

## *Christmas Star Project*

*(Updated 02/12/2006)*



## **Making the Star**

The display is made with clear 2mm thick Polycarbonate/Acrylic plastic sheet (The type found in DIY stores).

Cut a piece 40x40 cm square (16" x 16") for the star to easily fit on it.

### **Cutting the sheet**

Leave the protective film on the sheet.

Cut the sheet by very carefully scoring it with a good quality, heavy duty DIY knife and metal straight edge, taking care not to cut your fingers!

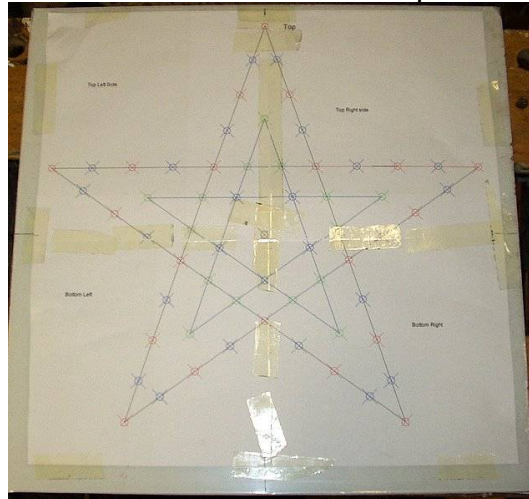
When sufficiently scored, it should be possible to snap the sheet cleanly.

Or it can be sawn using a jigsaw at very low speed with a fine toothed blade intended for plastic or metal cutting.

Now print the star templates on the next four pages – make sure they print at the correct size by setting the Adobe Reader print option for "Page Scaling" to "None".

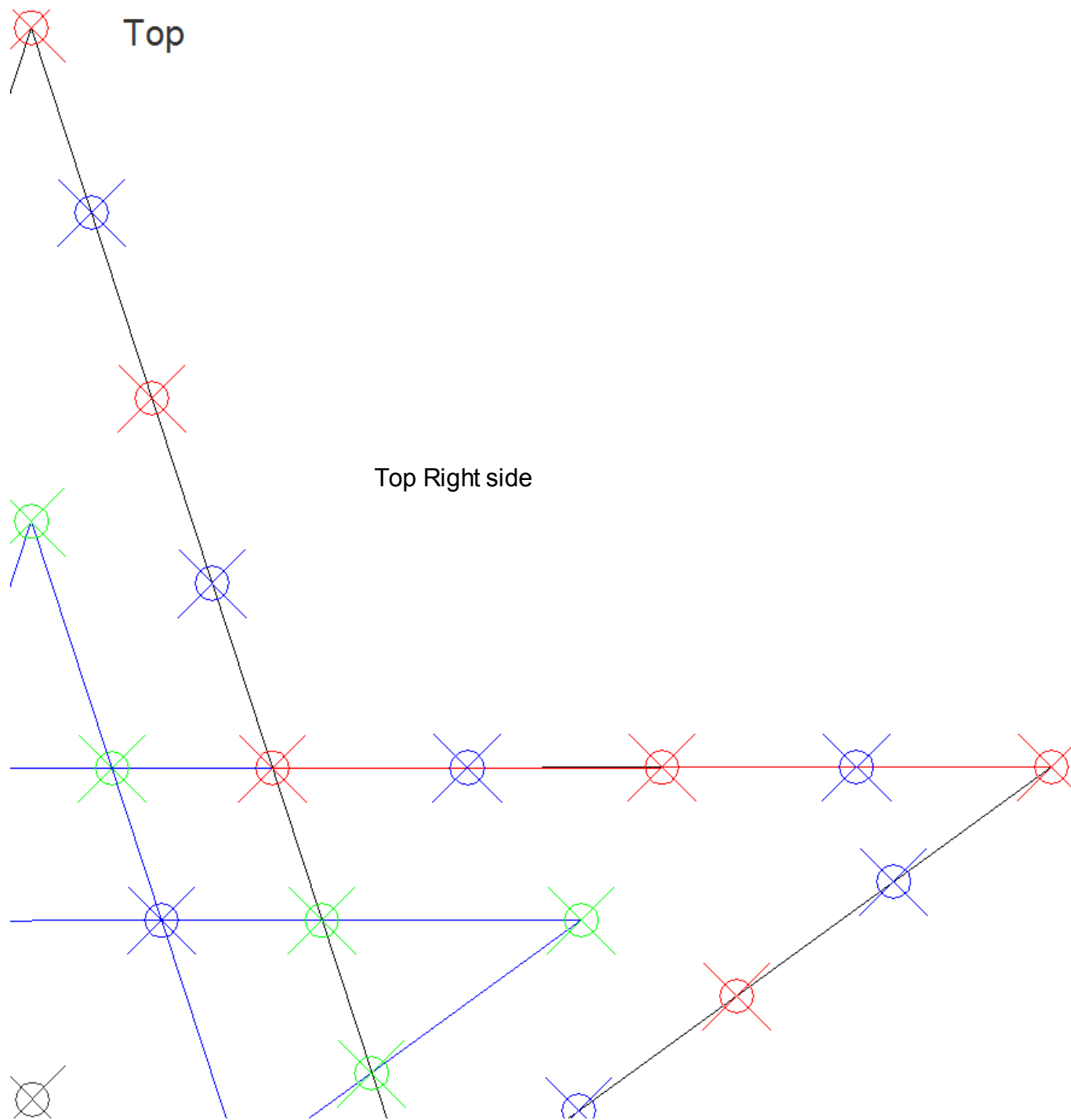
Trim excess paper at the overlapping sides (still leaving a small overlap) then join sheets with clear tape. (Hold the sheets to the light to get best alignment of the overlapped edges before finally taping them)

