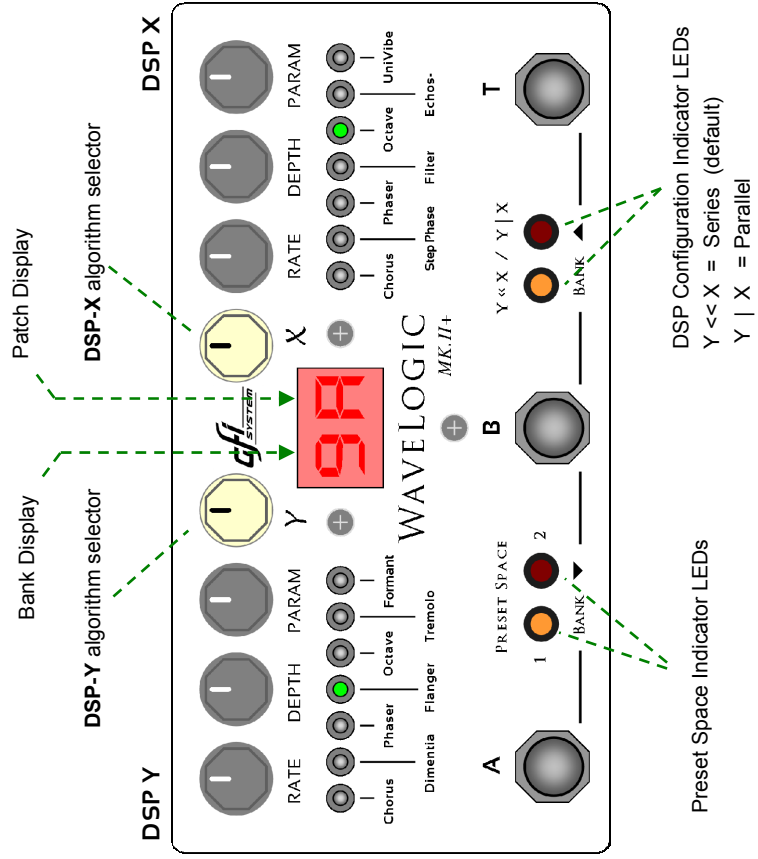# WaveLogic mkII+
Modulation Engines
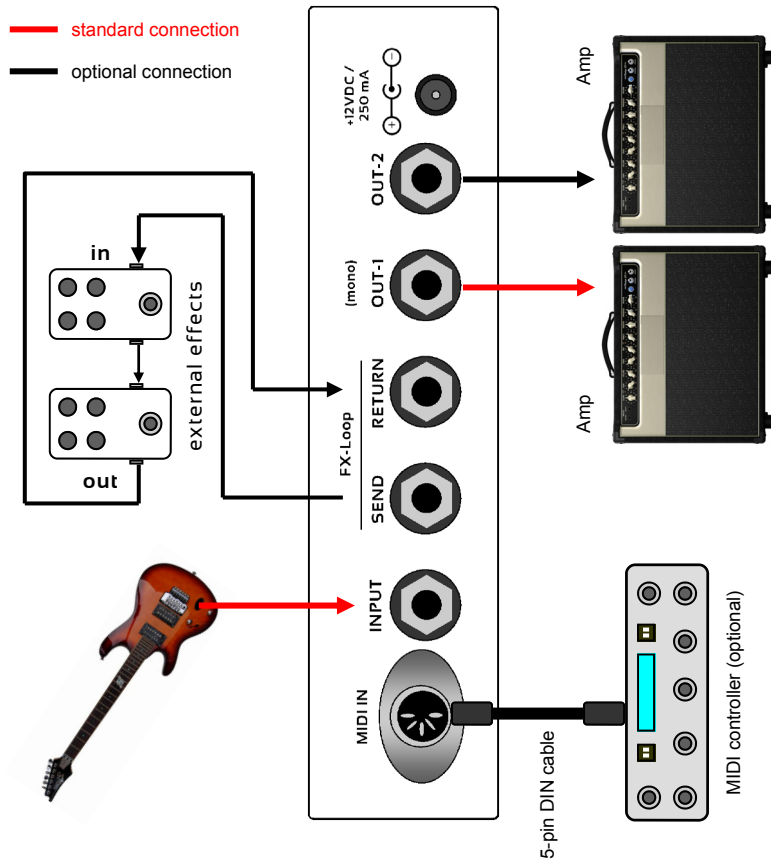
Chapter 1 - OVERVIEW

WaveLogic mkII+ consists of 14 DSP algorithms of modulations, filters, and dynamics-controlled effects, each one is handcrafted and fine-tuned to the last bit. Some drew inspiration from certain vintage as well as modern gears, some others were designed from the ground up.

What sets WL2-mkII apart from other multi-modulation pedals out there is the unique design that utilizes true dual DSP engines with series / parallel configuration capability, offering up to 49 *series-combined* effects and 49 *parallel-combined* effects. Other bells and whistles include FX-Loop, tap-tempo, dual preset spaces, and MIDI access.

Table of Contents

standard connection

optional connection

Amp

Amp

+12VDC / 250 mA

OUT-2

(mono) OUT-1

RETURN

FX-Loop

SEND

INPUT

MIDI IN

in

external effects

out

5-pin DIN cable

MIDI controller (optional)

Power Requirement

WL-MKII is powered using an external +12VDC power source capable of delivering 250 mA of current. If a 12VDC power source is not available, you can use a regulated 9VDC power source, with a slight reduction in headroom.

3

◆ Chapter 2 - OPERATION

OPERATION	FOOTSWITCH ACTION
Load Patch A	Press A
Load Patch B	Press B
Store Patch A	Press & Hold A for ~1 sec
Store Patch B	Press & Hold B for ~1 sec
PS-1 ⟷ PS-2	Press & Hold T for ~1 sec
Bank Down	Press A & B simultaneously
Bank Up	Press B & T simultaneously
Serial ⟷ Parallel	Press A & T simultaneously
Tap Tempo	Repeatedly Press T
Global Bypass	*Press A or B (whichever is currently active)*
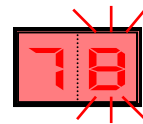
Hold until the patch display flashes 3x

Flashes continuously, until a patch is selected

Bypassing the pedal

To bypass the effect, press footswitch A or B, whichever is currently active (shown on the patch display) - suppose you using patch A, then press footswitch A to bypass the effect. When the pedal is in bypassed state, any of the following actions will immediately put it back into engaged state :

- Pressing footswitch A or B (load a patch).
- Turning the X or Y algorithm selector knob (select a sound).

When the pedal is in the 'Bypass' state all algorithm LEDs are off.

4

◆ **Chapter 3** - **DSP CONFIGURATIONS & FX-LOOP**

With two powerful DSP cores at its disposal WaveLogic MkII readily delivers two modulation effects simultaneously. To maximize the full potential of this *dual processor* concept, we've added the capability to switch between two configurations : *Series* or *Parallel*.

Series configuration stacks DSP-Y after DSP-X, so that your guitar signal is first processed by DSP-X and then followed by DSP-Y. **Parallel configuration** splits your guitar signal into two paths, one path is processed by DSP-X and the other by DSP-Y, and routed to its respective output. So you could have a stereo output with different modulation effects on each side.

To complete the cycle, we've also added an **FX-Loop**, enabling you to place other effects right after DSP-X - this may come in handy as DSP-X contains a number of algorithms that sounds great preceding an overdrive / distortion effect.

SERIES

external effects

PARALLEL

external effects
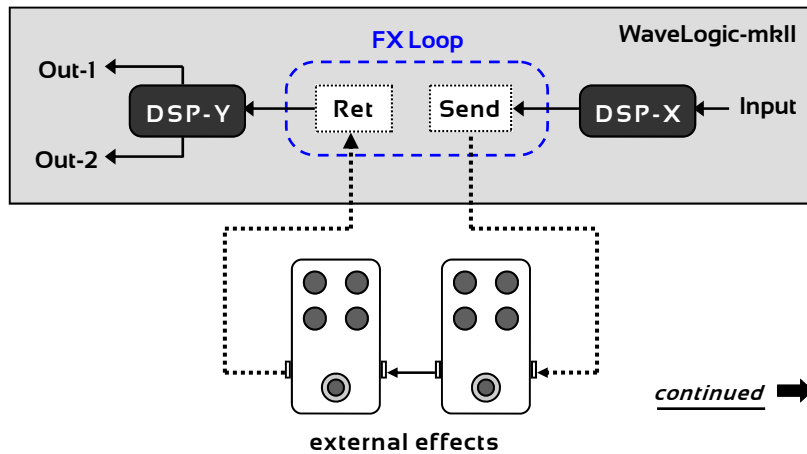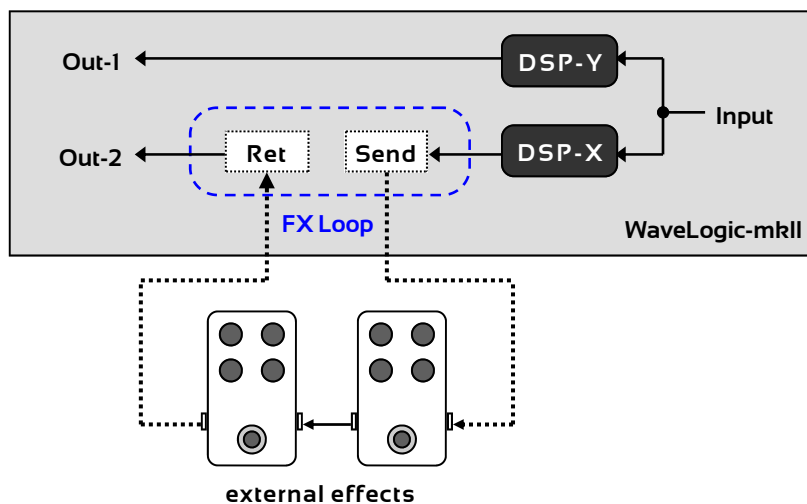
When you store a preset, the series / parallel configuration is stored as well.
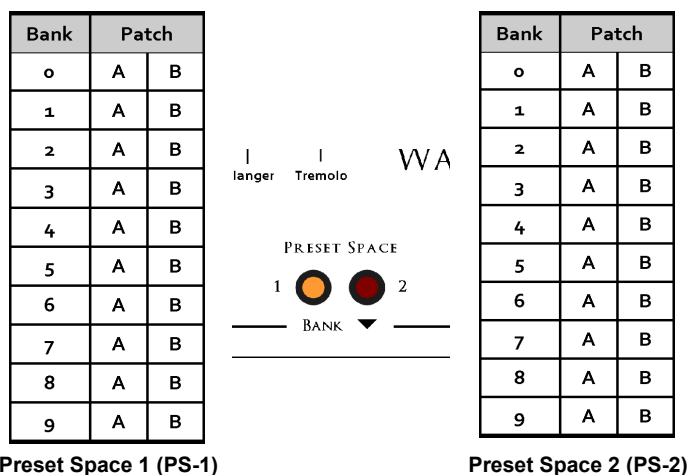
Application Hints

