

Resistance Decade Box by G4CNH – April 2017

A resistance decade box is something you may never need and yet if you do ever want one, you will be glad you have one at hand. The high prices of commercial units, even on auction sites, rule out buying one for the odd occurrence you may need it. Now one would expect to pay a high price for decade boxes that give something like 10 milliohms resolution but for general purpose at home, a cheap 1 Ohm resolution unit would suffice. The unit described is cheap to build though I splashed out more cash for the convenience of using figure dials on the switches. You could of course use standard pointer knobs and change the front panel label as required.

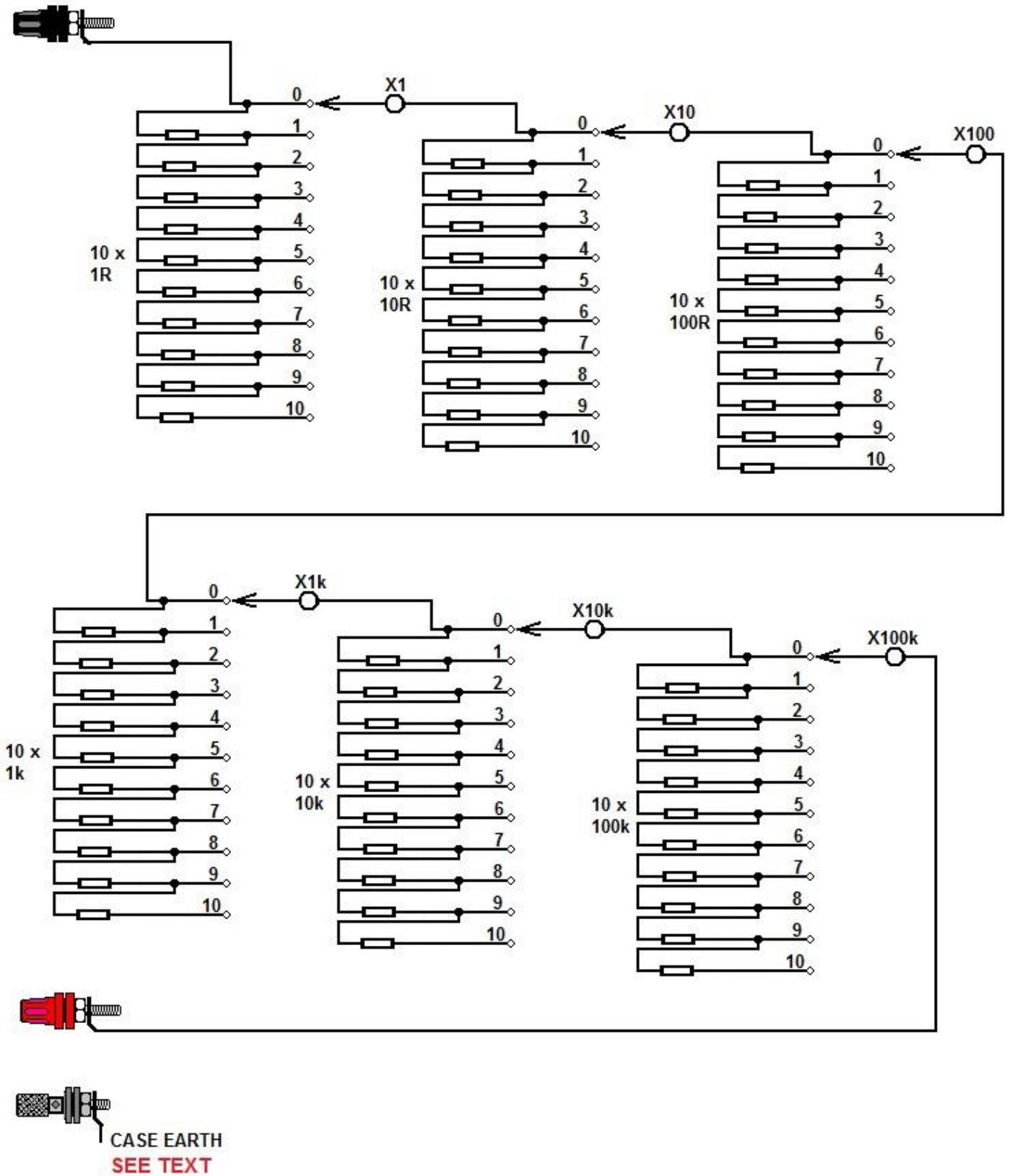
To reduce price and weight! I used a Hammond ABS box that is made from conductive plastic and thus providing a screened environment for the internals. In this instance, a Ground terminal is provided for connecting the box to a suitable Earthing point. The switches are Make Before Break so that operating them does not cause intermittent open circuits as you switch values.