When all four sheets are taped together, trim around the outside then tape it centrally onto the plastic sheet.

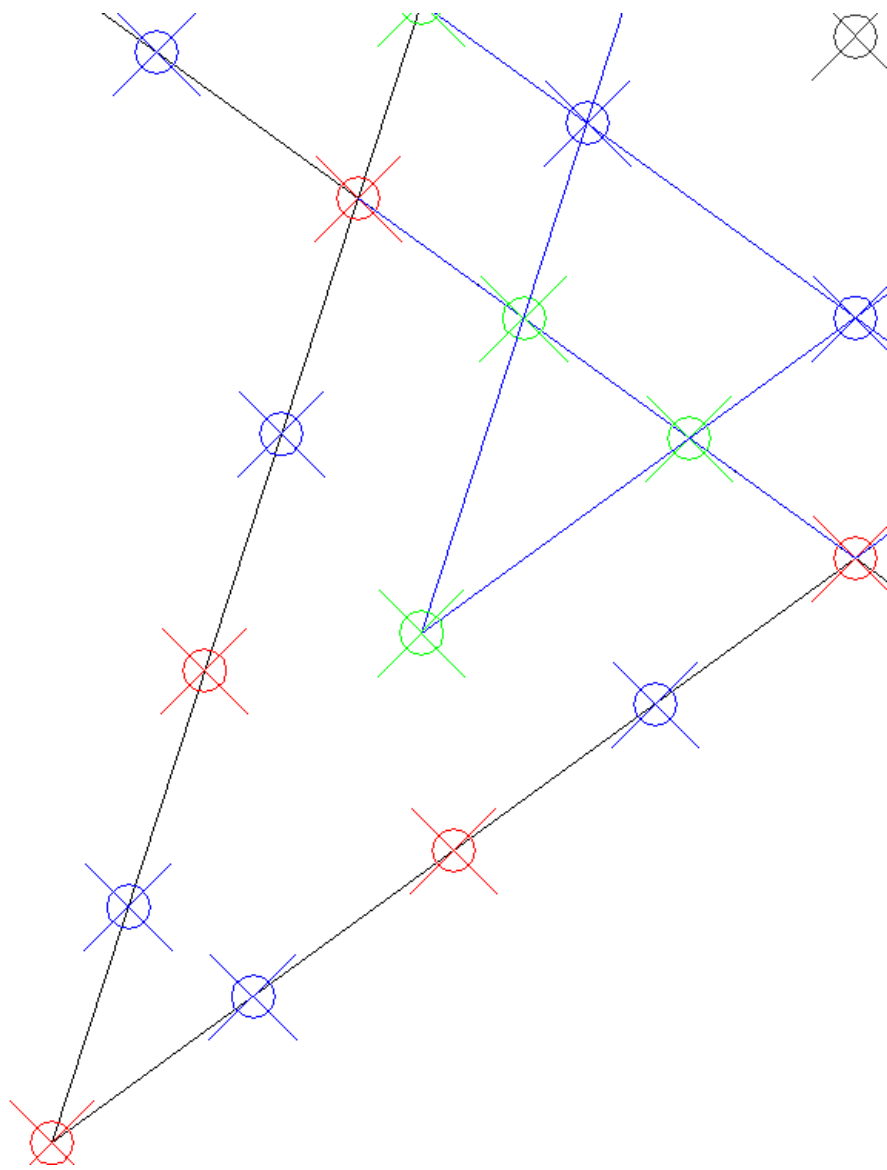


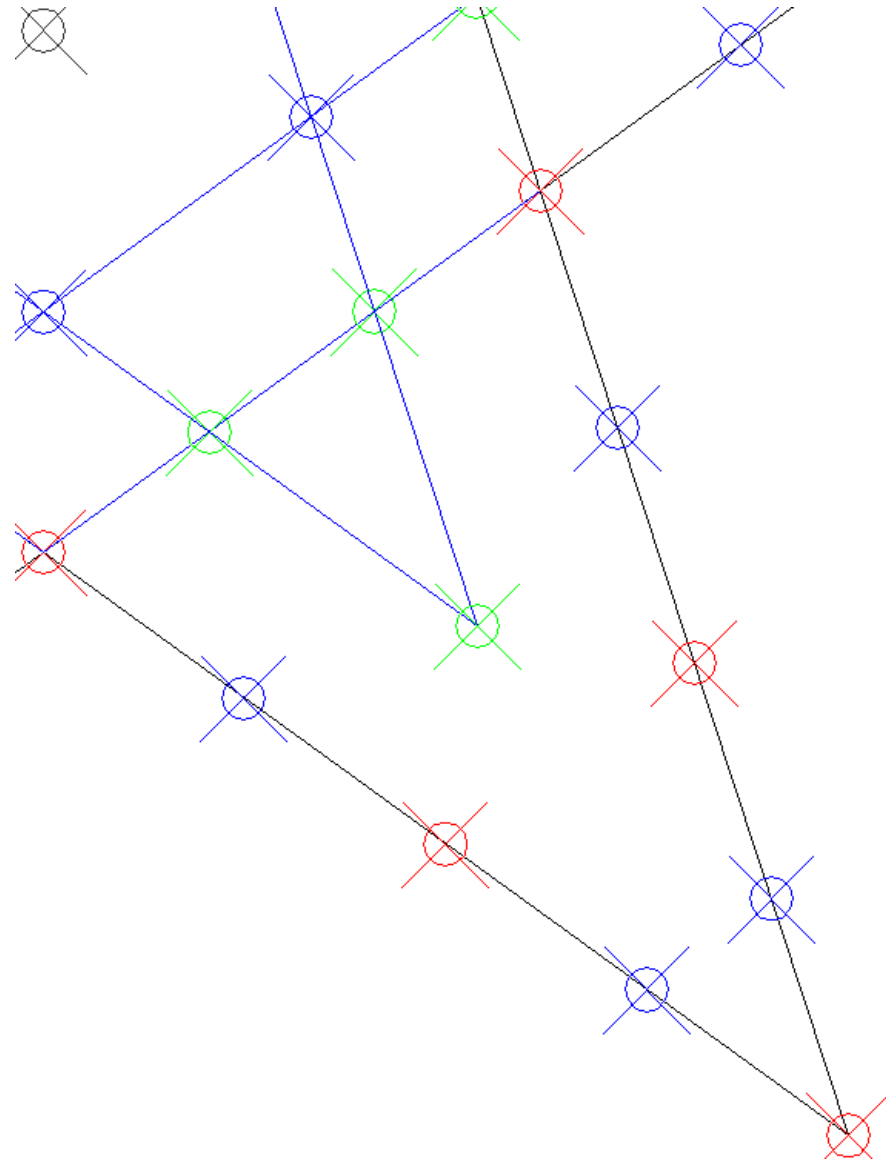
It helps if you first mark the centre points of each edge of the plastic and the paper.





Bottom Left





Bottom Right

## *Drilling the LED holes*

Use a sharp point to mark the plastic sheet for the centre of each hole.

Drill each hole slowly with a 5mm metal drill bit.

(Test the drill hole size first on some scrap material so that the LEDs are a firm fit in the holes).

You can also now drill two holes in the top corners of the sheet to attach string for hanging it in a window.

And drill a 5mm hole in the star centre for the RGB led.

Now make a print of the pcb layout and use it as a template to mark and drill mounting holes for it centrally below the star.

Fit all LEDs with the flat side (short lead) towards the top of the sheet.

If any are a loose fit, apply a drop of general purpose clear adhesive to the side of the led before pushing it into the hole.



