GE

Grid Solutions

Multilin 850

Feeder and Bay Controller Solutions for Industrial and Utility Applications

The Multilin™ 850 relay is a member of the Multilin 8 Series protective relay platform and has been designed for the management, protection and control of feeder applications. The Multilin 850 is used to provide primary (main) or backup protection for underground and overhead single or dual feeders for utility and industrial power networks.

With 11 Switchgear control elements, fully configurable Single Line Diagram on a large color graphical display, 36 alarm integrated annunciator panel and 20 push buttons makes the 850 the ideal choice for bay control and protection as a "One Box Solution".

Designed with advanced communications options and detailed asset monitoring capabilities, the Multilin 850 provides advanced functionality, including high-performance protection, extensive programmable logic and flexible configuration capabilities. With support for industry leading communications protocols and technologies, the 850 provides easy integration into new or existing SCADA or DCS for enhanced situational awareness.

Key Benefits

- One Box Solution with advanced logic and configuration flexibility, providing primary or backup protection for up to 2 feeders or feeders with 2 sets of voltage inputs
- User configurable Single Line Diagram on color display for local control, system status, and metering
- Advanced breaker diagnostics with comprehensive fault and disturbance recording
- Integrated arc flash detection using light sensors supervised by overcurrent to reduce incident energy and equipment damage
- Advanced cyber security features including AAA, Radius, RBAC, and Syslog enabling NERC® CIP requirements
- Draw-out design simplifies testing, commissioning and maintenance, increasing process uptime
- Patented environmental monitoring, providing visibility to changes in environmental conditions that can affect relay life

Applications

- Single/dual feeder applications for utility, oil & gas, mining & metals, process industry, commercial, and waste water segments
- Fast protection pass enabling load shedding schemes
- Reliable automatic bus transfer & autoreclose schemes
- Bay controller for wide range of switchgear applications
- High speed fault detection for arc flash mitigation

Innovative Technology & Design

- Advanced feeder One Box Solution for protection, control monitoring and diagnostics of single/dual feeder applications
- Patented environmental monitoring and diagnostics
- Advanced, flexible and embedded communications: IEC® 61850 Ed2, IEC 62439/PRP, Modbus® RTU & TCP/IP, DNP3.0, IEC 60870-5-104, IEC 60870-5-103
- Single setup and configuration software across the 8 Series platform
- Field swappable power supply
- Enhanced relay draw-out construction
- Elimination of electrolytic capacitors

Exceptional Quality & Reliability

- IPC A-610-E Class 3 manufacturing standards
- Highest reliability standards for electronics testing
- 100% Environmental Stress Screening and full functional testing
- Rated for IP54 (front) applications
- Harsh Environment Coating

Uncompromising Service & Support

- Covered under GE's 10 year warranty plan
- Designed, tested and assembled by GE

imagination at work

Multilin 850 Overview

The Multilin 850 is an advanced feeder protection device designed for high performance, protection, control and monitoring of incoming and outgoing feeders.

With up to 57 digital inputs and 22 digital outputs in a compact box, the 850 provides a versatile and cost effective control, protection, measurement & monitoring solution. Flexelements and Flexlogic enable users to customize schemes to meet a variety of applications.

From dual main to main-standby configurations, the Multilin 850D delivers a more economical and reliable solution, enabling customers to reduce hardware requirements and simplify device integration, including safe and secure Wi-Fi communications for system configuration and diagnostics.

Bay Controller/One Box Solution

The 850 offers comprehensive switchgear control aided by a configurable Single Line Diagram & breaker control. A total of 10 switchgear elements can be displayed and 8 elements controlled. The integrated solution for protection, control, monitoring and diagnostics eliminates the need for other external devices thus offering an integrated solution for switchgear systems. The device supports 6 user programmable pages. The Multilin 850 is an integrated solution that performs protection, control & monitoring of assets, and ease of retrieval of fault & event records. Coordinating remotely with SCADA over multiple communication protocols gives the Multilin 850 an added advantage for fast and efficient management of fault isolation and service restoration.

The Multilin 850 is a cost-effective retrofit solutions where individual components of protection, metering, control switches, annunciator & panel mimic can be replaced by only one relay.

Switchgear Control and Configurable SLD

The Multilin 850 provides a configurable dynamic SLD up to six (6) pages for comprehensive switchgear control of up to 2 breakers and 9 disconnect switches; including interlocks. Up to 15 digital and metering status elements can be configured per SLD page. These can be configured to show breakers, switches, metering, and status items.

Individual SLD pages can be selected for the default home screen pages. Automatic cycling through these pages can also be achieved through default screen settings.

The provision of such powerful control and display capability within the relay ("One Box" concept) eliminates the need for external controls, switches and annunciation on the panel reducing equipment and engineering cost.

