# LIGHTCYCLE PHASOR II

## BI-PHASE SHIFT USING PHOTORESISTORS

INSTRUCTION GUIDE

# BASED ON THE MU-TRON PHASOR II

**The Lightcycle is a phase shifter based on the rare Mu-Tron Phasor II, the stripped-down second-generation version of the original Bi-Phase pedal.**

**The phase pedal duplicates the original signal and manipulates it by shifting the phase of the copied signal. These types of effects originated in the studio with the birth of automated double tracking in the 60's. Engineers would run two tape machines at varying speeds to achieve a double tracking effect that produced a wide range of never before heard effects.**

**The Phasor II had a more simple and stage friendly control layout than the Bi-Phase that was easier to manage in live performance situations. As of this writing, the Mu-Tron Phasor II fetches no less than $700 on the used market.**

**FIRST TIME BUILDING A PEDAL?** Kick back and watch our 4-part series where we show you the basics of pedal building. Even if you're a complete beginner don't worry! We go over everything from unboxing, to choosing the right soldering iron, to making every connection. We also give tips on painting your pedal.

**Visit:** stewmac.com/pedal-build

## TOOLS AND SUPPLIES
(REQUIRED OR RECOMMENDED)

**Not pictured:** #1Phillips screwdriver, supplies to paint your pedal, clear silicone adhesive, spray finish.

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**Power: Model 12253 requires a standard 9V DC center-negative power supply (not included) and consumes less than 100mA.**

Soldering Iron #0502
Solder Wick #0504
Solder #0505


PC Board Holder #0500


Guitar Tech
Wrench Set #3691
or nut drivers/sockets


Wire Cutter #1607

Long-Nose Pliers #1610

Fine-Gauge Wire
Stripper #1606

## TOOLS AND SUPPLIES
(HELPFUL)

Magnifying Glass or
OptiVISOR #1685

Multimeter PM16B #3607

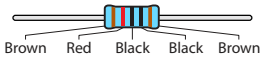

Soldering Aids #0521

Our Pedal Building Tool Set #2318 is the perfect companion for new pedal builders who do not already have a lot of tools and supplies.

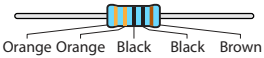
**Note:** While electrical properties remain the same, the appearance of parts may vary based on availability. If you are ever unsure, please contact us via the information on the back of this manual.

**We know you are excited to get started building. That said, one of the keys to a successful build, is taking the time to get to know all of your parts.** Sort all of your pedal's parts and check off according to the parts lists that follow. If you are not familiar with what they do, the next section will give you a little primer.

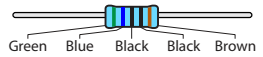
## PARTS LIST



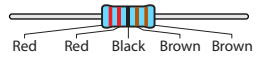

120Ω resistor (1) #101122



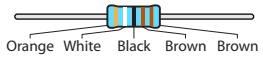

330Ω resistor (1) #7375



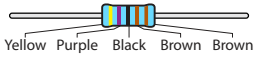

560Ω resistor (2) #7356



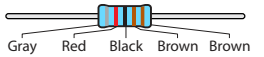

2.2K resistor (2) #7376



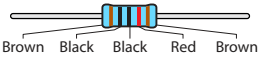

3.9K resistor (2) #100700



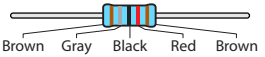

4.7K resistor (16) #7359



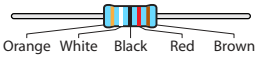

8.2K resistor (3) #100702




10K resistor (3) #7362

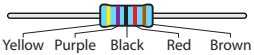



18K resistor (1) #7396

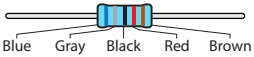



39K resistor (1) #100704

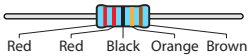
## **PARTS LIST** (CONT)



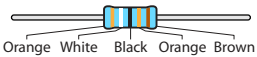

47K resistor (2) #7369




68K resistor (3) #7380



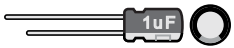

220K resistor (7) #7381



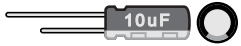

390K resistor (2) #7419

1N5817 rectifier diode (1)
#7522

1N4148 rectifier diode (2)
#7470

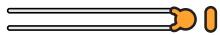



1µF capacitor (1)
#7314




10µF capacitor (3)
#7310


220µF capacitor (1)
#101930



820pF capacitor (1)
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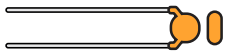
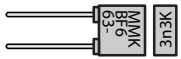
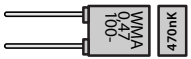


47pF capacitor (1)
#100720

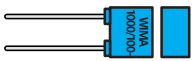
## **PARTS LIST** (CONT)



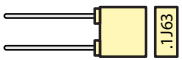

3.3nF capacitor (1)
#7303



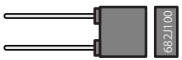

470nF capacitor (2)
#101932




1nF capacitor (1)
#101931

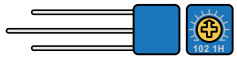



100nF capacitor (2)
#7304

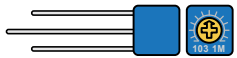



6.8nF capacitor (6)
#100723

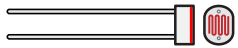

2N4401 transistor (1)
#100735



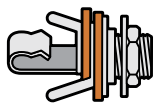

1K trim pot (1)
#100737




10K trim pot (1)
#7570



KE - 10720 LDR (6)
#100778

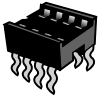


1/4" mono jack (2)
#4652

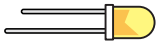
## **PARTS LIST** (CONT)


TC1044 SCPA Charge pump (1)
#100732


TL072 1C op-amp (6)
#7444



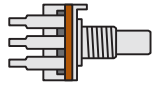
Integrated circuit socket (7)
#7484



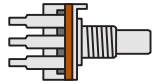
Yellow LED (1)
#7423

White LED (1)
#7422

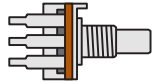
5mm LED mounting bezel (1)
#7432



B10K linear taper pot (1)
#7532

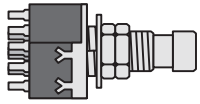


A10K audio taper pot (1)
#101646



A25K audio taper pot (1)
#102230

Adhesive foam tape squares (4)
#7560

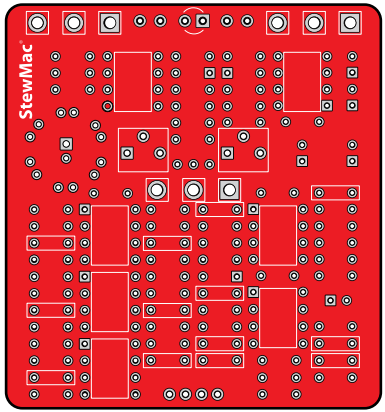


3PDT latching footswitch (1)
#1611

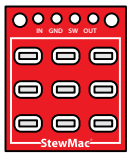
2.1mm DC power connector (1)
#7468

## **PARTS LIST** (CONT)

24" of lead wire (1)
#5960

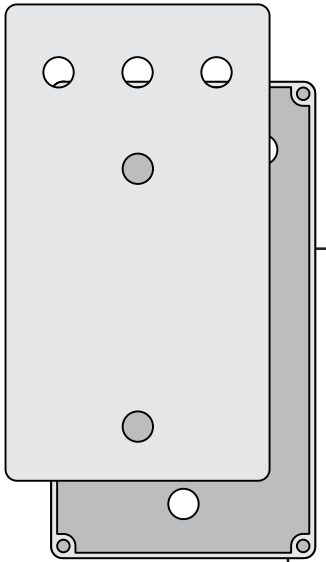



Circuit Board [PCB] (1)




Breakout Board (1)

Control knobs (3)
#7501



Pre-drilled enclosure (1)

StickerSheet (1)

# 1 PAINTING YOUR PEDAL HOUSING

Give your pedal a custom paint job by painting and adding the stickers provided in this kit (or custom decals that you can create on your own). Doing this pre-build is not only fun, but it's much easier than disassembling the pedal to paint it once you put it together. Don't forget to order quality primer and lacquers from stewmac.com.

