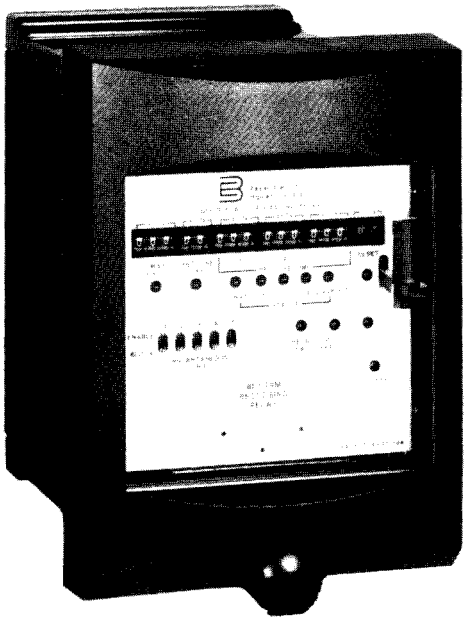

BE1-79M MULTIPLE SHOT RECLOSING RELAY

The BE1-79M Multiple Shot Reclosing Relay is microprocessor based to provide versatility and control in automatic circuit breaker reclosing.

ADVANTAGES

- Contact selectable reclosing sequences are programmable for up to 4 reclosure attempts.
- Ability to resume reclosing sequence if control power is interrupted.
- Individually adjustable time-delayed reclosing attempts.
- Separate high speed "Pilot" reclose input and output are available for transmission reclosing applications.
- Self-monitoring circuitry with alarm output.
- Optional outputs to control tripping schemes, and block load tap changer operation during reclosing sequences.
- Optional controls limit the duration of reclose command output and the overall reclosing cycle.
- Optional contact inputs to inhibit the reset timer, inhibit all reclose timing, obtain an alarm prior to lockout, or to permit a special reclosing sequence.
- Qualified to the requirements of IEEE C37.90.1-1989 and IEC 255 for fast transient and surge withstand capability; IEC 255-5 for impulse.
- Five year warranty.

ADDITIONAL INFORMATION

INSTRUCTION MANUAL
Request Publication 9170100990

STANDARDS, DIMENSIONS & ACCESSORIES
Request Bulletin SDA

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

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APPLICATION

PURPOSE

The BE1-79M Multiple Shot Reclosing provides automatic reclosing of tripped circuit breakers in power transmission and distribution systems. The majority of overhead line fault may be cleared by momentarily de-energizing the line. An automatic reclosure of the breaker, after the fault clears, provides improved service continuity and system stability. This, in turn, allows higher loading by decreasing the likelihood of line loss.

In applications, several items should be considered. These include the desired number of reclosing attempts, time delay between tripping and reclosing, supervisory control requirements, and coordination.

Where most faults are attributable to heavy tree exposure, as in distribution networks, multiple reclosure attempts are common. This is because of low voltage levels and is desirable considering customer inconvenience during outages. The BE1-79M is programmable for 0, 1, 2, 3, or 4 reclosure attempts.

On distribution and subtransmission networks, it may be desirable to delay reclosing to allow motors to drop off and local generators to be separated. On the other hand, faster reclosing in transmission systems minimizes damage and system shock. Reclosing is generally delayed for dissipation and deionization of the arc in the interrupter. The BE1-79M incorporates up to one instantaneous and three delayed reclosure attempts, with adjustable time delays.

In integrating automatic reclosing into distribution and transmission networks, it may be expedient to include some type of supervisory control. Flexibility is essential to minimize both customer inconvenience and system damage. This flexibility is provided in the BE1-79M. Contact inputs are available to initiate reclosing, bypass instantaneous reclosures, inhibit reset timing, permit or temporarily block reclosing or drive the relay to lockout. These contacts may be provided from the supervisory, control or protection circuits.

For system coordination, the BE1-79M reclosing relay possesses the ability for automatic system control. Outputs are available to enable or block instantaneous tripping of the circuit breaker, and to block automatic transformer load tap changer operation during a reclosing sequence. These outputs can be normally open or normally closed.

The relay also includes the capability to collect data on the success of reclosing, by recording each reclosing attempt (by type) in its memory. Outputs are also available to provide status information about the reclosing system: lockout, reclose fail, or relay fail.

The extent of reclosing integration is dependent on your desires and the system requirements. The BE1-79M has the flexibility to fulfill both.

SPECIFICATIONS

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 1 illustrates how various standard features, as well as options, function.

INPUTS

Contact Sensing

The Multiple Shot Reclosing Relay monitors the state of external contacts within the protection/control system. These contacts must have a minimum rating of .025A at 250 Vdc. Depending on selected option, the current through the contacts may be obtained from the relay itself (isolated contact sensing), or from a dc source with the voltage rating equal to the relay's power supply input (non-isolated contact sensing).

Maximum Sensing burden, which is dependent on power supply type, is listed below.

Power Supply Type	K	J	L	Z	Y
Burden per Input	1.5W	2.5W	1.0W	5.5W	2.5W

Contact sensing current is filtered and optically isolated by the contact interface circuitry. User-supplied contacts perform the following functions.

Breaker (52b) – Form B auxiliary contact of the controlled breaker defines the position of the breaker.

Reclose Initiate (RI) – Form A contact closed to initiate a reclosing sequence consisting of an instantaneous attempt followed by up to three time-delayed attempts.

SPECIFICATIONS (Continued)

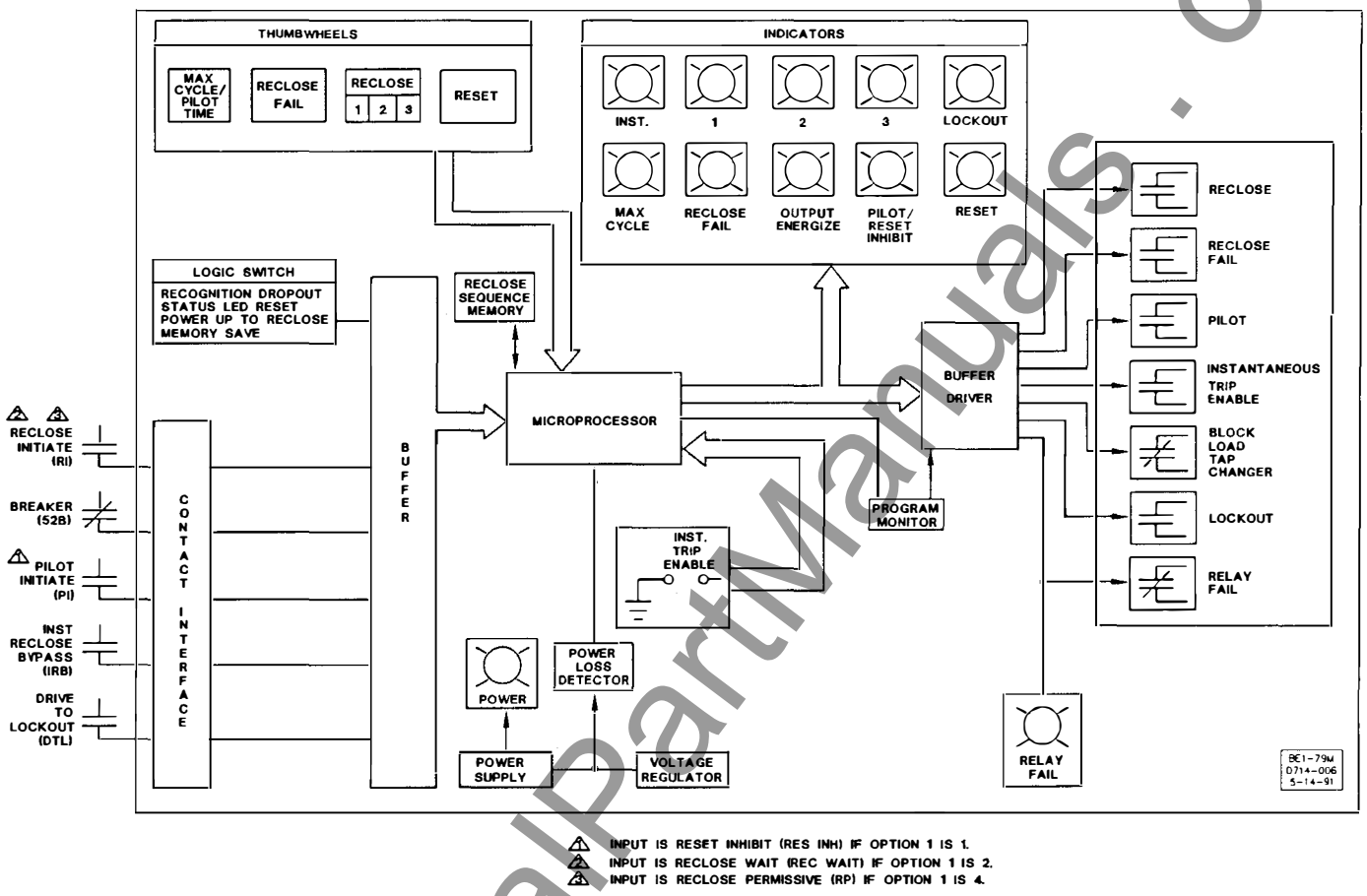


FIGURE 1. FUNCTIONAL BLOCK DIAGRAM

This contact is also required during the reclosing sequence to initiate each reclose time delay and subsequent reclose output closure.

Instantaneous Reclose Bypass (IRB) – Form A contact when closed bypasses the instantaneous reclose attempt in a normal reclosing sequence and initiates the reclosing sequence with the first time delayed reclosing attempt.

Drive-to-Lockout (DTL) – Form A contact which instantaneous drives the relay to the lockout condition when closed.

Pilot Initiate (PI) (Option) – Form A contact when closed initiates the pilot reclosing sequence consisting of an instantaneous attempt followed by up to two time-delayed attempts. This contact is also required during the pilot reclosing sequence to start each closure.

Reset Inhibit (RST INH) (Option) – Form A contact when closed inhibits the reset timer from timing. If this option is present, the 52b contact and RST INH must both be open to enable the reset timer to function.

Reclose Wait (RW) (Option) – Form A contact when closed, inhibits all timers from timing. All output contacts shall remain in their previous state, except reclose or pilot reclose which shall open if RW is closed. When RW is removed, reclosing will continue in the sequence to its next state (time delay or lockout). When this option is selected, "RI" is always logically "closed".

