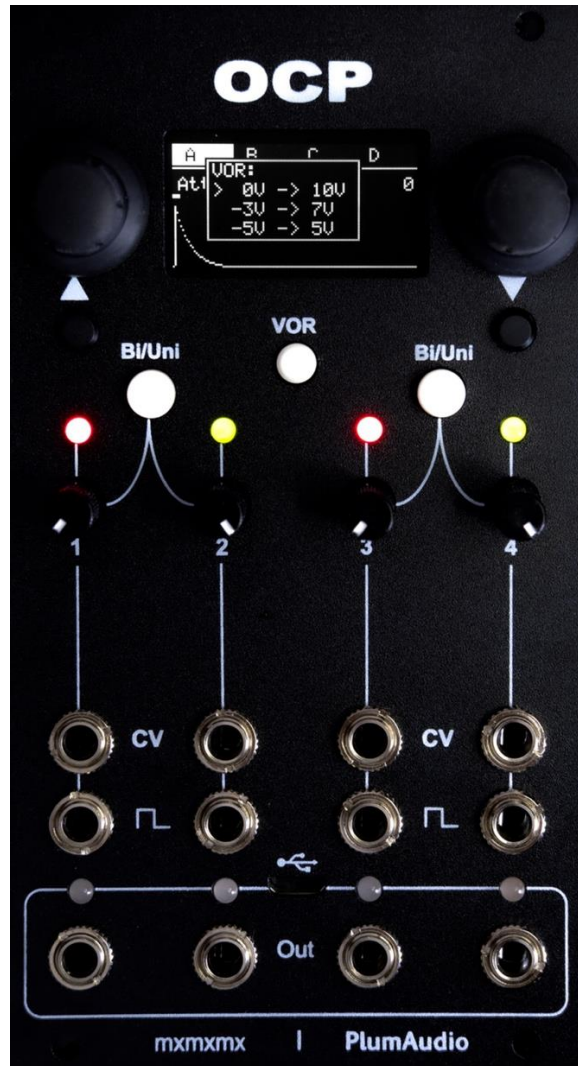




OCP (SMD) BUILD GUIDE



OCP is Ornament and Crime PLUS
Updated version of Ornament and Crime

Ornament and Crime - Polymorphic cv generator is one of the most versatile cv generator / processor modules for Eurorack.

Ornament and Crime can load dozens of different apps for many uses.

If this is your first Ornament and Crime - you are going to love this module and you will always find creative ways to use it in any of your following patches.



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PLUS?

OCP is slightly different from other Ornament and Crime versions, a few improvements are added to OCP:

VOR – Variable Outputs Range make it easy to select different offsets for the outputs (Unipolar 0-10v, Bipolar +/-5v and Asymmetric -3v to 7v), with the official firmware the module automatically chooses the best offset for each application and you can always change it with the dedicated VOR button.

Extended Range – OCP outputs can deliver 10 volts peak to peak when VOR is activated.

Front USB Input – Can be used for easily accessing - MIDI to CV / CV to MIDI functions of the Hemisphere firmware (Captain MIDI).

Atenuverters – With the 4 knobs you can scale and invert any modulation source you plugged to the CV inputs, when nothing is plugged in, those knobs are connected to an internal voltage source and can control many parameters of each application.

There are several steps in the assembly process:

1. Back side assembly
2. Front side assembly (UI parts)
3. Firmware Installation and Calibration

You will need those tools for the assembly process:

1. Soldering Iron and high quality soldering wire
2. DMM - Multimeter
3. Cutter
4. Paper masking tape
5. USB cable (Type A to micro USB Type B) – Note that you are using a cable that is capable of transmitting data.
6. Computer with free USB port for Firmware installation.



*** Tip about soldering iron tips:**

There are many soldering iron tips (heads) that are used for different kinds of soldering tasks, In fact, you can do all types of soldering with one conical (cone) tip and get good solder points, but I definitely recommend using the types of tips that are appropriate for the specific soldering task.

This is to make the solder faster and get better and nicer results.

For this project I'll recommend to use 2 types of soldering iron tips :



conical tip (at 360°-430°C) for most of the parts in this project, The sharper the edge, the higher the temperature.

