gerrysweeney.com

Seven Decade Programmable Resistor Board

TECHNICAL SPECIFICATION

Model: PDR-0105

1 ohm through 9999999 ohm, 1%, 1/2W

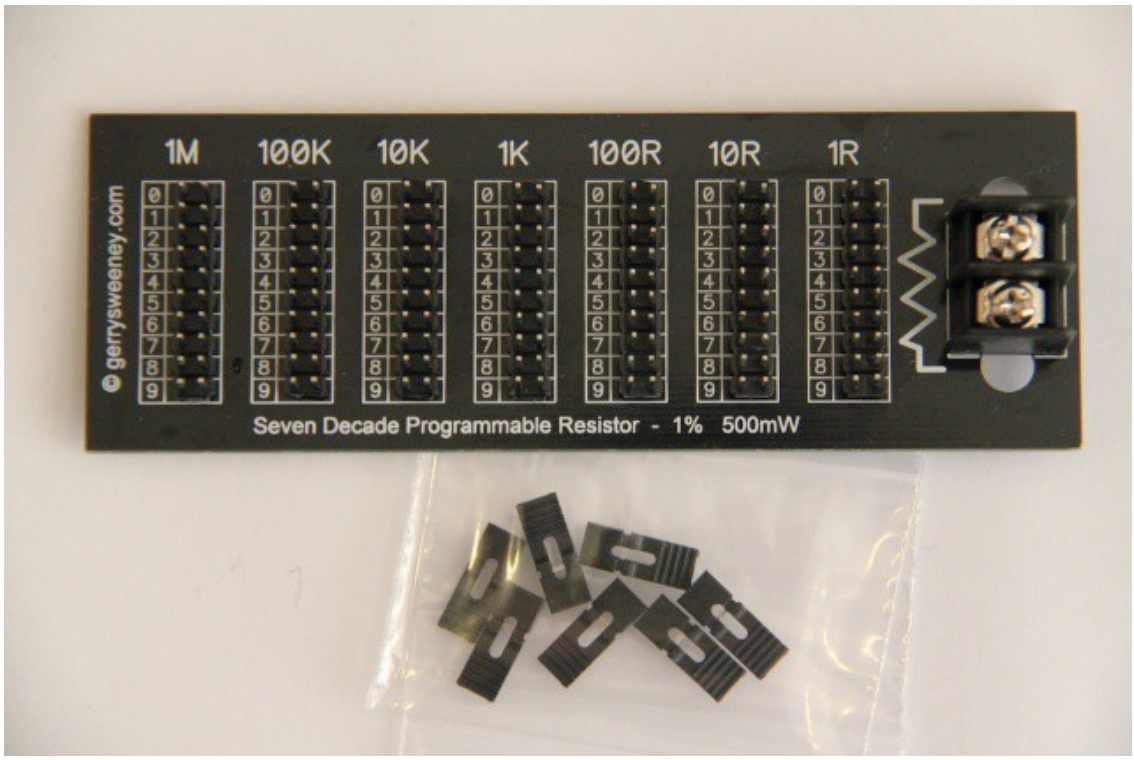


Table of Contents

Description

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

The inspiration behind this design was driven by a number of factors but low cost, physical size and convenience of use and ease of repair were primary drivers. The novelty of this solution is the use of simple 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) 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 full design idea, rationale and information in the following blog article here:

