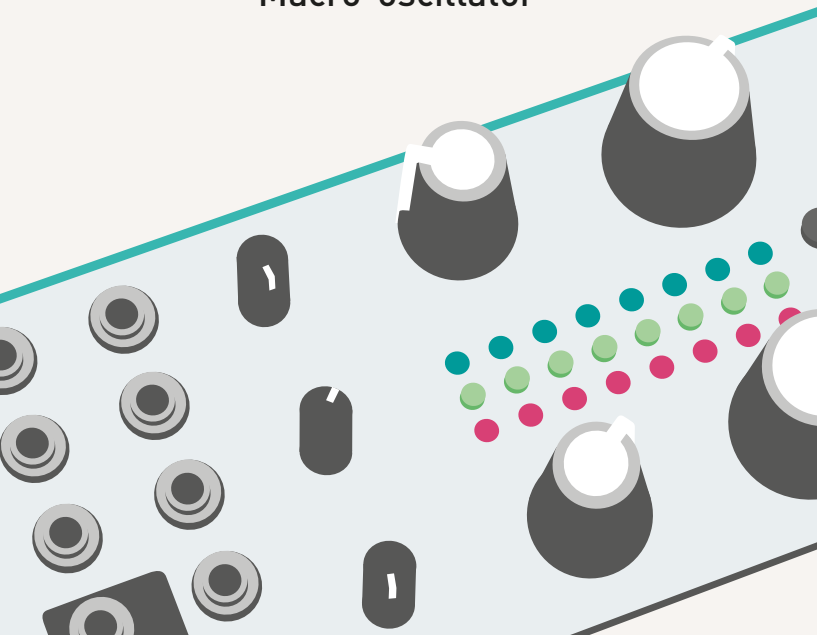
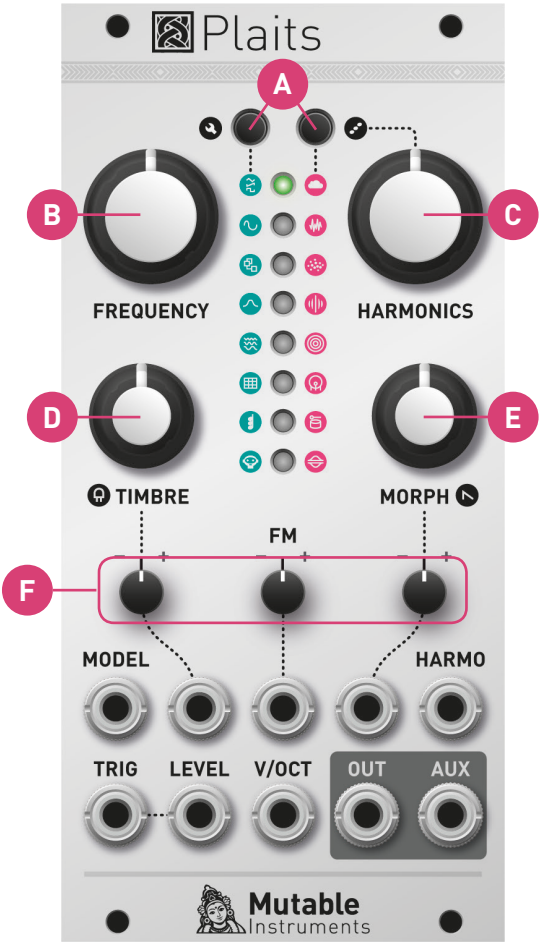
Mutable Instruments

Plaits

Macro-oscillator




Plaits
A
B
C
FREQUENCY
HARMONICS
D
E
TIMBRE
MORPH
FM
F
MODEL
HARMO
TRIG
LEVEL
V/OCT
OUT
AUX
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About Plaits

Plaits is a digital voltage-controlled sound source capable of sixteen different synthesis techniques. Plaits reclaims the land between all the fragmented islands of sound produced by its predecessor, Braids. Its built-in low-pass gate (LPG) and decaying envelope generator allows it to be used as a self-contained voice, in particular for percussive hits.

Front panel

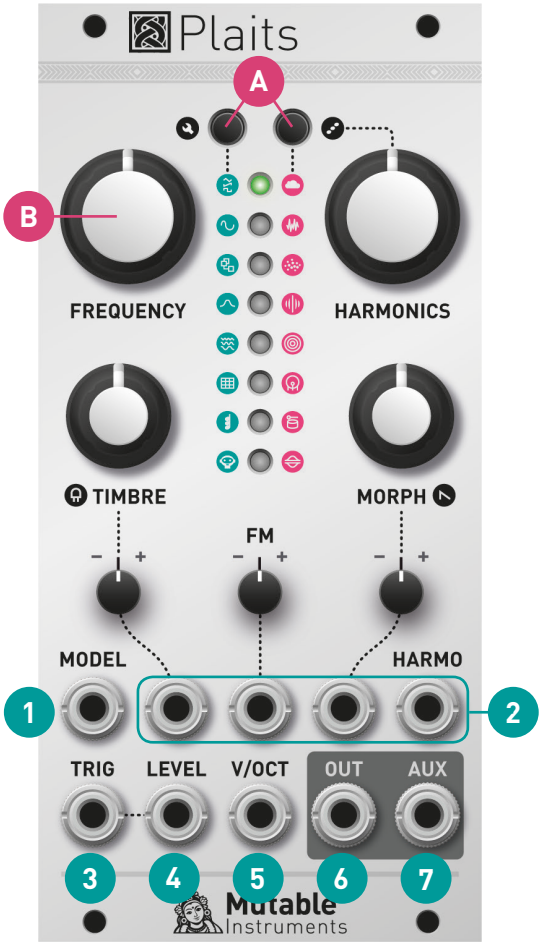
Controls

A. **Model selection buttons** and LEDs displaying the active model. Each button cycles through a bank of 8 models. The second bank is focused on noisy and percussive sounds.

B. **Coarse frequency control**. By default, it covers a range of 8 octaves, but it can be narrowed down to 14 semitones (refer to the **FREQUENCY knob range** section).

C. D. E. **Model-dependent tone controls**. Their actual function varies from model to model. In general, **TIMBRE** sweeps the spectral content from dark/sparse to bright/dense, **MORPH** explores lateral timbral variations and **HARMONICS** controls the frequency spread or the balance between the various constituents of the tone.

F. **Attenuverters** for the **TIMBRE**, **FM** and **MORPH** CV inputs. When the corresponding CV input is left unpatched and the trigger input **[3]** is patched, the attenuverter adjusts the modulation amount from the internal decaying envelope generator. When unplugging a CV input, and if the trigger input is patched, remember to reset the attenuverter to 12 o'clock if you do not want the internal envelope to take over!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Inputs and Outputs

1. Model selection CV input. When this CV input is modulated, two LEDs are lit: the steadily lit LED indicates the current model, and the slowly blinking LED indicates the central value, which would be obtained with a CV of 0V and which is still modifiable with the buttons **[A]**.

Note that when the trigger input **[3]** is patched, model changes occur only whenever a trigger is received.

2. CV inputs for the timbre, frequency, morph and harmonics parameters.

3. Trigger input. Serves four percussive purposes:

- Triggers the internal decaying envelope generator.
- Excites the physical and percussive models.
- Strikes the internal low-pass gate (unless the **LEVEL** CV input **[4]** is patched).
- Samples and holds the value of the **MODEL** CV input.

4. Level input. Opens the internal low-pass gate, to simultaneously control the amplitude and brightness of the output signal. Also acts as an accent control when triggering the physical or percussive models.

5. V/Oct CV input. Controls the fundamental frequency of the sound, from -3 to +5 octaves relative to the root note set by the coarse frequency knob **[B]**.

