GE

Grid Solutions

Multilin 8 Series

Innovative Solutions for Industrial and Utility Applications

The Multilin™ 8 Series is a single, integrated platform that delivers advanced protection, control, monitoring and metering for critical feeder, motor, transformer and generator applications in both utility and industrial environments.

With 12 switchgear control elements, fully configurable single line diagram on a large color graphical display, 36 alarm integrated annunciator panel and up to 20 push buttons, Multilin 8 Series is an ideal choice as a “One Box Solution” for applications both inside and outside the substation.

Designed with advanced communications options and detailed asset monitoring capabilities, the Multilin 8 Series provides advanced functionality, including high-performance protection, extensive programmable logic and flexible configuration capabilities. With support for industry leading communications protocols and technologies, the 8 Series provides easy integration into new or existing SCADA or DCS for enhanced situational awareness.

Key Benefits

- Same look and feel for protection, control and monitoring of feeders, motors, transformers and generators
- One Box Solution with advanced logic and configuration flexibility to provide comprehensive primary or backup protection, control and monitoring of electrical power systems
- User configurable single line diagram with color display for local control, system status, and metering
- Advanced motor, transformer and generator diagnostics with high-end fault and disturbance recording
- Integrated arc flash detection using light sensors supervised by overcurrent to reduce incident energy and equipment damage
- High-end cyber security such as AAA, Radius, RBAC, and Syslog enabling NERC® CIP requirements
- Draw-out design simplifies testing, commissioning and maintenance, increasing uptime
- Optional Wi-Fi connectivity minimizes system configuration and provides safe relay programming and diagnostic retrieval
- Relay environmental diagnostic helps visibility on change in environmental parameters

Innovative Technology & Design

- Advanced for protection, control monitoring and diagnostics of electrical systems
- 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 across the 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
- High 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

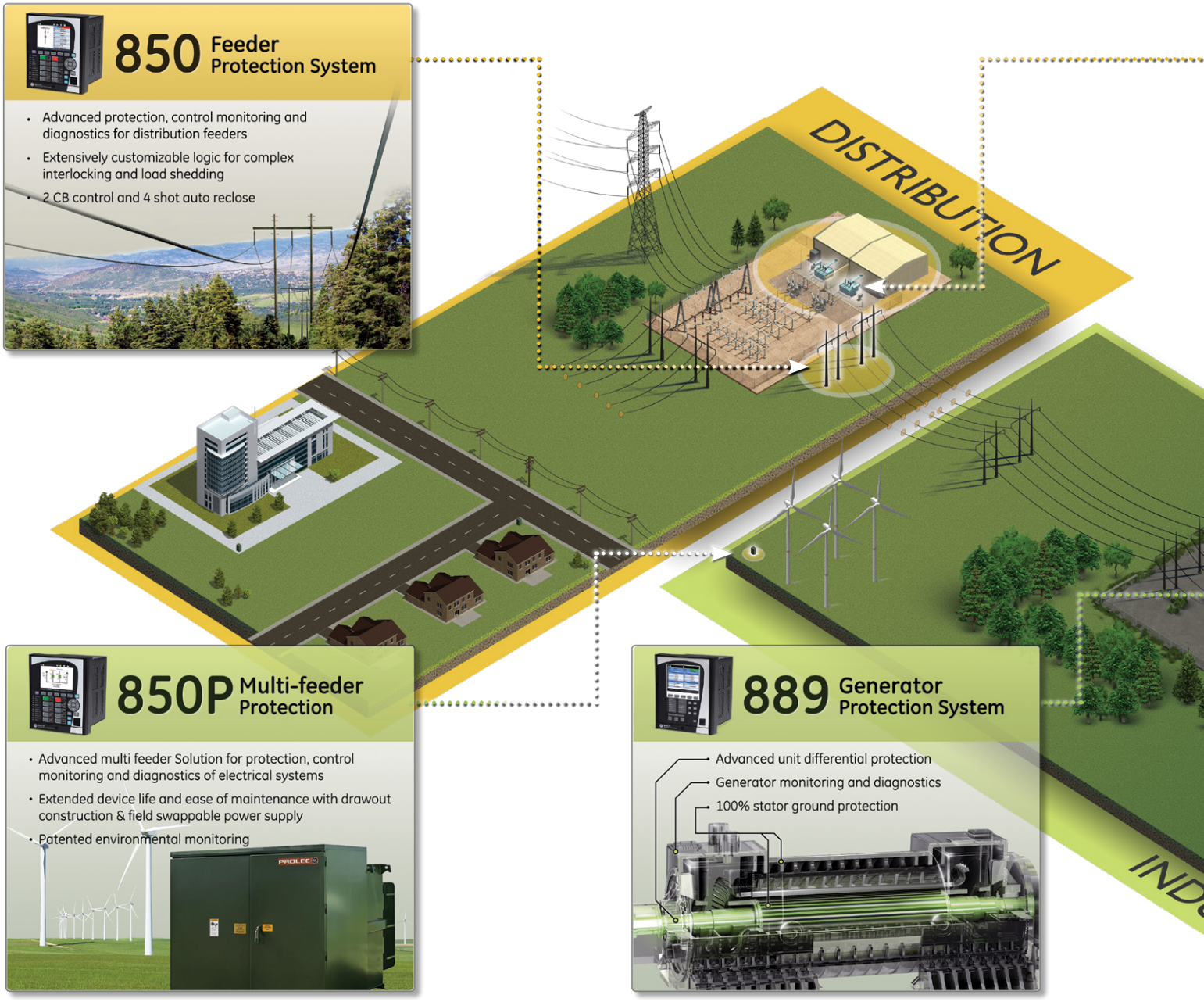
imagination at work

Multilin 8 Series Platform Overview

From oil pumping and refining facilities, to open pit or underground mining and processing operations, to large or small utilities, customers demand solutions that ensure maximum process uptime, minimum operational and maintenance efforts, and have the durability to withstand harsh environmental conditions.

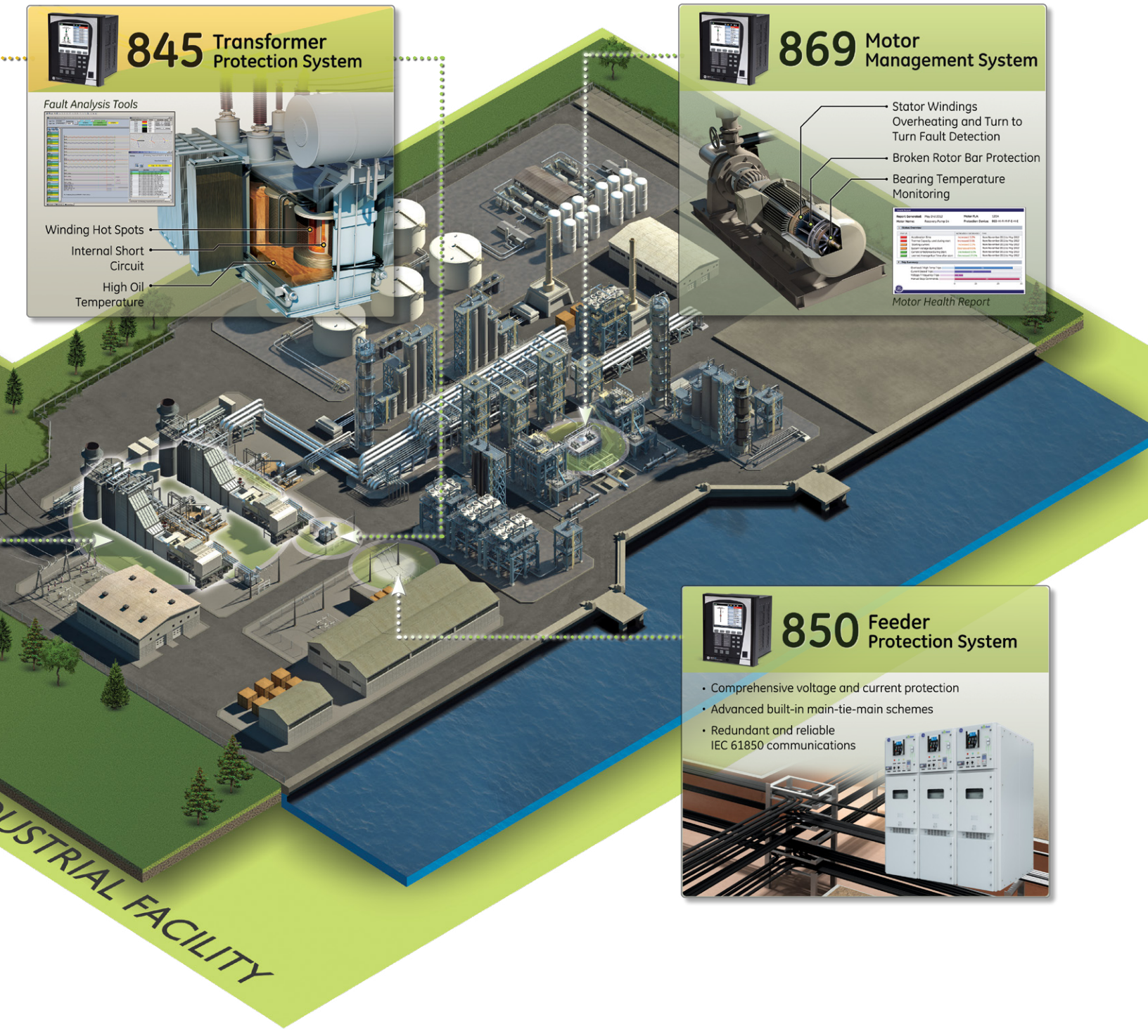
The Multilin 8 Series is GE's next-generation protection and control relay platform providing comprehensive protection and asset monitoring for critical feeders, motors, generators, and transformers.

Multilin 8 Series Platform - Application Example



The Multilin 8 Series is designed to solve the challenges that customers face in running their day-to-day operations including maximizing system and process uptime, simplifying system integration and maintenance, and extending the life of critical assets. GE is raising the bar on system performance and reliability.

With advanced communications the Multilin 8 Series integrates easily and seamlessly into new or existing DCS/SCADA systems, along with other Multilin protection devices, providing a comprehensive solution for the end-to-end electrical system.



Exceptional Quality & Reliability

Industry-leading quality, reliability and design processes are at the core of GE's next generation protective relay platform. With significant investments in state-of-the-art type test facilities that simulate a complete range of operating environments and designed to the IPC A-610 Class 3 standard, adhering to the highest reliability standards and ensuring rugged performance, each device completes one hundred percent Electrical Stress Screening prior to shipping from GE's facility.

The Multilin 8 Series Protection Relays are manufactured in an ISO® 9001:2008 certified manufacturing facility.

Pioneering Technology & Design

The Multilin 8 Series provides comprehensive, high performance protection, control, monitoring and diagnostics for critical assets in Industrial and utility environments.

Utilizing decades of experience, GE has implemented ease-of-use features, such as single screen set-ups delivering faster configuration, configurable scheme logic that eliminates the need for complex end-user programming, driving quicker setup times, decreased implementation costs and reduced points of failure.

The Multilin 8 Series products have an integrated protection integrity engine that utilizes customized algorithms, providing advanced diagnostics to ensure asset protection is not compromised.

Maintaining and safeguarding the electrical supply of an operation is critical to ensuring maximum process availability and performance.

