

Order Number

Serial Number

## PRODUCT / TEST MANUAL

**2C136K7**

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

<b>Issue Level</b>	<b>Date</b>	<b>Summary of changes</b>
A	16/07/1999	Initial issue.

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

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## 1. BROAD DESCRIPTION OF RELAY

The 2C136K7 is a high speed definite time sensitive earth fault relay with harmonic suppression. Current and time settings are made on DIL switches on the front panel of the unit . A bistable magnetic disc indicator is mounted on the front panel to indicate when the delayed output relay has operated. The indicator will operate after the time delay set by the front panel DIL time range switch. A front panel LED indicates when the instantaneous output relay operates.

## 2. SPECIFICATIONS

DC Auxiliary Supply	40 - 300 VDC
Supply Burden (At 110 V DC)	55mA typical independent of range.
AC Current Sensing Range	.5-15.5% of 5A (25-775mA, 25mA steps)
Setting Accuracy	±5% of setting (Vx & Temp at nominal)
Temp Dependence of I pickup	<±1.5mA per deg C (Temp range 20-50 deg C)
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	100A for 3sec
AC Burden	Less than 1VA
Resetting ratio (at 20 deg C)	Greater than 90%
Timer Range	0-31.875s, .125s steps
Timer Accuracy	±5% of setting (Vx & Temp at nominal)
Temp Dependence of Timer	<30ms (over Temp range 0-50 deg C)
Vx Dependence of Timer	<±2% of setting (Vx range 85%-110% of nom)
Max resetting time	<50ms
Overall Ambient Temperature Range	-5 to 55 deg C
Operation Indicator (Timed output)	Magnetic Disc
Enable Input	120 V DC
Operating Contacts	One changeover instantaneous contact One changeover time delayed contact

### Output Relay Contact Ratings

#### Make and Carry Continuously

1700 VA AC resistive with maximums of 380 Volt and 8 Amp

1700 VA DC resistive with maximums of 250 Volt and 8 Amp

#### AC Break Capacity

1700 VA AC resistive with maximums of 380 Volt and 8 Amp

#### Maximum Contact Capacity (Amps)

Voltage	DC			AC		
	30	125	250	110	220	250
Resistive	10	2.4	1.2	10	7	6.6
Inductive L/R 7 ms	7.5	1.8	.9	7.5	5	4.4

## 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 2C136 relay has been designed to withstand the high frequency interference test detailed in AS2481-1981 (Clause 5-5).
Case Type	2EN

## 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

159-136-107	Wiring Diagram
660-291-204	Circuit Diagram PCB 2C136K7
660-291-301	Loading Diagram PCB

## 5. HIGH VOLTAGE TESTING

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

**TABLE 1**

GROUP 1	GROUP 2
All terminals 7 to 12 joined 1&2	Frame 1 to 4, joined +E 3&4 +E

## 6. CALIBRATION & TEST PROCEDURE

- a) Connect DC Auxiliary power supply to terminals 1 (+) and 2 (-).
- b) Connect variable frequency adjustable current supply via Pickup/Dropout time measuring equipment and Ammeter to the current input terminals (B1 and B2). Use RL4-1 contact (terminals 7 and 8) to detect pickup of the 2C136.

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

- c) Check that 12V supply rail is within tolerance. (TPG TPA 0 V)

MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
11.5	12.6	12.0	<input type="text"/>	V DC

- d) Check that -12V supply rail is within tolerance. (TPL)

MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
-11.5	-12.6	-12.0	<input type="text"/>	V DC

- e) Check that 24V supply rail is within tolerance. (TPB)

MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
23.0	25.2	24.0	<input type="text"/>	V DC

- f) Connect oscilloscope TPH and monitor U11A-1.

- g) With zero input current, set trimpot VR02 to mid setting, SW02 to .5% I nom (25mA) and adjust VR02 to give zero DC offset as observed on the oscilloscope.

ACTUAL	OK
<input type="text"/>	

- h) Set current setting switch to 2% setting (100mA) and apply 50Hz input current such that a 5V peak to peak signal is observed on the oscilloscope at TPI U11C-8.

- i) Changes input current frequency to 150Hz and adjust trimpot VR03 for minimum signal amplitude on the CRO. Note that C38 may be padded if necessary.

- j) Temporarily short out diode D28 (TPJ to TPK), set input frequency to 50Hz and adjust input amplitude until square waves just appear at TPF U12D-14.

- k) Connect CRO second channel to TPD U14A-3 (D30 anode) and adjust trimpot VR04 so that U14A-3 goes high 8ms after U12D-14 goes low.

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

- l) Remove temporary short circuit from across D28.

- m) Set timer switches to zero.

- n) Set current setting DIL to 2%. Adjust trimpot VR01 until output relay just picks up at 100mA.

- o) Connect a dual beam storage oscilloscope with one probe to TPD and the other to TPM U14B-4. Adjust VR05 for 15mS from the time TPD goes low and TPM goes high.

ACTUAL	ms
<input type="text"/>	

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

- p) Check the operation of the Instantaneous output after adjustment is complete. Record results ensuring time is less than 80 Ms

	MAXIMUM	ACTUAL	UNITS
PU	80		mS
DO	80		mS

- q) Set current setting DIL switch to .5% and input current to zero. Check that TPH offset voltage is zero and adjust VR02 if necessary.

ACTUAL	OK

- r) Check TPC frequency is 64 Hz.

- s) Set current setting DIL to .5%. Connect pickup/dropout time measuring equipment to measure the time between application of 250 mA and subsequent closure of RL4-1 contact. Note that the pickup time of the instantaneous current sensing element plus output relay will be approximately 35 ms. Record operate times at the following settings:

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

- t) 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	22.0	28.0	25.0		mA
Hysteresis	1.5	2.5	2.5		mA
1.0% PU	46.5	53.5	50.0		mA
Hysteresis	3.0	5.0	5.0		mA
2.0% PU	95	105	100		mA
Hysteresis	6.0	10.0	10.0		mA
4.0% PU	192	208	200		mA
Hysteresis	12.0	20.0	20.0		mA
8.0% PU	386	414	400		mA
Hysteresis	24.0	40.0	40.0		mA
15.5% PU	750	800	775		mA
Hysteresis	46.0	77.0	77.0		mA

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

- u) Set input supply to 40 V DC and record pickup and hysteresis currents.

	MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
2.0 % PU	95	105	100	<input type="text"/>	mA
Hysteresis	6.0	10.0	10.0	<input type="text"/>	mA

v) Set input supply to 300 V DC and record pickup and hysteresis currents.

	MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
2.0 % PU	95	105	100	<input type="text"/>	mA
Hysteresis	6.0	10.0	10.0	<input type="text"/>	mA

w) Set input current to 110mA and record PU & DO times for an auxiliary supply of 125 volts

	MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
PU		80		<input type="text"/>	mS
DO		80		<input type="text"/>	mS

### 7. GENERAL & FUNCTIONAL

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

OK

b) Check that reset button resets the flag.

OK

c) Check the operation of the Enable relay.

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

