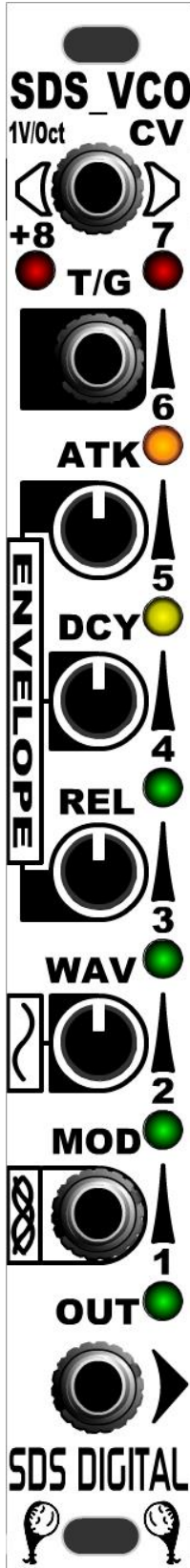


SDS_VCO DIY INSTRUCTIONS



Thank you for your purchase of the fantastic SDS_VCO DIY kit!
The new 2017 kits have the SMD components already mounted
so the build has become much easier.

*If you also have purchased the MIDI expansion, there is a small
amount of SMD soldering involved.*

First, make sure all of the parts are in the kit:

SEMICONDUCTORS:

- 2 * 1N4104 (OR SIM) RECTIFIERS, AXIAL
- 2 * MMBT3904 NPN TRANSISTOR (IF MIDI BOARD)

RESISTORS:

- 3 * 10K OHM 603 SMD 1% (IF MIDI BOARD)
- 2 * 100 OHM SMD 603 1% (IF MIDI BOARD)

OTHER:

- 1 * 24MHZ CRYSTAL (THROUGH HOLE)

LEDS:

- 4 * GREEN LEDS
- 2 * RED LEDS
- 1 * AMBER LED
- 1 * YELLOW LED

HARDWARE:

- 2 * 10 PIN ANGLED HEADERS (+ 1 * 3 PIN HEADER IF MIDI BOARD)
- 1 * 16 PIN RIGHT ANGLED MALE BOX HEADER
- 4 * 10K ALPHA POTS
- 4 * PANEL MOUNT MONO JACKS W/NUTS
- 1 * TRS 3.5MM JACK (IF MIDI BOARD)
- 2 * PC BOARDS + PANEL (+MIDI BOARD IF WAS INCLUDED)

D32

First let's start with the main board and mounting the Rectifiers & 24MHz
Crystal. Mount the first Rectifier, D33, (near bottom right corner from
component side). It's important to solder the rectifier from the bottom side as
shown. Marker must point towards the header pin socket. Snip the pins flush
on the component side to allow the 16 pin header to seat flush.



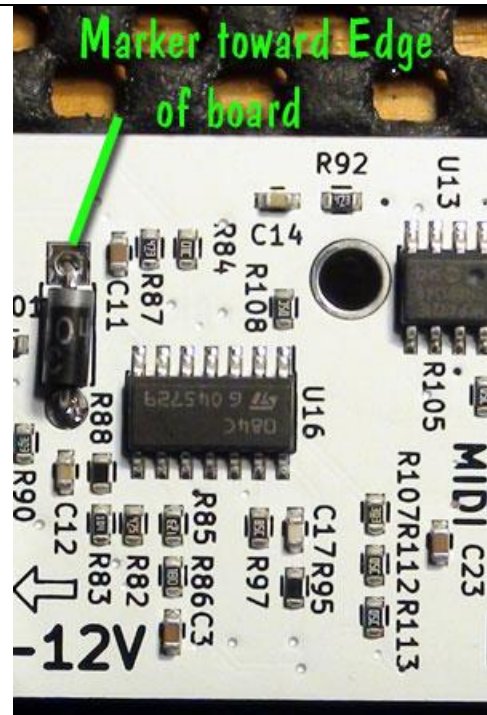
D32

The second rectifier is mounted as shown. Again pay attention to the polarity as marked on the PCB (not visible once the part is placed)

Be careful of close by SMD components.

Crystal

The 24 MHz crystal can be put in either way and must go on the component side as shown



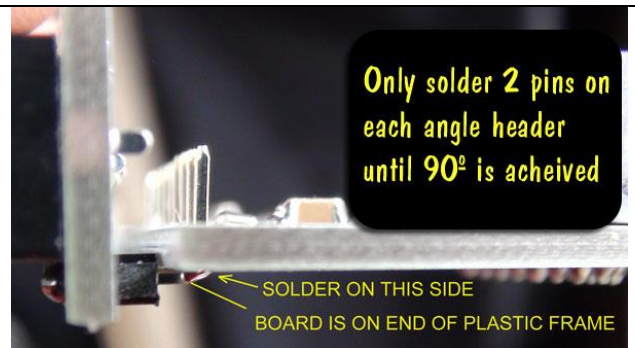
Header:

Mount the 16 pin right angle PSU header on the component side, keeping it as flush as possible. Start by soldering 2 pins (one on each end) so it can be easily moved after inspecting if need be. Once it looks good, solder the rest of the pins.

Board Interconnect Headers

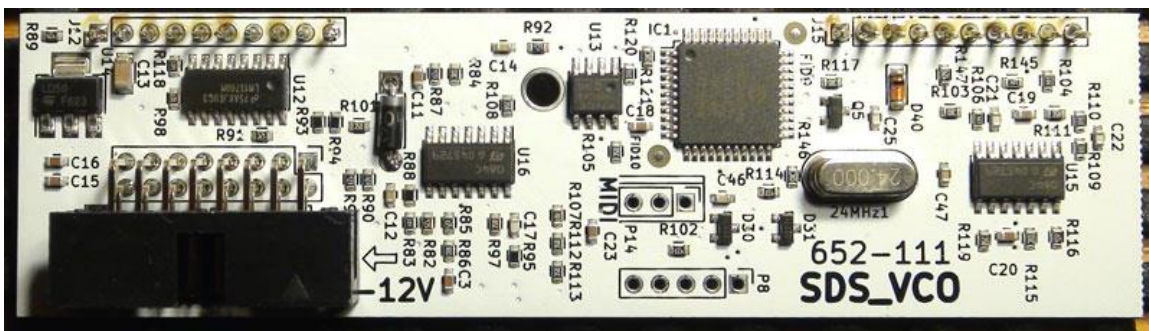
The included 10 pin right-angled headers should be mounted carefully as the distance under the board to the module's "space" is only the thickness of the rectifier mounted under there.

It's up to you how to solder them, but the two pins first idea is probably best. Once the panel is finished, make sure this connection is at 90°



Once 2 pins on each header are soldered, do a test fit. As the final soldering on the main board I would recommend soldering the pins from the back (once panel is on) as some of them come very close to SMD components, but it's up to you!

The board at this point should look as it does in the photo below:



The flux can be cleaned off using alcohol and a toothbrush (that's the problem with white PCB's!)

*Be careful not to get alcohol on the face panel. This may damage the top coat!

**BTW P8 (no header) is the programming port. L to R shown: +5V | Gnd | Vpp | PGD | PGC

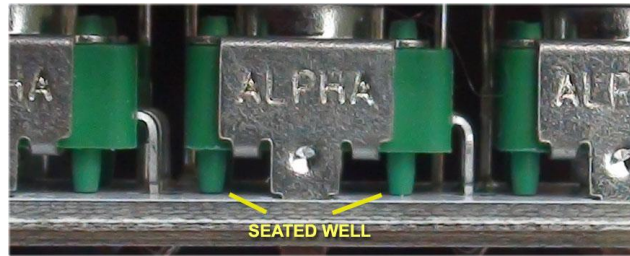
Panel board:

Now the main board is finished, and SMD components are on the panel board, the panel assembly can be completed.

First mount the pots, with only one support leg soldered so they can be moved if needed.

Try to flush them to the board as close as possible.

The "legs" under the pots are a good indicator.



Put all 4 jacks into position. Note that one of the jacks must have its ground lead bent to reach the hole, so will end up slightly crooked.

Now put on the face panel and nuts onto the jacks, tightening them up just enough to still be able to move them. The idea is to make sure the pots aren't binding on the edges of the holes, and the jacks aren't out of position enough to cover LED or header holes.

Solder the center lead of each jack so they can still be moved.

Soldering on mounting leg on each pot will make it easy to turn so can be tested right after for any binding to the face panel.

Once everything is aligned, undo the nuts and remove the face panel to prepare for the LED's.

LED's:

All of the LED's are oriented with the long lead into the round pads, while the shorter leads go into the square pads. I just recite "long-round, short square" which works!

