CV Clock Divider

CV Controllable Clock Divider

INCLUDES TILE INSTRUCTIONS

Voltage and shorting trigger/gate/clock outs.

12 divisions from /1 to /96 assuming 24ppqn, but can divide any clock source.

Divide CV 0-5V.

Manual or gate controlled start/stop.

Reset restarts clock count (to sync clock to start of bar, sync multiple clock dividers, etc.)

Clock/Start/Stop/Reset DIN Sync compatible.

Can convert between clock systems, divide sequencer clocks, or trigger modules.

Full IO control.

Arduino compatible AtTiny controller.

Specifications:

-6 HP Eurorack
-Depth: 40mm
-Power: 10-pin DIP
-Current: 12V:15ma
-Panel: 2mm powder coated aluminum.

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BUILDING INSTRUCTIONS

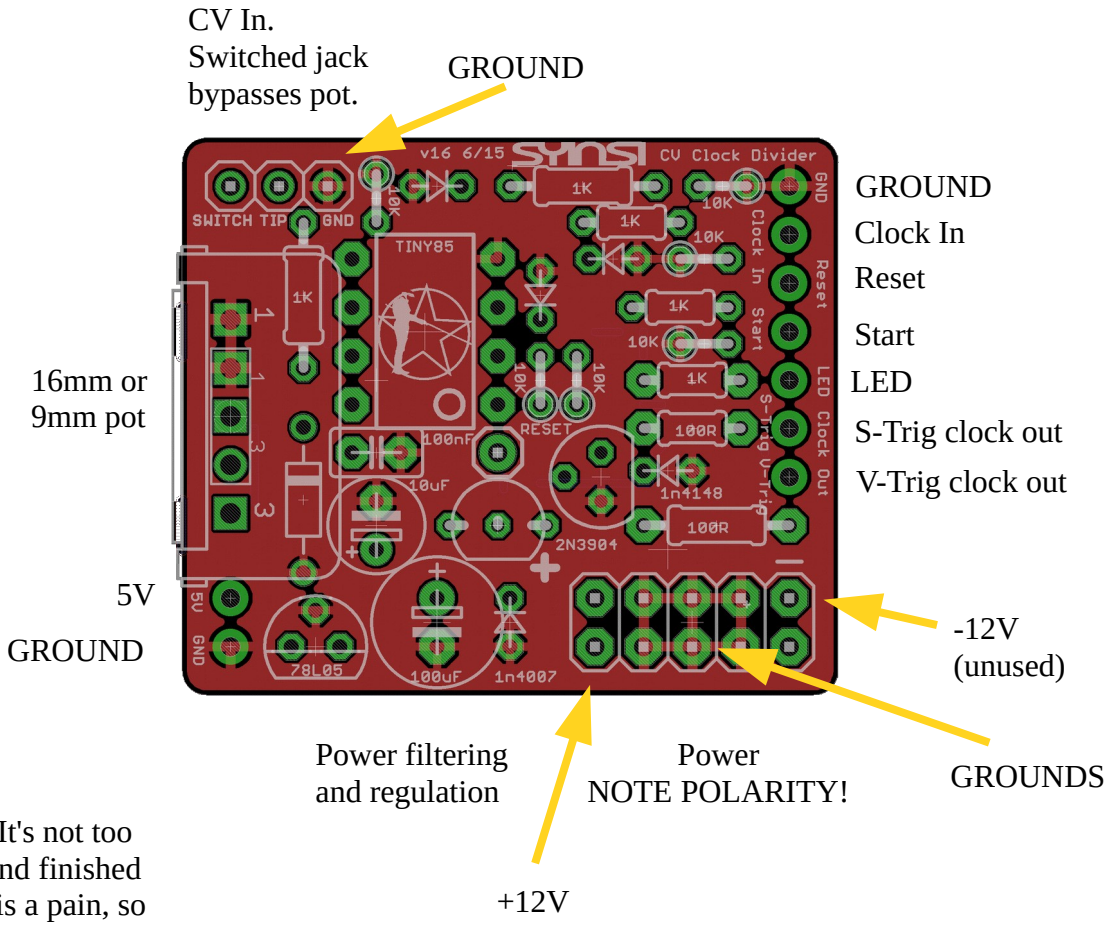
BOM:

1 100nFCeramic Disc Capacitor
1 10uF Radial Electrolytic Capacitor
1 100uF Radial Electrolytic Capacitor

2 100R Resistors
5 1K Resistors
6 10K Resistors

Atmega AtTiny85-20 DIL Microcontroller
2 2N3904 NPN Transistors
7805L TO92 5v 100ma Power Regulator
1 1n4007 Diode
4 5.6V Zener Diodes (1n4734)
1 1n4148 Diode

1 10kB Potentiometer 16mm or 9mm PCB mount
6mm LED + bezel.
5x2 Header (Eurorack Power) unshrouded
6 3.5mm Kobiconn-style sockets with lugs
1 SPDT On-On subminiature toggle switch.
DIL08 Socket
6HP Panel

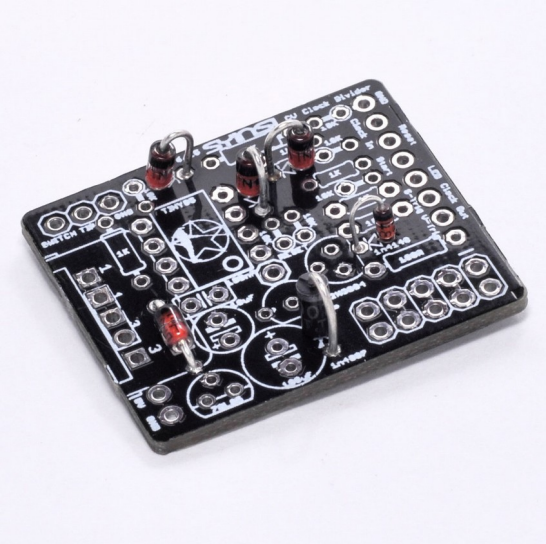


This document assumes you've done this sort of thing before. It's not too difficult if you're using the pre-programmed microcontroller and finished panel. The layout is very cramped and removing components is a pain, so double or triple check component values and orientation before soldering.

Construction time approximately 2 hours.

1. Begin with the resistors and diodes. Take care to ensure that the diodes are oriented properly. Double-check before soldering – this is the biggest cause of problems.

All unlabelled diodes are 5.6V Zeners. All except one are mounted vertically.



2. Next add capacitors. Make sure the electrolytics are oriented properly.

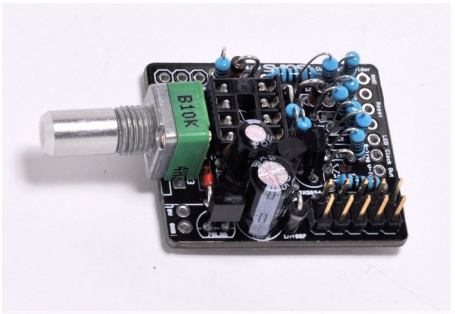
3. Add the IC socket. Again, check the orientation. The notch should match the silk screened notch.

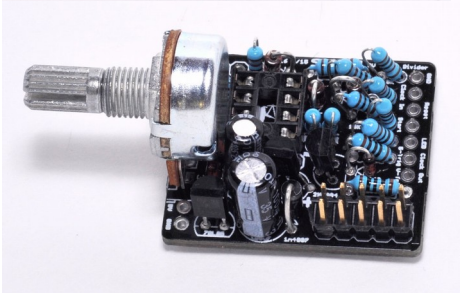
4. Now add the power regulator, and transistors, double check the orientation before soldering. Don't spend too long soldering these – three seconds maximum per lead. It's a good idea to put an alligator clip under the TO92 bodies to act as a heat sink while soldering.

