The SYNTHI HI-FLI

A User Guide

Digitana Electronics

Preface

This manual provides an in-depth guide to using the E.M.S. Synthi Hi-FLi, both the original 1970's units and the more recent 're-release' version by Digitana Electronics.

Electronic Music Studios (E.M.S) produced a rather 'minimalist' manual written by Robin Wood many moons ago when the original Hi-FLi was first produced circa 1972. Robin, who now runs E.M.S. (Cornwall), has kindly allowed me to produce a limited licensed re-run of the Synthi Hi-FLi and I thought an updated version of his manual seemed appropriate. Even though the original manual was brief it did cover the main aspects of the Hi-FLi succinctly and in writing this updated version I have incorporated and greatly expanded on the original notes in several areas. The guide is structured into roughly three parts: an overview of the Hi-FLi effects, a little bit of 'theory' to explain two important aspects of the Hi-FLi namely the envelope follower and the Phase Filter and finally a section on using the Hi-FLi in practice. Ten example 'dopesheets' are presented that illustrate just a fraction of the sound shaping possibilities of this amazing unit.

Acknowledgements

I would like to thank Robin Wood at E.M.S. for reading an earlier version of this guide and for much help during the prototyping stages of the Synthi Hi-FLi re-release project, including providing hands on testing, provision of original high quality schematics and test notes as well as the generous loan of an original 1970's Hi-FLi unit for A/B testing against the new release units.

Steve Thomas

Digitana Electronics

St Albans, England, 2011. v1.1

Technical Specification

- Input Sensitivity adjustable to 5mV
- Input Impedance 200K Ohms
- Output level up to 5V p-p
- Output Impedance 1K Ohm
- Switchable 110V/220V Mains Input
- +/-12V power rails
- Pedal control voltage swing +/-5V
- Power consumption 70W

Original 1970's E.M.S. SYNTHI HI-FLI.

Digitana Electronics licensed re-release SYNTHI HI-FLI 2010.

The Re-release Synthi Hi-FLi

Before getting into the details of the Hi-FLi hardware and its operation, let me begin with an overview of the Digitana Electronics re-release Hi-FLi and say something about how it compares with the original 1970's version.

Since the aim of the re-release was to reproduce the Hi-FLi sounds and functions in their entirety but in a 'modern' design, I was very mindful of taking great care in replicating exactly the original circuit designs. In this respect the only place where there is a deviation with the original is in the power supply. Since this does not affect the sonic performance of the unit (other than to make it more reliable) I decided this change was important. The Hi-FLi circuits are powered by +/-12V dual voltages and the original used voltage regulators that were probably the best one could find in the early 1970's but which are long since replaced by much better modern equivalents. Similarly the original used somewhat noisy open frame transformers whereas the re-release utilizes a very quite (and safer) toroidal transformer instead.

The only other component difference in the new and original units is in my choice of using 4" professional Alps faders compared to the 3" slightly 'plastic' feeling originals. The use of pro faders means better longevity and equally important gives much better 'resolution' during operation. This is particularly important as you will discover that in some settings, the Hi-FLi can produce different responses with just small movements of the faders. Thus once you discover a cool 'patch' it will be much easier to reproduce this exactly using the superior quality faders.

There are also the obvious cosmetic differences. The original units were built into white fibreglass 'pods' very typical of design fashion of that era. Although I investigated the possibilities of re-producing these for the re-release, it proved totally uneconomic for small production runs. That said not everyone was a fan of the original pod (some referred to it rather unkindly as looking like a 'toilet'!)

In any event I decided on a more conventional case design made from a steel black powder coated chassis combined with a 3mm anodised cnc machined top panel and wood end cheeks, Retro looks with practicality and durability.

A few words about the pedal unit. The original Hi-FLi pedal units went through a few design changes starting from a rather large heavy dual pedal unit and integral stand through to a separate dual pedal unit (still heavy) and finally a

more practical lightweight version that was based on Sola Sound pedal 'shells' sold by Steve Macari's in London.

Luckily these pedals are still available from Macari's and I have used them in the pedal units of the re-release. Inside the pedals is a small circuit board that contains a variable gain preamp as well as pedal voltages and bypass switching voltages. I have reproduced these circuits exactly. Indeed the pedal units can be used perfectly well with an original Hi-FLi because I have also adopted the same 8 way 'umbilical' cable (including the 8-pin Cinch-Jones plug) that connect the pedal unit to the main Hi-FLi console.

Front Panel Layout

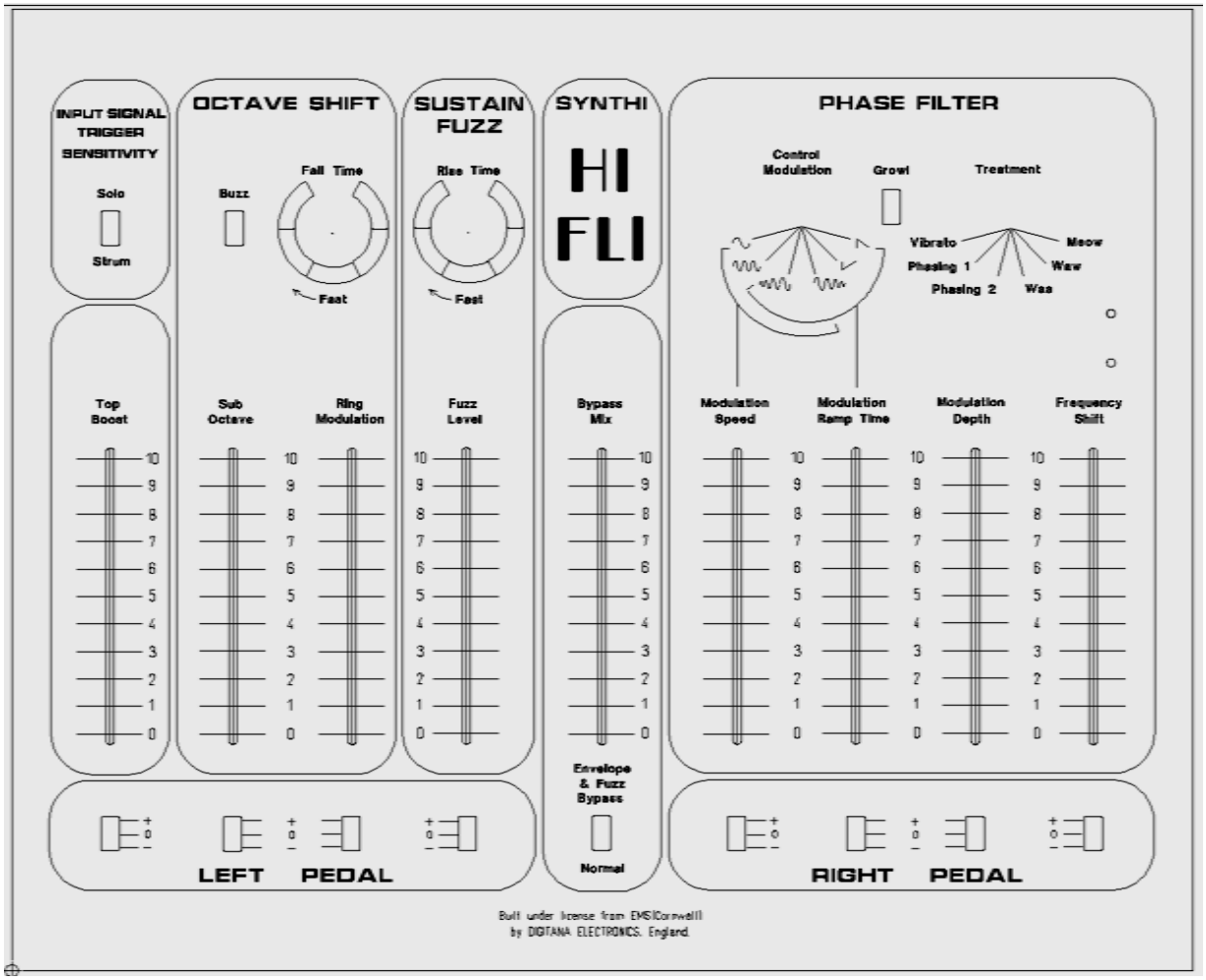
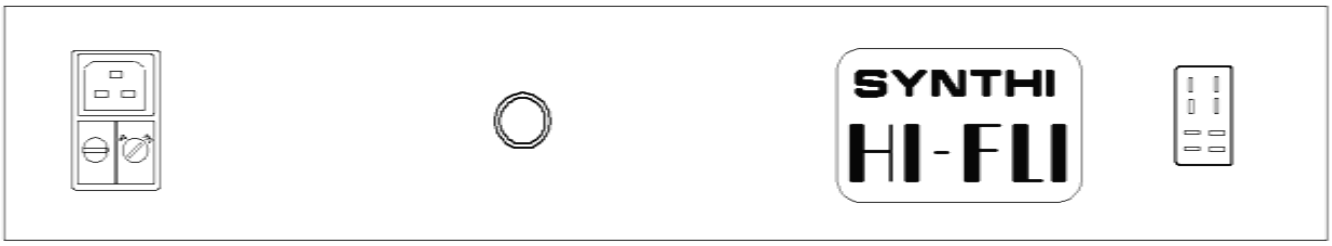


Fig 1

Rear Panel



Integral IEC Mains, fuse and 110/220V selector inlet.

Standard 6.3mm Mono out Jack Socket.

Pedal Unit connector (8 way female Cinch-Jones connector)

Fig 2

Dual Pedal Unit

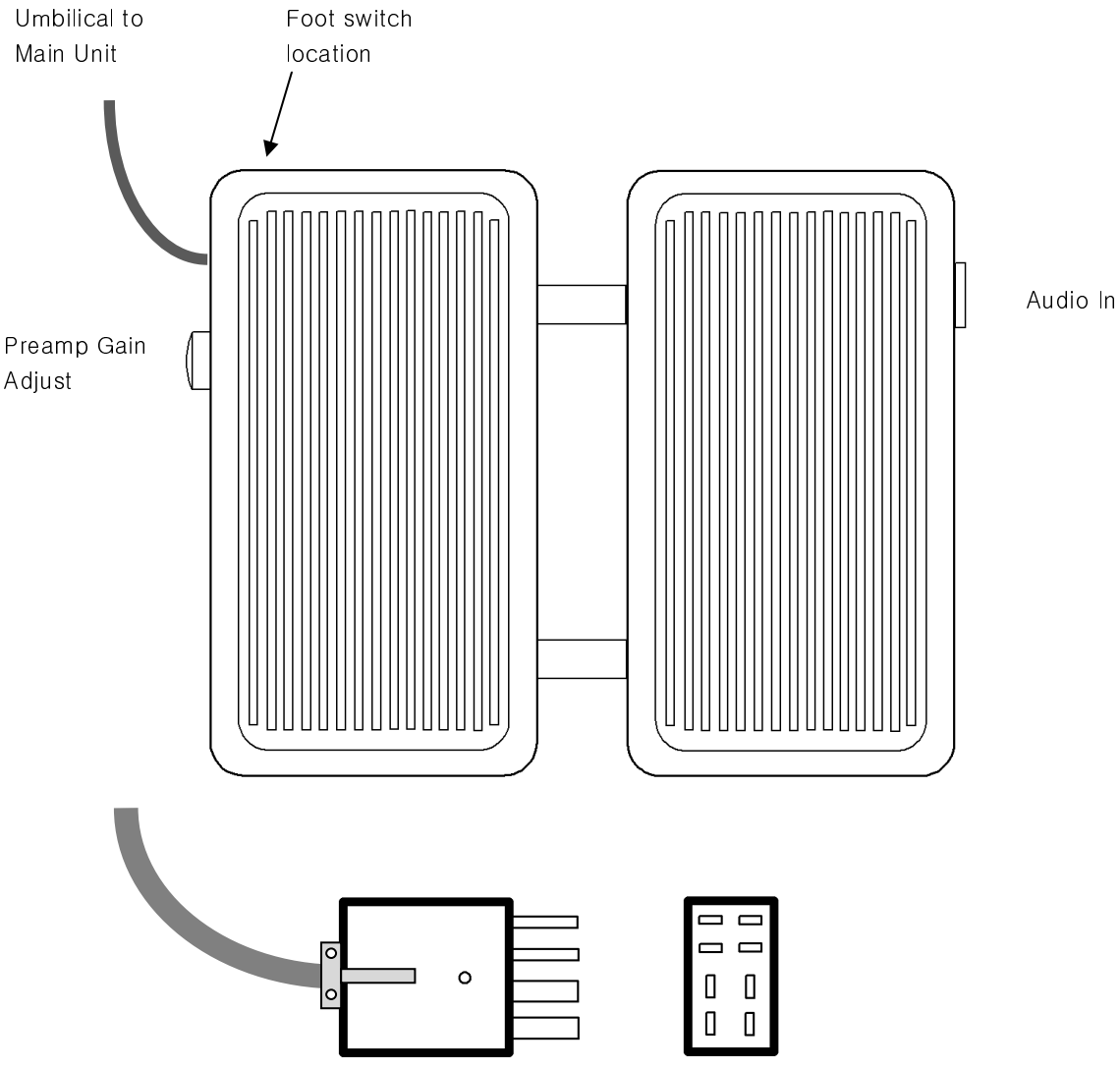


Fig 3

The umbilical connects to the main Hi-FLi unit via a male 8-pin Cinch-Jones plug. This carries +/-12V power into the pedal unit preamp board and control voltages, bypass switching voltage and audio into the main unit.

Hi-FLi Main Unit Overview

Looking at the Hi-FLi main console we see a collection of effects, each of which has a slider below it and below each of these (with the exception of the main mix slider) there is a 3 way slide switch. These slide switches engage control voltages from the pedal units. Indeed all the effects in the Hi-FLi are voltage controllable, a very radical concept in 1972 and one which gives the Hi-FLi huge power and versatility to create many complex and diverse effects.

Here is a brief summary of the main effects (starting left to right). A more detailed description of each effect and its structure will be given later.

INPUT SIGNAL SENSITIVITY

Solo/Strum Switch

Part of the Hi-FLi circuitry is to detect the start and end of the amplitude envelope of audio input signals, e.g. from a plucked guitar string(s). Two pulses are created one at the beginning (the 'attack' phase) of the amplitude envelope and another pulse at the end (the 'decay' phase) of the envelope.

These pulses are important in triggering/re-triggering the various dynamical modulation waveforms used in the Hi-FLi effects during playing of e.g. a guitar. The solo/strum settings refer to the sensitivities of this 'attack' and 'decay' detector circuit. The solo setting is the more sensitive and is designed to create the trigger/retrigger pulses when playing single strings. The strum setting is less sensitive and is designed to obtain correct trigger/retrigger pulses when playing chords where the amplitude envelope is both larger and more complex in shape than for single plucked strings.

A more detailed discussion of this will be given later.

TOP BOOST

Audio in from the preamp in the pedal unit is fed to the Top Boost that is basically a treble boost. It gives up to 30db boost of higher frequencies compensated to keep overall sound levels constant. It's a very useful feature that adds dramatic tonal qualities to the sound particularly in combination with the other Hi-FLi effects.

OCTAVE SHIFT

Sub Octave

This section involves a sub-octave generator that extracts a fundamental note from the audio input and drops it by one octave. Raising the fader increases the mix of dry and octave-shifted signal.

Buzz Switch

The sub-octave signal is a square wave. The buzz switch allows the option of converting this to a triangle wave which adds different harmonics providing a more 'buzzy/raspy' sound effect.

Ring Mod

The ring modulator effect in the Hi-FLi is quite different in design form typical ring mod circuits found in synthesizers. The latter basically multiply two wave forms together, so typically this results in a doubling of frequency if two pure tones are fed into it plus many other harmonics, giving raise to bell like ringing and metallic sounds.

In the Hi-FLi, a 'pseudo' ring modulation effect occurs where instead of multiplying two waveforms, the ring mod just adds a half wave rectified version of the fundamental to the output of the Top Boost and thus can produce a fundamental that is double in frequency. This 'pseudo ring mod' signal is sent to a pair of FET transistors controlled by the sub-octave signal itself. Because of this one doesn't hear metallic/bell like sounds. Rather the result is some great deep sub-octaves (with complex harmonics if the signal in is not just a pure tone) the amount of which are controlled by the ring-mod and sub-octave facers. So basically the sub-octave and ring mod effects are interconnected in a fairly complicated way.

Decay Rate

This controls the decay time of the audio input as it passes through top-boost, sub-octave and ring-mod effects. The Hi-FLi circuits create an envelope follower of the input signal amplitude and this envelope controls the level of the signal passing through these 3 effects. The decay rate knob controls the decay rate of the envelope. On fast setting the envelope will be very short, leading to clipped like plucks that 'sample' the initial input signal attack. On longer decay settings the envelope will act more as a follower. In this way you have control over the input signal envelope dynamics as it passes through effects further down the 'chain'.

SUSTAIN FUZZ

Attack Rate

Sustain fuzz is a silicon transistor based fuzz effect that incorporates some very clever and unique features to the Hi-FLi. The fuzz input signal is taken from the Top Boost section. The Hi-FLi detects the start and end of e.g. a plucked string from the envelope follower circuit mentioned above. Setting the fuzz attack rate fast, the fuzz appears instantly a string is plucked and the level controlled by the fader setting. But setting the time to slower values allows the fuzz to 'swell' in amplitude after the string is plucked. So you get a slewed or 'delayed' fuzz effect.

BYPASS MIXER

The main mix fader controls the amount of mix between 'dry' and 'wet' signals. At lowest setting 0, the signal is completely dry and the output of the pre-amplifier in the pedal unit goes directly to the audio output jack. At the maximum setting of 10, the signal route goes completely through all the effects in the Hi-FLi. Intermediate slider settings allow control over dry/wet mix. The bypass footswitch (which is built into the left hand pedal), switches between a fully dry signal and the mixed signal determined by the main fader setting.

