

Order Number

Serial Number

PRODUCT/TEST MANUAL

1B170K20

FOUR SHOT AUTO RECLOSE RELAY

Issue Level	Date	Summary of changes
A	24/08/00	Initial issue.

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1. DESCRIPTION OF OPERATION

The 1B170K20 is designed to provide up to four successive reclosures in an automatic circuit breaker reclosing system. Series or shunt initiate may be used to start the relay and after a time delay of T1 seconds a 2-second reclose pulse occurs. Immediately this pulse finishes, the lockout timer is initiated.

If the circuit breaker has not tripped after this interval has elapsed, the hold-in relay drops out and the recloser is completely de-energised.

2. SPECIFICATIONS

Initiate Relay (Double Wound)		
Series Initiate	Current	>1.2A
	Pulse Length	>40mS
	Resistance] . 11 Ohms
Shunt Initiate	Voltage	see "Aux."
	Tolerance	+15% -25%
	Pulse Length	>40mS
Auxiliary Supply	D32	+15% -25%
Operating Burden	<8 W & <12 W during reclose	
Standby Burden	Zero	
Circuit Breaker Aux. Contact	1 N/C Voltage Free	
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	
Accuracy's	Repeat $\pm 2\%$ of setting Setting $\pm 5\%$ of maximum setting	
Number of Shots	1 to 4 selected by switch	
Inhibit Inst. Protection after	1 to 4 selected by switch	
Lockout Timer Bypass	In/Out slide switch	
Operation Indicators	LED's indicating which shot in progress. LED indicating lockout relay energised.	
Counter	6 Digit non-reset	
Relay Contact Ratings		
Reclose Relay	Make & Carry	8A continuous 30A 3 Sec
	AC Break 3000VA with maximum of 440V & 8A DC Break .25A 240V, .3A 110V, 5A 32V	
Inhibit. Inst. Lockout	Make & Carry	3A continuous AC Break 500VA with maximums of 240V & 3A

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

151-170-120	Wiring Diagram 1B170K20
151-170-203	Circuit Diagram 1B170K3
660-033-303	Component Loading Diagram - Mother PCB
660-034-302	Component Loading - 4 Shot Reclose Relay PCB
660-035-301	Component Loading - Front Panel 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
9,10,11,12,13,14
All terminals

Group B
1,2,6,7,8,15,16,17
Frame

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. Simulating CB operation with this switch may test various sequences of operation.

Refer to Circuit Diagram 151-170-203 for component references.

6.1 Initiation

- a) Check that with auxiliary supply on, the hold-in relay RL4 latches in when a voltage pulse is applied. The CB should be in the "tripped" condition for this test.
- b) Check that RL4 also latches in as per (a) above but for a 1.2A series initiate pulse.

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.

6.2 Calibration of Interval Timers (Cont)

- 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	1 - 20s	.244ms	4.883ms
3	1 - 20s	.244ms	4.883ms
4	1 - 20s	.244ms	4.883ms

- e) Record Results

Interval 1	Minimum	Maximum	Nominal	Actual	Unit
	.6	1.4	1		s
	3.6	4.4	4		s
	6.6	7.4	7		s
	9.6	10.4	10		s

Interval 2	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 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 1 second, 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 faultfinding 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

