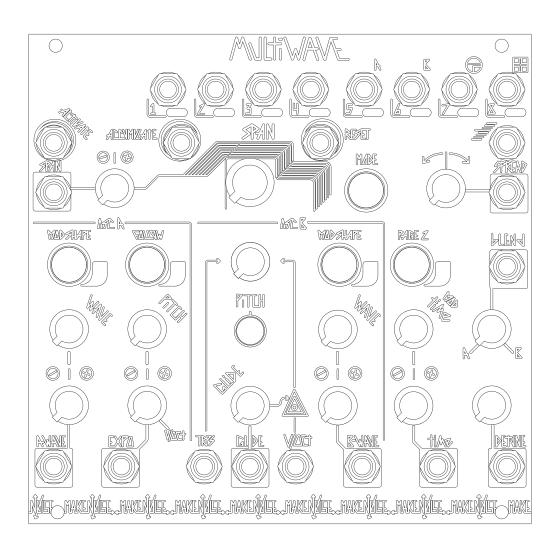
# MUtiWAVE



MAKENJISE

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This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes / modifications not approved by the Make Noise Co. could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

makenoisemusic.com Make Noise Co., 414 Haywood Road, Asheville, NC 28806



# **LIMITED WARRANTY**

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

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

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

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

Please contact technical@makenoisemusic.com with any questions, Return To Manufacturer Authorization, or any needs & comments.

http://www.makenoisemusic.com



About This Manual:

Written by Tony Rolando and Walker Farrell Illustration and layout by Lewis Dahm



# INSTALLATION

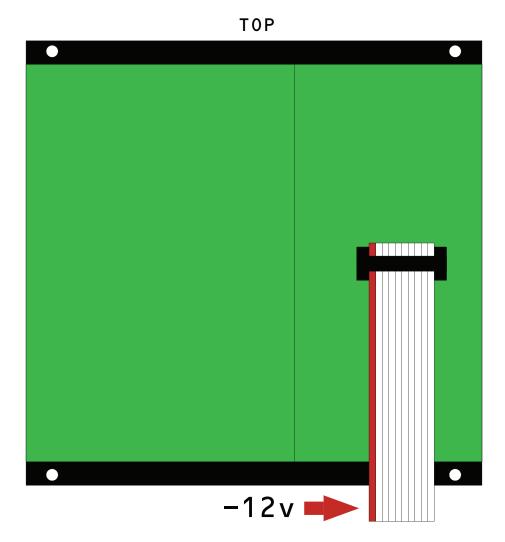
### **Electrocution hazard!**

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

The Make Noise MultiWAVE is an electronic music module requiring 230mA of +12VDC and 5mA of -12VDC regulated voltage and a properly formatted distribution receptacle to operate. It must be properly installed into a Eurorack format modular synthesizer system case.

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

To install, find 26HP in your Eurorack synthesizer case, confirm proper installation of Eurorack bus board connector cable on backside of module (see picture below), plug the bus board connector cable into the Eurorack style bus board, minding the polarity so that the RED stripe on the cable is oriented to the NEGATIVE 12 Volt line on both the module and the bus board. On the Make Noise 6U or 3U Busboard, the negative 12 Volt line is indicated by the white stripe.



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



# INTRODUCTION

**MultiWAVE** is an eight channel dual wavetable oscillator for the New Universal Synthesizer System or any Eurorack modular synthesizer. It uses a single set of controls and macro modulation functions to generate eight unique audio waveforms at eight independent channel outputs.

Each MultiWAVE channel contains two independent wavetable oscillators, Osc A and Osc B, each with its own wavetable loaded and variable relations in frequency, modulation, and wavetable position.

Many of MultiWAVE's parameters and inputs can be modulated independently across all eight channels in either of two ways: Spread, and Modulation Dissemination. These new modulation styles are used for the Osc A Wave Position, Osc B Wave Position, Mod Time, and Osc A Pitch parameters. (note the gold legending on the attenuverters for these parameters):

- The Spread control affects all channels to differing amounts based on the direction of the Spread parameter. It allows for weighted modulation of up to 40 destinations with a single control voltage. When Spread is modulated to the left of 12:00, channels further to the left are more affected by Spread. When Spread is set to the right of 12:00, channels further to the right are more affected by Spread. Individual parameters' Spread depth is set by their respective input attenuators.
- Parameters with their CV inputs patched bypass Spread and are instead subject to Modulation Dissemination, where the CV input's current value is captured by the respective channel at activation. In other words, modulation patched to the controls with the gold legending is shared from one channel to the next as channels are activated. The depth of Modulation Dissemination is set per parameter by the input attenuators.

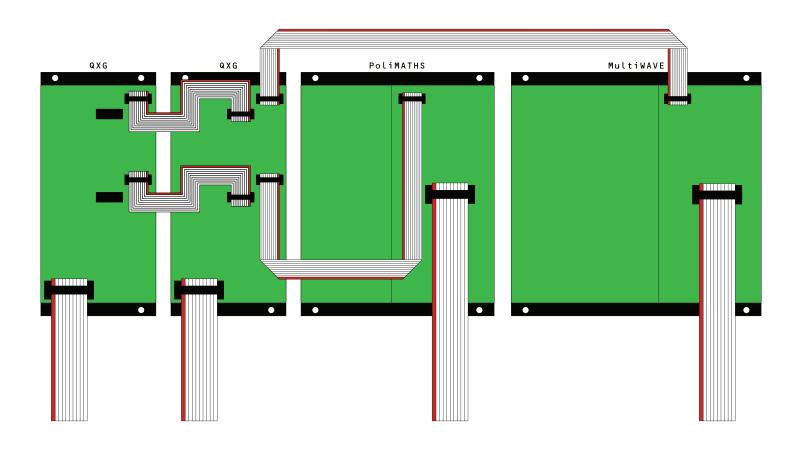
(The Osc B Pitch parameter's input is used for Modulation Dissemination, but is not subject to Spread. To Spread Pitch across the eight voices, use the Detune parameter instead.)

In conjunction with each other, these two modulation methods (Spread and Modulation Dissemination) allow for the aforementioned function parameters to be uniquely modulated across eight channels with only a single set of controls.

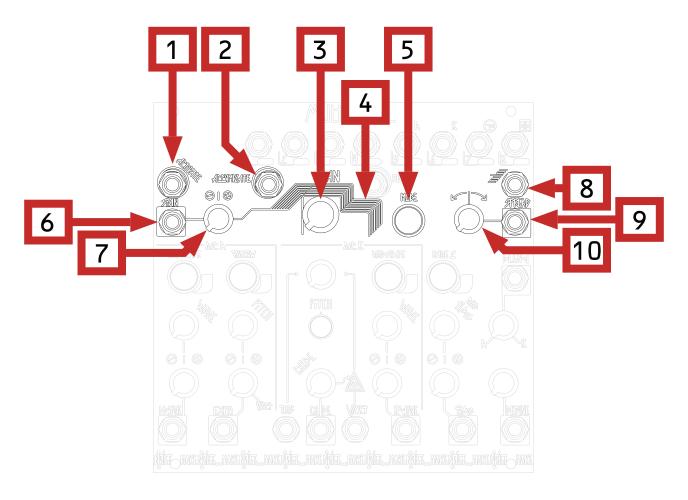
MultiWAVE channels are activated via Span and Activate controls which operate identically to those on Poli-MATHS. Channels can be activated directly in variable, and even arbitrary patterns using any control voltage patched to Span, chronologically using Round Activation or simultaneously using Parallel Activation. When a channel is Activated it receives new values for Modulation Dissemination as well as generating Channel Index signals for use with other N.U.S.S. modules (for example to Activate analogous PoliMATHS channels simultaneously for a poliphonic voice patch).

