Timer kit assembly instructions

Check that your kit contains the following parts:

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1 x CPU PCB                          1 x red croc clip
1 x display PCB                      1 x black croc clip
1 x 4.096MHz crystal                 1 x small keypad
7 x S8050 PNP transistor             4 x 3mm round red LED
1 x PIC16F72 microcontroller         8 x 1kR resistor
1 x 28 pin DIL socket                7 x 82R resistor
2 x 1N4001 diode                     1 x PCB mount toggle switch
3 x double 7 segment display         1 x PCB mount power socket
1 x 16 pin right angled header       1 x PCB mount screw connector
1 x 16 pin SIL socket                1 x PCB buzzer
2 x 33pF ceramic capacitors          1 x solid core red wire
1 x 100nF ceramic capacitor          1 x solid core black wire
1 x 10uF electrolytic capacitor      2 x cable ties
                                     4 x LED spacers
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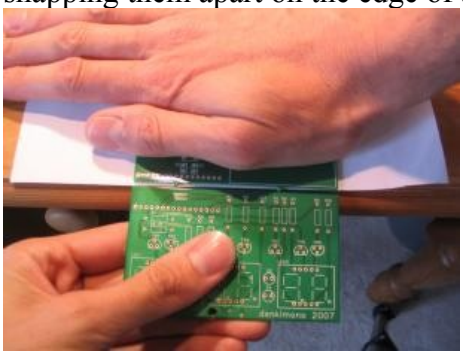
Construction notes:

- The parts should be mounted on the side of the PCB indicated by the silk screen.

- When soldering to the PCB, it is only necessary to apply solder to the side of the board opposite to the component being soldered. The holes on the PCB are plated through so the connection will be made on both sides.

- Some components must be mounted in a particular orientation on the PCB. Details are given in the instructions. Follow the mounting instructions carefully and read each step completely before mounting the component.

- If the CPU and display PCBs arrived joined together, then separate them by either sawing through the tags holding the boards together or by carefully snapping them apart on the edge of a table:

  After the boards are separated the protruding tags can be filed off if required.

- The PCB has a large copper fill area between the tracks that is connected to 0V. Care must be taken not to inadvertently bridge a connection to this area when soldering. The copper fill area is coated with solder resist, but this can be chipped and expose the copper underneath. Your joints should contain all the solder within the pad area with no blobs extending outside. Use a soldering iron with an appropriately sized tip and use as little solder as possible.

1. Fit the eight 1k resistors (Brown Black Red)
[CPU board: R14, R15]
[Display board: R1, R2, R3, R4, R5, R6]

2. Fit the seven 82Ω resistors (Grey Red Black)
[Display board: R7, R8, R9, R10, R11, R12, R13]

3. Fit the two silicon diodes
[CPU board: D5, D6]

Ensure the stripe on the diode is in the same direction as the stripe on the PCB symbol.

4. Fit the 100nF capacitor [CPU board: C1]

5. Fit the two 33pF capacitors [CPU board: C2, C3]

6. Fit the 4.096MHz crystal [CPU board: X1]

7. Fit the 28 pin DIL socket [CPU board: U1]

Line up the notch in the socket with the notch on the PCB symbol. Make sure the socket is seated correctly by first soldering two diagonally opposite corners of the socket. When the socket is flat on the PCB, solder the remaining pins.

8. Fit the 10uF capacitor [CPU board: C4]

Ensure the capacitor leg labelled negative (-) is placed in the hole opposite the hole labelled '+' on the PCB.

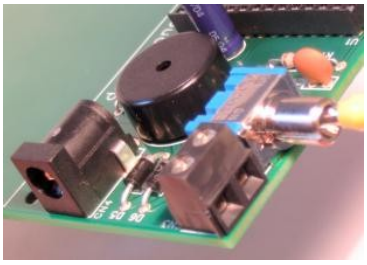
9. Fit the buzzer [CPU board: BUZZ1]