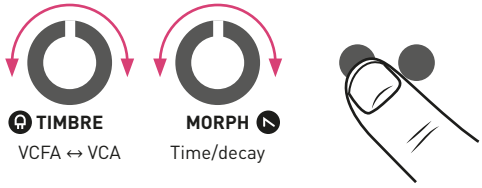
6. 7. Outputs. The **AUX** output carries a variant, sidekick, or by-product of the main signal produced on **OUT**.

Adjusting the internal LPG and envelope

Hold the first button **(A)** and:

- Turn the **TIMBRE** knob to adjust the response of the LPG, from VCFA to VCA.
- Turn the **MORPH** knob to adjust the ringing time of the LPG and the decay time of the internal envelope.

The value of both settings are represented by 4 yellow LEDs.

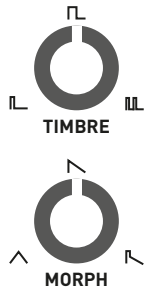


Adjusting the FREQUENCY knob range

Hold the second button **(A)** and turn the **HARMONICS** knob to select the range of the **FREQUENCY** knob. The first 8 settings correspond to **C0 +/- 7** semitones, **C1 +/- 7** semitones, and so on. The last setting, with all LEDs lit, corresponds to the **full 8-octave range** from C0 to C8.

Synthesis models

Pair of classic waveforms



Virtual-analog synthesis of classic waveforms.

HARMONICS: detuning between the two waves.

TIMBRE: variable square, from narrow pulse to full square to hardsync formants.

MORPH: variable saw, from triangle to saw with an increasingly wide notch (Braids' CSAW).

AUX: sum of two hardsync'ed waveforms, the shape of which is controlled by **MORPH** and de-tuning by **HARMONICS**.

A **narrow pulse** or **wide notch** results in **silence!**

Waveshaping oscillator

An asymmetric triangle processed by a waveshaper and a wavefolder.

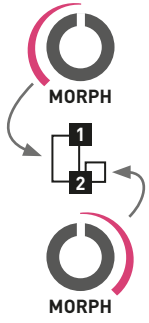
HARMONICS: waveshaper waveform.

TIMBRE: wavefolder amount.

MORPH: waveform asymmetry.

AUX: variant employing another wavefolder curve.

Two operator FM



Two sine-wave oscillators modulating each other's phase.

HARMONICS: frequency ratio.

TIMBRE: modulation index.

MORPH: feedback, in the form of operator 2 modulating its own phase (past 12 o'clock, rough!) or operator 1's phase (before 12 o'clock, chaotic!).

AUX: sub-oscillator.

Granular formant oscillator

Simulation of formants and filtered waveforms through the multiplication, addition and synchronization of segments of sine waves.

HARMONICS: frequency ratio between formant 1 and 2.

TIMBRE: formant frequency.

MORPH: formant width and shape.

AUX: simulation of filtered waveforms by windowed sine waves – a recreation of Braids' Z*** models. **HARMONICS** controls the filter type (peaking, LP, BP, HP).

Harmonic oscillator

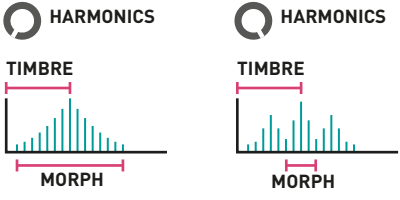
An additive mixture of harmonically-related sine waves.

HARMONICS: number of bumps in the spectrum.

TIMBRE: index of the most prominent harmonic.

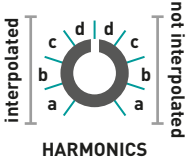
MORPH: bump shape – from flat and wide to peaked and narrow.

AUX: variant including only the subset of harmonics present in the drawbars of a Hammond organ.



Wavetable oscillator

Four banks of 8x8 waveforms, accessed by row and column, with or without interpolation.



HARMONICS: bank selection. 4 interpolated banks followed by the same 4 banks, in reverse order, without interpolation.

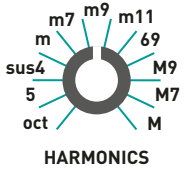
TIMBRE: row index. Within a row, the waves are sorted by spectral brightness.

MORPH: column index.

AUX: low-fi output.

Chords

Four-note chords, played by VA or wavetable oscillators.



HARMONICS: chord type.

TIMBRE: chord inversion and transposition.

MORPH: waveform. The first half of the knob goes through a selection of string-machine like raw waveforms, the second half of the knob scans a small wavetable.

AUX: root note of the chord.

Vowel and speech synthesis

A collection of speech synthesis algorithms.

HARMONICS: crossfades between formant filtering, SAM, and LPC vowels, then goes through several banks of LPC words.

TIMBRE: species selection, from Daleks to chipmunks.

MORPH: phoneme or word segment selection. Patch the trigger input **[3]** to trigger the utterance of a word, use the **FM** attenuverter to control the intonation and the **MORPH** attenuverter to control speed.

AUX: unfiltered vocal cords' signal.

Granular cloud

A swarm of 8 enveloped sawtooth waves.

HARMONICS: amount of pitch randomization.

TIMBRE: grain density.

MORPH: grain duration and overlap.

AUX: variant with sine wave oscillators.

Filtered noise

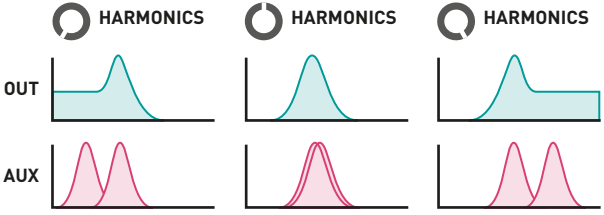
Variable-clock white noise processed by a resonant filter.

HARMONICS: filter response, from LP to BP to HP.

TIMBRE: clock frequency.

MORPH: filter resonance.

AUX: variant processed by two band-pass filters, with their separation controlled by **HARMONICS**.



Particle noise

Dust noise processed by networks of all-pass or band-pass filters.

HARMONICS: amount of frequency randomization.

TIMBRE: particle density.

MORPH: filter type – reverberating all-pass network before 12 o'clock, then increasingly resonant band-pass filters.

AUX: raw dust noise.

Inharmonic string modeling

Modal resonator bank

For your own pleasure, a mini-Rings! When the **TRIG** input is not patched, the resonator is excited by dust noise.

HARMONICS: amount of inharmonicity, or material selection.

TIMBRE: excitation brightness and dust density.

MORPH: decay time (energy absorption).

AUX: raw exciter signal.

Analog bass drum model

HARMONICS: attack sharpness.

TIMBRE: brightness.

MORPH: decay time.

AUX: emulation of another classic bass drum circuit.

Analog snare drum model

HARMONICS: balance of the harmonic and noisy components.

TIMBRE: balance between the different modes of the drum.

MORPH: decay time.

AUX: emulation of another classic snare drum circuit.

Analog high-hat model

HARMONICS: balance of the metallic and filtered noise.

TIMBRE: high-pass filter cutoff.

MORPH: decay time.

AUX: variant with a different flavor of tuned noise based on ring-modulated square waves.

Note: all the models listed on this page employ their own decay envelope and filter. The internal LPG is disabled for them.

Installation

Plaits requires a **-12V/+12V** power supply (2x5 pin connector). The red stripe of the ribbon cable (-12V side) must be oriented on the same side as the "Red stripe" marking on the module and on your power distribution board.

The module draws **50mA** from the **+12V rail**, and **5mA** from the **-12V rail**.

Online manual and help

The full manual can be found online at
mutable-instruments.net/modules/plaits/manual

For help and discussions, head to
mutable-instruments.net/forum

Please refer to the online manual for detailed information regarding compliance with EMC directives