The BE1-GPS100 is a multifunction, programmable numerical protection, meter, and control relay. Functions provided include three phase voltage controlled, voltage restrained, or standard overcurrent, phase residual and independent ground overcurrent, negative sequence overcurrent, breaker failure, over/underfrequency, phase over/undervoltage, zero sequence over/undervoltage, and negative sequence overvoltage, forward or reverse power, loss of excitation, volts per hertz, sync check, sensitive third harmonic ground fault monitoring, breaker monitoring and control and metering functions, all in an integrated system.

**ADVANTAGES**

- BESTlogic provides the user with very high flexibility in configuring a protection and control system.
- Substantial functionality in a small package, useful where space is very limited but high functionality is needed.
- Programmable LCD display allows the relay to replace local indication and control functions, such as panel metering, alarm annunciation, and control switches.
- Three independent communication ports with protocol support allows integration with distributed control systems.
- Provides optional separate ground current input for those applications where this is required.
- Includes frequency tracking and voltage restrained overcurrent for backup and cogeneration applications.
- Includes Real Time Clock with 8 hour capacitor ride through and optional battery backup.
- Available in fully drawout half rack case. Two Basler Electric half rack IEDs (Intelligent Electronic Devices) can be dovetailed together to mount in a standard 19-inch equipment rack with no special mounting hardware.
- Available in fully drawout S1 and S1 double-ended cases with test paddles for retrofit applications. The S1 case, with available adapter plates, fits cutout, drilling and behind panel projection dimensions for common Basler Electric, GE and Westinghouse unit case relays.

**WINDOWS® SOFTWARE**

Interface for setting and communicating with Basler protection products.

Request BESTCOMS for BE1-GPS100 (includes “settings compare” feature)

An evaluation copy of BESTWAVEplus program and manual for viewing oscillography files stored in COMTRADE format are provided with the relay. Validation and updates of the program may be obtained from www.BESTWAVEPLUS.com.

**ADDITIONAL INFORMATION**

**INSTRUCTION MANUAL**
Request publication 9318700990

**MODBUS™ INSTRUCTION MANUAL**
Request publication 9318700991

**DNP 3.0 INSTRUCTION MANUAL**
Request publication 9318700992
FEATURES

PROTECTION
- Phase and Neutral Instantaneous Overcurrent elements with settable time delay: 50TP, 50TN
- Phase, Neutral, and Negative Sequence Time Overcurrent elements: 46, 51P, 51N, 151N
- Phase overcurrent element (51P) includes capability of voltage restraint or voltage control.
- Internally calculated phase residual, 3I0, available on all relays. Optional independent ground input available. Neutral overcurrent elements (50TN, 51N, 151N) monitor either ground or calculated residual.
- Negative sequence overcurrent element (46) includes algorithm for timing based on generator K factors or may use standard TOC curves.
- All U.S. and IEC timing curves plus user programmable curve.
- Phase Undervoltage and Overvoltage elements: 27P, 127P, 59P, 159P. Elements use a 1 of 3, 2 of 3, or 3 of 3 logic, and monitor either line-line or line-ground voltages.
- Auxiliary Undervoltage and Overvoltage elements: 27X, 127X, 59X, 159X. Elements monitor either fundamental or third harmonic on the optional auxiliary 4th VT input, or fundamental phase residual, 3V0, of the phase inputs.
- Negative Sequence Overvoltage element: 47
- Overexcitation, Volts per Hertz element: 24
- Four Under/Overfrequency elements: 81, 181, 281, 381
- Forward/Reverse Power: 32, 132
- Loss of Excitation (offset sloped VAR flow algorithm): 40Q, 140Q
- Breaker Failure protection function: BF
- 4 general purpose logic timers: 62, 162, 262, 362
- Inadvertent energization protection using 50 elements supervised by 81 and/or 27 elements
- 100% stator ground fault protection using auxiliary voltage elements for ground overvoltage and 3rd harmonic ground undervoltage
- Sync check and/or dead bus close supervision 25, 27X (Requires optional 4th VT sensing circuit)
- Programmable Logic using BESTlogic
- Two protection settings group controllable via relay logic, 43 Aux switches, and hardwired inputs. Setting group selection may control tripping logic.
- Fuse loss detection (60FL) protects against false trip due to loss of voltage sensing.

