

DELTA CEP A2



owner's manual

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DELTA CEP A2 Owner's manual

Version 2.0 for firmware version 2.0 and higher. Jörg Schaaf, Radikal Technologies Deutschland GmbH, Copyright © 2023

For Radikal Technologies the highest quality standards are extremely important, and as such our products are constantly evolving. Technical changes made to improve a product may be made at any time without notice. Therefore, technical data and the appearance of the device may differ from the information given or illustrated in this manual.

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A EU Declaration of Conformity

The manufacturer /distributor:

**Radikal Technologies GmbH
Eduard-Schmid-Str. 27
81543 München
Deutschland**

hereby declares that the following product:

Product name: Music synthesizer without keyboard
Commercial: Eurorack Semimodular Synthesizer Module
Device name: DELTA CEP A2
Type: DELTA CEP A2 Eurorack & DELTA CEP A2 desktop



Serialnumber: _____

Productnumber: RT-01
Chargenumber: 1/2023

complies with the provisions of the Low Voltage Directive 2014/35 / EU, including amendments that were in force at the time of the declaration.

The following harmonized standards were applied:

EN 55013: 2003
EN 55020: 2003
EN 61000-3-2: 2000
EN 61000-3-3: 1995 + Correction 1998

München, 31.07.2023

Herr Jurgen Korduletsch
Geschäftsführer

Herr Jörg Schaaf
Leiter Entwicklung

B COMPLIANCE



FCC INFORMATION (U.S.A)

IMPORTANT NOTICE: DO NOT MODIFY THIS UNIT! This product, when installed as indicated in the instructions contained in this manual, meets FCC requirements. Modifications not expressly approved by Radikal Technologies GmbH may void your authority, granted by the FCC, to use this product. **IMPORTANT:** When connecting this product to accessories and/or another product use only high quality shielded cables. Cable/s supplied with this product **MUST** be used. Follow all installation instructions. Failure to follow instructions could void your FCC authorization to use this product in the USA.

NOTE: This product has been tested and found to comply with the requirements listed in FCC Regulations, Part 15 for Class „B“ digital devices. Compliance with these requirements provides a reasonable level of assurance that your use of this product in residential environment will not result in harmful interference with other electronic devices. This equipment generates/uses radio frequencies and, if not installed and used according to the instructions found in the user manual, may cause interference harmful to the operation of other electronic devices. Compliance with FCC regulations does not guarantee that interference will not occur in all installations. If this product is found to be the source of interference, which can be determined by turning the unit „OFF“ and „ON“, please try to eliminate the problem by using one of the following measures:

Relocate either this product or the device that is being affected by the interference. Utilize power outlets that are on branch circuits (circuit-breaker or fuse) install AC line filter/s. In the case of radio or TV interference, relocate/reorient the antenna.

If the antenna lead-in is 300 ohm ribbon lead, change the lead-in to coaxial-type cable. If these corrective measures do not produce satisfactory results, please contact the local retailer authorized to distribute this type of product. The statements above apply **ONLY** to products distributed in the USA.

FCC INFORMATION (CANADA)

DELTA CEP A2 Version 1.0 FCC Information (CANADA)

The digital section of this apparatus does not exceed the „Class B“ limits for radio noise emissions from digital apparatus set out in the radio interference regulation of the Canadian Department of Communications. Le présent appareil numérique n’émet pas de bruit radioélectriques dépassant les limites applicables aux appareils numérique de la „Class B“ prescrites dans la réglementation sur le brouillage radioélectrique édictée par le Ministre Des Communication du Canada. This only applies to products distributed in Canada. Ceci ne s’applique qu’aux produits distribués dans Canada.

C. WARRANTY and safety instructions

C.1 Warranty service

Radikal Technologies provides a warranty for 12 months following purchase for electronic and mechanical components of the product, subject to the conditions described herein. If defects occur within this warranty period that have not occurred due to improper handling of the device, these will be remedied by replacement or repair of the device. The general terms and conditions of Radikal Technologies apply.

C.2 Eligibility

Radikal Technologies Deutschland GmbH reserves the right to make the free implementation of the repair or the replacement of the device dependent on the warranty. In order for the warranty period to be determined, warranty returns must always be accompanied by the proof of purchase as a copy. The final decision on the warranty applies exclusively to Radikal Technologies Deutschland GmbH. If a legitimate warranty claim occurs, the product will be repaired or replaced within 30 days of receipt by Radikal Technologies. If mechanical damage and / or external interference is detected, any warranty entitlement invalidated. Products without warranty claim will be repaired for a fee. The costs for packaging and delivery will be invoiced separately and charged in advance. For legitimate warranty claims, the product will be sent postage paid within Germany. Outside of Germany, the delivery is at the expense of the customer.

C.3 Transferability of the guarantee

The warranty is only for the original first purchaser and is not transferable. Apart from Radikal Technologies Deutschland GmbH, no third party (dealer, etc.) is entitled to assure or execute warranty services. Guarantees beyond those mentioned above will not be granted.

C.4 Damage claims

Claims for damages of any kind, especially due to consequential damages, are excluded. The liability of Radikal Technologies Deutschland GmbH is limited in all cases to the value of the product. All services and deliveries are made exclusively on the basis of the General Terms and Conditions of Radikal Technologies Deutschland GmbH.

C.5 SAFETY INSTRUCTIONS

ATTENTION: Please keep the Eurorack case closed to prevent electric shock. There are NO functions or adjustment options for the user inside the Eurorack case. In case of malfunctions, contact only qualified service technicians.

Never expose the device to rain or moisture to prevent electrical shock and short circuits. If liquid has entered the unit, immediately unplug the power cord or AC adapter from the wall outlet and contact a technician. You should never turn on a wet or damp device as it may cause major damage and may result in a risk of electric shock.

DETAILED SAFETY INSTRUCTIONS

Please read the safety and operating instructions of the device carefully before using. Keep the safety and operating instructions of the device accessible at all times.

This device is designed to be operated exclusively in a closed Eurorack housing. Never use it outside such an enclosure, as this may cause malfunction and damage that may void its warranty.

Observe the installation instructions in this manual so that you do not make a mistake when installing the module in the housing.

If you are uncertain at any point when installing and connecting the module, do not hesitate to contact us. We are happy to help you with questions about installation.

Never operate the device near water (bathtub, sink, swimming pool, etc.) When installing the device make sure that it is not exposed to heat sources (heating, amplifier power amplifiers, etc.).

The Eurorack housing with the DELTA CEP A2 module should be installed on firm, sufficiently stable ground. The Eurorack housing may only be operated with suitable mains voltage sources or power supply units specified by the manufacturer. For safety reasons, please read the instructions in the manual that the housing manufacturer supplied with the device before putting it into operation.

The power cord or power supply cable should be routed so that it does not pose a stumbling hazard. Always use only flawless and undamaged power cords or power supplies. Turn off the case and remove the power cord before moving or transporting the device.

Before cleaning you should disconnect the Eurorack housing from the power supply.

Turn off the case and remove the power cord or power adapter cable if the device is not going to be used for a long time.

Only clean the module with a dry cloth or cloth slightly moistened with water.. NEVER use cleaning agents as this could damage the paint or screen printing. Make sure that no objects or liquids enter the front panel.

In the event of sudden temperature changes, condensation may form inside the module. Please make sure that the Eurorack housing with the module has a few hours to evaporate the condensed water, before you connect it to the mains voltage after a temperature change.

The device should be inspected by a qualified service technician if:

- Objects or fluids have entered the housing.
- The device was exposed to rain or moisture.
- The device has fallen to the ground and/or has mechanical damage.
- The device does not work in the usual or described way and incorrect operation can be excluded.

1. Introduction

Congratulations on your purchase of the DELTA CEP A2 Synthesizer. Whether you use it in its basic configuration in a modular system or as an expressive solo, bass or sequencer synthesizer - we hope you enjoy the instrument.

1.1 DELTA CEP A2 - a semimodular, paraphonic Synthesizer

You probably know what these two adjectives mean. For many of you, they may have even been the reason to include the DELTA CEP A2 in your setup. The following paragraphs are for those who bought the DELTA CEP A2 because of the sound, without worrying about the meaning of these two features.

Semimodular?

A modular synthesizer is an electronic sound and noise box made up of individual modules for sound research, which have no pre-wiring apart from their common power supply. Sound and noise generating modules, such as oscillators or noise sources can be freely connected to sound modifying modules such as filters. A third category of modules - the modulators - such as low-frequency oscillators (LFOs) and envelopes, provide automated control of sound parameters. For beginners, so much freedom can quickly become confusing. That's why semimodular systems such as the DELTA CEP A2 have pre-wiring, which greatly simplifies entry into the world of modular systems and, ultimately, electronic sound generation. Once you gain experience with the pre-wired system, you can break or add connections to enjoy all the freedom of a modular system.

Paraphonic?

Paraphonic synthesizers can be played polyphonically, because their oscillators allow for independent pitching according to chords. Although all of its oscillators share the same filter, VCA, and envelopes, polyphonic oscillator control allows for multiple voices to be played simultaneously, which is ideal for pad sounds. The DELTA CEP A2 sounds particularly good in paraphonic mode, because it consists of two oscillators per voice, which provide a nice beating effect when two oscillators are detuned against each other.

1.2 Installation and first use

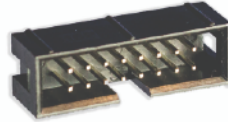
Before we go into the detailed description of the DELTA CEP A2 features, we first need to install the unit into a Eurorack cabinet. DELTA CEP A2 Desktop customers can of course skip this chapter. Before you start to install the module, you should disconnect the mains plug of the Eurorack cabinet.

Next, calculate the power requirements of the installed modules in the cabinet plus the new DELTA CEP A2 synthesizer (12V 140mA, -12V 80mA). To calculate the current consumption, add the current values of all installed modules. The overall power consumption should be below the cabinets maximum current for both voltages +12V and -12V. In the following example table you see a typical calculation:

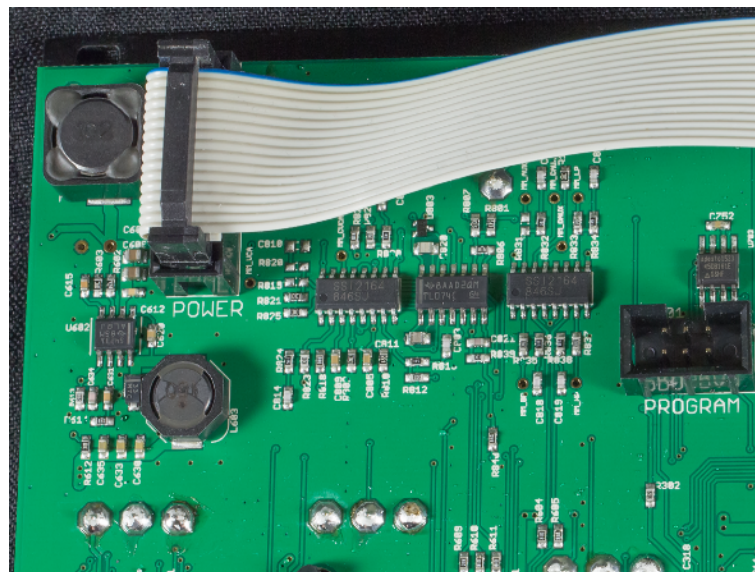
Power Calculation	+12 V	-12 V	5 V
DELTA CEP A2	140 mA	80 mA	0
MODUL XY	180 mA	40 mA	0
Module XX	220 mA	180	0
SUM	540 mA	300 mA	0

So in the example above the cabinet power must provide 540 mA at +12V and 300 mA at -12V. If the cabinet is not capable of providing the necessary current, you should not install the DELTA CEP A2.

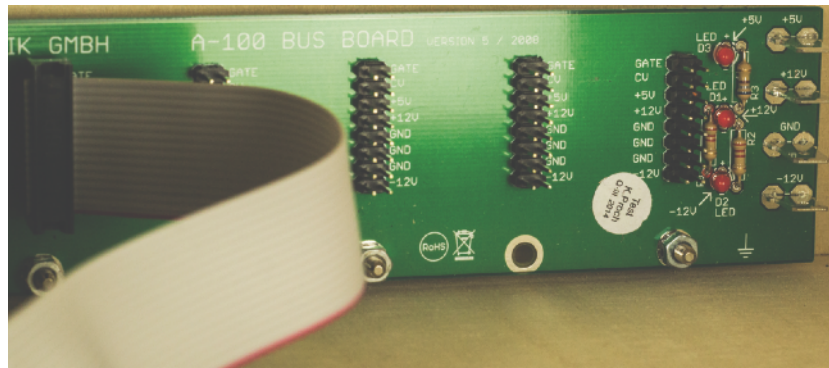
The Eurorack Standard has a 16 wire bus with pin headers. In the picture below you can see a typical boxed 16 pin header but unfortunately it is not used by all manufacturers and the Doepfer Technical Documents even suggests that only unboxed pin headers be used. In our opinion most modules have been destroyed so far, because no protection against misplaced sockets exists on most modules and bus systems.



The good thing about such a shrouded header is that you can connect the socket of ribbon cable only in one direction with the plug. In fact, boxes have a "nose" that has to be inserted into the slot seen above - and of course this only works if it is correctly aligned. But even more important - the sensitive pins of the pin header are protected with the help of the box against mechanical stress. On "crooked" follows quickly "off", if you have to straight out the pins again. Now take the supplied ribbon cable and plug it into the 16 pin base of the DELTA CEP A2 board. The boxed 16-pin header is easy to identify and is equipped with the "POWER" label for the sake of simplicity.



Now take a look at the power supply circuit board of the Eurorack cabinet and the supplied power cable of the DELTA CEP A2. The power cable has 16 wires and a color marking on the first wire (usually blue or red). On the bus board in a Eurorack cabinet, the first two contacts carry -12V. Please make sure that the first wire with the color marking is always connected to the -12 volt side of the pin headers. Also make sure that the cable is not pushed to the right, left, up or down. Unfortunately, the Doepfer bus system has no reverse polarity protection so please be extra careful at this step



Once you have connected the cable, you can put the DELTA CEP A2 in the correct position and screw it on with the enclosed screws and washers. Please use the plastic washers to prevent damaging the varnishing.



If everything is set up properly, you can turn on the power. At the same time a few of the Delta LEDs should light up and flash. If this is not the case, stop the power immediately and look for the error. But as a rule, the DELTA CEP A2 will now work and we can concentrate on the operation.

2. Overview

Before taking a closer look at the capabilities of the synthesizer, let's take a look at the interface of the DELTA CEP A2 Synthesizer from left to right.



Interpolator

Sitting on the left side are the eight + six LEDs, six buttons, and the large knob. This section has several functions. You can recall and save presets, take snapshots, morph through them, set the system tempo, as well as adjust various device settings. The eight LEDs not only display occupied snapshots, but above all serve to visualize parameter settings.

MIDI2CV

This is a well-equipped MIDI to CV interface that allows you to convert MIDI signals into control voltages for additional modules. To control the DELTA CEP A2 via MIDI, you do not

need to use any of the interface's outputs - the modulation sources and targets in the DELTA CEP A2 sections are already prewired.

LFO 1

The LFO has 5 waveforms, MIDI and clock synchronization, and an invertible modulation depth control.

SWARM OSC

The Swarm oscillator provides up to 8 oscillators. Paraphonic play modes (allowing 4 voices to be played simultaneously), pitch quantization, and easy tuning access are the highlights of the Swarm oscillator.

Mixer

This section mixes the outputs from the oscillator and the noise source or an external signal for the filter. The signal of the oscillator can be overdriven.

VCF

The filter section of the DELTA CEP A2 offers three different filters - a digital 12 dB multimode filter, an analog 12dB multimode filter, and a digital 24 dB lowpass filter.

ADSR

The ADSR envelope section provides crisp sound curves. As a highlight, this section offers a voltage control for the attack and decay time.

VCA





The VCA can be controlled by either the ADSR envelope or the gate signal. The VCA section also provides external inputs for the following FX processor.

FX


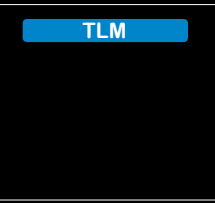

The right side of the front panel contains the effect section with reverb, delay, chorus, flanging and phasing effects.

Some words about labelling

If you check the labelling on the DELTA CEP A2 front panel you will notice different color schemes: white characters on blue background, white characters on black, etc.

Labels on the DELTA CEP A2 frontpanel.	
	Output jacks are marked with black characters on a blue background.
	Input jacks are marked with white characters on a black background.
	One input jack in the LFO section has a special function when the morph mode is active. We marked that with black characters on a white background.
	The framed white characters are only used for one button and two knobs. The button [PARAPHONIC] has the framed labelling 'QUANTIZER'. By holding the [QUANTIZER] button down, you get access to the two alternative features for the knobs SCALE ROOT and SCALE SEL. Please check Chapter 3.2.1 for more details.

Labels on the DELTA CEP A2 frontpanel.

