Ornament Kit: Octave Up

mas-effects.com/holiday

I hope you a have a ton of fun building this ornament, and that it brings some extra holiday cheer to you and everyone around you.

If you have any questions or run into any problems, you can email me directly <mark@mas-effects.com> or for quicker responses you can post to various DIY pedal groups online (to which I will also reply). For a list of recommended groups, visit mas-effects.com/holiday-instructions/

Happy Holidays!

Overview

This ornament is a playable octave "pedal."

The audio circuit is the Green Ringer by Dan Armstrong (on which the EQD Tentacle is based). It is supplied power when a mono instrument cable is plugged into the input jack. **Leaving your guitar plugged into this will drain the battery!**

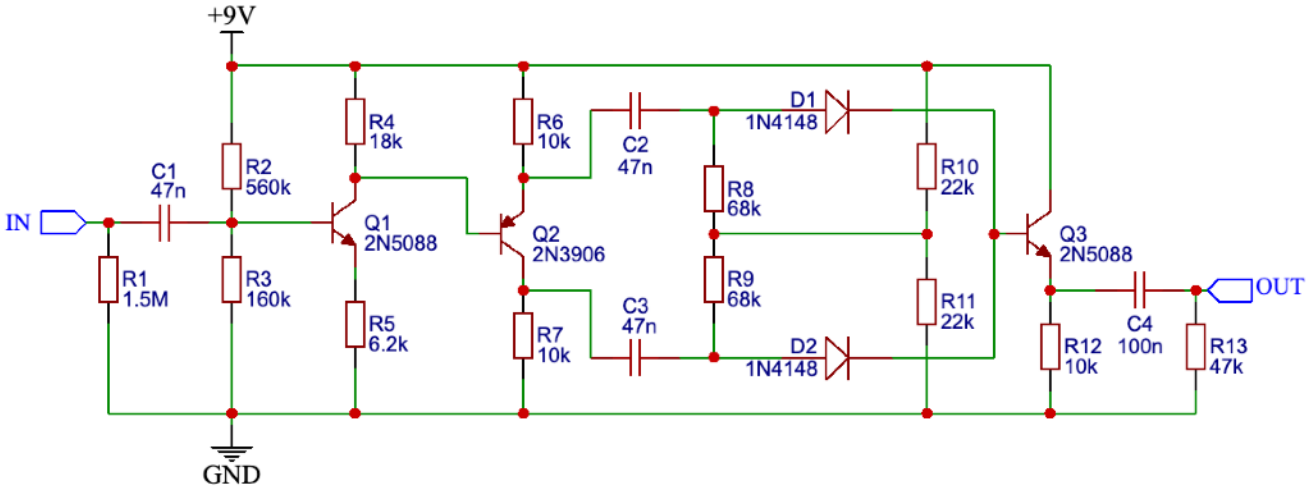
It "can have a single note played into it and will produce a second tone one octave above the original note. If two notes are played into it, it will produce sum and different tones just like a ring modulator. Depending on the musical interval between the two notes, the additional tones the Green Ringer produces will be harmonically related to the original notes (such as sub octaves) or dissonant."

