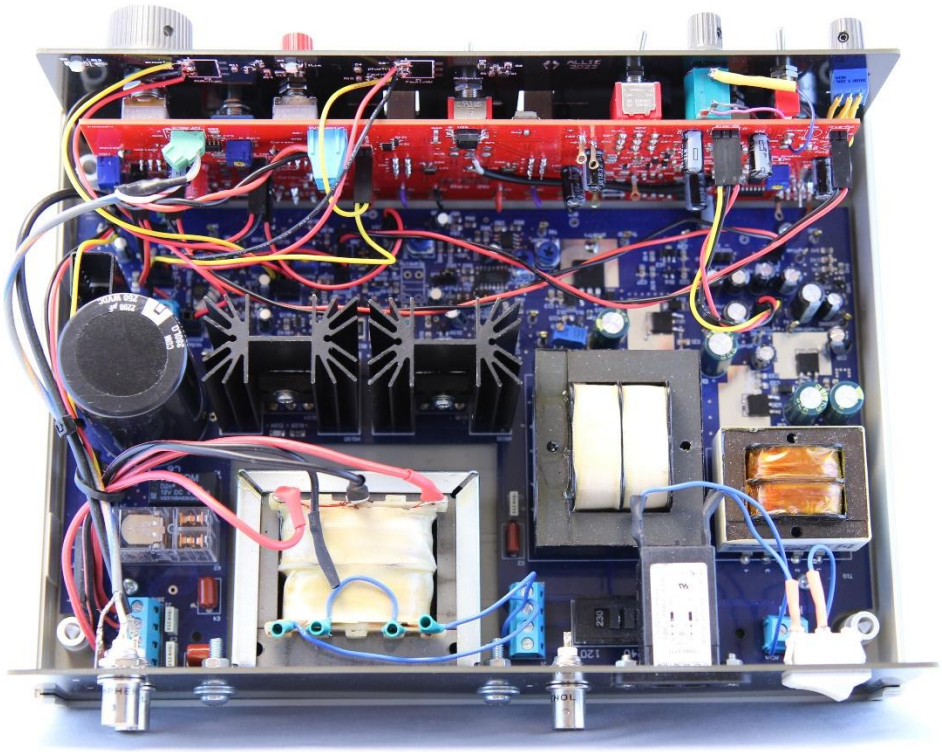
Front panel & Front Board
Installation Instructions

The whole Front part of the curve tracer is made up of 2 boards. The Front Board and the black Front Panel. The Front panel is the one with the silkscreen markings for the control indicators on it. It is the one visible when installed in the case. These 2 PCB's when put together form a sandwich of sorts.



This sandwich has a distance between them. The PCB surfaces that face each other determine this distance. The minimum distance is 17mm, you can go up to 18.5mm. This has to do with the shortest

and tallest parts. The shortest part is the 16-position step output rotary switch S21 and the tallest part is the Current range rotary switch S101 or the optional 3 or 5-turn Offset pot, Pot20. This potmeter requires at least a 16.5mm spacing. This multi-turn part may come with a nut that may be too thick for the knob you want to use. You can use any of the nuts that come with the toggle switches, they have the same pitch. The toggle switches that are mounted on the Front panel need to have pins that extend through the solder holes in the Front board. S21 has a mounting shaft that needs to stick out of the Front Panel enough to put a nut on it and mount the knob. Try the secure mounting of the knob you selected before you make anything permanent.

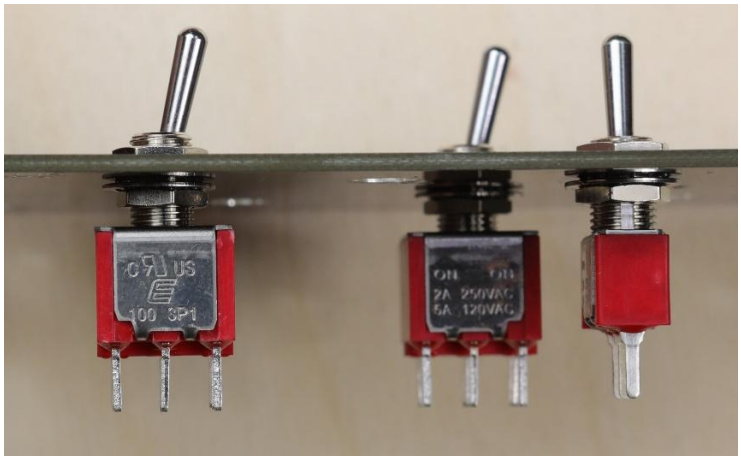
Note that we have recently made the two 3-pin connectors (P1 and P2) on the Front panel optional. These connectors are a pain to use and only accept a solid core wire. I simply soldered the multi-core wires I used directly to the solder pads of these connectors. This can be seen in the picture just above.

1. Solder all the SMD components to the Front board and the Front panel on both sides.
2. Be aware that it is very difficult to differentiate between the cathode or anode side for the special reversed mounting SMD LED's for the Front panel. Use a DMM in the Diode mode to make sure you mount them correctly.
3. While adding the THT parts, the silkscreen can be used to figure out to what side of the board the components need to go, but take extra care of soldering them to the correct side. On the GitHub are 3D files for the boards to make it clearer.
4. The 100uF caps can now be mounted on the Front board. Note that it is better to mount C23 to the other side of the board. Other makers have noticed that it hits the Main board. Also note that C79 is a 35V version. After soldering, but before you clip the leads, use a DMM and check for shorts on all the electrolytes.
5. Make sure that the two DUT connectors will fit the rectangular holes in the Front panel. There are no specifications for them, so we don't know if they will always fit. Use a fine file to make them fit if needed, but use tape around the edges of the PCB to protect the front of the Front panel in case you slip the file, to avoid scratches.
6. Solder the two DUT connectors flush to the Front board. Solder only one pin each to allow for easy removal and making adjustments.
7. You can now solder the 3 terminal blocks to the Front board, facing away from the Front panel.
8. You can also add the 2.54mm male connector strips, they are used to connect the Front board to the Main board and the Front panel.
9. There are a number of test points, now is a good time to populate them.
10. Add the trim pots.
11. If you deviated from our BOM and used a ¼ inch shaft Step Delay potmeter with the switch (Pot 2), you will need to ream out the hole in the Front panel a small amount. Make it large enough so it slides easily in and out.
12. We can now start to add the parts that will determine the mechanical connection between the Front board and the Front panel.
    The distance between the two boards will depend on the two tallest parts, the number-of-steps

rotary switch, or the current range rotary switch. In my case, the number-of-steps rotary switch sets the minimum distance to 18.4mm, so that fixes my distance to 18.5mm between the two boards all around. It helps if you create a few studs with that exact distance to aid in the adjustment of the distance between the boards.

The distance of 18.5mm between the boards all around can now be measured/created and can be adjusted by the nuts of the toggle switches.

13. Mount the number-of-steps rotary switch first. The lock of the number-of-steps rotary switch S3 needs to be adjusted so that there are only 8 positions. Secure that well with a nut and tighten it. Position the Step selector rotary switch on the board. Be careful of the position and solder only the middle pin. It's not easy to have it flush and vertically centered to the board so you may have to wiggle it to adjust it. Remember that this switch sets the minimum distance between the boards so make sure to solder it flush to the Front board.
14. Verify that the Current Range rotary switch S101 has been set to 6 positions. If not, remove the nut and the anti-slippage ring from the switch and check that the blocking ring of the switch is in position 6. Add the anti-slippage ring again and tighten the nut well. Verify that you now have 6 positions. Put the Current range switch in position on the bottom of the Front board and measure the height from the Front board to the top of the nut. It should be a bit less than 18mm. If it's more than 18.5mm, you can use a fine file to remove up to 1mm from the four plastic stand-off pins. Solder only the center pin of the Current Range rotary switch so it is flush to the Front board but can still be easily removed.
15. We're now going to add the toggle switches one by one so we can check and adjust the distance between the boards. The toggle switches have long solder lugs, so you can adjust the height above the Front board by the amount you let the switch "sink" into the holes of the PCB, while maintaining the spacing between the boards. To prepare, remove all rings and nuts from the toggle switches and then place just one nut about half way on the shaft. Use a caliper and fix it at 18.5mm.
16. Mount the Offset polarity switch S20 and the Y-Amp mA/Div toggle switch S70 to the Front panel. You should have already one nut on the shaft. Mount the two switches with a second nut on the Front panel such that the shaft still protrudes a fraction above the nut on the Front panel. This is only such that it is visually pleasing and there is enough room for the nut. Loosely tighten the nut on the other side, so the switch is in position but can still be moved and turned. You could use the anti-slippage rings on the back of the Face plate, see below, but they are not required.



