Tubbutec SH-1oh1 Tune

Midi retrofit and feature extension for Roland SH-101

Installation Manual

http://tubbutec.de

Contents

Disclaimer

Please note: When following this construction manual properly, damage to the SH-101 synthesizer can be ruled out.

The following installation requires some soldering. It is not complicated and only basic soldering skills are needed. However please practice on something else then your expensive synthesizer.

Tubbutec is not responsible for any damage caused by improper installation.

1 Installation of the SH-1oh1 mod -µTune edition

The SH-1oh1 has been designed to make installation as simple as possible. The original SH-101 CPU needs to be desoldered and replaced with a socket. Additionally some wires need to be soldered to points on the SH-101 circuit boards. In order to install the midi sockets you may need to drill holes into the plastic case of the SH-101.

1.1 Opening the SH-101

Unplug all external connection from the SH-101. Then remove all the screws on the bottom plate. The plate now comes off.

1.2 Check Voltage

An important first step is to check the voltage of the processor to make sure it is not higher than 5.5V. If the SH-101 is calibrated correctly this is usually the case, however it is advised to measure the voltage between pin 20 (GND) and pin 40 (VCC) of the processor. It should be about 5.0V. If is is higher than 5.5V adjust VR1 (D/A width) until it is about 5.0V.

A voltage higher than 5.5V may destroy the SH-1oh1.

1.3 Replacing the CPU with the socket

As a first step the original cpu needs to be desoldered. Fortunately it is only soldered on one side of the board so desoldering is relatively easy.

Remove all screws holding the brown 'SH-101 SYNTH BOARD' in place.After removing the two connectors on the opposite side of the keyboard, the board folds up.

You can now use a soldering iron and desoldering pump to desolder the 40 pin CPU. You may also use solder wick to remove the solder. Take out the CPU and keep it. It can later be put back into circuit if desired for some reason..

You can now solder the 40 pin socket in place of the CPU.

1.4 Soldering wires

Four wires need to be soldered to points on the SH-101 circuit boards. These are the green, red, yellow and orange wires. They are already cut to the correct length, stripped and tinned to make things easy for you. Pictures 1 and 2 show the positions of the wires. The red wire is for filter control, the green for pitch bend, yellow for volume accent and orange goes to +15V. Please do not omit the orange wire. The red wire's soldering point is located on the board beneath the SH-101 processor board between the ENV MOD and VCF MOD faders. The green wire's soldering point is located on the bender board beside the keyboard. The yellow and orange wires need to be soldered to the brown processor board.

When soldering the yellow wire to the middle pin of TR28 make sure to not create any shorts.

Finally solder the brown wire to the jack board as shown in figure 3 and cut the trace as show in the picture.

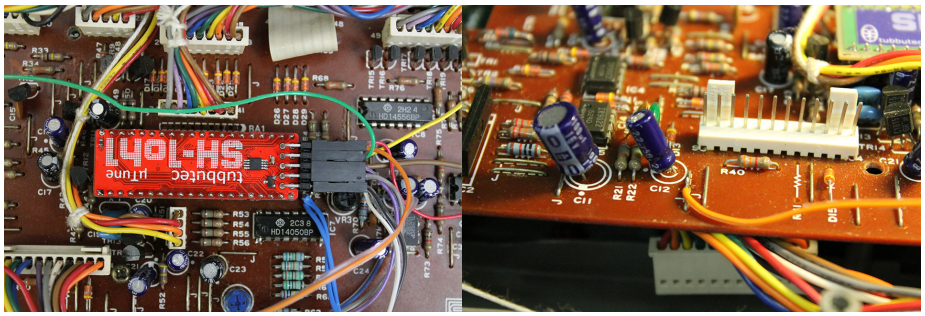

Figure 1: SH-1oh1 processor board placement and orange wire location

1.4.1 Improve SH-101 grounding

The SH-101 suffers from digital noise due to insufficient grounding. The following mod will not only reduce this noise, but also improve the accuracy of the CV voltage. It is therefore necessary in order to achieve adequate precision of the SH-101 µTune.

Solder a wire (Here in blue) between the leg of R63 as shown in figure 1 and 3 and the ground connection on the jack board (figure 3). We used two wires in paralell here to reduce impedance, but it is also possible to use a single thicker wire.

1.5 Installation of SH-1oh1 processor

Put the SH-1oh1 board into the socket as shown in picture 1. Make sure to not bend or break any of its pins. Now connect the wires to the SH-1oh1 using the connectors. The red and green wires should be on top. The color codes on the SH-1oh1 show the wire's correct positions. Do not interchange them!

You can use the color codes provided on the SH-1oh1 to install the socket's connectors properly. The midi in connector with black and white wires is placed in the lowest position with the black wire facing up. The midi out connector is placed beside it with the grey and purple wires facing up. The uppermost connector is placed with the red and green wires facing up.

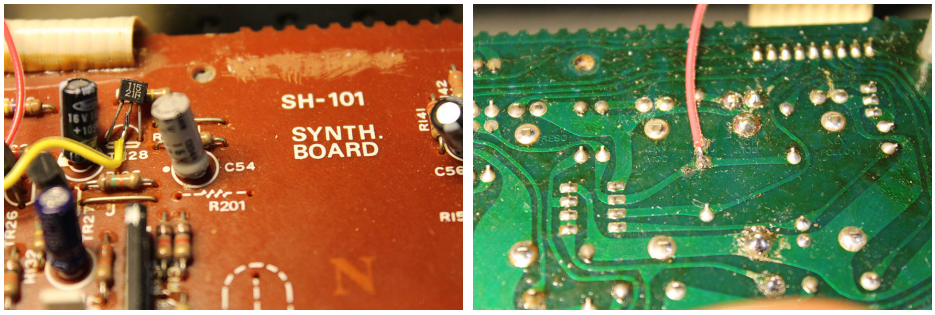

Figure 2: Location of yellow and red wires

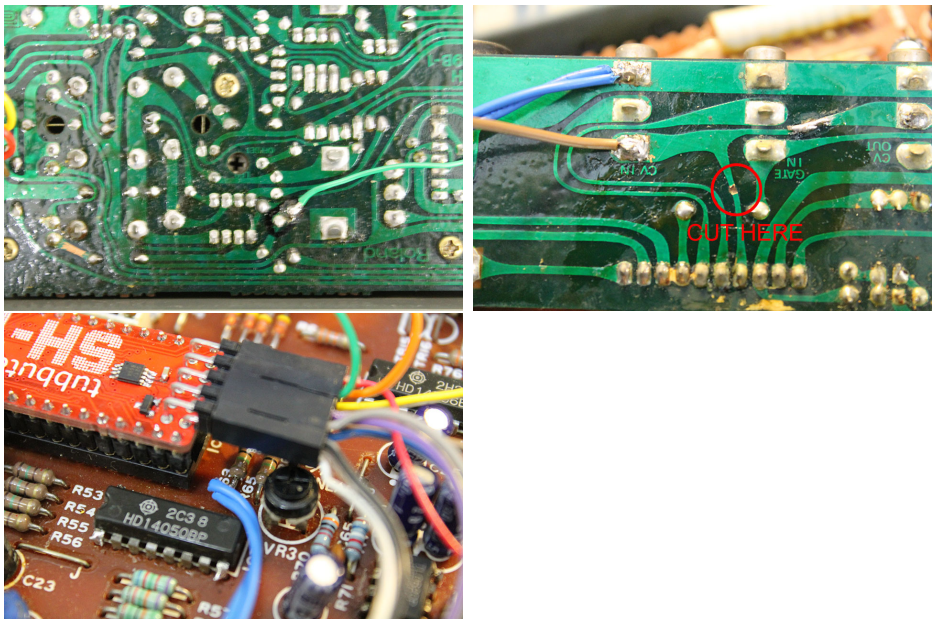

Figure 3: Location of the green and brown wire

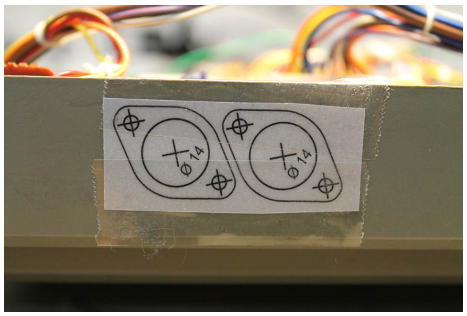

Figure 4: Stencil for the connector holes

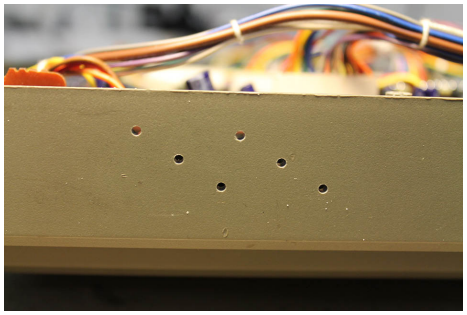

Figure 5: Hole location marked and drilled

1.6 Installing midi sockets

The midi sockets can be installed in various ways as they can be detached from the SH-1oh1 board. You can install them from inside the case or on the outside. You can also of course not drill any holes at all and just put them in the battery compartment. The socket with two wires (black and white) is the midi in socket, the one with the three wires is midi out.

Location of the sockets is also your choice, we recommend the space below the MODULATOR text. (See picture)

Use the stencil provided to mark the location of the holes, then drill with a wood or metal drill. Use a stepping drill for the large hole.

1.7 Cutting the yellow battery wire

If you want to use your SH-1oh1 with batteries the yellow wire coming from the battery compartment needs to be cut. This makes sure the circuit draws no power when switched off and increases battery life. Image 8 shows where to cut. There are two yellow wires: one that connect the upper with the

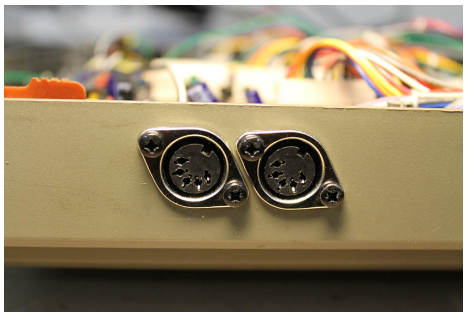

Figure 6: Holes drilled to final size and connectors installed

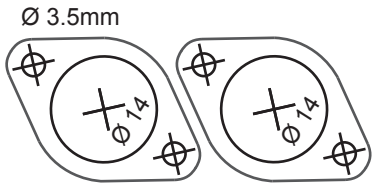

Figure 7: Drill aid for midi sockets

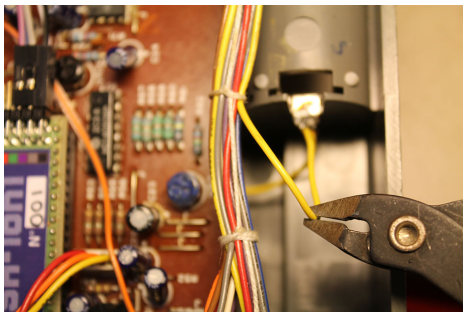

Figure 8: Cutting the yellow battery wire

lower battery compartment. The other one is part of the wiring harness. Only cut the one which is part of the wiring harness.

1.8 Calibration

After installing the SH-1oh1 µTune calibration needs to be performed. Calibration works a bit differently than in the SH-101 service manual.

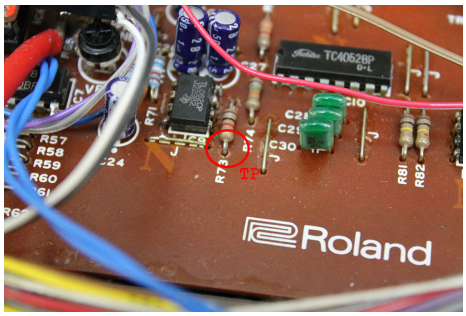

Figure 9: Test point for calibration

Switch into calibration mode by pressing LOAD and KEY TRANSPOSE, then turn on the SH-101.

1.8.1 Internal D/A calibration

1. Connect a voltmeter to the testpoint shown in figure 9 at R73.
2. Make sure LOAD lights up and adjust VR-2 (D/A Tune) until the voltage is 0V $\pm 1mV$.
3. Press PLAY and adjust VR-1 (+5V) until the voltmeter reads 2.75V $\pm 1mV$.
4. Press DOWN and adjust VR-3 (D/A linear) until the voltmeter reads 2.5V $\pm 1mV$.
5. Now disconnect the voltmeter from the test point and connect it to the CV-out jack. Press PLAY again and adjust VR-1 (+5V) until the voltmeter reads 2.750V.
6. Press DOWN and confirm 2.5V at CV-out
7. Press the UP button, then press the U/D button. Adjust VR-5 (range width) until the output pitch is the same in both cases.

VCO calibration

VCO width and VCO tune calibration is not necessary when the unit had been calibrated before installing the mod. The service manual is a bit hard to understand here, so here are instructions that should work:

1. Set the TUNE knob to the center position
2. The original Service manual calls for a calibration with A = 442 Hz. You can also calibrate to 440Hz which we will do here
3. Set the TRANSPOSE switch to the middle position and Range to 16'
4. Connect a tuner or frequency counter to the audio output. It is recoemmnded to also listen to the sound via the headphone output.
5. Play the highest A on the keyboard and adjust VR-7 (VCO TUNE) until the frequency it 440Hz-
6. Play the lowest A on the keybaord and adjust VR-6 (VCO WIDTH) until the frequency is 110Hz
7. Repeat steps 5 and 6 many times. You should notice that with each repetition you need to turn the knobs less. I started from scratch by putting the knobs at their center position and it took about 10 iterations until the pitch was in the range of +-1Hz. Stop when you feel it is good enough or if you are starting to make things worse. The pots are not very precise and it is difficult to set them absolutely perfectly. Temperature changes may affect the VCO whith anyway, so you can not do this perfectly.