Annunciator Panel and Virtual Push Buttons

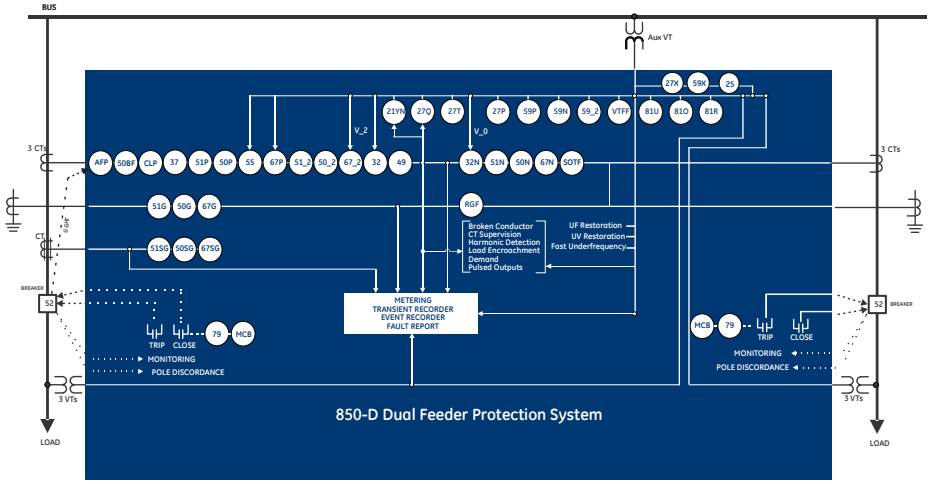
The Multilin 850 offers a configurable annunciator panel that can be constructed to show up to 36 alarms in either self-reset mode or latched mode per ISA 18.1 standard similar to a physical annunciator panel; eliminating the need for a physical one. This removes the need for additional programmable LEDs. The alarms can be displayed on the front panel in a configurable grid layout of 2x2 or 3x3.

The Multilin 850 extends the local control functionalities with 20 virtual pushbuttons that can be assigned for various functions. Each programmable pushbutton has its own programmable LED which can be used to acknowledge the action taken by the tab pushbutton.

With a fast protection pass, running every 2 msec, the 850 relay provides fast response to current, voltage, power, and frequency protection elements; helping reduce stress on assets. The Multilin 850 supports the latest communication protocols, including DNP, ModBus, IEC 60870-5-103, IEC 62439/PRP and IEC 61850; facilitating easy integration into new or existing SCADA/DCS networks.

Functional Block Diagram

ANSI DEVICE	DESCRIPTION
YN	YN Neutral Admittance
25	Synchrocheck
27P	Phase Undervoltage
27Q	UV Reactive Power
27T	Timed Undervoltage Protection
27X	Auxiliary Undervoltage
32	Directional Power
32N	Wattmetric Ground Fault (Wattmetric zero sequence directional)
37*	Undercurrent
49	Thermal Overload
50BF	Breaker Failure
50G	Ground Instantaneous Overcurrent
50SG	Sensitive Ground Instantaneous Overcurrent
50N	Neutral Instantaneous Overcurrent
50P	Phase Instantaneous Overcurrent
50PD	Pole Discordance*
50_2	Negative Sequence Instantaneous Overcurrent
51G	Ground Time Overcurrent
51SG	Sensitive Ground Time Overcurrent
51N	Neutral Time Overcurrent
51P	Phase Time Overcurrent
51_2	Negative Sequence Time Overcurrent
55	Power Factor
59N	Neutral Overvoltage
59P	Phase Overvoltage
59X	Auxiliary Overvoltage



ANSI DEVICE	DESCRIPTION
59_2	Negative Sequence Overvoltage
67G	Ground Directional Element
67SG	Sensitive Ground Directional Element
67N	Neutral Directional Element
67P	Phase Directional Element
67_2	Negative Sequence Directional Element
79	Automatic Recloser
81O	Overfrequency
81U	Underfrequency

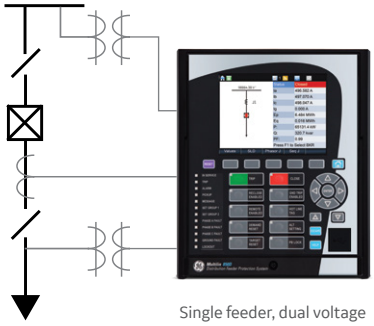
ANSI DEVICE	DESCRIPTION
81R	Frequency Rate of Change
87G	Restricted Ground Fault (RGF)
AFP	Arc Flash Protection
CLP	Cold Load Pickup
I1/I2	Broken Conductor
MCB	Manual Close Blocking
SOTF*	Switch Onto Fault
VTFF	Voltage Transformer Fuse Failure

** Only for 850D*

Distribution Feeder

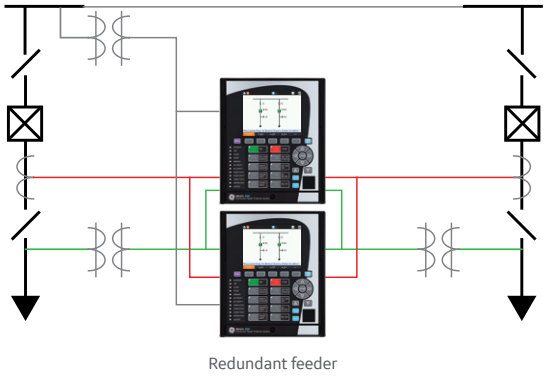
With support for up to 8 CT inputs & 2 sets of 4 traditional VT inputs, the 850 can be used for 2 feeders or feeders with 2 sets of voltage inputs, simplifying system architectures and operational costs.

The 850 offers redundancy with the same number of devices, enabling:



Single feeder, dual voltage

Dual feeder



Redundant feeder

Architecture Simplification - Reduced Number of Devices

- Less capital cost
- Less O&M cost

Mean Time to Repair - Less than 15 minutes

- Field swappable PSU
- Draw out construction
- Ready to consume service reports

Extended Asset and Relay Life

- Built-in Environmental monitoring
- Advanced breaker monitoring
- TGFD and Cable incipient fault detection/location

Simplified Management - Platform Based Solution

- Reduced training needs
- Standardized part number across systems
- Harmonized look and feel, operational experience

Protection & Control

As part of the 8 Series family, the Multilin 850 provides superior protection and control. The 850 offers comprehensive protection and control solutions for incoming, outgoing bus-tie/bus-coupler feeders. It contains a full range of selectively enabled, self-contained protection and control elements.

The voltage and frequency protection functions detect abnormal system conditions, potentially hazardous to the system. Some of these conditions may consist of over and undervoltage, over and underfrequency, and phase reversal.

Fast Underfrequency

The 850 has an 8 stage Fast Underfrequency element that measures frequency by detecting the consecutive voltage zero crossings and measuring the time between them. The measured frequency has a range between 20 to 70 Hz. This is useful for performing fast load-shedding when frequency variations from unbalance conditions arise due to:

- Inadequate load forecast or deficient generation capacity programming.
- Busbars, generator group or interconnection feeders trip.
- System splits into islands.

FlexCurves™

For applications that require greater flexibility, FlexCurves can be used to define custom curve shapes. These curves can be used to coordinate with other feeders to achieve fault selectivity.

RTD Protection

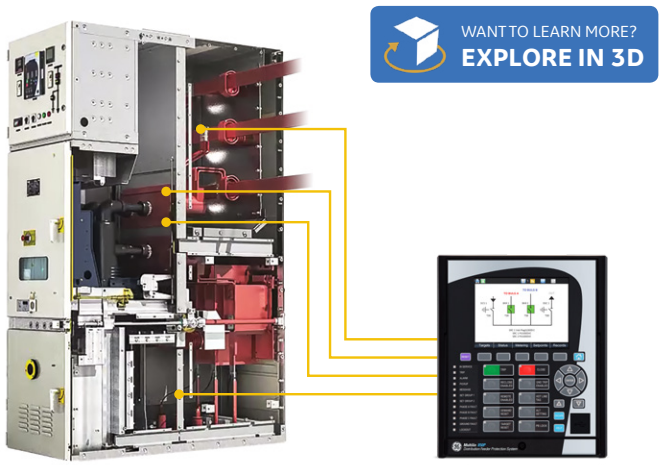
The Multilin 850 supports up to 13 programmable RTD inputs that can be configured for an Alarm or Trip.

The RTDs can be assigned to a group for monitoring ambient temperatures or any other desired temperature. The RTD voting option gives additional reliability to ignore and alarm for any RTD failures.

Integrated Arc Flash Protection

The Multilin 8 Series supports an integrated arc flash module providing constant monitoring for an arc flash condition within the switchgear, motor control centers, or panelboards. With a 2ms protection pass, the 8 Series is able to detect light and overcurrent using 4 arc sensors connected to the relay. In situations where an arc flash/fault does occur, the relay is able to quickly identify the fault and issue a trip command to the associated breaker thereby reducing the total incident energy and minimizing resulting equipment damage.

Self-monitoring and diagnostics of the sensors ensures the health of the sensors as well as the full length fiber cables. LEDs on the front panel display of the 850 can be configured to indicate the health of the sensors and its connections to the relay.



MV Switchgear | Multilin 8 Series

Fast, reliable arc flash protection with integrated light based arc flash sensors. This delivers detection in as fast as 2 msec, reducing the costs associated with equipment damage and unplanned downtime.

Inputs and Outputs

The 850 provides a max of 57 Digital inputs and 22 Digital outputs with an option for 7 Analog Outputs (dc mA), 4 Analog Inputs (dc mA), and 1 RTD input. The configurable analog inputs can be used to measure quantities fed to the relay from standard transducers. Each input can be individually set to measure 4-20 mA, 0-20 mA or 0-1 mA transducer signals.

Advanced Automation

The Multilin 850 incorporates advanced automation capabilities which exceed those found in most feeder protection relays. This reduces the need for additional programmable controllers or discrete control relays including programmable logic, communication, and SCADA devices. Advanced automation also enables seamless integration of the 850 into other protection or process systems (SCADA or DCS).

FlexElements™

FlexElement is a universal comparator, that can be used to monitor any (analog) actual value measured or calculated by the relay, or a net difference of any two analog (actual) values of the same type.

The element can be programmed to respond either to a signal level or to a rate-of-change (delta) over a pre-defined period of time.

This can be used to generate special protection or monitoring functions which allow the user to flag a user-defined abnormality to give better visibility to a certain condition.

FlexLogic™

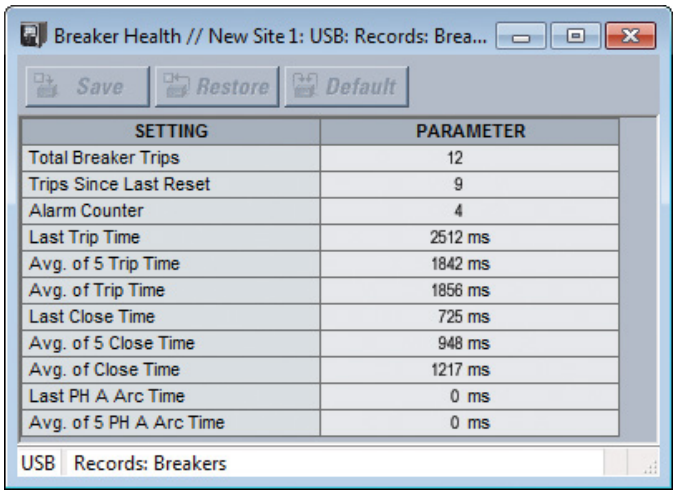
FlexLogic is the powerful programming logic engine that provides the ability to create customized protection and control schemes, minimizing the need for and associated costs of auxiliary components and wiring. Using FlexLogic, the 850 can be programmed to provide the required tripping logic along with custom scheme logic for feeder control interlocking schemes with adjacent protection (for example, preventing sympathetic tripping of healthy feeders), and dynamic setting group changes.