MultiWAVE also includes an output header for creating pre-patched connections to the signal inputs of a pair of QXG modules. When a PoliMATHS is also pre-patched to the QXGs' control inputs, the collection of modules comprises the eight voice, dual wavetable core of the New Universal Synthesizer System.



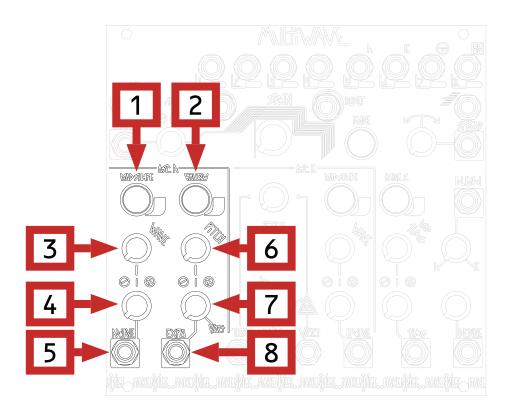






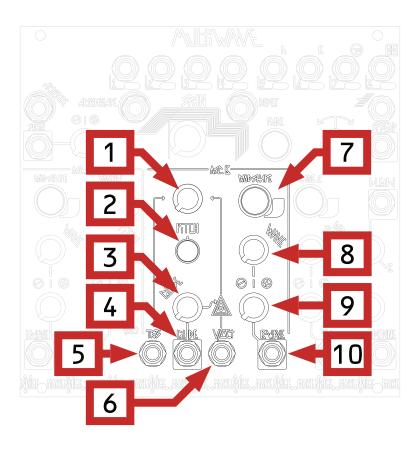
- **1. Activate Input:** Gate input. At rising edge, Channels Activate according to Span control as determined by current Span Mode.
- 2. Accumulate Input: Gate input. When patched, all Activation messages will be held by the target Channel(s) until gate is received at Accumulate. Channels display Orange to indicate they are being held.
- 3. Span: Sets the Channel Span for Activation according to current Span Mode. In Channel Index mode, Channel is Activated upon selection if Activate input is unpatched. Set to 12:00 with Span CV Input attenuverter clockwise in Channel Index mode to translate Channel Index messages from other N.U.S.S. modules.
- **4. Span Activity Window:** Displays current Span mode as selected by Mode Button. White=Channel Index; Yellow=Round; Blue=Parallel. Lights Bright White in Channel Index when set up to receive Channel Index messages from other N.U.S.S. modules.
- 5. Mode Button and Activity Window: Selects Span Mode, indicated by Span Activity Window.
- **6. Span CV Input:** Control Voltage input for Span parameter. Modulate with any control signal, or patch Channel Index output from other N.U.S.S. module.
- 7. **Span CV Input attenuverter:** Bipolar input attenuator for Span CV Input. Set clockwise with Span panel control set to 12:00 in Channel Index mode to translate Channel Index messages from other N.U.S.S. modules.
- **8. Channel Index Ouput:** Sends a Control Voltage indicating currently Activated channel. Patch to Span input on other N.U.S.S. modules.
- 9. Spread CV Input: Control Voltage input for Spread parameter.
- **10. Spread Combo Pot:** Bipolar panel control for Spread parameter. Sets direction and amount of modulation sent to unpatched Spreadable parameters according to the settings of their input attenuverters. When Spread CV Input is patched, operates as bipolar attenuator.