**1.** To minimize redoing steps, make sure you have a solid idea of the look and feel you're going for.

**2.** Lightly sand housing with a P240 grit sandpaper and wipe clean any debris.

**3.** Cover the holes from the inside with masking tape.

**4.** On a large piece of cardboard, elevate the housing top and bottom on a couple of small blocks of wood.

**5.** With long, slow strokes, spray one light coat of primer or primer/paint on top and bottom. Allow 45 minutes of drying time between next two to three coats.

**6.** If you're using primer followed by paint method, paint 3 coats with 45 minutes between coats.

**7.** Now, add your Lightcycle sticker and any other desired decoration (paint pens, acrylic paint, Sharpie etc.). Allow drying time.

**8.** Add 3 coats of clear coat glaze with 45 minutes between coats. Wait at least 2 hours before adding parts.

# UNDERSTANDING ELECTRONIC COMPONENTS

A number of different components are used to make an effects pedal. Here's an overview of what they do..

## RESISTORS

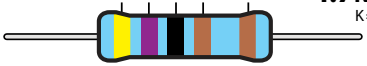
A resistor is used in an electrical circuit to present an opposition to current flow. It resists the amount of current that can pass through it.

A resistor's value—the amount of resistance it creates – is rated in ohms (Ω). The higher the ohmic value, the greater the resistance to this flow of current. For example, a 100Ω resistor creates ten times as much resistance as a 10Ω resistor.

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. When a gold or silver band is present, it's always one of the last colors in the code.

| | Band 1 | Band 2 | Band 3 | Multiplier | Tolerance |
|---|---|---|---|---|---|
| BLACK | 0 | 0 | 0 | 1 | |
| BROWN | 1 | 1 | 1 | 10 | +/- 1% |
| RED | 2 | 2 | 2 | 100 | +/- 2% |
| ORANGE | 3 | 3 | 3 | 1,000 | |
| YELLOW | 4 | 4 | 4 | 10,000 | |
| GREEN | 5 | 5 | 5 | 100,000 | +/- 0.5% |
| BLUE | 6 | 6 | 6 | 1,000,000 | +/- 0.25% |
| VIOLET | 7 | 7 | 7 | 10,000,000 | +/- 0.10% |
| GRAY | 8 | 8 | 8 | 100,000,000 | +/- 0.05% |
| WHITE | 9 | 9 | 9 | 1,000,000,000 | |
| GOLD | | | | 0.1 | +/- 5% |
| SILVER | | | | 0.01 | +/- 10% |

5-band code: 4 7 0 x10 ±1% = **4.7KΩ** ±1%
K=1,000



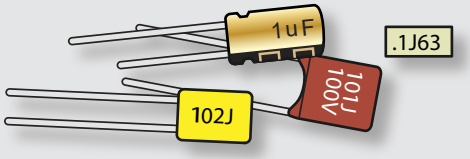
4-band code: read Bands 1 and 2 same as above, then Band 3 is the Multiplier and Band 4 is the Tolerance.

If you're having trouble reading the color bands, there are apps that make easy work of identifying them. Or, try using a multimeter to read a resistor's value. Just set your multimeter to ohms and connect the test leads on each side of the resistor.

## CAPACITORS

The two main uses of capacitors are to store electricity and to block the flow of DC current.

Capacitor values are typically printed on the component. The key values with caps are their voltage and capacitance.




The voltage spec for a cap refers to how much DC voltage it can handle at any given time. If this rating is exceeded, the capacitor will fail.

Capacitance, measured in farads, refers to how much electricity a capacitor can hold. One farad (1F) would be much too large for use in a pedal. Caps for pedals are rated between millionths of a farad, called microfarads (µF), billionths of a farad, called nanofarads (nF), or trillionths of a farad: picofarads (pF). **.001µF = 1nF = 1,000pF**.

Resistors and capacitors may also be referred to with shorthand notation on the printed circuit board when there is a decimal in the value. For example, the place on the board for the 4.7K resistor will read 4K7 and the spot for a 2.2nF capacitor will read 2n2. This is done to save space on the board and make the labels as clear as possible.

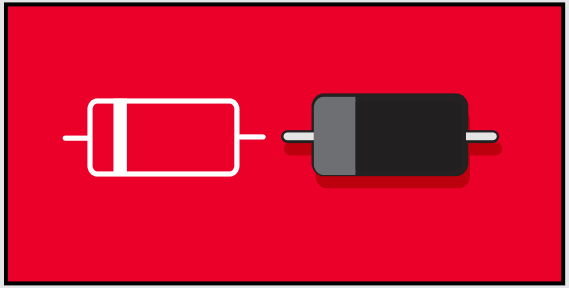

Some capacitors have polarity and some don't. It's extremely important to install polarized caps correctly in a circuit. The negative lead will often be indicated by a band of arrows pointing to the negative lead and will be shorter than the positive lead. The positive lead of an electrolytic cap will be longer and won't have any arrows pointing to it.

The hole in the PCB for the positive lead is square and marked with a "+".

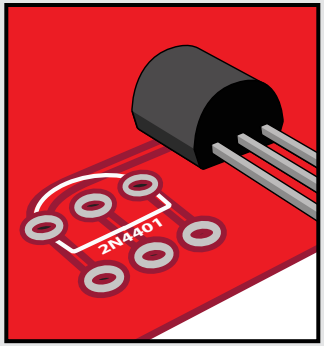

Installing capacitors with the polarity backwards will make the circuit malfunction and quickly destroy the capacitor— even causing it to explode.

## DIODES

Diodes are used where you want electricity to flow in only one direction, such as power rectification, and also to limit how much current can flow, to create "clipping" distortion.



Diodes are also polarized, so they need to be installed in the correct orientation. The stripe around one end 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.

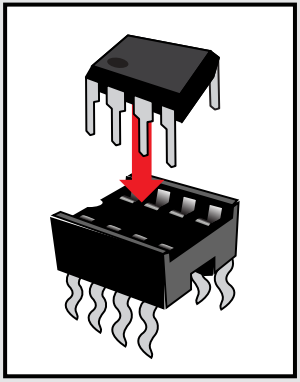



## TRANSISTOR

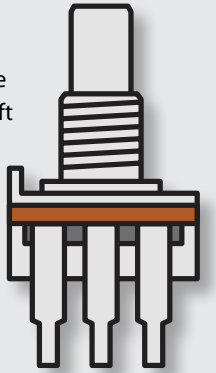
Transistors are used to amplify electrical signals. They have a square tab on one side. Be sure to match the tab to the outlined tab shown on the circuit board when installing.

## INTEGRATED CIRCUITS

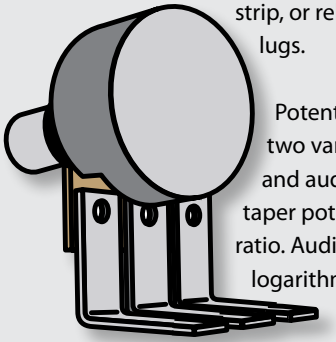
Integrated circuits are complex, tiny, self-contained collections of components that contain a complete circuit. Op-amps, audio processors, and linear voltage regulators are three kinds of integrated circuits.



## POTENTIOMETER



A potentiometer, or pot, is a variable resistor. This means as the knob shaft is rotated, the DC resistance will change. There are three lugs or soldering terminals on a conventional potentiometer. The outside two are the ends of the resistive strip, and the center lug is connected to the "sweeper." The sweeper allows you to vary the DC resistance relative to its position along the resistive strip, or relative to the outer two lugs.



Potentiometers come in two varieties, linear-taper and audio-taper. The linear-taper pot's taper works at a 1:1 ratio. Audio taper, has a special logarithmic ratio.

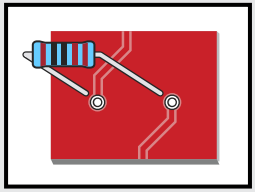
Audio taper is used because our ears don't hear changes in volume in a linear fashion as you might expect. As the volume increases, a greater change in signal or sound-pressure is required to perceive a smooth transition.

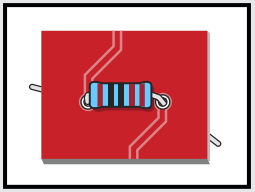
## LED

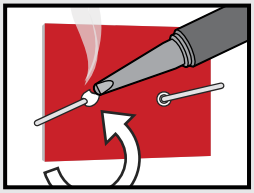
LED stands for Light Emitting Diode, and functionally LEDs are very similar to regular diodes. LEDs are most often used as indicator lights in pedals. They are polarized just like diodes and electrolytic capacitors and must be installed in the correct orientation to work. The positive (anode) lead of the LED will be longer and the anode side of the LED housing will be round. The negative (cathode) lead of the LED will be shorter and the cathode side of the LED housing will be flat. LEDs are mounted inside of a bezel, which protects the LED and insulates the leads from shorting against the enclosure or any internal components.