	[MANUAL] has an open frame marking. Open frame labellings are indicating that you get access to further functionality by holding the button down until all LEDs 1-8 light up.
	White characters on blue background are marking shift-functions. The DELTA CEP A2 has alternative functions for buttons and knobs. Hold the [SHIFT] button to access them. The [SHIFT]-button can be locked in. Just tap onto the button to lock the shift function in. The [SHIFT] led will flash. To release SHIFT again just hit the [SHIFT] button again.
	White characters on a black background are marking the basic function of a button or a knob.

2.1 Connection required - MIDI or CV/Gate?

You can elicit a sound from the DELTA CEP A2 without connecting a keyboard, sequencer, calculator or anything else. Simply press the [GATE]-button in the ADSR Envelope section. But that's not fun. There are generally two ways to provide the DELTA CEP A2 with external information that causes it to produce sounds and effects - the MIDI interface and a CV voltage paired with so-called gate or trigger signals.

2.1.1 MIDI - Music Instrument Digital Interface

The DELTA CEP A2 has a MIDI input on the front panel. If you just want to play it over a MIDI keyboard, connect the MIDI output of the keyboard to the MIDI input of the DELTA CEP A2 and play it on the keys of the keyboard. If you see the GATE LED light up while playing, you've done everything right.

2.1.1.1 Setting up the MIDI channel

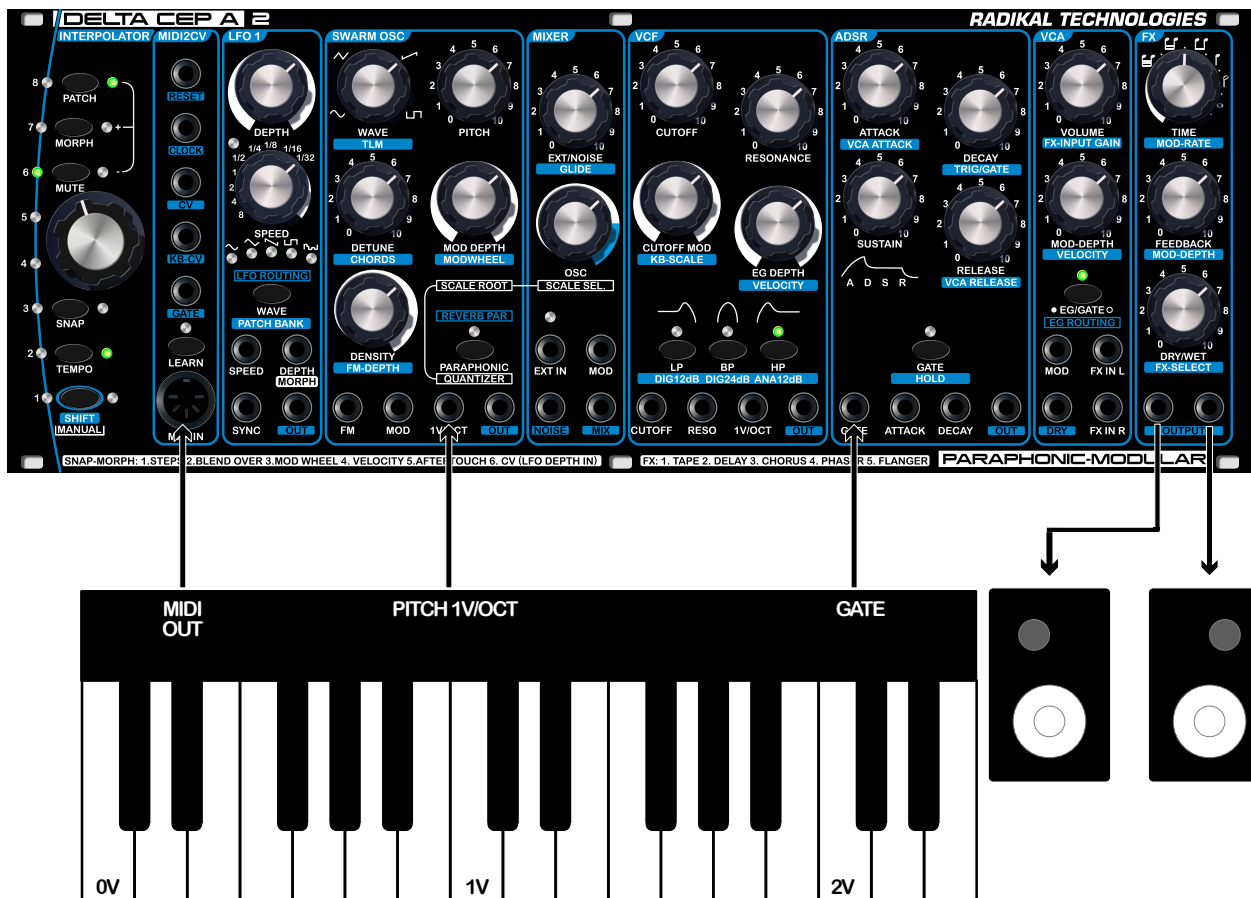
If the keyboard is set to a different MIDI channel, hold down the DELTA CEP A2 [LEARN] key and press a note. Now the control should work.

Setting up the MIDI Channel		
BUTTON	KNOB/ BUTTON	DESCRIPTION
---	LEARN	Hold down the [LEARN] button and press a key on the connected MIDI keyboard to set the MIDI channel.

Of course, if you have the desktop version of the DELTA CEP A2, you can use the MIDI input on the back of the device. Not only does this provide cosmetic benefits - the MIDI data is routed to the MIDI THRU output when using the rear MIDI input.

2.1.2 CV/GATE

CV is an abbreviation for Control Voltage. For Eurorack modules, the following voltages were set as standard:



Control- and Signalvoltages in the world of Eurorack.

Pitch Control	The standard is set to 1 volt per octave. In other words, when the voltage is increased by one volt, the pitch of an oscillator doubles - which is one octave.
LFO Output range	The LFO modulation voltages typically range between -2.5 and +2.5 volts (5VPP).
ADSR output range	Usually between 0 and 8 volts.
Audio Signals	Audio signals, which can also be used for modulation, usually have a voltage swing of 10 Vpp (between -5 and +5 volts)

A keyboard with a CV output that complies with the 1V / Octave standard can be plugged into the 1V/Oct input of the oscillator section. On the very popular Arturia Keyboard 'KEYSTEP' this output is labeled 'Pitch'.

In contrast to the CV voltages listed above, the gate signal is usually a so-called ramp voltage with a fixed voltage value. Without gate signal we measure 0 Volt and with gate signal a certain, not changing voltage. The Eurorack system has a gate voltage of + 5V. To increase compatibility and reduce the susceptibility to errors, most GATE-controlled inputs

can handle significantly lower or higher voltages. The DELTA CEP A2 will process gate signals between 2 and 10 volts without any problems. Thus, the envelope can also be triggered by a rectangular LFO, which can only output a maximum of +2.5 volts.

A CV / GATE keyboard will normally output the gate signal as long as you hold down the key. Pressing the button thus triggers the gate voltage and releasing the button switches the gate voltage back to 0 Volt. The pitch CV voltage, on the other hand, is usually outputted until another key with a correspondingly different CV voltage is pressed. This is important so that the pitch does not drop when you release the key. Sounds often have a certain release time, during which the pitch should of course remain stable. Use caution when working with a very old CV keyboard with a sample and hold circuit that drops in voltage after a few minutes. For long tones, you should activate the pitch quantizer of the Delta for safety. Reliably corrects the voltage drops of old keyboards.

Connect the GATE output of the keyboard to the GATE input in the ADSR section.

2.2. Audio connection and play

Now you have made a MIDI or CV / GATE connection and want to play the DELTA CEP A2 safe first extensively. There are basically two options:

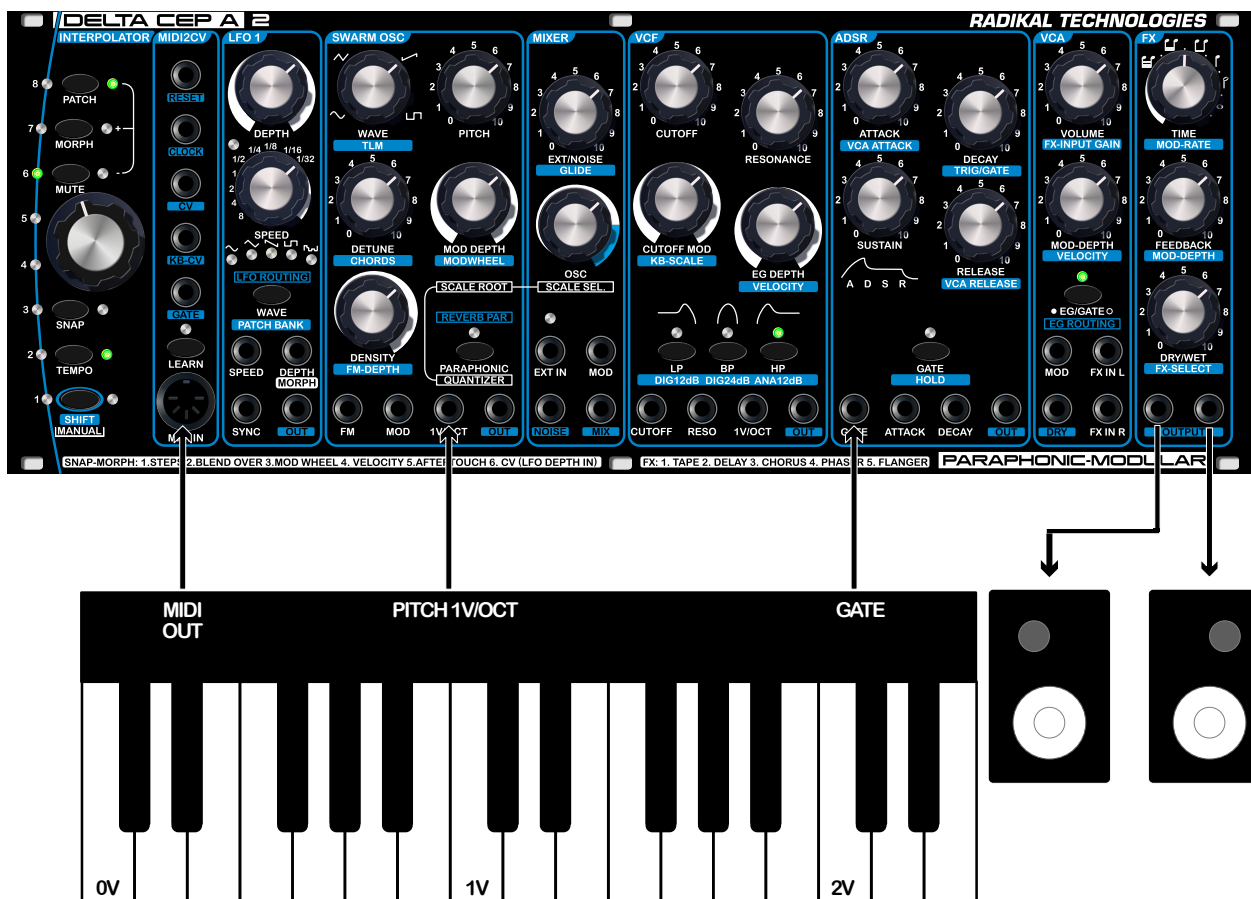
Exploring the DELTA CEP A2.

- | | |
|---|---|
| 1 | You play in manual mode and adjust the sound with the controls, buttons and cables until you like them. In doing so, you will get to know the device very well and, with the descriptions following in Chapter 3, you will get an accurate picture of your new synthesizer. |
| 2 | You are listening to some of the preset sounds that are in memory. Granted. That sounds tempting. About 70% of the storable synthesizers are not programmed by the user. (Fake News ??) But you won't be successful in finding own sound by stepping thru presets. It is very unlikely that your personal sound is already in there, because sounds are rarely played alone, but have to fit in the context of other sounds. Because of this, you will inevitably have to learn to lend a hand if your sound is important to you. |

Before you start, you need to connect the DELTA CEP A2 to your mixer or powered speakers (Nerds have thrown the manual into the corner by now because they connected their Delta ages ago).

The DELTA CEP A2 Desktop version has audio outputs with 6.3 mm jack outputs on the back - so you do not need an adapter or adapter module with large and small jacks to connect the Desktop DELTA CEP A2 to the mixer, soundcard or active speaker system.

The Eurorack version looks different. However, we assume that you have already connected other modules to the outside world and therefore have all the necessary adapters and cables to connect the DELTA CEP A2. Otherwise, we recommend a small multiples module such as the Doepfer A-181, with which you can connect the small jack plugs with large jack cables. Alternatively, there are ready-made adapter cables with a small and a large jack. That would be the cheapest solution by far. Make sure these cables are MONO.



What we do NOT recommend are adapters that have a 3.5mm jack in the front and into which you can insert a large jack cable directly behind. These types of adapters provide a high mechanical load for the 3.5mm sockets of all modules.

At the bottom right of the front panel in the FX section you will find the exits to the outside world in the Eurorack version.

Did you connect the DELTA CEP A2 to powered speakers or a mixer? Here again all connections in the overview. You only need to wire either the MIDI or the CV / GATE connection:

Let's begin the party!

1.) Exploring in Manual Mode.		
Button	Knob/Button	Description
---	SHIFT/ MANUAL	Immediately after switching on, the DELTA CEP A2 is actually already set to MANUAL mode. In manual mode, the LED to the right of the [SHIFT / MANUAL]-button lights up in green. If it does not light green, simply push this button!
ALL	ALL	Every controller and every button counts. No matter if with or without manual. Get to know the DELTA CEP A2. Play, get familiar with the device. If something does not work anymore, troubleshooting in chapter 2.3 might help. The instructions are divided into the individual sections. So if you stumble over a parameter name in a section that you can not initially recall, you will find the necessary explanations in the 3.00 ff section.

2.) Exploring in Patch Select Mode.		
Button	Knob/Button	Description
---	PATCH	Immediately after switching on, the DELTA CEP A2 is in MANUAL mode. Press the [PATCH] button to enter the PATCH-SELECT mode and recall the preset sounds.
---	MORPH & MUTE	Below the [PATCH] button, the two [MORPH] and [MUTE] buttons are labelled with a '+' and a '-'. With these two buttons you can call up the sound programs one after the other in PATCH mode. There are simple single tones underneath that can get by with just one snapshot and there are a few more complex examples that automatically call sequential 8 snapshots. If you are not familiar with terms like "snapshots" or "sequential", you understand why variant 1 of the DELTA CEP A2 exploration. These terms are in fact clarified in the manual.
---	SHIFT	With the [SHIFT] -key you exit the patch-select mode again in the direction of manual mode.

2.3 Troubleshooting

Most users, like me, don't give a shit about manuals. You only get it when something does not work the way you thought it should or just you ask a question in a forum. Here are the most important stumbling blocks in the operation:

Troubleshooting	
Knobs and buttons do not respond.	Make sure you have selected Manual mode. Just touch the [SHIFT / MANUAL] button. The LED to the right of this button should now light green. The same state is reached when you turn the device off and on again, because the DELTA CEP A2 basically always starts in manual mode.
BP and HP button in the filter section do not respond.	You have selected the 24dB lowpass filter. Since this filter provides only one low-pass, the other two buttons are not active. Use [SHIFT] & [DIG12dB] or [SHIFT] & [ANA12dB] to select one of the multimode filters. These provide as usual the switch between low pass, bandpass and high pass. If you activate low-pass and high-pass at the same time and turn back the resonance, you can also create great notch filter effects.
You play a tone, but the sound generation remains silent, even though the VCA and the VCO level control are adjusted.	Take a look at the VCA. Is the VCA EG/GATE LED lit? If not, the setting probably prevent the VCA from letting the signal through. Press the [EG / GATE] key in the VCA section once or twice to assign the envelope or gate signal to the VCA. In both cases, the LED lights up.

Troubleshooting	
I hold the [SHIFT / MANUAL] button and suddenly find the unit in a completely different mode.	The [SHIFT] key allows you to call alternate parameters of knobs and buttons. The parameters that can be accessed using the [SHIFT] key are printed on the front panel on blue labels. If you hold down the [SHIFT] key without turning a knob or pressing a button, you may load the Utility menu. Just look at the LED chain on the left, if you hold down the [SHIFT] key. You will see that all blue LEDs 1-8 are turned on one after the other. When you release the button, the LED to the right of the [SHIFT] button will not turn green because you have landed in the Utility menu. No panic. Touch the [SHIFT] key to exit this mode.
When I switch from a preset to manual mode to edit parameters, the current sound suddenly sounds quite different.	Each preset consists of up to eight snapshots, which may sound completely different. To edit a sound, you must first select the desired snapshot. In manual mode, hold down the [SHIFT] key and load a snapshot by selecting it with the big knob and then releasing the shift key. Now you can edit this snapshot in the value fetch mode.
While in patch mode, the potentiometers and buttons on the surface do nothing.	That's because each preset consists of up to 8 snapshots. On which snapshot should the pots affect when you start to turn the knobs in patch select mode?
I use the MORPH mode and would now like to change parameters during an LFO morph animation.	Use the control voltage inputs for real-time sound changes during a snapshot animation. Please note that some of the control voltage inputs are equipped with the option to set the modulation depth. If the modulation depths are turned to 0 in the snapshots used, the control voltage inputs will of course do nothing.
The envelope is no longer triggered via MIDI and the delta remains silent.	A patch cable is probably plugged into the GATE input of the ADSR section. This jack has priority over MIDI. Please unplug the patch cable to use MIDI.
The unit does not save my patches	Never forget to save the snapshots before saving the patch!
The knobs are assigned to parameters that does not match the labels.	Check, whether the [SHIFT] button is engaged. If the LED of the [SHIFT] button flahes, the knobs are assigned to the shifted parameters. Just tap the [SHIFT] button to release the shift function.

