

Block Post Simulator – PCB Construction

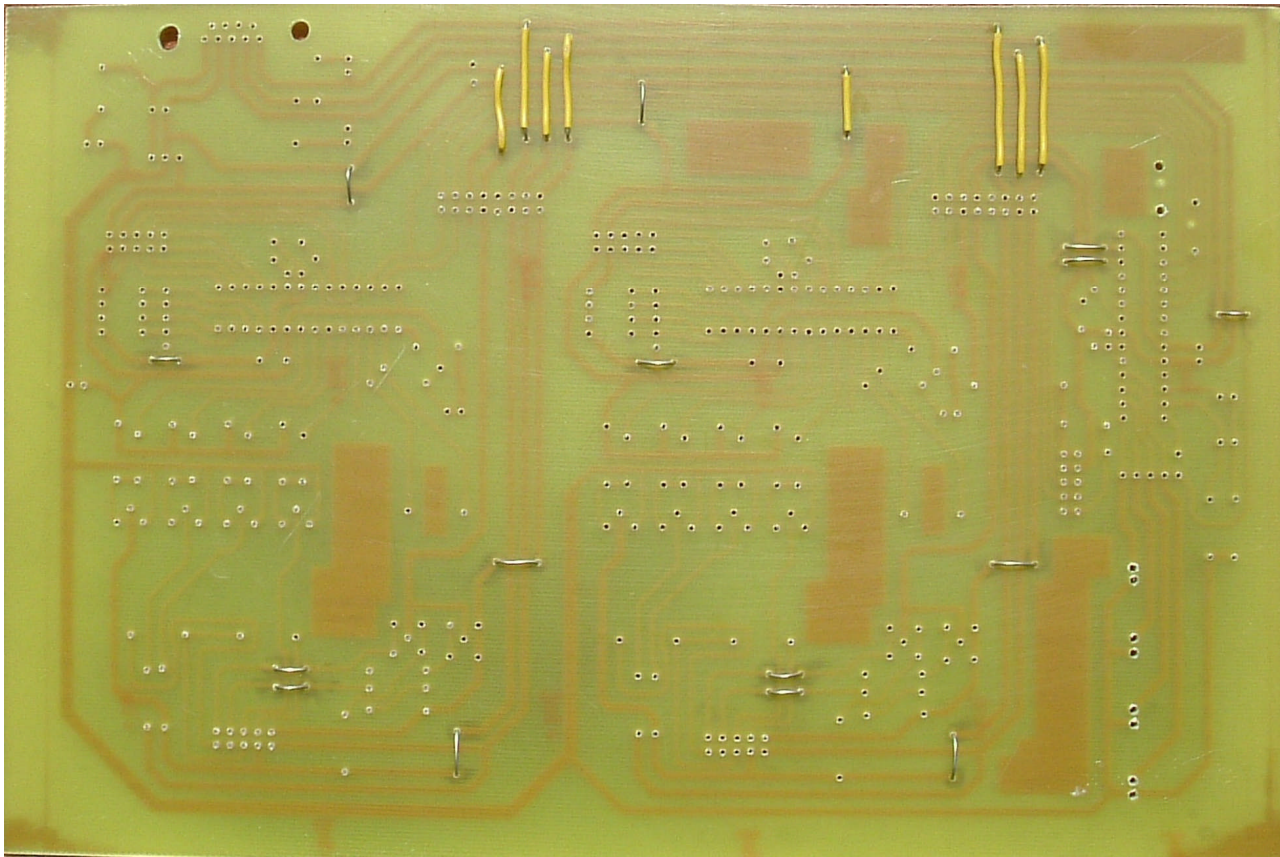
Block Post Module

John M Saxton

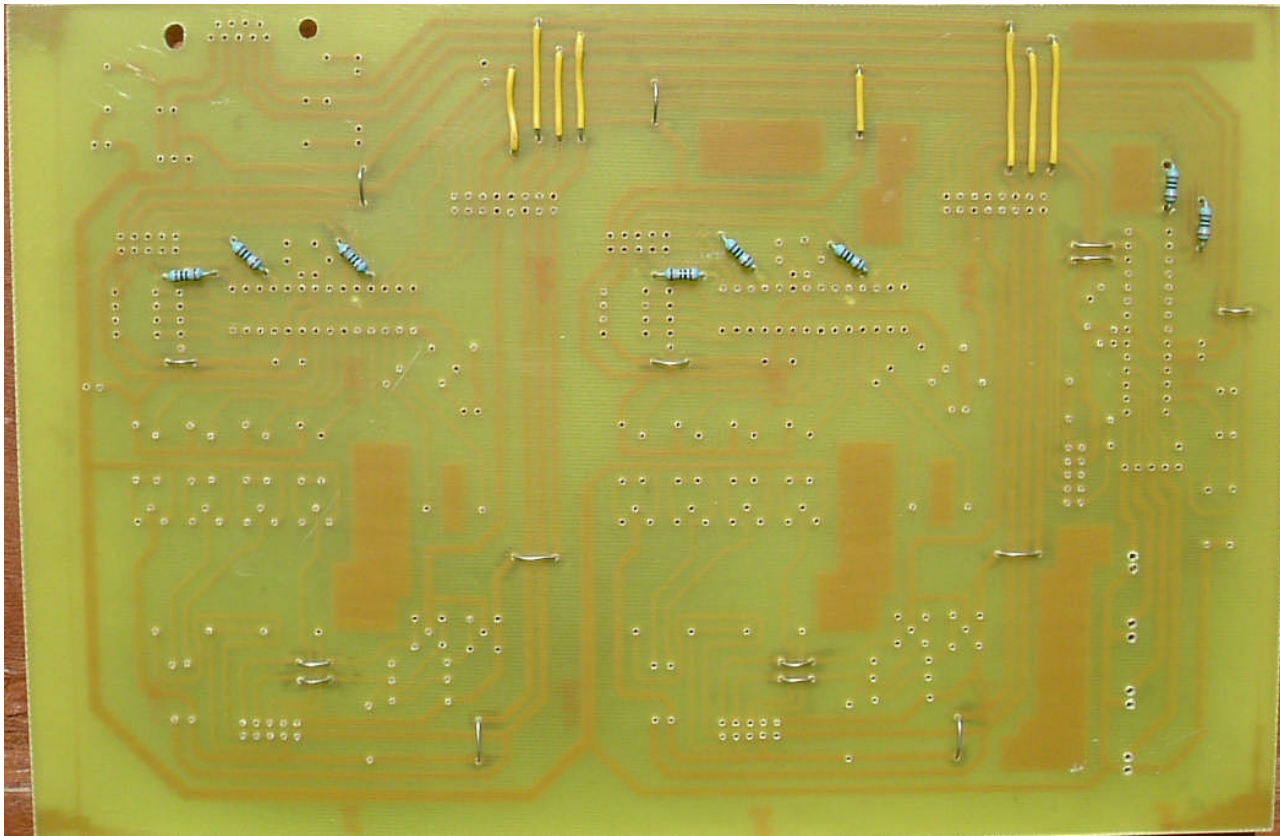
17 April 2006

List of Components – Block Post Module

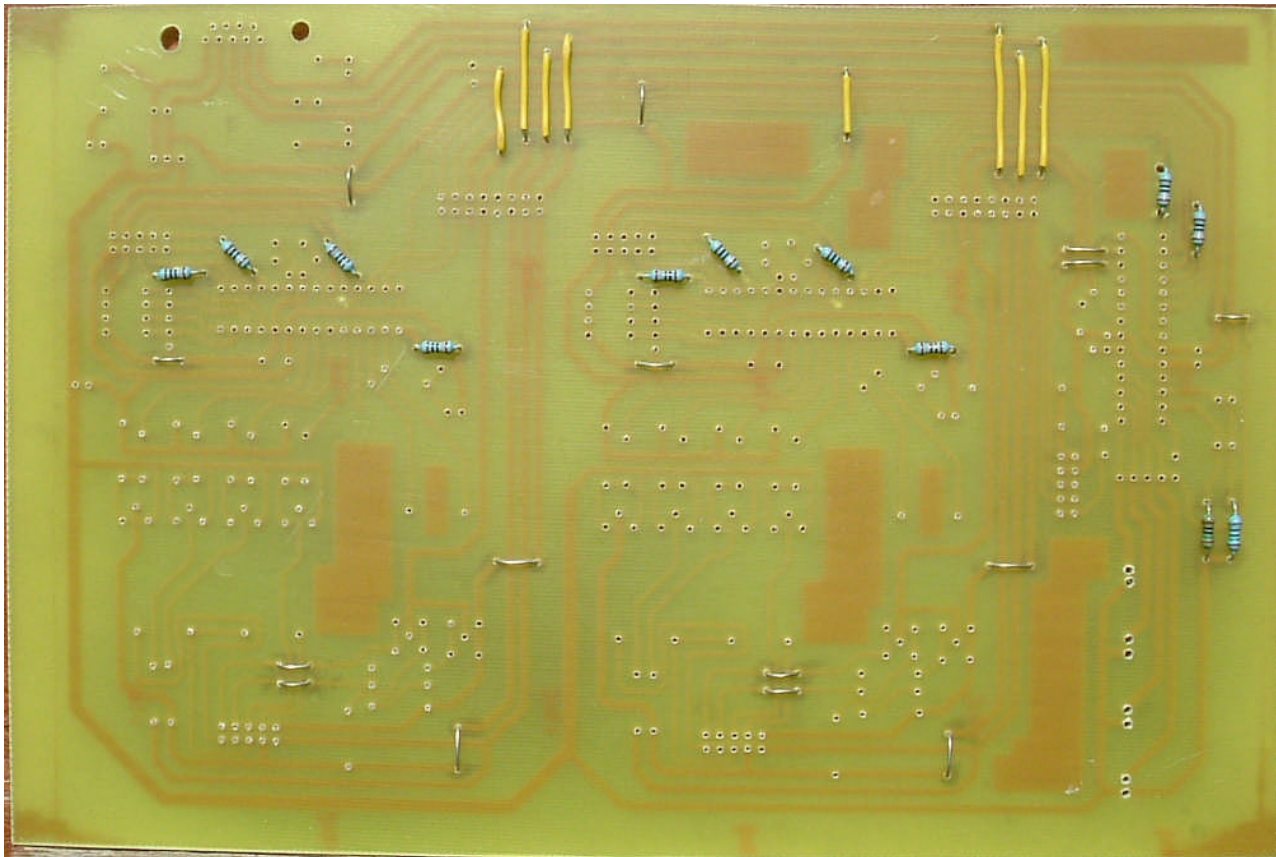
description	quantity	MAPLIN code	comment
100 Ω 0.6 Watt metal film resistor	8	M100R	
150 Ω 0.6 Watt metal film resistor	4	M150R	