## SOLDERING

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

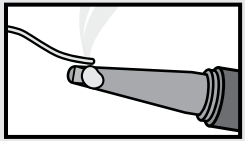






**1.** Hold components in place for soldering by threading the leads through the board and bending them apart on the reverse side. You will be making your solder joints on the reverse side of the board.

**2.** Tin the iron by melting a small amount of solder onto the tip of the iron.



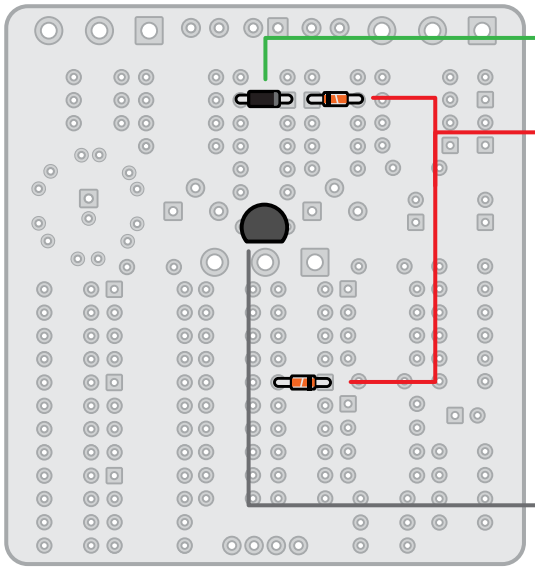
**3.** Insert the tip into the hole and let it heat for 4-5 seconds before touching it with solder. This heats the contact enough for the solder to flow nicely without damage. Feed the solder to the hole, not the iron, and you don't need much solder, just enough to fill the hole. Keep the iron on the connection for a second longer; this pause gives time for all of the flux to cook out of the joint. After the joint has cooled, trim away the excess lead wire.

Here's a few more soldering tips that might be helpful:

- Keep your soldering tip clean by wiping it often on a damp sponge.
- Also keep it tinned by occasionally melting a little solder onto it.
- Don't blow on the hot solder or touch anything until the joint has cooled completely. A good solder joint is shiny – a sign that it was left to cool undisturbed.
- Plan so each joint is only soldered once. Resoldered joints are messy and more likely to fail.

## 2 INSTALL 3 DIODES & 1 TRANSISTOR

Insert the diode leads through the component side (the side with the component's info silkscreened in white). In many cases, components must be inserted in a specific direction due to polarity, so follow the graphics carefully. For example, diodes are polarized, so they must be installed in the correct orientation. Install the diodes and transistor. Solder the diodes and transistor on the opposite side of the board, known as the solder side.



1N5817 rectifier diode (1)
#7522

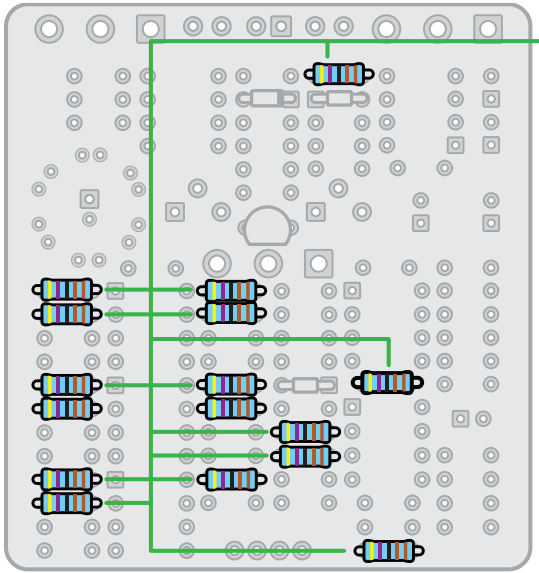
1N4148 rectifier diode (2)
#7470

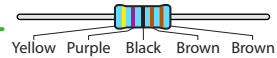
Note the stripe around one end of the diode. This marks the negative (minus) lead. On the PCB, the printed outline of the diodes also shows this stripe. Install each diode to match the direction shown. Place all diodes with the wires pointing down, through the component side.


2N4401 transistor (1)
#100735

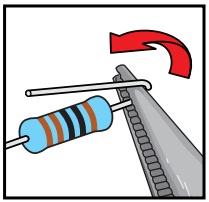
Next, we're going to add some resisitors to our PCB. Like in the previous step, you'll find an outline of each resistor and its value printed in the proper location on the PCB. Resistors are not polarized, so it doesn't matter which lead goes in which hole. Match resistors to the values on the PCB, a few at a time, and solder in place. Clip the leads close to the board, but not touching the board so you don't damage the solder pads.

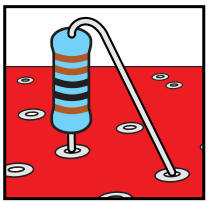
## 3 INSTALL 46 RESISTORS






4.7K resistor (16) #7359

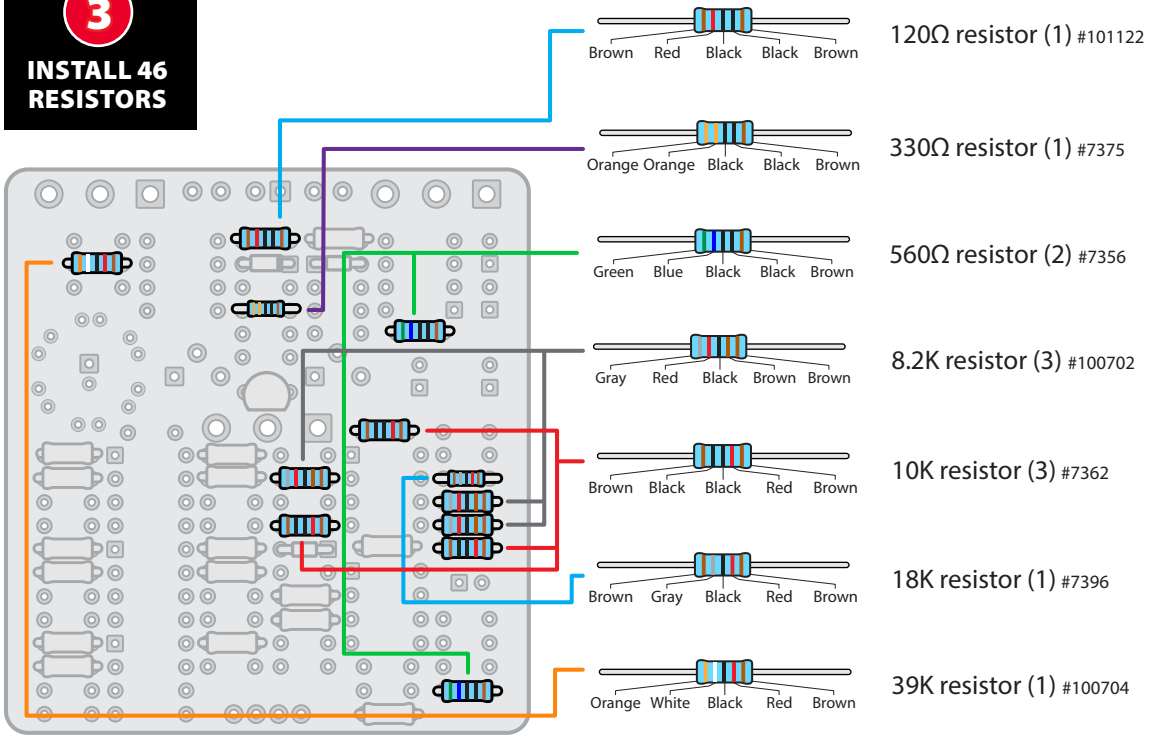




**Install resistors upright**

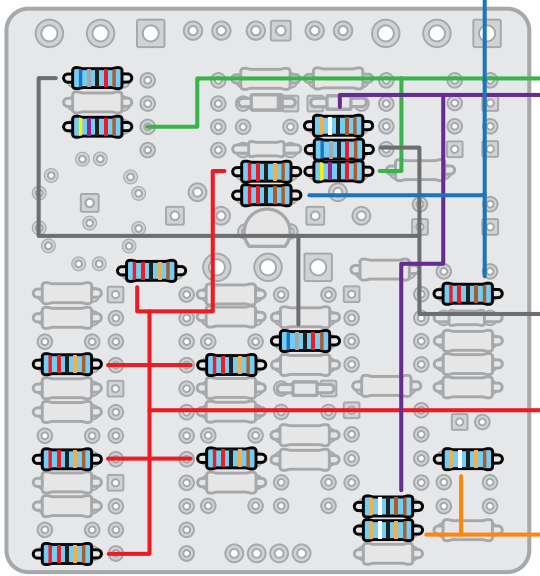
This circuit is a tight fit for many of the components. To make sure they all fit and clear one another, install the resistors vertically in columns. Holding a resistor vertically in your fingers, bend the lead on the top end down approximately 135°. This will allow you to install the resistor vertically easily and quickly into the board as shown. Needle nose pliers make easy work of the job, but you can also bend the lead with your fingers.

