GE Digital Energy

Substation automation and control in a single box

D25 multifunction intelligent electronic device

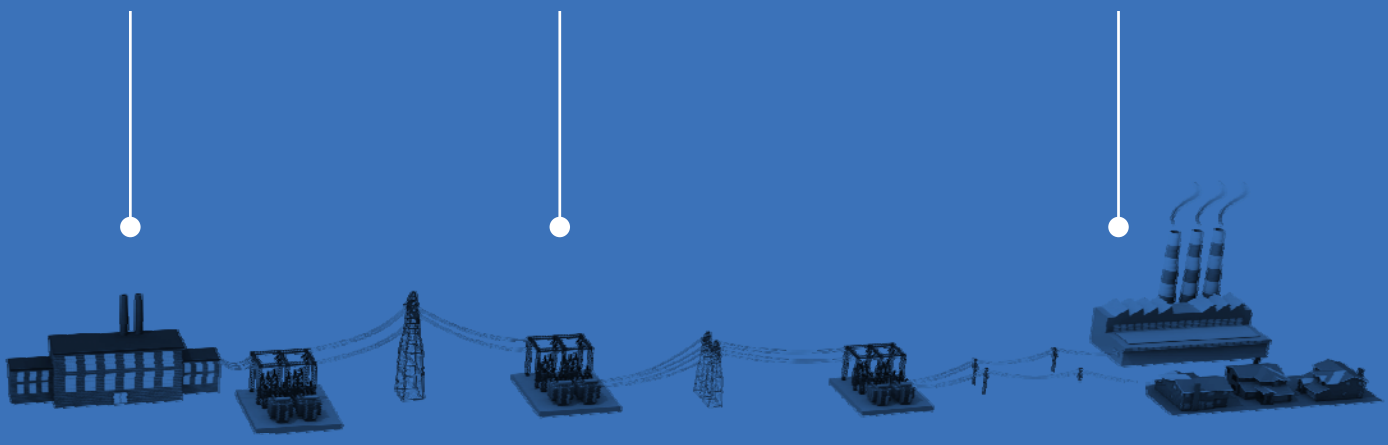
imagination at work

The D25* is a multifunction intelligent electronic device (IED) that is designed to be flexible, modular, and upgradable to suit both large and small automation projects in either new or retrofit situations.

Transmission substations. Customers have already deployed D25 units to control and automate substations of up to 65 bays. The D25 communicates through dual redundant Ethernet and runs applications including interlocking, advanced load shedding, and fault recording via IEC® 61850 GOOSE.

Distribution substations. Customers around the world have deployed D25 units at thousands of substations. A single D25 is designed to handle all the automation requirements of small substations.

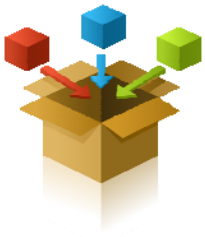
Generator substations. Many D25 units are deployed in generator substations to control, monitor, and automate large step-up transformers and integrate transformer sensor data within existing SCADA systems.



The brain that enables the Smart Grid.

- Power your substation and enable it to deploy smart grid applications such as Load Shedding and Integrated Volt/VAR control.
- Transform your grid from the 20th century to the 21st century; the D25 allows you to take a step-by-step approach that reduces initial investment expenditure.

Visit ge.ecomagination.com/smartgrid for more information on the GE Smart Grid.



IEC 61850 inside.

- The D25 is one of the most versatile IEC 61850 servers on the market and can connect to existing non-IEC 61850 equipment, transforming the data into logical nodes for presentation as IEC 61850 data.
- Supports IEC 61850 Enhanced Security Controls, which ensures the results of control actions are accurately recorded within the system.
- Supports IEC 61850 GOOSE for interlocking.
- A hybrid approach that can allow you to minimize the investment required to move to IEC 61850.
- Flexibility and integration capability – more than 120 protocols – which allows the D25 to be dropped into almost any utility's existing system.

Scalable and flexible.

- The modular design of the D25 hardware and software accommodates growth and change over time.
- The flexibility of the D25 design allows for the device to be used in any situation within an automation system, creating a one-box solution for every problem.

Did you know?

GE's 20 years of experience in SCADA and automation was used to build the D25 product line. Did you know that it...

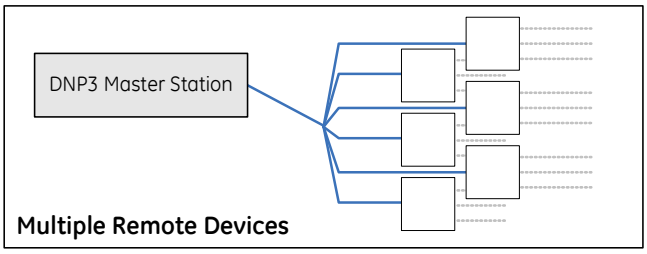
- Manages and preserves all event and original I/O time tags with 1 ms accuracy using a state-of-the-art database. This is a crucial feature of the D25 sequence of event recorder that most competing products do not offer.
- Offers an application to manage redundant I/Os within substations.
- Provides data suppression mechanisms to prevent SCADA control centers from being inundated with events during maintenance or commissioning.
- Provides harmonic spectrum (up to 21st harmonic) for every measured input.
- Can communicate in 120+ protocols and over multiple channels to multiple slaves (servers) and masters (clients).
- Is able to provide statistical information on AC analog values during a specified time frame.
- Is equipped with a sophisticated control lockout mechanism for substations and other equipment within the substation.
- Performs extensive power quality tasks such as finding Sags, Swells, and Interruptions.

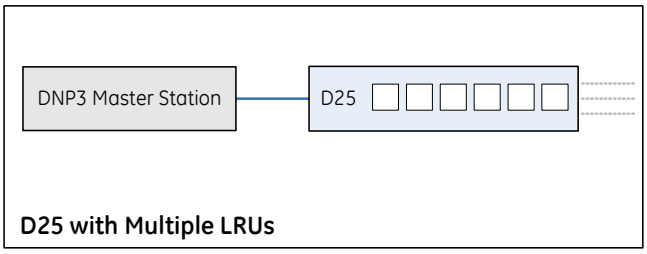
Master of all trades.

It's hard to sum up the roles the D25 can take on because it has the ability to perform so many varied functions. The following sections will give you an overview of how the D25 can solve some of your greatest utility and infrastructure issues.

One-of-a-kind communicator.

LRU Concept. Local Remote Unit (LRU) allows the D25 device to abstract a portion of its database and make it available to selected master stations The D25 is presented as multiple slave devices. The same concept applies to slave devices (or servers), where the D25 can act as multiple master stations and retrieve data as needed.





Protocol Conversion. With a suite of over 120 protocols, including IEC 61850, Modbus®, DNP, SPABus, Courier, and IEC 101/103/104; the D25 can translate multiple protocols over multiple channels. This is often useful in retrofit situations.

Ethernet-ready. The D25 supports standard communication methods over Ethernet, including Telnet and TFTP. D25 units can also provide a virtual connection to devices that do not have Ethernet capability, enabling you to perform remote configuration changes over a LAN.

Automation and control? All under control.

Synchronism Check. The D25 supports the *Synchcheck* functions, including a synchronism bypass function for any or all of the following conditions:

- Dead Line – Live Bus
- Dead Bus – Live Line
- Dead Bus – Dead Line

The D25 monitors the voltage difference, phase angle difference, and slip frequency to ensure proper breaker closure per specific user-defined settings.

Dynamic Bus Switching. The D25 supports multiple buses per feeder, where each bus is defined by a set of PTs and a digital input that indicates when the bus is active on that feeder. These digital inputs are referred to as Active Bus Indications. The D25 monitors the Active Bus Indications to determine which set of PTs to use for the feeder. This unique ability allows for dual-busbar schemes to be reconfigured dynamically, maintaining a system-metering scheme without requiring an external voltage selection scheme.

Auto Restoration. This application supports restoration on groups of two feeders joined by a Tie Switch and each having one breaker and zero to three feeder switches. It can accommodate up to 255 concurrent restorations with separate definitions on each feeder.

Load Shedding. The D25 bay controller can be equipped with a robust load shedding algorithm. The application monitors digital input states and digital output requests related with zones and groups in order to automatically control selected feeders. All application timing and other configuration parameters are customizable and can be changed online.

LogicLinx. An IEC 61131-3 compliant tool for creating, editing, compiling, debugging, and monitoring any PLC logic and automation functions.

AC Analog Alarming. D25 provides extensive and configurable alarming capability for AC analog values such as hysteresis parameters.

An avid collector of data and metering values.

The D25 has communication channels and analog and digital I/O modules for real time data acquisition and recording. It is capable of recording oscillography files and performing 1, 2, 2 ½, and 3-element metering on separate or bussed feeders, up to a maximum of six three-phase feeders.

Digital Fault Recording. When activated by configurable trigger conditions, D25 Digital Fault Recording software captures current and voltage waveforms as well as digital status on analog and digital channels. Up to 250 digital status inputs can be recorded and combined with 240 cycles of waveform data in standard COMTRADE files. The software stores up to 16 MB of fault data locally (approximately 150 seconds of 8 AC and 64 digital point data) for subsequent retrieval via PowerLink* Advantage or any other COMTRADE-compatible systems.

Harmonic Spectrum. The D25 can provide harmonic values (up to the 21st) on every AC Analog input and make it available to a control center.

Power Quality. The D25 can monitor power quality profile RMS values for up to 6 separate AC circuits. It has the ability to detect and report short-duration and extended-duration voltage swells, sags, and interruptions and also records the RMS voltage profiles of those events as COMTRADE format files.

Graphical Display Panel. This monochrome touchscreen panel can be configured as a fully functional local HMI with features such as interlocking and password control. Screens in the GDP can be customized to meet almost any demand.

AC Profiling. Record any AC analog value and store it in COMTRADE format. Record definitions can be customized for almost any scenario and can be triggered by any digital input. Data can be captured for as long as 5400 cycles.

Flexible I/O. Yoga every morning type flexible.

The D25 includes a modular system to increase its I/O capacity. It can accommodate up to 96 digital inputs, 32 digital outputs, 32 analog inputs (DC), and 15 AC inputs to monitor 3-phase circuits. The D25 can also support single/double digital points and accumulators.

All I/O is monitored and recorded at a 1 ms resolution. As well, the D25 can be time synchronized through IRIG-B or SNTP protocol.

Fluxbuster*. This technology enables accurate post-fault analysis. The D25 can monitor and record current waveform levels at up to the 42nd harmonic. This guarantees accurate recording of symmetrical fault current waveforms up to 20 times nominal magnitude and under offset conditions. The Fluxbuster technology does not sacrifice accuracy in order to provide a wide input range unlike many other protection devices. The Fluxbuster technology provides unparalleled accuracy of up to 0.3% of nominal (0.3% of nominal from 2% – 195% measurement range and 1.0% of nominal from 195% – 4200% measurement range).

High Current Control Card. The D25 can be equipped with a digital output module comprising of 32 relays, each rated at 10 A for 5 seconds and 4 A continuously. This can eliminate the need for separate interposing relays, reducing cost and saving valuable space within cabinets.

Scalable Analog Adapters. The D25 includes an optional 32-point analog input card that is customizable with multiple analog adapters. This enables you to pick and choose multiple types of DC analog inputs to meet a wide range of current and voltage requirements. Adapters can be changed in the field simply by plugging a different adapter.

Digital Inputs. 96 inputs are available with chatter filter to eliminate unwanted alarms. All inputs have been made extremely flexible to meet your needs; single-point, double-point and accumulators can be configured using digital inputs. The wetting voltage of digital inputs can also be selected to meet site-specific requirements.

Extension I/O Modules. The D25 can be equipped with DNP Extension I/O Modules which allow the I/O capacity to be increased by 500 digital inputs, 200 digital outputs, or 200 analog inputs (DC).

Manage Redundant I/O. The D25 is capable of managing redundant I/O based on the operational status of each device. The D25 can also maintain control functionality by redirecting a command to the final destination. This feature is unique within the GE Energy suite of devices.

Flexible IEC 61850 Bay Controller

The D25 IEC61850 server application allows any data available from any application in the unit to be modeled and presented as IEC61850 Logical Node data. The Data can come form any of the D25 internal applications or from devices connected using any of 120 protocols supported.

The D25 supports all of the IEC61850 Mandatory elements as well as an extensive list of optional components and is KEMA® certified.

IEC61850 GOOSE capability provides Peer to Peer communications between D25s any all other GOOSE enabled devices in the system. D25 meets IEC61850 Class P2/3 performances levels required for timely interlocking schemes.

D25 GOOSE also support fixed and configurable data sets ensuring compatibility with a wide range of protection relays including the GE UR relay family.

Keeps an eye on your transformers.

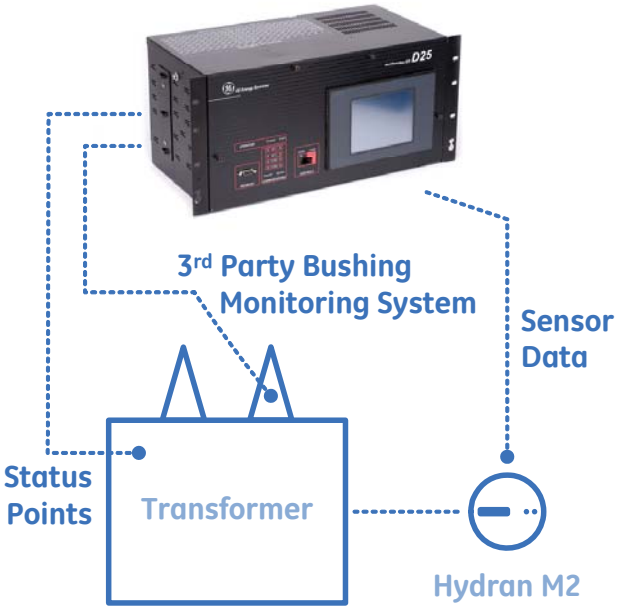
The D25 Transformer Monitoring application is a condition analysis and management system for critical power transformers. This system measures key transformer data, implements continuous on-line analysis models, and communicates critical information through the communication options supported by the D25.

On-line analysis models include:

- Load Current Model
- Cooling System Efficiency Model
- Winding Hottest Spot Model
- Insulation Aging Model
- Cooling Control Model
- Minute Average Apparent Power Model
- OLTC Temperature Differential Model
- Moisture Model
- On-Line Dynamic Loading Model

The dynamic loading model incorporates outputs from the other models as well as key measurements to provide the system operator with a perspective of the overloading capabilities of the transformer.

Among other transformer sensors, the D25 provides seamless integration with GE's Hydran* and Kelman* line of products.



Specifications

Port Configurations

AC Analog Inputs	0, 3, 6, 9, 12 or 15 inputs
DC Analog Inputs	0 or 16 inputs
Digital Status Inputs	0 to 96 inputs in increments of 32
Control Outputs	0, 16, or 32 trip/close pairs or 32 isolated high current outputs with 8 optional current supervision
Host Comm Ports	2 serial (38.4 Kbps) or 2 Ethernet (10 Mbps)
IED Comm Ports	2 (38.4 Kbps)
Time Sync	1 IRIG-B Input
Configuration Port	1 Maintenance port
Display	1 D25 Display Port (9600 bps)

Power Requirements

Input Options	20-60 Vdc 60-150 Vdc/85-135 Vac 50/60 Hz (CE) 150-350 Vdc/187-265 Vac 50/60 Hz (CE)
Maximum Power Consumption	65 W
Maximum Inrush Current on Cold Start	18 A (peak Amps)
Maximum Inrush Current under Dynamic Conditions [1]	45 A (peak Amps)[1]

Communication Ports

Maintenance Port	WESMAINT II+ DB-9-F, RS-232 @ 9600 bps
D25 Display Port	DB-9-F, RS-485 @ 9600 bps
UTC Time Port	DB-9-F, RS-232/RS-422
Standard Serial Comm. Ports (2)	DB-9-F, RS-232/485 up to 38400 bps
Optional Comm. Ports (2)	DB-9-F, RS-232/485 up to 38400bps, software configurable or Ethernet/802.3 10BASE-T or 10BASE-FL

AC Analog Value Measurement

Configuration Options	Direct AC analog inputs from CTs and PTs. Supports up to six 3-phase circuits Scaling factors are provided to allow fine-tuning of the nominal values of the AC inputs to match the actual nominal values of the field sources.
Analog Inputs	15 AC analog inputs organized in groups of three (3) inputs, Transformer isolated
Sampling Rate	64 samples per Power Line Cycle
A/D Resolution	13 bits plus sign

AC Voltage Inputs

Nominal PT Input Options	63.5 Vrms, 69.3 Vrms, 110 Vrms, 120 Vrms, 220 Vrms
Measurement Range	0% to 250% of nominal
Overload Voltage	250% of nominal continuous 350% of nominal for one (1) minute
Burden	Less than 0.1 VA @ nominal input
Accuracy [2]	±0.5 % of nominal Frequency ±0.01 Hz Phase angle ±0.5°

AC Current Inputs

Nominal CT Input Options	1 A *rms* or 5 A *rms*
Measurement Range	2% to 1600% of nominal for value measurement 2% to 4200% (asymmetrical) of nominal for DFR and protection
Thermal Overload	4 times nominal – continuous 30 times nominal – 10 seconds 100 times nominal – 1 second 10 minute duty cycle for inputs greater than 4 times nominal
Burden	16x 1A & 5A CT – Less than 0.2VA @ nominal input. 42x 1A CT – Less than 0.05 VA @ nominal input. 42x 5A CT – Less than 0.1 VA @ nominal input.
Accuracy [2]	16x 1A & 5A CT- ±0.5% of nominal 42x 1A & 5A CT- ±0.3% of nominal Frequency ±0.03 Hz Phase angle ±0.5°

General AC Features

RMS Data	RMS magnitudes and phase angles for measured inputs. Supports L-L or L-N PT connections with calculation of L-L or L-N magnitudes and phase angles
Metering	Electrical Power supports 1, 2, 21/2 and 3 element metering providing active, reactive, and apparent power; power factor per phase and circuit totals. Also provides displacement power factor angle per phase
Power Quality	THD and harmonic spectrum data to the 21st harmonic for each AC input
Electrical Energy	Import and export accumulators for kWh, kVAh, kVArh
Unbalance Detection	Symmetrical component circuit unbalance detection and maximum deviation from average methods
Alarming	High and low alarms on any analog data with qualifications of one power cycle or more
Line Frequency	50/60 Hz
Oscillography	Waveform and event recording on up to 15 AC analog channels simultaneously with concurrent capture of up to 250 digital input points Analog sample rate: 64 samples/cycle Record length: 240 cycles with programmable pre- and post-capture times
Per-cycle Data Logging	Capturing selected AC values and digital data every power cycle
Protection	3-step definite time over-current protection and breaker failure protection on all configured circuits
Accuracy [2]	Active/reactive/apparent power ±0.96% of nominal Power factor ±2.85% of FS Active/reactive energy ±2% of reading Apparent energy ±0.5% of reading

DC Analog Value Measurement

Configuration Options	Scaling factors are provided to allow fine-tuning of the nominal values of the DC inputs to match the actual nominal values of the field sources
Analog Inputs	16 DC analog optically isolated differential inputs
Sampling Rate	40 samples/second @ 50 Hz; 50 samples per second @ 60 Hz; 2 samples are averaged before captured in the database (effective reporting rate is 20 samples/sec @ 50 Hz, 25 samples/sec @ 60 Hz
A/D Resolution	14 bits plus sign