10. Fit the toggle switch [CPU board: S1]

11. Fit the power socket [CPU board: CN4]

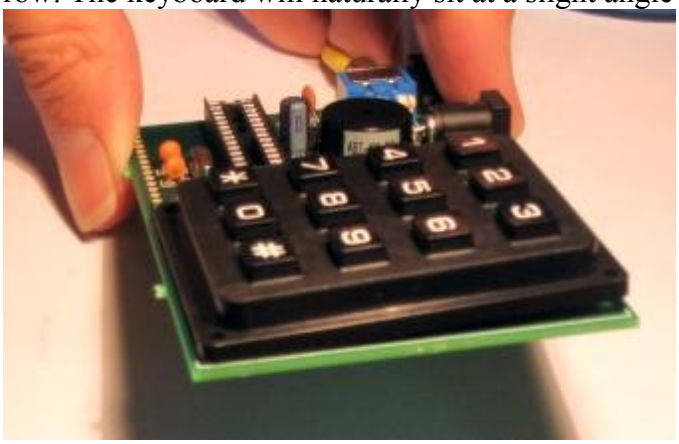
12. Fit the screw terminal connector [CPU board: CN3]

Make sure the holes for the wires are facing towards the outside of the PCB:

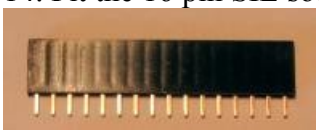


13. Fit the keyboard [CPU board: KB1]

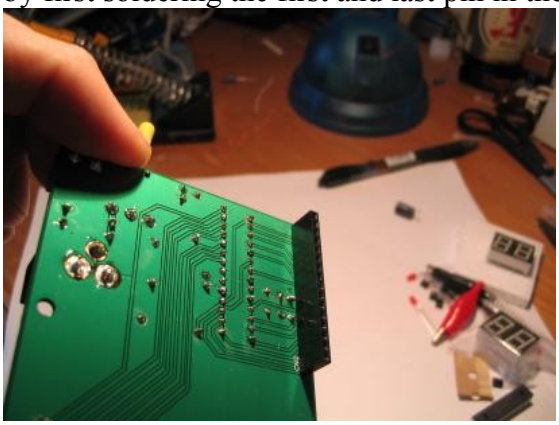
Make sure the keyboard is seated correctly by soldering the first and last pin in the row. The keyboard will naturally sit at a slight angle to the PCB:



14. Fit the 16 pin SIL socket [CPU board: CN2]

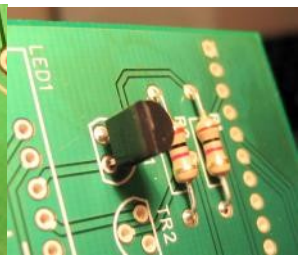


This should be mounted on the opposite side of the board to the rest of the components as shown on the silkscreen. Make sure the socket is seated correctly by first soldering the first and last pin in the row:



15. Fit the seven transistors [Display board: TR1, TR2, TR3, TR4, TR5, TR6, TR7]

Ensure that the flat side of the body of the transistor corresponds with the flat side of the symbol on the silkscreen. The body of the transistors will naturally sit about 3mm from the surface of the PCB, don't try and force them to sit directly on the PCB.

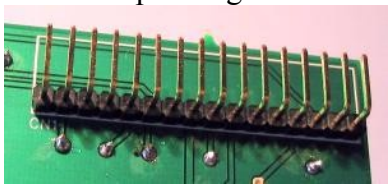


16. Fit the LED displays [Display board: LED1, LED2, LED3]

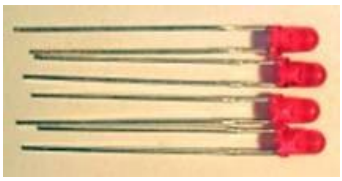
Ensure the orientation of the display corresponds with the symbol on the silkscreen, with the decimal points at the bottom. Make sure the display is seated correctly by first soldering two diagonally opposite corners. When the display is flat on the PCB and in line with the silk screen symbol, solder the remaining pins.

17. Fit the 16 pin right angled header [Display board: CN1]

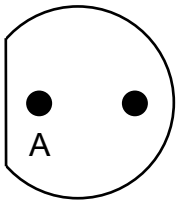
This should be mounted on the opposite side of the board to the rest of the components as shown on the silkscreen. Make sure the header is seated correctly by soldering the first and last pin in the row before soldering the rest of the pins. The short row of pins should be soldered to the board and the long bent pins should be pointing to the outside of the PCB as shown below:



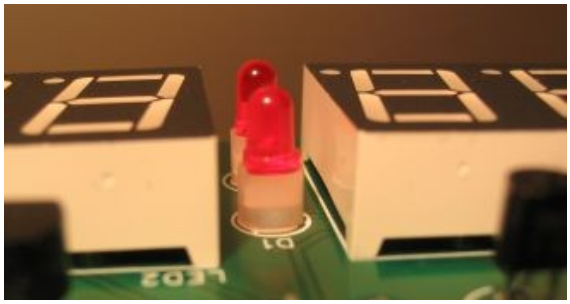
18. Fit the four LEDs and spacers [Display board: D1, D2, D3, D4]



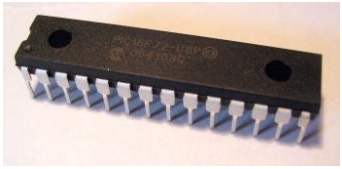
Ensure the pin on the flat side of the LED body is in the hole labelled ‘A’ (anode) on the PCB symbol:



Fit an LED spacer on the legs of each LED before mounting. This will keep the LED a few millimetres proud of the PCB so the top of the LED is in line with the top of the 7 segment displays. This allows the LEDs to still be visible when viewed from the side.

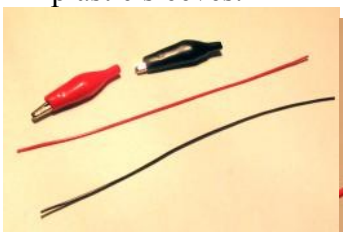
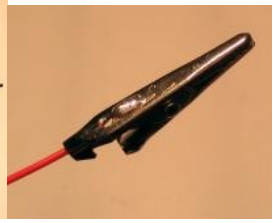


19. Insert the PIC16F72 microcontroller into the DIL socket [CPU board: U1]



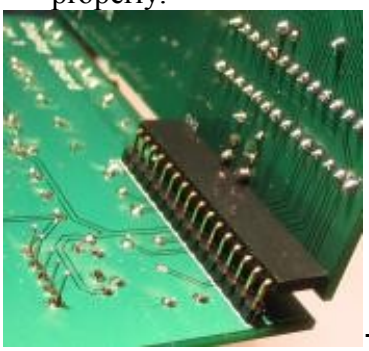
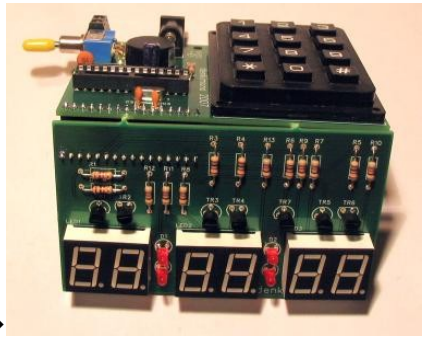
Make sure all the pins are seated in the socket properly. Make sure the PIC16F72 is orientated correctly in the socket with the notch on the device facing towards the outside of the PCB as shown:

20. Solder the red and black wires to the red and black crocodile clips and fit the plastic sleeves.

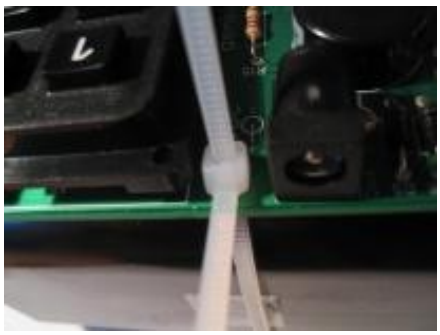



You can coil the wire by winding it around a pencil. Screw each wire into the terminal block on the PCB. Put the red wire into the terminal labelled “+6V” and the black wire into the terminal labelled “-”.

21. Connect the two PCBs together as shown. Ensure that the connectors line up properly.

Use the two cable ties to strap the timer to the battery by passing the ties through the holes on the two PCBs. Pass one cable tie through the hole in the display board, around the battery and through the hole in the CPU board. Use the second cable tie to lock the timer into position on the battery:

Attach the crocodile clips to the battery and operate the toggle switch to turn the clock on: