Class 100 Equipment
BE1-79S
SINGLE SHOT
RECLOSING RELAY

Cover removed showing case, drawout cradle, and typical connecting plug.

DEVICE NUMBER 79

PURPOSE

The BE1-79S Single Shot Reclosing Relay provides automatic reclosure of circuit breakers that have been tripped by a protective relay.

FEATURES

- Reliable solid-state design.
- Adjustable reset delay timing.
- Adjustable reclosing delay timing.
- Externally controlled "initiate" function.
- Externally controlled "cancel" function.
- Excellent timing accuracy and repeatability.
- Optional single-phase line and bus voltage monitoring.
- Reclose output may be momentary or continuous.
- Qualified to ANSI/IEEE C 37.90-1978, C37.90a-1974, and IEC 255 Surge Withstand Capability Test.
- Automatic reset.
- Low supply burden.
- Operating power may be derived from AC or DC source.
- Lockout alarm relay contacts.
- Light emitting diode (LED) lockout indicator.
- Off-line testing with standard test plug.
- Immunity to high levels of shock and vibration.
- Mechanically rugged, modular, drawout construction.
- Wide operating temperature range.
- Two year warranty.

Basler Electric
P. O. BOX 269 HIGHLAND, ILLINOIS 62249, U.S.A. PHONE 618-654-2341 FAX 618-654-2351

UBN-2
4-86

SPECIFICATIONS:

ELECTRICAL

- **POWER INPUT:** One of four types of power supplies may be selected to provide relay operating power.

Type	Nominal Input Voltage	Input Voltage Range	Maximum Burden at Nominal
B	48 Vdc	24 to 60 Vdc	4.5 W
C	125 Vdc 100/120Vac, 50/60 Hz	62 to 150 Vdc 90 to 132 Vac	7.5 W 13.0 VA
D†	24 Vdc	12 to 32 Vdc	4.5 W
X*	250 Vdc 250 Vac 50/60 Hz	140 to 280 Vdc 190 to 270 Vac	21.0 W 43.0 VA

* External modules required for contact sensing when type X power supply is specified.

† Type D power supply may require 14 Vdc to begin operating. Once operating, the voltage may be reduced to 12 Vdc.

- **CONTACT SENSING:** Used to monitor user-supplied external contacts that provide the breaker status, reclose initiate, and reclose cancel signals. These contacts must have a minimum rating of 0.05 A at 250 Vdc.

  Maximum contact sensing burden ranges from 1.5 W per contact for power supply B to 18.0 W for power supply X. (This burden only applies when contact is closed.)

  Depending on the selected option, the current through the contacts may be obtained from the relay itself (isolated contact sensing), or from a dc source with a voltage rating equal to the relay's power supply input (non-isolated contact sensing). Current through the contact is filtered and optically isolated by the contact interface circuitry.

- **OUTPUTS:** All output contacts are rated as follows.

  Resistive Rating

  120 Vac — make, break, and carry 7 A continuously.

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

  500 Vdc — make and carry 15 A for 0.2 seconds, carry 7 A continuously, break 0.1 A.

  Inductive Rating

  120 Vac, 125 Vdc, 250 Vdc — Break 0.1 A (L/R=0.04).

- **POWER INDICATOR:** A front panel light emitting diode (LED) illuminates to indicate the power supply is providing nominal operating voltages to relay circuitry.

- **RECLOSURE TIME CONTROL:** The time delay associated with the reclosing operation is continuously adjustable over the selected range. The relay may be specified to have a reclosure delay range of 0.1 to 2.0 seconds, 1.0 to 20 seconds, or 5 to 60 seconds.

- **RESET TIME CONTROL:** Automatically resets the relay when the breaker remains closed for a pre-set time. This time is continuously adjustable over the range of 5 to 60 seconds with a front panel control.