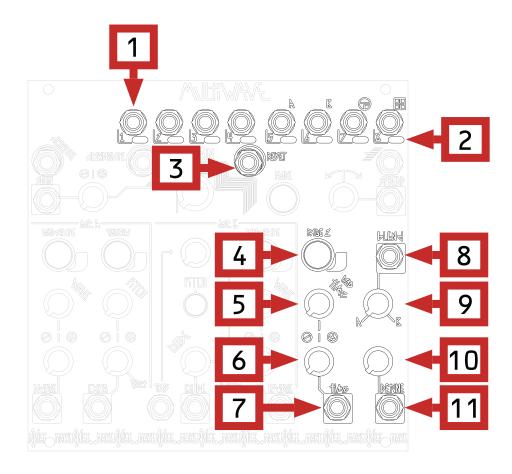
- 1. Mod Shape Button and Activity Window: Selects and denotes Mod Shape.
- 2. Follow Button and Activity Window: Selects and denotes Follow Mode.
- 3. Wave Panel Control: Sets wave position in currently loaded wavetable. Spreadable parameter.
- **4. Wave Attenuverter:** Bi-polar input attenuavor for Wave Position Modulation Dissemination or Spread amount.
- **5. A-Wave CV Input:** Control voltage input for A-Wave. Patching this input disconnects A-Wave from Spread and uses CV input for Modulation Dissemination instead.
- **6. Pitch Panel Control:** Sets starting Pitch for Osc A according to the selected Follow mode.
- **7. Pitch Attenuverter:** Bi-polar input attenuavor for Pitch Modulation Dissemination or Spread amount. When Follow is off, set fully clockwise for 1v/oct response.
- **8. Pitch Exponential Input:** Control voltage input for Pitch. Patching this input disconnects A-Wave from Spread and uses CV input for Modulation Dissemination instead. Tracks 1v/oct when Follow is Off and Pitch Attenuverter is set fully clockwise.





- 1. Pitch Panel Control: Sets starting Pitch for Osc B.
- 2. Pitch Fine Tune Control: Fine control of starting Pitch for Osc B.
- 3. Glide Panel Control: Sets Glide time at 1v/oct input.
- 4. Glide CV Input: Control voltage input for Glide.
- 5. TRPS. Transpose input: Live input that affects all eight channels. Tracks 1v/oct.
- 6. V/Oct Input: Modulation Dissemination input for Osc B Pitch. Tracks 1v/oct.
- 7. Mod Shape Button and Activity Window: Selects and denotes Mod Shape.
- 8. Wave Panel Control: Sets wave position in currently loaded wavetable. Spreadable parameter.
- **9. Wave Attenuverter:** Bi-polar input attenuavor for Wave Position Modulation Dissemination or Spread amount.
- **10. B-Wave CV Input:** Control voltage input for B-Wave. Patching this input disconnects B-Wave from Spread and uses CV input for Modulation Dissemination instead.





- 1. Channel 1-8 Outputs: Modular level waveform outputs for individual MultiWave channels. Alternatively can carry various submixes on outputs 5-8 (detailed by gold legending on panel) when Summing is turned on on Page 2.
- 2. Channel 1-8 Activity LED's: Display of Channel activity including current amplitude, Spread amount, and Accumulations.
- 3. Reset Input: Gate input. At gate high, resets MultiWAVE depending on current Span Mode.

  Channel Index Mode: Re-Activates selected Channel.

  Round Mode: Next Activation will be on Channel 1.

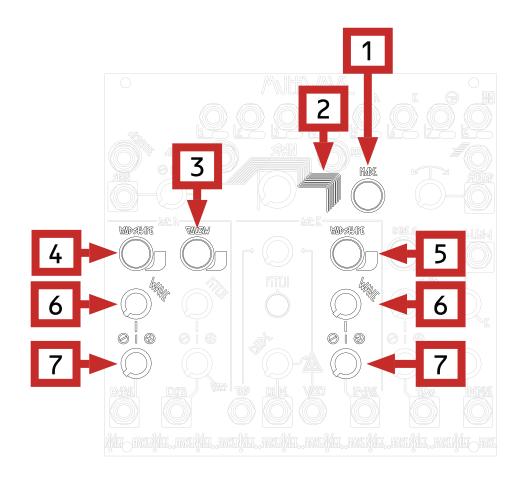
  Parallel Mode: Resets all clock dividers so that next Activation Activates all
  - Channels.

