Q157 SH++

The Q157 SH++ is a Sample and Hold module surrounded by accessory functions on a single-wide panel. There are 5 sections including an LFO with square and sine wave outputs, a frequency/gate divider, noise source with low-pass filtering, and a slew limiter with automatic looping. The slew limiter section also produces a decay envelope generator.

Several of the sections are connected together in a musically useful way to create modulation of oscillators and filters with minimal patching. The exception is the Decay/Slew section which operates stand-alone by default. All sections can be used together or separately.

The LFO provides square wave and sine wave outputs simultaneously with an LED indicating speed. A range switch selects between slow, fast and off for interactive playing. The LFO can be used to provide vibrato to oscillators, clocks to sequencers, or gates for the Sample and Hold section.

The Divider section automatically receives its input from the LFO's square wave unless a plug is inserted into its IN jack. The default division is /2, with jumpers on the circuit board offering /3, /4, /5, /6, /7 and /8. Dividing gates can be useful for sequencer patches, arpeggiations, even sub-octave waveform generation. An LED shows status of the output.

The Sample and Hold section receives its gate from the LFO unless a plug is inserted into its GATE jack. The GATE input is level sensitive and can be triggered by slow-moving waveforms or even noise. The sample and hold input is automatically connected to the noise section if there is no plug in the IN jack.

The Noise section provides a white noise filtered by a 2-pole low-pass filter. The knob can also be jumpered as a volume control if desired.

The Decay/Slew section provides portamento for keyboard pitch, creates envelopes from gates, or delays gate signals. The knob sets the speed. The curve is jumper-able from linear to exponential. Without a plug inserted into the IN jack, the slew mode automatically retriggers to create a trapezodial LFO waveform. In decay mode, a gate produces a decaying envelope to drive percussive patches. An LED shows status of the output.

