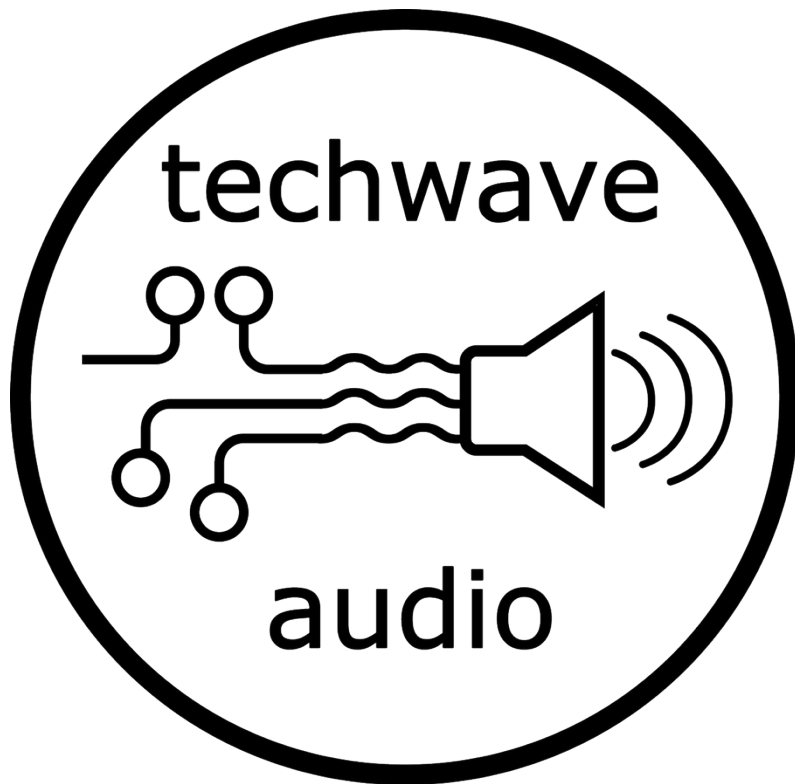




TechWave Audio

Midi Controller Module

MCM-100

User Manual - v1.2.0

TechWave Audio: Midi Controller Module

The TechWave Audio Midi Controller Module is a feature-rich and customizable monophonic MIDI input for your synth rack.

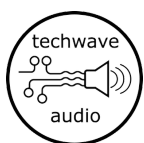
The latest online product information can be found at:

<https://techwaveaudio.com/midi-controller-module/>

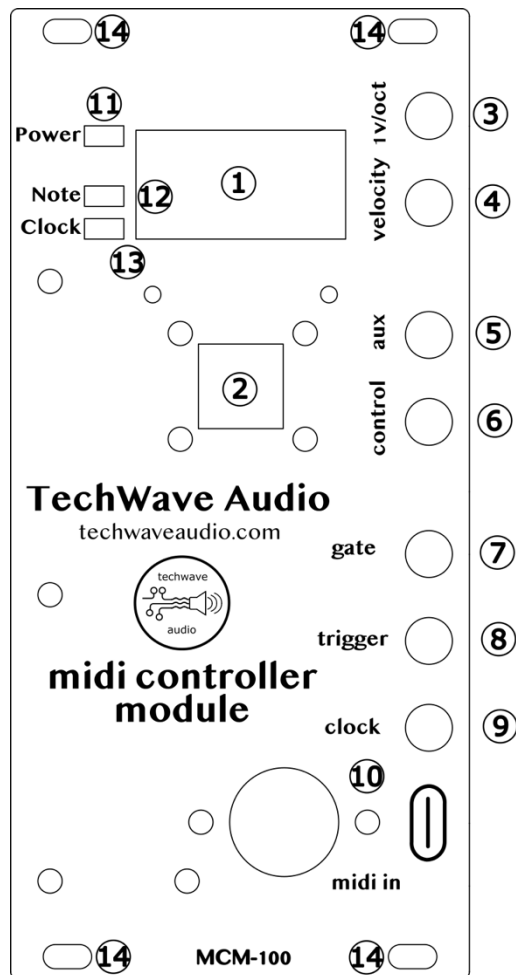
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Features

- Single or omni MIDI channel input
- MIDI input via standard 5-pin MIDI cable, or USB MIDI
- Four CV outputs for note (1v/oct), velocity, aux and control selectable 0 to +10v or 0 to +5v
 - 1v/octave through 10 octaves (at 0 to +10v), or 5 octaves (at 0 to +5v)
- Gate, trigger, and clock full 0 to +5v pulse outputs
- Selectable note priority (last, highest, lowest)
- Tuneable pitch and velocity adjust
- Customizable trigger output duration pulse width
- Pitch bend response range from 0 to 5 octaves
- Full display of output states
- Built in tuning and calibration setup
- Settings persist to on-board flash ROM
- Designed to fit in 12hp, 3U module
- Power Draw:
 - +5v: 70mA
 - +12v: 20mA
 - -12v: 15mA



Overview



- 1: Display Screen
- 2: Five-way button
- 3: Note 1v/octave CV output
- 4: Velocity CV output
- 5: Aux CV output
- 6: Control CV output
- 7: Gate pulse output
- 8: Trigger pulse output
- 9: Clock pulse output
- 10: MIDI input (5-Pin and USB-C)
- 11: Power LED
- 12: Note LED
- 13: Clock LED
- 14: Mounting holes

16p 2x08 IDC Eurorack power cable socket (not pictured, on the rear of the module)

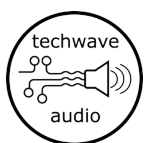
4 position DIP switch (not pictured, on the rear of the module) for allowing note CV and gate signal outputs to the Eurorack bus.

Display screen

The 0.96" OLED screen displays the dashboard while the module is active. Pressing the middle button on the five-way button switch enters the menu.

Five-way button

The five-way button controls the user input and menu navigation. On the dashboard, push the button down to enter the menu. Once in the menu, press up or down to navigate, or to the left to go back to the previous menu or dashboard. Press the button down again to select the currently highlighted entry in a menu.



Note 1v/octave CV output

The 1v/oct CV outputs a voltage between 0v to 10v output (selectable to 0 to 5v) for CV with 1v per octave. For +10v output, the module responds to notes from C -1 (note number 0) to B9 (note number 119). For +5v output, the module responds to notes C2 (middle-C, note number 36) to B6 (note number 95).

Velocity CV output

The velocity CV outputs a voltage between 0v to 10v (selectable to 0 to 5v) and responds to the velocity and volume of the incoming MIDI messages.

Aux CV output

The aux CV outputs a voltage between 0v to 10v (selectable to 0 to 5v) and can be configured to respond to MIDI aftertouch or expression messages.

Control CV output

The control CV outputs a voltage between 0v to 10v (selectable to 0 to 5v) and can be configured to respond to MIDI mod wheel, effect 1 or effect 2 messages.

Gate pulse output

When a MIDI note is received, the gate output will signal high at +5v. The signal will go low (0v) when the note stops playing and a MIDI note off signal is received.

Trigger pulse output

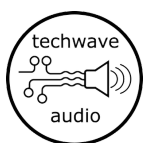
When a MIDI note on message is received, the trigger signal will go high to +5v for a configurable period (default of 100ms) before dropping back to 0v.

Clock pulse output

The clock output signal will send a 1ms +5v pulse whenever a MIDI clock tick is received.

MIDI input

Connect your MIDI input to the 5-pin DIN connector or via a USB-C cable. The MCM-100 only supports reading MIDI in via USB (that is, no MIDI out packets will be sent). If a standard 5-pin MIDI cable is used, the USB MIDI



connection will preempt it and will be disabled until the USB cable is unplugged.

If using USB, The MCM-100 will appear as

Manufacturer: TechWave Audio

Product: MCM-100

(Note: if you have purchased the MCM-100-EV early version, there is no USB-C output jack. You can still connect a micro-USB cable to the attached Raspberry Pi Pico and use USB MIDI; however, it's up to you how you route the cable)

Power LED

The power LED will light up when the module is connected to power.

Note LED

The note LED will light up when a note is played until the note is turned off. It also signals when the gate pulse output is high.

Clock LED

The clock LED will light up with each MIDI clock tick received.

Mounting holes

The use mounting holes to mount the module in your Eurorack case. When purchased, the kit should come with four M3 x 7mm screws for mounting.

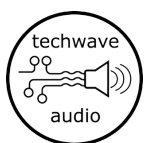
Eurorack power connector

On the rear of the unit, you will find a 16p 2x08 IDC connector for attaching a Eurorack power cable. Be sure to plug in the cable with the -12v line towards the bottom of the unit (usually indicated by a red stripe).

The power coupling for the module uses a standard 16 pin (2x08) IDC connector as detailed in the original [A-100 Doepfer power system bus](#). The +5v, +12v, and -12v bus lines are used.

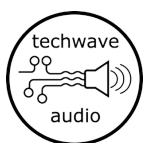
As measured, the power draw on the +5v, +12v, and -12v lines are:

- +5v: 70mA
- +12v: 20mA
- -12v: 15mA



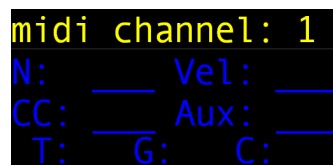
Note CV and gate bus output

Also, on the rear of the unit, you will find a 4-position DIP switch. Two of these switches are used to allow you to also send the note CV and the gate pulse outputs to the Eurorack bus.



Using the Midi Controller Module

When the module boots up, you will see the dashboard display (unless turned off via the settings).



```

midi channel: 1
N:      Vel:
CC:     Aux:
T:      G:   C:

```

The display shows the current MIDI channel it is listening on (either the channel number, or “—” for all channels). Also shown is the status of any currently playing note, the velocity level, and control CV level, and aux CV level. Across the bottom is shown the trigger, gate, and clock status.

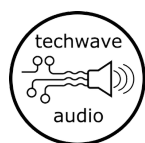
Plug in a USB-C cable or MIDI cable into the appropriate MIDI in jack. When receiving MIDI clock signals, the clock LED should flash (at intervals as set in the settings). If using a USB cable, you may need to route your MIDI data appropriately. The MCM-100 will appear as a USB device from “TechWave Audio” with the product name “MCM-100”.

When the module receives a note on signal (on the selected MIDI channel), the note will be displayed along with the velocity of that note, and the appropriate CV outputs will be set to the appropriate voltage level. Any control or aux messages received will display as well and their CV output will output the appropriate voltage.

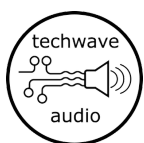
When a note is played, the trigger output will pulse high (+5v), and the gate output will be set high (+5v) for the duration of the note. The clock output will pulse high (+5v) with each MIDI clock tick received.

The Midi Controller Module will respond to the following received MIDI messages:

- **Note on / off:** sends/stops the note and velocity outputs
 - For +10v output, responds to C-1 (note number 0) to B9 (note number 119)
 - For +5v output, responds to C2 (middle-C, note number 36) to B6 (note number 95)
 - Sends a trigger pulse on note on, and turns on the gate for the duration of the note
- **Volume:** increases or decreases the velocity CV output

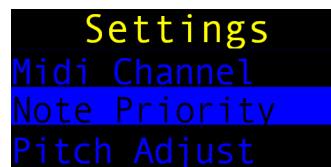


- **Pitch bend:** modifies any currently playing note. Adjustable range from 0 to 5 octaves
- **Sustain:** holds a note on while the sustain is active
- **Aftertouch:** selectable as an aux output
- **Expression:** selectable as a aux output
- **Mod wheel:** selectable as a control output
- **Effect 1:** selectable as a control output
- **Effect 2:** selectable as a control output
- **Mute (all notes off):** clears any note, velocity, and gate outputs
- **Clock tick:** MIDI clock ticks are sent directly to the clock output
- **Reset:** reset the MIDI input messaging queue and stops any output



Menu System and Settings

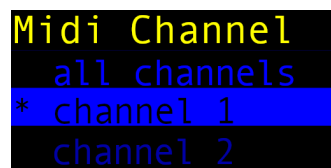
To enter the menu system from the dashboard, press down (**enter**) on the five-way button.



In the setting main menu screen, use the **up** and **down** buttons to highlight the menu items, and **enter** to select that item. Use the **back** button to exit out of the menu system and back to the dashboard.

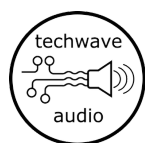
Any changes made within the settings menu will take effect immediately (i.e. a MIDI channel change). Note however that no settings are saved until you exit back to the dashboard, except for when you reset the settings to the defaults.

Midi channel settings



Set the MIDI channel to listen for incoming events on. You can select from channels 1 through 16, as well as (all channels).

Use the **up** and **down** buttons to select the channel setting and **enter** to change it. The current setting will have a star next to it (*). Use the **back** button to go back to the main menu.



Note Priority Settings

```
Note Priority
* Last Note
  Highest Note
  Lowest Note
```

Sets the note priority for incoming note on events.

The available selections are:

- Last Note: The last incoming note event
- Highest Note: Only the highest note events are kept
- Lowest Note: Only the lowest note events are kept

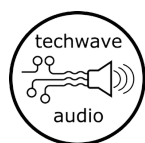
Use the **up** and **down** buttons to select the note priority and **enter** to change it. The current setting will have a star next to it (*). Use the **back** button to go back to the main menu.

Pitch Adjustment Settings

```
Pitch Adjust
Value: 0
[.....|.....]
(raw value)
```

Allows for adjustment of the outgoing CV value. The pitch adjustment allows for approximately +/- 6% output voltage (limited to 0 to +10/+5v). The adjustment slider ranges from -250.0 to 250.0 for the output value to the 12-bit DAC.

Use the **up** and **down** buttons to change the slider for the pitch adjustment. Press the enter key to confirm the new setting, or the back key to cancel.



Velocity Adjustment Settings

```
Velocity Adjust
Value: 0
[.....|.....]
(raw value)
```

Allows for adjustment of the outgoing velocity value. The velocity adjustment allows for approximately +/- 6% output voltage (limited to 0 to +10/+5v). The adjustment slider ranges from -250.0 to 250.0 for the output value to the 12-bit DAC.

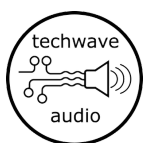
Use the **up** and **down** buttons to change the slider for the velocity adjustment. Press the **enter** button to confirm the new setting, or the **back** button to cancel.

Pitch Bend Range Settings

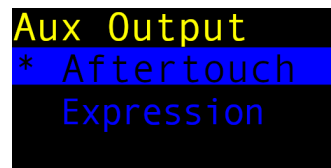
```
Pitch Bend Range
Value: 1
[.|.....]
(in octaves)
```

Sets the number of +/- octaves the pitch bend will cover from 0 to 5 octaves.

Use the **up** and **down** buttons to change the slider for the pitch bend range (in octaves). Press the **enter** button to confirm the new setting, or the **back** button to cancel.



Aux Output Settings

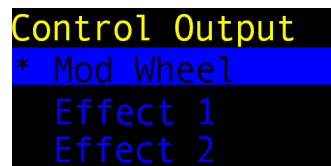


Sets the function of what events are sent to the aux channel. Only one event type can use the aux output at a time. The available events allowed are:

- Aftertouch (channel only, no poly aftertouch)
- Expression (CC message 0x0B)

Use the **up** and **down** buttons to select the aux output function and press the **enter** button to change it. The current setting will have a star next to it (*). Use the **back** button to go back to the main menu.

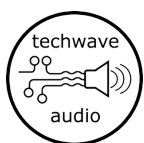
Control Output Settings



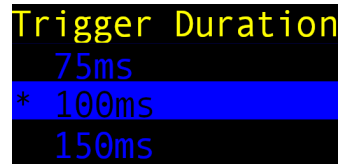
Sets the function of what events are sent to the control channel. Only one event type can use the control output at a time. The available events allowed are:

- Mod Wheel (responds to CC message 0x01)
- Effect 1 (CC message 0x0C)
- Effect 2 (CC message 0x0D)

Use the **up** and **down** buttons to select the control output function and press the **enter** button to change it. The current setting will have a star next to it (*). Use the **back** button to go back to the main menu.



Trigger Duration Settings

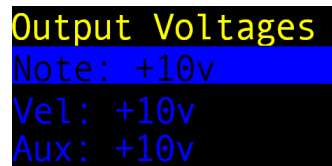


Trigger Duration
75ms
* 100ms
150ms

You can set how long the trigger pulse stays high when a note is turned on. The values range from 25 ms to 500 ms (default 100ms).

Use the **up** and **down** buttons to select the trigger duration and press the **enter** button to change it. The current setting will have a star next to it (*). Use the **back** button to go back to the main menu.

Output Voltage Settings



Output Voltages
Note: +10v
Vel: +10v
Aux: +10v

Using this menu, you can change the max output voltage for the four CV outputs from +10v to +5v. The default output voltage for all CV outputs is +10v.

Use the **up** and **down** buttons to select the output and press **enter** to toggle it between +10v and +5v. The value for the output shows the current voltage setting. Use the **back** button to go back to the main menu.

Display Settings

```
Display Settings
Hide dashboard
Display refresh
Clk led refresh
```

This menu allows you to modify the display settings for the dashboard and clock LED.

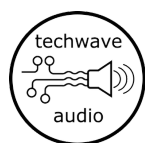
Use the **up** and **down** buttons to select the setting to change and **enter** to select it. Use the **back** button to go back to the main menu.

- Dashboard on / off: keeps the dashboard display on or off when not in the menu.
- Dashboard refresh: sets the number of ms for every refresh of the dashboard when displayed.
- Clock LED refresh: sets how often the clock LED blinks when receiving MIDI clock tick events.
 - off
 - every tick
 - every 2 ticks
 - every 3 ticks
 - every 6 ticks
 - every 12 ticks
 - every 24 ticks (full cycle)

Tuning Menu

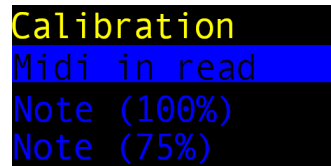
```
Tuning +10v
A4 (440)
C4 middle
C0
```

Using the **up** and **down** buttons, select the note value to output and press the enter **button**. The selected note voltage will be sent to the note CV output, and the gate line will turn on. You can then use an electronic tuner to adjust your VCO pitch, or alternatively an oscilloscope to view the frequency output from your mixer. The CV output will depend on the setting of the output voltage in the output voltage settings for the note output. Note that in the title area of the menu, the current max output voltage is



displayed. Press the **back** button to stop the current note played. Also press the **back** button on the selection screen to go back to the main menu.

Calibration Menu



Use the **up** and **down** buttons to select which calibration to run. Press the **enter** button to run the calibration test. When the test is running, press the **back** button to stop the test and return to the calibration menu. Press the **back** button in the menu selection screen to go back to the main menu.

Within the calibration menu, you can view the MIDI input log and calibrate the CV and pulse outputs.

MIDI input read log

Displays a running log of translated MIDI messages coming in.

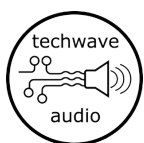
Note, Velocity, Aux and Control calibration

You can select the output level of the CV output at 100%, 75%, 50%, or 25%. The selected output will be sent to the CV output, and you can use a meter or oscilloscope to check the voltage level. The maximum output will depend on the setting of the output voltage in the output voltage settings for the selected CV output. For +10v output, the calibration should be adjusted to as close to 10v, 7.5v, 5v, and 2.5v respectively. For +5v output, the calibration should be adjusted to as close to 5v, 3.75v, 2.5v, and 1.25v.

To adjust the CV outputs, you can use the trimmer potentiometers on the rear of the module. There is one trimmer for each of the CV outputs.

Pulse gate, trigger and clock

Running the calibration for the gate, trigger and clock lines will pulse those lines from 0 to +5v in a square wave. The signal will go high for 250ms, then low for 250ms continuously.



About

Displays the current version and build information of the firmware. Press the **back** button to return to the main menu.

Reset All

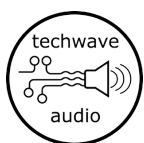
```
Reset Settings
Confirm reset?
[enter] confirm
[back] cancel
```

Allows you to reset the settings to their defaults. Press the **enter** button to reset, or **back** to cancel.

Note that if you do reset the settings, the default settings will *immediately* be saved over any custom configuration.

The default settings are:

- MIDI channel: 1
- Note priority: last note
- Pitch adjustment: 0.00
- Velocity adjustment: 0.00
- Pitch bend range: +/- 1 octave
- Aux output: aftertouch
- Control output: mod wheel
- Trigger duration: 100 ms
- Note output max voltage: +10v
- Velocity output max voltage: +10v
- Aux output max voltage: +10v
- Control output max voltage: +10v
- Dashboard display: on
- Dashboard refresh: every 200 ms
- Clock LED: every 12 ticks



Updating the firmware

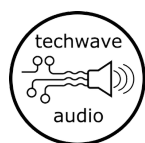
To view the current version of the firmware for your module, use the “About” page in the settings menu.

If you need to update to a different version of the firmware, the firmware downloads can be found on the [GitHub repository releases page](#). You will need a micro-USB cable to perform the firmware update.

To update the firmware:

1. Remove the module from your rack and (VERY IMPORTANT) unplug the module from your Eurorack power supply.
2. Download the desired firmware file version from the [GitHub repository releases](#). You only need to download the file with the **.uf2** extension.
3. If you *do not* have a MCM-100-EV (early version), unplug the micro-USB plug from the Raspberry Pi Pico board.
4. Plug the micro-USB end of the cable into the Raspberry Pi Pico board on the module.
5. While holding down the small boot select (BOOTSEL) button on the board, plug the other end of the cable into your computer. The Raspberry Pi Pico board will appear as a mass storage device, usually named “RPI-RP2”
6. Copy the downloaded firmware **.uf2** file to the storage device. When complete, the module should reboot. You can safely disconnect the cable. Your computer may give you a warning about the device not being properly ejected. You can safely ignore this warning.
7. If you have a production version with the included USB-C cable attached to the front panel, be sure to plug the attached jack back into the Raspberry Pi Pico board.
8. Reconnect the Eurorack power connector and put the module back into your rack.

Note that any settings you may have modified will be reset to any default.



Support

For any questions or issues with the MCM-100 module, see the following resources:

- [The TechWave Audio website](#)
- [Support and Downloads](#)
- [Contact TechWave Audio](#)
- Or feel free to open an issue in the TechWave Audio Midi Controller Module [GitHub repository](#)

