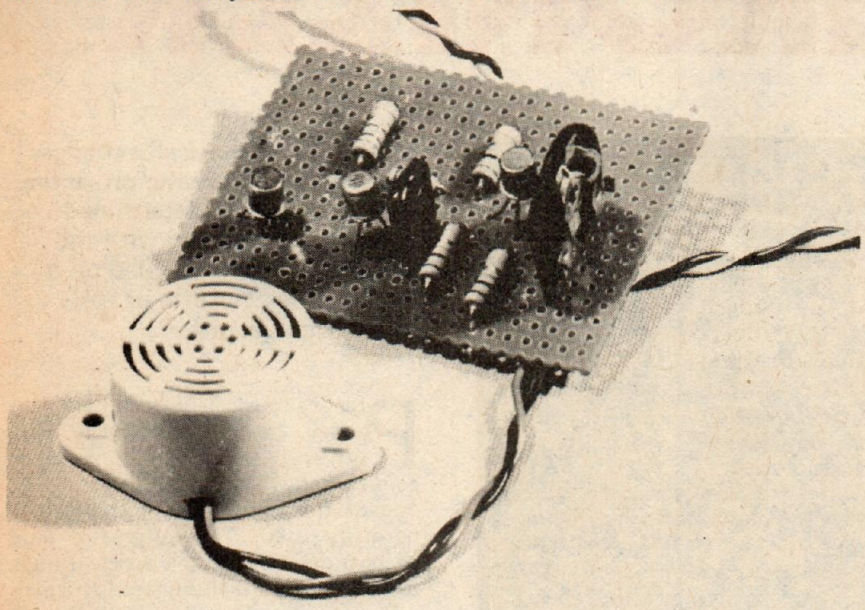
TEMPERATURE ALARM

Under or over temperature — or both — will activate this alarm.



The completed temperature alarm.

THIS circuit is designed to provide an alarm (either audible or by relay contact closure) whenever a temperature, as monitored by a thermistor, drops below, or rises above, a preset level. The thermistor sensor is a negative temperature coefficient device (NTC), that is, as temperature rises the thermistor resistance falls.

Using thermistors, the range of temperatures over which the unit will operate is from −20 to +150°C. However any one single type of thermistor is only useful over a 30°C range and it is therefore necessary to select a thermistor for the desired operating point by referring to Table 1.

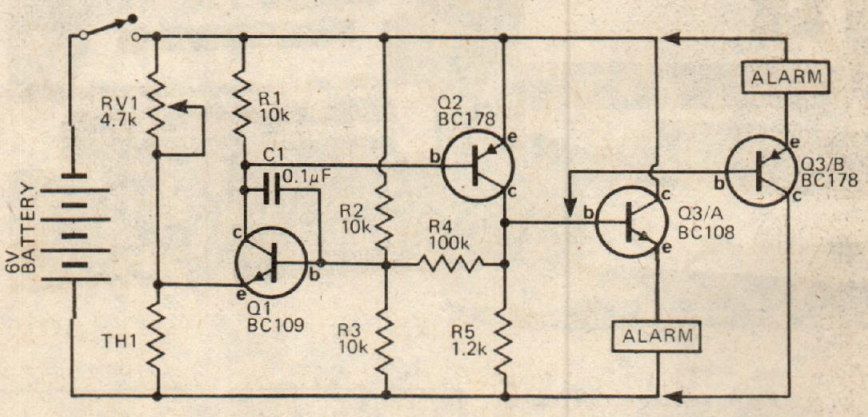
Select the desired temperature from column 1. The corresponding nominal value of thermistor will be found in column 2. The thermistor will have a value of resistance between 1 and 4 k at the operating temperature.

The hysteresis, or deadband, between the on and off switching points is only a few degrees centigrade and the circuit may therefore be used to switch a heater, etc, for temperature control in non-critical applications. If desired, the deadband may be widened by reducing the value of resistor R4.

TABLE 1

Operating Temperature °C	Suggested Thermistor (resistance, in ohms, at 25°C).
−20	180
0	560
+25	2200
+40	3900
+70	10 k
+100	27 k

NOTES:
Q3A IS USED FOR AN OVER TEMPERATURE ALARM.
Q3B IS USED FOR AN UNDER TEMPERATURE ALARM.



Circuit diagram of the temperature alarm.

HOW IT WORKS

The emitter of Q1 is connected to the junction of RV1 and TH1 (thermistor) which form a voltage divider. As TH1 varies with temperature the voltage at the emitter of Q1 will also vary with temperature.

Transistors Q1 and Q2 together form what is known as a Schmitt trigger. The Schmitt trigger is in fact an amplifier with positive feedback. If the temperature is below the point set by RV1, transistors Q1 and Q2 will be off, that is, not-conducting. The voltage at the base of Q1 will be set by R2, 3, 4 and 5. Since Q2 is off it does not affect the parallel arrangement of R4 plus R4 with R3. Thus with a 6 volt supply there will be 2.86 volts at the base. If the emitter voltage of Q1 falls below 2.86 − 0.6 volts, i.e. 2.26 volts, Q1 will turn on. This causes Q2 to turn on thus effectively putting R4 in parallel with R2. This causes Q1 to latch on, hence, its emitter voltage now has to exceed 3.14 − 0.6 volt before the transistor will turn off.

Reducing the value of R4 will make the difference between these two voltages greater thus increasing the deadband.

The relay or alarm is driven by Q3 which buffers the output of Q2. The circuit may be used for over-temperature, under temperature or both types of alarm simply by using the appropriate Q3 circuitry.

PARTS LIST Temperature Alarm

R1,2,3,	resistor	1.2k	½W	5%
R4	"	10k	"	"
R5	"	100k	"	"

RV1 potentiometer 4.7k linear
TH1 Thermister see Table 1

Q1	Transistor	BC108 or similar
Q2	"	BC178 or similar
Q3	"	See circuit diagram

Audible warning device (12V version available from Doram, P.O. Box TR8, Wellington Road Industrial Estate, Wellington Bridge, Leeds LS12 2UF) or 6V relay.
SW1 SPST toggle switch
6V battery
Pieces of matrix board.