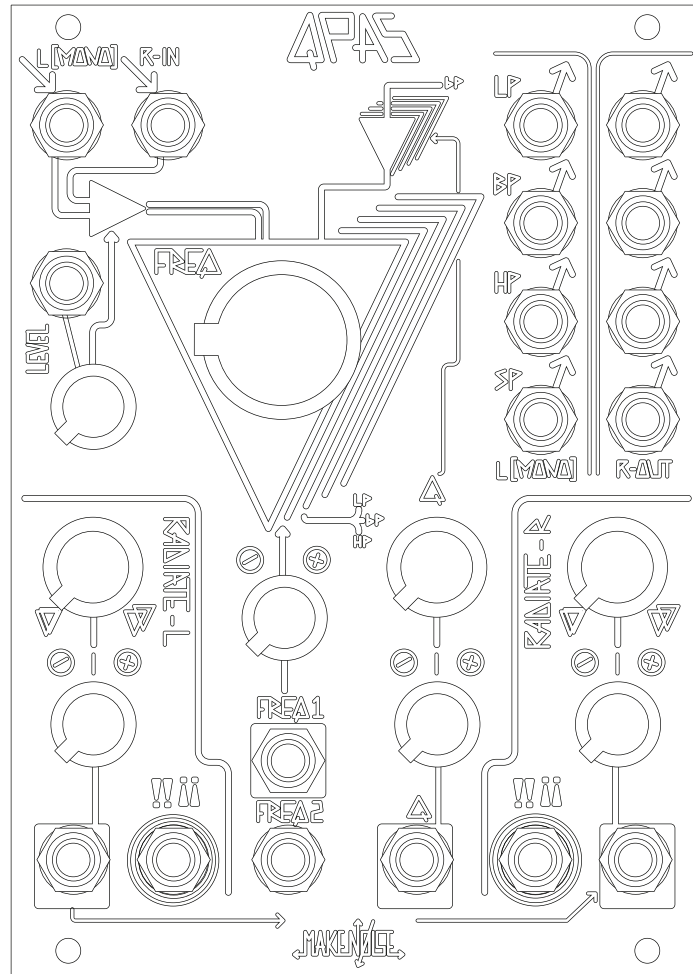


# 4PAS



# MAKE NOISE

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# LIMITED WARRANTY

Make Noise warrants this product to be free of defects in materials or construction for a period of one year from the date of purchase (proof of purchase/invoice required).

Malfunction resulting from wrong power supply voltages, backwards or reversed eurorack bus board cable connection, abuse of the product, removing knobs, changing faceplates, or any other causes determined by Make Noise to be the fault of the user are not covered by this warranty, and normal service rates will apply.

During the warranty period, any defective products will be repaired or replaced, at the option of Make Noise, on a return-to-Make Noise basis with the customer paying the transit cost to Make Noise.

Make Noise implies and accepts no responsibility for harm to person or apparatus caused through operation of this product.

Please contact [technical@makenoisemusic.com](mailto:technical@makenoisemusic.com) with any questions, Return To Manufacturer Authorization, or any needs & comments.

<http://www.makenoisemusic.com>



About This Manual:

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Illustration and layout by Lewis Dahm

QPAS hardware design by Tony Rolando

Special thanks to the beta testers!



# INSTALLATION

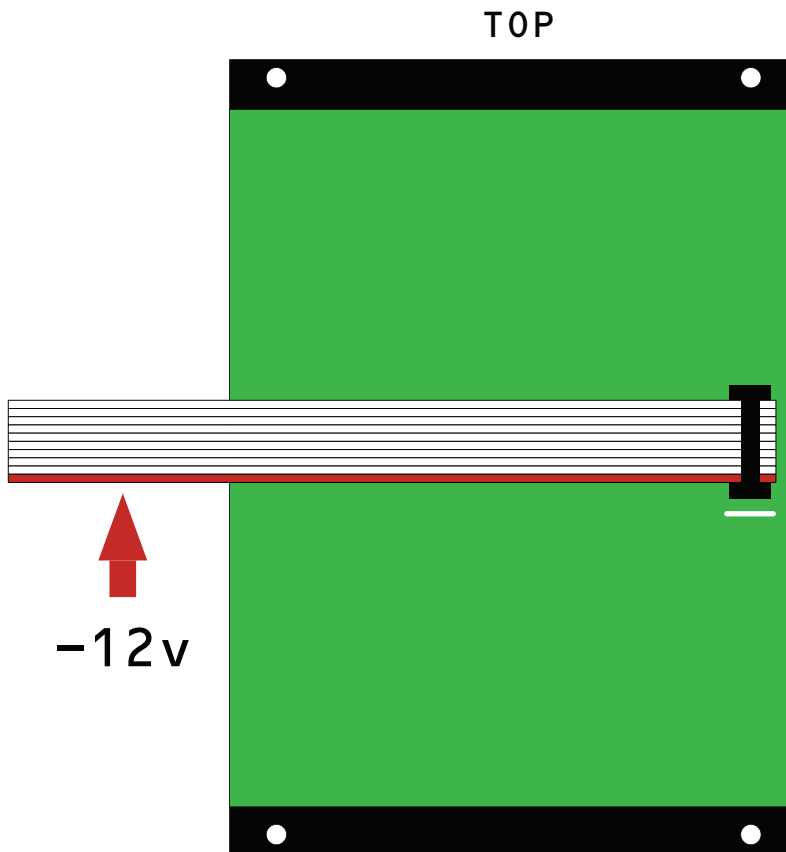
## Electrocution hazard!

Always turn the Eurorack case off and unplug the power cord before plugging or unplugging any Eurorack bus board connection cable. Do not touch any electrical terminals when attaching any Eurorack bus board cable.

The Make Noise QPAS is an electronic music module requiring 166mA of +12VDC and 190mA of -12VDC regulated voltage and a properly formatted distribution receptacle to operate. It must be properly installed into a Eurorack format modular synthesizer system case.

Go to <http://www.makenoisemusic.com/> for examples of Eurorack Systems and Cases.

To install, find 18HP in your Eurorack synthesizer case, confirm proper installation of Eurorack bus board connector cable on backside of module (see picture below), plug the bus board connector cable into the Eurorack style bus board, minding the polarity so that the RED stripe on the cable is oriented to the NEGATIVE 12 Volt line on both the module and the bus board. On the Make Noise 6U or 3U Busboard, the negative 12 Volt line is indicated by the white stripe.



Please refer to your case manufacturer's specification for location of the negative supply.



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# INTRODUCTION

The Quad Peak Animation System (QPAS) is a stereo multimode filter module, utilizing four filter cores for dynamic animation of resonant peaks. Stereo pairs for Low Pass, High Pass, Band Pass, and a new filter type called “Smile Pass”, are all available simultaneously. Each stereo pair consists of two outputs, each of which consists of two peaks. The four peaks share a single cutoff parameter, as well as a single Q (“resonance”) parameter.

Two Radiate controls, one for each pair of cores, further modulate the various cutoff peaks’ distance from each other and from the “main” cutoff frequency, providing animation and increasing the depth of the sound. There is also an exponential VCA on the input, with a combo pot.

The !!j inputs are clock, gate or audio rate modulation inputs that reward experimentation, affecting nearly all parts of the circuit. Each !!j input affects two of the peaks, one per pair.

All continuous controls on the QPAS are paired with control voltage inputs for full integration into a modular synthesizer.

The QPAS also features several jack normalizations to ease patching and increase flexibility:

The inputs are normalized to work as mono or stereo. For example, patching only to the left input sends the same signal to all four cores and thus makes stereo outputs available from a mono input. The outputs (with the exception of Smile Pass) are similarly normalised: patching out of only the Left output will put all four peaks in the Left output, and patching out of the Right output splits the four peaks into two pairs. When combined with the input normalizations, this makes either mono or stereo outputs available from either mono or stereo inputs, maximizing I/O flexibility within your modular synthesizer.

The Radiate controls’ CV inputs are normalised together for easy chained modulation in the same or opposite directions using the attenuvertors.

The QPAS is a 100% analog filter for musical applications and is not suitable for laboratory use.



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# FILTER BASICS

There are many different types of filters. The most commonly used filters in synthesizers are Low Pass, High Pass and Band Pass.

In musical terms, a filter removes harmonic content from the signal making it sound different. A Low Pass filter lets frequencies below the cut-off frequency pass through while all others are weakened by attenuation. The result is a duller sound as the cut-off frequency is lowered, and brighter as the cut-off frequency is raised. A High-Pass filter lets frequencies higher than the cut-off frequency pass through while all others are weakened. This results in the sound becoming thinner as the Cut-Off Frequency is increased, and fuller as the Cut-off is lowered. A Band-Pass filter lets frequencies near the Cut-Off frequency pass through (both above and below), while all others are weakened. This results in the sound occupying only a particular narrow part of the frequency spectrum.

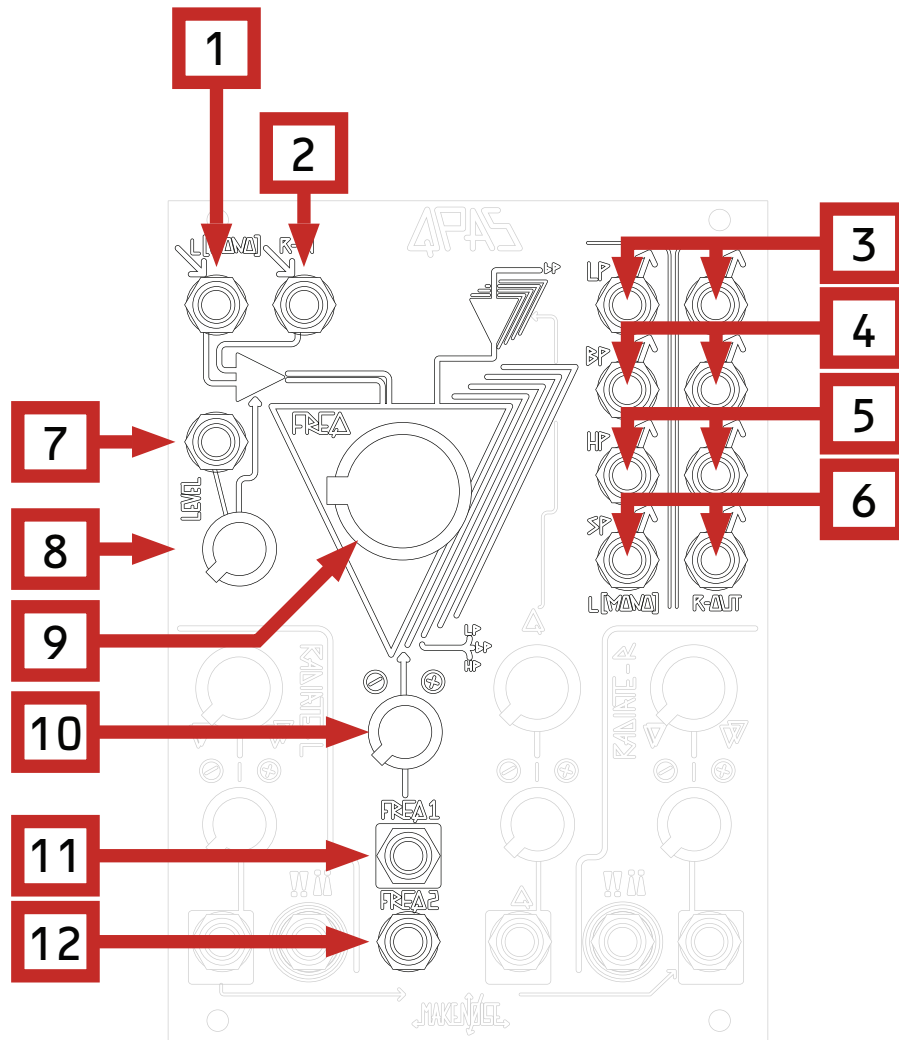
Although these changes start to occur at the cut-off frequency, it is not a severe operation! There is a transition from amplification to complete attenuation of the frequency beyond the cut-off point. This transition is called a "Slope." The Slope represents the steepness of the frequency response curve at the filter's cut-off frequency. In the case of filters for musical synthesis applications, slopes of 12 and 24db/Octave are most common. The QPAS filters have a Slope of 12db/Octave.

In synthesizer filters there is typically a feedback path that allows the Q-Factor of the circuit to be adjusted. Increasing the gain of this feedback path results in ringing oscillations at the cut-off frequency known as Resonance. Resonance is what makes a synthesizer filter growl!

The QPAS has Low-Pass, High-Pass, and Band-Pass filter circuits. There is also an additional filter type, nicknamed Smile Pass. The Smile Pass topology changes depending on the cutoff frequency, resulting in relatively constant output amplitude regardless of cutoff (unlike the Low-Pass and High-Pass, which let relatively little through at one extreme and which let nearly everything through at the other).



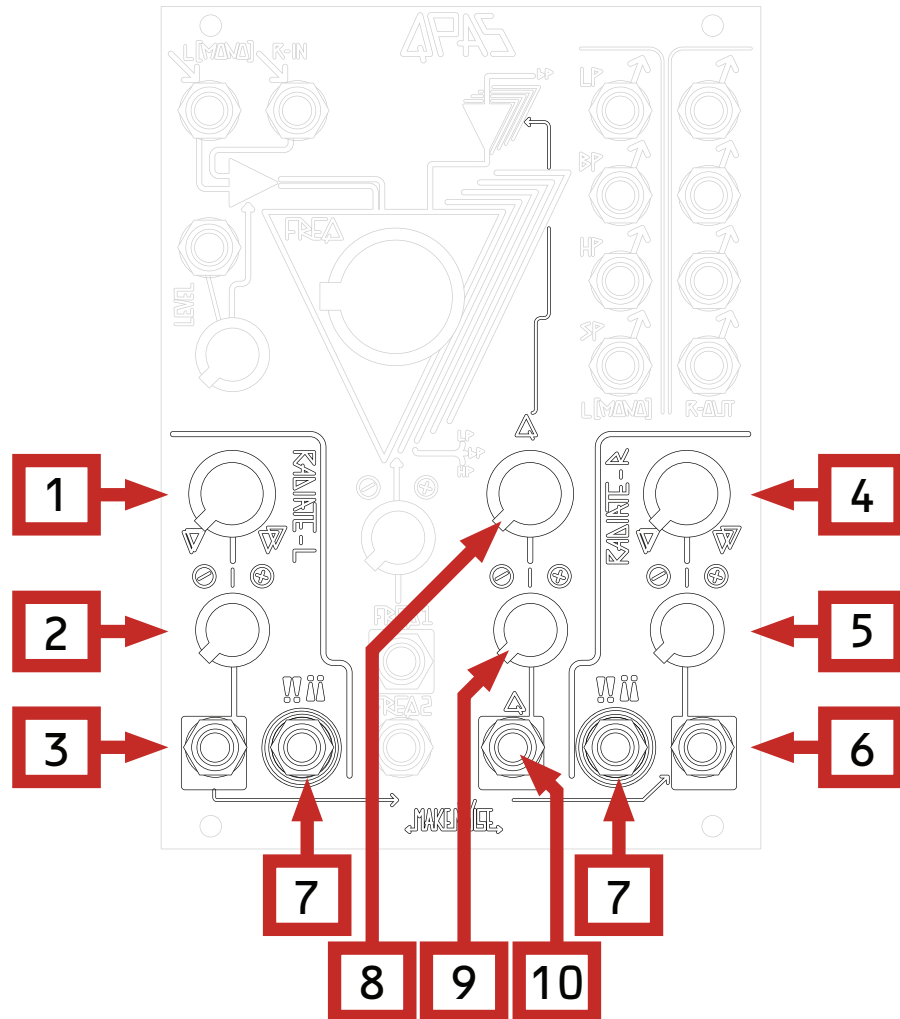
# PANEL CONTROLS



1. **L(Mono) Input:** Signal to be filtered by Left cores of QPAS. Modular level audio.
2. **R Input:** Signal to be filtered by Right cores of QPAS. Modular level audio. Normalled to L(Mono) Input.
3. **LP Outputs:** Left and Right Low Pass Filter Outputs. Right LP Output normalled to LP Left Output.
4. **BP Outputs:** Left and Right Band Pass Filter Outputs. Right BP Output normalled to BP Left Output.
5. **HP Outputs:** Left and Right High Pass Filter Outputs. Right HP Output normalled to HP Left Output.
6. **SP Outputs:** Left and Right Smile Pass Filter Outputs. **Note: SP Outputs are Stereo Only.**
7. **Level CV Input:** CV for Level control (internal VCA).
8. **Level Combo Pot:** Controls level of incoming signal to be filtered. Acts as attenuator for Level CV Input when patched.
9. **Frequency Panel Control:** Sets cutoff frequency of all four filter cores.
10. **Frequency CV Input Attenuverter:** Sets depth and polarity of modulation at FREQ1 CV Input.
11. **FREQ1 CV Input:** CV Input for Frequency.
12. **FREQ2 CV Input:** CV Input for Frequency (un-attenuated).



# PANEL CONTROLS



1. **Radiate-L Panel Control:** Sets value of Radiate for Left Cores.
2. **Radiate-L CV Input Attenuverter:** Sets depth and polarity of modulation at Radiate-L Input.
3. **Radiate-L CV Input:** CV Input for Radiate-L.
4. **Radiate-R Panel Control:** Sets value of Radiate for Right Cores.
5. **Radiate-R CV Input Attenuverter:** Sets depth and polarity of modulation at Radiate-L Input.
6. **Radiate-R CV Input:** CV Input for Radiate-R. Normalled to Radiate-L CV Input.
7. **!!! Inputs:** Gate or Audio Inputs for modulating many parts of the circuit.
8. **Q Panel Control:** Sets Resonance/Peak level for all four filter cores.
9. **Q CV Input Attenuverter:** Sets depth and polarity of modulation at Q CV input.
10. **Q CV Input:** CV Input for Q.



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# UNDERSTANDING THE QPAS

## FREQ and RADIATE

The QPAS uses a single cutoff frequency control (FREQ) for all four of the filter peaks for all four of the filter types. This control sets the base cutoff frequency for all peaks. However, each peak's cutoff frequency is further affected by the Radiate controls. Each Radiate control spreads two of the four peaks relative to the setting of FREQ. Because each pair of peaks is routed to a different side of the stereo output for each filter type, the two Radiate controls are named Radiate-L and Radiate-R, and modulation of both creates stereo animation for any signal. The Radiate controls have independent CV inputs and attenuverters, but for ease of related modulation the Left Radiate CV input is normalled to the Right Radiate CV input.

This means that patching a modulation source only to the Left Radiate CV input results in modulation of both Radiate controls, with modulation depth and direction set by the respective attenuverters. Setting both panel controls and attenuverters to the same settings will result in both pairs being modulated in the same fashion. Inverting the modulation on one of the attenuverters will have a different but still related result.

## Q

The QPAS uses a single Q control for all four of the filter peaks for all four of the filter types. This control feeds the Band Pass outputs back into the filters' inputs, setting the "height" of the four peaks, in other words the amplitude of those frequencies near their cutoff frequencies. At lower settings the peaks will tend to be "rounded" rather than "sharp", and manipulating the other controls of the QPAS will result in subtle sound sculpting. (Unlike most filter resonance circuits, the QPAS' achieves "zero" resonance around 9:00, while the most counterclockwise settings will provide "negative resonance." where the filter peaks are attenuated rather than accentuated.) At higher settings, the peaks will become more apparent, and modulation of the Radiate parameters more audible and dramatic. The highest settings can increase intensity significantly, especially when the cutoff frequencies approach frequencies that are already strong in the input signals. As somebody once said: "Pump up the resonance for a more pronounced sound."

## The Smile Pass Outputs

The Smile Pass outputs have an unusual filter response in which the filters change topology depending on the cutoff frequencies. Smile Pass is designed to create output signals of relatively equal amplitude regardless of cutoff frequency. It is especially useful for more subtle filtering effects.

*Note: To avoid phase cancellation in this complex filter type, the stereo outputs are not normalled for mono use.*

## Level

The QPAS signal inputs share a Level control with CV input and combo pot. This section functions as a VCA for the inputs, and in many cases could be used instead of a dedicated VCA module. Unlike the traditional post filter VCA (VCF->VCA), this VCA is PreFilter (VCA->VCF). This allows the QPAS character to be more accentuated, as it is not being attenuated by a VCA. However, it is still possible to achieve discrete notes when feeding a non-dynamic signal (such as the output of a VCO) into the QPAS. The VCA's response is Exponential, meaning that typical exponential enveloping can be created with linear functions patched the VCA. Driving it with an exponential function (from MATHS, for example) will result in a hyper-exponential response: very short, snappy VCA action!

The LEVEL control can also be used to adjust input drive. With higher Q settings, lower input levels will result in resonance that can be more powerful than the input level. The LEVEL control can be used to set this balance.



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**!!jj**

The !!jj inputs provide an additional modulation destination. They respond to nearly any clock, gate or audio rate signal and have an effect on most elements of the QPAS circuit. They may be used to occasionally excite and accent, or to continuously increase harmonics amongst other things.

### **Pinging**

The QPAS is “pingable”, meaning that patching a trigger to an input with higher Q setting will result in the filters momentarily opening at their cutoff frequencies with a pleasant decay. While sending a series of triggers to the input(s), try sequencing FREQ for a pseudo-melodic sequence. Modulating FREQ with an audio rate signal such as a VCO sine wave will result in sounds reminiscent of classic low-pass gate pings. The QPAS is Direct Coupled.

## **STEREO AND MONO USE**

The QPAS is set up for easy patching of Mono-to-Mono, Mono-to-Stereo, Stereo-to-Mono, or Stereo-to-Stereo.

For Mono to Mono, simply use the Left Input, and the Left Output of your selected filter type. The input will be passed through all four filter cores, and the Left output will contain the mix of all four peaks. (Note: the Smile Pass outputs cannot be used for this patch.)

For Mono to Stereo, use the Left Input, and both Left and Right Outputs of any filter type. The mono signal will be passed through all four filter cores, and two peaks will appear in each of the outputs. (The Radiate controls each control only one output per stereo pair.)

For Stereo to Mono, patch the left and right sides of a stereo signal to the Left and Right Inputs, but take only the Left Output of your selected filter type. Both sides of the Stereo signal will be present in the mono mix of all four cores. (Note: the Smile Pass outputs cannot be used for this patch.)

For Stereo to Stereo, patch the left and right sides of a stereo signal to the Left and Right Inputs, and take both outputs from your selected filter type. (The Radiate controls each control only one output per stereo pair.) This patch can also be used for Dual Mono, where each side of the QPAS filters a different signal.

*Note: If doing parallel processing such as mixing your VCO's Sine wave back in with the QPAS output, it is recommended to either do it pre-QPAS (allowing access to the internal VCA) or if mixing it post-QPAS then do so with an inverting mixer to avoid phase cancellations.*



# PATCH IDEAS

## Pings

Trigger stream -> QPAS input(s)

Set Q to 11:00 or higher. FREQ controls pings' pitch, Q controls decay. RADIATE controls each control two peaks' pitch. Set RADIATE controls full counterclockwise for a simpler sound.

*Optional: patch a sine wave to FREQ1 CV Input for FM plucks. Attenuate heavily to start.*

## Feedback Distortion

VCO -> Left input  
 LP (L) out -> Monitor  
 LP (R) out (DUMMY CABLE)  
 BP or HP Right out -> Freq 1 Input (patch VCA in series if you prefer)

Freq 1 input attenuator and Radiate-R give you fine control over some potentially really nasty overdrive. Set amount with Q control, from "liquid metal" to "decayed rust." This patch works to overdrive filter pings as well if you patch trigger stream to the input.

## Spectral Crossfader

Build a 2-voice sequence with René, DPO, and if you want, Optomix. Or use any 2 sound sources.

Voice 1 -> QPAS Left  
 Voice 2 -> QPAS Right  
 QPAS LP (L) -> Mixer Ch1  
 QPAS LP (R) (DUMMY CABLE)  
 QPAS HP (R) -> Mixer Ch2  
 Mixer output -> Monitor

The FREQ control will function as a crossfader in addition to filtering the sources.

## Transient Resonator

Use a Morphagene Reel with many transients, or significant dynamic variation.

Morphagene Outputs -> QPAS Inputs  
 MG CV Out -> QPAS Q CV In  
 HP (L) -> Monitor  
 Adjust Q to 11:00, attenuator full clockwise.  
 Set FREQ below 12:00

QPAS will create resonant tails for each transient.

