BE1-11g
Generator Protection System
Comm. Hardware

- Front panel USB port—no more 9-pin cables and settings
- Rear panel RS-485 port
- Rear panel IRIG-B time port
- Optional Ethernet port
  - Copper
  - Optical fiber
Software

- **BESTCOMSPlus®**
  - Settings and graphical logic
  - Drivers load automatically
  - Requires activation
- **BESTwave™ COMTRADE viewer**
- **BEST61850**—for IEC 61850 protocol
System Interface Software

- Flexible, comprehensive, intuitive, and user friendly
- Common to modern relays
- No cost
BESTlogic™ Plus

Programmable Logic

• Drag-and-drop interface with virtual switches, breaker control, timers, 7 available logic gates, and more.

• Available preprogrammed logic schemes for common applications.
System Summary

- Prevents errors
- Easy confirmation of relay setting
- Enabled and pickup set
- No pickup set
- Pickup set but mode disabled
- Disabled
Application Diagram
Time-overcurrent (51) element

- Seven TOC independent elements
- Total of 24 defined standard curves
- T (table): 4 curves user-defined
- P: programmed equation curve shape (1)
- Nine operation modes
- Reset time: instantaneous or integrated

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Program T Curves
3-Phase and Single-Phase Inputs

- Undervoltage (27, 27X)
- Overvoltage (59, 59X)
- Choice of inverse-time or definite-time

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<td>59</td>
<td>4</td>
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<td>59X</td>
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Single-phase over- (59X) and under- (27X) voltage elements have five measurement choices:

- Fundamental
- Positive-Sequence component $V_1$
- Negative-Sequence component $V_2$
- Zero Sequence component $V_0$
- Third Harmonic—180 Hz
Relay helps you test!

- Targets
- Fault Summaries
- Fault Records
  - Analyze events
  - Use COMTRADE playback
- Relay self-test
- Status reporting
- Event reporting
Reporting Aids

- Fault summaries: 255
- Oscillographic event reports: 6–32
  - 1 or 2 reports per fault
  - 240 cycles, to 32 samples/cycle
  - COMTRADE
- 1028-event sequence-of-events recorder
- Nonvolatile event memory for all
Familiarization Tests

- Power up
- Communications
- BESTCOMSPlus®
  style number
- IRIG time (if used)
- Contact sensing inputs
- Control outputs
- Current circuit
- Voltage circuits
- Power
- Aux V inputs
- Line/Bus Angle, Freq, Slip
Testing Procedure

• Reset targets
• Clear previous test logic (if needed)
• Make / modify logic and settings
  › “Save” to compile new logic
  › File > Save new settings
• “Upload settings and logic” to relay
• Perform test
• Enter results on provided report form
Loss of Excitation – Reverse Var (40Q)

Loss of Excitation - Reverse Var Based

40Q Element
Mode: Enabled
Pickup
- Secondary Var: 500.0
- Primary Var: 500.0
Time Delay (ms): 50

Diagram:

- 40Q Enabled
- Block
- Trip
- Pickup
- Output - OUT1
  - Output 1
- Trip
- Pickup
- Logic
- Output - OUT2
  - Output 2
- Fault Trigger
  - Trip
  - Pickup
  - Logic
Vector Jump (78V)

Vector Jump

78V Element
Mode
Enabled
Source
Phase VT
Pickup (°)
20
Trip Hold Time (ms)
150

Output - OUT1
Output 1

Output - OUT2
Output 2

FAULTTRIG
Trip
Pickup
Logic

Block
Trip
Pickup

78V Enabled
Neg. Seq. Overcurrent (46)

- 46 Curve
- Time dial = K factor
Neg. Seq. Overcurrent (46)
Questions?