5. Add potentiometer. Don't forget to clip the alignment tab from the face of the pot, and remove the cap if it has one. 16 mm or 9 mm pots can be used. The 9mm uses the 3 inner holes, and the 16mm uses the center and two outer holes.

6. Now is a good time to check all the joints to make sure there's no shorts or badly-soldered connections.

With a multimeter check for shorts between ground and +12 and -12. on the power connector.

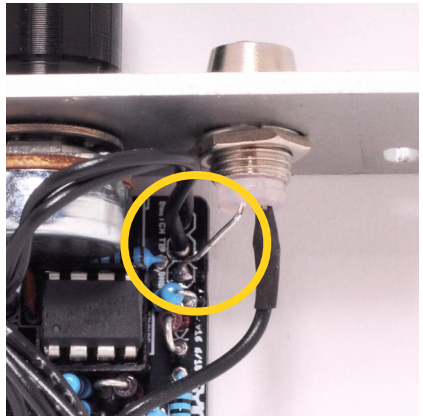


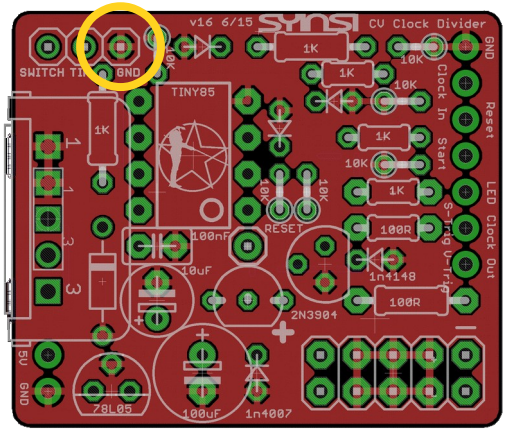


If you find a short then stop and double-check your soldering and fix any problems before continuing.

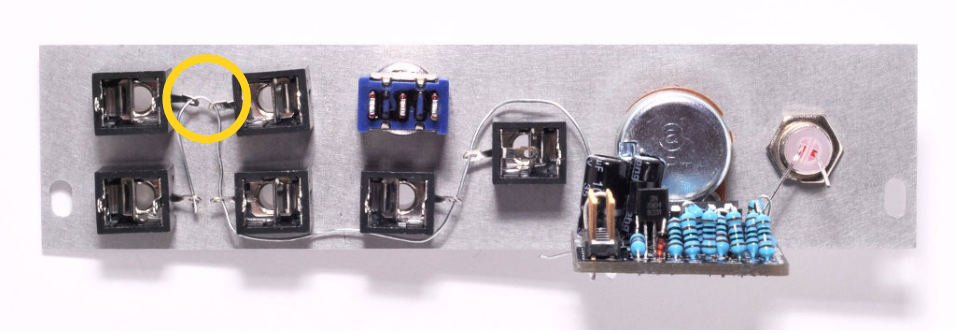
7. Mount the board to the panel. The holes for the pots are drilled extra large to align the pots to the graphics even if the graphics are misaligned. Tighten the pot when everything is aligned.

8. Mount the LED and bezel to the panel. The ground leg of the LED can be bent and soldered to the unused ground just underneath the LED bezel.

