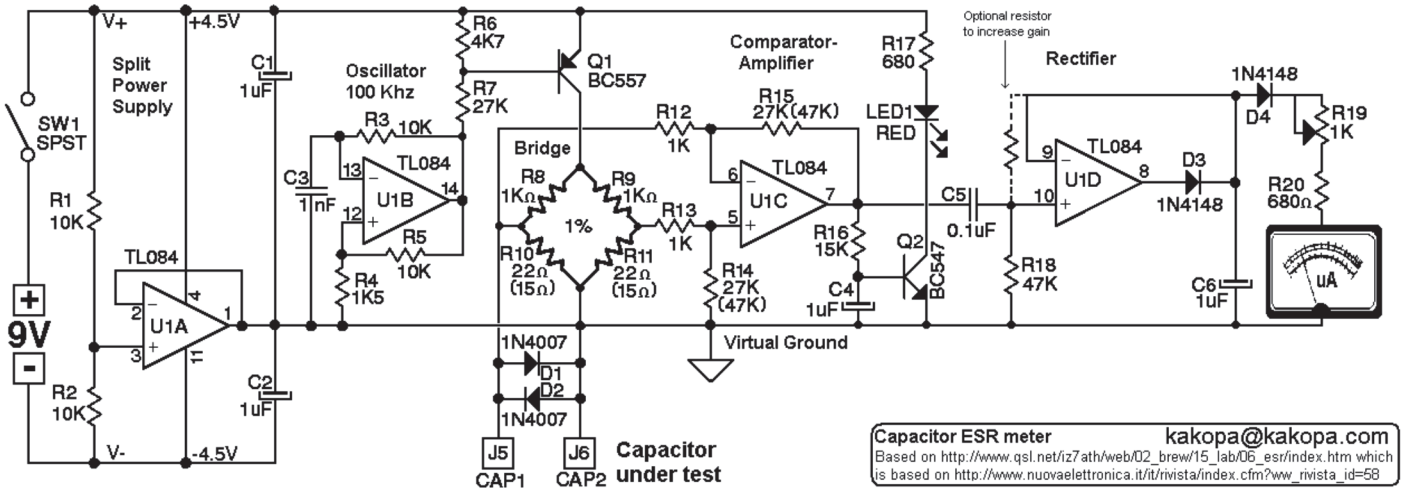
placed in parallel with one of the legs which introduces an imbalance which is amplified by an op-amp. The lower the ESR, the greater the imbalance and the higher the reading.



Click to enlarge

Op-amp A, first from the left, divides the 9V power supply into two halves so we have +4.5 and -4.5 with respect to the center point which becomes our virtual ground. This symmetrical power supply is required by the op-amps which follow.

Second op-amp, B, is the basis for the 100 KHz oscillator. In practice I have noticed that the frequency tends to be not close to 100KHz, probably due to component tolerance values, so it is best to check it and trim the value of R3 to bring the frequency close to 100 KHz. While this is not essential, it permits better comparisons between units built. At the output of this op-amp we should have a square wave between -4 and +4 V pp.

The transistor which follows serves several purposes. It shifts the level of the signal so it is always positive, between 0 and +4 and it isolates the load that follows from the output of the op-amp which does not have a low enough output impedance to drive the bridge directly.

At the collector of the transistor we find the bridge which is the central part of the unit. The two upper resistors are much larger in value than the two lower ones so that the voltage which is put to the capacitor under test is a small fraction of the output of the transistor. Any imbalance in this bridge is amplified by the next op-amp, C. Let us analyze the different cases in detail.

Pin 7 of IC - Output of comparator op-amp.