

# **CIRCUITBENDERS ROLAND SH-101 MODS**

## **DIY GUIDE**

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This DIY guide gives detailed instructions on how to install the following modifications on the Roland SH-101 analogue synth.

Filter overdrive knob.  
Audio input.  
VCF CV control input.  
LFO rate extender switch.  
PWM source selector.  
Filter FM controls.  
Filter FM source selector.

### **PARTS YOU WILL NEED:**

2 X Rotary switches, single pole minimum 6 way.  
3 X 100K log potentiometers  
150K resistor  
51K resistor  
2 X 100K resistor  
2 X Mono Jack sockets  
4.7 uF 10 Volt capacitor  
SPST toggle switch  
SPDT toggle switch  
SPDT (centre off) toggle switch  
5 knobs

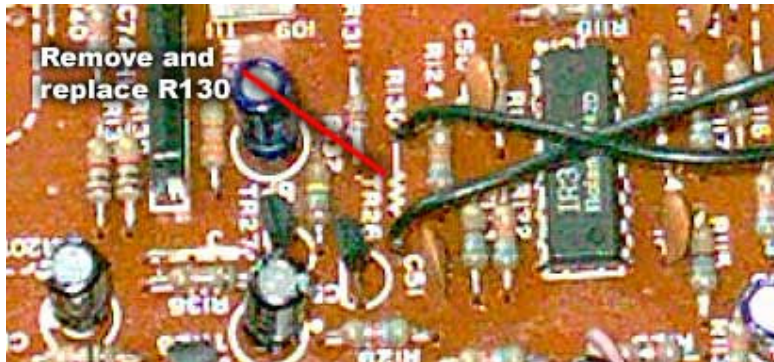
### **OPENING THE CASE:**

1. Remove the 12 screws securing the metal back plate and carefully remove.
2. Remove the 5 screws holding the keyboard assembly in place and pull out the 2 connectors on the back of the keyboard. You can now remove the keyboard itself but keep it handy as you may need to plug it back in for testing purposes.
3. Remove the 7 screws holding the SYNTH BOARD in place then carefully lift the board. You will probably have to disconnect a couple of the connection blocks from the synth board to do this.
4. Depending on where you mount the extra controls you may have to also remove the control board. This is difficult without first removing the Bender board. You will also have to pull off all the knobs and sliders from the front panel before the control board can be pulled up.

The individual mods are described on the following pages.

#### **FILTER OVERDRIVE KNOB:**

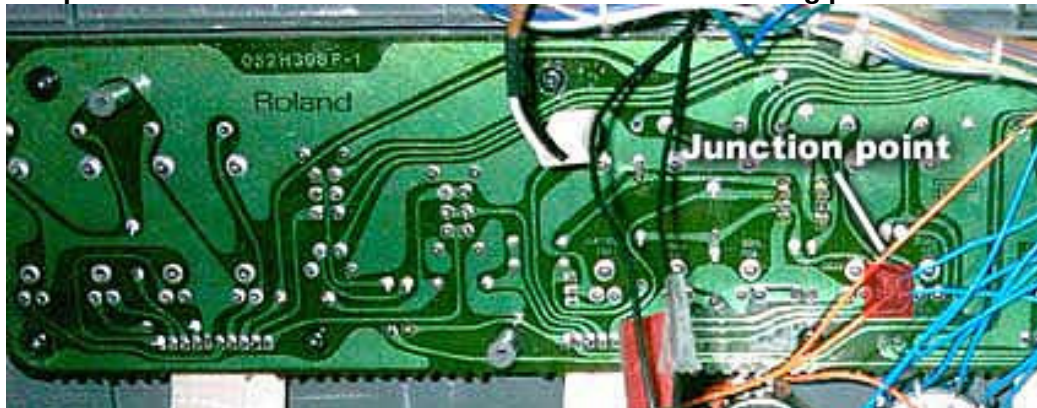
This is one of the easiest and most effective mods. To install this mod simply locate resistor R130 and remove it from the board. This resistor should then be replaced with a 100K log pot using the left and middle tags (viewed from the top of the pot with the tags towards you).

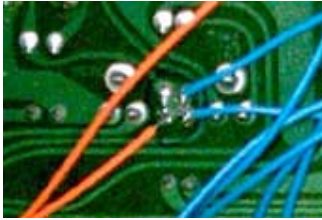


You may notice that this acts more like a 'filter cleaning' knob as the filter is overdriven at its minimum setting and clean at max. If this is a problem then a linear response pot can be used or you can use the right hand pin of the 100K log pot. We chose to have a filter cleaning type layout as this gives a far better response curve than the other two methods.

#### **VCF CV CONTROL INPUT:**

This is another simple mod that allows you to control the filter cut-off frequency using an external control voltage. All you need is a mono jack socket and a 100K resistor. Simply wire the sleeve connection of the socket to the ground of the 101 (there's a solder point marked with the ground symbol in the middle of the control board) and the tip connection via a 100K resistor to the junction point of R184, R185, R186 and R187. If you already have the control board free this junction is fairly easy to find by looking at the component side of the board. It is also shown in the following photos.





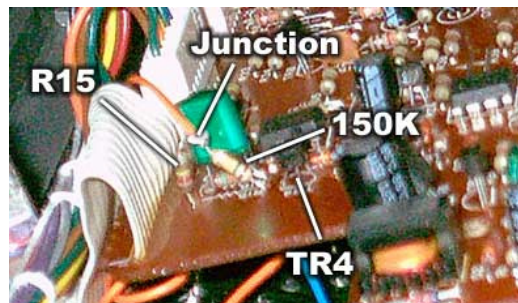
Junction between R184, R185, R186 and R187.

### LFO RATE EXTENDER SWITCH:

This mod adds a three way speed selection switch to the SH101's LFO. It offers two new range settings. The first allows the LFO speed to drop to 30 seconds (or more) per cycle and the second takes the speed well into audio frequencies. We have clocked it at over 1400Hz.

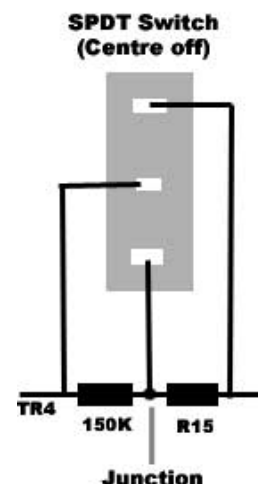
For this mod you will need an SPDT three way switch with a centre off position and a 150K resistor.

Locate resistor R15 on the far right hand side of the synth board and desolder it from the board on the TR4 side (a transistor marked on the board). You should then be able to lever up R15 on one side so it sticks into the air at about 45 degrees. Get your 150K resistor and solder one end to the free end of R15 and the other into the hole on the board recently vacated by the leg of R15. You should now have a triangular resistor arrangement shown in the picture below.



You now need to get your SPDT centre off switch. The junction point between the 150K resistor and R15 (shown above) should be wired to the bottom pin of the switch. The middle pin should be wired to the same point that the 150K resistor is soldered to the board, and the top pin is wired to the same point that R15 is soldered to the board.

You should end up with an arrangement as shown in this diagram. The 150K resistor can be substituted for higher values if an LFO sweep of longer than 30 seconds is required.





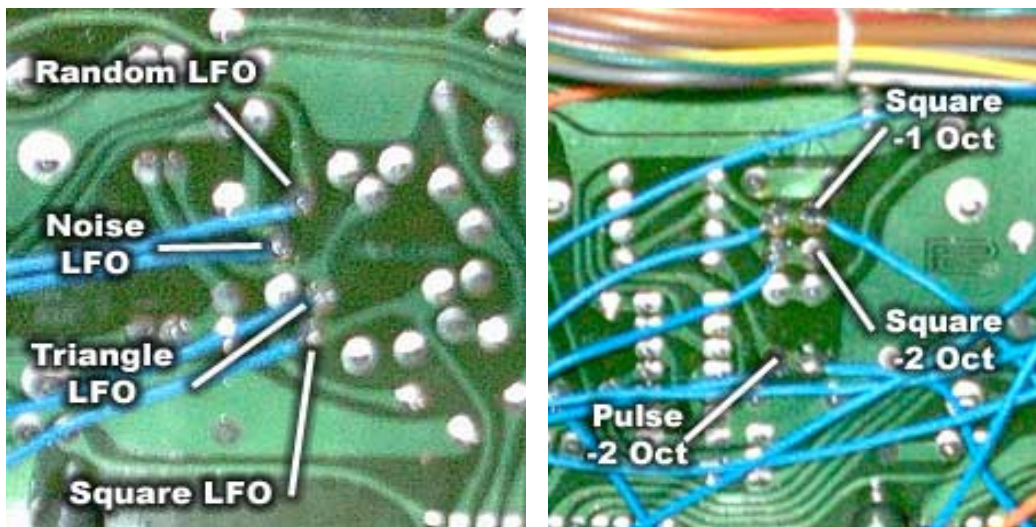
## PWM SOURCE SELECTOR KNOB:

This is a six way rotary selection knob, which allows you to set the modulation waveform source for the square wave PWM independently of the LFO. For this mod you need a rotary switch with its collar stop set so it only switches through settings 1-6. You should cut off the remaining tags.

The first step is to locate resistor R176 on the control board. This is marked on the picture below. Solder a wire from the common point of your rotary switch (the centre terminal) to the top terminal of this resistor. You will see a circuit-board trace coming off this solder point and going off to the right. You need to carefully cut this trace with a sharp knife at some point after R176 but before it reaches the next solder point to the right. Try to lever up and slightly roll back the copper trace to make sure the link is actually cut.



Next you should locate the two areas on the control board shown in the images below. The first is on the right side of the board and is the backside of the LFO front panel knob. It is also shown under the word 'TRACE' on the image above. The second can be found more or less in the middle of the board under the centre of the battery compartment. It is the back of the Sub octave switch.



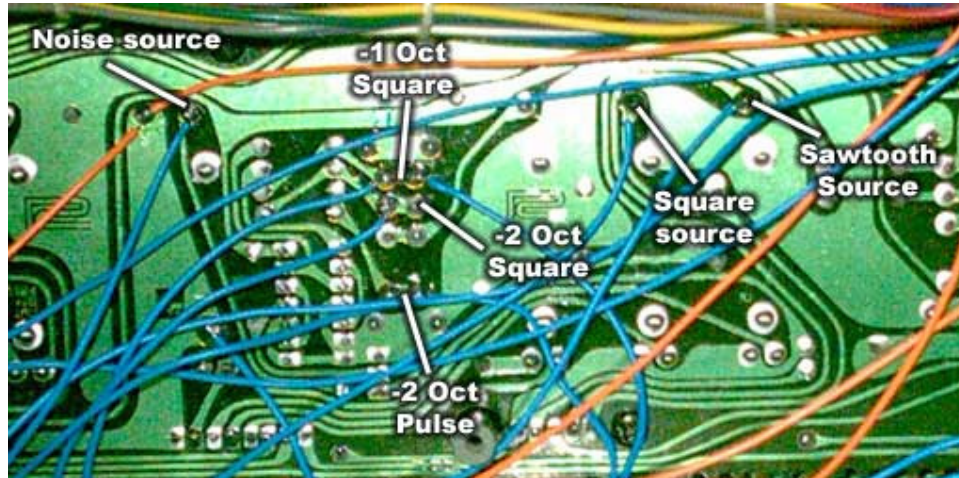
The solder points labelled are the six different PWM modulation sources and should be wired to the six tags on the PWM mod source switch.

## **FILTER FM MODS:**

These mod's allow you to modulate the filter cut-off frequency using the VCO waveforms as sources. With the resonance cranked up the FM mods create some stunning ring mod type sweeps and clanking.

For the FM mods you need a rotary switch (set to six positions), a 100K log pot, an SPST switch and a 100K resistor.

Firstly you need to locate the solder points for the FM sources. Look at the image below and find all of the labelled points. These six points should be individually wired to tags 1-6 on the rotary switch. This is the same area as the sources for the sub waveforms on the PWM source mod.



Next you should wire the right hand tag (viewed from above, with tags towards you) of the 100K log pot to the common (centre) tag of the rotary switch you just soldered the FM sources to. The left-hand pin of the pot should be soldered to the same ground connection you used earlier on the VCF CV input socket.

Finally, solder your 100K resistor to one pin of the SPST switch and then wire the free end of the resistor to the centre tag of the 100K pot. Wire the other pin of the SPST switch to the same junction between R184, R185, R186 and R187 that you used earlier on the VCF CV input mod and this mod is finished.

The rotary switch selects the source of the filter modulation, the dial controls the amount of the effect and the switch turns the FM on and off.

## **AUDIO INPUT MOD:**

The audio input mods allow you to either send an external signal through the SH101's filter and envelope or use an external signal as a source for the filter FM modulation.

For this mod you will need a 100K log pot, a 51K (or close) resistor, a mono jack socket, an SPDT switch and a 4.7 uF 10 Volt capacitor.

First wire the sleeve connection of the jack socket to the same ground point on the SH101 control board you used earlier. Next solder the leg of the capacitor marked negative ( - ) to the tip connection of the jack socket. The other leg of the capacitor should be wired to the right hand tag of the 100K pot (looking from above, tags towards you). The left hand tag is also wired to the same ground terminal as the sleeve of the jack socket.

When this is done you should wire the centre tag of the pot to the centre pin of your SPDT switch via the 51K resistor. You can solder the resistor directly to either the pot or the switch just so long as it is actually between the two components.



Of the two remaining pins on the switch you should wire one to the same junction between R184, R185, R186 and R187 that you used earlier on the VCF CV input mod and the other to the junction of R109, R110, R111 and R112 on the synth board. This second junction is on the solder side of the area indicated on the image on the left. You can identify this area from where it says SH-101 on the circuit board at the top of the image

If you have installed the rotary switches and dials in the blank area above the keyboard you may find that they interfere with the keyboard action. If this is the case then you should lower the keyboard slightly using thin washers on the upper two keyboard screws. We found that 2-3mm thick slices of quality instrument cable with the central core removed also does the same job as washers but allows for some compression as you tighten the screws.