Envelope & Fuzz Bypass Switch

This switch has two settings. In the 'normal' mode audio into the Hi-FLi goes through the standard routing discussed above. That is, the signal passes through Top Boost, Octave Shift and Sustain Fuzz sections. In the envelope and fuzz bypass mode, the audio input bypasses completely these three effects and enters unchanged into the Phase Filter section which will be described below. Thus none of the corresponding faders or the envelope decay rate/attack times knobs have any effect on the sound. The idea is to provide totally unmodified audio to the Phase Filter so that it can be used just by itself. This bypass switch was added to some later Hi-FLi's produced by E.M.S. in the 1970's.

Left Pedal Switches

Below each of the 4 sliders controlling Top Boost, Sub-Octave, Ring Mod and Fuzz level is a 3 way slide switch marked '+', 'o' and '-'. In the centre position the switch is off but in the other two settings they engage the control voltage generated by operating the left footpedal. These voltages vary between approximately +/-5V as the foot pedal operates between its two extremities. The two options '+', and '-' allow variations from negative to positive control voltage or from positive to negative for a movement of the pedal.

Recall that all the effects in the Hi-FLi are voltage controlled. Indeed each control slider is producing a voltage to control an effect when it is moved. By engaging the left pedal control voltages, Top Boost, Sub-Octave, Ring Mod and Fuzz level can by remote-controlled by operating the left pedal. The corresponding sliders still work and so the effect is controlled by the sum of the slider voltage and pedal voltage. The slider settings basically give the effect setting when the pedal is in the horizontal position (as opposed to 'up' or 'down') when the control voltage it puts out is close to zero.

PHASE FILTER

Here is where the major 'sound-scaping' effects occur. The Phase Filter consists of 12 filters together with FET/bipolar transistor switches that alter the signal path through the filters of audio fed from the left-hand effects.

Each of filters is of the 'all-pass' but frequency dependent phase shift type. This means each filter leaves the amplitude of any given frequency wave

unchanged but phase shifts the wave by an amount that depends on the waves frequency. The amount of phase shift in each filter can be controlled by a voltage. Varying the phase by applying modulation voltages together with the different signal path topologies through the filter allow for an amazing number of different effects some familiar some totally alien! It's likely that many of these phasing effects are unique to the Hi-FLi, and cannot be reproduced with modern effects units...analogue or digital.

Control Modulation Selector Switch

Six modulation waveforms that control the phase-shifting of the filters are available via this rotary switch. The first two are slow/fast continuous sine waves. The remainder are triggered or re-triggered waveforms, where the trigger/re-trigger pulses are generated by the attack/decay of the audio input envelope (more details of this will be discussed below). These waveforms are increasing amplitude sine waves; decreasing amplitude sine waves; ramp up and ramp down.

Treatment Selector Switch

Six different Treatments, which correspond to different topologies of audio signal paths through the 12 phase filters, are available via this rotary switch. The resulting effects are labelled as Vibrato, Phasing 1, Phasing 2, Waa, Waw and Meow. A detailed description of each of these will be given later.

Modulation Speed

This slider controls the speed of the Sine wave (constant as well as increasing/decreasing versions) modulation waveforms.

Modulation Ramp Time

Controls the ramp times of the modulation waveforms with dynamical envelopes, increasing/decreasing amplitude Sine waves and up/down ramps. For the Sine waveforms it controls the time taken for a wave to increase to its maximum amplitude/decrease to zero. For the ramp waveforms it controls the time taken for the amplitude of the ramp to reach maximum/minimum levels.

Modulation Depth

This slider controls the depth of the modulation waveforms controlling the amount of phase shifting produced the filters.

Frequency Shift

This controls the DC bias applied to the filters. The centre position (5) corresponds to 0 Volt bias. Above and below this a positive/negative bias is applied to each filter which controls the amount of phase-shifting applied to a given frequency wave. This control has a major affect on the sounds produced by the filters as it effectively shifts the DC bias of the modulation waveforms if applied. As a result, any applied modulation is acting within different frequency regions of the filter and produces dramatically different effects.

Growl Switch

The 'Growl' switch option was a feature that appeared on later Hi-FLi's produced by E.M.S in the 1970's, often referred to as 'mk2' units.

The switch is a 3-way centre off slide type. The growl circuit takes the sub-octave square wave from the Octave Shift section and divides its frequency by 2 and 4, thus producing a wave that drops the fundamental by 2 or 3 octaves (!) depending on the switch position. Rather than simply mixing these sub-harmonics with the original signal something rather more sophisticated is implemented.

These sub-harmonics are in fact used to modulate the phase filter but only when the filter control modulations is set to one of the 4 waveforms involving Sine waves (thus operating the Growl switch has no affect when the up/down ramp modulations are selected). This gives amazing/bizarre new modulations! The amount of growl is controllable via the modulation depth slider and also if the increasing/decreasing sine modulation is selected, by the modulation ramp time.

Growl can produce probably some of the most alien sounds from the Hi-FLi! Certainly it can turn a plucked guitar string note into something more associated with a synthesizer. Combined with all the other effects and treatments it can give a mind boggling array of sounds just from a single plucked guitar string. If two or more strings are struck then many additional complex harmonics and modulations are created (recall the Growl modulation of the phase filter is not something 'static' of fixed frequency. It changes with the pitch of the fundamental frequency extracted from a note.) This explains

why plucking two or more strings at same time produces very complex modulations.

Right Pedal Switches

The right pedal switches have the some functions as described above for the left pedal switches, only now they are associated with control voltage generated by movements of the right pedal and are applied to Modulation Speed, Modulation Ramp Time, Modulation Depth and Frequency Shift respectively.

Leds

On the right hand side of the control panel you will have noticed two red leds that glow when the unit is powered up. These are there to offer a basic visualization of the various control modulation waveforms as they are applied to the Phase Filter. We will discuss the leds and how to interpret their behaviour later on when we look at using the Hi-FLi in practice.

Finally, to help visualize how all the above effects and controls are linked together, in Fig 4 on the next page is a diagram representing the audio signal path through the Hi-FLi.

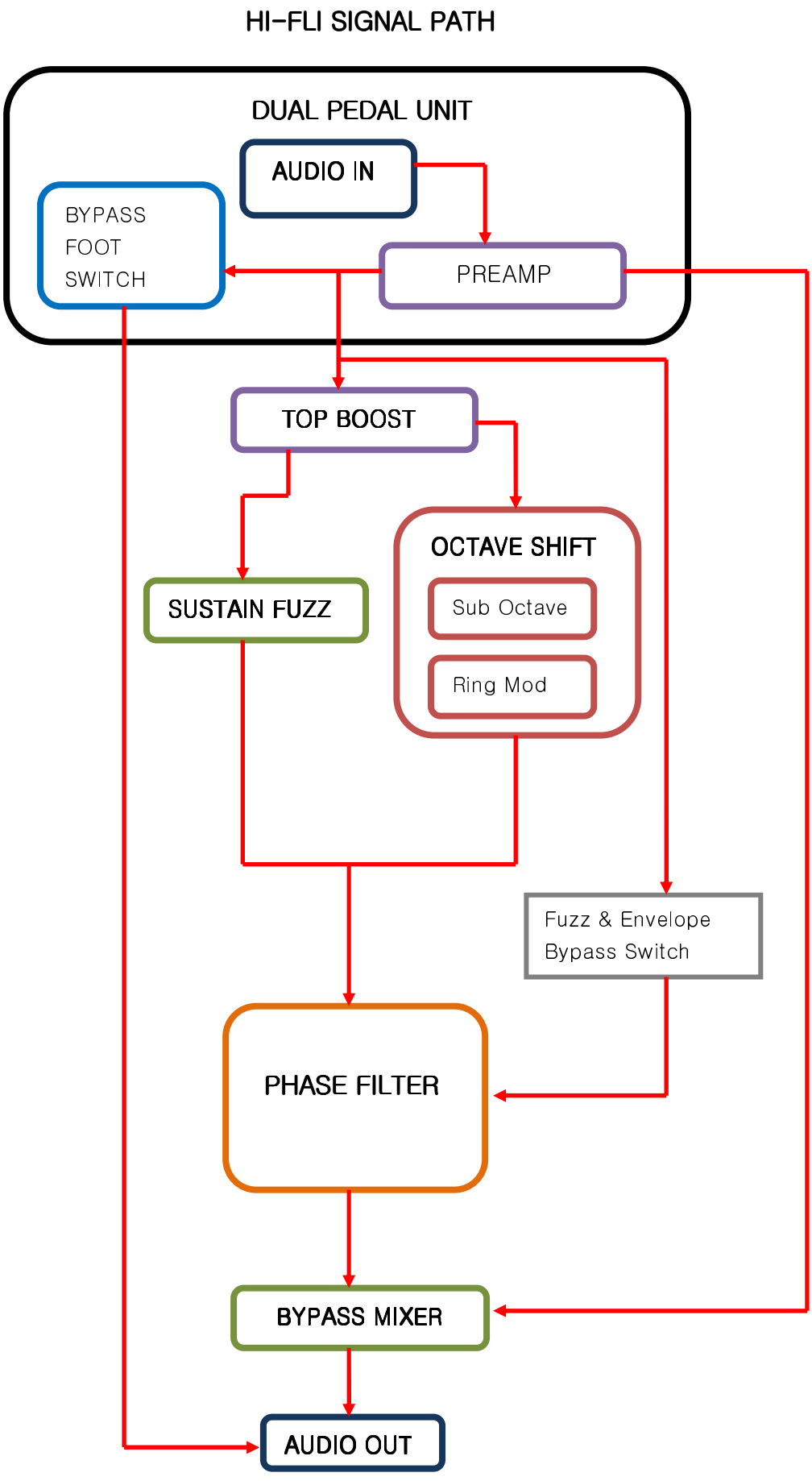

HI-FLI SIGNAL PATH
DUAL PEDAL UNIT
AUDIO IN
BYPASS
FOOT
SWITCH
PREAMP
TOP BOOST
OCTAVE SHIFT
SUSTAIN FUZZ
Sub Octave
Ring Mod
Fuzz & Envelope
Bypass Switch
PHASE FILTER
BYPASS MIXER
AUDIO OUT

Fig 4

A Deeper Look into the Hi-FLi

In order to really get the most out of the Hi-FLi its helpful to understand in a little more detail two important aspects of its function, namely the Envelope Follower section and the various Phase Filter 'treatments' which were briefly described above.

Envelope Follower and the Attack/Decay Detector

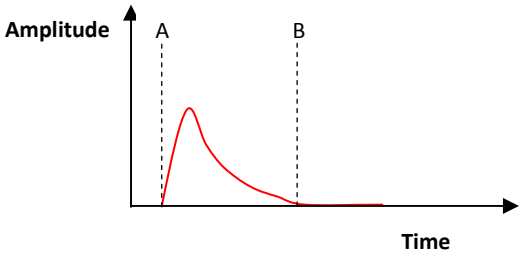


Fig 5a

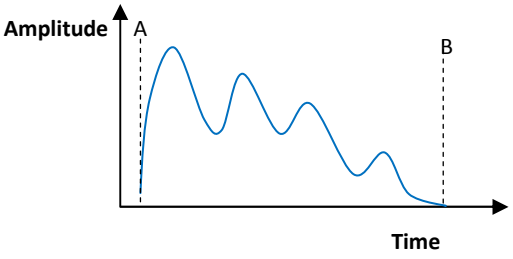


Fig 5b

Figs 5a and 5b illustrate a typical amplitude envelope when a single string is plucked (Fig 5a) compared to the case where several strings are strummed (Fig 5b). In the first plot we see a fast attack typical of a single plucked string quickly reaching a peak and then decaying in time. In the second plot again there is again a fast attack but the overall amplitude is larger and typically there may be several peaks in the amplitude before decaying, depending on how the chord is sounded.

In order to trigger and re-trigger some of the modulation waveforms in the Phase Filter section, the Hi-FLi needs to work out the start time and end time of the amplitude envelope, marked at A and B in the plots. This circuit is called the 'attack/decay' detector inside the Hi-FLi. Its design is certainly very clever, but the problem is that the second envelope has multiple peaks in it that can confuse the Hi-FLi into thinking that a single string has been plucked multiple times when in fact a single chord has been strummed once! The Hi-FLi generates a voltage pulse to mark the start and end of an amplitude envelope

which is then used to trigger/retrigger modulating waveforms applied to the Phase Filter as well as controlling the fuzz swell retriggering.

So without making any compensation for these two kinds of envelopes, the Hi-FLi might produce the pulses illustrated in Figs 6a and 6b

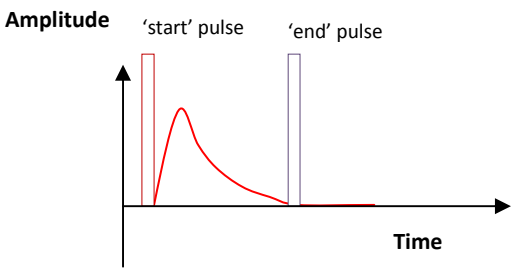


Fig 6a

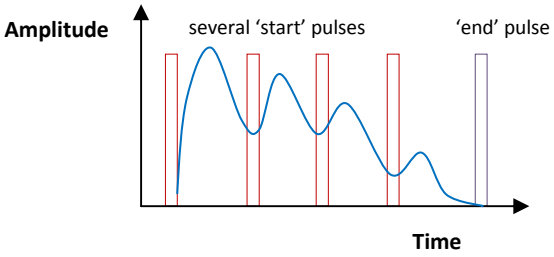


Fig 6b

In Fig 6a the Hi-FLi correctly generates a single pulse at the start and end of the envelope of a single plucked string but the same circuit when fed with the envelope of a chord strummed once as in Fig several start pulses!

The modulating 'one-shot' waveforms that are triggered/retriggered by these pulses are shown in Fig 7 below

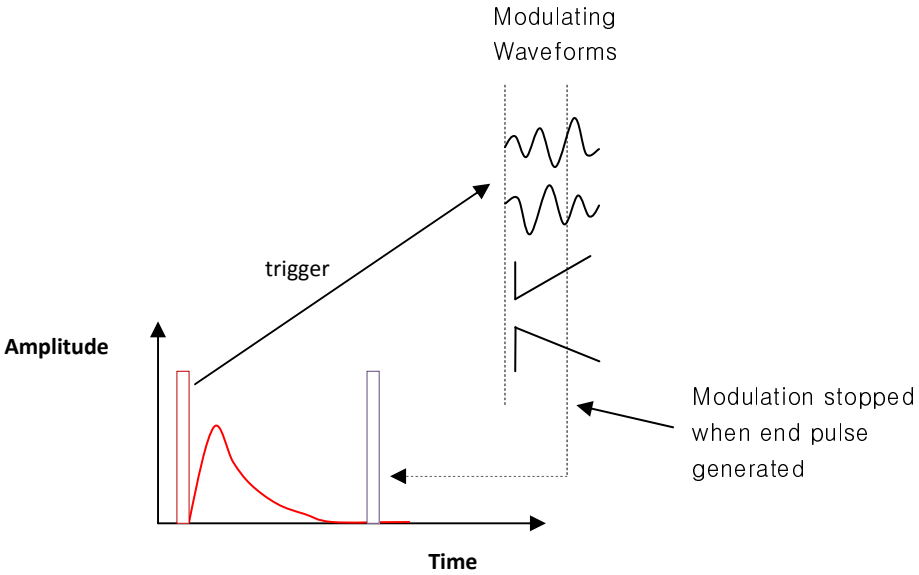


Fig 7

Notice that the slow/fast continuous sine wave modulations waveforms are not included above (even though they are available via the control modulation selector switch) because they are not 'one-shot' waveforms but rather are continuous waveforms that are not affected by the start/end pulses generated by the attack/decay detector.

From all this, we see its important for the Hi-FLi to be able to correctly identify the beginning and end of the amplitude envelope of a signal fed into it for proper triggering of the one-shot modulation waveforms.

To get around the problem of multiple 'triggering' when a chord is struck on the guitar the attack/decay detector circuit has two sensitivity settings via the sensitivity switch. The 'solo' setting is the most sensitive and is designed for single string plucking. In the 'strum' setting the attack/decay detector is less sensitive and so it only responds to the larger initial attack peak of a strummed chord and ignores the other smaller peaks in the envelope. In this way it correctly only generates a single start pulse.

However the above does depend on the amount of preamp gain set in the pedal unit, the guitar pickup volume settings and on playing style (on how hard the strings are plucked etc). So in practice you can play chords in 'solo' mode and single strings in 'strum' mode and still avoid multiple triggering of attack detection pulses, but it requires careful playing. We will discuss how to properly set up the Hi FLi gain settings later.

The Phase Filter Explained

Central to the unique sound shaping of the Synthi Hi-FLi is the Phase Filter. In fact the Phase Filter is a collection of 3 main circuits. The first is the so called vibrato/transient generator which is a function generator producing the 6 modulating waveforms mentioned earlier; slow/fast sine; increasing/decreasing amplitude sine and up/down ramps. The second part consists of a collection of 12 identical phase-shifting filters each of which has the property that it allows waves of all frequencies through without attenuation, but instead phase shifts them by an amount that depends on the wave's frequency. Hence the name 'phase filter' rather than 'frequency filter' as one might call more conventional filters like low-pass, band-pas or high-pass types. Each of the 12 filters can produce a maximum phase shift of up to 180 degrees. So if all 12 are used the total maximum shift is 12x180 = 2160 degrees.

Crucially the amount of phase shift can also be controlled by a voltage. This brings us to the final part of the Phase Filter, the so called 'bow-string' drivers. The bow string refers to a collection of 20 diodes strung together end to end and linked to each filter. By applying the modulation waveforms to this string, the amount of phase shifting can be varied.

Since there are 12 such filters this makes a total 240 diodes (!) which is a pretty unique design. The different sound treatments like Vibrato, Phasing etc are achieved by connecting these 12 filters up in different ways and also creating different signal paths through them. So let's consider each of the 6 main treatments Vibrato, Phasing 1, Phasing 2, Waa, Waw and Meow in turn.

To do this lets represent the 12 filters and the switches that control how they are inter-connected and which also control the signal flow by the following diagram:

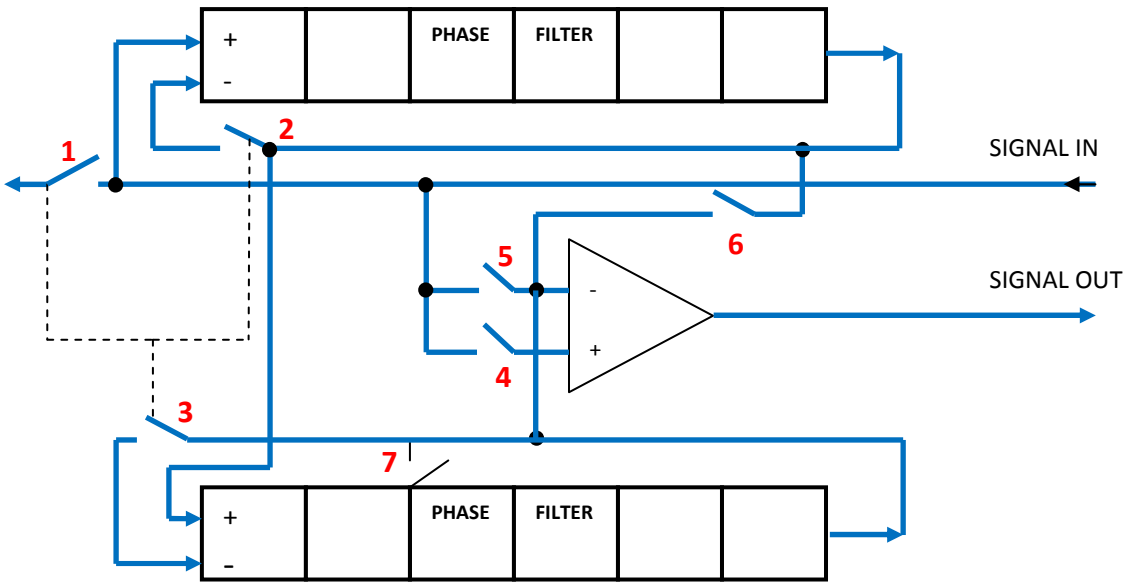


Fig.7 the Phase Filter signal structure

In Fig 7, the 12 phase filters (each filter represented as a square) are arranged in two blocks of 6 filters daisy chained together. The blue line shows the audio path. Notice there are 7 switches labelled 1-7 that can be open or closed and

so create different 'topologies'. It is these different connections that produce the different treatments. These switches in reality are transistors that can be turned on or off and so act as signal switches.

What is not shown in Fig. 7, but which is implied, is that each of the 12 filters has a modulation voltage controlling the amount of phasing. The modulation source is one of the six available waveforms discussed earlier (slow/fast sine; increasing/decreasing sine; up/down ramps.) These are fed via the 'bow strings' (a string of 20 diodes per filter) mentioned above.

The 6 different treatments, Vibrato, Phasing 1, Phasing 2, Waa, Wawa and Meow correspond to the following configurations of the 7 switches:-

TREATMENT	Switches1,2,3	Switch 4	Switch 5	Switch 6	Switch 7
Vibrato					
Phasing 1			on		
Phasing 2		on			
Waa	on				on
Waw	on			on	
Meow	on			on	

Table 1

Table 1 shows the switch configurations (a blank means the switch is off). From looking at the table, it might appear that there is no difference between the 'Waw' and 'Meow' effects but in fact there is and we will discuss this below.

Let's study each treatment in turn.

Vibrato

This is the simplest treatment. Here all the switches are open so the input signal goes once through all 12 filters in turn and back out again. Any variation of phase via modulation waveforms applied to each filter thus modulates the frequency of the signal, i.e. we have frequency modulation. For example imagine a sine wave (e.g. the fast Sine modulation) is used to modulate the

phase shift in each filter. Then we can visualize why the result is a vibrato effect:-

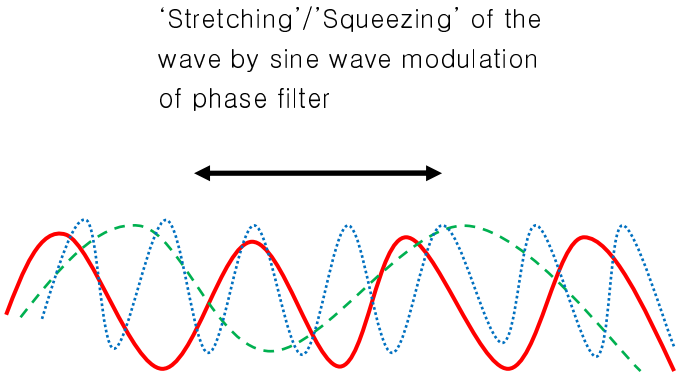


Fig. 8

In Fig. 8 the red wave represent say a particular frequency harmonic in an input signal fed into the filter. By applying the Sine wave modulation to each of the 12 filters, the wave is periodically 'stretched' or 'compressed' and so its frequency is decreased or increased accordingly. This is just vibrato!

Of course this effect, or rather the amount of stretching is frequency dependent. So higher frequency harmonics may have different amount of vibrato compared to lower frequencies.

In fact you can hear this difference when you set up the Hi-FLi to produce a vibrato effect. We'll talk about this a little later when discussing the setting up and using the Hi-FLi.

If instead of using a Sine wave to modulate the amount of phase shifting, we were to use say a ramp wave a 'swept-vibrato' effect would be heard rather than a repeating vibrato.

Phasing 1

This is very similar to the vibrato routing, but in addition switch 5 is on. This means that the phase shifted signal is mixed with the original signal. As the phase shifting approaches 180 degrees, you therefore get perfect cancelation of a given frequency harmonic. Since each of the 12 filters can at most

produce 180 degrees of phase shifting, the output signal goes to zero 6 times as we sweep the full phase shift range of the 12 filters.

This is illustrated in the following graphic

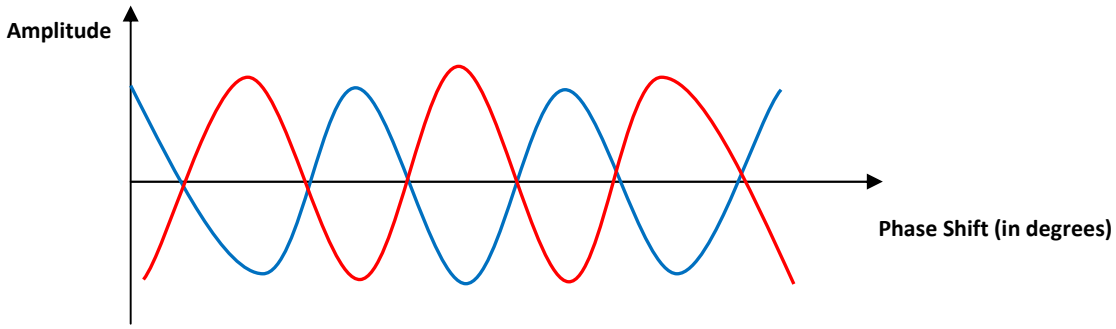


Fig. 9

In Fig. 9 the red wave represent the original input to the filter and the blue the phase shifted wave. When they are mixed together you get perfect cancellation at 180, 540, 900,1260,1620,1980 degrees, i.e. 6 times.

You can actually check this out yourself by operating the Frequency Shift slider with the treatment switch is set to 'Phasing 1'. As you move the slider from 0 to 10 you can hear the output signal increasing and decreasing 6 times as the slider reaches 10. Now if you apply e.g. a slow sine control modulation you will hear the classic 'wooshing' sound of a phaser as the phase shifting is periodically swept by the sine modulation.

Phasing 2

This is quite similar to Phasing 1 except now its switch 4 that is on instead of switch 5. This means the phase shifted signal and the original single are subtracted rather than added together. But again as in Phasing 1, the output will go to zero 6 times as the Frequency Shift slider is moved from 0 to 10. However the sound is different than Phasing 1 as you will discover. (Remember the amount of phase shifting produced by the filter is frequency dependent, so it differs between one harmonic and another!)

Waa

In this setting, switches 1, 2, 3 and 7 are all on. The former means that there is now feedback of the signal output occurring in both the upper and lower filter blocks. Moreover some of the original signal input is actually fed into the phase shift control of all 12 filters (this is indicated by the left pointing arrow near switch 1 in Fig 7). Finally with switch 7 also on, the signal is by-passing that last 4 sections of the lower filter block. The presence of feedback around the phase filter makes them act like a band-pass filter with a single peak occurring because switch 7 is closed. The frequency where the peak is located moves as the phase shift produced by the filter is changed. So if we fed a signal into the filter with the Waa setting and swept through the phase shift by moving the Frequency Shift slider from 0 through 10 we would hear the familiar 'Waa' effect as the frequency of the peak is swept to higher values. Modulating the phase shift by applying control modulations such as slow/fast sine etc will give distinct and powerful 'auto-Waa' effects.

Waw

For this effect, switches 1, 2, 3 and 6 are on. Now all 12 filters are used and there is feedback occurring on the upper and lower blocks of 6. Because switch 6 is on there is mixing between the output signal from the upper 6 filters with the signal that has gone through all 12 filters. As mentioned earlier because of feedback the phase filters act as band pass filters with 3 resonant peaks appearing in the upper and lower filter blocks respectively. As each filter is swept by applying e.g. a slow sine control modulation, the frequency of the 6 resonant peaks themselves move with the varying Sine modulation. The result is an extremely rich effect arising from the combination of phasing as in 'Phasing 1' but with simultaneous resonant filter sweeps as in 'Waa'. It is a unique effect for the Hi-FLi.

Meow

From Table 1 it seems there is no difference between 'Waw' and 'Meow' effects as regards the various switch settings. This is correct but what is not shown in Fig. 7/Table 1 is that in the Meow setting the control modulation applied to the lower block of 6 filters is inverted with respect to the upper block of 6. In 'Waw' the control modulation is the same for all 12 filters (i.e. it's the same for upper/lower blocks). The simple difference of inverting the control modulation applied to the lower block has a very striking effect on the sounds produced! If we imagine again applying a sine wave control modulation then

the 3 resonant peaks of the upper block will now move in opposite directions to the 3 peaks of the lower block. In the case of 'Waw' all 6 peaks move in unison back and fore with sine modulation. Now the two sets of 3 peaks always move in opposite directions. This can lead to amazing vocal/speech like phonetic sounds as the peaks cross! Again this is very likely a unique effect to the Hi-FLi.

So much for the 'theory' behind two very important parts of the Hi-FLi. Let's now move on to discuss its use in practice!

The Hi-FLi in Practice

Setting the sensitivity level of the Hi-FLi

Audio input into the Hi-FLi is via the 6.3mm mono jack input on the side of the right pedal. The pedal unit connects to the main unit via the umbilical and 8 pin plug. The main power to the Hi-FLi is via standard IEC connector. This connector has an integral fuse and 110V/220V selector chosen via a small screw-driver operated switch.

To avoid potential serious damage, please make sure you have chosen the correct voltage setting for the mains power used in your country!

Like the original 1970's units, there is no mains on/off switch in the Hi-FLi. The unit powers up when the mains is operated. You should see the two red indicator leds glow on power up.

Audio out from the unit is via standard 6.3mm mono jack on the rear panel. Connect this to a suitable amplifier.

The first thing to do is to set the input sensitivity switch to 'solo', all 4 left hand sliders to zero, the central mix slider to max (10) , fall time knob to slow (fully anti-clockwise). On the right hand side of the control panel, set modulation speed to 5, ramp time to 5 , modulation depth to 10 and frequency shift at about 3. Choose the increasing sine control modulation waveform  and 'vibrato' as the filter treatment. Set the Growl switch to its centre (off) position. Make sure all the pedal voltage switches (under each of the 8 effect sliders)

are in their central ‘off’ position and the slide switch under the central mix slider is in the ‘normal’ position.

On the pedal unit set the preamp gain to its lowest setting (knob fully anti-clockwise). Plug in your guitar to the pedal unit and set pick-up volumes to maximum. Now pluck a single string on the guitar. First try out the bypass foot switch on the left foot pedal. This is engaged by pressing the upper left part of the left pedal firmly until click is heard. By toggling this on/off you will hear either the total by-pass ‘clean’ sound of the guitar or the affected sound passing through the Hi-FLi.

While in bypass mode, raise the gain of the preamp by adjusting the gain knob on the side of the left pedal and listen to the sound. Its volume will increase. At some point you will hear distortion of the clean guitar sound. Once you hear this back off the preamp gain back down to the maximum level where no distortion is heard. Leave this setting.

The idea in adjusting the preamp gain is to get high enough signal going into the Hi-FLi to operate the envelope follower part of it but not so high as distortion occurs.

Now switch off bypass mode with the footswitch and pluck a single string.

Observe the led’s. You should see them oscillate in brightness a short while after plucking. Now put your fingers on the plucked string to stop it vibrating. You should see the led’s return to their constant brightness. Repeat this several times. Each time the same should happen.

What you are doing is triggering the control modulation waveform  by plucking the string. By stopping the string vibrating you are ending the modulation.

Now pluck the string slowly several times you will see the lights slowly build up into oscillating brightness and then repeat each time you pluck. You are re-triggering the  waveform on each pluck.

Now try strumming a chord. Depending on your playing style you may still find the above behaviour, i.e. if you strum once the  wave is triggered once only. If you strum harder you may find erratic or multiple triggering as you play the chord once. Try changing the sensitivity setting to ‘strum’. As mentioned earlier, this setting is less sensitive than ‘solo’ and you may have to pluck/strum strings harder to trigger the modulation waveforms. All this depends on your playing style. You may find you can correctly trigger/retrigger the modulation

waveforms when plucking single strings and sounding chords all in ‘solo’ sensitivity mode. Some experimentation is needed and you will soon find the best option for your playing style.

If you have completed this successfully then you have the correct sensitivity settings for operating the Hi-FLi. In practice you will find there is a fair amount of latitude to getting the triggering to work and yet not have too high a preamp gain which would otherwise introduce distortion. The bottom line is: keep the preamp gain as low as you can get away whilst still being able to trigger the control modulation waveforms.

Try out the above with some different control modulations. Rotate the selector switch to up or down ramps () and observe the led’s as you pluck a string. Now you will see the ramp waveforms trigger and ramp up the brightness of one or other of the led’s.

Working Through the Hi-FLi Effects

To demonstrate the individual effects, start with the same settings as listed above but now set the modulation depth slider to 0 and Frequency Shift to 5. In this way the phase filter is basically off and you will just hear the left hand effects only.

Top Boost

Play chords on the guitar or individual notes and raise the top boost slider. You will hear significant treble boost in the signal though the overall volume should remain relatively constant. Top boost is a very useful feature and in tandem with others effects to be described below has a significant effect on the overall sounds.

OCTAVE SHIFT

Set the treble boost at around 5. Now we’ll demo how the envelope follower works. The fall time knob is in the fully anticlockwise or ‘slow’ setting. Plucking a string you hear the full rise and fall of the amplitude ‘envelope’. Now try decreasing the fall time by rotating the knob towards the ‘fast’ setting. Sounding a note you will notice the envelope is now shorter in length. That is, even though the string may still be vibrating from plucking, the sound out of the

Hi-FLi decays away. Setting the fall time to its fastest setting will produce very short 'pulses' as you pluck. This is the basic envelope follower in action, with 'slow' fall (i.e. decay) times capturing the whole of the amplitude envelope of a plucked string whereas a 'fast' fall time only captures the initial fast attack part of the amplitude envelope.

The envelope follower and its adjustable fall time allow you creative control over the time the Hi-FLi effects are applied.

Sub - octave

Set the fall time back to slow. Now raise the sub-octave slider to 2 and compare the effect when single notes are played. You will hear the classic sub-octave square wave at a frequency one octave below the fundamental frequency of the note you are sounding, mixed in with the untreated sound. As you raise the slider further the amount of sub-octave in the mix will increase.

Now try moving the buzz switch to the 'buzz' setting. You should hear a more raspy/buzzy sub-octave signal compared to before. This is because the sub-octave waveform is now and approximate triangle wave compared to the previous square wave. The different harmonic content of these two sub-octaves when passed through the various treatments of Phase Filter section can produce quite distinct effects.

Ring - mod

Return the sub-octave slider to 0 setting. Now raise the ring-mod level slider and listen as you pluck notes. You will hear new harmonics enter the sound and at the maximum setting a distinct doubling of frequency should be detectable. This doubling in frequency is characteristic of classic ring-mod although as explained earlier the ring-mod effect in the Hi-FLi is very different from ring-mod effects found in synthesizers.

Now try adding some sub-octave effect whilst you raise and lower the ring-mod slider and compare how the presence of the sub-octave changes the sound. At this point you might also play with top boost setting to get a feel for how boosting upper frequencies can change the sound in tandem with sub-octave and ring-mod effects.

SUSTAIN FUZZ

Set the sub-octave and ring-mod sliders back to 0 and top-boost at around 5. Turn the fuzz rise time knob to fast setting. Raising the fuzz level slider you will hear the classic fuzz sound appear instantly each time a string is plucked. Now turn the rise time knob to slower values and repeat. This time you will find the fuzz doesn't appear the instant you pluck the string but rather there is a delay as it 'swells' to its maximum. As the rise time becomes slower, so the fuzz takes longer to reach its maximum after plucking a string. This 'slewing' of fuzz is a striking affect and one that again is a signature effect of the Hi-FLi, being used probably most famously by Steve Hackett in his Genesis days. He described it as a sort of backward guitar type sound. If you experiment with your style of plucking, (e.g. softer plucking and near to the guitar neck), it's possible to reproduce bow-like instrument sounds!

PHASE FILTER IN OPERATION

Having discussed the 'left-hand side' effects **top boost**, **octave shift**, **ring-mod** and **sustain fuzz**, let's move on to a practical discussion of sounds available when signals processed by these effects pass through the Phase Filter.

We will discuss the basic six treatments **vibrato**, **phasing 1**, **phasing 2**, **waa**, **waw** and **meow**.

Vibrato

Set the 4 left hand sliders to values 5, 0, 0, 0 respectively. Switch the control modulation to the first setting, slow sine. Make sure the Growl switch is centre (off) and set mod speed, ramp time, mod depth, frequency shift sliders to 10, 0, 7 and 5. Make sure all pedal switches are centre (off).

Looking at the leds you should see them oscillate slightly in brightness and change their rate and brightness amount as you increase the mod speed and mod depth sliders. Now play a few notes or strum a chord on the guitar. You will hear the classic varying pitch sound of vibrato. Experiment with changing the frequency shift slider. You will hear difference in the vibrato, its amount and tonal qualities as you push the slider away from its central position in either direction. Try switching to fast sine control modulation.

You will notice that in choosing either of these continuous modulation waveforms, the ramp time slider has no effect. This is quite normal because these are continuous waveforms not 'one-shot' re-triggerable types. Speaking of which, try applying the increasing sine waveform  . Set the ramp time to 5 and pluck a string. You will hear the vibrato 'swell' to its maximum after plucking the string. By adjusting the ramp time you will observe a range from very short (0 setting) to much longer times at a setting of 10. Repeat the tests with decaying sine and the two ramp wave modulations. Whilst doing this it's worth spending time playing with adjustments to mod depth, ramp time and frequency shift sliders to appreciate how they change the effect.

Phasing 1

Now let's try out the first phasing effect (not unnatural for a phase filter!).

Set the control modulation to slow sine again, treatment to phasing 1, speed, depth and frequency shift sliders to 5, 5, 5. Now play a chord. You will hear the classic phasing effect as the slow Sine sweeps the phase shift produced by the filter. By adjusting the depth control you'll be able to get very subtle phasing effects through to much deeper heavy phasing. Try altering the frequency shift again. If you think back to the bit of 'theory' we discussed behind the phase filter, the direct shift changes the frequency/phasing relationship. You will hear higher/lower frequency shifts in the phasing as you operate this slider. If you turn the depth to zero and pluck a string and sweep the frequency shift slider from 0 to 10 you will hear the sound volume periodically go quieter and then louder as you move the slider. This goes back to the graphic in Fig. 9 earlier. If you listen carefully you might be able to count that there are 6 places where the sounds hits a quite spot as you move the slider from 0 to 10 as the theory explained.

Try further experiments switching the control modulation to the other modulation waveforms and adjusting depth/frequency shift etc sliders and listening to the way they change the effect.

Phasing 2

Phasing 2 is similar to phasing 1 but the effect involves a greater proportion of lower harmonics in the phasing process. Go through the same tests as above and compare it with phasing 1.

Waa

Like vibrato, this is another example of a phase filter being able to produce 'non-phasing' like effects, in this case the 'waa' sound.

To demo this, switch the control modulation to slow sine, mod speed to 5, mod depth to 4 and treatment to 'waa'. You will have to experiment with the frequency shift slider a little to get the classic waa swept resonant peak sound. Usually it's better to have the slider away from central value 5, it depends on the value you set for the depth slider. Experiment is required here, but you should soon be able to produce classic auto-waa sounds as you play chords or single notes. Try switching to increasing/decreasing sine as modulation and adjust the ramp time. This gives really great delayed auto-waa sounds. The up/down ramps will generate swept waa sounds which are also very striking. You'll need to adjust the frequency shift/ mod depth slider combination to get long sweeps through the frequency range.

Waw

Back to another (new) phasing effect, 'waw'. Set the control modulation to slow sine again, treatment to 'waw', speed, depth and frequency shift sliders to 5, 5, 5. Now play a chord. You will hear a new phasing effect. As for phasing 1, the slow Sine sweeps the phase shifting produced by the filter, to produce the classic phasing effect. But since in this configuration the filter also acts as band-pass filter (with 6 resonant peaks) and that some of the original audio signal is being also fed into the control modulation of the filter you will hear a strikingly different effect compared to just phasing 1 or 2. The result is best described as phasing but with simultaneous sweeping of the 6 resonant peaks. The result is a unique sound effect. Many subtle differences in the effect can be achieved by adjusting the frequency shift slider (which changes the position in frequency 'space' of all 6 peaks) and the mod depth level. Some almost defy description. A sort of 'watery'/ phasing/vibrato is perhaps one attempt!

As an aside. Dave Gilmour was a well known owner/user of the first Hi-FLi prototype E.M.S. put out. It was used at some point during the Abbey Road sessions when Pink Floyd recorded Dark Side of the Moon in 1972/3. Although it has not been documented what tracks the Hi-FLi was used on, to my ears it seems the lead guitar in 'Any Colour You Like' is reproducible by using the 'waw' treatment, reasonably fast modulating sine wave (try fast Sine or

increasing Sine waveform) with the possible addition of some ring-mod and fuzz (and suitable top boos setting). You can try this as an experiment yourself. You'll need to play around with frequency shift and your guitar tone controls. Now whether this was how that lead sound was produced, who knows! What is true is that many PF fans have tried to reproduce the 'watery' phasing/vibrato sound on this lead with various classic pedals without real success. It has also been suggested the auto-waa overdubs on this track are also from the Hi-FLi.

Meow

Although the signal path through the Phase Filter is the same for this effect as for 'waw', there is a crucial difference between how the control modulation is applied to the filter. Recall from our discussion earlier, in the case of 'meow' instead of the 6 resonant peaks on the band-pass all moving in unison (as in waw) when modulation is applied, two pairs of 3 peaks move in opposite directions! The result is very striking. Set the control modulation to slow sine again, treatment to 'meow', speed, depth and frequency shift sliders to 5, 2 and 8. Now play a chord or pluck single notes. You will hear the 3 peaks crossing each other if you tweak the frequency shift/depth sliders. As they do so an amazing vocal/phonetic like sound emerges! It sometimes takes subtle adjustments to the sliders but once you discover it you will know. Explore other frequency regions of this effect by changing the frequency shift (especially at the extreme ends of the scale around 0 or 10) and depth levels. Try all the different control modulations as you do this.

Growl

Finally there is the Growl effect. This was an added feature found on so called 'mk2' Hi-FLi's released by E.M.S in the 1970's.

As mentioned in the overview section earlier, Growl is effectively a modulation waveform applied to the Phase Filter with its origin derived from a square wave 2 and 3 octaves below the fundamental of a plucked string. The way the octave dropped square wave is applied to the Filter means it only functions when one of the 4 sine wave based control modulation waveforms is chose. Choosing up/down ramps, the Growl switch has no effect. Growl will work with any of the 6 Filter treatment types.

The Growl effect switch is a 3-way slide type. In the centre it is off. In the down position the modulating square wave is 3 octaves below fundamental. In the up

position it is 2 octaves below. The level of Growl is controlled by the modulation depth slider. If this slider is at 0, no Growl modulation is applied.

Set the control modulation to slow sine again, treatment to 'vibrato' and frequency shift sliders to 5. The speed and ramp time sliders values are not important.

Set the Growl switch to the up position. Pluck a string with the depth slider at 0. A clean sound will be heard. Now start moving the depth slider slowly upwards and demo how the sound changes. Distinct 'synthesizer' like tones will be heard with level increasing as you raise the depth slider. Indeed as you will discover, the Growl switch produces the most 'synthetic' or alien sounds on the Hi-FLi!

Try plucking different notes on the guitar. You will hear that the frequency of the Filter modulation increases with increasing pitches you play.

Now repeat the above but with Growl switch down. Now the modulation is coming from a square wave some 3 octaves down from the note you pluck on the guitar!

You might notice that the mod speed slider has no effect over the speed of the Growl modulation. This is as it should be. The frequency of the sub-sub-octaves that are being applied to the filter in Growl mode track the pitch of the notes you pluck. However the ramp time does have an effect. Switch the control modulation to either increasing or decreasing sine setting. Now if you adjust the ramp speed slider you will discover that the amount of Growl 'tracks' the amplitude of the increasing/decreasing sine waveform. So if you set a long ramp time and choose increasing sine, then on plucking a string the Growl amplitude slowly builds up with the amplitude of the sine wave. Choosing faster ramp times will make the Growl effect kick-in faster after you sound a note.

Envelope and Fuzz bypass switch

This switch, located below the main mixer slider, allows audio input to completely bypass the left hand effects and envelope follower and go straight into the phase filter. Thus it provides a totally 'clean' signal directly into the Phase Filter. In the normal position the audio input goes through all the effects section on the left hand side of the Hi-FLi before entering the Filter. Even with all the slider set to zero there may still be 'colouration' of the audio as it is still

passing through a lot of circuitry. In the envelope and fuzz bypass setting of the switch, totally clean (fully bypassed) audio enters the Filter.

This setting is useful if you want to process other signals (e.g. synthesizer sounds, voice, other instruments) with the Phase Filter. In this mode the triggering of the one-shot modulation may not be so important. However as an additional feature, part of the audio input signal is still diverted to the attack/decay detector inside the Hi-FLi. This does not add any colouration at all the audio input to the Phase Filter as that comes directly from the preamp in the pedal unit. This feature is useful because it means that for audio sounds with sufficient attack envelopes (guitar, certain synthesizer sounds) the control modulation waveforms can be triggered just as in 'normal' mode. Try experimenting with different sound sources.

Note: in envelope/fuzz bypass mode the volume of the audio signal into the Phase Filter is higher compared to the 'normal' setting, so some adjustment to audio input level may be necessary.

Using the Pedal Unit

All our discussions above concerning the practical use of the Hi-FLi involved changing the 8 effects sliders by hand. A remarkable feature of the Hi-FLi design is that all the effects are voltage controlled and that such voltages can be produced by the left and right pedals. A moments' thought will make you realize what a brilliant idea this is! Basically below each of the 8 effects sliders is a 3-way pedal voltage slide switch. In the centre position, the pedal voltage is off. In either of the other two settings the pedal voltage will control the effect. Both pedals produce a voltage that swings between +/-5V as the pedal is operated from full 'down' to full 'up'. It should be clear that the 8 effects are split into two groups of 4, with top boost, octave shift, ring mod and fuzz level being controlled by the left pedal and the 4 Phase Filter parameters mod speed, mod ramp time, mod depth and frequency shift controlled by the right pedal.

On any effect with pedal voltage engaged, the effect is controlled by the sum of the pedal voltage AND the voltage produced by the slider. When the pedal is in the horizontal position, its control voltage output is near 0. In this case the voltage controlling the effect is purely from the slider. So you can think of the slider as setting the effect level when the pedal is horizontal.

To test out the pedals and get a feel for their operation, just work through each effect one at a time with the corresponding pedal switch in either the '+' or '-'

setting and all the other pedal switches in the 'o' off setting. It's worth also adjusting the position of the slider to see how this affects the response of the footpedal. After this you can then start experimenting deeper by engaging the pedal switches on several effects at the same time so that now operating the pedal (left or right) will control several effects at once.

Different combinations of pedal switches set to '+' or '–'with several effects being simultaneously controlled will produce a vast number of new effects.

Processing other Instrument Sounds

The Hi-FLi was probably primarily developed for guitar and so naturally our focus far has been on the use of the Hi-FLi as a guitar sound processor. However in the original flyer that E.M.S. put out at the time of the Hi-FLi launch in the 1970's it is mentioned that the unit can also process organ, miked sounds, wind and string instruments as well as voice and recorded music. Indeed historically speaking it's very likely that the Hi-FLi has been used as much as a production tool to process these other kinds of sounds as it has for guitar. So in this section we will discuss using the Hi-FLi to process 'non-guitar' sounds.

Basically in processing any sound with the Hi-FLi the main thing to consider first is the nature of the 'attack' envelope of the untreated sound. From our earlier discussions you will recall this is relevant to the attack/decay detector circuitry in the Hi-FLi which triggers the four one-shot modulation waveforms in the Phase Filter section. If the sound to be processed has a reasonably fast attack envelope then by adjusting the amount of pre-amp gain and experimenting with the solo/strum switch settings it will be possible to correctly trigger these waveforms. In this case all features of the Hi-FLi are available to treat the sound. Obvious examples would be punchy synthesizer lead sounds and drums. Other sounds such as vocals, bowed and wind instruments, etc might also trigger correctly.

You then have the choice of processing such sounds through the full complement of effects or, via the envelope and fuzz bypass switch, through just the Phase Filter section. The latter option is good if you want to pre-treat the sound with other external effects before Phase Filter treatment.

Traditionally one might think that effects such as sub-octave and fuzz are best used only on guitar sounds. But you will soon find by experimenting with different non-guitar sources that all four of the left-hand effects on the H-FLi

can produce some powerful sound-shaping when combined with the Phase Filter. Depending on the level settings chosen for these effects, a vast range of sonic variations can be produced from very subtle tonal colouration and spatial changes through to completely wild and alien sounds in which recognition of the original sound is lost completely!

Some good examples to try are processing synth lead sounds. A square wave bass lead from e.g. a TB303 when processed through the Hi-FLi can produce amazing sounds even when the 303 filter isn't really pushed to resonance. Adding sub-octave and ring-mod will produce growling/dirty overtones as will fuzz. Passing this through e.g. the Waa treatment in the Phase Filter with say up or down ramp modulation triggered by the 303 bass notes will then produced swept filtering of each note. You'll need to adjust the ramp time to get the filter sweeping on each note as this will depend on the tempo of the 303 bass.

Even if the attack envelope of the original sound is not sufficiently fast to trigger the one-shot modulation waveforms, this still leaves the slow and fast Sine wave as a source of Phase Filter modulations and of course the Growl option which in any case only works when these two waveforms are chosen. Therefore a significant pallet of sound processing is still possible.

The bottom line is that the Hi-FLi really does encourage the user to experiment with any sound source and not just guitar. It has potential in the area of instrument/voice/sound processing and as a versatile production tool.

As mentioned earlier, it's likely the Hi-FLi has probably been used by many as a processor of non-guitar sounds as much as for guitar. A good example is the band Cabaret Voltaire. Their early industrial sounds (for example on the work Methodology '74/'78: Attic Tapes) used the Hi-FLi to process many different instruments. As band member Richard Kirk says 'there are some effects you can get by putting other instruments through it that are just impossible with today's synths."

This brings us to the end of our practical tour of the individual Hi-FLi effects.

