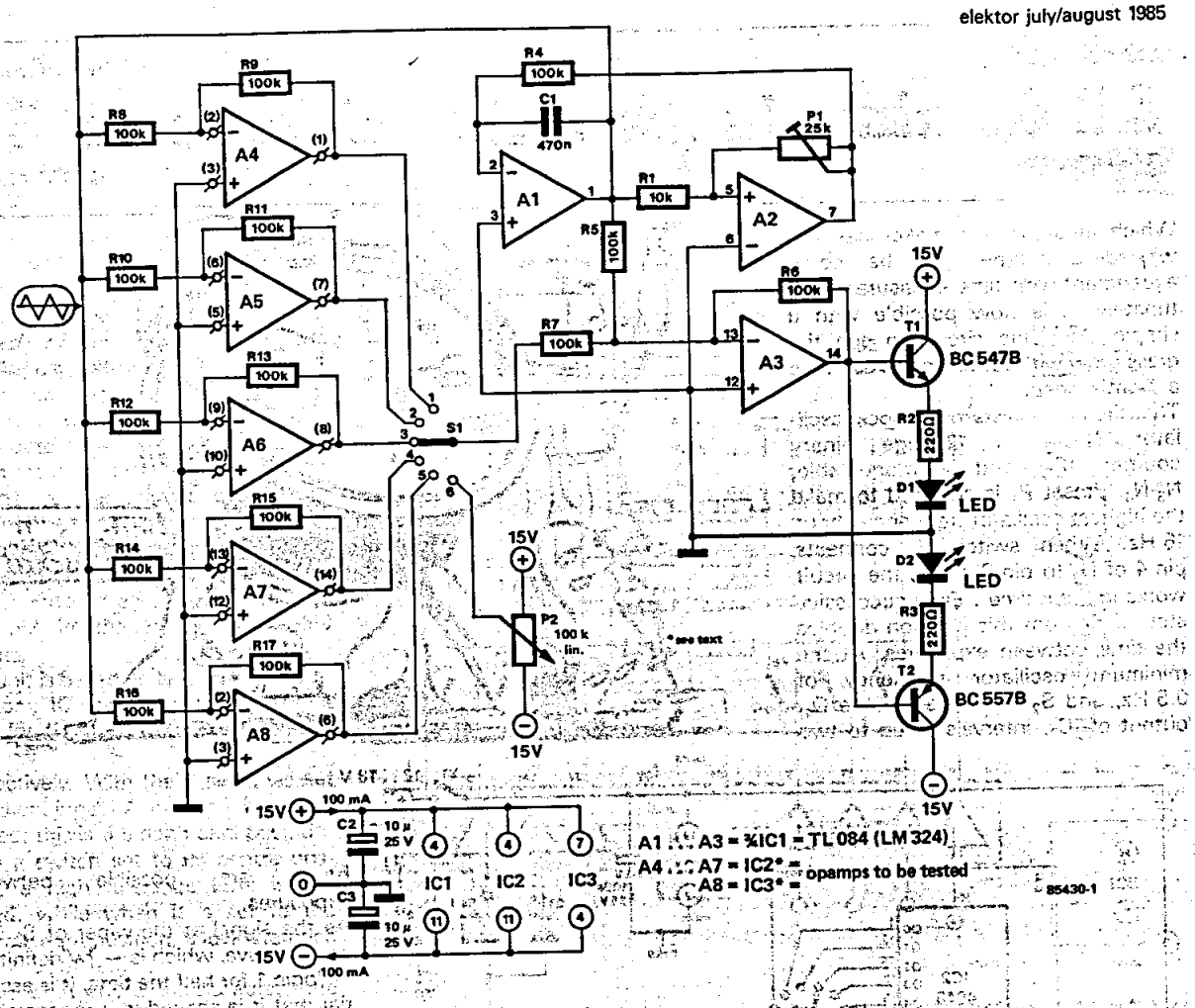


in figure 1 should be modified accordingly. When a specimen is defect, the output of A_3 consists of a triangular voltage superimposed on the (DC) offset. This is sufficient to bias the drive transistors and one or both LEDs flash in rhythm with the triangular voltage. The frequency of that signal is about 10 Hz, and this can be altered to some extent by changing the value of R_4 and/or C_1.

It is clear that the voltage at the output of A_3 must be greater than ±0.6 V, otherwise the bias for the transistors is too small. Preset P_1 should therefore be adjusted so that the LEDs just do not light when an opamp that is known to work correctly is inserted in the relevant specimen position.

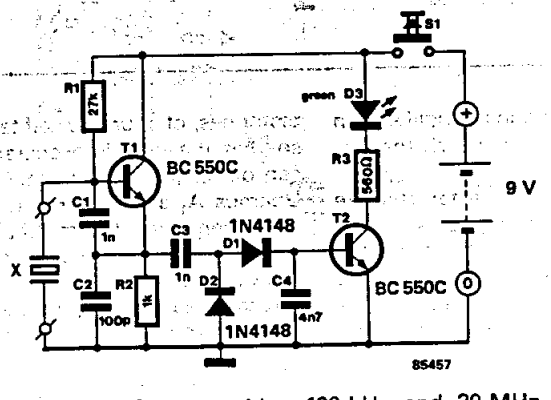
The self test function is easily checked: when P_2 is turned from one extreme of its travel to the other, first one LED, then both, and finally the other LED should light.

In positions 1...4 of switch S_1, the four opamps contained in, say, a TL 084 can be tested sequentially; in position 5, the single opamp contained in, say, an LM 355; and position 6 is the self test setting.

crystal tester

Many electronics hobbyists have crystals lying about, but don't know whether these are still working all right. The crystal tester described here will quickly show whether a crystal can be used or should be discarded.

Transistor T_1 and the crystal under test form an oscillator. Capacitors C_1 and C_2 form a voltage divider in the oscillator circuit. If the crystal is in good order, the oscillator will work. Its output voltage is then rectified and smoothed by D_1 and C_4 respectively. The resulting direct voltage at the base of T_2 is sufficient to switch this transistor on, so that the LED lights.



The circuit is suitable for use with crystals of a frequency between 100 kHz and 30 MHz. Current consumption is about 50 mA.