

BREADBOARDING AND SOLDERING BASICS: MAKING AN ELECTRO-HARMONIX LPB-1

WARNING: Soldering Irons can start fires or burn you if not handled with care. Put the iron on a stand when not in use, and unplug it when you are finished soldering.

WARNING: Solder smoke is toxic and should not be inhaled. It is advised that you use lead free, rosin core solder.

LPB1 POWER BOOSTER

- plugs into instrument or amp.
- variable linear boost
- 3x max
- switch to pass or boost
- increases sustain
- 3 yr. guarantee—\$14.95



Figure 1 – Photo from <https://www.ehx.com/products/lpb-1>

PARTS LIST:

Soldering Iron and Stand

Solder

Damp Sponge or Paper Towel

2N5088 or 2N5089 Transistor

Breadboard

Breadboarding Wires

9V Power Supply

9V Supply Compatible Jack

Quarter Inch Input and Output Audio Jacks

100K Ohm Potentiometer

2X 100nF Capacitor

2X 1M Ohm Resistor

1X 390 , 10K, and 100K Ohm Resistors

Computer with Internet Connection

2 Quarter inch guitar cables

Guitar and Amplifier

Breadboarding and soldering are vital for pedal prototyping and production. Breadboards are especially useful as they don't require you to solder all of the circuit components to a board. This means you will only need to solder components such as potentiometers and jacks. This guide will teach you how to breadboard one of the best simple boost pedals, the Electro Harmonix LPB-1 Linear Power Boost, and the basics of soldering. As long as you can handle a soldering iron safely, you should not need any outside experience to complete this, unless one of your components differs from the ones shown in the figures. It is suggested that you free up an hour and a half to complete this circuit.

SECTION I: SOLDERING AND BREADBOARDING BASICS

WARNING: Be careful when using a soldering iron. The soldering iron can burn you and start fires. Do not touch the soldering iron, and always use a stand when it isn't in use.

This section covers the basics of soldering and breadboarding. If you have anything to practice soldering on before you solder the components of the pedal, it wouldn't hurt to do so. However, this isn't completely necessary as you're only soldering components, and not working close on something like a PCB.

1. Prepare the soldering iron.

- a. Set up the stand in a place that it won't melt.
- b. Plug in the iron.
2. Tin the tip of the iron.
 - a. Wipe off any solder stuck on iron when it is sufficiently heated.
 - b. Put a small amount of solder onto the tip, verify that the tip is shiny.
3. Use the tip to heat the component, then touch the solder to the component. Refer to the Figures 2 and 3.

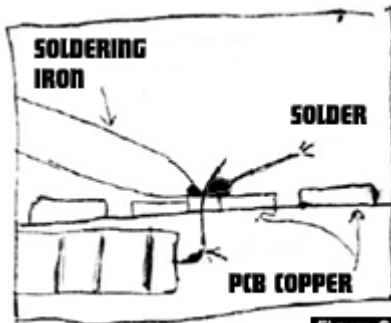


Figure 2

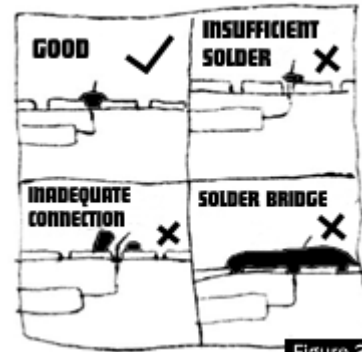


Figure 3

4. Remove the iron as soon as there is a sufficient amount of solder.
 - a. Using too much solder or overheating the component could be risky. A semiconductor device could break if overheated, and pooling too much solder can create a bridge.
5. Wipe the excess solder off of the iron.
6. Unplug the iron and set it on the stand until it has cooled.
7. Once the iron has cooled, put it away.
8. Familiarize yourself with the way a breadboard functions. Refer to figures 4, 5 and 6.
 - a. Breadboards use metal to allow components to all connect. See the graphic to understand where the strips are and how to make connections. Note that connecting a component to the same strip will not make a proper connection.

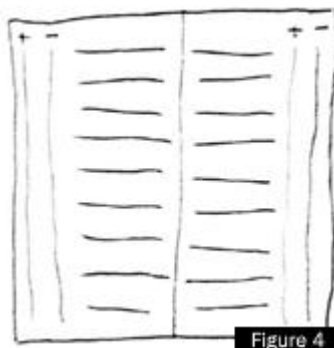


Figure 4

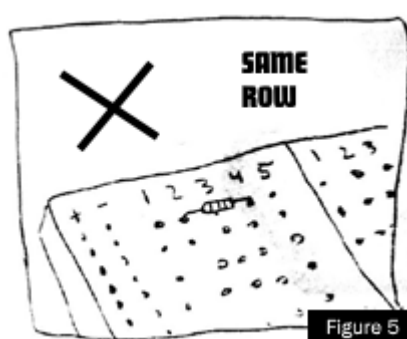


Figure 5

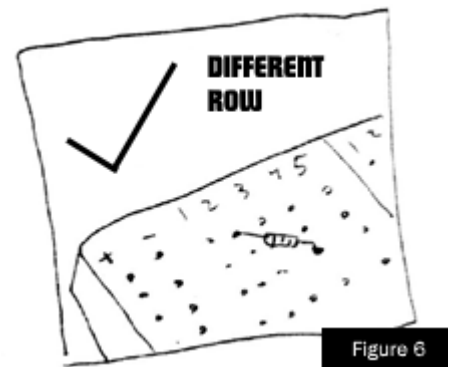


Figure 6

This concludes the basics of both soldering and breadboarding. With this knowledge, you are now able to make the Electro Harmonix LPB-1.

SECTION 2: SOLDERING COMPONENTS

WARNING: Be careful when using a soldering iron. The soldering iron can burn you and start fires. Do not touch the soldering iron, and always use a stand when it isn't in use.

This section will guide you in soldering wires to each of the components that need to be connected to the breadboard.

9. Solder a wire to both the positive and negative terminals of the power jack.

- a. Figure 7 demonstrates the positive and negative of one type of power jack. If your power jack is different, find a datasheet that matches on the internet.

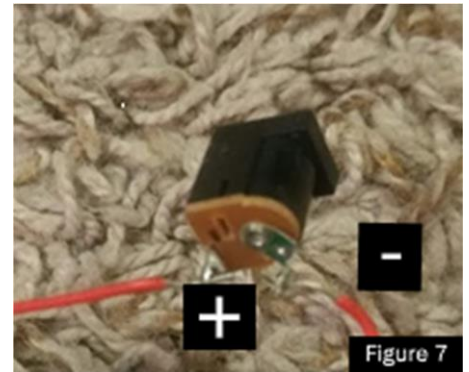


Figure 7

10. Solder a wire onto the Ring, Sleeve, and Tip of the Input jack as shown in figure 8.

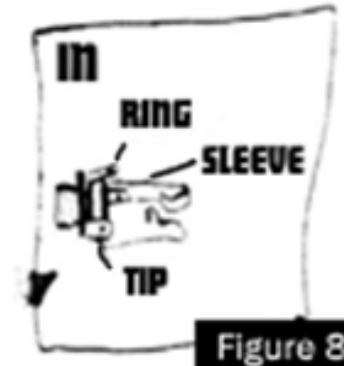


Figure 8

11. Solder a wire onto the Tip and Sleeve of the Output jack as shown in figure 9.

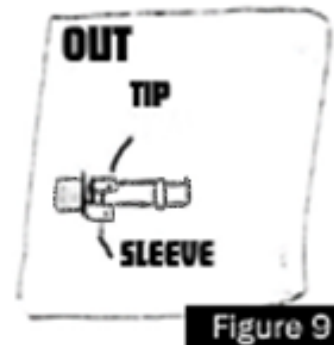


Figure 9

12. Solder a wire to each of the 3 pins on the potentiometer.



Figure 10

After completing step 12, all of the necessary components should have wires attached to them. This concludes all the soldering you will have to do for the LPB-1.

SECTION 3: BREADBOARDING COMPONENTS

NOTE: Be careful before connecting power to your circuit. Powering a circuit with a transistor, operational amplifier, or any semiconductor device that is not properly connected could result in the device breaking. Although this is not dangerous, it is less than preferable to have to replace a component in the circuit.

Now that all of the soldering is completed, you only have to breadboard the circuit.

13. Familiarize yourself with the circuit diagram shown in figure 11.

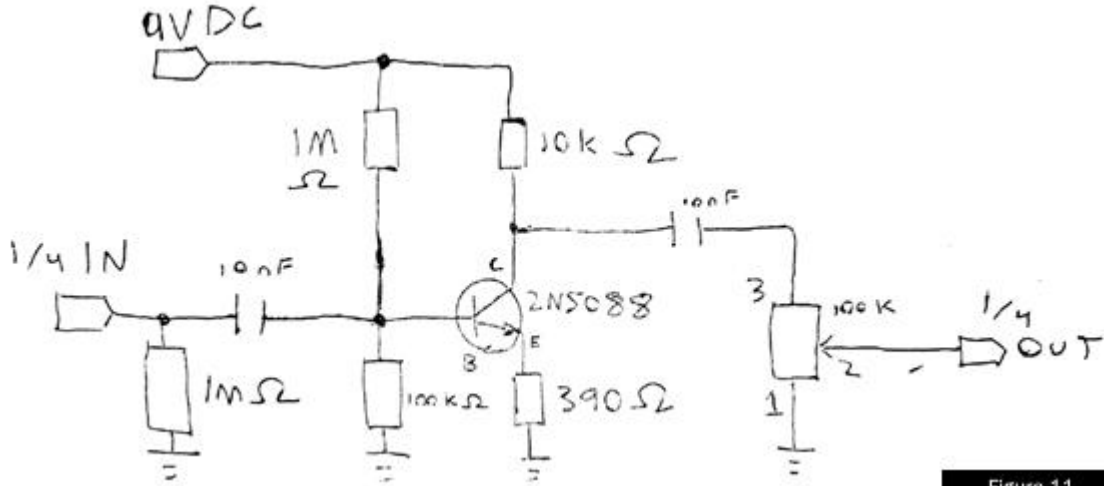


Figure 11

14. Connect the power source as demonstrated in figure 12.

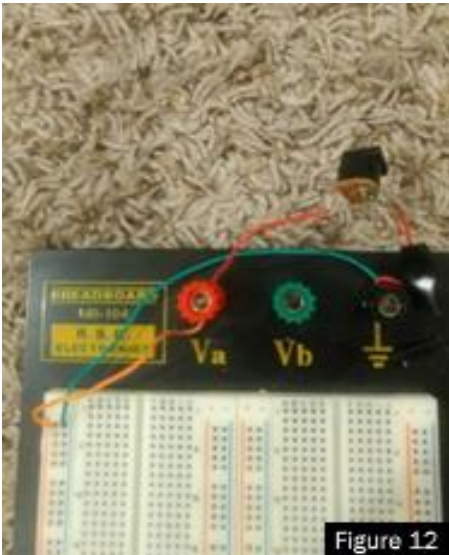


Figure 12

15. Find the Emitter, Base, and Collector of the transistor, or EBC. Use figure 13 or find a datasheet online if it is a different type.

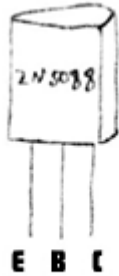
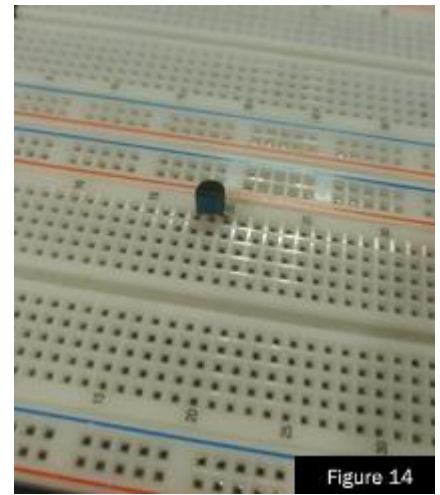
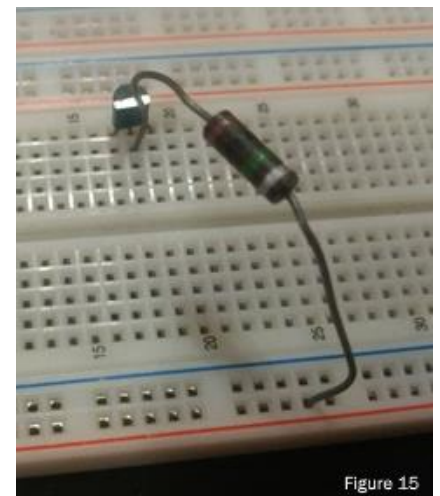


Figure 13

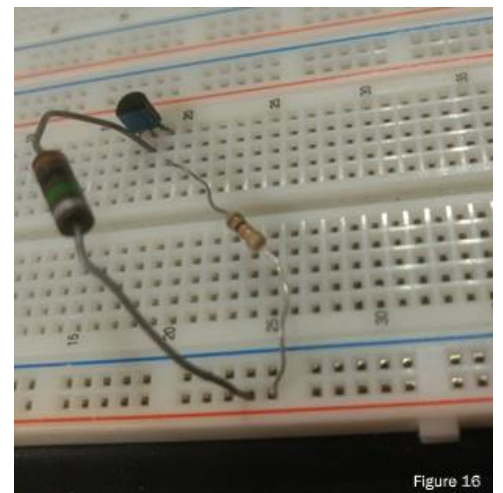
16. Start with the transistor. Put it in a place with plenty of spots to connect to.



17. Place a 1M resistor from the Base to the power (+) of the breadboard.



18. Place the 10K resistor from the Collector the the transistor to the power. (+)



19. Place the 390 Ohm resistor from the Emitter to ground. (-)

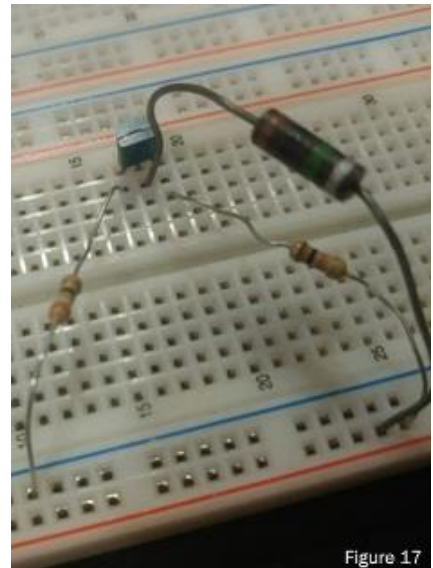


Figure 17

20. Place a 100K from the Base to the ground. (-)

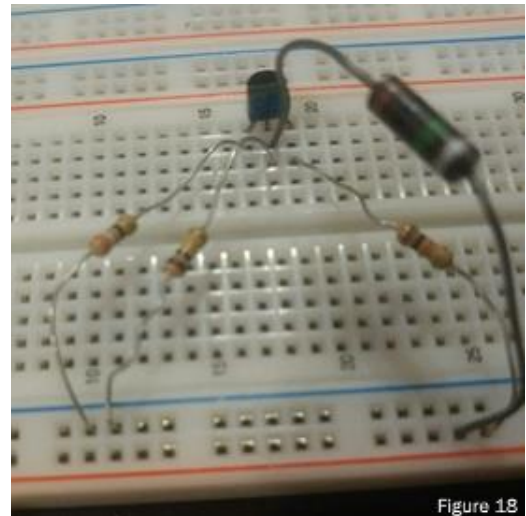


Figure 18

21. Connect the first 100nF capacitor from Base to a spot on the board.
You'll connect the input jack to this later.

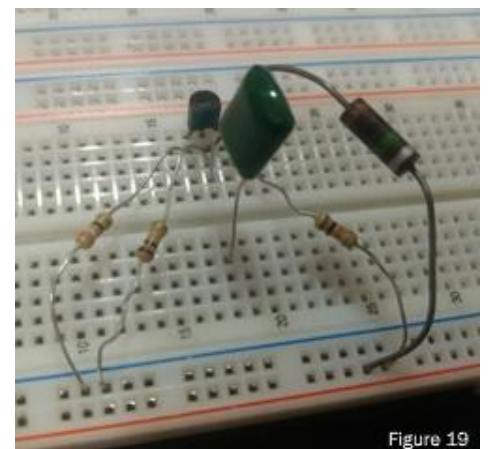
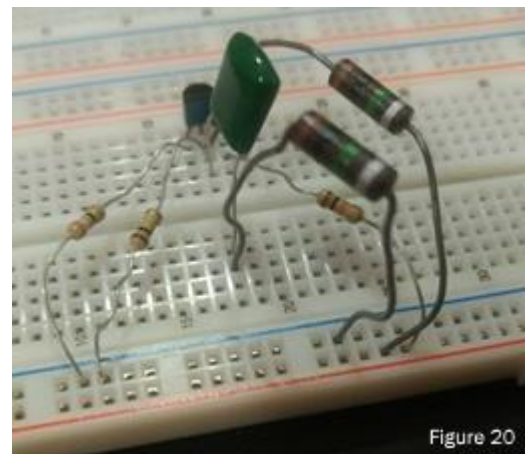
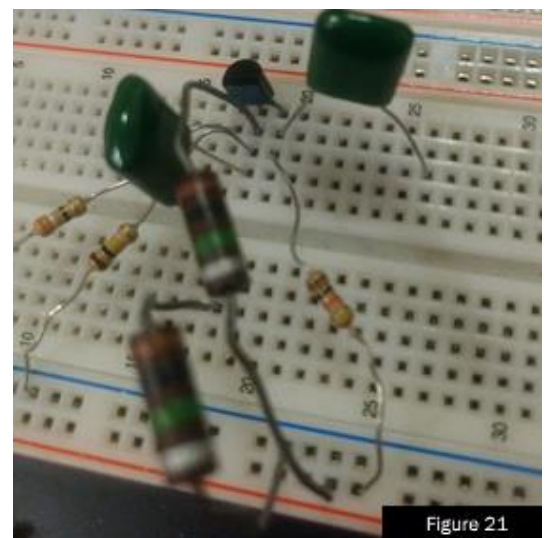


Figure 19

22. Place a 1M resistor from the capacitor to ground.



23. Place the 2nd 100nF capacitor from the Collector to an empty spot on the breadboard.

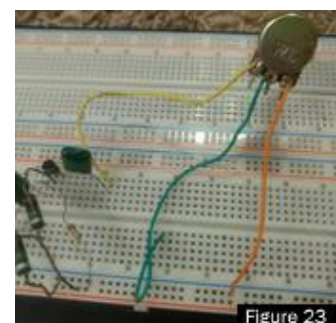


24. Connect the potentiometer to the 2nd capacitor

- a. Find which pin is which on your potentiometer. Refer to the figures 22 and 23, or find a datasheet online.



Figure 22



25. Connect the input jack to the first capacitor as in figure 24.
Connect the tip wire as input, and ground the sleeve and ring.

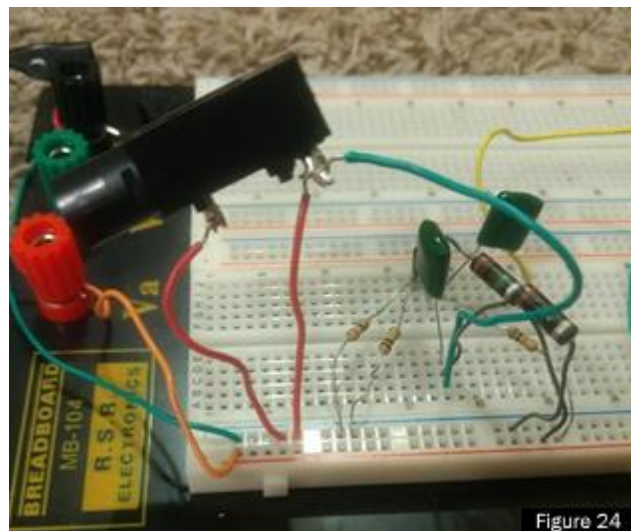


Figure 24

26. Connect the output jack to the potentiometer as in figure 25.
Connect the tip as output, and ground the sleeve.

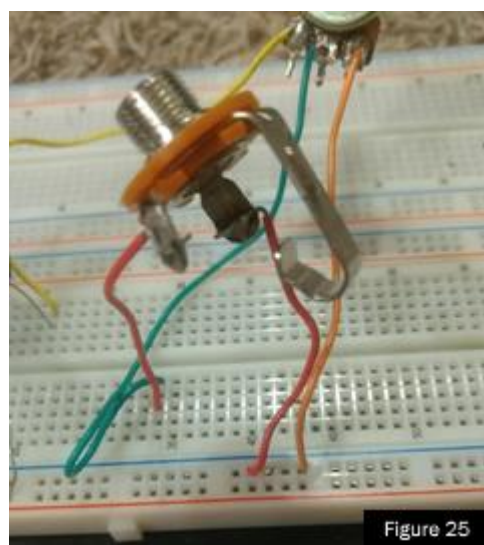


Figure 25

27. Verify that your breadboarded circuit matches the schematic. Again, an improper circuit could result in a broken transistor, which will have to be replaced.
28. Connect the first guitar cable from the guitar to the pedal input.
29. Connect the second cable from the pedal output to the amplifier input.
30. Connect the 9V power supply to the power jack. The pedal should now be on.

With the potentiometer at maximum, you should notice a definite boost in volume. The LPB-1 can boost the signal of your guitar by about 20db. If you swap the 2N5088 for a 2N5089, you should notice a higher output, and more distorted sound. You can use the skills you learned to make any pedal you can find a schematic for. If you like the LPB-1 enough, you can purchase an enclosure and a PCB, and use your newfound soldering skills to make the pedal in a more permanent structure.