    Page 2 Button and Activity Window: Press button to enter Page 2. Activity Window lights White
- to indicate Page 2 is active.
- **5. Mod Time Panel Control:** Sets Mod Time. Spreadable parameter.

4.

- **6. Mod Time Attenuverter:** Bi-polar input attenuavor for Mod Time Modulation Dissemination or Spread amount.
- **7. Mod Time CV Input:** Control voltage input for Mod Time. Patching this input disconnects Mod Time from Spread and uses CV input for Modulation Dissemination instead.
- 8. Blend CV Input: Control voltage input for Blend. Live input.
- Blend Panel Control: Sets Blend between Osc A and Osc B.
- **10. Detune Panel Control:** Detunes the eight channels of Osc B. In tune at counterclockwise. Harmonic oscillator at full clockwise.
- 11. Detune CV Input: Control voltage input for Detune. Live input.





### PAGE 2 FUNCTIONS

- 1. Mode Button: Turns output mixing on/off.
- Span LED: Lights GREEN to indicate output mixing is ON, RED to indicate OFF. 2.
- 3. Follow Button: Enables/disables Quantization.
- Osc A Mod Shape Button: Selects Mod region. 4.
- 5. Osc B Mod Shape Button: Selects Multimod Activation Behavior.

**OFF:** Multi-Mod Shapes are free running and not affected by Activations. **MAGENTA:** Activation Reset. A channels' Multi-Mod shape resets upon Activation. CYAN: Activation One-Shot. The shape is read through once upon Activation and then stops. For the two random Multimod shapes, the behavior is slightly different.

- Wave control: Table selection. 6.
- 7. Wave Attenuverter: Bank selection.



# THE MULTIWAVE VOICE STRUCTURE

MultiWAVE contains eight channels or voices, each consisting of two wavetable oscillators, Osc A and Osc B.

The channels are Activated via the Activate and Span controls, and modulated via CV, with Spread and Modulation Dissemination allowing for differing parameter values across the eight channels.

Osc A and Osc B each read waveshapes from 8 banks of 8 wavetables. 6 of the 8 banks were specially developed by Make Noise. The remaining banks are a curated collection of historical wavetables. All 8 banks are user-definable should you want to load custom wavetables. Each oscillator loads its own wavetable and has its own voltage controllable wave position within its loaded wavetable.

Osc A can be sequenced independently of Osc B, or Follow the pitch of Osc B in any of several modes including Linear Detune, Octaves, and harmonic Intervals. It may alternatively be set to Free and used for drone, or sequenced independently via its own Pitch parameter. (Setting the associated Pitch CV Attenuator Full CW will achieve a 1V/ Octave response.)

The Multi Modulation reads through the wavetables starting from the channel's unique wave position (taking into account Modulation Dissemination or Spread) at a rate set by the Mod Time parameter with Osc A and Osc B each having a unique Shape parameter.

Transpose, Glide, and Detune are also available for further control of Pitch.

Transpose is a 1v/oct input that affects all eight channels of Osc B simultaneously on all eight channels and is always actively read in real-time (cannot be sent to individual channels via Modulation Dissemination). Osc A will be transposed based on the Follow setting.

Glide adds portamento, with adjustable rate, to the 1v/oct input upon each new Activation. (Note that if a voice is Activated with the same V/Oct value as its previous activation, then there will be no Glide as it is not changing pitch.)

Detune changes the pitch of all eight voices to create chorusing or the type of pleasing drifting effects associated with classic analog polysynths. At its highest values, Detune spreads the pitch of the eight voices all the way out into the harmonic series for use as a "harmonic oscillator."

By default, each channel's output contains a mix of the Osc A and Osc B as set by the voltage controllable Blend parameter. An alternate output scheme is available upon entering Page 2.