470 Ω 0.6 Watt metal film resistor	4	M470R	
680 Ω 0.6 Watt metal film resistor	9	M680R	
10 k Ω 0.6 Watt metal film resistor	4	M10K	
4 x approx 10 k Ω SIL resistor pack	3		not available from MAPLIN
1N4001 diode	12	QL73Q	or 1N4148
47 pF capacitor 0.1 inch pitch	3	RA35Q	
220 nF capacitor 0.2 inch pitch	10	JL02C	
22 μ F, 50 V, electrolytic capacitor	1	DT57M	
5V SPST reed relay	12	JH12N	
2 x 5 way IDC plug	4	JB85G	
14 pin IC socket	6	BL18U	use in pairs for 28 pin PICs
9 way right angle D plug	1	FG66W	
9 way right angle D socket		FG25C	
20 mA LED – red	1	WL27E	
20 mA LED – green	1	WL28F	
20 mA LED – yellow	2	WL30H	
20 mA LED – orange	3	WL29G	
4 way DIL switch	2	JH08J	
7805 voltage regulator	1	CH35Q	



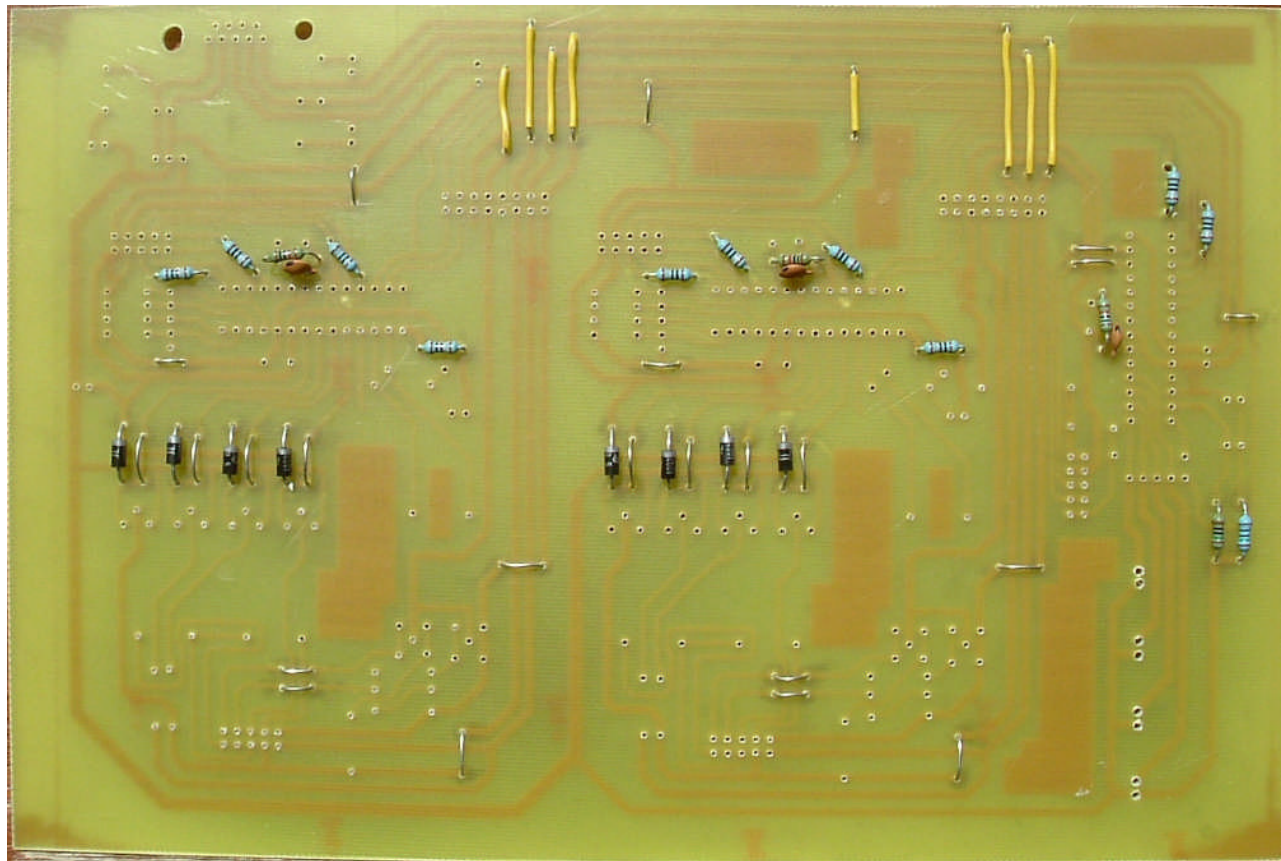
Step 1: The wire links – or most of them.