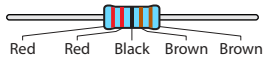
# 3 INSTALL 46 RESISTORS



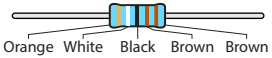
When installing resistors vertically, use care to install them in an orderly fashion in rows for a nice and consistent look.

## 3 INSTALL 46 RESISTORS

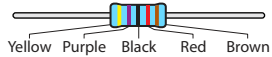




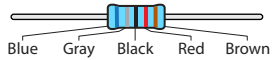

2.2K resistor (2) #7376



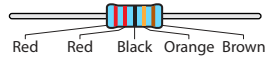

3.9K resistor (2) #100700



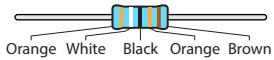

47K resistor (2) #7369




68K resistor (3) #7380



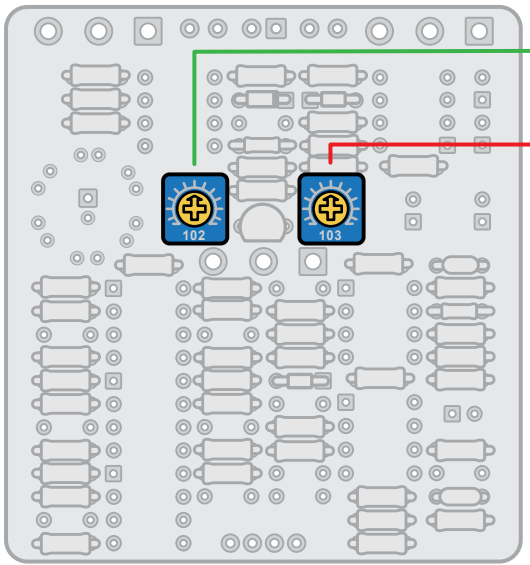

220K resistor (7) #7381

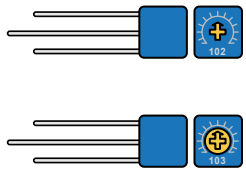



390K resistor (2) #7419

# 4 INSTALL 2 TRIM POTS

The internal trim pots featured on the Lightcycle allow the user to fine tune the overall "feel" the pedal will have when engaged. The trim pot on the left adjusts the sweep, or general feel of the effect when it is engaged. The trim pot on the right adjusts the the strength of the effected signal.



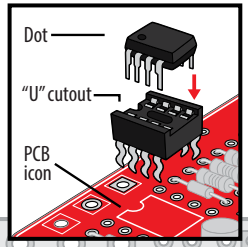




1K trim pot (1)
#100737

10K trim pot (1)
#7570

Carefully insert the legs of the trim pots into the PCB and solder in place on the back of the PCB.

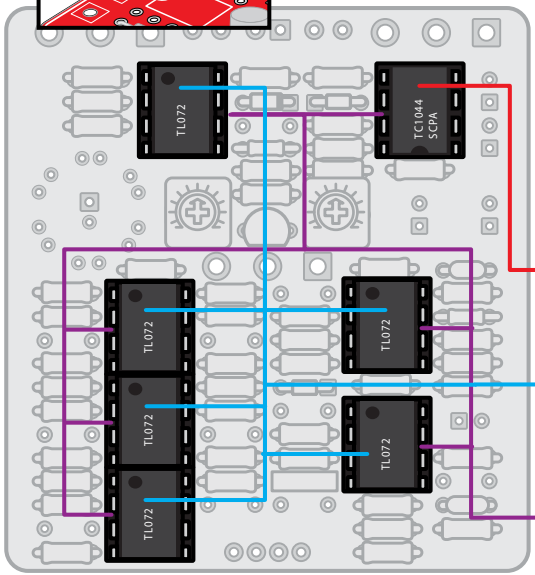
On page 37, we will show you how adjustments to the trim pots will affect your sound.

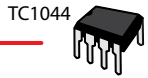



Next, carefully snap seven integrated circuit (IC) sockets onto the PCB. Make sure the u-shaped cutout matches the one on the PCB and that ALL of the legs have penetrated the PCB and none have folded under the part. Flip over the PCB and solder all of the sockets. Once cool, install the piggybacking charge pump and op-amp chips by snapping them into the sockets.

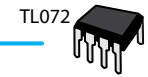
## 5 INSTALL 6 OP-AMPS & 1 CHARGE PUMP

Orienting these chips is ***critical***. On the op-amp chips, the small dot in the upper left corner on the IC sockets MUST be installed on the same end as the u-shaped cutout on the IC socket for proper orientation. With the charge pump chip, the u-shaped cutout needs to be installed to match the u-shaped cutout on the socket.

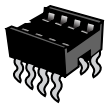



TC1044 SCPA charge pump (1)
#100732




TL072 1C op-amp (6)
#7444

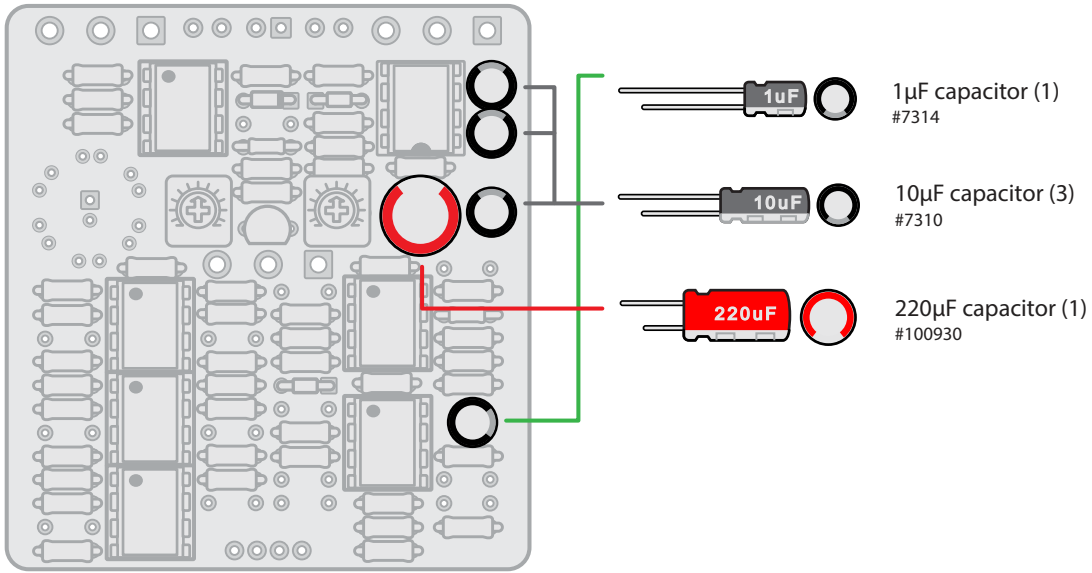


Integrated circuit socket (7)
#7484

The TC1044 SCPA in this circuit is known as a charge pump. In the Lightcycle, this chip takes the incoming 9v DC and doubles it, thus increasing the headroom in this circuit.

## 6 INSTALL 5 POLARIZED CAPACITORS

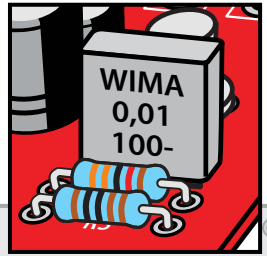
The three types of capacitors shown below are polarized and have to be installed in the correct orientation. Note the stripe running the length of each cap; this identifies the negative (minus) lead. On the circuit board, the circle for this cap's location has a round through hole on one side, and a square through hole on the other, this is where the "+" lead goes. Insert the capacitors with their stripe facing the round hole side. (On polarized caps of this type, there's a second way to identify the negative lead: it is the shorter of the two leads).




1µF capacitor (1)
#7314

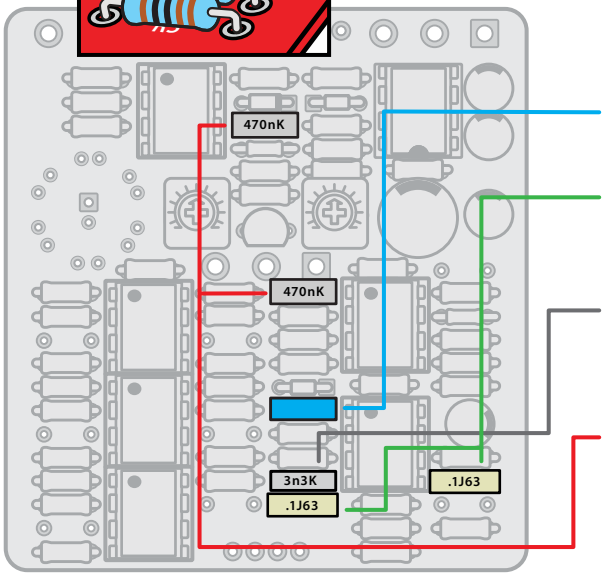
10µF capacitor (3)
#7310

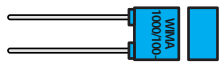
220µF capacitor (1)
#100930



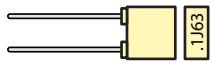

The remaining capacitors below are not polarized. However, best practice is to solder them in place with text facing the bottom of the PCB.

## 7 INSTALL 14 CAPACITORS

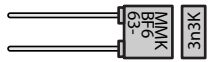


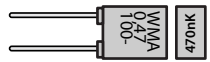

1nF capacitor (1)
#101931




100nF capacitor (2)
#7304

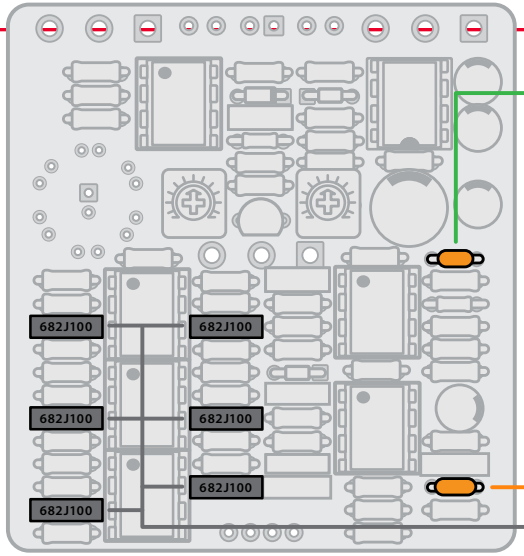


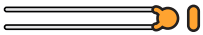

3.3nF capacitor (1)
#7303




470nF capacitor (2)
#101932

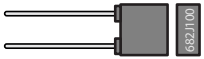
# 7 INSTALL 14 CAPACITORS



820pF capacitor (1)
#100722

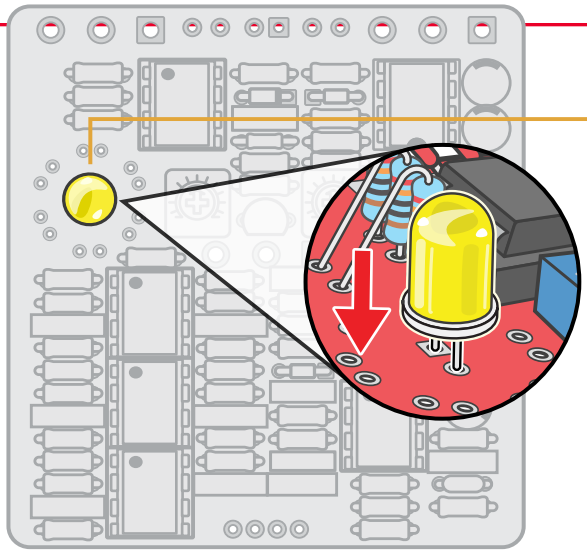
47pF capacitor (1)
#100720




6.8nF capacitor (6)
#100723

The next step is installing the yellow LED. This LED will interact with six surrounding light detecting resistors (LDRs). On the Lightcycle, the LDRs are used to control the gain of several IC OP-AMP stages. As the internal LED gets brighter, the gain of each stage increases. The principle is similar to a potentiometer. Turn it in one direction and the resistance increases, turning it in the opposite direction decreases it. LDRs perform a similar function, but instead of manually turning a knob, their resistance is determined by how bright the internal LED gets.

## 8 INSTALL YELLOW LED LIGHT



Yellow LED (1)
#7423

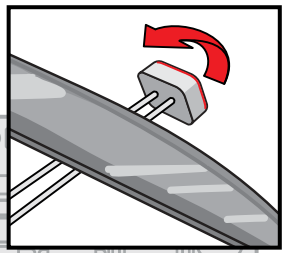
Install the yellow LED, feeding the longer positive (+) lead through the round hole marked A, the shorter negative (-) lead goes through the square hole marked K.

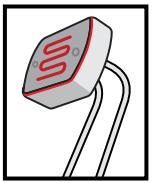
Solder it in place with the LED sitting flush to the board.

**WARNING:** The internal LED in this kit may potentially trigger seizures for people with photosensitive epilepsy. Builder discretion is advised.

## 9 PREP AND INSTALL 6 LDRS

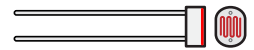
LDRs need the light of the LED to function, so it's critical that the surface of the light detecting sensor on the LDR is exposed clearly to the LED. The leads will need to be bent at a right angle so that the LDR faces the LED.





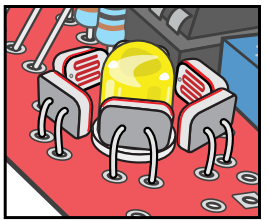
An easy way to do this to place the leads on a thin, flat tool and carefully bend them over at a right angle. We used a butter knife. Use care to make sure you bend all six at approximately the same spot for a consistent installation.



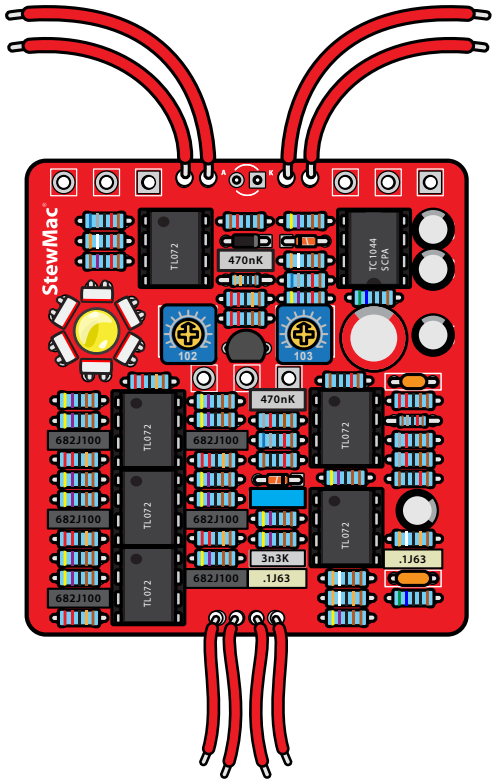


KE - 10720 LDR (6)
#100778

Solder in the LDRs facing the LED so that the tops are flush with the top of the LED, or just a hair lower. You do not want the LDRs sitting taller than the LED. These components are delicate, be careful not to overheat them.



Using heat sinks to dissipate excess heat is a good idea when soldering delicate electronic components.




## 10 INSTALL 8 LEAD WIRES

This kit comes with **24"** of 24 gauge lead wire. Using the correct 24AWG slot on your wire stripper cut the wire into four, **1.5"** sections and four **1"**sections. Strip around 3/32" off both ends of all wires.

The first four **1.5"** sections will attach the in, out and DC jacks at the top of the PCB and the other four **1"** sections will attach the breakout board to the bottom center of the PCB.

Insert the stripped ends of the wires into the holes on the component side of the PCB and solder them on the back.

StewMac's PCB Holder (#0500) is perfect for soldering tiny parts and wires. With two free hands and the ability to rotate the board, you'll easily find the perfect angle to work.

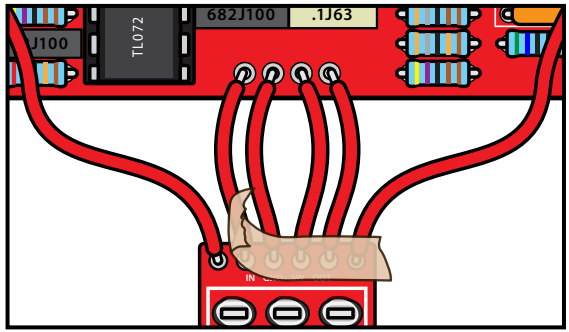
## 11 SOLDER BREAKOUT BOARD TO THE PCB

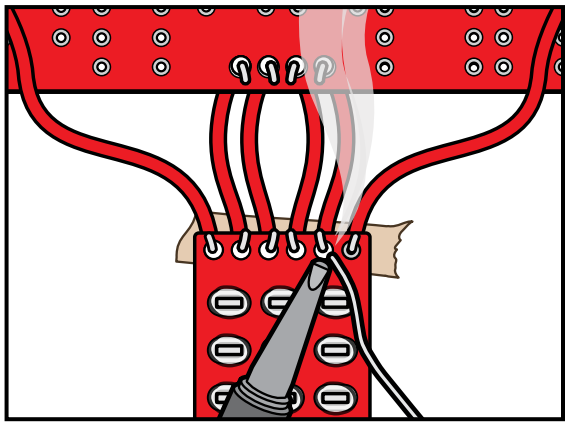
Now we're going to attach the breakout board to the PCB, as well as attach the wires to the breakout board that will connect to the pots. Have a small piece of masking tape on hand.

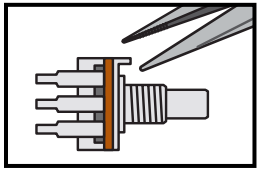
Align the PCB and breakout board component side up. Guide the leads of the **1"** wires coming from the bottom of PCB through the holes in the breakout board.

Next, cut two **4.5"**pieces of the remaining 24 gauge wire and strip 3/32" off both ends of both wires. Insert one end of each wire into the remaining holes on the breakout board and tape the leads to the breakout board on the component side to prevent them from slipping out of the holes.

Carefully flip the PCB and breakout board over and solder all the wires in place on the solder side of the boards. Once the solder has cooled, remove the tape.

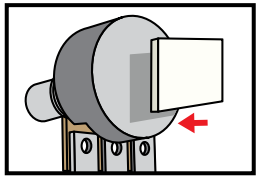


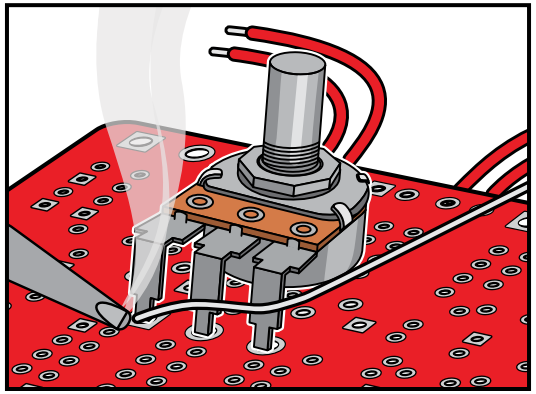


Locate the three pots. If any pot has an index pin protruding from it, break it off with a pair of needle nose pliers. This will allow the pot to mount flush in the housing.

## 12 ADD CENTER FEEDBACK POT



Before mounting the A10K Feedback pot in the center of the circuit board, place one section of the included double foam adhesive tape squares on the back of the Feedback pot to insulate it from the mounted electronic components.



Make note that there are two 10K pots in this kit, one audio (A) taper for the Feedback control and a linear (B) taper for the Depth. Use care not to mix these up during installation.

**Installing the Feedback pot**

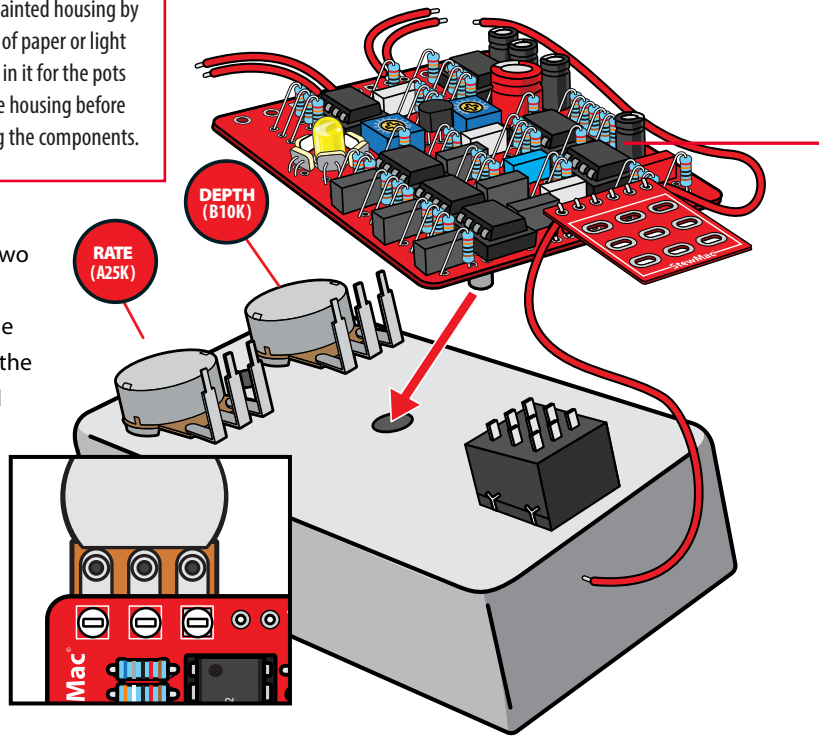
When installing pots, the leads are typically soldered to the PCB from the component side. On the Lightcycle, the populated board is too crowded to get at the lugs with a soldering iron without scorching components. It will need to be soldered from the back of the board. Place one of the included adhesive foam squares to the back of the pot to insulate it from the components and solder it in at the lugs.

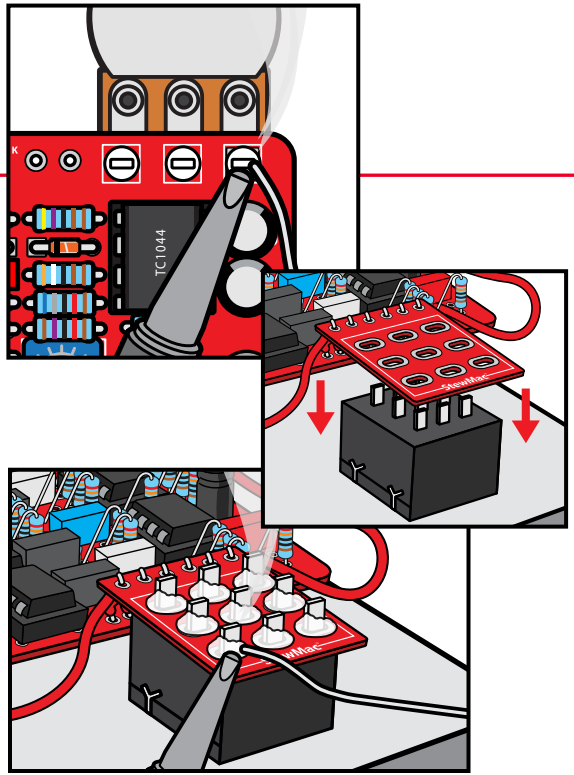
## 13 INSTALL REMAINING POTS

Protect your painted housing by laying a piece of paper or light cardboard with holes in it for the pots and footswitch on the housing before temporarily attaching the components.

Remove the nuts and washers from the two remaining pots and insert their threaded shafts into their coordinating holes on the OUTSIDE of the pedal housing. Reattach the nuts and washers inside the housing and lightly tighten.

Remove the nut and washer from the footswitch and insert the threaded shaft into the footswitch hole from OUTSIDE the housing. Add the nut and washer to the footswitch and thread only a few threads.






# 14 SOLDER POTS TO PCB

Temporarily attaching the pots and footswitch to the pedal housing will help to keep things steady for soldering them to the PCB.

Lay the PCB/breakout board component side up over the pots. The shaft of the foot switch will help to support the PCB. Manuever the lugs of the pots and the PCB until the lugs of the pots slip into their appropriate holes in the PCB. Once all the lugs have popped through the two boards, solder them in place.

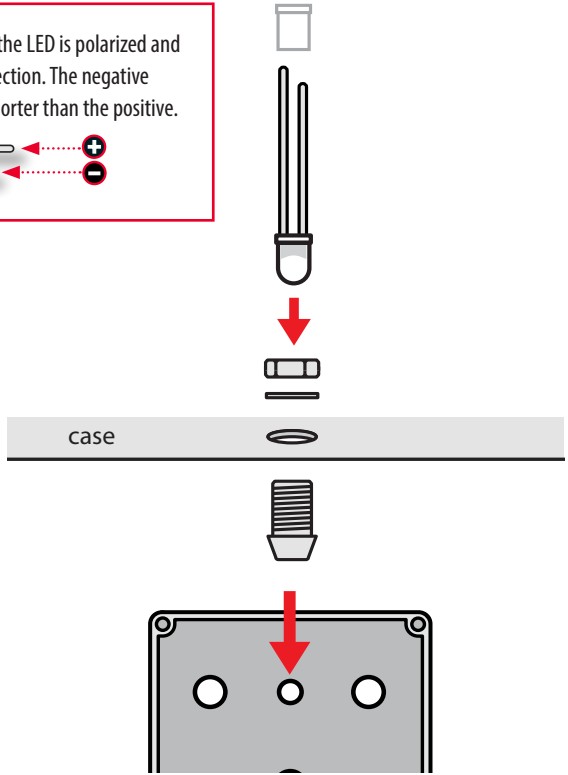
Remove the nuts and washers on the pots to free the PCB group of parts from the housing. Reattach the nuts and washers to pots and switch.

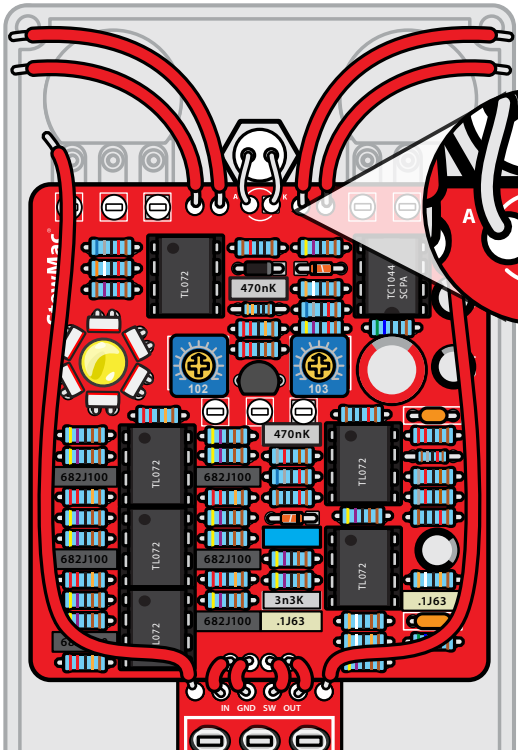
# 15 INSTALL LED INDICATOR LIGHT

Like some of the caps and diodes, the LED is polarized and has to be installed in a specific direction. The negative lead of the diode has a flat edge and is shorter than the positive.

The LED mounting bezel consists of two main parts: A ring that the LED fits into, and a plastic plug that goes over the LED from the back side to keep it in place.

Install the mounting bezel through the front of the enclosure. From the inside, slip a lock washer and nut on and tighten it up using a 3/8" wrench. Insert the LED into the bezel so that the two leads are parallel with the top and bottom of the housing and the shorter lead is closest to the outside of the enclosure. Feed the leads through the plastic plug, press the plug down until it's tight in the bezel. The LED will be held in place when you solder the leads to the switches and circuit board. For a more secure mount, you can run a bead of clear silicone adhesive around the plastic plug.






# 16 INSTALL CIRCUIT BOARD

Remove the nuts and washers again from the pots and footswitch and lay the pedal housing face down. With the component side of the PCB facing up, carefully insert the shafts of the pots and footswitch into their holes. Reattach the washers and nuts using a 10mm wrench for the pots, and 14mm wrench for the switch.

To connect the LED, thread the longer positive lead through the hole marked "**A**" and the shorter negative lead through the hole marked "**K**" on the component side of the PCB and solder in place. Use care to make sure these bare leads are not touching one another or the LED will malfunction.

Twist the pot shafts all the way counter-clockwise and install the knobs pointing at "7 o'clock" indicating their "zero" position.

# 17 INSTALL THE DC JACK

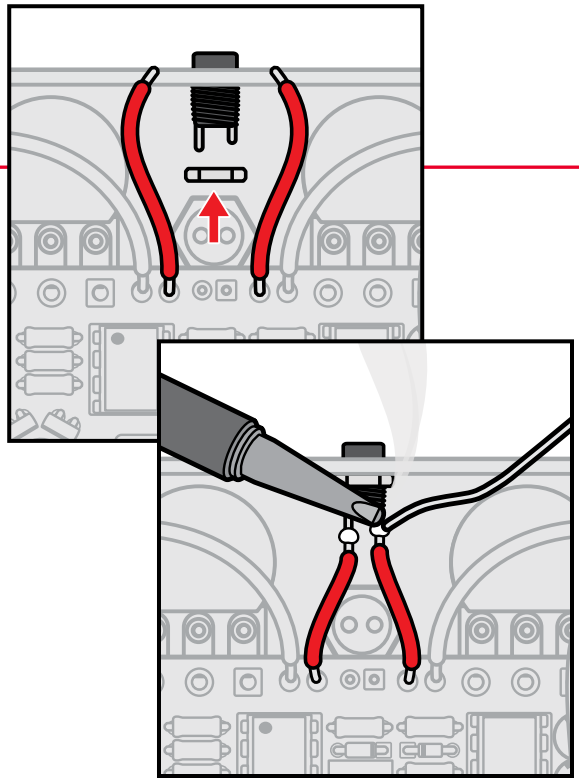
Insert the DC jack into the top of the housing making sure the longer of the two lugs is on the left.

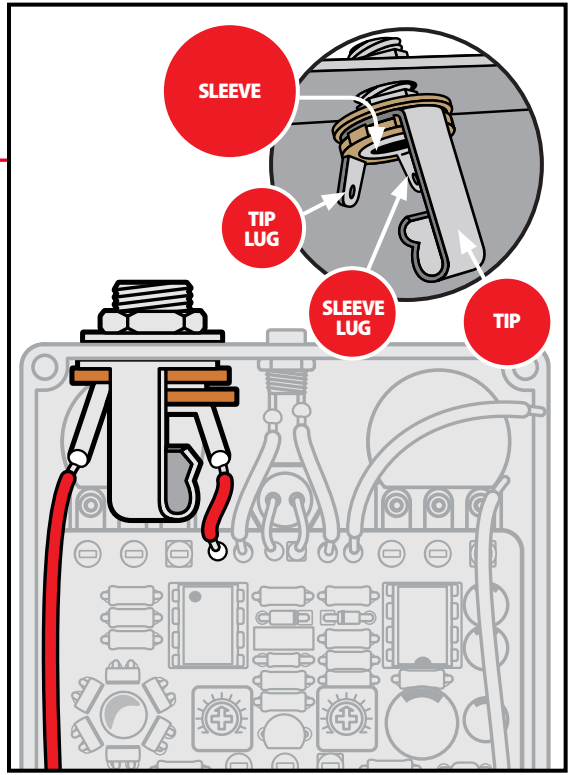
Using a 14mm wrench or needle nose pliers and 14mm nut, secure jack into housing just enough to allow the jack to rotate.

