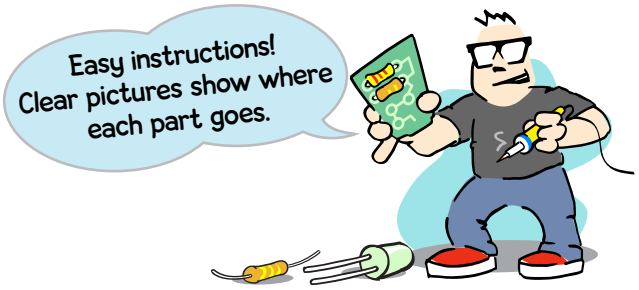
StewMac® + JHS PEDALS

LOW DRIVE

CLASSIC PEDAL KIT

Assembly Instructions

The **LOW DRIVE** is one of the great stompboxes from JHS, makers of high-end effects pedals. Whenever JHS adds a new pedal to their line, they retire an existing design. This means great JHS pedals like the **LOW DRIVE** have become rare and sought-after. You can't buy one, but you can build yourself one—and it's fun!



The **LOW DRIVE** is based on the Ibanez TS-808 Tube Screamer, but it's been tweaked with the bass player in mind. Maybe the most famous overdrive pedal ever, the TS-808 is your go-to pedal for the classic overdriven bass tones used by bands ranging from The Rolling Stones to Marty Robbins and Metallica. Guitar players love its thick sound, too.

Many bass overdrives lack good low end response and definition, but the modded circuit in the **LOW DRIVE** has excellent response with a clear, clean mid/high end—keeping the character and clarity of your rig intact.

In addition to reworking the circuit to be more suitable for bass, Josh Scott of JHS added a three-position switch toggling between stock clipping, open boost, and LED crunch for real versatility.

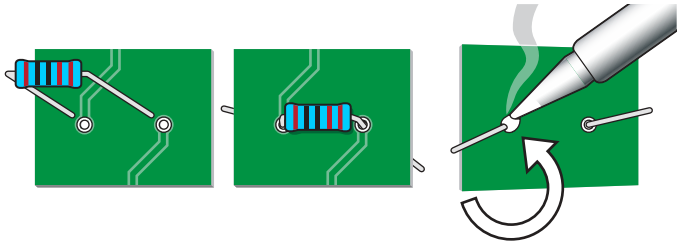
Tools and supplies

Required:	Soldering iron with fine point tip
	Solder
	Wire cutter/stripper
	1/2" nut driver or socket
	10mm nut driver or socket
	14mm wrench
	#1 Phillips screwdriver
Also helpful:	Clear silicone adhesive
	Circuit card holder
	Magnifying glass or OptiVISOR
	StewMac Soldering Aids
Power:	This pedal requires a standard 9V DC center-negative power supply (not included) and consumes less than 100mA. There's no battery option.

Tips for soldering

The solder joints you'll make on the circuit board are very small, and too much heat can damage the board. The idea is to make joints quickly, without scorching the eyelets.

Hold components in place for soldering by threading the leads through the board and bending them apart on the reverse side.



Make your solder joints on the reverse side. Insert the tip into the eyelet and let it heat for 4-5 seconds before touching it with solder. This heats the contact enough for the solder to flow nicely without damage. You don't need much solder, just enough to fill the eyelet. After soldering, trim away the excess lead wire.

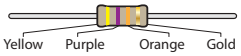
Give your pedal a custom paint job!

Any paint sold for use on metal will work well on the kit case. Spray paints like Rustoleum® or Krylon® are a durable finish. You might want to paint the case before building the kit, so you won't need to take the parts back out for painting.

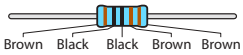
A way to add custom graphics is to print them from your computer onto waterslide decal paper. If you use decals, protect them from scratches by spraying clear topcoats over them.

Parts list

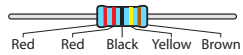
Resistor values are indicated by colored bands, read from left to right. The first color in the code is usually the one painted closest to a lead wire. When a gold or silver band is present, it's always one of the last colors in the code. A magnifier is a big help in reading these codes.



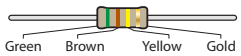
(2) **R1, R2** Resistors (47 kΩ)



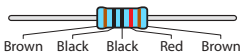
(6) **R3, R5, R9, R12, R16, R17** (1 kΩ)



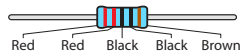
(1) **R4** Resistor (2.2 MΩ)



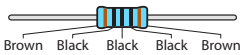
(2) **R6, R19** Resistors (510 kΩ)



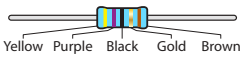
(6) **R7, R8, R10, R13, R20, R22** (10 kΩ)



(1) **R15** Resistor (220 Ω)



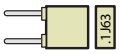
(1) **R21** Resistor (100 Ω)



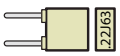
(1) **R23** Resistor (47 Ω)

(2) **C1, C15** Capacitors (10 µF)

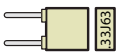
(2) **C3, C4** Capacitors (100 µF)



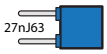
(3) **C2, C12, C14** Capacitors (.1 µF)



(2) **C9, C10** Capacitors (.22 µF)



(1) **C7** Capacitor (.33 µF)



(1) **C5** Capacitor (.027 µF)

(2) **C6, C13** Capacitors (1 µF)

(1) **C8** Capacitor (51 pF)

(1) **D1** Diode (P6KE22A)

(3) **D2, D3, D7** Rectifiers

(2) **D4, D5** Red LEDs (5mm)

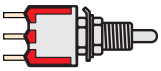
(1) **D8** Clear LED (5mm, glows yellow)

(1) Ribbon cable

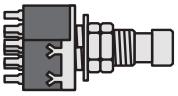
(1) **Q1, Q2** Transistor (2n3904)

(1) **R11** Pot (500 kΩ, audio taper)
(1) **R14** Pot (5 kΩ, linear taper)
(1) **R18** Pot (100 kΩ, linear taper)

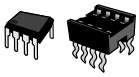
(4) Adhesive foam tape



(1) On-Off-On solder lug toggle



(1) Footswitch (3PDT, latching)



(1) **U1** Low noise op-amp (4558p 500nA)
(1) **U1.2** socket for op-amp

(1) DC power connector (21MM)

(2) Mono jacks, 1/4"

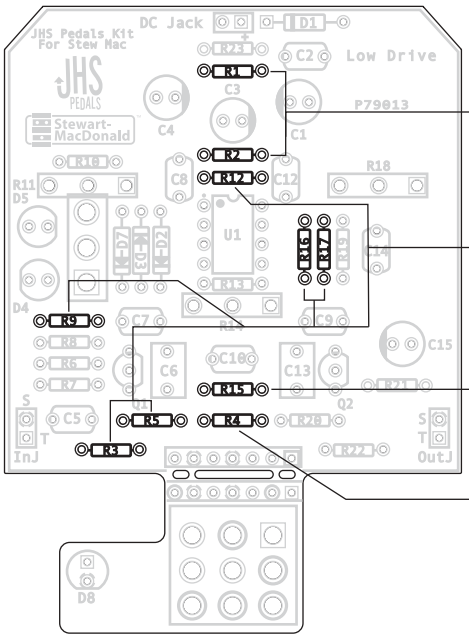
(3) Control knobs

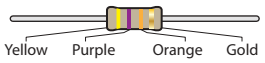
(1) LED mounting bezel (5mm)

(Not pictured) (1) Circuit board

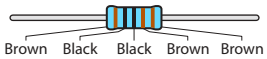
(Not pictured) (1) Metal case with 4 screws

Step 1: Install twenty resistors

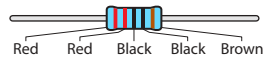




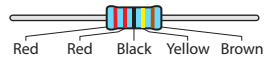
R1, R2 Resistors (47 kΩ)



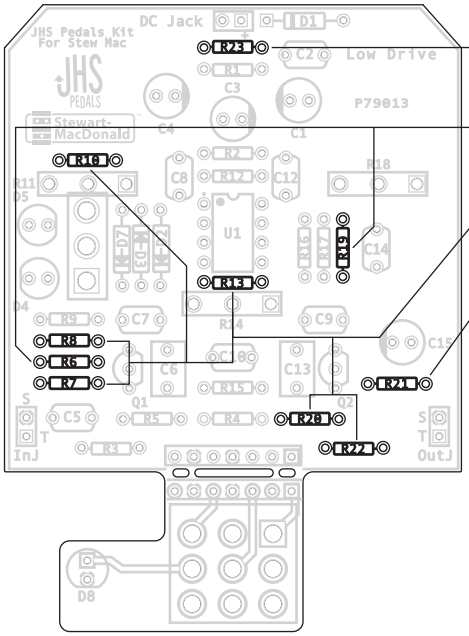
R3, R5, R9, R12, R16, R17 Resistors (1 kΩ)