Picture shows LEDs ready for the next stage (wiring-up).

## Wiring the LED Anodes and Cathodes

The diagrams on the next two pages show colour coded guides to wiring the LED anode and cathode connections. A cathode connection is the shorter lead adjacent to the flat side of each led.

Using thin, single strand insulated wire. Make the connections by carefully striping just enough insulation to wrap the wire around each led lead without cutting the wire.

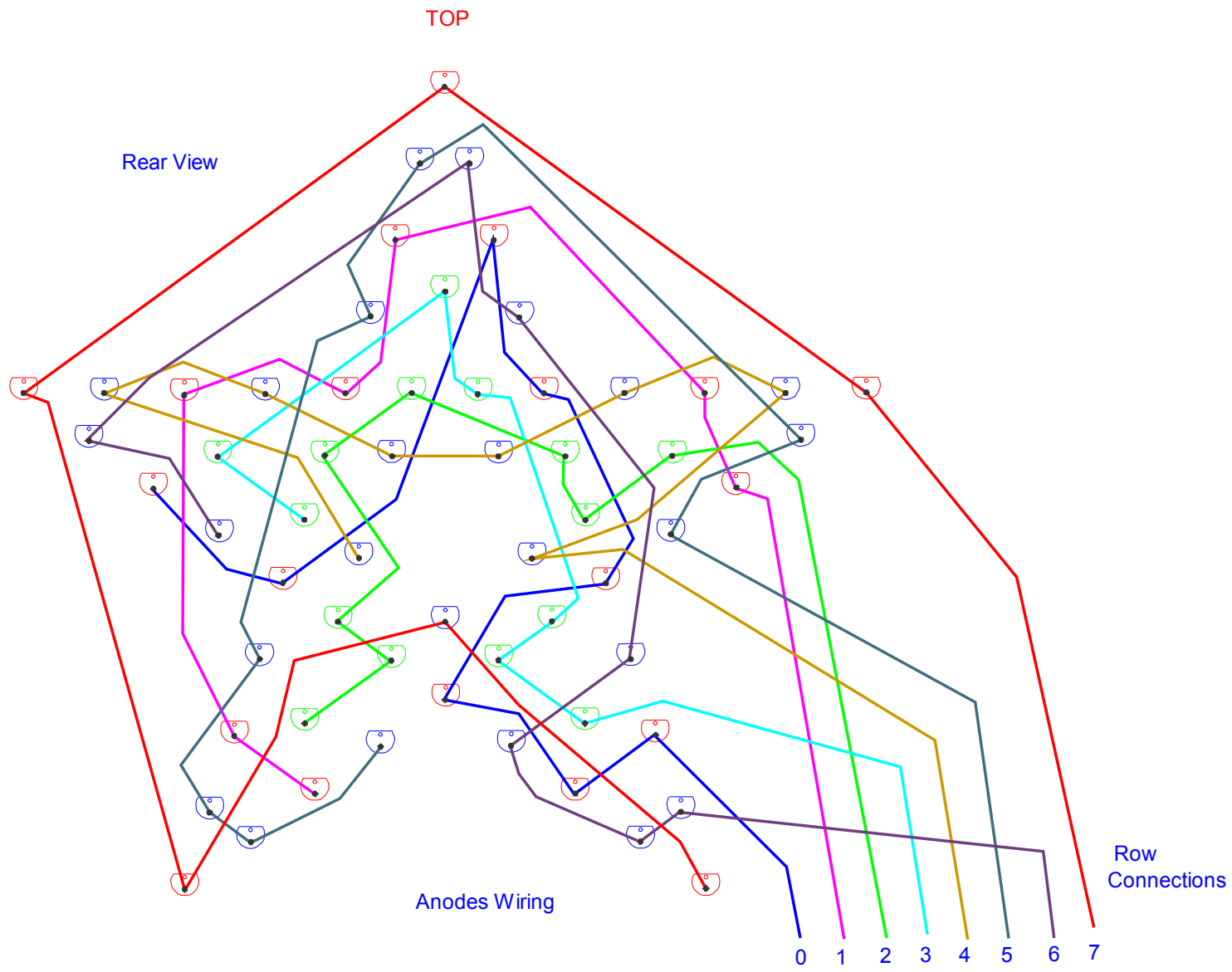
Leave plenty of wire free for connecting each wire to the pcb which is intended to fit centrally at the base of the star.

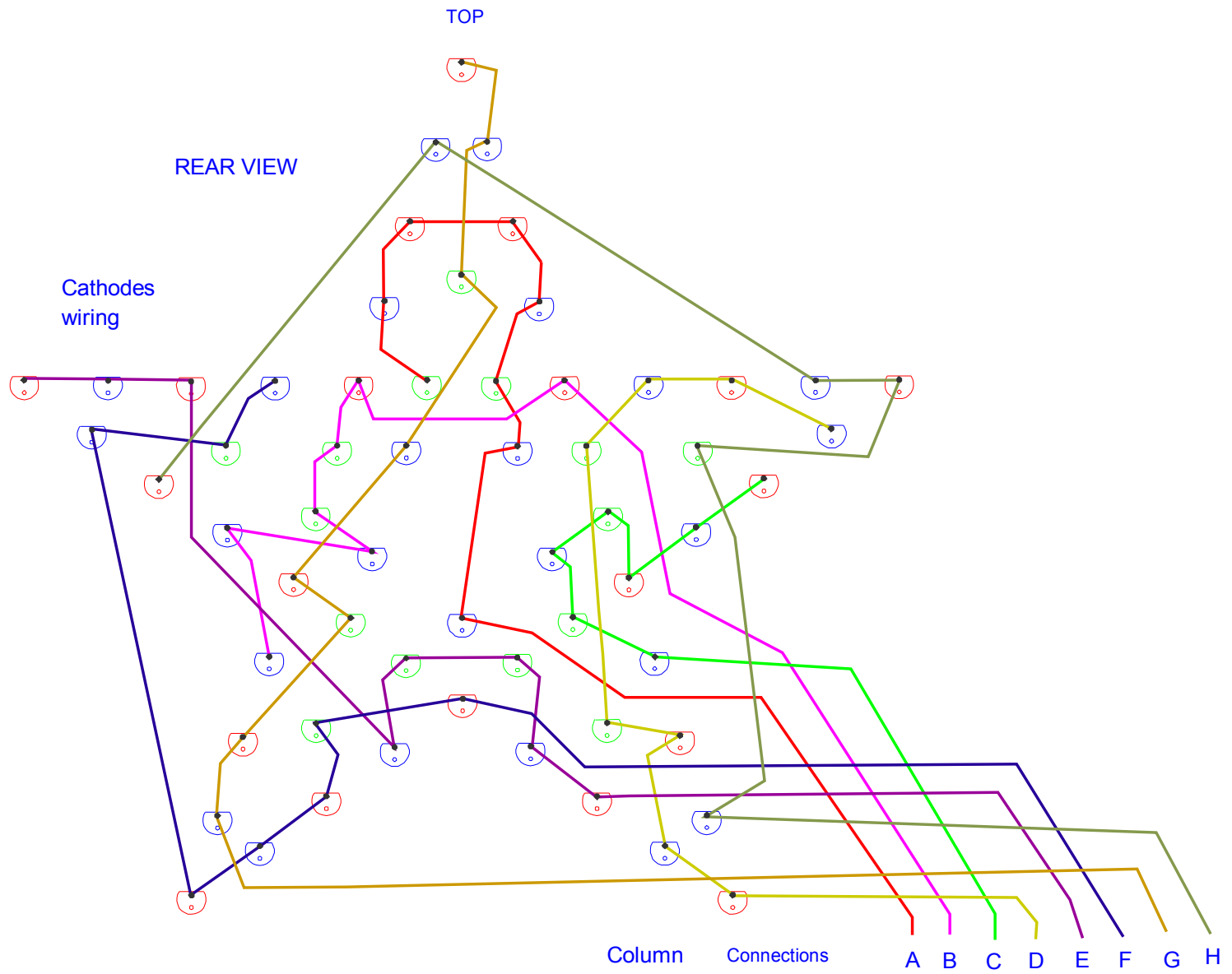
Do not solder the leads closer than about 5mm from each LED and trim the surplus lead length after making a connection.

Use small pieces of pvc tape or sticky labels to mark each Row/Column wire to make it easier to identify when connecting to the PCB.

The trimmed LED leads are quite sharp – you may want to cover them over later using another similar sized plastic sheet.