Solder the left wire to the longer lug of the DC jack.

Solder the right wire to the shorter lug of the DC jack.

Once solder joints have cooled, tighten the nut with a pair of needle nose pliers. Be careful not to tighten too tightly because you can crack the bushing of the jack.






## 18 INSTALL THE INPUT JACK

**Model 12253 comes with two mono jacks**. One will be your input jack and the other your output jack. Insert the jack into the left side of the housing with the tip connection facing up. Add the washer and thread the nut on to the shaft enough so that the pot can rotate freely.

Solder the right wire at the top of the PCB to the input jack lug that corresponds with the sleeve connection. The sleeve lug should be the one closest to the DC jack.

Solder the left **4.5”** wire from the breakout board to the lug of the input jack that corresponds with the tip connection. The tip lug should be the one closest to the outside wall of the enclosure.

Once the solder has cooled, orient the jack as shown in the diagram, make sure none of the connections on the jack are shorting to any other components, and tighten the nut on the jack.

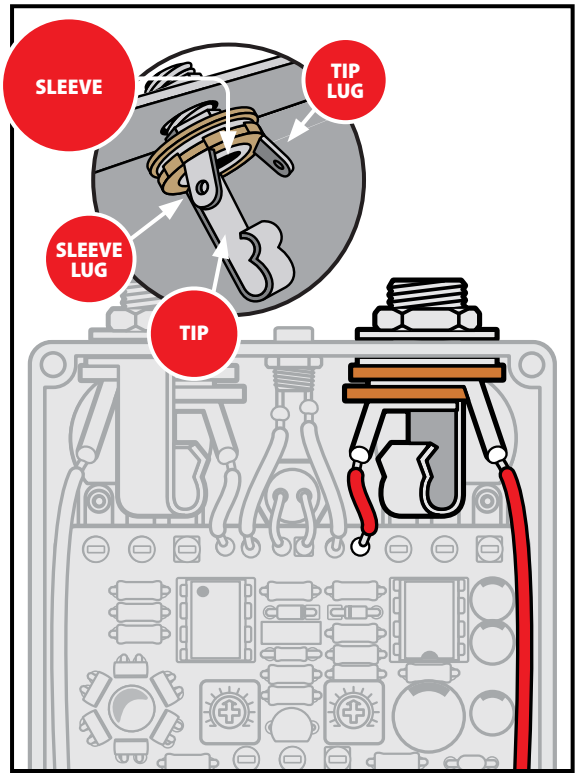
## 19 INSTALL THE OUTPUT JACK

Insert the output jack into the right side of the housing with the tip facing down. Add the washer and thread the nut on to the shaft enough so that the jack can rotate freely. You may need to rotate the jack to provide easier access to setting the solder joints.

Solder the left wire at the top of the board to the output jack lug that corresponds with the sleeve. The sleeve lug should be the one closest to the DC jack.

Solder the **4.5”** wire from the right side of the breakout board to the lug of the output jack that corresponds with the tip. The tip lug should be the one closest to the outside wall of the enclosure.

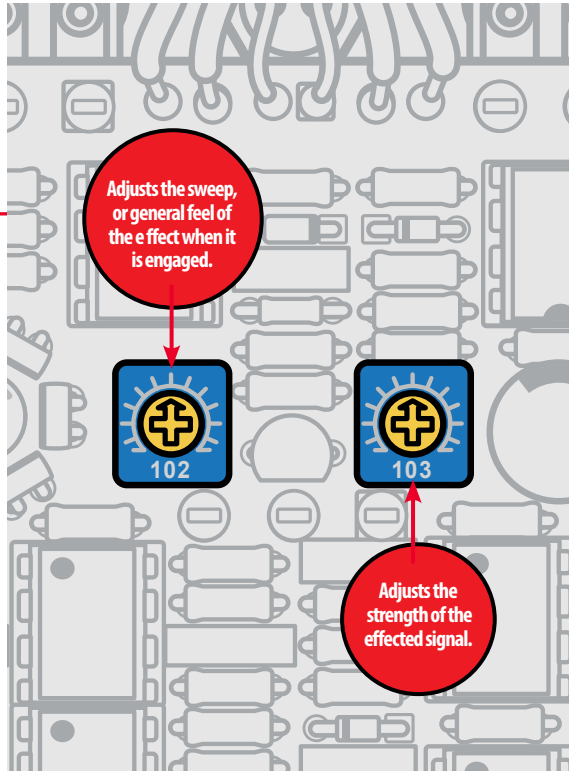
Once the solder has cooled, orient the jack as shown in the diagram, make sure none of the connections on the jack are shorting to any other components, and tighten the nut on the jack.

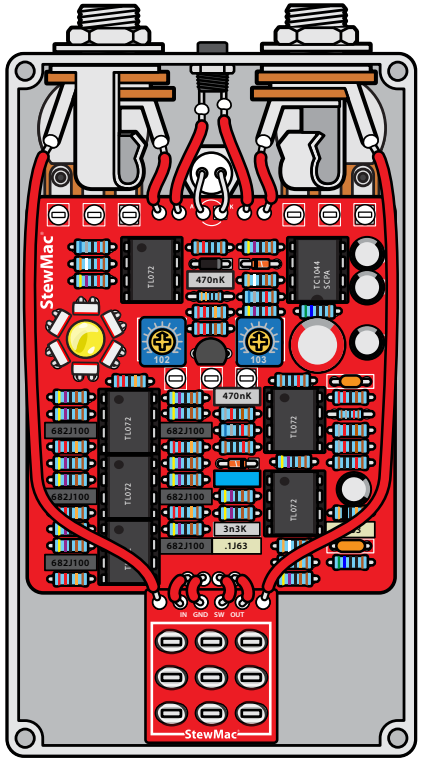


# 20 FINE TUNING TRIM POTS

**Trim Pots Adjustments** With the main controls AND trim pots set to the noon position on the dial, play your instrument and adjust the internal trim pots until you achieve a sound that is pleasing to your own ears.

Tone is a highly subjective topic, what sounds good to others may not sound good to you. Experiment with the trim pots to find your ideal settings.



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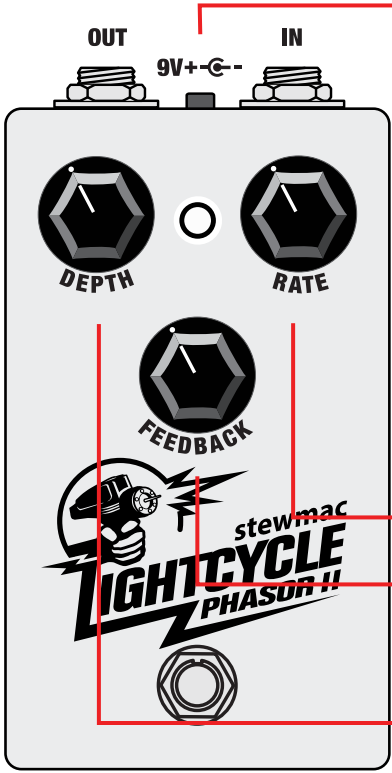
## COMPLETED VIEW

With all parts in place, this is what your pedal should look like.

Congrats, on a job well done!

Now, simply attach the back of the pedal, pop on the knobs, plug this thing in and bend some tone!

## HERE'S HOW THE CONTROLS WORK




**POWER** Use a standard 9 volt DC power supply with a 2.1mm negative-center barrel (not included). We always recommend pedal-specific, transformer-isolated, wall-wart power supplies or supplies with separate isolated outputs. Some switching supplies, as well as some linear (non-switching) pedal power supplies can be noisy. Switching-type power supplies, daisychains, and non-pedal specific power supplies do not filter dirty power as well and let through unwanted noise. Do not run at higher than 9V DC voltages!

**RATE** Controls the speed in which the effect runs.

**FEEDBACK** Controls the amount of signal regeneration.

**DEPTH** Controls the intensity of the effect.


## Built to last a lifetime.

Our promise to you is simple and uncomplicated. If any of our products ever break, wear out, or fail to exceed your every expectation simply return it for a replacement. **Quality you can trust. For life.**

### TECHNICAL SUPPORT:

If you have any questions before, during, or after your build, please reach out to our Tech Support Team by email at service@stewmac.com.

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 #12253 Updated January, 2024