# **ACTIVATING MULTIWAVE**

Whenever a MultiWAVE channel is Activated, that channel's Spreadable parameters and 1v/oct input all update to reflect the current values at any patched CV inputs. If it is Activated in tandem with a PoliMaths in a QXG chain (by patching one module's Channel Index output to the other's Span input with the destination module set to Channel Index mode), then the resulting channel output will also be gated at the QXG by the respective PoliMaths channel, resulting in the creation of a traditional poliphonic note event.

MultiWAVE features three unique Activation modes, selected by the Mode button. The selected mode determines the functions of the Activation input and Span parameter.

### **Channel Index (Mode Activity Window WHITE)**

In this mode the SPAN control is used to manually or CV select between the eight channels. Whenever a channel is selected by Span (indicated by White cursor illumination on the channel output activity window) it will be Activated. Turn the panel control for intuitive "strumming," or send a sequence to Activate channels in whatever order you prefer.

Span at 12:00 selects no channel, with values to the left selecting channels 8 through 1, and values to the right selecting channels 1 through 8.

When the Activate input is patched, the selected channel will only Activate upon reception of a trigger or gate at the Activate or Reset input. In this case, channels will NOT Activate immediately upon channel selection, thus allowing Span Activations to be "masked" by a gate stream. (Also note that with Span at 12:00, no channel is selected and thus no channel will be Activated.)

This is also the mode used for one New Universal Synthesizer module to communicate with another (for example, MultiWAVE with PoliMATHS). Patch the Channel Index Out from the leading module to the Span CV In on the following module. Set the following module to Channel Index mode, and set its panel controls for Span CV Attenuator to Full CW and Span Panel control to 12:00. In this condition the SPAN Activity window will show a more Bright White. (To start with this patch, nothing should be patched to Activate, Accumulate, or Reset).

### Round (Mode Activity Window YELLOW)

In this mode each successive trigger at the Activation input Activates a new channel, moving to the right or left by the number of channels set by the Span control. For example when Span is set to 1 (indicated by White cursor at Ch1), the simplest Round pattern is created as all eight channels are Activated sequentially one at a time. When Span is set to 2, every second channel is Activated. At 3, every third channel, etc. Different patterns are created depending on the setting of Span and the channel that was last Activated when a new Span is selected. If a gate is sent to the Reset input, the next Activation will start again at Channel 1, allowing for patterns of any length to be created.

Span may be set either to the right or left of 12:00, with lefthand values causing motion to the right.



### Parallel (Mode Activity Window CYAN)

In this mode each channel Activates at a clock division of a clock received at the Activate input. The divisions are set by the Span control, with values nearest to 12:00 generating the lowest divisions (all channels /1), with the spread of divisions increasing as the Span control moves further to the left (Channel 1 having the largest divisions) or right (Channel 8 having the largest divisions). The current set of divisions is indicated by the White cursor position via Span control. Using CV, the range of the knob can be exceed for very large integer divisions. If a gate is sent to the Reset input, all channels' clock division counters will reset. See "Parallel Mode Clock Divisions table" on page 29 for a detailed list of all sets of divisions.

### **Accumulation**

When the Accumulate input is patched, Activations are accumulated and delayed until this input receives a trigger or gate, at which point channels that had received an Activation message since the last Accumulation trigger will all Activate simultaneously. Channels that are currently Accumulated (but not yet Activated) light ORANGE.



## OSC B

### **Pitch**

Pitch of Osc B. Sum of the Coarse panel control, Fine panel control, Transpose input, and 1v/oct input (via Modulation Dissemination and plus Glide).

### **Wave Position (Spreadable parameter)**

Starting Wavetable position to create base timbre for Osc B Oscillator. By default, internal modulation starts from this position and continues to the end of the table at the rate set by the Mod Time control. Alter this behavior with the Mod Region setting (see Page 2).

### Mod Shape (Button) and Mod Time (Spreadable parameter)

The Mod Shape button selects the shape that will be used to read through the currently selected wavetable for timbre modulation. Read starts from Wave position and goes through to end of table, with amplitude scaled for travel distance. Associated activity window shows shape by both color and brightness.

The Mod Time parameter sets the rate of this modulation, which can be different per voice via Spread or Modulation Dissemination.

### Glide

Sets glide amount between old and new pitch value upon reception of change in 1v/oct signal upon channel Activation. Note that if a voice is Activated with the same V/Oct value as its previous activation, then there will be no Glide as it is not changing pitch.

### **Transpose**

Real-time input for global transposition of Osc B Pitch across all eight voices (not subject to modulation dissemination). Tracks 1v/oct.



# PAGE 2

As you might imagine, you may press the Page 2 button to enter Page 2, which allows access to global functions.

### **Wavetable Selection**

While in Page 2, each Osc uses its respective Wave control to select Table while Wave Attenuverter selects Bank. If the current position of the Wave control is different from the previously selected wavetable, then the current position will appear as a white cursor and the currently selected table will appear as a brighter version of the bank's color. In this way you can check which table is loaded without loading another one. After navigating the cursor to the current table it will become live for selection of a new table.

There are eight banks, each a different color, displayed at channel outputs with currently selected table shown by the Cursor in White:

```
RED - CLASSIC SHAPES
BLUE - MAKE NOISE
GREEN - WARP AND FOLD
PURPLE - ADDITIVE
PINK - SYNC
ORANGE - ORGANS
YELLOW - VOCAL
CYAN - FM
```

On Page 2, Wavetable Selection is previewed. Once Page 2 is exited, the selected table is loaded, which takes 2 seconds.

The tables in these banks may be replaced with user-defined tables by connecting the MultiWAVE to a computer using the USB jack.

### **Output Mixing**

On Page 2, Mode Button turns output mixing on/ off. SPAN window lights GREEN to indicate Mixing is ON, or RED to indicate Mixing is OFF.

Output mixing allows for easier use outside the QXG/PoliMaths chain. Outputs are as follows:

```
1-4: individual channel outputs5: mono mix of all eight channels, Osc A only6: mono mix of all eight channels, Osc B only7: odd channels only8: even channels only
```

When output mixing is OFF, each channel appears at its own output.



### Multimod

On Page 2, Osc B Mod Shape button chooses Multimod Activation behavior.

OFF: Multi-Mod Shapes are free running and not affected by Activations.

MAGENTA: Activation Reset. A channels' Multi-Mod shape resets upon Activation.

CYAN: Activation One-Shot. The shape is read through once upon Activation and then stops.

### **Mod Region**

On Page 2, Osc A Mod Shape button selects Mod Region (the region of the wavetable that will be modulated by Mod Shapes).

OFF: Default. Modulates from Wave position to end of table.

PURPLE: Modulates from beginning of table to Wave position.

### Quantization

On Page 2, Follow button enables Quantization.

**OFF:** No Ouantization.

**YELLOW:** 12-TET quantization enabled. Affects Pitch, Transpose and V/Oct. Also affects Osc A Expo control in Free and Detune modes (including when channels are Spread). The oscillators are also locked to A=440 when this is on and the fine tune is at noon.



# OSC A

### Pitch (Spreadable parameter)

Pitch of the Osc A. Behavior depends on the setting of the Pitch Follow button (see below).

### Pitch Follow (Button)

Sets Follow behavior. Press and hold this to reset to OFF mode.

OFF: Free. Makes Osc A Pitch independent (and tracks v/oct when Pitch attenuverter set CW).

Pink: Expo Detune. Makes Pitch add +/- one octave to Osc B Osc's pitch.

Magenta: Linear Detune. Pitch offsets from Osc B's pitch by a consistent Hz amount.

Cyan: Octaves. Locks Osc A to octaves up or down from Osc B's pitch.

**Green:** Integer Multiply. Locks Osc A to integer ratios of Osc B Osc's pitch (useful for guaranteed in-tune tracking relative to Osc B, or for sub-oscillator effects etc.)

### **Wave Position (Spreadable parameter)**

Wavetable position to create base timbre for Osc A Oscillator.

### Mod Shape (Button)

Selects the read shape for Osc A wavetable (same selection as on Osc B) Press and hold this to reset to OFF mode.

### Global Parameters (affect both Osc A and Osc B)

### Blend

Sets output mix between Osc A and Osc B.

### **Detune**

Global detune across all eight voices. Set low for beating/chorusing or high for "harmonic oscillator" effects.

### **Mod Time (Spreadable parameter)**

The Mod Time parameter sets the rate of read modulation, which can be different per voice via Spread or Modulation Dissemination.



# **TIPS & TRICKS**

- When using "Harmonic Oscillator" (Detune full CW), it will often make more sense to sequence Transpose instead of 1v/oct.
- The effects of the Detune control are more apparent when voices overlap--this can be a good reason to use the Accumulate input and Activate voices simultaneously.
- In Multimod Activation One-Shot Mode, the Yellow and Orange Multimod shapes act differently.
  - YELLOW: TIME sets an adjustable slew rate.
  - ORANGE: TIME does nothing.



# **APPENDIX A: INCLUDED WAVETABLES**

1_tr 2_tr 3_tr 4_sc 5_s: 6_sc 7_sc	SSIC SHAPES ri_saw ri_square ri_saw_square_pwm quare_pwm ine_square_saw aw_ramp_combo uper_saw_index ine_dc_clip	3_0coast_mult_even 4_0coast_mult_full 5_xpo_modulate 6_strega_tone	1_warp_sine 2_pw_sine 3_fold_sine 4_mirrored_sine 5_wrap_sine 6_horizontal_fold_sine 7_horizontal_fold_saw	ADDITIVE 1_additive_saw 2_additive_saw_formant 3_additive_square 4_additive_square_formant 5_additive_saw_hp 6_additive_harm_lp 7_additive_harm_sweep
2_s; 3_d; 4_s; 5_d; 6_s; 7_d;	C lip_sync_sine ync_sine po_sync_sine ync_saw po_sync_saw ync_square po_sync_square to_sync	KEYS 1_organ_odds 2_organ_harm 3_organ_harm_clip 4_organ_simmer 5_organ_full 6_fm_bell 7_fm_epiano 8_fm_pluck	1_vow_u_a 2_vow_o_i 3_vow_a_i 4_vowel_multi 5_vowel_multi_rounded 6_vintage_vox_1 7_vintage_vox_2	FM 1_fm_index_1 2_fm_index_2 3_fm_index_3 4_fm_index_4 5_fm_index_5 6_fm_index_6 7_fm_index_7 8_fm_index_8



# APPENDIX B: LOADING CUSTOM WAVETABLES

To access the MultiWAVE folder structure for reorganizing wavetables, or loading custom tables, connect MultiWAVE to a computer via USB-C cable (the USB-C jack is on the bottom left behind the panel), and power on the system while holding the MODE button.

MultiWAVE will appear as an external drive called MULTIWAVE.

The folders are as follows:

1-red
2-blue
3-green
4-purple
5-pink
6-orange
7-yellow
8-cyan

Wavetables are stored in WAV format and are compatible with the WaveEdit software by Synthesis Technology.

Filenames must begin with a number from 1 to 8 to designate the slot they will appear in. For example here are the factory contents of the "1-red" bank:

1\_tri\_to\_saw.wav
2\_tri\_to\_square.wav
3\_tri\_saw\_square\_pwm.wav
4\_square\_pwm.wav
5\_sine\_to\_square\_to\_saw.wav
6\_saw\_ramp\_combo.wav
7\_super\_saw\_index.wav
8\_sine\_dc\_clip.wav

Once you have placed the files of your choosing, eject the drive from the computer. Then press the MODE button to allow the MultiWAVE to boot up as normal, after which the wavetables will be selectable on Page 2.