Q157 SH++ Specifications

Panel Size: Single Width 2.125"w x 8.75". Moog Unit (MU) format.
Functions: Sample & Hold, LFO, Gate Divider, Noise with LP Filter, Decay Generator, Slew Limiter.
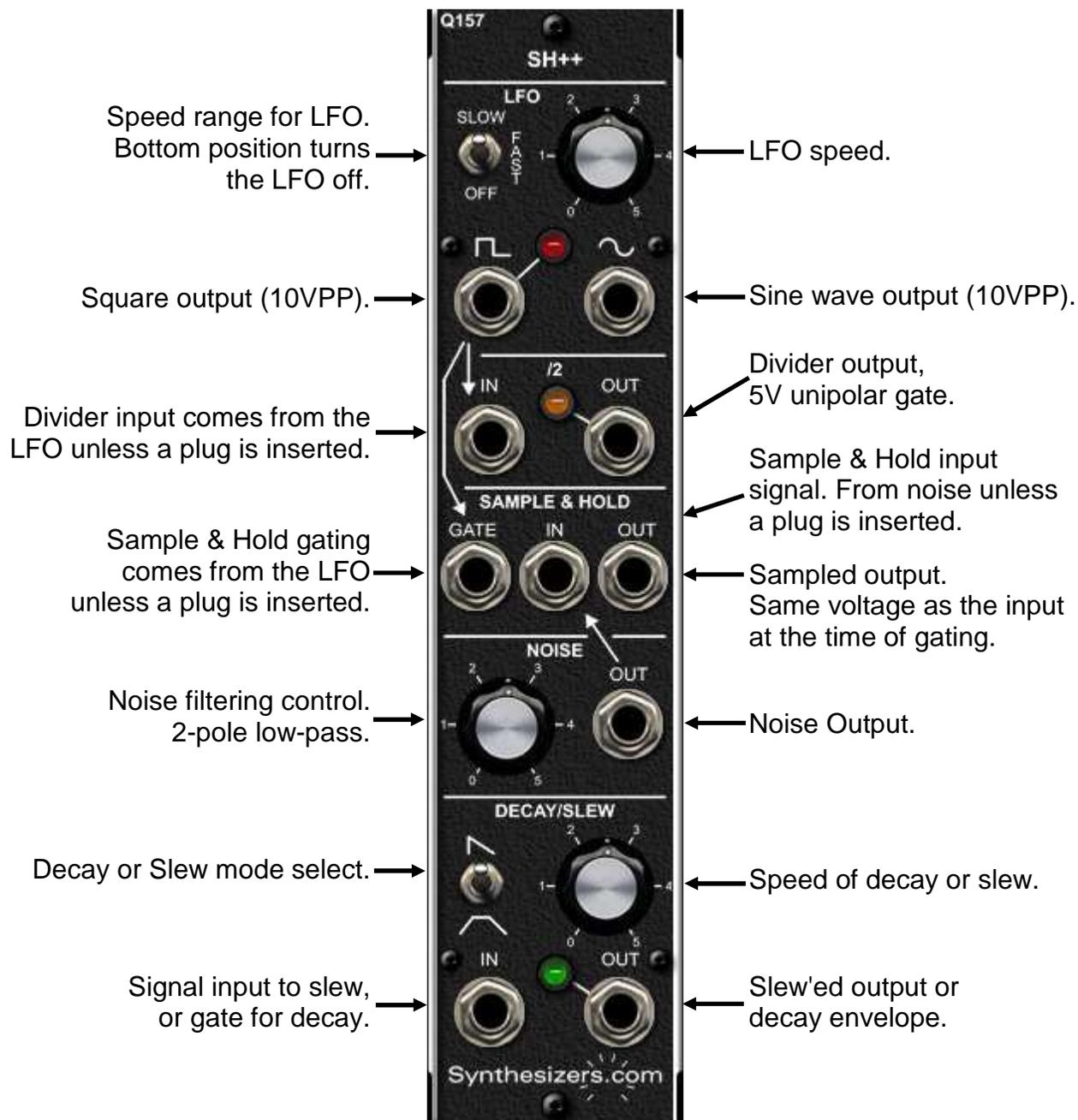**Audio levels:** 10V peak-to-peak typical
Gate Levels: 5V. ~1.5V Threshold.
Power Requirement: +15V@60ma, -15V@60ma, +5V@50ma
Power Connector: Synthesizers.com standard 6-pin keyed MTA connector.
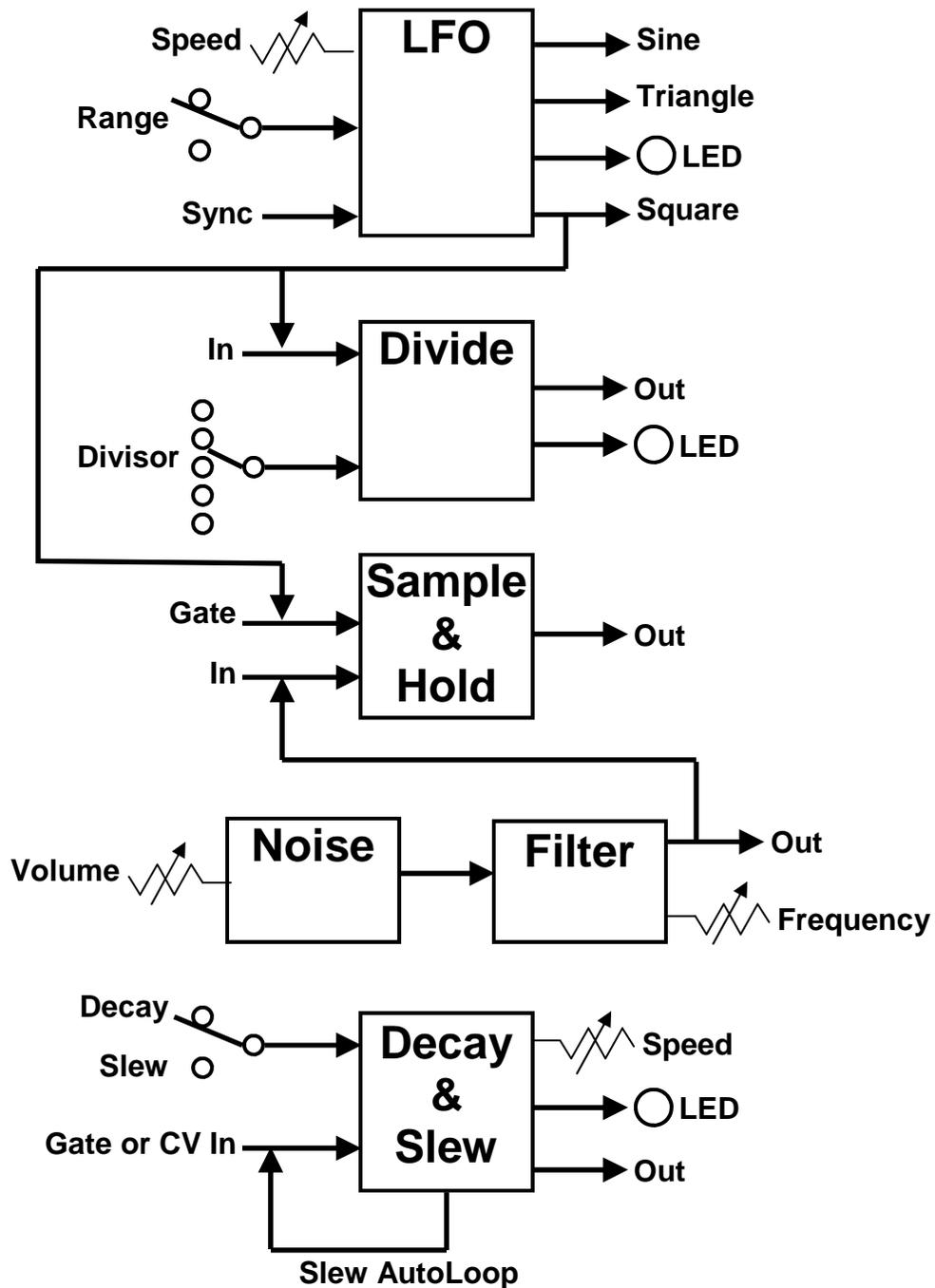
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The Q157 SH++ has 5 sections logically organized. LFO, Divider, Sample & Hold, Noise with filtering and Decay/Slew. Connections with arrows are made using switching jacks unless a plug is inserted to break the connection.

Speed range for LFO. Bottom position turns the LFO off.

LFO speed.

Square output (10VPP).

Sine wave output (10VPP).

Divider input comes from the LFO unless a plug is inserted.

Divider output, 5V unipolar gate.

Sample & Hold gating comes from the LFO unless a plug is inserted.

Sample & Hold input signal. From noise unless a plug is inserted.

Sampled output. Same voltage as the input at the time of gating.

Noise filtering control. 2-pole low-pass.

Noise Output.

Decay or Slew mode select.

Speed of decay or slew.

Signal input to slew, or gate for decay.

Slew'ed output or decay envelope.

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Functional Diagram

The Q157 consists of an array of circuit blocks connected together in a musically useful way while making the best use of available space.

Speed — **LFO** → **Sine**
Range → **Triangle**
○LED
Sync → **Square**

In → **Divide** → **Out**
Divisor → **○LED**

Gate → **Sample & Hold** → **Out**
In

Volume — **Noise** → **Filter** → **Out**
Frequency

Decay
Slew → **Decay & Slew** → **Speed**
Gate or CV In → **○LED**
→ **Out**
Slew AutoLoop

LFO

The top section is the LFO. It's connected to the Divider section and to the GATE of the Sample & Hold section. Switching jacks allow those sections to become disconnected if desired.

The LFO provides Sine wave and a Square wave outputs. The Sine wave can be used to provide vibrato (FM) for oscillators, tremelo (AM) to VCAs, filter modulation, and has many other uses.

The Square wave can be used to trigger envelope generators, step sequencers, or any other place a gate signal can be used. The Square wave can also be used to modulate oscillators and filters for atonal metallic sounds.

A Triangle waveform and a sync input are provided on the circuit board as user-selected options.

The circuit board offers some other options for the LFO section. A Triangle wave output is provided. Just move the plug from Sine or Square wave connector to Triangle if that's what you want. Also there is a Sync input which can also be swapped with Sine or Square connectors if you want that feature. Provide a sharp rising edge into the Sync input to restart the LFO.
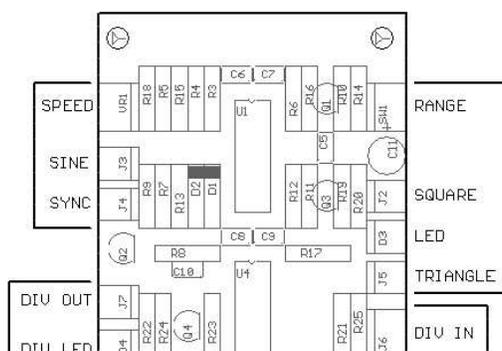
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Divider

The divider section gets its input from the LFO's square wave. This is a digital divider set to divide-by-two. It produces a single output pulse for every 2 input pulses.

If you want to divide another signal instead of the LFO's square wave, simply insert a plug into the IN jack to break the default connection. Typically this would be a gate signal or maybe a square or pulse wave from an oscillator.

The output of the Divider is unipolar, 0 to 5 volts and can be used as a gate or as audio. When being used as audio, it's best to patch it through a DC-to-AC converter such as the Q120 Connector Interface module or channel 4 of the Q114 Mixer++ module.

Other divisions besides /2 are provided via circuit jumpers.

The circuit board offers a jumper to select the division. The default division is /2. The jumper array is 2x7 and located just to the right of U4 as seen on this drawing. Options, from top to bottom are: /3, /4, /5, /6, /7, /8, /2. Simply move the small shorting jumper to the desired location.
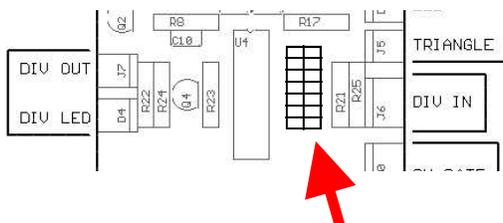
Sample & Hold

The Sample & Hold section gets its GATE signal from the LFO's square wave. To use a different signal, simply insert a plug to break the default connection.

The Sample & Hold section gets its signal input from the Noise section. This creates a typical random stair-stepped signal source used for filter and oscillator modulation. To use a different signal, simply insert a plug to break the default connection.

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Noise and Filter

The Noise section provides both a white noise source and a 2-pole low-pass filter to provide a wide range of random audio or control voltages. The output is connected to the Sample & Hold's signal input unless a plug is inserted to break the default connection.

The knob controls a low-pass filter by default but can be changed to control noise level if desired.

The circuit board provides an option for the Noise section's control knob. The default is that the knob controls the filter frequency, and the level connector is jumpered for full level. If you'd rather have the knob control the noise level, simply remove the 2 connectors from the pot and replace them with jumpers to set the filter in the high position, then move one of the connectors over to the noise level connector.
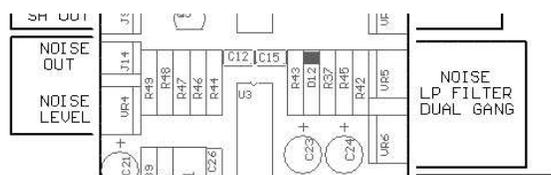
Decay/Slew

The Decay/Slew section provides a decay envelope or a slew processor. Selection is made with the toggle switch.

The Decay/Slew section is not automatically connected to any other section because when its input has no plug, it loops in Slew mode like a trapezodial LFO.

In the Decay position (up), the IN jack is typically a gate signal to trigger the decay generator. The decay output is useful for modulating an oscillator (VCO), filter (VCF), or amplifier (VCA) with a sharp, percussive decay envelope. The knob controls the time - clockwise is a longer time (slower). The output is a 0-5v envelope signal. The gate input is level sensitive and will trigger on slow moving signals at around 1.5 volts.

In the slew mode, without a plug inserted, the circuit loops automatically like an LFO to provide gates or modulation signals.

In Slew mode (down), the section acts like a slew-limiter. This is useful for providing portamento for pitch voltages, to slow down or delay gates, or to smooth the rise-times of modulating signals such as envelopes. The knob controls the speed with clockwise being a longer time (slower). With no input plug, the circuit loops automatically and can be used as an LFO gate source or modulation source.

The circuit board provides an option for the curve of both the decay and the slew outputs. The default setting is exponential but you can change the curve to linear using the jumper. At zero speeds, there can be small parasitic oscillation in the output signal in the linear setting.
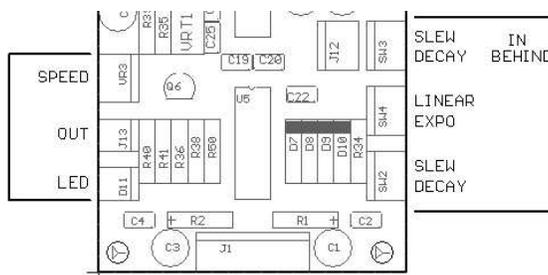
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Basic Sample & Hold Patch

Here's a very typical synthesizer patch using the Sample & Hold on a noise signal, triggered by the internal LFO. It relies on default internal connections made by the switching jacks and requires no patch cables. This patch provides a signal at the Sample & Hold output that is a random stair-step. It's typically used to modulate the frequency of a filter or an oscillator - a filter in this example.

Q157 SH++   Q107 Filter

Patch the SH output through the Slew section to smooth out the stair-stepping.

Portamento and Vibrato

This patch shows the LFO section providing a vibrato effect on the oscillator using the sine wave output, and portamento on the bottom section. The other sections are unused and can be used for other things or ignored. A good vibrato is around 7hz. Set the toggle switch to the slew position (down).

Q157 SH++   Q106 Oscillator

Keyboard Pitch

Adjust the AMOUNT knob for vibrato depth.

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Utilities

The Q157 SH++ module is basically 6 modules in one - LFO, Divider, Sample & Hold, Noise with Filter, Slew limiter, Decay envelope.   These functions can be used together or separately, in any way you wish. This patch uses the LFO for modulation, the decay generator as an envelope, while the divider boosts resonance every-other note.

Q106 Oscillator   Q157 SH++   Q107 Filter   Q148 VCA++

Keyboard
Gate

Pitch
Voltage

Audio
Out

4-Descending Step Sequence

In this patch, the LFO triggers the Sample & Hold section, while every 4th pulse triggers a new decay cycle that gets sampled. The result is a pitch voltage with 4 descending voltages. Set the Divider jumper to /4 (the 2nd position on the jumper block). Set the mode to Decay and adjust the speed of it and the LFO for the desired effect.

Q157 SH++   Q106 Oscillator
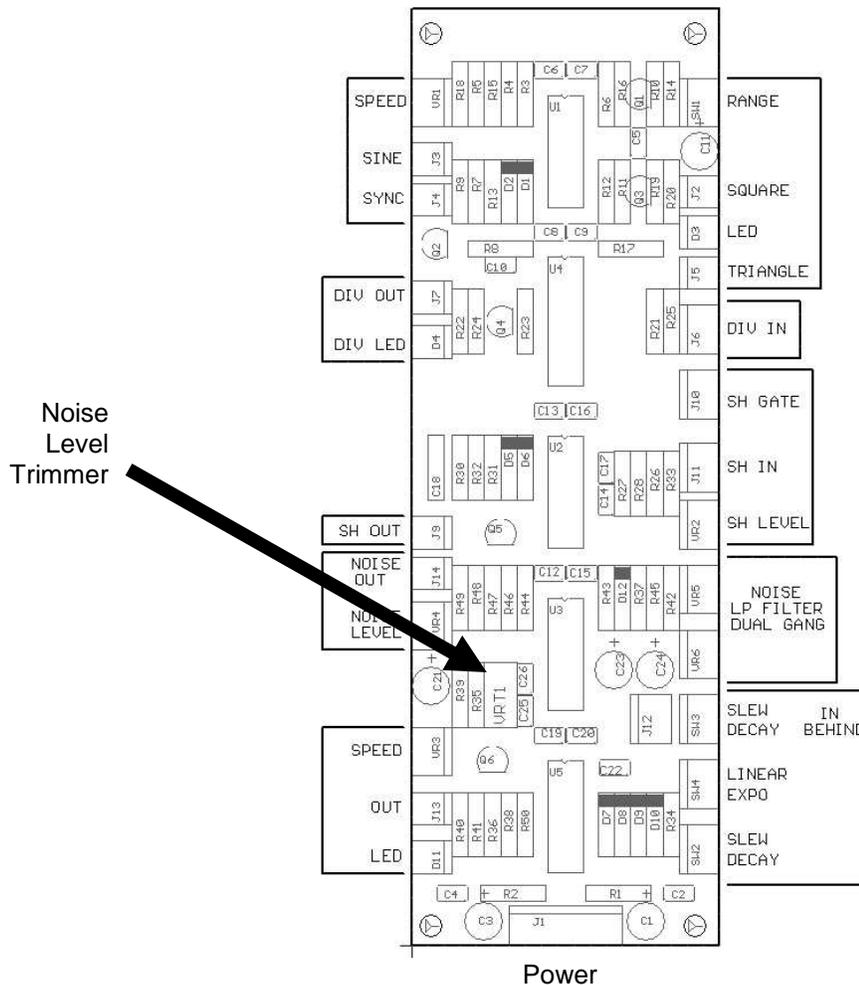
Audio
Out

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Calibration

There is one trimmer on the Q157 circuit board. This trimmer adjusts amplitude of the noise output.

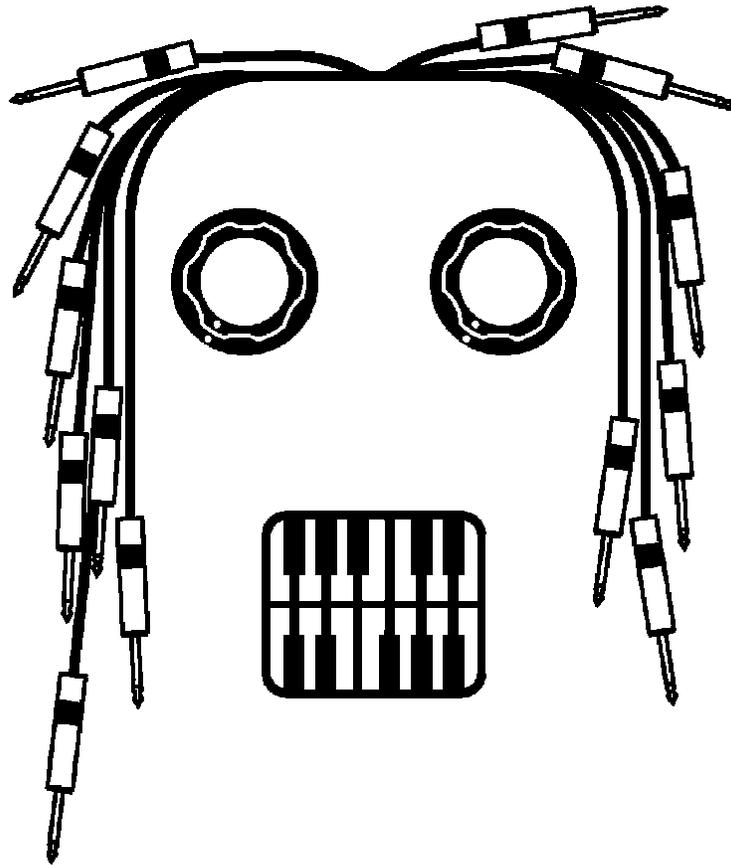Measure or view the noise output on an oscilloscope.
Turn the filter knob full clockwise.
Adjust the trimmer for 10V peak-to-peak signal.

Noise
Level
Trimmer

Power

Obligatory
Blank
Page

Patcher Jack