

flight of harmony



Voltage-controlled power starvation Eurorack Module
v1



fig. 1: Famine 500 front panel.

Components

1	Assembled Famine Starvation module
1	16-pin to 16-pin Doepfer-style power cable
1	16-pin socket to 3x 16-pin shrouded header cable
2	M3x0.5x6mm Stainless-Steel machine screws
2	M3 Nylon washers

Specifications

Width	4hp	
Depth	40mm / 1.6"	
Supply Voltage	$\pm 12\text{VDC}^1$	
Supply Current (max draw @ $\pm 12\text{V}$)	$I_{+12\text{V}} = 16\text{mA}$	$I_{-12\text{V}} = -14\text{mA}$
Max. CV Input Voltage	$\pm 5\text{V} / 10\text{V}_{\text{p-p}}$	
Max. Starved Output Voltage	$\approx \pm 10.5\text{V}$	
Min. Starved Output Voltage	0V	
Max. Output Current (Amps)	500 mA	
CV input coupling	Direct	
CV input impedance	39k Ω	

1) Intended for $\pm 12\text{V}$ systems only. Can operate on higher voltages but thermal capacity is untested.

FYI

As with all f(h) products, Famine was engineered towards maximizing functionality while keeping cost as low as possible. If some aspects of the unit seem awkward, it is most likely due to this. The goal is to make unique, useful, enjoyable, and affordable instruments, not just Hoover¹ out your bank account.

And remember: every instrument has its quirks and unexpected aspects, so RTFM²! Specific quirks are mentioned in the description of the particular feature they apply to, so please read this through before emailing!

What is it?

Famine is a Voltage-Controlled (VC) Power Starvation module. It is placed between your Power Supply (PS) and the power bus to control the voltage of your power bus - think of it as a Voltage-Controlled Amplifier (VCA) for your power supply. It does not have a conventional output signal; Famine's output is the power your modules run on.

What does it do?

Famine restricts the amount of power sent to your modules, starving them, causing erratic behavior. Starvation is a common technique in lofi and circuit bending, used for glitching, and often makes devices behave in completely new ways.

Each device is affected differently and it is impossible to predict what will happen. Some will have a vast change in behavior, while others will just shut off.

Is it dangerous?

Good question! The answer: maybe. We've been researching this since 2010 and still do not have an answer. *Warning, it gets technical from here:* Damage from undervoltage incidents *does* occur in industrial and home applications - all AC, with mains voltage above 100V, and involving transformers and/or constant-current circuits, usually in power supplies. The damage theory is: to maintain a constant power output, as voltage decreases, current must increase. This increase in current then exceeds the current-handling capacity of the system and it melts down. In the scenario Famine is designed for, it is *after* the PS, internally current- and thermally-limited (on top of whatever protection is built into the PS), and very low-voltage.

Does this mean it is safe? No. Famine is not safe. **You use this module entirely at your own risk. flight of harmony / f(h) is not responsible for any damage that may be caused by usage of this module.**

Now back to: Is it dangerous? Maybe. Theory says "yes", but actual usage says "not yet". There have been no reported instances of a module being damaged while being powered by Famine³. Regardless, caution is advised.

1) Hoover is a company that manufactures vacuum cleaners.

2) RTFM = Read The F*cking Manual!

3) The one instance referred to in the Famine1500 launch turned out to be in error. I examined the FAM500-E v1.0 manual Nov.2022 — p.2/9

Inductive kickback⁴ is a known phenomenon, and modules with inductors or electromechanical systems should be avoided.

Controls and Behavior (fig. 2)

Usage note: Performance varies mildly with load, so no exact values can be given.

All/+V: With the **All/Split** toggle in *All*, this knob controls both +V and -V output. When the toggle is set to *Split*, it controls only the +V output. Clockwise (CW) rotation increases voltage⁵, counter clockwise (CCW) decreases voltage. (fig. 3)

-V: With the **All/Split** toggle in *Split*, this knob controls the -V output. When the toggle is set to *All*, it has no effect on anything. Clockwise (CW) rotation increases voltage, counter clockwise (CCW) decreases voltage. (figs. 4, 5)

All/Split: When set to *All*, +V and -V outputs are simultaneously controlled by the **All/+V** knob and CV input jack. When set to *Split*, the +V output is controlled by the **All/+V** knob and CV input jack, and the -V output is controlled by the **-V** knob and CV input jack

Crush/Wrack: Only functions when **All/Split** is set to *All*. This selects how the outputs change relative to each other. In *Crush*, the -V mirrors the change of +V (fig. 3). In *Wrack*, the -V output moves inversely with +V. (figs. 6-8)

Starve/Feed: True bypass⁶ switch to enable or disable **Famine**. Set to *Starve* to enable, set to *Feed* to disable. (figs. 9, 10)

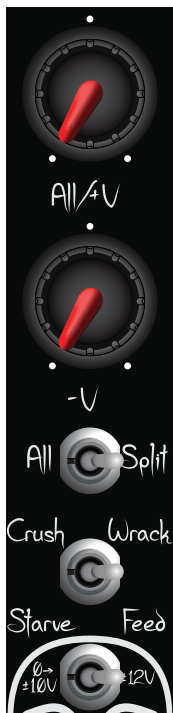


fig. 2: Controls.

module and spoke with the manufacturer and they said it was working correctly. The user later admitted being unsure of how the module was intended to function originally.

- 4) While capacitors try to keep *voltage* constant, inductors (transformers, chokes, motors, etc.) try to keep *current* constant. Inductive kickback is when current through an inductor tries to reverse direction. As current flows through an inductor it generates a magnetic field. This field circulates in a direction that reinforces the flow and opposes changes to it. If the flow stops or is reversed, the magnetic field tries to force the flow to remain the way it was, and can cause current surges before it collapses.
- 5) This is an OCD nightmare. as value goes from 0 to 12, it is increasing. From 0 to -12, however, is decreasing numerically, but the absolute value is increasing, as is the magnitude. And so, throughout this manual, "increasing" and "decreasing" are used in the absolute value/magnitude sense, ignoring the polarity.
- 6) "True Bypass" means that when the device is bypassed, it is *completely* disconnected from whatever circuit it was affecting, as opposed to only *partially* disconnected. Typically this is by breaking both the input and output connections, while the horrible, icky, bad, *untrue* bypass may only disengage the output connection, which leaves the input of the device still attached to the circuit, draining it like a leech, and potentially coloring the signals.

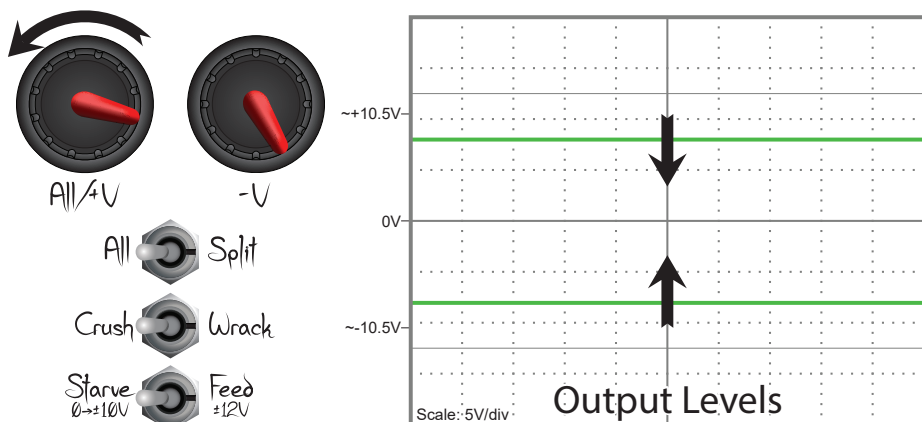


fig. 3: All/+V with All/Split toggle in All.

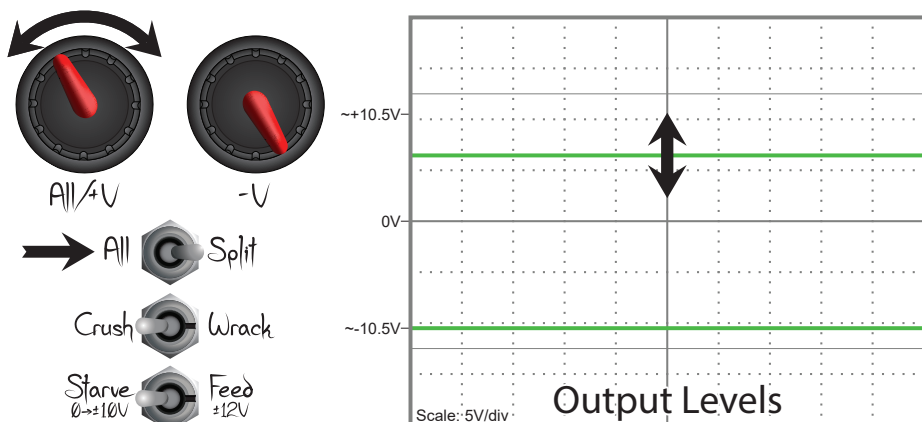


fig. 4: All/+V with All/Split toggle in Split.

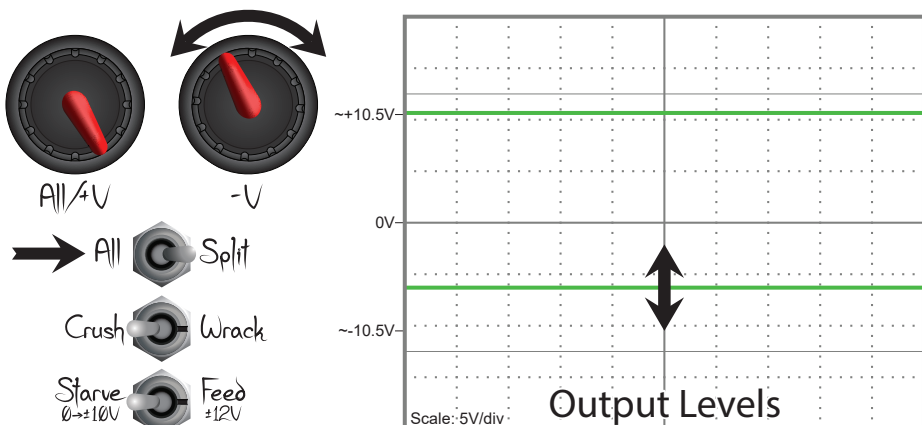


fig. 5: -V with All/Split toggle in Split.

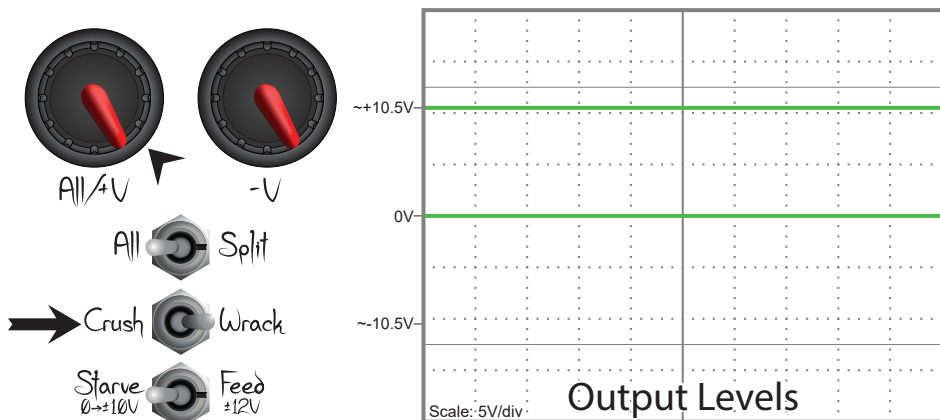


fig. 6: **All/+V** fully CW with **Crush/Wrack** toggle in **Wrack**.

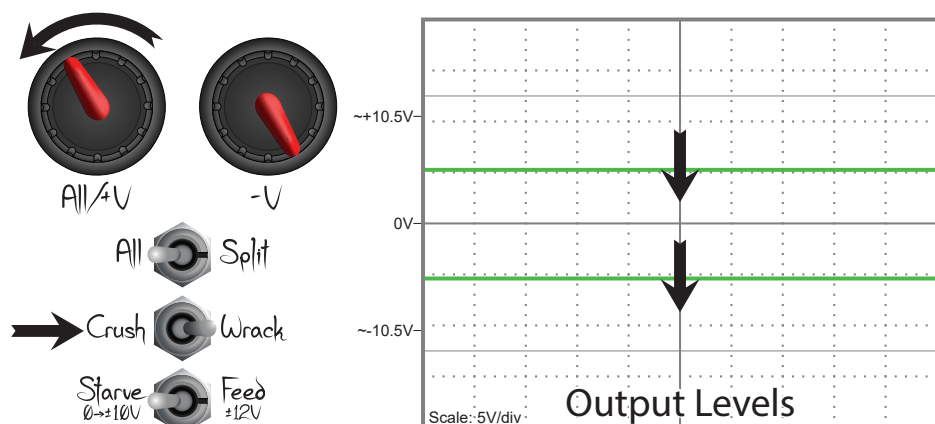


fig. 7: **All/+V** decreasing CCW with **Crush/Wrack** toggle in **Wrack**.

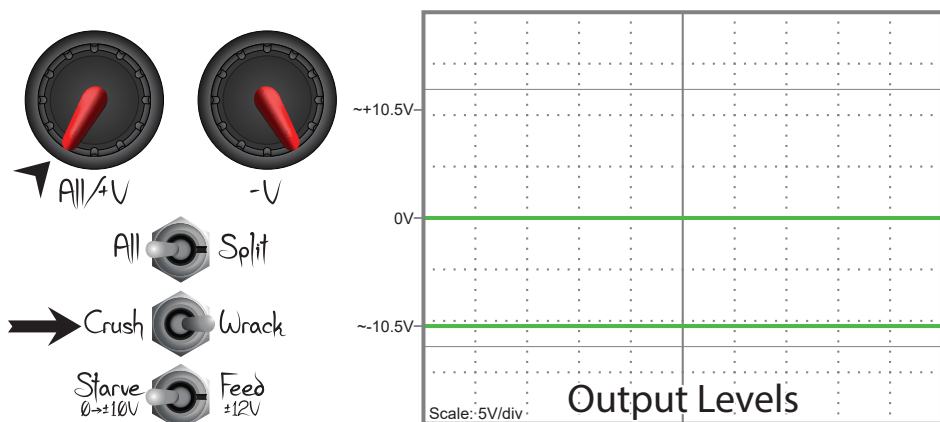


fig. 8: **All/+V** fully CCW with **Crush/Wrack** toggle in **Wrack**

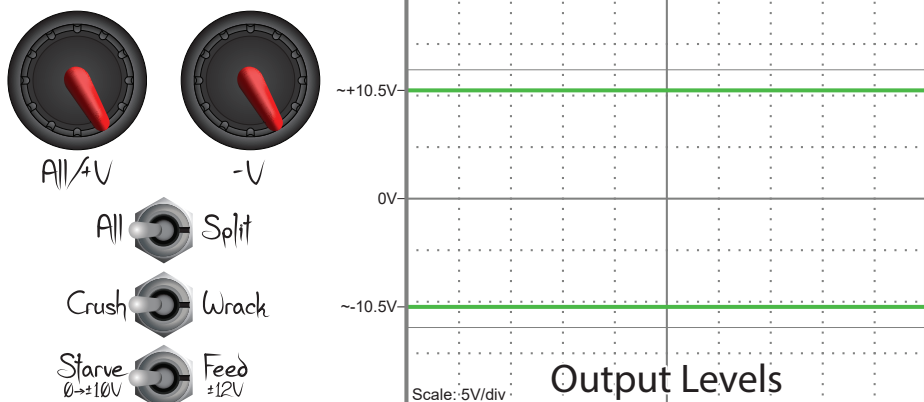


fig. 9: **Starve/Feed** toggle in *Starve* with knobs at maximum.

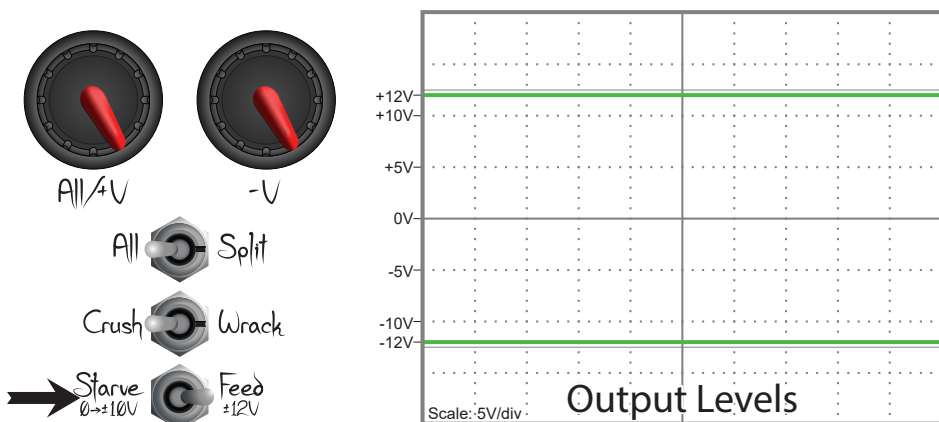


fig. 10: **Starve/Feed** toggle in *Feed*.



fig. 11: The eyes.

The eyes (fig. 11)

The eyes of the skull glow to indicate the amount of starvation being applied:

brighter = more starvation = less voltage.

The relative brightness of the LEDs is dependent on the load, so it will vary slightly based on what **Famine** is powering.

Jacks (fig 12)



fig.12: Jacks.

CV works opposite to the knobs: as CV increases, output voltage decreases, i.e., more voltage = more starvation.

All/+V: CV input jack, summed with **All/+V** knob. With the **All/Split** toggle in *All*, this jack controls both +V and -V output. When the toggle is set to *Split*, it controls only the +V output.

-V: CV input jack, summed with **-V** knob. *Only functions when All/Split is set to Split*. With the **All/Split** toggle in *Split*, this jack controls the -V output.

Rear connections (fig. 13)

CAUTION

These connectors are directly connected to the power supply and can be extremely hazardous. Do not touch them directly while powered or allow them to contact conductive items in your case.

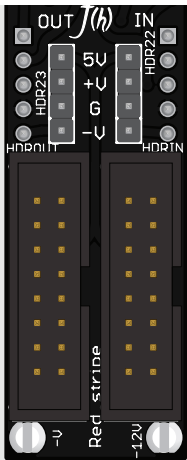


fig. 13: Rear power connections.

OUT: The side on the left is Famine's output section.

IN: The side on the right is Famine's input section.

Connector types

The 2x8/16-pin headers are the same as those standard on Doepfer-style power distribution boards (busses).

The 1x4 headers (HDR22, HDR23) are for alternate connections that do not use the typical eurorack connectors. You can make your own cables, or contact me to have one or more built for a nominal fee.

+5V

There is no starvation of the +5V rail. The +5V headers are shorted together to allow the +5V to pass through to the bus; same with the Gate and CV pins.

Rear CV pins (fig. 14)

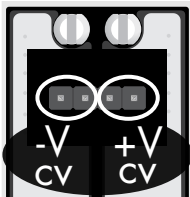


fig.14: Rear CV pins.

The recessed header on the back is an auxiliary CV input header. CV signals input here are summed with the knob and front CV input signals. The two pins of each input are wired together (just like multiples) allowing the signal to be relayed to another module if desired (fig. 15).

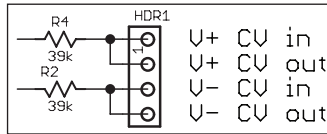


fig. 15: Rear CV pin internal connections.

Heat Sinks

CAUTION

The heat sinks are directly connected to the power supply and can be extremely hazardous. Do not touch them directly while powered or allow them to contact conductive items in your case.

The shiny areas on the rear PCB are the heat sinks⁷(fig. 16).

The -VR heat sink is connected to the -V output pin and the +VR is connected to ground.

The heat sinks can get very hot during use, make sure they do not contact or come near to anything flammable, burnable, or meltable (like power cables).

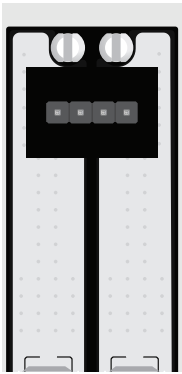


fig. 16: Heat Sinks.

Hail and thanks to:

James and the ~~Giant Peach~~ Great Wizard. James for reminding me I had blabbed about Famine ten years ago and it was long overdue, and MxR Frost for torturing every damn module they laid wizardry hands on. James, the world will blame you for this one.

Huge thanks and appreciation to Wildfire Laboratories. Their great Commodity Fetishism module helped me say "Screw it, I'm doing it." Go buy their stuff, it's all really cool. (<https://wildfirelaboratories.com/>)

Stuff

A big thank you to those who have sent in suggestions and comments, keep them coming!

Comments, samples, suggestions, complaints to: flight@flighttoharmony.com

We have a Discord server! Contact me at the address above for an invite link.

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<http://www.flighttoharmony.com>

7) Radiator/cooling fins/something to dissipate heat.

f(h)