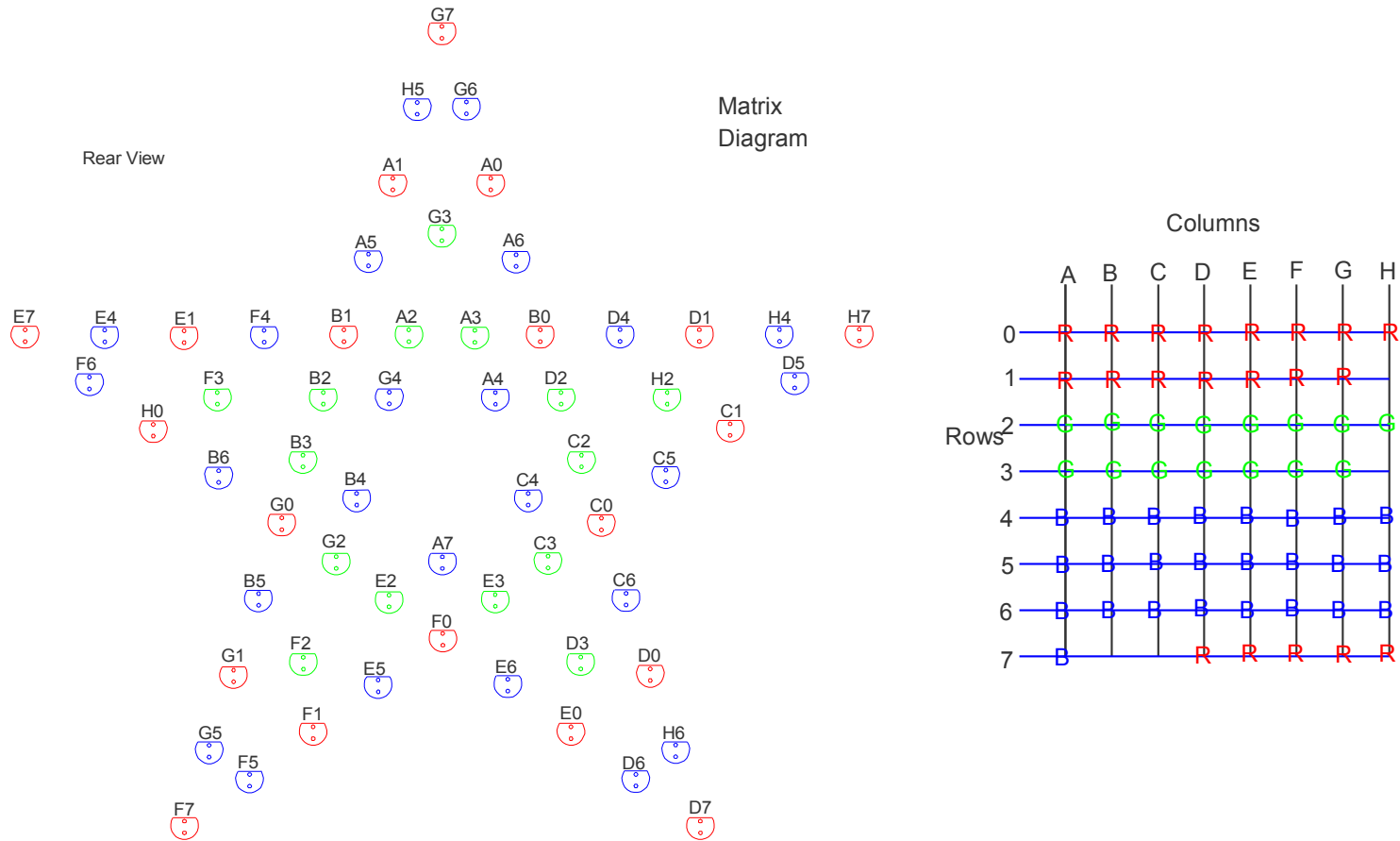






## Matrix Diagram

This diagram identifies each LED in the matrix – useful for locating any wiring errors or faults.

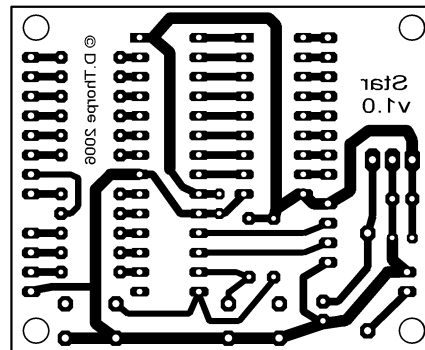


## **PCB Track Layout**

The circuit can either be built on stripboard or use this single sided pcb layout.

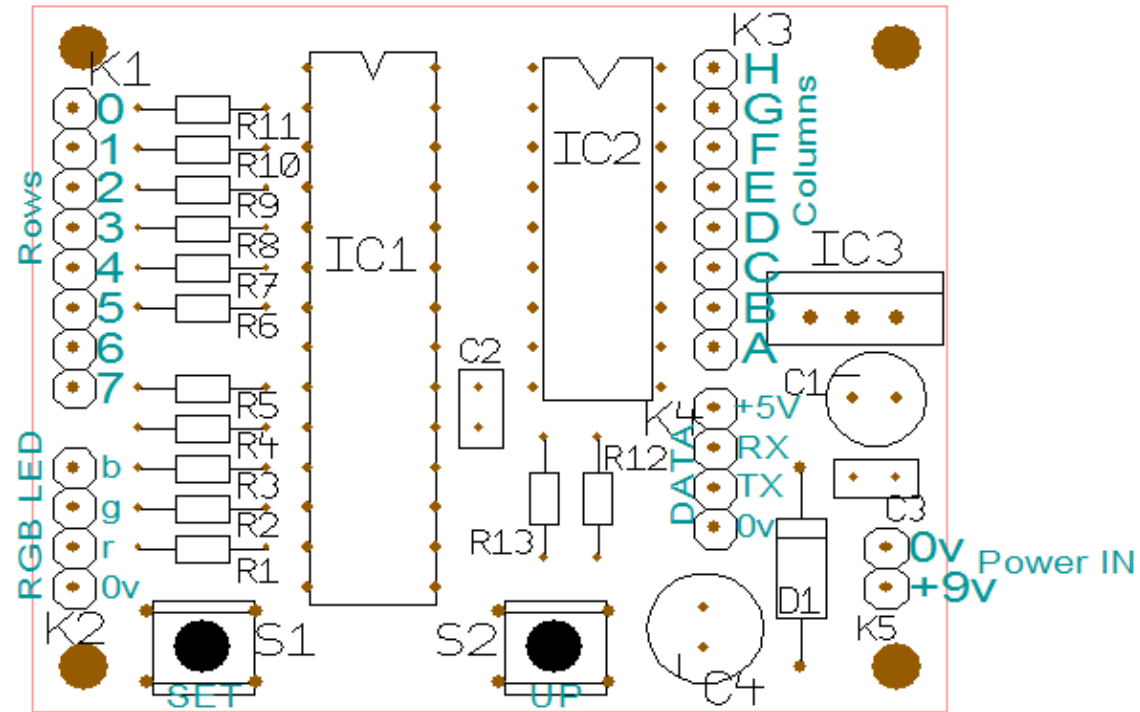
PCB is shown actual size: 5.6 x 4.6 cm (2.2 x 1.8 inches) and is ready for printing, using the toner transfer method.

Print this page actual size (ensure that print option for "Page Scaling" is set to "None")

