



Order Number

Serial Number

PRODUCT / TEST MANUAL

2C135K4

DEFINITE TIME SENSITIVE EARTH FAULT RELAY WITH HARMONIC SUPPRESSION

Issue Level	Date	Summary of changes
A	28/06/01	Initial issue.

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ERL	MW	MW	

1. BROAD DESCRIPTION OF RELAY

The 2C135 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	110 VDC nom.
DC Auxiliary Supply Tolerance	85% to 110% of nom
Supply Burden (independent of range)	55mA
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%-110% 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%-110% 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

Continuous Current

250 Volt AC at 10 Amp
 125 Volt DC at 10 Amp

Allowable Contact Power

1650 VA AC resistive and 300W DC resistive
 1100 VA AC inductive and 225 W DC inductive

Rated Load

Voltage	Resistive Load	Inductive Load
110 V AC	10 A	7.5 A
220 V AC	7.5 A	5 A
30 V DC	10 A	7.5 A

Operation Indicators

Hand resettable magnetic disc (permanent memory).

2. SPECIFICATIONS (Cont)

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

159-135-104	Wiring Diagram
660-277-202	Circuit Diagram PCB 2C135K4
660-277-303	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

GROUP 1

1, 2, 9, 10, joined
1, 2, 6, 7, 8, joined
All terminals

GROUP 2

3, 4, 5, 6, 7, 8 joined
3, 4, 5, 9, 10 joined
Earth

6. CALIBRATION & TEST PROCEDURE

- Connect 110V DC Auxiliary power supply to terminals 1 (+) and 2 (-).
- Connect variable current supply to terminals (9 and 10). Connect time measuring equipment to terminals 7 and 8 to detect pickup of the 2C135.

6. CALIBRATION & TEST PROCEDURE (Cont)

c) Check that 12V supply rail is within tolerance TP 12V. (TP GND is ground)

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

d) Check that 24V supply rail is within tolerance TP 24V.

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

e) Connect oscilloscope 0V connection to +12V rail (shield can of input transformer is a convenient point) and monitor TP 4.

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.

ACTUAL	OK
<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 TP 6.

h) Change input 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 a square wave just appears at TP 8. Connect CRO to TP A and adjust trimpot R42 so that TP A goes high 8ms after TP 8 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 and set timer switches to zero.

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

l) Set current setting DIL switch to .5% and input current to zero. Check that TP4 output offset voltage is zero and adjust R12 if necessary.

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



6. CALIBRATION & TEST PROCEDURE (Cont)

m) Set current setting DIL to .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 current sensing element plus output relay will be approximately 20ms. Record operate times at the following settings.

SETTING	MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
0.125	0.138	0.152	0.145		s
0.25	0.26	0.28	0.27		s
0.5	0.49	0.55	0.52		s
1.0	0.97	1.07	1.02		s
2.0	1.92	2.12	2.02		s
4.0	3.82	4.22	4.02		s
8.0	7.62	8.42	8.02		s
16.0	15.22	16.82	16.02		s
31.875	30.30	33.49	31.895		s

n) 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

o) Set current setting DIL to 2%. Set auxiliary supply to 93.5 V, record pickup and hysteresis currents.

	MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
2.0% PU	19	21	20		mA
Hysteresis	1.2	2.5	2.0		mA

p) Set auxiliary supply to 121V, record pickup and hysteresis currents.

	MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
2.0% PU	19	21	20		mA
Hysteresis	1.2	2.5	2.0		mA

q) Set input current to 22mA and record PU & DO times for an auxiliary supply of 110 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

d) Check that the burden at 110 V DC is less than 55ma when the output relay is energised and de-energised

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

