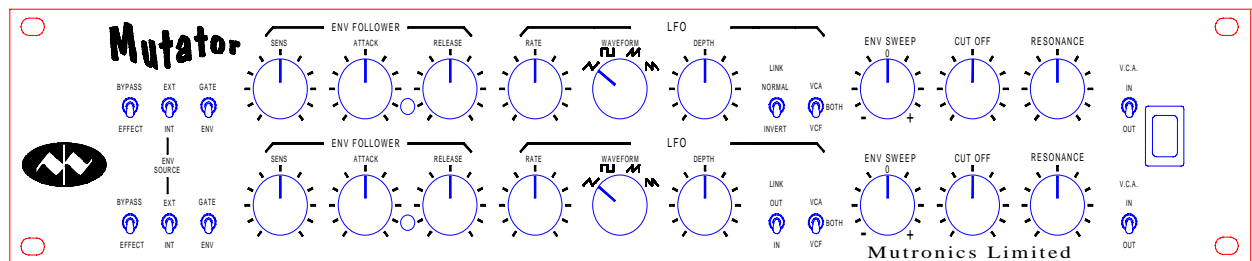


Mutator

MANUAL



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Foreword

After more years than I would care to mention of being a recording engineer, I have come to a definite conclusion. True stereo filtering seems to alter spatial perceptions in a bizarre and unexpected way. I first came to this conclusion many years ago whilst slaving away on reggae sessions trying to create the ultimate dub. After hours of total self gratification - fiddling with the EQ sweeps of my mixing desk, I sheepishly turned round to see whether the band had lost the will to live or at the very least abandoned all hope of leaving the studio with a finished master. To my utter astonishment and ego enhancement I was presented with several pairs of feet pointing towards the heavens with quivering smiles of ecstasy plastered across their lips. It wasn't their music any more - it had turned into something strange and indescribable - but somehow it didn't seem to matter.

Several years later I was re-creating this effect on the majority of my sessions and was beginning to feel slightly miffed at the dull, nagging ache I was developing in my back from bending over the desk like a bloody contortionist to get to all those darned EQ pots.

"Hark!!" I thought to myself "What if all these knobs were in one unit - what if all these wonderful sounds could be produced from one box - what if Pamela Anderson really was my girlfriend - what if one piece of outboard could produce stereo filtering, Frequency dependent panning, gating, LFO blah blah blah blah"

The Mutator was born.

Overview of the Mutator

The Mutator is a stereo analogue filter and envelope follower with full control facilities.

It contains two independent voltage controlled filters, similar to those found in analogue synthesisers, which can be used to treat any external sound source. Each filter can be controlled from its own associated low frequency oscillator (L.F.O) and/or its own envelope follower section, which extracts the envelope contour of an input signal and applies it to control the cut-off frequency of the filter.

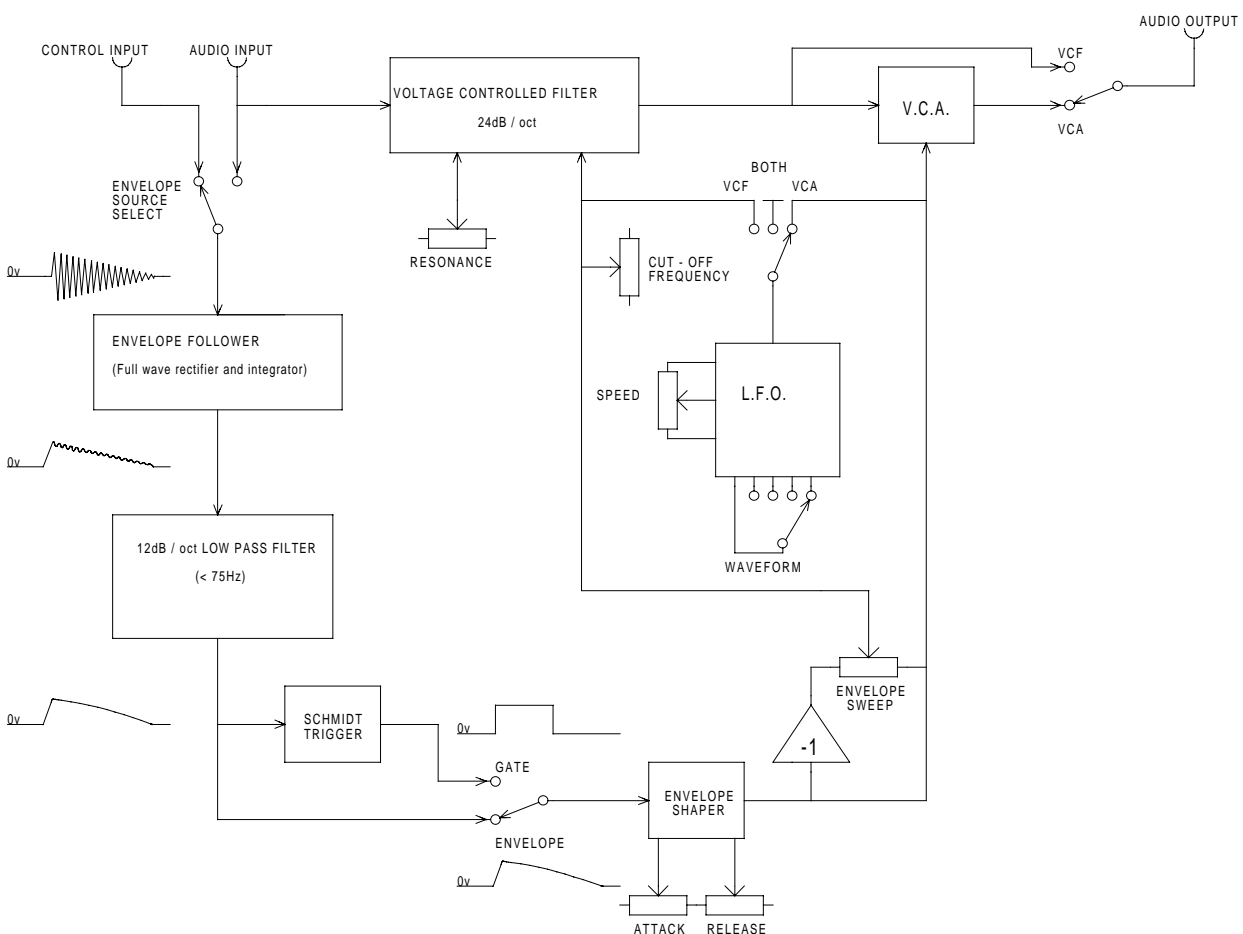
Each envelope follower can be switched to track either the envelope of the sound that is being treated by the filter, or that of an independent external control signal. This external control signal can be any audio source, eg. a drum sound, a guitar, a synth., a sampler output, or even a microphone. Thus the envelope characteristics of one sound can be superimposed onto the filtering contour of another.

Another switch on the envelope follower selects envelope follow mode or gate mode - in which the circuit detects whether a signal is above a certain threshold level before switching on.

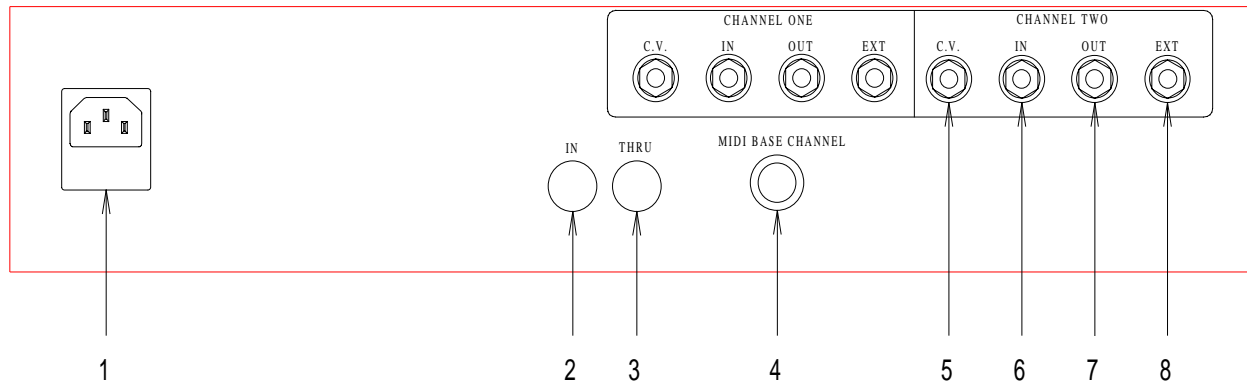
In gate mode, the device can operate much like a dedicated noise gate unit, with the added capabilities of the analogue filters.

The L.F.O.'s have four different sweep waveforms each and may be switched via a stereo link to produce stereo panning effects.

Block Diagram



Connections to the Mutator



1. Mains in 240V 50Hz A.C.

2. MIDI IN

3. MIDI THRU

4. MIDI BASE CHANNEL (If base channel 1 is selected then the Mutator [left channel] will respond to midi channel 1 and the Mutator [right channel] will respond to midi channel 2. If channel 2 is selected the Mutator will respond to midi channels 2 & 3 etc. Selecting channel 16 will cause the Mutator [left channel] to respond to midi channel 16 and the Mutator [right channel] to respond to midi channel 1.)

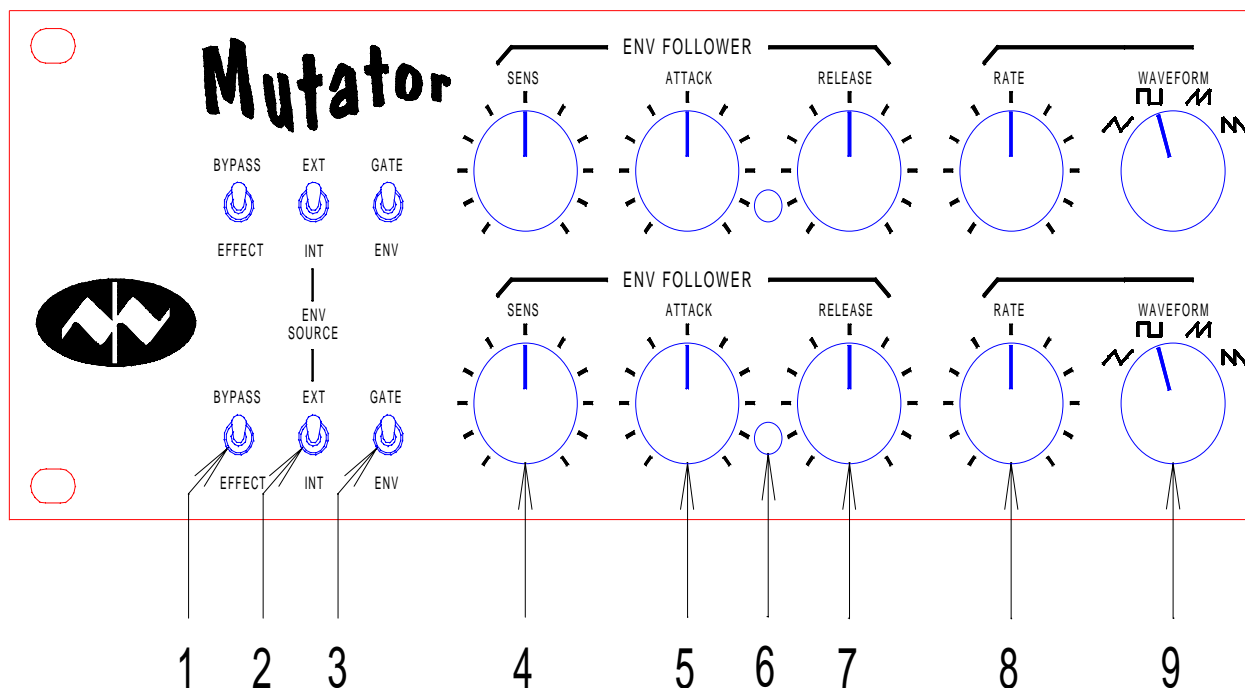
5. C.V. (Control Voltage) input. For use with an external MIDI to C.V. converter. CH1 C.V. input is normalised* to CH2 C.V. input unless a jack is plugged into CH2 C.V. input.

6. Audio inputs. CH1 input is normalised to CH2 input unless a jack is plugged into CH2 input. This enables MONO IN \Rightarrow STEREO OUT operation of the unit by plugging a MONO source into CH1 input only.

7. Audio outputs.

8. EXTERNAL control signal input. Selected when the EXT. position of the envelope source switch on the front panel is chosen. CH1 external input is normalised to CH2 external input unless a jack is plugged into CH2. external input.

*In the above instances the term "NORMALISED" means that when a jack plug is plugged into channel 1 input only, the signal is also fed to channel 2 input. This connection is broken if another jack plug is inserted into channel 2 input, in which case both channels operate independently.



Front Panel Functions

The front panel controls for the Mutator are identical for both channels, with the exception of switch 11 which is detailed below.

1. Main EFFECT/BYPASS switch. When in bypass mode audio in is connected directly to audio out.

2. ENVELOPE SOURCE switch. Selects which signal drives the envelope follower circuit. In INT. position the sound being treated is used as the control signal for the envelope follower. In EXT. position the external control input becomes the envelope follower control signal.

3. ENV/GATE switch. In ENV mode the envelope follower acts as its name implies, precisely following the amplitude of the control signal and producing a rapidly varying control signal which can be used to sweep the Cut-Off frequency of the Filter and/or volume level of the VCA. In GATE mode the envelope follower is either full on or completely off, depending on whether a controlling signal is above or below the gate threshold as set by the sensitivity control.

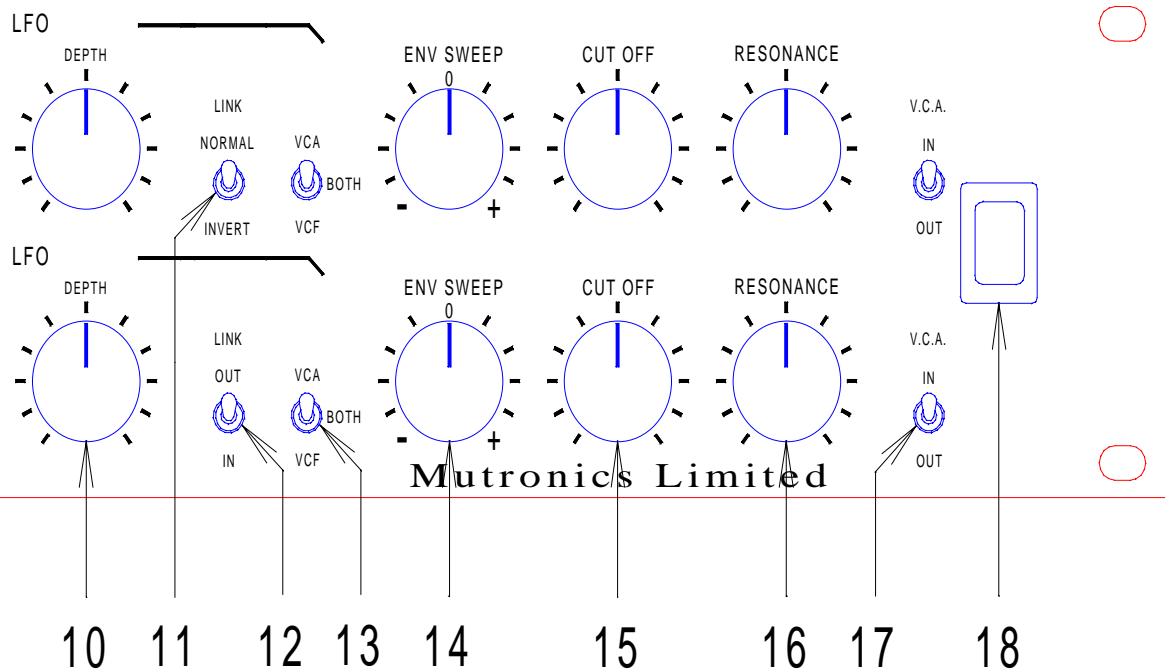
When MIDI is implemented this switch also routes MIDI note on/off information to either gate or LFO re-trigger. (see page 12)