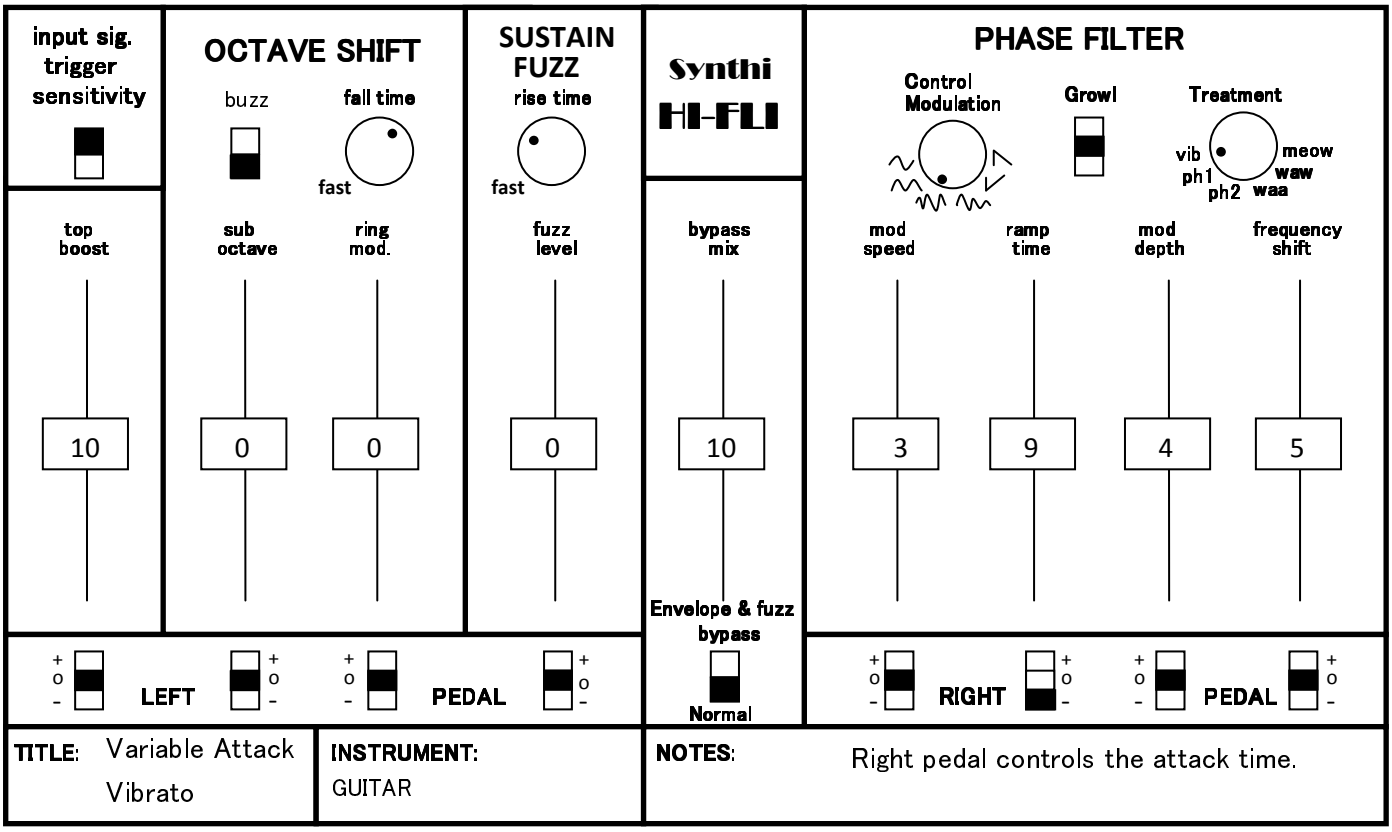
What should hopefully be clear to you by now is the vast sound processing capability of the Hi-FLi when you combine all the effects together. If you repeat the various Phase Filter practical experiments discussed above but this time 'pre-treating' the sound before it enters the Filter by adding varying amounts of top boost/sub-octave/ring-mod and fuzz effects you will realize the huge potential of the Hi-FLi. Adding any of the latter will produce a remarkable diversity of sounds. It would be impossible to even describe them

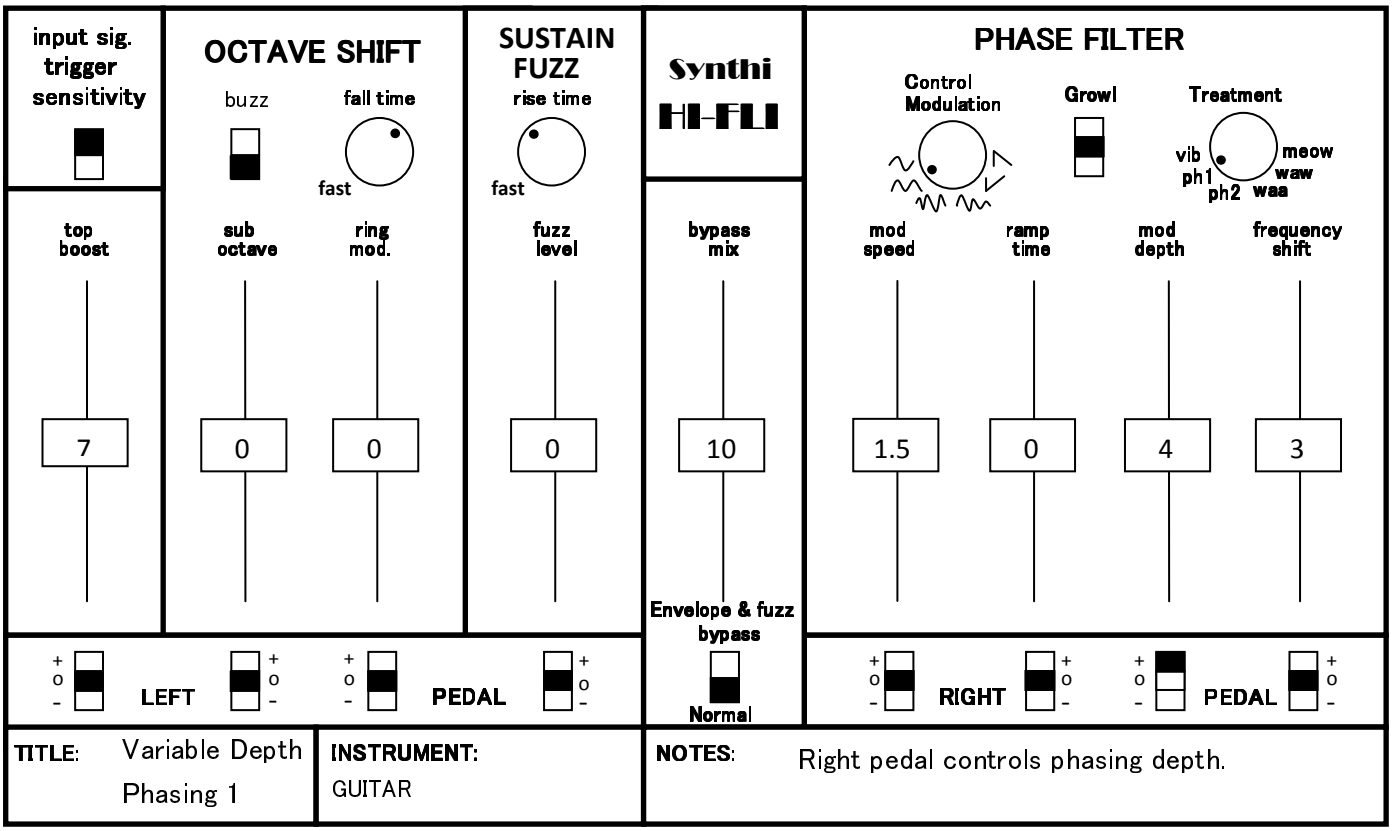
all here! Instead a set of 10 example dopesheets is listed below which offer just a small taste of what is possible.

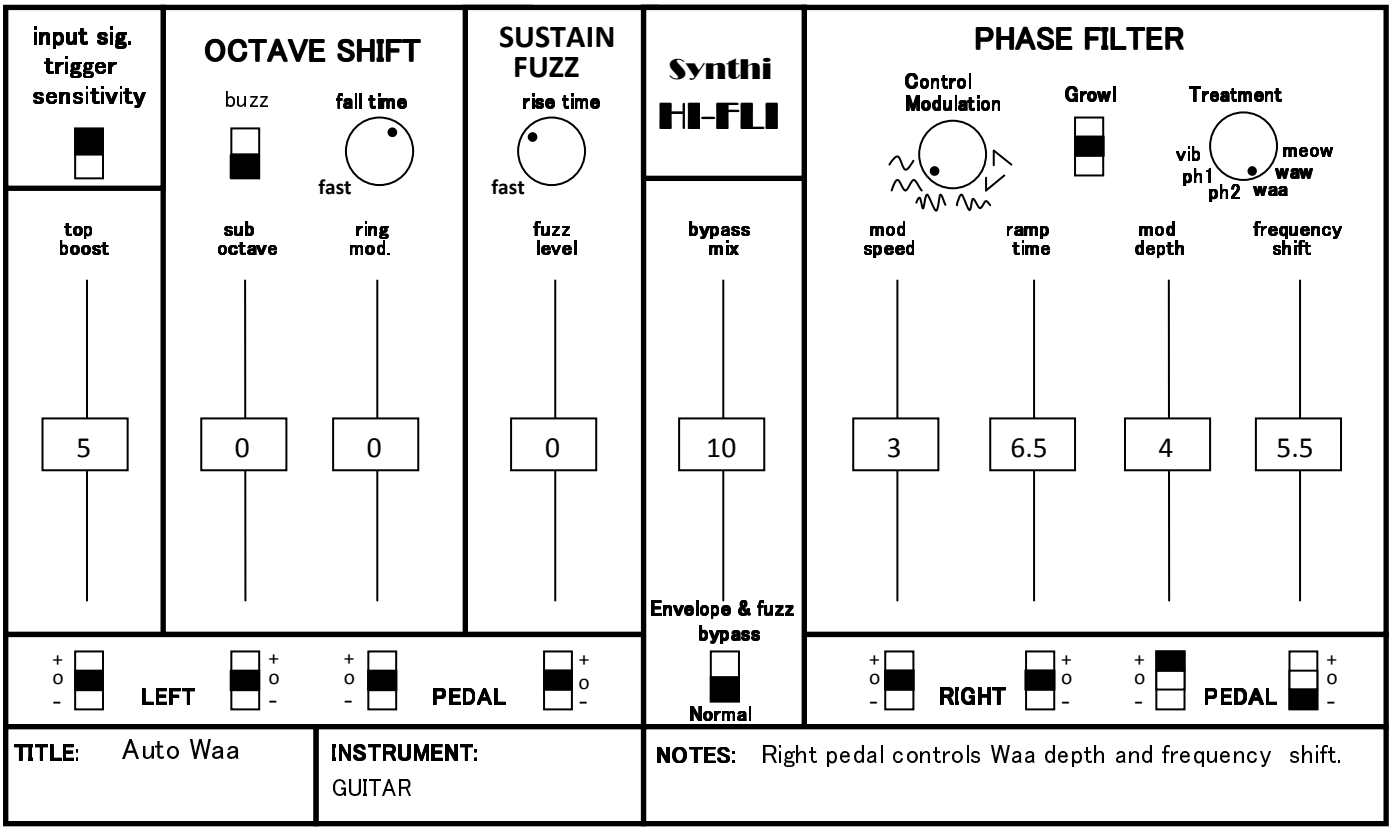
The Hi-FLi is a very very 'deep' effects unit and experimentation with changing all the various parameters via sliders, switches, knobs and pedals is a must. Doing so you will discover new sounds pretty much each and every time which is the best compliment one can make to this unique box.

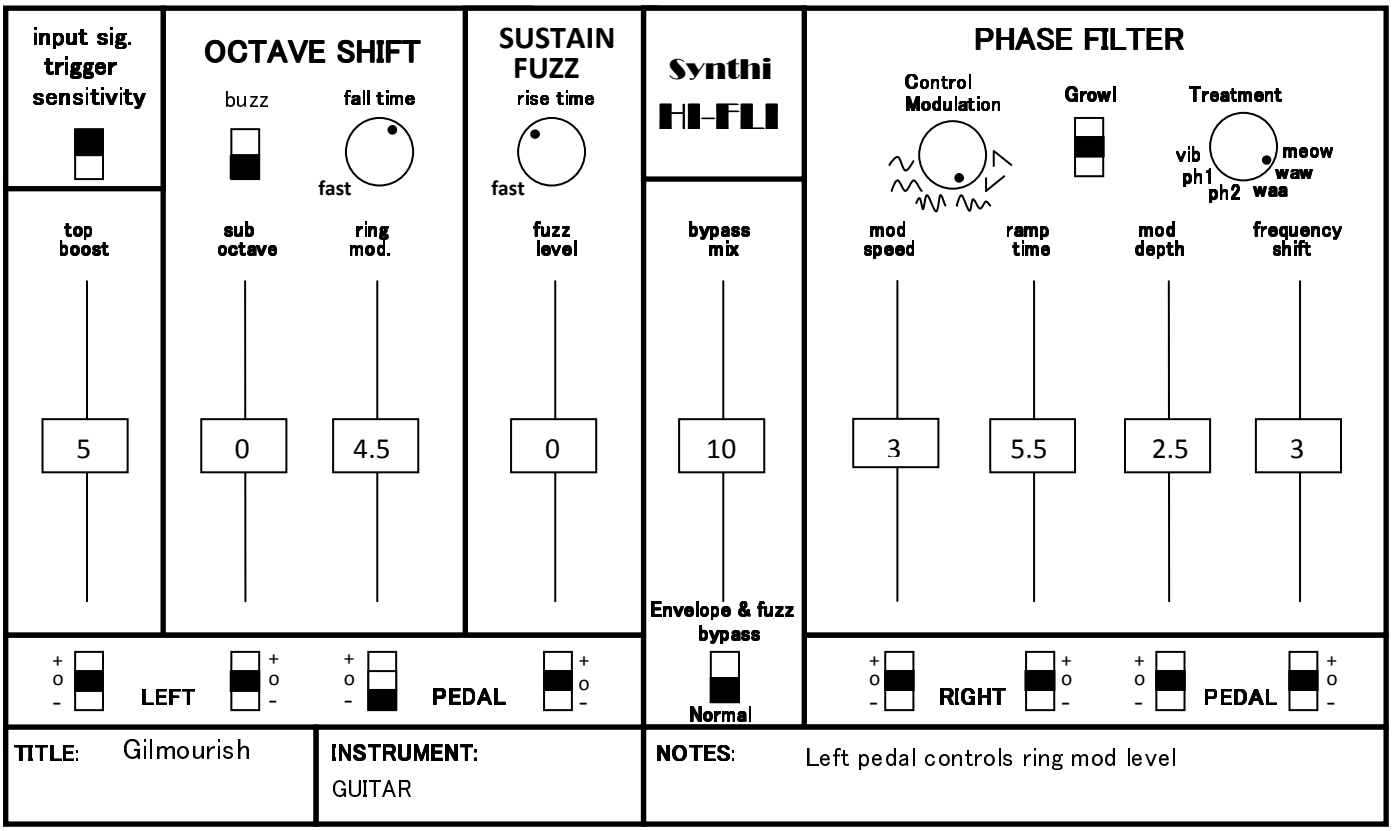
EXAMPLE DOPESHEETS

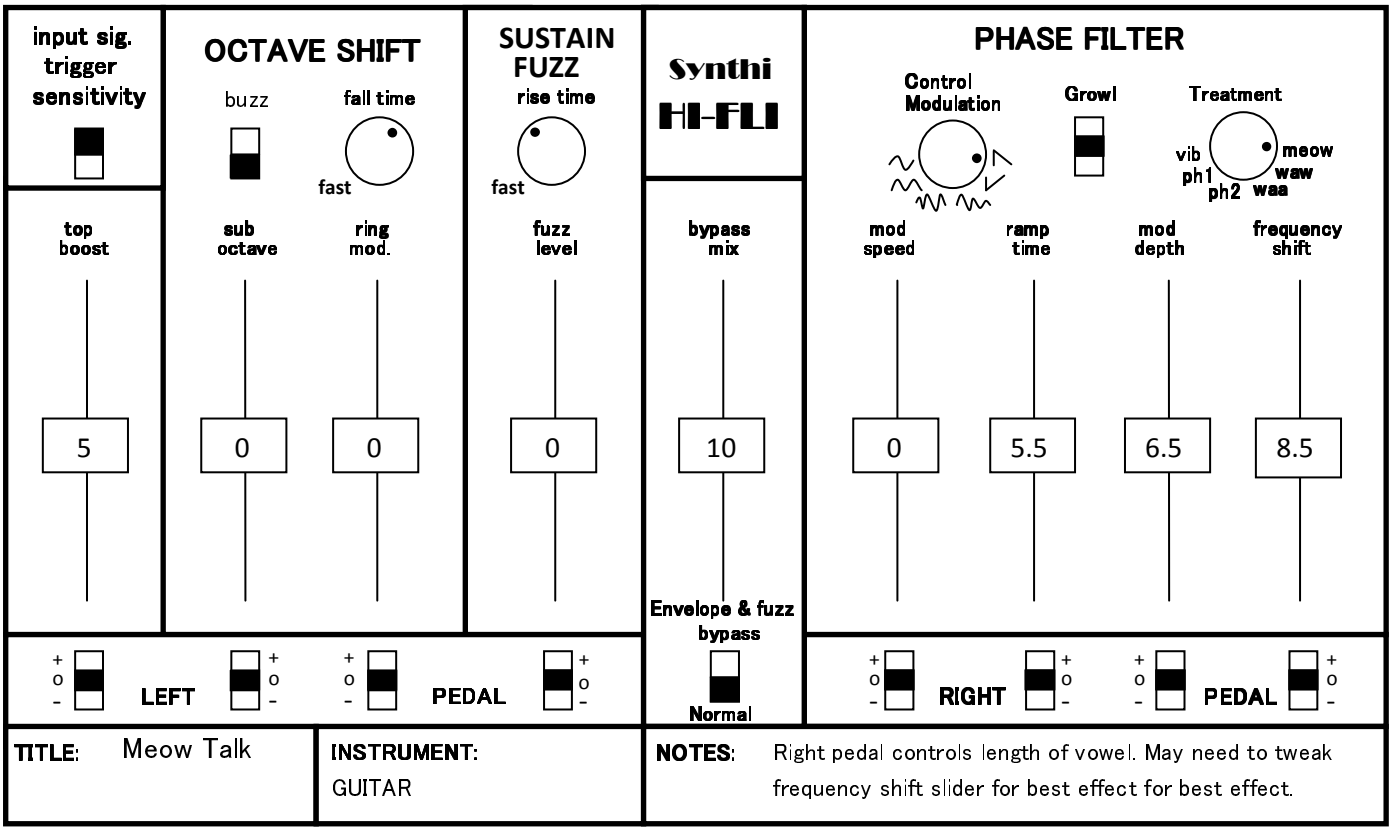
Here are some 'dopesheets' ('patchcards' on which all the various slider/switch/knob settings and other information can be recorded of any particular patch you want to set-up again). Dopesheets are a very useful way of recording your own newly discovered cool sounds on the Hi-FLi and they make it easy to quickly set up the patch again. Blank dopesheets are included at the end of the examples below for your own use. A pdf version, so you can print multiple copies off, can be downloaded from the Digitana Electronics website at http://www.synthi.co.uk.

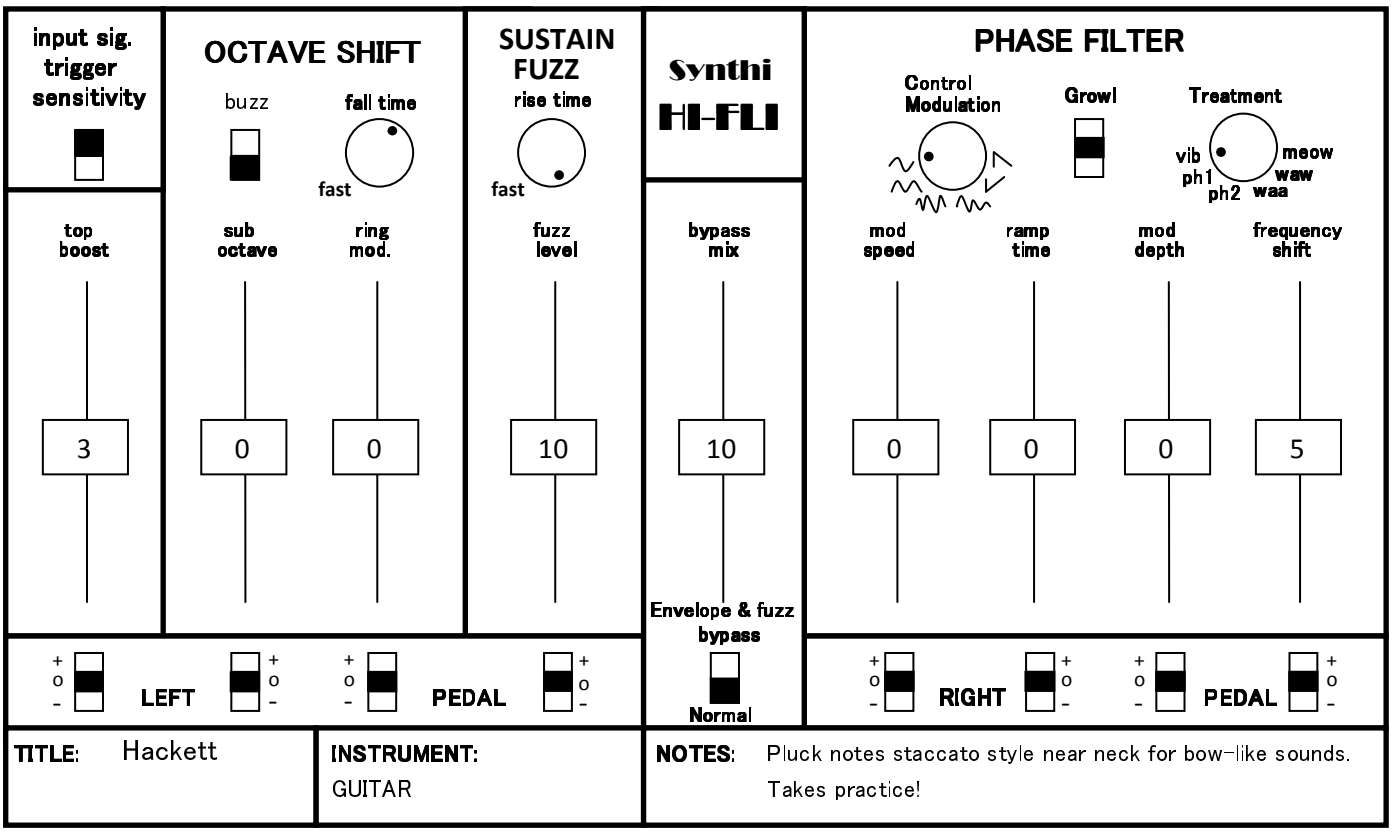

input sig. trigger sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN FUZZ
rise time
fast
Synthi HI-FLI
PHASE FILTER
Control Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top boost
sub octave
ring mod.
fuzz level
bypass mix
mod speed
ramp time
mod depth
frequency shift
10
0
0
0
10
3
9
4
5
Envelope & fuzz bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE: Variable Attack Vibrato
INSTRUMENT: GUITAR
NOTES: Right pedal controls the attack time.

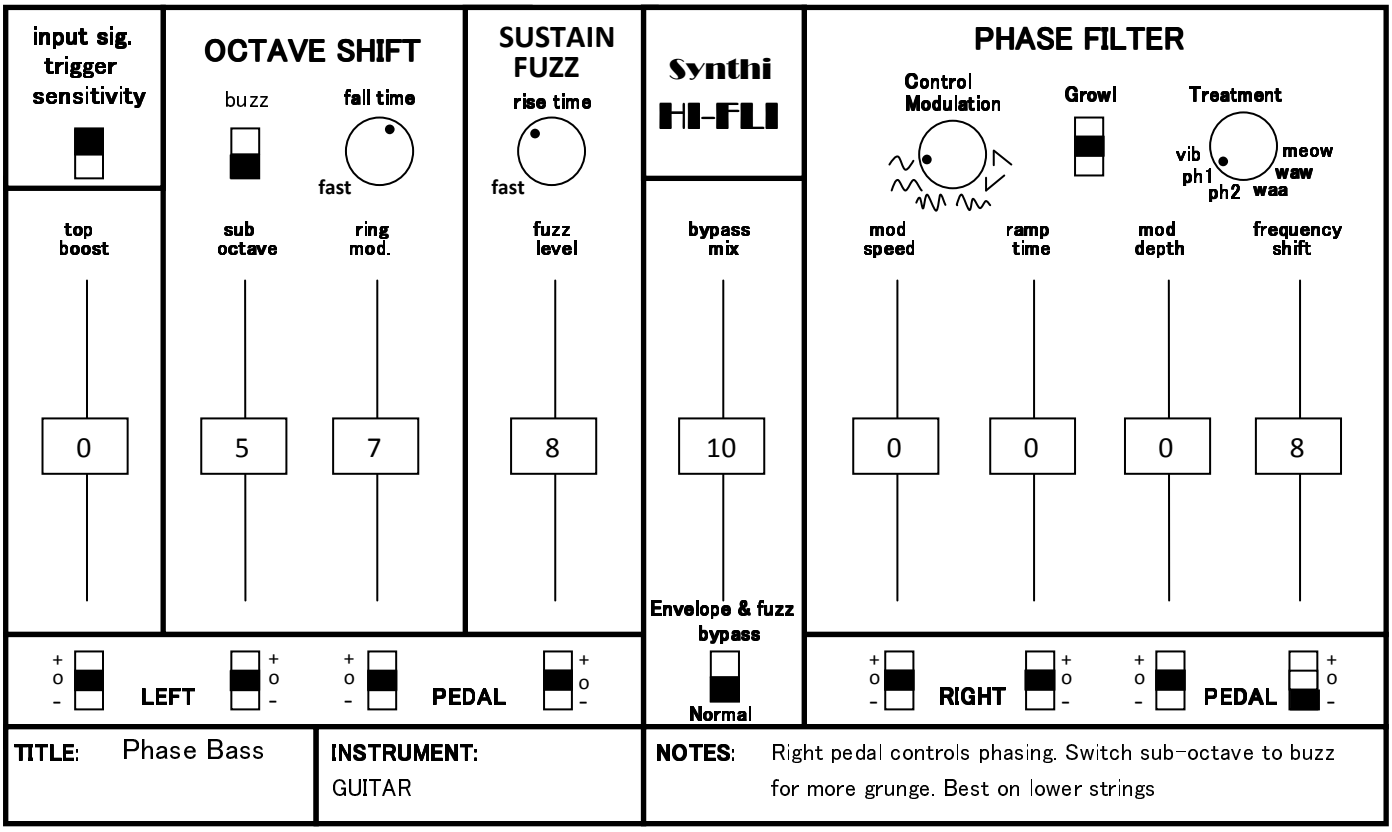

input sig. trigger sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN FUZZ
rise time
fast
Synthi HI-FLI
PHASE FILTER
Control Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top boost
sub octave
ring mod.
fuzz level
bypass mix
mod speed
ramp time
mod depth
frequency shift
7
0
0
0
10
1.5
0
4
3
Envelope & fuzz bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE: Variable Depth Phasing 1
INSTRUMENT: GUITAR
NOTES: Right pedal controls phasing depth.


input sig. trigger sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN FUZZ
rise time
fast
Synthi HI-FLI
PHASE FILTER
Control Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top boost
sub octave
ring mod.
fuzz level
bypass mix
mod speed
ramp time
mod depth
frequency shift
5
0
0
0
10
3
6.5
4
5.5
Envelope & fuzz bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE: Auto Waa
INSTRUMENT: GUITAR
NOTES: Right pedal controls Waa depth and frequency shift.


input sig. trigger sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN FUZZ
rise time
fast
Synthi HI-FLI
PHASE FILTER
Control Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top boost
sub octave
ring mod.
fuzz level
bypass mix
mod speed
ramp time
mod depth
frequency shift
5
0
4.5
0
10
3
5.5
2.5
3
Envelope & fuzz bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE: Gilmourish
INSTRUMENT: GUITAR
NOTES: Left pedal controls ring mod level


input sig. trigger sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN FUZZ
rise time
fast
Synthi HI-FLI
PHASE FILTER
Control Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top boost
sub octave
ring mod.
fuzz level
bypass mix
mod speed
ramp time
mod depth
frequency shift
5
0
0
0
10
0
5.5
6.5
8.5
Envelope & fuzz bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE: Meow Talk
INSTRUMENT: GUITAR
NOTES: Right pedal controls length of vowel. May need to tweak frequency shift slider for best effect for best effect.

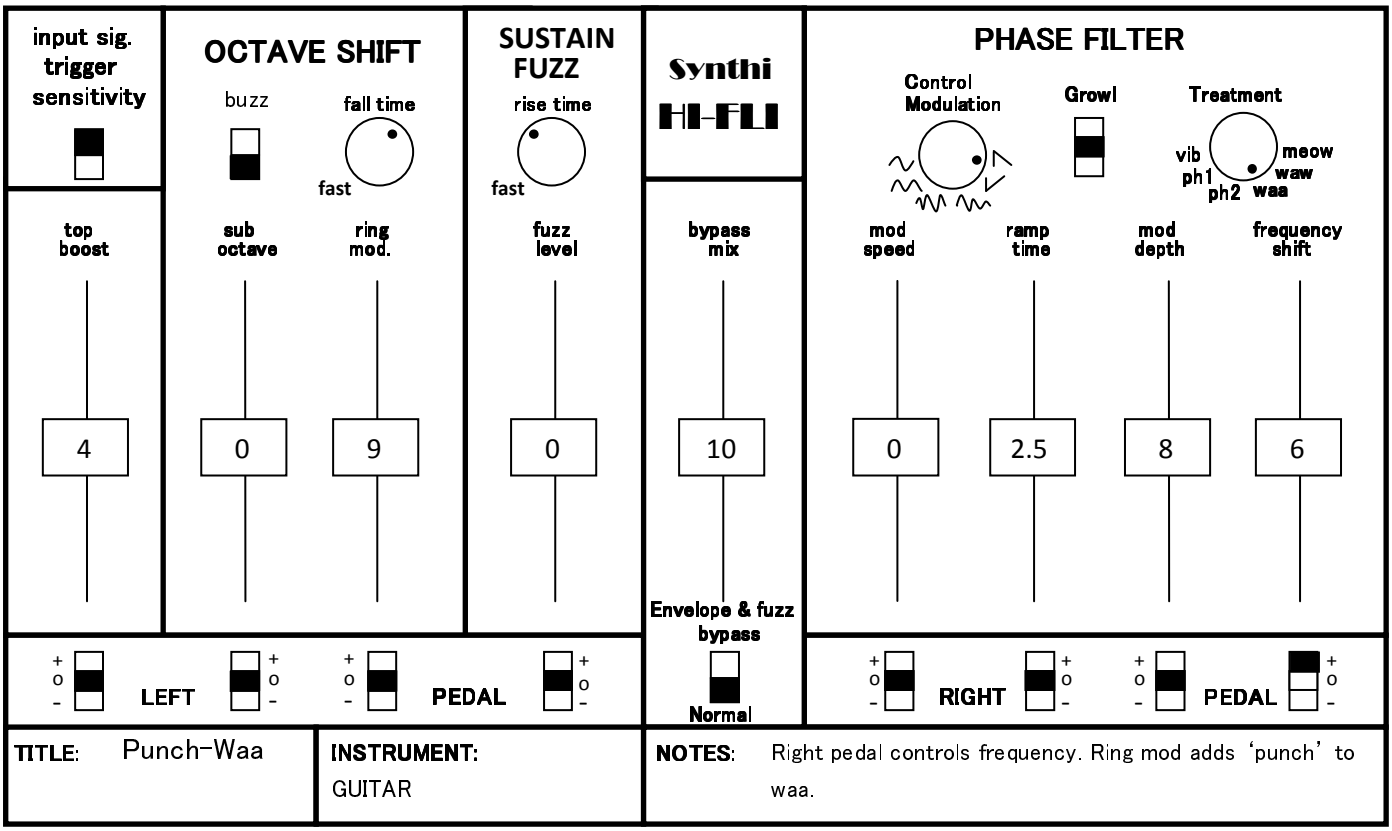

input sig. trigger sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN FUZZ
rise time
fast
Synthi HI-FLI
PHASE FILTER
Control Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top boost
sub octave
ring mod.
fuzz level
bypass mix
mod speed
ramp time
mod depth
frequency shift
3
0
0
10
10
0
0
0
5
Envelope & fuzz bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE: Hackett
INSTRUMENT: GUITAR
NOTES: Pluck notes staccato style near neck for bow-like sounds. Takes practice!



TITLE: Phase Bass

INSTRUMENT: GUITAR

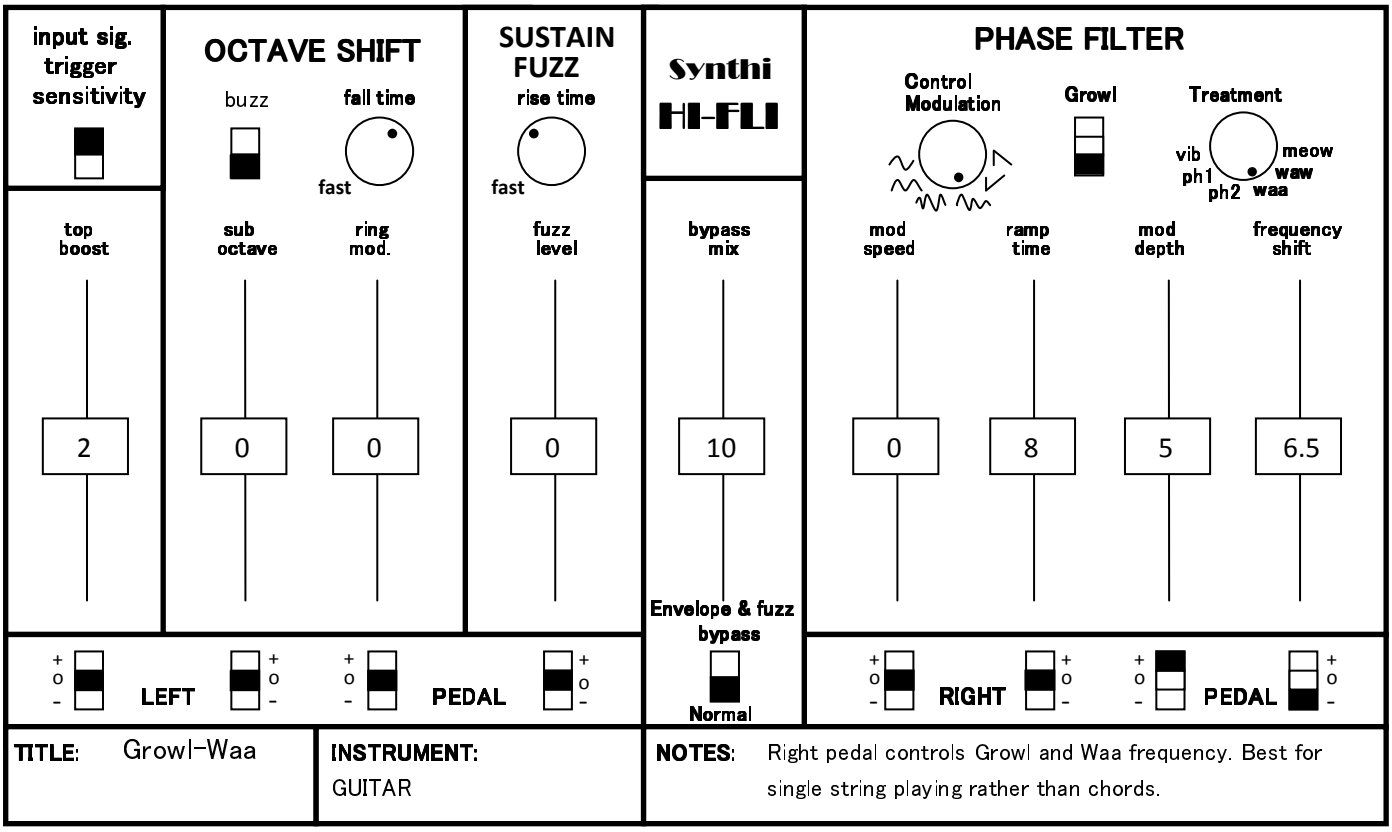
NOTES: Right pedal controls phasing. Switch sub-octave to buzz for more grunge. Best on lower strings

