Simple Thermostat
– Keeping it Cool

WHEN challenged to design a cheap system to switch on a cooling fan for an electronics enclosure when a certain cabinet temperature was reached, the circuit of Fig. 2 was eventually arrived at. The fan relay RLA had to switch when the detected temperature rose to a certain value above ambient, so a differential thermostat was required.

Probably the cheapest transducer available is the ordinary silicon diode: 1N4148s cost 50 pence per hundred! A normal diode has a forward voltage drop which varies by 2·3mV per degree Celsius.

When fed with a constant current, it forms a simple and reliable temperature sensor which is reasonably linear over a wide range. If a differential temperature control is required, it is a fairly simple matter to use a pair of diodes in a bridge circuit, and use a potentiometer to set up any offset required.

In Fig. 2, both the sensor and reference diodes are "doubled up" to give an increased sensitivity of about 4·5mV per degree Celsius. The op.amp IC1 has no feedback and operates in open-loop mode as a comparator, fed by the bridge network which itself is supplied with a 12V regulated supply (Zener D5); one pair of diodes D3, D4 acting as

an ambient temperature reference whilst the other set (Sense) is used as a probe, with capacitor C1 removing noise.

The trimmer potentiometer VR1 provides any offset required and allows temperature control of around 12°C. The fan is switched by relay RLA which is driven by the transistor switch TR1. An ordinary 741 op.amp will be quite adequate in this application although a CA3140 was used for IC1 in the prototype.
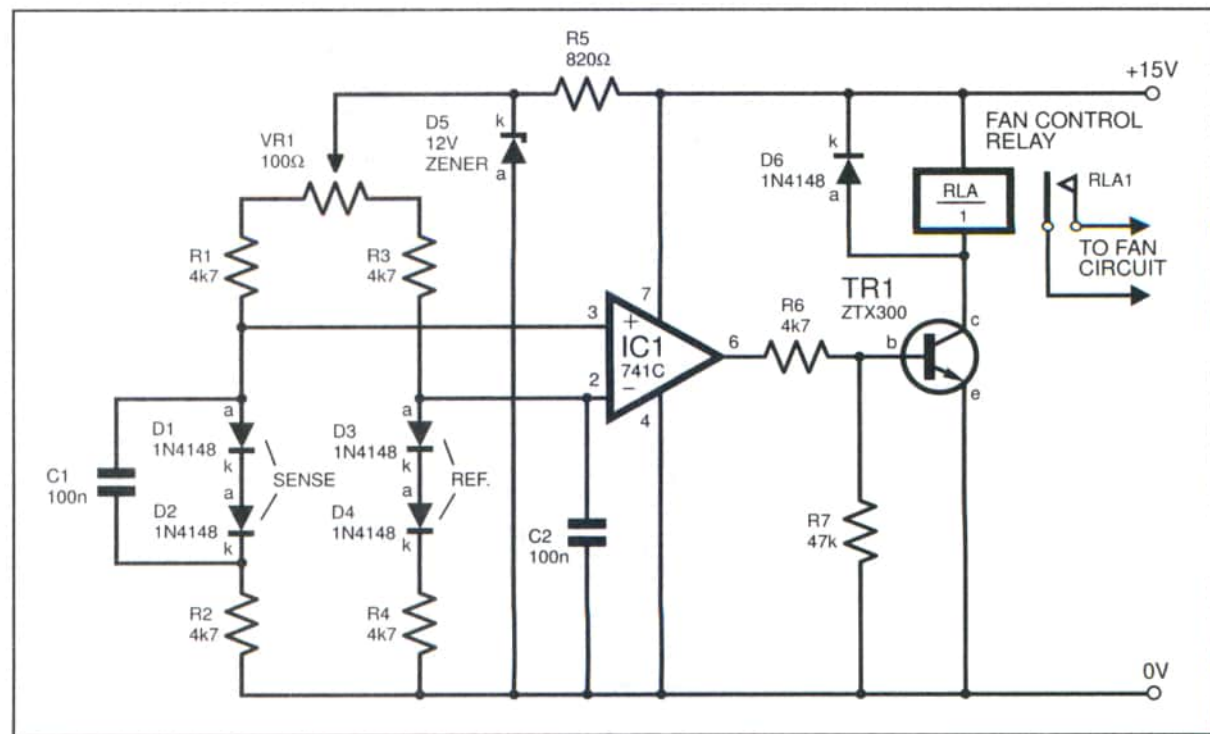
Ted Whittaker, Stone, Staffs.

Fig.2. Circuit diagram for a Cooling Fan Thermostat.