3.0 The sections of the DELTA CEP A2 in detail

3.1 LFO section

The LFO (LOW FREQUENCY OSCILLATOR) section of a synthesizer is the most important and widely used modulation source. An LFO generates periodic modulation voltages. The LFO of the DELTA CEP A2 can be tuned far into the audio range and allows both MIDI and external clock synchronization.



Knobs and buttons of the LFO-Section.		
Button	Knob/Button	Description
---	DEPTH	The DEPTH knob adjusts the voltage swing of the modulation voltage and thus the modulation strength. In the middle position, the strength is 0. To the left and right, the strength of the modulation is increased while the modulation voltage in the left value range is additionally inverted.
---	SPEED	The speed control adjusts the speed of the LFO.
SHIFT	SPEED	If you want the LFO to sync to the current tempo, hold down the [SHIFT] key while adjusting the Speed knob. As long as the LFO does not receive external synchronization, the internal tempo clock is the deciding factor for the speed. In this case, you can change the speed by tapping quarter notes on the [TEMPO] button. If you hold down the [SHIFT] key, you can only select speeds that correspond to the printed note values according to the current tempo.
---	WAVE	You can tap the [WAVE] button to select the waveform of the LFO.

Knobs and buttons of the LFO-Section.		
Button	Knob/Button	Description
---	WAVE	By holding down the [WAVE] button, you can route the LFO to different modulation destinations without a patch cable. Adjust the amount of modulation simply by adjusting the knob of the desired parameter while holding the button. The next table lists the possible modulation destinations.
---	WAVE	In 'Patch Select' mode, you can use the [WAVE] button to access the 5 memory banks. The LEDs of the LFO Wave Selection will light up according the bank number 1-5. See chapter 4. "Programs and Snapshots".

3.1.1 LFO routing

Assigning the modulation routings and depths is easy. Hold down the [LFO WAVE] button and use the parameter knobs to assign. The modulation strength is 0 in the middle position. The strength of the modulation is increased to the left and right side, and inverted in the left area as well. There is one exception to this rule. The oscillator waveform and TLM modulation share a control. The two modulations cannot be used simultaneously. The modulation depth is 0 in the middle position. The strength of the TLM modulation is set to the left and the strength of the waveform modulation to the right.

Overview of the LFO modulation destinations. Hold down the [LFO-WAVE] button to assign.		
BUTTON	KNOB	PARAMETER
[LFO-WAVE]	OSC WAVE	Between the middle and the right maximum position you change the depth of the waveform modulation.
[LFO-WAVE]	OSC WAVE	You change the strength of the TLM modulation between the middle position and the left maximum position.
[LFO-WAVE]	OSC PITCH	This control adjusts the amount of pitch modulation. The modulation strength is 0 in the middle position. The strength of the modulation is increased to the left and right side, and inverted in the left area as well.
[LFO-WAVE]	OSC LEVEL	This control sets the strength of the oscillator level modulation. The modulation strength is 0 in the middle position. The strength of the modulation is increased to the left and right side, and inverted in the left area as well.
[LFO-WAVE]	CUTOFF	With this controller you set the strength of the filter frequency modulation. The modulation strength is 0 in the middle position. The strength of the modulation is increased to the left and right side, and inverted in the left area as well.
[LFO-WAVE]	RESONANCE	This control adjusts the strength of the filter resonance modulation. The modulation strength is 0 in the middle position. The strength of the modulation is increased to the left and right side, and inverted in the left area as well.
[LFO-WAVE]	VOLUME	With this controller you set the strength of the volume modulation. The modulation strength is 0 in the middle position. The strength of the modulation is increased to the left and right side, and inverted in the left area as well.

As you can see, you can even assign the LFO to multiple modulation destinations in this way. Routing can even be morphed between snapshots. You can quickly lose track of things. Therefore there is a key combination with which all internal modulation routings can

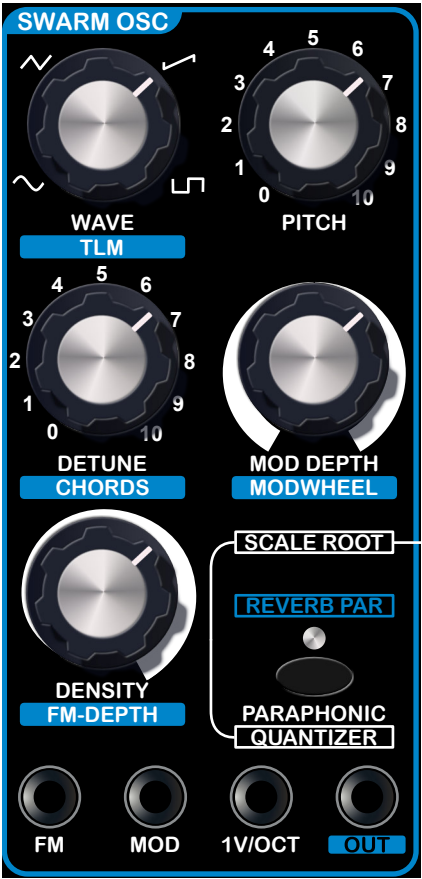
be reset. Hold down the [EG/GATE] button in the VCA section and press the [WAVE] button to reset all modulation links.

3.1.2 LFO in- and outputs

In- and output jacks of the LFO-Section.		
Jack	Input/Output	Description
SPEED	Input	An applied control voltage controls the speed of the LFO.
SYNC	Input	The LFO-SYNC input controls the LFO speed directly. Incoming square-wave pulses are interpreted as 16th signals. To sync the LFO to this signal, hold down the [SHIFT] key while adjusting the speed.
DEPTH	Input	With a control voltage applied to this input, you can control the voltage swing of the LFO wave. Higher voltages increase the modulation depth.
OUT	Output	The periodic modulation voltage can be taken from this output. Connect the output of the LFO to a modulation inputs of other sections or external modules to learn more about the impact of the LFO on modulation targets.

3.2 Swarm Oscillator section

The Oscillator section is the heart of every subtractive synthesizer. The oscillator generates waveforms in the audible frequency range. Up to eight oscillators can be heard simultaneously. The oscillator section of the DELTA CEP A2 provides smooth waveform selection (see Chapter 12. Glossary), TLM modulation for pulse width modulation on rectangle waveforms and sound changes on other waveforms, FM modulation, waveform morphing, and more. Highlights include the integrated tone scale quantizer, the chord memory and the paraphonic playability.



Knobs and buttons of the Oscillator section.		
Button	Knob/Button	Description
---	WAVE	With the WAVE control, you can continuously crossfade between different oscillator waveforms. The basic waveforms are sine, triangle, sawtooth and square.
SHIFT	TLM	Use the [SHIFT] key to reach the TLM control with the WAVE knob. TLM behaves like a pulse width parameter for square waveforms, but also alters other waveforms by shifting the midpoint of the waveform and correspondingly compressing or stretching the front or back half of the vibration.
---	PITCH	With the pitch control you can adjust the pitch of the oscillators over a wide range.
SHIFT	PITCH	Hold down the [SHIFT] key as you turn the pitch knob to get an exact tuned pitch and switch octaves.

Knobs and buttons of the Oscillator section.		
Button	Knob/Button	Description
---	DENSITY	With the Density control you can set the number of oscillator clones between 1 and 8.
SHIFT	FM-DEPTH	The [SHIFT] key lets you use the DENSITY knob to control the amount of FM modulation FM input
---	DETUNE	Here you can set the amount of oscillator clone detuning.
SHIFT	CHORDS	The [SHIFT] button lets you use the Detune knob to select various chords. A chord is built up from between 2 and 8 notes. You can control the number of involved notes with the Density knob. To the right of the middle you will find Major and to the left of the middle minor chords.
---	MOD-DEPTH	In the middle position, this controller is neutral. On the right and left of the center position, the knob controls the modulation depth of a modulation source connected to the MOD input. To the left of the middle position, the modulation source will modulate the waveform morphing, and values right from the center will modulate the TLM modulation described above. If you want to use the LFO for TLM or waveform modulation, you will need to connect a cable from the output of the LFO to the MOD input.
SHIFT	MOD-WHEEL	While holding down the [SHIFT] key, the MOD-DEPTH knob adjusts how much MIDI modulation wheel data affects the strength of the vibrato.

3.2.1 in- and outputs of the Swarm-Oscillator section.

In- and output jacks of the Oscillator setion.		
Jack	Input/Output	Description
FM	Input	This input is used to connect an FM modulation source. For example, connect the output of another oscillator or LFO here. The amount of FM modulation can be adjusted while holding the [SHIFT] key with the density knob.
MOD	Input	Depending on the position of the MOD DEPTH control, a connected modulation voltage will affect either TLM modulation or waveform morphing.
1V/OCT	Input	This input controls the pitch of the oscillator. An increase in the control voltage by one volt causes a frequency doubling. The input voltage at this jack can be quantized to common tone scales. More about this can be found in chapter 3.2.1 "Scale Quantizer".
OUT	Output	This is the audio output of the swarm oscillator.

3.2.2 Scale quantizer

At the 1V/octave input the pitch of the Swarm Oscillator can be continuously adjusted. This is a nice feature, especially in the experimental field. However, if you have to rely on precisely dialing in a frequency to reach the pitches of a particular scale, limiting that freedom may make sense. Setting up an analogue step sequencer becomes a torment

when you need to target the notes of a specific musical scale exactly. For this purpose, the DELTA CEP A2 has a musical scale quantizer. The Oscillator section only outputs pitches that correspond to a selectable scale. The scales can be selected by holding down the [PARAPHONIC] button while selecting the scale with the OSC-LEVEL knob in the Mixer section. In the center position of the knob setting, the quantizer is switched off. The selection is visualized by the eight LEDs in the left interpolator section. If the bottom LED is lit white, the quantizer is off. Below the middle position are minor and above the middle position major scales visualized by blue and red colors. The following tone scales are available:

Scales of the quantizer:
-7: Pentatonic minor
-6: Blues minor
-5: Gipsy minor
-4: Melodic minor
-3: Harmonic minor
-2: Nature minor
-1: Dorian
+1: Quantizer off
+2: Chromatic
+3: Diatonic Major
+4: Lydian
+5: Mixolydian
+6: Hexatonic
+7: Blues major
+8: Pentatonic major

TIP: Minor tone scales are displayed in blue, while major scales are displayed in red.

The origin (root) of the tone scales can be shifted by any semitones. To do this, turn the MOD-DEPTH knob of the Oscillator section while holding down the [PARAPHONIC] button.

Scale Quantizer operation.		
Button	Knob	Description
PARAPHONIC	OSC LEVEL	With the OSC-LEVEL knob of the mixer section you can select the desired tone scale for the quantizer while holding down the [PARAPHONIC] key.
PARAPHONIC	MOD-DEPTH	With the MOD-DEPTH knob of the Oscillator section, you can shift the root of the tone scale by half-tone-steps while holding down the [PARAPHONIC] button.

3.2.3 Paraphonic operation

You probably know the difference between a monophonic and a polyphonic synthesizer. While a monophonic instrument will only ever produce a single note, a polyphonic synthesizer will allow you to play multiple notes simultaneously. This is basically also possible with the DELTA CEP A2 - but all voices share one filter, one envelope and one VCA. For better differentiation, a distinctive name has been introduced for synthesizers with these properties: 'PARAPHONIC'. Most monophonic synths with a paraphonic playmode have only two oscillators. By activating the paraphonic mode, one can play two keys to produce two different notes simultaneously. Each note is running only one oscillator, which makes the sound very static.

With the DELTA CEP A2, this is fundamentally different. Since the Swarm oscillator can produce up to 8 oscillator clones, a chord of up to four voices can be played with two oscillators per voice, making chords sound more alive. Especially with the saturation stage in front of the filter paraphonic voices show advantages, because a saturation level behaves very dynamically when the number of voices (and thus the level at the entrance of the saturation level) changes. This can be used creatively to great effect.

If you press the [PARAPHONIC] key, you will notice that there are two different paraphonic modes. The LED above the [PARAPHONIC] button lights up either yellow or green - depending on which setting is active when you press the button. The difference between the two modes is related to the control of the envelopes.

PARAPHONIC 1 (YELLOW): Each note that appears at the MIDI input triggers the envelope. Since all the oscillators share a filter and a VCA section, triggering the envelope causes not only the new, played note to be heard when triggered, but all still held notes as well. The envelope will go through again and all voices will sound again accordingly.

PARAPHONIC 2 (GREEN): In this mode, the envelope will only be re-triggered once all notes have been released. If you add or release a note while holding, the chord changes accordingly, but the envelopes remain neutral. This mode works well with high sustain levels.

TIP: The paraphonic mode works only if you play the DELTA CEP A2 via MIDI. Polyphony cannot be transmitted via a single control voltage.

3.3 Mixer section

In the Mixer section you can adjust the levels of the different sound sources to be send to the filter section. Sound sources include external signals, a noise source and the output of the Swarm oscillator. Why are there three sound sources but only two controls? Noise and the external signal can only be used alternatively. As soon as you feed a sound source into the external input with a cable, the noise in the mixer is muted. (Do not panic - At the noise output, the noise source can be picked independently).



Buttons and knobs of the Mixer section.		
Button	Knob	Description
---	EXT/NOISE	This adjusts the level of an external signal or noise source. When feeding in external signals, make sure that the input is not overdriven. The LED above the EXT IN input should not be solid red.
SHIFT	GLIDE	Use the [SHIFT] key to access the glide function of the oscillator with the EXT/NOISE knob. Glide creates sliding pitches between two notes, and the slider lets you adjust the speed of that slide. The behavior of the glide is also dependent on the selected trigger and note priority setting!
---	OSC	Here you set the level of the Swarm oscillator. In the blue colored area, the input circuit of the filter goes into saturation, by which further sound variations of the oscillator waveforms can be set.

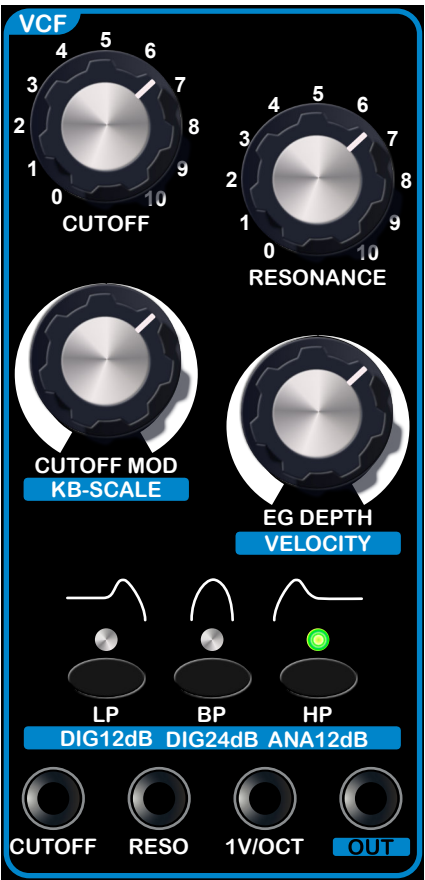
Buttons and knobs of the Mixer section.		
Button	Knob	Description
PARAPHONIC	SCALE-SEL.	With the OSC-LEVEL knob of the mixer section you can select the desired tone scale for the quantizer while holding down the [PARAPHONIC] key. The scales are listed in the description of the oscillator section!
SHIFT	OSC	Every now and then it may be necessary to lower the level of a sound program a little bit, because otherwise the sound would be louder than all the other sounds. You can adjust the level with [SHIFT] & the OSC level control. Unlike the master volume knob in the VCA section, this level setting is stored in the patch and in the snapshots.

3.3.1 In- and outputs of the mixer section

In- and output jacks in the Mixer section.		
Jack	Input/Output	Description
EXT IN	Input	In this input you can feed an external signal.
MOD	Input	This input controls the volume of the oscillator signal. High modulation voltages add to the distorted signal.
NOISE	Output	At this output you can pick up the noise signal directly.
MIX	Output	At this output you can collect the summed signals from the mixer output.

3.4 Filter section

In the filter section (see Chapter 13.1 Glossary for a discussion on filters) the sound character of the oscillator oscillations or other input signals can be changed by removing specific frequency ranges..



