

Order Number

Serial Number

## PRODUCT / TEST MANUAL

**1B110K1**

**SINGLE SHOT AUTO RECLOSE**

<b>Issue Level</b>	<b>Date</b>	<b>Summary of changes</b>
B	26/04/1996	Initial issue.

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## 1. DESCRIPTION OF RELAY

The 1B110 is a single shot auto reclose relay employing solid state timing and logic elements with electromechanical voltage blocking and interface relays. Reclose on/off control relays are also located within the unit. Toggle switches are provided for Single Shot/Auto Reset, Dead Line/ Live Line and Interlocked/Non-Interlocked modes of operation. LEDs indicate the Lockout and Line Voltage Normal conditions and an electromechanical counter records the number of reclose operations. The Reclose and Reset timers are digital and are set by front panel mounted thumbwheel switches.

## 2. SPECIFICATION

DC Auxiliary Supply	D88-D138 (D200-D275 with external resistors)
Auxiliary Supply Burden (excluding RCO and RCI relays)	
Standby:	<2W (125V) <7W (250V)
Peak:	<17W (125V) <38W (250V)
AC Sensing Supply	110V or 63.5V (tapped)
Live Line Threshold	75% of nominal
Dead Line/Live Line Blocking	Front panel switch selectable
Burden	<1.5VA (110V input)
Series Initiate Input	
Min. op. current	<1.25A
Pulse Length	40ms
* Shorter pulse lengths will initiate the unit but higher currents are required.	
Shunt Initiate (D125 and D250)	
Pulse Length	>11ms
CB Status Contact	N/C (i.e. closed for CB tripped) Connected to auxiliary supply -ve
Reclose Timer Range	.1 to 99.9 sec
Reclose Timer Accuracy	±3% of setting ±50ms
Reclose Pulse Length	2.0 sec ± .1 sec
Reset Timer Range	1 to 999 sec
Reset Timer Accuracy	±3% of Setting ±.1 sec
Ambient Temperature Range	-5 to 50 deg
External Inhibit	RCI relay (terminals B9 & B4) holds unit in "reset" mode whilst energised.

### 3. TEST EQUIPMENT REQUIRED

DC Auxiliary Supply	AC 50Hz Supply
Frequency Counter	Digital Voltmeter
Oscilloscope	
Electronic Counter (for measuring operate and release times)	
Artificial Circuit Breaker	High Voltage Test Equipment

### 4. ASSOCIATED DRAWINGS

151-110-201	Circuit Diagram 1B110K1
660-246-301	Loading Diagram - Motherboard
660-247-301	Loading Diagram - Relay Mounting Board
660-248-301	Loading Diagram - Blocking & Signalling Relay Board
660-245-301	Loading Diagram - Logic Board
660-244-301	Loading Diagram - Thumbwheel Board

### 5. HIGH VOLTAGE TESTING

- a) Apply 2KV RMS 50 Hz between terminal groups 1 and 2 in Table 1 for 1 minute.
- b) Apply 3 5KV 1/50us pulses of each polarity between terminal groups 1 and 2 in Table 1.

**TABLE 1**

<b>GROUP A</b>	<b>GROUP B</b>
A1,3,4,5,6,7,8,9, 11,12,14,15,16,B7, 8,14,15,16	A17,18,19,20 B1,2,3,4,5,6, 9,11,12,1,3,17,18,19,E
A1,5,6,7,8,9,14,15,16, 17,18,19,20,B1,2,3, 4,5,6,9,14,15,16	A3,4,11,12,B7,8 11,12,13,17,18,19,E
A1,5,6,7,8,9,14,15, 16,17,18,19,20 B1,2,3,5,6,7,8, 17,18,19	A3,4,11,12, B4,9,11,12,13, 14,15,16,E
B11,12,13	E

### 6. CALIBRATION & TEST PROCEDURE

#### 6.1 General

- a) Connect the series initiate relay coil to the 1.25A current source via the artificial CB trip pulse.
- b) Adjust both trimpots in the unit to approximate mid-setting.
- c) Set Reclose timer to 3.0 seconds and Reset timer to 5.0 seconds.
- d) Apply 125V to circuit and check that +10V rail is within  $\pm 10\%$  of its nominal voltage.

**Actual**

**6.1 General (Cont)**

- e) Set auxiliary supply to 88V and apply a 1.25A 40ms start pulse. Check that start relay picks up and holds in; if not the series initiate coil polarity may be incorrect.

**Actual**

- f) Reduce the pulse width to 11.0ms and record the minimum current at which start relay holds in.

**Actual**  A

- g) De-energise circuitry and reconnect artificial CB to provide a shunt initiate pulse 11ms long.

- h) Re-apply auxiliary supply of 88V and check that start relay holds in when pulsed.

**Actual**

- i) De-energise circuitry and remove link from enclosure terminals A7-A9. Connect 1K 30W resistor between terminals A8 and A9.

- j) Increase auxiliary supply to 200V and check that start relay picks up and holds in when an 11ms pulse is applied.

**Actual**

- k) Repeat j) at Vx 275V and check that RL+ voltage (660/245 PCB pin 24) is within tolerance.

Minimum	Maximum	Nominal	Actual	Unit
130	145	160	<input type="text"/>	V

- l) Check that Lockout relay RL4 picks up when the unit is started and that "Lockout" LED operates. RL4 should drop out when unit self-resets or is externally reset.

**Actual**

**6.2 Voltage Blocking**

- a) Check that the voltage blocking relays RL1 and RL2 operate within specification as follows:

- b) RL1 picks up for AC voltage applied between terminals A15-A14.

Minimum	Maximum	Nominal	Actual	Unit
38	46		<input type="text"/>	V

**6.2 Voltage Blocking (Cont)**

c) RL1 picks up on 110V connection. i.e. Terminals A16-A14.

Minimum	Maximum	Nominal	Actual	Unit
66	79		<input type="text"/>	V

d) RL2 picks up for AC voltage applied between terminals B15-B14.

Minimum	Maximum	Nominal	Actual	Unit
38	46		<input type="text"/>	V

e) RL2 picks up on 110V connection. i.e. Terminals B16-B14.

Minimum	Maximum	Nominal	Actual	Unit
66	79		<input type="text"/>	V

f) Check that "Line V normal" LED is on when both RL1 and RL2 are picked up. Note that auxiliary supply must be applied.

**Actual**

g) Check that the "VB discrepancy alarm" contacts are functional (i.e. continuity between terminals B7 and B8 when RL1 and RL2 are in opposite states).

**Actual**

**6.3 Operation of RCO and RCI Relays**

a) Check that RCO relay RL and picks up when 88V is applied between terminals B2 (+ve) and B6.

**Actual**

b) Check that +88V appears at B1 and B3 when RCO is picked up.

**Actual**

c) Check that RCO drops out when B2 and B5 are shorted together. Do not leave B2 and B5 joined permanently as resistor R25 is not rated for continuous operation under these conditions.

**Actual**

d) Check that RCI relay RL8 picks up when 88V is applied between terminals B9 (+ve) and B4.

**Actual**

e) Connect 10K 10W stud resistor to terminal B6 and 15K 10W stud resistor to terminal B4.

f) Check that RCO relay picks up when 200V is applied via 10K resistor to B6 (-ve) and B2 (+ve).

**Actual**

**6.3 Operation of RCO and RCI Relays (Cont)**

- g) Check that RCI relay picks up when 200V is applied via 15K resistor to B4 (-ve) and B9 (+ve).

**Actual**

- h) Check that RCI relay contacts are functional and correctly wired.

**Actual**

- i) Check that unit is held in the reset mode when RCI relay (RL8) is energised.

**6.4 Timer Calibration**

NOTE: To verify that the thumbwheel switches and down counters are fully functional, the timebase oscillator IC1 is temporarily set to ten times its normal frequency and the long time settings checked. The oscillator is then “correctly” calibrated and the results recorded.

- a) Join terminals A5 and A6 (to simulate a tripped circuit breaker) and connect a frequency counter to test point TP1 (on PCB 660/245).
- b) Initiate unit and temporarily adjust trimpot R3 to give a TP1 waveform period of 39.1  $\mu$ s.
- c) Connect frequency counter to TP3 and adjust trimpot R18 to give a waveform period of 3.91ms.

Minimum	Maximum	Nominal	Actual	Unit
3.75	4.06	3.91	<input type="text"/>	ms

- d) Connect timing apparatus to measure the time interval between commencement of the initiate pulse and either “CB close” contact operation (Reclose Time) or “unsuccessful reclose” contact operation (Reset Time).
- e) Set Reclose and Reset timers to 77.7 and 777.
- f) Initiate unit and measure Reclose time.

Minimum	Maximum	Nominal	Actual	Unit
7.63	7.95	7.77	<input type="text"/>	s

- g) Initiate unit and measure Reset time.

Minimum	Maximum	Nominal	Actual	Unit
76.3	79.5	77.7	<input type="text"/>	s

- h) Set Reclose and Reset timers to 88.8 and 888.

- i) Initiate unit and measure Reclose time.

Minimum	Maximum	Nominal	Actual	Unit
8.72	9.08	8.88	<input type="text"/>	s

#### 6.4 Timer Calibration (Cont)

j) Initiate unit and measure Reset time.

Minimum	Maximum	Nominal	Actual	Unit
87.2	90.8	88.8	<input type="text"/>	s

k) Re-adjust trimpot R3 to give a TP1 waveform period of 391us.

Minimum	Maximum	Nominal	Actual	Unit
375	406	391	<input type="text"/>	us

l) Record results for the following Reclose times:

Minimum	Maximum	Nominal	Actual	Unit
.65	.75	.7	<input type="text"/>	s
.75	.85	.8	<input type="text"/>	s
7.6	7.8	7.7	<input type="text"/>	s
8.7	8.9	8.8	<input type="text"/>	s
76.0	78.0	77.0	<input type="text"/>	s

m) Record result for the following Reset times (set Reclose timer to 1 sec).

Minimum	Maximum	Nominal	Actual	Unit
1.8	2.2	2	<input type="text"/>	s
3.8	4.2	4	<input type="text"/>	s
6.7	7.3	7	<input type="text"/>	s
7.6	8.4	8	<input type="text"/>	s
9.5	10.5	10	<input type="text"/>	s

#### 6.5 Output Pulse Length Check

Connect the PU/DO time measuring equipment to measure the reclose pulse length and record results.

Minimum	Maximum	Nominal	Actual	Unit
1.8	2.2	2.0	<input type="text"/>	s

#### 6.6 Sequences

To verify that the unit is fully functional the following logic sequences should be checked. Set the reclose time to 3 sec and the reclaim time to 8 sec for convenience. Set switches to "Auto Reset", "Live Line Blocking" and "Interlocked".

a) Initiate with CB remaining closed (Auto Reset Mode).  
 Switch CB auxiliary contact out of circuit (simulating a closed CB). Initiate unit and check that start relay RL3 holds in and drops out after 8 seconds (i.e. Reset Time). No reclose pulse should occur.

Actual

b) Initiate with CB remaining closed (Single Shot Mode). Set SS/AR switch to SS and repeat test a). Unit should remain energised after 8 second Reset time, until reset by interruption of auxiliary supply.

Actual

**6.6 Sequences (Cont)**

- c) Successful Reclose  
Set to "Auto Reset" and switch CB N/C auxiliary contact into circuit. Initiate unit and check that a 2 second reclose pulse occurs 3 seconds after initiation. During or after this pulse, manually reset the artificial CB, thus simulating a successful reclose. Check that 1B110 de-energises itself 8 seconds after initiation.

**Actual**

- d) Successful Reclose  
Repeat test c) in the "Single Shot" mode. The unit should remain energised indefinitely until manually reset.

**Actual**

- e) Unsuccessful Reclose  
Set unit to A/R. Initiate unit but do not reclose the artificial CB when the reclose pulse occurs. This simulates a CB which fails to respond to a reclose pulse or is immediately re-tripped on closing.

The "unsuccessful reclose" relay should pick up 8 seconds after initiation and the unit remain energised.

**Actual**

- f) Reclose Blocked (Dead Line)  
Set voltage blocking switch to "Dead Line" and initiate unit. The "unsuccessful reclose" relay should pick up when the reclose timer times out (i.e. 3 sec) and no reclose pulse should occur.

**Actual**

- g) Reclose Blocked (Live Line)  
Set voltage blocking switch to "Live Line" and apply 110V AC between terminals A14 and A16 and B14 and B16. Initiate unit and check that response is the same as in f).

**Actual**

- h) Unsuccessful Reclose (Non Interlocked).  
Repeat g) with unit set to "Non Interlocked". Do not reclose the CB when the reclose pulse occurs. After 8 seconds the UR relay should pick up.

**Actual**

**7. GENERAL & FUNCTIONAL**

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