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

Electrical Specification

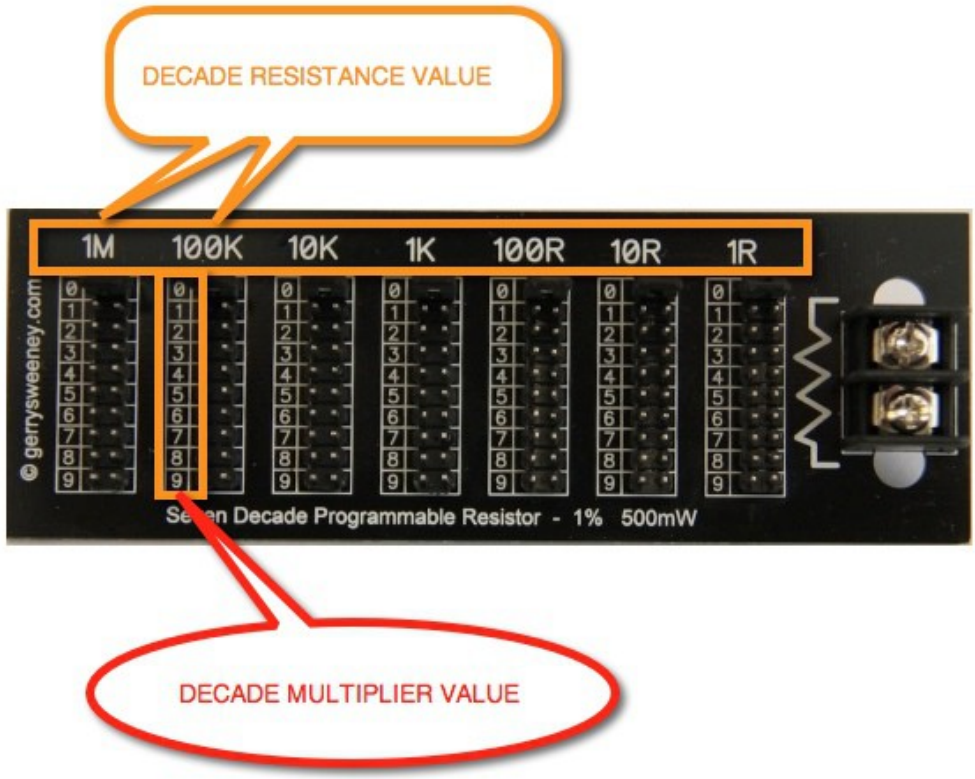
Minimum Resistance *(see note 1)	0 ohm
Maximum Resistance *(see note 1)	9.999999Mohm
Resistance Resolution	1 ohm steps
Tolerance *(see note 1)	1%
Power Handling	500mW
Temperature Coefficient	100ppm
Contact and Terminal Resistance	~0.5 ohm
Replaceable Component Footprint	SMD 1210

Notes

1. Precision can vary based on a number of environmental factors including temperature. The precision of the low range 1R through 10R will be somewhat inaccurate because of the impact of contact and lead resistance, this can be eliminated greatly by using a 4-wire resistance measurements.
2. For the higher resistance ranges, humidity and board cleanliness can have a noticeable impact, especially on the 1MR through 9MR range.

