# Simple, cheap, decade resistance box

Tired of digging out that odd-value resistor, or constantly switching out an R-value on your breadboard, while prototyping? You need a (or several!) decade resistance box(es)! Very useful to have for prototyping. I found these perfect, wonderfully cheap "mechanical decade counters" (I believe she means decade "switch" but ok) at www.adafruit.com - a 5-stage switch (see below) for $7.50. Super cheap and makes building this very affordable. Below is the schematic for ONE STAGE. You need 1 stage (with 9 equal value resistors) for each decimal range in your decade box. The first stage would be 0 to 9 ohms in 1 ohm increments (i.e. 1 ohm resistors), the second stage is 0 to 90 ohms in 10 ohm increments (i.e. 10 ohm resistors), and so on. Obviously, for clarity, the right-most switch is 0-9 ohm. For the best result, use 1% tolerance resistors but you can use 5% with the proviso that you might want to adjust for accuracy by measuring the displayed value with an ohmmeter and then using the low-value decades to increase accuracy if you need it. Select the power dissipation rating (Watts) according to your needs. My applications are all low power so 1/4W is fine for me.

## How does it work?

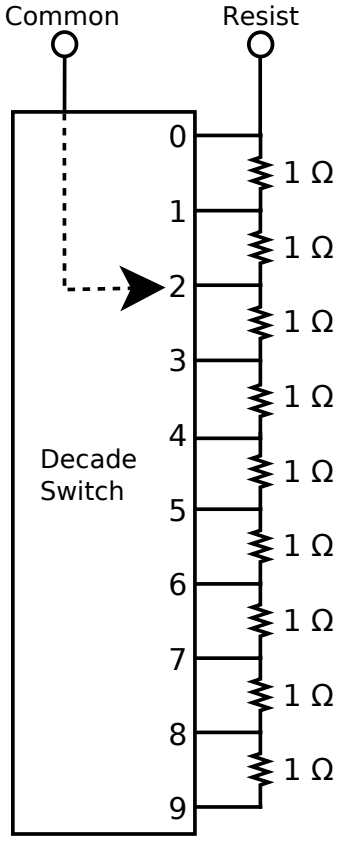
The "common" pin on the switch shorts to the "N" pin corresponding to the number on the display.

Thus, the total resistance between "common" and "Resist" will be the sum of N resistors where N is the number on the the switch display.

So, to build a resistor decade box for values from 1 to 10 Megohms *minus 1 ohm* you need SEVEN counters (plus the two end plates). My suggestion is to build TWO of them and buy three of the 5-pack switches from AdaFruit. You'll have one "switch" or stage left over so why not make one of them 8-stage (100 megohm). See my note to the right regarding the smaller version of this decade switch at AdaFruit if you want to build a smaller version of this. You may want to know that there are also other types of decade switches, the "thumbwheel" type being the most common.

Now, all you have to do is wire the gangs in series (that is, tie "Resist" on stage 1 to "Common" on stage 2 and so on) and attach a binding post to the Common pin of the first stage, and one to the Resist pin of the last stage.

**Schematic for first stage showing switch in "2" position (so, 2 Ω).**




## The decade switch


Available at AdaFruit for $7.50 for 5-decade counter with end plates. www.adafruit.com/products/1082

There's also a smaller, cheaper version which should work as the above: www.adafruit.com/products/1084

## My project

I'm building a "7 x 2, plus 1 x 6" decade resistance box. That is, two gangs from 1 ohm to 10 megohm minus 1, and one 1 ohm to 1 megohm minus 1. This will be housed in a standard Hammond project box with three sets of binding posts (1 for each switch gang). I will not be using a PCB and will solder the resistors directly to the switch through-hole pads.

I'll post pictures here soon of the blow-by-blow of my build.