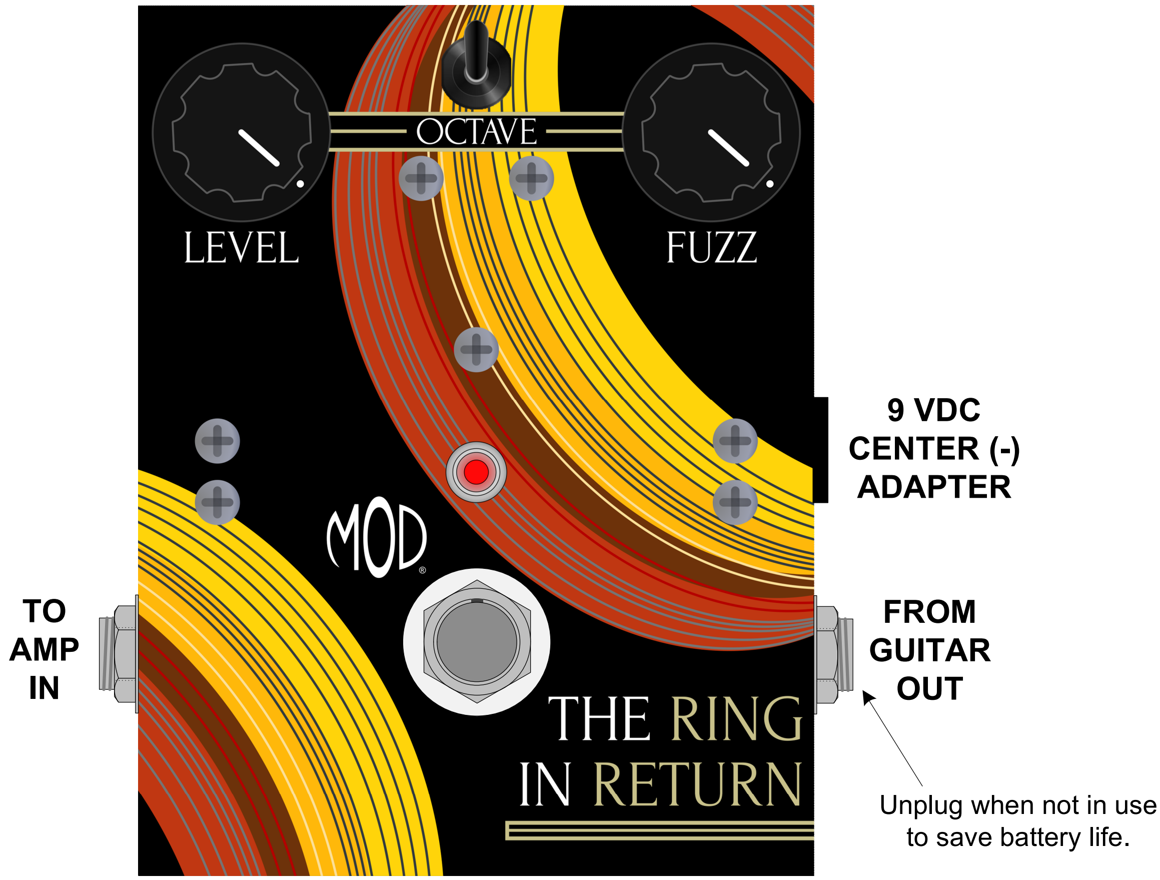
THE RING IN RETURN (K-903)



Use these instructions to learn:

- How to build an effects pedal for octave fuzz.

The Ring In Return is an octave-up fuzz effect that is an all-analog design that captures those late 60s octave-up fuzz tones. Transformer-coupled germanium diodes produce sounds that range from a subtle octave-up to thick, harmonically-rich sonic textures, and synth-like tones. Experimenting with different pickups and tone-control settings on your guitar with The Ring In Return can also produce sitar-like sounds.

Warning: This circuit was designed for use with a 9 VDC power supply only.

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TOOL LIST

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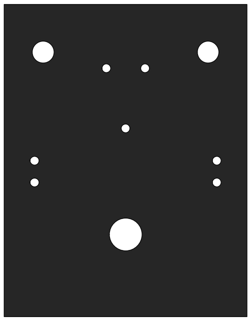
- Ruler
- Hobby Vise (or other means to secure box while working)
- Xacto Knife or similar cutting tool

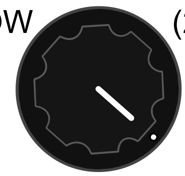
PARTS LIST 1

Stranded Wire (22 AWG) - Red
K-PUL1569 (4 FT)

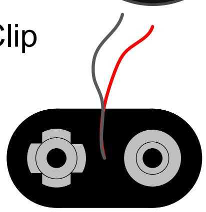
Enclosure
P-H1590BBCE-BK (1)



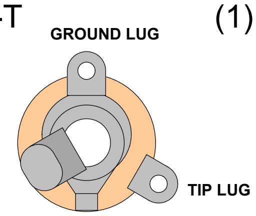
MXR Style Knob
P-K345-GLOW (2)



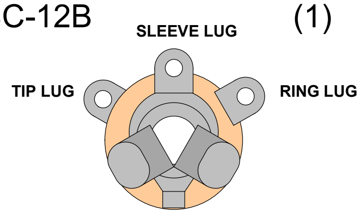
Battery Clip
S-H155 (1)



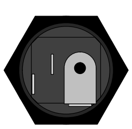
¼” Mono Jack (Output Jack)
W-SC-11-T (1)



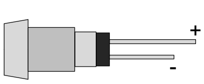
¼” Stereo Jack (Input Jack)
W-SC-12B (1)



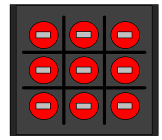
DC Power Jack
S-H750 (1)



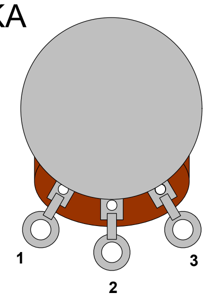
Light Emitting Diode
P-L400 (1)



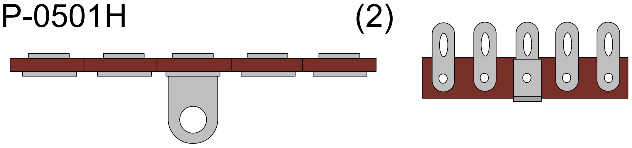
3PDT Foot Switch
P-H501-L-BLK (1)



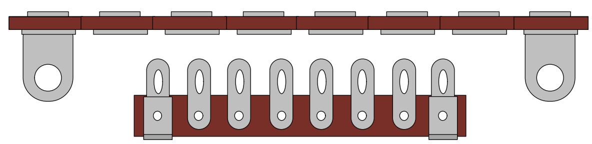
Potentiometers: 1KL and 500KA
R-VA1KL (1)
R-VA500KA (1)



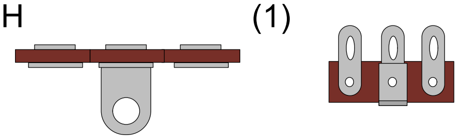
Terminal Strip with 5 Terminals
P-0501H (2)



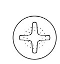
Terminal Strip with 8 Terminals
P-0802H (2)



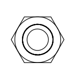
Terminal Strip with 3 Terminals
P-0301H (1)



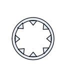
#4 Screw (3/8" long)
S-HS440-38 (7)



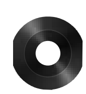
#4 Nut
S-HHN440 (7)



#4 Lock Washer
S-HLW4 (7)

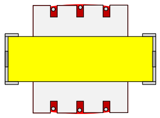


Black Dress Nut
P-H54-DRESS-BLK (1)

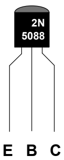


PARTS LIST 2

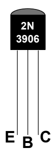
Audio Transformer (1.5K : 600 Ω)
P-T42TM022 (1)



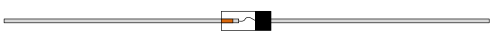
NPN BJT (2N5088)
P-Q2N5088 (2)



PNP BJT (2N3906)
K-PQ-2N3906 (1)

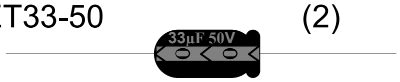


Germanium Diode (1N34A)
P-Q972 (2)

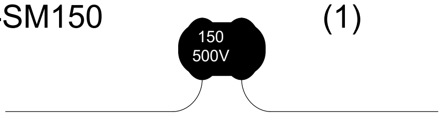


100μF Polarized Capacitor 25V
C-ET100-25-IL (2)

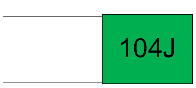
33μF Polarized Capacitor 50V
C-ET33-50 (2)



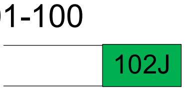
150pF Capacitor 500V
C-SM150 (1)