**Left Red LED:**

Only one LED needs to be prepared before inserting. The Left top Red LED must jut over a mm or 2, so bend both leads about 5mm down to about 15 degrees, then correct by bending the opposite way near the head. This will ensure the LED doesn't look "cockeyed" once in place.

Drop all of the LED's into their holes starting from bottom, 4 green's, one yellow, 1 amber, then the straight red, and the bent left red.

Put the panel back on and lightly tighten the nuts on the jacks, then flip the whole thing to pop in the LED's. The LED's will tightly snap into their panel holes when pushed up with a fingernail.

Solder 1 lead of each LED first to check they are all sticking through nicely, then finish their other leads.

Almost Done!

One of the trickiest parts of DIY-ing this module is getting the proper angle and alignment to the main board.

As mentioned above, only solder 2 pins on each header to test for clearance and alignment. The tolerances are pretty close so laying the module on a table and checking the Rectifier (D32) is touching the table is crucial. Once all of the pins are soldered, things become pretty rigid!

Power-up:

Before applying power, take a loupe or very strong magnifier and take a few minutes to inspect your solder work for destructive shorts.

Good places to pay attention to are:

- 1) LED's. The LED's on the "round pad" side are hot (+5V) so it's important no shorts to ground.
- 2) Header pins on both boards
- 3) D32 & D33 Rectifiers in the right direction
- 4) All of the microcontroller/IC pins for solder splats. Generally not a danger, but s**t happens!

As the PIC18F46K22I/P has already been flashed up with a firmware, there's no need to do this, which is a good thing if you don't have a PICkit 3 programmer kicking around!

Go ahead and power up!

The LED's will dance around, showing you are successful, but now it's time to calibrate.

Calibration:

The module will more than likely need to be calibrated. This is normally factory set, but as you are the factory, it has become your job. ;)

- 1) Power down the module and set WAV knob fully left (CCW) (as if to select wave#0.)
- 2) Find a reliable accurate voltage source for 2.50 volts, be it a pot w/cap, signal generator etc.
- 3) Find a DMM meter to check the voltage source above
- 4) Unplug everything from the SDS_VCO's jacks (I know you'll already have stuff in them!)
- 5) Power up the module and within 12 seconds, wiggle the ATK knob to enter calibration mode.
*Leave the ATK knob turned up, as turning it fully down will exit this mode.
If the LED's look like a bar ever diminishing lower, you waited too long, cycle the power again.

MOD CV centering:

- 6) Adjust the WAV knob until all LED's are off, then back up half way between all off, and the first green LED. This can be tricky so check the "distance" between LED 1 & 2 to get an estimate. It should be just above the All off threshold in any case, usually very near the bottom.

VCO CV zeroing:

- 7) Plug your exact/accurate 2.5 volt source into the VCO CV (top)
- 8) Turn DCY knob fully up (CW)
- 9) Slowly turn it downwards. The LED's will follow your movement.
Keep turning until all LED's are off.
*Note that sometimes everything is perfect so all LED's will be off with DCY fully up, in which case, just leave it that way, fully up. It's usually near the top.

Exit & Save:

- 10) Once you are confident everything is set properly, turn the ATK knob fully left to exit & save.

Done!

If your SDS_VCO will also have a MIDI expansion board, please see SDSVCOMIDI-DIY.pdf at <http://www.freshnelly.com/sdsvco/SDSVCOMIDI-DIY.pdf>

The firmware at the time of this document is V1.00, so you can check the website at <http://www.freshnelly.com/sdsvco/sdsvco.htm> for possible updates or alternates.

* Firmware updates are accomplished with a downloaded .mp3 file played into the VCO CV (top) jack at full volume of your phone, mp3 player etc.

** If using a phone, make sure ringers, alerts, & alarms won't interfere with the audio at all!

Firmware update instructions will also be on the site, but pretty similar to the calibration.

>>Patch your mp3 audio source to top jack, then Power up the module, but wait longer than 12 seconds.

>>Turn the WAV knob to select wave # 0. Wiggle the ATK knob to enter audio FWUD mode.

>>Before the time-out indicated by the falling LED bar, the audio FW file must be started.

>>Watch der blinkenlites for a while until they stop and the start-up Splash happens (about 90 seconds)
Done!

Happy VCO'ing!

Sandy Sims, SDS Digital 2017

Owner's manual: http://www.freshnelly.com/sdsvco/0-SDS_VCO_usersMan.pdf