Placing overdrive / distortion effects in the FX-Loop gives you a very flexible setup that helps you achieve rich sound variation. Here are some suggestions :

*   "Phaser *before* distortion" and "Phaser *after* distortion" will give you very different sounds. Use Phaser algorithm on DSP-X for that subtler and full-bodied phasing sound, and use Phaser algorithm on DSP-Y when you need a more pronounced phasing effect. Try this with Octave algorithm as well.

*   Most people like UniVibe *before* distortion, that's why we place it in DSP-X.

*   Envelope Filter works flawlessly *before* distortion, that's why it's also in DSP-X.

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Chapter 4 - PRESET SPACES

Presets in WaveLogic mkII are arranged in 20 banks of 2 patches each for a total of 40 presets. The 20 banks are further grouped into 2 *spaces* : Preset Space 1 (PS-1) and Preset Space 2 (PS-2). You may treat the two preset spaces as *pages*, that you can *flip* at will to access all 40 patches anytime you like.

Toggling between PS-1 and PS-2 (*flipping the pages*) is done by pressing and holding footswitch T for approximately 1 second, the LEDs on the pedal will give indication of which preset space is currently selected.

Bank	Patch	
0	A	B
1	A	B
2	A	B
3	A	B
4	A	B
5	A	B
6	A	B
7	A	B
8	A	B
9	A	B

Bank	Patch	
0	A	B
1	A	B
2	A	B
3	A	B
4	A	B
5	A	B
6	A	B
7	A	B
8	A	B
9	A	B

Preset Space 1 (PS-1)   **Preset Space 2 (PS-2)**

Switching between spaces

Suppose you are using Patch A of Bank 4 in PS-1, and you want to switch to Patch B of Bank 5 in PS-2. Follow these steps :
1. Press and hold footswitch T for 1 second to toggle from PS-1 to PS-2.
2. Do Bank-Up once.
3. Do Load-B

The sound will be updated only at the last step (step 3).

◆ <u>Chapter 5</u> **- TAP TEMPO**

The 'Rate' parameter in WaveLogic mkII can be conveniently controlled by tapping on footswitch T. However this is not applicable to all 14 algorithms, but only to those that are inherently '*ryhtmic*'. These are the 6 algorithms that are tap-tempo enabled :

DSP	ALGORITHM	TAP RATIO (Sub-division)
X	Phaser	1 : 1 (1/4 note) 2 : 1 (1/2 note)
	Uni-Vibe	1 : 1 (1/4 note) 2 : 1 (1/2 note)
	Step Phase	1 : 1 (1/4 note)
	Echoswell	1 : 1 (1/4 note) 3 : 4 (dotted 8th)
Y	Formant	1 : 1 (1/4 note)
	Phaser	1 : 1 (1/4 note) 2 : 1 (1/2 note)
	Tremolo	1 : 1 (1/4 note) 1 : 2 (8th note) 1 : 4 (16th note) 3 : 4 (dotted 8th)

● **The Algorithms :**

CHORUS

A classic chorus effect that is inspired by a couple of select vintage analog chorus pedals. Use this algorithm to add fullness and achieve rich, shimmering sound of the 80's, or maybe just a touch of subtle pitch movement.

RATE — Controls the modulation rate. Range : 0.5 to 6 Hz

DEPTH — Controls the depth of pitch modulation.

PARAM

TONE = Adjust the tonality of the overall sound.

[t n]

Out of many other parameters that can be given to a chorus effect, one of the most useful that we found is a *Tone control.* The ability to shape the overall tonality of the chorus sound gives much flexibility in sculpting the desired sound, especially if you use this algorithm for both clean and distorted sound, which may require different tone-shaping to get that *perfect* result.

As the knob is turned clockwise, treble is cut, suitable for overdriven guitar. As the knob turned counter-clockwise, the lows are cut, great for bass guitar.

Neutral

Low-cut   **High-cut**

PARAM

9
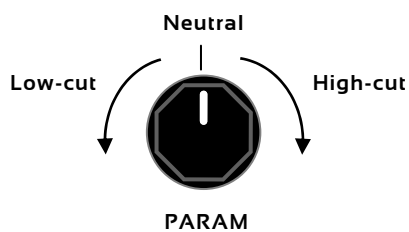
● **The Algorithms :**

DIMENTIA

This algorithm is a re-creation of the Roland® DC-2 Dimension C pedal, a highly revered effect unit with an unmistakably unique sound. DC-2 is basically a chorus pedal, with one important distinction : it tends to hide the pitch modulation and periodic nature of conventional chorus effects, thus allows pronounced chorusing while still seeming subtle. A signal that goes into this pedal will come out sounding big, spacious, with a sense of depth - sort of adding 'dimensions' to the sound.

Instead of providing four pre-set sounds as in the original pedal, we opted to provide full control over *Rate*, *Depth*, and *Predelay* parameters. This is a subtle effect, but it's indeed the strength of the algorithm - it doesn't mess with your tone, just make it huge and 'dimensional'. <u>Works best in stereo</u>.

RATE   Controls the modulation rate. Range : 0.25 to 2 Hz

DEPTH   Controls the depth of modulation.

Unlike CHORUS, the depth setting does not have much affect on the perceived pitch modulation. Instead, the *depth* parameter works on the spatial widening and 'dimension' of the sound.

PARAM   **PREDELAY =** Controls the length of base delay time.

[P d]

This parameter adjust the balance between clarity and ambience. Lower settings give crystal clear sound, while higher settings yield a richer and diffuse ambience at the expense of some definition.

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● **The Algorithms :**

FLANGER

This is our take on the classic flanger effect. Despite of having only 3 knobs, this algorithm is capable of delivering wide range of flanging sounds, from subtle swirls to intense jet plane sweeps and swooshes.

RATE — Controls the modulation rate. Range : 0.1 to 5.5 Hz

**DEPTH** — Controls the depth of the "flanging sweep ".

PARAM **[F b]**

FEEDBACK = Controls the amount of feedback. Higher feedback gives more pronounced flanging effect, that's when the jet-plane swooshes come alive.

> Turn the knob clockwise to get *positive* (+) feed back and counter-clockwise to get *negative* (-) feedback. Each one has its own unique sonic sig nature, (-) feedback has deeper notches and peaks that gives more intense sweep, while (+) feedback has an almost vowel-like quality that howls and growls.
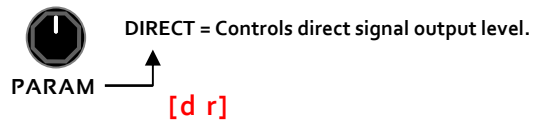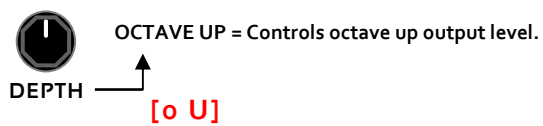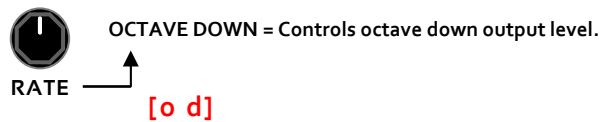
> Set the knob at center position to kill the feedback.

no feedback

max (-) feedback   **max (+) feedback**

PARAM

11
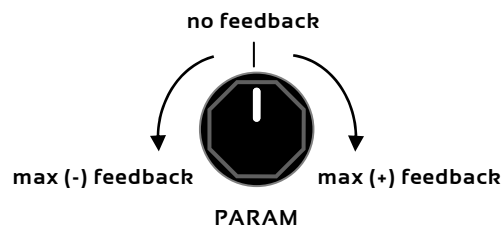
● **The Algorithms :**

DSP-Y   DSP-X

OCTAVE

This algorithm synthesizes polyphonic *octave-up* and *octave-down* component of the input signal and blends these components with the direct signal to produce output. The level of each component are independently adjustable using the three available knobs. The Rate knob controls the octave down output level, Depth knob controls the octave-up output level, and Param knob controls the direct signal output level.

RATE   OCTAVE DOWN = Controls octave down output level.

[o d]

DEPTH   OCTAVE UP = Controls octave up output level.

[o U]

PARAM   DIRECT = Controls direct signal output level.

[d r]

● <u>**The Algorithms**</u> **:**

ENVELOPE FILTER

This algorithm filters your guitar sound using a set of filters whose characteristics follows the dynamics of your picking, kind of playing a wah pedal with the rocker position controlled, not by four foot, but with your picking strength. Since this effect relies on the signal dynamics it works best preceding overdrive / distortion pedals.

RATE **SENSITIVITY =** The Rate knob controls the sensitivity of the
[S n] envelope follower.
To achieve the optimal filter sweep range, set this knob to match the output level of your guitar / bass pickup. Use lower settings for high-output pickup, and use higher settings for low-output pickups.
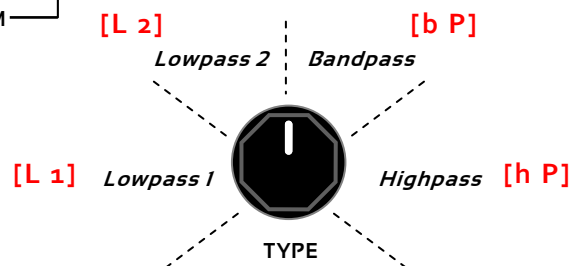
DEPTH **RESONANCE =** Controls the filter's resonance. Lower settings
[r S] yields a 'more polite' sound, higher settings gives more pronounced effect.

PARAM **MODE =** Selects between four filter modes.

[L 2] **[b P]**
Lowpass 2 | *Bandpass*

[L 1] *Lowpass 1* *Highpass* **[h P]**

TYPE

* L2 (*Lowpass 2*) is a more 'quacky' version of L1 (*Lowpass 1*), it covers a wider frequency range, great for clean sound.

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● <u>**The Algorithms**</u> **:**

T A P
TEMPO

DSP-Y   DSP-X

PHASER

This versatile phaser algorithm is modelled after the MXR® EVH-Phase 90 pedal, which uses 4-stage phase-shifting elements to create smooth and swirly phasing sounds. Feedback (resonance) control provides continuous adjustment of the phasing intensity, you can go from *smooth and subtle* all the way to *modern and in-you-face phasing* sounds.

You can choose from four different modulation modes : *Triangle-wave*, *Square-wave*, *Sawtooth-wave*, and *Envelope-controlled*.

RATE

Controls the modulation rate. Range : 0.1 to 8 Hz.

The modulation rate can be directly controlled via tap tempo by tapping on footswitch T. <u>When using tap tempo, use the Rate knob to set the *tap ratio*</u>, the ratio between the rate of your foot taps and the actual modulation rate.

[2 1]   *2 : 1*   *1 : 1*   **[1 1]**

(Half note)   *(Quarter note)*
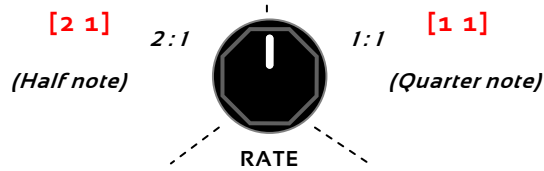
RATE

SENSITIVITY = In <u>*Envelope*</u> mode, the Rate knob controls the sensitivity of the envelope follower.

[S n]

To achieve the optimal phasing sweep range, set this knob to match the output level of your guitar / bass pickup. Use lower settings for high-output pickup, and use higher settings for low-output pickups.

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FEEDBACK = Controls the amount of feedback (resonance).

DEPTH

[F b]

WAVE = Selects between four LFO modulation waveforms.

PARAM

[S q]   [S t]

Square   Sawtooth

[T r] *Triangle*   *Envelope*   [E n]

PARAM
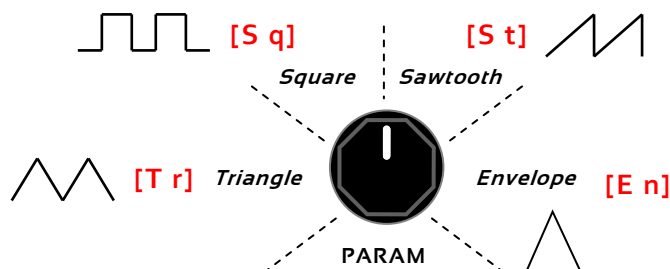
The amount of phase modulation is controlled by your picking dynamics. Use the Rate knob to adjust sensitivity.

Triangle wave is the most commonly used in phaser pedal, giving smooth and even phasing sweep.

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● **The Algorithms :**

T A P
TEMPO

DSP-X

UNIVIBE

A re-creation of the classic Uni-vibe® effect. Technically this is similar to a 4-stage phaser, but the unique phase modulation sweeps created by the use of light bulbs and *light-dependent resistors* LDRs (in the original pedal) gives its signature sound, the sounds that was made huge by Jimi Hendrix, Robin Trower, and others in the 60's and 70's. While originally designed as a rotary speaker effect simulation (not so close) pedal, it became an effect its own right.

RATE Controls the modulation rate. Range : 0.1 to 8 Hz.

The modulation rate can be directly controlled via tap tempo by tapping on footswitch T. When using tap tempo, use the Rate knob to set the *tap ratio*, the ratio between the rate of your foot taps and the actual modulation rate.

[2 1]   2 : 1   1 : 1   **[1 1]**

(Half note)   (Quarter note)

RATE
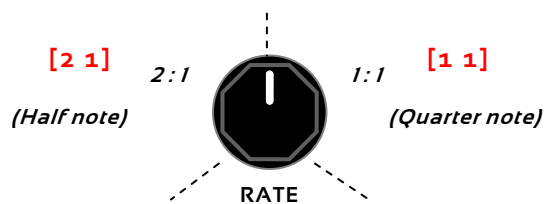
PARAM   **INTENSITY** = Controls the modulation intensity, in particular the low-end 'throb'.

[I n]

16

DEPTH

[b L]

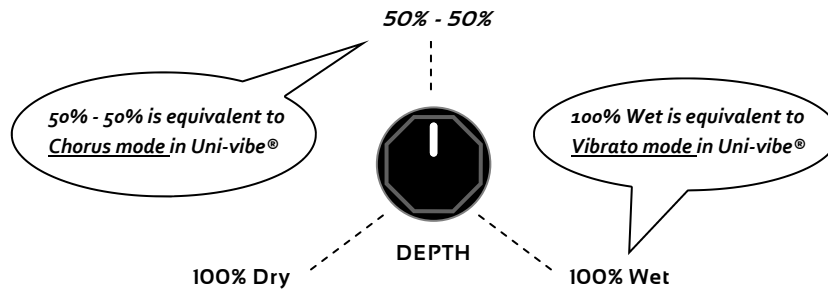**BLEND =** Controls the proportion of mixture between wet and dry signal.

This knob gives a versatile control over the texture of the sound. You can achieve both the *Chorus* and *Vibrato* mode of the Uni-vibe pedal, plus arbitrary blending between the two.

50% - 50%

50% - 50% is equivalent to Chorus mode in Uni-vibe®

100% Wet is equivalent to Vibrato mode in Uni-vibe®

DEPTH

100% Dry

100% Wet

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● **The Algorithms** :

T A P TEMPO

DSP-Y

FORMANT

This algorithm applies a set of Formant filters, which mimic the characteristic of human vocal tract, any signal that goes through this algorithm will sound as if it was radiated through a human's mouth. Spectrally-rich signal such as an over-driven guitar sound excites these filters the best. The filters' central frequencies can be LFO-modulated or controlled by knob (or MIDI expression pedal).

RATE — RATE = In _Auto_ mode this knob controls the modulation rate.

FREQUENCY = In _Manual_ mode this knob sets the formant frequency.

DEPTH — Controls the effect's intensity (blending between modulated signal and unprocessed signal).
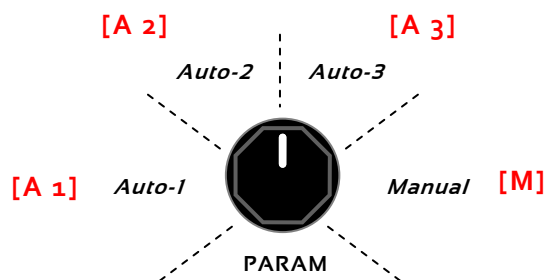
PARAM — MODE = Selects between four modes .
* _Auto-1_ and _Auto-2_ are _cyclic_ modulation.
* _Auto-3_ is _chaotic_ (random) modulation.
* _Manual_ mode (use the Rate knob to control the formant.

[A 2] **[A 3]**

Auto-2 | _Auto-3_

[A 1] _Auto-1_ | _Manual_ **[M]**

PARAM

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● **The Algorithms :**

STEP PHASER

This is a 4-stage phaser algorithm that employs *step* LFO to modulate the phase shifts, producing quantized and stepped sweeps, instead of smooth ones. There are four LFO shapes to choose from : *ramp-up steps*, *ramp-down steps*, *triangle steps*, and *chaotic steps*.

For ramp-up, ramp-down, and triangle, the modulation rate can be directly controlled via tap-tempo (with tap ratio of 1:1), by tapping on footswitch T.

This algorithm delivers sweet and hypnotic rhythmic steps that makes you groove on and on.

RATE — Controls the modulation rate. Range : 1 to 4 Hz (cyclic LFO)
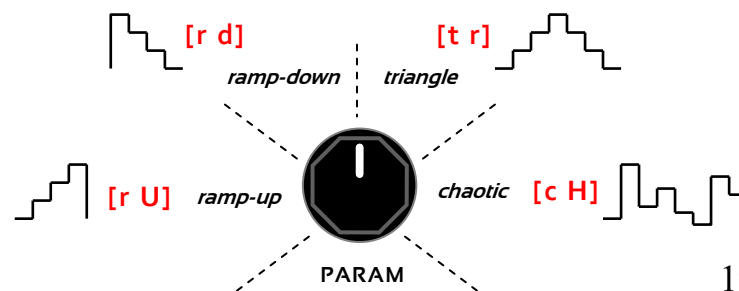4 to 14 Hz (chaotic LFO)

DEPTH — Controls the effect's intensity (blending between modulated signal and unprocessed signal).

PARAM — PATTERN = Selects between four step LFO patterns.

[r d] ramp-down   triangle [t r]

[r U] ramp-up   chaotic [c H]

PARAM

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● **The Algorithms :**

TAP TEMPO

DSP-Y

TREMOLO

This algorithm modulates the volume of your guitar signal, resulting in periodic volume variation. There are 4 wave shapes to choose from, and each one gives distinct tremolo characteristic :

* *Triangle* - Gradual rise and fall - at slow rate you could achieve volume-swell like effect .
* *Sine* - smooth, even, and nice.
* *Shark Fin* - the sharp attack and smooth decay of this waveform uniquely modifies the timbre of your sound, sort of adding piano-like chime.
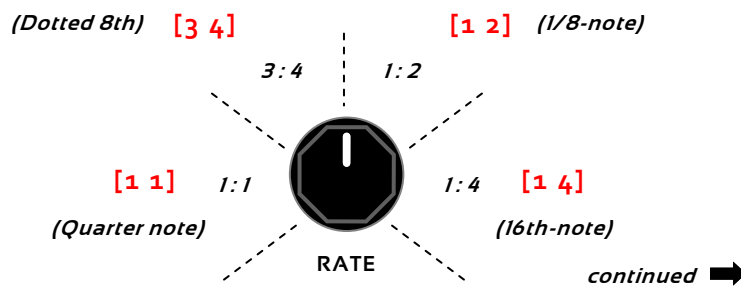* *Square* - chops your signal on and off, hard and fast.

RATE

Controls the modulation rate. Range : 1 to 12 Hz.

The modulation rate can be directly controlled via tap tempo by tapping on footswitch T. <u>When using tap tempo, use the Rate knob to set the *tap ratio*</u>, the ratio between the rate of your foot taps and the actual modulation rate.

A ratio of 1:1 means the modulation rate follows the rate of your foot taps, a ratio of 1:2 means the modulation rate is twice the rate of your foot taps, and so on.

(Dotted 8th) **[3 4]** 3 : 4   1 : 2   **[1 2]** *(1/8-note)*

[1 1] *1 : 1*   *1 : 4* **[1 4]**

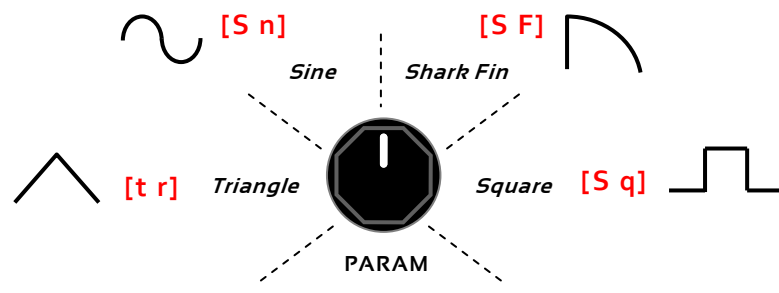*(Quarter note)*   *(16th-note)*

RATE

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DEPTH

Controls the depth of the amplitude modulation (Tremolo effect).

This control gives you complete control over modulation depth, from subtle amplitude variation to all out stuttering chop fest.

PARAM

WAVE = Select between four LFO waveforms .

[S n] Sine Shark Fin **[S F]**

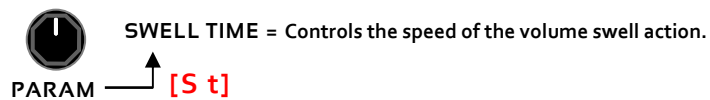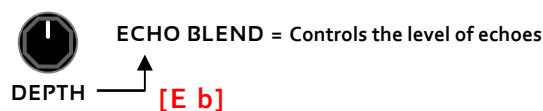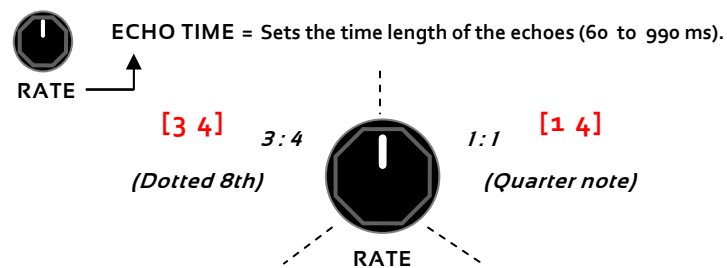**[t r]** Triangle Square **[S q]**

PARAM

● **The Algorithms :**

ECHOSWELL

This algorithm slows down the attack of the input signal's envelope, creating a 'volume swell' effect that is normally created using the guitar's volume knob or a volume pedal.

One thing we discovered while designing this algorithm is that things get exponentially more interesting when we have echoes following this volume-swelled sound. This combination produces huge layers of sound; the key is to find a harmonious combination between echo time and swell time.

As with any other 'envelope-modifying' effect processor, you have to maintain '*precise*' playing, sloppiness will fail. For single-note lines *stacatto* picking will give the best result. Chords must be strummed fast, do not let individual string rings.

RATE

ECHO TIME = Sets the time length of the echoes (60 to 990 ms).

[3 4]   *3 : 4*   *1 : 1*   **[1 4]**

(Dotted 8th)   *(Quarter note)*

RATE

DEPTH

ECHO BLEND = Controls the level of echoes

[E b]

PARAM

SWELL TIME = Controls the speed of the volume swell action.

[S t]

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● **The Algorithms :**

2-Effects Combination to try

DSP-Y	DSP-X	Config.	Comment
Chorus Dimentia Flanger	Chorus	Series	*Sparkling, dreamy, great for clean sounds.*
Chorus Dimentia Flanger	Chorus	Parallel	*Very wide stereo image, great for clean sounds.*
All	Echoswell	Series	*Combine swell+delay with each effects in Y for interesting and trippy sounds.*
Formant Phaser Tremolo Octave	Octave	Series	*Octave followed by filter, tremolo, even another octave!*
Octave	Filter Phaser Step Phase	Series	*Filters and Phasing followed by octave*
Phaser	Phaser	Series / Parallel	*Bi-phaser anyone?*
Tremolo	UniVibe Phaser	Series	*Trem and Throb!*

☞ You can achieve even wilder sonic possibilities by placing other effects in the FX-Loop!

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◆ <u>Chapter 7</u> - Configuring MIDI Channel

Wavelogic MKII is equipped with MIDI access, nearly all functionalities of the pedal can be remotely controlled using a suitable MIDI controller.

5-pin DIN cable

MIDI controller
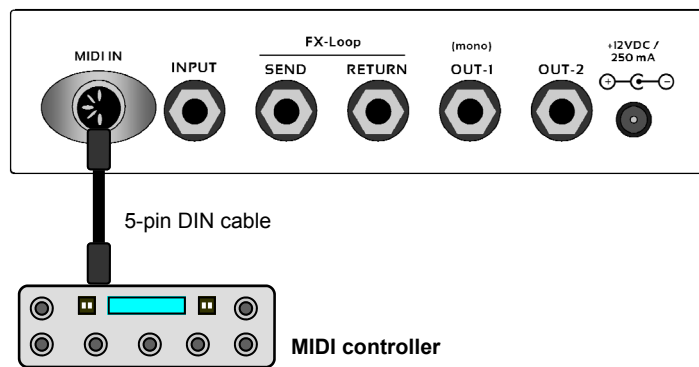
Before Wavelogic can respond to midi messages it must be assigned a unique channel. Midi channel in Wavelogic can be configured to :

- **Single channel** (channel 1 to Channel 16)

- **Omni** (receive on all channel)

- **Off** (reception is disabled)

<u>The default configuration is "Off" (midi reception disabled).</u>

To make changes to the midi channel configuration, use the following procedure :

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1. Press the DSP-X algorithm selector knob to enter midi channel configuration mode.