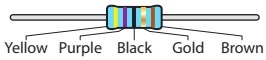


R15 Resistor (220 Ω)

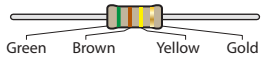


R4 Resistor (2.2 MΩ)

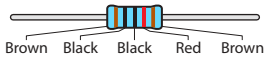




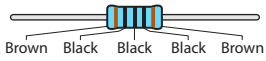
R23 Resistor (47 Ω)



R6, R19 Resistors (510 kΩ)



R7, R8, R10, R13, R20, R22 Resistors (10 kΩ)

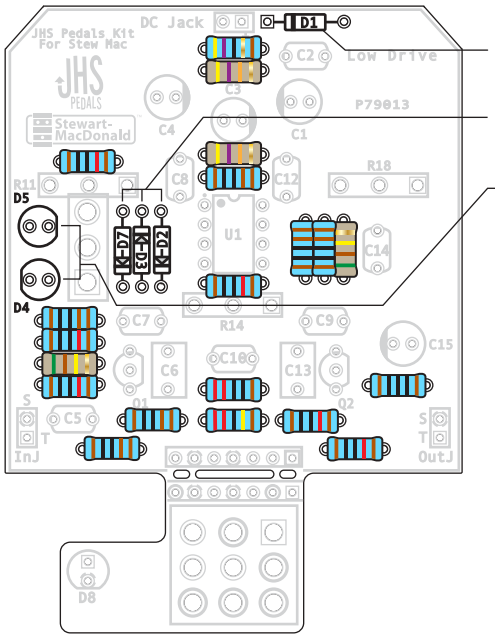


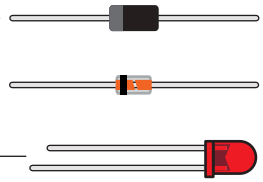
R21 Resistor (100 Ω)

Resistors have a low profile, sitting closer to the board than taller components, so install them first. Their locations are marked with numbers on the board.

Resistors are not polarized, so it doesn't matter which lead goes in which eyelet. They can be installed in either direction.

Step 2: Install six diodes





D1 Diode (P6KE22A)

D2, D3, D7 Rectifiers

D4, D5 Red LEDs (5mm)

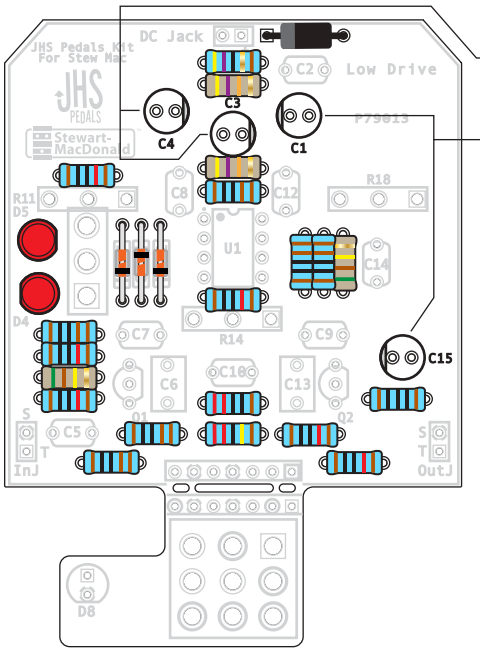
Diodes are polarized, so they need to be installed in the correct orientation. Note the stripe around one end: this marks the negative (minus) lead of the diode. On the circuit board, the printed outline of the diodes also shows this stripe. Install each diode so that its stripe matches the direction shown on the circuit board.

D1 is a larger sized P6KE22A. **D2**, **D3**, and **D7** are all 1N4148 rectifiers.

The leads on diodes sometimes vary in diameter. If the leads don't fit into the holes in the circuit board, trim them at a steep angle to create sharp points that fit into the holes

Next install the two red LED (Light Emitting Diode) clipping diodes, **D4** and **D5**, on their location marks. These are also polarized and need to be installed in a the correct orientation. On the circuit board, their location marks indicate a flat on one side. This matches the slight flat on one side of the LED diode. Install them so the flat on the board matches the flat on the LED.

