Making DUMMY Displays   April 2011

How many of us still have printed labels to display digits on our overheads, MCP's we've built and dummy radio's etc ?   I have on my overhead for sure.   So, it got me thinking as to how difficult it is to change these to real displays. Not too difficult actually once you understand how to do it. I started doing this when I built Steve Mitchell's overhead for him and now I've done a set for my overhead and also for a couple of other people into the bargain.

So what is a seven segment display?   Well it's a group of LED's contained within one package.   Now we know an LED has a Cathode (-) and an Anode (+).   By allowing a current to flow from the Anode to the Cathode light is generated and hence the name 'Light Emitting Diode'.

It then follows that by arranging a number of LED's in a single package, that by lighting certain segments, a digit can be represented as shown below.
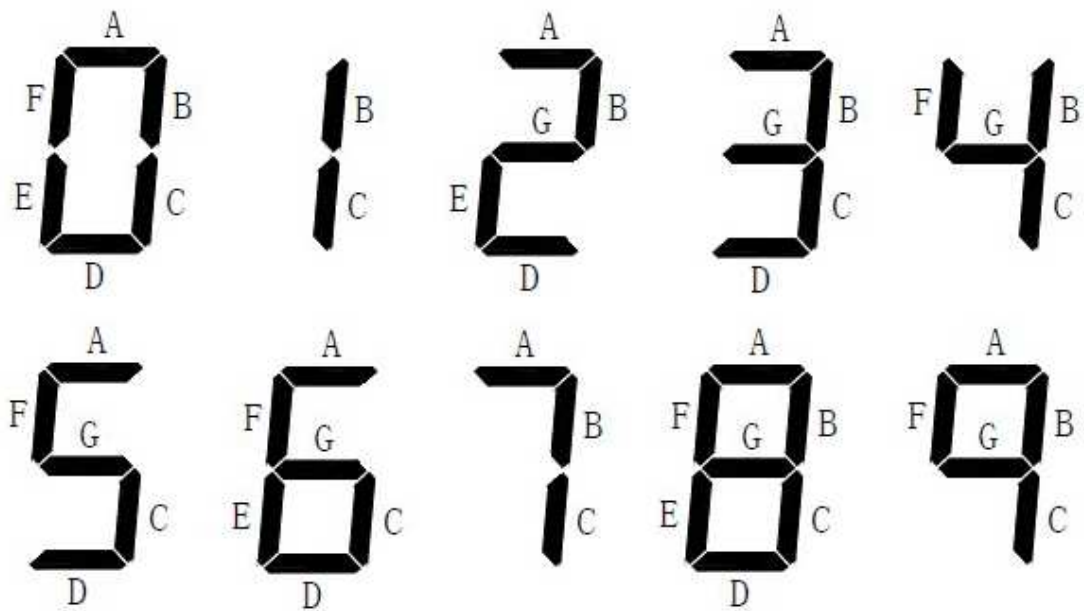
Fig.1

Common Anode or Common Cathode. Because an LED has both an Anode (+) and a Cathode (-), to make things simple, seven segment displays are manufactured with either a common Anode or a common Cathode. Usually the common is available on two pins.
In this example, we will be using displays with a common Cathode. But for displays which are common Anode, it's just a matter of swapping the + & - around.
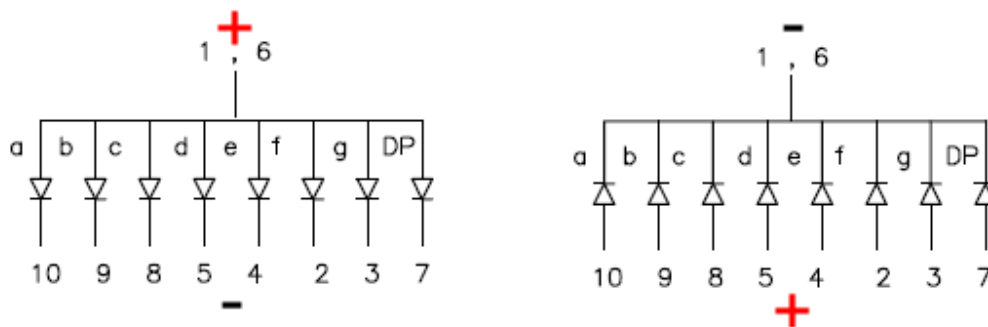

