

Order Number

Serial Number

PRODUCT/TEST MANUAL

1B170K16

FOUR SHOT AUTO RECLOSE RELAY

Issue Level	Date	Summary of changes
C	13/05/1996	Initial issue.

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1. BROAD DESCRIPTION

The 1B170 is a four shot auto-reclose relay employing solid state timing and logic elements with electromechanical interface relays.

A delay is provided after initial circuit breaker tripping to allow the fault to de-ionize, before reclosing is initiated. If another fault occurs shortly afterwards (as may occur during severe electrical storms) a second delay is provided to allow de-ionization and a second reclosure is initiated. A switch on the front panel is provided to allow from one to four reclosures to be made. If all attempts are unsuccessful (or short lived), a "lockout" relay picks up, either instantaneously or after a further delay (the lockout time) -selectable by slide switch after the final reclose pulse.

After the relay has "locked out" and the circuit breaker is again closed (by means other than the 1B170 relay - e.g. manual close initiate), the 1B170 relay is reset to provide another reclosure sequence on the next fault.

2. SPECIFICATIONS

DC Auxiliary Supply		D30 - D60
Auxiliary Supply Burden		Zero
Standby		<8.5W (50V)
Peak		
Initiate Relay (Double Wound)		
Series Initiate	Current	>1.2A
	Pulse Length*	>40mS
	Resistance	<.15 Ohms
	*Shorter pulse lengths will initiate the unit but higher currents are required.	
Shunt Initiate	Voltage	D30 - D60
	Pulse Length	>40mS
Circuit Breaker Auxiliary Contact		1 N/O (ie. open for CB open) Connected to auxiliary supply -ve.
Time Ranges		
Reclose 1st Shot		.5 - 10 Sec
Reclose 2nd Shot		1 - 20 Sec
Reclose 3rd Shot		1 - 20 Sec
Reclose 4th Shot		1 - 20 Sec
Lockout		5 - 100 Sec
Output Pulse length		2 Sec \pm 10%
Accuracies		Repeat \pm 2% of setting Setting \pm 5% of maximum setting
Number of Shots		1 to 4 selected by switch
Inhib. Inst. Protection after		1 to 4 selected by switch
Lockout Timer Bypass		In/Out slide switch

2. SPECIFICATIONS (Cont)

Operation Indicators	LEDs indicating which shot in progress. LED indicating lockout relay energised.
Counter	4 Digit non-reset
Relay Contact Ratings	
Reclose Relay 1 C/O	Make & Carry 8A continuous 30A 3 Sec AC Break 3000VA with maximum of 440V & 8A DC Break .25A 240V, .3A 110V, 5A 32V
Inhib. Inst. 1 C/O	Make & Carry 3A continuous AC Break 500VA with maximums of 240V & 3A
Lockout 2 C/O	Make and Carry 10A continuous AC break 15000VA with maximums of 240V & 7A
Ambient Temperature Range	-5°C to 50 °C

3. TEST EQUIPMENT REQUIRED

Auxiliary Supply Electronic Frequency Counter
Oscilloscope (Dual Beam) Extender Card (with DIN 41617 connectors)
to facilitate monitoring of test points on PCBs.
Artificial CB or switches and pulse generator to simulate same.

4. ASSOCIATED DRAWINGS

151-170-116	Wiring Diagram 1B170K16
151-170-216	Circuit Diagram 1B170K16
660-033-304	Loading Diagram - Mother PCB
660-034-304	Loading Diagram - Main Logic PCB
660-035-300	Loading Diagram - Front Panel PCB
651-382-301	Loading Diagram - Relay Mounting PCB

5. HIGH VOLTAGE TESTING

- a) Apply 2KV 50Hz test for 1 minute between terminal Groups A and B.
- b) Apply 3 5KV 1/50 impulses of each polarity between terminal Groups A and B.
- c) Apply 3 5KV 1/50 impulses of each polarity between terminals 11 and 12.

Group A

1,2,3,4,5,6,7,8
3,4,5,9,10,15,16,17
1,2,11,12,13,14,15,16,17

Group B

9,10,11,12,13,14,15,16,17,E
1,2,6,7,8,11,12,13,14,E
6,7,8,9,10,E

6. CALIBRATION & TEST PROCEDURE

The 1B170 may be tested with or without an artificial circuit breaker, a switch in the latter case being used to represent the CB auxiliary contact. Various sequences of operation may be tested by simulating CB operation with this switch.

Refer to Circuit Diagram 151-170-216 for component references.

6.1 Initiation

- a) Check that with auxiliary supply on, the hold-in relay RL4 latches in when a voltage pulse of duration 40ms is applied. The CB should be in the "tripped" condition for this test.

Actual

- b) Check that RL4 also latches in as per (a) above but for a 1.2A 40ms series initiate pulse.

Actual

6.2 Calibration of Interval Timers

- a) IC1-b, IC1-c, IC1-d and IC1-e are Schmitt Trigger type oscillators which are successively gated into a single ripple counter timer (IC7). The four oscillators have similar calibration procedures.
- b) Connect a frequency (or period) counter to the output of the oscillator IC being calibrated.
- c) Adjust the trimpot connected in series with the dial pot to achieve a 20:1 ratio between Maximum and Minimum settings of the dial pot.
- d) Add one or two padding capacitors in parallel with the main oscillator frequency at maximum (and minimum) dial pot settings. The frequencies are given in the table below.

Interval No	Time Range	Min Per	Max Per
1	.5-10s	.122ms	2.441ms
2	2-20	.244	4.883
3	1-20	.244	4.883
4	1-20	.244	4.883

- e) Record Results

Interval 1	Minimum	Maximum	Nominal	Actual	Unit
	.6	1.4	1	<input style="width: 100px; height: 15px;" type="text"/>	s
	3.6	4.4	4	<input style="width: 100px; height: 15px;" type="text"/>	s
	6.6	7.4	7	<input style="width: 100px; height: 15px;" type="text"/>	s
	9.6	10.4	10	<input style="width: 100px; height: 15px;" type="text"/>	s
Interval 2	Minimum	Maximum	Nominal	Actual	Unit
	1.2	2.8	2	<input style="width: 100px; height: 15px;" type="text"/>	s
	7.2	8.8	8	<input style="width: 100px; height: 15px;" type="text"/>	s
	13.2	14.8	14	<input style="width: 100px; height: 15px;" type="text"/>	s
	19.2	20.8	20	<input style="width: 100px; height: 15px;" type="text"/>	s

6.2 Calibration of Interval Timers (Cont)

Interval 3	Minimum	Maximum	Nominal	Actual	Unit
	1.2	2.8	2		s
	7.2	8.8	8		s
	13.2	14.8	14		s
	19.2	20.8	20		s

Interval 4	Minimum	Maximum	Nominal	Actual	Unit
	1.2	2.8	2		s
	7.2	8.8	8		s
	13.2	14.8	14		s
	19.2	20.8	20		s

6.3 Calibration of 2 Sec Output Pulse

Oscillator IC1-f drives the 2 second output pulse timer IC8. Adjust IC1-f output period to 15.62ms. This adjustment also sets the width (7.81ms) of TP-Z (although the width of this clocking pulse is not critical).

Record output pulse length.

Minimum	Maximum	Nominal	Actual	Unit
1.9	2.1	2		s

6.4 Calibration of Lockout Timer

IC9 and associated components comprise the lockout timer. In this instance, the on-chip oscillator is used. The calibration procedure is similar to that employed for calibrating the interval timer oscillators. The oscillator period at minimum setting is 1.221ms and 24.21ms at maximum setting. Pin 6 of IC9 must be low when calibrating the oscillator.

Record results:

Minimum	Maximum	Nominal	Actual	Unit
6	14	10		s
36	44	40		s
66	74	70		s
96	104	100		s

7. GENERAL AND FUNCTIONAL

- a) Operation with CB auxiliary contact remaining in the “tripped position” is easily achieved. After initiation, the 1B170 will initiate the switch selected number of 2 second reclose pulses and will then go into lockout, either instantaneously or after the lockout time has elapsed, depending on the slide switch setting.
- b) Set “number of shots” switch to “4” and set interval timers 1,2,3 and 4 to 1second, 2 seconds, 4 seconds and 8 seconds respectively.

Connect oscilloscope trace 1 to TP-Y and trace 2 to TP-X. When relay is initiated, a square wave will appear at TP-Y, with frequency determined by which time interval is in progress. By having different interval times, operation of the decade counter, oscillator gates (IC3a, 3b, 3c, 3d, 4c, 4d and 5d) and virtually all remaining logic, may be verified by observing the changing waveform period at this test point.

Note that IC1-a provides a reset at power-on to set the decade counter to zero. It is therefore permissible whilst fault finding to reset the decade counter (IC2) by temporarily shorting capacitor C7. TP-X pulses high for 7.8ms at the end of each reclose pulse, with the exception of the final one, where TP-X goes high permanently.

- c) Operation for other sequences should be according to the timing diagrams shown in the Descriptive Manual. Check operation for each setting of switches SW1 and SW2.

OK

- d) Check that the relay is electrically sound and mechanically robust as per Standard Inspection & Test Schedule 903.000.026.

PASS

TESTED BY: _____ DATE: _____

8. CONNECTION DIAGRAM