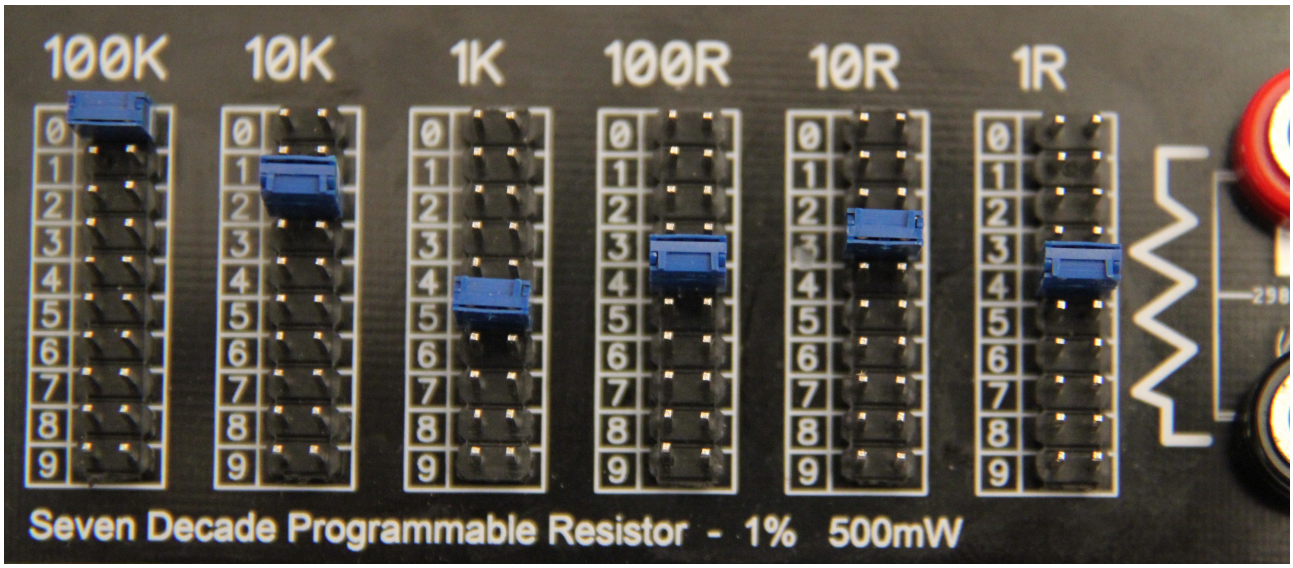
Usage

Using the decade resistor is very easy. Simply connect the decade resistor into the circuit and dial up the resistance by setting the jumpers to the appropriate values. The value of the resistance is set by selecting each DECADE MULTIPLIER VALUE 0-9 and multiplying it by the DECADE RESISTANCE VALUE and then adding each of the seven resultant values together to give you the total resistance.



Example

Here is an example of setting the resistance value to 25,434 ohms (25.434K).