The filter section of the DELTA CEP A2 has three basic filter types that can be selected on the front panel. To do this, hold down the [SHIFT] button at the bottom left and tap the button of the desired filter. The selection options are labeled with blue labels:



Filtertypes of the DELTA CEP A2.	
Filtertype	Description
Digital 12 dB multimode filter (SHIFT+DIG12dB)	The digital 12 dB multimode filter has a lowpass (LP), a bandpass (BP) and a highpass (HP) function. With the three buttons any combination of these filter functions can be sent to the output.
Digital 24 dB lowpass filter (SHIFT+DIG24dB)	The 24 dB digital filter is an emulation of a typical low-pass transistor cascade. Therefore, you can only select the lowpass filter (LP).

Filtertypes of the DELTA CEP A2.	
Filtertype	Description
Analogue 12 dB multimode filter (SHIFT+ANA12dB)	The analogue 12 dB multimode filter, like its digital counterpart, has the three filter functions lowpass, bandpass and highpass. The filter sounds quite similar to its digital copy, but adds a certain unbridled behavior to the signal processing.

Buttons and knobs of the Filter section.		
Button	Knob/Button	Description
---	CUTOFF	Use this knob to set the desired filter frequency.
---	RESONANCE	Use this knob to adjust the resonance of the filter. Resonance is the feedback of the filter output to the filter input. This feedback causes an amplification of the output in the range of the cutoff frequency. This intensifies the effect of the filter sound. Resonance can lead to feedback oscillation.
---	CUTOFF MOD	Here you can set how much and with which polarity a control voltage at the cutoff CV input modulates the filter frequency. In the middle position, the modulation depth is 0. To the left, the effect of the control voltage is inverted - a higher voltage lowers the filter frequency. Right of the center an increasing the control voltage increases the filter frequency.
SHIFT	KB-SCALE	This is a MIDI parameter. Set up how much higher notes on the keyboard control the filter frequency. The middle position is neutral. Higher notes will open the filter more than lower notes at positive values.
---	EG-DEPTH	Here you can set how much and with what polarity the cutoff frequency of the filter is controlled by the ADSR envelope voltage. In the middle position, the envelope is neutral and causes no sound changes. In the right part of the scale, a higher voltage value at the envelope output produces a higher cutoff frequency in the filter. In the left scale area, the behavior is exactly the opposite. A higher envelope voltage lowers the cutoff frequency.
SHIFT	VELOCITY	This parameter is a MIDI parameter. The velocity of the MIDI note controls the cutoff filter frequency if desired. With [SHIFT] & VELOCITY you can adjust the strength of the dynamics control. Positive values cause the filter frequency to increase as you play the notes more strongly.
	LP	With the LP button you can mute and unmute the lowpass filter output of the active filter. When the output is opened, the LED above the button lights up.
SHIFT	DIG12dB	Use [SHIFT] & [DIG12dB] to select the digital multimode filter. This filter is selected by default at INIT sounds!
---	BP	Use the [BP] button to activate or mute the bandpass filter output of the active filter. When the output is active, the LED above the button lights up. This button has no function on the 24dB lowpass filter.

Buttons and knobs of the Filter section.		
Button	Knob/Button	Description
SHIFT	DIG24dB	Select the digital, 24 dB lowpass filter with [SHIFT] & [DIG24dB].
- - -	HP	Use the HP button to activate or mute the highpass filter output of the active filter. When the output is active, the LED above the button lights up. This button has no function when the 24dB lowpass filter is selected.
SHIFT	ANA12dB	Select the analog multimode filter with [SHIFT] & [ANA12dB].

3.4.1 In- and outputs of the filter section

In- and output jacks of the Filter section.		
Jack	Input/Output	Description
CUT	Input	This input allows for voltage control of the filter frequency.
RESO	Input	This input allows for voltage control of the filter resonance.
1V/Oct	Input	This input provides a 1V / oct control of the filter frequency.
OUT	Output	At this output you can pick up the sum of the filter outputs of the analog 12dB multimode filter. If you want to route the filter selection signal without an effect, use the dry output after the VCA section.

3.5 ADSR section

In the ADSR section the sound can be manipulated over time. It controls for example how quickly a sound reaches its maximum volume after playing a note and how fast it fades out after releasing a key.



Knobs and buttons of the ADSR envelope section.		
Button	Knob/Button	Description
---	ATTACK	The attack time controls the timespan between the reception of a gate signal (key press) and attaining the peak of the envelope. Higher values rise up the volume or the filter frequency slower than small values.
---	DECAY	The decay time controls the timespan between the peak and attaining the Sustain level (level while holding the key). Short decay values in conjunction with short attack times ensure crisp and short envelopes. At high sustain levels, the decay time has little effect on the envelope shape and sound.
---	SUSTAIN	The sustain level controls which value is output while holding a key. The sustain level starts after the attack and decay phases and will not exit until the gate signal returns to 0 (equivalent to letting go of the keyboard key).
---	RELEASE	The release time indicates how much time the envelope takes after the sustain phase to drop its level to zero.

		By default, the envelope of the DELTA CEP A2 controls the filter frequency and the VCA volume. If you press the [EG/GATE]-button of the VCA section, the VCA will be disconnected from the envelope. The color of the button LED changes from green to blue for visualization. The volume is now controlled by a GATE signal. The gate opens when a key is pressed and closes when the key is released. Sometimes this type of control is too abrupt. Therefore, the DELTA CEP A2 allows to extend the attack time and the release time during GATE operation of the VCA. These additional functions can only be accessed in the GATE operation of the VCA via the [SHIFT] key:
SHIFT	VCA ATTACK	The attack time of the VCA Gate function can be slowed down by adjusting VCA ATTACK while holding the [SHIFT] button.
SHIFT	VCA RELEASE	The release time of the VCA Gate function can be extended by holding the [SHIFT] button & turning the VCA RELEASE knob.
---	GATE	The [GATE] button lets you manually trigger the envelope when no keyboard is available.
SHIFT	HOLD	Hold down the [SHIFT] button and simultaneously push the [GATE] button to freeze the envelope. This can come in handy when you set a tone and have no hand free to press a key. In Morph mode, you can setup a snapshot trigger for the envelope with this button combo. Whenever the morpher reaches a new snapshot, the envelope will get triggered.
SHIFT	TRIG/GATE	You can use the [SHIFT] button & decay knob to connect the LFO output to the ADSR trigger input without plugging in a cable. The envelope then runs in an auto-trigger mode controlled by the the LFO speed. You will notice that the gate time of the envelope trigger can also be changed with [SHIFT] & Decay. Higher values set longer gate times.

3.5.1 Internal routing of the envelope modulation source

Routing the ADSR internally to sound parameters is very simple. Nevertheless, you can set the modulation strength independently for each modulation target. Hold down the [EG/GATE] key of the VCA section and use the parameter knobs to assign. The modulation strength is 0 in the middle position. The strength of the modulation is increased to the left and right side, and inverted in the left area as well. There is one exception to this rule. The oscillator waveform and TLM modulation share a control. The two modulations cannot be used simultaneously. The modulation depth is 0 in the middle position. The strength of the TLM modulation is set to the left and the strength of the waveform modulation to the right.

Overview of the internal ADSR modulation targets and their setup		
TASTE	REGLER	PARAMETER
[EG/GATE]	OSC WAVE	Between the middle position and the right maximum position you change the strength of the waveform modulation.
[EG/GATE]	OSC WAVE	You change the strength of the TLM modulation between the middle position and the left maximum position.
[EG/GATE]	OSC PITCH	This control adjusts the amount of pitch modulation. The modulation strength is 0 in the middle position. The strength of the modulation is increased to the left and right side, and inverted in the left area as well.

Overview of the internal ADSR modulation targets and their setup		
[EG/GATE]	LFO RATE	This control sets the strength of the LFO speed modulation. The modulation strength is 0 in the middle position. The strength of the modulation is increased to the left and right side, and inverted in the left area as well.
[EG/GATE]	LFO DEPTH	With this controller you set the strength of the LFO modulation depth modulation. The modulation strength is 0 in the middle position. The strength of the modulation is increased to the left and right side, and inverted in the left area as well.

As you can see, you can even assign the ADSR to multiple modulation destinations this way. Routing can even be morphed between snapshots. You can quickly lose track of things. Therefore there is a key combination with which all internal modulation routings can be reset.

3.5.2 Reset of all internal modulation assignments

Hold down the [EG/GATE] button in the VCA section and press the [WAVE] button to reset all modulation links.

3.5.3 In- and output jacks of the ADSR envelope section

In- and output jacks of the ADSR envelope section.		
Jack	Input/Output	Description
GATE	Input	You can feed a gate signal into this input to trigger and hold the envelope.
ATTACK	Input	This input allows the voltage control of the Attack time of the envelope.
DECAY	Input	This input allows the voltage control of the Decay time of the envelope.
OUT	Output	At the output, the envelope voltage can be tapped to control other modules.

3.6 VCA section

In the VCA section of the DELTA CEP A2, you will find the dry audio output of the synthesizer as well as the external inputs of the stereo effects processor. Additionally this section serves as a classic voltage controlled amplifier. The Desktop version of the DELTA CEP A2 wires the FX Inputs additionally to regular 6.3 mm jacks at the backpanel of the desktop cabinet.



Buttons and knobs of the VCA Section		
Button	Knob/Button	Description
---	Volume	Set the volume of the DELTA CEP A2 with this knob.
---	Mod Depth	Here you can set how much the control voltage applied to the "MOD" input affects the volume.
---	EG/GATE	With the [EG/Gate] button you can switch between three basic operating modes of the VCA: 1.) Envelope mode (green LED). The VCA is controlled by the ADSR envelope. 2.) GATE mode (blue LED). The VCA is controlled by a gate signal. 3.) OFF (no LED). The VCA level is controlled by neither the envelope nor by the gate signal. The VCA level changes with the voltage at the MOD input. This mode is perfect for controlling the VCA from an external, free envelope.
SHIFT	FX-Input Gain	By holding [Shift] & turning the FX Input Gain knob you can adjust the gain of the external signal that is fed into the FX.

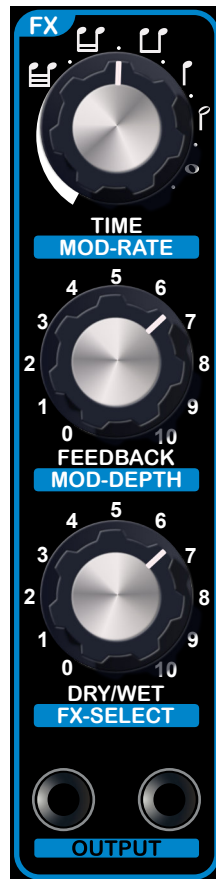
SHIFT	Velocity	By holding the [Shift] button & turning the Velocity knob to adjust how much the velocity affects the volume.
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3.6.1 In- and outputs of the VCA section

In- and output jacks of the VCA Sektion		
Jack	Input/Output	Description
MOD	Input	This is the control voltage input for the VCA volume control.
DRY	Output	The dry output provides the output of the synthesizer without effect.
FX-IN L	Input	These two inputs allows for to feed an external stereo signal into the effect inputs.
FX-IN R	Input	

3.7 FX section

The FX section of the DELTA CEP A2 can be used for both - an external and an internal sound source. It provides tape delay, tempo delay, chorus, flanging and phaser effects. The controller assignment depends on the selected FX algorithm. Up to four effect parameters can be controlled in the algorithms.



This first FX slot is followed by the second with a reverb algorithm. The reverb can be combined with the effects of the first slot. Let's first deal with the effects of the first slot:

3.7.1 Slot 1: Delay and modulation FXs

The knob assignment depends on the selected FX algorithm. Up to four effect parameters can be controlled in the algorithms.

Common to all is the function of the third controller DRY/WET. Here you can always adjust the Dry/Wet ratio. Hold the the [SHIFT] button and select the desired FX algorithm with the FX-SELECT knob. There are five different choices. For clarity, the list is printed on the lower right edge of the front panel. The number corresponding to the selection is displayed on the far left with the LEDs 1-5.

FX: 1. TAPE 2. DELAY 3. CHORUS 4. PHASER 5. FLANGER

3.7.1.1 Tape Delay (1)

Knobs of the FX section after selecting the Tape Delay mode.		
Button	Knob/Button	Description
SHIFT	FX-SELECT	Hold the [SHIFT] button and select the tape delay algorithm with the FX SELECT knob. Make sure that LED 1 on the left side lights up while dialing.
---	TIME	Here you set the echo time.
---	FEEDBACK	Here you set the number of echo repeats.
---	DRY/WET	This knob adjusts the Dry/Wet ratio of the output signal.
SHIFT	MOD-RATE	At the tape delay algorithm you have the possibility to filter the echo signal. Hold down the [SHIFT] key and set the MOD RATE knob to the center to set the filter to neutral. Clockwise, the controller works as a highpass filter and counterclockwise as a lowpass filter.
SHIFT	MOD-DEPTH	While holding down the [SHIFT] key, use the MOD DEPTH knob to adjust the amount of jitter in the tape delay.

3.7.1.2 Tempo Delay (2)

Knobs of the FX section after selecting the Tempo Delay mode.		
Button	Knob/Button	Description
SHIFT	FX-SELECT	While holding down the [SHIFT] button, use the FX SELECT knob to select the tempo delay algorithm. Make sure that LED 2 on the left side lights up when dialing.
---	TIME	After selecting the Tempo Delay algorithm, settings of the delay time are quantized to note values. Therefore, the delay time setting in this mode is not continuous. It depends on the note values at the current tempo. You can change the tempo at any time by tapping quarter notes on the tempo button. You'll see how the tempo LED adapts to your typing. In MIDI sync mode, the delay time changes according to the MIDI clock.
---	FEEDBACK	Here you set the number of echo repeats.
---	DRY/WET	This knob adjusts the Dry/Wet ratio of the output signal.
SHIFT	MOD-RATE	The Tempo Delay allows the modulation of the delay time with a built-in LFO. Hold down the [SHIFT] button and set the desired modulation speed with the MOD RATE knob.
SHIFT	MOD-DEPTH	Bei gehaltener [SHIFT]-Taste können Sie mit dem MOD-DEPTH-Regler die Stärke der Delaytime-Modulation einstellen.

3.7.1.3 Chorus (3)

Knobs of the FX section after selecting the Chorus mode.		
Button	Knob/Button	Description
SHIFT	FX-SELECT	Hold the [SHIFT] button and select the chorus algorithm with the FX Select knob. Make sure that LED 3 on the left side lights up while dialing the algorithm.
---	TIME	Here you set the average delay time of the three modulated delay lines for the chorus effect.
---	FEEDBACK	Here you control the feedback of the delay lines to give the chorus a more metallic and intense effect.
---	DRY/WET	This knob adjusts the Dry/Wet ratio of the output signal.
SHIFT	MOD RATE	While holding down the [SHIFT] key, use the MOD RATE knob to adjust the chorus modulation speed.
SHIFT	MOD DEPTH	While holding down the [SHIFT] key, use the MOD DEPTH knob to adjust the chorus modulation depth.

3.7.1.4 Phaser (4)

Knobs of the FX section after selecting the Phaser mode.		
Button	Knob/Button	Description
SHIFT	FX-SELECT	Hold the [SHIFT] button and select the phaser algorithm with the FX Select knob. Make sure that LED 4 on the left side lights up while dialing the algorithm.
---	TIME	The phaser generates its effect by simultaneous phase cancellations in several frequencies, which are cyclically shifted thru the frequency spectrum. With the Time knob you can set up to what maximum frequency the cancellations are shifted.
---	FEEDBACK	Here you set the lowest frequency to which the phase cancellations are to be shifted.
---	DRY/WET	This knob adjusts the Dry/Wet ratio of the output signal.
SHIFT	MOD RATE	By pressing [SHIFT] & MOD RATE you can control the speed of the phaser modulation.
SHIFT	MOD DEPTH	---

3.7.1.5 Flanger (5)

Knobs of the FX section after selecting the Flanger mode.		
Button	Knob/Button	Description
SHIFT	FX-SELECT	Hold the [SHIFT] button and select the flanger algorithm with the FX Select knob. Make sure that LED 5 on the left side lights up while dialing the algorithm.
---	TIME	Here you set the delay time of the flanger effect.
---	FEEDBACK	Here you set the flanger feedback of the effect.
---	DRY/WET	This knob adjusts the Dry/Wet ratio of the output signal.
SHIFT	MOD RATE	At the flanger algorithm you can adjust the speed of the flanger modulation by holding [SHIFT] and adjusting the speed with the MOD RATE knob.
SHIFT	MOD DEPTH	Set the modulation depth for the flanger with [SHIFT] & MOD DEPTH.

3.7.2 Slot 2: Reverb FX

Hold the [PARAPHONIC] button to access the reverb parameters. Some also require pressing the [SHIFT] key:

Reverb-parameters			
Button	Button 2	Knob	Parameter
PARAPHONIC	--	FX-TIME	Reverb time. With this parameter you change the length of the reverb tail.
PARAPHONIC	--	FX-Feedback	Reverb damping. The room's spatial behavior of the reverb effect can be simulated by adjusting the damping.
PARAPHONIC	--	FX DRY/WET	Hall Dry/Wet. Set the FX balance of the reverb signal here.
PARAPHONIC	SHIFT	FX-Time	Reverb stereo width. Reverb stereo width increases the spaciousness of the reverb effect.
PARAPHONIC	SHIFT	FX-Feedback	Hall feedback. Changes the character of the reverb effect through feedback.

3.7.3 FX-Section In- and Outputs

Inputs and outputs of the FX section. These ports are also available on the rear panel with 6,3mm instrument jacks on the desktop synthesizer version of the DELTA CEP A2.

Jack	Input/Output	Description
OUTPUT L	Output	The two outputs at the bottom of the FX section are the sum outputs of the DELTA CEP A2. You pick up not only the effect signal but also the synthesizer signal at this output. You can adjust the proportion between the dry synthesizer signal and the effect signal as described above with the [DRY/WET] control. The level of this output can be controlled with the VOLUME control in the VCA section.
OUTPUT R	Output	
FX-IN L	Input	The effects unit of the DELTA CEP A2 is a stereo effects unit. Because of this, you can feed a stereo signal directly into the effect section of the DELTA CEP A2 in the VCA section. The two inputs on the desktop model are also on the rear of the device as 6.3 mm jacks.
FX-IN R	Input	

4. Patches & snapshots

The DELTA CEP A2 allows for the storage of 40 sound programs (patches), each with up to 8 snapshots. Snapshots are variations of a sound program. Snapshots can be slight variations in the sound program or completely different sounds. Snapshots can be accessed in a variety of ways. While sound programs can only be called up by selecting a sound in patch mode, snapshots can be selected according to the keyboard velocity, blended via modulation wheel or aftertouch, or invoked or morphed using an LFO. Morphing snapshots is one of the core elements of the DELTA CEP A2, unique in the world of synthesizers. Sequencer fans will be pleased that the DELTA CEP A2 can trigger snapshots in a way like a step sequencer and will generate gate signals for the ADSR envelope. This allows you to play 8 different snapshot sounds one after the other as a looped sequence. We will have a closer look to this feature later ;-) (Chapter 4.5 Snapshot morphing)

4.1. Storing of snapshots

Storing snapshots on the DELTA CEP A2 is simple. Set a sound, select a snapshot memory with the big knob (already used snapshots will light up green) and tap the [SNAP] button. You have now taken a snapshot. If you want the snapshot to be saved permanently, even after switching the Delta off, you must save a Patch. (chapter 4.2).

Storing of Snapshots		
Button	Knob/Button	Description
---	BIG KNOB	Select the snapshot memory you want to save the snapshot in.
SNAP	---	Tap the [SNAP] button to save the snapshot.

4.2 Storing patches (sound programs)

When you save a patch (sound program), you store up to 8 snapshots permanently in memory. The DELTA CEP A2 has 40 patches. In order to save a patch, you must first

switch to patch mode. Then select the desired memory location with the big knob and press the [SNAP] key. As you select the destination memory, you will hear the sound that you will overwrite while playing. That may seem irritating at first glance. But it is a great help to avoid accidentally over-writing one of its better sounds.

Before you save a sound, you must save or overwrite at least one snapshot with the current sound settings. Otherwise your sound changes will be lost!

So always SAVE SNAPSHOT first and then the sound program!

Saving patches (sound programs)		
Button	Knob/Button	Description
---	PATCH	Switch the DELTA CEP A2 into patch mode to save your sound creations.
---	BIG KNOB	Point to the desired patch memory target for your patch with the Big Knob. As you make your selection, you can play the sound you are going to overwrite so you won't accidentally overwrite your favorite sounds.
---	LFO-WAVE	Use the [WAVE] button in the LFO section to switch the 5 memory banks. The LEDs of the LFO Wave Selection will light up according the bank number 1-5.
---	SNAP	Tap the [SNAP] button to save the patch.

4.3 Recalling patches

Recalling and loading the patches is a no brainer as well. You can browse and load the patches in two different ways:

Browsing and Loading Patches 1 (using the Big Knob)		
Button	Knob/Button	Description
---	PATCH	Switch the DELTA CEP A2 into patch mode to browse and load patches.
---	BIG KNOB	Use the Big Knob to select the desired Patch. You can already listen to it while selecting. With the Big Knob you can choose from 8 sound programs of the selected memory bank.
---	LFO-WAVE	You can switch to the other memory banks with the [WAVE] button in the LFO section.
---	PATCH	Pressing the [PATCH] button again will load the sound program.
---	SHIFT/MANUAL	This button allows you to exit the sound selection without loading a sound.

Browsing and Loading Patches 2 (+/- Buttons)		
Button	Knob/Button	Description
---	PATCH	Switch the DELTA CEP A2 into patch mode to browse and load patches.

---	+ & -	As you can see from the silkscreen labels, the [Morph] and [Mute] buttons work as tone selection buttons. You can use the [+] and [-] buttons to access all sound programs even across memory banks.
---	LFO-WAVE	You can switch to the other memory banks with the [WAVE] button in the LFO section.
---	PATCH	Pressing the [PATCH] button again will load the sound program.
---	SHIFT/ MANUAL	This button allows you to exit the sound selection without loading a sound.

As you can probably imagine, the two variants of the patch selection can be combined as desired.

4.4 Revising snapshots

Sometimes after taking a snapshot you realize, that one or two parameters are not set up the way you would like. Perhaps the tuning is not right, the effect is too loud or the envelope is not snappy enough. Therefore, it makes more than sense that you can load a snapshot for modification. The same is true for patches (sound programs). If you save a patch without first taking a snapshot, the DELTA CEP A2 automatically saves the first snapshot and loads it when you call up the patch. Even if you want to revise a patch, you should choose the Snapshot editing feature. Compared to the normal editing, the previous loading of a snapshot has a great advantage: In this mode, the controllers work in a value-fetching mode. When you turn a knob, the sound does not change until it reaches the original parameter value. Here's how to pick up a snapshot for modification:

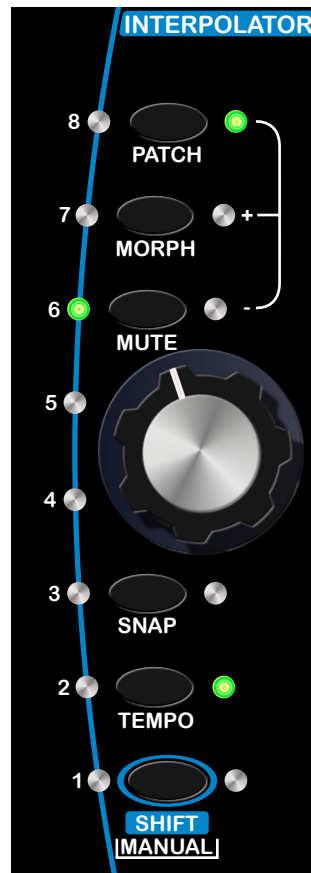
Revising Snapshots		
Button	Knob/Button	Description
SHIFT	BIG KNOB	Hold down the [SHIFT] button and select the desired snapshot with the Big Knob. If you release the [SHIFT] button, you can revise the loaded snapshot.
---	SNAP	If you have revised the snapshot as desired, save it. To do this, push the [SNAP] button.
---	SHIFT	Finally, tap the [SHIFT] button to return to manual mode.

4.5 Snapshot morphing

Let's finally get to the bottom line: selecting and morphing snapshots during a performance. In the DELTA CEP A2 snapshots can be used for programming subtle sound changes, for erratic sound sequences, for programming very dynamically playable sounds and much more. Cleverly programmed you can even replace a drum computer with the DELTA CEP A2.

All functions of the Snapshot Interpolator are in the Morph menu. You can reach it by tapping the [MORPH]-button. But be careful - if you are currently in the Patch-Select menu, you must first exit it using the [PATCH] or [SHIFT] button. Otherwise, the [MORPH] button will simply call up another sound program.

Once you have pressed the [MORPH] button, the MORPH mode stored in the program will be active. So do not be alarmed if suddenly a sequence sounds or the sound melts away.



4.5.1 Snapshot sequencing

The first two Morphing modes have a special feature. They can either be controlled via a Tempo LFO or via the Big Knob. First of all we want to deal with the 'big knob'. Its usage allows us to do the morphing directly with the big knob. So that the tempo LFO does not get in the way, turn off the internal tempo clock first.

Switching off the tempo clock.		
Button	Knob/Button	Description
SHIFT	TEMPO	Hold down the [SHIFT] button and tap the [TEMPO] button. If the tempo LED flashes yellow, the MORH-LFO is stopped, it is green, it is running. So you can always switch between running and stopped.

Next, select the first mode in the Morph menu. There you can select the Snapshots with the 'Big Knob' one after the other while the cruise control is stopped.

Selection of the first morphing mode - recalling snapshots serially.		
Button	Knob/Button	Description
MORPH	BIG KNOB	While holding down the [MORPH] button, select morphing mode No. 1 on the LED scale with the Big Knob.
	BIG KNOB	If you release the [MORPH] key, you can select the snapshots with the big knob.

Example of use: Save a few lead sounds as snapshots and choose from them with the 'Big Knob' during your performance.

When you turn the clock back on, the snapshots are sequentially recalled one after the other. Set the basic tempo by tapping quarter notes on the [TEMPO] button. Hold down the [TEMPO] button and set a clock divider for this tempo.

Switching on the tempo clock.		
Button	Knob/Button	Description
SHIFT	TEMPO	Hold down the [SHIFT] button and tap the [TEMPO] button. If the tempo LED flashes yellow, the MORH-LFO is stopped, it is green, it is running. So you can always switch between running and stopped.
TEMPO	- - -	Tap the tempo on the [TEMPO] button. To the right of the tempo button you will see an LED that flashes according to the detected tempo.
TEMPO	BIG KNOB	Hold down the [TEMPO] key and use the Big Knob to select a value between 1 and 8 in the LED string. Now the cruise control is running and you are listening to a sequence of your snapshots! The higher the value, the faster the sequence.
No.	note value	The following note values are offered in the selection: Tip: When selecting No. 6, the speed of tapping the [TEMPO]-button is the current clock (quarter-note selection).
1	2/1	
2	1/1	
3	3/4	
4	1/2	
5	1/3	
6	1/4	
7	1/8	
8	1/16	

Applications: Wave-Sequencing, rhythmic timbre changes.

But the interpolator can do more. You can vary the mode by instructing the interpolator to send a trigger to the ADSR when a snapshot is reached, so that a note is played at each step:

Setting up a snapshot-trigger		
Button	Knob/Button	Description
SHIFT	ADSR-GATE	Morph menu function: While holding down the [SHIFT] button, tap the [ADSR-GATE] key. Now the envelope is triggered at each snapshot change over. You can press the key combination several times to select different gate times. After four settings, the gate trigger is switched off again. If it's just about switching off, the shortcut in the following row is handy.
- - -	ADSR GATE	Press the [ADSR-GATE] button to turn the snapshot trigger off again.

Applications: Sequences, Rhythms.

4.5.2 Snapshot morphing

The snapshot morphing actually works just like the snapshot sequencer mode in the chapter before. The only difference is that the values do not jump, but are blended and morphed. We start again without the clock to control the morphing with the 'Big Knob'.

Switching off the tempo clock.		
Button	Knob/Button	Description
SHIFT	TEMPO	Hold down the [SHIFT] button and tap the [TEMPO] button. If the tempo LED flashes yellow, the MORH-LFO is stopped, it is green, it is running. So you can always switch between running and stopped.

Now select the snapshot morphing mode:

Selection of the second operating mode - morphing snapshots.		
Button	Knob/Button	Description
MORPH	BIG KNOB	While holding down the [MORPH] button, select No. 2 on the LED scale.
	BIG KNOB	If you release the [MORPH] button, you can crossfade the snapshots with the big knob or morph from one snapshot to the other.

Applications: Producing spectacular sound changes with just one knob.

Switching on the tempo clock.		
Button	Knob/Button	Description
TEMPO	- - -	Tap the tempo on the [TEMPO] button. To the right of the tempo button you will see an LED that flashes according to the detected tempo.
SHIFT	TEMPO	Hold down the [SHIFT] button and tap the [TEMPO] button. If the tempo LED flashes yellow, the MORH-LFO is stopped, it is green, it is running. So you can always switch between running and stopped.
TEMPO	BIG KNOB	Hold down the [TEMPO] key and use the Big Knob to select a value between 1 and 8 in the LED string. Now the morphing function is running and you are listening to a sequence of your snapshots! The higher the value, the faster the sequence.

Applications: Drones, ecstatic pads and strange sound developments.

The snapshot morphing mode allows for triggering the ADSR envelope at snapshot change over:

Setting up a snapshot trigger.		
Button	Knob/Button	Description
SHIFT	ADSR-GATE	Morph menu function: While holding down the [SHIFT] button, tap the [ADSR-GATE] key. Now the envelope is triggered at each snapshot change over. You can press the key combination several times to select different gate times. After four settings, the gate trigger is switched off again. If it's just about switching off, the shortcut in the following row is handy.
---	ADSR GATE	Press the [ADSR-GATE] button to turn the snapshot trigger off again.

Applications: Sequencing and Rhythm programming with gliding sound changes.

4.5.3 Modulation wheel-dependent morphing

With this mode you bring more expression into your performance. The modulation wheel lets you morph from one snapshot to the next, controlling a wide range of sound variations.

Selection of the third operating mode - morphing snapshots via the modulation wheel.		
Button	Knob/Button	Description
MORPH	BIG KNOB	While holding down the [MORPH] button, select No. 3 on the LED scale.
---	MIDI Controller 1 (modulation-wheel)	If you release the [MORPH] button, you can morph thru the snapshots with the modulation wheel of a MIDI controller keyboard.

Applications: Expressive performing with the modulation wheel.

4.5.4 Velocity-dependent morphing

Actually, morphing is not an optimal term here. Just imagine that the DELTA CEP A2 calculates 128 (0-127) dynamic levels based on the snapshots (snapshots and intermediate levels) and then selects the sound variation corresponding to the dynamic level, depending on the velocity of each keystroke.

Selection of the fourth operating mode - call up snapshots and intermediate levels by keyboard velocity.		
Button	Knob/Button	Description
MORPH	BIG KNOB	While holding down the [MORPH] button, select No. 4 on the LED scale.
---	Key Velocity (MIDI)	The sound will now sound differently depending on the velocity response of each keystroke.

Applications: Dynamic playable patches.

4.5.5 Aftertouch-dependent morphing

If you don't have any hands free to use any controllers, Aftertouch is a good alternative for breathing life into your keyboard performance:

Selection of the fifth mode - morphing snapshots via aftertouch.		
Button	Knob/Button	Description
MORPH	BIG KNOB	While holding down the [MORPH] button, select No. 5 on the LED scale.
---	MIDI Aftertouch	If you release the [MORPH] key, you can morph between the snapshots with the aftertouch of a MIDI keyboard.

Application: Expressive Soundchanges.

4.5.6 CV dependent morphing

Of course it would be unforgivable if the morphing could not be controlled by a control voltage. But you can. Unfortunately, a modulation input must be misappropriated for this purpose. We picked out for the LFO-DEPTH control input. Connect the control voltage modulation source to this input.

Selection of the sixth mode - morphing snapshots via control voltage.		
Button	Knob/Button	Description
MORPH	BIG KNOB	While holding down the [MORPH] button, select No.6 on the LED scale.
---	CV Eingang (LFO-DEPTH)	If you release the [MORPH] key, you can morph between the snapshots with the control voltage you applied to the LFO DEPTH Input.

Applications: Full freedom. It does not matter if you select the snapshots via a sequencer or control them via a theremin controller. The CV entrance is the gateway to a whole universe of possibilities.

4.6 The combination of different modulation sources

Keyboard velocity, aftertouch, modulation wheel - all well and good. But what if you want to combine keyboard velocity dynamics and aftertouch, for example? Is that possible? Yes, that is indeed possible. One can mix several modulation sources and also reduce their effect accordingly, so that the control can be done as sensitively as possible.

Combining multiple modulation sources for realtime morphing.		
Button	Knob/Button	Description
---	MORPH	If you briefly press the [MORPH] button, the status LED next to the [MORPH] button lights green. If instead you hold down the [MORPH] button until LEDs 1-8 lights red and then release, the status LED to the right of the [MORPH] button will turn white - indicating that you have reached the morph combination mode.
---	BIG KNOB	After you have released the [MORPH] button, the LED of the already active modulation sources will light up. With the big knob, you can now select one additional modulation source.