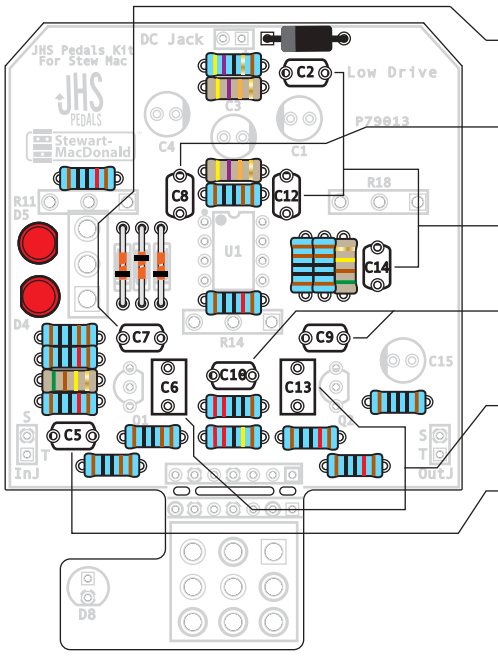
Step 3: Install fourteen capacitors

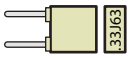


C3, C4 Capacitors (100 µF)

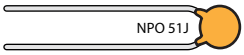
C1, 15 Capacitors (10 µF)

The four capacitors shown above are polarized, and have to be installed in the correct orientation. Note the white stripe running the length of each cap; this identifies the negative (minus) lead. On the circuit board, the circle for this cap's location has a thicker line on one side: insert the capacitors with their stripe facing that side. (On polarized caps of this type, there's a second way to identify the minus lead: it is the shorter of the two leads.)

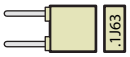




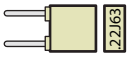
C7 Capacitor (.33 µF)



C8 Capacitor (51 pF)

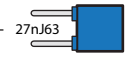


C2, C12, C14 Capacitors (.1 µF)



C9, C10 Capacitors (.22 µF)

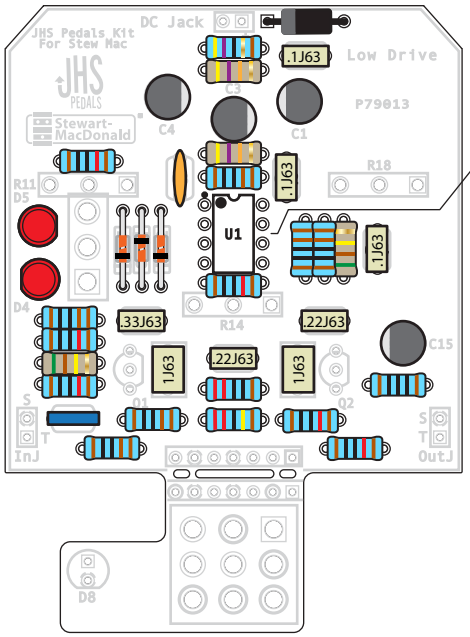
C6, C13 Capacitors (1 µF)

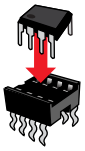


C5 Capacitor (.027 µF)

The remaining capacitors are not polarized. Solder these caps in place facing either direction.

Step 4: Install the operational amplifier





U1 Low noise op-amp (4558P, 500nA)

U1.2 socket for op-amp

The operational amplifier consists of two parts: the op-amp itself (**U1**), and the socket it plugs into (**U1.2**).

You'll solder the socket first, then install the op-amp in the socket.

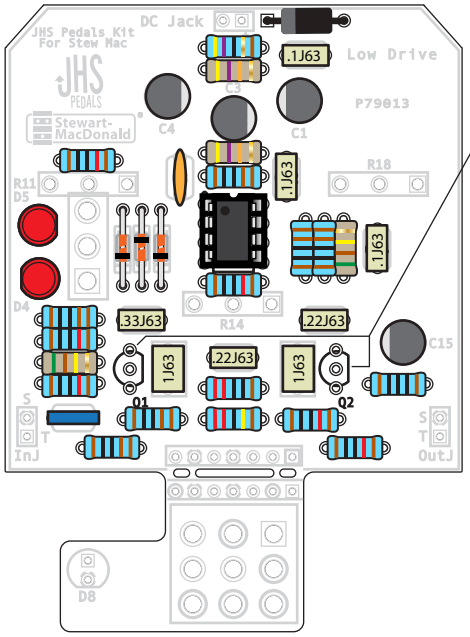
The op-amp has to be oriented correctly in order to function properly. There are two indicators on the circuit board to guide you in positioning it:

1. The rectangular **U1** position marker has a small notch at one end. Align the similar notch in socket **U1.2** when installing the socket.