[1] 5 seconds on and 1 second off

[2] Refer to *D25 Product Information* (PRPI-040) for details

DC Current

Nominal Input Range Options	±1 mA, ±5 mA, ±10 mA, or ±20 mA
Input Burden	5K to 250Ω (1 to 20 mA)
Accuracy	±0.10% of full scale
Temperature Coefficient	±30 ppm/°C

DC Voltage

Nominal Input Range	±5 Vdc
Measurement Range	±6 Vdc
Overload Voltage	±30 Vdc (NM) continuous, ±200 Vdc (CM) continuous
Input Impedance	More than 10 MΩ
Accuracy	±0.05% of full scale
Temperature Coefficient	±15 ppm/°C

Digital Inputs

General	Up to 96 optically isolated (5000 Vrms), organized in cards of 32 inputs
Digital Input Options	One of: 12, 24, 48, 120, 250 Vdc ±20%, bipolar inputs
Burden	1.2 to 10 mA, maximum power dissipation is 0.5 W per input
Contact Debounce	Three-level programmable software filtering for debounce and chatter
Configurable Input Types	Digital input, Sequence of Events with time-tagging accuracy of 1 ms, Change of State, Up to 8 digital inputs as Pulse Accumulator
On-Board Wetting Supply (not available with graphical display)	24 Vdc or 48 Vdc (depends on supply ordered), isolated, external wetting optional

Digital Outputs (D25KE)

Standard Digital Outputs	16 or 32 relay outputs switch one side of the controlled load; single component failure protection and detection preventing false control of any coil driver output; select-check-before execute security; master trip/master close bus scheme
Configurable Output Types	Latching (On/Off), Trip/Close, Raise/Lower, Programmable pulse duration from 5 to (2^{31}-1) ms in 1 ms intervals
Output Relay Contacts	1 Form A
Maximum Switching Power	60 W or 125 VA (resistive)
Maximum Switching Voltage	75 Vdc or 50 Vac (DB-25) 120 Vdc (FACE-40)
Maximum Switching Current	2 A
Maximum Carrying Current	2 A
Operate Time	5 ms
Release Time	5 ms
Breakdown Voltage	1500 Vac for one minute (coil to contact)
Isolation between Adjacent Outputs	300 Vdc (with compression terminal block), 100 Vdc (with DB-25 connectors)
Interposing Relay Option	Groups of 8 digital outputs can be directly interfaced to D20KI module

High Current Digital Outputs (D25HC KE)

Standard Digital Outputs	32 isolated digital outputs with single component failure protection and detection, preventing false control of any coil driver output; select-check-before execute security 8 outputs with optional current supervision seal-in function
Configurable Output Types	Raise/lower, Programmable pulse duration from 5 to (2^{31}-1) ms in 1 ms intervals
Output Relay Contacts	8x 1 Form C 16x 1 Form A 8x 1 Form A with optional current seal-in function
Maximum Make Current	10 A for 5 seconds
Maximum Continuous Carrying Current	4 A
Maximum Break Current	10 A @ 28 Vdc 0.85 A @ 60 Vdc 0.45 A @ 120 Vdc 0.3 A @ 300 Vdc
Maximum Switching Voltage	300 Vdc or 300 Vac
Current Sensing Level for Seal-In Function	Min. 60 mA Max. 200 mA
Operate Time	7 ms
Release Time	10 ms
Isolation Between Adjacent Outputs	300 Vdc
Simultaneously Operated Outputs	Maximum 16, includes maximum 4 with current supervision

