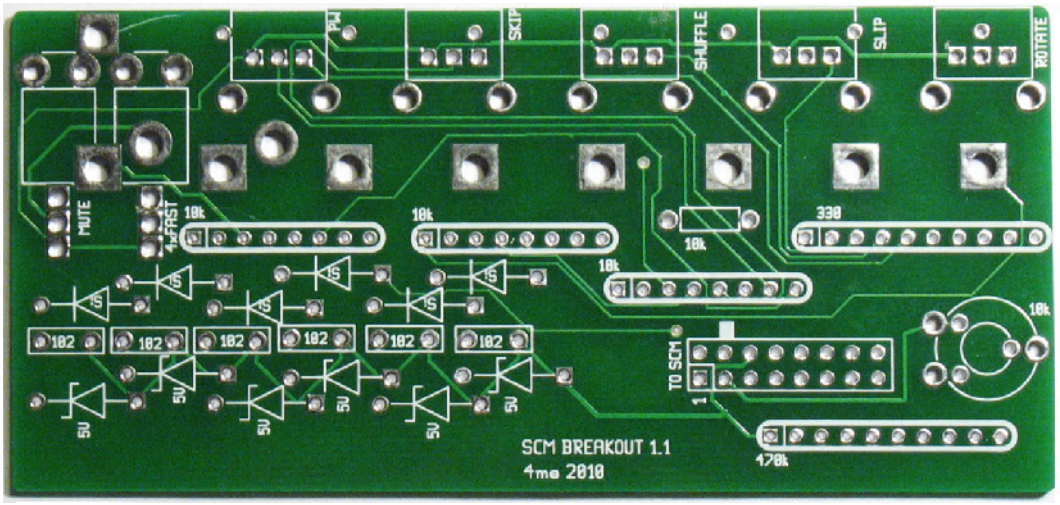
4ms S.C.M. Breakout

(Expansion Module for the Shuffling Clock Multiplier)

Kit Builder's Guide for PCB v1.1

4mspedals.com



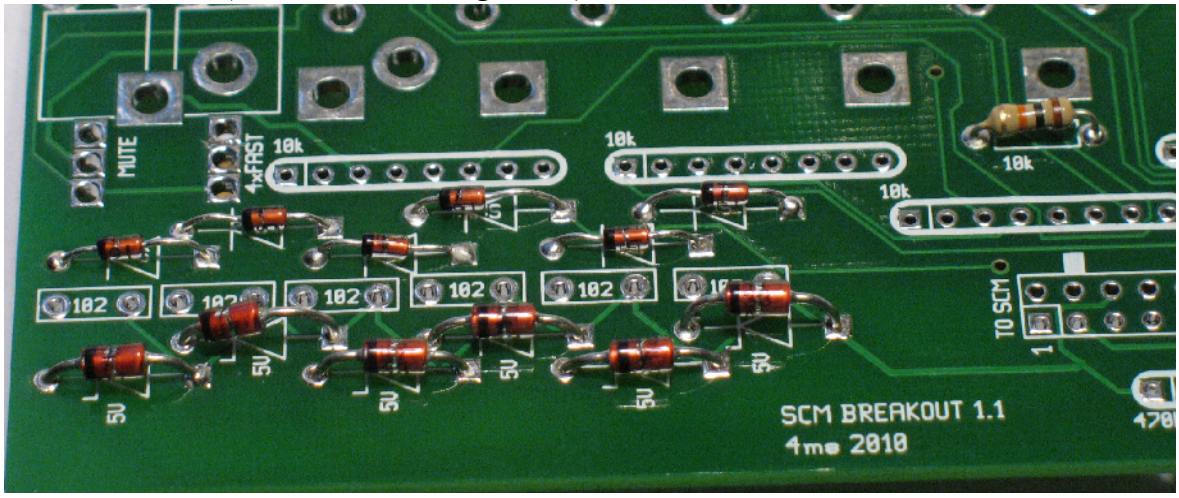
Shuffling Clock Multiplier Breakout

This guide is for building a Shuffling Clock Multiplier Breakout module (SCMBO) from the 4ms kit. The SCMBO requires an SCM to operate, as it connects directly to the SCM board to add features to the SCM. For more information, you can download the SCMBO manual here: http://4mspedals.com/scm.php

Step 1: Diodes and resistor

Insert and solder the diodes and resistor. After soldering, snip the leads nearly flush to the PCB (you'll be snipping the leads flush on all the components after soldering). There's a black band on each diode that must go towards the line on the PCB (the arrow on the PCB points towards the band).