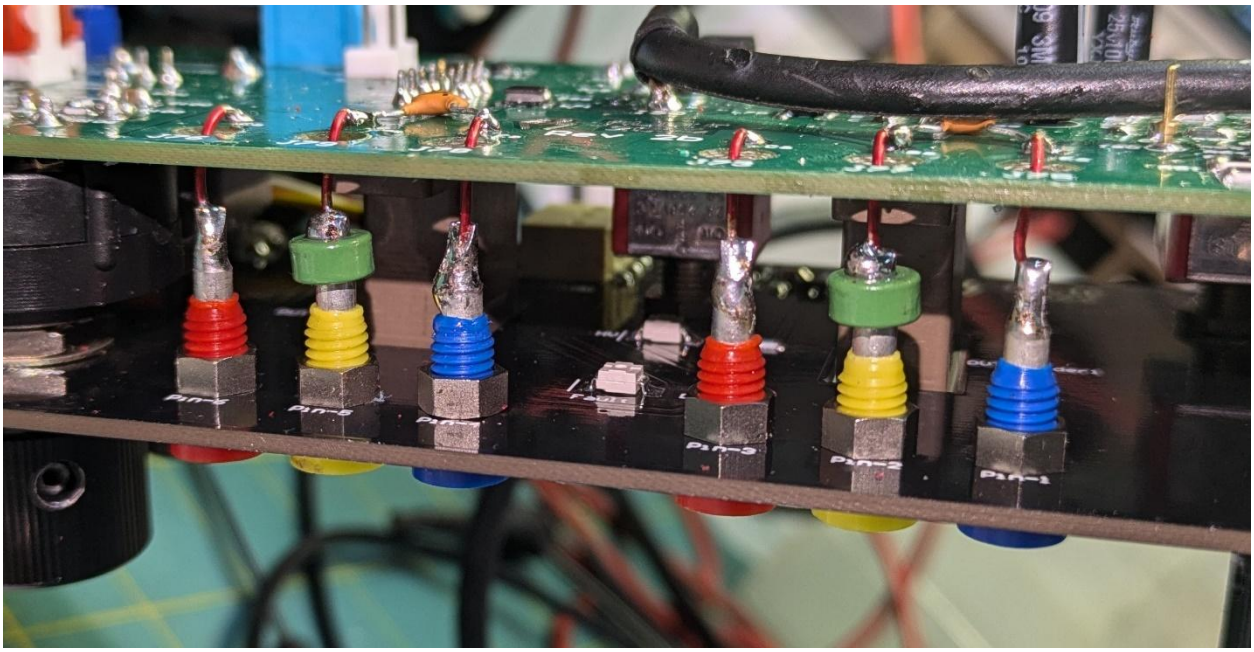
17. Put the Front panel on top of the Front board and position the two toggle switches so the pins fall in the holes of the Front board. While using a caliper or your studs, adjust the distance between the two boards by raising or lowering the solder lugs of the switches in the board. Start with the X-Amp switch and position it well. The end of the pins of the switch could be flush with the board. Solder only one pin of the switch in position. Soldering only one pin will allow you to readjust the 18.5mm distance between the boards. Do not rely on the amount the switches protrude through the board. It depends on the switch version and also tolerances. Measure the distance between the boards.
18. Now do the same with the Offset switch. Verify that the distance between the boards is still 18.5mm.
19. Remove the nuts from the two switches on the Front panel side and separate the two boards again. Make sure you keep the other two nuts on the switches undisturbed.
20. Mount the DUT selector toggle switch S71 and the Voltage Range selector switch S100 on the Front panel in the same way as the previous two. As before, put the Front panel in position on top of the Front board such that the pins of the two switches are in their respective holes on the PCB.
21. Verify the 18.5mm distance between the Front panel and the Front Board again and proceed to solder one pin of each switch to the Front board.
22. Remove the two nuts on the Front panel side of these switches and separate the two boards again.
23. Mount the Polarity switch S72 to the Front panel and adjust the height with the two nuts but keep them loose enough.
24. Put the two boards together again and position the Polarity switch. When the distance is 18.5mm, solder one pin. Remove the nut from the Front panel side.
25. Now add the BJT/FET and the Sweep/DC switches the same way, checking the 18mm and solder just one pin.
26. You can now also mount the Current and Voltage potmeters. You can remove the rings, but keep only one nut on the both potmeters. They are used to adjust the 18.5mm distance. Position and hold the potmeters flush to the board and solder one pin. Both potmeters can be soldered flush to the Front board.