4. SENSITIVITY control. In ENV mode this sets the optimum drive level for the envelope follower circuit. Too low and the LED (6) only glows faintly, too high and the LED is driven hard on. The optimum setting is when the LED peaks in brightness at the loudest points of the control signal. In GATE mode the sensitivity control sets the threshold level at which the gate operates.

5. ATTACK control. This adds an attack time (fade-in) at the front of the envelope. When set to zero (fully anti-clockwise) it has no effect on the envelope contour - fully clockwise it gives up to 2 seconds of fade-in.

6. Envelope LED. The brightness of this follows the envelope contour produced by the envelope follower. It is useful for setting the sensitivity control and visually displays the effects of changing the ATTACK and RELEASE controls.

7. RELEASE control. This adds a variable release “tail” to the envelope. Even after the control input signal has died away up to 5 seconds of fade-out may be added by this control. Setting this control to small amounts can be useful for smoothing out rapidly changing envelopes when in ENV mode.



8. RATE control (of LFO). This changes the sweep rate of the low frequency oscillator, from about one cycle every ten seconds to 100 cycles per second. Note that when the LINK switch (12) is on only the rate control of Channel 1 has any effect as it is being used to control both channels (LFO 2 is switched out when LINK is in).

9. WAVEFORM control. Selects between the four available low frequency oscillator waveforms - Triangle, Square, Ramp up and Ramp down.

10.LFO DEPTH control. Determines the amount of LFO sweep sent to the filter and/or voltage controlled amplifier.

11.LINK NORMAL/INVERT switch. LFO 1 can be sent to channel 2 (via switch 12) for stereo panning/cross-modulation effects. The Normal/Invert switch inverts the output of LFO 1 that is being sent to channel 2. This is particularly useful for stereo effects.

12.LINK IN/OUT switch. When in, LFO 1 is sent to both channels (for stereo effects), when out, LFO 1 affects channel one, and LFO 2 affects channel two.

13.VCA/BOTH/VCF switch. Selects whether the output of the LFO sweeps the voltage-controlled amplifier, the Voltage-controlled filter, or both simultaneously.

14.ENVELOPE SWEEP control. Determines the amount of filter frequency sweep (up or down) being sent to the voltage controlled filter from the envelope follower.

15.CUT-OFF Frequency control. This sets the centre roll-off frequency of the voltage-controlled filter.

16.RESONANCE. Sets the Resonance (or Q) of the VCF. High values produce self-oscillation.

17.VCA IN/OUT switch. Selects whether the final output goes through the voltage-controlled amplifier or is taken from the VCF output

18.Mains power on/off switch.

Operation of the Mutator




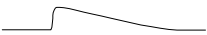






Envelope Follower.

The envelope follower can track either the envelope of the signal being treated (**INT** position on **ENV. SOURCE** switch) or a separate control signal (**EXT** position on switch.)

If the mode switch is in **ENV** position (and **ATTACK** and **RELEASE** set to zero), turning up the **SENS.** control will cause the **LED** to light when a signal is present - its brightness following the loudness of the signal.

Setting Sensitivity Control.

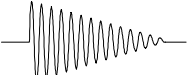

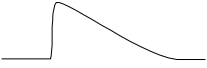
For optimum performance, set the **SENS.** control so that the **LED** reaches maximum brightness when the signal appears loudest. You may have to back the dial off slightly anti- clockwise as driving the circuit too hard will cause the **LED** to stay on maximum brightness even if the signal strength isn't quite at maximum.

Input Signal	SENS. Control	LED	Output of ENV. Follower
	Too Low	  Faint	
	Optimum	 	
	Too High	  Always Bright	

Gate Mode.

If the mode switch is now flicked to the **GATE** position, the **LED** will come on at maximum brightness when a signal is present and be completely off when the signal falls low. (This is also a quick way of seeing what maximum **LED** brightness looks like.)

Thus the output of the envelope follower will look like the diagrams below depending on the switch position -

Input Signal	Mode	Output of ENV. Follower
	GATE	
	ENV	

In **GATE** mode, increasing the **ATTACK** and/or **RELEASE** controls will change the shape of the output as shown below

Zero **ATTACK** and Zero **RELEASE**



Some **ATTACK** and Zero **RELEASE**



Large **ATTACK** and Zero **RELEASE**



Some **ATTACK** and Some **RELEASE**



Zero **ATTACK** and Large **RELEASE**



As you can see, a versatile range of envelope shapes may be constructed from the original gate shape.

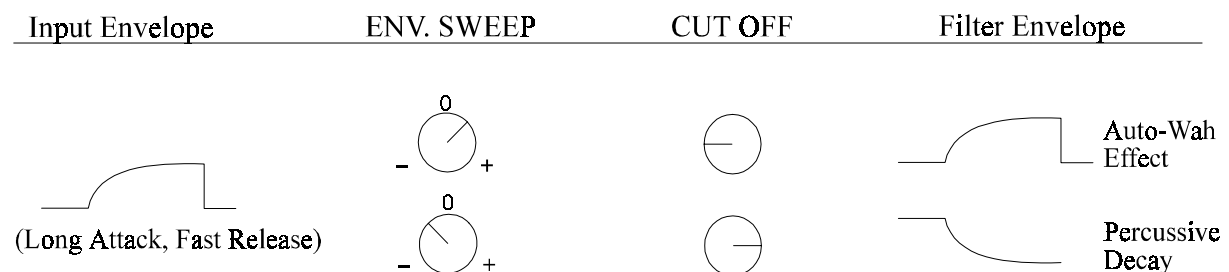
Envelope Mode

In **ENV.** mode, the **ATTACK** and **RELEASE** controls work as described above, but super-impose their contours on top of the original envelope shape of the signal. This can be very useful for smoothing out fast "wobblers" from a complex envelope!

Filter Sweep.

The output of the envelope follower section is sent to its voltage controlled filter via the envelope sweep control in the filter section. This control has a centre zero (at 12 O'Clock) with both positive and negative sweep amounts available. Thus the arriving envelope contour can sweep the filter cut-off frequency up or down from its original setting.

The same incoming envelope could produce entirely different effects on the sound depending on the settings of the **ENV. SWEEP** and **CUT-OFF** controls, eg.:



If the **ENV. SWEEP** control is set to zero, the filter cut-off frequency will be manually changed by the **CUT-OFF** control.

The **RESONANCE** control allows a variable resonant peak to be added to the filter response, similar to that produced by an analogue synthesiser filter. At low settings the sound will appear fatter with subtle treble roll-off, much like a tone control. At higher settings a noticeable "twang" will be heard as the filter is swept, and at the highest settings the filter will begin to self-oscillate at its cut-off frequency.

VCA IN/OUT Switch.

After the filter stage there is a voltage controlled amplifier (VCA) which, when switched in, controls the final output volume of that channel.

The VCA is driven by the output of the envelope follower with the same envelope that is fed to the **ENV. Sweep** control.

If an external source is selected for the envelope follower, and the gate mode is selected, and the VCA is switched in, the treated sound will be gated in and out by the external control signal.

The filter section can be effectively by-passed by turning its cut-off full up and its resonance to zero - (the VCF becomes “transparent”), and with the VCA switched in, the unit will function as a dedicated noise gate. If the cut-off and resonance are altered, filter sweep will combine with the gated effect.

The Low Frequency Oscillators (LFO).

There are two LFO's - LFO 1 refers to the LFO situated on channel 1, guess which one LFO 2 refers to !

The low frequency oscillators can automatically sweep the filter cut-off (and/or VCA volume).

Four waveforms are available - Triangle, Square, Ramp up and Ramp down.

Sweep speed is controlled by the **RATE** control and the sweep range is adjusted by the **DEPTH** control.

The LFO output may be sent to the VCF cut-off , the VCA level , or to both depending on the position of the **VCA / BOTH / VCF** switch.

LINK IN/OUT Switch.

For stereo effects, the **LINK** switch on channel 2 can select the output of LFO 1 instead of its own channel's LFO.

In this linked position, the **RATE** and **WAVEFORM** controls of LFO 2 no longer function, but its **DEPTH** control adjusts the amount of LFO 1 sweep now being sent to VCF 2.

LINK NORMAL/INVERT Switch.

This switch on LFO 1 selects whether an in-phase or antiphase (upside-down) version of the output of LFO 1 is sent to channel 2.

If it is set to **INVERT**, stereo filter sweeping will occur when VCF or BOTH is selected on the **VCA/BOTH/VCF** switch.

If **INVERT** is selected, but with the LFO destination switches on both channels set to **VCA** only, then normal volume autopanning will occur.

This can be particularly useful if the unit is being operated in the mono in ⇒ stereo out mode.

External C.V. in.

The CV sockets on the back panel allow a standard 1 volt per octave Control Voltage to adjust filter cut-off frequency. An external MIDI ⇒ CV box will allow sequencing of Mutator filter sweeps.

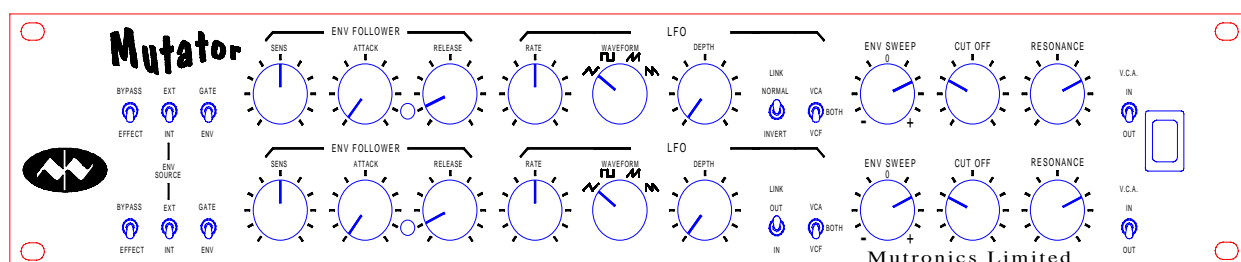
An alternative way of producing MIDI sequenced filter sweeps is to send a sound from a MIDI keyboard , module or sampler to the EXTERNAL control input(s) and then sequence the velocity or MIDI volume of this control signal. With the envelope source switch set to EXT (see example 2 below) changes in volume of the control signal will sweep the filter cut-off frequency.

Using the Mutator

Although device function has been described in considerable detail in the above sections, it may be informative if examples of the various ways that the machine can be used are given, with a guide to knob and switch settings - which can be used as a basis for experimentation.

Example 1. Using the Mutator to give a vintage analogue sound to an instrument.

An instrument such as a digital synth is plugged into the Mutator's audio in(s). This patch works best if the original sound has a percussively decaying envelope (like a piano). The Mutator adds a vintage analogue "twang" to the sound. No external control signal need be plugged in for this setting.

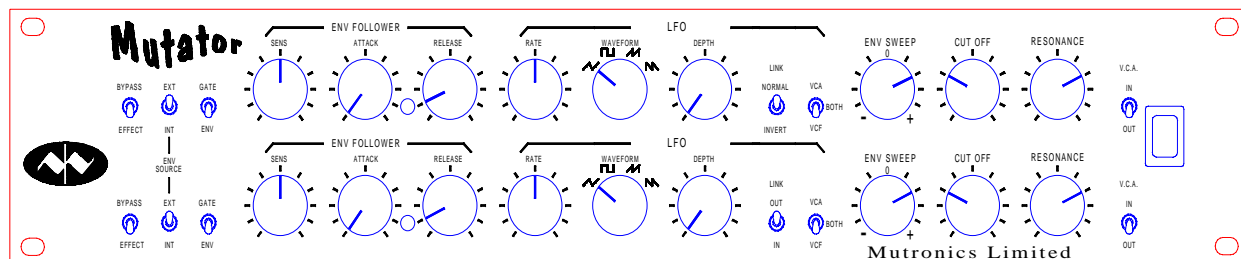


If mono in \Rightarrow stereo out mode is being used, and slightly different settings of sweep and cut-off are used per channel, stereo movement will be noticed on the output. This will also be affected by experimenting with different amounts of attack.

Example 2. Using a different external control sound to modulate the treated sound via the Mutator.

(The results of this depend on what is being used as the control source. Try many different sounds - i.e. drum loops, kick or hi-hats, bass guitar etc.)

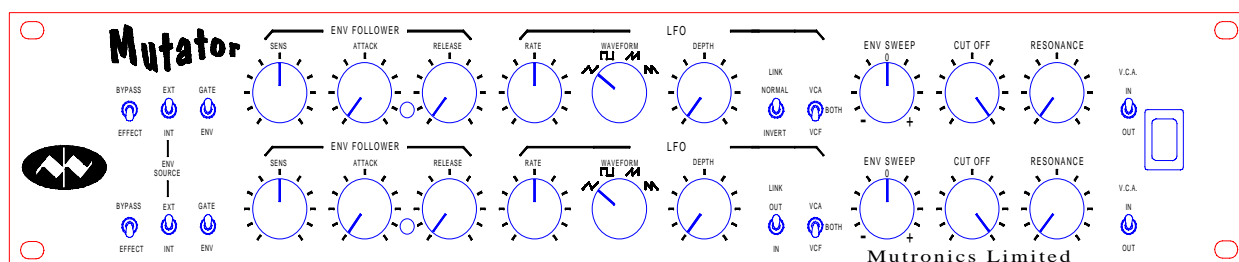
The control signal must be plugged into the EXTERNAL input socket(s) on the back panel.



Example 3. Using the Mutator to gate a sound from a control key.

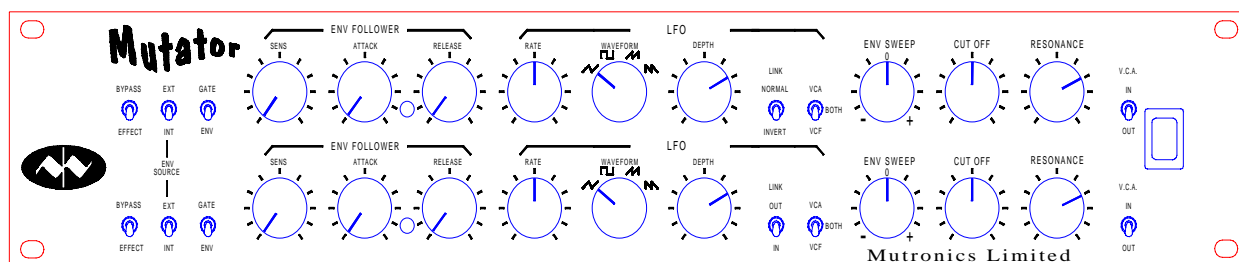
(Works well with pad sounds, strings, choirs, etc.). External control source should be a percussive pattern, eg. hi-hats or a drum loop, or even a tone from a spare sampler output (as is often used to produce gated pad effects from a noise gate unit).

Hint - if you do not have access to a sampler, but do have a keyboard or module that has two or more audio outputs, try assigning a simple tone patch (eg. a sine wave with minimum attack and release and maximum sustain on its envelope) to one audio output (eg. pan full left) and using this as the Mutator's control signal. The same keyboard could then produce a pad sound from another output (eg. pan full right) to be treated by the Mutator.



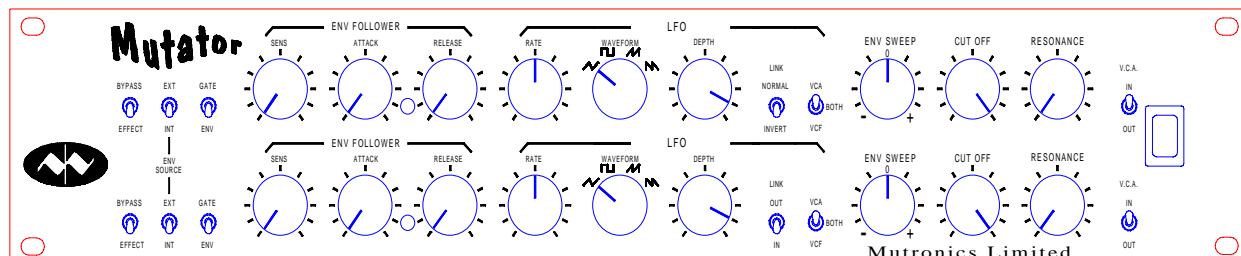
Example 4 Using the Mutator as a stereo panning filter.

This is an unusual effect which is unique to the Mutator. As the filter cut-off frequency of one channel rises that of the other channel falls. Thus the overall sound pans from side to side, but in a frequency dependent way. This effect is difficult to describe in words - just try it and experiment with different LFO 1 rates. It is particularly useful when a mono sound source is fed into audio in of channel 1 only so that it is converted into a stereo panning image.



Example 5. Using the Mutator as a volume auto-panner.

This effect is again useful when the device is being operated in the mono in \Rightarrow stereo out mode. The effected sound swings from side to side but its frequency content is unchanged. The width and position of the panning can be changed by adjusting LFO 1 and LFO 2 depth controls.



MIDI Option.

The Mutator is available with a built-in MIDI card or can be retro-fitted with this card if required.

This card works on two adjacent MIDI channels which are selected by the MIDI base channel rotary switch on the back panel. If base channel one is selected the Mutator will respond to MIDI channels 1 and 2, if channel 2 is selected it will respond to channels 2 and 3 etc. Selecting channel 16 will make the machine work on channels 16 and 1.

Gate on/off, Filter cut-off frequency, Resonance and VCA volume are all controllable over MIDI.

When the Mutator channel is switched into gate mode a MIDI note on command will trigger the gate function. The MIDI note value of the note played will control the cut-off frequency of the filter. As the manual cut-off frequency knob still has an effect it may be desirable to turn this fully anti-clockwise to zero so that the full sweep range of cut-off frequency is available over MIDI.

Pitch-bend will also affect the filter cut-off frequency and has been given an extended range so that a pitch-bend lever can sweep the entire frequency range of the filter.

Resonance has been assigned to MIDI controller 1 (the Modulation wheel on most MIDI keyboards).

Again, it may be best to set the manual resonance knob to zero when resonance is being programmed over MIDI.

VCA level is changed by MIDI controller 7 (the MIDI Volume controller). Thus it is possible to write volume gating patterns in the controller page of a sequencer.

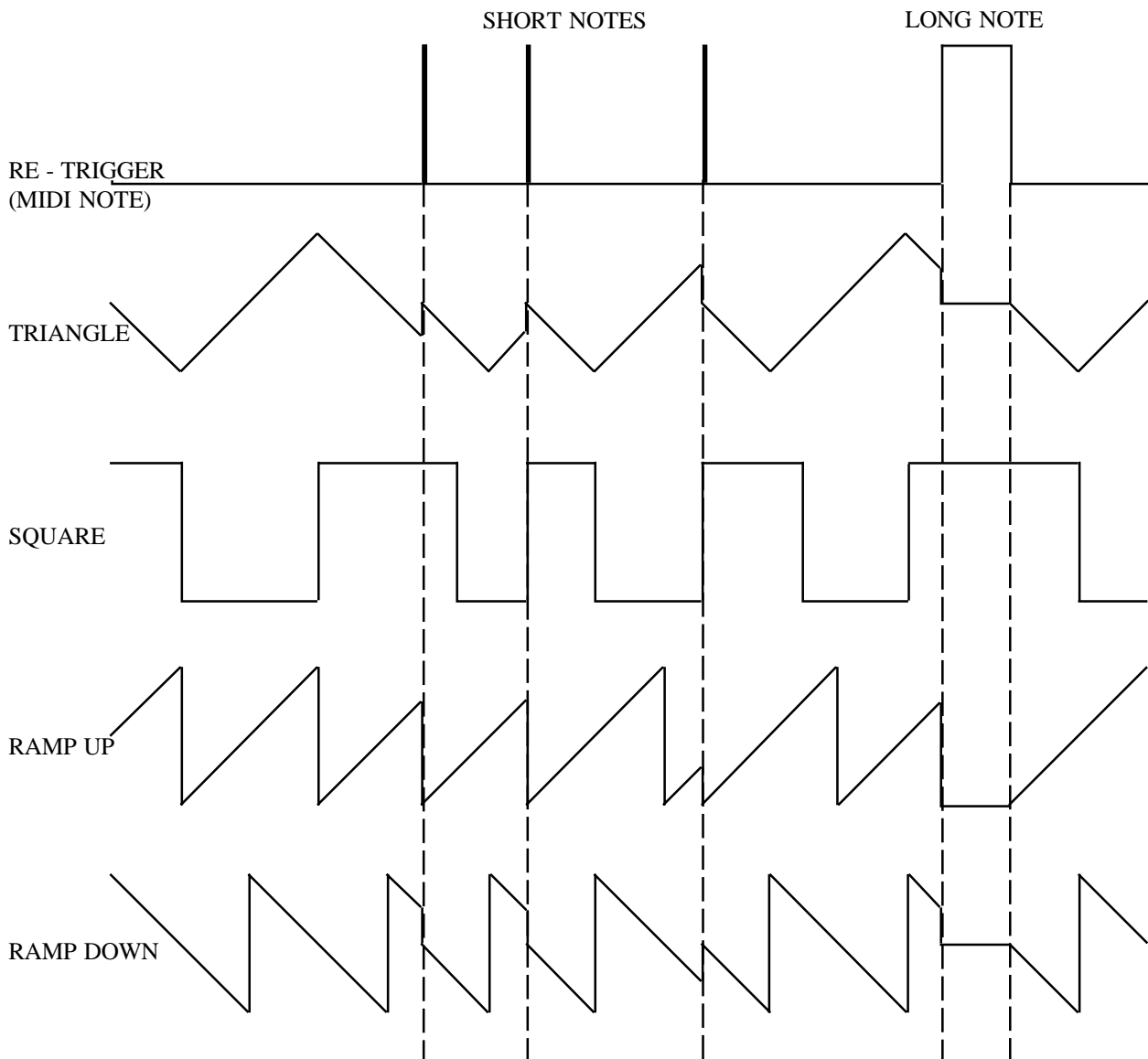
LFO re-trigger. When a Mutator channel is not in gate mode (i.e. env. mode) the now ‘spare’ MIDI note on/off information is used to re-trigger the LFO and thus sync. the LFO rate to the timing of a track.

Note value still controls the cut-off frequency, of course, but every new note-on command will halt the LFO at the beginning of its waveform. A midi note off command (end of a note) will restart the LFO. Thus, effectively, a very short midi note will instantaneously reset the LFO to the beginning of its waveform.

A large range of LFO waveforms may be produced by using this re-trigger feature, as can be seen from the diagrams below which show the effects of re-trigger on the the LFOs basic waveforms..

If it is desired to have an LFO sweep that is exactly in time with a track it is best to set the LFO rate to be slightly slower than is needed and then use a short note to reset the LFO exactly on the beat.

Interesting and possibly unexpected LFO rhythms can be obtained by experimenting with different LFO and re-trigger rates, and note lengths.



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This apparatus meets the requirements of BS EN 50081 part 1 with regard to electromagnetic emissions, and BS EN 50082 part 1 with regard to electromagnetic immunity: it thereby complies with the Electromagnetic Compatibility Directive 73/23/EEC.

The unit meets the requirements of BS EN 60065 with regard to electrical safety and so complies with the Low Voltage Directive 89/336/EEC.

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"The thing about the Mutator is that it is actually alive. Mutronics didn't warn me about this of course and even the man who runs our local pet shop hasn't got a clue what I should feed it with or how often I should trim it's claws/ Yes, I know it bites and it frightens my girlfriend but the fact is, it makes these wonderful noises and I can't stop playing with it. Get one only if your prepared to house train it and want to sound different and strange." *Tony Coleman - Tongue and Groove Records*

"The Mutator is quite obviously a modern classic, you just grab the knobs and rotatuM."
Mark McGuire - Producer.

"In an age of repetitive beats, allow yourself a little soothing luxury with a Mutator from Mutronics. Sink into an analogue bubblebath of creamy smooth low passes and refreshing highs. Wallow yourself in the beauty that envelopes you in its pure self-indulgence - permit yourself an earbath of spectral bliss. Empty your mental colostomy bag and inspect the 'nuff knobage' on the Mutator today." *Kris Weston - The Orb*

"The Mutator sits in my rack like an Arnie in a row of Shirlie Temples, probably the most potent 2U on the planet." *Dave White - engineer*

"I've used the Mutator as a mixing tool, as a variable effects unit for recording MIDI, electric and acoustic instruments and as an added sound source in live performance. The conclusion I've reached is that you never quite know where you're going to end up when you Mutate, but the results are always surprising, unusual and sometimes shocking. This may not be useful for a Michael Bolton production, on the other hand, if you're someone who enjoys hearing somebody ask, "What's that sound like a herd of mad elephants on the rampage?" then Mutation will become second nature to you" *David Toop - Writer /Musician*

"Forget the other shit - this thing is a legend." *The Rapino Brothers - Re-mixers / producers*

The Mutator is fast augmenting, ney indeed replasing our vintage synth collection which includes the classic mini Moog, ART Axe and Roland SH101." *Edwyn Collins - Artist + Studio owner*