The current midi channel is immediately displayed 2-digit LED display.
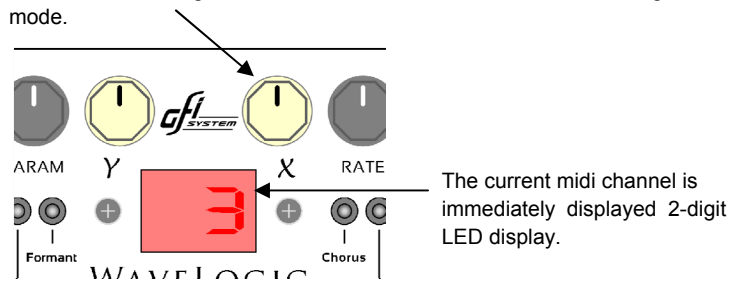
2. Rotate the DSP-X algorithm selector knob to increment or decrement the midi channel number.

*   At this point, if you wish to abort the procedure without making any changes simply perform any knobs or switches operation - except the DSP-X algorithm selector knob.*

3. When you've reached the desired midi channel number, press the selector knob again to save your selection.

1	- Channel 1
2	- Channel 2
3	- Channel 3

AL	- Omni (receive on ALL channel)
OF	- Off (midi reception disabled)

⋮   ⋮

16 - Channel 16

25
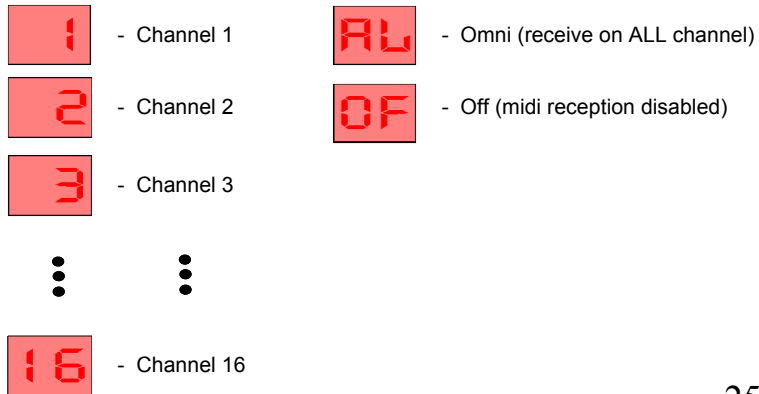
◆ Chapter 8 - MIDI Implementation Chart

KNOBS :	CC#	Value Range
X-Algorithm Select	14	0 - 7
Y-Algorithm Select	15	0 - 7
X Rate	16	0 - 127
Y Rate	17	0 - 127
X Depth	18	0 - 127
Y Depth	19	0 - 127
X Param	20	0 - 127
Y Param	21	0 - 127

OPERATION:	CC#	Value Range
Load Patch A	24	any
Load Patch B	25	any
Bank Down	28	any
Bank Up	29	any
Bypass	32	Bypass = 0, Engage= 127
DSP Configuration	33	Series = 0, Parallel = 127
DSP-X state	34	Off = 0, On= 127
DSP-Y state	35	Off = 0, On = 127
Tap Tempo	36	any

Patch Changes :

Patches in WL-MKII are arranged in 20 banks of 2 patches each for a total of 40 presets. The 20 banks are further grouped into 2 spaces. MIDI access to these patches is available as MIDI *program change* messages, where the patches are numbered sequentially :

SPACE	BANK	PATCH	PC #
PS-1	0	A	0
		B	1
	1	A	2
		B	3
	⋮	⋮	⋮
	9	A	18
		B	19
PS-2	0	A	20
		B	21
	⋮	⋮	⋮
	9	A	38
		B	39

<u>Features</u> :

- 14 Modulations / Filter effects in a compact unit.
- True dual processor engines.
- Switchable Series / Parallel DSP configuration.
- Tap-Tempo.
- Dedicated FX-Loop.
- 2 independent preset spaces, 2 x 10 patches each.
- MIDI access.
- 24-bits signal processing.

<u>Specifications</u> :

- Input impedance   : 1 MOhm.
- Output impedance : 500 ohm.
- Recommended load impedance : greater than 10 KOhm.
- *Input*, *Out-1*, *Out-2*, Send, *Return* : 1/4" TS (mono) connector.
- *MIDI In, Midi Thru* : 5-pin DIN (female).
- Current draw: ~ 250 mA
- Dimension : 17.6 (L) x 9.1 (W) x 5.0 (H) cm
- Powered by a +12VDC Adaptor (included).

This product is designed and manufactured by :

Email : gfisys@gmail.com.
Web   : www.gfisystem.com

GFI System
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