



## BE1-1051 OVERCURRENT PROTECTION SYSTEM

The BE1-1051 is a multifunction, numerical relay that provides three phase, ground, and negative sequence directional or non-directional overcurrent protection with permissive pilot logic, directional power, four shot recloser, breaker failure, over/underfrequency, over/undervoltage, sync check, breaker monitoring, control, and metering functions in an integrated system.

### ADVANTAGES

- Each overcurrent element can be individually set for directional or non-directional control for maximum flexibility in any application.
- BESTlogic provides the user with complete flexibility in configuring a protection and control system. User programmable variable and switch names make these relays completely self documenting.
- Programmable LCD display allows the relay to replace local indication and control functions, such as panel metering, alarm annunciation, and control switches.
- Optional Direct Access Virtual Control panel can eliminate panel switches by allowing access to virtual control switch functions at the push of a button.
- Three independent communication ports with protocol support allows integration with distributed control systems.
- Optional Ethernet port with MMS/UCA2 protocol allows high performance, peer to peer communications for the next generation of integration systems.
- Provides optional separate ground current input for those applications where this is required.
- Includes frequency tracking and voltage restrained overcurrent for generator backup and cogeneration applications.
- Includes Real Time Clock with 8 hour capacitor ride through, and optional battery backup.
- Available in horizontal and vertical configurations to provide cost savings in any installation. All configurations are fully drawout and fit cutout, drilling, and behind panel projection dimensions for Basler, GE M1/M2 and Westinghouse FT32 cases.

### WINDOWS® SOFTWARE

Interface for setting and communicating with Basler protection products  
Request BESTCOMS™ for BE1-1051

### ADDITIONAL INFORMATION

#### INSTRUCTION MANUAL

Request publication 9334800990

#### TIMING CURVES

Request publication 9252000999

#### MODBUS™ INSTRUCTION MANUAL

Request publication 9334800991

#### DNP 3.0 INSTRUCTION MANUAL

Request publication 9334800992

<b>FEATURES</b> Pages 2 and 3
<b>APPLICATIONS</b> Page 3
<b>FUNCTIONAL DESCRIPTION</b> Pages 4 - 6
<b>BESTlogic</b> Pages 8 and 9
<b>SPECIFICATIONS</b> Pages 7, 10-11
<b>ORDERING INFORMATION</b> Page 12



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UHS-3  
8-01

## FEATURES

### PROTECTION

- Phase, Neutral, and Negative Sequence Instantaneous Overcurrent elements with settable time delay: 50TP, 150TP, 50TN, 150TN, 50TQ, 150TQ
- Phase, Neutral, and Negative Sequence Time Overcurrent elements: 51P, 51N, 151N, 51Q (51P elements can have voltage restraint)
- Each overcurrent element can be set for forward, reverse, or nondirectional control (67P, 67N, 67Q). Directional control is by Positive (671), Negative (672), Zero Sequence Voltage (670V) and Zero Sequence Current (670I) polarized directional units.
- Permissive Pilot logic function provides POTT or PUTT communication aided protection: P85.
- All U.S. and IEC timing curves plus user programmable curve
- Optional separate ground current input provides zero sequence current polarization and/or ground overcurrent protection for a separate ground CT.
- Switch onto fault, high speed overcurrent protection: SOTF
- Two directional power elements: 32, 132
- Overexcitation, volts per Hertz element: 24
- Phase undervoltage and overvoltage elements: 27P, 59P. Elements use 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, 59X, 159X. Elements monitor either fundamental or third harmonic on the auxiliary 4th VT input or fundamental phase residual, 3V0, of the phase inputs.
- Negative Sequence Overvoltage element: 47
- Over/Under Frequency elements: 81, 181, 281, 381, 481, 581
- Breaker Failure protection function: 50BF
- Two general purpose logic timers: 62, 162
- Virtual lockout functions latch states in non-volatile memory: 86, 186
- Four protection setting groups with external or automatic (cold load pickup, load, unbalance, recloser shot) selection modes
- Sync check with dead line/dead bus voltage monitor logic, 25, 25VM (Requires optional 4th VT sensing circuit)
- Fuse loss detection protects against false trip due to loss of voltage sensing: 60FL
- Programmable Logic using BESTlogic

### CONTROL

- Four shot recloser with zone sequence coordination and sequence controlled protective element blocking functions
- Virtual breaker control switch—controllable from both HMI and com. ports: 101
- Five virtual selector switches—controllable from both HMI and com. ports: 43, 143, 243, 343, 443
- Virtual control functions include remote tagging functionality with trip circuit monitor interlock logic.

- Hardwired "Emergency Trip" pushbutton
- Communication port control of 101 and #43 switches allows for SCADA control of relay and breaker
- Virtual switch functions can be operated directly from the front panel without scrolling the HMI when the optional Direct Access Virtual Control panel is selected.