2. The **U1** position marker has a dot in one corner. There is a dot molded into the corner of op-amp **U1**. Align these corners when pressing the op-amp into place.

Solder socket **U1.2** to the board. The op-amp **U1** then snaps in without solder. This feature allows you to try different op-amps with no soldering.

Step 5: Install two transistors

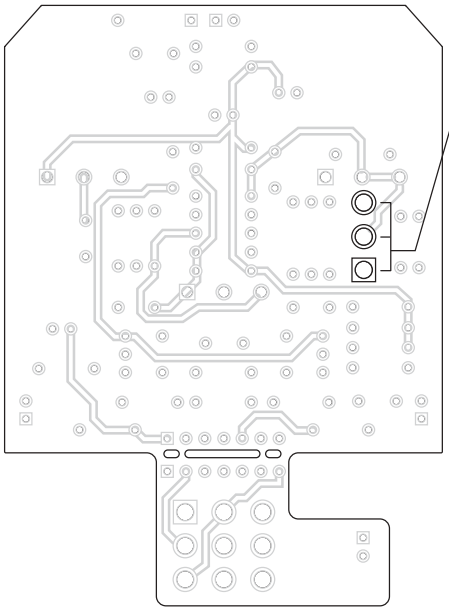


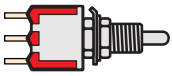
Q1, Q2 Transistor (2n3904)

Q1 and **Q2** are 2n3904 JFET* transistors. They are directional, and need to be installed in a specific orientation. Note that they have a flat side. On the circuit board, their location outlines also have a flat side. Install the transistors to match these outlines.

*JFET: Junction Gate Field-Effect Transistor

Step 6: Install the mini toggle switch



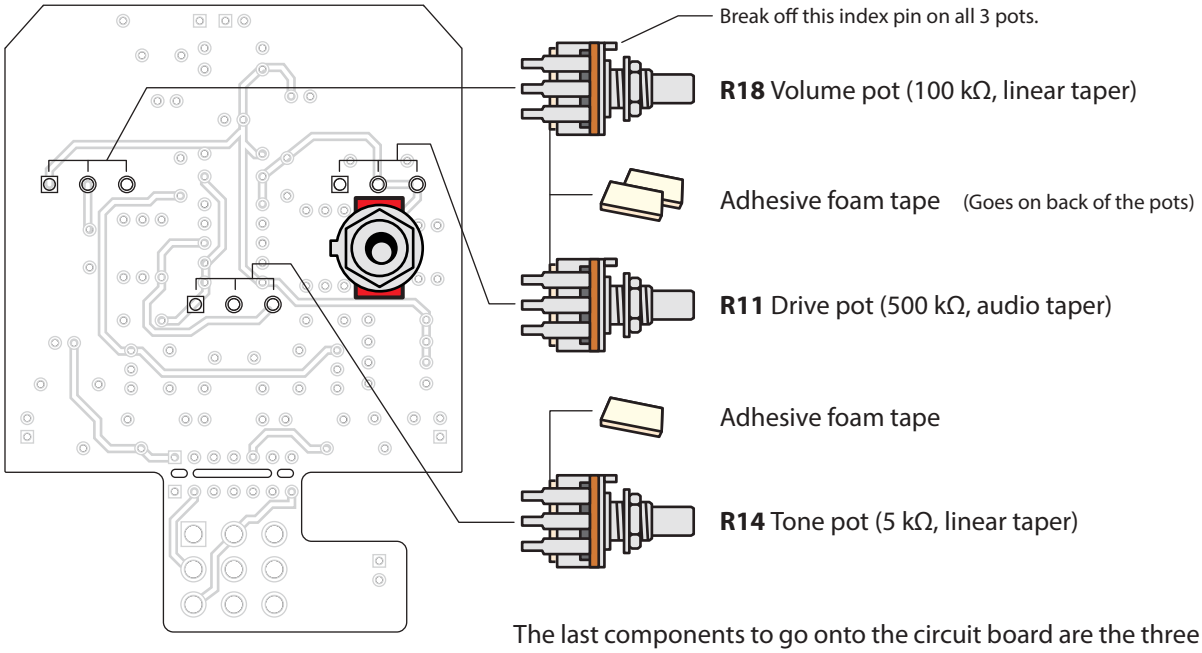


On-Off-On solder lug toggle

The three-position **mini toggle switch** installs on the back of the board, and there is no location marker printed. Solder the switch to the three large eyelets pictured, making sure it's flat and square to the circuit board.

