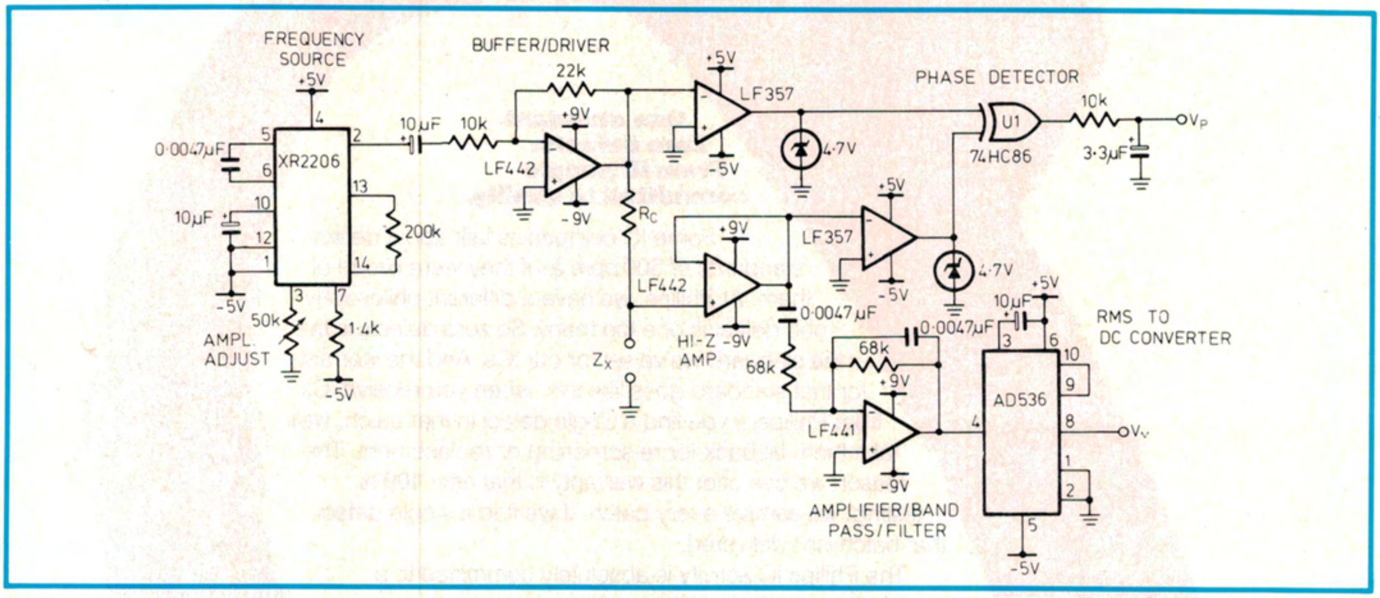
Circuit & Design Ideas

Interesting circuit ideas from readers and technical literature. While this material has been checked as far as possible, the circuits have not been built and tested by us. As a consequence, we cannot accept responsibility, enter into correspondence or provide constructional details.



Complex impedance meter

No, not an impedance meter that's complex, but a meter to measure complex impedances.

Impedance meters are extremely useful test instruments. Despite this they are rarely seen, most likely due to their exuberant price tags. Likewise the need for measuring impedance is often seen as an unnecessary complication, and so is waived in favour of more familiar measurements.

By measuring impedance, both the resistance and reactance of a circuit can be determined. Similarly taking capacitance and inductance measurements is a breeze with an impedance meter.

This circuit calculates the impedance magnitude and argument (phase) of a circuit placed across the terminals Zx. The frequency of operation is 25kHz.

Impedance magnitude is calculated using a voltage divider network formed by the calibration resistor Rc and the unknown circuit element. Rc has not been assigned a value because its value depends on the range of impedances measured. A basic guideline is that Rc should be about 10 ohms. Values up to about 1M work well.

The phase circuit simply compares the phases of the signals before and after they have been passed across the circuit element. A basic rule here is

Phase Angle (degrees)
= (36 x Vp (volts)).

Calibration of the meter is performed simply using a few impedance elements (e.g., resistors and capacitors joined in series), to produce calibration graphs of impedance magnitude and impedance argument versus Vm and Vp respectively.

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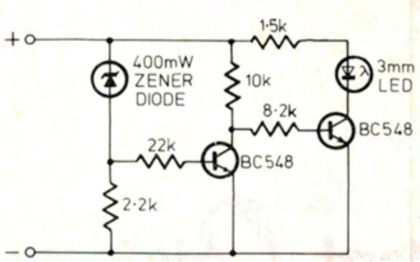

Low battery indicator

This circuit will let the users of electronic equipment powered by zinc-carbon and similar cells know when the batteries are nearing the end of their useful life.

When the supply falls to within 0.8 volts of the voltage across the zener diode, the LED will light.

Using a 10 volt zener diode the LED will light when the supply voltage falls to 10.8 volts, which is suitable for use with a 12 volt battery supply. The current drawn rises from 2mA to 7mA when the LED lights.

For a 9 volt battery supply the zener diode could be 7.5 volts and the resistor in series with the LED could be reduced from 1.5k to 1.0k ohms.

Because zener diodes are not made to strict tolerances, it may be necessary to try several before the desired operating point is obtained.

Note also that because zeners do not have a sharp "knee" below 6 volts, this circuit is not very suitable for lower voltages.

This circuit can also be used to warn the user that Ni-Cad batteries require re-charging, but because they have a fairly flat discharge characteristic the working voltage of the zener diode becomes much more critical. A suitable re-charge point for Ni-Cad batteries would probably be 1.2 volts per cell or a little less.

If used with Ni-Cad batteries, the circuit may help reduce the risk of "reverse-charging" one or more of the cells, which can occur if the voltage is allowed to fall too low.

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