### INSTRUMENTATION

- Real time A, B, C phase current, voltage, and frequency and derived neutral and negative sequence current and voltage
- Real Time per phase and 3 phase Watts, Vars, and 3 phase Power Factor

### REPORTS

- Current demands for phase, neutral, 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
- Demand registers stored in non-volatile memory
- Optional 4000 point log of demand readings
- kWh and kvarh, forward and reverse
- Breaker operations counter, contact interruption duty, breaker trip and close speed.
- Automatic Reclosing success statistics

### FAULT RECORDING

- 255 event sequence of events report with I/O and alarm sub-reports
- 16 event summary reports provide information on faults and close events.
- Event Reporting; 1 or 2 oscillography records per event report
- Total number of oscillography records settable from 6 to 16
- Total of 240 cycles oscillography memory @ 16 samples/cycle
- COMTRADE format
- Load compensated distance to fault
- All SER, fault and oscillographic records saved to non-volatile memory

### COMMUNICATION PORTS

- Three independent general purpose communication ports
  - Front RS-232 COM0 ASCII communications
  - Rear RS-232 COM1 ASCII communications
  - Rear RS-485 COM2 ASCII, Modbus™ or other common protocols
- Dual Ethernet port options include fiber optic 10baseF (COM3), and RJ45 10baseT connection (COM4) or redundant 10baseF connection (on COM3 and COM4).
- IRIG time sync (unmodulated)

## FEATURES, continued

### SELF TEST AND ALARM FUNCTIONS

- Relay fail, major alarm, and minor alarm LEDs, and fail-safe alarm output contact
- Extensive internal diagnostics monitor all internal functions of the relay
- More than 20 additional alarm points—programmable for major or minor priority  
Including:
  - Phase current, and forward and reverse watt and var demand alarm
  - Neutral and negative sequence unbalance demand alarms
  - Three breaker alarm points programmable for slow trip, interruption duty threshold, or operations counter
  - Trip circuit voltage and continuity monitor
  - Close circuit monitor via BESTlogic
  - Voltage Min. and Max. alarms

### PROGRAMMABLE I/O

- Eight programmable inputs
- Six programmable outputs and one dedicated programmable alarm output
- Output 1 and 6 are high speed (1/4 cycle nominal)
- Output 6 is Form C

### HARDWARE FEATURES

- Three mounting configurations
  - MX Vert: M1, M2/FT31, FT32 size, fully drawout
  - MX Horiz: panel or 19" rack mount, fully drawout
- 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 2x16 character display

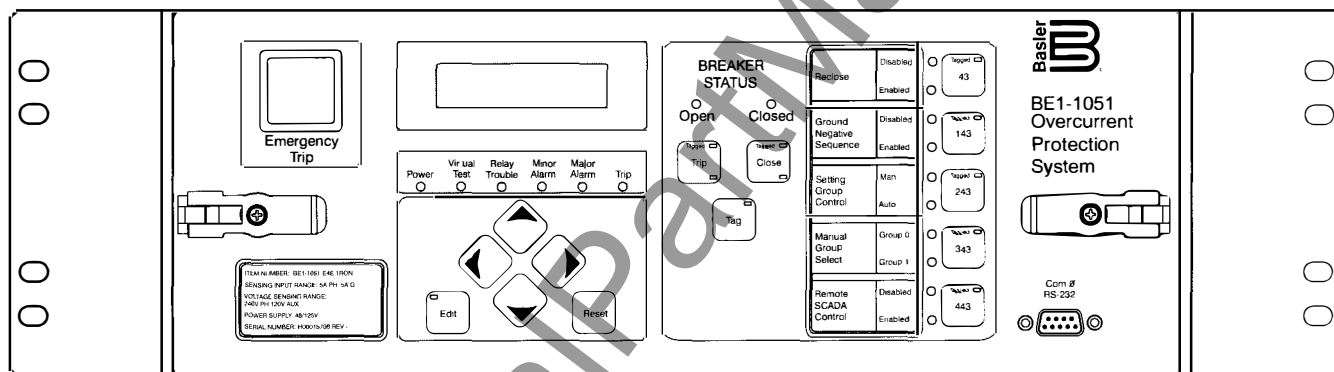


Figure 1 - Advanced HMI (Human Machine Interface) with optional Direct Access Virtual Control Panel

## APPLICATIONS

The BE1-1051 Overcurrent Protection System provides three phase, ground, and negative sequence overcurrent, voltage and frequency protection and is intended for use in any directional or non-directional overcurrent protection application. Its unique capabilities make it ideally suited for applications with the following requirements:

- Applications that require low burden to extend the linear range of CTs.
- Applications that require high accuracy across a wide frequency range such as for motor, generator, and generator step-up transformer protection or in cogeneration facilities.
- Applications that require the flexibility provided by wide setting ranges, multiple setting groups, and multiple coordination curves in one unit.
- Applications that require the economy and space savings provided by a multifunction, multiphase unit. This one unit can provide all of the protection, control, metering, and local and remote indication functions required on a typical circuit.
- Applications that require directional control and fault locating.
- Transformer backup applications where overexcitation protection is required.
- Applications that require communications and protocol support.
- Applications where the capabilities of a digital multifunction relay are required, yet drawout construction is also desirable.
- Applications where bus protection is provided by a high speed overcurrent blocking scheme on the transformer bus mains instead of a dedicated bus differential circuit.
- Applications where the capabilities of intelligent electronic devices (IEDs) are used to decrease relay and equipment maintenance costs.

## FUNCTIONAL DESCRIPTION

The BE1-1051 is a multifunction, numerical relay that provides a comprehensive mix of protective functions to detect faults and abnormal operating conditions in substations and on feeders, along with control and metering functions in an integrated system. Additional features included in this relay such as voltage restrained overcurrent (51V), overexcitation (24), synch check (25), over and under voltage (27/59) and over and under frequency (81O/U) make this system suitable for any directional or non-directional overcurrent application including feeder, transformer, generator, co-generation, bus, and load shedding applications. 16 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 for substation and feeder applications. The voltage sensing circuits automatically configure themselves internally for 3 phase 3 wire or 3 phase 4 wire VT circuits.

The BE1-1051 also can 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 neutral or tertiary of a transformer. This optional current circuit provides zero sequence current polarization for directional overcurrent protection.

An optional fourth Auxiliary Voltage input is also available. This voltage input can be connected to line side potential for synch check (25) and dead line (25VM) closing supervision or to a ground sensing VT connection for ground fault protection on the delta side of a cogeneration intertie transformer.

