

PRODUCT/TEST MANUAL

2H33K16

UNDER FREQUENCY RELAY



Order Number

Serial Number

Issue	Date	Summary of changes
A	16/08/2000	Initial issue.

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ERL	MW	MW	

1. BROAD DESCRIPTION

The 2H33 is a digitally set definite time under frequency relay utilising a crystal oscillator for both frequency measuring and time delay functions. Harmonics on the input are attenuated by an active band pass filter and analog circuitry is also used to provide an under voltage lockout function. The remaining circuitry is CMOS digital and both frequency level and time delay are set on thumbwheel switches mounted on the front dial of the unit. Operation of the high power output relay is flagged with a bistable magnetic disc flag and the output relay will self-reset if a digitally pre settable number of "good" input cycles have occurred.

2. SPECIFICATIONS

Frequency Sensing Circuitry Characteristics

Operational Setting Range	15.00 to 22.50ms period (ie. 66.67 to 44.44 Hertz) Thumbwheel switch selection with 0.01ms resolution
Accuracy	±0.05% of setting
Repeatability	±0.01ms
Hysteresis	Less than 0.05ms
Response Time	100ms (approx). Dependent on input frequency and degree and rate of frequency shift.
Sensing Supply	110V AC nominal (140V AC max. continuous)
Sensing Supply Burden	Less than 2VA at nominal
Undervoltage Lockout	Preset at 50% of nominal. (May be internally adjusted within the range 30% to 60% of nominal.)

Timer Circuitry Characteristics

Operation Setting Range	0.05 to 9.99 Sec. Thumbwheel switch selection with 0.01 Sec. resolution. Caution should be exercised when setting below 0.05 Sec. as instability may occur under certain conditions.
Accuracy	±1% of setting, +20ms -0ms
Repeatability	Less than 0.01 Sec.
Reset Time	Internal DIL Switch selection of from 1 to 9 "good" input cycles to elapse before timer resets.
Auxiliary Supply	24 VDC
Auxiliary Supply Range	-20% to +20%
Auxiliary Supply Burden	10 Watt (110V unit)
Ambient Temperature Range	-5°C to +55°C

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

2. SPECIFICATIONS (Cont)

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	
	1K operations (N3 Rating)	b	12	12	5	2.5

a = Without magnetic blowouts b = With magnetic blowouts

* As tested by Powernet Yarraville laboratories in Victoria.

3. TEST EQUIPMENT REQUIRED

24 Volt DC Supply 110 Volt AC Supply Digital Frequency Meter
 Digital Voltmeter Digital Storage Oscilloscope

4. ASSOCIATED DRAWINGS

169-033-116 Wiring diagram
 660-099-310 PCB Loading - Analogue Section
 660-100-301 PCB Loading - Digital Section
 660-129-301 PCB Loading - Thumbwheel Switch Mtg.

5. HIGH VOLTAGE TESTING

Note ** Do not apply high voltage to terminal 11 (remote reset)

- Apply 3 5KV 1/50 impulses of each polarity between terminal groups as listed in A & B below.
- Apply 2KV RMS between the terminal groups as listed in A & B below for 1 minute.

GROUP A	GROUP B
1,3,5,7	20,22,24,26,28
1,3,20,22	5,7,24,26,28
All terminals	FRAME

6 CALIBRATION & TEST PROCEDURE

6.1 UNDERVOLTAGE LOCKOUT CALIBRATION

- Apply auxiliary supply of 19 volts and check that 8.2 volt and 16.4 volt rail voltages are within +/- 10 percent of nominal.
- Monitoring test point 2 on the 660-099 PCB adjust trimpot R18 until the voltage just goes low when the AC voltage is reduced below 55 volts. (The filter switch should be in the "OUT" position.)
- Check that test point 2 switches cleanly as the AC voltage is increased above approximately 65 volts .

6.2 OSCILLATOR 1 Mhz

Connect a frequency counter to TP3 on PCB 660-100 and check that the frequency is within +/- 50 Hz of 1 Mhz.

OK

6.3 FREQUENCY MEASURING CLOCK CIRCUITRY

- a) Connect the oscilloscope to TP4 and trigger input to IC3 pin 2. (set trigger on the -ve going edge).
- b) Set "period setting to 20.00 ms, "time" to 0.05 S and "cycles to reset" DIL switch to 4 cycles.
- c) Set AC input period to 20.01 ms and check that TP4 waveform is as shown on sheet 18 of the descriptive manual. Note that the observed waveform will jitter due to the non synchronism of AC input and clock waveforms. This waveform is best observed by storing a single sweep on a storage oscilloscope.
- d) Adjust the input period to 19.90ms and check that the three or four "hysteresis" pulses disappear for the overfrequency condition. (Output relay dropped out.)

6.4 PERIOD SETTING THUMBWHEEL SWITCHES

For the following settings record the input waveform period at which the output relay operates. Adjust frequency downwards (increasing period) to ensure that the hysteresis does not influence the results. Perform the tests at nominal AC and DC voltage levels.

SETTING	MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNITS
11.11	11.10	11.12	11.11		ms
12.22	12.21	12.23	12.22		ms
13.33	13.32	13.34	13.33		ms
14.44	14.43	14.45	14.44		ms
15.55	15.54	15.56	15.55		ms
16.66	16.65	16.67	16.66		ms
17.77	17.76	17.78	17.77		ms
18.88	18.87	18.89	18.88		ms
19.99	19.98	20.00	19.99		ms
20.00	19.99	20.01	20.00		ms

6.5 TIMER LOGIC CHECK

Check that when the underfrequency condition is present a 10 ms period waveform appears at TP6 on 660-100 logic PCB.

OK

6.6 TIMER OPERATIONAL CHECK

Measure the time interval between the opening of the "power" contact and the operation of the output relay contact. Note that the observed times will be 30 - 40 ms greater than the timer settings due to the operate time of the output relay and the response time of the frequency sensing circuitry.

6.6 TIMER OPERATIONAL CHECK (cont)

Record times for the following time settings.

SETTING	MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNIT
0.11	0.12	0.16	0.14		SEC
1.22	1.23	1.27	1.25		SEC
2.33	2.34	2.38	2.36		SEC
3.44	3.45	3.49	3.47		SEC
4.55	4.56	4.60	4.58		SEC
5.66	5.67	5.71	5.69		SEC
6.77	6.78	6.82	6.80		SEC
7.88	7.89	7.93	7.91		SEC
8.99	9.00	9.04	9.02		SEC
9.00	9.01	9.05	9.03.		SEC

6.7 CYCLES TO RESET TIMER

- a) Adjust input frequency to 50 Hz and set period setting to 20 ms. Set timer to 0.20 sec. The number of cycles to reset the timer will be the time interval between closure of the “power” contact and the dropout of the output relay.
- b) Set “cycles to reset” DIL switch to 0111 (7 cycles) and record the time.

MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNIT
135	165	150		MS

- c) 16 Set “cycles to reset” DIL switch to 1000 (8 cycles) and record time.

MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNIT
153	188	170		MS

7. GENERAL & FUNCTIONAL

- a) Check that the flag can be remotely reset by applying negative of the auxiliary to terminal 11
- b) 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