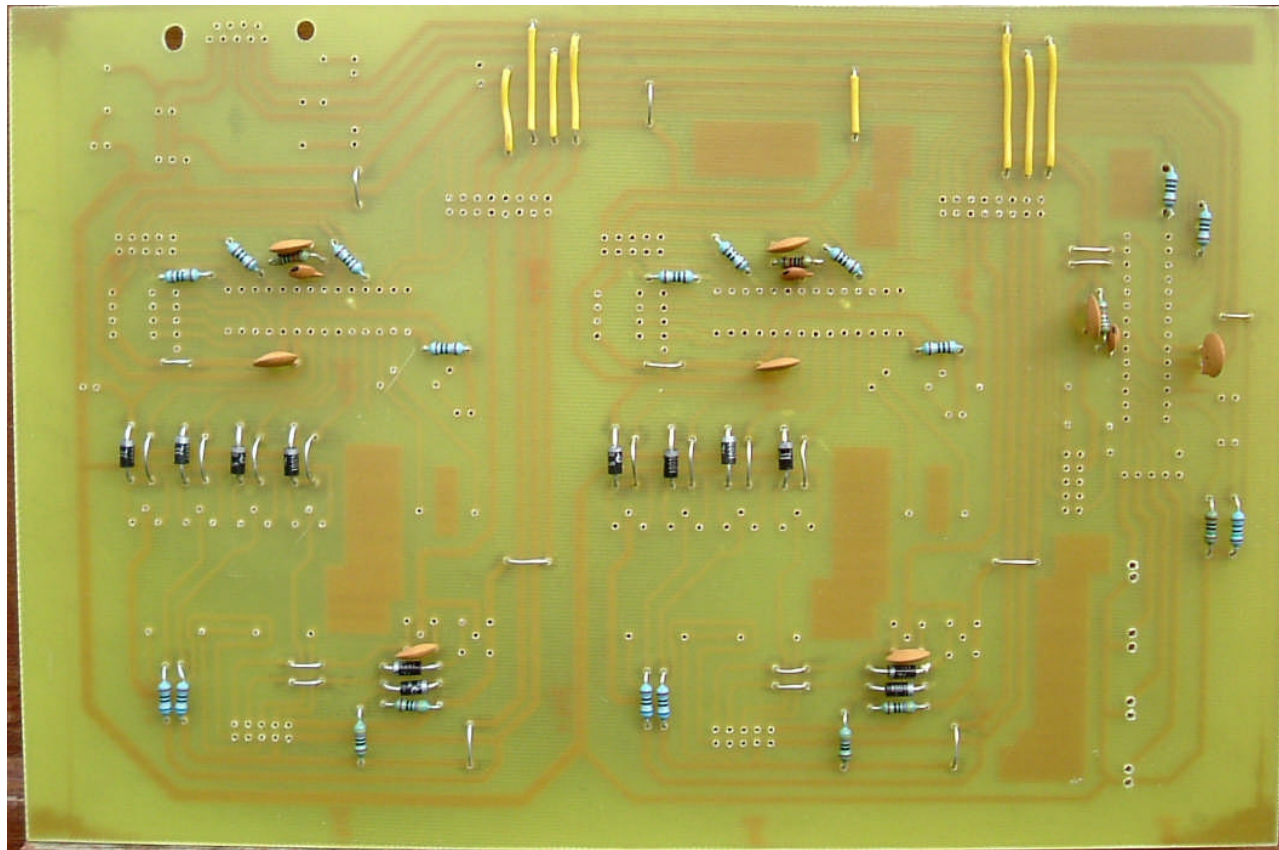
Step 2. These resistors should be about $100\ \Omega$, although the exact value is not critical.