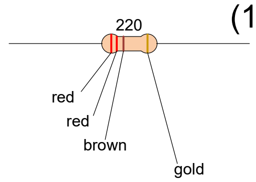
0.1μF Capacitor 100V
C-PEID1-100 (1)



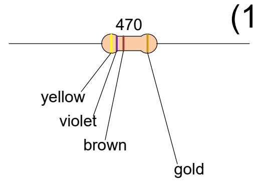
0.001μF Capacitor 100V
C-PEID001-100 (1)



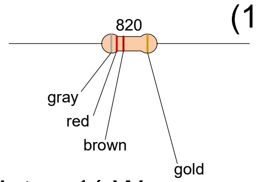
220Ω Resistor ½ W
R-A220 (1)



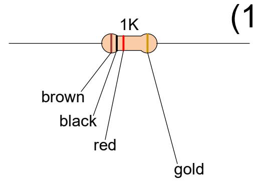
470Ω Resistor ½ W
R-A470 (1)



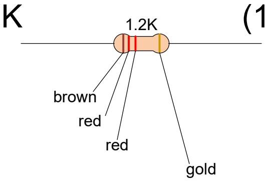
820Ω Resistor ½ W
R-A820 (1)



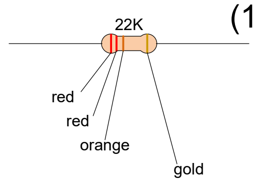
1kΩ Resistor ½ W
R-A1K (1)



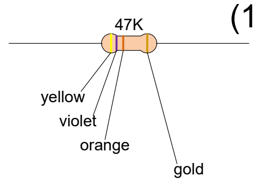
1.2kΩ Resistor ½ W
R-A1D2K (1)



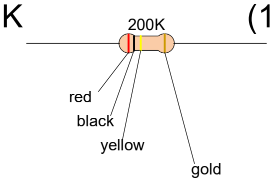
22kΩ Resistor ½ W
R-A22K (1)



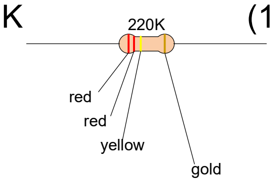
47kΩ Resistor ½ W
R-A47K (1)



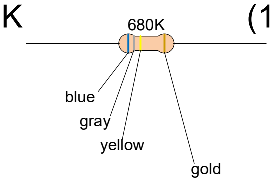
200kΩ Resistor ½ W
R-A200K (1)



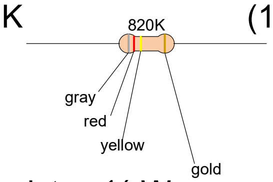
220kΩ Resistor ½ W
R-A220K (1)



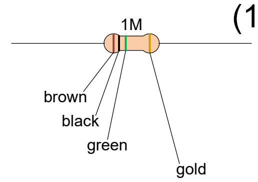
680kΩ Resistor ½ W
R-A680K (1)



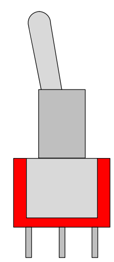
820kΩ Resistor ½ W
R-A820K (1)



1MΩ Resistor ½ W
R-A1M (1)



SPDT Toggle Switch
P-H540 (1)

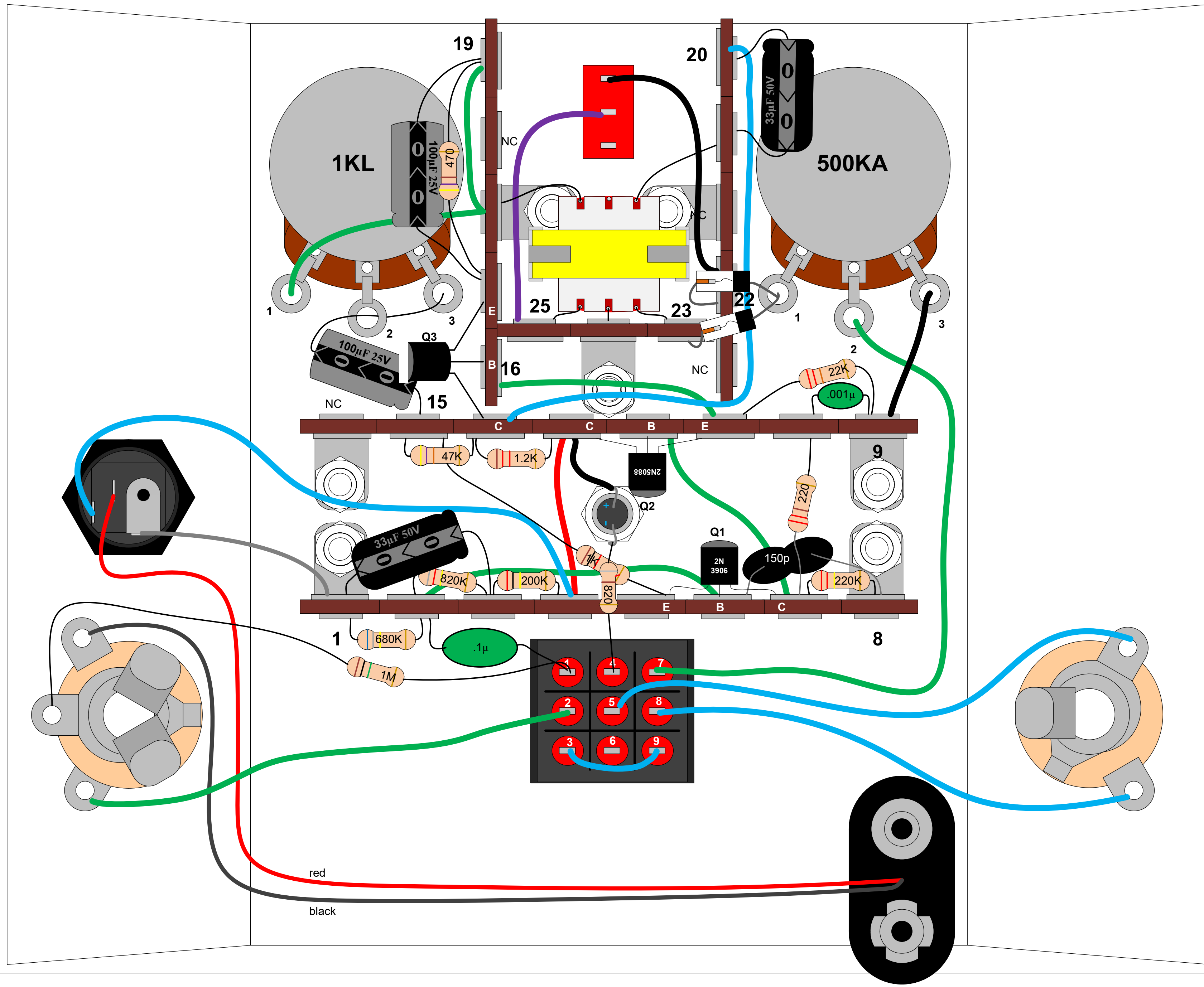


Toggle Switch Cap - Black
P-HTCAP-B (1)

Sticker
K-903-LABEL (1)

FINAL ASSEMBLY REFERENCE DRAWING

This is a large version of the final assembly drawing. Refer to this drawing as you make your way through each step of the instructions. Before you make a new connection at a particular terminal or solder lug, notice how many other connections will be made at that terminal. That way you can decide whether it's best for you to solder the connection and leave space open for future connections or hold off on soldering until after every connection at that location has been made.

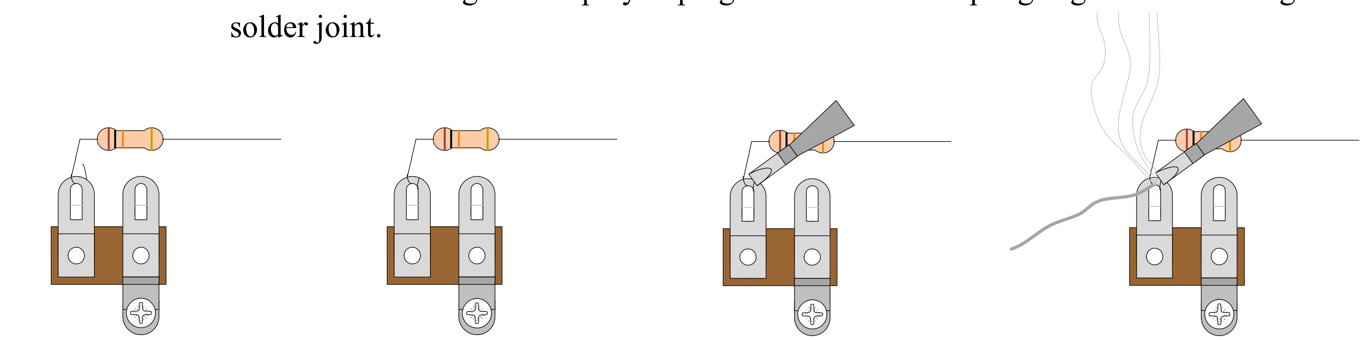


SOLDERING TIPS

It is important to make a good solder joint at each connection point. A cold solder joint is a connection that may look connected but is actually disconnected or intermittently connected. (A cold solder joint can keep your project from working.)

Follow these tips to make a good solder joint. *Take your time with each connection and make sure that all components are connected and will remain connected if your project is bumped or shaken.*

1. Bend the component lead or wire ending and wrap it around the connection point.
    - Make sure it is not too close to a neighboring component which could cause an unintended connection.
2. Wrap the component lead so that it can hold itself to the connection point.
3. Touch the soldering iron to both the component lead and the connection point allowing both to warm up just before applying the solder to them.
4. Be sure to adequately cover both component lead and connection point with melted solder.
    - Remove the soldering iron from your work and allow the solder joint to cool. (The solder joint should be shiny and smooth after solidifying.)
    - Cut off any excess wire or component leads with cutting pliers.
    - Clean the soldering iron's tip by wiping it across the wet sponge again after making the solder joint.



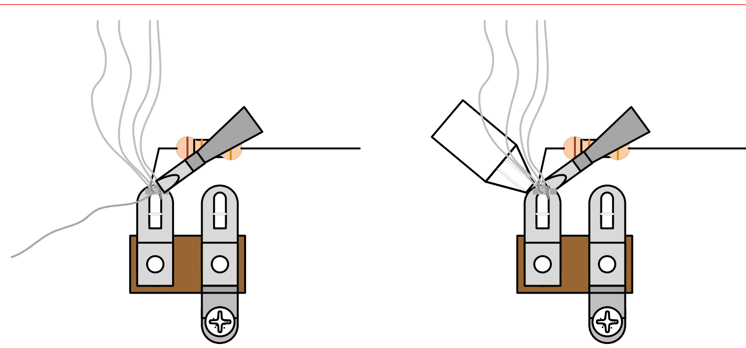
1. Bend the component lead and wrap it around the connection point.

2. Wrap the component lead so that it can hold itself to the connection point.

3. Heat up both component lead and connection point with the soldering iron.

4. Apply solder to both component lead and connection point.

De-Soldering Tip



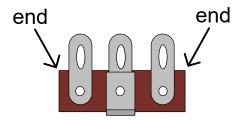
1. Heat up old solder joint with the soldering iron.

2. Apply fresh solder to mix in with old solder joint

3. Use a de-soldering tool to remove the old solder joint while it is heated.

SECTION 1 – Mount Large Components

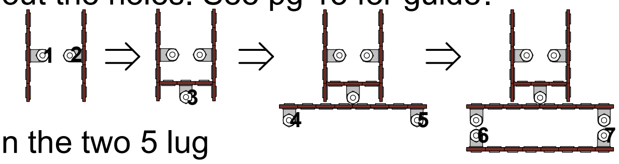
Please refer to DRAWING 1 and DRAWING 2.



Orient the enclosure with the two 5/16" holes on top.

Apply the sticker to the top of the box then use a blade to cut out the holes. See pg 13 for guide.

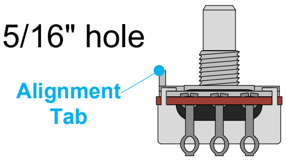
Using the seven screws, nuts and lock washers provided, fasten the five terminal strips to match DRAWING 2.



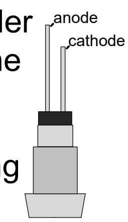
The ends may require trimming or filing for a perfect fit. Fasten the two 5 lug terminal strips and the 3 lug terminal strips first. Then fasten the two 8 lug terminal strips.

Mount the 1KL pot in the 5/16" hole on the left and the 500KA pot in the remaining 5/16" hole on the right.

- *Bend back and remove the alignment tab on the top of each potentiometer using a pair of pliers before mounting the pots so that they can mount flush against the enclosure surface.*

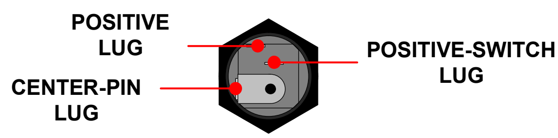


Mount the LED in the ¼" hole above the footswitch's mounting hole. The lock washer goes under the nut inside the enclosure. Align the LED leads so that the cathode (short lead) is closer to the footswitch as shown in Drawing 2.



Mount the SPDT toggle switch in the ¼" hole at the top. Leave all stock hardware on the bushing and make sure they are fully threaded before inserting through the chassis hole. Use the black dress nut to mount the switch. Align the switch as shown in the drawing and tighten the nut.

Mount the DC power jack in the 15/32" hole on the left side of the enclosure. Orient its solder lugs so that the center-pin lug is facing the bottom side of the enclosure.



Mount the input jack in the 3/8" hole on the left side of the enclosure with the hardware provided. The washer goes under the nut on the outside of the enclosure. Make sure the center solder lug of the input jack is facing up. Correct positioning of the jack makes soldering the connections easier.

Mount the output jack in the 3/8" hole on the right side of the enclosure. Make sure the two solder lugs are in their most upright position before tightening the nut.

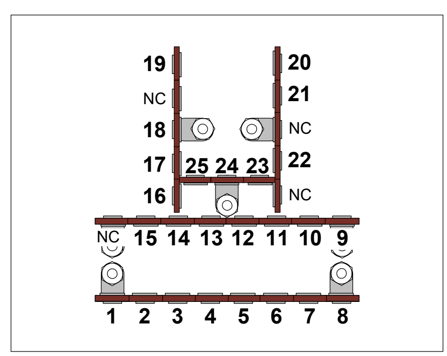
Mount the footswitch in the 15/32" hole in the center of the enclosure. The black washer goes under the mounting nut on the outside of the enclosure. Then the lock washer mounts on the inside between the enclosure surface and the other nut. Discard the nylon washer. Make sure that the footswitch is oriented to match DRAWING 2.

SECTION 2 – Wire Large Components

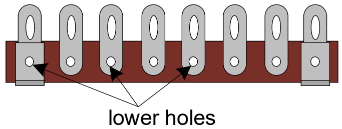
Please refer to DRAWING 3.

Stripping wire, tinning wire and soldering. Throughout these instructions you will be told to strip and tin a length of wire numerous times. Unless noted otherwise, cut the wire to the length stated in the instructions. Then strip ¼" of insulation off each end. Twist each end of the stranded wire, and apply a small amount of solder to each end (i.e. tin the wire ends). This will prevent the stranded wire from fraying and will make the final soldering much easier.

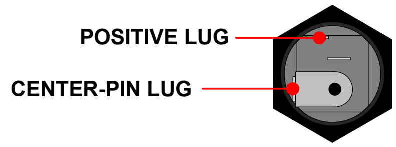
Please note that each terminal has been numbered as illustrated here and will be referred to as a "**terminal #_**" when connecting different components and wires throughout the assembly instructions.



- Strip and tin a 2" piece of wire and connect Footswitch lug 8 to the output jack's tip lug.
- Strip and tin a 1 ½" piece of wire and connect Footswitch lugs 3 and 9.
- Strip and tin a 2" piece of wire and connect Footswitch lug 2 to the input jack's tip lug.
- Strip and tin a 4" piece of wire and connect Footswitch lug 7 to the 500KA pot's lug 2.
- Strip and tin a 1 ½" piece of wire and connect it from the lower hole of terminal #7 to the lower hole of terminal #12. *(This allows for more room when connecting components later in the instructions).*



- Strip and tin a 2 ½" piece of wire and connect it from the lower hole of terminal #2 to the lower hole of terminal #6.
- Strip and tin a 1 ¼" piece of wire and connect it from terminal #4 to the lower hole of terminal #13. Do not solder either connection yet.
- Strip and tin a 1 ¼" piece of wire and connect terminal #13's lower hole and the long lead (anode) of the LED. Solder both connections now.
- Strip and tin a 2" piece of wire and connect it from terminal #4 to the power jack's positive lug. Leave room at #4 for the 200K resistor that will mount to #3 and #4 later on.



- Strip ¾" of insulation off the end of the wire spool, twist and tin it. When this tinned wire end cools, cut off the bare portion of wire. (This will be used as a short jumper wire). Connect this jumper from the power jack's center-pin lug to terminal #1. Use the excess length of this jumper to wrap around the connection points.
- Strip and tin a 1 ¼" piece of wire and connect the 500KA pot's lug 3 to terminal #9.
- Strip and tin a 4" piece of wire and connect from the lower hole of terminal #14 to the lower hole of terminal #20.
- Strip and tin a 1 ¾" piece of wire and connect terminals #11 and #16.
- Strip and tin a 1 ½" piece of wire and connect terminal #18 to the 1KL pot's lug 1. Do not solder the terminal #18 connection yet.
- Strip and tin a 1 ½" piece of wire and connect terminals #18 and #19. Now solder the #18 connection.
- Strip and tin a 2" piece of wire and connect terminal #25 and lug 2 of the SPDT toggle switch. Do not solder the terminal #25 connection yet.
- Strip and tin a 2" piece of wire and connect terminal #22 and lug 1 of the SPDT toggle switch. Do not solder the terminal #22 connection yet.
- Strip and tin a 2" piece of wire and connect Footswitch lug 5 to the output jack's sleeve lug.

Double check all of your connections at this point because it will be very difficult to make corrections after the components are soldered into place.

<u>SECTION 3 – Mount Components to Terminal Strips</u>

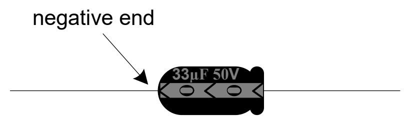
Please refer to DRAWING 4.

Connect and solder all the following components to their respective terminals as listed. *(Make sure that none of the component leads are so close together that it could cause an unintended short).*

- Connect the 680K resistor to terminals #1 and #2.
- Connect the 0.1µF cap to terminal #2 and Footswitch lug 1. Mount this cap upside down with its leads facing up.
- Connect the 1M resistor to footswitch lug 1 and the input jack's ground lug.

- Connect the 820K resistor to terminals #2 and #3. Push this component down slightly to allow room for the next component. Do not solder the connection on terminal #3 yet.

- Connect one of the 33µF caps to terminals #1 and #3. Make sure the negative (-) end of the cap is connected to terminal #1. Do not solder the connection on terminal #3 yet.



- Connect the 200K resistor to terminals #3 and #4. Solder the connections at #3 now.

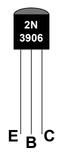
- Connect the 220K resistor to terminals #7 and #8.

- Connect the 150pF cap to terminals #6 and #8. Push this cap down to allow room for the next component.

- Connect the 220 ohm resistor to terminals #7 and #10.

- Connect the 2N3906 transistor to terminals #5, #6 and #7 as listed below. Do not solder the terminal #5 connection yet.

  Terminals #5: Emitter
  Terminals #6: Base
  Terminals #7: Collector



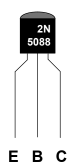
- Connect the 1K resistor to terminal #5 and #15. Now solder the #5 connection.

- Connect the .001µF cap to terminals #9 and #10.

- Connect the 22K resistor to terminals #9 and #11.

- Connect one of the 2N5088 transistors to terminals #11, #12 and #13 as listed below.

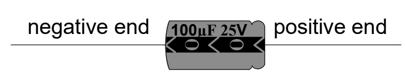
  Terminals #11: Emitter
  Terminals #12: Base
  Terminals #13: Collector



- Connect the 1.2K resistor to terminals #13 and #14. Leave room on #14 for mounting Q3 later.

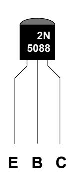
- Connect the 47K resistor to terminals #14 and #15. Leave room on #14 for mounting Q3 later.

- Connect the positive (+) end of a 100µF cap to terminal #15 and the negative (-) end to both lugs 2 and 3 of the 1KL pot.



- Connect the remaining 2N5088 transistor to terminals #14, #16 and #17 as listed below.

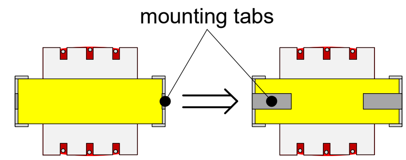
  Terminals #14: Collector
  Terminals #16: Base
  Terminals #17: Emitter



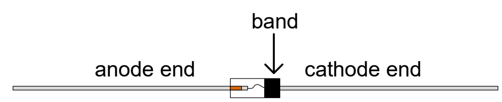
- Connect the 470 ohm resistor to terminals #17 and #19. *(Remember that terminals #17 and #19 are three terminals apart from one another so make sure you connect correctly).*

- Connect the remaining 100µF cap to terminals #17 and #19. Make sure the negative (-) end is connected to #19.

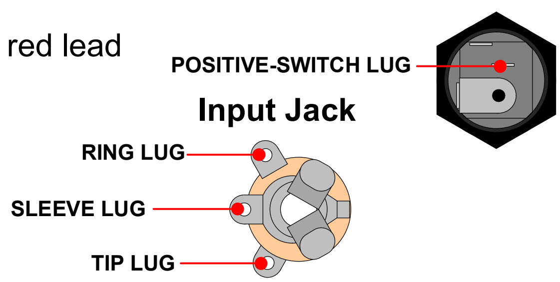
- Press the metal mounting tabs of the transformer inward so they are flush with the bottom of the transformer. Now place the transformer upside down in the enclosure in the area shown on DRAWING 4. The side marked “P” should be facing the top side of the enclosure.



- With the transformer resting upside down, insert its three leads facing the bottom side of the enclosure through terminals #23, #24 and #25, but do not solder.
- Only two of the three leads on the “P” side of the transformer will be used. Connect the lead on the left side to terminal #18. Connect the lead on the right side to terminal #21.
- Carefully clip off the remaining unused middle lead on the “P” side of the transformer and solder the three transformer lead connections at terminals #23, #24 and #25.
- Connect the remaining 33µF cap to terminals #20 and #21. Make sure the negative (-) end is connected to #21.
- Connect one of the 1N34A diodes to terminal #23 and the 500KA pot’s lug 1. Make sure the banded end (cathode) connects to the pot lug 1. Do not solder the Pot lug 1 connection yet.



- Connect the remaining 1N34A diode to terminal #22 and lug 1 of the 500KA pot (also with the banded end (cathode) at lug 1). Now solder the connection at lug 1.
- Locate the battery snap connector. Connect and solder the red lead to the positive-switch lug of the power jack.



- Connect and solder the black lead of the battery snap connector to the input jack’s ring lug.
- Connect and solder the 820 ohm resistor from lug #4 of the footswitch to the negative lead of of the LED. Be careful not to touch the resistor or LED leads to any other part.

  Clip the anode lead of the LED and resistor to a reasonable length and connect them by bending and crimping the leads around each other. Solder them once they are tightly connected to each other.

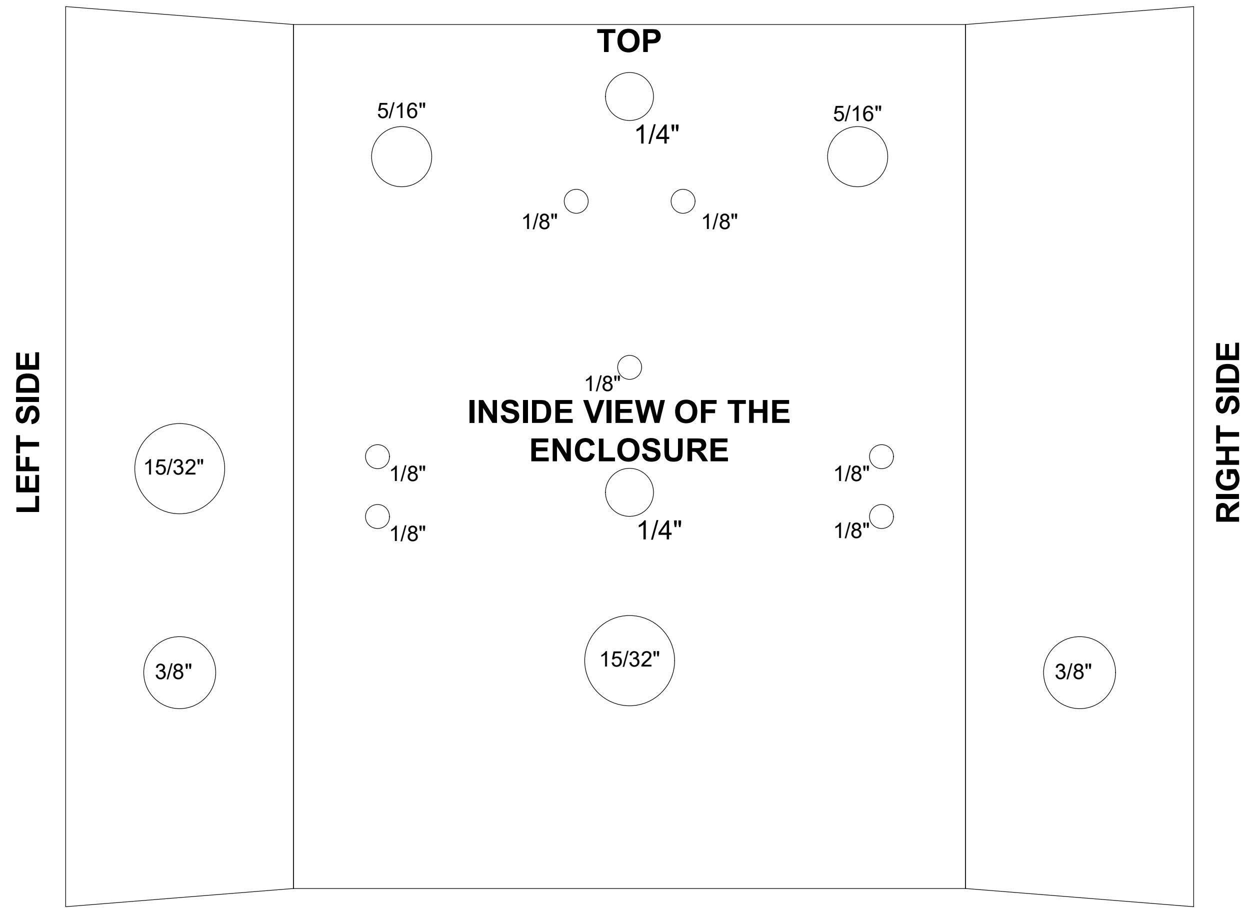
SECTION 4 – Finishing Up

It’s always a good idea to thoroughly double-check your connections before applying power.

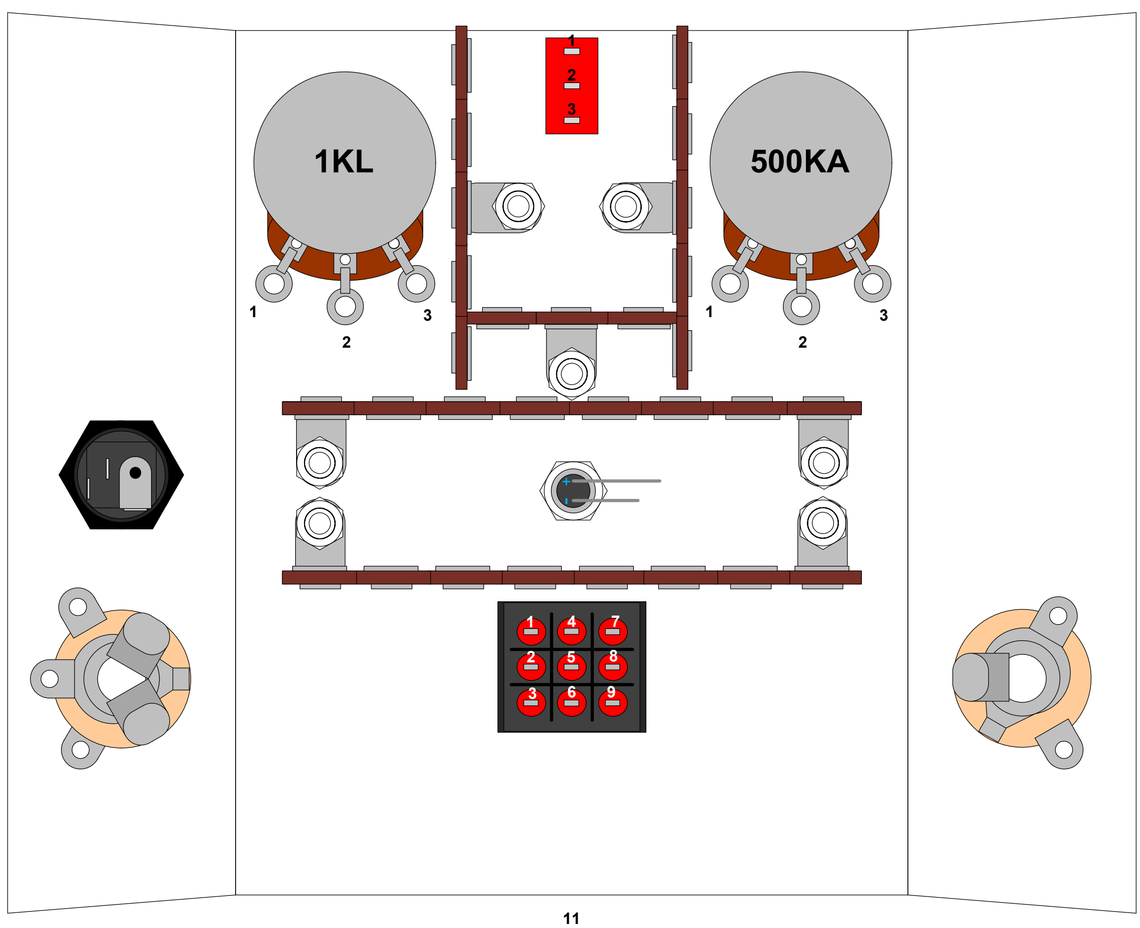
Attach the knobs provided to the two potentiometer shafts. Install 9 volt battery, close cover using screws provided. Plug guitar into input jack on right. This turns unit on. Plug cable into output jack and plug into your amplifier.

Unplug from the input jack of the unit to turn it off and save power.

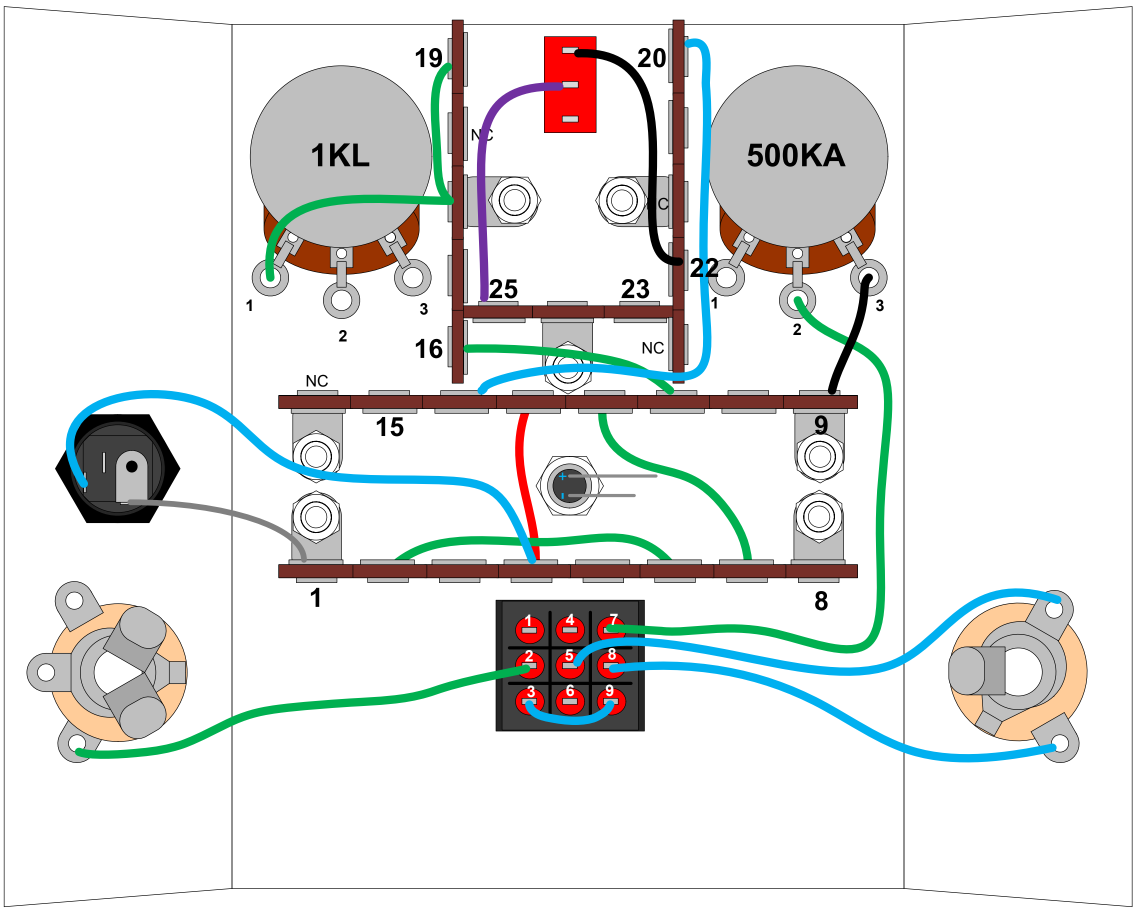
DRAWING 1



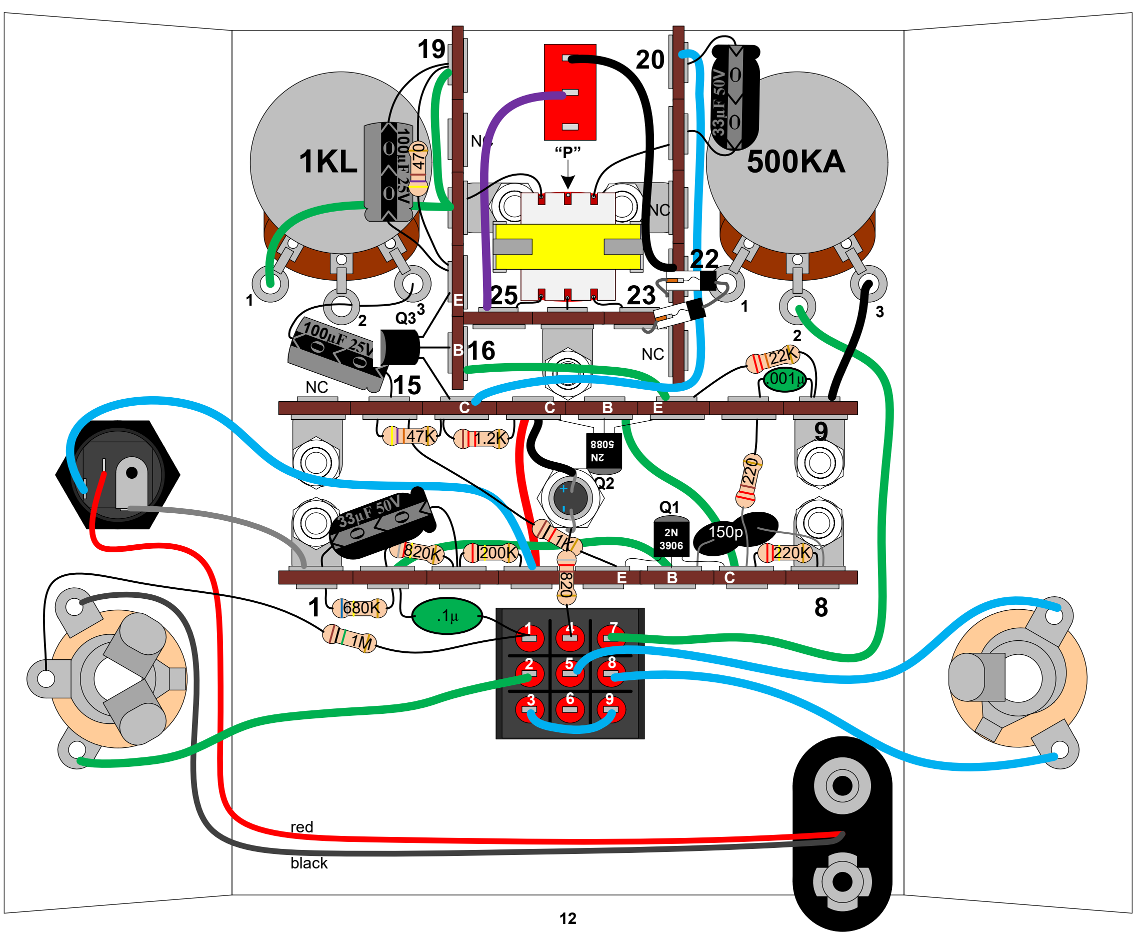
DRAWING 2



DRAWING 3

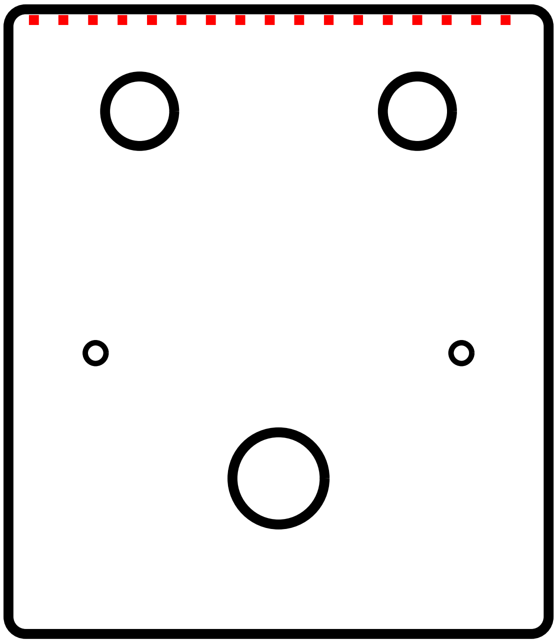


DRAWING 4



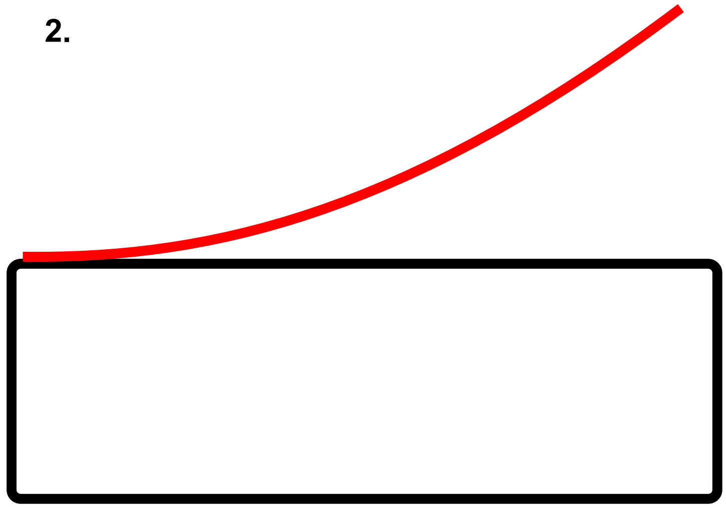
APPLYING THE STICKER TO MOD PEDAL ENCLOSURES

1.



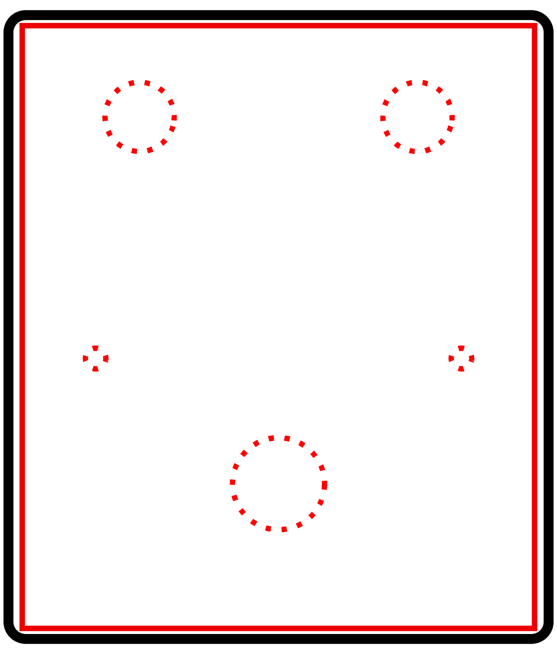
- Locate the top of the pedal as well as the top of the sticker. Page one of the instructions for your kit will have an image of the pedal that can be used for reference.

2.



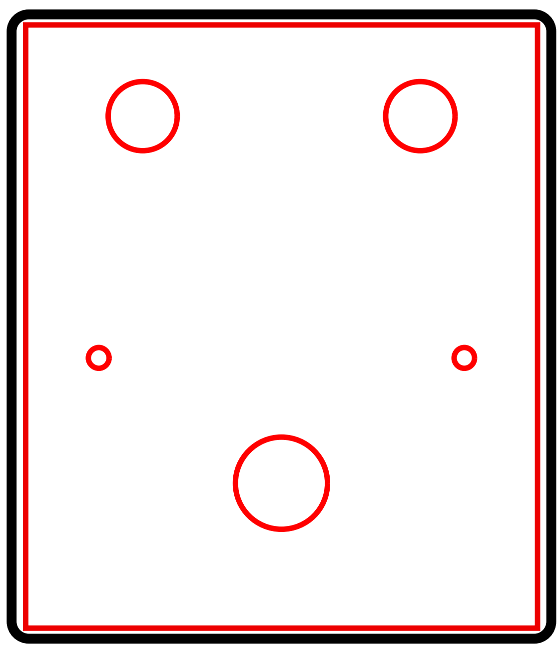
- Peel the backing from the sticker. Carefully line up the top edge of the sticker with the top of the pedal. Press down to apply the sticker only to the edge. Run a finger across the edge to push any air out from beneath the sticker. Continue this motion as you work your way down the pedal until the sticker is fully attached.

3.

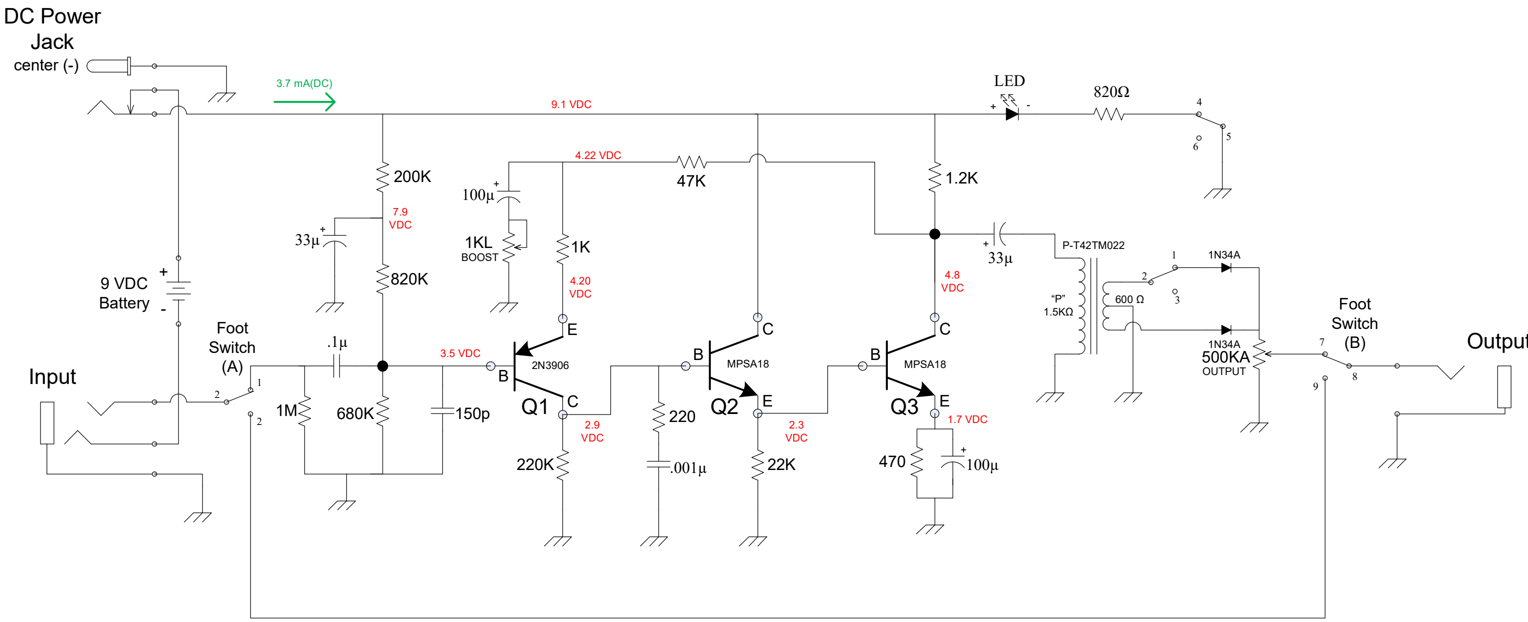


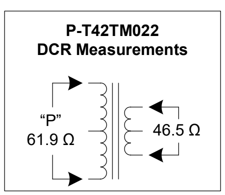
- Locate the holes beneath the sticker and depress them using a fingertip. Be sure that the area of the sticker surrounding the holes is fully adhered to the surface.

4.

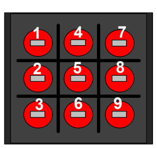


- With an Xacto knife or similar tool, carefully pierce the sticker in the center of each hole. Carefully work the knife from the center of the hole to the edge and begin cutting fully around the edge until the sticker has been fully cleared from the hole.

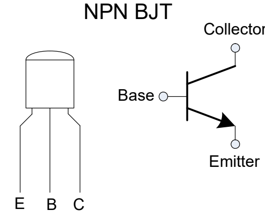




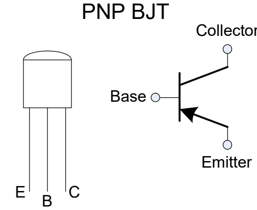
3PDT Foot Switch



MPSA18
NPN BJT



2N3906
PNP BJT



MOD Electronics

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"The Ring In Return" (K-903)
Schematic

Use this troubleshooting supplement to help:

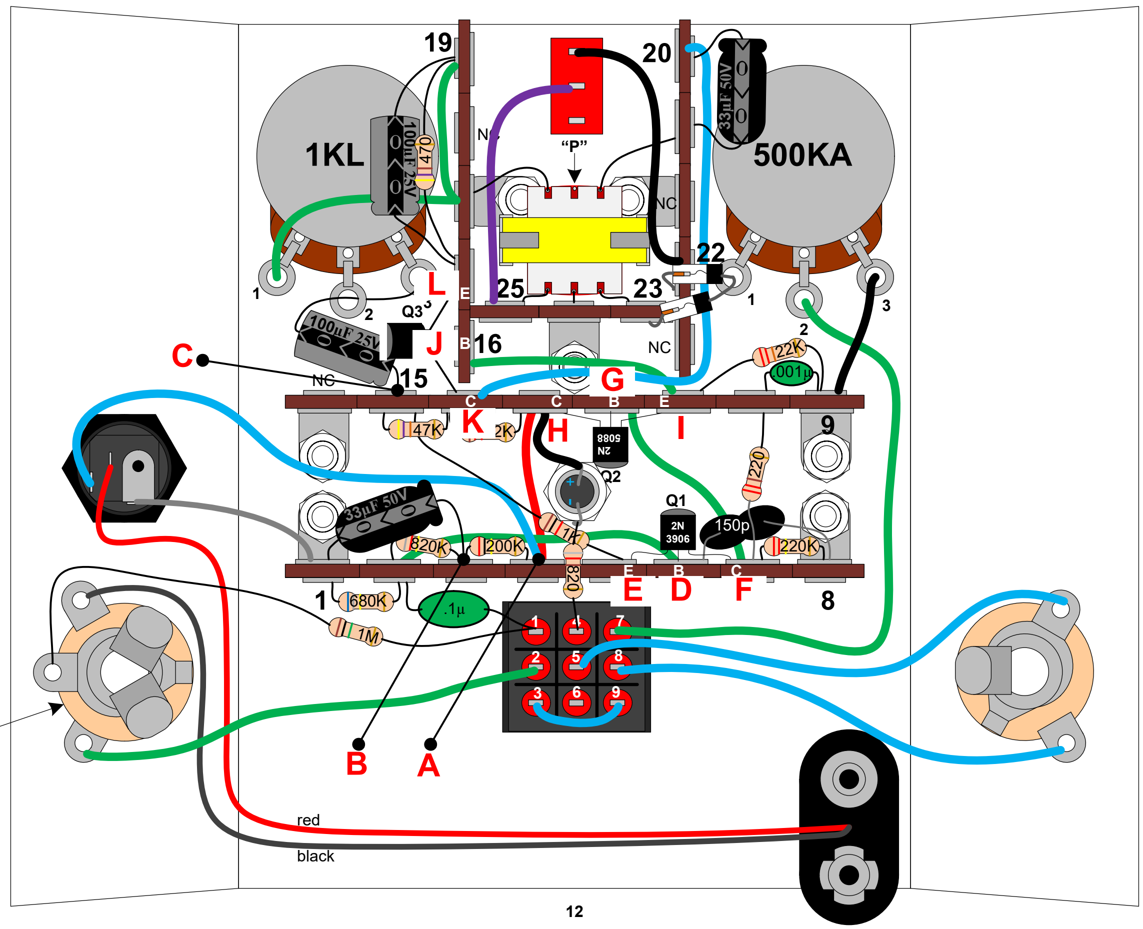
- Measure DC voltage test points to identify major discrepancies and locate problem areas.

(Keep in mind that the voltage measurements will vary slightly from kit to kit. The voltages you measure should be in the same ballpark, but do not expect to get the exact same value.)

Using a volt meter, connect the ground side lead of the meter to any ground point on the pedal. One ground point would be the output jack's ground lug. The other volt meter lead will be used to measure DC voltage at the test points shown below.

DC Voltage Test Points

A (Power Supply):	9.1 VDC
B (33µF cap):	7.9 VDC
C (100µF cap):	4.22 VDC
D (Q1 Base):	3.5 VDC
E (Q1 Emitter):	4.20 VDC
F (Q1 Collector):	2.9 VDC
G (Q2 Base):	2.9 VDC
H (Q2 Collector):	9.1 VDC
I (Q2 Emmiter):	2.3 VDC
J (Q3 Base):	2.3 VDC
K (Q3 Collector):	4.8 VDC
L (Q3 Emitter):	1.7 VDC



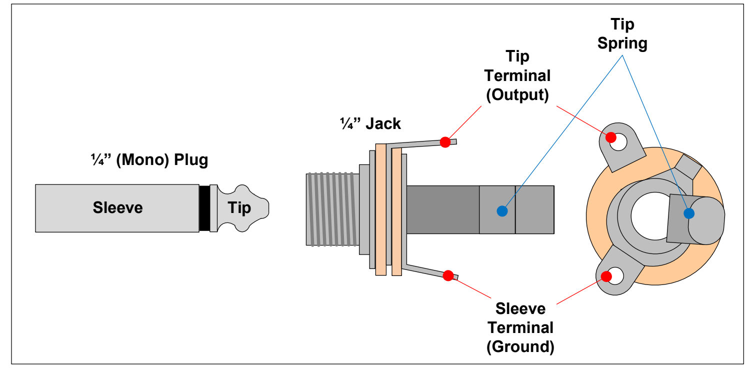
Don't forget to plug into the input jack if you are testing with a battery as the power supply.

Measuring AC Voltages from the Guitar Signal

Once your DC voltages are in order, if your kit is still not working properly, you can measure AC voltages along the signal path to troubleshoot further.

You will need a volt meter that can measure the small signal AC voltages that electric guitars put out. The output signal from your guitar will likely be less than 1 V.

First, measure the output signal directly from your guitar. You can do this by plugging your guitar cable into the guitar and leaving the other end of the cable disconnected. Connect your meter across the disconnected ¼" plug's "tip" and "sleeve" sections. Make sure your guitar's volume and tone controls are turned up and strum a chord. When you strum, you should see the AC voltage reading on the meter quickly rise to some maximum value and then fall back to 0 VAC when you stop strumming and the strings are at rest.



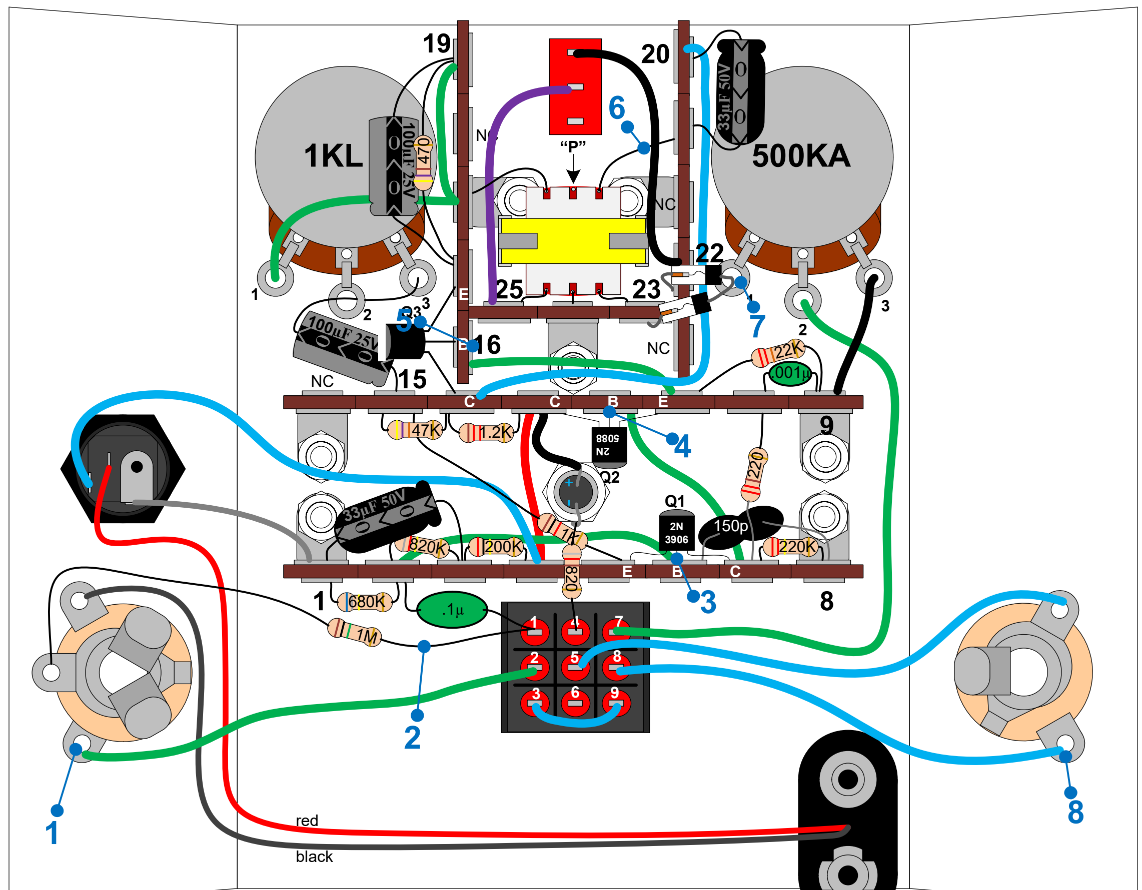
Once you are able to measure the output signal from your guitar directly, plug the guitar into the input jack of your kit and use the AC test points to measure the guitar signal along the signal path. Start with test point one and move along in order. You should be looking to identify the last test point where the signal seems normal and the first test point where the signal seems unusual or where it is no longer even present.

AC Voltage (Signal) Test Points

1 = Input jack tip lug	0.18 VAC
2 = Input to effect circuit	0.18 VAC
3 = Q1 base	0.18 VAC
4 = Q2 base	1.9 VAC
5 = Q3 base	1.8 VAC
6 = Transformer primary	2.6 VAC
7 = Diode cathodes	0.2 VAC
8 = Output jack tip lug	0.2 VAC

Control settings for Voltage Measurements

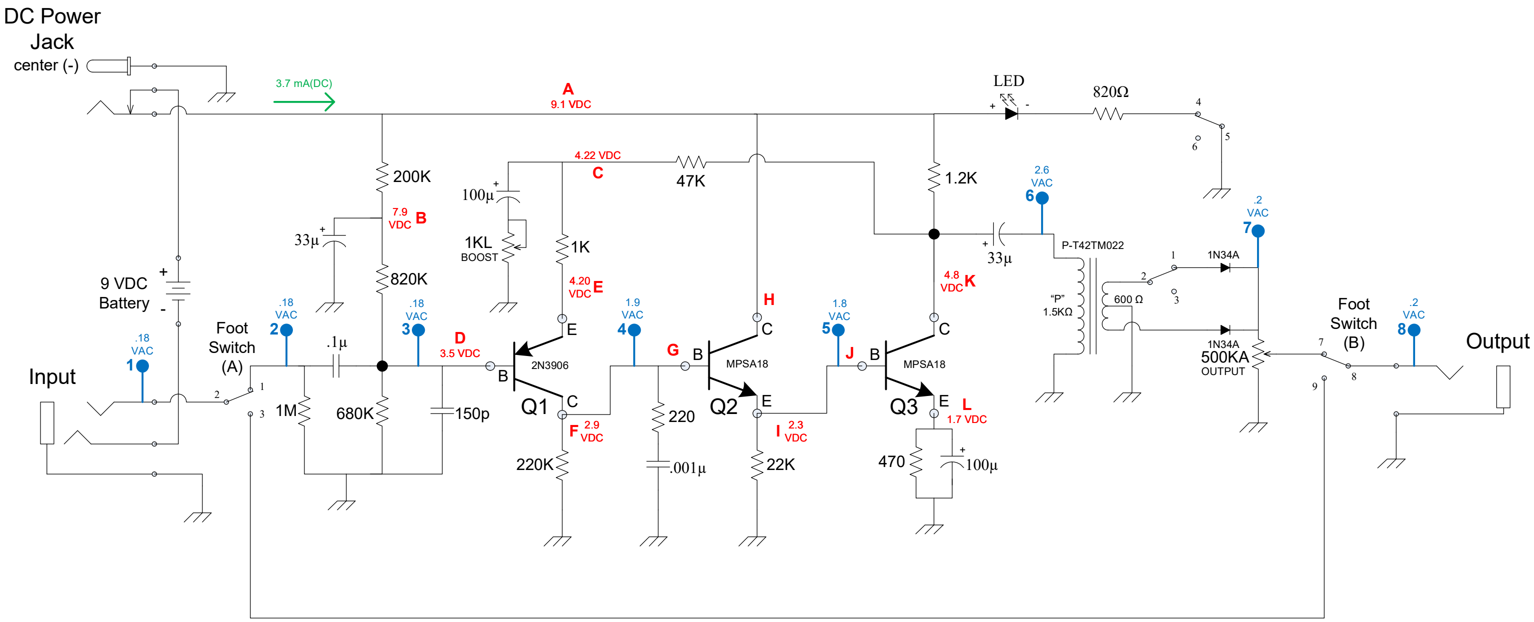
- Output (500KA) = full clockwise rotation (max)
- Fuzz (1KL) = full counter-clockwise rotation (min)
- Octave (Toggle) = On (toggle pointing to Octave text)
- Guitar: Strat Neck Pickup (full volume and tone settings)

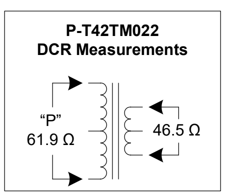


Control settings for Voltage Measurements

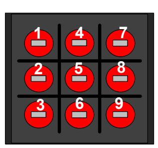
- Output (500KA) = full clockwise rotation (max)
- Fuzz (1KL) = full counter-clockwise rotation (min)
- Octave (Toggle) = On (toggle pointing to Octave text)
- Guitar: Strat Neck Pickup (full volume and tone settings)

- Letters A to L = DC Voltage Measurements
- Numbers 1 to 8 = AC Signal Voltage Measurements

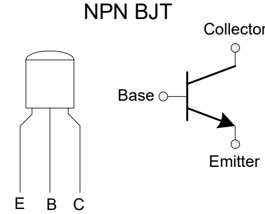




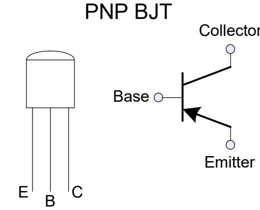
3PDT Foot Switch



MPSA18
NPN BJT



2N3906
PNP BJT



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Schematic