Breaker Health Monitoring

The breaker is monitored by the relay not only for detection of breaker failure, but also for the overall “breaker health” which includes:

- Breaker close and breaker open times
- Trip circuit monitoring
- Spring charging time
- Per-phase arcing current
- Trip counters

All algorithms provide the user with the flexibility to set up initial breaker trip counter conditions and define the criteria for breaker wear throughout a number of set points.



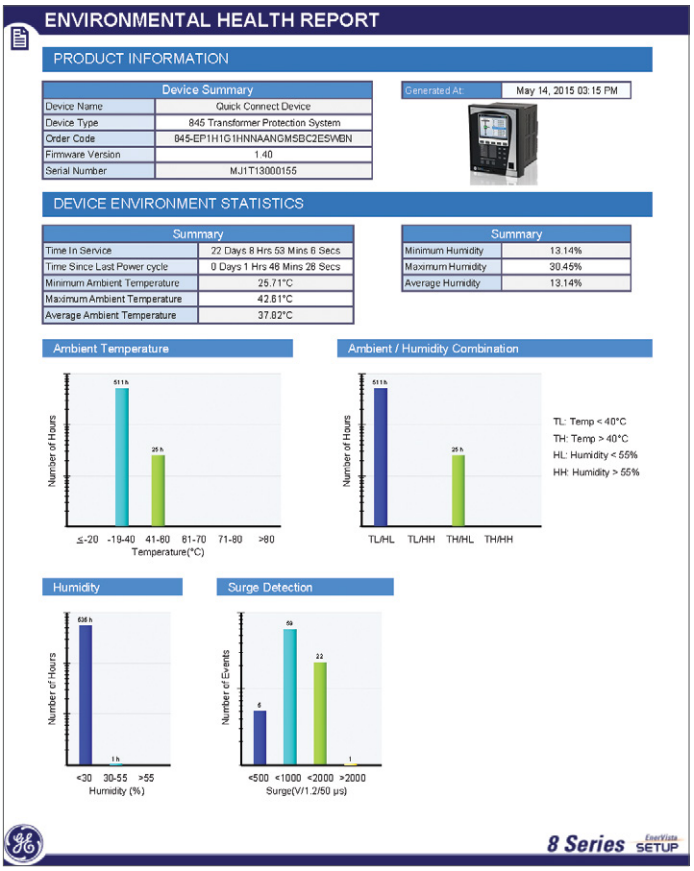
Breaker Health Reporting assists Condition-Based Maintenance and savings in Operational Costs

Monitoring & Diagnostics

The Multilin 850 includes high accuracy metering and recording for all AC signals. Voltage, current, and power metering are built into the relay as a standard feature. Current and voltage parameters are available as total RMS magnitude, and as fundamental frequency magnitude and angle.

Environmental Monitoring

The 850 has an Environmental Awareness Module (EAM) to record environmental data over the life of the product. The patented module measures temperature, humidity, surge pulses and accumulates the events every hour in pre-determined threshold buckets over a period of 15 years. This data can be retrieved using the EnerVista Setup Software. This report helps identify the operating condition of the installed fleet so that remedial action can be taken.



Environmental health report is available via Multilin PC Software

Metering

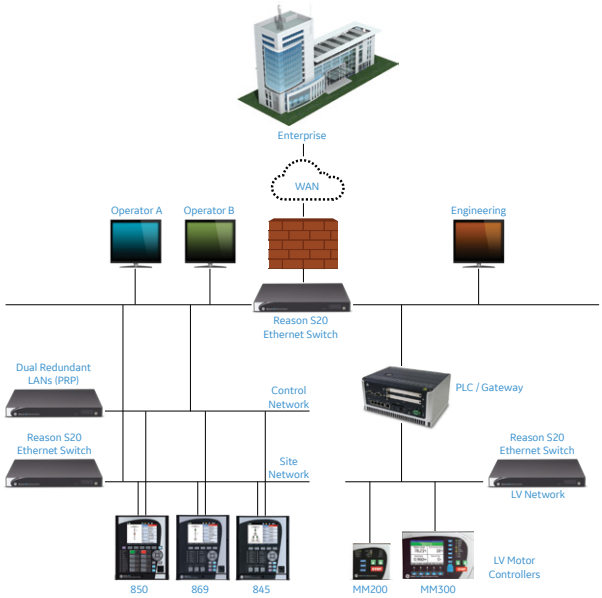
The Multilin 850 offers high accuracy power quality monitoring for fault and system disturbance analysis. It delivers unmatched power system analytics through the following advanced features and monitoring and recording tools:

- Harmonics measurement up to 25th harmonic for both currents and voltages including THD.
- The length of the transient recorder record ranges from 31 to 1549 cycles (typically half a second to half a minute).
- 32 digital points and 16 analog values.
- Comprehensive data logger provides the recording of 16 analog values.
- Detailed Fault Report. The 850 stores fault reports for the last 16 events. 1024 Event Recorder.

Communications

The Multilin 8 Series provides advanced communications technologies for remote data and engineering access, making it easy and flexible to use and integrate into new and existing infrastructures. Direct support for fiber optic Ethernet provides high-bandwidth communications, allowing for low-latency controls and high-speed file transfers of relay fault and event record information. The 850 also supports two independent IP addresses, providing high flexibility for the most challenging of communication networks.

Providing several Ethernet and serial port options and supporting a wide range of industry standard protocols, the 8 Series enables easy, direct integration into DCS and SCADA systems. The 8 Series supports the following protocols:



- IEC 61850 (8 Clients, 4 Logical Devices, Tx & Rx expansion, Analog GOOSE), IEC 62439 / PRP
- DNP 3.0 serial, DNP 3.0 TCP/IP, IEC 60870-5-103, IEC 60870-5-104
- Modbus RTU, Modbus TCP/IP

The 850 has two interfaces, a USB front port and Wi-Fi for ease of access to the relay.

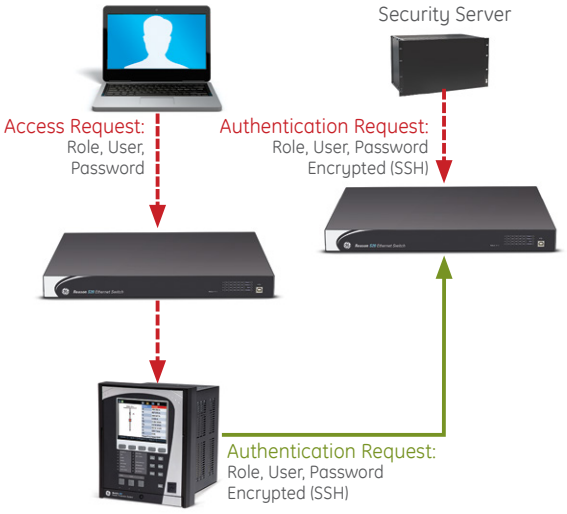
Wi-Fi Connectivity:

- Simplify set-up and configuration
- Simplify diagnostic retrieval
- Allows personnel to be a safer distance from the front of the switchgear
- WPA-2 security

Cyber Security

The 8 Series delivers a host of cyber security features that help operators to comply with NERC CIP guidelines and regulations.

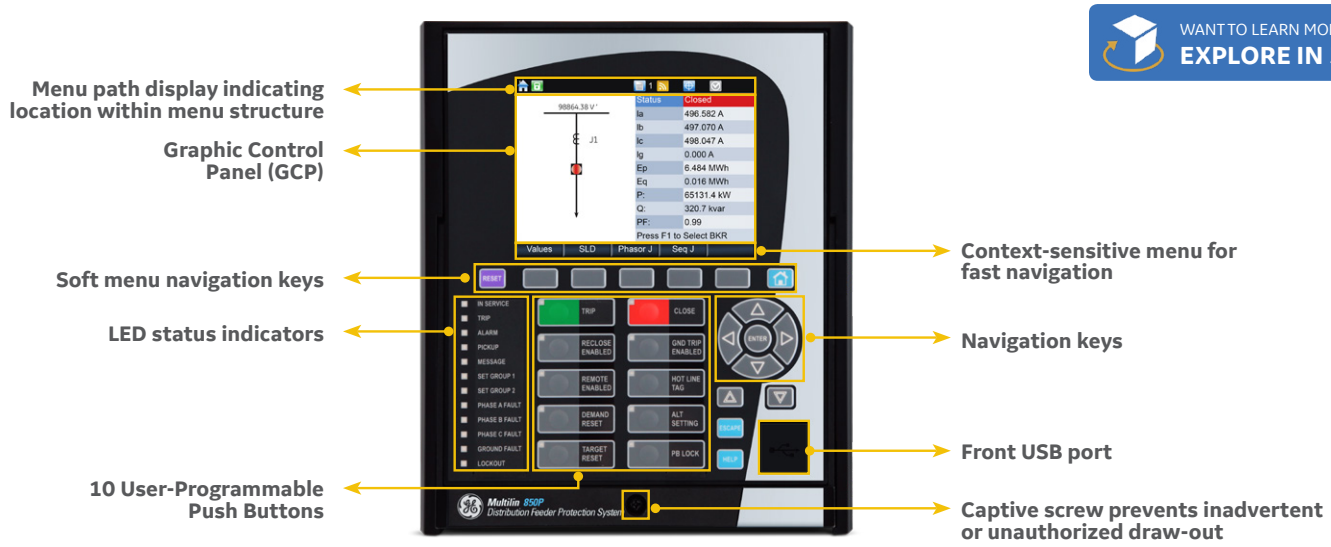
- AAA Server Support (Radius/LDAP)
- Role Based Access Control (RBAC)
- Event Recorder (Syslog for SEM)



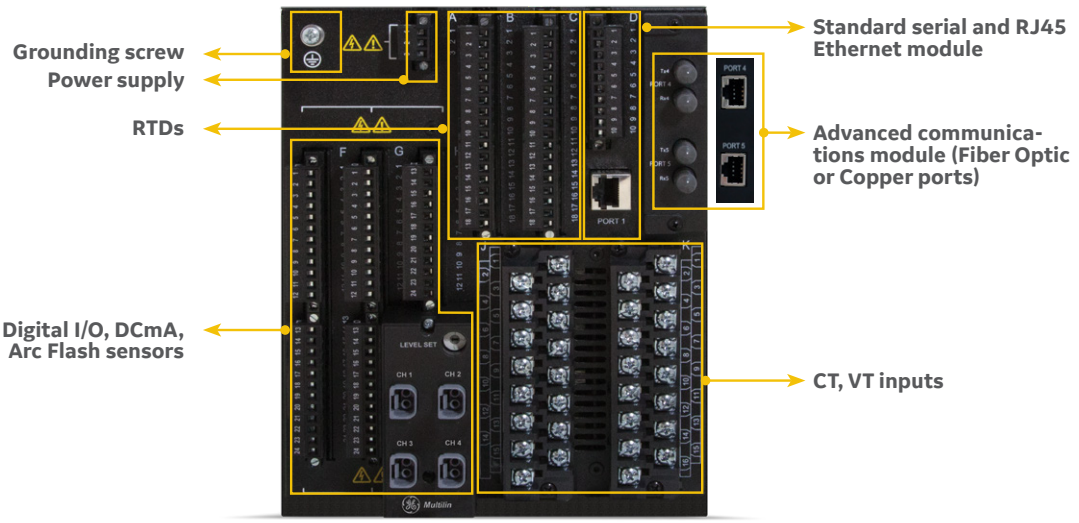
Cyber Security with Radius Authentication

Front View - Advanced Membrane Front Panel

WANT TO LEARN MORE?
EXPLORE IN 3D



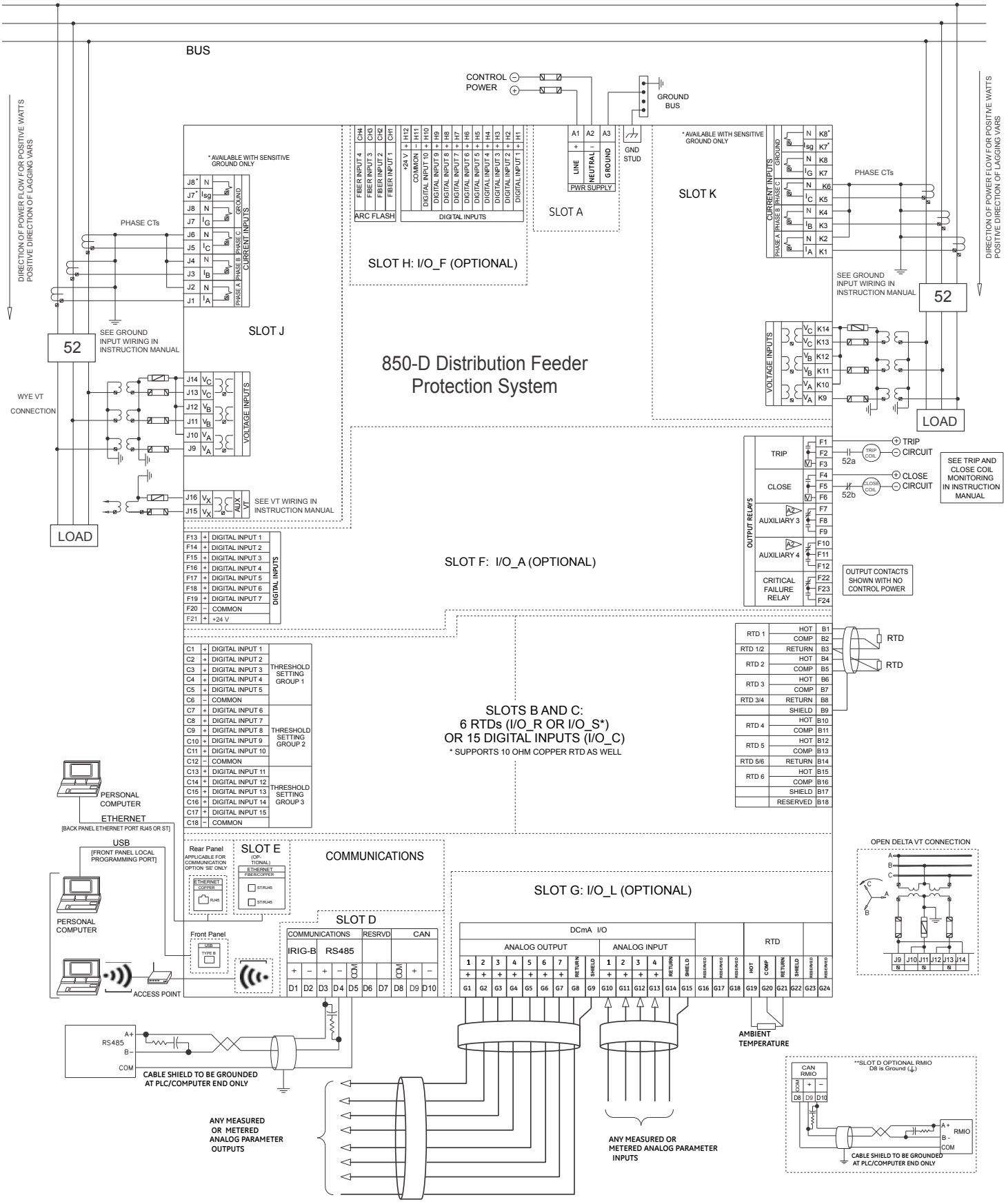
Rear View



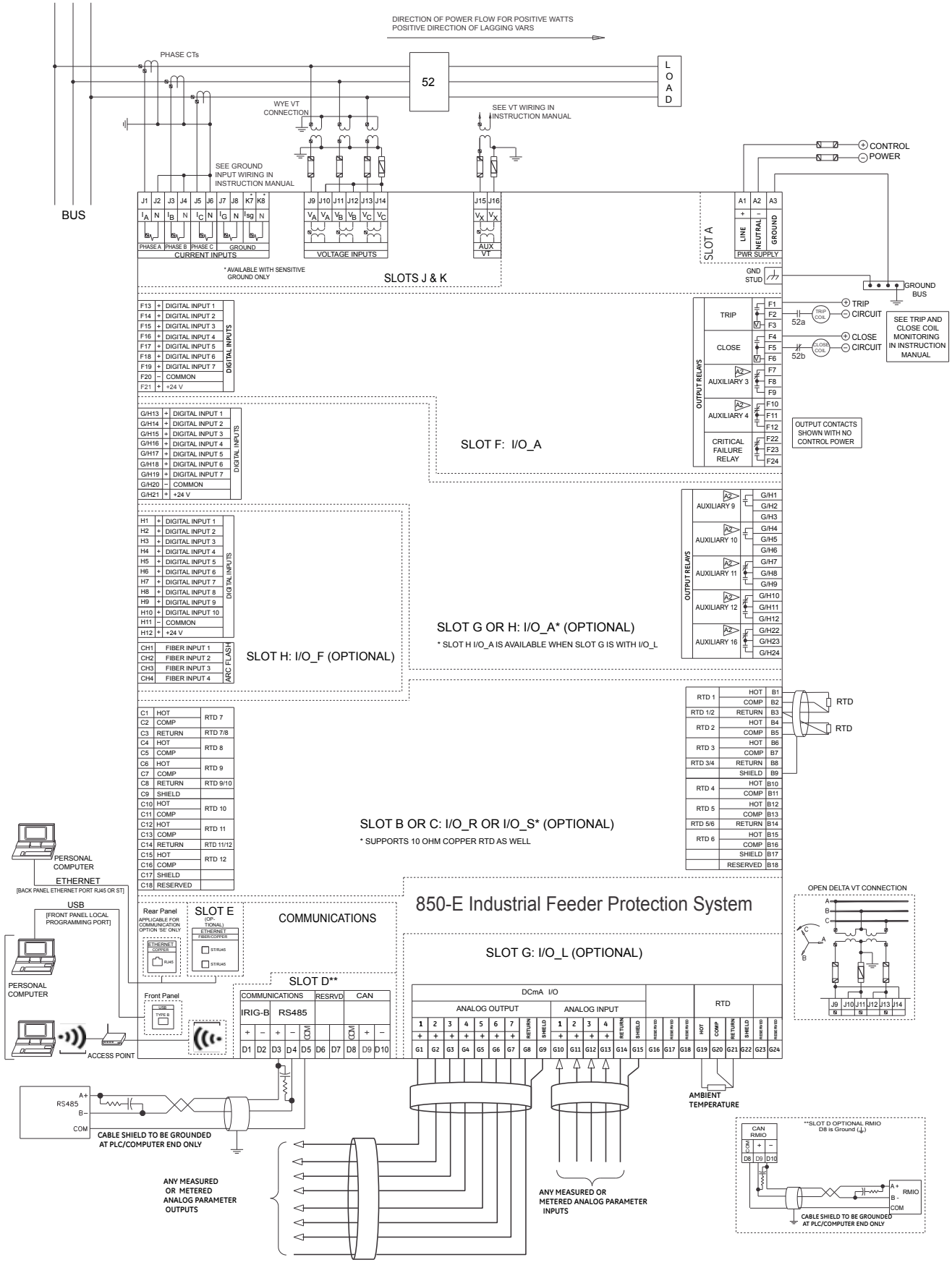
Optional IP20 cover available

Dimensions & Mounting

850D Wiring Diagram



850E Wiring Diagram



Ordering

850	*	**	NN	**	*	*	*	A	*	*	*	*	*	*	*	*	*	*	*	N	Description
Base unit	850																				Feeder Protection Relay (Standard: English Language; High Voltage PS, Graphical Control Panel)
Application		E																			Industrial
		D																			Distribution Feeder
Phase Currents - Bank 1/2			P1																		1A three phase current inputs (J1) with 4 voltage inputs (J2)
			P5																		5A three phase current inputs (J1) with 4 voltage inputs (J2)
Phase Currents - Bank 3				NN																	No phase current inputs
Ground Currents					G1																1A ground input (NA for N1)
					G5																5A ground input (NA for N1)
					S1																1A ground + 1A sensitive ground input (NA if 2nd set of CT selected)
					S5																5A ground + 5A sensitive ground input (NA if 2nd set of CT selected)
					D1																1A ground + 1A polarizing current input (NA if 2nd set of CT selected)
					D5																5A ground + 5A polarizing current input (NA if 2nd set of CT selected)
Power Supply						H															110 - 250 V dc/110 - 230 Vac
						L															24 - 48 VDC
SLOT B - LV I/O							N														None
							R														6 X RTDs (Pt100, Ni100, Ni120)
							S														6 X RTDs (Pt100, Ni100, Ni120, Cu10)
SLOT C - LV I/O								N													None
								R													6 X RTDs (Pt100, Ni100, Ni120)
								S													6 X RTDs (Pt100, Ni100, Ni120, Cu10)
								C													15 Digital Inputs (for 24 V DC, Int/Ext supply)
SLOT F - HV I/O									A												2 Form A (Vmon), 3 Form C, 7 Digital Inputs (Low / High voltage, Int/Ext supply)
									M												4 SSR (HSHB) +1 Critical Failsafe Relay +7 Digital Inputs (Low/High voltage, Int/Ext supply)
SLOT G - HV I/O										N											None
										A											2 Form A (Vmon), 3 Form C, 7 Digital Inputs (Low / High voltage, Int/Ext supply)
										B											10 Digital Inputs + 9 Digital Outputs
										D											8 Double Pole Output
										K											10 Digital Inputs + 5 Digital Outputs (No Internal wetting, TCS) + 1 Critical Failsafe Relay
										L											7 DcmA O/P + 4 DcmA I/P + 1 RTD
										M											4 SSR (HSHB) + 1 Critical Failsafe Relay + 7 Digital Inputs (Low/High voltage, Int/Ext supply)
SLOT H - HV I/O											N										None
											A										2 Form A (Vmon), 3 Form C, 7 Digital Inputs (Low / High voltage, Int/Ext supply)
											B										10 Digital Inputs + 9 Digital Outputs
											D										8 Double Pole Output
											F										10 Digital Inputs + 4 Arc flash inputs
											K										10 Digital Inputs + 5 Digital Outputs (No Internal wetting, TCS) + 1 Critical Failsafe Relay
											M										4 SSR (HSHB) + 1 Critical Failsafe Relay + 7 Digital Inputs (Low/High voltage, Int/Ext supply)
Faceplate												M									Basic : Membrane key pad
												G									Standard : Rugged key pad
												A									Advanced : Membrane Front Panel with 10 PBs
Current Protection													S								Basic = 50P, 50N, 50G, 51P, 51N, 51G
													M								Standard = Basic + 50SG, 50_2, 51SG, 51_2, RGF
													D								Standard = 37 (3), 50P (4/CT bank), 50N (4/CTbank), 50G (4/CT bank), 51P(4), 51N(4), 51G(2/CT bank), 50SG(4/CT bank), 50_2(4/CT bank), 51SG(2/CT bank), 51_2 (2/CT bank), RGF(3), SOTF (3/Bkr), 67P (4), 67N (4), 67G (1/CTbanks), 67SG (1/CTbanks), 67_2 (1/CT bank), 49 (2), Load Encroachment (1/CT bank), Broken Conductor (3)
													A								Advanced = Standard + 67P, 67N, 67G, 67SG, 67_2, 49, Load Encroachment, Broken Conductor
Voltage Monitoring & Protection														S							Standard = 27P (4/VT banks), 27X (2/VT banks), 59P(4), 59N(4), 59X (2/VT banks), 81O (6/VT banks), 81U (6/VT banks)
														P							Advanced = Standard + 25 (1/CT bank), 27T(4), 27Q (3/Bkr), 32(4), 32N(4), 55(4), 59_2(2/VT banks), 81R (6/VT banks), Fast U/F (8), Neutral Admittance (3)
Control															F						Standard = Basic + Flexlogic, CLP, 50BF (2/CT bank), CT Spvn (3)
															D						Standard = Setpoint Group Control, Virtual Inputs, Trip Bus (6), Breaker Control (1/Bkr), VTFF (1/ VT bank), FlexLogic, CLP (1/Bkr), 50BF (2/CT bank), Pole Discordance (3), Autorelcose (1/Bkr), CT Spvn (3)
															C						Advanced = Standard + Autorelcose, Bus Transfer (Requires voltage option P)
															H						Advanced HMI = Advanced + Tab PBs, Annunciator Panel, Configurable SLDs with Bay Control
															T						Advanced HMI = Standard + Tab PBs, Annunciator Panel, Configurable SLDs with Bay Control
Monitoring																B					Basic = Breakers Coil Monitoring (1/Bkr), Breaker Arcing (1/Bkr), Harmonic Detection (6), THD, Current Demand (1/CT bank), Digital Counters (16), Data Logger
																C					Standard = Basic + Advanced Breaker Health (1/Bkr)
																A					Advanced = Standard + Harmonic Detection (6) + TEFD (1/Bkr)
Communications																	S				Standard = Front USB, 1 x Rear RS485 : Modbus RTU, DNP3.0, IEC60870-5-103 + 1 x Ethernet (Modbus TCP, DNP)
																	1				Advanced = Front USB, 1 x Rear RS485 + 2 x Ethernet Fiber, MODBUS RTU / TCP, DNP3.0, IEC 60870-5-103/104, 1588, SNTP, OPC UA
																	3				Advanced + PRP
																	3				Advanced + Extended IEC 61850
																		E			Advanced + PRP + Extended IEC 61850
Advanced Communication Connector																		P			None
																		A			ST, Multi-mode 1310nm
																		E			RJ45, Copper 10/100M
Wireless Communication																			N		None
																			W		WiFi 802.11
Security																				B	Basic
																				A	Advanced - CyberSentry Level 1

Note: Harsh Environment Coating is provided as standard on all 8 series units.
** HV I/O, Option A - Max 2 across slots F through H*
Arc Flash Detection (Option F): Includes 4 x Arc Flash sensors, each 18 feet (5.5 meters) long

CONFIGURE ONLINE

imagination at work

GEGridSolutions.com

GEA-32050(E)
English
180312