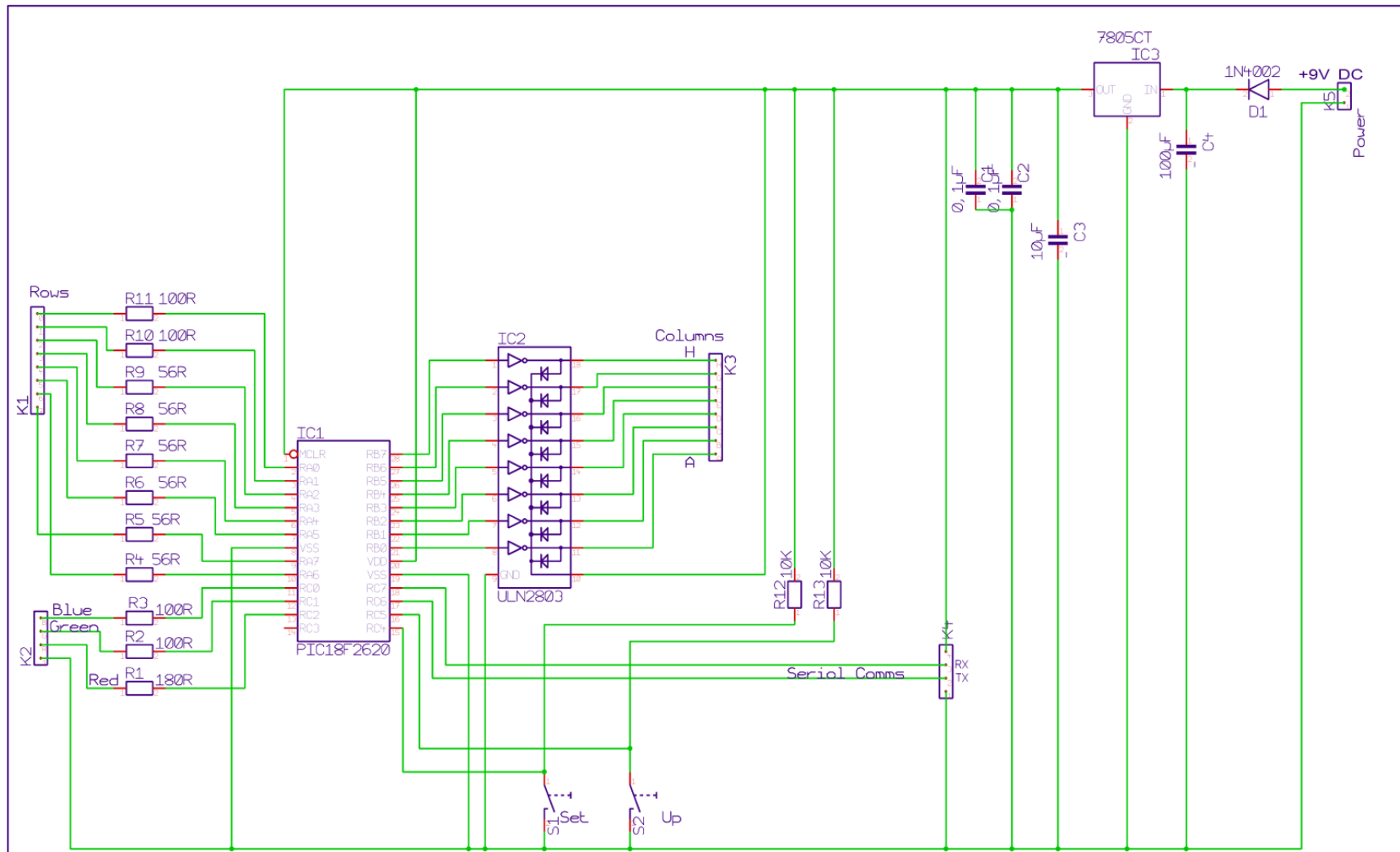


## Component Layout

Note Capacitors polarity (-ve side is marked)



# Circuit Diagram



Scale	103.50%	2006/11/01	Author	D. Thorpe	Sheet	1
Version	1.0		Title	xmas2006		
Copyright	D. Thorpe		Project	Christmas Star		

## Parts List

<b>Component</b>	<b>Value</b>	<b>Notes</b>
C1	0,1 $\mu$ F	Small 50v type
C2	0,1 $\mu$ F	Small 50v type
C3	10 $\mu$ F	16 or 25v working electrolytic
C4	100 $\mu$ F	25v working electrolytic
D1	1N4002	Or 1N4001
IC1	PIC18F2620	Plus a 28pin 0.3" socket
IC2	ULN2803	Or ULN2803A
IC3	7805CT	Standard 5V regulator
R1	180R	All resistors are 0.25W carbon
R2	100R	
R3	100R	
R4	56R	
R5	56R	
R6	56R	
R7	56R	
R8	56R	
R9	56R	
R10	100R	
R11	100R	
R12	10K	
R13	10K	
S1	6mm Tactile	6x6mm pushbutton
S2	6mm Tactile	

Blue LEDS (5mm) High brightness (about 6000mcd) X 25

Green LEDS as above X 15

Red LEDS as above X 20

(Three more will be needed to make the multicolour feature for the star centre) or use an RGB (4 lead) LED.

## **Centre RGB LED**

I first tried using separate Red, Green and Blue LEDs, glued together to make an RGB effect.

This was improved upon by diffusing the clear plastic lenses by rubbing each with very fine abrasive paper.

(this also widened the viewing angle)

From a distance it looked acceptable – but I decided to obtain a proper (4 lead) 5mm RGB led instead.

My original PCB connector for the RGB led/s was intended for common cathode (negative) use.

When my RGB led arrived, I found it had a common anodes (positive) instead (there was no mention of this in it's spec.)

Anyway, I have now modified the firmware to allow either type – just hold the UP button pressed during power-on to configure it for a common anode type. (the new setting is then retained in memory).

Please see the circuit diagram and pcb layout to wire-up the RGB led.

For common anode LED, please ignore the 0v (GND) RGB led pcb connection and use any +5v track on the pcb instead.

The pin out connections for RGB leds may vary – check your LED's data sheet before connecting it up.



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