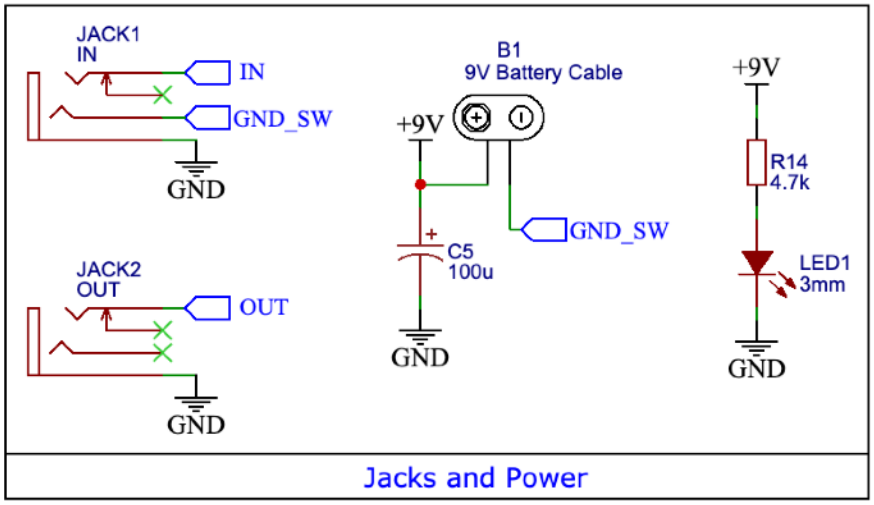
It "gives the musician much better control over the effect produced than a conventional ring modulator," since they are "no longer playing against an arbitrary modulator frequency."

Bill of Materials

QTY	Designator	Part	Note
2	D1,D2	1N4148	Matched
1	LED1	3mm LED	
3	C1,C2,C3	47n	
1	C4	100n	
1	C5	100u	Electrolytic
2	Q1,Q3	2N5088	
1	Q2	2N3906	
1	R1	1.5M	
1	R2	560k	
1	R3	160k	
1	R4	18k	
1	R5	6.2k	
3	R6,R7,R12	10k	
2	R8,R9	68k	
2	R10,R11	22k	
1	R13	47k	
1	R14	4.7k	
1	B1	9V Battery Cable	
2		Audio jack	
1		Bell	Optional, decorative
		Wire	Optional, to hang bell
		Ribbon	Optional, decorative

Schematic


+9V
IN
C1
47n
R1
1.5M
R2
560k
R3
160k
GND
R4
18k
Q1
2N5088
R5
6.2k
R6
10k
Q2
2N3906
R7
10k
C2
47n
C3
47n
D1
1N4148
D2
1N4148
R8
68k
R9
68k
R10
22k
R11
22k
Q3
2N5088
R12
10k
C4
100n
R13
47k
OUT


JACK1
IN
IN
GND_SW
GND
JACK2
OUT
OUT
GND
B1
9V Battery Cable
+9V
GND_SW
C5
100u
GND
+9V
R14
4.7k
LED1
3mm
GND
Jacks and Power

Instructions

PREFACE: For Beginners

If you haven't spent much time soldering components to a PCB (printed circuit board) then here are a couple tips to help you ensure success with this project.

Nearly all problems people face when building kits such as this come from either

A. Placing **components in the wrong spots**, or with the wrong orientation, or
B. **Bad solder joints**

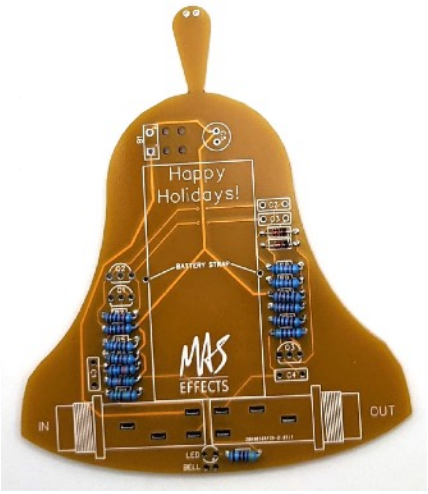
Placing components correctly:

- **Leave the components in the bags** until you are ready to use them. I labeled each bag and kept similar-looking components in separate bags to help ensure you don't mix them up
- Read this build instructions document. I will make notes about **polarity and orientation** of diodes, electrolytic capacitors, and transistors. These are very important to follow.
- Take your time

Getting good solder joints:

- First and foremost, watch this excellent, short, and to-the-point video about soldering: youtu.be/IpkkfK937mU
- If possible **practice soldering wires** onto a prototyping or vero board (fiberglass board with holes, and copper pads).
- Watch carefully to recognize when the solder has been pulled up onto the component legs, and spread across the pad of the board. This indicates both the component and the pad were sufficiently heated, and the solder bonded with them.
- If the solder isn't wicking up against the pad and component within a few seconds: Stop. Wait a few moments. Then try again. Wipe your soldering iron or rotate it against the joint if necessary to get good heat transfer.

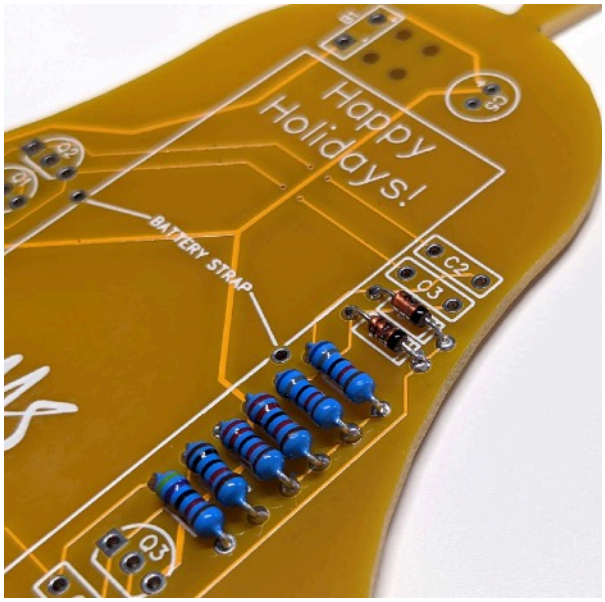
STEP 1: Resistors (R1 - R14)



It's typically easiest to populate the circuit board from the shortest to the tallest components. Resistors sit very low to the board so we start with those.

You can use either small 1/8W resistors or the larger 1/4W resistors. 1/4W were included with the kits. You may find it easier to bend the legs 90 degrees from body of the resistor before trying to place them.

Orientation does not matter. Resistors can be inserted in either direction.



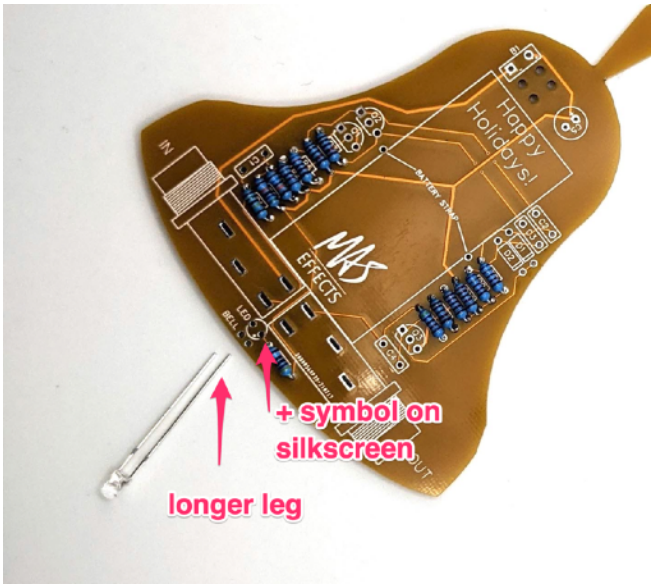
STEP 2: Diodes (D1, D2)

Diodes must be oriented correctly. The side with the stripe is the cathode (-) and the other side is the anode (+).

Place the diodes so **the cathode (striped side) is over the stripe on the silkscreen** printed on the circuit board.

FYI: The diodes for this circuit must be matched, meaning I (painstakingly) measured the forward voltage drop (Vf) on each and paired it with a diode with similar characteristics. The design of this circuit requires the two diode paths to have similar voltage drops.

STEP 3: LED (LED1)

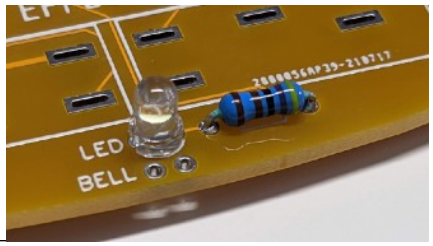


Light emitting diodes (LEDs), like the signal diodes used in the previous step, also have polarity and must be oriented correctly.

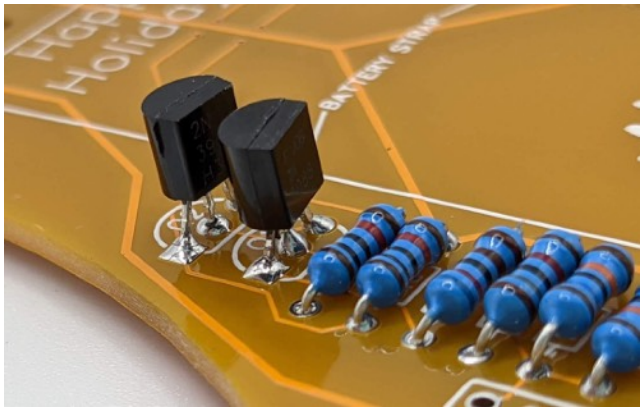
The cathode (-) is indicated by a shorter leg, and the anode (+) has a longer leg.

Insert the anode (longer leg) into the hole marked with a plus sign (+).

FYI: This LED is purely decorative and can be whatever color you prefer. Referring to the schematic you'll find R14 is used to limit the current going through this LED. Changing R14 to a lower value (e.g. 220 to 1k) will make the LED brighter, while going with a higher value (e.g. 10k to 20k) will make it dimmer.



STEP 4: Transistors (Q1 - Q3)

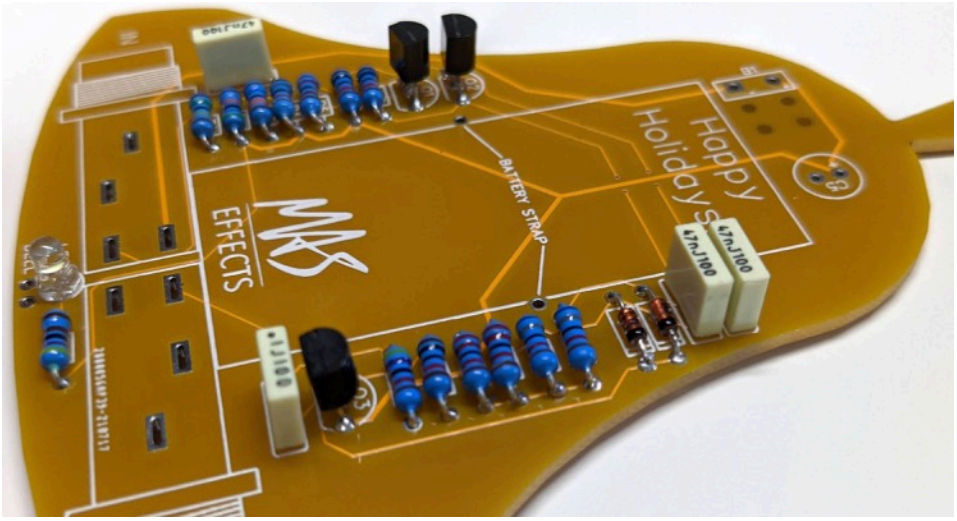


Next solder in place the 3 transistors: Q1 through Q3.

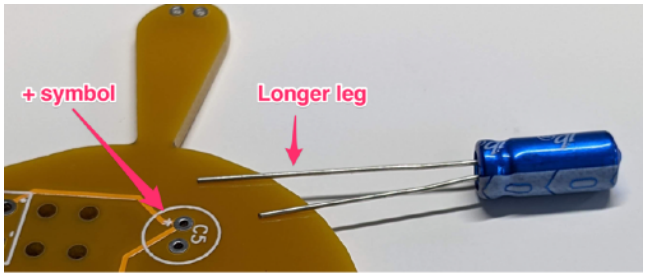
Orientation matters, so line up the flat side of the component with the flat side of the white silkscreen outline.

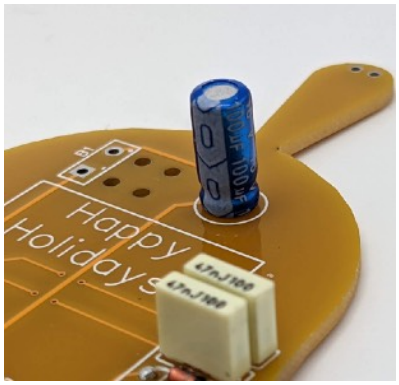
STEP 5: Non-polarized Capacitors (C1 - C4)

Orientation does not matter for these capacitors, so they can be inserted in either direction. Just make sure not to mix up C4 (100nF) with C1, C2, and C3 (47nF).



STEP 6: Polarized Capacitor (C5)





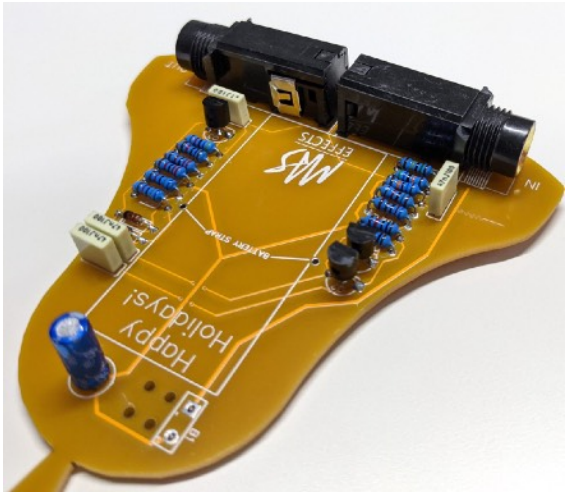
C5 is used to compensate for power fluctuations and is fairly large. Due to the construction methods for larger capacitors it is necessarily polarized.

Just like with the LED, **the positive side (+) has a longer leg**, and the negative side (-) has the shorter leg.

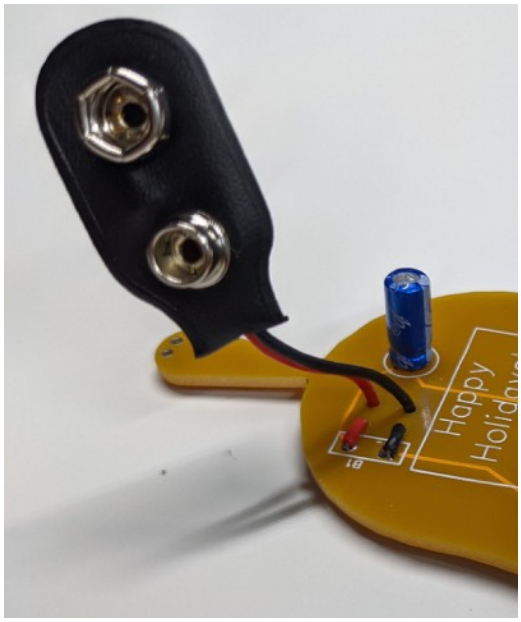
STEP 7: Input and Output Jacks

Next, insert and solder the jacks into place.

FYI: To power on this circuit, a mono cable needs to be inserted into the input jack. The cable makes a connection between the sleeve, which connects to the circuit's ground, and the ring which connects to the battery's negative (-) terminal.

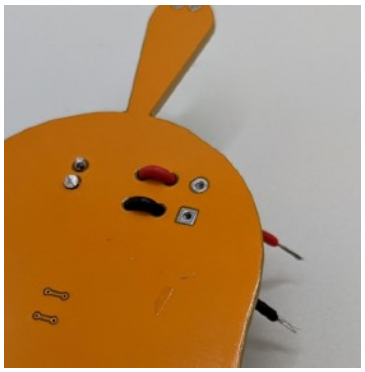


STEP 8: Battery Clip

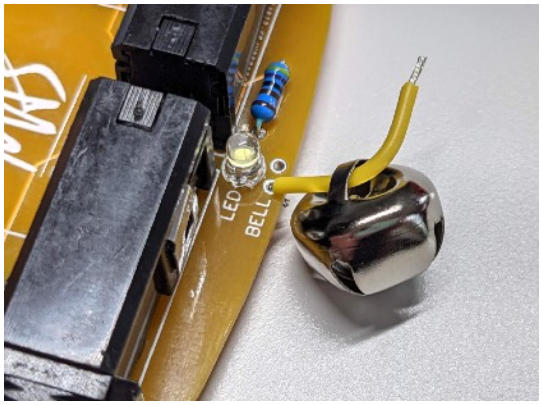


Trim the wires to a suitable length and solder **the black wire to the (-) pad** and the **red wire to the (+) pad**.

There are holes that can optionally be used to provide strain relief; i.e. so the solder joints don't get stressed if you pull on the battery cable. To use them see the pics below.



STEP 9: Bell



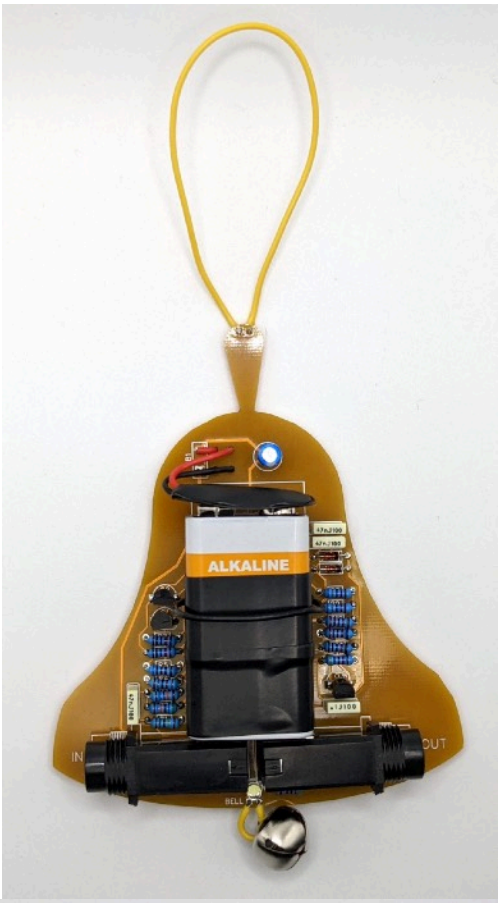
Attach the bell with a bit of wire, soldering the two ends into the pads at the bottom labeled "BELL."

STEP 10: Hanger and Battery Strap

10a. The battery strap wire will help restrain the 9V battery and keep it from dangling. Scrap cutoff wire from the battery clip works well for this.

Solder one end of a wire to a pad in the middle marked "Battery Strap." Holding a 9V battery in place, loosely wrap a wire around it to estimate an appropriate length. Trim, strip, and solder the other end.

10b. Solder both ends of the remaining wire to the top of the bell, forming a loop that can be used to hang the ornament.



STEP 11: Ribbon

Tie a bow at the top of the bell using the included ribbon.

STEP 12: (Optional) Clean

You can use an old toothbrush or cloth and rubbing alcohol to remove the soldering flux from the circuit board. Less diluted alcohol, e.g. 91%, will make the job easier.

STEP 13: Share with friends, family, bandmates

Be sure to take pics and **post online** to share with everyone. And if you know anyone who might appreciate either a kit or a pre-assembled ornament, **send them to mas-effects.com/holiday** .

Happy Holidays!