CONTROL
- Virtual breaker control switch—controllable from both HMI and com. ports: 101
- Four virtual selector switches—controllable from both HMI and com. ports: 43, 143, 243, 343
- Communication port control of 101 and #43 switches allows for SCADA control of relay and breaker.

INSTRUMENTATION
- Real time A, B, C phase current, voltage; frequency; and derived neutral and negative sequence current and voltage.
- Real Time 3 phase Watts, VARs, and Power Factor.

REPORTS
- Current demands for phase, ground, and negative sequence currents, and forward and reverse Watts and VARs—magnitudes and time stamps are recorded for today's peak, yesterday's peak, and peak since reset.
- kWh and kVARh, forward and reverse
- Breaker operations counter and contact interruption duty. Breaker operate time also available.

FAULT RECORDING
- 255 event sequence of events report with I/O and alarm sub-reports
- Fault Reporting; 1 or 2 oscillography records per fault report
- 16 fault summary reports; two most recent Fault Summary Records saved to non-volatile memory
- Total number of fault and oscillography records settable from 6 to 16
- Total of 240 cycles oscillography memory @ 12 samples/cycle
- COMTRADE format

COMMUNICATION PORTS
- Three independent general purpose communication ports
  - Front RS-232 ASCII communications
  - Rear RS-232 ASCII communications
  - Rear RS-485 ASCII, Modbus®, DNP®3.0, and TNP protocols
- IRIG-B time sync (unmodulated)

SELF TEST AND ALARM FUNCTIONS
- Relay fail, major alarm, and minor alarm LEDs, and fail-safe alarm output contact (closed or open).
- Extensive internal diagnostics monitor all internal functions of the relay.
- More than 20 additional alarm points—programmable for major or minor priority including:
  - User defined logic state alarms that may be associated with any user specified relay logic state or relay protective element status.
  - Phase current, and forward and reverse Watt and VAR demand alarm.
  - Neutral and negative sequence unbalance demand alarms.
The BE1-GPS100 Generator Protection System provides three phase, ground, and negative sequence overcurrent, voltage, frequency, reverse power, loss of excitation, volts per hertz, and sync check protection and is intended for use in any generator protection application. Its unique capabilities make it ideally suited for applications with the following requirements:

- Applications that require the flexibility provided by wide setting ranges, multiple setting groups, multiple coordination curves, and an extremely versatile programmable logic, in one unit.
- Applications that require the economy and space savings provided by a multifunction unit. This one unit can provide all of the protection, control, metering, and local and remote indication functions required in many typical units.
- Retrofit applications requiring the features and functions of the GPS-100 in an S1 case.
- Applications where the small size and limited behind-panel projection facilitates modernizing protection, metering, and control systems in existing substations.
- Applications that wish to have the protection redundancy provided by having differential relaying in an independent protective relaying package.
- Applications that require communications and protocol support.
- Applications where drawout construction is desirable.
- Applications that require high accuracy across a wide frequency range.
- Applications where the capabilities of intelligent electronic devices (IEDs) are used to decrease relay and equipment maintenance costs.

FEATURES, continued

- Three breaker alarm points programmable for slow trip, interruption duty threshold, or operations counter.
- Trip circuit voltage and continuity monitor.

PROGRAMMABLE I/O
- Four programmable inputs.
- Five programmable outputs and one dedicated programmable alarm output.

HARDWARE FEATURES
- Three case configurations
  - S1: Basler/GE style (with test plug)
  - S1 Double ended: Basler/GE style (with test plug)
  - H1: Half Rack
- Active CT technology for low burden and increased dynamic range.
- Flash Memory for upgrading embedded programming without changing chips.
- Real Time Clock with 8 hour capacitor ride through and optional battery backup.
- Integral HMI with 2x18 character display and keypad for editing settings and resetting targets and alarms.
- Wide range ac/dc power supply options provide long hold up time to ride through dips on power source. (100 ms with 4 output relays energized, upon complete loss of source. Starting voltage 125Vac for Option 1 (48/125Vac/dc) and 250Vac for Option 2 (125/250Vac/dc))
- Automatically adjusts sampling rate for sensed line frequency over the range of 10-75 Hz to provide high accuracy of protective elements over a wide operating range.

Figure 1 - Advanced HMI (Human Machine Interface)

APPLICATIONS

The BE1-GPS100 Generator Protection System provides three phase, ground, and negative sequence overcurrent, voltage, frequency, reverse power, loss of excitation, volts per hertz, and sync check protection and is intended for use in any generator protection application. Its unique capabilities make it ideally suited for applications with the following requirements:

- Applications that require the flexibility provided by wide setting ranges, multiple setting groups, multiple coordination curves, and an extremely versatile programmable logic, in one unit.
- Applications that require the economy and space savings provided by a multifunction unit. This one unit can provide all of the protection, control, metering, and local and remote indication functions required in many typical units.
- Retrofit applications requiring the features and functions of the GPS-100 in an S1 case.
- Applications where the small size and limited behind-panel projection facilitates modernizing protection, metering, and control systems in existing substations.
- Applications that wish to have the protection redundancy provided by having differential relaying in an independent protective relaying package.
- Applications that require communications and protocol support.
- Applications where drawout construction is desirable.
- Applications that require high accuracy across a wide frequency range.
- Applications where the capabilities of intelligent electronic devices (IEDs) are used to decrease relay and equipment maintenance costs.
FUNCTIONAL DESCRIPTION

The BE1-GPS100 is a multifunction, numerical relay that provides a comprehensive mix of protective functions to detect generator faults and abnormal operating conditions along with control and metering functions in an integrated system. This system is suitable for any generator application and many utility/cogeneration facility intertie applications. Twelve sample per cycle digital signal processing, with frequency compensation, extracts the fundamental component for high accuracy with distorted waveforms and at off-nominal frequency operation.

The unit has one set of three phase current and voltage sensing inputs to provide all common protective functions except generator differential, 87G (which, provided as a separate relay, prevents the "all your eggs in one basket" pitfall). The voltage sensing circuits automatically configure themselves internally for 1 phase, 3 phase 3 wire, or 3 phase 4 wire VT circuits. An optional 4th auxiliary voltage input is available for either generator ground sensing or bus voltage sensing.

The BE1-GPS100 can also be ordered with an optional independent ground current input, typically used for application with a separate ground CT such as a flux balancing window CT or to provide ground backup protection for the generator step up transformer.

The S1 and half rack cases are fully drawout with current circuit shorting provisions. Two Basler Electric half rack IEDs (Intelligent Electronic Devices) such as primary and backup BE1-GPS100s or the BE1-851 or -951 Overcurrent Protection Systems can be dovetailed together to mount in a standard 19" equipment rack with no special mounting hardware. Replacing an obsolete GE or Westinghouse single function relay with a GPS-100 in an S1 case upgrades existing protection and monitoring without having to cut the panel.

Three independent communications ports, along with built-in support for Modbus® and other common protocols, provide easy access to integrating the protection, control, metering, and status monitoring functions into a substation automation system. The standard IRIG-B port provides time synchronization from a master clock.

Real time metering provides Watt, Watt-hour, VAR, VAR-hour, voltage, amp, and unbalance loading telemetry for the protected circuit. Contact sensing inputs and alarm monitoring functions provide real time status information. Remote control is provided by virtual control and selector switches with select-before-operate control of programmable outputs.

BESTlogic
BESTlogic programmable logic provides the user with high flexibility in configuring a protection and control system.

Each of the protection and control functions in the BE1-GPS100 is implemented as an independent function block that is equivalent to its single function, discrete device counterpart. Each independent function block has all of the inputs and outputs that the discrete component counterpart might have. Figures 8A and 8B show each of the independent function blocks available for use in the BE1-GPS100 and their associated logic I/O. Programming BESTlogic is equivalent to choosing the devices required by your protection and control scheme and drawing schematic diagrams to connect the logic inputs and outputs to obtain the desired operational logic.

The BE1-GPS100 relay can store, as user settings, one user programmable, custom logic scheme. To save you time and provide guidance, preprogrammed logic schemes have also been provided. Any of the preprogrammed schemes can be copied into the logic settings, then modified to the application's needs. User-programmable variable and virtual switch names make relay event reports user-friendly.

BESTlogic provides the protection engineer with the flexibility to set up this powerful multifunction system with the same freedom that was once enjoyed with single function, discrete devices. It is no longer necessary to compromise your standard protection and operating practices to work within the limitations in programmability of previous multifunction devices.
**FUNCTIONAL DESCRIPTION, continued**

![Diagram of electrical connections](image)

*Independent Ground input is optional.

**Figure 2B - Typical External Sensing Connections, with Vx and IG Used for Stator Ground Fault**

![Diagram of electrical connections](image)

*Independent Ground input is optional.

**Figure 2C - Typical External Sensing Connections, with Vx Used for Sync Check and IG Used for Ground Differential Overcurrent**

**Figure 3 - Typical External Connections**

*NOTES:*

1) CONNECTIONS SHOWN ARE FOR USE WITH PPC-PROGRAMMED LOGIC
   SOFTWARE. SPECIFIC CONFIGURATION DEPENDS ON SPECIFIC APPLICATION.
   GENERATOR PROTECTION WITH SEQUENTIAL TRIP AND SYNC CHECK LOGIC.
   ALL INPUTS AND OUTPUTS ARE FULLY PROGRAMMABLE USING BE1-GPS.

*BE1-GPS100*
FUNCTIONAL DESCRIPTION, continued

Figure 4 - Typical Application, Single Line

Figure 5 - BE1-GPS100 Rear Panel Connections

Figure 6 - BE1-GPS100 S1 Rear Panel Connections

Figure 7 - BE1-GPS100 S1 Double-Ended Rear Panel Connections
GENERAL SPECIFICATIONS

5 Amp CURRENT INPUTS
- Continuous rating: 20A
- One Sec. Rating: 400A
- Saturation limit: 150A
- Burden: <10 milliohms

1 Amp CURRENT INPUTS
- Continuous rating: 4A
- One Sec. rating: 80A
- Saturation limit: 30A
- Burden: <22 milliohms

PHASE AC VOLTAGE INPUTS
- Continuous: 300V, Line to Line
- One Sec. rating: 600V, Line to Neutral
- Burden: Less than 1VA @ 300Vac

AUXILIARY AC VOLTAGE INPUT
- Continuous: 150V
- One Sec. rating: 600V
- Burden: Less than 1VA @ 150Vac

A/D CONVERTER
- Sampling Rate: 12/cycle, adjusted to input frequency 10-75Hz

POWER SUPPLY
- Option 1: DC range 35 - 150V
  AC range 55 - 135V
- Option 2: DC range 90 - 300V
  AC range 90 - 270V
- Option 3: DC range 17 - 32V (down to 8V for momentary dips)
- Burden: 6 watts continuous, 8 watts maximum with all outputs energized

TRIP CONTACTS
- Make and carry: 30A (0.2sec)
- Continuous: 7A
- Break: 0.3A DC (L/R=0.04)

CONTROL INPUTS

<table>
<thead>
<tr>
<th>Power Supply</th>
<th>Low Range</th>
<th>High Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option</td>
<td>Turn On Voltage Range</td>
<td>Burden</td>
</tr>
<tr>
<td>1) 48/125 Veo/Vdo</td>
<td>28-38 Vee/do</td>
<td>23 k ohms</td>
</tr>
<tr>
<td>2) 125/200 Veo/Vdo</td>
<td>69-100 Vee/do</td>
<td>66 k ohms</td>
</tr>
<tr>
<td>3) 24 Vdo</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Control input opto-isolators pass sensing current in only one direction. They will recognize AC voltage with appropriate debounce timer settings (4ms PU, 12ms DO for 60Hz applications).

COMMUNICATION PORTS
- Response time: <100 mSec for metering and control functions
- Baud rate: 300 - 19200

ELECTRICAL ENVIRONMENT
- IEC 255-5 Insulation Test for Electrical Relays
  Impulse and Dielectric Strength (2000 Vac at 50/60Hz)
- IEC 255-22-1 1 MHz Burst Disturbance Tests for Electrical Disturbance Tests for Measuring Relays and Protection Equipment
- EN 61000-4-4 Electrical Fast Transient/Burst Immunity Test
- EN 61000-4-3 Radiated, Radio-frequency, Electromagnetic Field Immunity Test
- IEEE C37.90.3 (Jan. 01) Draft Standard Electrostatic Discharge Tests for Protective Relays
- EN 61000-4-2 Electrostatic Discharge Immunity Test

MECHANICAL ENVIRONMENT
- Operating temperature range: -40°C to 70°C (-40°F to 158°F)
  *LCD Display is inoperative below -20°C.
- Storage temperature range: -40°C to 70°C (-40°F to 158°F)
- Qualified to IEC 255-21-1 (Class 1) Vibration Tests for Electrical Relays
- Qualified to IEC 255-21-2 (Class 1) Shock and Bump Tests for Electrical Relays

CERTIFICATIONS
- CE Qualified to meet or exceed standards required for distribution in the European Community.
- UL Recognized per Std. 508, File E97033
- CSA Certified per CAN/CSA-C22.2 Number 14-M91
- DNP3.0 IED Certified, Subset Level 2 by SUBNET Solutions, Inc.
- GOST-R certified per the relevant standards of Gosstandart of Russia

CASE SIZE
- H1: 10.50" (266.7mm) W x 3.47" (88.1mm) H x 9.10" (231.1mm) D with mounting flanges
  (8.5"W without mounting flanges)
- S1: 6.65" (168.91mm) W x 9.32" (236.73mm) H x 9.51" (241mm) D
- S1 double ended: 6.65" (168.91mm) W x 9.32" (236.73mm) H x 9.51" (241mm) D (includes relay cover)

SHIPPING WEIGHT
- H1: Approx. 10 pounds (4.54 kg)
- S1: Approx. 11.2 pounds (5.08 kg)
- S1 double-ended: 12.8 pounds (5.81 kg)

WARRANTY
- 7 years
Figure 8A - BESTlogic Function Blocks
Figure 8B - BESTlogic Function Blocks
PERFORMANCE SPECIFICATIONS

INSTANTANEOUS OVERCURRENT WITH SETTABLE DELAY (50TP, 50TN)

Pickup:
- 5A CT: 0.5 - 150.0A
- 1A CT: 0.1 - 30.0A

PU time with TD=0.000 Sec
- 2 cyc for P&G @ 5 x PU
- 3 cyc for N&Q @ 5 x PU

Delay time: 0.000 - 60 sec

Time Accuracy:
- ±0.5% or ±½ cyc for P & N
- ±0.5% or ±1 cyc for Q

TIME OVERCURRENT (51P, 51N, 151N)

Pickup:
- 5A CT: 0.5 - 16.0A
- 1A CT: 0.1 - 3.20A

Time dial:
- TD=K=0 - 99 for 46 curve
- TD=0.0 - 9.9 for all other curves

Time-Current Characteristics:

The following expression describes the inverse time current characteristic for each curve:

\[
T_T = \frac{AD}{M^B} + BD + K = \text{Time to trip}
\]

\[
T_R = \frac{RD}{M^{C-1}} = \text{Time for decaying reset}
\]

where \( D \) = Time dial, \( M \) = Multiple of PU and A, B, C, N, K and R are constants that govern the shape of each curve. The protection engineer can set the constants for the \( P \) (programmable) curve to achieve virtually any characteristic.

51P VOLTAGE CONTROL (27R)

Control Modes:
- Uncontrolled
- Voltage controlled
- Voltage restrained

Control/Restraint Range: 30 - 250V

Restrained Mode Characteristic: (see below)

<table>
<thead>
<tr>
<th>Curve Type</th>
<th>Constants</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>A = 0.2663, B = 0.03393, C = 1.000, D = 1.2969, E = 0.028, F = 0.5000</td>
</tr>
<tr>
<td>S2</td>
<td>A = 0.0286, B = 0.02080, C = 1.000, D = 0.9844, E = 0.028, F = 0.0940</td>
</tr>
<tr>
<td>L1</td>
<td>A = 5.6143, B = 2.18592, C = 1.000, D = 1.000, E = 0.3125, F = 0.028, G = 7.8001</td>
</tr>
<tr>
<td>L2</td>
<td>A = 2.3955, B = 0.21359, C = 1.000, D = 1.000, E = 0.8750</td>
</tr>
<tr>
<td>D</td>
<td>A = 0.4797, B = 0.12840, C = 1.000, D = 1.5625, E = 0.028, F = 1.7500</td>
</tr>
<tr>
<td>M</td>
<td>A = 0.3022, B = 0.0991, C = 1.000, D = 0.9825, E = 0.028, F = 8.0000</td>
</tr>
<tr>
<td>H</td>
<td>A = 8.9341, B = 0.1042, C = 1.000, D = 0.4375, E = 0.028, F = 0.8868</td>
</tr>
<tr>
<td>I2</td>
<td>A = 0.2747, B = 0.1042, C = 1.000, D = 0.4375, E = 0.028, F = 0.8868</td>
</tr>
<tr>
<td>V1</td>
<td>A = 5.4678, B = 0.1042, C = 1.000, D = 0.4375, E = 0.028, F = 0.8868</td>
</tr>
<tr>
<td>V2</td>
<td>A = 4.4309, B = 0.1042, C = 1.000, D = 0.4375, E = 0.028, F = 0.8868</td>
</tr>
<tr>
<td>E1</td>
<td>A = 7.7624, B = 0.1042, C = 1.000, D = 0.4375, E = 0.028, F = 0.8868</td>
</tr>
<tr>
<td>E2</td>
<td>A = 4.9883, B = 0.1042, C = 1.000, D = 0.4375, E = 0.028, F = 0.8868</td>
</tr>
<tr>
<td>A</td>
<td>A = 0.0114, B = 0.0991, C = 1.000, D = 0.9825, E = 0.028, F = 8.0000</td>
</tr>
<tr>
<td>B</td>
<td>A = 1.4636, B = 0.0991, C = 1.000, D = 0.9825, E = 0.028, F = 8.0000</td>
</tr>
<tr>
<td>C</td>
<td>A = 8.2506, B = 0.0991, C = 1.000, D = 0.9825, E = 0.028, F = 8.0000</td>
</tr>
<tr>
<td>G</td>
<td>A = 12.1212, B = 0.0991, C = 1.000, D = 0.9825, E = 0.028, F = 8.0000</td>
</tr>
<tr>
<td>F</td>
<td>A = 0.0000, B = 0.0991, C = 1.000, D = 0.9825, E = 0.028, F = 8.0000</td>
</tr>
<tr>
<td>46</td>
<td>A = 0.0000, B = 0.0991, C = 1.000, D = 0.9825, E = 0.028, F = 8.0000</td>
</tr>
<tr>
<td>P0</td>
<td>A = 0.0000, B = 0.0991, C = 1.000, D = 0.9825, E = 0.028, F = 8.0000</td>
</tr>
</tbody>
</table>

NEGATIVE SEQUENCE OVERCURRENT (46)

Pickup:
- 5A CT: 0.1 - 16.0A
- 1A CT: 0.02 - 3.20A

Time dial:
- TD=K=0 - 99 for 46 curve
- TD=0.0 - 9.9 for all other curves

Time-Current Same curves as 51 Characteristics: elements

BREAKER FAILURE (BF)

Time:
- 50 - 999mSec

Dropout:
- 5A CT: 0.5A
- 1A CT: 0.1A

Time Accuracy:
- ±0.5% or +1½ cyc / -½ cyc

VOLTS/HZ (24)

Pickup:
- 5A CT: 0.02 - 12.0A
- 1A CT: 0.02 - 3.20A

Delay Time:
- Inverse Squared Curve

\[
T_T = (M-1)^2 \ 
T_R = D_R \times FST \times 100
\]

where \( M = Pickup \ V/Hz \)

\( T_T = \text{Time to Trip} \)

\( T_R = \text{Time to Reset} \)

\( D_T = \text{Time Dial, Trip} \)

\( D_R = \text{Time Dial, Reset} \)

Actual V/Hz

\[
M = \text{Pickup V/Hz}
\]

ET = Elapsed Time

FST = Full Scale Trip Time (\( T_T \))
PERFORMANCE SPECIFICATIONS, continued

SYNC CHECK (25)
 Delta Phase Angle: 1 - 99 degrees
 Delta Voltage Magnitude: 1 - 20V
 Delta Frequency: 0.01 - 0.50Hz

PHASE OVER/UNDERVOLTAGE
(27P, 127P, 59P, 159P)
 Mode: 1 of 3; 2 of 3; 3 of 3
 Pickup: 10.0-300V_L-N or 10.0-300V_L-N
 Delay Time: 0.050 - 600sec.

NEGATIVE SEQUENCE OVERVOLTAGE (47)
 Pickup: 1.0 - 300V_L-N
 Delay Time: 0.050 - 600sec.

AUXILIARY / 3V0 OVER/UNDERVOLTAGE
(27X, 127X, 59X, 159X)
 Mode: Fundamental V_x, Phase 3V0, 3rd Harmonic V_x
 Pickup: 1.0 - 150V
 Delay Time: 0.050 - 600 Sec.

FREQUENCY (81, 181, 281, 381)
 Mode: Over, Under
 Pickup: 20 - 70 Hz
 Delay Time: 0.00 - 600 Sec.
 Time Accuracy: ±0.5% or ±1 cyc (plus 3 cyc recognition time), whichever is greater

POWER (32, 132)
 Mode: Forward, Reverse
 Pickup: 5A: 1.0 - 6000 Watts, 3 ph
 1A: 1.0 - 1200 Watts, 3 ph
 Pickup Accuracy: ±3% (see Instruction Manual)
 Delay Time: 0.050 - 600 Sec.

UNDEREXCITATION (40Q, 140Q)
 Pickup: 5A: 1.0 - 6000 VARs, 3 ph
 1A: 1.0 - 1200 VARs, 3 ph
 Pickup Accuracy: ±3%
 Delay Time: 0.050 - 600 Sec.

GENERAL PURPOSE LOGIC TIMERS
(62, 162, 262, 362)
 Mode: PU.DO
 1 Shot, Non-Retrig.
 1 Shot, Retrig.
 Integrating
 Latch
 T1 and T2 Delay Time: 0.000 - 9999 Sec.
 Time Accuracy: ±0.5% or ±¼ cyc

CURRENT PICKUP ACCURACY (All 46, 50 and 51)
 Phase and Ground: 5A 2% or 50mA
 1A 2% or 10mA
 Neutral and Negative 5A 3% or 75mA
 Sequence: 1A 3% or 75mA

VOLTAGE PICKUP ACCURACY (All 27, 47 and 59)
 ±2% or ±0.5V

DEFINITE TIME ACCURACY UNLESS OTHERWISE STATED (All 27, 32, 40Q, 47 and 59)
 Definite Time Accuracy: ±0.5% or ±1 cyc

SETTING GROUPS
 Setting Groups: 2
 Control Modes: External: Discrete input logic;
 Binary: Input logic

METERING
 Current Range: 5A 0.5 to 15.0
 1A 0.1 to 3.0
 Current Accuracy: ±1%
 Phase Voltage
 Range: 3W 0 - 300 V_L-L
 4W 0 - 300 V_L-L
 0 - 173 V_L-N
 Phase Voltage Accuracy: ±0.5% for
 50V<V_L-L<300V
 Auxiliary Voltage Range: 0 - 150V
 Auxiliary Voltage Accuracy: ±0.5% for
 50V<V<150V
 Watt/VAR:
 5A 0 to ±7500
 1A 0 to ±1500
 Watt Accuracy: 1% @ Unity PF
 VAR Accuracy: 1% @ Zero PF
 Energy: 0 to ±1.0E12 (F/R registers)
 Frequency: 10 - 75Hz
 Frequency Accuracy: 0.01Hz

DEMANDS (IA, IB, IC, IN, IQ, Fwd Watts, Rvs Watts, Fwd VARs, Rvs VARs)
 Demand Interval: 1 - 60 min.
 Demand Mode: Thermal

BREAKER MONITORING
 Duty Mode: I or I²
 Duty Alarm Range: 0 - to 100%
 Op Counter Alarm Range: 0 - 99999
 Trip Time Alarm Range: 20 - 1000mSec
ORDERING

SAMPLE STYLE NUMBER
The style number identification chart defines the electrical characteristics and operation features included in BE1-GPS100 relay. If the style number were BE1-GPS100 E3N1H0U, the device would have the following:

- (E) - 5 Amp nominal system with 5 Amp Independent Ground Input
- (3) - Three phase voltage sensing
- (N) - Not applicable
- (1) - 48/125Vac/Vdc power supply
- (H) - Half Rack drawout case, normally closed alarm
- (0) - ASCII Communications
- (U) - Battery backup for real time clock

NOTES:
- If case option is G or H, Cover option must be N.
- Case option must be G, H, C or D for Current Sensing Input Type B, E, or F or voltage sensing option to be 4.
- ASCII communication is standard on Com0 (front RS-232) and Com1 (rear RS-232) ports.
- Aux VT input adds 25 Sync-Check option (case option G, H, C or D).

STANDARD ACCESSORIES
9334818100 Battery Backup Replacement kit (if "U" is chosen for Option 1)
9180400108 H1 Test Case with 1 CT Terminal Block and 18-position Bottom Terminal Block
9289922100 Test box to facilitate bench testing.
9108551021 Adapter plate to mount an S1 case in a GE S2 or Westinghouse FT-21 cutout.
9108550122 Adapter plate to mount an S1 case in a Westinghouse FT-32 cutout.
9289900017 Escutcheon plate to panel mount one H1 relay.
9289900016 Escutcheon plate to panel mount two dovetailed H1 relays.
9289929100 Adapter bracket with cutout for ABB FT test switch, to mount a single H1 case in a 19" rack.
9289924100 Adapter bracket to mount a single H1 case in a 19" rack.