NONLINEAR LABS C15 Sound Synthesizer User Manual

NONLINEARLABS

C15 Sound Synthesizer
User Manual

Contents [hide

Introduction

In the development of the C15, we first focused on human control and playability. We designed a self-contained instrument “for those who love to play keys”.
The implementation of a MIDI interface is now widening the spectrum of applications for the C15 – especially in the studio environment.

The second extension that is included in this software release is an internal digital recorder. It automatically stores the audio output signal of the last hours. Selected segments of the audio can be downloaded in a lossless digital format. It also allows for the restoration of the synth engine's state at any point in time within the recorded audio.

The MIDI implementation of the C15

Since the Studio Package update, the C15 can receive and send MIDI messages. Received MIDI messages can control the C15 and affect the sound, similar to playing the instrument itself. When playing on the C15, MIDI messages can be sent, reflecting the performance. Note that received MIDI messages will never be sent, so there is no "MIDI Thru" or loopback functionality.

Receive and Send options include a Channel (Omni, 1 … 16) specifier, filtering events accordingly. When a Split Sound is loaded, a secondary (Split) Channel can be used in order to separate both Parts from each other.

As classical MIDI operates on 7-bit resolution (128 steps), there is a loss in accuracy (the C15 operates on much higher precision). Nevertheless, precision can be maintained by enabling "High Res." options. When enabled, the resolution increases to 14 bit (16384 steps). Values are then encoded as a pair of MSB (coarse) and LSB (fine) components, effectively doubling the number of messages. This is still compatible with the classical resolution, as the LSB component is optional when receiving MIDI messages.

The C15 can send and receive MIDI messages for the following events:

Note On and Note Off

When enabled, the C15 will produce sounds when receiving MIDI Note messages. Likewise, the C15 will send MIDI Note messages when playing on the internal keybed, if enabled. Note On and Off velocities are supported and can optionally operate on high resolution, using an additional MIDI CC (Control Change) message on Control Number 88, encoding the LSB component.

When a Split Sound is loaded, Notes can be received and sent on both Parts, using the secondary (Split) Channel setting.

The eight Hardware Sources

Physical control elements of the C15 like a pedal or the bender are called Hardware Sources.
They can be flexibly mapped to the Macro Controls, each of which can modulate up to 90 assignable parameters.

In the C15's user interface the Hardware Sources are represented by eight sliders. Their positions can be sent and received via MIDI in the following way:

- Pedal 1/2/3/4 can be assigned to MIDI CCs 01…31 for the MSB while CC 33…63 can work as LSB for 14-bit resolution. CC 64…69 can be assigned in a 2-state switching mode.
- Ribbon 1/2 can be assigned to MIDI CC 01…31 for the MSB while CC 33…63 can work as LSB for 14-bit resolution.
- The Bender can be assigned to MIDI Pitchbend or to MIDI CC 01…31 for the MSB while CC 33…63 can work as LSB for 14-bit resolution.
- Aftertouch can be assigned to MIDI Channel Pressure or to MIDI CC 01…31 for the MSB while CC 33…63 can work as LSB for 14-bit resolution, or to one-half of the range of MIDI Pitchbend (up or down).

Note that assignments are non-exclusive, so multiple Hardware Sources can be bound to the same received MIDI message, as well as being merged into indistinguishable MIDI messages when sent. This may be useful in certain scenarios, so there are no restrictions. However, it is up to the user to find a meaningful setting, apart from the provided default setting, consisting of distinct assignments.

Preset Selection

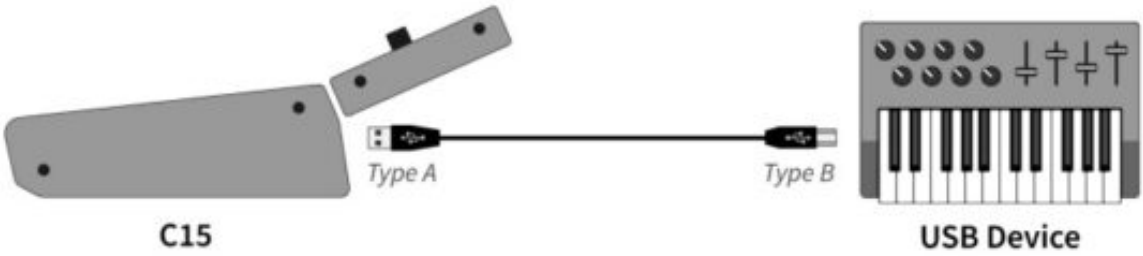
One of the Preset Banks can be assigned to receive and send MIDI Program Changes. The Program Change numbers are mapped to the first 128 presets of this Bank.

USB Connection

Connecting the C15 to a USB Device

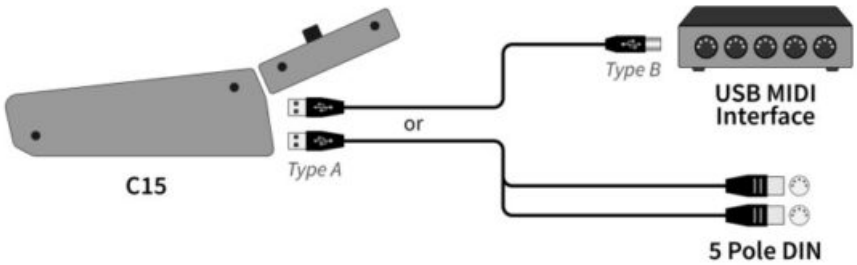
The C15 has a Type A connector for USB, and its embedded computer system works as a “USB host” for “USB devices” connected to this port. This means that you only need a standard USB cable to set up a MIDI communication with an instrument, a hardware sequencer, or a MIDI interface that has a USB Type B connector. You can connect the C15 to multiple USB MIDI devices via a USB hub.

Important: The USB port of the C15 can only supply a limited current to bus-powered devices.
Devices that have a higher power consumption need to be run with their own power supply, or through a powered hub.



Connecting the C15 via 5-pole DIN Connectors

To use the classical MIDI cables and 5-pin DIN Ins and Outs a MIDI interface can be connected as a USB device directly to the USB port of the C15. The most convenient and cost-effective solution is cabled with an integrated USB-MIDI interface.

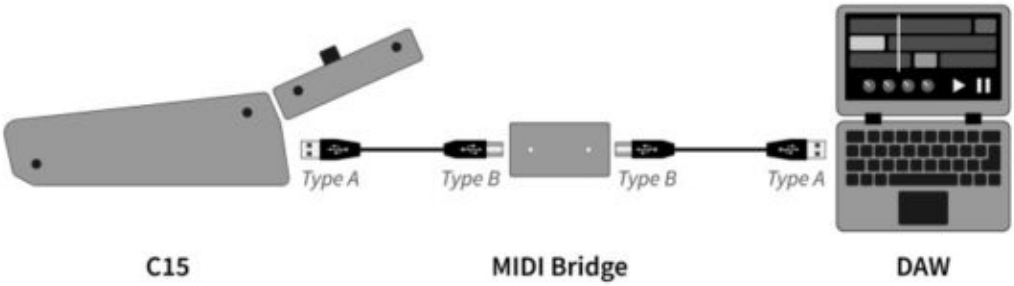


Connecting the C15 to a Computer

A computer running a DAW or similar is the center of many setups. It functions as a USB host and can only be connected to USB devices. Since the C15 is also a USB host we provide the “MIDI Bridge” that functions as a double-sided USB device with two Type B connectors. One of the ports is connected to the C15 and the second to your computer.

Our adapter will appear as “NLL-MIDI-Bridge” in the list of USB MIDI devices. The two LEDs on top of the box show the operation of the two USB Ports. If both are lit in green color the box is working normally. If one of the LEDs is not green, the connection to its side is interrupted. More information about the operation of the MIDI Bridge can be found in the “MIDI-Bridge-UserManual.pdf”.

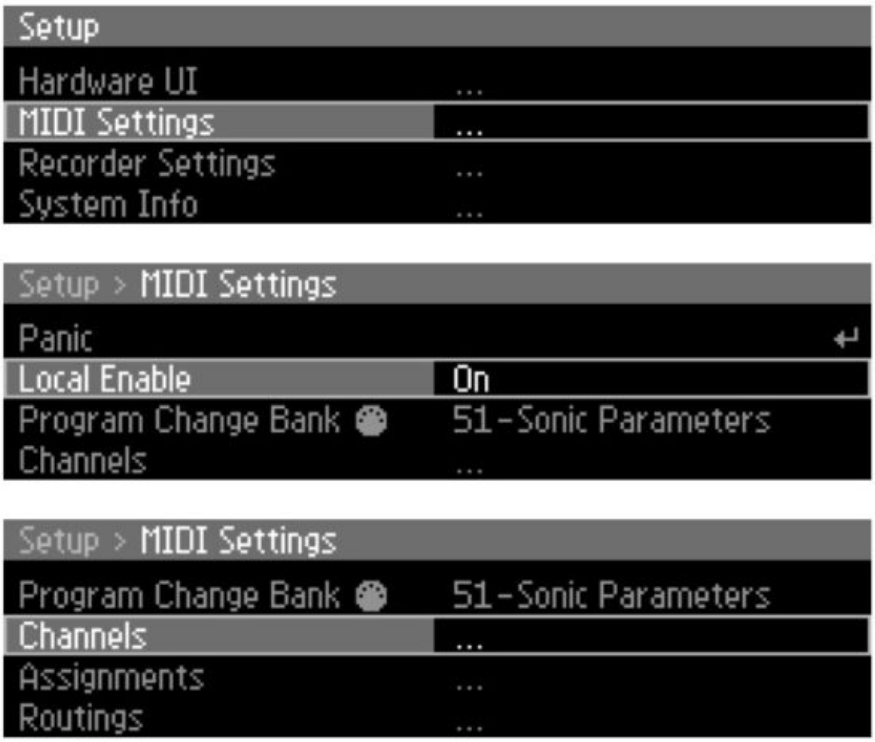
Besides its function for the C15, the MIDI bridge can also be used for the MIDI connection between other USB hosts, like two computers.



MIDI Settings

In the Setup (both in the graphical UI and on the hardware) you find a new page for “MIDI Settings”. It is divided into the sections “Channels”, “Assignments” and “Routings”. Furthermore, you find direct access to “Panic”, “Local Enable” and “Program Change Bank” at the very top of the settings page.


Setup
Device Settings
GUI Settings
MIDI Settings
Recorder
System Info
About
General
Panic
All Sounds Off
Global Local Enable
On
Off
Program Change Bank
None
Channels
Send
Primary Channel
1
Split Channel (Part II)
2
Receive
Primary Channel
1
Split Channel (Part II)
2
Assignments
Pedal 1
CC 20 (LSB: CC 52)
Pedal 2
CC 21 (LSB: CC 53)
Pedal 3
CC 22 (LSB: CC 54)
Pedal 4
CC 23 (LSB: CC 55)
Ribbon 1
CC 24 (LSB: CC 56)
Ribbon 2
CC 25 (LSB: CC 57)
Bender
Pitchbend
Aftertouch
CC 26 (LSB: CC 58)
Enable High-Res. CC (enable LSB)
On
Off
Set to Defaults:
Classic
High-Res.
Enable High-Res. Velocity (CC 88)
On
Off
Routings
Primary Channel
Split Channel
Send
Receive
Send
Receive
Local
Notes
Prog. Change
n.a.
Pedal 1
Pedal 2
Pedal 3
Pedal 4
Bender
Aftertouch
Ribbon 1
Ribbon 2
Set to Defaults:
All On
All Off



Panic

When triggered, the C15's Voice Allocation, Envelopes, and Buffer will be reset and an "All Notes Off" MIDI message will be sent on the respective channel(s). As a result, all internal audio and external gear will stop playing. A common method to face stuck MIDI notes, but it also can be helpful, when you lost control of the sound, e.g. through a feedback loop.

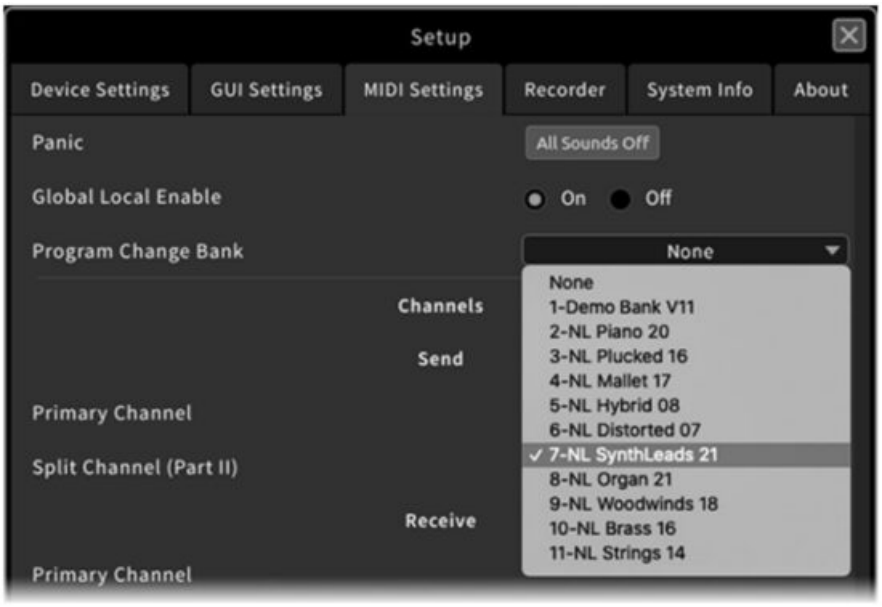
Panic can also be triggered by pressing all four soft buttons on the base unit at the same time.

Local Enable

When set to "Off", both the C15's keyboard and the eight Hardware Sources are disconnected from the synth engine but still can be used to send MIDI notes and Control Change, Pitchbend, or Channel Pressure messages.

Please note that changing this setting while a note is active resets the voice allocation, the envelopes, and the buffer of the C15, so that the audio playback is interrupted for a brief moment. In this case, a MIDI All Notes Off message is also sent on the respective channel(s).

Program Change Bank



Here you can assign the Preset Bank that is used for sending and receiving MIDI Program Change messages. By selecting “None”, no MIDI Program Change messages will be received or sent. Please see the next subchapter “Choosing a Bank for MIDI Program Change” for choosing a Preset Bank directly from the preset view.

Please note, that every time you change the Program Change Bank, a corresponding MIDI message is sent.

Choosing a Bank for MIDI Program Change:

To make use of MIDI Program Change messages one of the C15’s preset banks has to be assigned as the source and target of Program Changes. A received Program Change would select the preset with the referring number in this bank and the selection of a new preset in the bank will send a MIDI Program Change with its number. Selecting a preset that has a higher number than 128 will not send a Program Change.

The “Direct Load” switch decides if the C15 only sends a MIDI Program Change when you select a preset, or if the preset is also loaded into the sound engine. Therefore it has a similar effect to a “Local Off” for Program Changes.

The header of the MIDI-assigned bank is marked by a symbol that looks like a 5-pole MIDI connector. The bank can be connected or disconnected in the following ways:

- In the graphical UI, you find the entry “Connect Bank to MIDI PC” or “Disconnect Bank from MIDI PC” in the context menu of the bank header.
- In the Preset Screen of the Hardware UI activates the “Bank” focus by pressing the Soft Button 1 (with a dual preset hold the button for a second). In the “Edit” menu you find the entry “MIDI PC: On” or “MIDI PC: Off”, which can be toggled by the “Enter” button.

By connecting a bank to MIDI PC the previously connected bank will be disconnected. After disconnecting the currently connected bank, none of the banks will be connected. The currently assigned bank can also be found and changed in the “Program Change Bank” menu in the MIDI Settings.

MIDI Settings: Channels

Channels

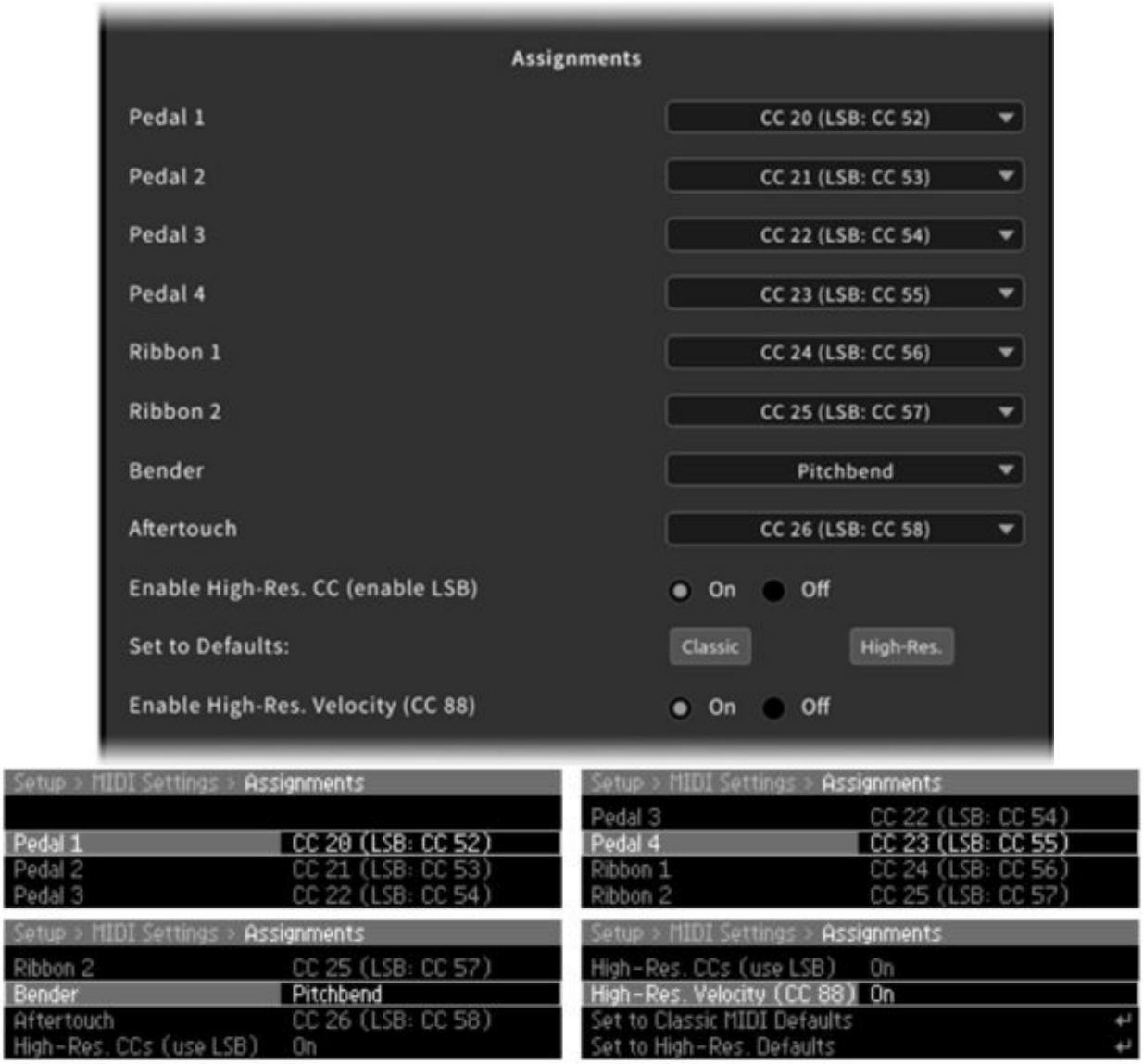
Here you can select the MIDI channel that is used to send and receive MIDI messages for both Primary and Split Channel. The Split Channel is relevant only if a Split Sound is loaded. If you select “Omni”, messages from all 16

MIDI channels will be applied. “None” will block all incoming and/or outgoing MIDI messages. When “Split Channel” is set to “Common”, it will use the same MIDI channel as the Primary Channel.

Settings for Split Channels apply to Split Sounds only. It controls the MIDI channel for MIDI messages sent and/or received by Part II. If the Split Channel is not set to “Common”, the Split Point(s) are not applied to the received MIDI notes and both Parts can be played over the full MIDI note range.

Please note that changing this setting while a note is active resets the voice allocation, the envelopes, and the buffer of the C15, so that the audio playback is interrupted for a brief moment. In this case, a MIDI All Notes Off message is also sent on the respective channel(s).

MIDI Settings: Assignments



These settings determine which types and numbers of MIDI messages are assigned to the Hardware Sources. High-Resolution options for Velocities and Hardware Sources as well as a Bank selector for Program Changes are also provided. The Assignments apply to both MIDI Send and MIDI Receive.

Pedals 1, 2, 3, 4

Each pedal can be assigned to a MIDI Control Change. The CC numbers 1 to 31 are available for continuous operation in 7-bit and 14-bit (High-Res.) mode. In 14-bit mode, a second CC with a number between 33 and 63 is

automatically assigned for the LSB.

In addition, the CC numbers 64 to 69 are available. They work as 2-state switches, as it is typical for e.g. a MIDI sustain pedal. When the C15's pedal position rises above 50 %, a MIDI CC value of 127 is sent, when it falls below 50% a value of 0 is sent. A received MIDI CC value smaller than 64 sets the pedal position to 0 %. Values of 64 or larger set the pedal position to 100 %.

By selecting "None" the pedal is disconnected from MIDI.

Ribbons 1, 2

Each ribbon can be assigned to a MIDI Control Change. The CC numbers 1 to 31 are available in 7-bit and 14-bit (High-Res) modes. In 14-bit mode, a second CC with a number between 33 and 63 is automatically assigned for the LSB.

By selecting "None" the ribbon is disconnected from MIDI.

Bender

In the typical application as a pitch bender, the Bender can be assigned to MIDI Pitchbend.
This has 14 bits resolution by definition.

The Bender can also be assigned to a MIDI Control Change. The CC numbers 1 to 31 are available in 7-bit and 14-bit (High-Res) mode. In 14-bit mode a second CC with a number between 33 and 63 is automatically assigned for the LSB.

By selecting "None" the Bender is disconnected from MIDI.

Aftertouch

The most common assignment would be MIDI Channel Pressure. This has only 7 bits of resolution.

Aftertouch can also be assigned to a MIDI Control Change. The CC numbers 1 to 31 are available in 7-bit and 14-bit (High-Res) modes. In 14-bit mode, a second CC with a number between 33 and 63 is automatically assigned for the LSB.

Two additional options are available to assign Aftertouch to one-half of the MIDI Pitchbend.
"Pitchbend up" has a range from the center to the maximum while "Pitchbend down" goes from the center to the minimum. These ranges have 13 bits of resolution.

By selecting "None" Aftertouch is disconnected from MIDI.

High-Res. CCs (use LSB)

Control Changes can be transmitted with a resolution of 14 bit by using two CCs, one for coarse (MSB) values and one for fine (LSB) values. The LSB message has to be sent before the MSB message. The number of the CC for the LSB is derived from the number of the CC for the MSB by adding 32.

To avoid conflicts with other applications of the LSB CCs, their use can be disabled ("Off"). This setting applies to all assigned MIDI Control Changes.

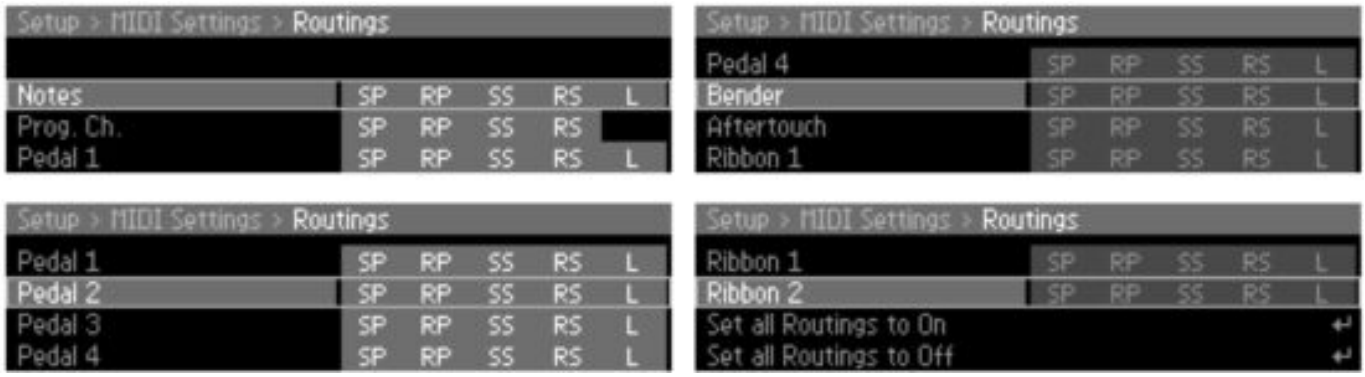
High-Res. Velocity (CC 88)

Note On and Note Off velocities can be transmitted with a resolution of 14 bit by sending a CC 88 message before each Note On or Note Off message. The value of the CC 88 represents the LSB that is providing additional 7 bits of resolution.

To avoid conflicts with other applications of CC 88, its use as velocity LSB can be disabled (“Off”).

	Classic MIDI	**High Resolution**
Pedal 1	CC20	CC20 + CC52 (MSB + LSB)
Pedal 2	CC21	CC20 + CC53 (MSB + LSB)
Pedal 3	CC22	CC20 + CC54 (MSB + LSB)
Pedal 4	CC23	CC20 + CC55 (MSB + LSB)
Ribbon 1	CC24	CC20 + CC56 (MSB + LSB)
Ribbon 1	CC25	CC20 + CC57 (MSB + LSB)
Bender	MIDI Pitchbend	MIDI Pitchbend
Aftertouch	MIDI Channel Pressure	CC26 + CC58 (MSB + LSB)
High-Res. Velocity (CC88)	Off	On
High-Res. CCs (use LSBs)	Off	On

MIDI Settings: Routings



These settings allow setting individual and specific MIDI routings. The matrix consists of five columns: -Send Primary’ (SP), and “Receive Primary’ (RP). “Send Split” (SS), “Receive Split” (RS), and “Local” (L). The rows list -Notes”, “Program Change” and the eight Hardware Sources -Pedal 1-4″, “Bender”, “Aftertouch” and -Ribbon 1-2″.

In the graphical UI, a checkmark at the respective matrix position sets the entry to “On”, removing the checkmark sets it to “Off”. On the hardware, a highlighted entry represents “On”, a dark one “Or

Also, the access to the matrix is different on the hardware. When you choose one of the rows and press “Enter”, you reach a dedicated settings dialog for this row. In the center, the display shows you the name of the respective component, e.g. “Notes”. Use soft buttons 2 and 3 to change between the rows. With soft button 4, you can switch between the columns. The name of the actual column is also displayed below the chosen row, e.g. “Send Primary”.

By turning the dial, you can set the entry to “On” or “Off”. When holding the shift button while turning the dial, you can set the whole row to “On” or “Off”. The status is also displayed by the checkmarks on the right side. By pressing soft button 1, you get back to the matrix overview.

Send (Primary/Split)
When set to “Off” the respective C15 component will not send MIDI messages on the respective channel.

Receive (Primary/Split)
When set to “Off” the respective C15 component will not receive MIDI messages on the respective channel.

Local
When set to “Off” the respective component is disconnected from the synth engine, but still can be used to send MIDI notes and Control Change, Pitchbend, or Channel Pressure messages.

In this mode, the base unit display is not showing the associated Macro Control, but the MIDI-CC number assigned to the Ribbons instead.

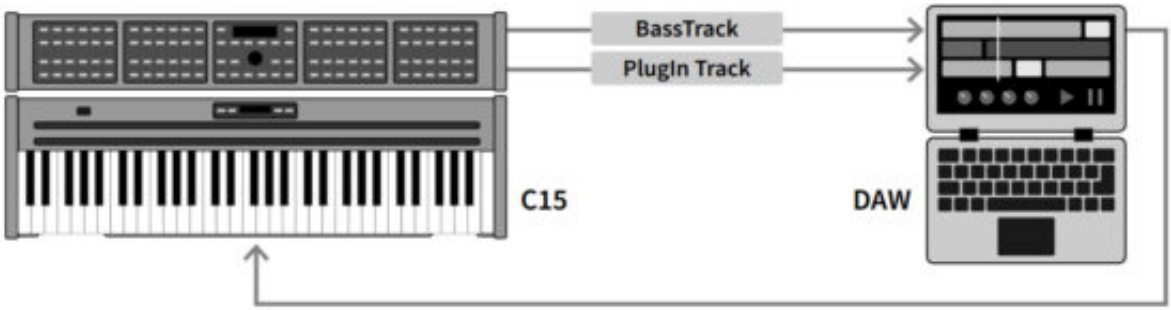
Set all Routings to On/Off
Below the Routings Matrix, you find the options to enable or disable all routings by pressing “Set all Routings to On” or “Set all Routings to Off” (respectively “All On”/”All Off” in the WebUI).

Please note that changing the routings setting while a note is active resets the voice allocation and the envelopes of the C15, so that the audio playback is interrupted for a brief moment. In this case, a MIDI All Notes Off message is also sent on the respective channel(s).

Practical Studio Examples

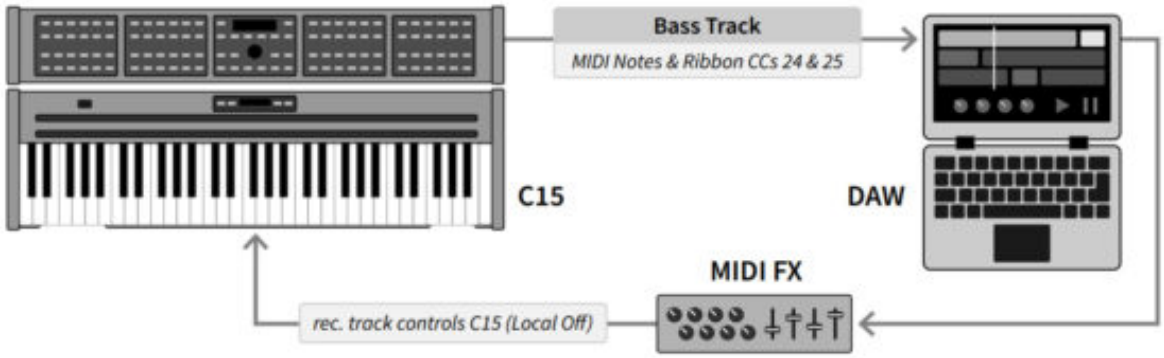
With the C15’s MIDI features, it can be used as a master keyboard and production tool in the center of your studio or live performance set. In the following, we want to show you exemplary scenarios, which will help you to understand the MIDI settings better and give you some orientation and helpful tips when using the C15 as a production tool.

Scenario 1: Studio Setup

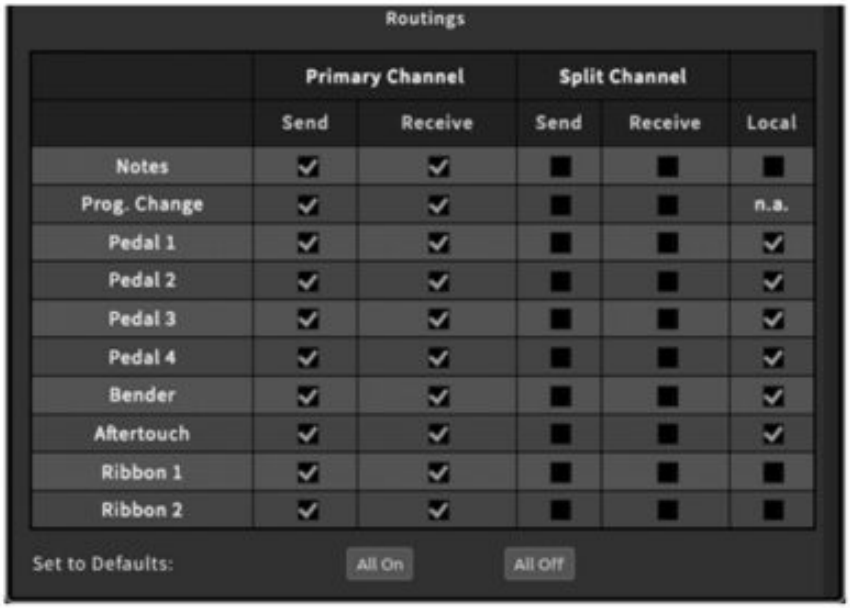


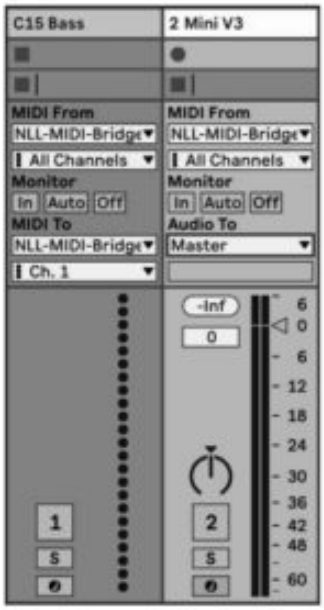
A Digital Audio Workstation (DAW) is the heart of almost every modern music studio. Therefore, this first scenario will focus on using your C15 with the benefits of a DAW, but also as a controller for other instruments within the DAW. So, on the one hand, we will use the C15 as a sound generator, and on the other hand, to control a Plug-In.

Please note that this setup is not entirely applicable to a live situation as any change to the MIDI settings while a note is active can lead to a reset of C15's envelopes and voice allocation and an "All Notes Off" MIDI message. As a consequence internal and external audio will stop for a brief moment.

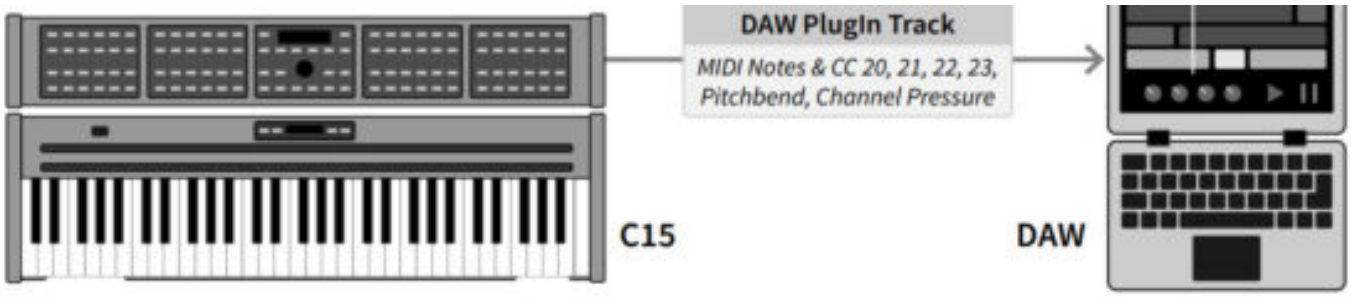


First, we want to record a MIDI track, that triggers a C15 bass sound. This MIDI track receives MIDI notes and CC values by the C15. As we send MIDI data to the DAW and back to the C15, we can benefit from the MIDI processing features of the DAW (arpeggiator, chord generator, etc.).For the bass track, we want to record MIDI-Notes and the ribbon's CC values.

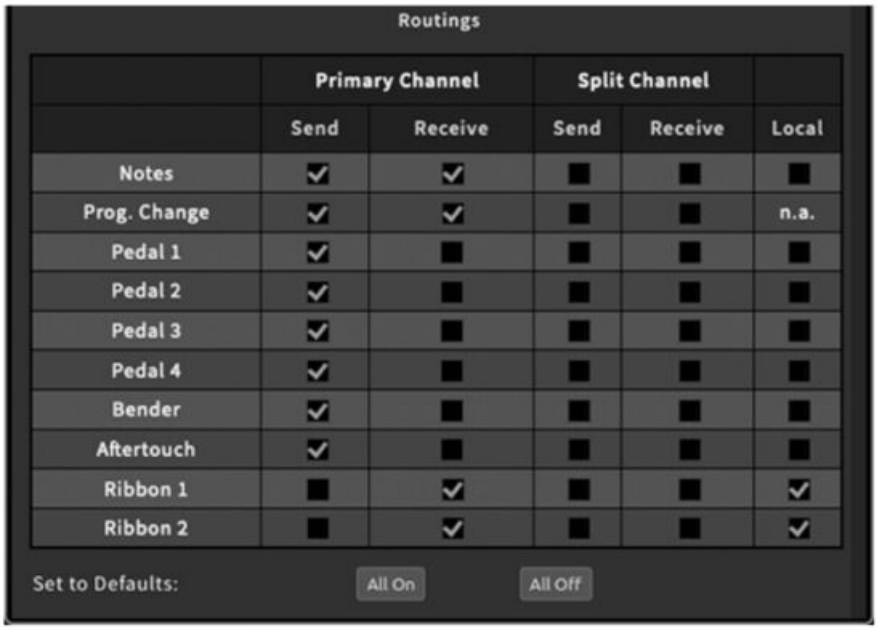




For this purpose, we have to change some of the routing settings: turn on “Send” and “Receive” for both Notes and Ribbon 1 & 2 for Primary Channel. As we don’t want MIDI Echo issues to appear, we turn off Local for them. The direct connection between the keys, both ribbons, and the C15 is now interrupted and completely controlled via MIDI. MIDI-Monitoring of your DAW should be activated. You can now record the track. The track “C15 Bass” of the DAW now controls the C15 and the ribbon’s LEDs reflect the incoming CC values. You can now use the keys and the remaining Hardware Sources to control a Plug-In in the DAW. In this example, we use Arturia’s Mini V3. Therefore, we want to turn off track 1’s MIDI monitoring and choose track 2 for recording. The C15 keeps on playing, run by the recorded Bass track.

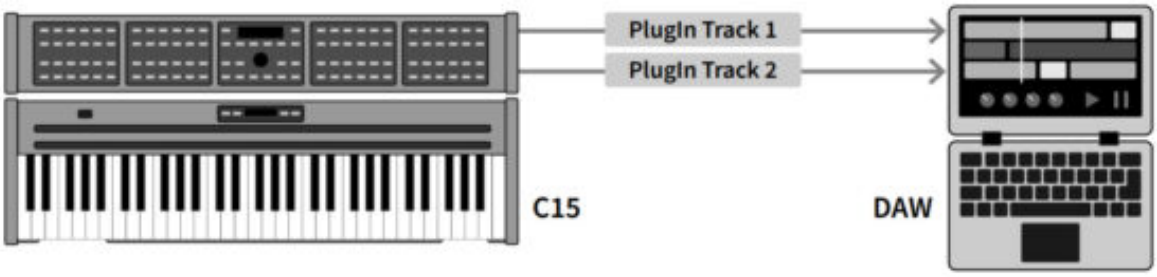


As the C15 is still hearable, we do have to make some adaptions to the Routings settings. We want to turn off Local and Receive for all other Hardware Sources as they would interfere with the playing bass sound otherwise. You can now turn on Local for the Ribbons again, as this allows you a direct impact on the bass sound. Further, turn on “Send” for Pedals 1-4, Bender as well as Aftertouch and Notes, as we want to use these to control the Plug-In.



We can now control the Plug-In without changing the bass sound unintentionally.

Scenario 2: Controlling two Plug-Ins at the same time



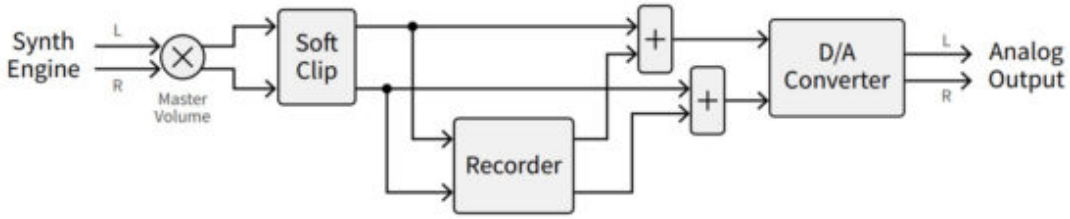
Thanks to C15's Split Mode, we can use MIDI to control and play two Plug-Ins at the same time.
For this scenario, we need to load an existing Split-Preset or create a new one, as only then MIDI data is sent and received on the Split Channel as well. Next, we have to set the "Send" and "Receive" channels according to our settings in the DAW. In this case, we have two Plug-In tracks set to MIDI Channel 1 and 2. Therefore, we set Primary Channel to 1 and Split Channel to 2 for both "Send" and "Receive". We can now control Plug-In 1 with the left and Plug-In 2 with the right Split Part.

In the Routing settings, you can distribute the Hardware Sources on the channels or use them on both simultaneously – there are reasonable scenarios for both use cases.

As you wish, you can turn off Local, so you don't hear the C15, and the MIDI-CCs will pop up on the small base unit display.

As this setup is just about sending MIDI, all "Receive" entries were deactivated for the sake of clarity.

The Digital Audio Recorder

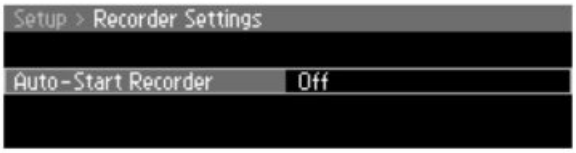


General Function

The internal recorder enables you to capture the C15's output signal with the best possible audio quality at any time, without connecting a sound card.
The stereo signal behind the Soft Clipper and before the D/A converter is written to the RAM, using the lossless compression of the FLAC format (24 bits, 48 kHz).
A maximum of 500 MB can be stored in the RAM. Because of the FLAC compression, this is enough for hours of permanent playing and for days of recording when there are pauses in the playing.
If the recorded amount of data exceeds the limit of 500 MB, the oldest data will be overwritten.
Therefore it works like a ring buffer that always contains the latest recording.
The content of the RAM will be lost, when you switch off the C15. You can select a segment of the recorded audio and download it to your computer to use it in your production environment. The recorded audio can be downloaded in both the FLAC and WAV formats.

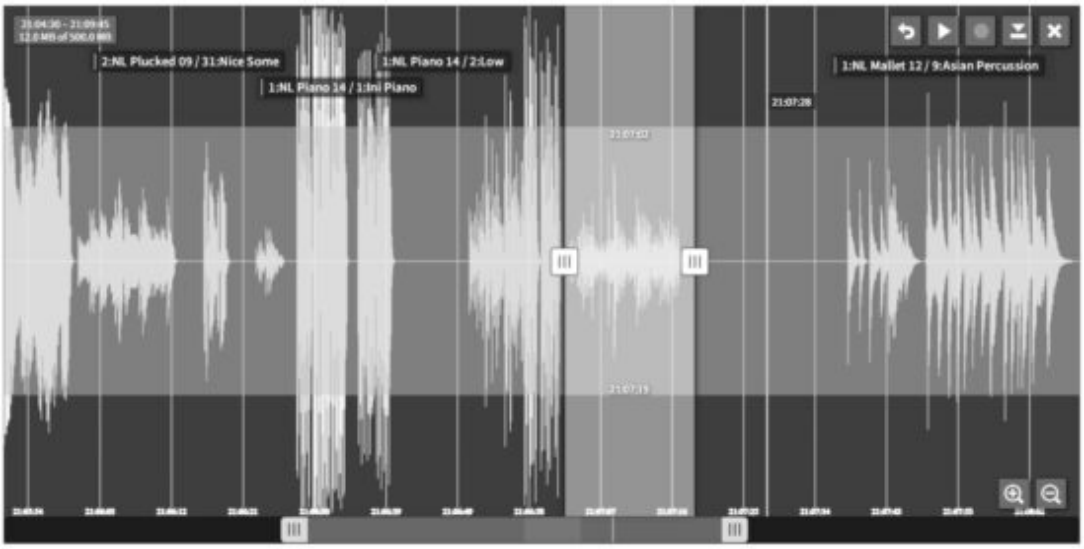
Recorder Settings – Auto-Start

In the Setup, you find a new page for “Recorder” settings. With the option “Auto-Start Recorder” the user can decide if the audio recording starts automatically when the C15 is switched on, or if the user has to start it by the Record button.



User Interface

The Recorder tab can be opened by the “Open Recorder” entry in the “View” menu.
(The tab has the address **http://192.168.8.2/recorder/index.html)**



The recorder works independently from its browser tab is open or not.

Zoom and Scroll

At the bottom of the recorder display, you find a dark stripe representing the whole length of the audio recording that is in the memory. It is the frame for a bar that is used for scrolling and zooming. By holding the bar in its grey center area and dragging it, you shift the visible section of the recorded audio, which means that the display content is scrolled. By the two handles at the ends of the bar, you can change its length and therefore the zoom factor.

The two buttons with magnifier “+” and “-” icons and the mouse wheel respectively the “+” and “-” buttons of your computer keyboard can also be used to zoom in and out.

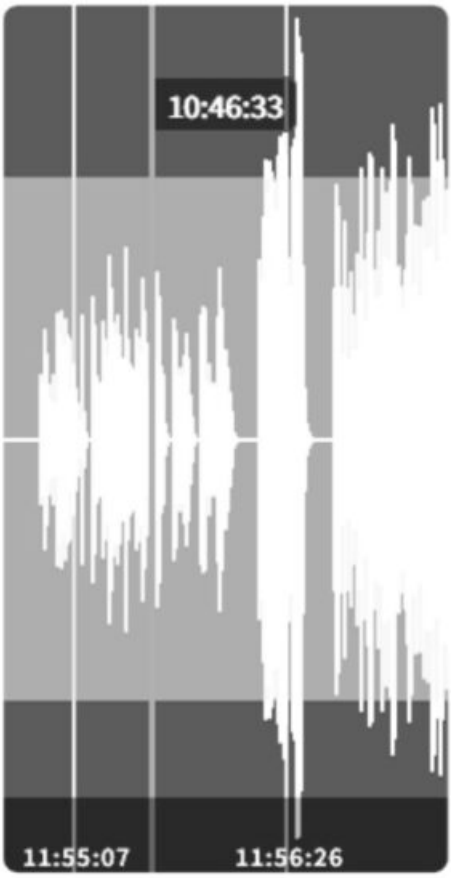
Control Buttons

Restore – Play/Pause – Record – Download – Delete

Computer Keyboard Shortcuts

Command	**Shortcut**
Play / Pause	space bar
Record	R
Restore	Z
Download	S
Zoom In / Out	+ / –
Scroll	left / right arrow keys
To Previous/Next Preset Marker	up / down arrow keys (coming soon)

Playing Back Recorded Audio



The C15 can playback the recorded audio through its outputs. The playback start position is set by a click/touch in the darker outer lanes of the recorder display. A green line – the Play cursor – shows the position. A time label is attached.

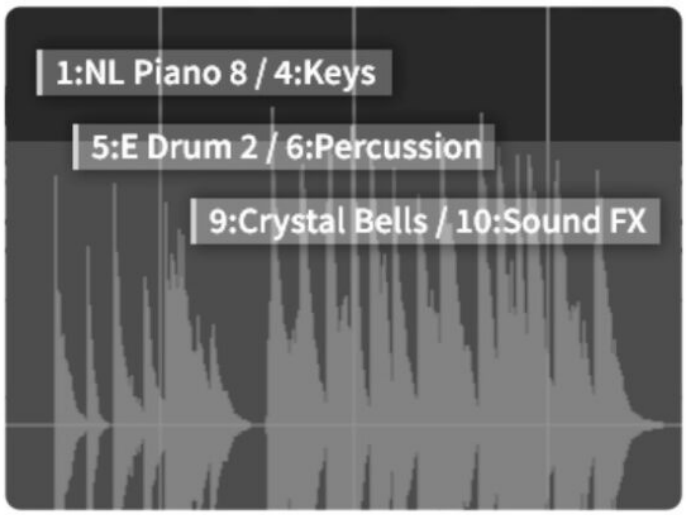
When the Play button is pressed, the Play cursor starts to move and the recorded audio is played back. The button gets a “Pause” symbol and can be used to interrupt and continue the playback. Alternatively, you can press the space bar for toggling between Play and Pause.

You can play the C15 live while the playback is running, but please be aware that the sum of the two signals can cause clipping distortion

Restoring a Sound

The Undo system of the C15 memorizes every user action on parameters or presets. It allows going back to the state of the synth engine at any point in time since the start of the session. Therefore it is possible to restore the sound at a certain position on the timeline of the Recorder and to use the same state of the synth engine as it was at the time of recording.

For this, you move the Play cursor to the point in time in which you want to restore the sound and press the Restore button or the Z key on your keyboard. The Undo System will go back to the state of the parameters at the selected point in time, takes a “snapshot” of them, and copies it into the edit buffer.

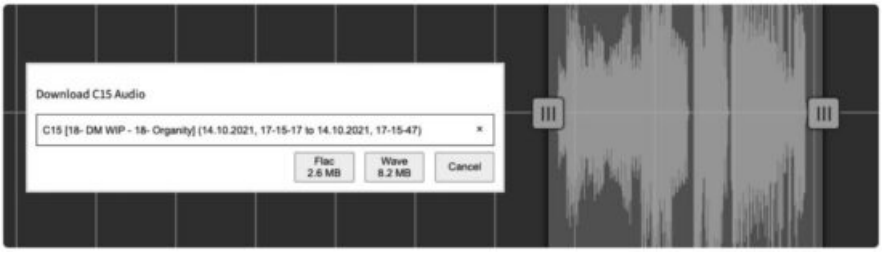


Please note that the selection and load status of a preset cannot be restored because the preset might have been changed, moved or deleted.

In order to not lose the information on which presets were used, the Recorder creates a label when a preset is loaded. The left end of the label is aligned to the loading time. The label contains the number and name of the bank and the preset. This might have changed in the meantime, but often it can still be found under the same name at the same place.

To be on the safe side we recommend creating copies of the banks that contain important presets by using the “Export” command.

Selecting a Segment for Download



By clicking/touch and dragging in the inner lane, you can select a time segment. The start and end points can be shifted by the two light-blue handles. Two labels are showing the times at the start and end points.

The selected part can be downloaded by pressing the Download button or “S” on the computer keyboard. A dialog opens in which you can change the file name and choose between FLAC and WAV format (24 bit, 48 kHz). If the browser is set to ask for the destination for the downloaded file, it will open the referring dialog now. Otherwise, it will store the file in the standard download folder.

The selection can be disabled by a single click/touch in the inner lane.

Starting and Stopping the Recording

When you press the Delete button the audio memory will be cleared and as a result, the timeline will be empty.

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C15 Studio Package – Addendum
Vers. 25 (2022-04-14)
Authors: Stephan Schmitt, Matthias Seeber, David Johannes Meyer

Documents / Resources

	NONLINEAR LABS C15 Sound Synthesizer [pdf] User Manual C15, Sound Synthesizer, C15 Sound Synthesizer

References

- Startseite - UI Labs
- NONLINEAR LABS - Home