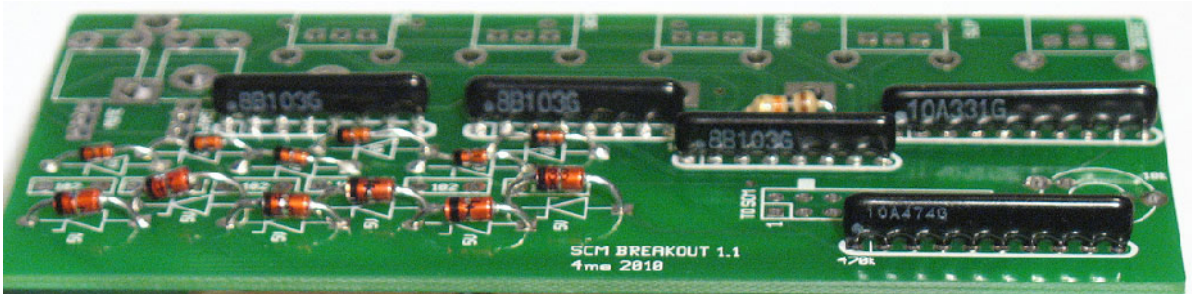
- *"Si" 1N914 diodes x 6 (small red glass diodes)*
- *"5V" 1N4733 Zener diodes x 6 (slightly larger red glass diodes, labeled "4733")*
- *10k resistor x 1 (Brown Black Orange Gold)*



Step 2: Resistor Arrays

Insert and solder the 5 resistor arrays. Each array has a white dot on one end, which must go into the hole that's boxed out on the PCB (towards the left, as shown in the photo).

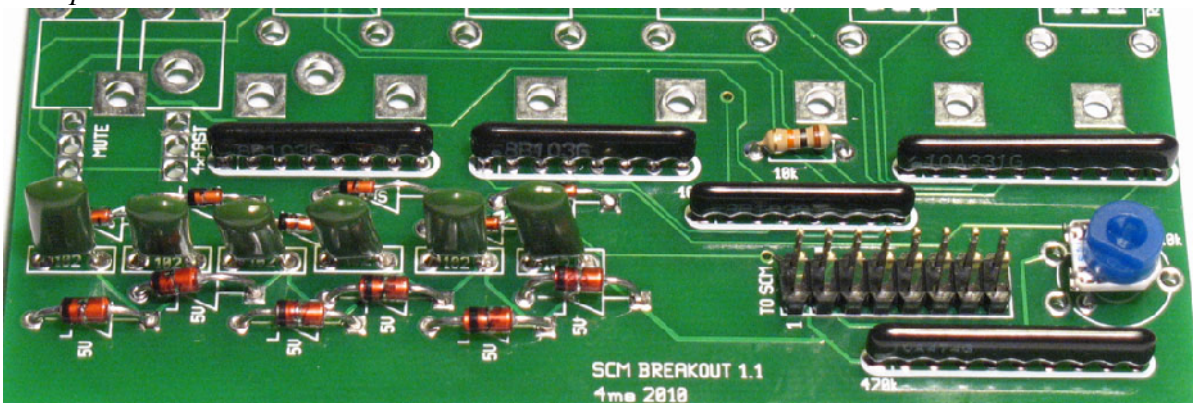
- *10k isolated array, 8-pins x 3 (labeled 8B103G)*
- *470k bussed array, 10-pins x 1 (labeled 10A474G)*
- *330ohm bussed array, 10-pins x 1 (labeled 10A331G)*



Step 3: Capacitors, header pins, trim-pot

Insert and solder the six green capacitors, the 16-pin header, and the trim-pot. The caps and header pins may be orientated either way, and the trim-pot will only fit one way.

- *1000pF "102" capacitors x 6*
- *10k trim-pot x 1*
- *16-pin header x 1*

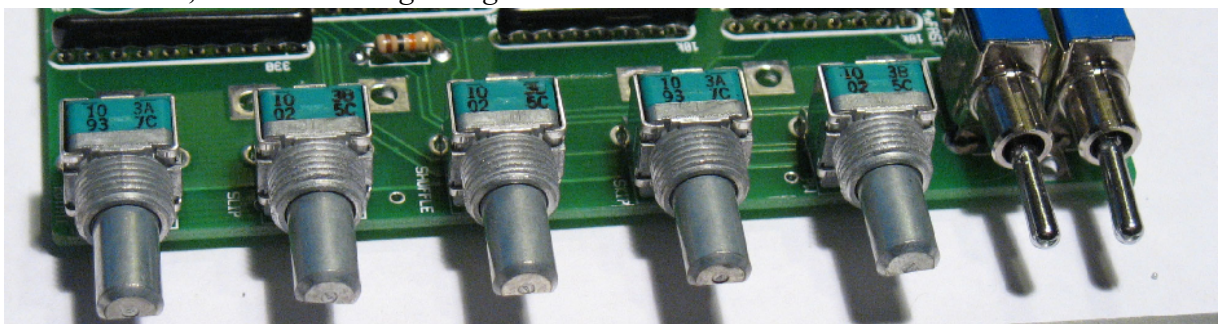


Step 4: Pots and Switches

Insert the 5 pots and 2 switches, but **DO NOT SOLDER YET**.

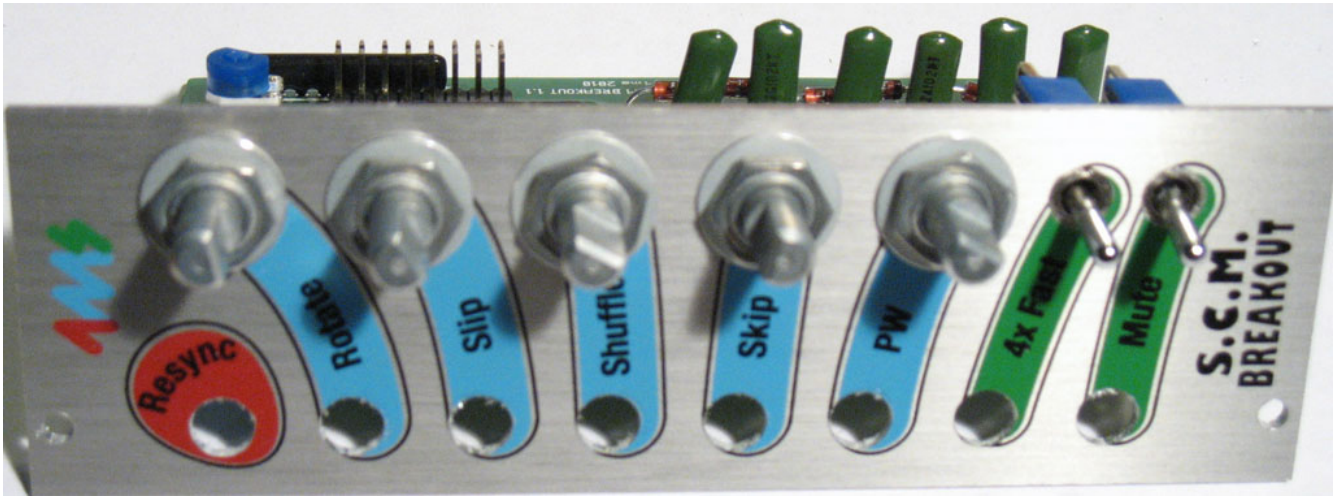
There are two types of pots: the Linear taper has a detent in the center that you can feel when you turn the shaft. The Audio taper has no detent.

- **Slip, Shuffle, PW:** *10k Linear taper with center detent ("10 3B")*
- **Rotate, Skip:** *10k Audio taper without detent ("10 3A")*
- **4x Fast, Mute:** *SPDT right-angle mount switches*



Step 5: Mount and Solder Pots and Jacks

Mount the panel to the pots, using a washer and nut for each of the 5 pots. Tighten them down firmly by hand, but no so much that the pots begin to rotate or twist off the pcb.



