

# PRODUCT/TEST MANUAL

## 2H33K18

### UNDER-FREQUENCY RELAY



Order Number

Serial Number

Issue	Date	Summary of changes
A	10/11/00	Initial issue.
B	3/08/2005	Changed the "cycles to reset" times back to the original 2H33 specification

Due to RMS continuous product improvement policy this information is subject to change without notice.  
 This document is uncontrolled and subject to copyright.

Author	Checked & Registered	.pdf file created	Released
ERL	DG	DG	



## 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 analogue 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 (i.e. 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	Pre-set 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	125 VDC
Auxiliary Supply Range	-25% to +20%
Auxiliary Supply Burden	<10 Watt



**2. SPECIFICATIONS (Cont.)**

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

**DC Break Capacity (Amps)**

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

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

**4. ASSOCIATED DRAWINGS**

169-033-118	Wiring diagram
660-099-301	PCB Loading - Analogue Section
660-100-301	PCB Loading - Digital Section
660-129-301	PCB Loading - Thumbwheel Switch Mtg.

**5. HIGH VOLTAGE TESTING**

a) Apply 3 5KV 1/50 impulses of each polarity between terminal groups as listed in A & B below.

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

b) Apply 2KV RMS between the terminal groups as listed in A & B below for 1 minute.

**GROUP A**  
 1,3,5,7  
 1,3,20,22  
 All terminals

**GROUP B**  
 20,22,24,26,28  
 5,7,24,26,28  
 FRAME



**6. CALIBRATION & TEST PROCEDURE**

**6.1 UNDERVOLTAGE LOCKOUT CALIBRATION**

- a) Apply auxiliary supply of 94 volts and check that 10 volt and 20 volt rail voltages are within +/- 10 percent of nominal.
- b) 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.)
- c) Check that test point 2 switches cleanly as the AC voltage is increased above approximately 65 volts .

**6.2 BANDPASS FILTER OPERATION**

- a) Connect a dB (decibel) measuring DVM between IC1 pin 8 and the +10 volt rail.
- b) Check that for 110 volts AC in maximum amplitude on the DVM occurs within the range of 45-50 Hz.

OK

- c) Check that at 30 Hz and 60 Hz that IC1-8 is more than 7db below amplitude at resonance.

**6.3 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

**6.4 PERIOD SETTING THUMBWHEEL SWITCHES**

**Note.** The following tests are performed using a Doble F2700/2251 and the results recorded.

- a) 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.

Settings

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 OPERATIONAL CHECK**

**Note.** The following tests are conducted using a Doble F2700/2251 and the results recorded.

a) Record times for the following time settings.

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

**6.6 CYCLES TO RESET TIMER**

**Note.** The following tests are performed using a Doble F2700 and the results recorded.

a) Set "cycles to reset" DIL switch to 0111 (7 cycles) and record the time.

MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNIT
160	195	175	<input type="text"/>	MS

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

MINIMUM	MAXIMUM	NOMINAL	ACTUAL	UNIT
180	215	195	<input type="text"/>	MS

**7. GENERAL & FUNCTIONAL**

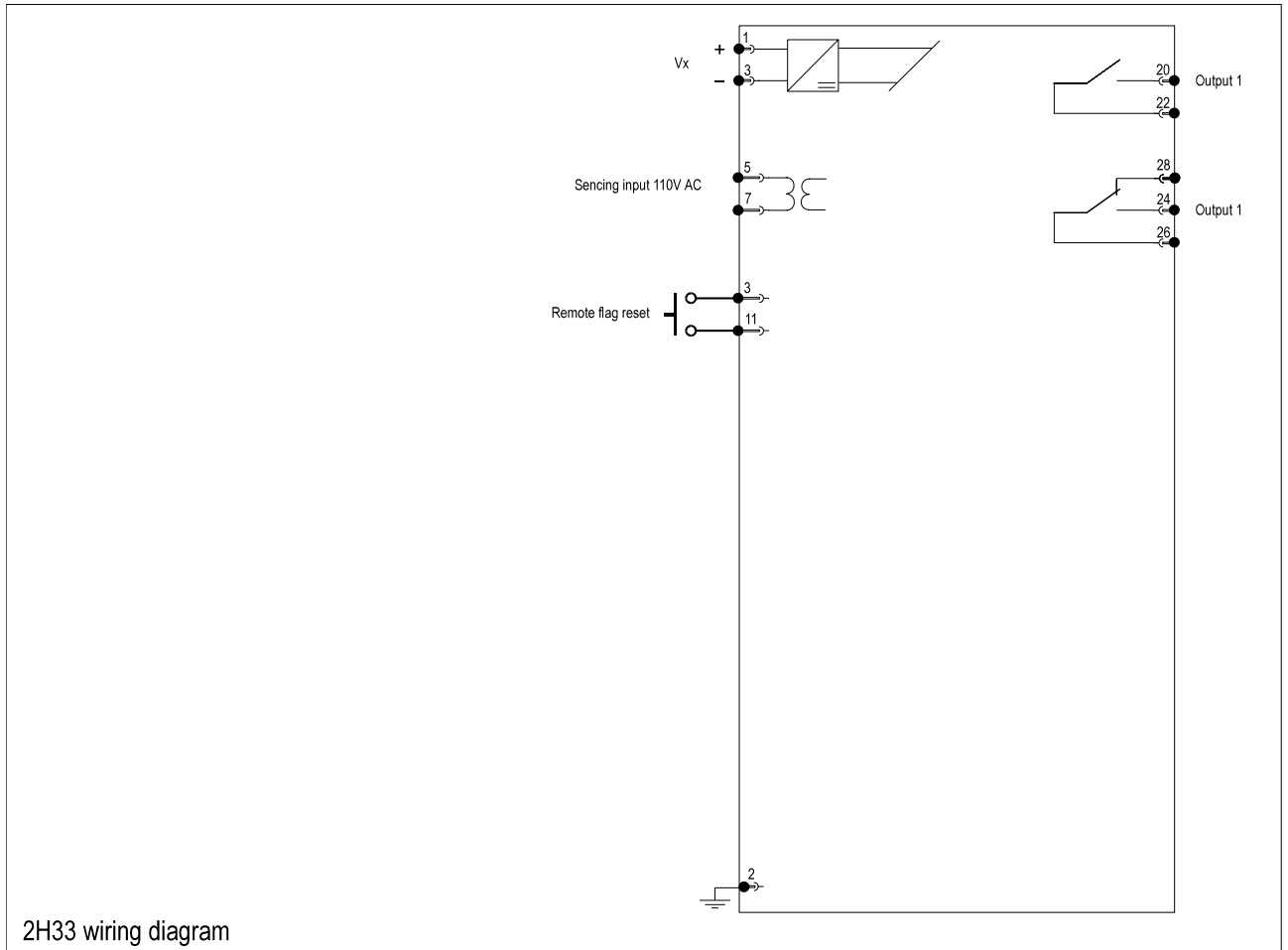
Check that the flag can be remotely reset by applying negative of the auxiliary to terminal 11

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



2H33 wiring diagram