Step 3. The resistors added in this view are $150\ \Omega$, and are used for limiting the current through the LEDs.

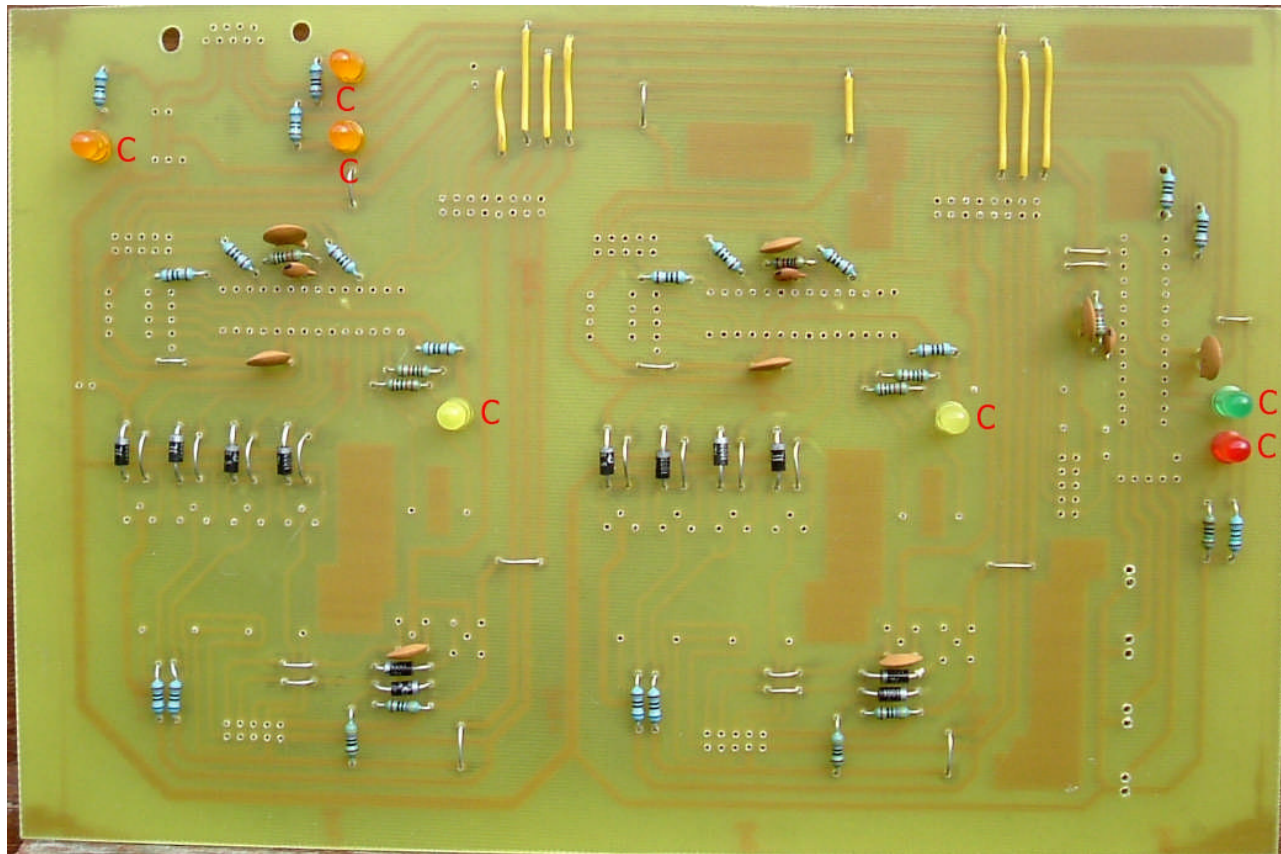


Step 4: In the upper half of the board, we have added the timing components for the PICs. These consist of a 10 k Ω resistor and a 47 pF capacitor. Near the centre of the board, we have added more links and suppression diodes for the reed relays. These diodes are 1N4001. Make sure you get these the correct way round! The diodes are required to avoid upsetting the PICs with inductive spikes from the relays.

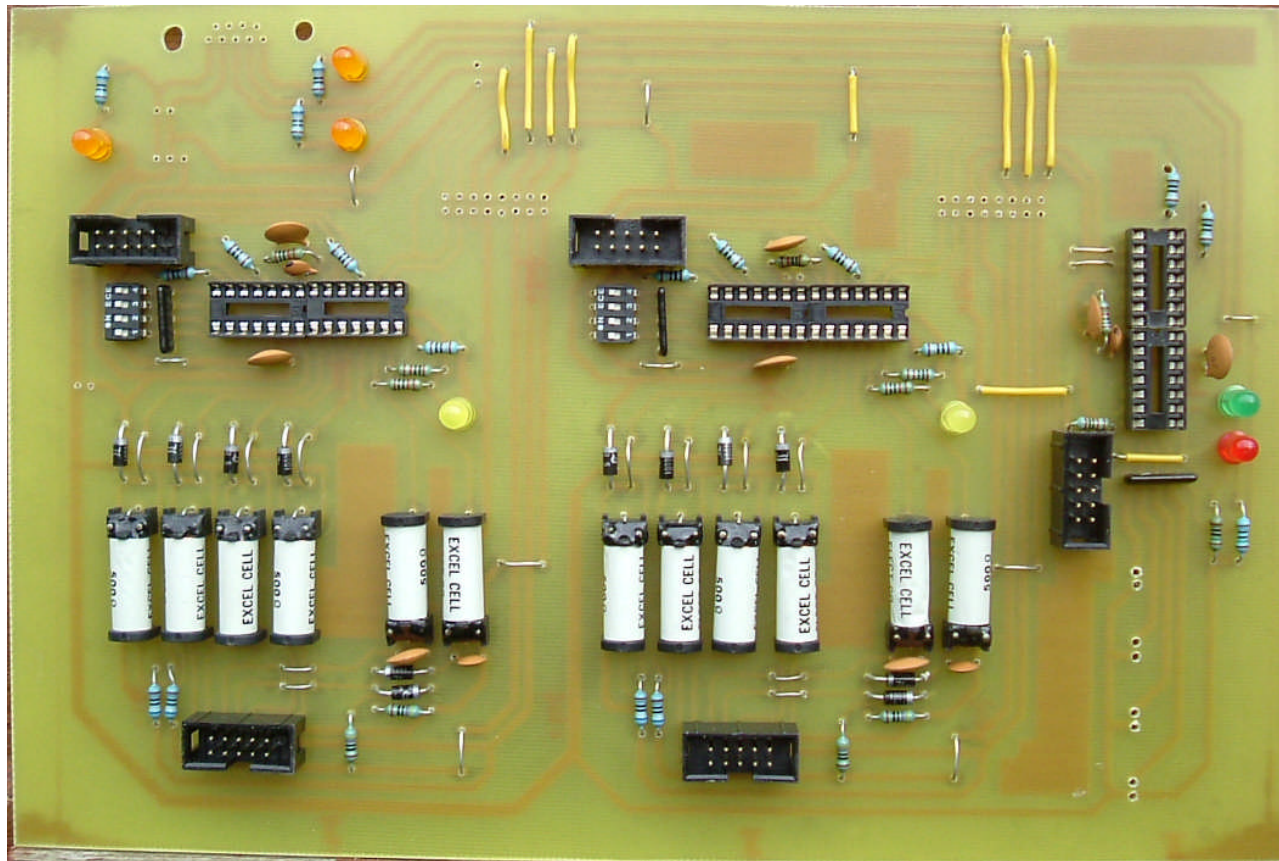


Step 5. The new, ceramic, capacitors in this view are all for decoupling purposes: they should be 100 nF or 220 nF. Mostly these are near the PICs, but there are also some for the *tapper pressed* detection reed relays (I had trouble with inductive spikes from the block bell getting through the reed relay, even though the block shelf was supposedly isolated from the PIC!).

The new resistors in the lower part of the board are all about 470 to 680 Ω . The vertical (in this view) pairs of resistors are to limit the current through the non-pegging block indicator. They are 680 Ω , but note you may still want to add more series resistance to limit the current further. The pairs of diodes, the associated 470 Ω resistor, are for the *line-clear* detection circuit. The other resistors are about 680 Ω and are to limit the current through the *tapper pressed* detection relay; the reed relays are 5 Volt devices, but the block shelf power rails are typically more like 12 Volts.



Here are the indicator LEDs. Make sure you insert them the correct way round! I've used C to denote the correct side for the cathode, which is the short lead or flat side (yes -if you look carefully I inserted the yellow ones the wrong way round). They should be 20 mA devices. You can have any colours you like; but in this example: RED is on whilst the timetable chip is in setup mode, and goes out when you switch to run mode. GREEN flashes when a train is triggered (sent from timetable chip to one of the block chips). YELLOW indicates that the block chip is busy – i.e. engaged in bell ringing, or talking to another PIC. The ORANGE LEDs indicate that the power is on.



Here are the reed relays, and also:

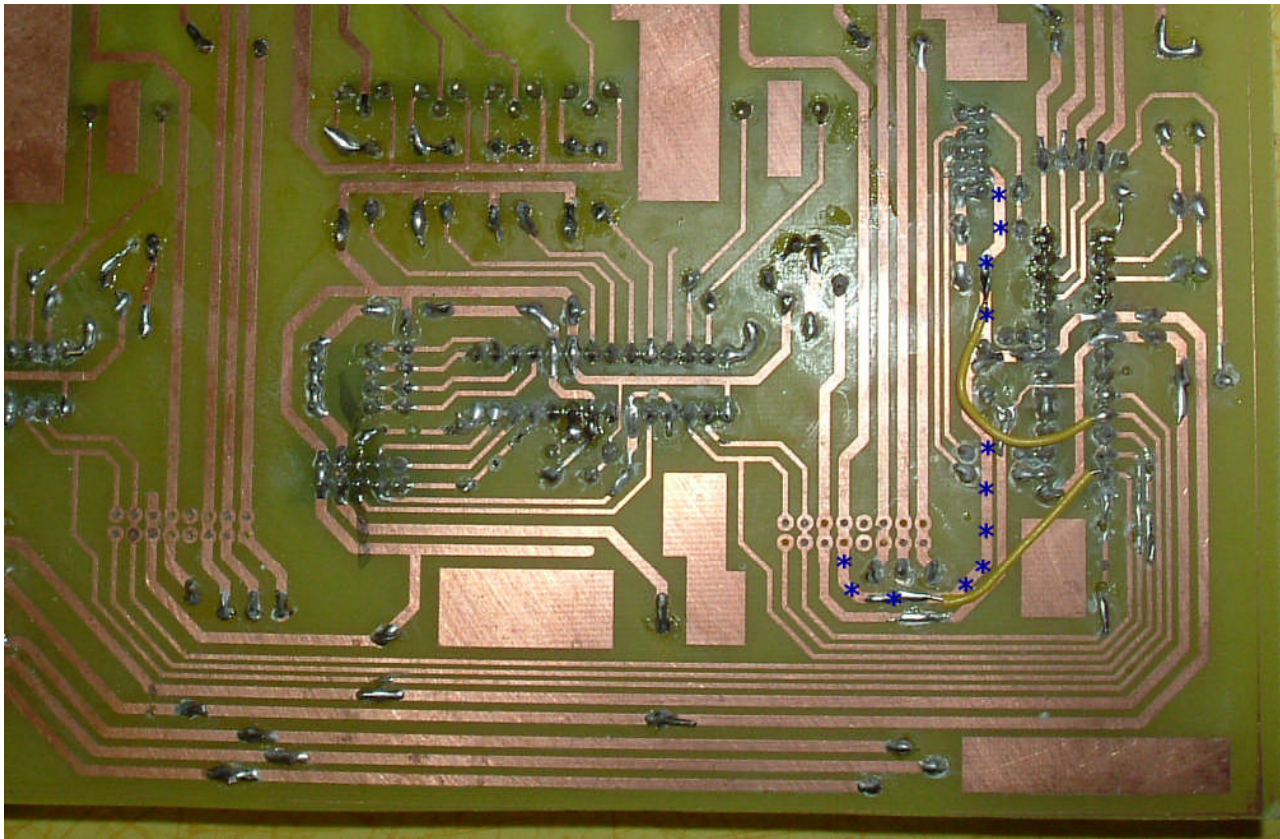
IDC plugs – take care with the orientation, the notch is towards the edge of the PCB

IC sockets – note that the notch (pin 1) is at the right, or top, in this view. The one at the far right (next to the timetable chip) is not required at present, but is likely to be useful in the future.

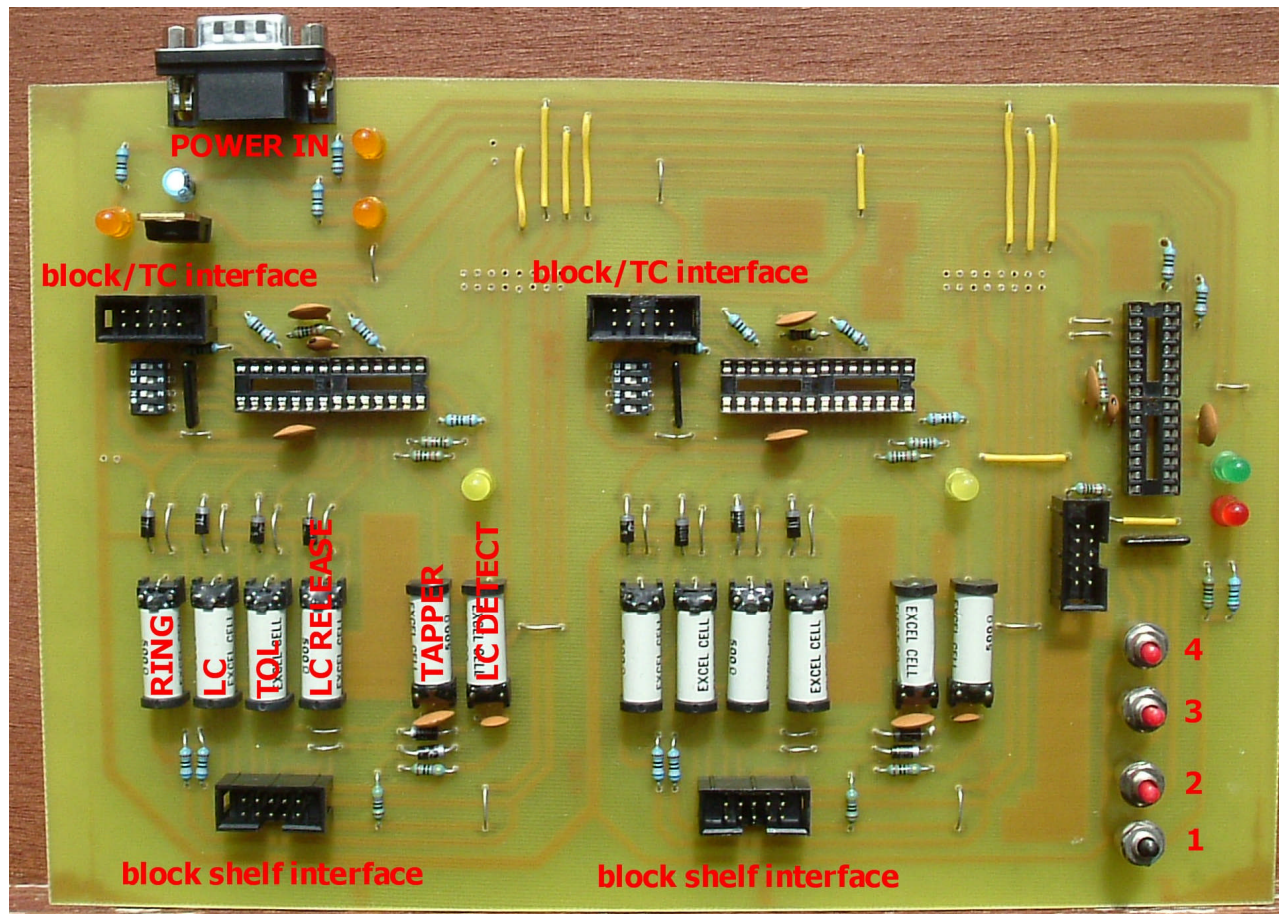
DIL switches – not required in present version of software, but are likely to be useful in the future

SIL resistor packs – note the dot (common terminal) goes at the bottom or right in this view. The resistance value is not critical; anything from about 10 k Ω to 30 k Ω is fine.

(If you look carefully the 47 pF capacitor for the middle PIC has fallen out – something I discovered after powering the board...)



Two links are also required on the underside of the board, which are shown above, with the board flipped on its long edge. They connect pins 24 and 27 of the timetable chip to digital ground. The digital ground line is marked with *.



Now we have added the 9 way right angled D plug, which takes power onto the board, and also the 7805 voltage regulator. A small electrolytic smoothing capacitor has been added near the voltage regulator. The only things missing are the PICs themselves.

The functions of the reed relays are indicated: **RING** rings the bell; **LC** and **TOL** connect the appropriate power rail, via a 680Ω resistor, to the non-pegging block line; **LC RELEASE** closes at line clear on the non-pegging block; **TAPPER** detects when the tapper is pressed; **LC DETECT** detects when the pegging block is at line clear (at least it will if you get the diodes the correct way round...)