The switch is not directional, so it works equally well turned in either direction.

Step 7: Install the control pots

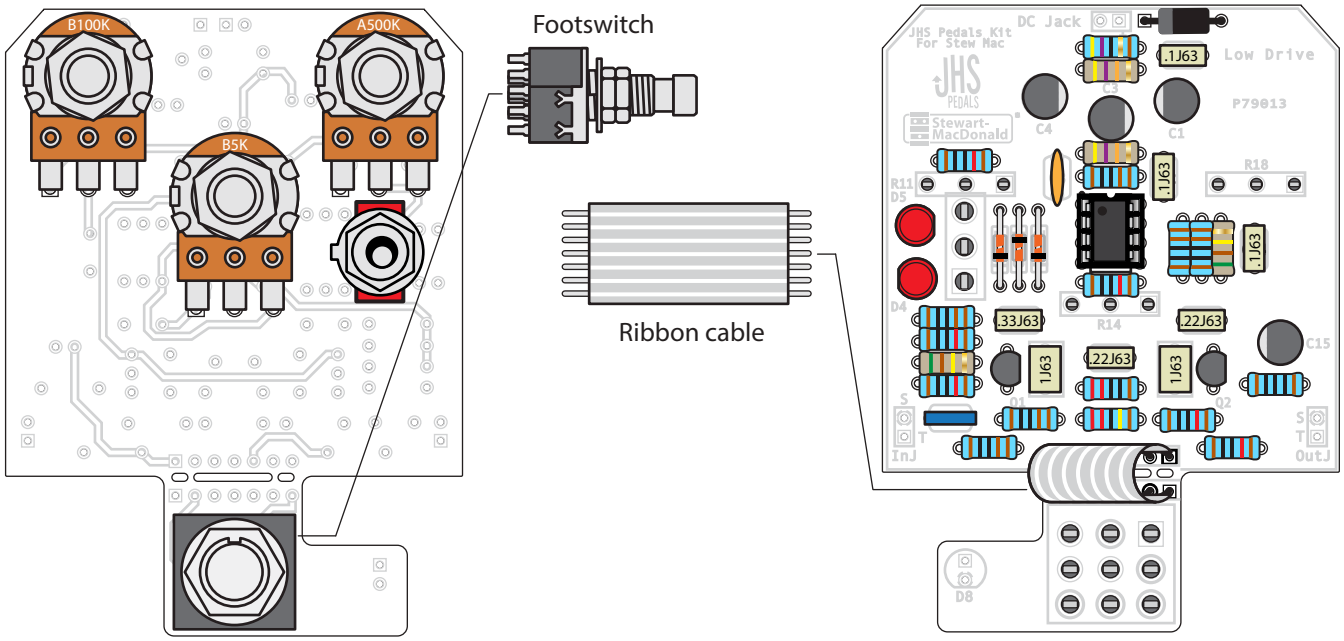


The last components to go onto the circuit board are the three control pots. They install on the back of the board. Each pot has three connecting lugs; the illustration in **Step 8** shows the three pots in position on the board.

Each pot has an index pin protruding from the case. Break off this pin before installation, so the pot will mount flush against the pedal case. Needle nose pliers work well for removing the pins.

Use the **adhesive foam tape** to insulate the back of the pot from the soldered leads of the other parts. Solder the pot in place, making sure it sits flat on the back of the board.

Step 8: Install the footswitch, then the ribbon cable

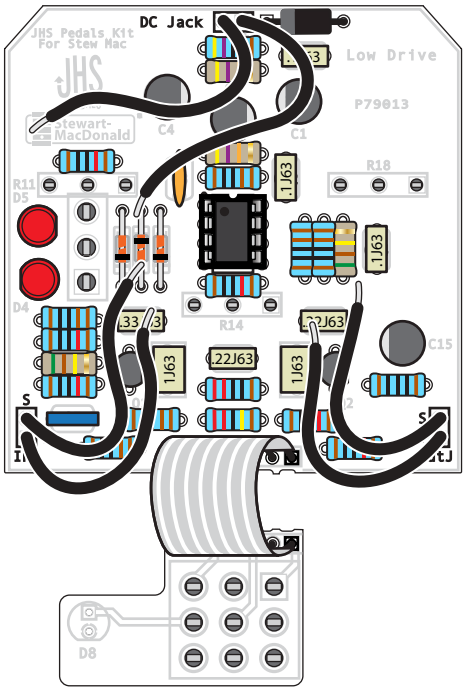


Install the **footswitch** on the back of the circuit board. The switch lugs will fit in only one of two directions; either orientation works fine. Insert the lugs through the nine eyelets so the switch sits flush, making contact all around.

