed to facilitate a hierarchy for centralized management. This is accomplished through a Master level access password which can be used for resetting lower level access passwords and higher level privileged operations. In cases where operational security is required as well as a central administrative authority then the use of the password system is highly encouraged. The feature robustness of this system requires it to be managed exclusively through the EnerVista 3 Series Setup software. This section describes how to perform the initial setup. For more details on the password security feature, refer to *Chapter 6 - Password Security*.

- 1. 339 devices shipped from the factory are initially set with security disabled. If the password security feature is to be used, the user must first change the Master Password from the initial Null setting, this can only be done over communications, not from the front panel keypad. The new Master Password must be 8 to 10 characters in length, and must have minimum 2 letters and 2 numbers. The letters are case sensitive. Set **Change Master Password** to Yes to enable password security. After entering a valid Master Password, enter the new Master Password again to confirm, then select **Change Password**.



To disable password security, Set **Change Master Password** to Yes and then click **Disable Password**.



- 2. Now that the Master Password has been programmed, enter it again to log in to the Master Access level. The Master Level permits setup of the Remote and Local Passwords. If the Master Password has been lost, contact the factory.



- 3. With Master Level access, the user may disable password security altogether, or change the Master Password.
- 4. The Master Access level allows programming of the Remote Setpoint and Remote Control passwords. These passwords are initially set to a Null value, and can only be set or changed from a remote user over RS485 or Ethernet communications. Remote Passwords must be 3 to 10 characters in length.

REMOTE PASSWORDS	
Change Remote Setting Password	Yes
Enter New Remote Setting Password	
Confirm New Remote Setting Password	
Change Password	
Change Remote Control Password	Yes
Enter New Remote Control Password	
Confirm New Remote Control Password	
Change Password	

5. Initial setup of the Local Setpoint and Local Control passwords requires the Master Access level. If Overwrite Local Passwords is set to YES, Local passwords can be changed remotely only (over RS485 or Ethernet). If Overwrite Local Passwords is set to NO, Local passwords can be changed locally only (over USB or keypad). If changing Local Passwords is permitted locally, the keypad user can only change the Local Passwords if they have been changed from the initial NULL value to a valid one. Local Passwords must be 3 to 10 characters in length.

SETTING	PARAMETER
MASTER PASSWORD	
Change Master Password	No
Change User Passwords	Yes
O/W Local SP Pwd	Yes
LOCAL PASSWORDS	
Overwrite Local Setting Password	Yes
Enter New Local Setting Password	
Confirm New Local Setting Password	
Change Password	
Overwrite Local Control Password	Yes
Enter New Local Control Password	
Confirm New Local Control Password	
Change Password	

Quick Connect Device | Setpoints: S1 Relay Setup: Access Passwords

6. If any Remote password has never been set, that level will not be attainable except when logged in as the Master Level. The same logic applies to the Local passwords.
7. When passwords have been set, the user will be prompted to enter the appropriate password depending on the interface being used (remote or local), and the nature of the change being made (setpoint or control). If the correct password is entered, the user is now logged into that access level over that interface only. The access level turns off after a period of 5 minutes of inactivity, if control power is cycled, or if the user enters an incorrect password.

339 Motor Protection System

Chapter 4: Quick setup - Front control panel

The “Quick Setup” utility is part of the 339 relay main menu, and can be used for quick and easy programming. Power system parameters, and settings for some simple over-current elements can be easily set.



Ensure the relay is in "Relay Ready" state before using Quick Setup.

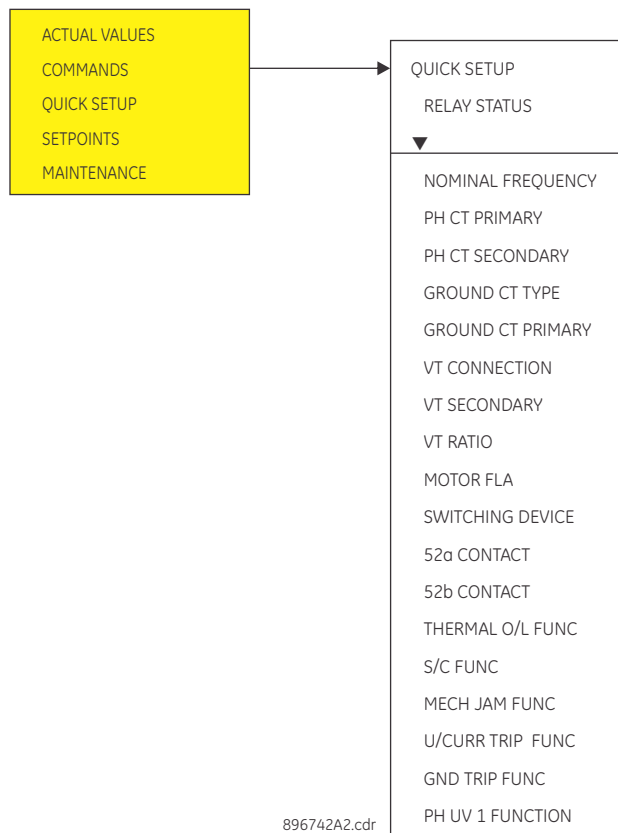


Figure 4-1: Quick Setup menu

Quick Setup settings

The setpoints below can be programmed under the "Quick Setup" menu.

Note that monitoring of Breaker Status via 52a, 52b, or both of these contacts,, should be programmed under [SETPOINTS > S2 SYSTEM SETUP > BREAKER](#).

PATH: [QUICK SETUP >](#)

RELAY STATUS

Range: Ready, Not Ready

Default: Not Ready

NOMINAL FREQUENCY

Range: 50 Hz, 60 Hz

Default: 60 Hz

PH CT PRIMARY

Range: 1 A to 6000 A in steps of 1

Default: 500 A

GND CT TYPE

Range: None, 1 A Secondary, 5A Secondary, 50:0.025

Default: 50:0.025

VT CONNECTION

Range: Wye, Delta

Default: Wye

VT SECONDARY

Range: 50 V to 240 V in steps of 1

Default: 120 V

VT RATIO

Range: 1.0:1 to 300.0:1 in steps of 1

Default: 1:1

THERMAL O/L FUNC

Range: Disabled, Enabled

Default: Disabled

SHORT CIRCUIT FUNC

Range: Disabled, Trip, Latched Alarm, Alarm

Default: Disabled

MECHANICAL JAM FUNC

Range: Disabled, Enabled

Default: Disabled

U/CURR TRIP FUNC

Range: Disabled, Enabled

Default: Disabled

GROUND TRIP FUNC

Range: Disabled, Enabled

Default: Disabled

PH UV1 FUNCTION

Range: Disabled, Enabled

Default: Disabled



NOTE

The settings changed using the Quick Setup menu, are available for review and modification by navigating through **S1 RELAY SETUP**, **S2 SYSTEM SETUP** and **S3 PROTECTION** in the **SETPOINTS** main menu.

339 Motor Protection System

Chapter 5: Maintenance

General maintenance

The 339 requires minimal maintenance. As a microprocessor-based relay, its characteristics do not change over time. The expected service life of a 339 is 20 years when the environment and electrical conditions are within stated specifications.

While the 339 performs continual self-tests, it is recommended that maintenance be scheduled with other system maintenance. This maintenance can involve in-service, out-of-service, or unscheduled maintenance.

In-service maintenance

1. Visual verification of the analog values integrity, such as voltage and current (in comparison to other devices on the corresponding system).
2. Visual verification of active alarms, relay display messages, and LED indications.
3. Visual inspection for any damage, corrosion, dust, or loose wires.
4. Event recorder file download with further events analysis.

Out-of-service maintenance

1. Check wiring connections for firmness.
2. Analog values (currents, voltages, RTDs, analog inputs) injection test and metering accuracy verification. Calibrated test equipment is required.
3. Protection elements setting verification (analog values injection or visual verification of setting file entries against relay settings schedule).
4. Contact inputs and outputs verification. This test can be conducted by direct change of state forcing or as part of the system functional testing.
5. Visual inspection for any damage, corrosion, or dust.
6. Event recorder file download with further events analysis.

NOTICE

To avoid deterioration of electrolytic capacitors, power up units that are stored in a de-energized state once per year, for one hour continuously.

Unscheduled maintenance (system interruption)

- View the event recorder and oscillography for correct operation of inputs, outputs, and elements.