- **VOLTAGE MONITOR INDICATORS:** The optional voltage monitor circuitry includes four light emitting diode (LED) indicators; an LB indicator illuminates when the bus voltage is greater than the live bus setting; an LL indicator illuminates when the line voltage is greater than the live line setting; a DB/$\overline{\text{OV}}$ indicator illuminates when the bus voltage is less than the dead bus (DB) setting, or less than the overvoltage limit ($\overline{\text{OV}}$) setting; and a DL/$\overline{\text{OV}}$ indicator illuminates when the line voltage is less than the dead line (DL) setting, or less than the overvoltage limit ($\overline{\text{OV}}$) setting.

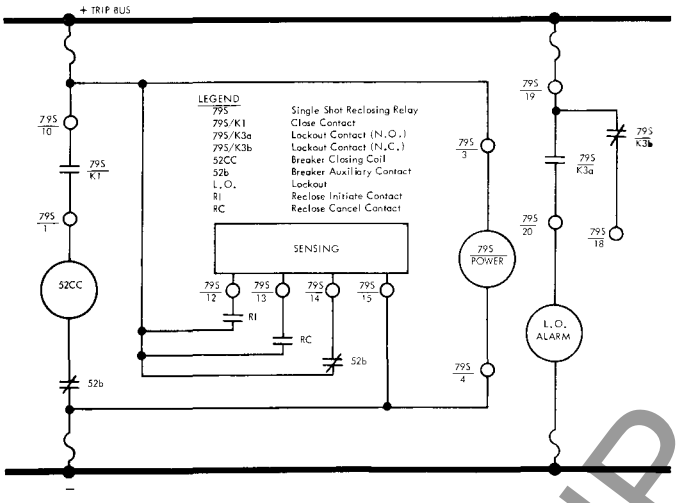
- **VOLTAGE MONITOR CONTROLS:** The optional voltage monitor circuitry provides four independent controls for adjustment of Live Bus (LB), Live Line (LL), Dead Bus (DB) or Bus Overvoltage Limit ($\overline{\text{OV}}$), and Dead Line (DL) or Line Overvoltage Limit ($\overline{\text{OV}}$) levels.

  There are also three optionally available maximum trial times which establish the maximum time allowed for proper closure conditions to occur. Reset timer option "B" has a 95 ±10 second maximum trial time, option "C" has a 15 ±2 second maximum trial time, and option "D" has no maximum trial time, meaning the unit will continue to wait for proper closure conditions to occur indefinitely.

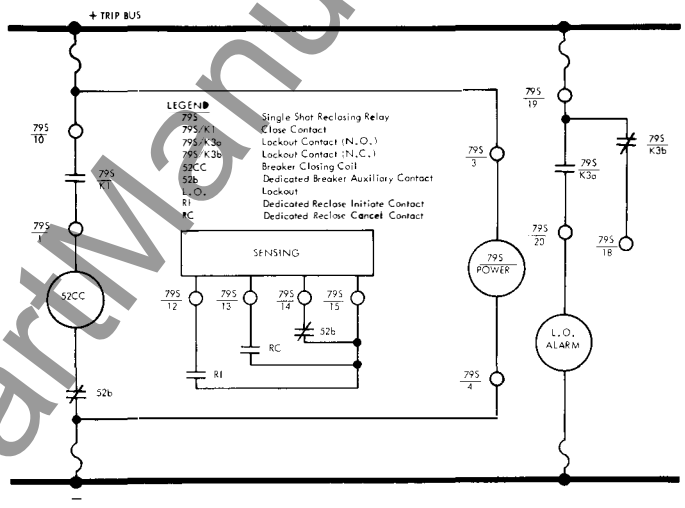
- **TIMING ACCURACY:** ±5%.

ENVIRONMENTAL

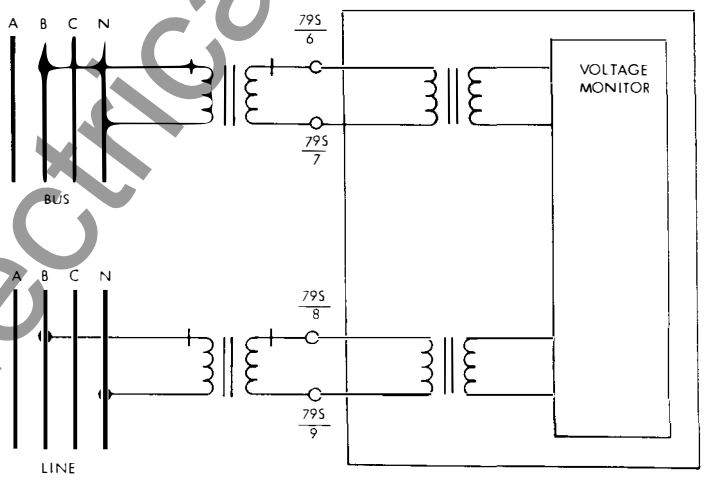
- **OPERATING TEMPERATURE:** −20°C (−4°F) to +65°C (+149°F).
- **STORAGE TEMPERATURE:** −50°C (−58°F) to +90°C (+194°F).
- **SHOCK:** 15 G's in each of three mutually perpendicular axes without damage or degradation of performance.
- **VIBRATION:** The relay has been tested and withstood vibrations of 1.36 G's over the range of 5 to 26 Hz, 0.036 inch displacement over the range of 26 to 52 Hz, and 5 G's over the range of 52 to 260 Hz without structural damage or degradation of performance. This vibration spectrum was applied in each of three mutually perpendicular axes with a sweep time of 5 minutes.
- **WEIGHT:** 13.5 pounds maximum, net.



NON-ISOLATED INPUTS



ISOLATED INPUTS



OPTIONAL VOLTAGE MONITORING — SINGLE PHASE

FIGURE 1. CONTROL CIRCUIT CONNECTIONS

THEORY OF OPERATION (Refer to Figure 2)

POWER SUPPLY

A variety of power supply options allows a wide range of external voltage inputs for operation of the relay. Nominal outputs of these supplies are ±12 Vdc. A LED indicator on the front panel illuminates when the power supply is operational.

INITIATE CONTACT SENSING (RI)

The initiate contact sensing is provided in one of two optional configurations; one configuration is used when isolated input sensing is specified, the other configuration is used when non-isolated input sensing is specified. When isolated sensing is provided, the relay supplies current to an isolated Form A contact in the protective system. When non-isolated input sensing is specified, the relay receives a voltage through a contact from the protective system. In either case, after the initiate contact sensing circuit detects a contact closure from the protective system, it generates an INITIATE signal to the automatic reclose enable logic.

BREAKER OPEN SENSING (52b)

The breaker open sensing is provided in one of two optional configurations; one configuration is used when isolated input sensing is specified, and the other configuration is used when non-isolated input sensing is specified. When isolated sensing is provided, the relay supplies current to an isolated Form B contact in the protective system. When non-isolated input sensing is specified, the relay receives a voltage through a contact from the protective system. The breaker open sensing circuit detects the breaker position. If the breaker opens (52b closes), and if the RI signal has been present prior to the closing of 52b, a BREAKER OPEN signal is generated as an input to the automatic reclose enable logic.

When the controlled breaker closes, BREAKER OPEN is terminated. This occurs regardless of the state of the other inputs to the relay. Termination of the BREAKER OPEN signal stops the reclose timer, initiates the reset timer, and terminates the reclose output.

CANCEL CONTACT SENSING (RC)

The cancel contact sensing is provided in the same two configurations as the initiate contact sensing. When the cancel contact sensing detects a signal from the protective system, it generates a RECLOSE CANCEL signal which inhibits the operation of the automatic reclose enable logic.

VOLTAGE MONITOR (OPTIONAL)

The voltage monitor is present in relays provided with the voltage monitor option (option 2-S, see chart 1). This circuitry monitors a single phase of the line and bus voltages and will inhibit operation of the reclose logic unless specific voltage conditions are met. Selector switches and adjustment controls allow tailoring operation of the relay to a wide range of line and bus closing conditions.

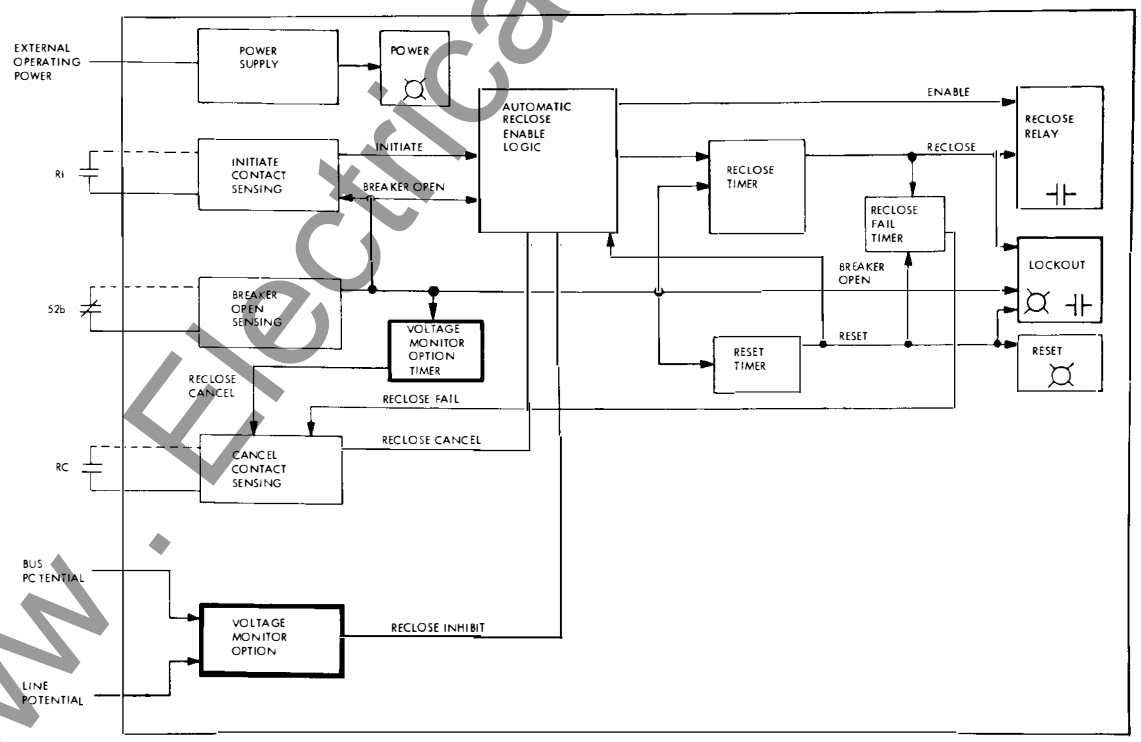


FIGURE 2. FUNCTIONAL BLOCK DIAGRAM (TYPICAL)

Circuit board-mounted switches provide selection of any combination of four permissible closing conditions: LIVE LINE/LIVE BUS, DEAD LINE/LIVE BUS, LIVE LINE/DEAD BUS, and DEAD LINE/DEAD BUS. Four front panel controls provide independent selection of the live and dead voltage levels for the line and bus inputs over the range of 10 to 135 volts. This scheme establishes live and dead voltage zones in which reclosing can occur, and provides a precise means of pre-selecting the line and bus voltage levels so that the live zone is above the monitored live level and the dead zone is below the monitored dead level. Non-selection of specific closing conditions prevents closing from occurring during these conditions.

As an example, the reclosing relay may be programmed for LIVE LINE/LIVE BUS and DEAD LINE/LIVE BUS closing, with the individual controls set for LIVE LINE, above 100 volts; DEAD LINE, below 40 volts; and LIVE BUS, above 35 volts (figure 3). In this case, reclosing would be permitted only when the line and bus voltage conditions satisfy these front panel settings. If these conditions are not met, the voltage monitor generates an INHIBIT signal to inhibit the automatic reclose enable logic.

For live line and live bus, circuit board-mounted mode selector switches allow independent selection of an adjustable upper overvoltage limit ($\overline{OV}$) level that defines a live voltage band for permissible reclosing operation. In this mode, live line or live bus closing will be permitted if the appropriate monitored voltage(s) is within the permissible band. As shown in figure 3, no closing will be permitted if the monitored bus voltage is above the selected $\overline{OV}$ setting of 80 volts or below the "LIVE" setting of 35 volts.

When the BREAKER OPEN signal is received, a timer in the voltage monitor establishes a time frame within which the desired voltage conditions for closing must occur if a reclosing is to be attempted. If Reset Timer Option B has been selected, the time limit is 95.0±10.0 seconds; for Option C the limit is 15.0 ±2.0 seconds. Option D has no limit.

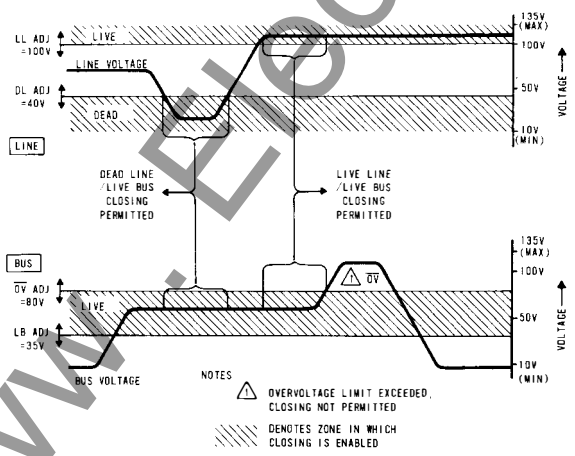


FIGURE 3. EXAMPLE OF LIVE LINE/LIVE BUS AND DEAD LINE/LIVE BUS CLOSING, WITH LIVE BUS OVERVOLTAGE LIMIT ($\overline{OV}$)

AUTOMATIC RECLOSE ENABLE LOGIC

The automatic reclose enable logic controls the reclose timer, starting and stopping it in response to various enable and inhibit signals. The automatic reclose enable starts the reclose timer when INITIATE and BREAKER OPEN have arrived in the proper sequence and are present, and the RECLOSE CANCEL is not present. Once the reclose timer is started, it will continue to time as long as a BREAKER OPEN is present, RECLOSE CANCEL is absent and the optional voltage monitor INHIBIT signal is absent.

RECLOSE TIMER

The reclose timer is started by the automatic reclose enable logic and measures an interval controlled by the front panel RECLOSE TIME control. At the completion of the programmed interval, if RECLOSE CANCEL is not generated by the cancel contact sensing circuit, BREAKER OPEN is still present, and the optional voltage monitor INHIBIT signal is absent, the reclose timer generates RECLOSE to close the contacts of the reclose relay, energizing the breaker close coil and energizing the internal lockout relay. RECLOSE is terminated when BREAKER OPEN ends due to the breaker closing or when RECLOSE CANCEL is generated.

RECLOSE FAIL TIMER (OPTIONAL)

The reclose fail timer is present on relays provided with the reclose fail option (options 3-2, or 3-3, see chart 1). In these relays, the reclose fail timer begins to time the maximum allowable reclose interval for which RECLOSE will be generated.

When a 2-3 or 5-6 second reclosing signal (option) is provided, a RECLOSE FAIL signal is generated by the reclose fail timer if the reclose command from the relay does not cause the controlled breaker to close in the pre-set time. The RECLOSE FAIL signal when internally applied to the cancel contact sensing circuit has an effect similar to receiving RC from the protective system. RECLOSE CANCEL generated in response to RECLOSE FAIL inhibits the automatic reclose enable logic, causing it to disregard the BREAKER OPEN signal from the breaker open sensing circuit.

RESET TIMER

The reset timer provides an automatic reset for the relay when the controlled breaker is closed for the duration of the reset interval. The reset timer measures an interval between 5 and 60 seconds as determined by the setting of the RESET TIME control on the front panel.

When BREAKER OPEN is terminated, indicating that the controlled breaker is closed, the reset timer begins to measure the programmed interval. At the completion of this interval, the timer generates RESET and illuminates the RESET indicator. The RESET signal resets the reclose fail timer, resets the automatic reclose enable logic so that it is able to respond to a subsequent protective trip of the breaker, deenergizes the internal lockout relay and extinguishes the LOCKOUT indicator, and illuminates the RESET LED. The reset state, with the RESET LED illuminated, is the normal state for the relay as it waits for a protective breaker trip.

If a breaker trip occurs before the reset interval has expired, the RESET signal is not generated, the internal lockout relay is energized (if not previously energized by a close command), and the Reclosing Relay will not attempt to close the breaker or to reset its circuits. Resetting of the relay requires closing the controlled breaker by other means and its remaining closed for the duration of the reset interval.

ORDERING INFORMATION:

MODEL NUMBER:

BE1-79S Single Shot Reclosing Relay

STYLE NUMBER:

The relay model number is followed by a style number that appears on the front panel, draw-out cradle, and inside the case assembly. The style number is a combination of letters and numbers identifying the features included in a particular unit. A sample style number at right and Figure 4 illustrates the manner in which the various features are designated. The Style Number Identification Chart below defines each of the options and characteristics available for this device.

SAMPLE STYLE NUMBER: B1N-A4C-D4SOF

The style number above describes a single shot reclosing relay having the following features: single shot reclosing with reclose initiate and reclose cancel inputs, lockout and reset circuits, reclosure time delay continuously variable over the range of 5 to 60 seconds, internal operating power to be obtained from a 125 Vdc or 100/120 Vac supply, a reset timer that is continuously adjustable over the range of 5 to 60 seconds without maximum trial timer, non-isolated contact sensing input is supplied, line and bus voltage monitoring, reclose signal is continuous until controlled breaker is closed, and semi-flush mounting.

NOTE: Description of a complete relay must include both the Model Number and Style Number.

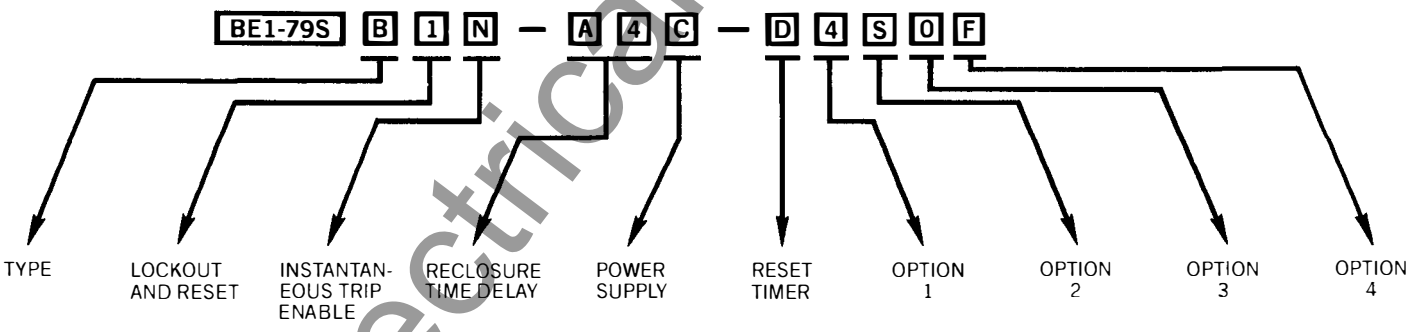


FIGURE 4. STYLE NUMBER BLOCK DIAGRAM

CHART 1. STYLE NUMBER IDENTIFICATION CHART(1)

TYPE	LOCKOUT AND RESET	INSTANTANEOUS TRIP ENABLE	RECLOSURE TIME DELAY	POWER SUPPLY	RESET TIMER	OPTION 1	OPTION 2	OPTION 3	OPTION 4
B One Shot with Reclose Initiate and Reclose Cancel	1 Lockout and Reset Circuits	N None	A2 0.1-2 Sec. A3 1-20 Sec A4 5-60 Sec.	B 48 Vdc C 125 Vdc 100/120 Vac D 24 Vdc **X 250 Vdc 230 Vac	*B Time Delay 5-60 Sec. with 95 sec. Max. Trial Timer *C Time Delay 5-60 Sec with 15 Sec. Max. Trial Timer D Time Delay 5-60 Sec. without Max. Trial Timer	4 Non-Isolated Contact Sensing Input 5 Isolated Contact Sensing Input	N None D Line and Bus Voltage Monitor with Power Supply Status Output F Power Supply Status Output S Line and Bus Voltage Monitor	0 None 2 Maximum Reclose Signal 2-3 Sec. (Non-Adjustable) 3 Maximum Reclose Signal 5-6 Sec. (Non-Adjustable)	F Semi-Flush Mounting P Projection Mounting

** Requires one of the following Contact Sensing Modules

OPTION 1	MODULE PART NUMBER
4	9 1463 01 103
5	9 1463 01 102

NOTE:
(1) Style Number is located on the relay front panel, drawout cradle and inside the case assembly.

* Maximum Trial timer only available with option 2-S.

HOW TO ORDER:

Designate the model number followed by the Complete Style Number:

BE1-79S 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 reclosure time delay.) All squares must be completed.

STANDARD ACCESSORIES:

The following standard accessories are available for use on the Single Shot Reclosing Relay.

TEST PLUG:

Order Test Plug, Basler part number 10095. (Two plugs required for complete testing capabilities.)

EXTENDER BOARD:

The Extender Board will permit troubleshooting of the P.C. boards outside the relay cradle. Order Basler part number 9 1129 30 100.

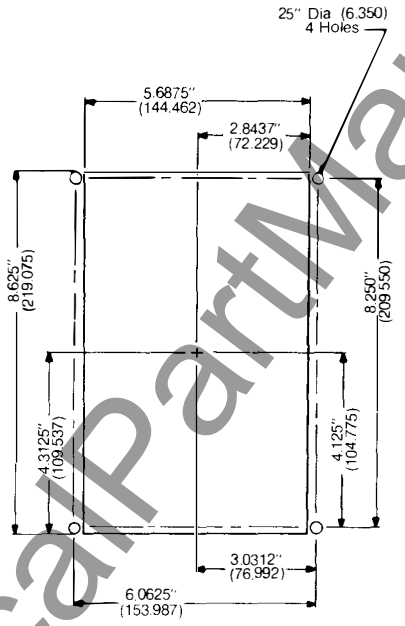


FIGURE 5. PANEL DRILLING PLAN

Numbers in parentheses indicate metric dimensions (Millimeters).

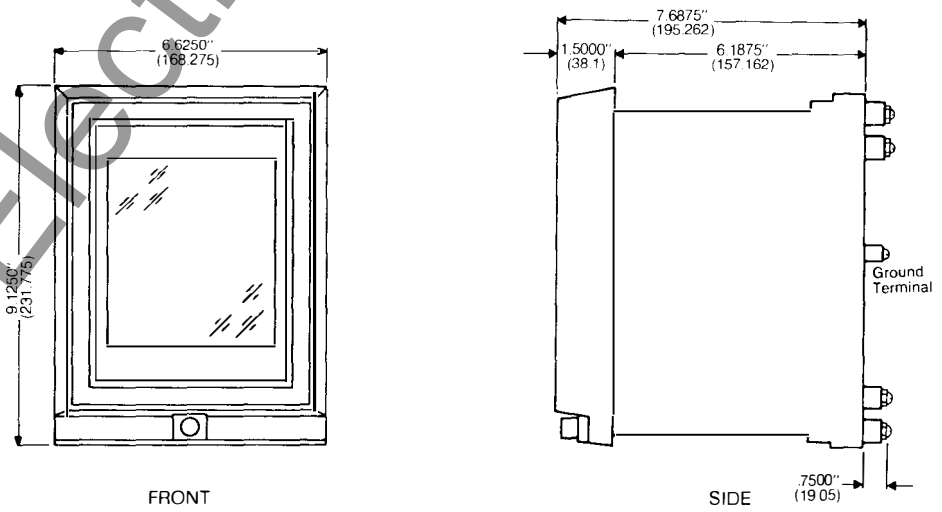
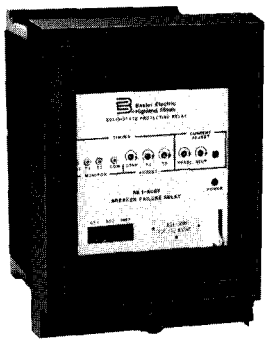


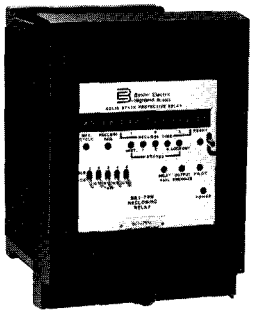
FIGURE 6. OUTLINE DRAWING

NOTE: All drawings and data subject to change without notice

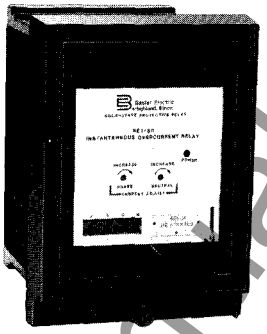
Basler is basic to system protection.



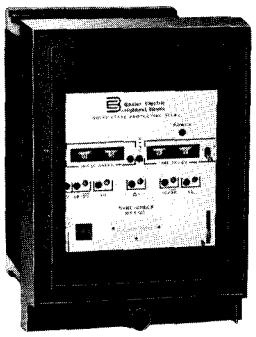
BE1-50BF
BREAKER FAILURE
RELAY



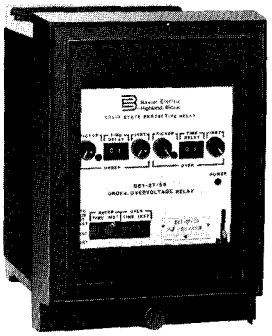
BE1-79M
MULTIPLE SHOT
RECLOSING RELAY



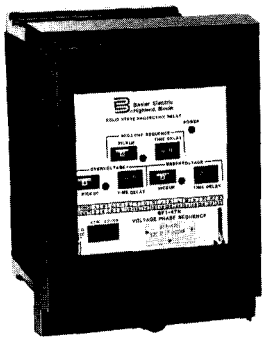
BE1-50
INSTANTANEOUS
OVERCURRENT RELAY



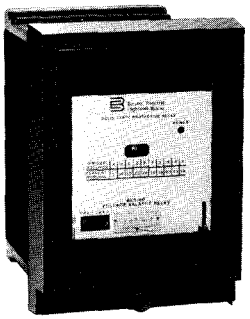
BE1-25
SYNC CHECK RELAY



BE1-27, 59, 27/59
VOLTAGE RELAYS

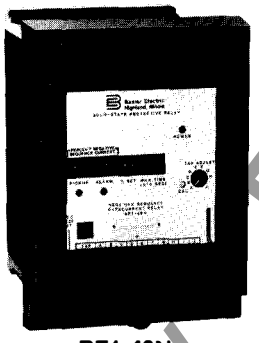


BE1-47N
VOLTAGE PHASE
SEQUENCE RELAY

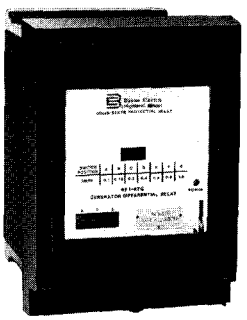


BE1-60
VOLTAGE BALANCE
RELAY

As the demand for more sophisticated generating systems increases, the need for more complex system protective devices is created. Recognizing this need, Basler Electric Company has introduced a line of solid-state protective relays, representing the first major change in design concept since the development of the electro-mechanical relay. The relays are available in a semi-flush mounted or projection mounted drawout relay case and are similar in appearance to the electro-mechanical relays they replace. Each relay offers a wide variety of standard as well as optional features to enhance the flexibility of today's changing application requirements. This flexibility, in hand with greater performance and higher reliability specifications, enables Basler Electric to be a leading supplier of control and protective devices for the electric power industry.



BE1-46N
NEGATIVE SEQUENCE
OVERCURRENT RELAY



BE1-87G
GENERATOR DIFFERENTIAL
RELAY

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