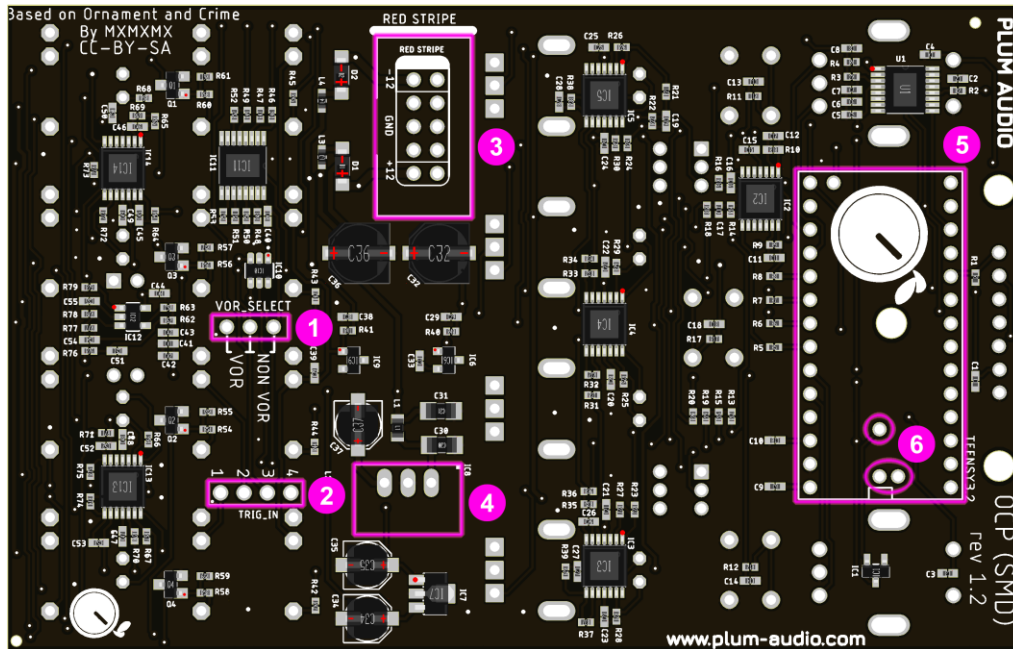


Knife tip (at 300°-360°C) for pin headers and IC sockets, with this tip you can hit up 2-3 pins simultaneously and solder long row of pins in one continuous drag (my favorite tip!)







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BACK SIDE OF THE BOARD:

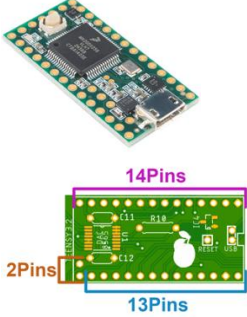



All the SMD components are already pre-soldered but few TH parts should be soldered here:
The parts are ordered according to their height on the board and I recommend assembling them in this order.

<p>1</p>	<p>VOR Pin headers (1 Row of 3 Pins) for VOR Select jumper.</p> <p>After soldering - Use the jumper cap to select the desired option. The position of the jumper is used to set or disable the VOR option of the hardware. See further explanation later in this document</p>	
<p>2</p>	<p>Back TRIG Pin headers (1 Row of 4 Pins) For back TRIG_IN Interface.</p> <p>These headers are connected to the normalization pin of the trigger inputs and allow a 1uT_u (1U Temps Utile) connection in favor of receiving triggers from the back (or connection to the trigger pin of the bus board if you have supporting modules)</p>	
<p>3</p>	<p>Power connector – Power ribbon cable should connect your bus board to this connector. pay attention – the “cut” in the plastic shield should oriented as printed on board.</p>	
<p>4</p>	<p>R785.0-0.5, 5V DC-DC Converter (Regulator)</p>	