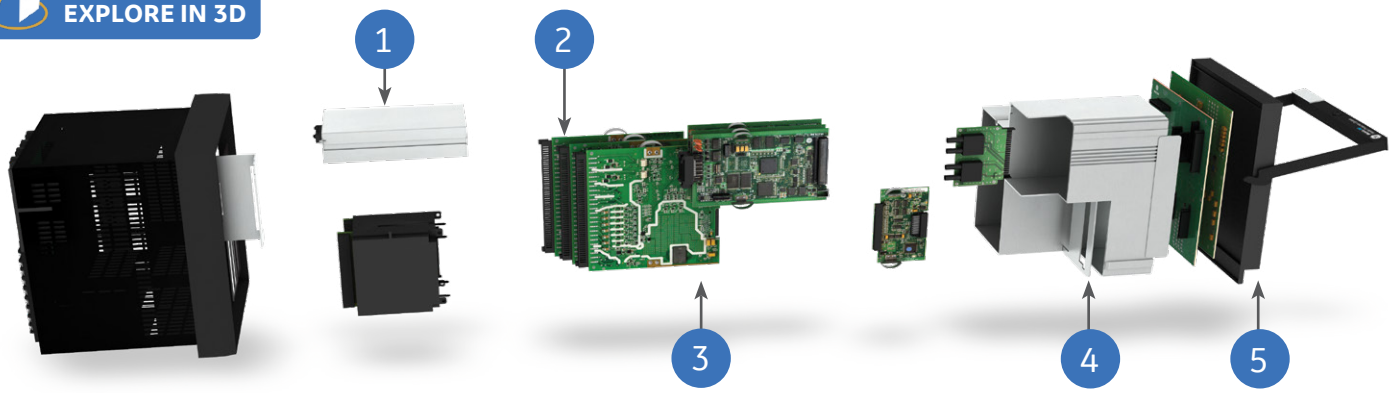
The Multilin 8 Series incorporates the latest cyber security features, including password complexity, RADIUS authentication, role-based access control (RBAC), for customers to comply with NERC CIP and NISTIR 7628 requirements.

Understanding that customers need protection and control devices that must reliably operate in extremely harsh and challenging environments, GE delivers the Multilin 8 Series with harsh conformal coating on all printed circuit boards and a patented environmental awareness module that provides real- time detection of environmental factors that affect product life, as part of its standard offering, delivering higher reliability and extended relay life.

Uncompromised Service and Support

In addition to the superior technology and innovative design advancements that enable delivery of uncompromised performance and reliability, the Multilin 8 Series is also backed by GE's 10-year warranty.

WANT TO LEARN MORE?
EXPLORE IN 3D



1 **Field Swappable Power Supply**
Extends the usable life of the protection relay and minimizes costly, time consuming replacement and re-configuration

2 **Harsh Environment Coating**
Standard on all printed circuit boards delivering higher reliability and extended relay life

3 **IPC A-610 Class 3 Manufacturing**
Drives to the highest level of reliability standards delivering rugged performance

4 **IPC A-610 Class 3 Manufacturing**
Drives to the highest level of reliability standards delivering rugged performance

5 **Draw-Out**
Providing simplified device fleet management

Multilin 8 Series Overview

The Multilin 8 Series is an advanced protection device designed for high performance, protection, control and monitoring of feeders, motors, transformers & generators.

The 8 Series provides a versatile and cost effective control, protection, measurement & monitoring solution. The Flexlements and Flexlogic enables users to customize various schemes to meet a variety of applications.

Switchgear Control and Configurable SLD

The Multilin 8 Series provides a configurable dynamic SLD up to six (6) pages for comprehensive switchgear control of up to 3 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 PBs

The Multilin 8 Series 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. The alarms can be displayed on the front panel in a configurable grid layout of 2x2 or 3x3.

The Multilin 8 Series 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 the 8 series provides a faster response for current, voltage, power, and frequency protection elements; helping reduce stress on assets. The Multilin 8 series 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, integrating into new or existing networks.

Protection and Control

The Multilin 8 Series provides superior protection and control for various applications. It contains a full range of selectively enabled, self-contained protection and control elements.

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 8 Series supports up to 12 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 any RTD failures.

Integrated Arc Flash Protection

The Multilin 8 Series supports an integrated arc flash module providing constant monitoring of an arc flash condition within the switchgear, motor control 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 8 Series 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 8 series can be configured to indicate the health of the sensors and its connections to the relay.

MV Switchgear or Motor Control Center **Multilin 8 Series**

Fast, reliable arc flash protection with light-based arc flash sensors integrated within the Multilin 8 Series of protection & control devices. With arc flash detection in as fast as 2msec, the costs associated with equipment damage and unplanned downtime is significantly reduced.

Inputs and Outputs

The 8 Series provides digital inputs and digital outputs as per the attached chart, 7 Analog Outputs (dc mA), 4 Analog Inputs (dc mA). 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.

The 8 Series can also be set to issue trip or alarm commands based on signal thresholds. The configurable analog outputs can be used to provide standard transducer signals to local monitoring equipment. The analog outputs can be configured to provide outputs based on measured analog values, or calculated quantities.

An optional general purpose transducer input allows a user-defined quantity to be monitored and used as part of the protection as defined by FlexLogic™.

Advanced Automation

The Multilin 8 Series incorporates advanced automation capabilities that exceeds what is found in most 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 8 Series 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 that can enable the user to flag a user defined abnormality that gives 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 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 protections (for example, preventing sympathetic tripping of healthy feeders), and dynamic setting group changes.

Monitoring & Diagnostics

Asset failures and faults can have a significant impact on a process, resulting in loss of revenue and material. Predictive maintenance and situational awareness to the Asset operating condition can help reduce unplanned downtime and energy consumption - maximizing Asset output and life.

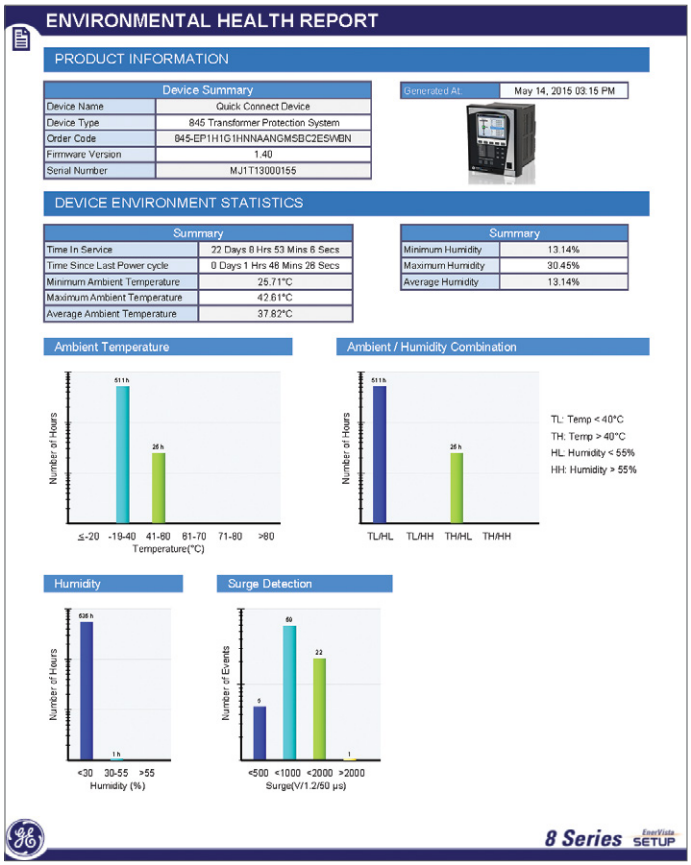
Please refer to the individual 8 Series product brochure for the detailed Monitoring & Diagnostic offering.

The Multilin 8 Series 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 8 Series 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. Reliable and secure operation of the 8 Series relay and other electronic devices in the vicinity may be affected by environmental factors. The 8 Series relay has been designed to meet or exceed all required industry standards, however some operating conditions may be beyond those standards and reduce total lifespan of the device.

Typical environmental conditions that may affect electronic device reliability include voltage, current density, temperature, humidity, gas, dust, contamination, mechanical stress, shock, radiation, and intensity of electrical and magnetic fields. These environmental factors are different from natural weather conditions at particular installation conditions and are beneficial to monitor. The 8 Series built-in environmental awareness feature (patent “Systems and methods for predicting maintenance of intelligent electronic devices”) collects the histograms of each operating condition from the point the device is put into service. Monitored environmental conditions include temperature, humidity and transient voltage. The histogram of each environmental factor may be retrieved from the diagnostic page accessed through a PC running the EnerVista Multilin 8 Series Setup program

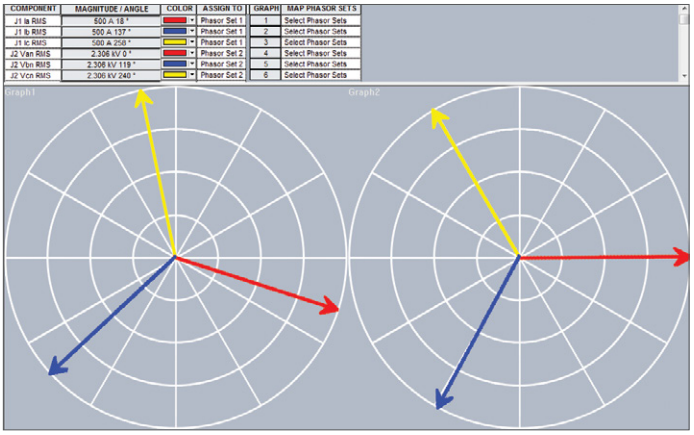


Environmental health report is available via Multilin PC Software

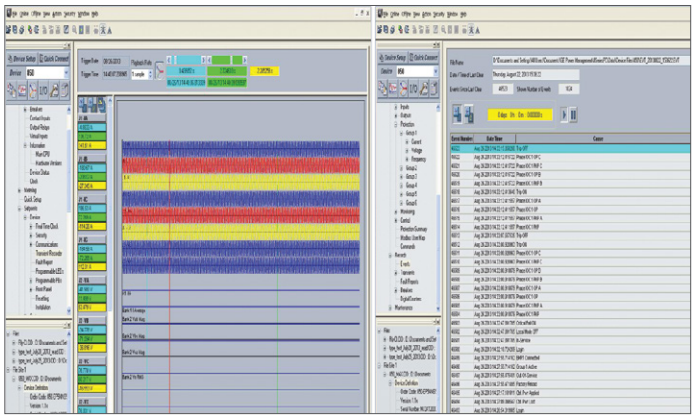
Metering

The Multilin 8 Series offers high accuracy power quality monitoring for fault and system disturbance analysis. The Multilin 8 Series 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 cycles to 1549 cycles, depending on the user specified configuration. This gives the user the ability to capture long disturbance records which is critical for some applications.
- 32 digital points and 16 analog values, assigned by the user, can be captured in the COMTRADE format by the transient recorder.
- Comprehensive data logger provides the recording of 16 analog values selected from any analog values calculated by the relay. Capture rates range from 16 ms, 20ms, 1 second, 30 seconds, 1 minute, 30 minutes, or 1 hour rate. This data capture flexibility allows the operator to measure power factor or reactive power flow (for example), for several hours or even days, enabling detailed analysis and corrective action to be taken, if required.
- Detailed Fault Report allows the user to identify the fault location, fault type and element(s) that triggered the relay to trip. It carries other useful information, such as pre-fault and fault phasors, relay name and model, firmware revision and other details. The relay stores fault reports for the last 16 events. 1024 Event Recorder chronologically lists all triggered elements with an accurate time stamp over a long period of time. The 8 series stores the last 1024 events locally in the relay.



Multilin 8 Series Phasor viewer



Multilin 8 Series monitoring system performance with oscillography and event records

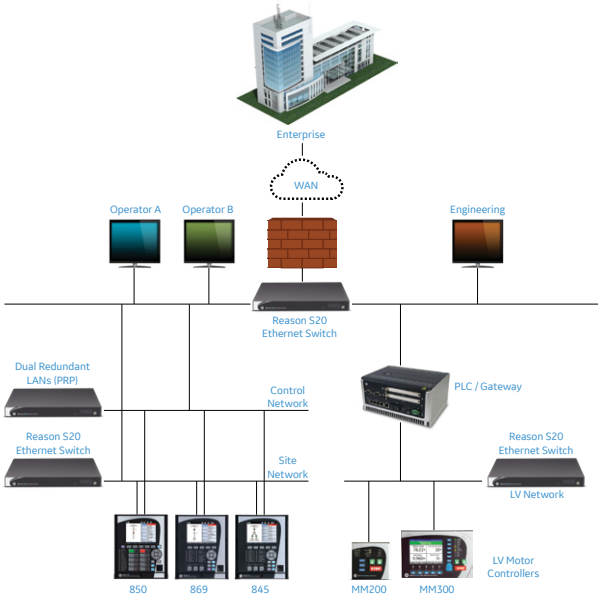
Communications

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 8 Series 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 8 Series has two interfaces as USB front port and Wi-Fi for ease of access to the relay.



Wi-Fi Connectivity:

- Simplify set-up and configuration
- Simplify diagnostic retrieval
- Eliminate personnel in front of 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)

Enables integration with centrally managed authentication and accounting of all user activities and uses modern industry best practices and standards that meet and exceed NERC CIP requirements for authentication and password management.

Role Based Access Control (RBAC)

Efficiently administrates users and roles within 8 Series. The new and advanced access functions allow users to configure up to three roles for up to eight configurable users with independent passwords. The standard "Remote Authentication Dial in User Service" (Radius) is used for authentication.

Event Recorder (Syslog for SEM)

Captures all cyber security related events within a SOE element (login, logout, invalid password attempts, remote/local access, user in session, settings change, FW update, etc.), and then serves and classifies data by security level using the standard Syslog data format. This will enable integration with established SEM (Security Event Management) systems.

Cyber Security with Radius Authentication

Software and Configuration

The EnerVista™ suite is an industry-leading set of software programs that simplifies every aspect of using the Multilin 8 Series. EnerVista provides all the tools to monitor the status of the protected asset, maintain the device and integrate the information measured by the Multilin 8 Series, into SCADA or DCS process control systems. The ability to easily view sequence of events is an integral part of the setup software, as postmortem event analysis is critical to proper system management.

EnerVista Launchpad

EnerVista Launchpad is a powerful software package that provides users with all the setup and support tools needed for configuring and maintaining Multilin products. The setup tools within Launchpad allow for the configuration of devices in real-time, by communicating via serial, Ethernet or modem connections, or offline by creating device setting files to be sent to devices at a later time. Included in Launchpad is a document archiving and management system that ensures critical documentation is up-to-date and available when needed.

8 Series Setup Software

8 Series Setup Software is a single setup and configuration across the platform and can reduce device setup and configuration time.

Simulation

The 8 Series can simulate current and voltage inputs when this feature is enabled. Other test operations are also possible such as LED lamp test of each color and testing of output relays. The simulation feature is provided for testing the functionality of the relay in response to program conditions, without the need of external AC voltage and current inputs. First time users will find this to be a valuable training tool. System parameters such as currents and voltages, phase angles are entered as set points. When placed in simulation mode, the relay suspends reading actual AC inputs, generates samples to represent the programmed phasors, and loads these samples into the memory to be processed by the relay. Both normal and fault conditions can be simulated to exercise a variety of relay features.

1 Easy to Use - Draw-out case

2 Easy to Configure - 1 simple step

3 Detailed Diagnostics

Simplified Setup and On-Going Maintenance

The robust 8 Series streamlines user workflow processes and simplifies engineering tasks, such as configuration, wiring, testing, commissioning, and maintenance. Building on the history of simplified setup and configuration, the 8 series has implemented simplified setup screens to minimize relay setup time. In addition, for local programming, the 8 series comes with a fully functional GCP, which allows users to locally monitor the asset.

Ease-of-Use

Continuing its legacy in providing easy-to-use protective relay solutions, the 8 Series is designed to minimize product and system configurability requirements, for quicker physical installations, easier and simplified setup and configuration.

Full Color Graphical HMI Front Display

A large, full color Graphic Control Panel (GCP) ensures clear representation of critical status and measurements. When the keypad and display are not being used, the GCP will automatically revert to screen saver mode, which will turn off the display until one of the local pushbuttons is pushed.

The 8 series front panel provides 14 LED indicators and 3 LED pushbutton indicators. 10 LED's are user- programmable, while "In service" and "Pickup" LED's are non-programmable. "Trip" and "Alarm" LED's are not color programmable but can be assigned with selected operands.

The GCP can be used to view device and system status, alarms and event logs, and metering information. The GCP and navigation keys simplify relay configuration and setup, allowing users to make setting changes directly through the front panel. Up to six user-defined pages are available in the home menu.

LED Indicators for Quick Status Indication

The front panel includes user configurable LED's. Each LED can be completely configured and named based on the application and user requirements. The color of each indicator conveys its importance.

G = Green: General Condition

A = Amber: Alert Condition

R = Red: Serious Alarm or Important Status

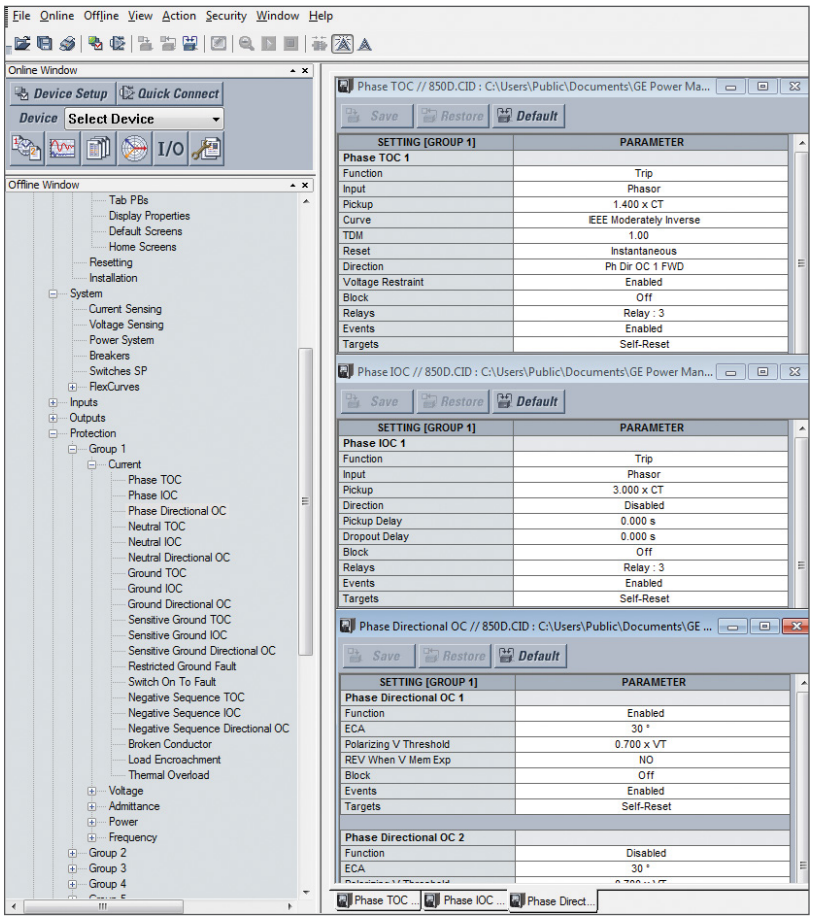
User-programmable LED's can be turned on by a selection of FlexLogic operands representing protection, control or monitoring elements. Each LED can be configured to be self-reset or latched and labeled based on the application and user requirements. User-programmable LED's can be selected to be either Red, Green or Orange to give the distinctive indication of selected operations.

Save | Restore | Default

Groups: 1 2 3 4 5 6 I/O Cards: F G H All Enabled Trip

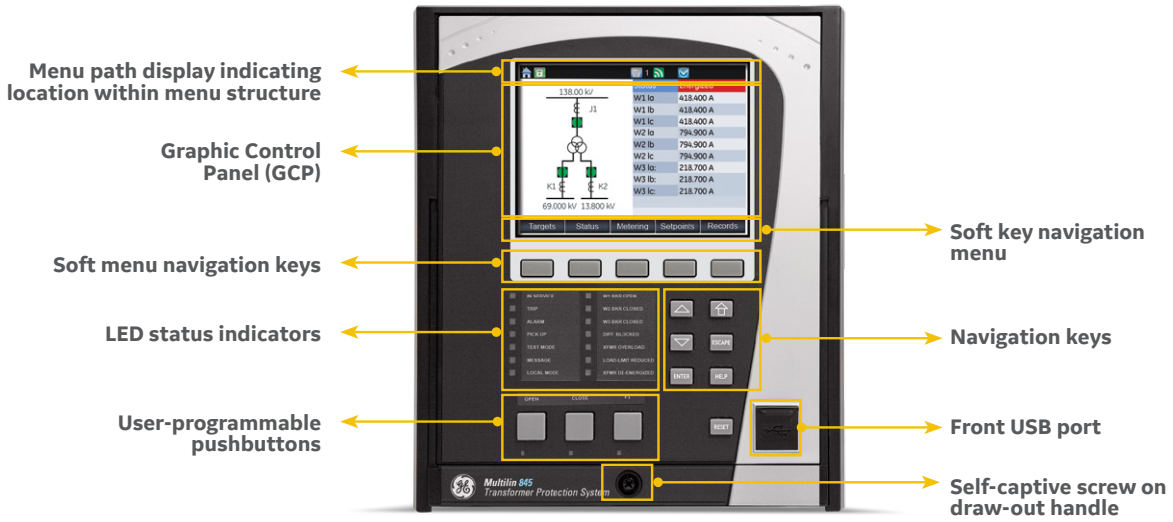
	GROUP 1			
PROTECTION ELEMENTS	R2	R3	R4	FUNCTION
Phase TOC 1	☐	☒	☐	Trip
Phase IOC 1	☐	☒	☐	Trip
Phase Directional OC 1				Enabled
Neutral TOC 1	☐	☒	☐	Trip
Neutral Directional OC 1				Enabled
Restricted Ground Fault 1	☐	☒	☐	Trip
Switch On To Fault 1	☐	☒	☐	Trip
Negative Sequence TOC 1	☐	☒	☐	Trip
Neg Seq Directional OC 1				Enabled
Broken Conductor 1	☐	☒	☐	Trip
Load Encroachment 1	☐	☒	☐	Enabled
Phase UV 1	☐	☐	☒	Trip
Auxiliary UV 1	☐	☐	☐	Trip
Neutral Admittance 1	☐	☒	☐	Trip
Fast Underfreq 1	☐	☐	☒	Trip
Fast Underfreq 2	☐	☐	☒	Trip
MONITORING ELEMENTS	R2	R3	R4	FUNCTION
Trip Circuit Monitoring	☐	☐	☐	Configurable
Close Circuit Monitoring	☐	☐	☐	Configurable
Breaker 1 Arcing Current	☐	☐	☐	Configurable
Breaker Health	☐	☐	☐	Configurable
Harmonic Detection 1	☐	☐	☐	Configurable
Harmonic Detection 2	☐	☐	☐	Configurable
CONTROL ELEMENTS	R2	R3	R4	FUNCTION
Pole Discordance 1	☐	☒	☐	Configurable
Trip Bus 1	☐	☐	☐	Trip
UV Restoration 1	☐	☐	☐	Configurable
UF Restoration 1	☐	☐	☐	Configurable
CT Supervision 1	☐	☐	☐	Configurable
VT Fuse Failure 1	☐	☐	☐	Configurable

Multilin 850 Protection Summary

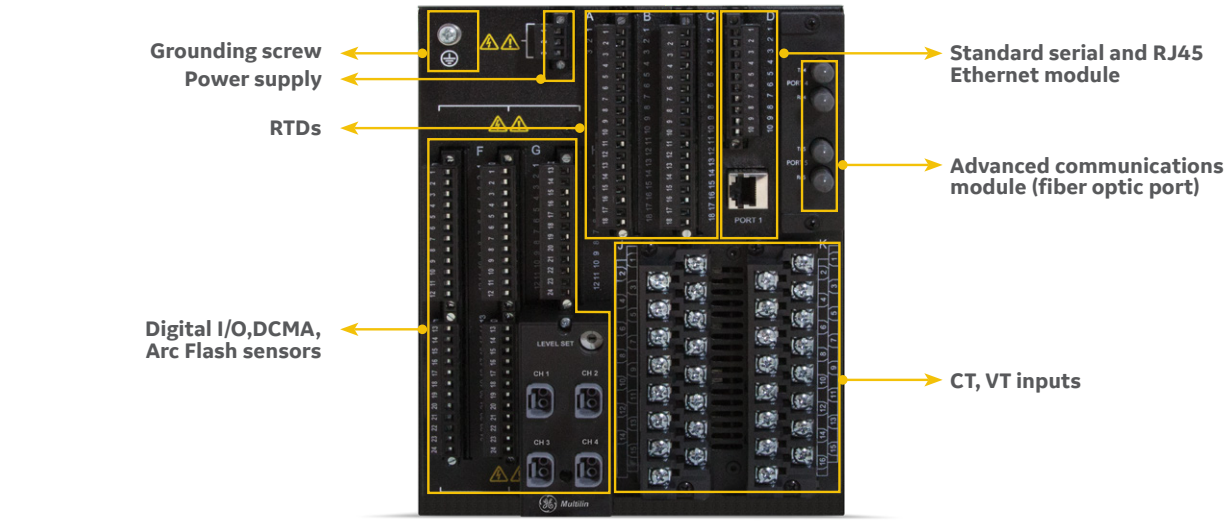


Multilin 850 Settings

Front View - Rugged Front Panel



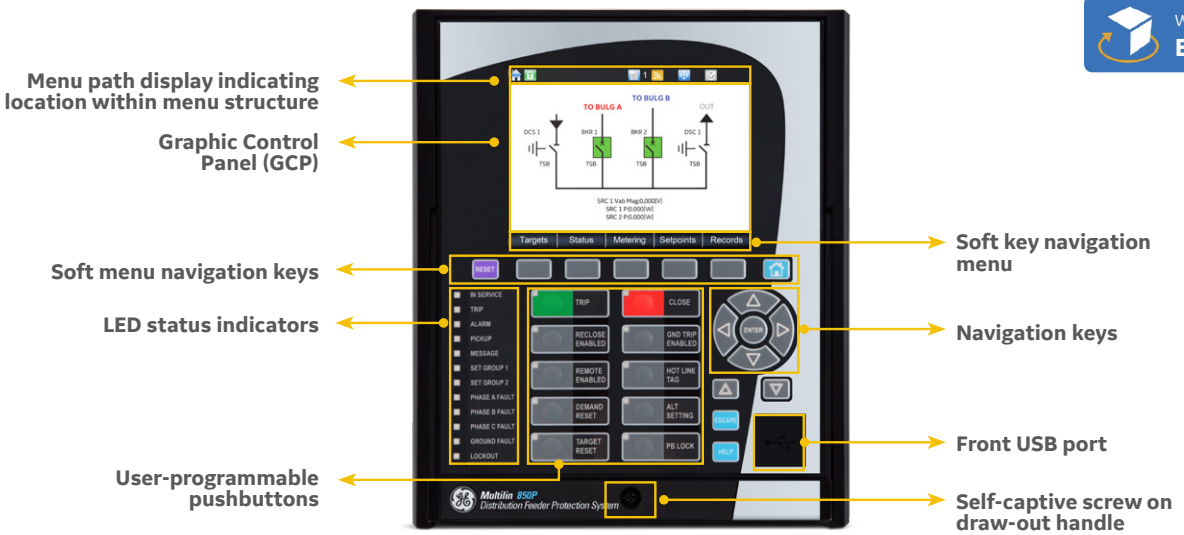
Rear View



Dimensions & Mounting

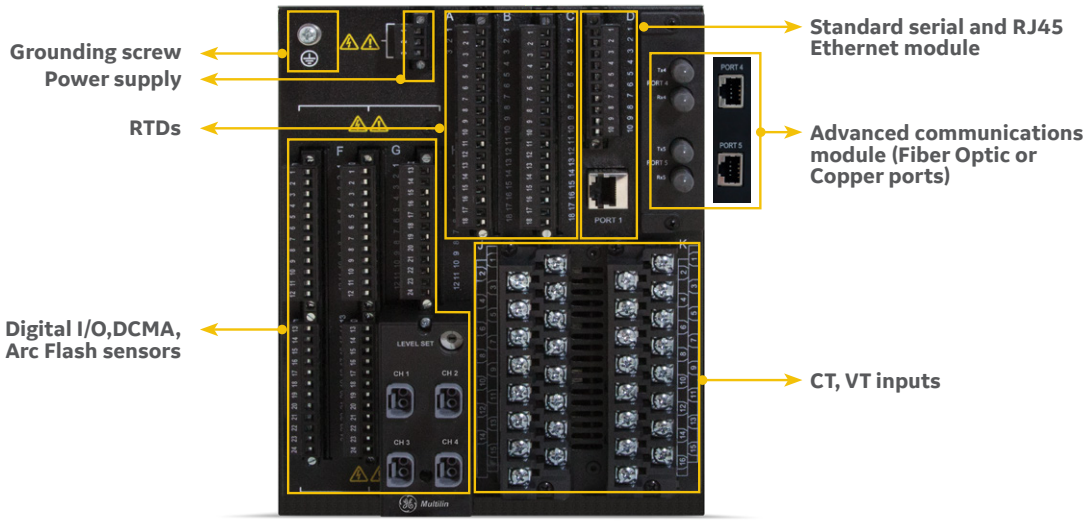
Front View - Advanced Membrane Front Panel (850 only)

WANT TO LEARN MORE?
EXPLORE IN 3D



Only available for 850

Rear View



Optional IP20 cover available

Dimensions & Mounting

Retrofit Existing Multilin SR Devices in Minutes

Traditionally, retrofitting or upgrading an existing relay has been a challenging and time consuming task often requiring re-engineering, panel modifications, and re-wiring. The Multilin 8 Series Retrofit Kit provides a quick, 3-step solution to upgrade previously installed Multilin SR 735, 750/769, 469&489 protection relays reducing upgrade costs.

With the new 8 Series Retrofit Kit, users are able to install a new 850/869/889 feeder/motor/generator protection system without modifying existing panel or switchgear cutouts, re-wiring, or need for drawing changes and re-engineering time and cost.

With this three-step process, operators are able to upgrade existing SR relays in as fast as 21 minutes, simplifying maintenance procedures and reducing system downtime. The Compatibility mode enables the user to changes the Modbus actual value registers to emulate the SR 735, 750/760, 469 or 489 relays. This eliminate the downtime required to change the Modbus address in SCADA/DCS.

1 Update **Settings File**

EnerVista 8 Series Setup Software provides automated setting file conversion with graphical report to quickly and easily verify settings and identify any specific settings that may need attention.

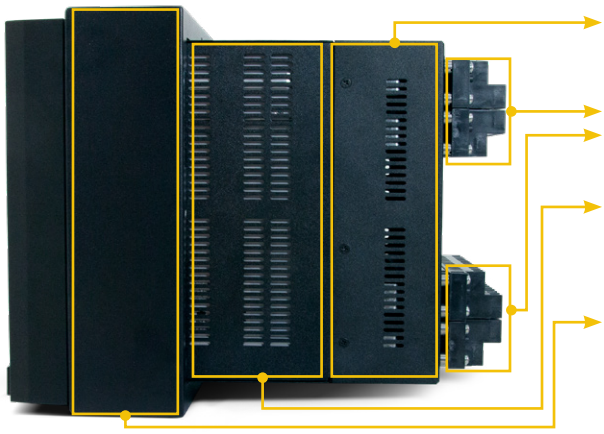
2 Replace **Relay**

Simply remove the terminal blocks and then remove the SR chassis from the panel. No need to disconnect any of the field wiring.

3 Plug & Play **Reconnection**

Insert the new 8 Series Retrofit chassis into the switchgear and simply plug-in the old terminal blocks - there is need to make any cut-out modifications or push and pull cables.

The 8 Series Retrofit Kit comes factory assembled and tested as a complete unit with the 8 Series protection device and includes replacement hardware (terminal blocks and screws) if the existing hardware is significantly aged or damaged.



Factory wired SR Terminal Block Frame to ensure mapping of SR terminal locations to the 8 Series terminal block

Existing SR Terminal Blocks easily plug-in

8 Series Protection Relay (matched to existing SR 735 or 750/760 device)

3" Depth Reduction Collar to ensure relay depth closely matches the previously installed SR device, eliminating the need to push or pull cables

Explore in Detail

visit us online to explore the SR to 8 Series retrofit kit in detail using our interactive app.
www.GEGridSolutions.com/8SeriesRetrofitKit

Multilin 8 Series Retrofit

Key Functions by Application

ANSI Device	Description	850E Industry Feeder Protection	850D Distribution Feeder Protection	850P Padmount Feeder Protection	869 Motor Protection	845 Transformer Protection	889 Generator Protection
12/14	Over Speed Protection/ Under Speed Protection				•		
21YN	Neutral Admittance	•	•				
24	Volts per Hertz				•	•	•
25	Synchrocheck	•	•			•	•
27P	Phase Undervoltage	•	•	•	•	•	•
27Q	UV Reactive Power	•	•				
27TN	Third Harmonic Neutral Undervoltage						•
27T	Timed Undervoltage Protection	•	•				
27X	Auxiliary Undervoltage	•	•			•	•
32	Directional Power	•	•		•	•	•
32N	Wattmetric Ground Fault (Wattmetric zero sequence directional)	•	•				
37	Undercurrent		•		•		
37P	Underpower				•		
38	Bearing RTD Temperature				•		•
39	Bearing Vibration (dcmA)						•
40	Loss of Excitation				•		•
40Q	Reactive Power				•		•
46	Current Unbalance				•		•
47	Phase Reversal				•		•
49	Thermal Overload	•	•		•		•
	Hottest Spot Temperature					•	
	Aging Factor					•	
	Loss of Life					•	
49S	Stator RTD Temperature				•		
49TOL	Thermal Overload						•
50/27	Inadvertent Energization						•
50/87	Instantaneous Differential Overcurrent					•	
50BF	Breaker Failure	•	•	•	•	•	•
50G	Ground Instantaneous Overcurrent	•	•	•	•	•	•
50SG	Sensitive Ground Instantaneous Overcurrent	•	•		•		•
50LR	Mechanical Jam				•		
50N	Neutral Instantaneous Overcurrent	•	•	•	•	•	•
50OL	Overload						•
50P	Phase Instantaneous Overcurrent	•	•	•	•	•	•
50_2	Negative Sequence Instantaneous Overcurrent	•	•	•	•	•	•
51G	Ground Time Overcurrent	•	•	•	•	•	•
51SG	Sensitive Ground Time Overcurrent	•	•				•
51N	Neutral Time Overcurrent	•	•	•	•	•	•
51P	Phase Time Overcurrent	•	•	•	•	•	
51V	Voltage Restrained Time Overcurrent						•
51_2	Negative Sequence Time Overcurrent	•	•	•		•	
52	AC Circuit Breaker		•		•		
	Pole Discordance		•				
55	Power Factor	•	•		•	•	•
59N	Neutral Overvoltage	•	•	•	•	•	•
59P	Phase Overvoltage	•	•		•	•	•
59X	Auxiliary Overvoltage	•	•		•	•	•
59_2	Negative Sequence Overvoltage	•	•		•	•	•
64TN	100% Stator Ground using 3rd Harmonic Voltage Differential						•
66	Maximum Starting Rate				•		
67G	Ground Directional Element	•	•			•	•
67SG	Sensitive Ground Directional Element	•	•				•
67N	Neutral Directional Element	•	•		•	•	•
67P	Phase Directional Element	•	•		•	•	•
67_2	Negative Sequence Directional Element	•	•				•
76	Excitation Current Protection (dcmA)						•
78	Out-of-Step Protection				•		•
79	Automatic Recloser	•	•				
81O	Overfrequency	•	•		•	•	•
81U	Underfrequency	•	•		•	•	•
81R	Frequency Rate of Change	•	•		•	•	•
86	Start Inhibit				•		
87G	Restricted Ground Fault (RGF)	•	•			•	•
87GD	Restricted Ground Fault (RGF)						•
87O	Overall Unit (Gen-Xfrm) Protection						•
87S	Stator Differential				•		
87T	Transformer Differential					•	
AFP	Arc Flash Protection	•	•		•	•	•
CLP	Cold Load Pickup	•	•				
I1/12	Broken Conductor	•	•				
MTM	Automatic Bus Transfer Scheme	•	•				
MCB	Manual Close Blocking	•	•	•			
SOTF	Switch on to Fault		•				
TGFD	Transient Ground Fault Detection	•	•				
VTFF	Voltage Transformer Fuse Failure	•	•		•	•	•
n/a	Fast Underfrequency	•	•				
n/a	Underfrequency Restoration	•	•				
n/a	Undervoltage Restoration	•	•				
n/a	Load Encroachment	•	•				

imagination at work

GEGridSolutions.com

GEA-32051(E)
English
180312