

# ***USB2PPM Engineering board***

## Construction Manual

---

Version 1.0a  
Released 04/2023

Gregor Schlechtriem  
[webmaster@pikoder.de](mailto:webmaster@pikoder.de)

[www.pikoder.de](http://www.pikoder.de)

## Table of Contents

<b>Helpful Hints</b>	<b>3</b>
<b>Contents of the Kit and Tools needed</b>	<b>4</b>
<b>Construction</b>	<b>6</b>
Step 1: Populate the USB jack.....	6
Test step: Check USB connection .....	7
Step 2: Populate resistors R1, R2, and R3 .....	7
Step 3: Populate the capacitor C1 .....	8
Step 4: Populate the IC socket.....	8
Step 5: Populate the capacitor C2 .....	9
Step 6: Populate the LED .....	9
Step 7: Populate the pin header .....	10
Step 8: Insert the IC into the socket.....	10
<b>Commissioning</b>	<b>11</b>
<b>Connectors</b>	<b>13</b>
<b>Schematics</b>	<b>15</b>

## ***Helpful Hints***

Before you start the construction of your USB2PPM, please review these instructions completely. Then you would know what matters and would avoid mistakes that will be hard to fix afterwards.

A basic understanding of electronic parts, their handling, and soldering (including SMD components) is required for the construction and the commissioning of this engineering board.

Conduct the soldering and the wiring in an orderly and conscientious manner; do not use acidic solder of any kind. Make sure that there are no cold solder joints. Keep these things in mind, because an unclean or bad joint, a defective contact or a bad construction cause a time-consuming search for faults and could possibly cause a destruction of the components.

You can significantly reduce the chance that something will not work. Check every step before continuing. Follow the instructions! Only do the things written in the manual and do not skip any steps! Check every step twice: once for building and once to check.

Please take the time it needs to build this kit. Tinkering is not task work and should be enjoyable!

Please share with me any errors, unclear instructions or ideas for improvements. You can reach me at [gregor@pikoder.com](mailto:gregor@pikoder.com). I am looking forward to your feedback.

---

# 2

---

## *Contents of the Kit and Tools needed*

The kit in front of you contains all the necessary components needed to build a USB2PPM engineering board including the pre-programmed PIC16F1455. Please verify the completeness with the help of the attached checklist.

### Parts list: USB2PPM

#### Resistors

47k, 0,25 W (yellow/purple/orange/gold)	R1	<input checked="" type="checkbox"/>
470R, 0,25 W (yellow/purple/brown/gold)	R2, R3	<input type="checkbox"/>

#### Capacitors

100 n	C1	<input type="checkbox"/>
470n	C2	<input type="checkbox"/>

#### Semiconductors

PIC16F1455-I/P	IC1	<input type="checkbox"/>
LED 3mm bi-color	IC2	<input type="checkbox"/>

#### Misc.

Micro USB jack	J1	<input type="checkbox"/>
IC socket 14 pins		<input type="checkbox"/>
Header male 3 pins	PPM_OUT	<input type="checkbox"/>
Printed circuit board (pcb)		<input type="checkbox"/>

You also need the following tools:

1. Electronic Soldering Iron
2. Electronic Solder
3. Side cutters
4. Multimeter

Additionally, to commission your board you will need:

1. USB cable
2. PC with PiKoder Control Center (PCC, downloaded from [www.pikoder.com](http://www.pikoder.com))

---

# 3

---

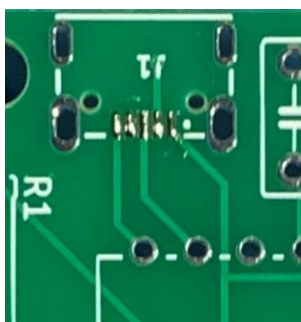
## Construction

The following paragraphs will describe how to populate the components on the circuit board. The silk print on the circuit board will support this process. All parts are populated on the top side.

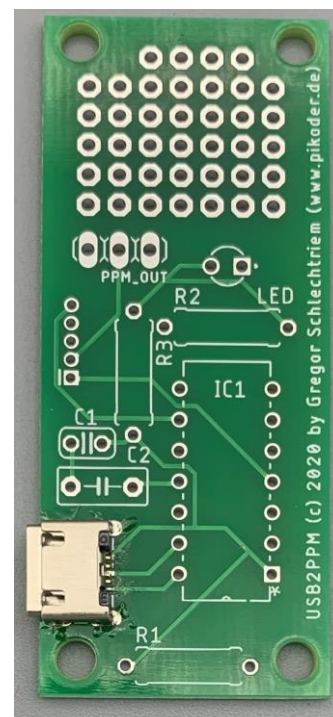
The order of the placement of the components depends on their height; generally, you will place the lower first.