Fig.2

Here's an example. The figure on the left is for common Anode connection and the one on the right is for common Cathode connection.
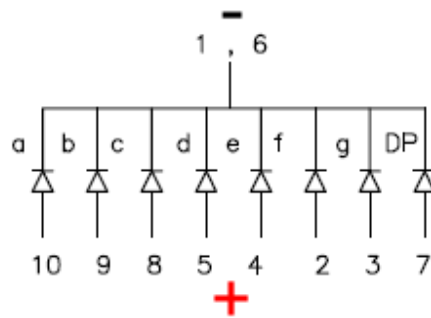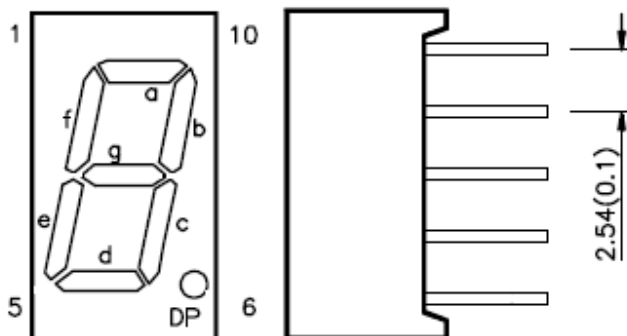
Fig.3

Looking at the above diagram all the Anode Pins are given a number while the common is shared between pins 1 & 6.   Because my displays are common Cathode, either pin 1 or 6 can be connected to GND.   I decided to use pin 1 as my standard GND connection and dispense with 6.

Ok, it's time to work out what digits we want to display.   That means taking voltage to the pins we need to display each digit and also a common GND to pin 1.   Here's a table of the pins you need to display each digit if you use the same 7 segment displays as I did.   Also refer to Fig.1.

0 = A B C D E F which equals pins 10 9 8 5 4 & 2 with 1 as common GND
1 = B C which equals pins 9 & 8 with 1 as common GND
2 = A B D E G which equals pins 10 9 5 4 & 3 with 1 as common GND
3 = A B C D G which equals pins 10 9 8 5 & 3 with 1 as common GND
4 = B C F G which equals pins 9 8 3 & 2 with 1 as common GND
5 = A C D F G which equals pins 10 8 5 3 & 2 with 1 as common GND
6 = A C D E F G which equals pins 10 8 5 4 3 2 with 1 as common GND
7 = A B C which equals pins 10 9 & 8 with 1 as common GND
8 = A B C D E F G which equals pins10 9 8 5 4 3 & 2 with 1 as common GND
9 = A B C F G which equals pins 10 9 8 3 & 2 with 1 as common GND

Pin Numbering & Pin Pitch

Most common types of 7 segment displays in the size we want have a pin pitch, that is the distance between each pin of 2.54mm or 1/10".   Again most common displays have the No.1 pin at the top left corner when looking at the face of the display and count up anti clockwise around the display (our example finishes at 10). But please refer to the datasheet for your chosen displays to confirm this.
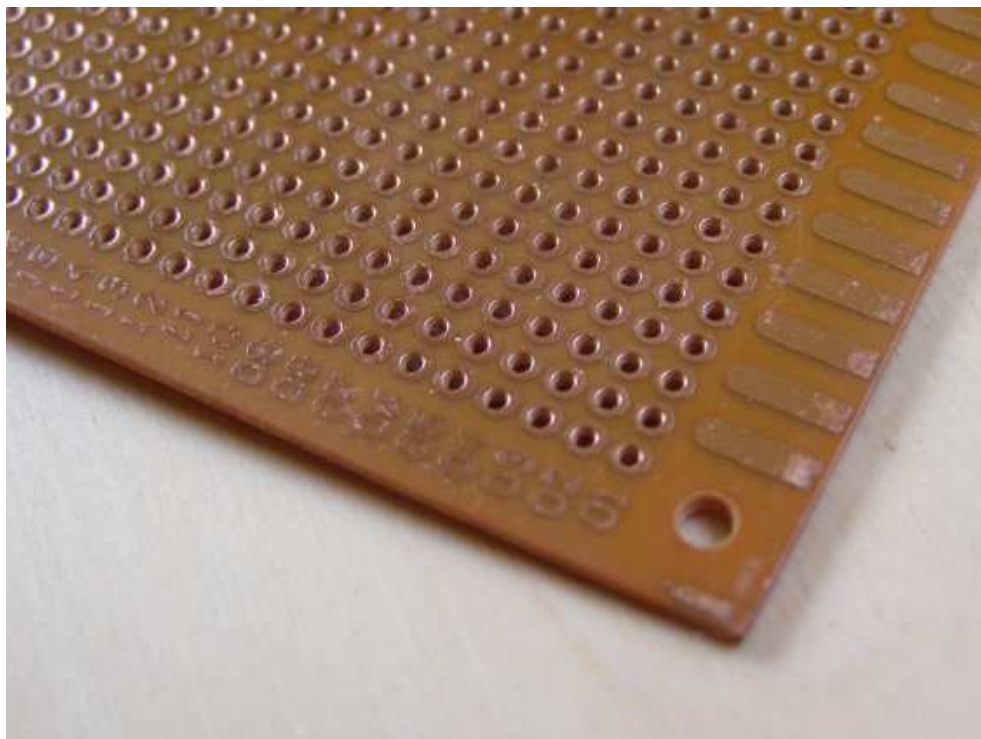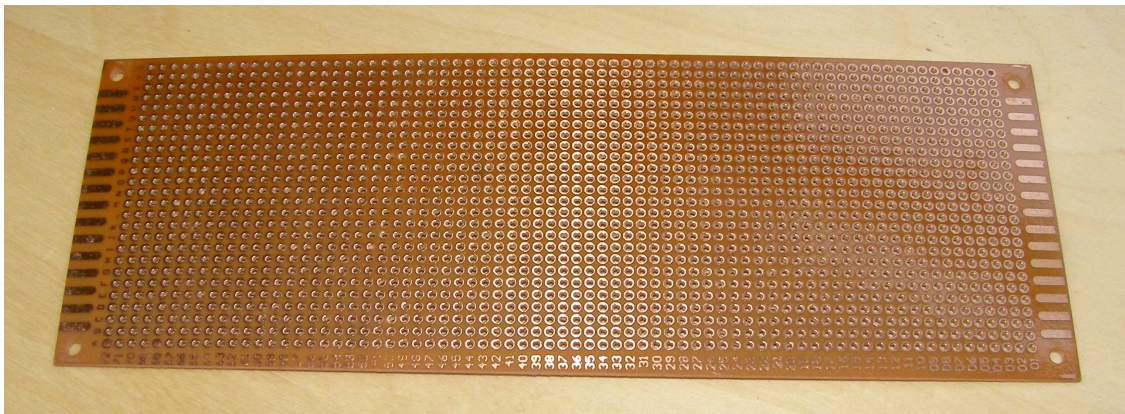
Suitable 7 Segment Displays.

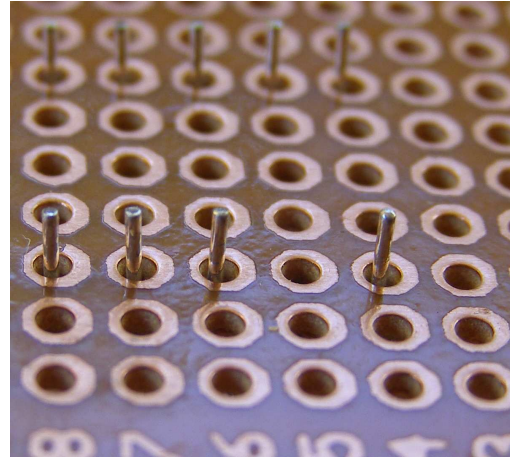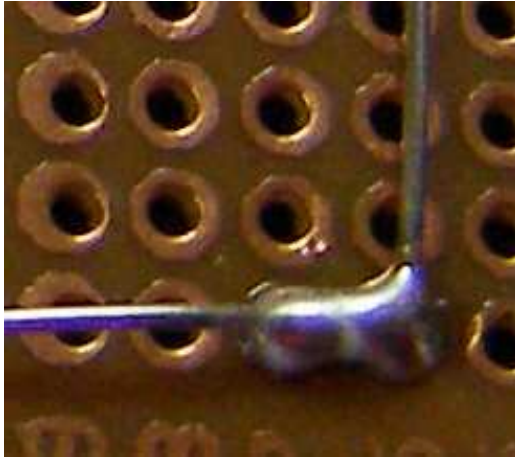Here's some 7 segment displays that may be of interest to you.

Kingbright SA32-11 Series (Common Anode)
Kingbright SC32-11 Series (Common Cathode)
Kingbright SC36-11 Series (Common Cathode)
Lucky Light KW1-361 Series (Common Cathode)
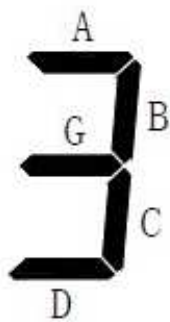
OK, How Do We Do It?

Remember that these displays have a pin pitch of 2.54mm.   Well what is needed is some breadboard that also has the same pitch like this.

This is very cheap, you can get it off ebay or at your local electronics hobby shop. Each hole is printed with a copper ring that allows you to solder components (or in our case the pins of our displays) to it, yet is isolated from the hole next to it. It is also possible by adding some extra solder, to 'bridge' two holes together to get continuity.
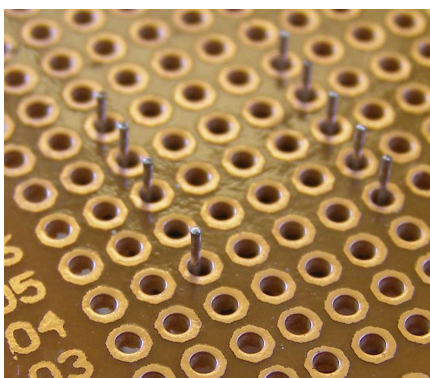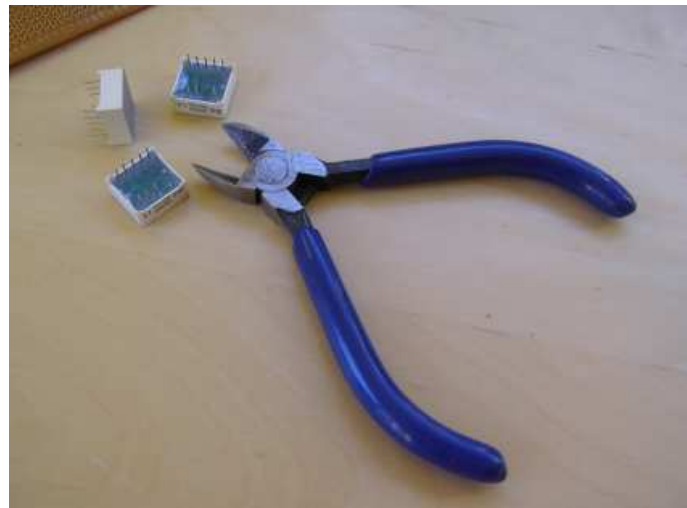

So, how do you go about doing it?

Well first of all, you need to work out what pins you need to use for each digit. In this example, we'll look at the digit 3. Now 3 is made up using segments A B C D & G. Referring to the datasheet, that means we will connect pins 10, 9, 8, 5 & 3 and use pin 1 as our common.

Trim off any pins that you don't need.
This then ensures that there is no danger of lighting an unwanted segment.
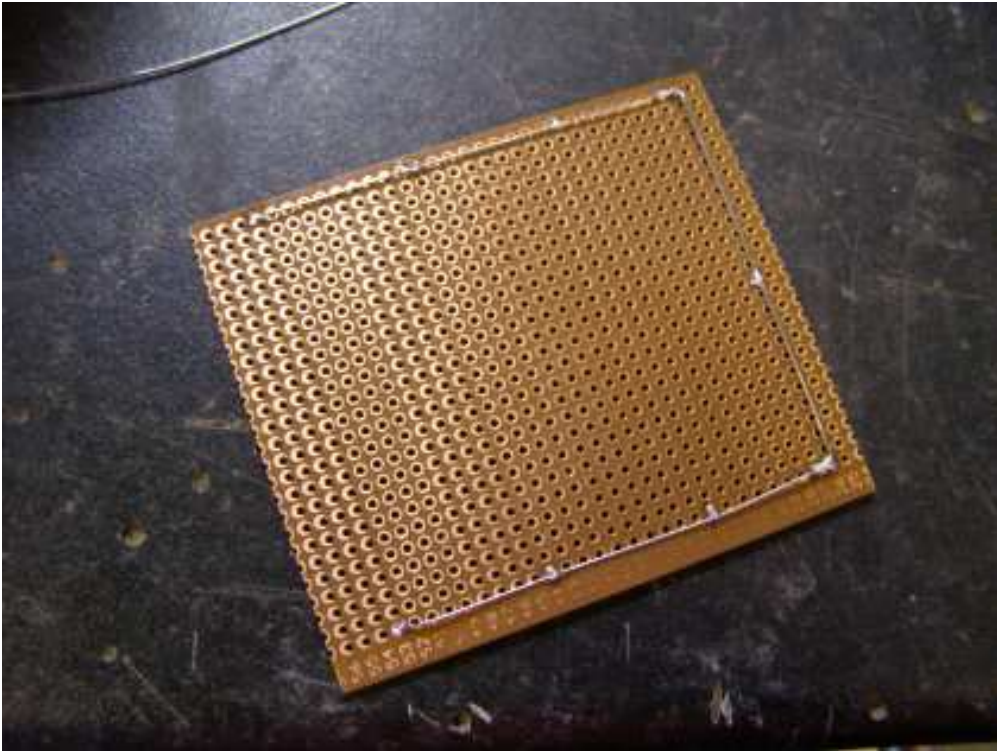So for the digit 3, pins 7, 6, 4 & 2 can be trimmed back.

Repeat this process for each digit you want to light.
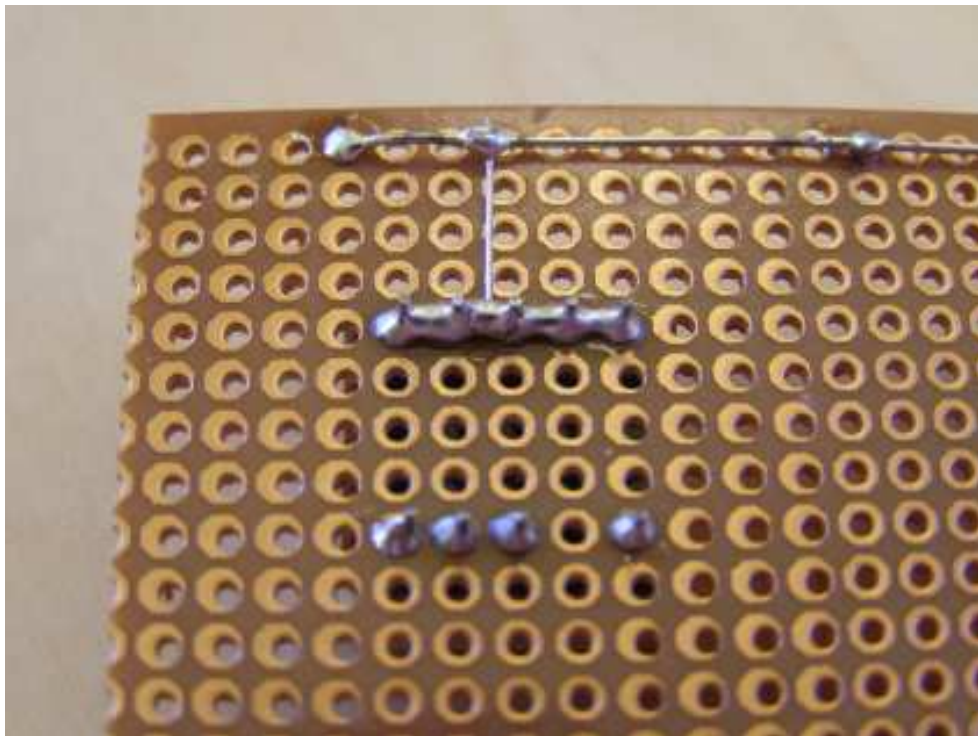Then simply place your 7 segment display into position on the breadboard and solder the pins.

Now all we have to worry about is getting the correct pole to the correct pins.

There is a couple of ways you can do this. What I found best on large displays (like the 737 Elec Meter Panel where I have 13 displays to connect up) was to run a circuit wire round the edge of the board.
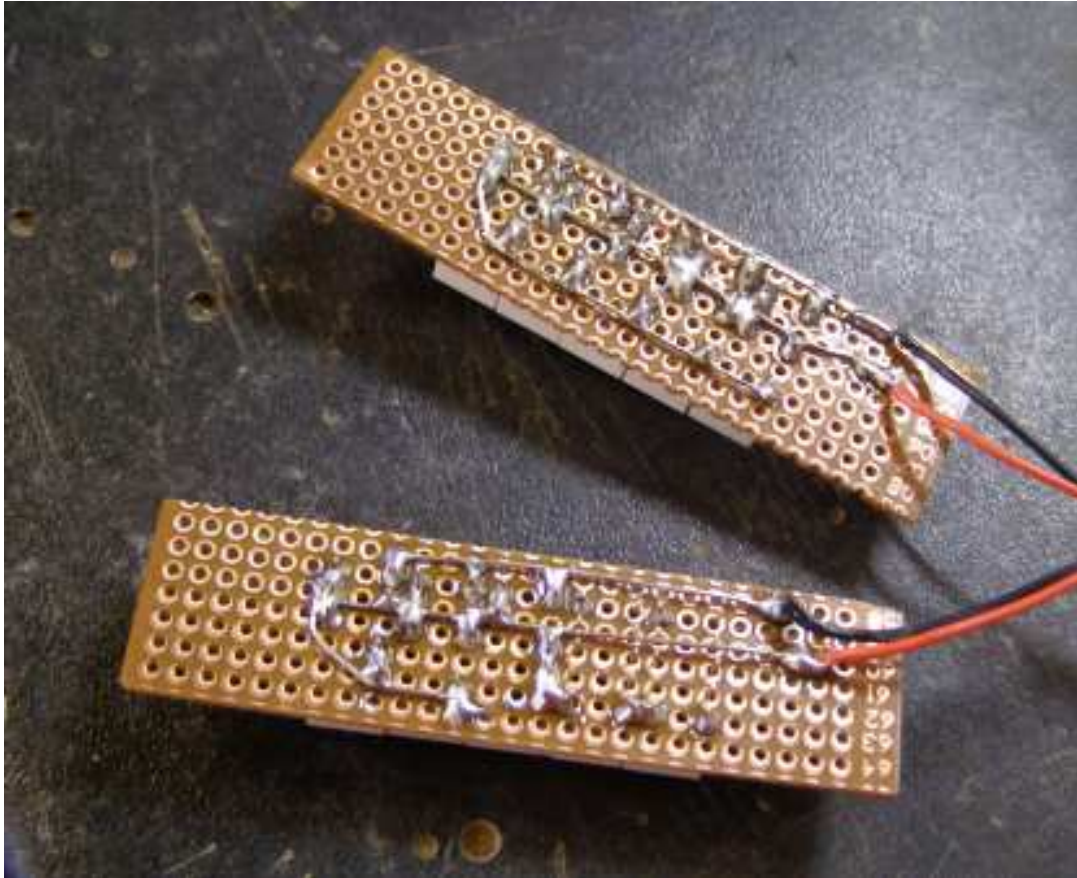
This allowed me to 'Bridge' pins with solder and then connect the bridged pins with the circuit wire like this.
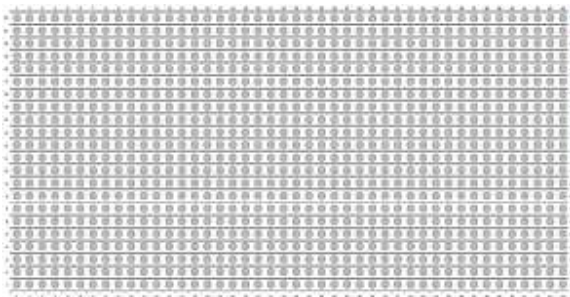
And on smaller boards (like the Flight Alt and Land Alt), I found it easier to run a common and bridge the common pins to it and then distribute the other pole using small diameter wire.

Ok, I admit bridging the pins does make for a lot of solder and a slightly 'untidy' appearance, but hey, it works and does add that certain something when installed in the overhead.
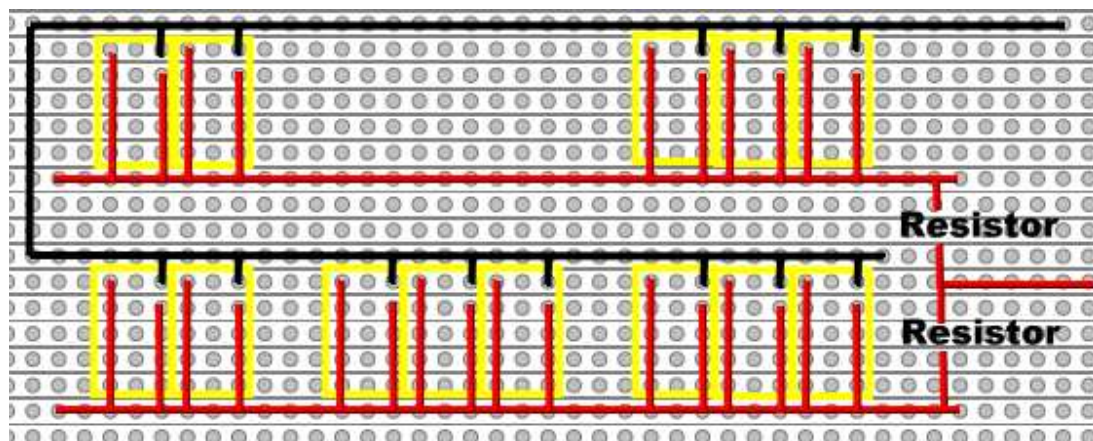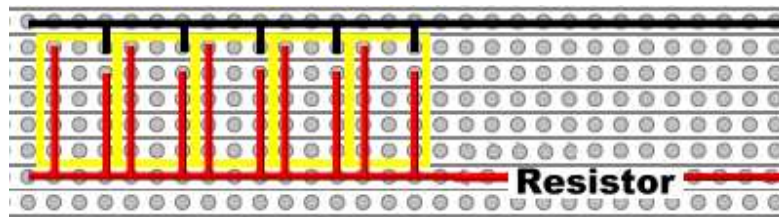
Need To Work Out How To Delver the Correct Pole to the Correct Pins?

Well here's something that's going to help you sort that.   It's a stripboard planning sheet which I use all the time when making up circuits.   You draw out your board before you start soldering. Makes for an easy life :o))

http://www.eleinmec.com/downloads/sbps.pdf

Here's A Couple Of Examples

Yellow = 7 Segment Display
Black = GND
Red = Display Operating Voltage.

Notes On Resistors

Like any type of LED, a 7 segment display will have an operating 'Forward Voltage'. In my case it was 2.75v. But I didn't have a 2.75v supply, only a 5v from an ATX power supply. So, I calculated that I could use a 180 ohm resistor on each group of displays to bring the supply to them within limits.

If you are at all unsure of what resistor to use, then start high at 330 ohm and work down until you have an acceptable appearance. Do not go below 180 ohm unless you are 100% sure that by your calculations it is safe to do so. The last thing you want is to 'pop' a display after all the hard work you just put into making them.

DO NOT under any circumstances connect your displays directly to a 5v supply (unless of course you have 5v displays).

Please refer to the data sheet of your chosen displays to get the operating voltage and any other information you need.

And this is what they look like in place. This was the first set I made which we fitted to Steve Mitchell's Overhead.

This is just an outline of what you can do with dummy displays. All displays are different, so unless you use the Kingbright SC36-11EWA and Lucky Light KW1-361CGS displays that I did, then please ensure you select the correct pin numbers for connection.

Hopefully that has motivated you to light up your displays.

Thanks for your interest and please feel free to comment, suggest or criticize. Without feedback, nothing ever improves :o))

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