BE1-60 VOLTAGE BALANCE RELAY

The BEI -60 Voltage Balance Relay's solid-state design provides a reliable instantaneous response to block other devices from incorrect operation resulting from a blown fuse or other fault in a potential transformer circuit.

FEATURES

- Pickup adjustable in 5% increments over a range of 5 to 50% of nominal voltage.
- Single-phase to single-phase, single-phase to three-phase, or three-phase to three-phase sensing.
- Maximum trip time of 100 milliseconds for voltage differences greater than three times the setting.
- Low sensing and supply burdens.
- Qualified to the requirements of
  - IEEE C37.90-1978, C37-90a-1974, and IEC 255 for surge with stand capability;
  - IEEE C37.90.1-198X for fast transient;
  - IEC 255-5 for impulse.
- UL Recognized under Standard 508, UL File #E97033.
- Five year warranty.

ADDITIONAL INFORMATION

INSTRUCTION MANUAL

Request Publication 9170700990

STANDARDS, DIMENSIONS and ACCESSORIES

Request Bulletin SDA

UBS-3
8-02

Basler Electric

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APPLICATION

PURPOSE

The BE1-60 Voltage Balance Relay is intended to provide high speed protection for power systems equipment and protective systems from misoperation or false tripping in the event of a sudden loss of sensing potential resulting from a blown fuse. The relay is applied to detect this condition and initiate the required corrective/preventative action as well as indicate the problem and its location.

Devices that may require this form of protection include voltage control or restraint types of overcurrent relays, impedance measuring relays, synchronizing relays, voltage regulators and static excitation systems.

In the system shown in Figure 1, the generator is equipped with a static exciter and includes voltage controlled or restrained time overcurrent relays in its protection package (as well as other devices). If one of the fuses in the power potential transformer blows, the resulting unbalanced voltage condition may cause excessive heating in the power stage of the static exciter. For this condition it is desirable to alarm the condition and initiate an orderly shutdown of the unit.

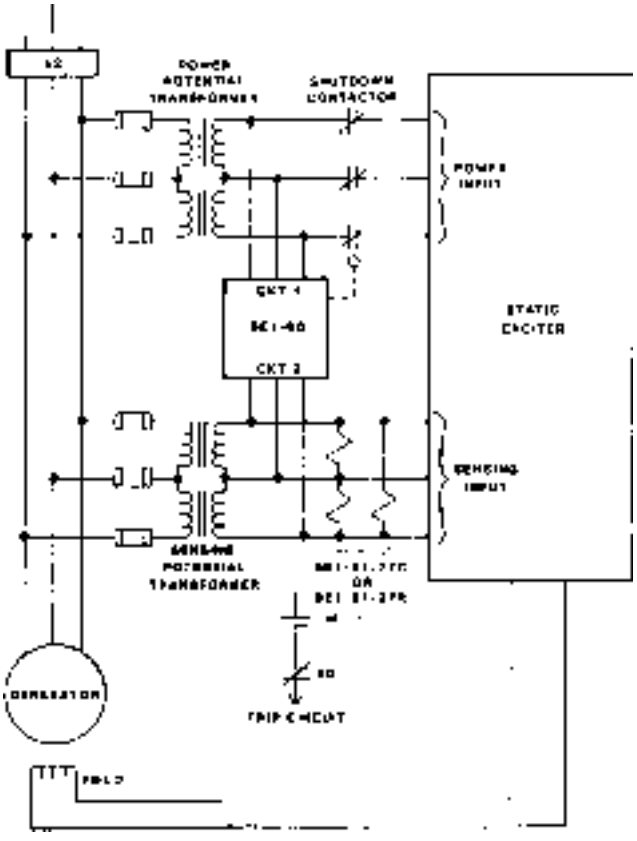


Figure 1 - Typical Application

Output #I would accomplish this task.

If one of the fuses in the sensing potential transformer were to open up, the static exciter (with 3-phase sensing) would increase its output to maximum in an attempt to restore the sensed voltage to its proper level. For this condition, the BE1-60 Voltage Balance Relay would initiate an emergency shutdown of the unit and alarm the condition. Output #2 would accomplish this task.

Also in this case, since the same potential source provides the restraint or control input to the time overcurrent relays, false tripping of the unit may result by operation of the overcurrent function. This is not desirable as the overcurrent relay's target would give a false indication of the reason for tripping. Output #2 would be required to block operation of the overcurrent devices. This would be accomplished by opening a normally closed contact from the BE1-60 which is in series with the tripping outputs from the overcurrent functions.

Note: 1) If the overcurrent functions were voltage controlled and the output current was in excess of the pickup setting of the relay, a loss of control potential would allow this overcurrent function to pickup and start timing. Without the inhibit from the BE1-60, undesired overcurrent tripping would result.

2) If the overcurrent functions were voltage restrained, the loss of a restraint potential would result in the sensitivity of the relay being increased (0.25 times setting), and the relay would pickup and start timing. Again, without the inhibit from the BE1-60, undesired overcurrent tripping would result.

Targets on the BE1-60 indicate that CKT #I (Power Potential Transformer Fuse) or CKT #2 (Sensing Potential Transformer Fuse) caused the current shutdown sequence.

When setting the relay's % difference pickup, consideration should be given to the maximum voltage excursions permitted for normal operating conditions. For instance if the output voltage of the power potential transformer varies 5 percent from machine no load to machine full load then the setting must permit this fluctuation.

It should also be noted that since both of the inputs to the BE1-60 are monitoring essentially the same voltage, tripping of the BE1-60 will not occur for system faults.

SPECIFICATIONS

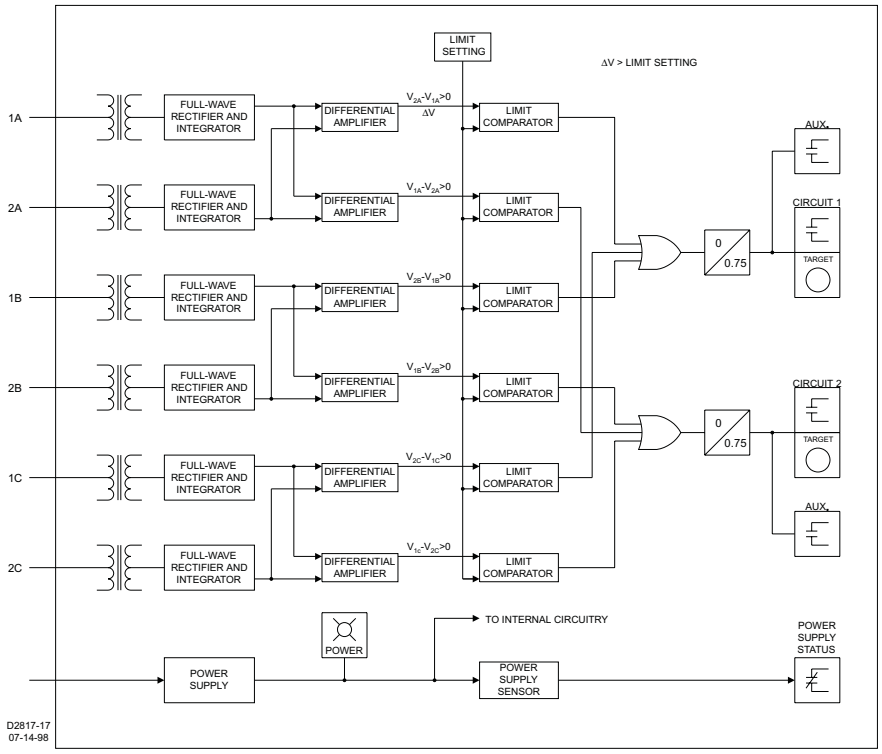


Figure 2 - Functional Block Diagram

FUNCTIONAL DESCRIPTION

The specifications on these pages define the many features and options that can be combined to satisfy an application requirement. The block diagram in Figure 2 illustrates how various standard features, as well as the options, function.

INPUTS

Voltage Sensing

System potential transformers with 120/208 V secondaries supply the Voltage Balance Relay's input transformers with single and/or three-phase voltages from the two monitored circuits. Each phase voltage is scaled, rectified, and integrated to establish a dc level which represents the voltage level of that particular phase.

Nominal sensing input ratings, defined by the style number, are 208 VL-L for wye, 120 VL-L for delta, and 120 Vac for single-phase with a maximum burden of 1 VA per phase at 50/60 Hz. The sensing range is 60% to 125% of nominal voltage within the frequency range of 45 to 65 Hz. The maximum continuous voltage rating is 160% of nominal.

Power Supply Inputs

One of five power supply types may be selected to provide internal operating power. They are described in Table 1.

Type	O	P	R	S	T
Nominal Voltage	48 Vdc	125 Vdc 120 Vac	24 Vdc	48 Vdc 125 Vdc	250 Vdc 230 Vac
Burden	3.5 W	4.5 W 10.5 VA	4.0 W	4.0 W 4.5 VA	7.5 W 21.0 VA

Table 1 - Power Supply Options

DIFFERENTIAL AMPLIFIER

The output from the rectifier and integrator circuits is applied to two differential amplifiers. These differential amplifiers determine which circuit has the lowest voltage and the magnitude of the voltage difference between the two monitored circuits.

SPECIFICATIONS, continued

LIMIT SWITCH
A front panel ten position thumbwheel switch, adjustable in 5% increments from 5 to 50% of nominal voltage, sets the voltage difference pickup level.

LIMIT COMPARATOR
The magnitude of the voltage difference is compared to the limit setting. When the limit setting is exceeded, energization of the ouput relays associated with the circuit having the lower voltage level occurs. Pickup accuracy is within 1.5 volts or 5% of the limit setting. When the voltage difference falls to less than the limit setting, the output relays are de-energized after a delay of approximately 0.75 seconds. Dropout is 90% or greater of the pickup value.

TARGETS
Magnetically latched, manually reset, target indicators are optionally available to indicate that an output has tripped. Either internally operated or current operated targets may be specified. Current operated targets require 0.2 A in the output trip circuit to actuate, and trip circuit current must not exceed 30 A for 0.2 seconds, 7 A for 2 minutes, and 3 A continuous. Current operated targets may be selected only when normally open (NO) output contacts have been specified.

OUTPUTS
Output contacts are rated as follows:

Resistive
120/240 Vac - make 30 A for 0.2 seconds, carry 7 A continuously, break 7 A.

250 Vdc - make and carry 30 A for 0.2 seconds, carry 7 A continuously, break 0.1 A.

500 Vdc - make and carry 1.5 A for 0.2 seconds, carry 7 A continuously, break 0.1 A.

Inductive
120/240 Vac. 125 Vdc, 250 Vdc - break 0.1 A (L/R = 0.04).

Push-to-Energize Output Pushbuttons
Accessible with a thin nonconducting rod through the front panel, push-to-energize pushbuttons are available to energize each output for testing the external control/protective system wiring.

SURGE WITHSTAND CAPABILITY
Qualified to IEEE C37.90a-1974, Surge Withstand Capability Test and IEC 255, Impulse Test and Dielectric Test.

POWER SUPPLY STATUS OUTPUT
The power supply output relay is energized and its NC output contact is opened when power is applied to the relay. Normal internal relay operating voltage maintains the power supply status output relay in a continuously energized state with its output contact open. If the power supply output voltage falls below the requirements of proper operation, the power supply output relay is de-energized, closing the NC output contact.

MECHANICAL

Operating Temperature
-40° (-40°F) to +70°C (+158°F)

Storage Temperature
-65° (-85°F) to +l00°C (+212°F)

Weight
14.25 pounds maximum

Shock
In standard tests, the relay has withstood 15g in each of three mutually perpendicular axes without structural damage or degradation of performance.

Vibration
In standard tests, the relay has withstood 2g in each of three mutually perpendicular axes swept over the range of 10 to 500 Hz for a total of six sweeps, 15 minutes for each sweep, without structural damage or degradation of performance.

CONNECTIONS

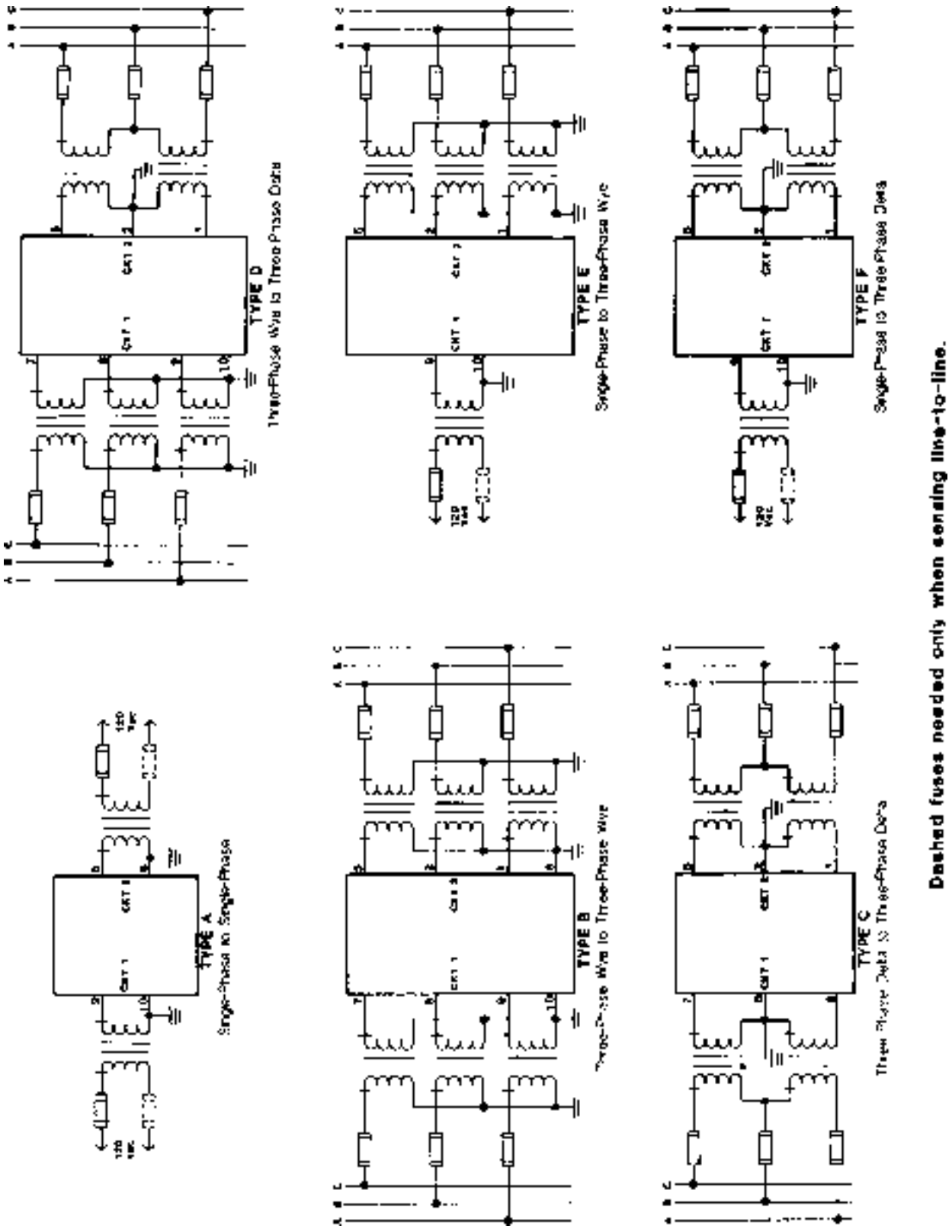


Figure 3 - Voltage Sensing

CONNECTIONS

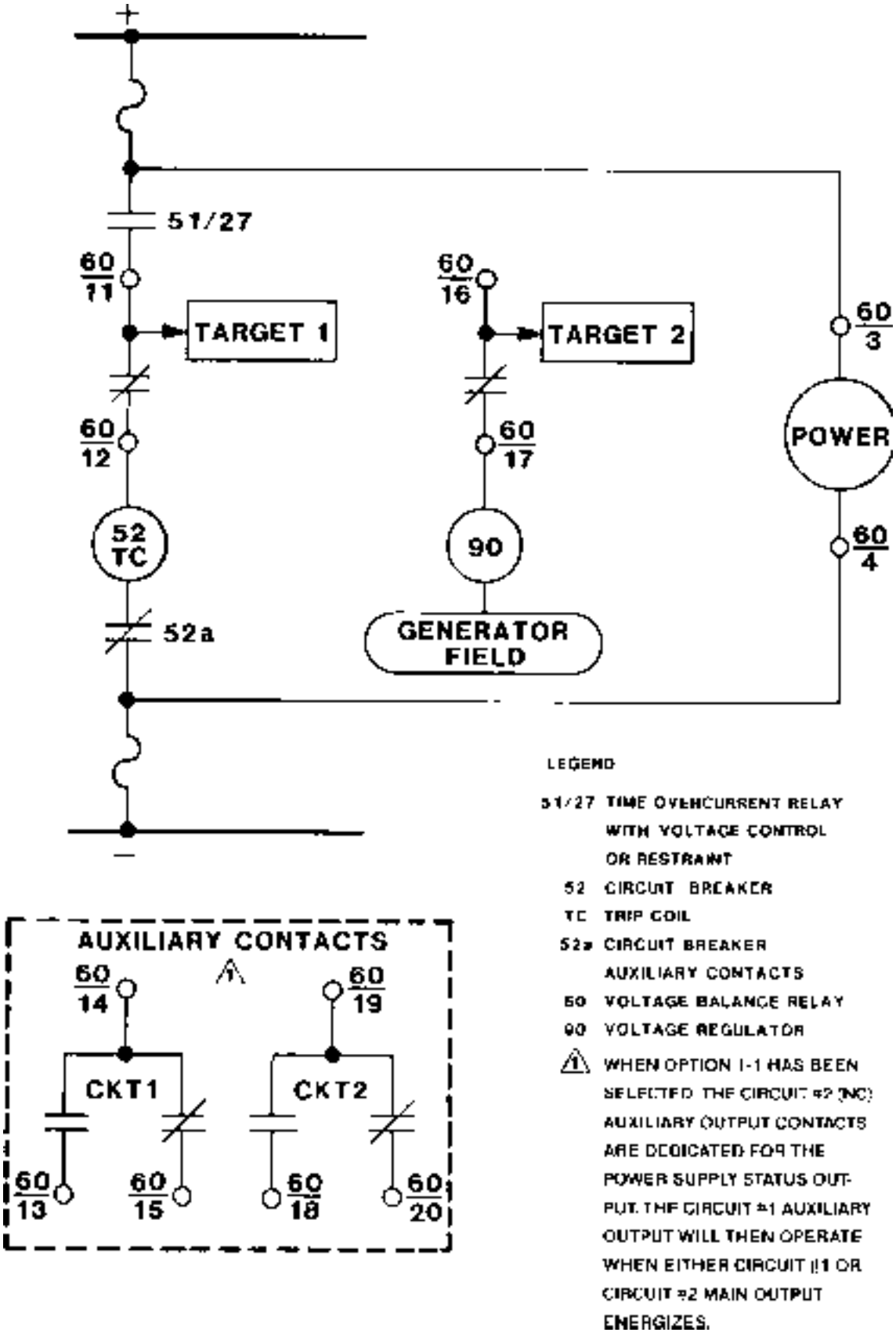


Figure 4 - Control Circuits

ORDERING

MODEL NUMBER
BE1-60 Voltage Balance Relay

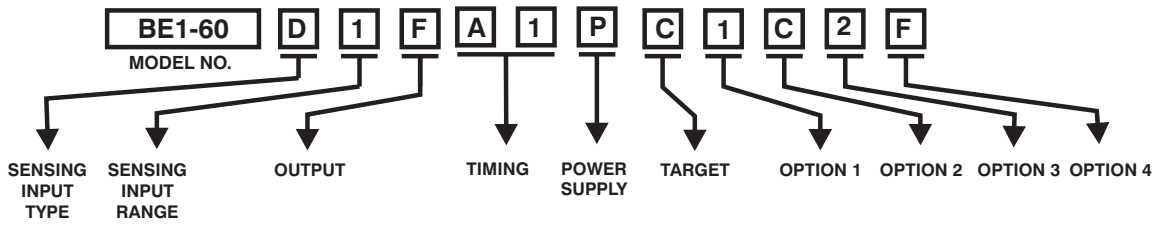
STYLE NUMBER
The style number appears on the front panel, drawout cradle, and inside the case assembly. This style number is an alphanumeric combination of characters identifying the features included in a particular unit.

The sample style number below illustrates the manner in which the various features are designated. The Style Number Identification Chart (page 8) defines each of the options and characteristics available for this device.

SAMPLE STYLE NUMBER: D1FA1PC1C2F
The style number above describes a BE1-60 Voltage Balance Relay having the following features.

Sensing Input Type	(D) Three-phase wye to three-phase delta
Sensing Input Range	(1) 60 to 125% of nominal voltage
Output	(F) Two normally open output relays (one per circuit)
Timing	(A1) Instantaneous
Power Supply	(P) 125 Vdc or 100/120 Vac external operating power
Target	(C) Two internally operated targets (one per circuit)
Option 1	(1) Power supply status output
Option 2	(C) Push-to-energize outputs
Option 3	(2) Two normally closed auxiliary output contacts (one per circuit)
Option 4	(F) Semi-flush mounting

Note: The description of a complete relay must include both the model number and the style number.



HOW TO ORDER:
Designate the model number, followed by the complete style number:

BE1-60
Style Number: ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

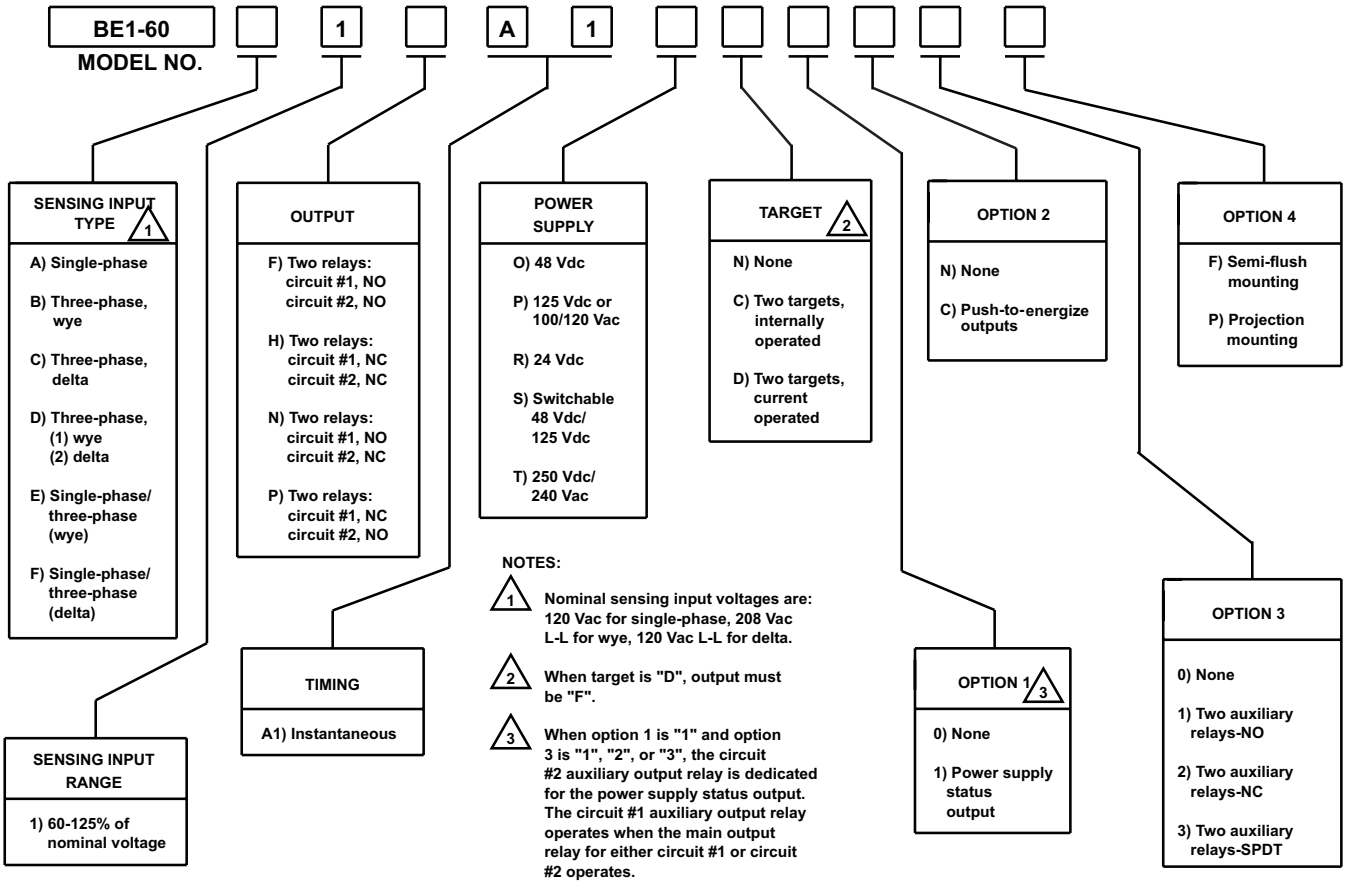
Complete the style number by selecting one feature from each column of the Style Number Identification Chart and entering its designation letter or number in the appropriate square. (Two squares are used to indicate time delay characteristics.) All squares must be completed.

STANDARD ACCESSORIES:
The following accessories are available for the BE1-60
Voltage Balance Relay.

Test Plug
To allow testing of the relay without removing system wiring, order two test plugs, Basler Electric part number 10095.

Extender Board
The extender board permits troubleshooting of the printed circuit boards outside of the relay cradle. Order Basler Electric part number 9165500100.

ORDERING



NOTES:

1. Nominal sensing input voltages are: 120 Vac for single-phase, 208 Vac L-L for wye, 120 Vac L-L for delta.
2. When target is "D", output must be "F".
3. When option 1 is "1" and option 3 is "1", "2", or "3", the circuit #2 auxiliary output relay is dedicated for the power supply status output. The circuit #1 auxiliary output relay operates when the main output relay for either circuit #1 or circuit #2 operates.
4. All relays are supplied in an S1 size case.

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