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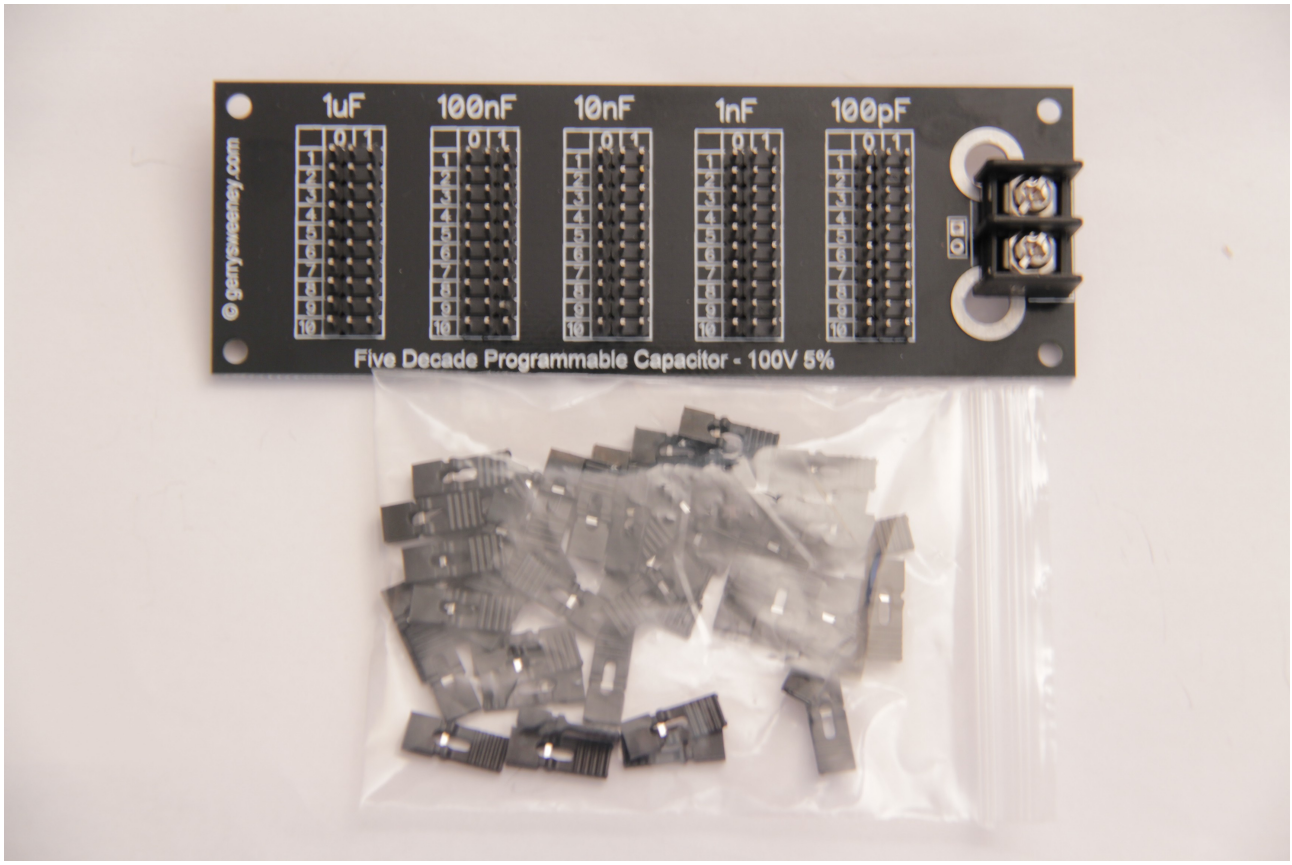
Five Decade Programmable Capacitance Board

TECHNICAL SPECIFICATION

Model: PDC-0001

100pF through 9.9999uF, 100V, 5%



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Description

This device provides a convenient and low cost solution for hardware developers, hackers and education use for prototyping and/or experimenting with electronic circuits. Traditional decade capacitance devices use switches and as a result they can be physically large and are expensive. As a result of these economics most decade capacitance solutions are typically high precision and very costly to manufacture.

The inspiration behind this design was from the first module in the series, a Seven Decade Resistance Board. The design was driven by a number of factors but low cost, physical size, convenience of use and ease of repair were primary drivers. The novelty of this solution is the use of simple and ubiquitous 0.1" pin headers and jumpers which are low cost, easy to use and if the jumpers wear out, they cost next to nothing to replace - most electronics engineers or hackers will have an abundant supply of these to hand.

At the time of publication this concept (using 0.1" headers/jumpers and small low-cost form factor) for a Decade Resistance Board was an original idea that had not to the best of my knowledge been put into production - of course like all great ideas it did not take long for the inevitable copies to appear. You can see the origional design idea, rationale and information in the following blog article here:

http://gerrysweeney.com/seven-decade-programmable-resistor-a-low-cost-solution/

And here is a blog article covering the creation and use of the Decade Capacitance Board.

Electrical Specification

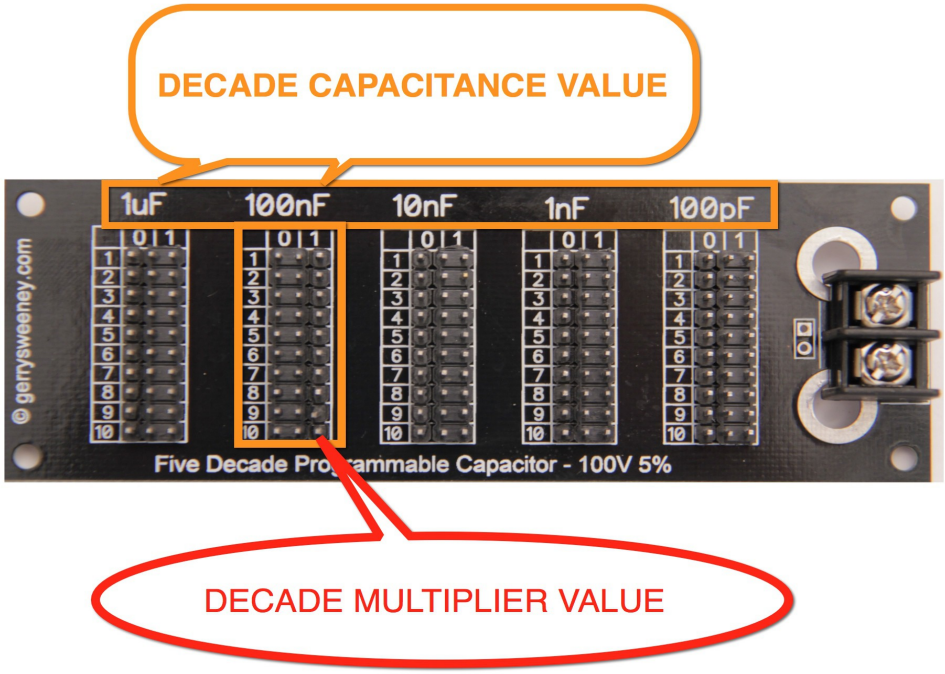
Minimum Capacitance *(see note 1)	100pF
Maximum Capacitance *(see note 1)	9.9999uF
Resistance Resolution	100pF steps
Tolerance	5%
Maximum Working Voltage *(see note 2)	100VDC / 70VAC
Residual Capacitance	~24pF
Replaceable Component Footprint	SMD 0805/1210

Notes

1. Precision can vary based on a number of factors including fly lead length and wire type.
2. 100VDC can hurt you. If you are using the board at these voltage levels please remember that this is a open board design, also remember that capacitors can hold a charge so remember to discharge it with a resistor before handling after using with high voltages.

Usage

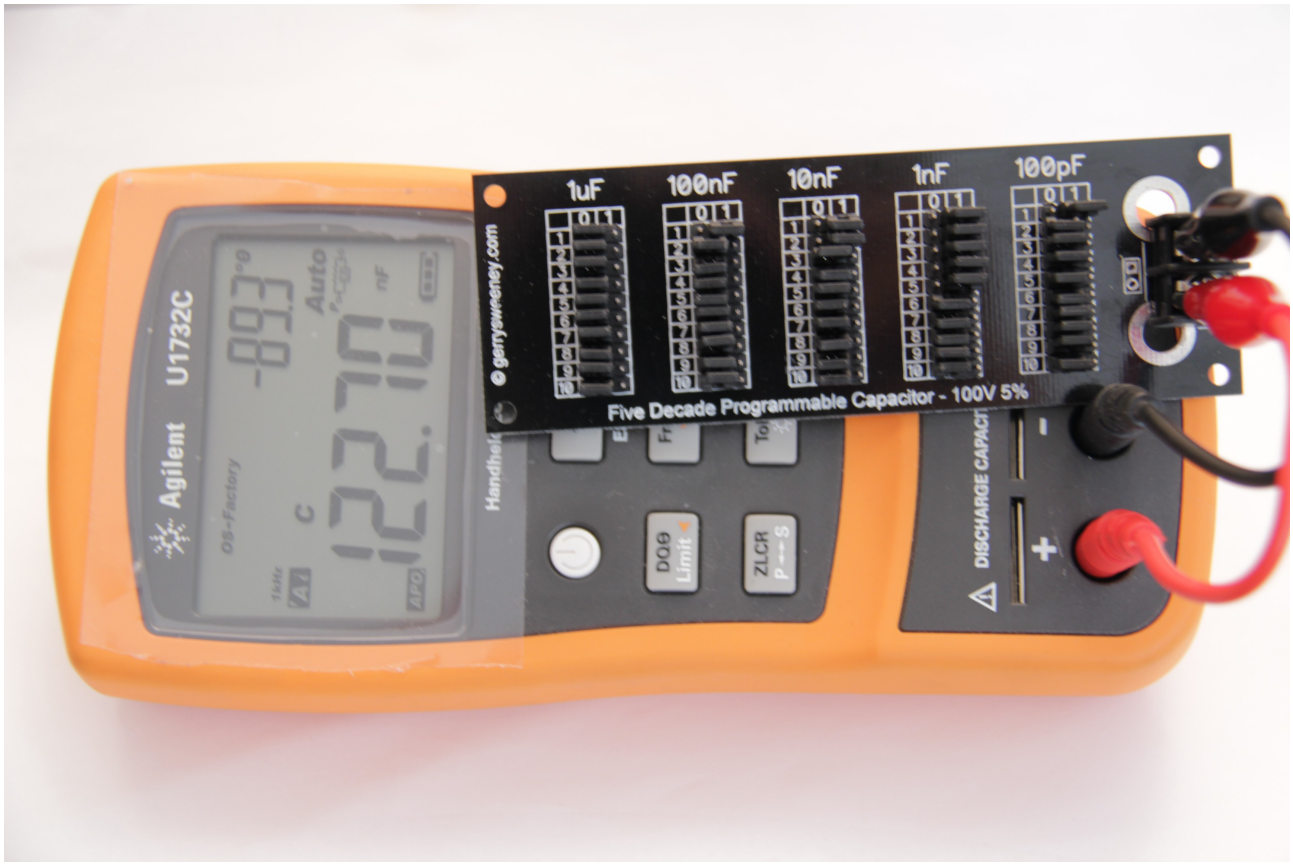
Using the decade capacitor is very easy. Simply connect the decade capactor board into the circuit and dial up the resistance by setting the jumpers to the appropriate values. The value of the capacitance is set by selecting each DECADE MULTIPLIER 1-10 and multiplying it by the DECADE CAPACITANCE VALUE and then adding each of the five resultant values together to give you the total capacitance.



Unlike a decade resistor where each component is placed in series, for a decade capacitance to work, the components need to be placed in parallel. To accommodate this each decade had three columns of pins and 10 jumpers per decade are provided. Putting a jumper into the leftmost position removes the associated capacitor and placing the jumper on the leftmost two pins adds the associated capacitor to the output.

Example

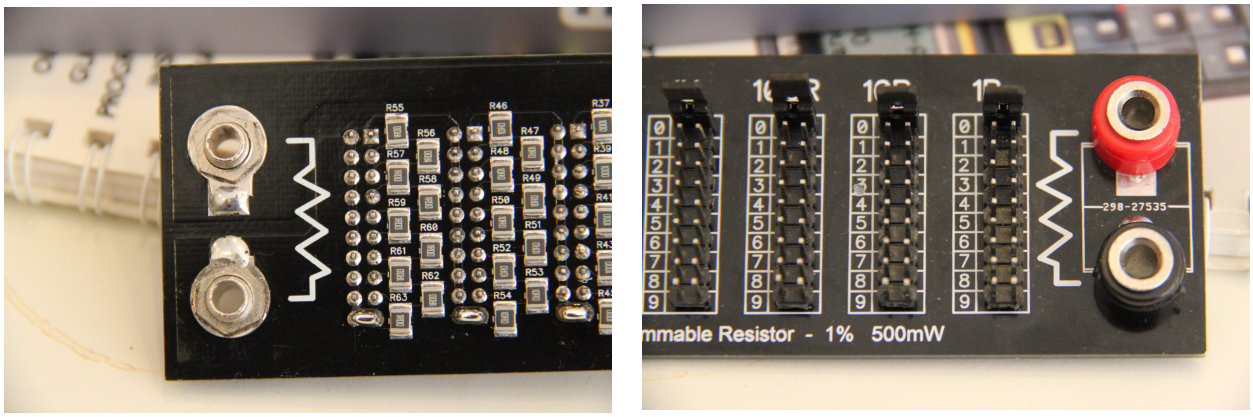
Here is an example of setting the capacitance value to 125.1nF



Modification Options

Using Industry Standard 4mm Banana Jacks

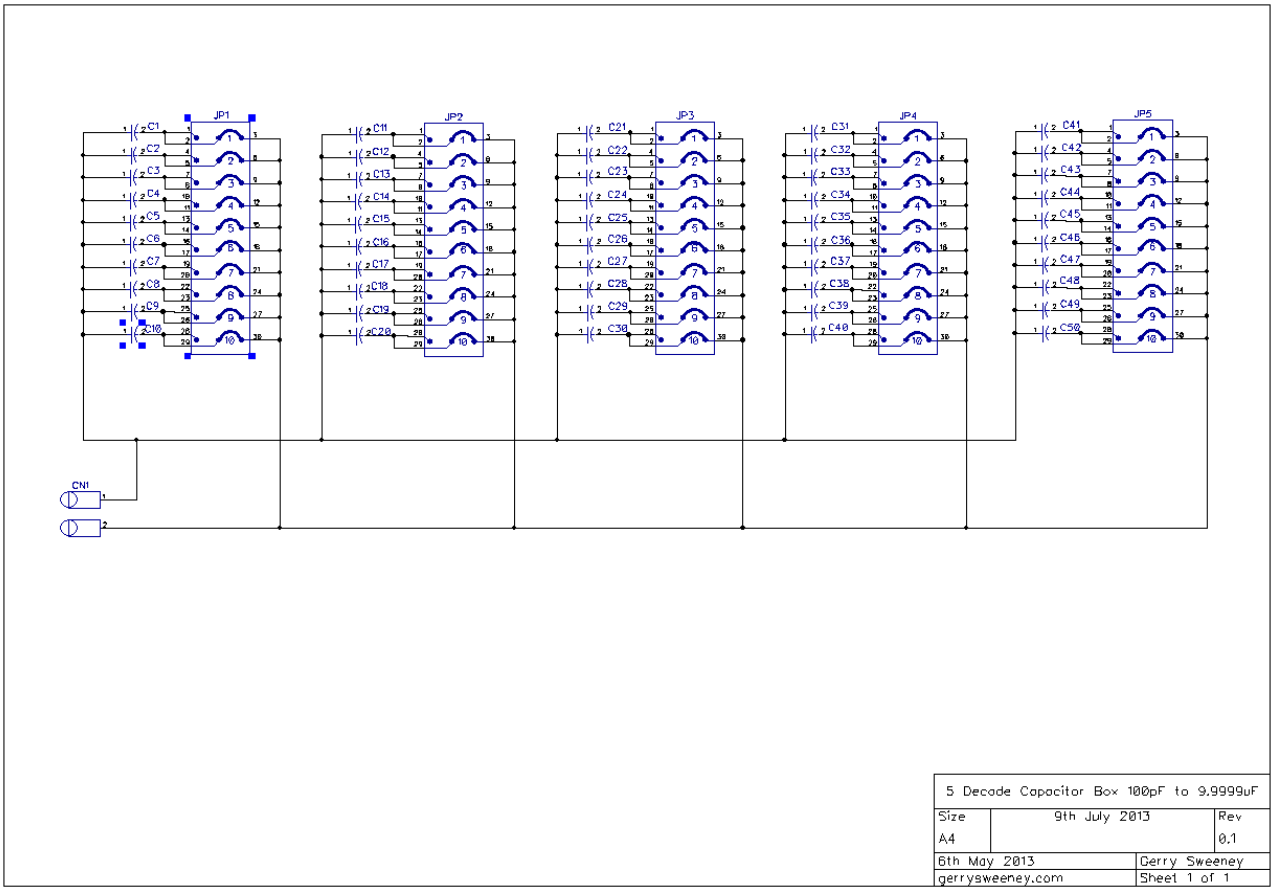
The default configuration of this board comes with a simple and robust screw-terminal making it easy for you to attach the wires or connections of your choice. However, in some environments the industry standard 4mm Banana plugs are preferable. The board has been designed to include appropriately sized and spaced holes to allow you to replace the two pole screw terminal block with a pair of easily available 4mm Banana Sockets, simply de-solder the terminal block and install the two banana sockets as shown – be sure to solder the lug to the pads originally used to hold the terminal block. Here is an example of the modification.



(images shown are for different board with the same footprint)

Schematic Diagram

Here is the schematic diagram for the decade resistance board.



Physical Board Dimensions

Here are the physical dimensions of the board (rev b), all sizes are shown in millimetres (mm)