27. Finally, you can mount the Step Output rotary switch S21. Because this switch does not have a stop, it does not really matter how you position it on the Front board. However, the bottom hole on the Front board is position 1 (the 50nA/50uV position), so you could position it using that way. It can be mounted rather flush to the board, but don't bend the fragile pins. The total height of the switch is such that the shaft may not protrude enough through the Front panel to secure the knob. Raise the switch as much as possible from the bottom of the Front board while the pins are still protruding 0.5-1mm on the solder side to make good soldering possible. Solder only the center pin first. Leave the nut on this switch. It will be used to adjust the 18.5 mm distance.
28. Once you have all switches and potmeters soldered and positioned, you can now make a final adjustment of the sandwich before you solder everything permanently. Mount the two boards together and adjust all nuts on the switches and the Step Output rotary switch and Volt potmeter for a precise adjustment of the 18.5mm distance across all four sides of the two boards. If needed, you can now still reposition the depth of the switches in the Front board with a solder iron.
29. Once you are satisfied, you can go ahead and solder all the pins of the switches, the DUT sockets and the potmeters.
30. The Offset and Delay potmeters are mounted on the Front panel itself. The Step Delay potmeter has a locking pin. To secure the Offset potmeter, use the anti-lock ring between the potmeter and the Front panel to better secure it. Both parts will be connected to the Front Board by short wires. Note where the Tap pin of P20, the Offset potmeter goes to. Also note where the two pins of the switch from the Step Delay potmeter need to go to. With the potmeter in the fully CCW position, the switch should be closed.

    However, if you decide to mount the special 5-turn potmeter, it will just about fit. If you lack the wiggle room, you may need to do a little bit more work. The fit is very tight, so I recommend that you drill the hole for the shaft with a 7.5mm drill, and use a counter to clean the front of the hole, and widen the inside such that the little lip of the potmeter body falls inside the hole. This will give you an additional mm of play. Mount the potmeter with the solder lugs pointing to the left, towards the offset polarity switch. Check that you enough clearance from the solder points of C27, C30 and J1 on the other side. With the back of the potmeter pressed to the Front board, I now have 16.2mm between the boards which is enough.
31. Add a piece of shielded cable between pin 8 of S22 labeled B/G to pin 2 of S71, the DUT selector switch also called B/G. The cable should be grounded only on one end, you can use the large hole called ISO just below the B/G pin of the DUT switch. Use a bit of shrink tube to make sure the shield at the S22 side is covered.
32. The 2mm banana jacks are mounted on the Front panel and will be connected to the Front board through short wires. Make sure that the C and E wires can handle 2 Amps. Do not connect the wires and do not solder them to the Front board until you have verified the complete operation of the Curve Tracer, by using the Verification and Calibration document. Soldering these connections makes it much harder to take the Sandwich apart. We already implemented ferrites in the B/G connections to the DUT sockets on the front panel, but if you are planning to use longer leads

connector to the 2mm banana jacks, you could add an optional ferrite bead (2x Wurth Elektronic p/n 782115020030, DigiKey p/n 732-782115020030-ND) on the B/G connection to stop some more hf signals coming into the instrument. The beads are listed in the OffPCBParts BOM.

Here is a picture of Maker Matt Web that built the CT:



33. To make room for the sandwich in the plastic enclosure, use a sharp side cutter to remove the two most forward mounting studs on the bottom and top of the enclosure to make the sandwich fit. Note that the top cover can only be mounted one way because there are slots. The cover with the holes for the screws is the bottom of the enclosure.
34. The Pulse test point may interfere with the Main board when it is situated in the enclosure. You can bend the test point upwards a bit to create more room.

Below are two pictures of the finished sandwich. On top my version with knobs that came out of my stash, and the 2mm banana jacks I used for earlier prototypes. Below is the sandwich that Mark made with the knobs that are in the off-PCB parts BOM on the GitHub.


Step Delay
Off
Max
Offset
Pos
Off
Neg
Min
Max
Polarity
P
N
VBA Curve Tracer
DUT Select
Left
Right
Off
High Voltage
Fault
B/G
C/D
E/S
B/G
C/D
E/S
B/G
C/D
Steps
BJT
FET
Step Output
uA/mV
nA/V
mA/V
CL
Current
Voltage
PWR
Current Range
Sweep
DC
Voltage Ranges
Y mA/Div
70V 1A
35V
2A
200V
0.1A


Step Delay
Off
Max
Offset
Pos
Off
Neg
Min
Max
Polarity
P
N
VBA Curve Tracer
DUT Select
Left
Right
Off
High Voltage
Fault
B/G
C/D
E/S
B/G
C/D
E/S
B/G
C/D
Steps
BJT
FET
Step Output
uA/mV
nA/V
mA/V
CL
Current
Voltage
PWR
Current Range
Sweep
DC
Voltage Ranges
X-Amp
70V 1A
35V
2A
200V
0.1A