# Clock/Temperature Module
Stock No. 650-728

A dual function module operable in clock or temperature modes and having a serial data output and alarm. The module is powered by a 1.5V (AA size) battery mounted in an integral holder to the rear of the PCB. The temperature is sampled via an on board sensor or externally fitted probes and may be displayed in either °C or °F. The sampling rate can be set to either once per second or once per 10 seconds.

Figure 1. Connection Diagram
View from display side

A. TR1 BC183L
B. R1 10k
C. Buzzer
D. R2 1k
E. Internal sensor
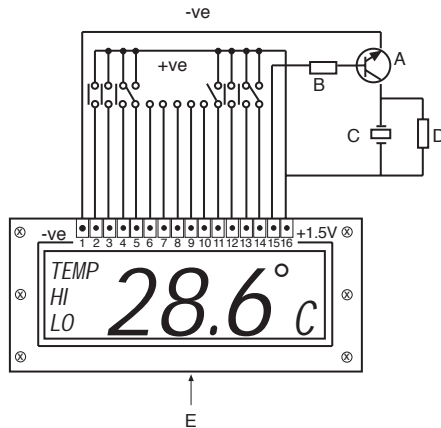
Edge connections
1. Negative of 1.5V cell.
2. Set hours.
3. Set minutes.
4. Test point (Activates all segments of the display when both pin 4 and pin 2 are high).
5. Sampling rate. With the switch closed (i.e. pin 5 high) the display is updated once every second. With the switch open the display is updated once every 10 seconds.
   Note: The set points only function in the 10 second mode.
6. When the high temperature set point is reached this output goes high. It remains high for at least one minute or until the temperature falls below the set point whichever is the longer.
7. When the low temperature set point is reached this output goes high. It remains high for at least one minute or until the temperature rises above the set point, whichever is the longer.
8. Alarm output. When either the high or low temperature set point is reached this output pulses high for 1 second.
9. Serial data output.
10. Serial data clock output.
11. With switch open the temperature is displayed. With switch closed (pin 11 high), the time is displayed.
12. Set high temperature.
13. Set low temperature.
14. With the switch open the temperature is displayed in °C. With the switch closed (pin 14 high) the temperature is displayed in °F.
15. Alarm output. When either the high or low set point is exceeded a 4kHz square wave is output for 6 seconds.
16. Positive of 1.5V cell.

Setting the clock
1. With pin 11 positive the module operates in the clock mode.
2. Take pin 3 high for approximately 2 seconds until the colon stops flashing. Each subsequent pulse of pin 3 increases the minutes display. (Hold positive for fast setting).
3. Set the hours in the same way using pin 2.
4. The clock will restart after a short period (10 to 15 seconds) or switch to temperature mode (pin 11 low) and back to clock for instant restart.
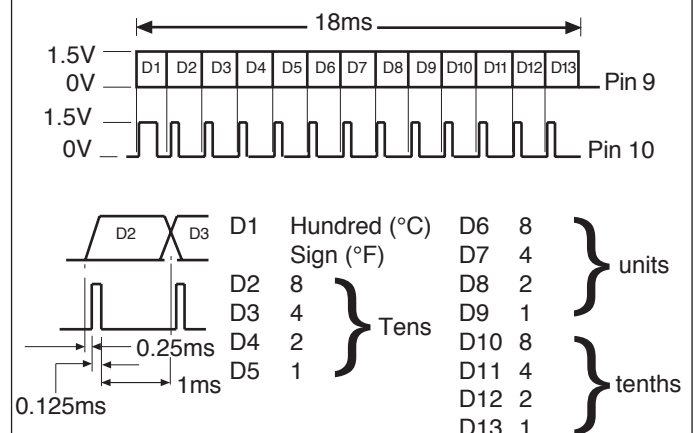
Temperature mode
With pin 11 negative the module operates in temperature mode. Set the sampling rate to 10 seconds (pin 5 low). Take pin 13 positive to display the low temperature set point. With pin 13 high take pin 3 positive to alter this point. To activate the alarm at the set point hold pin 13 positive and momentarily take pin 2 positive. The symbol 'LO' appears on the display. Taking pin 2 positive again de-activates the alarm and removes the symbol. The high temperature set point is altered in the same way except that pin 12 must be held positive to display this set point. In activating the alarm the symbol 'HI' appears on the display and is removed when the alarm is de-activated.

Note: Changing the temperature set points is only possible when the module is in the temperature mode and switched to 10 second sampling. The alarm output operates in either sampling mode but does not work if the module is in clock mode.

Serial data output
Pin 9 outputs the current temperature in 13 bits every time the module takes a sample. Data bit 1 in °C mode indicates negative when high and positive when low. In °F mode bit 1 indicates that the hundreds numeral is present when high, a low indicating a temperature below 100°F. The other bits go high to indicate the presence of the B.C.D. number (see Fig.2). Pin 10 outputs 13 pulses at data clock rate for each sample. Gate this with pin 9 to read the data.

Figure 2.

D1	Hundred (°C) Sign (°F)	D6	8
D2	8	D7	4
D3	4 (Tens)	D8	2
D4	2	D9	1
D5	1	D10	8
		D11	4
		D12	2
		D13	1

units: D6, D7, D8, D9
tenths: D10, D11, D12, D13

For example   159.7°F would be 1010110010111
24.6 would be 0001001000110

Alarm outputs

Whenever the high or low temperatures set points are reached a 4kHz pulsed signal is output on pin 15 for 6 seconds. This output can be connected to a buzzer (see Fig.1.) Also pin 6 goes positive when the high temperature set point is reached or exceeded. Pin 7 goes positive when the low temperature set point is reached or exceeded. Each output stays high while the condition remains or for a minimum period of 1 minute.

Note: This output will remain high for this minimum time even if the actual temperature has now reached the other set point. Only after this period has passed will the other output go high.
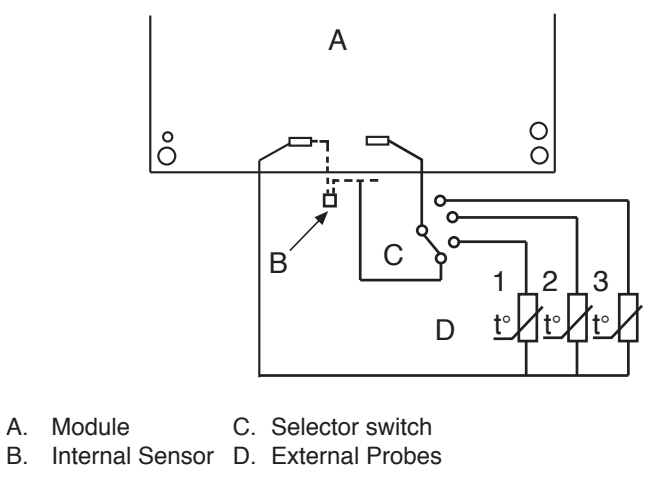
External probes

NOTE: The operating temperature of the module using the internal sensor is -5°C to +50°C and should not be used outside these limits unless an external probe has been fitted. To use the module with optional external probes, first remove the battery. Then take out the screws from the module front and remove the battery holder. Lift one wire on the internal sensor (or remove altogether if not required), solder another wire to this lifted wire and insulate the joint with plastic sleeving. Connect 2 other wires as shown in Fig.3, and wire as many probes as required via a suitable switch. Fig.3 shows a typical example where the module can be switched to use either the internal sensor or one of three external probes.

Bezel

To fit the optional panel mounting bezel (**RS** Stock No.650-778) remove the screws from the front of the module. Locate the pegs on the bezel in the centre holes and refix through the corner holes.

Figure 3.

A. Module   C. Selector switch
B. Internal Sensor   D. External Probes

Technical specifications

Internal sensor temperature range:	-5°C to +50°C
External probe temperature range :	-20°C to +70°C
Resolution	0.1°C (0.1°F)
Temperature accuracy:	-10°C to +40°C ±1°C @ 1.5V
	-20°C to -10°C ±2°C @ 1.5V
	+40°C to +70°C ±2°C @ 1.5V
Sampling rate	1 second or 10 seconds
Alarm output	4kHz for 6 seconds
Clock	12 hour clock
Clock accuracy	± 0.5 seconds per day
Operating voltage	1.5 V ⎓