Solder one lug and let it cool. This holds the switch in place while you solder the remaining lugs.

Next, install the **ribbon cable**. Insert the cable leads through the front of the board, and solder them in place on the back.

Step 9: Install the lead wires, cut the board

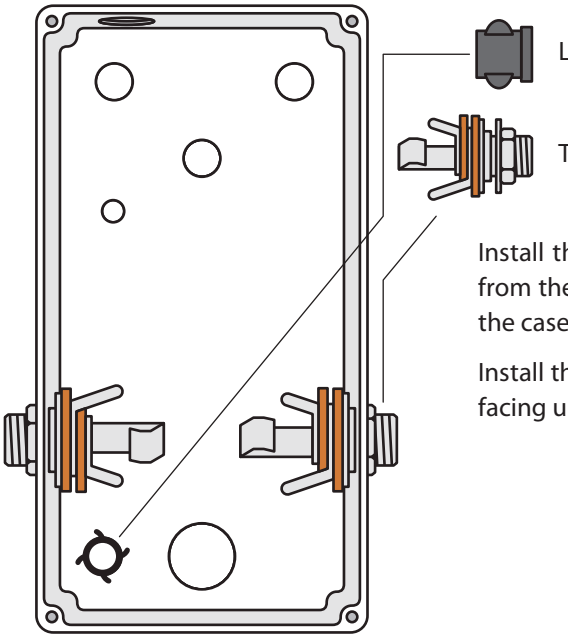


Lead wire, cut into six 2" lengths

Cut the **lead wire** into six 2" lengths for the input, output, and power jacks. Strip the insulation on the ends and thread them through the front of the board. Solder them on the back of the board.

Now you can cut the switch portion of the board away from the main board. Small wire cutters make quick work of this, and a small saw also works.

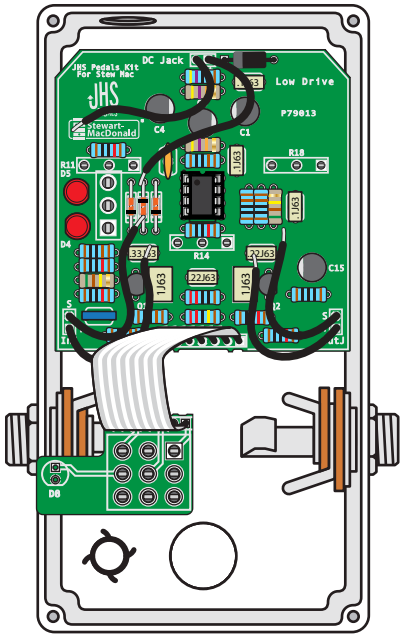
Step 10: Install the LED mounting bezel and the two jacks



Install the plastic **mounting bezel** for the LED indicator by pressing it in from the outside, through the top of the case. Spread the tabs open inside the case to hold it in place.

Install the **input and output jacks** on the sides of the case. Keep the lugs facing up so you'll have easy access when it's time to solder them.

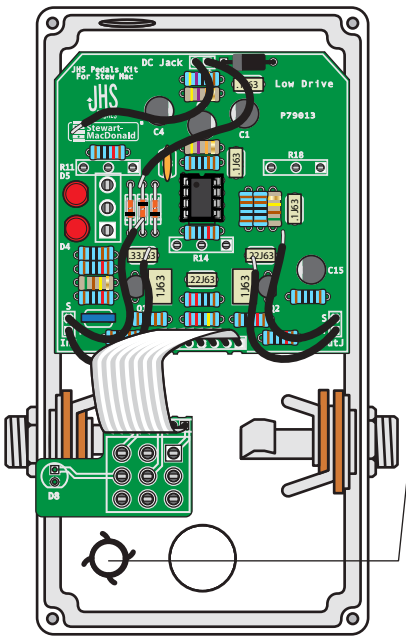
Step 11: Mount the circuit board in the case



The **main circuit board** is held in place by the control pots and mini toggle switch.

Install their shafts through the top of the case, and thread flat washers onto them on the outside. Install the mounting nuts so they are good and snug, but take care not to overtighten.

Step 12: Install the LED in the mounting bezel

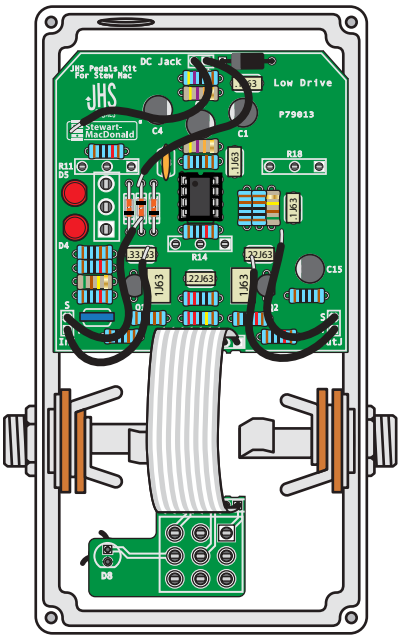


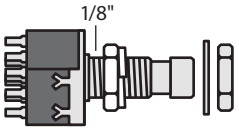
D8 LED (5mm)

Like some of the caps and diodes, the **D8** LED is polarized and has to be installed in a specific direction. One side of the diode has a flat edge, indicating the negative lead. Another indication is that the negative lead is shorter than the positive. The circle marking the **D8** location on the switch circuit board has a corresponding flat to indicate the mounting orientation.

Insert the LED into the bezel. It will be held in place by soldering it to the switch circuit board in **Step 13**, but for a more secure mount you can run a bead of clear silicone adhesive around the LED and bezel.

Step 13: Install the footswitch





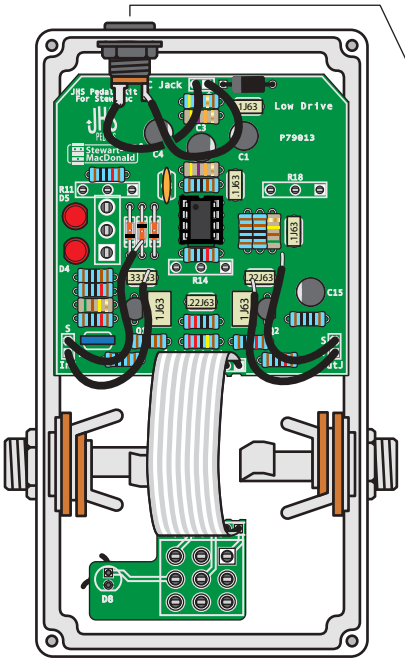
Thread one of the nuts onto the **footswitch**, leaving a 1/8" gap between it and the switch housing. Place the split lock washer on next.

Carefully install the switch so the legs of the diode feed through the **D8** holes on the switch circuit board.

Place the flat washer on the switch shaft on the top of the case. As you tighten the remaining nut on the switch, hold the switch circuit board inside the case so that it doesn't rotate.

Solder the **D8** LED and trim the leads.

Step 14: Install the DC power connector

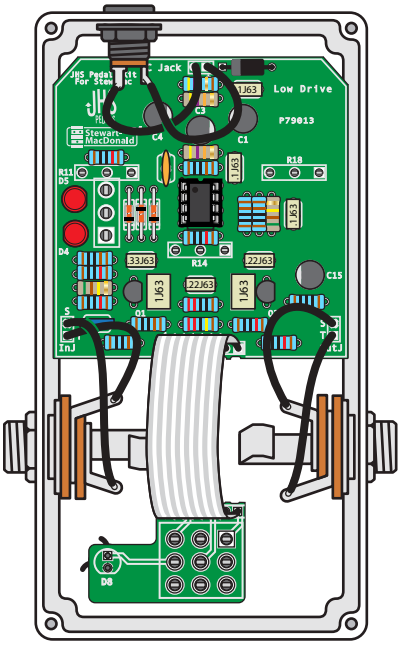


DC power connector

Insert the **DC power connector** so the negative lug is facing up, and tighten it in place. The negative lug is the one with the largest metal tab.

Solder the installed leads from the circuit board to the jack. Where they attach to the board, the positive lead is on the the right and the negative is on the left.

Step 15: Wire the input/output jacks



On the circuit board, the input and output jack leads are labeled **InJ** and **OutJ**. The leads are also labeled **T** for tip, and **S** for sleeve. Looking at a jack, you'll see that the sleeve lug is attached to the threaded shaft. The tip lug connects to the spring metal piece that contacts the tip of a guitar cord.

Solder these four leads as shown to finish the assembly.

Screw the bottom onto the case and add the control knobs.

Plug in and rock out!

Here's how to use the **LOW DRIVE**: