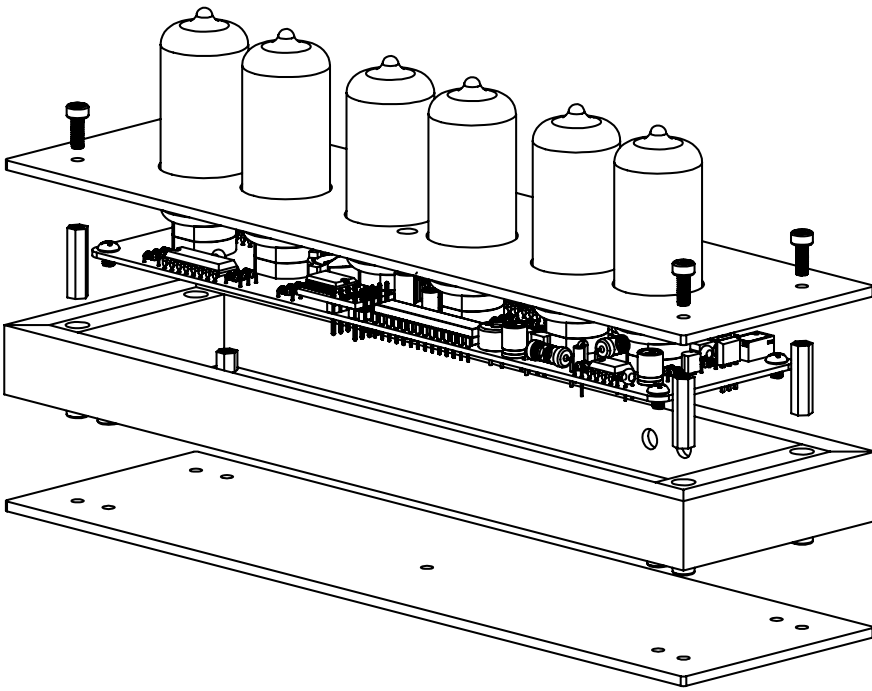


IV-11 VFD tube clock

Assembly instructions v1.2.3



Designer: Yan Zeyuan. China
Website: <http://www.nixieclock.org>
E-mail: yanzeyuan@qq.com

Attention

- ◇ Attention: All components are through-hole or DIP parts, please solder carefully;
- ◇ Warning: Make sure all components are pressed completely down on the PCB or the assembled clock will not fit in the housing.
- ◇ Warning: Before soldering, check the polarity each component.
- ◇ Warning: Please disconnect the power immediately if testing shows any unexpected results. Check for component placement mistakes, component polarity and that no solder bridges occurred during assembly.

Catalogue

Parts list

| | |
|-----------------|---|
| Parts list..... | 4 |
|-----------------|---|

Pre-installation preparation

| | |
|--|---|
| Identify electronic parts and installation method..... | 5 |
|--|---|

Assembly electronic components

| | |
|--|---|
| Assembly of low voltage and high voltage power modules..... | 6 |
| Assembly of the rest of components (except IV-11 tubes)..... | 8 |
| Assembly of IV-11 tubes..... | 9 |

Assembly housing

| | |
|---|----|
| Step 1 Prepare bottom plate for assembly..... | 10 |
| Step 2 Assemble spacers from bottom..... | 10 |
| Step 3 Affix the main board..... | 11 |
| Step 4 Assembly of the wooden frame..... | 12 |
| Step 5 Assembly of the top plate..... | 13 |

Parts list

Before getting started, please check the contents of the package. If any are missing, please contact the seller.

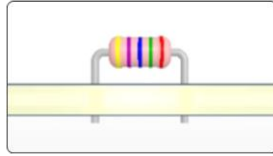
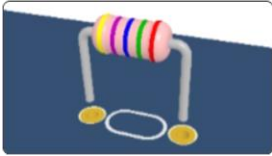
| No. | Name | Description | Designator | Footprint | Qty | Value |
|-----|----------------------|------------------------|--|-----------|-----|-----------|
| 1 | STC15F2K56S2 | Programmed | MCU | SKDIP28 | 1 | |
| 2 | TD62783APG | IC | U1, U2, U3, U4, U5, U6 | DIP18 | 6 | |
| 3 | 74HC595N | IC | U7, U8, U9, U10, U11, U12 | DIP16 | 6 | |
| 4 | LPD8806D | IC | U13 | DIP16 | 1 | |
| 5 | MC34063 | IC | U16, U17 | DIP8 | 2 | |
| 6 | DS3231Module | RTC Module | U15 | DIP8 | 1 | |
| 7 | IR Receiver | | U14 | HS0038 | 1 | |
| 8 | IRFU5305 | P-Channel Power MOSFET | Q1 | TO-251 | 1 | |
| 9 | IRLU024 | N-Channel Power MOSFET | Q2 | TO-251 | 1 | |
| 10 | BS250 | P-Channel Power MOSFET | Q6 | TO-92 | 1 | BS250 |
| 11 | Capacitor | | C8, C10 | C-102 | 2 | 330pF |
| 12 | Capacitor | | C1, C2, C3, C4, C5, C6, C12, C14, C15, C16 | C-102 | 10 | 0.1uF |
| 13 | Polarized Capacitor | | C11 | C-4x6 | 1 | 10uF/25v |
| 14 | Polarized Capacitor | | C13 | C-6.3x8 | 1 | 100uF/35v |
| 15 | Polarized Capacitor | | C7, C9, C17 | C-6.3x8 | 3 | 220uF/16V |
| 16 | Battery Socket | | Battery Socket | CR1220 | 1 | |
| 17 | Battery | | Battery | CR1220 | 1 | |
| 18 | FUSE | | F1 | F3.6x10 | 1 | 250V-1.5A |
| 19 | Buzzer | | Buzzer | BUZZER9mm | 1 | |
| 20 | Power Socket | | DC5V | DC-003 | 1 | |
| 21 | Headset Socket | | GPS, Temp | PJ-313 | 2 | |
| 22 | Ambient Light Sensor | | ALS | 5mm | 1 | |
| 23 | PNP Transistor | | Q3, Q5 | TO-92 | 2 | C9015C |
| 24 | NPN Transistor | | Q4, Q7 | TO-92 | 2 | C9014C |
| 25 | Resistor | | R28, R31 | 1/4W | 2 | 0.24 |
| 26 | Resistor | | R5 | 1/8W | 1 | 10 |
| 27 | Resistor | | R11, R14, R17, R20, R23, R26 | 1/8W | 6 | 120 |
| 28 | Resistor | | R9, R10, R12, R13, R15, R16, R18, R19, R21, R22, R24, R25, R30 | 1/8W | 13 | 200 |
| 29 | Resistor | | R1, R3, R4 | 1/8W | 3 | 1K |
| 30 | Resistor | | R2 | 1/8W | 1 | 4.7K |
| 31 | Resistor | | R8, R27, R32 | 1/8W | 3 | 10K |
| 32 | Resistor | | R6, R7 | 1/8W | 2 | 20K |
| 33 | Resistor | | R29 | 1/8W | 1 | 100K |
| 34 | Inductance | | L1, L2 | L-5x12 | 2 | 100uH |
| 35 | Diode | | D2 | | 1 | 1N4007 |
| 36 | Schottky Diode | | D1, D3 | | 2 | 1N5819 |
| 37 | LEDs | | LED1, LED2, LED3, LED4, LED5, LED6 | 5mmRGB | 6 | |
| 38 | VFD tubes | | IV1, IV2, IV3, IV4, IV5, IV6 | IV11 | 6 | |

Housing parts and accessories

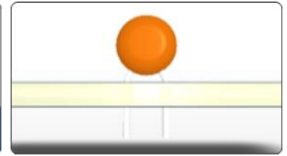
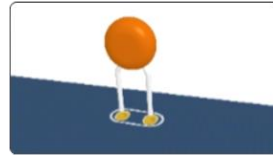
| No. | Name | Description | Quantity |
|-----|---------------------------|--|----------|
| 1 | PCB board | 203 x 50 x 1.6mm Gold plating | 1 |
| 2 | VDF tube spacer | Laser cut | 12 |
| 3 | Plastic spacer | Φ5mm x 11mm for support IR receiver | 1 |
| 4 | Plastic spacer | Φ5mm x 3mm for support light sensor | 2 |
| 5 | Rubber sleeve | Φ7mm x 9mm for cover light sensor | 1 |
| 6 | IR remote controller | NCH | 1 |
| 7 | Power adapter | DC 5V 1.5A | 1 |
| 8 | Top and bottom plate | Laser cut | 2 |
| 9 | Wooden frame | | 1 |
| 10 | Copper spacer | M3x18mm female-female for support top and bottom plate | 4 |
| 11 | Copper spacer | M3 x 5mm female-female for support PCB board | 5 |
| 12 | Philips screw | M3 x 4mm to affix PCB board | 5 |
| 13 | Hexagon socket head screw | M3 x 5mm to affix PCB board | 5 |
| 14 | Hexagon socket head screw | M3 x 8mm to affix top and bottom plate | 8 |

Pre-installation preparation

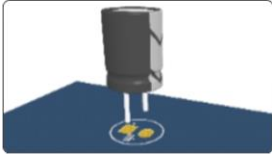
Identify electronic parts and installation method.



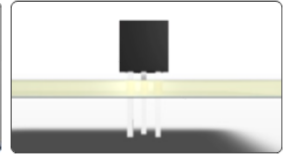
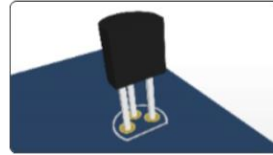
Resistor. Polarity-free



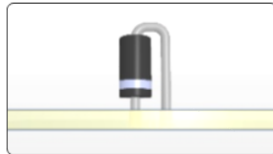
Ceramic capacitor. Polarity-free



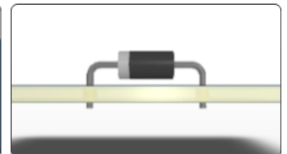
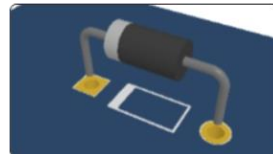
Polarized capacitor. Notice the polarity



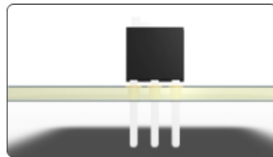
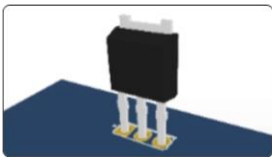
Transistor. Notice the polarity



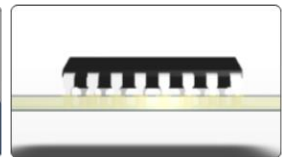
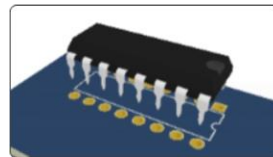
Diode(Vertical). Notice the polarity



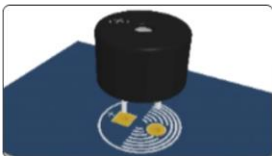
Diode(Horizontal). Notice the polarity



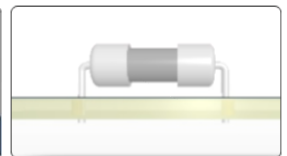
MOSFET. Notice the polarity



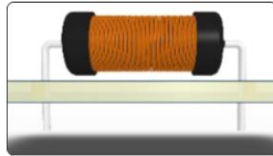
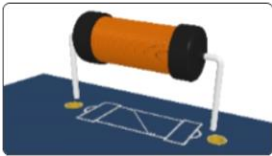
IC. Notice the direction of installation



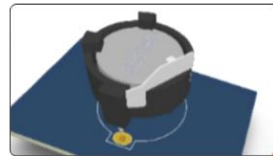
Buzzer. Notice the polarity



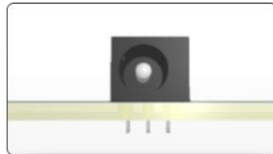
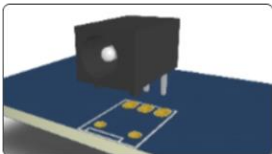
Fuse. Polarity-free



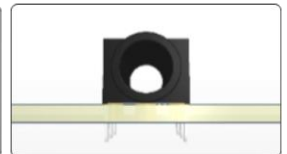
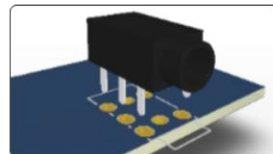
Inductor. Polarity-free



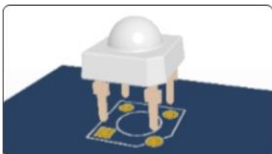
Battery socket. Notice the orientation



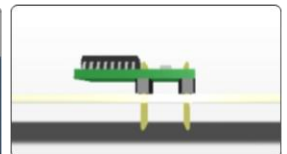
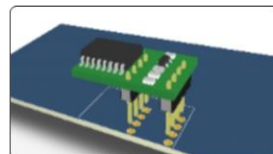
Power socket. Notice the orientation



GPS/Temp socket. Notice the orientation



RGB LED. Notice the polarity



RTC Module. Notice the orientation

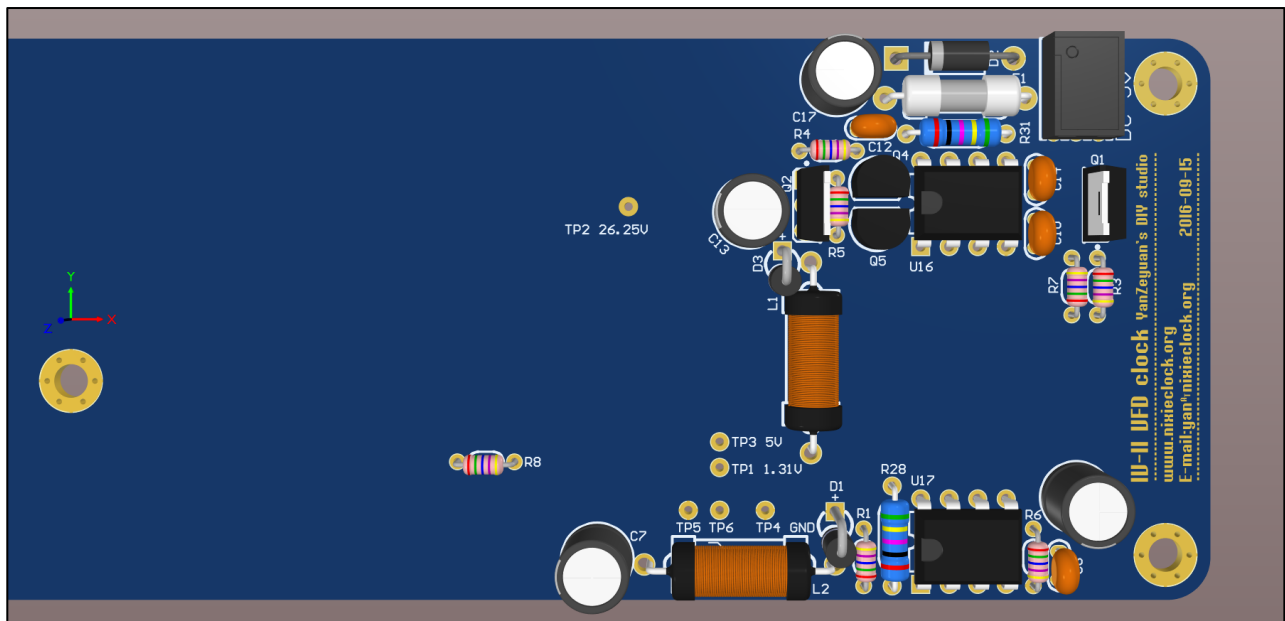
Assembly electronic components

Assembly of low voltage and high voltage power modules

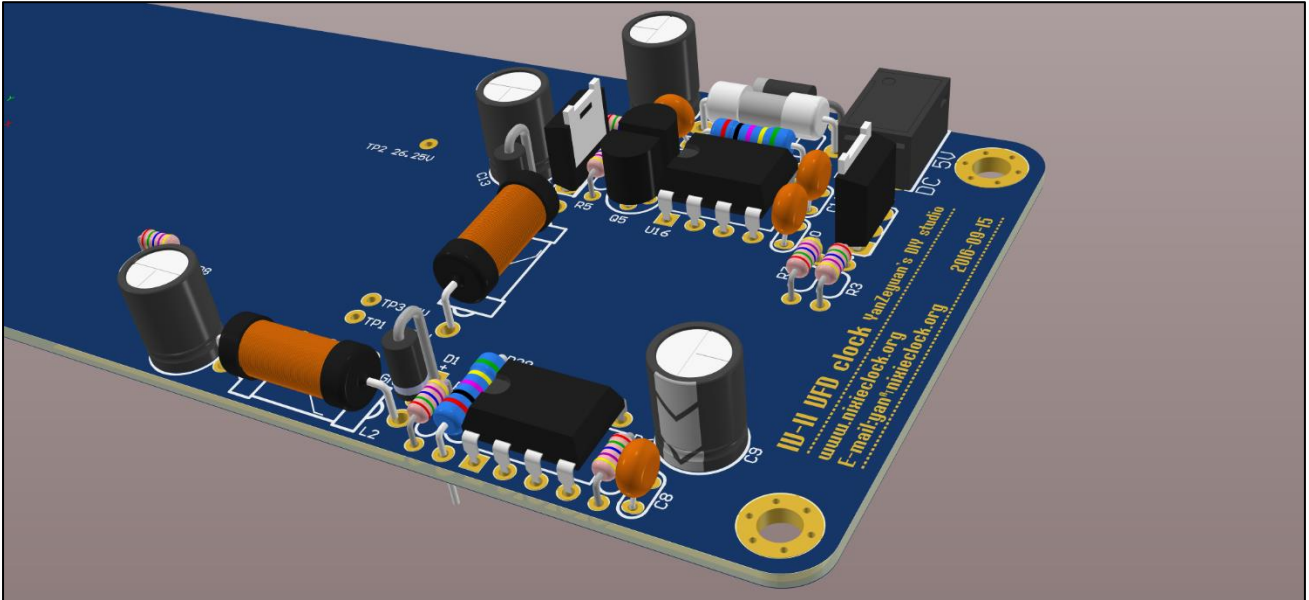
The following components are needed:

| Name | Description | Designator | Footprint | Qty | Value | Notice |
|---------------------|------------------------|-------------|-----------|-----|-----------|-----------|
| MC34063 | IC | U16, U17 | DIP8 | 2 | | Polarized |
| IRFU5305 | P-Channel Power MOSFET | Q1 | TO-251 | 1 | | Polarized |
| IRLU024 | N-Channel Power MOSFET | Q2 | TO-251 | 1 | | Polarized |
| Capacitor | | C8, C10 | C-102 | 2 | 330pF | |
| Capacitor | | C12, C14 | C-102 | 2 | 0.1uF | |
| Polarized Capacitor | | C13 | C-6.3x8 | 1 | 100uF/35v | Polarized |
| Polarized Capacitor | | C7, C9, C17 | C-6.3x8 | 3 | 220uF/16V | Polarized |
| PNP Transistor | | Q5 | TO-92 | 1 | C9015C | Polarized |
| NPN Transistor | | Q4 | TO-92 | 1 | C9014C | Polarized |
| FUSE | | F1 | F3.6x10 | 1 | 250V-1.5A | |
| Power Socket | | DC5V | DC-003 | 1 | | |
| Resistor | | R28, R31 | 1/4W | 2 | 0.24 | |
| Resistor | | R5 | 1/8W | 1 | 10 | |
| Resistor | | R1, R3, R4 | 1/8W | 3 | 1K | |
| Resistor | | R8 | 1/8W | 1 | 10K | |
| Resistor | | R6, R7 | 1/8W | 2 | 20K | |
| Inductance | | L1, L2 | L-5x12 | 2 | 100uH | |
| Diode | | D2 | | 1 | 1N4007 | Polarized |
| Schottky Diode | | D1, D3 | | 2 | 1N5819 | Polarized |

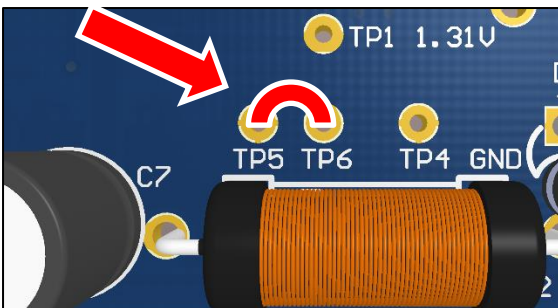
Solder all above listed parts to the PCB according to the silkscreen markings on the board. The polarity of the components must match the print on the board. See pictures in parts list for polarity and description. The result should now look like this:



Assembly electronic components

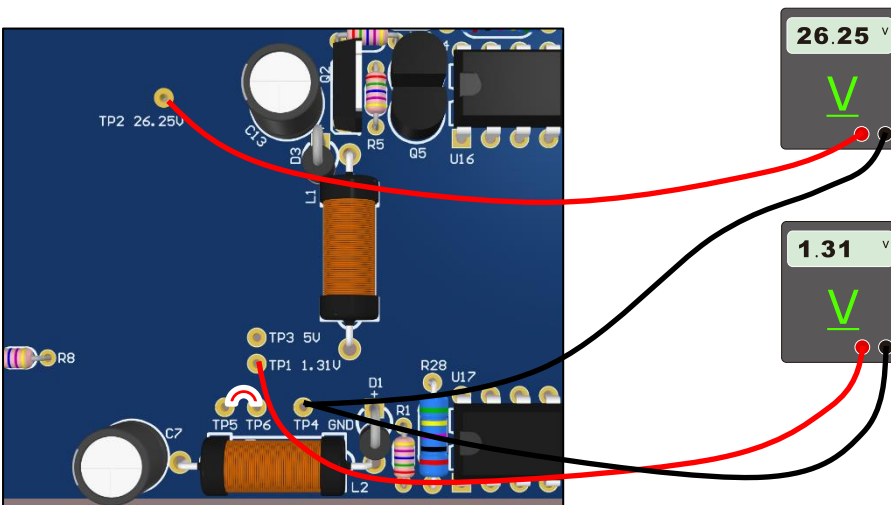


Please check the board to make certain that the parts are all soldered correctly, then for testing, place a wire jumper between TP5 and TP6 as shown below:



Connect the power adapter. The voltage measured between TP2 and TP4 should be about 26.25 VDC; the voltage measured between TP1 and TP4 should be about 1.31 VDC.

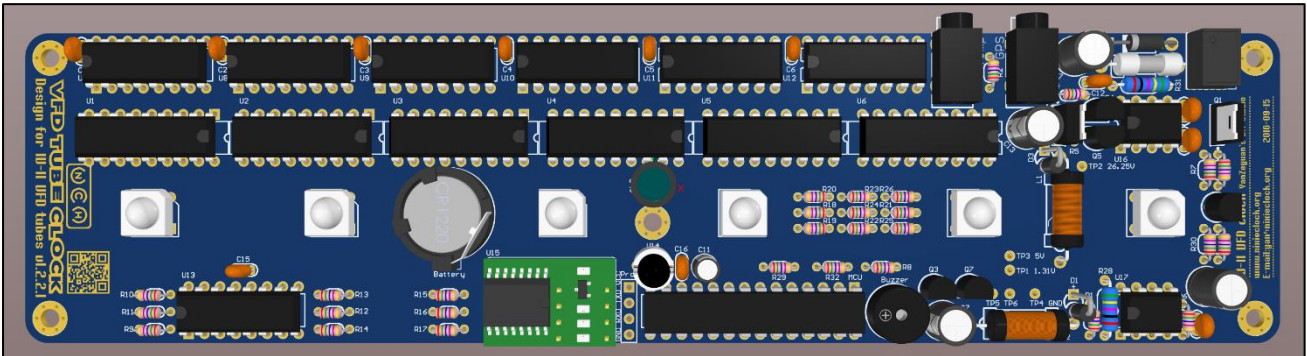
Please remove the jumper between TP5 and TP6 after measuring the voltage.



Assembly electronic components

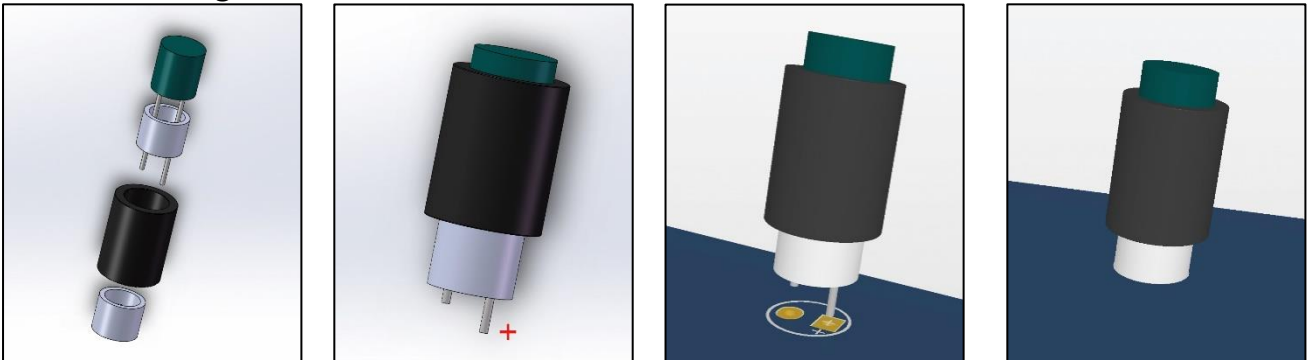
Assembly of the rest of the components (except IV-11 tubes)

Solder the rest of the components to the board, except IV-11 tubes. The polarity of the components must match the print on the board. The result should now look like this:



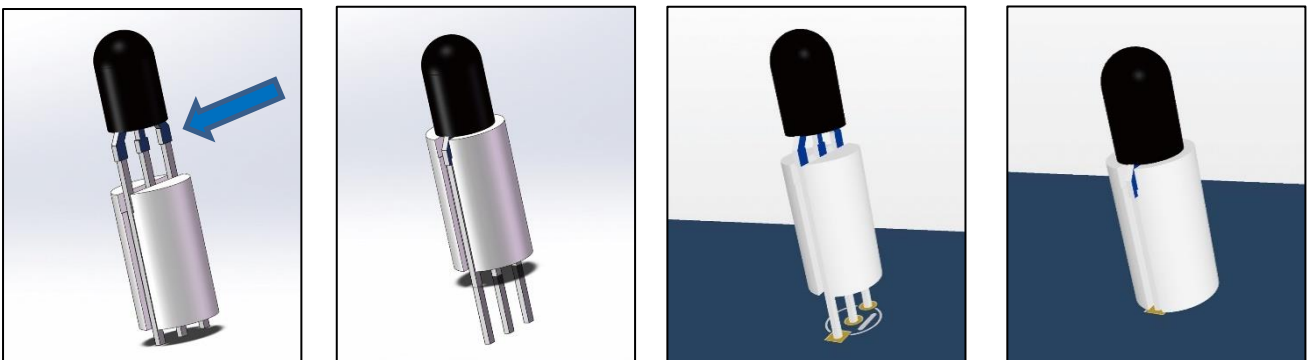
Ambient light sensor and IR receiver need special attention during installation:

- Ambient light sensor



The sensor needs to first go through a plastic spacer ($\Phi 5\text{mm} \times 3\text{mm}$), then go through the rubber sleeve and plastic spacer. Next, solder it on the board and match the placement and polarity following the pictures above.

- IR receiver



The receiver needs to first go through a plastic spacer ($\Phi 5\text{mm} \times 11\text{mm}$), then solder it on

the board, observing the blue mark on one side of the pins. Make sure the blue side is facing a line mark on the board as shown on the picture above.

Assembly electronic components

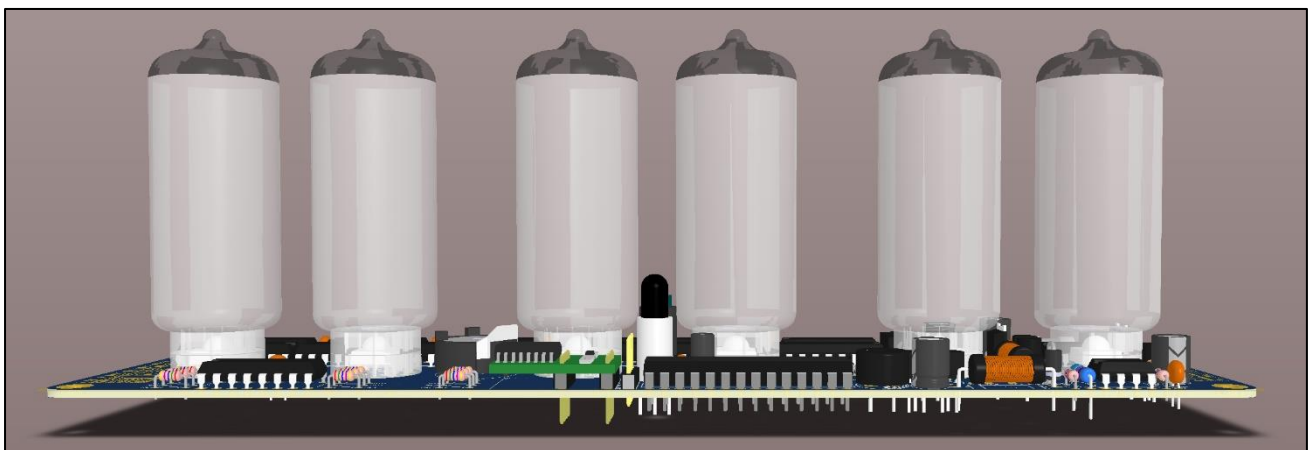
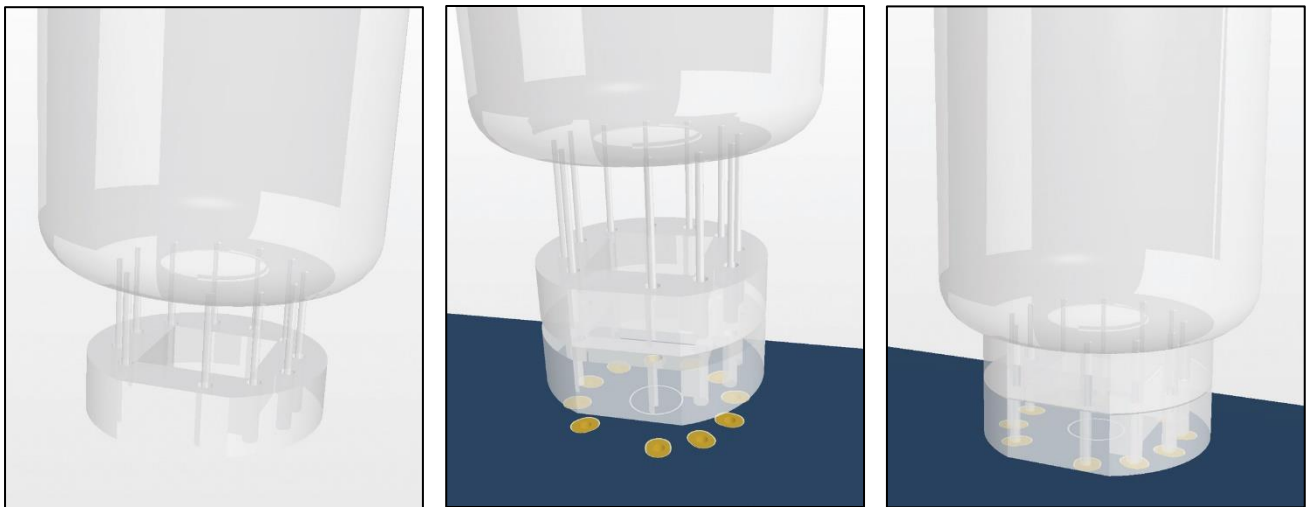
Please check the board and make sure the parts are soldered correctly. Then connect the power adapter and watch that six LEDs light up. The buzzer will make a "Beep" sound when the **Power button** of IR remote controller is pressed.

Assembly of IV-11 tubes

The following components are needed:

| Name | Description | Designator | Qty | Value | Notice |
|-----------|-----------------|------------------------------|-----|-------|--------|
| VFD tubes | | IV1, IV2, IV3, IV4, IV5, IV6 | 6 | | |
| | VFD tube spacer | Laser cut | 12 | | |

Please straighten all pins of tubes, then put pins through two tube spacers (please remove the protective film and clear all small holes), and solder the tubes on the board following the pictures below:



Please check the board and make sure all tubes are soldered correctly, then connect the power adapter and check all functions following the user manual.

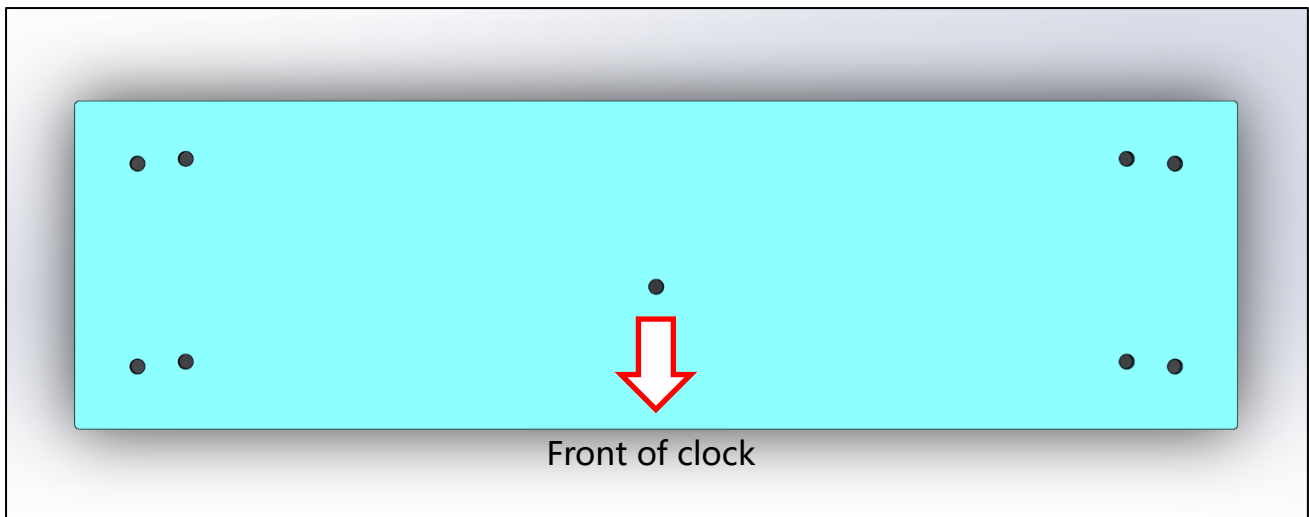
Assembly housing

The following parts are needed:

| Name | Description | Qty |
|---------------------------|--|-----|
| Top and bottom plate | Laser cut | 2 |
| Wooden frame | | 1 |
| Copper spacer | M3x18mm female-female for support top and bottom plate | 4 |
| Copper spacer | M3x5mm female-female for support PCB board | 5 |
| Philips screw | M3 x 4mm for fix PCB board | 5 |
| Hexagon socket head screw | M3 x 5mm for fix PCB board | 5 |
| Hexagon socket head screw | M3 x 8mm for fix top and bottom plate | 8 |

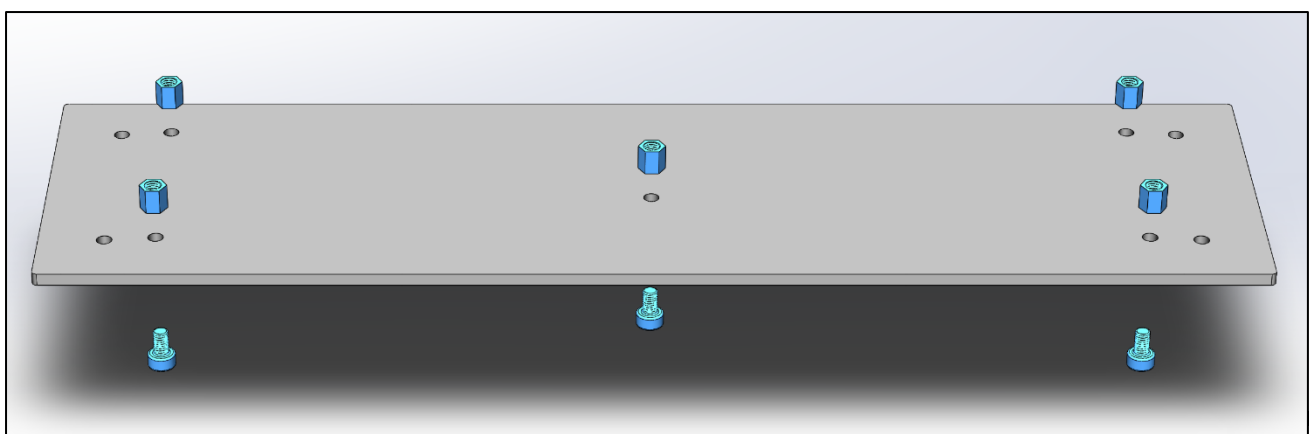
Step 1 Prepare bottom plate for assembly

Take out the bottom plate and place it in front of you following the picture below:

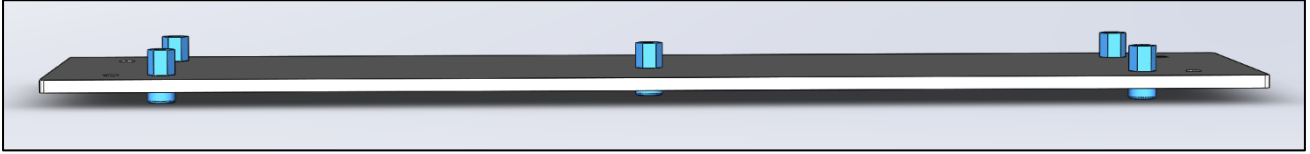


Step 2 Assemble spacers from bottom

Fix 5 pcs copper spacer (M3x5mm) with 5 pcs hexagon socket head screws (M3x5mm) from the bottom.

