

Order Number

Serial Number

## PRODUCT/TEST MANUAL

**2C135K13**

### DEFINITE TIME SENSITIVE EARTH FAULT RELAY WITH HARMONIC SUPPRESSION

<b>Issue Level</b>	<b>Date</b>	<b>Summary of changes</b>
A	21/01/1999	Initial issue.

Due to RMS continuous product improvement policy this information is subject to change without notice.

<b>Document updated</b>	<b>Checked</b>	<b>Registered</b>	<b>.pdf file created</b>	<b>.pdf uploaded to web site</b>

**1. BROAD DESCRIPTION OF RELAY**

The 2C135K13 is a high speed definite time sensitive earth fault relay with harmonic suppression. Current and time settings are made on DIL switches on the dial of the unit and bistable magnetic disc flag also mounted on the dial indicate when delayed output relay operation has occurred.

**2. SPECIFICATIONS**

DC Auxiliary Supply	24 VDC nom.
DC Auxiliary Supply Tolerance	85% to 110% of nom
Supply Burden (independent of range)	65mA
AC Current Sensing Range	.5-15.5% of 1A (.5 - 155 mA, 5mA steps)
Setting Accuracy (Vx & Temp at nominal)	±5% of setting
Temp Dependence of Ipickup (over Temp range 20-50 deg C)	<±1.5mA per deg C
Vx Dependence of Ipickup (over Vsupply range 85%-1 1 0% of nom)	<±2% of setting
Max operate time @ 1.1 x setting	<80ms
Max resetting time from 1.1 x setting	<80ms
Harmonic Rejection	Greater than 20 x setting for frequencies >100Hz
AC Continuous Rating	10A
AC Short Time Rating	200A for 3sec
AC Burden	Less than 1VA at 5A
Resetting ratio (at 20 deg C)	Greater than 90%
Instantaneous output	<80 mS operate time
Timer Range	0-31.875s, .125s steps
Timer Accuracy (Vx & Temp at nominal)	±5% of setting
Temp Dependence of Timer (over Temp range 0-50 deg C)	<30ms
Vx Dependence of Timer (over Vsupply range 85%-1 1 0% of nom)	<±2% of setting
Max resetting time	<50ms
Overall Ambient Temperature Range	-5 to 55 deg C
Operation Indicator (Timed output)	Magnetic Disc

**Output Relay Contact Ratings**

**Make and Carry Continuously**

3000 VA AC resistive with maximums of 660 Volt and 12 Amp  
 3000 VA DC resistive with maximums of 660 Volt and 12 Amp

**Make and Carry of 0.5 Second**

7500 VA AC resistive with maximums of 660 Volt and 30 Amp  
 7500 VA DC resistive with maximums of 660 Volt and 30 amp

**AC Break Capacity**

3000 VA AC resistive with maximums of 660 Volt and 12 Amp

**DC Break Capacity (Amps)**

Voltage			24V	48V	125 V	250V
Resistive rating		a	12	1.5	0.5	0.25
		b	12	12	10	5
L/R=40 mS	Maximum break	a	12	1	0.4	0.2
		b	30	15	5.5	3.5
	1000 operations (N3 Rating)	b	12	12	5	2.5

## 2. SPECIFICATIONS (Cont)

Operation Indicators	Hand resettable magnetic disc (permanent memory).
Insulation Withstand	In accordance with AS2481-1981 (Clause 5-4), 2KV 50Hz between output and input. In Accordance with AS2481-1981 (Clause 5-4), 1.2/50 5KV.
Noise Immunity	The 2C135 relay has been designed to withstand the high frequency interference test detailed in AS2481-1981 (Clause 5-5).
Case Type	FSD20

## 3. TEST EQUIPMENT REQUIRED

DC Auxiliary Supply  
AC Variable Current & Frequency Supply  
Ammeter  
Frequency Counter  
Oscilloscope  
HV Test Equipment  
Electronic Counter (for measuring operate & release times)

## 4. ASSOCIATED DRAWINGS

159-135-013	Descriptive Manual
159-135-113	Wiring Diagram
660-277-209	Circuit Diagram PCB 2C135K13
660-277-309	Loading Diagram PCB

## 5. HIGH VOLTAGE TESTING

- Apply 2KV RMS 50Hz between terminal Groups 1 and 2 in Table 1 for 1 minute.
- Apply three 5KV 1/50us pulses of each polarity between terminal Groups 1 and 2 in Table 1.

**TABLE 1**

<b>GROUP 1</b>	<b>GROUP 2</b>
5&8, 9&10	1&2, 3&4
1&2, 3&4,5&8	9 & 10
All terminals	Earth

## 6. CALIBRATION & TEST PROCEDURE

- Connect 24V DC Auxiliary power supply to terminals 5 (+) and 8 (-).
- Connect variable frequency adjustable current supply via Pickup/Dropout time measuring equipment and Ammeter to the current input terminals (9 and 10). Use RL2-1 contact (terminals 1 and 2) to detect pickup of the 2C135.

