



BugBrand DRM1 Major Drum

Operation Manual

Thanks for picking up the **BugBrand DRM1 Major Drum!**

The DRM1 is a fully analogue drum voice synthesizer capable of creating a wide array of percussion sounds and is built around the following parts:

- Input Trigger Conditioner with four Decay Envelopes
- Voltage Controlled Oscillator
- White Noise Generator
- Voltage Controlled Filter
- Dual Voltage Controlled Amplifier
- Impact Generator
- Output Summer with Soft-Clipping/Saturation
- Expandable via DRM1X MD Expander module

The DRM1 can be seen as a continuation of my work with Modular Synthesizer designs and while it has diverse standalone potential for studio or live work, the palate of sounds can be further extended when coupled with Control Voltages (CVs) or Gate signals from external devices.

I hope you enjoy playing!

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January 2014

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Input

The DRM1 can be triggered by any of the 3 inputs:

- **Trigger In** (Banana Skt) – this expects a gate/logic input, typically from 0 to +10V, with triggering occurring on the rising edge. Gate signals of a lower voltage will trigger with lower amplitude, so dynamics can be achieved using varying gate voltages.
- **Pad/Signal** (1/4" Mono Jack) – audio/trigger input with **In Drive** level control (allows up to +20dB gain). The input can be from a piezo/mesh drum trigger pad, an external CV gate signal, or an audio signal. For regular triggering when using audio (as opposed to a gate signal), a simple and dynamic signal is advised such as kick drum, metronome, etc., but you may want to experiment with other audio signals when filtering signals (switch VCF input to Ext).
- **Manual Button** – this triggers an event at full (10V) amplitude.

Decay Generators

The four Decay Envelope Generators are triggered together* and all behave in a similar manner with the exception that the **Bend** envelopes are roughly twice as quick as the **Amp** envelopes. Turn the dials anti-clockwise for short decays or clockwise for longer decays.

(* the Filter side Envelopes can be triggered together with or independently of the Osc side via the DRM1X)

Trigger Out / Impact

A 2.5mS pulse is generated on each event and this passes both to **Trigger Out** (Banana Skt) and to the Impact section. The **Impact** (Tone) control filters this pulse to produce an attack sound on each event – turning the control anti-clockwise produces a bassy thud, while clockwise produces a trebly click.

Oscillator

The Voltage Controlled Oscillator (VCO) section is built from a triangle core design with exponential control (1V/Oct). The **Tune** control covers the full audio range from roughly 20-20kHz (11 Octaves) and the **Shape** control blends from Triangle (fully anti-clockwise) to Square (fully clockwise).

The overall frequency (pitch) of the VCO is set by the summation of the Tune control coupled with any modulation from the Osc's **Bend** or **FM** (frequency modulation) CV controls. The Bend Depth control, which can be switched to positive or inverted polarity (or centre off), sets the influence of the Bend Decay Envelope, while the FM depth sets the modulation from the external Osc CV input or the internally patched White Noise signal (for tuned noise sounds). For external CV, turn the FM control fully clockwise for 1V/Oct response.

Note that the range of the VCO can extend into sub-audio frequencies if negative CVs are applied or if an inverted Bend is used – this can be useful when modulating the Filter's Cutoff Frequency.

The VCO can be Sync'd on each trigger with an internal jumper setting.

Filter

The Voltage Controlled Filter (VCF) is a 12dB/Oct State Variable design with Low/Band/High-pass outputs which self-oscillates at full resonance (**Q**) and covers the full audio range from roughly 20-20kHz.

In a similar manner to the Osc section, the operating frequency is set by the **Cutoff** control combined with modulation from the **Bend** and **FM** controls. This time it is the output of the Osc section that is offered as switchable FM source.

The filter can take its input from the internal White **Noise** generator, the summed trigger input signal (e.g. for external filtering) or switched to no input (middle position). This position is most of use when the VCF is in self-oscillation and produces pure sine waves – these sound great when FM'd from the Osc.

The output is switchable from Band Pass to either Low or High Pass (the choice of which is set by internal jumper).

VCA's

The VCO and VCF each pass through a Voltage Controlled Amplifier (VCA). The section **Level** controls set how much the Amp decay envelopes open each section's VCA.

Output

The three sources (Impact, VCO, VCF) are summed before output and diode limiting is in place to control output signal amplitudes and alter the tonality by introducing soft-clipping. Note that the response of the **Out Drive** control will depend on the settings of the section level controls – adjusting the balances allows a wide variety of sonic results.

Signal levels within the DRM1 are typically the modular standard of 10 Volts Peak to Peak, apart from the audio output which is limited to roughly +4dBu for standard studio level.

Jumpers / Expansion

The sections that make up the DRM1 are tuned to the job of producing percussion sounds, but they remain close to their modular roots. With this in mind, various pin-headers are present on the main circuit board both for altering the standalone behaviour and for allowing expansion, for example with the DRM1X Expander.

The DRM1 is initially set with three jumpers in place on the board:

- **F-Trig** – this allows the Filter side envelopes to be triggered independently of the Osc side via the DRM1X. For normal operation a jumper *must* be placed joining the Snd and Rtn pins.
- **<HP/LP>** – this selects which of High Pass or Low Pass filters is used for the **Filter Output** switch (a jumper *must* always be in place). When the DRM1X is used, the jumper is replaced by a new panel switch.
- **<SYNC** – the jumper selects whether the VCO is sync'd on each trigger event. The jumper is placed to the left for Sync ON (between Rtn and Snd) or to the right for Sync OFF. Sync options are also increased with the DRM1X.

Expansion headers are also present for:

- Envs – the four Decay Envelopes (all positive polarity – 0 to +10V range)
- SectCVs – 1V/Oct CV inputs for the Osc and Filter sections.
- AmpCVs – CV inputs for the VCAs.
- Misc – direct outputs (+/-5V) of Osc waves (Tri/Sqr) and White Noise, plus an extra input to the VCF.

Trimmers

There are two blue trimmer potentiometers on the circuit which are used to fine tune the CV response of the Osc and Filter sections, set when the associated FM control is fully up. These are calibrated during testing, but may require small adjustments to match your system. The Osc section is capable of perfect tracking over a minimum of 4 Octaves, while the Filter will provide over 6 Octaves. The DRM1 should be powered for at least 15 minutes before adjusting scaling.

Power

The DRM1 runs from a +/- 15V bipolar supply – the same standard as used for BugBrand Modules. For the standalone device a DC/DC converter board is present in the case which hooks to the DRM1 **POWER** header via a 4 way cable. This is made separate from the main DRM1 so that the module can be used in a larger system if required.

The standalone unit is supplied with an external 12V DC power pack (minimum 0.5A with 2.1mm centre positive plug) which operates on any worldwide mains voltage.

Interfacing with Banana Sockets

As 4mm banana cables do not carry a ground connection, you *must* join the DRM1's system ground to the CV source's ground.

Banana-to-Banana:

External banana systems should have a Ground banana socket, usually located on the PSU. Connect a banana cable between this and the DRM1's black **GND** banana socket.

Banana-to-Jack:

This first connection is made with a two wire cable assembly – jack to twin banana:

- the *BLACK* cable, from jack sleeve, plugs to the black **GND** banana socket on the rear of the case.
- the *WHITE* cable, from jack tip, then plugs to the CV destination.

Further connections from the same piece of external gear can then be made with just a CV signal cable – further ground connections are only required when introducing further external gear.

Guarantee

The DRM1 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.