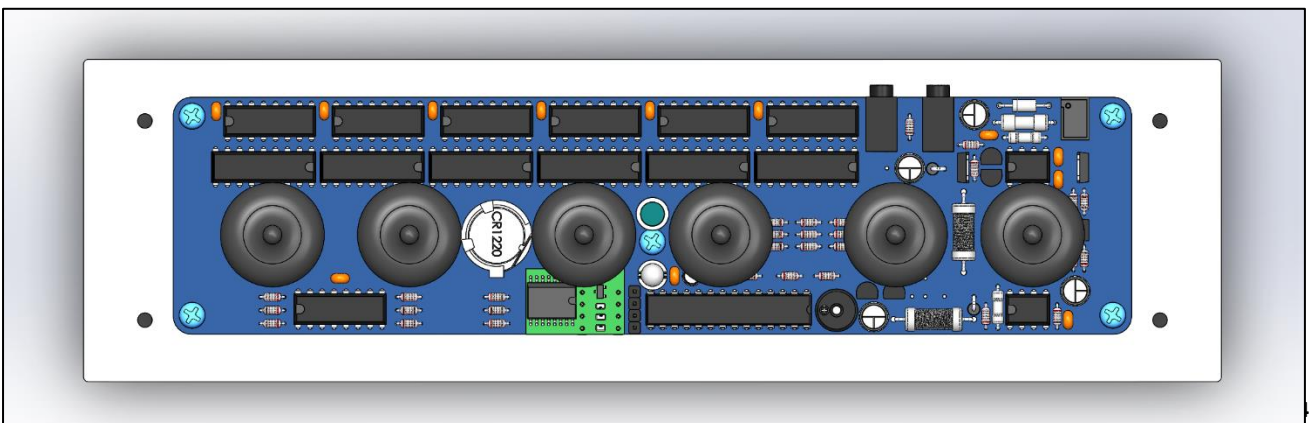
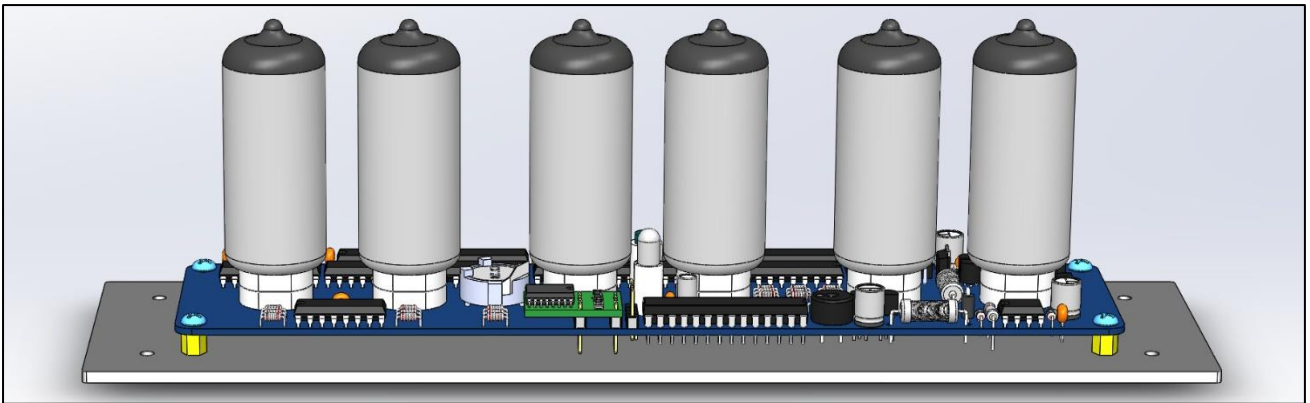
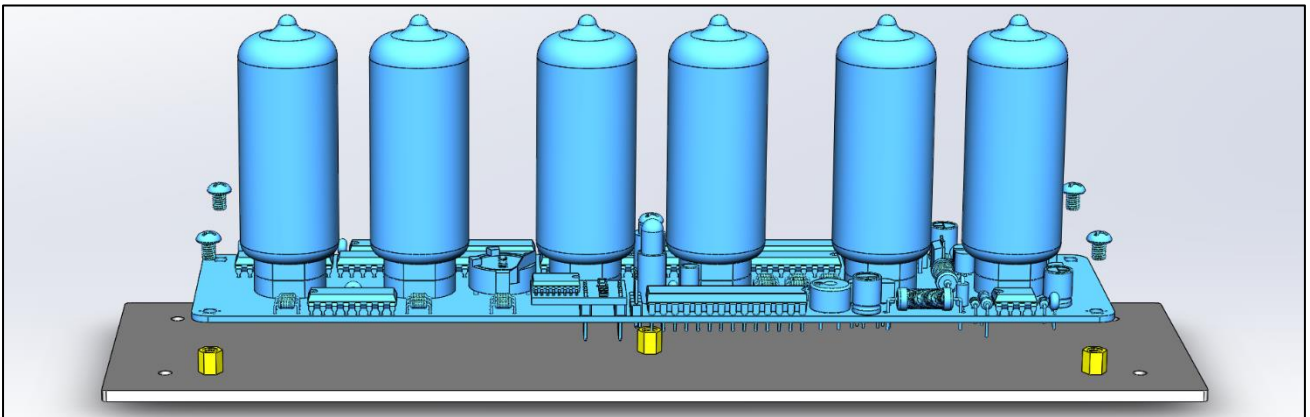


Assembly housing



Step 3 Affix the main board

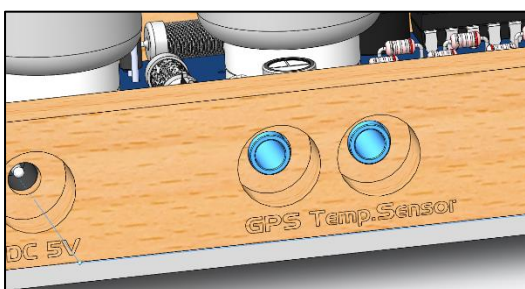
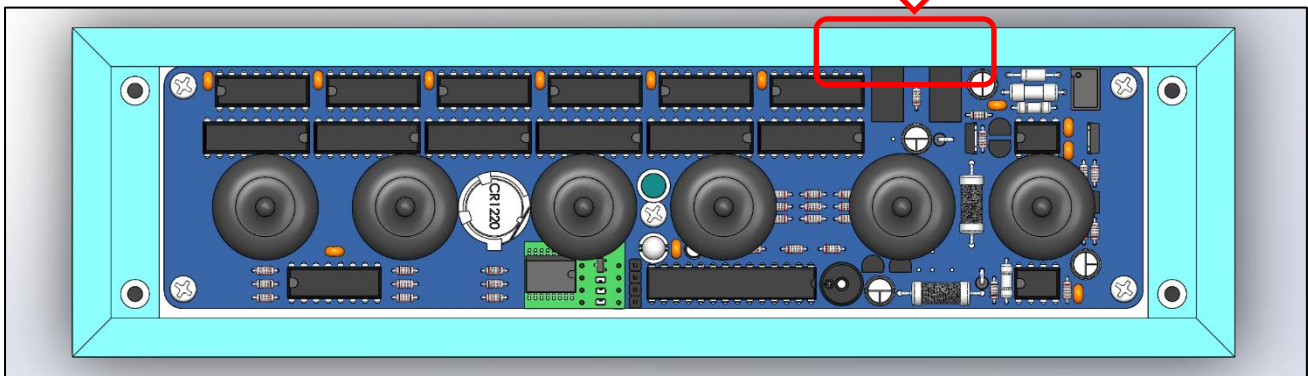
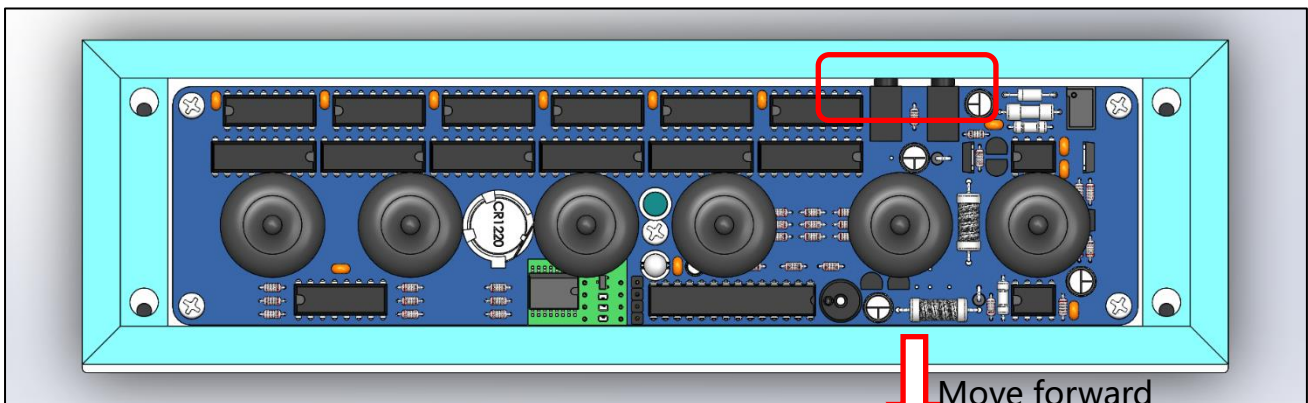
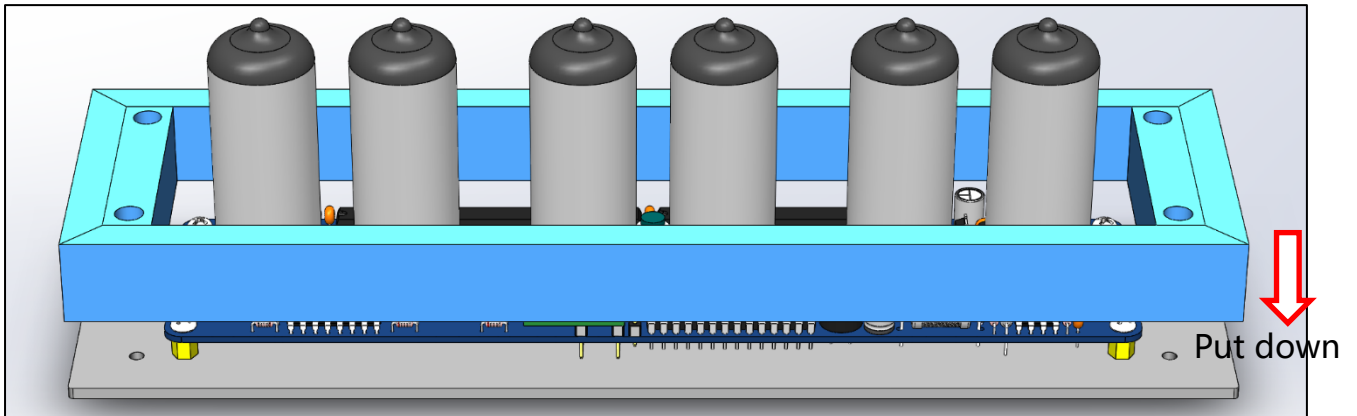
Affix the main board to the base plate with 5 pcs philips screws ($M3 \times 4mm$) from the top.



Assembly housing

Step 4 Assembly of the wooden frame

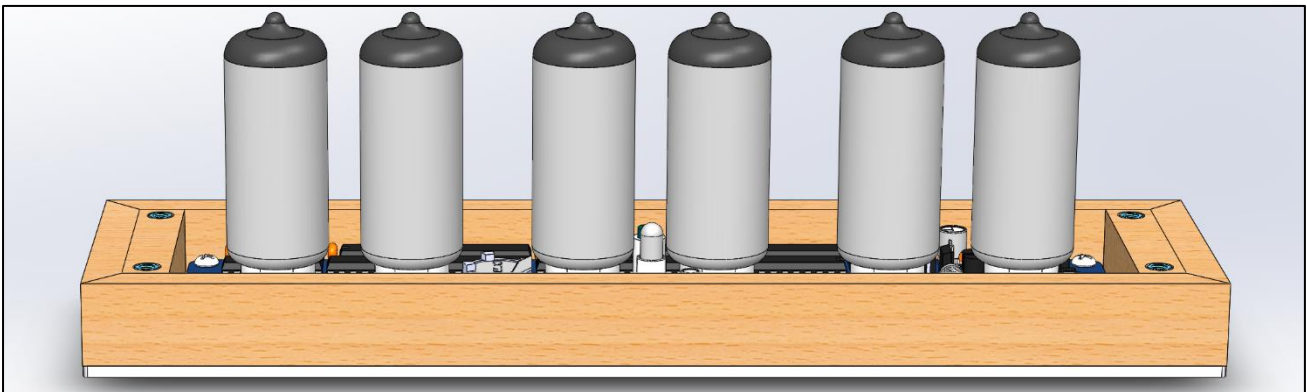
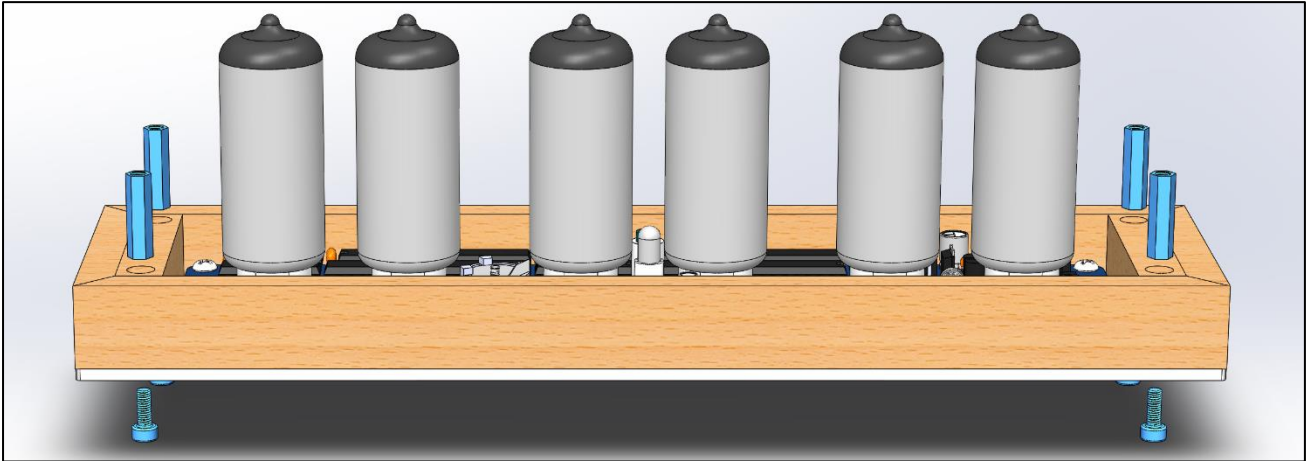
Assemble the wooden frame following the pictures below:



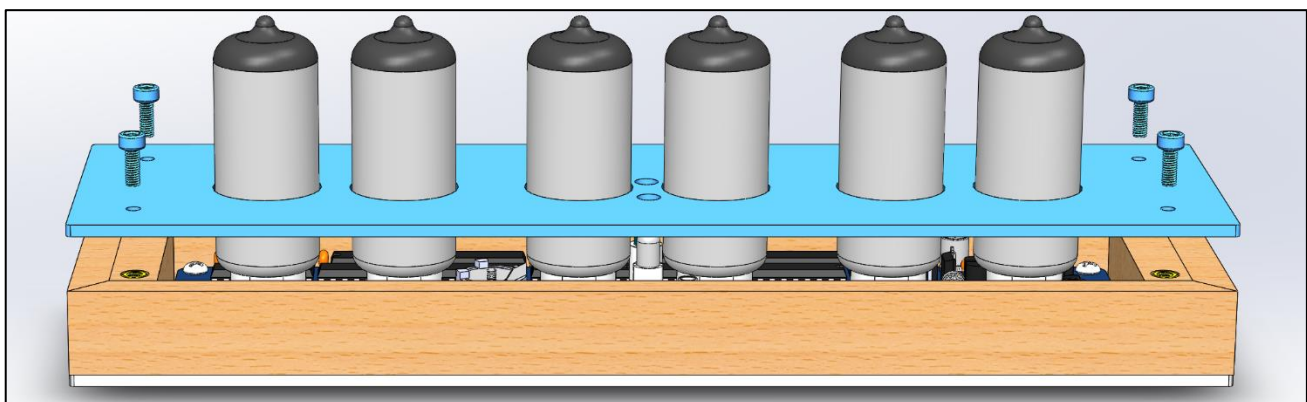
Two sockets will fit into the two holes of wooden frame.

Step 5 Assembly of the top plate

Fix 4pcs copper spacer (M3x18mm) with 4pcs hexagon socket head screws (M3x8mm) from the bottom.



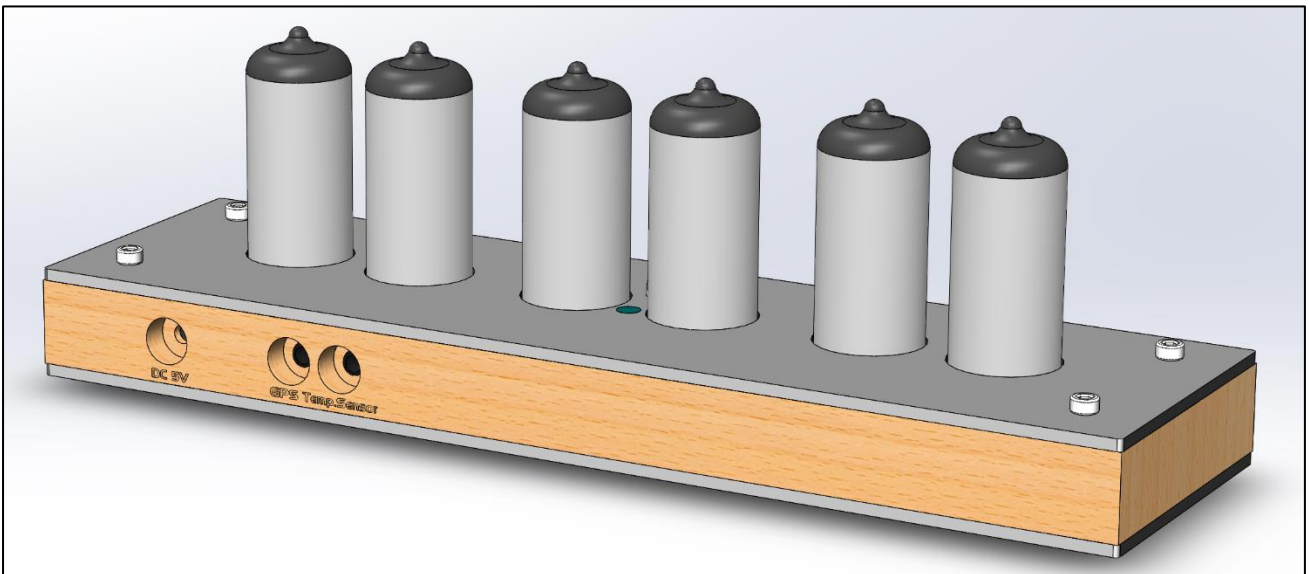
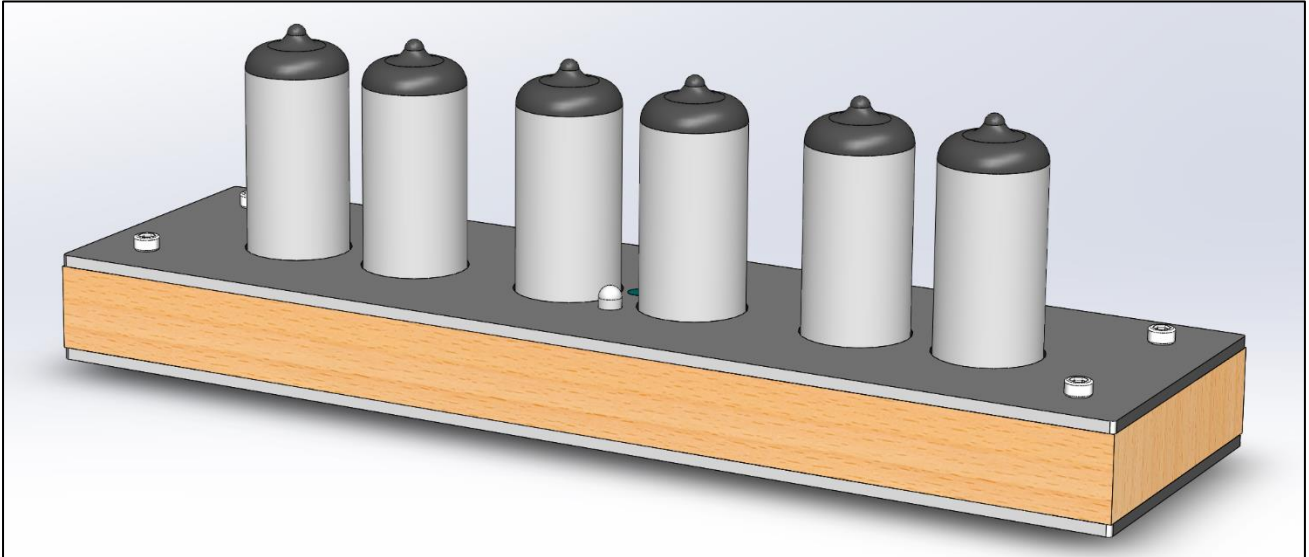
Then fix the top plate with 4pcs hexagon socket head screws (M3x8mm) from the top.



Do not tighten 4pcs of screws too tight to prevent from cracking the top plate.

Assembly housing

Now it is time to enjoy your beautiful new IV-11 VFD tube clock, have fun!



Any problems during assembly, please contact us.