	SNAP	Use the [SNAP] key to confirm your selection. This process - the selection and confirmation can be done several times to get a mix of the modulation sources. If you tap an already activated modulation source again with [SNAP], it will be removed from the modulation mix.
--	-------------	--

Below is the overview of the choices. Very important! By selecting options No. 7 and 8 you can limit the effect of the modulation sources:

Table of combinable modulation sources.	
Option No	Modulation source
1	Step sequenced snapshot animation.
2	Continuous snapshot morphing.
3	Modulation wheel (MIDI).
4	Keyboard Velocity (MIDI).
5	Aftertouch (MIDI).
6	CV control.
7	The effect of the modulation sources is reduced by a factor of 0.75x.
8	The effect of the modulation sources is reduced by a factor of 0.5x.
7 + 8	Activating both factors at the same time reduces the effect even more. $0.75x \cdot 0.5 = 0.375x$.

4.7 Notes on the number of snapshots.

Most of the time you can get to your destination with fewer than eight snapshots. Less snapshots have many advantages:

- a. Fewer snapshots do less work than more snapshots.
- b. If you want to make a small change to all snapshots, you will need to revise fewer snapshots.

If you want to create a sound that changes its timbre via velocity, modulation wheel, aftertouch or CV voltage, basically two snapshots on memory slots 1 and 8 will be perfect in most cases. If you want to achieve automated morphing between two sounds, using snapshot memories 1 and 5 is a better choice. That's because the LFO morph function runs in a circle. If you use memory 1 and 8, you have one long transition between 1 and 8 and one very short between 8 and 1. Using 1 and 5 results in a more linear morphing.

However, if you want to create more complex sound sequences or even entire drum sets or a wild effect journey, 8 snapshots will make sense.

4.8 Muting of snapshots

The DELTA CEP A2 Snapshot Interpolator basically does not care if it morphs from Snapshot 1 to Snapshot 8 through Snapshot 5, or from No. 1 directly to No. 8. The tonal result will be very different depending on the differences between these snapshots. For that reason, it can be very appealing to just mute a snapshot. The morphing will change dramatically as a result. You can test muting one or more snapshots or insert them again without deleting or overwriting snapshots.

Snapshot muting and unmuting.		
Button	Knob/Button	Description
---	SHIFT	First press the [SHIFT] button to switch to manual mode.
---	BIG KNOB	Choose a snapshot you would like to mute.
	MUTE	Use the [MUTE] button to confirm your selection. A muted step lights red. If you select the same snapshot again and tap with [MUTE] button, the muting will be canceled and LED light of that snapshot will turn green again.

4.9 In the beginning there was the INIT sound

When editing existing sounds, sound design may become more complicated: Hidden parameters are set to values that are not needed for the new sound. Finding these settings and resetting the parameters to a standard sound can be a lengthy procedure, especially if you're not familiar with the synthesizer. For this reason, the DELTA CEP A2 provides an INIT SOUND function to reset all parameters to default values.

INIT SOUND - Resetting the synth parameters to a basic sound.		
Button	Knob/Button	Description
---	SHIFT	First press the [SHIFT] button to switch to manual mode.
SHIFT	PATCH	Hold down the [SHIFT] button and tap the [PATCH] button to reset the sound to a default setting.

The Init Sound loads the following settings into the temporary sound memory:

INIT SOUND Parameter	
SWARM OSCILLATOR	Number of oscillator clones: 1 Waveform: Sawtooth TLM: 0 FM Depth: 0 Mod Depth: 0 Detune: 0 Density: 0 Chords: Off Glide: Off Scale: Off Mod Wheel: 0
MIXER	Noise/EXT: 0 Osc: 100 Saturation: 0
FILTER	Type: Digital 12dB Multimode Filter Output: LP Cutoff: Max Resonance: 0 EG-Depth: 0 KB-Scale: 0 Velocity: 0

INIT SOUND Parameter	
ADSR	Attack: 0 Decay: 0 Sustain: MAX Release: 0 VCA Attack: 0 VCA Release: 0
VCA	VCA Gate: ADSR Volume: MAX Input Gain: 0 Mod Depth: 0 Velocity: 0
FX	Dry/Wet: Dry FX-Algorithm: Tape Delay Feedback: 0 Delaytime: 0.1 Reverb Dry/Wet: 0
LFO	LFO Depth: 0 LFO Wave: SINUS

4.10 Deleting all snapshots

Sometimes you just want to start over. A sound program consists of up to 8 snapshots. Here's how to delete them all simultaneously:

Deleting of all snapshots.		
Button	Knob/Button	Description
---	SHIFT	First press the [SHIFT] button to switch to manual mode.
---	MUTE	Hold down the [MUTE] button until all 8 LEDs light up red. When you release the [MUTE] button, all LEDs flash alternately red and green.
---	MUTE	If you tap the [MUTE] key, all snapshots of the current program will be deleted. Have you changed your mind? Then look in the next line!
---	SHIFT	Use the [SHIFT] key to exit the menu without deleting the snapshots.
---	---	Do not worry. As long as you do not overwrite the current memory, deleting the snapshots is not permanent. You could retrieve the snapshots of a saved program by recalling the original program. Only when you overwrite the original program will the changes become permanent.

5. Patch dump functions

You can exchange sounds with other DELTA CEP A2 users or archive your own sound banks. The DELTA CEP A2 has three different memory dump functions:

1. Transferring a single patch with all 8 snapshots.
2. Transferring a whole soundbank with 8 patches.
3. Transfer all saved sound banks in one go (40 patches).

All dump functions listed above send the data out via the DRY output of the VCA section. Data is received via the EXT-IN input in the mixer section. The data sent does not make high demands on the recording device. You can record the data using your mobile phone, DAW or traditional tape deck. It is particularly attractive during studio productions to transfer a single patch, because you can easily record the sound data and place it at the beginning of the DAW project. When playing the song back, the DELTA CEP A2 is automatically loaded with the sound settings that were used during the production of the song.

Transferring a single patch.		
Button	Knob/Button	Description
---	SHIFT	First press the [SHIFT] button to switch to manual mode.
---	---	Arm the recording at the connected data recorder.
---	PATCH	Hold down the [PATCH] button until all 8 LEDs light up red.
---	PATCH	As soon as you release the [PATCH] button, the data of the current patch will be sent via the DRY output of the VCA section.

Transferring of a whole bank of patches.		
Button	Knob/Button	Description
---	PATCH	If you have not accessed Patch Select mode, please select it now by tapping the [PATCH] button.
---	PATCH BANK	Select the bank of patches you want to transfer. To do this, press the [PATCH BANK] button in the LFO section several times until the desired bank number lights up.
---	SHIFT	Hold down the [SHIFT] key to enter the utility menu.
---	BIG KNOB	Select the fourth submenu with the big knob. LED 4 lights up green when selected.
---	DENSITY	Select option 1 with the Density control in the SWARM OSC section. In this selection, the LED to the right of the [SHIFT] button lights up blue.
---	---	Switch the recording device to recording!
---	SNAP	Press the [SNAP] button to transmit the 8 sound programs of the current bank.

Transferring all banks (40 patches) at once.		
Button	Knob/Button	Description
---	SHIFT	Hold down the [SHIFT] button to enter the utility menu.
---	BIG KNOB	Select the fourth submenu with the big knob. LED 4 lights up green when selected.
---	DENSITY	Use the Density control in the SWARM OSC section to select option 2. When selected, the LED to the right of the [TEMPO] button lights up blue.
---	---	Switch the recording device to recording!

---	SNAP	Press the [SNAP] button to transmit all 40 patch memories. Warning! This procedure will take some minutes to finish.
-----	-------------	---

TIP: Of course, you can also use all three methods to transfer from one device to the other device.

TIP2: The DELTA CEP A2 will receive the dumps only in Patch Select mode. We want to make sure, you are not losing any editing if a dump comes in by accident.

6. Note-trigger and note priority settings

Different generations of synthesizers had developed different electronic circuit technology to interrogate keyboards of synthesizers. The various techniques produced different behaviors in case that one plays more than one key simultaneously. The oldest two variants were the "lowest note" - and the "highest grade" priority. Later, when the keyboard query was done digitally, another variant was added - the priority of the last played note. This means that the last played note always has priority. Since the DELTA CEP A2 does not have a keyboard and of course only one voltage can be applied to its CV output at the same time, the following settings have relevance only for MIDI control.

You may be wondering why this imperfection of pitch detection should be customizable at all, rather than just using the "Last Note Priority". This is because these older techniques can be used creatively when playing a solo. For example, if you are in "highest note" priority while holding down a note and quickly tapping a note above it (with a higher pitch), the DELTA will play the two notes in rapid alternation, even though you are tapping only the higher note. This is especially useful when playing trills and is an interesting way to virtually increase the virtuosity.

Older synthesizers such as the original Minimoog had another weakness. If you played something inaccurate and held the previous note a bit too late, so that the old and the new note briefly overlapped, the envelope was not triggered on the new note. This is unsatisfactory especially for percussive sounds with strong envelope influence. Ingenious developers came up with the idea to re-trigger the envelope depending on the recorded keyboard voltage. This option was called multi-trigger. Of course, this technique was adapted for the DELTA CEP A2, but it can also be switched off. With multi-trigger you can create sound variations by overlapping notes. By combining the different trigger and note priority settings you get 6 options:

Note priority and trigger-settings					
	multi trigger	single trigger	Highest note priority	Lowest note priority	Last note priority
1		X		X	
2		X			X
3		X	X		
4	X			X	
5	X				X
6	X		X		

The various note triggers and note priority settings are selected as follows:

Setting up note priority and trigger modes		
Button	Knob/Button	Description
---	SHIFT	Hold down the [SHIFT] button to enter the utility menu. You must hold the button until all LEDs 1-8 are lit blue. If you now release the [SHIFT] button, you have entered the utility menu.
---	BIG KNOB	Select the third submenu with the big knob. LED 3 lights up yellow in this selection.
---	DENSITY	With the Density knob you can call up the 6 different combinations of note priority and trigger mode from the table above. The lower 3 options work with single trigger and the upper three options work with Multitrigger.
---	SHIFT	Use the [SHIFT] button to exit the utility menu.

7. Stepsequencer

The DELTA CEP A2 has a small but powerful step sequencer, into which you can enter up to 16 notes or rests. The length of the sequence always results from the number of entered notes and rests. A step can be a note or a rest. The resolution can be changed in jam-mode. Steps can be added or removed at any time. This makes the sequencer an interesting playground. The notes are entered or the entire sequence is transposed via a connected MIDI keyboard.

Step-Sequencer operation		
Button	Button/Knob	Description
SHIFT	LEARN	Hold down the [SHIFT] button and touch the [LEARN] button to call up the sequencer editor. The [LEARN] LED flashes at the tempo of the sequencer.
---	MIDI-NOTE	As soon as you tap a note on the connected keyboard, the sequencer starts and repeats this note. If you play more notes, they will be added.
---	The current position and the number of entered notes and rests is indicated with the LEDs on the left. The sequence is divided into two groups of 8 steps each. The current edit position in the sequence always lights up white, entered steps of the first group of 8 dark blue and steps of the second group turquoise. In addition, a running light shows the playback position.	
---	BIG KNOB	In the sequence editor, you can use the Big Knob to select the position in the sequence at which the next note or rest is to be inserted.
---	GATE	The [GATE] key of the ADSR section sets a pause at the current position. Subsequent notes are shifted forward.
TEMPO	BIG KNOB	Hold down the [TEMPO] button to use the BIG KNOB to set the resolution of the sequence.
---	LEARN	After the sequence has been imported, you can transpose it using the connected MIDI keyboard. To do this, press the [LEARN] button again. The flashing Learn button changes color depending on the current clock.

SHIFT	TEMPO	Should the sequence stop, the clock generator of the DELTA is stopped. In this case, hold the [SHIFT] button and tap the [TEMPO] button to start the clock generator. The sequence should then run again.
SHIFT	LEARN	If, on the other hand, you want to edit the sequence again after transposing, you can go back to the sequence editor with [SHIFT] & [LEARN].
	2x LEARN	To exit the sequencer and erase the notes, press the [LEARN] button twice. Note that pressing the Learn button while transposing also clears the sequence memory!

8. MIDI control of sound parameters via MIDI controller

The sound parameters of the DELTA CEP A2 can be controlled via MIDI controllers. The controllers and buttons of the DELTA CEP A2 send the parameters out via the MIDI output if you have the desktop version with the MIDI output. Note that the Delta must be in Manual mode for parameter control to take effect. In the following table you can see the assignment of the MIDI controller to the sound parameters.

CC	Bereich	Neutral	Parameter
29	0-127		LFO Speed
30	0-127	64	LFO Modulation Depth
35	0-127		LFO Waveform
31	0-127		LFO->EG Auto Trigger & Auto-Trigger Gate-Time
32	0-127	64	LFO Depth EG Depth
33	0-127	64	LFO Rate EG Depth
16	0-127		MIX Swarm-Oscillator (0-97, >97:Saturation)
17	0-127		MIX External In/Noise
34	0-127	64	MIX Modulation
36	0-7		Cycle Tempo Divider
47	0-127		SWARM Tune MSB
48	0-127		SWARM Tune LSB
46	0-127		SWARM Waveform
49	0-127	64	SWARM TLM
50	0-127		SWARM Damping
51	0-127		SWARM Density (number of clones)
52	0-127		SWARM Spread (detuning of clones)
53	57-71	64	SWARM Chord Type
5	0-127		SWARM Glide
54	57-71	64	SWARM Quantizer Scale
55	58-70	64	SWARM Scale Base (+/- 6 halftones)
56	0-127	64	SWARM Modulation
57	0-127		SWARM FM Modulation Depth
58	0-127	64	SWARM Modwheel Depth
59	0-127	64	SWARM Mod Internal
60	0-127	64	SWARM EG Wave/TLM Modulation
61	0-127	64	SWARM TLM Modulation Intern
62	0-2		VCF Filter Type (0=Multimode, 1=LP24, 2=Analog)
63	0-7		VCF Filter Band (Bit[0]=LP, Bit[1]=BP, Bit[2]=HP)
3	0-127		VCF Cutoff
9	0-127		VCF Resonance
18	0-127		VCF Cutoff Modulation

CC	Bereich	Neutral	Parameter
19	0-127		VCF EG Depth
20	0-127		VCF Key Scale
21	0-127		VCF Velocity Scale
22	0-127		VCF Cutoff Internal Modulation
23	0-127		VCF Resonance Internal Modulation
80	0-127		ADSR Attack Time
81	0-127		ADSR Decay Time
82	0-127		ADSR Sustain Level
83	0-127		ADSR Release Time
84	0-127		VCA Gate Attack Time
85	0-127		VCA Gate Release Time
24	0-127		VCA Velocity Modulation
25	0-127	64	VCA External Modulation Depth
26	0-127	64	VCA Internal Modulation Depth
86	0-4		FX Type (0:TapeDly, 1:TapDly, 2:Chorus, 3:Phaser, 4:Flanger)
92	0-127		FX Wet
117	0-127		FX LFO Rate
118	0-127	64	FX LFO Depth
89	0-127		Delay Time coarse (higher 7 Bits)
90			Delay Time LSB (lower 3 Bits, send before coarse value)
103	0-14		Tap Delay Time (note value)
104	0-127	64	Delay Feedback
105	24-104	64	Delay Feedback EQ (<64 HighCut, >64 LowCut)
106	0-127		Chorus Delay Time
107	0-127	64	Chorus Feedback
108	0-127		Phaser Low Note
110	0-127		Phaser High Note
91	0-127		Reverb Wet
119	0-127		Reverb Room Size
93	0-127		Reverb Width
94	0-127		Reverb Damp
95	0-127		Reverb Feedback
7	0-127		Volume
27	0-2	0	Paraphonic OFF/ON1/ON2

8.1. MIDI program changes

The sound programs of the DELTA CEP A2 can be switched using program change. MIDI program changes between 0 and 39 call up user memories 1-40, MIDI program changes between 64 and 103 call up ROM memories 1-40. With an external program change transmitter or the DAW you can significantly improve the workflow of the DELTA CEP A2. Program changes are executed directly - even if the Delta is in manual mode. So you can change sound programs and still influence the sounds with controls. There is no need to switch to patch select mode and back.

9. MIDI to CV interface

The DELTA CEP A2 has a MIDI input and a dedicated MIDI to CV interface to convert the incoming MIDI signals into control voltages for external modules. Wiring of these control voltage outputs to inputs of the DELTA CEP A2 sections is not required as such connections are already internally wired. Rather, use these outputs for additional modules that you want to connect to the DELTA CEP A2.



Setting up the MIDI channel for the MIDI2CV Interface		
Button	Knob/Button	Description
---	LEARN	Hold down the [LEARN] button and press a key on the connected MIDI keyboard to set the MIDI channel.

9.1. In- and Outputs of the MIDI2CV section

The following table provides information about the outputs of the MIDI2CV interface:

Outputs of the MIDI2CV Section	
Jack	Description
GATE	This output outputs a GATE signal whose length corresponds to the holding time of the incoming MIDI note. Use this output, for example, to trigger and control external envelope modules.
KB-CV	This output produces a pitch control voltage with Volt/Octave ratio that matches the received MIDI note.

Outputs of the MIDI2CV Section	
Jack	Description
CV	This CV voltage follows a MIDI controller, which you can set with the [LEARN] button. Hold down the [LEARN] button and send the desired controller from your keyboard, MIDI controller, or computer program to set the assignment.
CLOCK	Here, the interface outputs the current system clock with an adjustable prescaler. The current system clock depends on the settings and the availability of internal or external clock sources. The system clock can run independent with an onternal clock generator, with MIDI sync or with an external analog clock signal.
RESET	When the DELTA CEP A2 receives a START command via MIDI, this output will output a trigger signal to allow external sequencers to return to the start position of the sequence.

9.2 MIDI clock synchronization

The DELTA CEP A2 allows for synchronizing the LFOs, the timing of the effects (delay times and modulation speeds) and the speed of the interpolator to a MIDI clock. The internal clock, over the 'tapping' adjustable clock, is turned off as long as the unit receives a MIDI clock and as soon as MIDI clock synchronization is enabled. The tap function is switched off during MIDI synchronization. The settings for the MIDI clock are configured in the Utility menu:

Enable reception of MIDI synchronization data		
Button	Knob/Button	Description
- - -	SHIFT	Hold down the [SHIFT] button to enter the utility menu. You must hold the button until all LEDs 1-8 are lit blue. If you release the [SHIFT] button afterwards, you have loaded the utility menu.
- - -	BIG KNOB	Select the fourth submenu with the big knob. LED 4 lights up green when selected.
- - -	DENSITY	Select the LED to the right of the [MORPH] BUTTON to select the function for receiving MIDI Clock
- - -	SNAP	Press the [SNAP] button to turn MIDI synchronisation on or off.
- - -	SHIFT	Press the [SHIFT] button to exit the utility menu.

Enable MIDI Clock Transmission (DELTA CEP A2 Desktop Only)		
Button	Knob/Button	Description
- - -	SHIFT	Hold down the [SHIFT] button to enter the utility menu. You must hold the button until all LEDs 1-8 are lit blue. If you release the [SHIFT] button afterwards, the utility menu will become active.
- - -	BIG KNOB	Select the fourth submenu with the big knob. LED 4 lights up green when selected.

---	DENSITY	Use the Density knob to select the LED to the right of the [PATCH] button to select the menu entry for sending MIDI Clock.
---	SNAP	Press the [SNAP] button to turn the transmission of MIDI sync on or off.
---	SHIFT	Press the [SHIFT] button to exit the utility menu.

9.3 [TEMPO]-button and tempo LED at MIDI-sync mode

If you synchronize the DELTA CEP A2 via MIDI, you can read the current status on the Tempo LED:

[TEMPO]-button and tempo LED at MIDI-sync mode			
Button	Button	Tempo LED	Description
---	---	blue	When the tempo LED flashes blue, the DELTA CEP A2 is receiving a MIDI clock. The system tempo corresponds to the MIDI clock speed.
---	---	yellow	If no MIDI Clock is sent because the MIDI clock has stopped, the Tempo LED flashes in yellow at the current tempo.
---	TEMPO	yellow	As long as the LED lights up yellow because no MIDI clock is being received, you can adjust the tempo by tapping quarter notes on the [TEMPO] button. You will see that the blinking speed changes accordingly.
SHIFT	TEMPO	green	If you press [SHIFT] & [TEMPO] while the MIDI Clock is missing, the internal clock runs and starts a sequencer that is connected to the DELTA CEP A2 clock output. With the start signal, patches with active morph mode 1 and 2 of the interpolator will run as well.
SHIFT	TEMPO	green	If you want to stop the clock, hold the [SHIFT] button and push the [TEMPO] button again.
---	---	blue	If the DELTA CEP A2 receives a MIDI clock again, the tempo will resync to the MIDI Clock. In that case, the Tempo LED will flash with a blue light again.
---	---	---	Important! While the DELTA CEP A2 is in MIDI Sync mode and receiving a clock, you can not start or stop by [SHIFT] + [TEMPO]. However, the DELTA CEP A2 receives MIDI Stop, Start and Continue commands to keep synchronized sequencers in sync.

9.4 [TEMPO]-button and tempo LED when running with internal clock

The speed of the DELTA CEP A2's internal clock is dependent on the speed one taps quarter notes on the [TEMPO] button:

[TEMPO]-button and tempo LED when running the internal clock			
Button	Knob/ Button	Tempo LED	Button
- - -	- - -	yellow	The tempo LED will flash yellow to show you what speed to expect at startup. As long as it blinks yellow, it does not output a clock at the clock output, nor does it control the morphing. However, the tempo already affects the LFO and the FX section. So the tempo delay runs according to this clock and the modulation effects chorus, flanging and phaser are also aimed at this tempo.
- - -	TEMPO	yellow	Tap the [TEMPO] button to change the tempo. When the LFO is running in sync mode, you will recognize, that the LFO speed flashing follows the tempo as well. The LFO runs in sync, when adjusting the speed while holding the SHIFT button.
SHIFT	TEMPO	green	Hold down the [SHIFT] button and push the [TEMPO] button to start both the external clock and the morphing sequencer. The tempo LED will now flash green, because the clock is running.
SHIFT	TEMPO	green	If you want to stop the clock again, hold [SHIFT] & push [TEMPO] again.

9.5 Clock-Output jack and Clock-Divider

As mentioned above, the clock output is used to synchronize external modules. When using a MIDI clock as the timebase, you can set a clock divider for the output. These settings are in the utility menu as well:

Divider for external clock signals.		
Button	Knob/Button	Description
- - -	SHIFT	Hold down the [SHIFT] button to enter the utility menu. You must hold the button until all LEDs 1-8 are lit blue. If you release the [SHIFT] button afterwards, the utility menu will become active.
- - -	BIG KNOB	Select the fifth submenu with the big knob. LED 5 lights blue in this selection.
- - -	DENSITY	In this menu you can select 6 different division factors with the Density knob. After selection, confirm the selection with the [SNAP] button. The division factors result in the following note values: 1/4, 1/8, 1/12, 1/16, 1/24, 1/32. These are arranged as follows on the LEDs to the right of the buttons: [SHIFT/MANUAL] = 1/4 [TEMPO] = 1/8 [SNAP] = 1/12 [MUTE] = 1/16 [MORPH] = 1/24 [PATCH] = 1/32
- - -	SNAP	Confirm the desired value by pushing the [SNAP] button.
- - -	SHIFT	Press the [SHIFT] key to exit the utility menu.

10.1 Tuning the DELTA CEP A2

In order to get the octave switching of the oscillator working correctly even at different tunings, we need a way to set the basic tuning of the module. This can be done in the tuning menu:

Mastertuning of the DELTA CEP A2		
Button	Knob/Button	Description
- - -	SHIFT	Hold down the [SHIFT] button to enter the utility menu. You must hold the button until all LEDs 1-8 are lit blue. If you release the [SHIFT] button afterwards, the utility menu will become active.
- - -	BIG KNOB	Select the seventh submenu with the big knob. LED 7 lights up purple in this selection.
- - -	DENSITY	With the [DENSITY] knob, you can set the basic tuning of the module in the range of +/- 7 cents - ie the pitch A from 433 to 447 Hz. In the middle position A = 440 Hz, a white LED lights above and below the Big Knob. Values above this basic mood are indicated by red LED lights and values below by blue LED lights.
- - -	SHIFT	Press the [SHIFT] button to exit the utility menu.

10.2 Setting up LED brightness and color

With the DELTA CEP A2 you can adjust the maximum brightness of the LEDs according to the ambient light. You can also determine the color of the morphing automation visualization.

Adjusting the LED brightness.		
Button	Knob/Button	Description
- - -	SHIFT	Hold down the [SHIFT] button to enter the utility menu. You must hold the button until all LEDs 1-8 are lit blue. If you release the [SHIFT] button afterwards, the utility menu will become active.
- - -	BIG KNOB	Select the first submenu with the Big Knob. LED 1 lights up red in this selection.
- - -	DENSITY	With the Density control you can adjust the maximum brightness of the LEDs.
- - -	SHIFT	Press the [SHIFT] button to exit the utility menu.

Einstellen der LED Farbe für die Interpolator Automation		
Button	Knob/Button	Description
- - -	SHIFT	Hold down the [SHIFT] button to enter the utility menu. You must hold the button until all LEDs 1-8 are lit blue. If you release the [SHIFT] button afterwards, the utility menu will become active.
- - -	BIG KNOB	Select the second submenu with the big knob. LED 2 lights yellow in this selection.
- - -	DENSITY	With the Density control you can set the color for the visualisation of the interpolation. The color is displayed with the right LED row.
- - -	SHIFT	Press the [SHIFT] key to exit the utility menu.

10.3 Auto Power-Down function (DESKTOP version only)

The DELTA CEP A2 has a Power-Down function that turns the unit off after 30 minutes of inactivity. Before that happens, the DELTA CEP A2 starts flashing red. The 30 minutes timer will restart as soon as the unit receives a MIDI note message or you hit any button while it is flashing. Of course, you can deactivate that function in the utility menu:

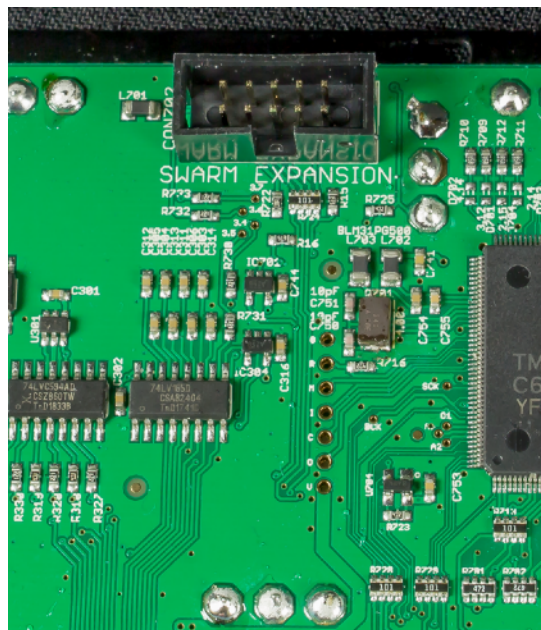
Power-Down function		
Button	Knob/Button	Description
- - -	SHIFT	Hold down the [SHIFT] button to enter the utility menu. You must hold the button until all LEDs 1-8 are lit blue. If you release the [SHIFT] button afterwards, the utility menu will become active.
- - -	BIG KNOB	Select the fourth submenu with the big knob. LED 4 lights green in this selection.

- - -	DENSITY	Select the LED beside the {SNAP]-button with the DENSITY knob.
- - -	SNAP	Toggle the Power-Down function On and Off with the {SNAP]-button.

11. RT-311 bridge

The DELTA CEP A2 has a digital interface to drive the Swarm Oscillator RT-311 directly. The connection is made on the back of the modules.

There you will find a ten pin header in the upper area of the main board of the DELTA CEP A2. The socket connector has a label "SWARM EXPANSION". To connect the two modules you need a ten pin ribbon cable. The Swarm Oscillator should be installed in the same cabinet as close to the DELTA CEP A2 as possible. If you want to make this connection, you should definitely disconnect the power supply and unplug the power cord or power supply beforehand! Version 1.3b of the RT-311 firmware is necessary for the two devices to communicate. This firmware can be found in the Eurorack download section of our homepage www.radikaltechnologies.com.



The ribbon cable only transmits the control data for the oscillator tunings. In order to play the RT-311 together with the DELTA CEP A2 you should feed the output of the Swarm Oscillator into the DELTA CEP A2 external input in the mixer section. The paraphonic mode will then run with 6 oscillators per voice for ultra fat pad sounds.

The connection does not unify the tuning of the oscillators. You must set the RT-311 and the DELTA CEP A2 to a common pitch or harmonic interval for the two to understand each other musically. The CV inputs of the RT-311 have priority over a DELTA CEP A2 bridge.

Im Video unter folgendem Link wird die Verbindung zwischen Delta CEP A und dem Swarm-Oscillator RT-311 genau beschrieben:

<https://youtu.be/xFdwun0JCCo>

12. Technical Information

Eurorack sound module with semi-modular, paraphonic sound engine.
Playmodes: Monophonic or 4 voices in paraphonic mode.

Dimensions:

68 TE Eurorack Module (345,1 mm x 129 mm x 30 mm)
68 TE Desktop Cabinet (350 mm x 140 mm x 90mm)

Power Consumption:

Power Consumption: 140 mA @ +12 V
50 mA @ -12V

Weight: 1,8 KG

User interface elements:

23 knobs, 14 buttons, 31 3,5 mm in- and output jacks, 27 RGB LEDs

LFO section:

LFO with sine, triangle, sawtooth and rectangle waveforms plus random voltage generator and inverting modulation depth control. The LFO can run synchronized to MIDI and external sync clock.

Oscillator section:

Swarm Oscillator with up to 8 Oscillator clones, seamless waveform selection, TLM modulation for PWM and timbre blending, chord memory and chord presets, detune, FM-modulation, glide function and scale-quantised CV input.

Mixer section:

Noise and external signal volume control, and oscillator level with saturation.

Filter section:

There is a digital 12 dB stereo multimode filter with low-pass, bandpass and high-pass function, a 24 dB digital low pass filter and an analogue 12 dB multimode filter with low-pass, highpass and bandpass function.

ADSR envelope section:

Envelope with attack time, decay time, sustain level and release time. Attack and release times can be controlled by control voltage. Retrigger function available via LFO.

VCA Section:

Main level, FX-Input gain and ADSR/GATE/Free Selection.

FX Section:

Programmable FX Processor with tempobased sync delay, tape delay, chorus, flanger and phaser plus an additional reverb FX.

Memory Section:

40 Patches with up to 8 snapshots each.

Interpolator section:

Blend between up to 8 snapshots.

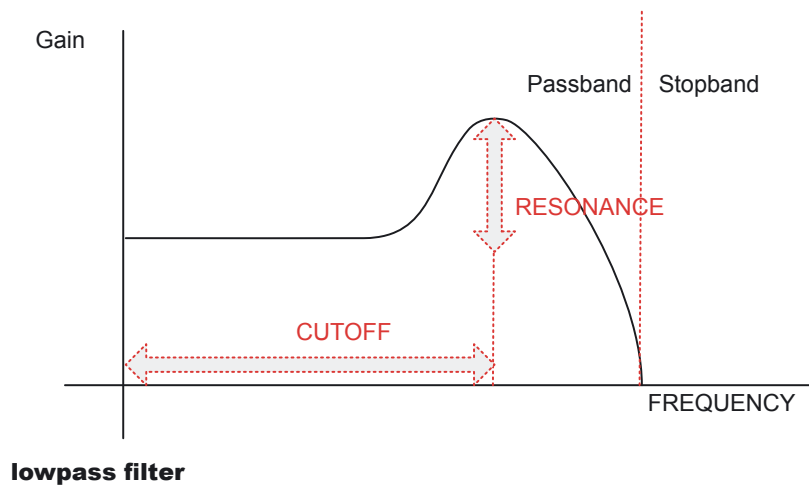
MIDI2CV section

MIDI Interface with control voltage outputs for other modules.

13 Glossary

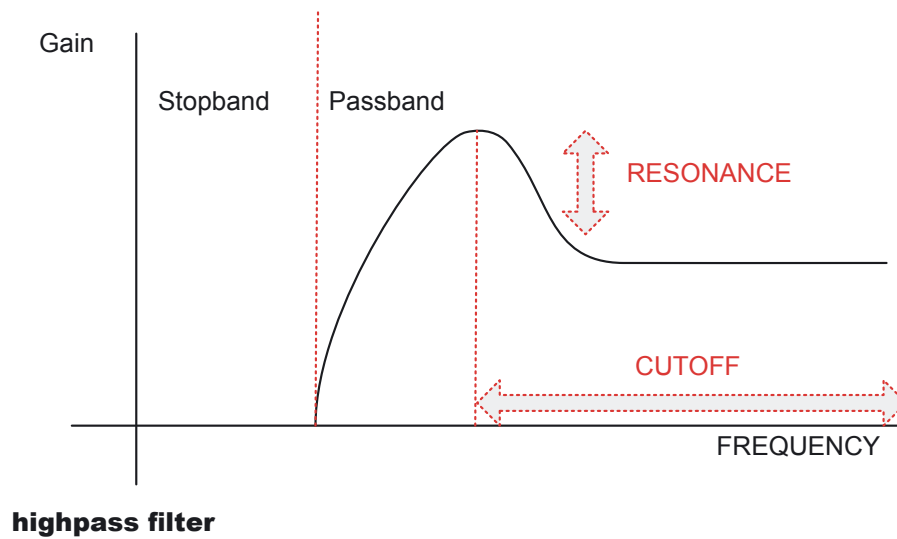
13.1 Filter (lowpass, bandpass, highpass)

You certainly know about filters from optics. If you bring a transparent, red disc into a ray of light, only red light passes thru the optical filter. Sound filters are quite similar. While a red filter in the optics only passes red light, a lowpass filter in audio circuits only passes frequencies below the cutoff frequency. Highpass filters do the opposite. They only pass frequencies, that are higher than the cutoff frequency. Filters in synthesizer circuits usually allow for adjusting the cutoff frequency in realtime. The highest audible frequency of a lowpass filter is set using the cutoff knob. If you set the cutoff frequency to the lowest frequency, no signal will pass through. On the other hand, if you now switch to highpass filter operation, the signal comes out of the filter almost unprocessed. Namely, only frequencies higher than the cutoff frequency are output at the high pass. Since the cutoff knob is now set to the lowest frequency, the harmonics generated by the oscillator are above the set frequency. Turning the cut-off knob clockwise will make the sound thinner and thinner as you cut off the fundamental and lower harmonics with the filter.