For directional applications, all overcurrent elements can be independently set for forward, reverse, or non-directional control. The target reporting function in the BE1-1051 automatically adapts the targets as appropriate. For example, if the 150TP and the 51P functions are set for directional control, they post targets for an A phase fault as "167A" for directional instantaneous trip or "67TA" for directional time trip respectively. Directional control is by sequence directional elements. The zero sequence current polarized element uses the optional independent ground input for its polarization signal. The zero sequence voltage polarized element requires that the VT connection be 4W. The positive sequence directional element has memory voltage to provide reliable directional control for close in balanced three phase faults.

Three standard independent communications ports, along with two optional Ethernet ports that support common protocols, provide easy access to integrating the protection, control, metering, and status monitoring functions into a substation automation system. The standard IRI-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 BE1-1051 is implemented as an independent function block that is equivalent to its single function, discrete device counterpart. Each independent function block has all the inputs and outputs that the discrete component counterpart might have. Figures 5A and 5B show each of the independent function blocks available for use in the BE1-1051. Programming BESTlogic is equivalent to choosing the devices required by your protection and control scheme and drawing schematic diagrams to connect the inputs and outputs to obtain the desired operational logic.

The BE1-1051 relay can store, as user settings, one user programmable, custom logic scheme. To save you time, several preprogrammed logic schemes have also been provided. Any of the preprogrammed schemes may be copied into the logic settings without making any additional BESTlogic settings.

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 deal with the limitations in programmability of previous multifunction devices.

Figures 2a, 2b, 2c, and 3 show typical external connections, and Figure 4 shows rear panel connections.

## FUNCTIONAL DESCRIPTION, continued

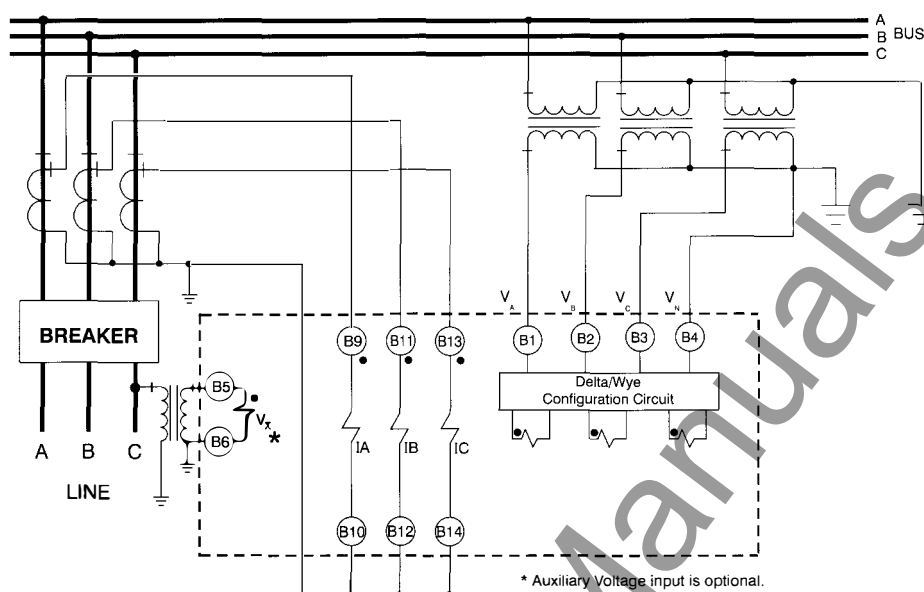


Figure 2A - Typical External Sensing Connections - Feeder Breaker Application

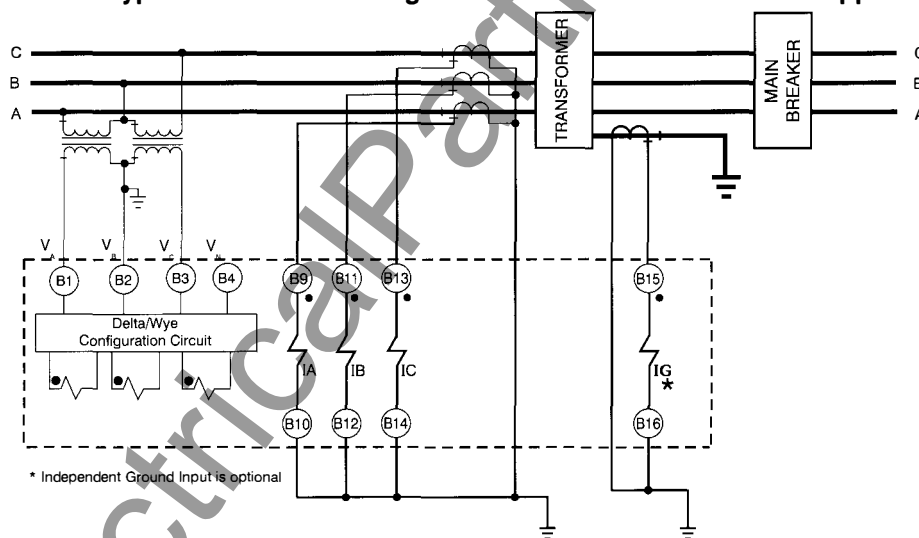


Figure 2B - Typical External Sensing Connections - Transformer Backup Application

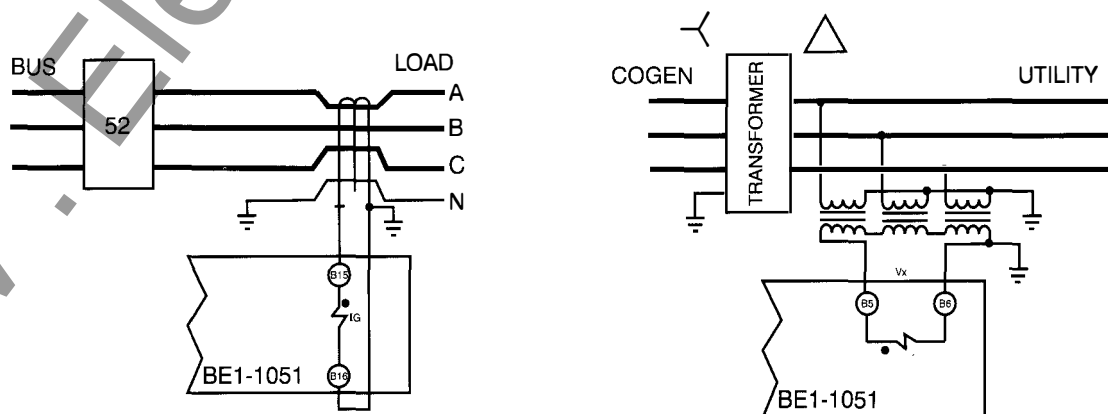
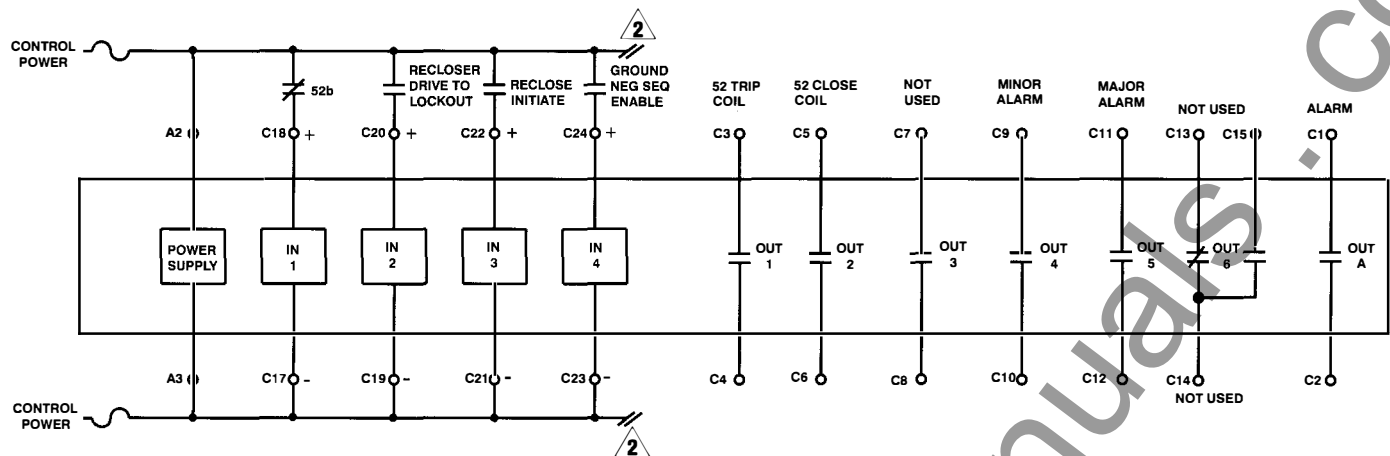


Figure 2C - Typical Alternate Connections for  $V_x$  and  $I_G$

FUNCTIONAL DESCRIPTION, continued



NOTES:

- 1.) CONNECTIONS SHOWN ARE FOR USE WITH PRE-PROGRAMMED LOGIC SCHEME OC-W-79. OC-W-79 PROVIDES OVERCURRENT PROTECTION WITH RECLOSING CAPABILITIES. ALL INPUTS AND OUTPUTS ARE FULLY PROGRAMMABLE USING BESTlogic.

2. IN5, IN6, IN7, IN8 not shown.

Figure 3 - Typical External Connections

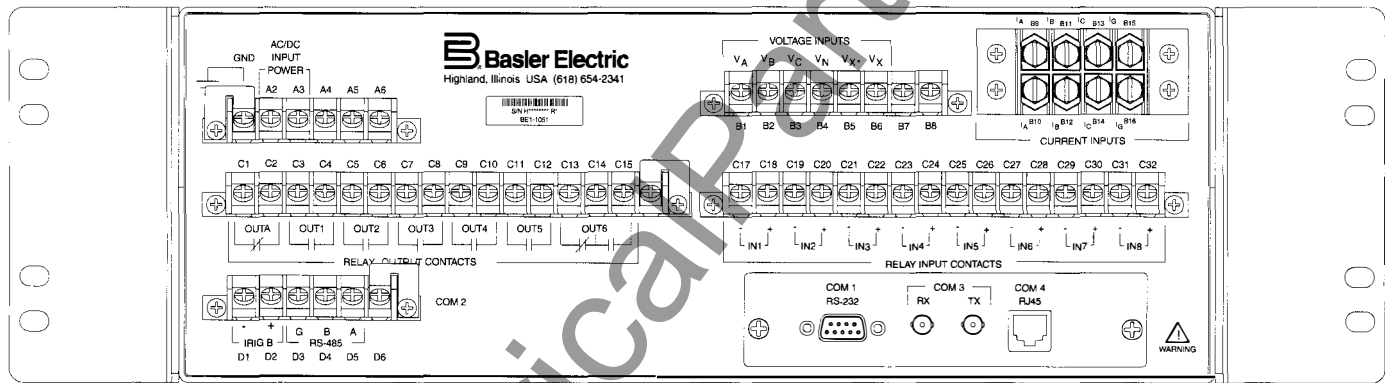


Figure 4 - BE1-1051 H1 Rear Panel Connections

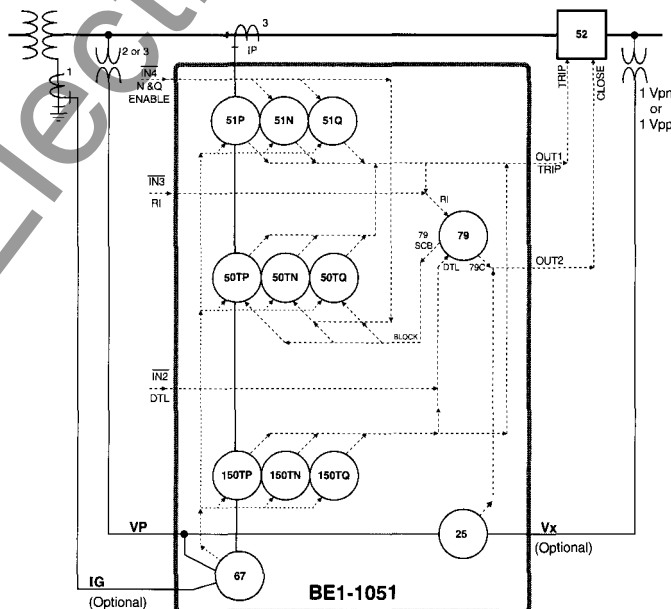


Figure 5 - Typical Application Single Line

## GENERAL SPECIFICATIONS

### 5 Amp CURRENT INPUTS

Continuous rating:	20A
One Sec. Rating:	400A
Saturation limit:	150A
Burden:	<10milliohms @ 5A

### 1 Amp CURRENT INPUTS

Continuous rating:	4A
One Sec. rating:	250A
Saturation limit:	30A
Burden:	<22milliohms @ 1A

### 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:	16/cycle, adjusted to input frequency 10 - 75Hz
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### 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
Burden:	16 watts

### TRIP CONTACTS

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

### CONTROL INPUTS

Wetting voltage range:	Same as power supply option
PS Option L:	Burden 16kohm Nominal Turnon 16Vdc
PS Option Y; jumper low:	Burden 37.5Kohm Nominal Turnon 33Vdc
PS Option Y; jumper high:	Burden 95Kohm Nominal Turnon 83Vdc
PS Option Z; jumper low:	Burden 95Kohm Nominal Turnon 83Vdc
PS Option Z; jumper high:	Burden 190Kohm Nominal Turnon 165Vdc

### COMMUNICATION PORTS

RS-232/RS-485 baud rate:	300 - 19200
Ethernet band rate:	10BaseT/10BaseF

### DIELECTRIC STRENGTH

2000 Vac at 50/60 Hz in accordance with IEEE  
C37.90 1989 and IEC 255-5

### SURGE WITHSTAND

Qualified to IEEE C37.90.1-1989, IEC 255-22-1

### FAST TRANSIENT

Qualified to IEEE C37.90.1-1989, IEC 255-22-4

### RADIO FREQUENCY INTERFERENCE (RFI)

Qualified to IEEE C37.90.2-1995, IEC 255-22-3

### ELECTRO STATIC DISCHARGE (ESD)

Qualified to IEEE C37.90.3, IEC 255-22-2, IEC  
1000-4-2.

### 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)

IEC 68-2-1 Basic Environmental Testing Proce-  
dures, Part 2: Tests—Test Ad: Cold (Type Test)

IEC 68-2-2 Basic Environmental Testing Proce-  
dures, Part 2: Tests—Test Bd: Dry Heat (Type  
Test)

IEC 68-2-30 Basic Environmental Testing Proce-  
dures, Part 2: Tests—Test Db and Guidance:  
Damp Heat, cyclic (12+12 cycle), (6 day type  
test)

IEC 68-2-56 Environmental Testing Part 2: Test-  
Cb: Damp Heat, Steady State, Primary for  
Equipment

### VIBRATION

Qualified to IEC 255-21-1, Class 1

### SHOCK

Qualified to IEC 255-21-2, Class 1

### AGENCY RATINGS

UL pending, CSA pending

### CASE SIZE

Horizontal: 5.40"(22.6mm)H x 14.63"(371.6mm)W  
x 8.70"(220.9mm)D  
7.70"(195.6mm)D (alternate mounting)  
Vertical: 14.63"(371.6mm)H x 5.40"(22.6mm)W  
x 8.70"(220.9mm)D  
7.70"(195.6mm)D (alternate mounting)

