Order Number | Serial Number

PRODUCT/TEST MANUAL

2C59K13

CIRCUIT BREAKER FAIL RELAY

Issue Level	Date	Summary of changes
D	5/04/01	Initial issue.

Author	Checked & Registered	.pdf file created	Released
ERL	MW	MW	Digitally signed by Michael Williams cn=Michael Williams, ou=Test Room, o=Relay Monitoring Systems, c=AU Date: 2001.06.26 16:59:38 +11'00' Reason: Document is released

1. BROAD DESCRIPTION

The 2C59K13 is a mounted 6 Rack Unit high Definite Time Overcurrent relay employing electronic measuring and timing elements and having electromechanical output contacts. Modular construction is used enabling the instantaneous current sensing, timer modules to be withdrawn.

2. SPECIFICATIONS

Auxiliary Supply Voltage		250V DC (+15% / -20%)
Auxiliary Supply Burden (at 250V)		
Current Sensing Circuitry		7W
Timer		3.5W
Output Relays		33W (all relays picked up)
Nominal input Current		1 Amps
Nominal setting Range		50% -200% (each input)
Setting Accuracy		+/- 10% of setting
Sensing Supply Burden (at 1A)		<0.5VA/phase
Frequency Tolerance		47 - 52Hz
Ambient Temperature Range		-5 to 55 deg C
Dropout/Pickup Ratio		<75%
Withstand Current		5X max setting continuous
		20X max setting 3 seconds
		>50A 1 second
Operate Time	1.5 x < I < 40 x set	20ms symmetrical or fully offset
Release Time	1.5 x < I < 40 x set	20ms symmetrical or fully offset with current interruption at a zero current crossing.
Timer Range		100 - 500ms
Timer Reset Time (overshoot time)		<7ms
Timer Repeatability Error		<+/- 2% of setting

3. TEST EQUIPMENT REQUIRED

DC Auxiliary Supply

AC Variable Current Supply

Digital Voltmeter

Frequency Counter

Oscilloscope

HV Test Equipment

Electronic Counter (for measuring operate & release times).

4. ASSOCIATED DRAWINGS

159-059-013	2C59K13 Descriptive Manual
159-059-213	2C59K13 Master Circuit Diagram
660-108-208	Circuit Diagram PCB Current Sensing
660-108-308	Loading Diagram PCB Current Sensing
660-198-203	Circuit Diagram PCB Timer
660-198-302	Loading Diagram PCB Timer
660-264-301	Loading Diagram PCB Motherboard

5. HIGH VOLTAGE TESTING

a) Apply 2KV RMS 50Hz between terminal groups 1 and 2 in table 1 below for one minute.

b) Apply 3 5KV 1/50us pulses of each polarity between terminal groups 1 and 2 in table 1 below.

TABLE 1

GROUP 1	GROUP 2
Inputs	Outputs
All terminals	Frame

6. CALIBRATION & TEST PROCEDURE

6.1 Overcurrent Sensing PCB (660/108-8)

This PCB contains 3 identical circuits fed from separate current transformers mounted in the main chassis. Each sensing circuit has an open collector output relay drive transistor. The operate times are measured from the time of application of input current to closure of contact on the output relay mounted on 660/162-1 Relay Board. The transformers are recalibrated at test with trim pots R1, R2 and R3 (159-059-213 reference) to permit interchange of boards between units.

a) Plug 660/108 board into unit. (Each phase on this PCB picks up when 140mV is applied to the input, with dial at mid-scale).

b) Check that dial pot knobs have equal over travel at either end.

c) Connect RMS measuring DVM across phase A PCB input (pins 26 and 28, or terminal block TB2-3 and TB2-4) and apply 250V Auxiliary Supply.

d) Apply 1.25A input and adjust trim pot R1 until the voltage across its terminals is 140mV.

e) Connect DVM across phase B PCB input (pins 16 and 18, or terminal block TB3-3 and TB3-4) and apply 250V Auxiliary Supply.

f) Apply 1.25A input and adjust trim pot R2 until the voltage across its terminals is 140mV.

6.1 Overcurrent Sensing PCB (660/108-8) (Cont)

g) Connect DVM across phase C PCB input (pins 8 and 10, or terminal block TB4-1 and TB4-2) and apply 250V Auxiliary Supply.

h) Apply 1.25A input and adjust trim pot R3 until the voltage across its terminals is 140mV.

j) Check that Test Point "5" waveform is clean, and varies by a factor of four to one in amplitude as the dial pot is moved from min. to max. setting. R3 may be decreased if the scale span is too small.

j) Check that Test Point "6" waveform is as smooth as possible ie. symmetrical 3 phase ripple). If percentage ripple is too great, C6 may be altered to achieve best symmetry.

k) Check that pickup currents are within accuracy at the following settings:

SETTING	MIN	MAX	NOM	UNITS
0.5	0.45	0.55	0.5	**A**
1.0	0.9	1.10	1.0	**A**
1.5	1.35	1.65	1.5	**A**
2.0	1.80	2.20	2.0	**A**

l) Check that DO/PU ratio is between 70% and 80%, repeating step above if necessary.

ACTUAL **%**

m) Repeat steps 9 to 10 for input B, monitoring test points 3 and 4 in lieu of 5 and 6, adjusting R24 in lieu of R3, and check that pickup currents are within accuracy at the following settings:

SETTING	MIN	MAX	NOM	UNITS
0.5	0.45	0.55	0.5	**A**
1.0	0.9	1.10	1.0	**A**
1.5	1.35	1.65	1.5	**A**
2.0	1.80	2.20	2.0	**A**

n) Check that DO/PU ratio is between 70% and 80%.

ACTUAL **%**

o) Repeat steps 9 to 10 for input C, monitoring test points 1 and 2 in lieu of 5 and 6, adjusting R45 in lieu of R3, and check that pickup currents re within accuracy at the following settings:

SETTING	MIN	MAX	NOM	UNITS
0.5	0.45	0.55	0.5	**A**
1.0	0.9	1.10	1.0	**A**
1.5	1.35	1.65	1.5	**A**
2.0	1.80	2.20	2.0	**A**

p) Check that DO/PU ratio is between 70% and 80%.

ACTUAL **%**

6.2 Operate Time Check

Connect timing apparatus to measure time delay between application of AC input current and operation of the corresponding relay.

a) Set input A to 5 A on .5A Setting

	MAX	ACTUAL
Check PU time at 200 V	19 ms	ms
Check DO time at 287 V	19 ms	ms

b) Set input A to 20 A on 2 A Setting

	MAX	ACTUAL
Check PU time at 200 V	19 ms	ms
Check DO time at 287 V	19 ms	ms

c) Set input B to 5 A on.5 A Setting

	MAX	ACTUAL
Check PU time at 200 V	19 ms	ms
Check DO time at 287 V	19 ms	ms

d) Set input B to 20 A on 2 A Setting

	MAX	ACTUAL
Check PU time at 200 V	19 ms	ms
Check DO time at 287 V	19 ms	ms

e) Set input C to 5 A on .5 A Setting

	MAX	ACTUAL
Check PU time at 200 V	19 ms	ms
Check DO time at 287 V	19 ms	ms

f) Set input C to 20 A on 2 A Setting

	MAX	ACTUAL
Check PU time at 200 V	19 ms	ms
Check DO time at 287 V	19 ms	ms

6.3 Timers

The timer may be initiated by applying auxiliary volts to terminals 9&10(A phase),11&12(B phase),13&14(C phase). Refer to Circuit Diagram 159-059-213.

a) Cut links C and E to set the divide ratio to 256.

b) Connect period counter between Timer IC1 pin 1 and 0V and time interval measuring unit to measure time between application of 250V and closure of output contacts.

6.3 Timers (Cont.)

c) Pad select on test capacitors as necessary to achieve .5s scale maximum time. Readjust R13 (phase A), R14 (phase B), R15 (phase C) as necessary to achieve full calibration as follows:

SETTING	MIN	MAX	NOM	A Ø	B Ø	C Ø
0.1	0.09	0.11	0.1	sec	sec	sec
0.2	0.19	0.21	0.2	sec	sec	sec
0.3	0.29	0.31	0.3	sec	sec	sec
0.4	0.39	0.41	0.4	sec	sec	sec
0.5	0.49	0.51	0.5	sec	sec	sec

7. GENERAL & FUNCTIONAL TEST

a) Check that relays 1,2,3,4,5&6 operate correctly when Auxiliary Supply is applied to their respective coils, and that all contacts are functional and correctly wired.

ACTUAL | **OK**

d) Check that each of the plug-in boards have been correctly polarised.

ACTUAL | **OK**

e) 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

Refer to drawing 159-059-213 Sheets 1 and 2