Metal film resistor trimming

K. Bertholdt

Suppose you need an oddball resistor value like 2.8 kΩ but you only have 2.2 kΩ available. Of course you can create the desired value from two or more standard resistors (if available!) or employ a preset as a makeshift solution (space allowing). There is, however, an alternative, cheekier method that seems to be little known, hence this Design Tip.

Connect your 2.2 kΩ resistor to an ohmmeter (or a multimeter set to the Ω range). Next, use a sharp hobby knife to scratch a tiny amount of lacquer off the resistor body. You'll find that careful scratching increases the value of the resistor as effectively the metal film layer is reduced. You'll be surprised how easily a metal film resistor can be trimmed to a slightly higher value!

(050295-1)

Editor's note

As already intimated by the author, the method is fairly brutal, hence should only be used in experimental situations or when no alternative is available. The damaged resistor loses its rated wattage and mechanical stability, while the bared metal film is not a permanent solution.
In circuits designed for regular use resistors with the proper value should be used, or failing that, a combination of standard undamaged resistors approaching the desired value.

# Logarithmic volume control

Bart Boerman

This volume control makes use of an operational amplifier and a few passive components to mimic the operation of a logarithmic control while using a linear potentiometer. The circuit does better in terms of reliability when compared to other designs employing double linear pots to create the logarithmic transfer function.
The circuit is also handy when digital potentiometers are used, the majority of these being linear-law. The circuit shown here allows such a digital pot to be easily changed into its logarithmic counterpart.

The graph shows the transfer function of the circuit for alternating voltages. The horizontal axis shows the spindle position, the vertical axis, the gain of the circuit for three different values of R1.
With R1 at 1 kΩ the range of the circuit extends from –20 dB to
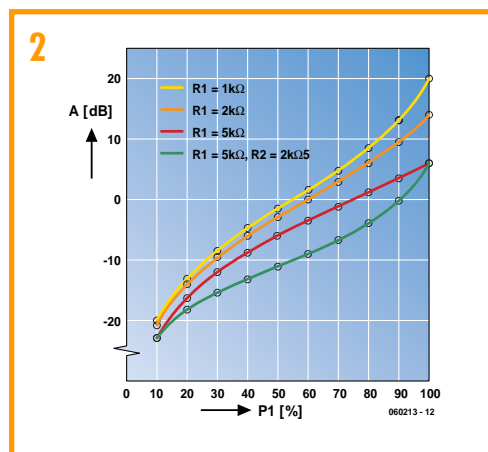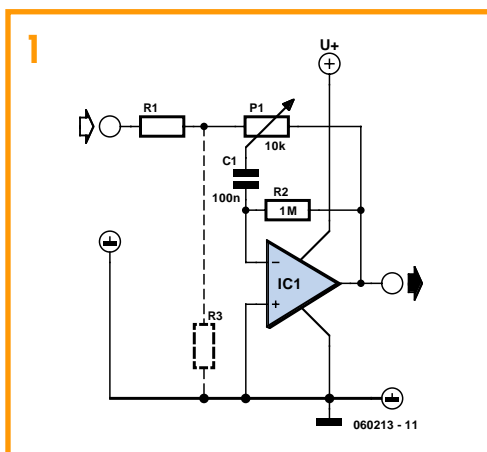
+20 dB (potentiometer span 10% to 100%), i.e., an effective range of 40 dB. In the same control area, a linear pot would have a range of just 20 dB (from –20 dB to 0 dB). In linear terms, the difference between the two ranges equals a factor of 10!
Thanks to components C and R2, the offset voltage at the opamp output remains small even at relatively high gain. The values of these components are uncritical and can be chosen from a wide range, for example, C = 100 nF and R2 = 1 MΩ. This will result in roll-off frequency of about 10 Hz. In practice, both extremely low and extremely high gain settings should not be used. Simply make sure R1 is always larger than one tenth, and smaller than the maximum, value of the potentiometer. If you need to set attenuation levels higher than 20 dB, then an extra resistor (R3) is an option. Do note however that the replacement value (R1∥R3) then equals the initial value of R1.

(060213-I)