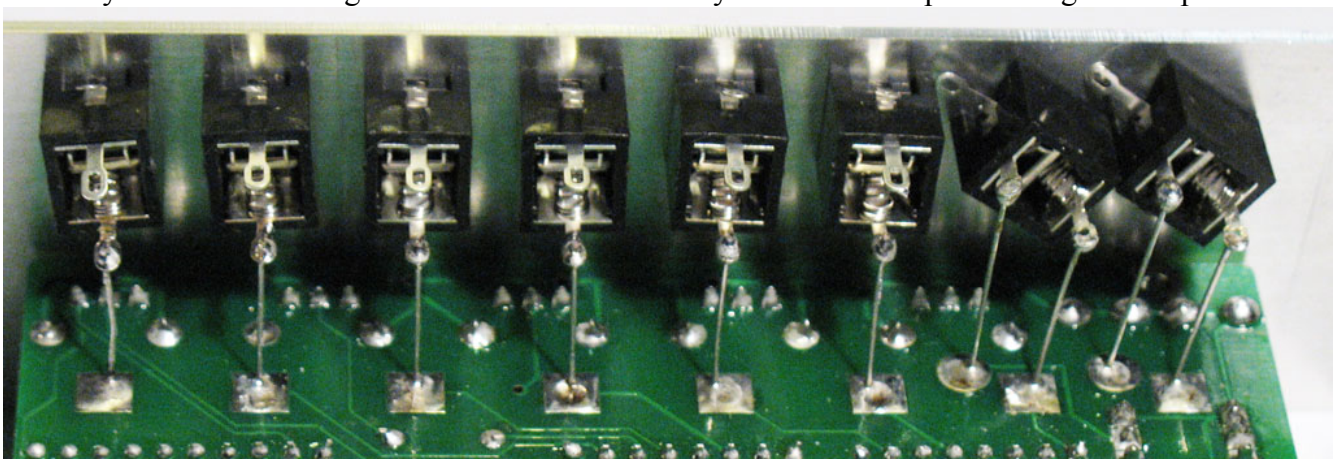
Double-check that the pots are square and flush to the PCB (not twisted off due to tightening the nuts). Make sure the two switches are poking out of the panel in a way that you can flip them easily.
Now solder the pots and swiches (5 solder points per pot/switch).

Step 6: Jacks

Mount the 8 jacks as shown in the photo. The leftmost 6 jacks (Resync, Rotate, Slip, Shuffle, Skip, PW) are mounted with the ground tab sticking up (away from the PCB). The two rightmost jacks (4xFast and Mute) are mounted at a 45 degree angle with the ground tab pointed up and towards the middle of the unit.

Now wire each jack to the PCB. The six leftmost jacks get one wire each, from the signal pin on the jack to the square pad directly underneath it on the PCB (the signal pin is the one closest to the PCB, attached to a spring on the jack). The two rightmost jacks also get a wire from the signal pin to the square pad, as well as a wire from the switch pin to the round pad (the switch pin is the one in the middle of the jack).

You may need to bend the ground tabs down so that they don't stick out past the edge of the panel.



Step 7: Knobs
Tighten all the nuts on the pots using a socket or wrench.
Push on the 5 knobs.

Step 8: Test and tweak the trim-pot
Plug the unit into an SCM using the ribbon cable. Make sure the red stripe is towards the white box on both the SCM and the SCMBO (see the SCMBO manual for details).
Never connect an SCM Breakout directly to the power rail.

To calibrate the unit, you must adjust the trim pot so that you have a complete range of rotation.

1. Run a fast clock into the SCM
2. Turn the trim-pot fully clockwise using a small screwdriver.
3. Turn the Rotate knob fully up/clockwise, PW to the center, and all other knobs fully down/counter-clockwise. Flip both switches to the right.
4. Slowly turn the trim-pot counter-clockwise, watching which light is blinking the slowest (at the same speed as the input clock). The slowest light should start as S8/x8 or perhaps S6, and move upwards as you turn the trim-pot.
5. Stop turning the trim-pot just at the point when Jack x2 is blinking the slowest. Don't turn the trim pot any more than necessary to make Jack x2 the slowest. You now should be able to get any light to be the slowest just by turning the Rotate knob: this is a complete range of rotation.
6. *Optional: Calibrate the unit for a specific pulse-width instead of complete rotation.*
    - Turn PW to the center position (detent), and the other knobs to any position you want. The jacks should be outputting pulse waves that are slightly longer than 50% high and slightly shorter than 50% low.
    - Turning the trimpot clockwise will bring the ratio closer to 50/50 with PW at the detent, but you may no longer have a complete range of rotation using the Rotate knob (you will always have a complete range using CV, the trim-pot does not effect the CV inputs)
    - If your needs require you to very often have a precise 50% duty cycle pulse wave (or any particular duty cycle), you may wish to calibrate the trim-pot to get this with PW at the center detent. Doing so might sacrifice having a complete range of parameters using only the knobs (however, the unit will still have it's full range if CV is applied).

Step 9: Patch it up!
You're done! Test out all the features, read the manual, and have fun!