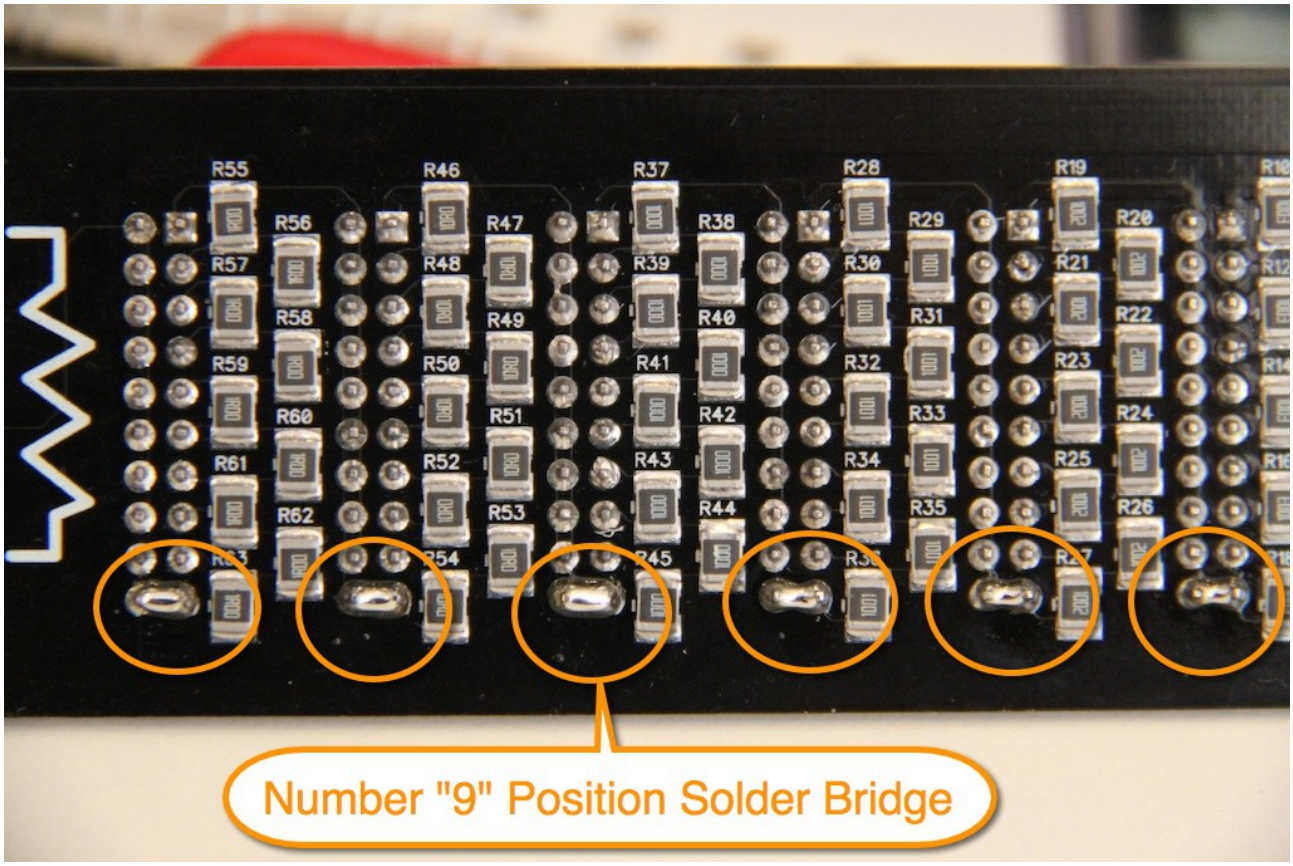


Modification Options

There are a couple of simple ptional modifications you can apply depending on your exact requirements.

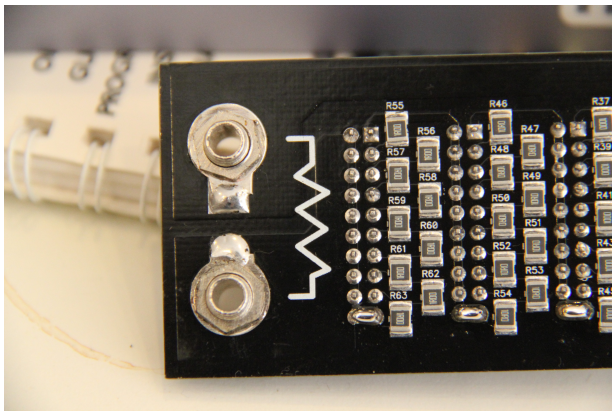
1. Changing the resistance value in-circuit

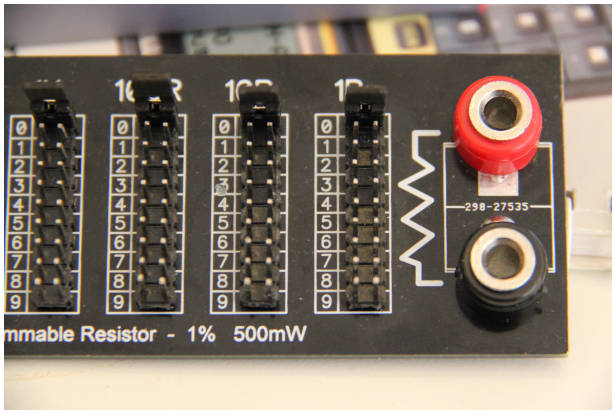
When using the decade resistance in your circuit you will often want to change the value while your circuit is running. You should always be aware that when you remove any jumper the resistance becomes infinite (i.e. open circuit) and of course depending on the circuit you are working on, your circuit might not tolerate this. An option you have is to make a solder bridge on the back of the board at each “9” position. After this mod, when you remove the jumper from a decade the overall resistance will only increase to is “9” value rather than open circuit - in almost all cases this is a safer option. As of “Revision B” of this board, this modification is done out of the box. You can of course revert this behaviour by simply removing the solder bridges if you require. Here is a picture of the board with this modification applied.



2. Using Industry Standard 4mm Banana Jacks

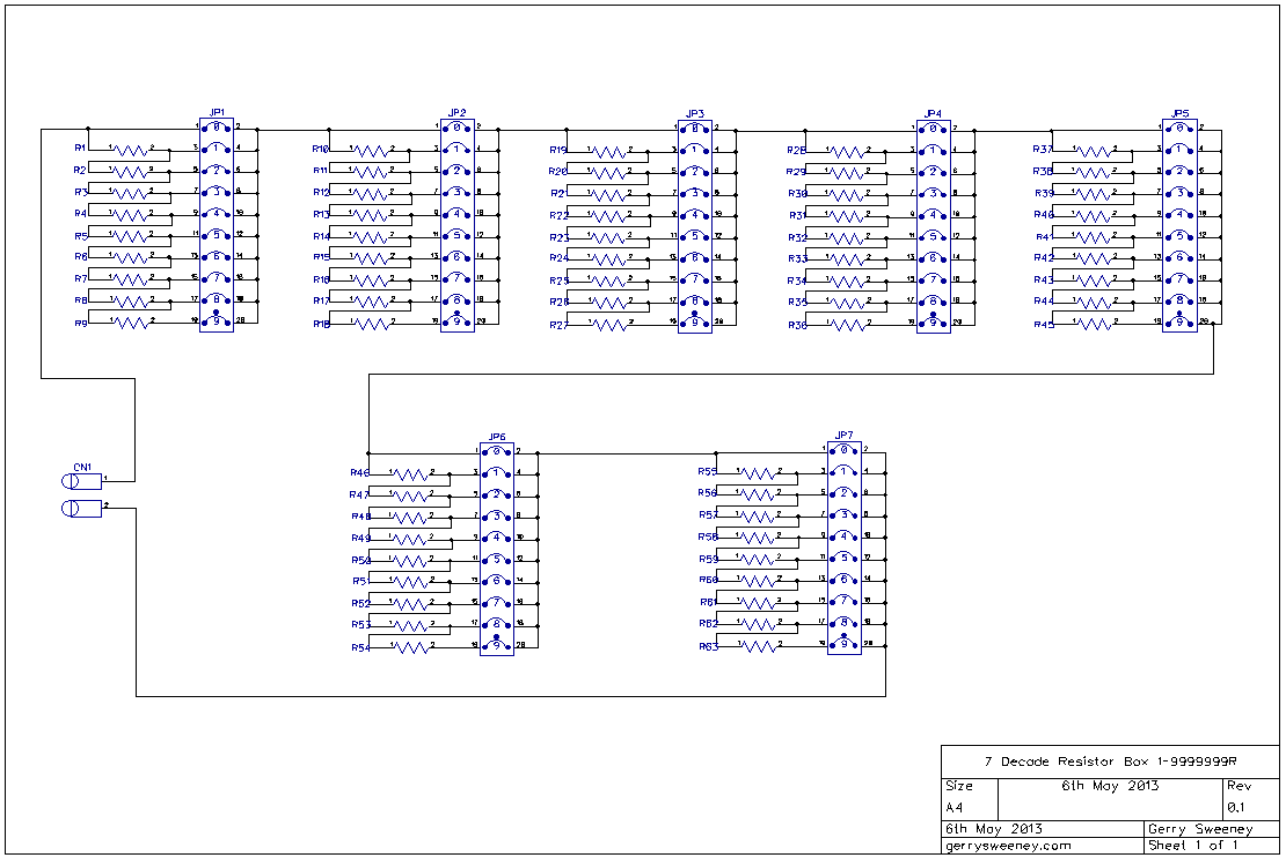
The default configuration of this board comes with a simple and robust screw-terminal making it easy for you to attach the wires or connections of your choice. However, in some environments the industry standard 4mm Banana plugs are preferable. The board has been designed to include appropriately sized 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.





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)