In the graph, you can look closely at the behavior of a low-pass filter. To the right of the filter curve, no signal is allowed through because the filter has its stopband there. Adjusting the resonance of a filter emphasizes the frequency range that lies around the cutoff frequency, as shown the drawn peak. Resonance and cutoff frequency are filter parameters that can be changed via envelopes, LFOs or other modulation signals in a synthesizer.

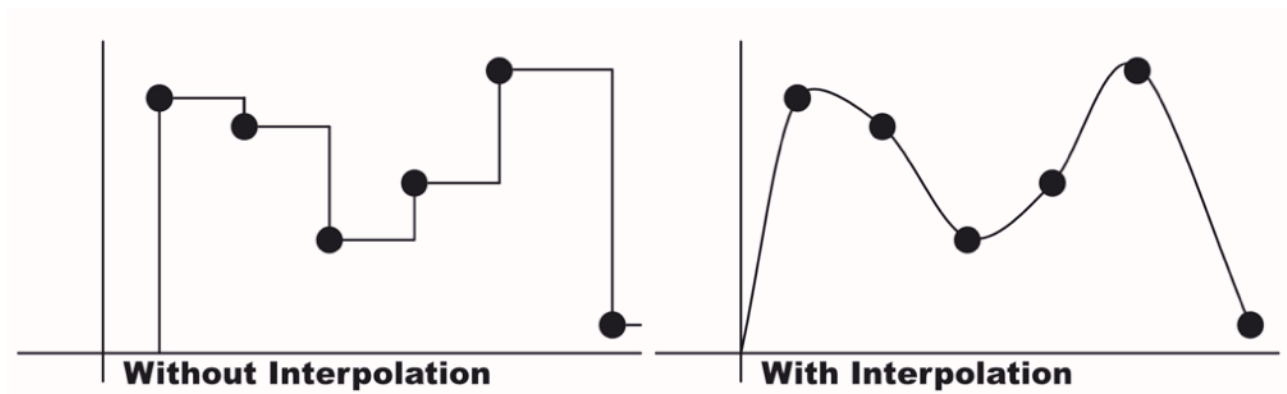
The following figure shows the behavior of the high-pass filter. Low frequencies are in the stopband and high frequencies are allowed through.



The band pass filter allows frequencies near the cutoff frequency through, but above and below this range, all frequencies are suppressed.

13.2 Interpolation

Do you still remember the school time? Have you ever written measurement results into a table in physics or mathematics lessons and then entered them into a graph? Then your teacher asked you to connect the points of the measurement series in the graph. Since no further measured values are to be found in their table between point A and B, it is now necessary for their drawing skills to plot the assumed intermediate values between two points with a curve in the graph. This is exactly what the interpolator in the CEP A Delta does. Its measurement points are its snapshots in this case. For each of the parameters that have changed between the snapshots, the DELTA CEP A2 calculates the necessary intermediate values to produce a smooth sound transition and no sudden changes. This procedure is called interpolation.



13.3 MIDI

It's hard to imagine today - but before 1983, there was no consistent protocol that could have been used to combine synthesizers from different manufacturers. Dave Smith (Sequential Circuits), in collaboration with Ikutaro Kakehashi (Roland Corporation), created a hardware interface and associated protocol that was technically appropriate, easy to implement, and easy to control. I remember very well the magic of connecting a Roland JX-3P and a Yamaha DX-9 with this somehow old-fashioned 5-pin cable. Playing the sound engines from a DX-9 and the JX-3P from one keyboard at the same time was incredibly exciting. Five-pin DIN cables had been finally banned from domestic living rooms a few years earlier, and the RCA cable had long since lost its superiority in the hi-fi world, as this strange plug was dug up again in modern synthesizers. That was one of the thoughts that then turned into this MIDI interface. Not only was the MIDI interface new - for most users, the MIDI interface was the very first digital data connection they had ever experienced. At the time nobody had a computer and therefore had no experience with data processing of any kind. But this MIDI interface revolutionized the technical possibilities enormously and started a deserved triumph in the music world. A few months later, it was no longer possible to market electronic musical instruments without this interface.

MIDI has two major advantages over the much faster and more universal USB interface - it can actively send data, while a USB device must always wait until its data is polled by the host computer. Galvanic isolation between the connected devices is accordingly MIDI standard compulsory program. As a result, no hiccup loop can form across the MIDI interface, and noise that may be inevitable on the bulk of a microprocessor supply may not be able to propagate to the next device. Therefore, the MIDI interface still has something to offer today, which many miss USB-based solutions. Only a few manufacturers provide a galvanic isolation of the USB interface.

What does MIDI actually do? Basically it is a primitive language to exchange musical commands as effectively as possible between multiple musical instruments. The most common command, for example, is the note command. A note command usually contains information about the pitch being played and the velocity used for that tone. So this MIDI event is sent when you press a key. If you release the button, another command is sent. This can be another note command with the velocity value 0, or a so-called Note Off command.

Of course that's not all that MIDI can do. If you trigger the pressure dynamics (aftertouch), this will be sent as well as the movement of the pitch bender or the regulation of the modulation wheel. A common tempo base can also be created via MIDI. So-called MIDI real-time messages transmit a 96th clock, start, stop and continue commands to run several sequencers and drum machines at the same speed.

13.4 Waveforms

Oscillators and LFOs generate periodic, varying output voltages. If one plots these output voltages into a graph, one sees the resulting oscillation forms. In subtractive synthesizers, the following modes of vibration play a special role:



SINE



TRIANGLE



Sawtooth



Rectangle

The sine waveform is a fundamental without overtones. Sine waves do not change their sound during filtering. They can only get quieter by filtering. If you need a dull, unobtrusive boost in the bass range, you're in the right place. Due to the lack of overtones, this waveform is very suitable for FM sounds.

If you want to add a few restrained overtones to the sine wave, you should work with the saturation in the mixer or change the Time Linearity Modulation value. After that, of course, you no longer have a sine wave.

The triangle wave has a few overtones, but it still sounds very soft. You can use triangle waves well for soft melody sounds.

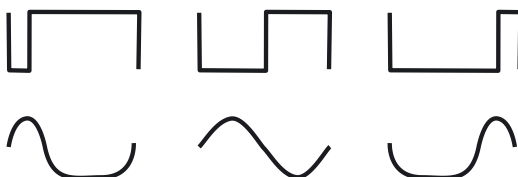
The sawtooth waveform has the brightest spectrum with all even and uneven overtones. Therefore, in subtractive synthesis, it offers the most interesting spectra for processing in filters.

The square waveform has an unbalanced, slightly aggressive sound character, because it contains only the odd overtones. If you need the Emerson, Lake and Palmer 'Lucky MAN' sound, just pick up several Oscillator Clones, set them to Rectangle and detune the Oscillator Clones. open the filter, set a high sustain level in the envelope, activate Glide and add some reverb - it instantly sounds like Keith Emerson.

With the help of TLM modulation, you can use the square wave to form a pulse wave. This reduces the belly sounding lower midrange overtones.

13.5 TLM Modulation (Time Linearity Modulation)

Almost every synthesizer player has heard of the pulse width of a square wave. If you change the clock ratio at a square wave, you will get a so called Pulsewave. By modulating the clock-ratio, you get a so-called pulse width modulation (PWM). During the design of the Spectralis synthesizer, we developed a new form of modulation that acts like a PWM on square waves, but can also be applied to other waveforms. We called this modulation TLM modulation, where TLM stands for Time Linearity Modulation. You bump the time of the first half-wave and stretch the time of the second half-wave. Using the square wave and the sine wave, the graphic shows how the TLM affects different modes of oscillation.



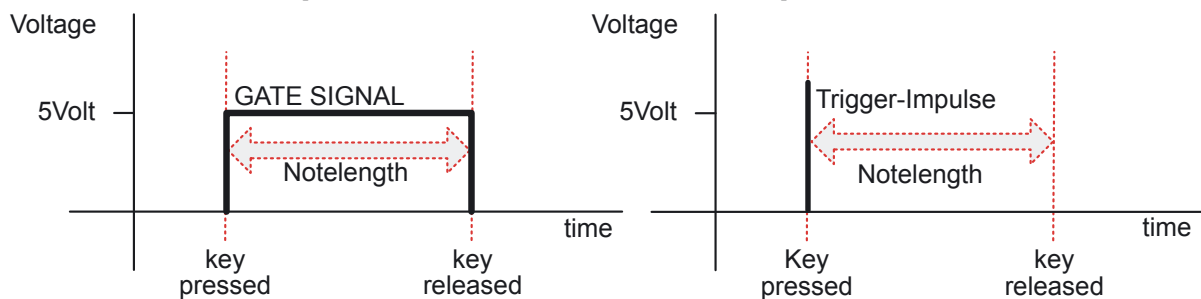
In the middle you see the TLM value 0, to the right and left of it positive and negative values.

13.6 The difference between a gate and a trigger signal

In my conversations with Modular Synthesizer newbies, the question arises every now and then about what the difference is between a gate signal and a trigger signal. The subject can be a bit confusing, because you usually give a gate signal to an ADSR envelope and still talk about triggering the envelope.

With the help of two drawings it quickly becomes clear what the difference is:

While the gate signal holds a voltage of 5 volts until the key is released, a trigger signal will only produce a short pulse that is completely independent of the duration of the sound.



For ADSR envelope control this difference is very important. The envelope phases can basically only be completed if a key is pressed long enough and the envelope receives a gate signal while it is being pressed. Only then does it go through the attack and decay phases and rest in the sustain phase until the key is released and the envelope transitions to the release phase.

The behaviour is quite different if only one trigger signal is received. If the attack time is set very short, the envelope with the trigger signal can at least output their maximum level briefly, but then go directly into the decay (release) phase. When driving a trigger signal you will notice that the envelope settings of the decay phase and the sustain level no longer have any influence on the sound. You can extend the envelope by extending the release phase.

However, if the transient (Attack) time is set to a high value, there may be no signal from the envelope when triggering, because the short trigger is then insufficient to bring the output voltage of the envelope to a relevant level. The decay (release) phase always starts at the voltage level that the envelope last had. In the case of a gate control, this is usually the holding level; when triggered by a trigger signal, it has the reached the level of the attack phase.

This behavior can be used musically. Create a sound with a sustain level of 0, a short attack time of 0, and a moderate decay time. The release time, however, is set long.

If you play the sound longer, you get a short, percussive sound. Holding the gate signal causes the sound to be brought to the sustain level of 0 volts with a short decay time. The subsequent release time does not change this because it starts from the zero level of the sustain phase. If, on the other hand, you send a very short GATE time - ie only touch the note - the release phase joins directly to the attack phase, resulting in a much longer sound history. This allows you to manipulate the curve of the envelope over the gate time.

14. Preset Patches


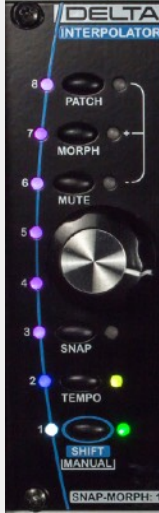

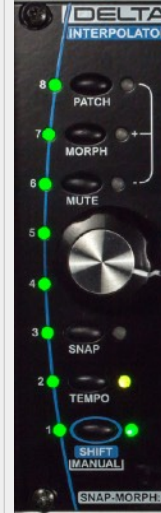
Patches					
B N K	N r.	Patch	Categ ory	Bemerkungen	Verbindungen
A	1	Bombast Rectangle	Lead	Fat Rectangle Solo Sound.	
A	2	Brassy	Lead	Keyboard Velocity is assigned to the Cutoff-frequency.	
A	3	Fusion	Lead	Percussive lead sound.	
A	4	Distorted	Lead	Saturated Melody sound.	
A	5	Mystic Ground	FX	Mystical FX sound.	
A	6	AT Morph	Lead	Aftertouch morphs through Snapshots.	
A	7	AT Morph 2	Lead	Aftertouch morphs through Snapshots.	
A	8	Wave Dynamic	Lead	Velocity and Aftertouch control over snapshots.	
B	1	Classic Synth Bass	Bass		
B	2	Funky Bass	Bass		
B	3	Deep Pressure	Bass		
B	4	Basic Dry	Bass		
B	5	Interval Bass	Bass		
B	6	Dyna Bass	Bass	8 velocity Snapshots	
B	7	Chorus Bass	Bass	Keyboard Velocity is assigned to the Cutoff-frequency.	
B	8	Lost chance	Bass	Keyboard Velocity is assigned to the Cutoff-frequency.	
C	1	Stereo Pad 1	Pad	Stereo Pad sound for the Paraphonic Mode.	LFO OUT->FILTER CUTOFF
C	2	Spacefunk	Lead	Funky Solosound.	
C	3	HouseChords	Hook	Chord Memory preset.	
C	4	BombastChord	Hook	Chord Memory preset.	
C	5	Random Filter	PadFX	Pad sound with RND filter modulation.	LFO OUT->FILTER CUTOFF
C	6	Warm Pad	Pad	Morphing Pad sound with two snapshots.	LFO OUT->FILTER CUTOFF
C	7	Waveform Modulator	Pad	Aftertouch controls LFO speed.	LFO OUT->OSCILLATOR MOD

Patches					
C	8	PhaserPad	Pad	Two Phaser modulation speeds in one Pad sound.	LFO OUT->FILTER CUTOFF
D	1	Chamäleon	Lead	8 Snapshots for eight different sounds.	
D	2	Moog Intervall	SEQ	Sequencer sound.	
D	3	Basic Sequence	SEQ	Chord Memory preset.	
D	4	Klangsequenz	SEQ	Sequence over 8 snapshot.	
D	5	ResoShimmer	FX	Filter Resonance FX.	ADSR OUT ->LFO SPEED IN LFO OUT -> CUTOFF IN
D	6	Spacestation DELTA CEP A2	FX	Filter Selbstoscillations-Effect mit with RND LFO	LFO OUT -> CUTOFF IN
D	7	Moskito Morph	FX	The modulation wheel morphs through 4 snapshots. The Moskito sits between positions 5 and 6.	LFO OUT -> CUTOFF IN
D	8	SoloMorph		Eight favourite Solo-sounds	
E	1	Notensequenz Sequenz	Seq	Start/STOP per [SHIFT] plus [TEMPO] starts and stops a sequencer line.	
E	2	Velocity Drums	Drums	128 velocity steps for different drum sounds.	
E	3	Windmaschine	FX	Running in Interpolator 2 mode without any power supply.	
E	4	Morphektor	FX	8 Snapshots morpher.	LFO OUT -> OSC FM
E	5	Sequentiel	SEQ	Sequence Snapshots with mutes.	
E	6	Drummatrixa	DRM	Drumsequence Snapshots with mutes.	
E	7	HiHat Sequenz	DRM	Sequence Snapshots with mutes.	
E	8	Klicker	DRM	Sequence Snapshots with mutes.	

15.3 Installing new firmware releases

Firmware versions are published as 10 minute audio files in wave format. We suggest to play the file with the VLC player. The VLC player is available for WINDOWS, Apple MAC OS, and even Linux computers but also for iOS and Android devices.

Connect the audio output of the computer, mobile phone or tablet with the external input in the MIXER section and play the audio file with the VLC player. As soon as the DELTA CEP A2 detects a firmware file, you will see an LED animation at the left LEDs.

Firmware detection	Firmware loading	Transfer error	Firmware update success
			
<p>If the unit detected the file but did not receive the audio signal from the beginning, the left LEDs will built up a row of 4 red lit LEDs. Just restart the file from the beginning.</p>	<p>If the firmware reception started at the beginning of the file and when all bytes are received properly, you will get the LED animation above. Each LED represents a memory section of the firmware. The LED at the write position plays a color animation. The LEDs below the current write position are lighting white and LEDs above are lighting purple. This animation will run for around 10 minutes until all LEDs turn white.</p>	<p>The DELTA CEP A2 detects transmission errors by calculating and comparing checksums. As soon as an error occurs, all LEDs turn red. Run the file from a playback position, where the firmware submission was running fine. The DELTA CEP A2 can complete the reception from any position. After a little while, the LED animation will change to the normal state again.</p>	<p>When the transfer is completed, the DELTA CEP A2 copies the received file into the flash memory. This procedure takes around three seconds. All LEDs are turned off while the unit is flashing the firmware. Afterwards all 8 LEDs at the left side turn green indicating, that the firmware update was successfull. Now please reboot the synth. The DELTA CEP A2 is now ready to use!</p>