### SHIPPING WEIGHT

Approx. 16.5 pounds

### WARRANTY

7 years

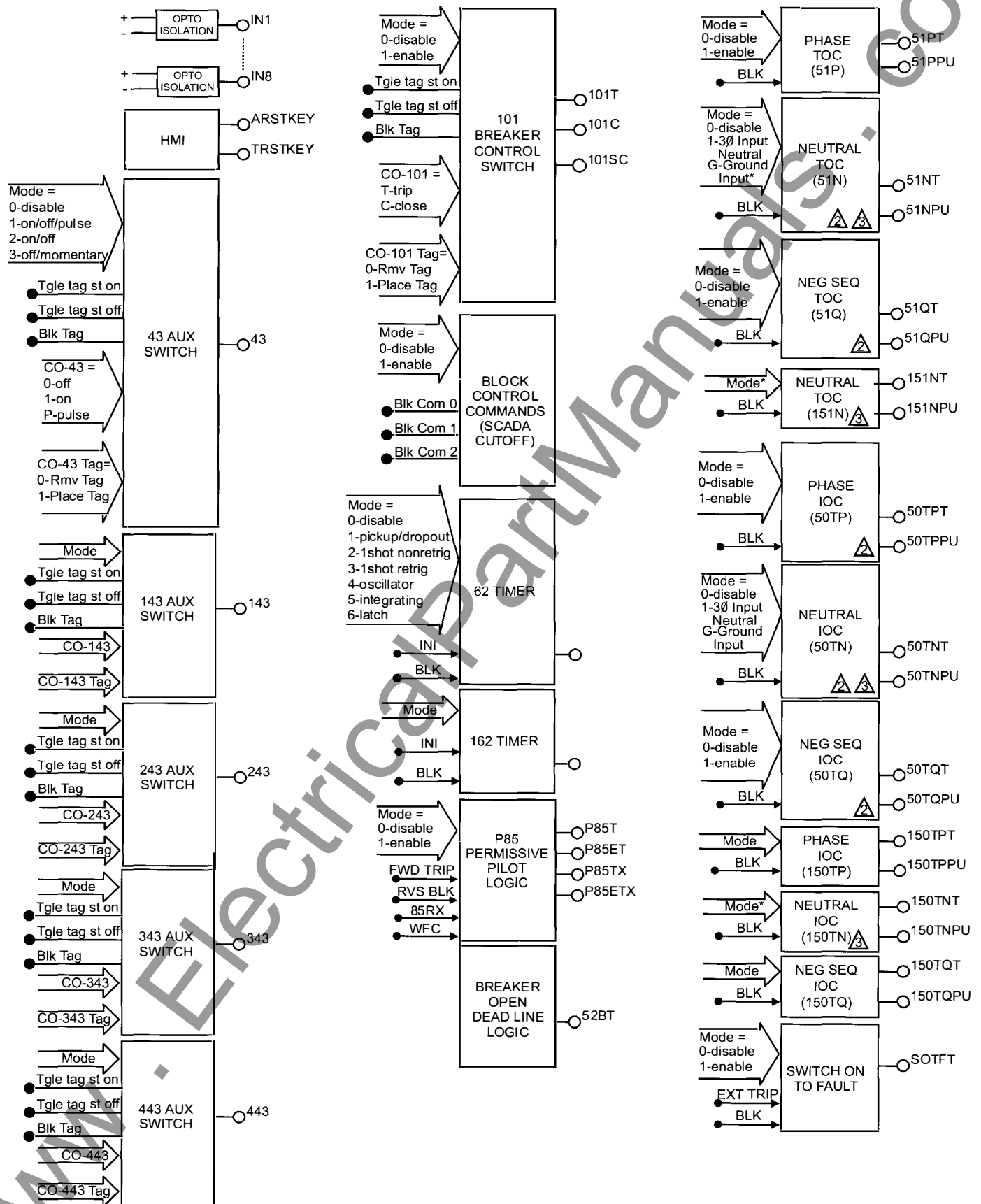


Figure 6A - BESTlogic Function Blocks



### Figure 6B - BESTlogic Function Blocks

## PERFORMANCE SPECIFICATIONS

### INSTANTANEOUS OVERCURRENT WITH SETTABLE DELAY (50TP, 150TP, 50TN, 150TN, 50TQ, 150TQ)

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

PU time with TD=0.000 Sec

1¼ cyc for P, N & G @ 5 x PU

2¼ cyc for Q @ 5 x PU

Delay time: 0.000 - 60 sec

Time Accuracy: ±0.5% or ±¼ cyc for P and N  
±0.5% or ±¼ cyc for Q

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

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:

$$T_T = \frac{AD}{M^N C} + BD + K = \text{Time to trip}$$

$$T_R = \frac{RD}{M^2 - 1} = \text{Time for decaying reset}$$

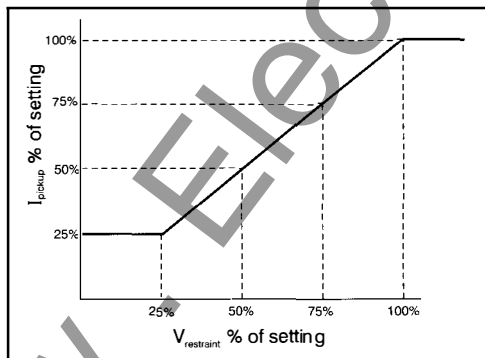
where D = Time dial, M = Multiple of PU and A, B, C, N, K and R are constants that govern the shape of each curve. The protection engineer can set the constants for the P (programmable) curve to achieve virtually any characteristic.

### 51P VOLTAGE CONTROL (27R)

Control Modes: Uncontrolled, voltage controlled, voltage restrained.

Control/Restraint Range: 30 - 250V

Restrainted Mode Characteristic: (see below)



### SWITCH ONTO FAULT (SOTF)

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

Hold Timer: 50-999 msec

Curve Type	Constants					
	A	B	C	N	K	R
S1	0.2663	0.03393	1.000	1.2969	0.028	0.5000
S2	0.0286	0.02080	1.000	0.9844	0.028	0.0940
L1	5.6143	2.18592	1.000	1.000	0.028	15.750
L2	2.3955	0.00000	1.000	0.3125	0.028	7.8001
D	0.4797	0.21359	1.000	1.5625	0.028	0.8750
M	0.3022	0.12840	1.000	0.5000	0.028	1.7500
I1	8.9341	0.17966	1.000	2.0938	0.028	9.0000
I2	0.2747	0.1042	1.000	0.4375	0.028	0.8868
V1	5.4678	0.10814	1.000	2.0469	0.028	5.5000
V2	4.4309	0.0991	1.000	1.9531	0.028	5.8231
E1	7.7624	0.02758	1.000	2.0938	0.028	7.7500
E2	4.9883	0.0129	1.000	2.0469	0.028	4.7742
A	0.01414	0.00000	1.000	0.0200	0.028	2.0000
B	1.4636	0.00000	1.000	1.0469	0.028	3.2500
C	8.2506	0.00000	1.000	2.0469	0.028	8.0000
G	12.1212	0.00000	1.000	1.000	0.028	29.000
F	0.0000	1.00000	0.000	0.0000	0.028	1.0000
46	*	0	0	2	0.028	100
P	0 to 600	0 to 25	0 to 1	.5 to 2.5	0.028	0 to 30

