Ge0sequencer

TB-Seq & Desktop Synths

V1.5.0

GEOSYNCHRONOUS SYNTHS

Table of Contents

Overview

MIDI-2-CV & Sequencer Module

The TB-Seq eurorack module and integrated MIDI interface in the Ge0synchronous desktop semi-modular synthesisers combine standard MIDI note to CV V/Oct, gate and trigger conversion as well as MIDI to CV clock with configurable PPQN (pulse per quarter note) – both in and out.

The module also provides a basic “TB” style 1 to 16 step, sixteenth note, sequencer with eight persistent memory slots.

Partnering the module itself is a Windows or Mac based application that can be used to create, save and upload sequences to the sequencer memory slots. The application also allows device settings to be sent to the module. Data transfer between the host computer and module is by means of MIDI SysEx messages via the 5-pin DIN MIDI Input.

Feature Summary

- 5 pin DIN MIDI Input.
- CV Input for CV Clock input pulses and CV Run to start sequencer. (Incoming clock configurable PPQN from 1 to 24)
- CV Output for MIDI to CV Clock (configurable PPQN from 4 to 24)
- CV Output for gate, trigger and accent. Gate and trigger correspond to incoming MIDI note or sequencer steps.
- CV Output for modulation – value set via configurable MIDI CC.
- 8x 1 to 16 step sequencer slots
- Integrated display and menu to configure device settings, and activate, copy or clear sequencer slots.
- Standalone PC based application to create, save and upload sequences and device settings via MIDI SysEx messages.

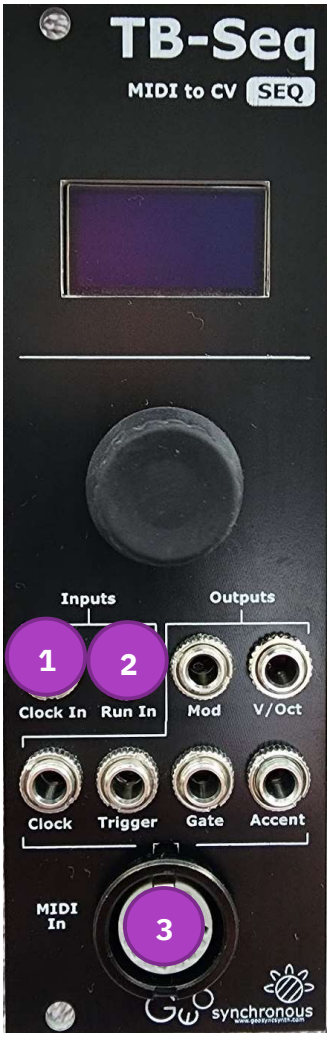
Connections

PPQN Definition

Most instrument clocks are defined in terms of Pulse Per Quarter Note. A quarter note usually equates to a “beat” in a standard 4/4 pattern. For example, MIDI sends 24 PPQN, which means in a standard TR style 4/4 step sequencer it sends 6 pulses for each step – or in other words, 6 pulses per 1/16th note.

In terms of the Ge0Seq sequencer, each step is 1/16th note, hence the full 16 steps in a sequencer are a single note, with 4 steps per quarter note.

TB-Seq Connections



1 **Clock In** - A CV input jack that receives a pulse on a regular interval. The number of pulses that are received before the sequencer moves on to the next step is determined by the **CV Clock In – PPQN** setting.

It maybe easier to understand this in terms of ***ticks per step***. For example, with a PPQN in setting of **4**, the next step in the sequence will be played every time a pulse is detected on this input. The ***ticks per step*** being **1.**

With a setting of **16**, the next step will be played after 4 pulses have been received. The ***ticks per step*** here is **4**.

2 **Run In** – A trigger to “start” the sequencer. A short pulse on this input will start the sequencer playing and it will advance through the steps based on the **Clock In** pulses and the **PPQN In** setting as described above. If a subsequent pulse is received it will “stop” the sequencer.

3 **MIDI In** – Connect this port to your MIDI controller / MIDI interface or MIDI keyboard. This port is used to receive MIDI. The MIDI clock for example to control the tempo of the sequencer. MIDI start/stop signals will result in the sequencer starting/stopping. This port is also used to received

MIDI SysEx messages from the **Ge0sync Sequence Editor** application and firmware updates when in bootloader mode.

CV Outputs

The remaining ports on the module are all outputs.

- **V/Oct** This provides a CV note output. This will either send the note as played on your connected MIDI device or will send the appropriate voltage as defined by the sequencer step that is currently playing.
- **Mod** This sends a CV voltage, between 0 and 10v that corresponds to the incoming MIDI CC value for the CC setting defined by **MIDI CC Mod CV**. As MIDI CC's send a value between 0 and 127, the value will be scaled to spread across the 10v range. For example, if a value of 64 is sent, the jack will output approximately 5v.
- **Clock** This sends a pulse that can be used as a CV clock elsewhere in your modular setup. The number of pulses sent is dictated by the **CV Clock Out PPQN** setting. In the same way as the CV Input clock, the number of pulses that are sent per quarter note can be configured but these must be a logical division of 24 (MIDI PPQN). This output is only active when there is an incoming MIDI clock signal.
- **Trigger** This sends a pulse for a period of time (default 20ms – configurable in the settings) when a note is triggered, either by the attached MIDI keyboard or the step sequencer. **Note:** Trigger pulses are not sent during slides.
- **Gate** This sends a pulse that is maintained for the length of the note. Again, this pulse is sent either while a key is pressed on the attached MIDI keyboard or the step sequencer is playing a note.
- **Accent** A pulse is sent when the sequencer step has the Accent value enabled for this step. Like gate, this is sent for the duration of the note. The accent output is only enabled when the sequencer is playing.

Desktop Connections

<TBD>

Device & Sequencer

Sequence Slots

The device comes with a default sample sequence in slot “D” (Default). The other eight sequence slots are blank and must be “sent” a sequence via the companion Ge0sync Sequence Editor application.

The eight sequence slots can be used to store multiple sequences for later “activation”. Only the currently activated sequence is played when the sequencer is started by either MIDI or CV.

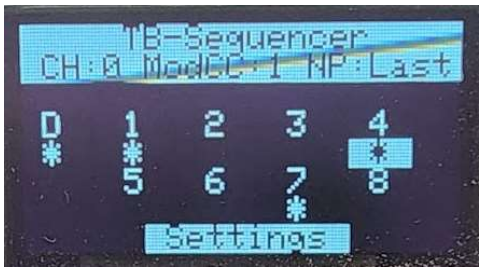
Home Page

When you power on the device, after the initial splash screen, the device will load the settings from the internal EEPROM. If this is the first time the device has been powered on, or you have erased the EEPROM, the default settings will be applied and the device will reboot.

When the device is ready for use it will show the “home page”. This shows some basic MIDI configuration details in the header, a list of the slots showing which ones have sequences stored and which is the currently activated sequence.

Once sequences have been loaded into slots, the slot will show an "*****" under the corresponding slot number. The currently activated sequence is denoted by a highlighted box around the corresponding sequence "*****"

The following example shows sequences in slots D, 1, 4 and 7, with slot 4 being the currently activated sequence.



Modifying Settings from the Device

From the home page, click or turn the encoder to access the Settings menu.

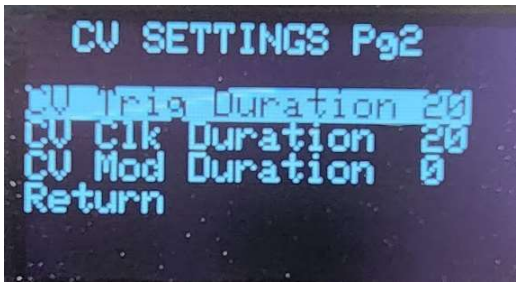
When any settings menu is displayed, the device will return to the home page if the encoder is not touched for 20 seconds.

Any menu with a "*Return*" option will take you back one level in the menu system. For example, from the main Settings menu this will take you back to the home page.

Settings Menu

From here you can access the 3 sub menus :

- **CV Settings** Allows you to modify any of the CV settings. Each setting is described in *"Global Device Settings"* on page 15. The CV settings also has a second page of settings that is available by selecting ***More CV Settings*** Most of these settings can also be updated from the Ge0sync Sequencer application.



- **MIDI Settings** Allows you to modify any of the MIDI settings. These are also described in detail later. Again, these settings are also available in the Ge0sync Sequencer application.

- **Sequence Settings** Allows you to activate, copy or clear sequence slots as described below.

CV Settings - Scale Factor

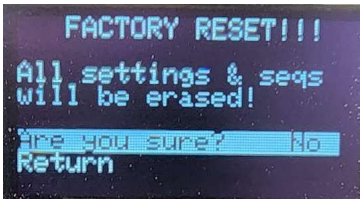
One setting that is not available in the Ge0sync Sequencer application is the **CV adjust mV** scale factor, this is only configurable on the device itself.

The Scale Factor allows you to adjust the “width” of a single note, in terms of a single note mV range. The device uses a digital to analog converter to convert the MIDI note value into a V/Oct value that is then sent to the V/Oct CV jack. The scaling should be accurate by default, however depending on your Eurorack power supply you may need to adjust the scaling by using this setting.

The setting allows scaling between 0.9 and 1.1 in increments of 1/1000th. In most cases you should not need to adjust this setting from the default 1.000 value.

Factory Reset

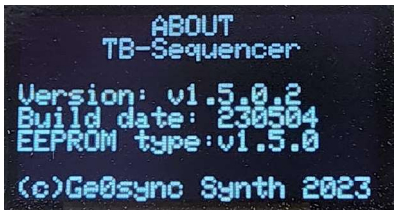
Should you wish to erase the contents of the EEPROM and return the device to a factory default un-initialised state, select this menu option and confirm your choice on the subsequent page.



WARNING! This will erase all sequences and return the device settings to the default values. The device will reboot twice during this process.

About

This menu item shows some basic information about the device, the firmware version, the date of build and the EEPROM format version. This can be used to confirm that the device and Ge0sync Sequence Editor application are using compatible versions.



Manipulating Sequences from the Device

You can perform some manipulation of the sequence data stored in the memory slots from the **Settings -> Sequence Settings** menu.

From here you can

- **Activate Seq** – select a slot to activate.
- **Clear Seq** – select a slot to clear.
- **Save Active Seq** – select a slot to save the currently active sequence into.
- *Edit Active Seq – not yet supported.*
- **Return** – go back to the main menu.

To perform one of the actions, scroll to the menu item and click the encoder button. The encoder can then be used to scroll through the available sequence slots to select which slot to manipulate.

Activate Seq

This simply copies the sequence stored in the selected slot into the active memory on the device. The active sequence will now play when MIDI start is received or when the CV RUN and CV CLOCK Input signals are received.

If you attempt to activate a slot that is empty, a suitable error is shown.

Clear Seq

No confirmation! The selected sequence slot will be cleared. If you select this option by accident, wait for 20 seconds and the menu will timeout and return you to the home page.

Save Active Seq

This option can be used to copy a sequence from one slot to another. The selected slot will have receive a copy of the in memory active sequence.

For example, you want to duplicate the sequence from slot 1 to slot 2.

1. First activate slot 1 to copy its sequence into the active sequence memory.
2. Save Active Seq to slot 2, this will write the active sequence in memory to slot 2.

Edit Active Seq

Not yet supported. A suitable error message is shown.

This will be added in a subsequent release if there is enough program space, allowing step by step editing of the active slot.

Using the Ge0sync Sequence Editor Application

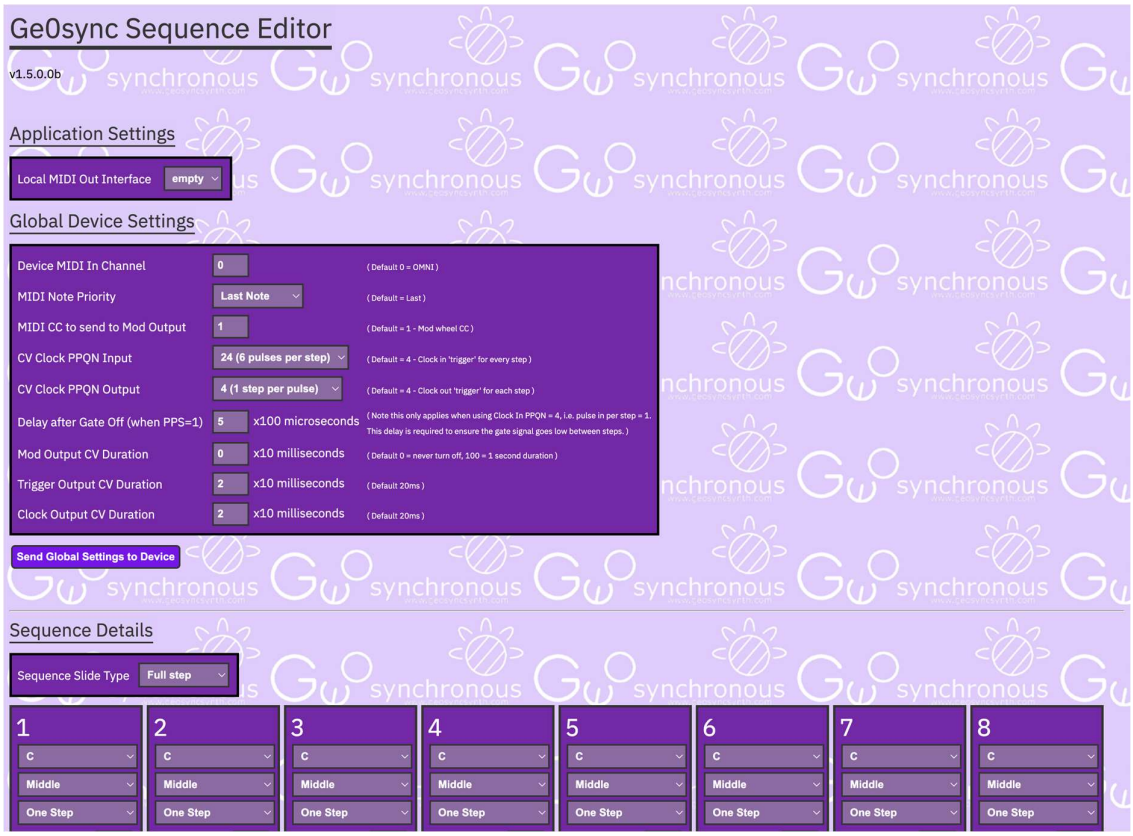
Installing the Ge0sync Sequence Editor

New sequences must be created using the Ge0sync Sequence Editor application running on either a Windows (7, 10, or 11) PC or a Mac (Intel or Apple Mx CPU).

Download, install and run the correct version of the application for your PC. The latest version of the application can be downloaded from

https://geosyncsynth.com/documentation/

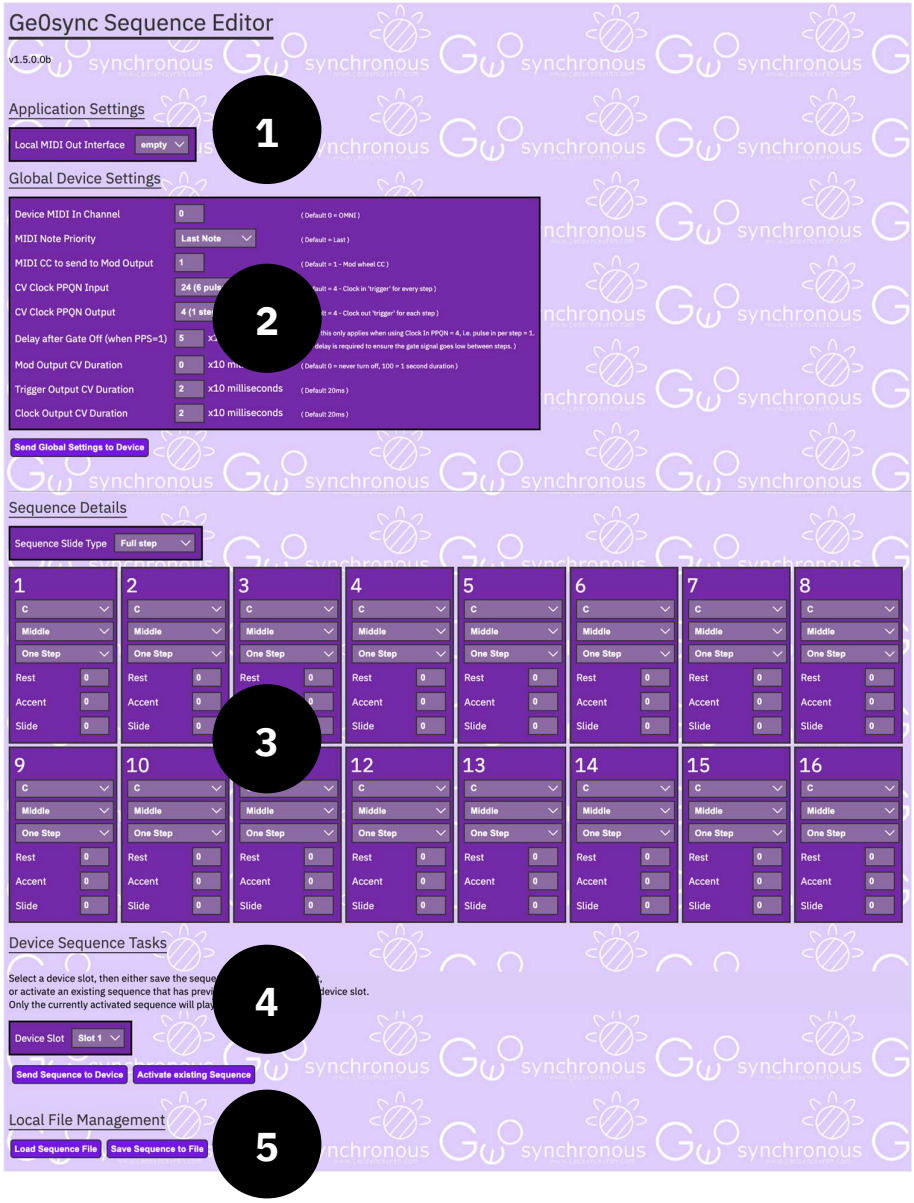
Note: You should download the version of the editor that matches the firmware running on your device. The current firmware version is displayed when the device boots and in the About information.



Application Sections

The application is split into 5 sections

1. Application Settings
2. Global Device Settings
3. Sequence Details
4. Device Sequence Tasks
5. Local File Management



Application Settings (1)

This section allows you to configure the application settings, specifically, which local MIDI interface will be used to communicate with the device.

Testing Communication

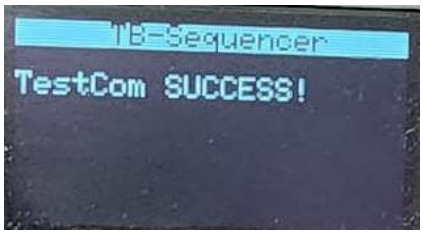
To update the device, for example to send a sequence to the device, you must have a MIDI connection between your PC and the device. Either connect your sound card/audio interface (with MIDI DIN connectivity) directly to the module MIDI IN DIN port, or via a MIDI OUT/thru chain.

You can also use a USB MIDI capable device, for example a keyboard or MIDI controller that connects to your PC via USB, but then provides a MIDI OUT/thru 5-pin DIN connection to the device.

Once connected, you should see the PC based MIDI interface/keyboard listed in the drop down in the **Application Settings -> Local MIDI Out Interface**

Select the interface you want to use and confirm successful communication by clicking the **Test Comms** button. The GUI will show a success message next to the button and at the same time a success message will be displayed on the device display.

This test also validates that the version of the application is compatible with the firmware on the device, if the versions differ sufficiently an error will be shown on the device. Update the application or device firmware accordingly.



Global Device Settings (2)

This section allows you to modify device behavior settings. These settings are also configurable on the device itself – using the **Settings Menu** as described in *"Modifying Settings from the Device"* on page 7.

Device In MIDI Channel

This option sets the MIDI In channel on the device. The device will respond to MIDI notes sent on this channel.

Note MIDI start/stop and SysEx are global, so non channel specific. By default, the device is set to OMNI mode and will therefore respond to MIDI notes sent on any channel.

To restrict the device to a specific incoming channel, select a channel between 1 and 15.

To set the device back to OMNI mode, select 0.

MIDI Note Priority

Sets the note priority when more than one MIDI note is played at the same time.

The available options are **Last, Top** and **Bottom.** The default is Last.

- Last sets last not priority, the last note received will be played.
- Top sets top note priority, the highest note received will be played.
- Bottom sets bottom note priority, the lowest note received will be played.

MIDI CC to send to Mod Output

The device provides a Modulation Output CV jack. This output sends values between 0 and 10v as CV signals.

This setting allows you to select which MIDI CC controller is used to set the modulation output voltage. The default is CC = 1 which corresponds to the MIDI modulation wheel on your MIDI keyboard. To change the CC binding select one of the values from 1 to 127.

MIDI CC values have a range between 1 and 127. The device maps these to the voltages between 0 and 10v. For example, the midpoint in your modulation wheel will correspond to MIDI CC value 64, which will send an approximate 5v signal to the Mod Output jack.

The duration of the Mod Out CV voltage "pulse" or signal can be modified via the **Mod Output CV Duration** setting.

CV Clock PPQN Input

The sequencer can be triggered and clocked via CV inputs. When the device receives a pulse signal on the CV RUN input jack, the device will start playing via the incoming CV clock pulses. The number of pulses that correspond to a quarter note (4 steps) can be modified with this setting.

For example, MIDI uses 24 PPQN (therefore sends 24 pulses per quarter note) which means each sequencer step corresponds to 6 pulses (6 pulses per step)

This setting lets you set the number of PPQN when using the CV clock In. Supported values are

- 24 PPQN – 6 pulses per step
- 20 PPQN – 5 pulses per step
- 16 PPQN – 4 pulses per step
- 12 PPQN – 3 pulses per step
- 8 PPQN – 2 pulses per step
- 4 PPQN – 1 pulse per step

Note: 4PPQN, or 1 pulse per step is useful to allow a trigger input to advance the sequencer every time a pulse is received. Note also that because there are no 'sub-divisions' to this setting, some special handling of the Gate Output CV jack is needed with the **Delay after Gate Off** setting.

Note: The sequencer can only be triggered by either CV or MIDI. If the sequencer is already playing by one method, any start/stop send via the other method will be ignored. Where possible the device will show a temporary error message if it receives a second type of message.

CV Clock PPQN Output

The device allows the conversion of the incoming MIDI clock to send a CV clock output. MIDI clock is fixed at 24 PPQN. This setting allows you to send the same number of pulses into your CV modules or to sub-divide the clock.

- 24 PPQN – every MIDI pulse results in a CV pulse – 6 pulses per step
- 12 PPQN – every 2nd MIDI pulse sends a CV pulse – 3 pulses per step
- 8 PPQN – every 3rd MIDI pulse sends a CV pulse – 2 pulses per step
- 4 PPQN – every 6th MIDI pulse sends a CV pulse – 1 pulse per step
- 1 PPQN – every 24th MIDI pulse sends a CV pulse – ***4 steps per pulse*.**

Delay after Gate Off

Note: Only used when ***CV Clock PPQN Input = 4*** *(i.e. 1 pulse per step)*

The device needs to turn the CV Gate output low between sequence steps to allow envelopes, VCAs etc to re-trigger. However, if we only have 1 pulse per step arriving at the CV Clock Input we do not have any warning (sub-divisions) that the next step is to start. If we simply turn the gate low and then high again most euro modules don't notice this change because the digital processing of the device is so fast.

To work around this, use this setting to specify how long to delay after the gate has gone low before turning it on again. The value is set on the device to correspond with microseconds of delay. **The default value is 300 microseconds (us).**

Because we are using a single byte of MIDI SysEx to send settings data to the device, the application sends a value between 1 and 10 and the device multiples this by 100 to get a delay value between 100us and 1000us (1ms). The device settings menu can modify this value in increments/decrements of 1us.

Note: Higher values can cause a sort of shuffle effect which may be desirable or not!

Note: Settings lower than 300us may not be long enough of a delay for your eurorack module to detect the gate off.

Mod Output CV Duration

The modulation CV output jack can be configured to send a CV value for a specific length of time.

When an incoming MIDI CC value is received, the value is translated into a voltage between 0 and 10v and this voltage it sent on the Mod Output Jack for the length of time specified by this setting.

The default setting is 0. This means to continue to send the voltage indefinitely, or until a new value is set. Otherwise, the value of this setting is multiplied by 10 inside the device and the Mod Output jack will send the value for that number of milliseconds. For example, a setting of 2 will result in the jack outputting its voltage for 20ms.

Trigger Output CV Duration

When a MIDI note is received or the sequencer sends a CV output to the V/Oct output jack, the trigger output is enabled. The length of time that this jack sends the trigger pulse is controlled by this setting. The device multiplies the value by 10 and will send the trigger output pulse for that number of milliseconds. For example, the default setting of 2 corresponds to 20ms.

Clock Output CV Duration

A clock pulse is sent on the CV Clock Out jack based on the required Clock Out PPQN setting. The length of time that this jack sends the clock pulse is controlled by this setting. The device multiplies the value by 10 and will send the clock output pulse for that number of milliseconds. For example, the default setting of 2 corresponds to 20ms.

Sending Settings to the Device

To send all the device setting changes you have made in the application, click the **Send Global Settings to Device.**

Only settings that are different to those stored on the device will be updated.

Note: If you change the MIDI In Channel, the device will update all the other settings first, then reboot to restart the internal MIDI interface to pick-up the new MIDI channel.

Creating, Sending & Activating Sequences

Sequence Details (3)

The sequence details section defines the parameters for each of the 16 steps in your sequence.

The sequencer is loosely based on the classic TB-303 in terms of the settings per step. However, it follows a more logical, modern step-based programming style where the notes and duration area not input independently!

Sequence Slide Type

One of the classic 303 style parameters is the slide.

The Ge0Seq sequencer adds a further configuration option to the slide, the **slide type**, which lets you decide what percentage of the first node plays before it starts to incrementally slide up or down to the next note.

All steps in any given sequence will use the same slide type.

How does it work?

A step can consist of multiple clock ticks – the *ticks per step* – which is calculated based on the MIDI clock in, or CV Clock in PPQN.

If there is more than one tick per step the slide can transition between the start note and end note in equal increments. The number of increments is dictated by the number of ticks per step and the slide type setting.

For example, with the **MIDI clock** controlling the sequence, there are **6 *ticks per step***. Therefore, if the **slide type** is set to ***full step***, then the slide will transition between the start note and end note in **6 equal increments**. If the slide type is set to ***half step***, **then 3 increments** will be used, and these will **start in the *second half* of the note**.

The device will attempt to honour the slide type as best it can, however some combinations are not technically possible to achieve. In these cases the device will attempt its best effort to perform a slide. For example, if the device is configured in such a way that it is using **1 *tick per step***, there are no ‘sub-steps’ and no increments can be calculated.

If this is the case the start note will play, followed by the end note. A fast slide will be heard because the gate is never turned off between sliding notes.

The slide type can be

- **Full step** – the slide will start at the beginning of the step and slide up/down in equal increments (where possible)
- **Half step** – the slide will start half-way through the step and slide/up down in equal increments (where possible)
- **Quarter step** – the slide will start between two-thirds and a three-quarters of the way through the step (where possible)

The following table shows the possible combinations of incoming PPQN and what the device will do based on the slide type setting.

PPQN	**4**	**8**	**12**	**16**	**20**	**24 (MIDI)**
Tick per Step	1	2	3	4	5	6
MIDI	No					Yes
CV	Yes					
Slides over last x ticks of the step						
Full	No	2	3	4	5	6
Half	No			2	2	3
Quarter	No					2

Sequence Steps (1-16)

Each step has the following six independent attributes.

Note

The note to play, from C to B with a special value '*STOP*'.

STOP: The special note value of STOP is used to reduce the number of steps in a sequence.

For example, if you want a four step sequence, set step 5 to STOP. The application will dynamically adjust to hide the settings for steps 5 through 16 as shown in this example.

Octave

The octave offset to apply. Options are

- Down 2
- Down
- Middle
- Up
- Up2

Setting Note: ***C*** and Octave: ***Down 2*** corresponds to MIDI node C1.

Step Length

The number of steps this note should be played. Options are 1, 2 or 4.

- **1** plays a 1/16th note
- **2** plays a 1/8th note
- **4** plays a ¼ note

For example, here Step 1 is 4 steps long, and step 5 is two steps long. The application hides the appropriate steps.

Rest, Accent & Slide

These settings can be enabled (1) or disabled (0) per step.

- **Rest** - turns the step off and no note is played.
- **Accent** - sends a pulse for the duration of the step on the CV Accent Output jack.
- **Slide** - causes this note to slide up or down to the next note. See the associated slide type description on page 19 for more details.

Device Sequence Tasks (4)

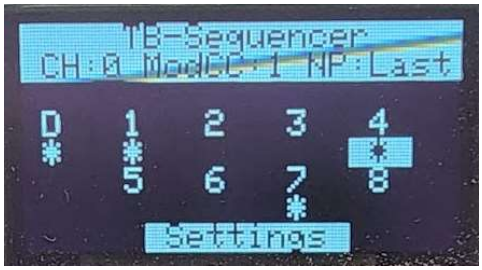
Once you have created a sequence it must be uploaded to the device. Select the device slot that you wish to work with from the **Device Slot** drop down menu and then select one of the tasks.

Send Sequence to Device

To send the sequence you have programmed in the application to the device, first choose a slot location from the drop down and then click the **Send Sequence to Device** button in the **Device Sequence Tasks** section.

The device display will show it is receiving incoming SysEx data, followed by a message to show it is saving the sequence data to the chosen device slot.

Note: When a sequence is saved to the device it will automatically become the active sequence. When the device returns to the home page the slot should now show that it has a saved sequence "*" and that it is the active sequence (highlighted "*") as shown here for slot 4.



WARNING: If an existing sequence is saved in the device slot it will be overwritten without any additional warning or confirmation. Be sure to select the correct slot before sending a sequence to the device.

Activate existing Sequence

To activate an existing sequence that has been previously saved to the device, first select the slot you wish to activate from the **Device Slot** drop down menu and click **Activate existing Sequence.**

The device display will show it is receiving incoming SysEx data, followed by a message to show it is activating the sequence data from the chosen device slot.

If there is no sequence stored in that device slot the device will show a suitable error message and the default sequence will become the active sequence.

Local File Management (5)

You can load and save sequence information to the local storage device on your PC for future use. This allows you to build a library of sequences and not be limited by the eight slots on the device.

To save the current sequence data to a file, select **Save Sequence to File.**

To load a sequence file into the application, select **Load Sequence File.**

Note these tasks only save or load the sequence from/to the application. If you wish to send a saved sequence to the device you will need to

1. Load the sequence from a local file.
2. Send the sequence to the device.

Note: It is recommended you always save your sequences to the local filesystem so you can later re-upload them to the device if the slot memory has been.

Updating Device Firmware

There are two ways you can update the device firmware, either via MIDI SysEx or via a USB ISP programmer (if you have one).

To update via SysEx the device must first be restarted in bootloader mode.

To update via ISP you do not need to use bootloader mode.

If you are updating the firmware you should ensure that you also download the latest (matching) Ge0sync Sequence Editor application from the Ge0sync website : https://geosyncsynth.com/documentation/ or from the GitHub releases page.

With some updates it may not be possible to maintain backwards compatibility with older versions and the EEPROM will need to be re-initialised after the firmware is updated. If this is case a warning will be provided with the firmware release.

Putting the device into Bootloader mode

The device can be put into bootloader mode by holding down the encoder switch while powering on the device.

Press and hold the encoder button within the **first three seconds of bootup**. Keep holding it for **another two seconds** until you see the RDY LED flash twice and then turn on steady. Release the button when the LED is on steady.

The device is now in bootloader mode and is ready for the firmware to be sent via MIDI.

To exit bootloader mode without sending an update press the reset switch on the side of the module.

Note: If the device is stuck in a bootloader cycle (i.e. it cannot find the firmware) then you will see a repeated slow flash of the RDY LED. If this is seen you need to re-send the firmware to the device. In this stuck state, hold down the encoder button for **5 seconds** and the LED will turn on steady. You are now in bootloader mode and ready to send the firmware.

Note: It is generally easiest to have the module out of the rack when updating so you can access the reset switch and view the RDY LED.

Updating via MIDI SysEx

Download a MIDI SysEx tool such as SysEx Librarian on Mac, or MIDI OX on Windows.

https://www.snoize.com/sysexlibrarian/

http://www.midiox.com/

Download the .syx version of the firmware for the device from the Ge0sync website : https://geosyncsynth.com/documentation/ or from the GitHub releases page.

Open your SysEx tool and configure the MIDI OUT port for the MIDI interface that is connected to the device.

Put the device into bootloader mode as described above. Load the **firmware.syx** file into the SysEx tool and send it to the device.

When the device starts to receive the firmware data you should see the RDY LED flashing as it downloads each buffer. When the download is complete, assuming it was successful, the device will automatically reboot and you should see that it is now running the new version.

If the device doesn't reboot, or you don't see the RDY LED flashing, check your MIDI configuration in your SysEx tool. Sometimes you may need to either reduce the SysEx tool buffer size and/or add a delay between each buffer in your SysEx tool.

With Windows we have had success with MIDI OX, 256kb buffer size, 32 buffers and no additional delays. With Mac we have had success with 64kb buffers and no or 100ms delays.

WARNING: Do not interrupt the download process this may result in a corrupt firmware image. Don't panic, simply reboot the device, place back into bootloader mode and attempt to re-send the firmware. The bootloader should never become corrupted and will always be ready to accept the firmware.

Updating using the ISP header

The device provides an ISP programming header to upload firmware updates. You will need either an Arduino Uno (google using Arduino as an ISP) or a serial in-circuit programmer such as a USBASP.

(https://www.freetronics.com.au/products/usbasp-icsp-programmer-for-avr-arduino)

Download and install avrdude. (https://github.com/avrdudes/avrdude/releases)

WARNING: Uploading the firmware may erase the EEPROM contents if not careful, essentially performing a factory reset of the device. Make sure you have saved any sequences to the local filesystem on your PC before updating firmware.

WARNING: Incorrectly uploading firmware can potentially corrupt the device, this can always be recovered, but may require re-flashing the bootloader and CPU fuse settings. Proceed with caution!

Upload using avrdude

After installing avrdude and your ISP USB device, connect the corresponding MISO, MOSI, SCK, RST, GND and VCC pins from your ISP device to the header on the rear of the Ge0Seq module. Connect the 6 pins before connecting the USB device to your PC!

When you connect the USB cable to your PC you should see the device power up as normal as it is getting 5v power from the USB port.

Once you are happy, download the latest hex firmware image from the Ge0sync website https://geosyncsynth.com/documentation/ or from the GitHub releases page.

Open a terminal window and run the appropriate avrdude command, substituting “usbasp” for your programmer type and firmware.hex for the firmware filename

```
➢  avrdude -c usbasp -p m328p -b 19200 -D -U flash:w:firmware.hex:i
```

The device should reboot and display the new version string.

Flashing a new CPU or Recover a non-functional device

Note: You should never need to change the fuse settings or re-upload the bootloader unless you have accidentally erased the device or you are building a DIY module and starting with a brand new Atmega328p.

There can be many reasons why the device has been bricked, but if you get no response, and you don't ever see the RDY LED coming on, or cannot enter bootloader mode you can try to reset the fuses and re-load the bootloader.

Note If the bootloader is running but there is no usable firmware on the device you will see a slow flash of the RDY_LED but the display will never initialise. You can re-send the firmware after entering the bootloader from this slow flash state by holding the encoder button for approximately five seconds or until the RDY LED turns on steady.

The appropriate bootloader.hex file is available from the website : https://geosyncsynth.com/documentation/ or from the GitHub releases page.

Run the following three commands to flash a brand new from factory Atmega328p or if you cannot get into the bootloader.

WARNING: Running the first command will erase the EEPROM!

```
➢  avrdude -c usbasp -p m328p -B4 -e -U efuse:w:0xFD:m -U hfuse:w:0xDA:m -U
   lfuse:w:0xFF:m -U lock:w:0xFF:m
➢  avrdude -c usbasp -p m328p -b 19200 -D -U flash:w:bootloader.hex:i
➢  avrdude -c usbasp -p m328p -b 19200 -D -U flash:w:firmware.hex:i
```

The first command erases the device and sets the fuse/lock bits to tell it where to look for the boot loader, this runs at an extremely low baud rate in case you have messed up the CPU crystal frequency! The second command installs the bootloader in the top 1KB of the flash memory. After you have run the second command you should see some life from the device with a slow flash of the RDY LED. The third command installs the firmware starting at the first block of the flash memory. Once completed, the device should reboot and the splash screen is displayed after a few seconds.

If all appears lost, contact us! geosync.synth@gmail.com