159-135-913

Issue A 21/01/1999

Sheet 4 of 6

**6. CALIBRATION & TEST PROCEDURE (Cont)**

c) Check that 10 V supply rail is within tolerance.

MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
9.5	10.5	10.0	<input type="text"/>	V DC

d) Check that 20 V supply rail is within tolerance.

MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
19.0	21.0	20.0	<input type="text"/>	V DC

e) Connect oscilloscope 0V connection to +10V rail (shield can of input transformer is a convenient point) and monitor TP4.

f) With zero input current, set trimpot R6 to mid setting, SW2 to .5% Inom (5mA) and adjust R12 to give zero DC offset as observed on the oscilloscope. (TP04)

ACTUAL	UNITS
<input type="text"/>	OK

g) Set current setting switch to 2% setting (20mA) and apply 50Hz input current such that a 5V peak to peak signal is observed on the oscilloscope at TP06.

h) Change input current frequency to 150Hz and adjust trimpot R20 for minimum signal amplitude on the CRO. Note that C11 may be padded if necessary.

i) Temporarily short out diode D9, set input frequency to 50Hz and adjust input amplitude until square waves just appears at TP 8. Connect CRO to TP A and adjust trimpot R42 so that TP 9 goes high 8ms after TP A goes low.

MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
8.0	9.0	8.0	<input type="text"/>	ms

j) Remove temporary short circuit from across D9.

k) Set timer switches to zero.

l) Set current setting DIL to 2%. Adjust trimpot R6 until output relay just picks up at 20mA.

m) Set current setting DIL switch to 0.5% and input current to zero. Check that TP 4 output offset voltage is zero and adjust R12 if necessary.

ACTUAL	UNITS
<input type="text"/>	OK

n) Set current setting DIL to 0.5%. Connect pickup/dropout time measuring equipment to measure the time between application of 15 mA and subsequent closure of RL2-1 contact. Note that the pickup time of the instantaneous (range switch set to "all off") current sensing element plus output relay will be approximately 45ms. Record operate times at the following settings:

SETTING	MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
0.125	0.15	0.17	0.16	<input type="text"/>	s
0.25	0.27	0.29	0.28	<input type="text"/>	s
0.5	0.50	0.56	0.53	<input type="text"/>	s
1.0	0.98	1.08	1.03	<input type="text"/>	s
2.0	1.93	2.13	2.03	<input type="text"/>	s
4.0	3.83	4.23	4.03	<input type="text"/>	s
8.0	7.63	8.43	8.03	<input type="text"/>	s
16.0	15.23	16.83	16.03	<input type="text"/>	s
31.875	30.30	33.40	31.91	<input type="text"/>	s

**6. CALIBRATION AND TEST PROCEDURE (Cont)**

159-135-913  
 Issue A 21/01/1999  
 Sheet 5 of 6

- o) Set timer to zero and record the following pickup and hysteresis currents at the indicated settings:

SETTING	MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
0.5% PU	4.4	5.6	5.0		mA
Hysteresis	.3	.7	.5		mA
1.0% PU	9.3	10.7	10.0		mA
Hysteresis	.6	1.4	1.0		mA
2.0% PU	19.0	21.0	20.0		mA
Hysteresis	1.2	2.8	2.0		mA
4.0% PU	38.4	41.6	40.0		mA
Hysteresis	2.4	5.6	4.0		mA
8.0% PU	77.2	82.8	80.0		mA
Hysteresis	4.8	11.2	8.0		mA
15.5% PU	150	160	155		mA
Hysteresis	9.3	21.7	15.5		mA

- p) Reconnect auxiliary supply set to 21 V to enclosure terminal 5 (+ve) with terminal 8 common negative. Record pickup and hysteresis currents:

	MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
2.0% PU	19.0	21.0	20.0		mA
Hysteresis	1.2	2.5	2.0		mA

- q) Repeat step q) above for an auxiliary supply of 27 V:

	MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
2.0% PU	19.0	21.0	20.0		mA
Hysteresis	1.2	2.5	2.0		mA

- r) Set input current to 22mA and record PU & DO times for an auxiliary supply of 24 volts

	MAXIMUM	ACTUAL	UNITS
PU	80		mS
DO	80		mS

## 7. GENERAL & FUNCTIONAL

- a) Check that magnetic disc flag operates correctly when the output relay picks up.

OK

- b) Check that reset button resets the flag.

OK

- c) Check that the Instantaneous LED functions correctly

OK

- d) Check that the relay is electrically sound and mechanically robust as per Standard Inspection & Test Schedule 903-000-026.

**PASS**  OK

TESTED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

## 8. CONNECTION DIAGRAM

159-135-913  
Issue A 21/01/1999  
Sheet 6 of 6