### Step 1: Populate the USB jack

The first part to assemble would be the USB jack (SMD component). Use a very fine soldering tip and small diameter rosin core solder. Try to pre-melt solder onto the pads for the USB jack (see below). Place the component in the correct position and against the solder. Melt the solder while nudging the component into it. Ensure your iron also makes contact with the component leg, and the pad.



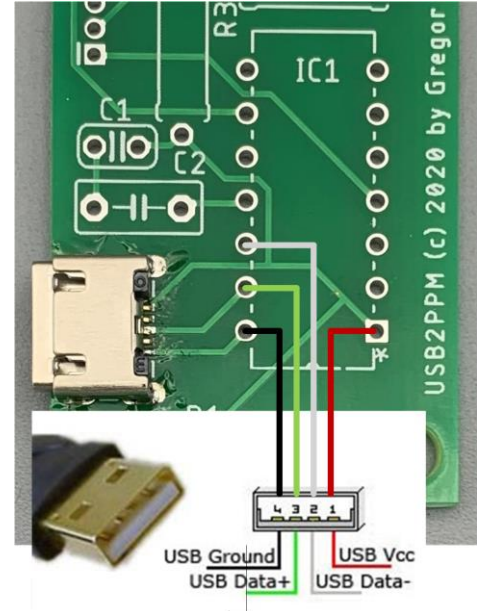
Solder melted on pads



## Test step: Check USB connection

By far the most support requestes and problem reports are linked to the USB connection. And it is very difficult to make any fixes or repairs once the IC socket is placed.

Therefore, you should verify that the first step was completed successfully. Please connect your USB cable to the pcb and verify the soldered connections by using an ohmmeter: one probe would be on the pcb pad and the other would be used to contact the respective metal connector of the USB cable. Please refer to the image regarding the four measurements to be made.



## Step 2: Populate resistors R1, R2, and R3

Now you would place the resistors R1 – R3. In order to do this, bend the connecting wires at a 90 ° angle based on the grid dimensions and then place the component in the designated holes (refer to the image to the right). Please pay attention to the color codes.

To ensure that the part does not fall of the circuit board when turning it around for soldering, bend the connecting wires at a roughly 45 ° angle apart and the solder them carefully with the conducting paths on the back of the circuit board. Afterwards cut off the excess wire.



### Step 3: Populate the capacitor C1

Next, place the capacitor C1 followed by a mild angling of the connection wires in order to prevent it from falling out. The capacitor is non-polarized; therefore, the alignment is irrelevant.



### Step 4: Populate the IC socket

Place the socket in the position indicated on the top of the circuit board. Once again, verify the positioning: the notch (marked with a red arrow in the following image) needs to point to the left.

To avoid the socket from falling out of its position when turning the board slightly bend the two outer diagonal pins and then go ahead and solder all the other pins.





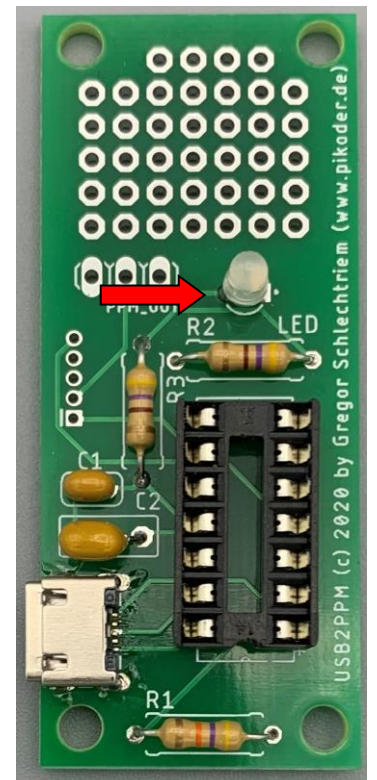
## Step 5: Populate the capacitor C2

Now, place the capacitor C2 into the respective position followed by a mild angling of the connection wires in order to prevent the pieces falling out. This capacitor is also non-polarized meaning that the alignment is irrelevant.



## Step 6: Populate the LED

Place the LED. Please note that the LED is polarized and that the shorter wire needs to be on the left hand side (see red arrow).



## Step 7: Populate the pin header

The last component you would solder on the circuit board would be the pin header.



## Step 8: Insert the IC into the socket

Finally, insert the IC with the notch (or point) fitting the notch of the IC socket (see red arrow in the image to the right).



---

# 4

---

## ***Commissioning***

Please start of by connecting your USB2PPM engineering board with the USB port of a Windows 10 computer. The PC will install the drivers needed upon the initial connect. Once this step is completed, your board is ready for use.

If you wanted to program USB2PPM settings, then please download the [PiKoder Control Center \(PCC\)](#) form the PiKoder website.

You will find additional information regarding the use and the suitable parameter values in the [PiKoder/USB User's Guide](#).



---

# A

---

## Connectors





# B

## Schematics