S1, S2 = CO Short Inv, IAC Short Inv

L1, L2 = CO Long Inv, IAC Long Inv

D = CO Definite Time

M = CO Moderately Inverse

I1, I2 = CO Inverse, IAC Inverse

V1, V2 = CO Very Inv, IAC Very Inv

E1, E2 = CO Ext Inverse, IAC Ext. Inverse

A = IEC Standard Inverse

B = IEC Very Inverse

C = IEC Extremely Inverse

G = IEC Long Time Inverse

F = Fixed Time

46 = Negative Sequence Overcurrent

P = Programmable

\* Constant A is variable for the 46 curve and is determined as necessary based on generator full load current, minimum pickup, and K factor settings.

### DIRECTIONAL CONTROL (ALL OVERCURRENT)

Mode: Forward, Reverse, Nondirectional  
67P Polarization: Positive Sequence w/Memory Negative Sequence  
67Q Polarization: Negative Sequence  
67N Polarization: Selectable any combination Zero Sequence Voltage (Requires 4W VT) Zero Sequence Current (Requires IG) Negative Sequence

### BREAKER FAILURE (BF)

P&N Fault detector: 5ACT 0.5-150A  
1ACT 0.1-30A

Time: 50 - 999mSec

Time Accuracy: ±0.5% or +1¼ cyc / - ¼ cyc

### VOLTS/HZ (24)

Pickup: 0.5 - 6V/Hz

Delay Time: Inverse Squared Curve

$$T_T = \frac{D_T}{(M-1)^2}$$

$T_T$  = Time to Trip

$D_T$  = Time Dial, Trip

Actual V/Hz

M = Pickup V/Hz

FST = Full Scale Trip Time ( $T_T$ )

$$T_R = D_R \times \frac{ET}{FST} \times 100$$

$T_R$  = Time to Reset

$D_R$  = Time Dial, Reset

ET = Elapsed Time

## PERFORMANCE SPECIFICATIONS, continued

### SYNC CHECK (25)

Delta Phase Angle:	1 - 45 degrees
Delta Voltage Magnitude:	1 - 20V
Delta Frequency:	0.01 - 0.50Hz

### SYNC CHECK, VOLTAGE MONITOR (25VM)

Dead Threshold:	10 - 150V
Live Threshold:	10 - 150V
Dropout Time Delay:	0.050 - 60.0sec
Logic:	Dead Phase/Dead Aux. Dead Phase/Live Aux. Live Phase/Dead Aux.

Two Independent outputs: 25VM1 and 25VM2

### PHASE OVER/UNDERVOLTAGE (27P, 59P)

Mode:	1 of 3; 2 of 3; 3 of 3
Pickup:	10.0-300V
Delay Time:	0.050 - 600sec.
27 Inhibit:	Disable, 10.0 - 300V

### NEGATIVE SEQUENCE OVERVOLTAGE (47)

Pickup:	1.0 - 300V <sub>L-N</sub>
Delay Time:	0.050 - 600sec.

### AUXILIARY / 3V0 OVER/UNDERVOLTAGE (27X, 59X, 159X)

Mode:	Fundamental $V_x$ , 3 phase Residual (3V0), 3rd Harmonic $V_x$
Pickup:	1.0 - 150V
Delay Time:	0.050 - 600 Sec.

### FREQUENCY (81, 181, 281, 381, 481, 581)

Mode:	Over, Under
Pickup:	40.00 - 70.00 Hz
Delay Time:	0.000 - 600 Sec.
Time Accuracy:	$\pm 0.5\%$ or $\pm 1$ cyc / -0 cyc (Min. trip time affected by minimum 3 cycle security count)

### GENERAL PURPOSE LOGIC TIMERS (62, 162)

Mode:	PU.DO 1 Shot, Non-Retrig. 1 Shot, Retrig. Integrating Latch
T1 and T2 Delay Time:	0.000 - 9999 Sec.
Time Accuracy:	$\pm 0.5\%$ or $\pm 1/4$ cyc

### RECLOSER (79)

Mode:	Power up to close, Power up to lockout
Reclose Shots:	0 - 1 Pilot Reclose 0 - 3 Delayed Reclose
Reclose, Reset, Fail, Max. Cycle Timers:	0.100 - 600 Sec.
Time Accuracy:	$\pm 0.5\%$ or $\pm 1 3/4$ cyc / -0 cyc

### POWER (32, 132)

Mode:	Forward, Reverse
Pickup:	5A: 1.0 - 6000 Watts, 3 ph 1A: 1.0 - 1200 Watts, 3 ph
Pickup Accuracy:	$\pm 3\%$
Delay Time:	0.050 - 600 Sec.

### CURRENT PICKUP ACCURACY (All 50, 51, 50BF)

Phase and Ground:	5A	2% or 50mA
	1A	2% or 10mA
Neutral and Negative Sequence:	5A	3% or 75mA
	1A	3% or 75mA

### VOLTAGE PICKUP ACCURACY (All 27, 47 and 59)

$\pm 2\%$  or  $\pm 0.5V$

### DEFINITE TIME ACCURACY UNLESS OTHERWISE STATED (All 27, 32, 47 and 59)

Definite Time Accuracy:  $\pm 0.5\%$  or  $\pm 1/2$  cyc

### SETTING GROUPS

Setting Groups:	4
Control Modes:	Automatic:CLP;Recloser shot; Dynamic load or unbalance External: Discrete input logic; Binary Input Logic

### METERING

Current Range:	5A	0.5 to 15.0
	1A	0.1 to 3.0
Current Accuracy:	$\pm 1\%$	
Phase Voltage	3W	0 - 300 V <sub>L-L</sub>
Range:	4W	0 - 300 V <sub>L-L</sub>
Phase Voltage	$\pm 0.5\%$ for $50V < V_{L-L} < 300V$	
Accuracy:		
Watt/VAR:	5A	0 to $\pm 7500$
	1A	0 to $\pm 1500$
Watt Accuracy:	1% @ Unity PF	
VAR Accuracy:	1% @ Zero PF	
Energy:	0 to $\pm 1.0E12$ (F/R registers)	
Frequency:	10 - 75Hz	
Frequency	0.01Hz	
Accuracy:		

### 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 I <sup>2</sup>
Duty Alarm Range:	0 - to 100%
Op Counter Alarm Range:	0 - 99999
Trip Time Alarm Range:	20 - 1000mSec

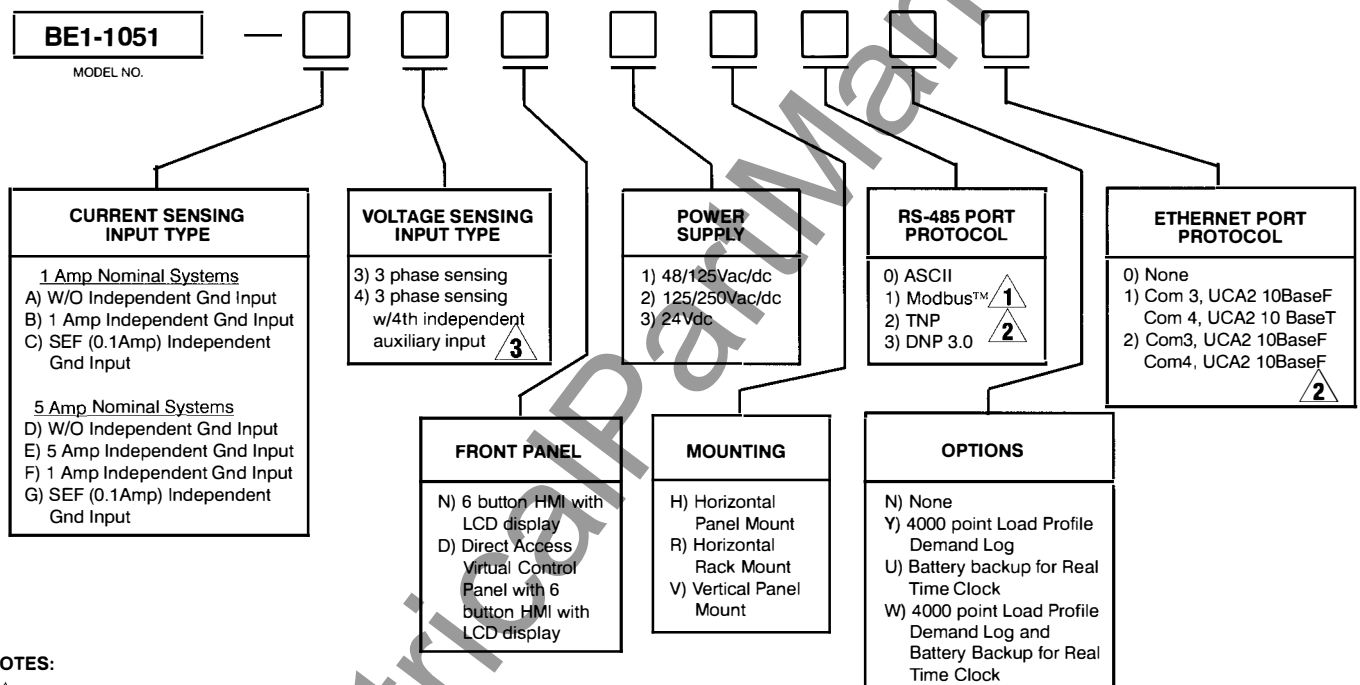
## ORDERING

### SAMPLE STYLE NUMBER

The style number identification chart defines the electrical characteristics and operation features included in BE1-1051 relays. For example, if the style number were BE1-1051 **E3N1R0U0**, the device has the following:

BE1-1051

- (E) - 5 Amp nominal system with 5 Amp Independent Ground Input
- (3) - Three phase voltage sensing
- (N) - Standard 6-button HMI with LCD display
- (1) - 48/125Vac/Vdc power supply
- (R) - 19" Horizontal Rack Mount, Drawout Case
- (0) - ASCII Communications on Com 2
- (U) - Battery Backup for Real Time Clock
- (0) - Without Ethernet communications ports



#### NOTES:

- 1** All units include three independent communications ports standard: Com0 (front RS-232), Com1 (rear RS-232, Com2 (rear RS-485). ASCII Communications is standard on Com0, Com1, and Com2.
- 2** Consult your Basler Representative for availability of other protocol options.
- 3** Adds 25 sync check option.

**B Basler Electric**



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