

About the design

For the uninitiated, balanced modulation (sometimes called “ring modulation” after an early method of realising it) differs from a standard Voltage Controlled Amplifier by allowing negative multiplication of signals as well as positive. It was used in many classic synths and electronic music studios to allow the generation of dissonant metallic tones (not to mention Daleks and Cybermen!) from two simple input waveforms of differing frequencies.

The MC1496 modulation chip from the late 1960s has passed into legend and is still popular today, however the original Aries AR315 was about the only use of its more sophisticated, much better-performing, analogue computing grade military spec sibling the MC1595L, which is now out of production. Unlike the MC1496, the MC1595L has low distortion and does not “lose tone” as signal levels are increased.

We started out copying the AR315 design but performance was poor. Eventually we worked out that their design was lifted almost wholesale from the Motorola datasheet (Fig. 21, trainspotters!) and not only needed to be fully recomputed for 12V supplies, but that a change made by Aries to facilitate input attenuators had compromised performance. Adding a high quality op-amp buffer allowed these problems to be overcome while keeping the attenuators! We also restored the Motorola design’s zener-diode-reference subregulators to improve power supply noise immunity and minimise the need for recalibration.

Lastly, we decided to use old mil-spec LM101AH or industrial spec LM201AH chips in hermetic can packages. They did actually sound better!!

Specifications and Warranty

40mm flange depth, 60mm internal case depth recommended as a minimum.
Power requirements: +12V at 20mA, -12V at 22mA, with short-term reverse voltage protection.

Balanced Modulator section

Inputs protected against pos/neg overvoltage
Input impedance (each channel): 100kohm
Linear control response
Maximum post-attenuator voltage differential between channels for proper operation: +/-10V
Distortion (10Vpp, 1kHz, X, 50% gain): <0.5%
Output frequency response: DC to 100kHz (-3dB)
Output impedance (each output): 1kohm

Attenuator section

Input impedance (each channel): 100kohm max, affected by output load and control position.
Linear control response, max +/-20V input.

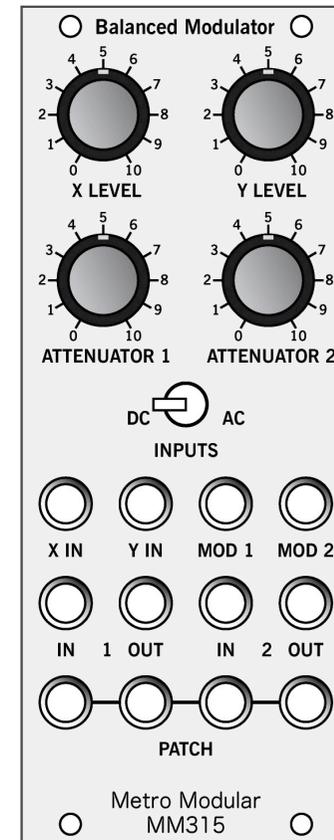
Patchbay section is fully normalised

This module is warranted against manufacturing defects for 12 months from the date of purchase. Damage or malfunction due to: mistreatment; mechanical shock; disassembly; unauthorised modification, calibration or repair; reversed power supply voltage; or power supply overvoltage is not covered by warranty. You MUST contact us for return authorisation before sending modules for repair.

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MM315 Balanced Modulator

Instruction and Operating Manual



Metro Modular

"the sound your eyes can follow"

Welcome and Installation

Thank you for your purchase of the Metro Modular MM315.

The MM315 is an excellent balanced modulator which can generate all sorts of clangorous sounds when cross-modulating audio signals. It also has two independent passive attenuators and a separate patchbay which can be used to enhance your modular system.

This module has been tested and calibrated at the factory and should reach you in perfect condition. If it appears to have suffered damage in transit then please contact the seller immediately.

This module is designed to be installed into any standard Eurorack synthesizer as follows.

1. Carefully remove the module and attached ribbon power cable from the shielded foil bag.
2. Plug the module into a standard Eurorack busboard (not Cwejman!) with power disconnected. Ensure that the red stripe on the power cable is aligned to the STRIPE or -12V marker on the busboard connector. If the busboard uses polarised headers (ie flying busboards or Elby) then the power ribbon cable should only be able to connect in the right direction.
3. Turn on the busboard's power supply while watching any status lights on the power supply and other modules. If ANY status lights fail to turn on, disconnect power IMMEDIATELY and recheck the connection of the MM315's power cable to the busboard.
4. Once operation has been verified, screw it in!

What it can do

Both X and Y inputs have very good linearity and "null rejection" (the ability to prevent signal feedthrough or "bleed" when the other input is not active), but the X input has slightly better performance.

Therefore if you are cross-modulating a constant level audio source (or "carrier") and a varying level source (or "modulator") such as speech, a voiced musical instrument, an LFO or an envelope generator, connect the carrier to X and the modulator to Y for best results.

Due to its accuracy it can be put to use as a good quality VCA. We have had good results when the Y input is driven by a Mutable Peaks, a CGS/Serge Quadslope and a Doepfer A-140. As the MM315 has a fully linear response through zero, envelope generators which do not output zero volts when inactive may cause slight signal bleed.

The module has been factory calibrated to give unity gain on the X input when +5V is present on the Y input. Please turn the Y input attenuator to about 6 when using +8V envelopes (most Euro envelopes), and 5 when using +10V envelopes (ie Envelator). Likewise, please turn the input attenuator to 5 when inputting an audio source which may exceed +5V or -5V, such as the output of the MM314 or the square wave of the MM317.

The attenuators are passive linear controls that can be used to scale control voltages or audio for unattenuated inputs in other modules, or can be used to drop modular audio outputs to levels suitable for mixers.

The 4-way patchbay is ideal for distributing a single signal to up to three other points.

Front Panel

X INPUT and Y INPUT jacks are used to input the signals to be cross-modulated.

X INPUT and Y INPUT controls are used to attenuate the levels of the input signals. Varying either one will proportionately control the MOD1 and MOD2 outputs.

MOD1 and MOD2 jacks output the modulated signal, and are isolated from each other.

INPUTS switch allows a choice of DC mode where any signal (audio or control voltage) can be applied, or AC mode where a 5Hz highpass filter blocks steady voltages on both X and Y inputs. AC mode should only be engaged when audio signals are input on both X and Y, and will stop carrier bleed caused by signals with a DC component such as narrow pulse waves. Try it!

IN jacks receive signals to be attenuated, which are then attenuated from unity to zero by the **ATTENUATOR controls**, and output through the **OUT jacks**. Channels 1 & 2 are independent of each other.

PATCH jacks are all wired together as a 4-way patchbay, as shown. Connecting more than one signal source at a time for passive mixing is not recommended, as the signal sources themselves may be damaged.