

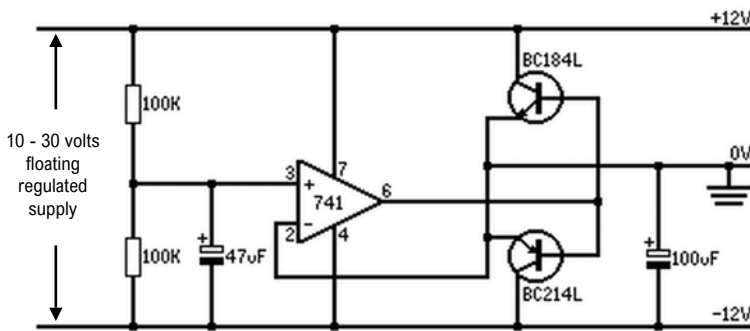
# CIRCUIT MAKER

## Single rail to dual rail for op-amps

Most op-amps require a split power supply of some form because both positive and negative output voltage swings are needed. In some applications it is possible to connect the op-amp across a single supply and bias all the inputs up to half the rail voltage but this implies the use of large numbers of DC blocking capacitors. It is more economical and often better to generate a half-rail voltage using another op-amp and if necessary, a couple of transistors. Provided that the input rails are

floating from earth the new half-rail voltage may be connected to earth, giving in effect a dual supply with centre earth which is ideal for audio applications.

The circuit itself is very obvious. The op-amp is connected as a voltage follower, the input voltage being set at half-rail by the resistor divider and smoothing capacitor. Two transistors are connected to the output of the op-amp to provide current boosting if necessary; the feedback loop being made after these. Note that the maximum voltage supply is limited by the op-amp, in this case 30 volts being the wisest maximum. If the supply is to be used for other op-amps this limit is not relevant.

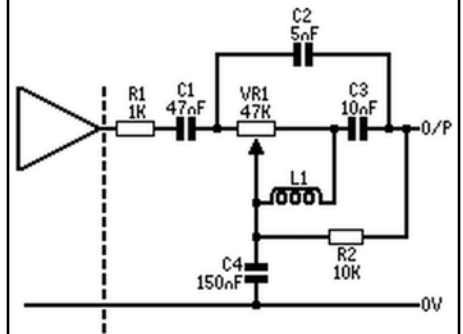


## Pseudo phaser

Dave Rogers-Walton

Tone stops allow the electronic organ player to select from different fixed filters whilst playing and so are really a type of performance control. There is no reason why a similar facility should not be added to the more usual performance controls (e.g. pitch bend) found on synthesisers. What is needed is some form of one-knob, complex tone control which, unlike standard tone circuits, should be able to shift the balance within the important mid-band as well as at the extremes, so varying the whole character of the sound. The circuit shown does exactly this. It has also been found to have a useful effect at the output of guitar overdrive circuits.

RV1 simultaneously alters the time constants of several high and low-pass signal paths which are then remixed at the output. One of the results of this is the formation of a notch which varies in centre frequency as well as depth, depending on the setting of RV1. L1 forms resonant



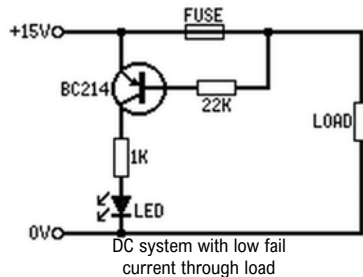
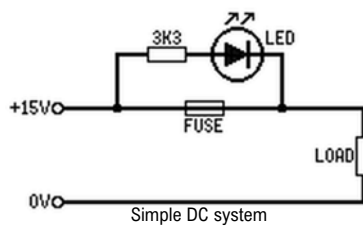
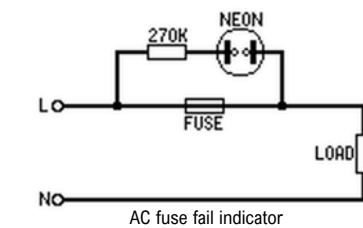
circuits with the capacitors over most of RV1's range but is effectively faded out of circuit towards either end, thus adding another variable element to the frequency response contouring.

Used with a reasonably bright audio input, the perceived loudness is then similar for all settings, so a small turn of this single control can be used to obtain a distinct change in timbre without having to readjust the volume, while a back and forth rotation during a sound gives an effect like a manually swept one-notch phaser. A bypass switch is not needed since with RV1 fully anticlockwise, the tonal response is almost identical to a 'straight through' path. For best results this circuit must: (1) feed into an impedance of 47k or over, for example, a non inverting op-amp, which if given a gain of X5 will also more than make up for the insertion loss of the passive circuit. (2) be driven from a low impedance stage, designated 'A' in the diagram. This may already exist within a piece of equipment (emitter follower, op-amp, etc) in which case the present circuit can simply be added on passively. If the available output impedance is more than a few hundred ohms, however, a simple buffer stage should be included.

## Fuse failure indication

The failure of a fuse either as a result of a fault or simple ageing and over-heating can be quite alarming because the piece of equipment in question usually stops working with no indication as to why. It is thus useful to arrange for some form of indicator to light when a fuse fails. The simplest indicator is for mains when a neon (together with a 270K resistor if not built into the neon) is strapped across the fuse. Obviously when the fuse blows the voltage at the load end drops and the neon lights. The small leakage current through the neon will be of little consequence to the following circuit, even in the event of a major fault. Failures in DC circuits can be a little more tricky depending on the nature of the following circuits. If a current of say 5 mA is acceptable, even in event of fuse failure, a LED may be connected across the fuse in the same way as the neon. The polarity of the LED should be altered if the fuse is in a negative supply line. If even low current is not acceptable a transistor must be used to drive the LED. A PNP type for a positive rail system can be connected across the fuse with the base connected to the load side. A LED and suitable resistor are added to the collector. If the fuse fails the base voltage falls, switching on the transistor and causing the LED to light.

While on the subject of failures, the usefulness of connecting a small neon across the mains supply as soon as it enters a piece of equipment should not be underestimated. Such a neon will give immediate indication as to the state of the mains supply thus saving valuable time if the fault is in the mains lead, as it often is.



Such miniature neon lamps are cheap to buy and easy to fit. They also provide an added reminder when servicing that mains is supplied even though the equipment is switched off - something that it is all too easily forgotten.