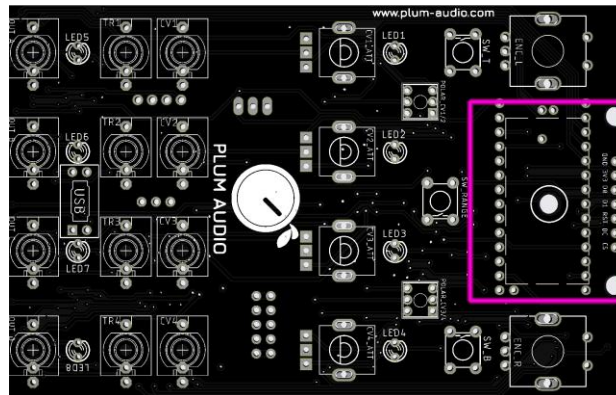


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5	<p>Teensy 3.2</p> <p>Inside the kit you will find the teensy board and rows of 14, 13 and 2 pin headers, the male headers is already attached to the female sockets (If not, please connect them before soldering).</p> <p>The side of female sockets should soldered to the back of the module board and the pin headers to the teensy board. Insert all sockets to the holes in the module board, place the teensy on top of the pin headers and first solder the pins to the teensy.</p> <p>then you can solder the female headers to the main board from the other side.</p> <p>Watch Video (Video of the TH version assembly, it's exactly the same here...)</p>	
6	<p>Pogo Pins</p> <p>used to connect 3 pads from the bottom of the teensy board to the module board.</p> <p>one pin is for reset and other two is to connect the USB data signals (D+ and D-).</p> <p>first you need to remove the teensy from his socket.</p> <p>Insert the pins to the holes (spring end should face up) and solder them from the other side of the board.</p>	

FRONT SIDE OF THE BOARD (INTERFACE PARTS):

1. OLED SCREEN



Inside the kit you will find a small bag with the OLED, 3 standoffs and 1X7 pin header. First screw the 3 standoffs to the board in order to support the screen, insert 1X7 pin headers to the holes in the module board.

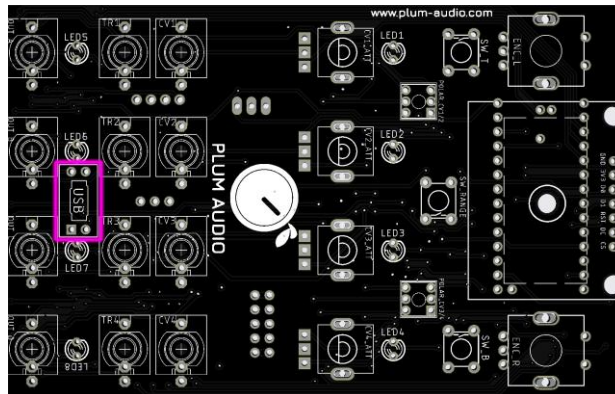
Place the screen on top of the standoffs, make sure that the pin headers in their places from both sides and tight the top 2 screws. now you can solder the pin headers from both sides.

[Watch Video](#) (Video of the TH version assembly, it's exactly the same here...)



For the rest interface parts – Put them in place but do not solder them yet:

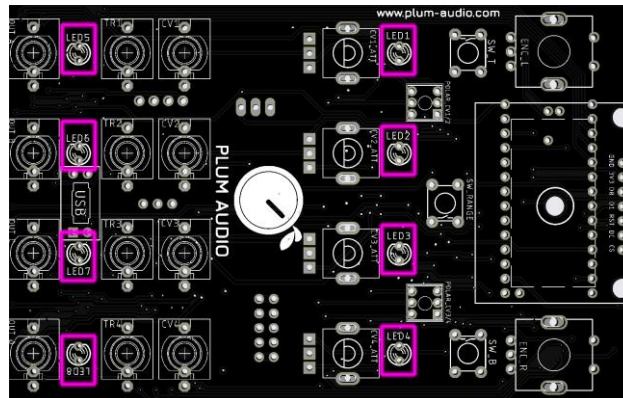
2. USB Jack:



Prepare the USB board by soldering the USB jack to the small USB board and the pin headers to the bottom side of this board. Place the USB board in his place on the module board, don't solder it yet.

[Watch Video](#) (Video of the TH version assembly, it's exactly the same here...)

3. LED's



Inside the kit you will find a bag of bipolar LEDs.

These LEDs should light green when the voltage is positive and red when the voltage is negative.

Use the black LED stands provided in the kit, which allows the installation of the LEDs at the right height and provide support and insulation for the LED legs.

Place the LEDs in their holes, the flat side of the LED's should be oriented as printed on the board.

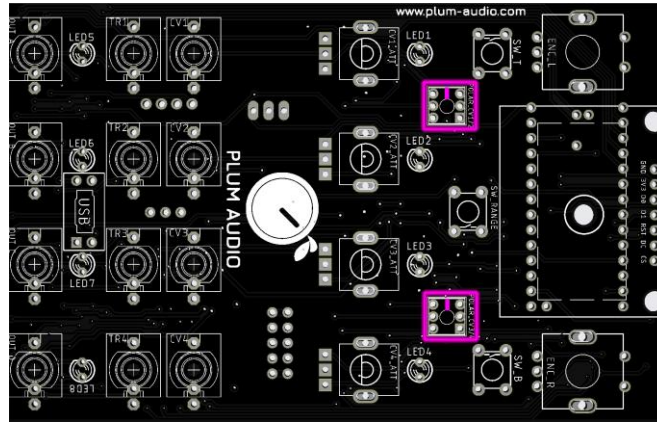
bend the legs in the other side, do not solder the LED's yet.

You can solder the LEDs only after you checked if they light the correct colors (do it as the last assembly step):

- Top row of LEDs should light Green when attenuators fully clockwise.
- Outputs LEDs (at bottom of the module) should light Red when the module is powered and the default app is activated (ASR app in official firmware).

If this is not the case, it means the LEDs are in reverse polarity.

4. Push Buttons:



Inside the kit you will find 2 push buttons with a white caps.

Although they will work even if you install them in reverse polarity - for the sake of interface correctness you should install them in the correct polarity.

the buttons have two modes: pressed and unpressed, the un-pressed state should indicate bipolar operation of the attenuverters and the pressed state will indicate unipolar operation.

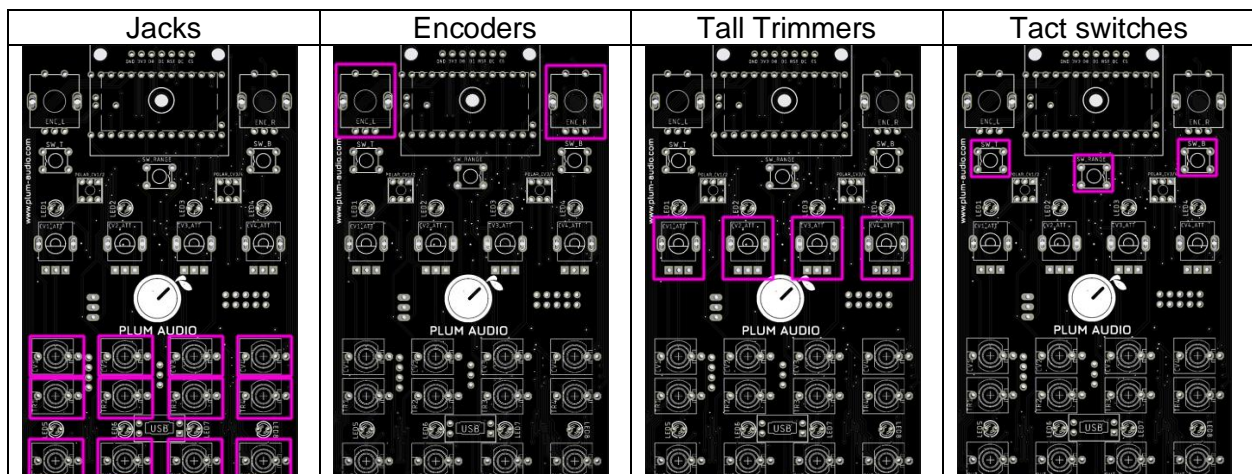
At the bottom of the button there is a minus mark on one side, this mark should be directed to the left.

Insert the buttons to the holes in the board but do not solder yet (you can bend tow legs from the other side to hold them in place).



5. Jacks, Encoders, Tall Trimmers, Tact switches:

There is no special instructions for the rest of the interface parts, attach them to the board but do not solder yet.





6. After all UI parts are in place attach the panel and tight all jack nuts and encoder nuts.
7. Use paper masking tape to hold buttons and LEDs in place and solder all parts except the USB board.
8. Before you solder the USB board, connect a micro USB cable to the jack (leave the other end unconnected), push the pin headers of the USB board against the cable and make sure the jack align with the panel.
9. After everything is soldered in place, put the Knobs on the encoder shafts.

Hurray, you're almost done!

Install firmware and calibrate your module before first use...



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VOR / NON VOR:

Before installing the firmware it's time to choose about VOR.

VOR = Variable Outputs Range.

VOR is a unique feature of Plum Audio versions for Ornament and Crime.

Other versions (Non Plum Audio) of Ornament and Crime modules can only offer output range of 9 volts peak to peak (vpp) and single offset from -3v to 6v.

To change this offset, physical resistors at the circuit board should be replaced with different values followed by long calibration process.

This range is a compromise for most o_C applications, it is not good enough for envelopes which needs a peek of 8v-10v to completely open a VCA and it's not good enough for a LFO's which needs a -/+5v (Bi-Polar) range for its operation.

Plum Audio versions (Like the OCP module you just built) comes with VOR option, when you are using VOR you get:

- extended range of 10 volts peak to peak (vpp).
- option to set the offset to: Bi-Polar (+/-5v), Uni-Polar (0v to 10v) or Asymmetric (-3v to 7v).
- Auto select of VOR offset when opening new app (In official firmware only):
Envelopes – Uni Polar
LFO's – Bi-polar
Sequencers and Quantizers – Asymmetric.

VOR required a special circuit on the module followed by VOR supported firmware and different calibration process.

To activate VOR in hardware level – Move the VOR SELECT jumper on the back to VOR position.

VOR supported firmware can be download from Plum Audio website:

<https://www.plum-audio.com/oc-firmware>

The combination of official firmware with VOR is highly recommended, if you want to work with other firmware we recommend disabling VOR due to the lack of VOR support for other firmwares.

Notes:

- When VOR is disabled - The VOR button on the front panel does nothing ...
- When switching from VOR to NON VOR or vice versa recalibration is required.
- VOR supported Hemisphere is available but there is a bug in the calibration app, if you planning to use this combination first calibrate your module using Official firmware (VOR Supported) and switch to VOR Supported Hemisphere after the calibration is complete.



CALIBRATION:

Before you can use your new OCP it is very important to calibrate it - [Watch Video](#).

The calibration lets you fine-tune the CV outputs and inputs as well to adjust some basic settings.

The calibration procedure of the OCP is similar to any other Ornament and Crime version but when using VOR there are few more steps.

In this document I will review the calibration of OCP with VOR firmware in highlights.

To read about the calibration procedure in depth please refer to the Ornament and Crime manual [here](#).

To enter to the calibration mode push down and hold the left encoder during startup.

1. Encoder directions:
With the encoders supplied with the kit, the left encoder will be in reverse direction, to fix it – press twice on the “up” button (the button bellow the left encoder).
2. Use default values:
Yes! It is a new module that has never been calibrated before...
3. Correct display offset:
With the OLED provided there should be no offset problems, you can skip to the next step.
4. CV Outputs:
In the following 40 steps you will calibrate the CV outputs from the farthest left out (A) to the farthest right out (D).
There are 10 calibration points for each output - 0v to 10v.
5. VOR:
The next 2 steps are used to calibrate the 2 extra offset modes of the cv outputs (VOR), first step is for the bi-polar mode and second for the asymmetrical mode.
In both steps you need to calibrate to the closest you can get to 0v. Since VOR system is using the internal DAC of the Teensy (less accurate then the main DAC) precision of +/-0.0015v is fine.
6. CV Inputs:
To calibrate the CV Inputs 0v first turn all attenuverter knobs fully clockwise and insert patch cable to each cv input you calibrate.
Leave the other end unconnected.
to calibrate CV in 1 to 1v and 3v, connect the other end to one of the outputs.
7. Screensaver timeout period:
Here you can set the timeout period before the screensaver is activated.
The default value is 25 seconds, if you preferer longer or shorter times you can configure it now.

Save? Yes!!! ☺



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You're done!

Check your new OCP and read Ornament and Crime firmware manual to understand how to operate it.

If you have problems, questions or if you found mistakes in this document visit [PlumAudio DIY First Aid](#) group at Facebook to get help or to contact me.

With Love,
Shay Shezifi,
Plum Audio



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