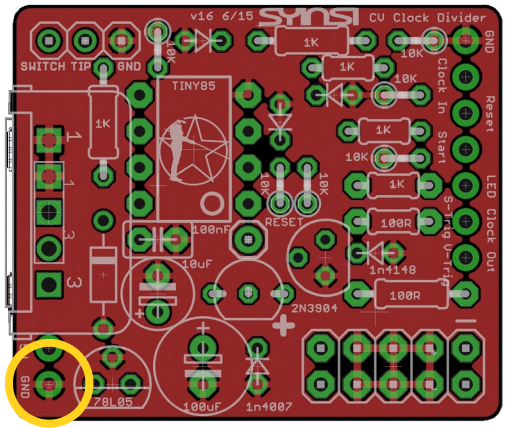




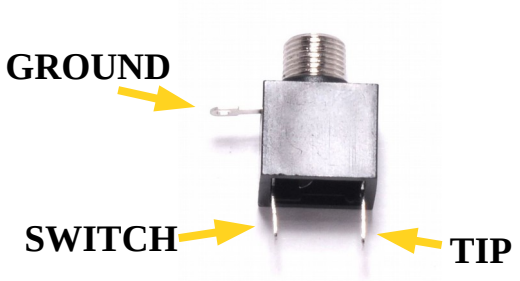
9. Mount the 3.5mm sockets with the ground lug (the one on the outside) facing towards each other. Twist the ground lugs with needle-nose pliers so they're facing left-right. This will make wiring the grounds much easier.



To connect the grounds, string a single piece of stranded bare wire between all the socket grounds. Wire the ground to the bottom of the PCB under the pot.

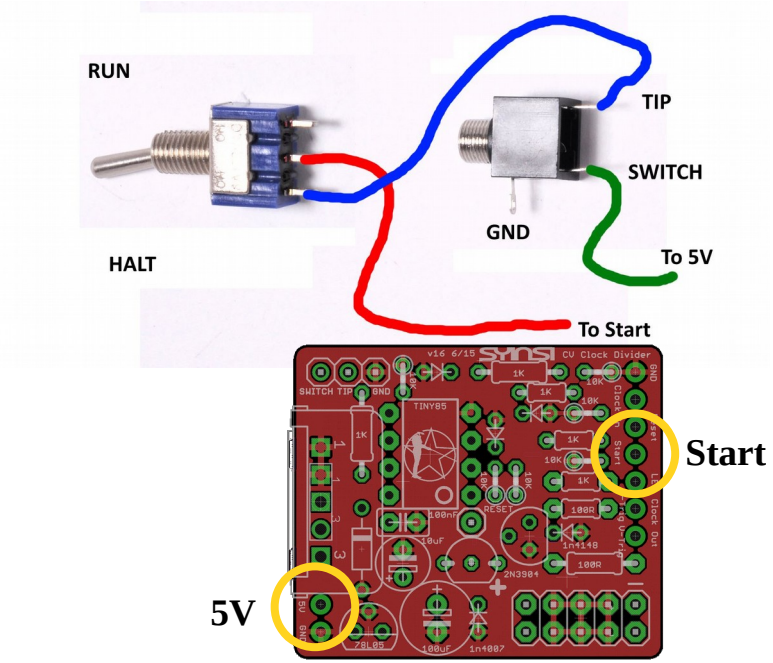


10. Wire the CV socket to the PCB above the potentiometer. Tip to Tip, Switch to Switch.



11. Wire the LED, Clock, Reset, V-Trig, and S-Trig to the PCB. Be sure to connect only the TIP on the 3.5mm sockets (SWITCH isn't used), and that they're connected to the right place on the PCB.

12. Finally, we need to wire the switch and Start/Stop socket to Start on the PCB. These are wired to allow manual or automated control of whether the clock divider is running or not. Run/Halt has the same behaviour in either mode. Clock will not run unless Start is held high.

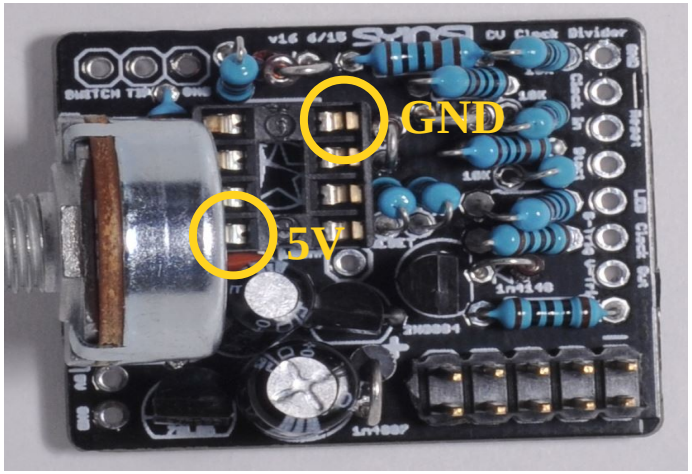


13. Done! Time to test.

Check that power isn't shorted as in step 6.

If that's okay then connect power with a finger on the POWER REGULATOR. If the regulator gets warm or hot quickly then disconnect the power and check your connections and soldering.

If it's okay, then test the voltage at PIN 5 on the microcontroller socket with a multimeter. It's okay if it's out by a couple tenths of a volt.



14. If everything checks out, unpower the board and insert the programmed microcontroller. Double check the orientation.

Power the board while watching the front panel. The LED should flash once briefly as soon as power is applied. If it does, yeah!

If not, turn off the power immediately and double check wiring and connections. See if any pins got bent while inserting into the socket. Is the LED wired properly? Is the back of the pot touching any microcontroller pins?

Updating Firmware

Because of the circuits connected to the programming pins, the controller has to be programmed off-board. Here's one way of doing it easily with an Arduino: http://highlowtech.org/?p=1229.

Download the latest firmware from here: http://github.com/THX2112/CV-Clock-Divider.

There are no fuses to set, and the microcontroller runs on the internal clock at 8MHz.

Troubleshooting

- ☑ No power shorts to ground?
- ☐ Are all the components oriented properly?
- ☐ All connections soldered properly?
- ☐ No solder bridges between joints?
- ☐ All wires going to the right places?

If still having problems send an email to thx2112@syinsi.com.

Also try the DIY forum at muffwiggler.com.

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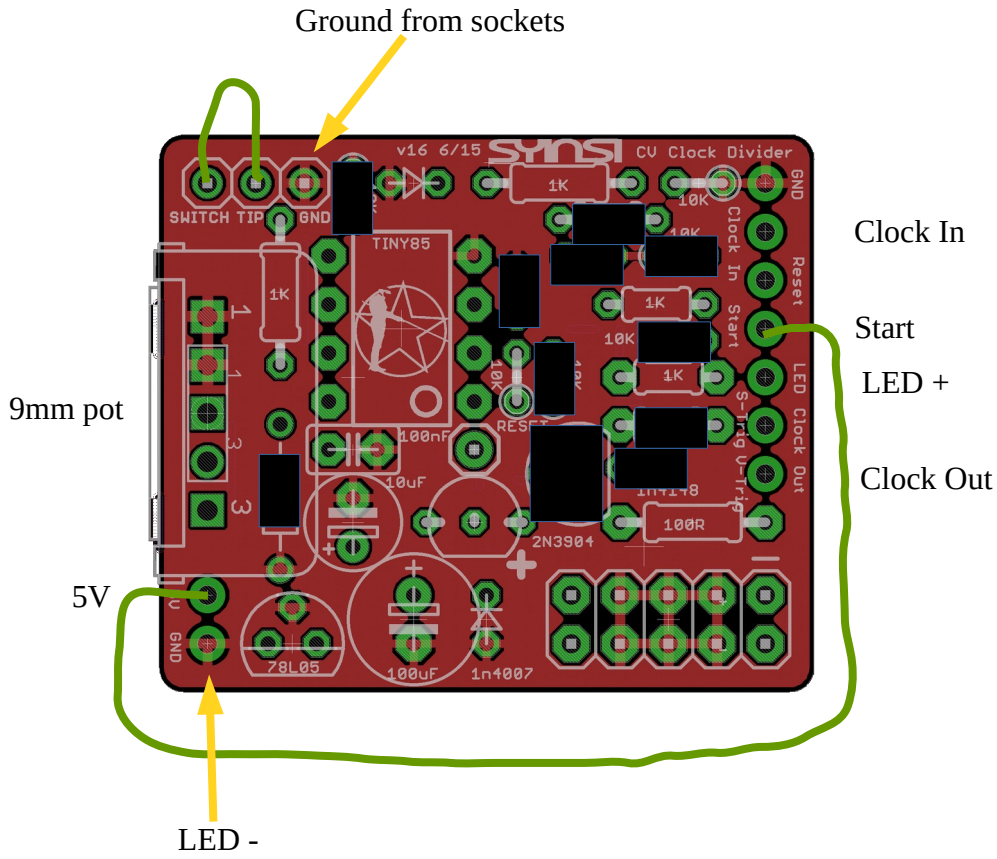
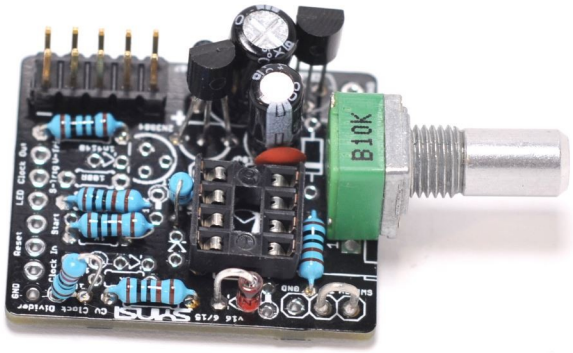
DIL08 Socket
Tile Panel



The tile module is built similar to the full Eurorack module with the following changes:

-Only parts indicated are installed.
-START connected to 5V.
-SWITCH jumpered to TIP.
-Clock-In connected to Clock In socket.
-V-Trig connected to Clock Out socket.
-Ground from sockets to PCB.

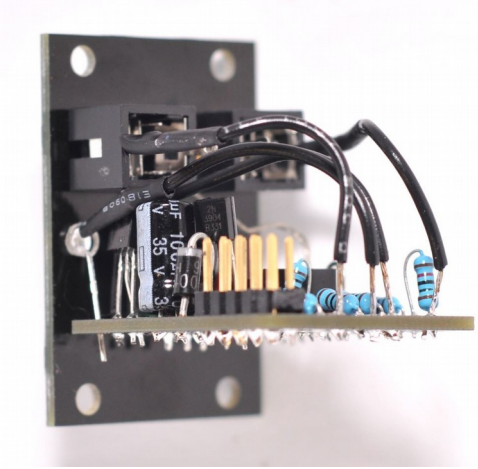


Install all components and jumper between SWITCH and TIP.

Check for shorts and ~5V to IC.

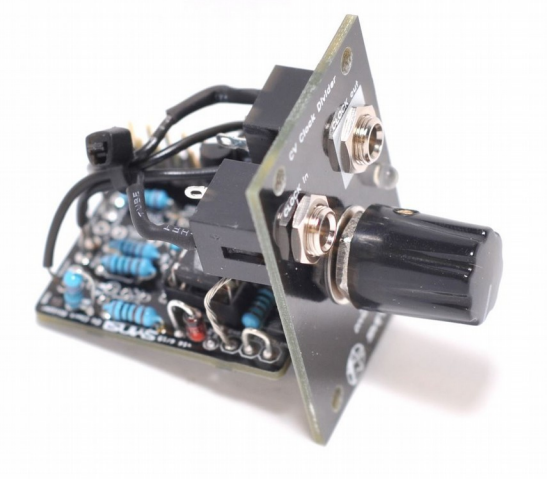
Attach sockets to panel. Twist grounds so they're facing each other and holes overlap. Solder ground lead.

Attach panel to PCB and solder other end of ground lead.



Put negative lead of LED (shorter one) through ground on PCB and insert LED into panel. Solder ground and wire positive lead to PCB.

Solder wire between +5 (next to LED ground) and START on PCB.



Solder CLOCK IN and CLOCK OUT sockets to PCB.

Test again for shorts and ~5V on IC Socket, then insert IC. LED should flash once briefly when power is applied. If not, check connections again.

Happy clock dividing!