

2022.1



Table of Contents

Group C: control modules	
C GF₄ group fader/distributor	3
C GF₄e expander	5
Group M: signal modifiers	
M C₃A crossfade array	7
$M T_2D$ dual triode distortion	9



- input attenuation: channels 1–4
- group level response curve
- ③ group level control
- (4) group level CV attenuation
- (5) inverting switches: outputs 2 & 4
- 6 channel inputs 1-4
- (7) channel outputs 1-4
- (8) CV input: group level
- (9) CV output: group level



+12V: 95mA • -12V: 80mA • 12HP (optional expander)

The C GF₄ group fader/distributor controls up to four signals with a single group level control, while keeping these signals separate and preserving their individual levels relative to each other. This can be useful for controlling a group of related modulation signals, distributing a modulation signal to multiple destinations at different levels, or controlling several parallel signal processing paths with a single performance control.

group C: control modules

C GF₄ group fader/distributor

Inputs & Outputs

Input 1 of the C GF_4 is normalled to an internal +5V source, so in the absence of any incoming signals the C GF_4 can operate as a macro control for up to four other parameters in the patch. Inputs 2 through 4 are each normalled to the previous input, so a signal patched into any input from 1 to 3 will also appear at subsequent inputs (including the internal +5V, if nothing is patched to input 1). Each input has an attenuator for setting individual levels within the group; these levels will maintain their relationship proportionally as the group level changes.

Outputs 2 and 4 can be inverted with their respective switches, providing even more options for more complex modulation setups.

Group Level & CV

The central knob controls the overall level of the group, from full attenuation (CCW) to unity gain (CW). The response curve of the master level control can be switched between a linear or exponential setting, to accommodate modulation or audio signals (or experimentation to individual taste).

Voltage control of the group level is also possible, and the CV input has a dedicated attenuator and a pair of LEDs which indicate polarity and relative level of the incoming signal. The CV output acts as either a passthrough for the attenuated CV signal, or outputs a voltage corresponding to the position of the manual level control if no external CV is present, which can be used as an additional manual control of another module in the system.



- ① offset voltage: channels 1 & 3
- 2 mute switches: channels 1-4
- ③ mute control inputs: channels 1-4



+12V: 10mA • -12V: 15mA • 6HP

The C GF₄e is an optional expander for the C GF₄ module, adding offset voltage controls to channels 1 and 3, and mute functions to all four channels of the core C GF₄ module. The mute functions may be triggered manually, or with control voltages at the four mute control inputs.

The modules are linked via 12-pin ribbon cable connections on the back of each module. The C GF_4e may be positioned on either side of the core module, as long as the ribbon cable orientation is maintained (ie.: stripe down on both modules).

group C: control modules

C GF₄e expander for C GF₄

Offsets

The individual offset controls for channels 1 and 3 apply a 0-5V bias voltage to the existing signal on that channel. This may be combined with the internal +5V source normalled to input 1 to achieve offset voltages above 5V. The inverting switches of channels 2 and 4 will also affect the offset, so negative offsets and opposing pairs of offsets are also possible.

Mutes

The channel mute functions may be triggered manually with the four toggle switches at the center of the control panel. These switches have a latching function in the upward direction, and a momentary, spring-loaded function in the downward direction.

Mute functions may also be triggered via control voltages at each of the four control inputs. Any voltage above 2.5V will trigger the mute, which will remain engaged as long as the voltage remains above the 2.5V threshold. Gates, LFOs, and envelopes are all potential sources for triggering a mute, and interesting timing variations are possible with different LFO shapes and envelope segment rates.

The manual switches for the mute functions will override the control inputs; flipping the switch back to the center position will allow the control inputs to take over again.



- input attenuation: channels 1-4
- 2 crossfade controls: A B C
- ③ crossfade CV attenuation: A B C
- (4) channel inputs: 1–4
- 5 CV inputs: A B C
- 6 CV outputs: A B C
- (7) crossfade outputs: A B C



+12V: 80mA • -12V: 75mA • 18HP

The M C₃A crossfade array uses three crossfading stages to create smooth, independently controlled transitions between four inputs. All signal paths are DC-coupled and suitable for low-frequency signals and control voltages as well as audio signals. Aside from the typical use of crossfaders to transition between complete voices or tracks, audio applications for the M C₃A include use as a versatile mixer for a group of oscillator outputs before filters or other processors, wet/dry mixes with multiple effects, controlled feedback patches, and adding harmonic complexity by generating sidebands with audio-rate modulation sources.

group M: signal modifiers

M C₃A crossfade array

The M C_3A can also combine modulation sources in creative ways: to generate evolving, complex modulators from a group of relatively simple LFOs; shift between several different envelope rates and shapes; blend a varying amount of noise or other random elements with periodic modulators; and shape LFOs or envelopes through feedback loops.

Crossfades

The first two crossfade stages, A and B, are arranged in parallel and each handle one pair of input signals. Crossfade A is fed by inputs 1 and 2, while crossfade B is fed by inputs 3 and 4. Crossfade C is then fed internally by the outputs of crossfades A and B, with these outputs also available separately on the front panel for more patching flexibility. Each of the three crossfade stages has a dedicated manual control as well as independent CV inputs. The crossfade curves have been tuned for subjectively smooth transitions between audio signals, and even levels when used with modulation signals such as LFOs.

Control Voltages

Each CV input has a dedicated attenuator, and a pair of LEDs which indicate the polarity and relative level of the incoming signal. CV outputs for each crossfade stage will act as a pass-through for the attenuated external CV signal, or output a voltage corresponding to the manual crossfade control position when no external CV is present. This feature allows for chaining of modulations within a more complex patch (often avoiding the need for a multiple), or using the manual crossfade control to simultaneously sweep another parameter elsewhere in the system.



- 1 tube bias control
- spectral tilt filter control
- ③ triode input attenuation
- ④ feedback loop attenuation
- (5) tube plate voltage: 12V or 5V
- 6 dry/wet mix control
- ⑦ dry/wet mix CV input attenuation
- 8 CV inputs: dry/wet mix & tube bias
- (9) channel inputs & outputs



+12V: 111mA • -12V: 65mA • 18HP • 35mm • 202g

The M T_2D dual triode distortion presents two independent channels of distortion which can be patched separately for different sources, stereo signals, parallel processing of a single source, or in series for the greatest amount of distortion for a single source.

group M: signal modifiers

$M T_2D$ dual triode distortion

Inputs & Outputs

Each channel or stage of the MT_2D has independent patch points for the main signal input and output, as well as separate control voltage inputs for each bias and dry/wet mix control. The second input is connected internally to the first output, to simplify configuration of the two stages in series, without an external patch cable. The first output may also be used in this configuration to extract the signal from only the first stage to another module, while still passing signal to the second stage, for creative split-processing from a single source.

Bias

The tube bias controls influence the final wave shape and perceived character of distortion; settings near the middle are typically the most versatile, while settings near either end of the range can be interesting for more extreme distortion, and to influence the texture of any selfoscillation of the feedback loops when they are near their maximum levels. An external control voltage can be applied, with the manual control setting the center or resting point for any applied modulation.

Tilt

The spectral tilt filter controls alternately boost or cut the high and low frequencies of the input signal, centered at approximately 680Hz. This filter also greatly influences the self-oscillation of the feedback loops at their highest levels, and can provide some limited control of the feedback pitch.



Drive

The drive controls provide manual attenuation of the input signal before the tube distortion is applied. These will often be left near their maximum for stronger distortion sounds, as the dry/wet mix controls can then be used to reduce the final distortion if desired. Lower drive settings can be very useful for taming the character of high feedback levels.

Feedback

The feedback controls allow the signal after the triode distortion stage to be returned to the input, just before the tilt filter. Higher settings will increase the amount of feedback to the point of self-oscillation, at roughly the three o' clock position of the control. Feedback levels below self-oscillation can still greatly increase the final distortion, and naturally leaving the feedback control at minimum will produce no feedback at all. Careful attention to balancing both the feedback level and the drive control can produce the most interesting results, especially for medium distortion levels.

Plate Voltage

The plate voltage switch supplies the tube with 12V or 5V, for either a smoother character or more severe distortion, respectively. Unlike most of the controls on the M T_2D , this will effect both channels or stages simultaneously. The 5V setting can produce quite harsh sounds in combination with high feedback levels and more extreme bias settings. The visible brightness of the tube will also be increased at the 5V setting, which is normal.

group M: signal modifiers

$M T_2D$ dual triode distortion

Mix

The dry/wet mix control mixes the original signal with the distorted signal, to adjust the amount of overall distortion at the ouput, and can be controlled by an external control voltage, with a dedicated attenuator for each channel. Example 1: lower mix settings can be combined with a tilt filter setting which emphasizes the higher frequencies, to apply a stronger distortion to the high end while maintaining clarity by restoring the unprocessed lower frequencies from the dry signal. Example 2: an external envelope with a short attack and short decay can be applied to the dry/wet mix to add a hard leading edge to percussive sounds.