

Assembly Instructions for B7971 Smart Socket

Identification and installation of the resistors, Fig1

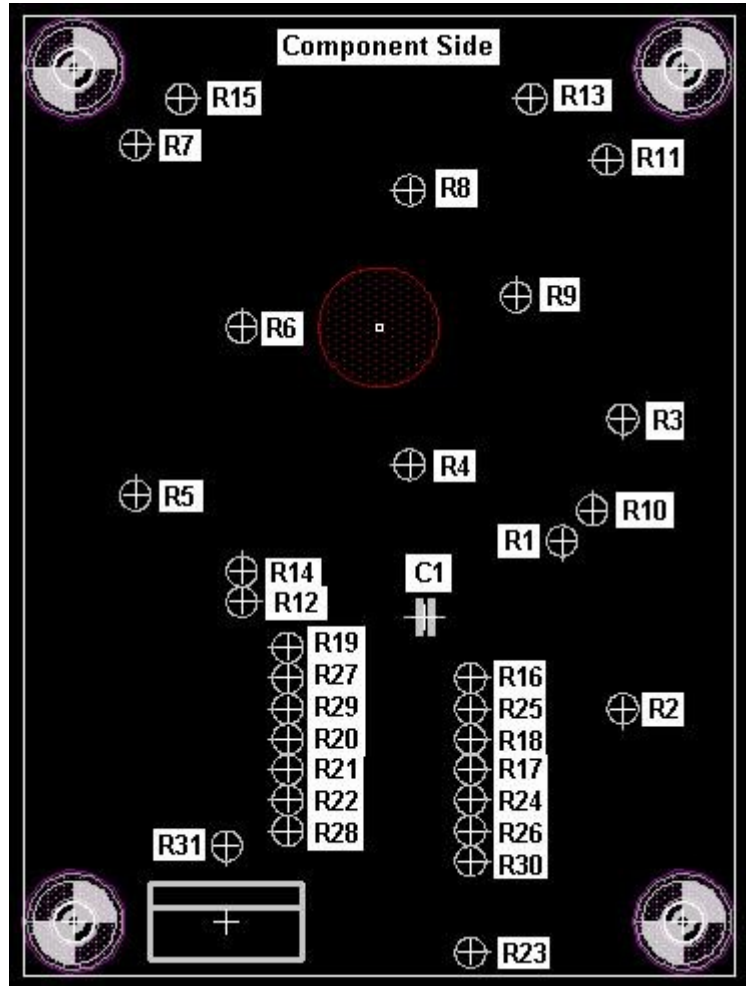
Segment 1, **R1**, 22k
Segment 4, **R4**, 22k

Segment 2, **R2**, 27k
Segment 3, **R3**, 27k
Segment 5, **R5**, 27k
Segment 6, **R6**, 27k
Segment 8, **R8**, 27k
Segment 12, **R12**, 27k

Segment 7, **R7**, 24k
Segment 9, **R9**, 24k
Segment 11, **R11**, 24k
Segment 13, **R15**, 24k

Segment 10, **R10**, 33k
Segment 14, **R14**, 33k
Segment 15, **R13**, 22k

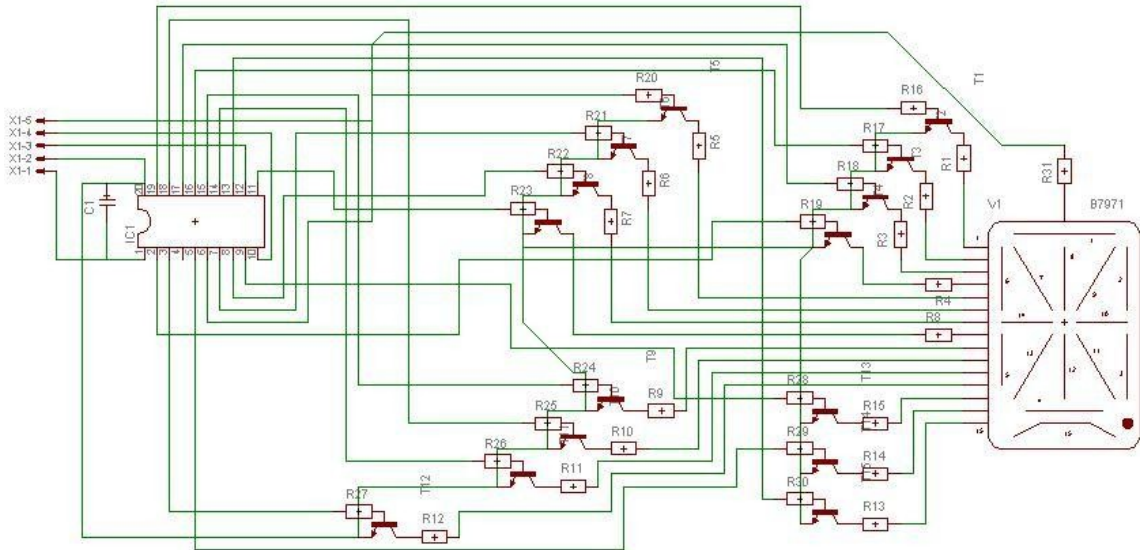
Of the remaining resistors,
R16-R30 are transistor base
bias resistors, of any value
between 10k-33k.



R31 is the anode resistor. The Smartsocket is designed to operate at 170V but should a higher voltage be required a suitable resistor can be installed in the R31 position. ***For 170V operation only R31 should consist of a short wire link.***

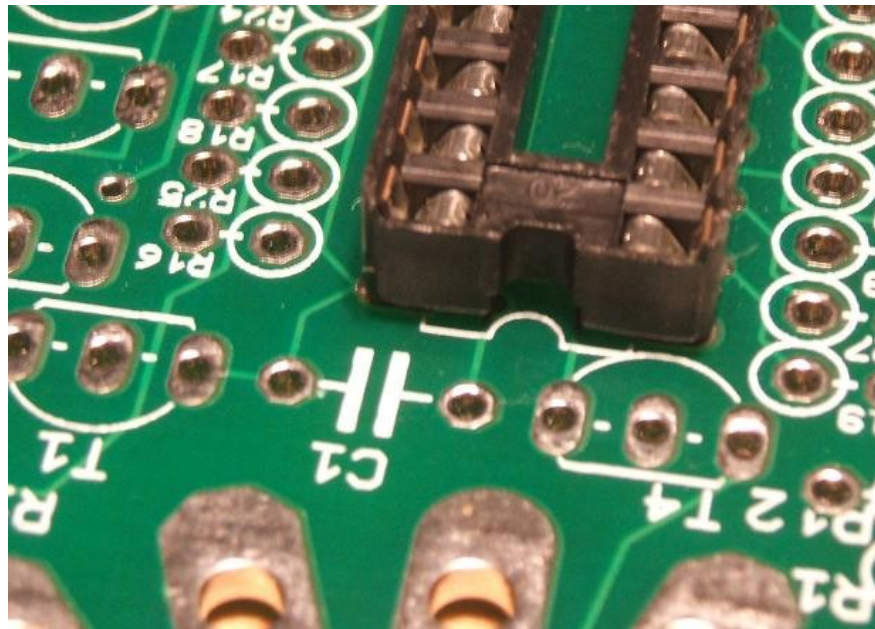
Installing a current limiting resistor in position R31 allows a higher high voltage supply to be utilised. Although the correct ratio of resistances is disturbed when doing that, as long as the high voltage is below 250v there is usually no noticeable difference in the brightness of the different sized segments

Fig 2
Schematic diagram

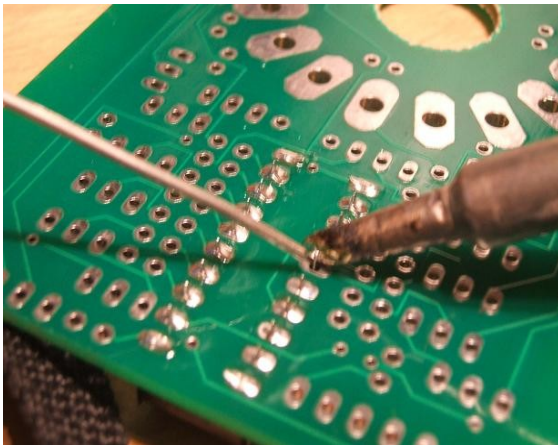
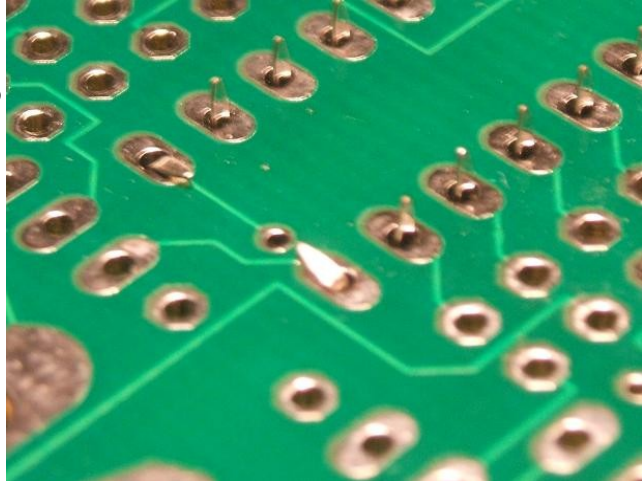


Installing the IC socket

First install the IC socket to the PCB. Note that the orientation of the socket should match the orientation of the ic socket outline on the PCB. The notch on the socket should align with the notch on the pcb silkscreen overlay.



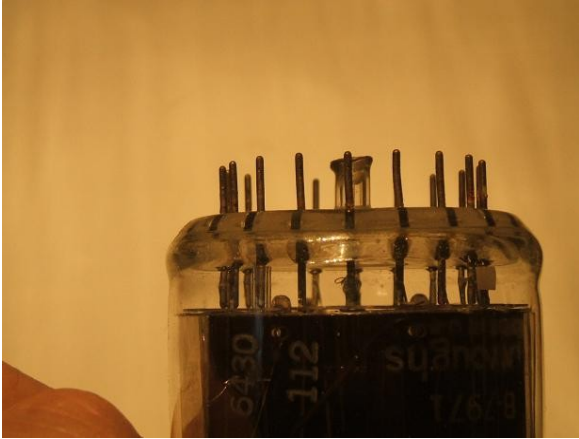
To secure the IC socket in position it is helpful to bend over a couple of the socket legs at either end of the socket to hold it in place while the legs are being soldered.



Solder the socket legs to the board using an iron with a small sized bit and suitable solder. Applying the iron tip to the pad first, slightly before touching it to the socket pin allows the pad to be heated and helps the solder to flow. After a second or so introduce the solder to the joint. It should flow freely between the pin and the solder pad. Care should be taken not to introduce too much heat to any joint because of the potential for causing component damage or for causing the pad to come away from the pcb.

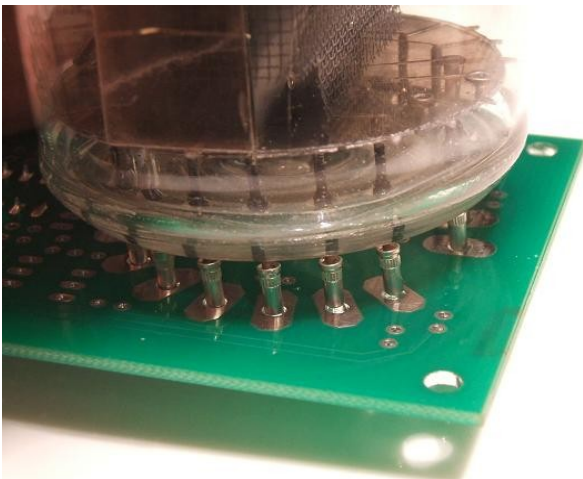
Installing the socket pin receptacles for the B7971 tube

The B7971 tube pins are rarely straight and perfectly aligned and it is worthwhile taking some time to carefully straighten them as much as possible before attempting the next step.



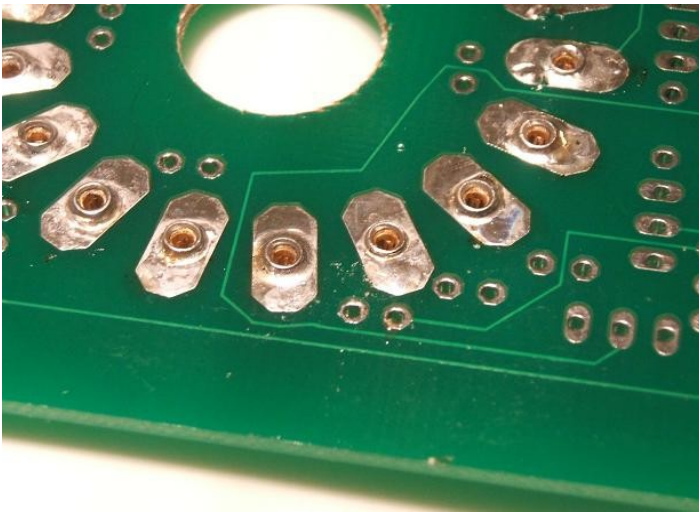
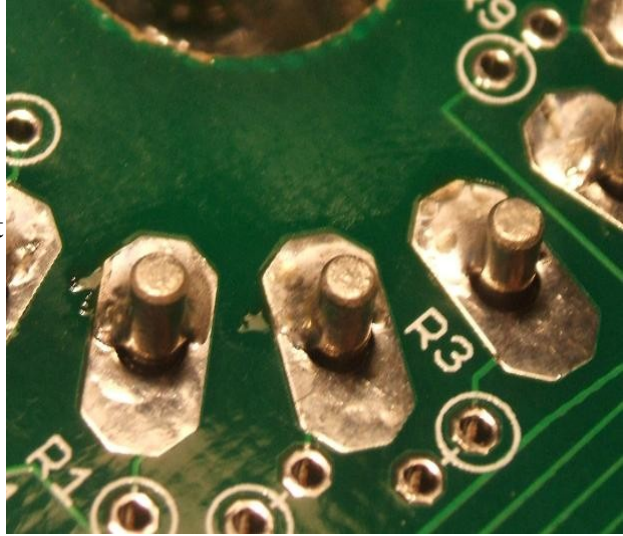
You can see here that there is a small amount of misalignment of the tube pins. By taking the time to straighten them you will reduce the risk of causing a failure later. The usual failure occurs when a small crack appears where the pin enters the glass envelope of the tube. This normally leads to a slow and irreversible release of the neon gas, which is known as outgassing.

Once straightened the pins can receive the pin receptacles which will later form the socket on the Smartsocket pcb. Note there is a missing socket at pin position #7. There is no internal connection to this pin which is used in the Smartsocket and therefore this pin does not need to be fitted.



Carefully align the pin receptacles with the holes in the pcb and slide the pcb onto the tube pins.

Soldering the pin receptacles to the pcb while they are also still fitted to the B7971 tube carries some risk of causing damage to the tube from overheating the pins. Therefore it is a good idea to use only just enough solder as possible to hold the pin in place. Pictured to the right is an example which shows the half soldered pins. Later the tube can be removed and the top side of the receptacles can be soldered to the upper pads of the pcb to make a mechanically strong tube mount.



Once soldered to the top of the pcb the pins are fully installed.

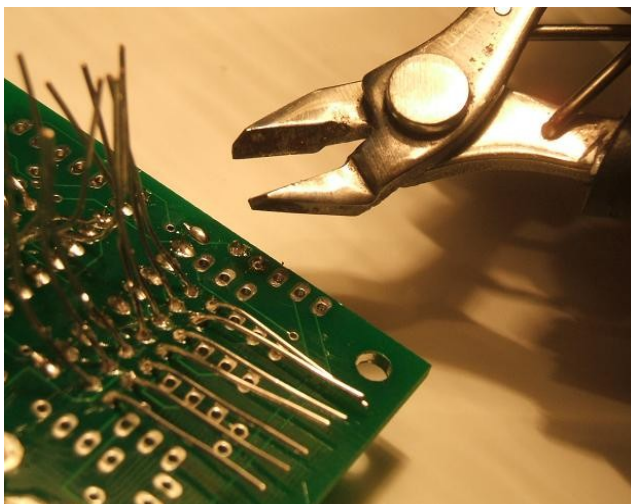
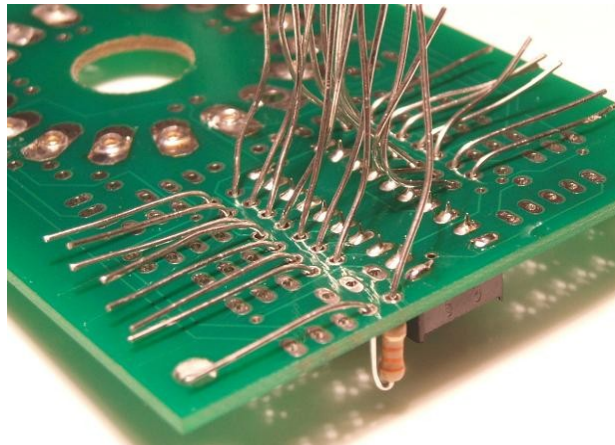
Test fit the B7971 tube to the socket at this point and if any pin receptacles need to be relocated it is much easier to do it now than later on when all of the other components are installed.

Installing the resistors to the pcb

Next, prepare all the resistors for use by bending the lead at one end of the resistor body back onto itself. All of the resistors on this pcb are mounted vertically in this way in order to achieve a smaller pcb layout.

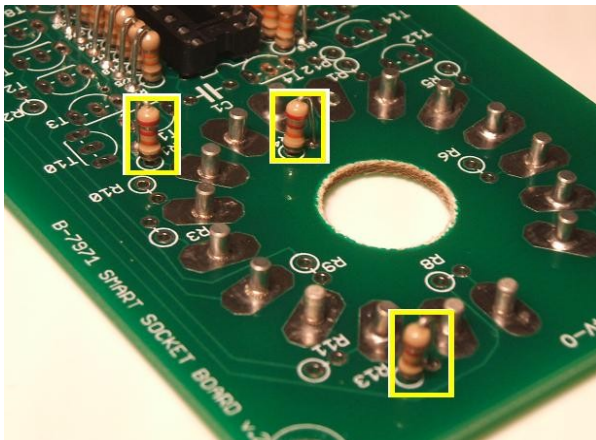
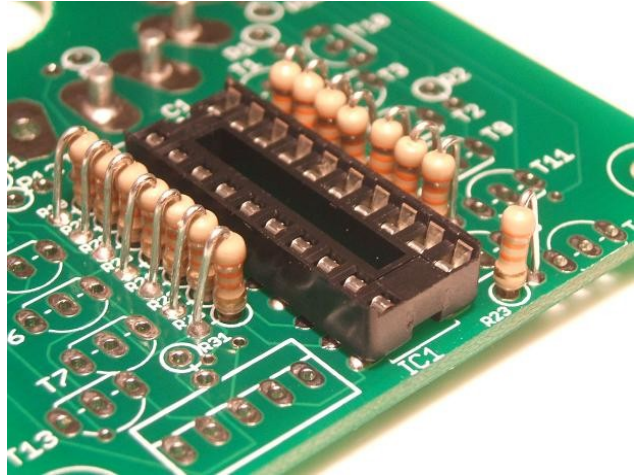


Continue by installing the resistors to the pcb. It may be easier to install resistors R16 – R30 before any others. These are the base drive resistors which interface the microcontroller to the driver transistors. Insert them according to the image on the pcb silkscreen and bend over the legs to help lock them to the board while you begin soldering them to the appropriate pads. Alternatively, you may not need to bend the leads over if you invert the board quickly and allow gravity to push the board down onto the resistors.



Using sharp cutters, trim the excess length of the resistor leads until you leave only a small soldered joint, neat and tidy close to the board and with no excess pieces of wire sticking out which could potentially cause a short circuit to another pcb track

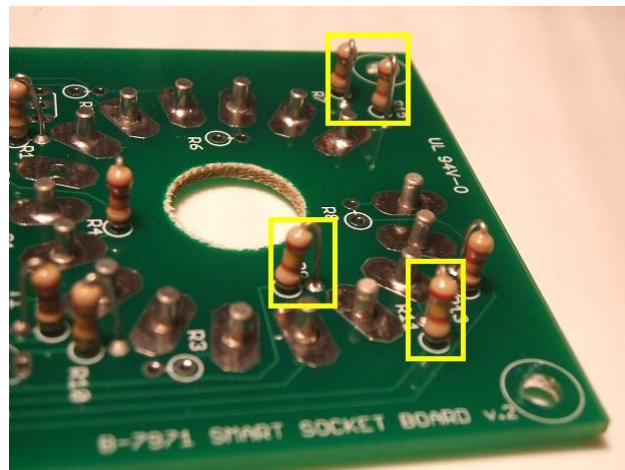
Once you have completed the previous steps of soldering, and trimming the excess off the leads, you will have completed the installation of resistors R16 – R30 and your pcb will now look something like the picture to the right.



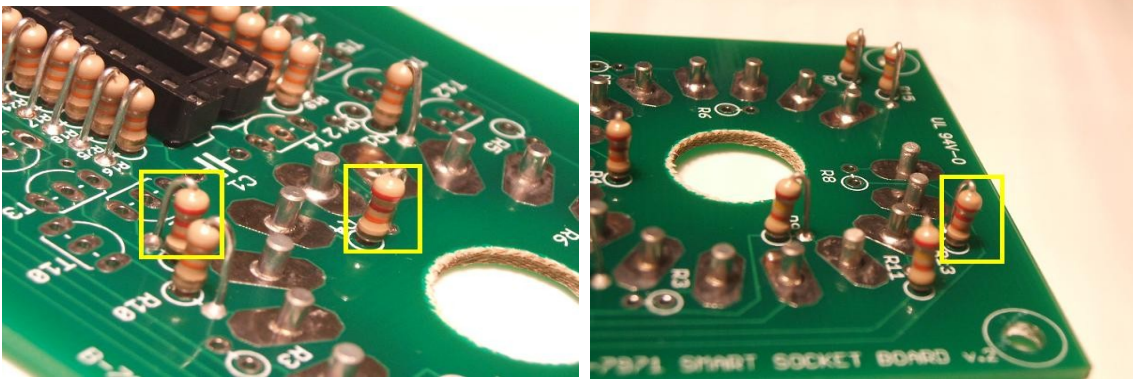
The installation of the remaining resistors follows the same sequence of soldering and trimming as before. Although it is possible to install all resistors at one time before soldering them into place, it is sometimes less confusing to install them in batches, individually by their particular value.

Here, the 22k resistors R1, R4, R13 are being installed.

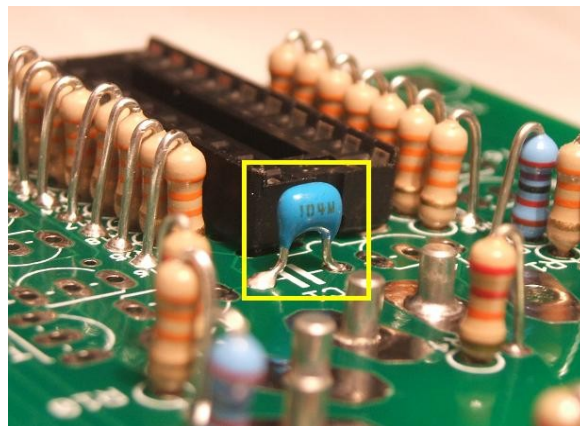
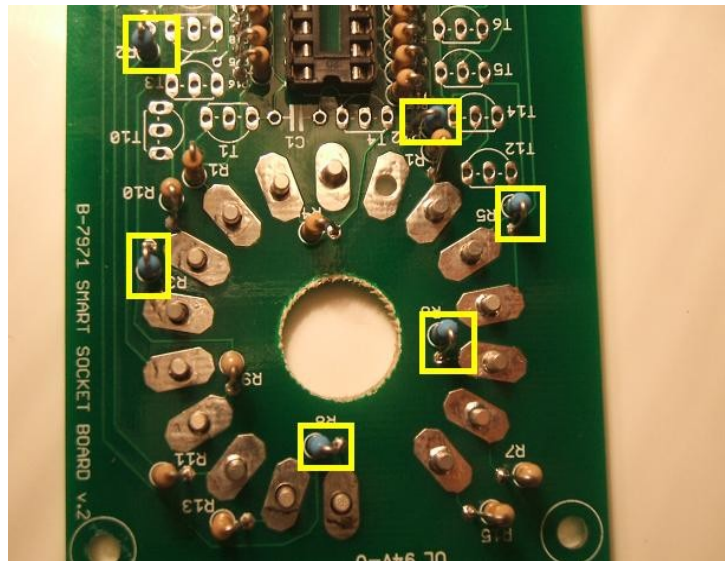
Here the 24k resistors R7, R9, R11, R15 are being installed.



Followed by the 22k resistors, R1, R4 and R13, pictured below.



The last remaining resistors should be R2, R3, R5, R6, R8 and R12, all of which have a value of 27k.



Now install the 0.1µF decoupling capacitor in front of the IC socket

Installing the transistors and the wire link

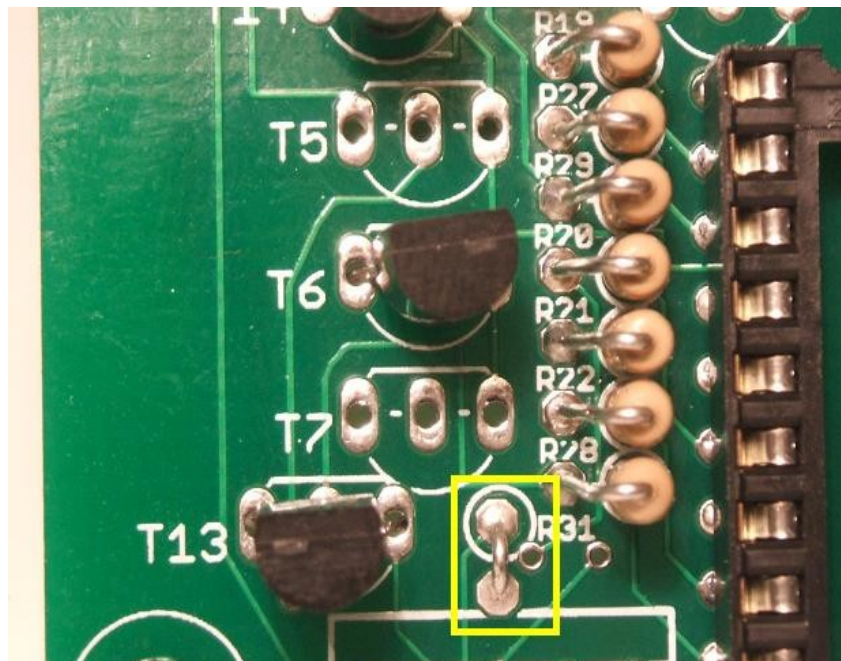


Using one of the waste resistor leads make a u-shaped wire link like this. This link fits into the position of R31 if using a 170V power supply

The transistors are all MPSA42 (or equivalent) high voltage NPN transistors. They are supplied in a d-shaped plastic package and the pcb silkscreen outline gives an indication of which way around the transistors should be installed.

When soldering the transistors it is important not to let too much heat to build up in the package. For this reason it is safer to solder only one leg of each transistor at a time which allows each device time to cool down between applications of the soldering iron. Generally it is a good idea to solder the middle leg of each transistor first. Once all middle legs have been soldered you can turn the board over and move the transistor packages around until they are all straight and level with each other before turning the board over and continuing with the soldering the remaining legs of the transistors.

Here you can see the wire link in position R31 highlighted with the yellow box, and the transistors aligned in accordance with the silkscreen image.





Here is the finished pcb which shows a strip of terminal pins to the bottom left in position 'X1'.

It is also possible to fit a 5-way plug and socket in position X1, but because in normal use the sockets will rarely need to be disconnected a cost saving can be made by using ribbon cable to interconnect the sockets.