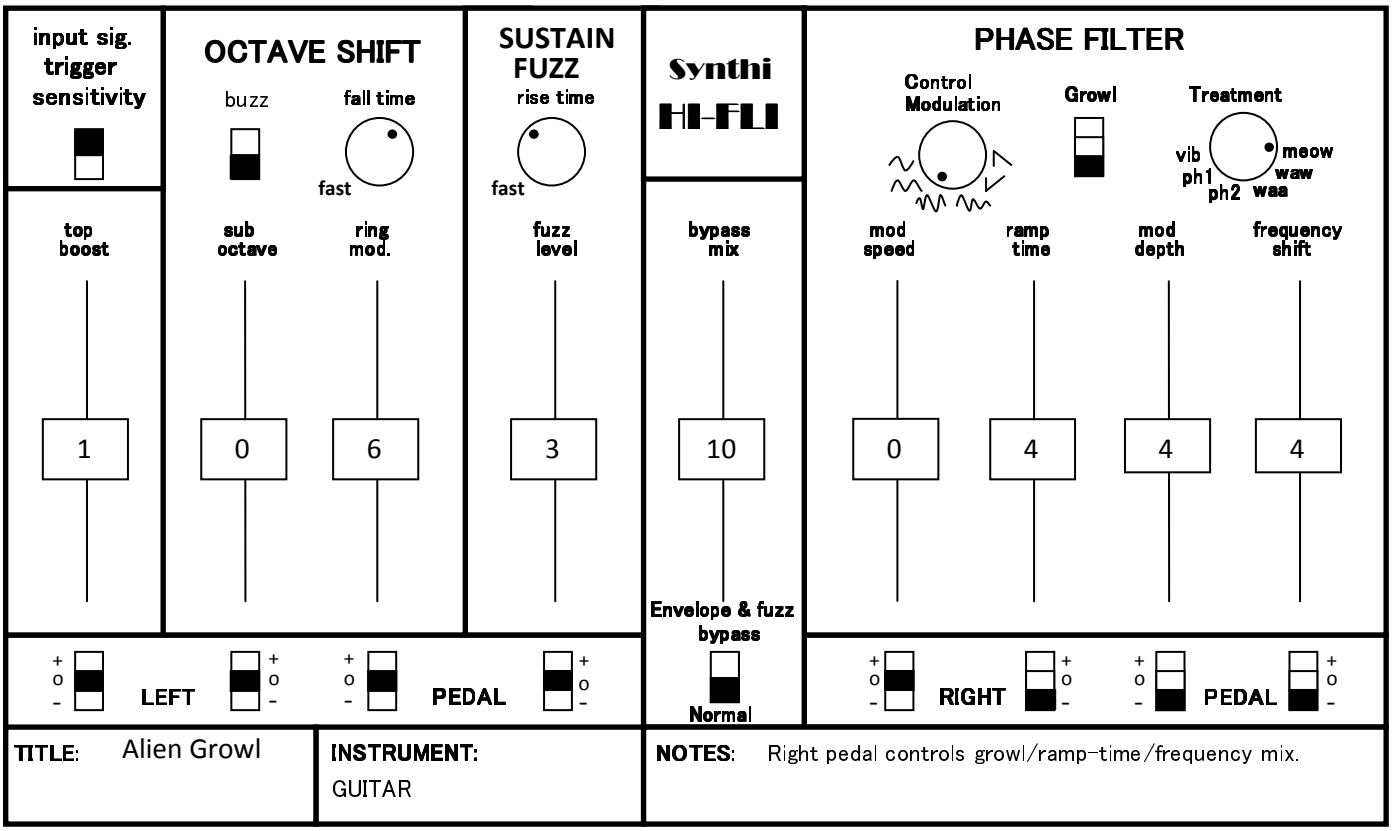


TITLE: Punch-Waa

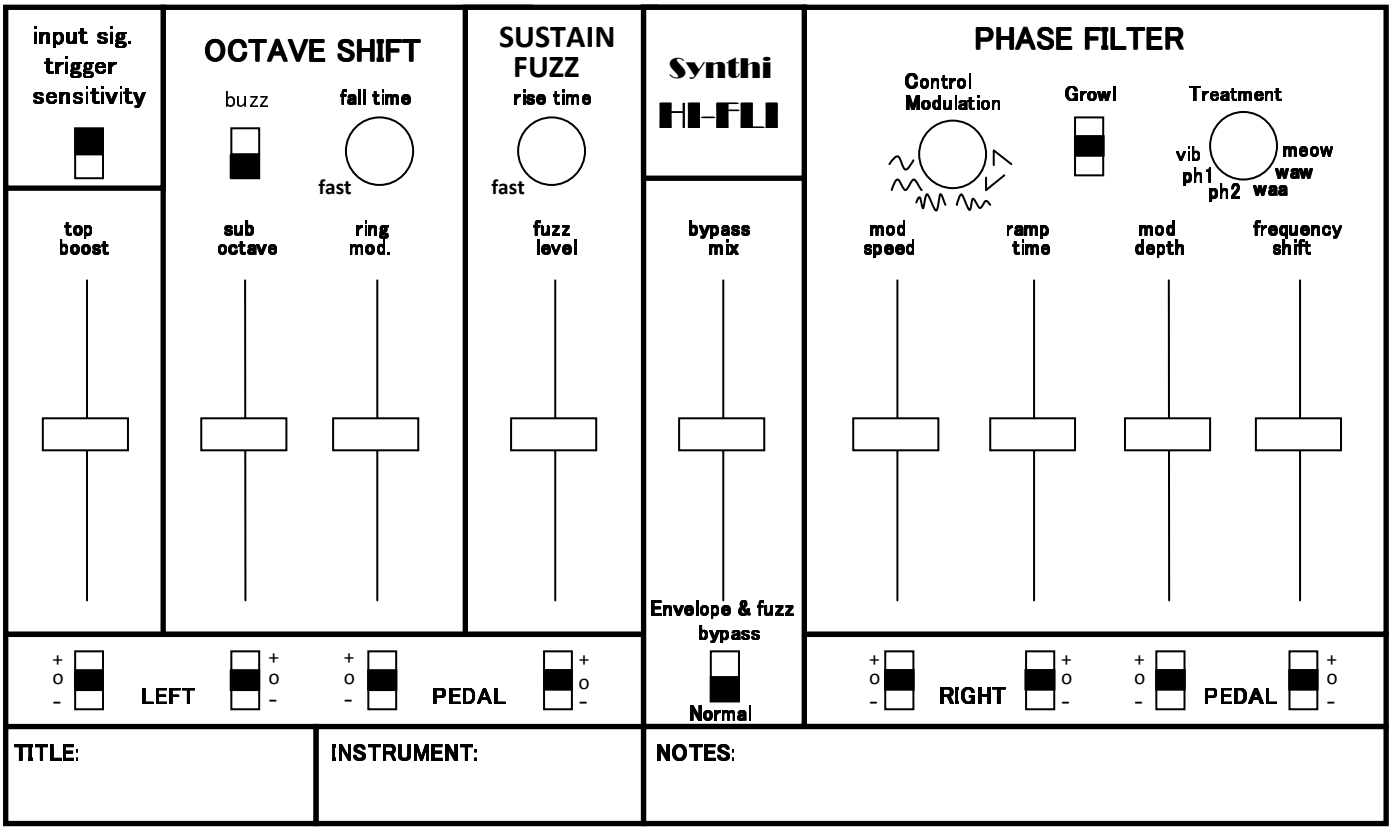
INSTRUMENT: GUITAR

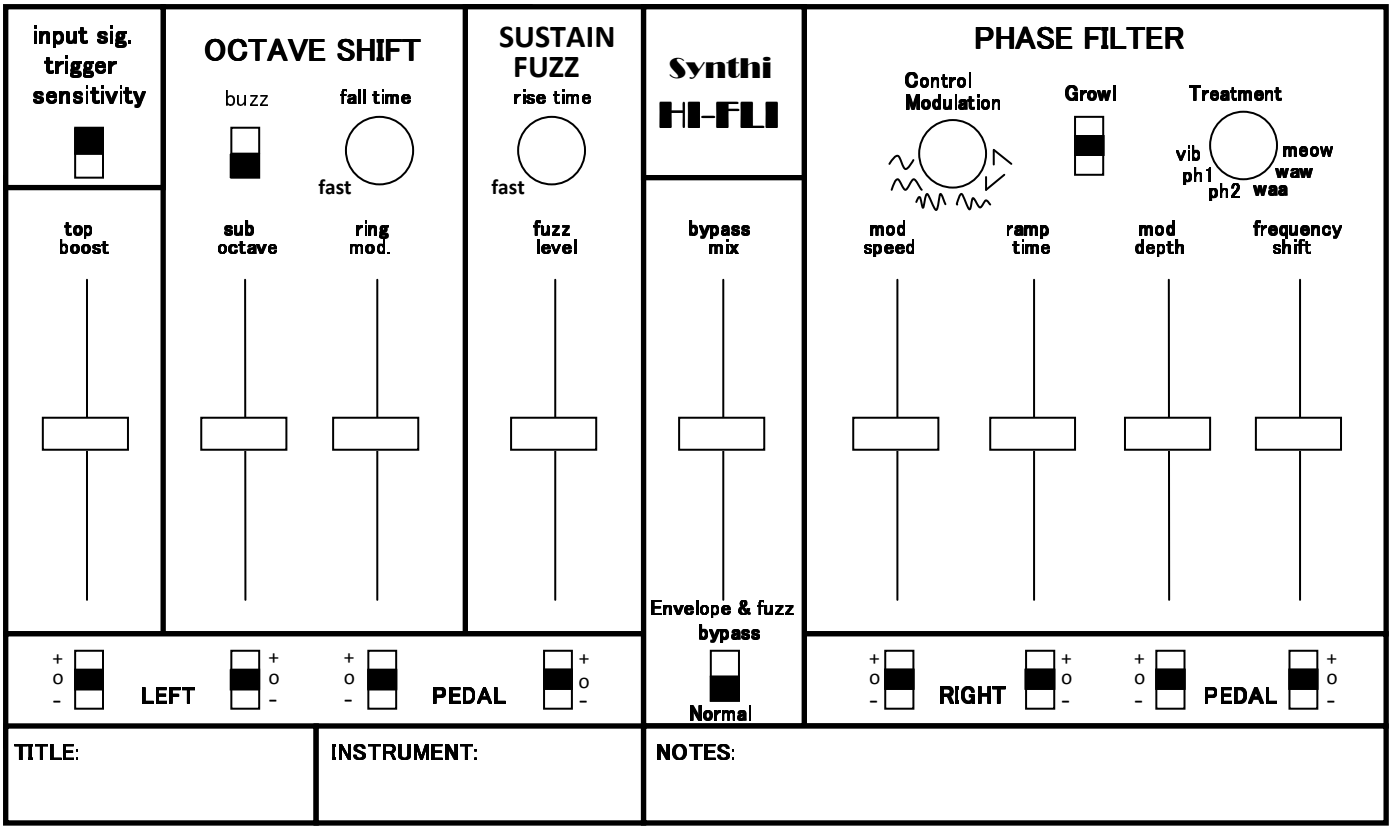
NOTES: Right pedal controls frequency. Ring mod adds 'punch' to waa.

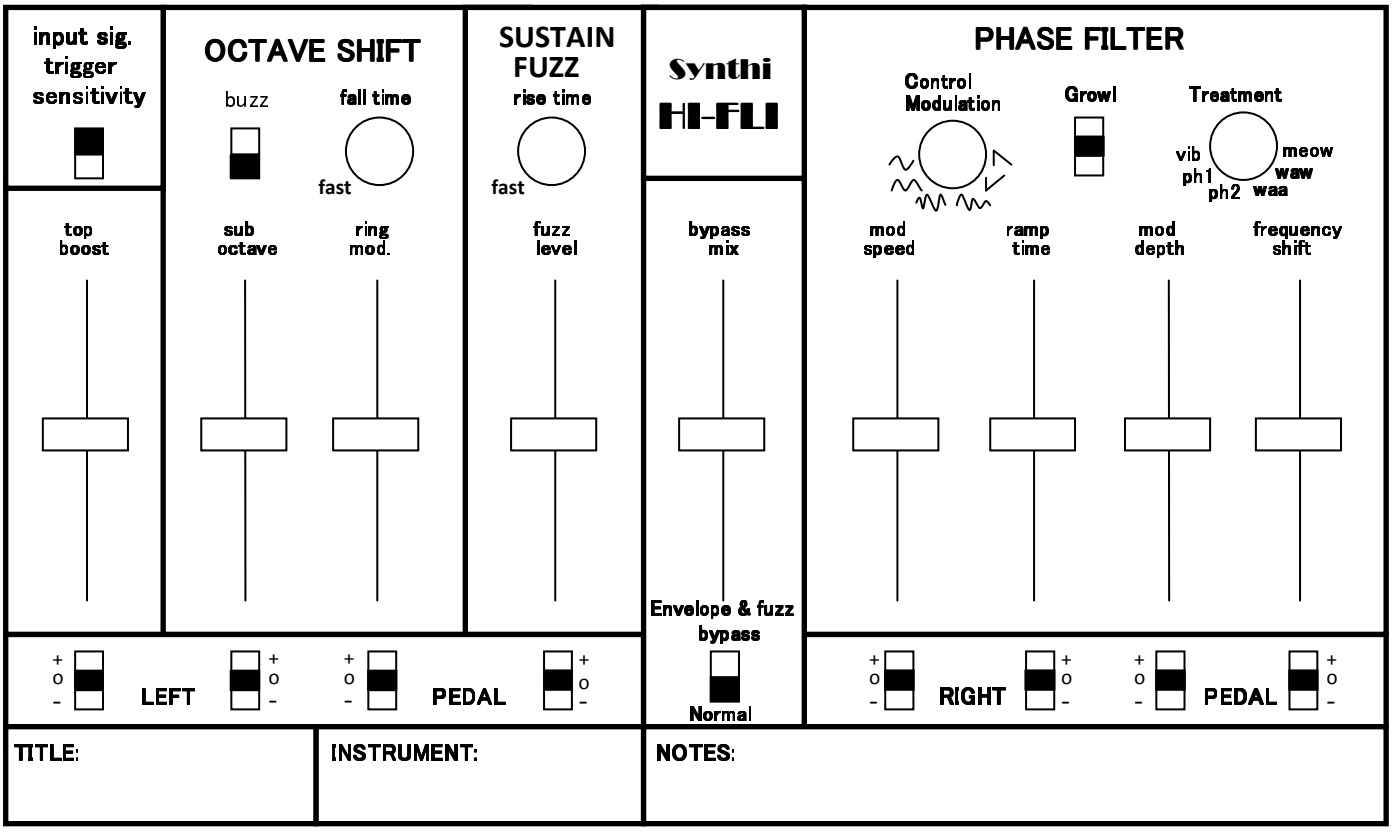

input sig. trigger sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN FUZZ
rise time
fast
Synthi HI-FLI
PHASE FILTER
Control Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top boost
sub octave
ring mod.
fuzz level
bypass mix
mod speed
ramp time
mod depth
frequency shift
2
0
0
0
10
0
8
5
6.5
Envelope & fuzz bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE: Growl-Waa
INSTRUMENT: GUITAR
NOTES: Right pedal controls Growl and Waa frequency. Best for single string playing rather than chords.

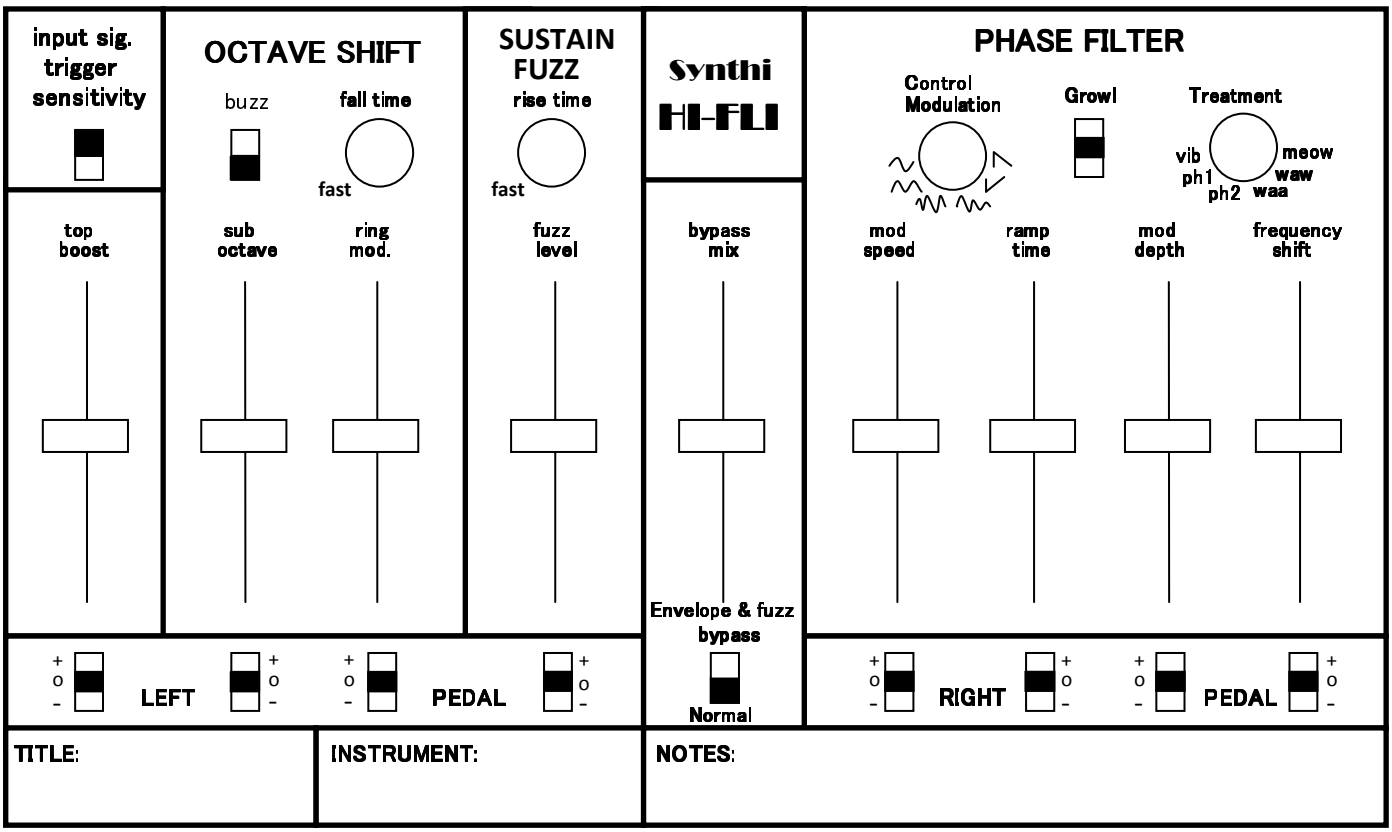

input sig. trigger sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN FUZZ
rise time
fast
Synthi HI-FLI
PHASE FILTER
Control Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top boost
sub octave
ring mod.
fuzz level
bypass mix
mod speed
ramp time
mod depth
frequency shift
1
0
6
3
10
0
4
4
4
Envelope & fuzz bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE: Alien Growl
INSTRUMENT: GUITAR
NOTES: Right pedal controls growl/ramp-time/frequency mix.

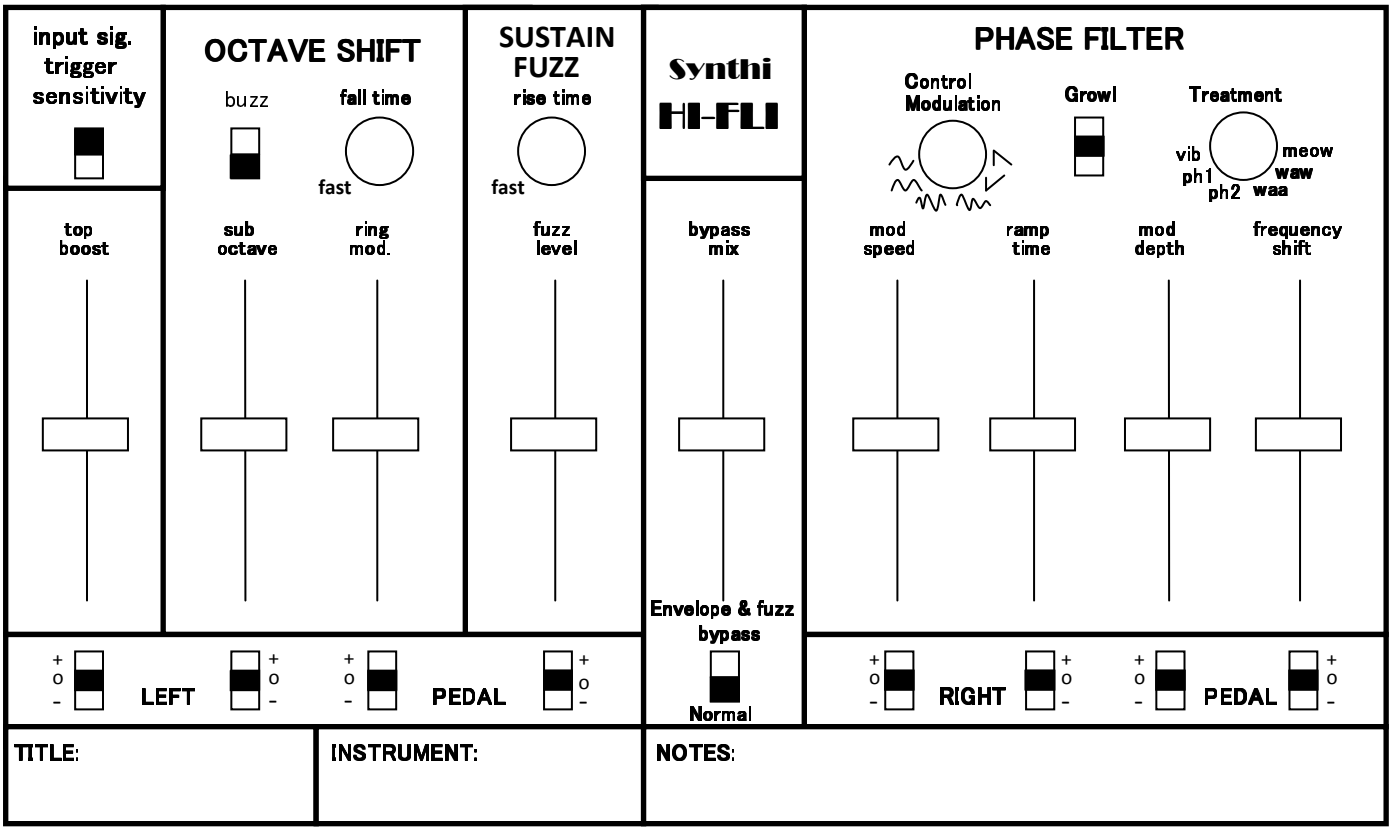
Blank Dope Sheets

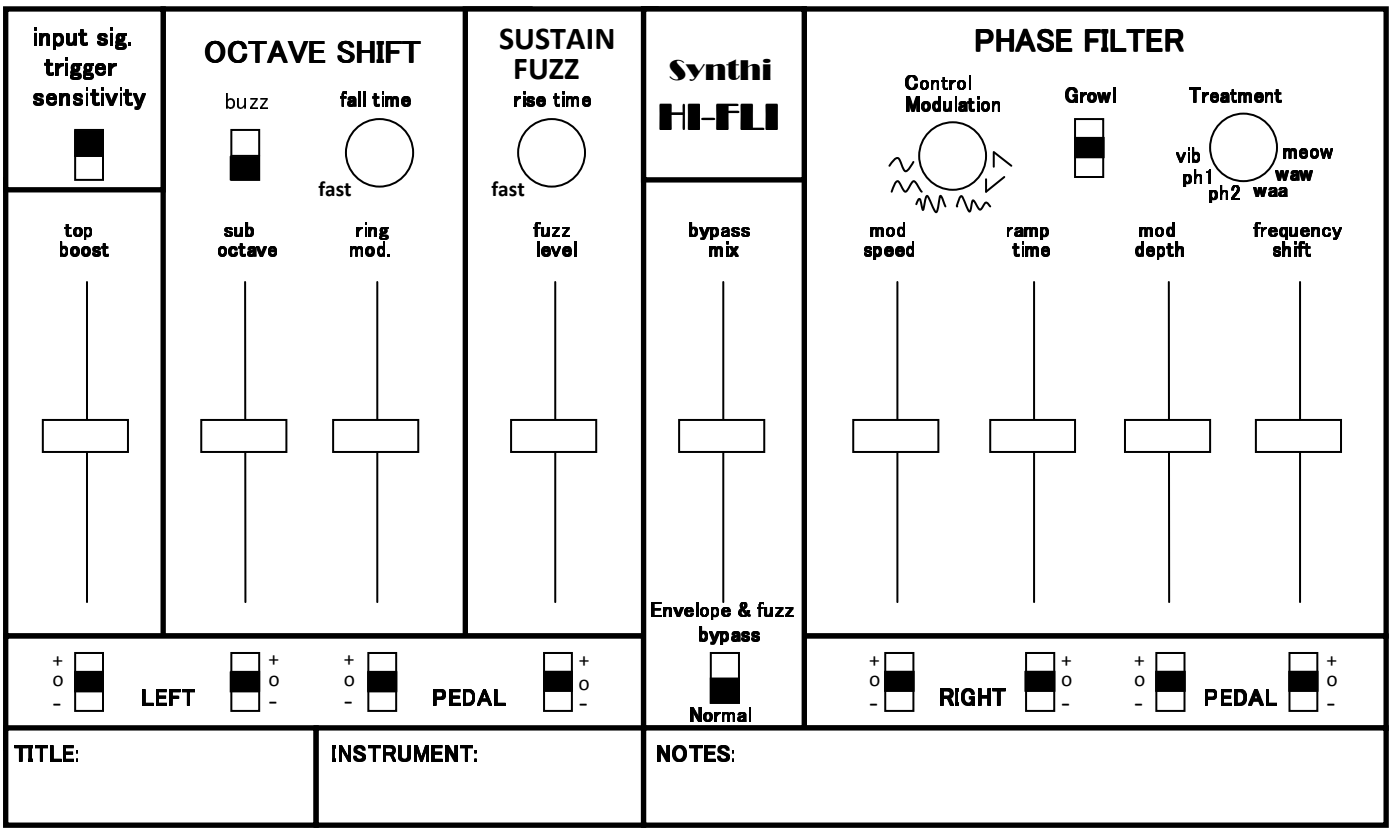


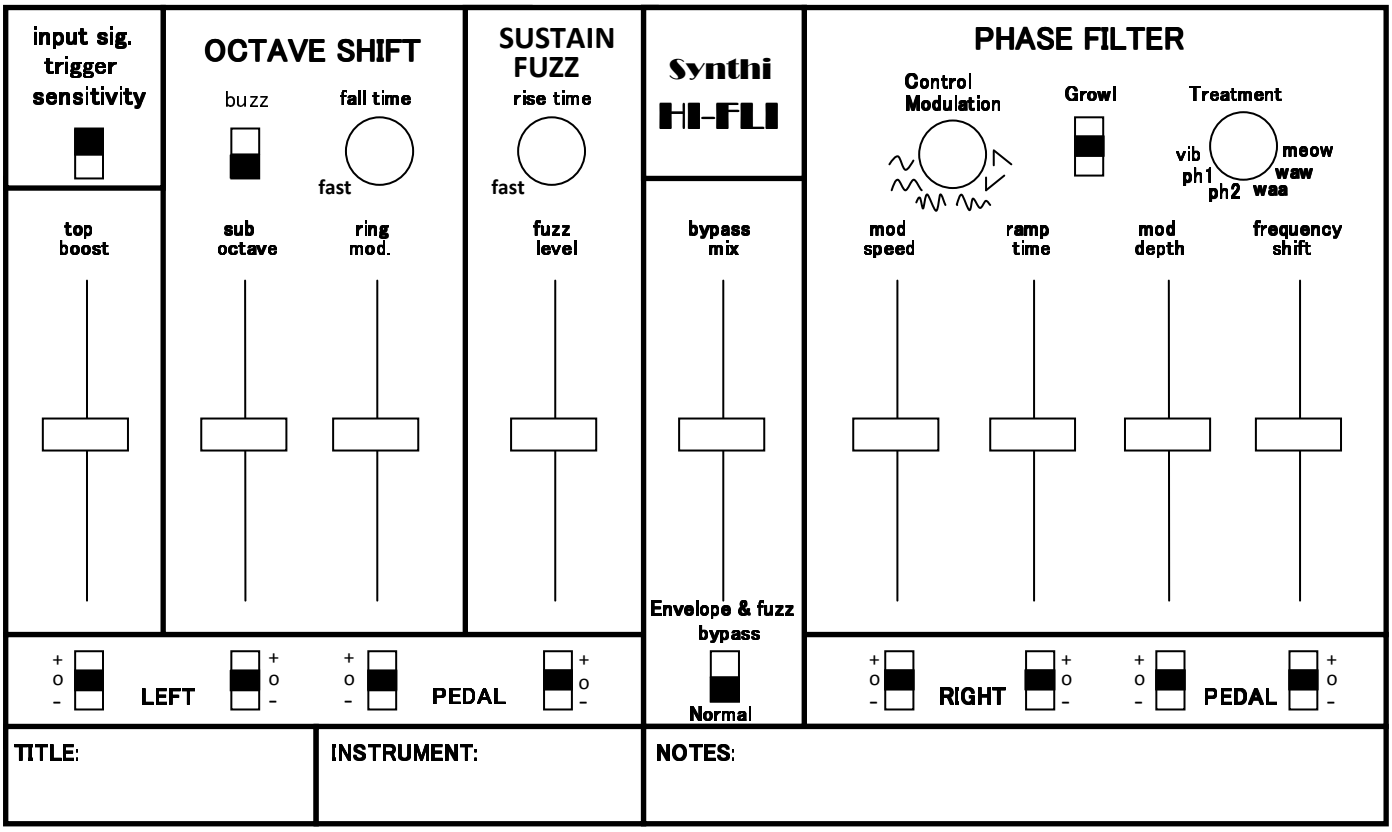


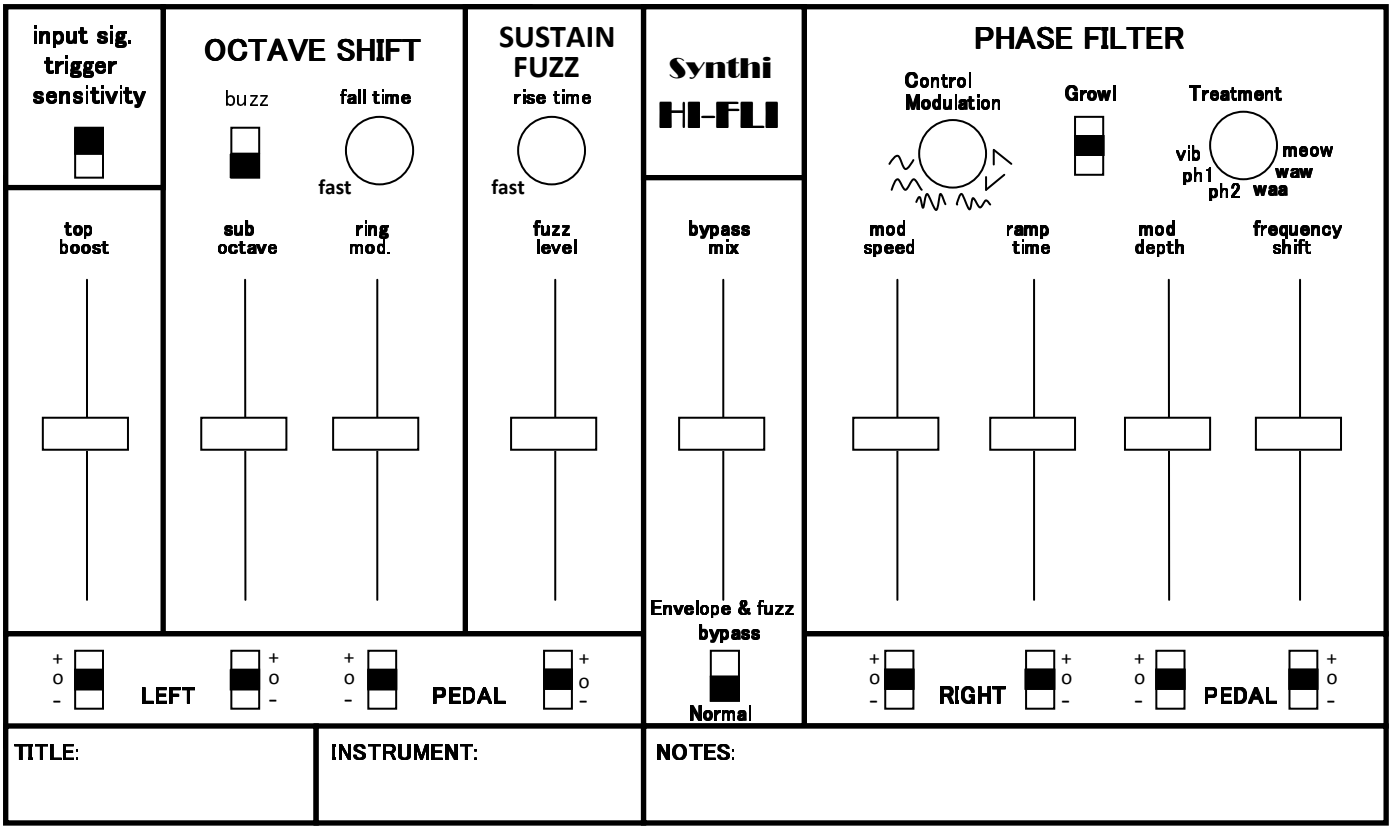

input sig.
trigger
sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN
FUZZ
rise time
fast
Synthi
HI-FLI
PHASE FILTER
Control
Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top
boost
sub
octave
ring
mod.
fuzz
level
bypass
mix
mod
speed
ramp
time
mod
depth
frequency
shift
Envelope & fuzz
bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE:
INSTRUMENT:
NOTES:


input sig.
trigger
sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN
FUZZ
rise time
fast
Synthi
HI-FLI
PHASE FILTER
Control
Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top
boost
sub
octave
ring
mod.
fuzz
level
bypass
mix
mod
speed
ramp
time
mod
depth
frequency
shift
Envelope & fuzz
bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE:
INSTRUMENT:
NOTES:


input sig.
trigger
sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN
FUZZ
rise time
fast
Synthi
HI-FLI
PHASE FILTER
Control
Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top
boost
sub
octave
ring
mod.
fuzz
level
bypass
mix
mod
speed
ramp
time
mod
depth
frequency
shift
Envelope & fuzz
bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE:
INSTRUMENT:
NOTES:


input sig.
trigger
sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN
FUZZ
rise time
fast
Synthi
HI-FLI
PHASE FILTER
Control
Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top
boost
sub
octave
ring
mod.
fuzz
level
bypass
mix
mod
speed
ramp
time
mod
depth
frequency
shift
Envelope & fuzz
bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE:
INSTRUMENT:
NOTES:


input sig.
trigger
sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN
FUZZ
rise time
fast
Synthi
HI-FLI
PHASE FILTER
Control
Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top
boost
sub
octave
ring
mod.
fuzz
level
bypass
mix
mod
speed
ramp
time
mod
depth
frequency
shift
Envelope & fuzz
bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE:
INSTRUMENT:
NOTES:


input sig.
trigger
sensitivity
OCTAVE SHIFT
buzz
fall time
fast
SUSTAIN
FUZZ
rise time
fast
Synthi
HI-FLI
PHASE FILTER
Control
Modulation
Growl
Treatment
vib
ph1
ph2
meow
waw
waa
top
boost
sub
octave
ring
mod.
fuzz
level
bypass
mix
mod
speed
ramp
time
mod
depth
frequency
shift
Envelope & fuzz
bypass
Normal
LEFT
PEDAL
RIGHT
PEDAL
TITLE:
INSTRUMENT:
NOTES: