*EACH 100M RESISTOR IS
10x 10MΩ 1% RESISTORS IN
SERIES, ON A SMALL
PIECE OF 'VEROBOARD'
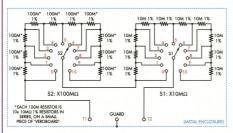
Low-cost gigaohm decade resistance box

During development of the Digital Insulation Meter described elsewhere in this issue, it was necessary to check its operation with an accurate high-resistance reference – preferably one that provided resistance values up to around 1GΩ or 1000MΩ. Since such a reference does not appear to be readily available, I decided that the only option was to build my own.

The idea was to come up with a two-decade resistance box to provide values between 0Ω and 1100MΩ (1.1GΩ) in 10MΩ steps, with a basic accuracy of 1% per step. The resulting design uses a considerable number of 10MΩ 1% metal-film resistors, mainly because this is the highest value currently available with this tolerance.

There are 110 of these resistors used in all, since each of the 100MΩ resistors used in the "x100MΩ" decade is made up using ten 10MΩ resistors in series. The resistors are currently available for around six cents each, so the total cost for the resistors is around $6.60.

The switches used for S1 and S2 are of the standard single-pole rotary type, programmed for 11 positions. The two switches are housed in a standard 119 x 94 x 57mm diecast aluminium box, which provides both physical protection and shielding (which is quite important for making measurements on resistance values of this order). This box is currently available for about $19, so it's actually the most expensive part of the project. The only other components needed, apart from the resistors, are the two rotary switches, their knobs and three binding posts, bringing the total cost of the decade box up to around $43.

The individual 10MΩ resistors used for the "x10MΩ" decade are simply connected between the connection pins of switch S1, in daisy-chain fashion. On the other hand, the ten 10MΩ resistors used in each leg of the "x100MΩ" decade are mounted on small pieces of stripboard or Veroboard and connected in series. Each of these fabricated "100MΩ" resistors is then connected between two of the connection pins of S2 using two short leads made from hookup wire.

If you want to use this unit with the Digital Insulation Meter on the 1000V test mode, the resistors should be high-voltage types as specified in the parts list for that project.

Jim Rowe,
SILICON CHIP.

This 2-decade resistance box provides values between 0Ω and 1.1GΩ in 10MΩ steps. It is built into a diecast aluminium box which provides the necessary shielding.