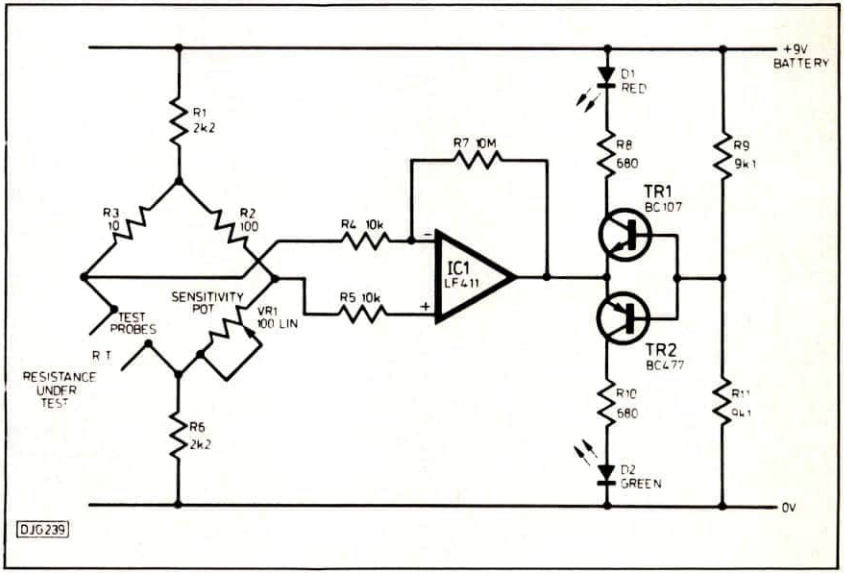
Short Detector

DUE to current needs to have high densities of semiconductors on modern printed circuit boards, accuracy in soldering is of vital importance. As with wrap joints a wrong pin can give devastating results. Looking for bridges and shorts to debug projects can be very frustrating and time consuming. This project was designed to make debugging fast and accurate.

Initially the sensitivity should be set to maximum. The probes from the output marked RT are held against two tracks in the area of the p.c.b. where the short is suspected. This represents the measuring arm and completes the bridge circuit. If the l.e.d. is illuminated the circuit under-test must measure more than 10 Ohms, but if the green l.e.d. is illuminated then the value of the short must be less than 10 Ohms, and the sensitivity control should be adjusted until null is obtained and both l.e.d.s. are extinguished.

Again the bridge is nulled, this procedure is repeated until the sensitivity pot is fully clockwise, indicating zero resistance, therefore the probes are above the short which can now be visually identified and removed.

The measuring component of this circuit is a Wheatstone bridge. The bridge can be balanced for any resistance of 10 Ohms or less, The value of which can be read from a calibrated dial on



VR1. The op-amp IC1 is used to compare the two arms of the bridge. Because of this arrangement, the output level of IC1 can only be one of three values.

When the bridge is balanced the centre point of both arms V1-V2 will have a differential of zero, therefore both points will be at half rail potential. The inputs of IC1 will be the same, thus the output of IC1 will be half the supply.

The bases of TR1 and TR2 are fixed at half supply potential, so when the bridge is balanced, the Vbe of both transistors is zero and is indicated by both l.e.d.s. being extinguished. If the bridge is adjusted and voltage V1 becomes positive with respect to V2 the output from IC1 falls to approximately 1V and TR1 is forward biased so illuminating D1.

If the bridge is adjusted such that V1 becomes negative with respect to V2, i.e. adjustment of VR1, or change in RT value, the output from IC1 goes high, approximately 8V, which reverse biases TR1 and forward biases TR2 to illuminate l.e.d. D2. Resistors R8, R10 are used to limit l.e.d. currents.

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