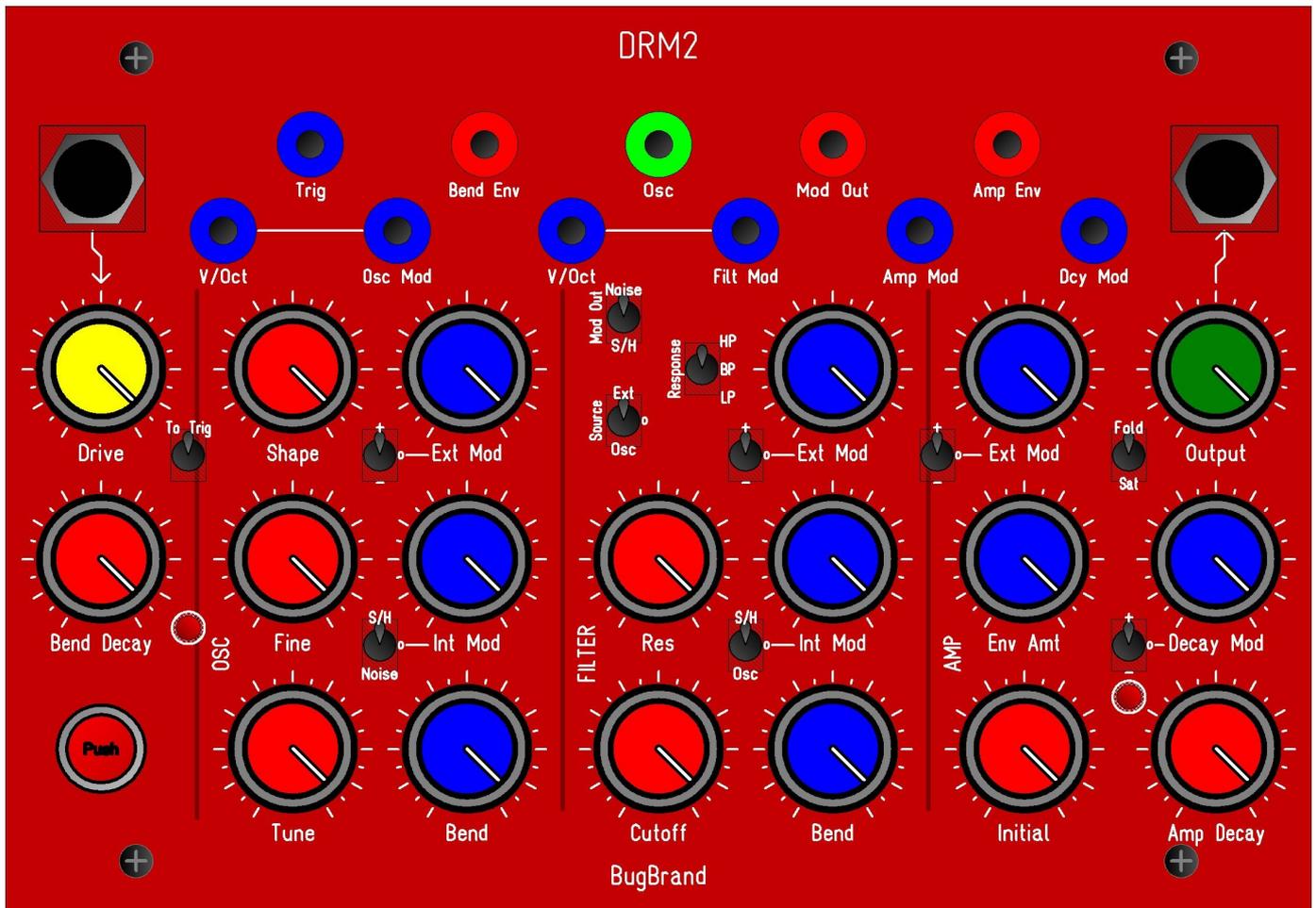


# BugBrand DRM2 Operation Manual

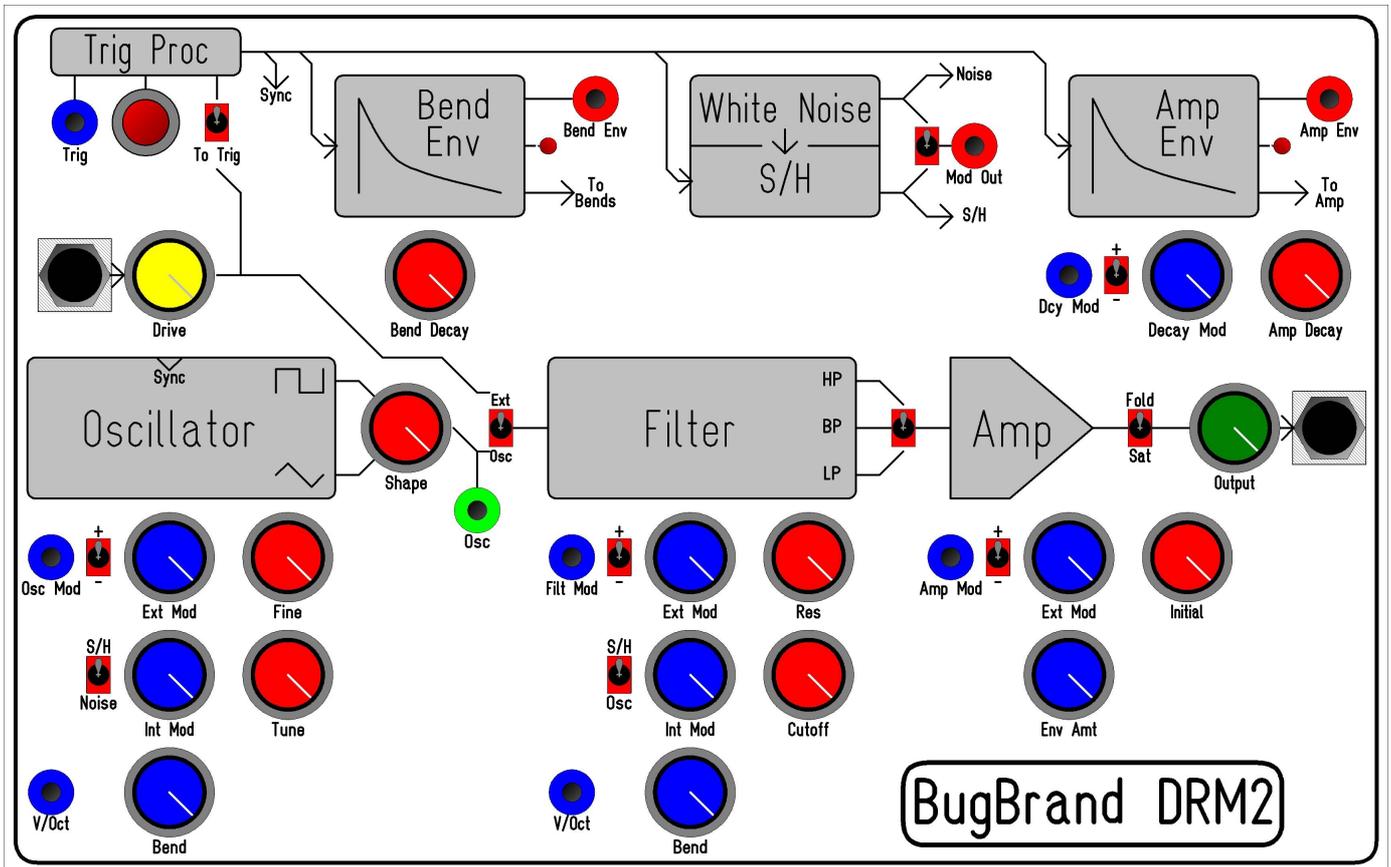


The DRM2 is presented as a wide-ranging drum voice synthesizer but it is really a full analogue synthesizer just with drum-focused envelopes. The sound path is a somewhat traditional subtractive arrangement of Oscillator → Filter → Amplifier, while the control section offers two Decay Envelopes and a Sample & Hold. This core is then garnished with switched internal routings, an Audio Preamp and diverse 4mm banana CV Inputs/Outputs to complete a compact but powerful sound generator.

This manual breaks down the constituent parts (see block diagram overleaf) before giving usage examples and interfacing details.

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[A colour version PDF is available to download from the website]



The DRM2 core can be seen as a sound section (Osc, Filter, Amp) and an associated control section (Trig, Envs, S/H). The block diagram shows the circuit blocks that make up the DRM2, their associated controls and I/O, and the signal flow. Note the use of colours to denote function and the use of *Int* for internal signal routing vs. *Ext* for external control inputs.

## Sound Section

**Oscillator:** The Voltage Controlled Oscillator (VCO/Osc) is the core sound generator, but it can also function as a modulation source at audio or low frequencies. It is a triangle core design with temperature compensated exponential control (1V/Oct), the frequency of which is governed by a summation of the Tune/Fine controls and any of the modulation inputs.

- The output is sweepable from Triangle to Square with the Shape control and its output (+/-5V) is provided at the green Osc socket.
- The Tune control sweeps the frequency over the range of approximately 1Hz to 10kHz, while the Fine control gives a 1 Octave range. The Osc can go well beyond these ranges with CV control.
- There are two Internal modulation sources – Bend from the Bend Envelope and Int Mod which is switchable between S/H or Noise modulation (with centre off)
- There are two External modulation sources – a precision 1V/Oct input for pitch CV (accurate over about 6 octaves) and Ext Mod with switchable polarity. Each input is designed for typical 10V peak-to-peak signals but accepts anything up to +/-15V.
- The Oscillator can be synced (reset) on each Trigger Event via an internal jumper (set ON as supplied). This resets the Triangle wave to 0V.

**Filter:** The Voltage Controlled Filter (VCF) is a 12dB/Oct State Variable design with temperature compensated exponential control (1V/Oct). It can self-oscillate at full resonance to produce a pure sine-wave and has a switchable output response (Low/Band/High-pass).

- The Source switch selects the filter input between Osc or Ext (preamp) or it can be set to centre-off for no input, useful when the filter is self-oscillating.
- The Cutoff control sweeps the frequency over the full audio spectrum and is summed with any other modulation source.
- There are two Internal modulation sources – Bend from the Bend Envelope and Int Mod which is switchable between S/H or Oscillator modulation (with centre off)
- There are two External modulation sources – a precision 1V/Oct input for frequency CV (accurate over about 6 octaves) and Ext Mod with switchable polarity. Each input is designed for typical 10V peak-to-peak signals but accepts anything up to +/-15V.

**Amplifier:** The Voltage Controlled Amplifier (VCA/Amp) is linearly controlled and feeds into a shaping section, which can be switched between Saturation or Wave-Folding, before a final Output level control and impedance balanced 1/4" Output socket.

- The opening of the Amplifier is governed by a sum of the Initial (Manual) control and any modulation sources, ranging from 0 (fully closed) to +10V (fully open).
- Internal modulation comes from the Amp Envelope via the Env Amt control, while External modulation is from the CV source with switchable polarity (again 10V peak-to-peak typical).
- Low settings (under c.25% depth) keep the VCA in clean range, while greater depth brings in the effects of the shaping sections.
- Saturation is based on soft-clipping zener limiting, while Wave-Folding provides three stages of folding to add overtones.

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## Control Section

**Input / Preamp:** The unbalanced 1/4" line input brings signals into the DRM2 both for processing through the Filter and/or Triggering events. The Drive control offers gain from fully off up to +20dB and zener saturation/clipping. Switch the To Trig switch to the Up position to pass the amplified signal to the Trigger Processor.

**Trigger Processor:** The Trigger Processor sums three sources to produce a global Event Trigger pulse.

- Trig Socket – this expects a gate/logic input with triggering occurring on the rising edge. It will typically take a 0 to +10V input but lower amplitudes can be used to provide amplitude dynamics.
- Manual Button – this triggers an event at full amplitude.
- External Signal – with the To Trig switch On (up), an external signal is rectified and filtered to produce an event trigger. The signal can be an external gate or an audio signal with the most regular results coming from simple, dynamic signals such as a kick or click – the Drive control should be adjusted to give regular triggering.

**Bend Envelope:** The Bend Envelope is a simple manual Envelope with variable exponential Decay, triggered with each Event Trigger. The output passes to the Bend Env socket, LED indicator and the Bend Modulation controls. The amplitude depends on the amplitude of the any trigger input up to typical +10V.

- Envelope time range: 10mS to 1.5S

**White Noise / Sample & Hold:** White Noise (+/-5V) is generated with a standard transistor based circuit. This is used both for the S/H source and Osc modulation, along with switched output through the Mod Out socket. The S/H samples the input voltage each time an Event Trigger occurs and holds that voltage until the next trigger (note – the voltage can droop over time – this is normal). The output range reflects the +/-5V input and again the section can be switched to output through the Mod Out socket.

**Amp Envelope:** The Amplitude Envelope adds Voltage Control to the Decay time setting and offers longer decay times. Decay time is set by the sum of the Decay control coupled with the Ext Mod control input with polarity switch. The output connects to the Env Amt VCA control along with Amp Env socket and associated LED.

- Envelope time range: 10mS to 10S
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### First Patch:

There are a number of settings which might initially catch you off guard:

- The first half of the Tune dial covers sub-audio ranges & these will only be audible if the waveshape has some square blended in (ie. Not fully counter-clockwise).
- Ensure the Filter Source switch is set to Osc.
- On the Amp section, either turn up the Initial control for steady drone, or ensure the Env Amt dial is turned up.
- For modulations, make sure the switches aren't in the centre-off position.

### Further ideas:

- Noise Modulation – using Noise on the Osc Int Mod offers a range of results. With the Osc tuned low, apply a small amount of noise for noisy kicks. With the Osc tuned high, apply a medium amount of noise for tuned noise results or full noise modulation for something approaching white noise (good for hats)
- Self-oscillating Filter – turn Res up full and set the Filter Source switch to centre-off for pure sines. Now set Int Mod to Osc to FM the frequency – you could also patch S&H via the Ext Mod or apply it to the Osc itself. Also try switching the Source switch back to Osc.
- Variable Decay – patch S&H to Dcy Mod and adjust to taste.
- Amp Envelope shaping – patch the Amp Env into Dcy Mod to change the envelope shape.

- External Signal Processing – plug an audio source into the input and adjust Drive. Keep To Trig switch Off (down) and switch Filter Source to Ext. Now play with the Amp Initial control and adjust Cutoff / Res. You can then apply Triggers to fire the Envelopes and/or S&H for modulations.
  - Switching the To Trig switch On (up) will, with Drive adjusted, create trigger events. Take the Initial control back down to zero and apply Amp Env with the Env Amt control. Short Amp Decay settings will gate the sound. Something akin to Compression (fixed fast attack, variable decay) can be achieved by patching the Amp Env output into the Amp Mod input and switching it to inverted modulation (keep the Env Amt control down in this case)
  - Self-Triggering – patch the Osc output to Trig input and set the Osc Shape to something from 50% to fully Square, keeping the Tune set very low. The Osc then creates trigger events – try applying some S&H to modulate the Osc for random rate variations.
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### **Calibration:**

The DRM2 comes calibrated, but may require small adjustments to match your system. Always let the DRM2 warm up for 30-60 minutes and proceed with care:

- O\_SCL is the main Oscillator scaling adjustment  
HFRQ adjusts high-frequency tracking, but should not generally need adjustment  
O\_OFS offsets the Oscillator frequency, typically set for Tune range 1Hz-10kHz
- F\_SCL adjusts the Filter scaling
- NLVL adjusts the noise amplitude (limited to +/-5V) but should not require adjustment.

### **Power:**

The cased / standalone DRM2 comes with worldwide (90-264V AC) power pack which provides the required 300mA @ 12VDC via 2.1mm centre positive plug. The standalone case holds a DCDC converter to generate the standard +/-15V bipolar supply.

The DRM2 can also be used as a module within a larger BugBrand/Frac system. Power draw is +ve 70mA , -ve 70mA

## **Interfacing with Banana Sockets:**

As 4mm banana cables do not carry a 0V connection, you must join the DRM2's 0V (black banana on rear of case) to that of any external system to establish a common 0V.

### **Banana-to-Banana:**

External banana systems should have a 0V banana socket, usually located on the case or PSU. Connect a banana cable between this and the DRM2's black 0V socket. With this common 0V established, signals can then be patched freely between systems.

### **Banana-to-Jack:**

Use BugBrand Interface Cables – minijack to banana.

- The first connection is made with a two wire cable assembly.
  - The Black cable, from jack sleeve, plugs to the black 0V socket on the rear of the DRM2, thus establishing a common 0V.
  - The White cable, from jack tip, then plugs to a CV source/destination.
- Further connections to the same piece of equipment can then be made with single wire signal cables.
- If a further piece of equipment needs to be used, another twin assembly should be used to again establish a common 0V connection.

## **Guarantee:**

The DRM2 comes with a 2 year 'reasonable' warranty. If any mechanical or electronic failure occurs within the period, I will repair the fault free of charge. This excludes failure from maltreatment or modification and any cosmetic degradation. Contact should first be made via email to discuss the problem. Shipping to return the device is paid by the user and I cover return shipping. Failures that are not covered by this guarantee may be fixed at standard rates.