Reclose Permissive (RP) (Option) – Form A contact when closed permits a reclose sequence ("RI" is logically closed). When opened, all reclose time-delays are inhibited, the reclose or pilot reclose shall open, and the "IRB" and "PI" inputs are latching inputs. If RP is opened during a reclosing sequence, then closed, the relay will continue in the sequence to its next state (time-delay or lockout).

SPECIFICATIONS (Continued)

Power Supply

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

TABLE 1. POWER SUPPLY OPTIONS

Type	K	J	L	Z	Y
Nominal Voltage	48 Vdc	125 Vdc	24 Vdc	250 Vdc 230 Vac	48 Vdc 125 Vdc
Burden	9.0 W	19.5 W 36.0 VA	11.0 W	364.5 W 79.0 VA	9.0 W 19.5 W

Reclose

The reclose output contact is closed to energize the circuit breaker's closing coil. One instantaneous and up to three time-delayed reclosure attempts can be programmed. An instantaneous reclosure is defined as a reclose attempt with no intentional time delay. Each of the time-delayed reclosures are individually adjustable in 0.1 second increments from 0.1 to 99.9 seconds or 1.0 second increments from 1 to 999 seconds. The number of reclosing attempts before lockout is front panel programmable. Setting any of the reclosure time delays to 000 will produce lockout when that reclosing attempt is reached in the sequence.

Reclose Fail

The front panel programmable reclose fail option is available to limit the duration of the reclose command signal. Initiated at the onset of a reclose command output signal, the reclose fail time setting is compared to the time the reclose command signal is present. If the set time is exceeded before the breaker closes, the relay immediately goes to lockout, the reclose fail output contact is closed, and the reclose fail LED indicator illuminates. The reclose fail setting is adjustable in 0.1 second increments from 0.1 to 9.9 seconds. A setting of 00 inhibits the reclose fail timer and causes the reclose command signal to be continuous until the breaker closes.

Lockout

A normally open output contact is provided, as well as a front panel LED to indicate lockout. Lockout inhibits further relay operation and will occur for any of the following conditions:

1) The number of breaker trips in a sequence exceeds the number of programmed reclosure attempts.
2) Closure of the drive-to-lockout input contact,
3) Reclosure failure, or
4) The total reclosing sequence time exceeds the maximum cycle time setting.

To bring the relay out of lockout, the circuit breaker must be closed (manually or by other means) and then remain closed for the reset time delay setting.

Reset

When a breaker has been reclosed, the microprocessor initiates the reset timing function. If the breaker remains closed for the duration of the front panel programmable reset time setting, the relay automatically resets. However, if the breaker reopens prior to expiration of the rest time, the relay will proceed to the next reclose attempt, or, if programmed reclose attempts have been exhausted, to lockout. The reset timer is inhibited from timing if the reset inhibit option is selected and the input is present. The reset timing function is also initiated during the power-up sequence (except when the memory save function is enabled and the breaker is open). A front panel LED is illuminated to indicate that the relay is in the reset state. The relay must be in the reset state for a reclosing sequence to be initiated. The reset time setting is adjustable from 10 to 1000 seconds in 10 second increments, or 1 to 100 second, in 1 second increments. A setting of 00 produces the maximum time available (1000 or 100 seconds).

Power-up

When power is applied to the relay, from a non-powered-up state, the relay will assume either a "relay fail" condition (if the circuit breaker is closed) or a "lockout" condition (if the breaker is open), except when the "power-up to reclose" or "memory save" features are enabled.

Standard Programmable Features

Several functions are available with each relay that can be programmed by changing the setting on PC board mounted 16 position switch.

Memory Save

When this feature is enabled and power is removed, that point in the reclosing sequence is stored in memory. Upon power restoration, operation is then resumed from the exact point in the reclosing sequence where power was lost. With this feature disabled, the relay will undergo a normal power-up routine when power is restored.

Power-up to Reclose

When this feature is enabled, the relay will allow an immediate reclosing sequence from an initial power-up condition. When disabled, the relay will undergo a

SPECIFICATIONS (Continued)

normal power-up routine upon application of power.

Status LED Reset

When this feature is enabled, the reclosing status LEDs (INST, 1 2 3 4 and Pilot) will extinguish whenever the relay goes to the reset condition. When disabled these LED's will remain illuminated until power is removed or extinguished from the reset lever.

Recognition Dropout

When this feature is enabled, the time period between the RI or PI inputs dropout and 52b input recognition must be less than 200 milliseconds. When disabled, this time period must be less than 17.5 milliseconds.

Pilot Initiate

The pilot initiate option provides an additional input, output, and reclosing sequence. The pilot initiate reclosing sequence is as follows: The pilot initiate (PI) and breaker open (52b) contact signals are received, illuminating the pilot reclose LED and instantaneously closing the pilot reclose output contact. The pilot reclose output contact will remain closed until the breaker closes, or, if present, until the reclose fail time setting is exceeding. When the breaker closes, the reset timing function commences. If the breaker reopens before the relay resets, the relay will assume a normal reclosing sequence, beginning with the second time delayed attempt. Pilot initiate takes precedent over RI. An optional pilot timer is available with adjustable time delay of 0.03 to 0.99 seconds in 0.01 second increments.

Instantaneous Trip Enable

An instantaneous trip enable option is available to enable instantaneous tripping of the circuit breaker. Each of the five front panel switches defines the state of instantaneous trip enable output contacts for a particular point in the overall operation. With the switches in the enable position, the instantaneous trip enable output contacts are closed during the following periods:

Switch Enabled	Contact Closed	
	From	To
1	Lockout and/or reset	First trip
2	Instantaneous reclosure	Next
3	First time-delayed reclosure	trip
4	Second time-delayed reclosure	Next
5	Third time-delayed reclosure	trip

Instantaneous tripping may be enabled or disabled for any single trip or combination of trips. A "cold load" feature is available which will keep the contact open for switch 1 until the relay goes to the reset condition.

Block Load Tap Changer

A normally closed or normally open contact is available to prevent the operation of a transformer's automatic load tap changer during a reclosing sequence. This contact is energized when a reclosing sequence is initiated and remains in its energized state until the relay either resets or reaches lockout. If a normally closed contact is selected, the contact is open during the reclosing sequence.

Reclosing Event Memory

The Reclosing Event Memory is included to provide the user with a method of automatically counting the number of instantaneous, 1st time-delay, 2nd time-delay, 3rd time-delay, pilot reclose attempts and the number of times the relay has gone to lockout. A maximum of 999 attempts for each reclose type can be stored in the relays memory. The memory is a non-volatile RAM (random access memory) and will retain data through all power interruptions.

Maximum Cycle

The maximum cycle time option limits the maximum duration of the total reclosing sequence. This front panel programmable timing function is initiated by the recognition of the first trip in a sequence, and continues until the unit is either reset or advanced to lockout. Failure to achieve reset before this set time has elapsed will advance the relay to lockout. A front panel LED illuminates to indicate that the maximum cycle time setting has been exceeded. The maximum cycle is adjustable from 1 to 1,000 seconds in 1 second increments. The 1000 second maximum cycle limit is obtained by a setting of 000.

Outputs

All 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 15 A for 0.2 seconds, carry 7 A continuously, break 0.1 A.

Inductive

120/240 Vac, 125 Vdc, 250 Vdc – break 0.3 A (L/R = 0.04)

Microprocessor

The input signals and front panel switches are read and interpreted by the microprocessor. The

SPECIFICATIONS (Continued)

microprocessor determines the course of action by selecting the proper reclosing sequence, and affecting output contacts accordingly. The microprocessor also performs all timing functions.

Program Monitor

Operation of the microprocessor is continuously monitored by the program monitor. Should the microprocessor fail to function properly, the program monitor will discontinue microprocessor operation, close the relay fail alarm output contact and reset all other output contacts.

Relay Fail

A normally closed output contact is provided to indicate a Multiple Shot Reclosing Relaying failure. This contact opens on completion of the power-up sequence and remains open until power is lost or the microprocessor malfunctions. A front panel LED is illuminated during power-up and in the event the Multiple Shot Reclosing Relay fails.

Built-in-Test (BIT)

The Build-in-Test is a quick test routine programmed into the BE1-79M relay. When initiated, the relay will perform a programmed sequence of events, each event occuring at one-second intervals. This sequence will quickly verify proper operation of all indicators and outputs incorporated into the unit.

Surge Withstand Capability

Qualified to ANSI/IEEE, C37.90.1 Surge Withstand Capability Test and IEC 255, Impulse Test and Dielectric Test.

Mechanical

Operating Temperature

-40°C (-40°F) to +70°C (+158°F)

Storage Temperature

-65°C (-85°F) to +100°C (+212°F)

Weight

13 pounds

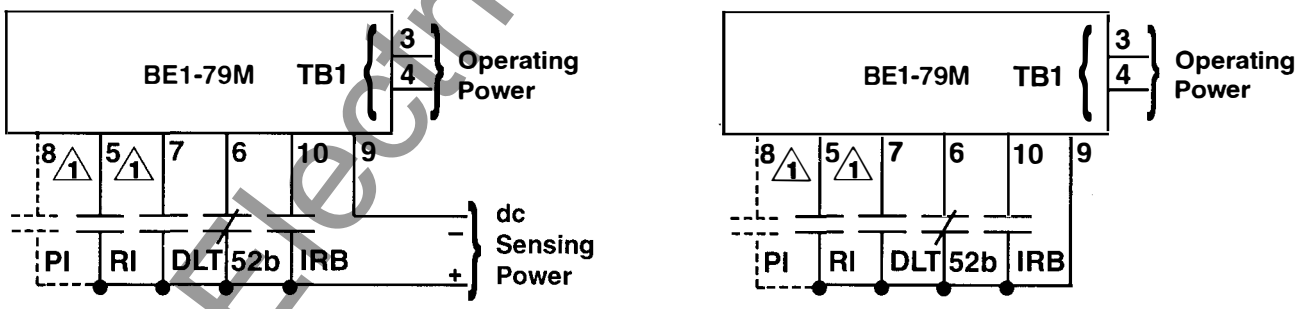
Shock

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



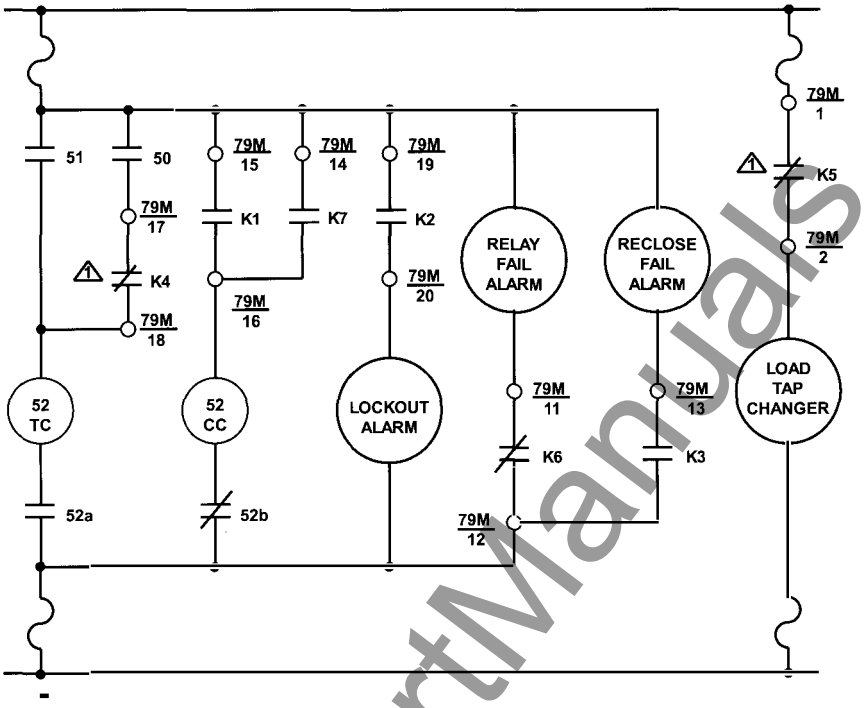
Legend:

RI	Reclose Initiate Sensing Input Contacts
DTL	Drive-to-Lockout Sensing Input Contacts
52b	Circuit Breaker Sensing Input Contacts
IRB	Instantaneous Reclose Bypass Sensing Input Contacts
PI	Pilot Initiate Sensing Input Contacts (Optional)
RST INH	Reset Inhibit Sensing Input Contacts (Optional)
REC WAIT	Reclose Wait Sensing Input Contacts (Optional)
RP	Reclose Permissive Sensing Contacts (Optional)

⚠1 If Option 1 is 1
PI is Replaced with RST Inhibit
If Option 1 is 2
RI is Replaced with REC Wait
If Option 1 is 4
RI is Replaced with RP

Figure 2. Contact Sensing

CONNECTIONS, Continued



LEGEND:

79M MULTIPLE SHOT RECLOSING RELAY
50 INSTANTANEOUS OVERCURRENT RELAY
51 TIME OVERCURRENT RELAY
52 CIRCUIT BREAKER
52a CIRCUIT BREAKER AUXILIARY CONTACTS
52b CIRCUIT BREAKER AUXILIARY CONTACTS
K1 RECLOSING OUTPUT CONTACTS
K2 LOCKOUT ALARM OUTPUT CONTACTS
K3 RECLOSE FAIL ALARM OUTPUT CONTACTS (LOCKOUT AND RESET-2, 5, 6, 8)
K4 INSTANTANEOUS TRIP ENABLE OUTPUT CONTACTS (CONTROL OUTPUT-A, C)
K5 BLOCK LOAD TAP CHANGER OUTPUT CONTACTS (CONTROL OUTPUT-B, C)
K6 RELAY FAIL ALARM OUTPUT CONTACTS
K7 PILOT RECLOSING OUTPUT CONTACTS (LOCKOUT AND RESET-3, 5, 7, 8)
TC TRIP COIL
CC CLOSING COIL
CONTROL CIRCUIT FUSING (IF USED)
⚠ MAY BE NO OR NC

Figure 3 - Control circuits

ORDERING

MODEL NUMBER

BE1 -79M Multiple Shot Reclosing Relay.

STYLE NUMBER

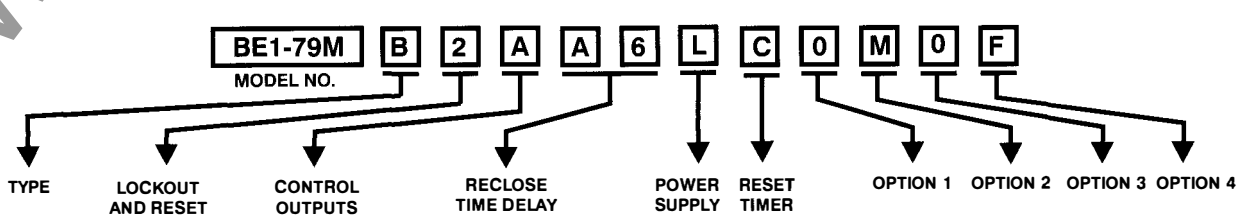
The style number appears on the front panel, drawout cradle, and inside the case assemble. This style number is an alphanumeric combination of characters identifying the features included in a particular unit. The sample style number below illustrates the manner in which the various features are designated. The Style Number Identification Chart (page 8) defines each of the options and characteristics for this device.

Type	(B)	Multi-shot
Lockout and Reset	(2)	Lockout and reset with reclose failure alarm
Control Outputs	(A)	Instantaneous trip enable
Reclose Time Delay	(A6)	0.1 to 99.9 seconds
Power Supply	(L)	24 Vdc external operating power
Reset power	(C)	10 to 1000 seconds
Option 1	(0)	None
Option 2	(M)	Isolated contact sensing
Option 3	(0)	None
Option 4	(F)	Semi-flush mounting

SAMPLE STYLE NUMBER: B2AA6LCOMOF

The style number above describes a BEI-79M Multiple Shot Reclosing Relay having the following features.

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



Sample Style Number Illustrated

ORDERING, continued

HOW TO ORDER:

Designate the model number followed by the complete Style Number:

BE1-79M Style No. ☐☐☐☐☐☐☐☐☐☐

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

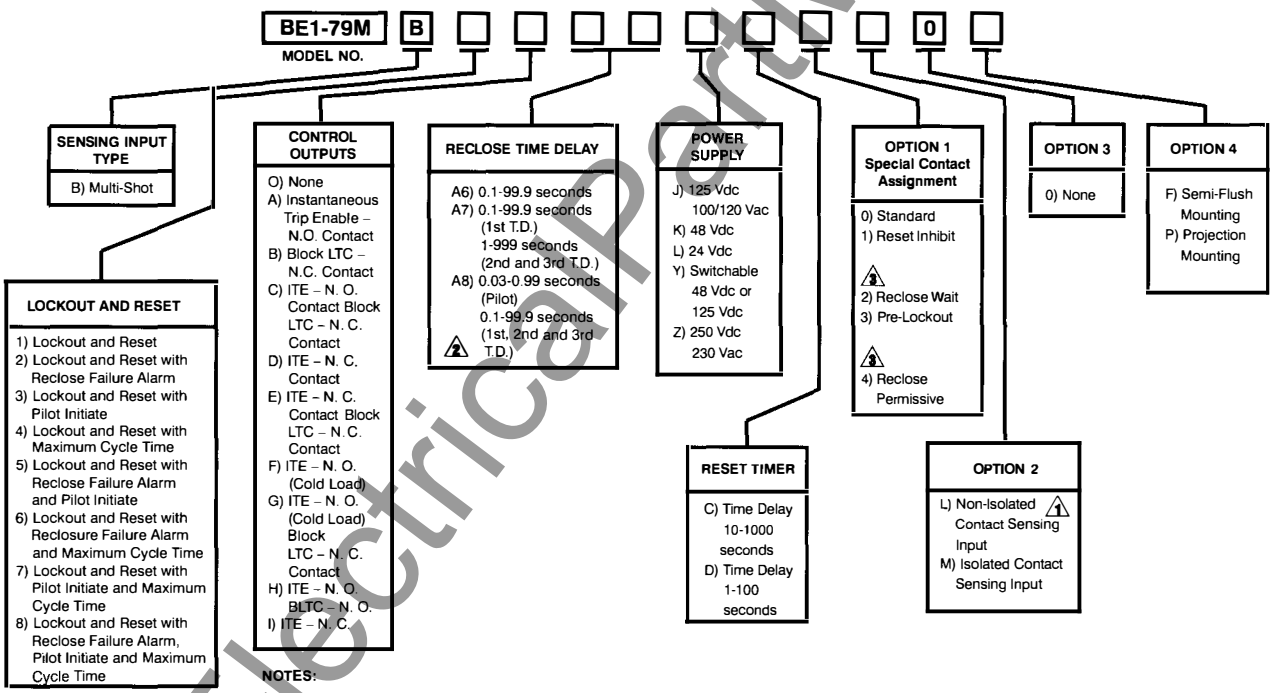
STANDARD ACCESSORIES:

The following standard accessories are available for the BE1-79M Multiple Shot Reclosing Relay.

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

Extender Board
The Extender Board will permit troubleshooting of the P. C. boards outside the relay cradle. Order Basler part number 9165500100.

STYLE NUMBER IDENTIFICATION CHART



NOTES:

1. Non-isolated contact sensing L requires dc sensing power.
2. Pilot Initiate Option required (L.O. and reset must be 3, 5, 7, 8).
3. Not available with Pilot Initiate (LO. and Reset must be 1, 2, 4, or 6).

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