The resistors used are Metal Film 0.6W at 1% which I consider to be an adequate tolerance for home hobby electronics. The circuit below shows how simple these boxes are yet many are sold for £100's but why? The reason is that these tend to get used in Calibration Houses that often demand very high accuracy at very low values which thankfully we are unlikely to need.

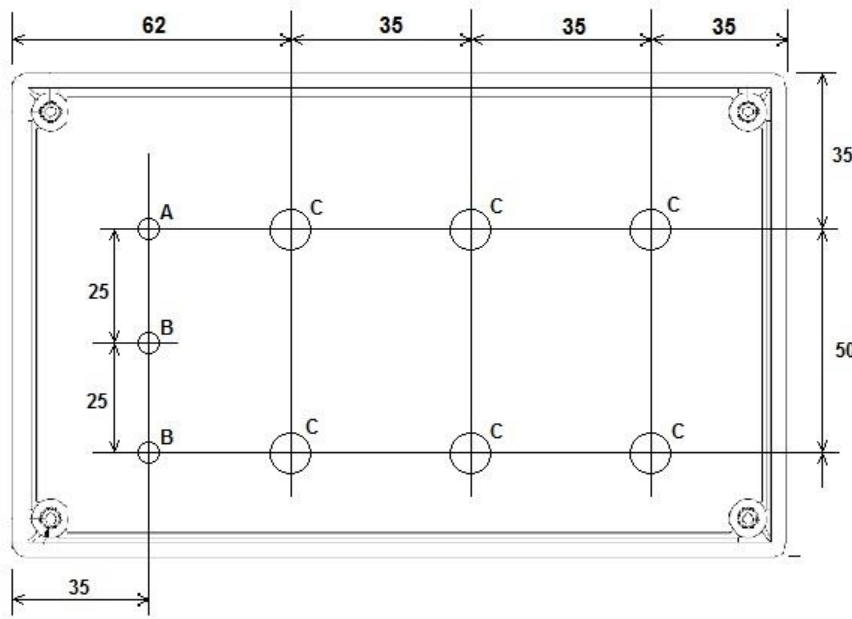
As with any decade box, one has to be thoughtful when using it, take for example the situation when the decade box is set to 100 and you want to go down to 99? Before setting the 100 dial from 1 to zero, you want to set both the lower two decades (x10 and x1) to 9. Thus when you switch the 100 decade to zero then 99 ohms will be present. You have to apply the same thought process when going up so if you have 99 ohms set on the box, switch the x100 decade to 1 before setting the x10 and x1 switches to zero.

The switches came without an indexing washer so I could not set them to have 11 positions. What I did was connect tags 1 and 12 together so position 11 is the same as 0, i.e. no resistance switched in. If you have spare resistors you could always include an extra one such, for example using the x1k switch, you could go from zero to 11k.

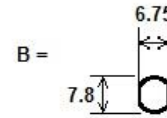
Decade Box Circuit Diagram



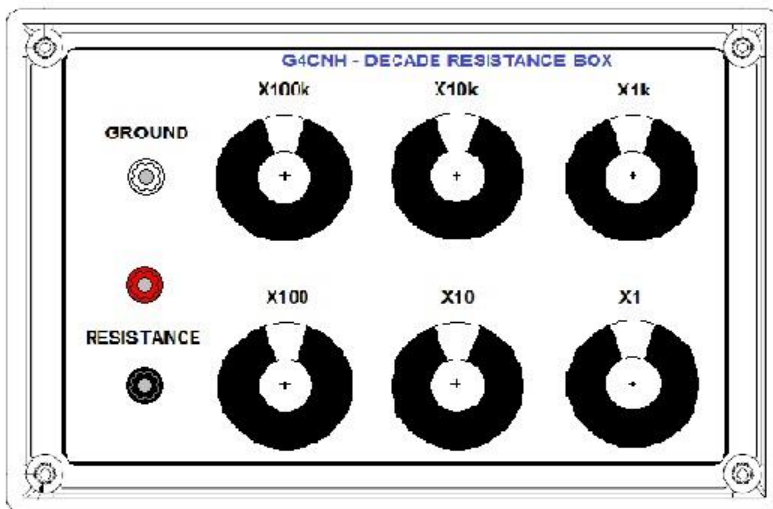
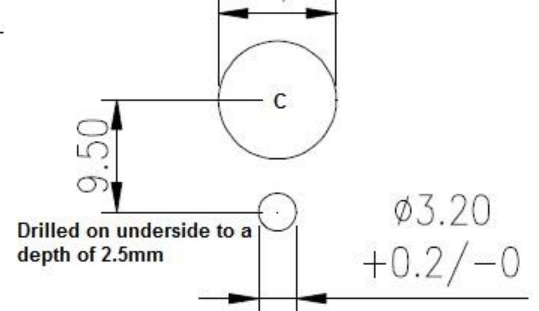
The layout



A = 5.5mm Clearance

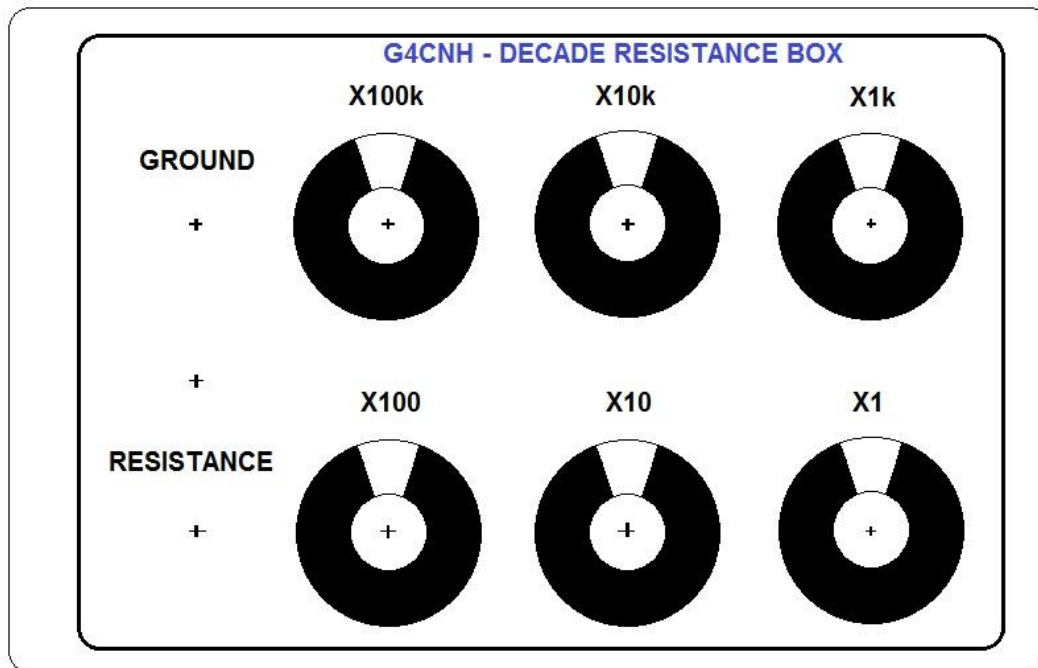


c = Metric $\phi 10.0$
Imperial $\phi 9.5$
 $+0.2/-0$



THESE ARE VIEWS ON THE COVER - IF THE LABEL TEMPLATE IS CORRECTLY PRINTED TO SIZE THEN THIS CAN BE USED AS A DRILLING TEMPLATE.

Label Template; adjust print size such that outer thin line matches size of box cover.



Parts used.

ITEM	DESCRIPTION	SUPPLIER	PART No.
1*	ABS Shielded , 167 x 107 x 64.9, Hammond 1594RFIEBK	RS	528-7347
2	1p 12w rotary switch, MBB (6 off- Cut Spindles to 8mm)	CRICKLEWOOD	RTY1
3	Knob, 15mm, (6 off)	RS	225-704
4	Figure dial 0-11	RS	468-0644
5	knob cap	RS	225-899
6	4mm Terminal Post, Red	CRICKLEWOOD	4TR
7	4mm Terminal Post, Black	CRICKLEWOOD	4TB
8	Ground Post, uninsulated	MAPLIN	JL99H
R1-R10	1 Ohm, 1% 0.6W	RS	150-565
R11-R20	10 Ohm, 1% 0.6W	RS	125-1154
R21-R30	100 Ohm, 1% 0.6W	RS	148-269
R31-R40	1k Ohm, 1% 0.6W	RS	148-506
R41-R50	10k Ohm, 1% 0.6W	RS	148-736
R51-R60	100k Ohm, 1% 0.6W	RS	125-1168



Not shown in above picture or parts list is the four small rubber feet I attached to the case bottom half. Due to construction of box these are mounted further away from the corners as usual to give ample space for the securing hardware. One could of course use self-adhesive feet.