Auxiliary Digital Outputs

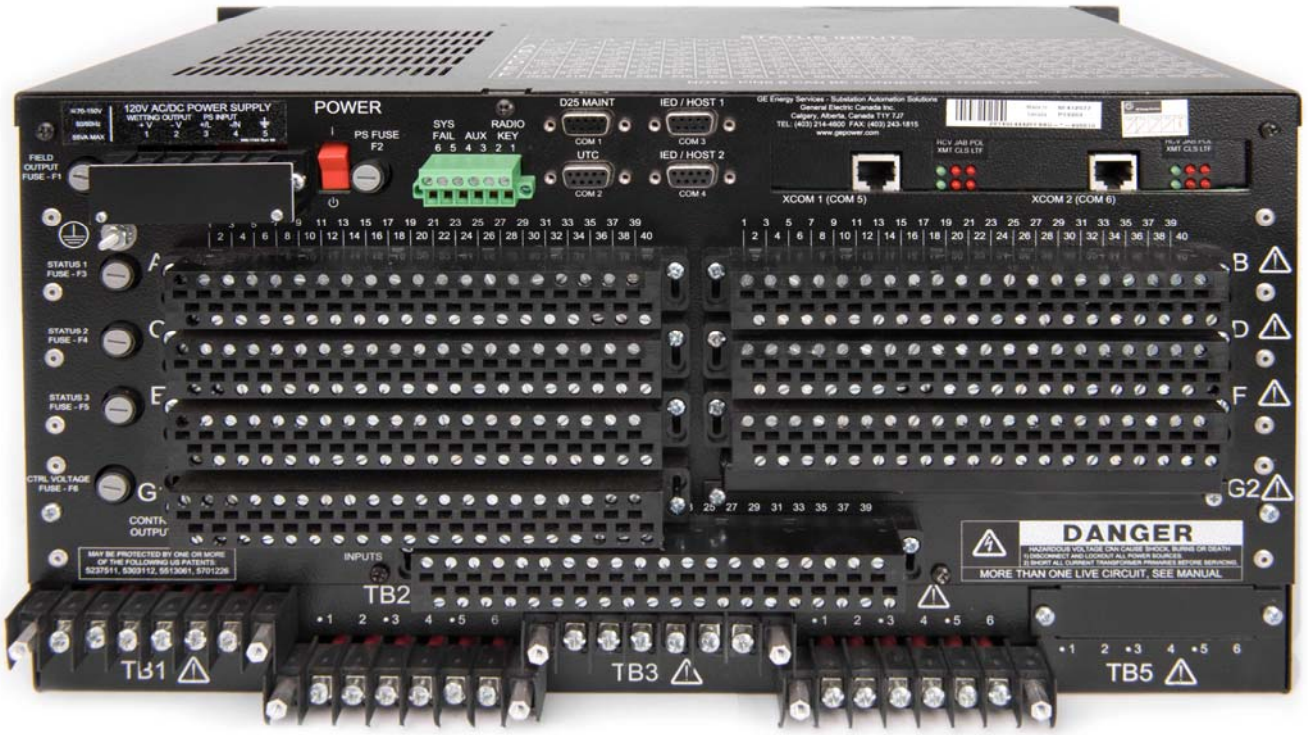
Radio Keying Output Relay Contact	1 Form A
Auxiliary Control Output Relay Contacts	1 Form A
System Fail Relay Contacts	1 Form B
Maximum Switching Power	60 W (resistive), 125 VA
Maximum Switching Voltage	75 Vdc or 50 Vac
Maximum Switching Current	2 A
Maximum Carrying Current	2 A
Breakdown Voltage	1500 V (coil to contact)

Available Displays

Alphanumeric	Backlit LCD with keypad
Graphical	Backlit LCD with touch screen, 320 X 240 pixels, 4.76" X 3.58"

Physical Specifications

Dimensions	19" (48cm) Width, 8.75" (22cm) Height, 9" (23cm) Depth
Weight	31 lbs. (14.1kg) maximum
Operational Temperature	-20°C to +70°C (without display), 0°C to +60°C (with alphanumeric display), 0°C to +50°C (with graphical display)
Storage Temperature	-40°C to +90°C (without alphanumeric display), -20°C to +70°C (with alphanumeric display), 0°C to +70°C (with graphical display)
Humidity Rating	0 to 95% relative humidity, non-condensing
Environmental Rating	IP20
Installation/Over-voltage category	Class II
Pollution Degree	2



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