Pulse

SYNTHESIZER

User's Manual
Pulse • Pulse Plus

waldorf

Produktgarantie / Product Warranty

Vielen Dank für den Kauf dieses Waldorf Produktes. Es zeichnet sich durch Zuverlässigkeit und Langlebigkeit aus. Dennoch können Material- oder Verarbeitungsfehler nicht völlig ausgeschlossen werden. Daher bieten wir Ihnen eine verlängerte Garantie. Damit Garantieleistungen in Kraft treten, müssen Kaufrechnung und Garantiekarte vollständig ausgefüllt innerhalb von 14 Tagen zurückgesandt werden. Diese Garantie erstreckt sich auf alle Defekte in Material und Verarbeitung für den Zeitraum von 1 Jahr ab Kauf des Produktes. Während der Garantiezeit ersetzt oder repariert Waldorf Electronics das durch Waldorf Electronics oder ein autorisiertes Service Zentrum als defekt befundene Produkt, ohne dem Kunden Material- oder Arbeitsaufwand in Rechnung zu stellen.
Um die Garantie in Anspruch zu nehmen, muß sich der Kunde zunächst telefonisch mit dem zuständigen Vertrieb in Verbindung setzen. Produkte, die ohne vorherige Absprache eingesandt werden, können nicht kostenfrei ausgetauscht bzw. repariert werden.
Das Produkt muß frei und versichert in Originalverpackung eingesandt werden. Detaillierte Fehlerbeschreibungen sind beizufügen. Unfrei und/oder nicht originalverpackt eingesandte Produkte gehen ungeöffnet zurück.
Waldorf Electronics behält sich vor, das eingesandte Produkt auf den neusten Stand der Technik zu bringen, wenn dies erforderlich sein sollte.
Diese Garantie deckt keine Defekte ab, die durch unsachgemäße Behandlung oder Eingriffe von unautorisierten Personen verursacht wurden und ist beschränkt auf die Behebung von Defekten, die während der normalen Nutzung durch Material- oder Verarbeitungsfehler aufgetreten sind.

Thank you for choosing this Waldorf product. It is a dependable device and is designed to last. However, the potential for defects in material or workmanship cannot be eradicated completely. This is why we provide an extended warranty for you.
To ensure your unit has full warranty coverage, mail the receipt and the fully completed warranty card back within 14 days of purchase.
This warranty covers all defects in material and workmanship for a period of one year from the date of original purchase. During this time, Waldorf Electronics will repair or replace the product without charge for materials or labor, provided the product was first inspected and found faulty by Waldorf Electronics or an authorized service center. You must first contact your dealer or distributor by telephone. Products that were mailed without prior agreement cannot be exchanged or repaired free of charge.
The unit must be insured and sent prepared in its original package. Please include a detailed description of the defect. Products that were not send prepared or in the original package will be returned unopened.
Waldorf Electronics reserves the right to upgrade the unit with the latest technological advances if necessary.
This warranty does not cover defects due to abuse, operation under other than specified conditions, or repair by unauthorized persons. The warranty covers only those malfunctions caused by material or workmanship defects that occur during normal operation.

Garantiekarte / Warranty Card

Bitte schicken Sie die Garantiekarte vollständig ausgefüllt zusammen mit einer Kopie der Kaufrechnung zurück, um die Produktgarantie in Anspruch nehmen zu können.

Please fill out this warranty card completely, include a copy of the purchase receipt and send the two items to us in order to ensure the warranty is valid.

Waldorf Electronics
Support Department
Neustraße 9-12
53498 Waldorf
Germany

Name / Name:

Straße / Street:

PLZ, Wohnort / ZIP Code, City:

Land / Country:

Telefon / Telephone:

Telefax / Facsimile:

Produkt / Product:

☐ Pulse SYNTHESIZER ☐ Pulse+ SYNTHESIZER

Sonstige verwendete Geräte / Other used equipment:

Sonderausstattungen / Custom features:

Seriennummer / Serial number:

Kaufdatum / Purchase date:

Name Ihres Händlers / Name of your dealer:

Ort Ihres Händlers / City of your dealer:

Produktunterstützung / Product Support

Wenn Sie Fragen zu Ihrem Waldorf Produkt haben, gibt es vier Möglichkeiten, uns zu kontaktieren:

If you have any questions about your Waldorf product, feel free to contact us via one of the four options listed below.

1 Schicken Sie uns eine E-Mail. Das ist der mit Abstand effizienteste und schnellste Weg, uns zu erreichen. Ihre Fragen können sofort an die richtige Stelle weitergeleitet und innerhalb kürzester Zeit beantwortet werden.

info@waldorf-gmbh.de

Send us an e-mail message. This is the most efficient and fastest way to contact us. Your questions will be forwarded immediately to the resident expert and you will quickly receive an answer.

2 Senden Sie uns ein Telefax. Fast so schnell wie E-Mail, allerdings für Sie und uns weniger komfortabel.

+49-(0)2636-7935

Send us a fax. This is as fast as e-mail, but not quite as comfortable for you and us.

3 Schicken Sie uns einen Brief. Etwas langsamer, dafür jedoch genauso zuverlässig wie ein Telefax.

Waldorf Electronics
Neustraße 9-12
53498 Waldorf, Germany

Send us a letter. It will take a bit longer, but it is just as dependable as a fax.

4 Und wenn es ganz dringend ist, rufen Sie uns an. Wir versuchen, Ihre Fragen möglichst sofort zu beantworten.

+49-(0)2636-80563

If you're in big hurry, call us, we'll try to answer your questions right away.

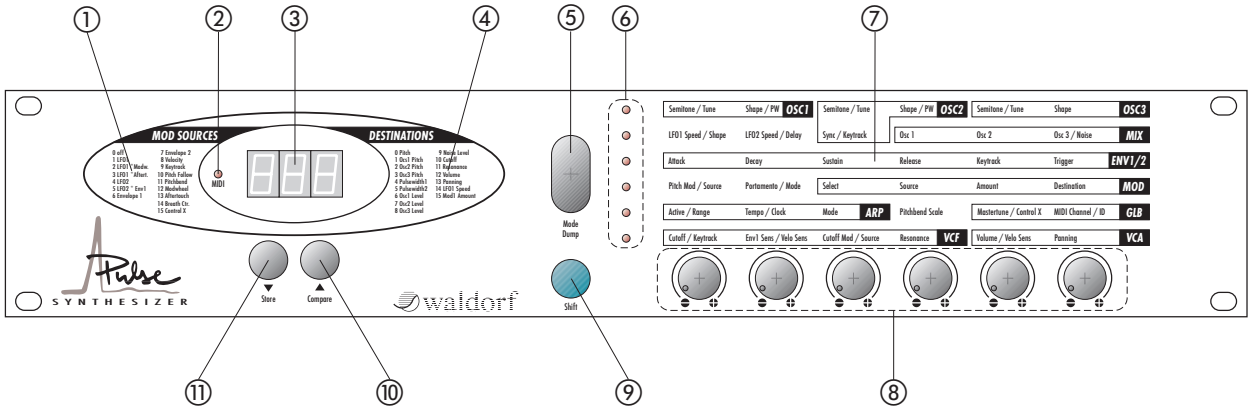
1. Contents

1.1 Table of Contents

1.2 Diagrams

2. Control Features and Connections

2.1 Front Panel



① Modulation source assignment table

② MIDI status LED

③ Display

④ Modulation destination assignment table

⑤ Mode key; selects the parameter level. Alternate function: Dump

⑥ Mode LED; indicates the currently active parameter level

⑦ Parameters

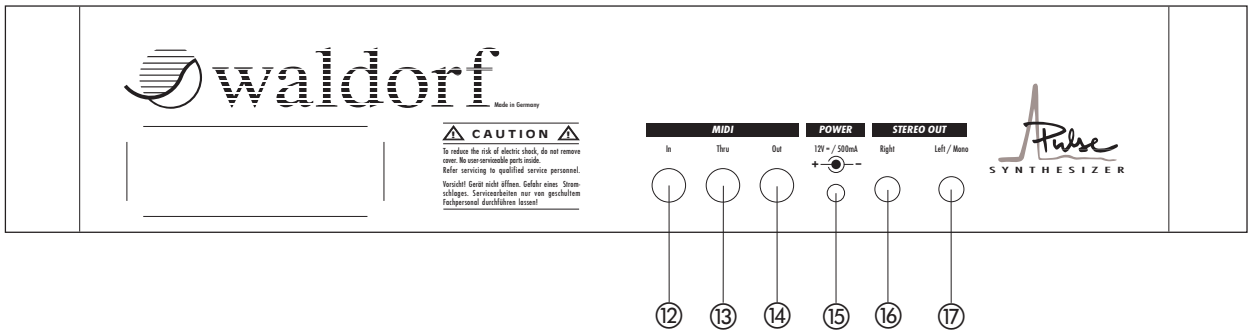
⑧ Rotary pots; adjust parameters

⑨ Shift key; activates alternate functions for pots and keys (those featuring orange markings)

⑩ ▲ Scroll key; raises the program number. Alternate function: Compare

⑪ ▼ Scroll key; lowers the program number. Alternate function: Store

2.2 Rear Panel



⑫ MIDI In jack

⑬ MIDI Thru jack

⑭ MIDI Out jack

⑮ Power supply socket DC 12V

⑯ Stereo Out Right

⑰ Stereo Out Left/Mono

The additional connectors of the Pulse Plus are described in the chapter „Additional Functions of the Pulse Plus“.

3. Foreword

Thank you for purchasing the Waldorf Pulse.
You now own a monophonic analog synthesizer featuring a wide range of unique sounds.

To ensure your instrument functions properly and enjoys a long life, please read and heed the instructions in this manual.

Software:	Stefan Stenzel
Hardware:	Thomas Kircher
Design:	Axel Hartmann
Text & Layout:	Oliver Rockstedt
Translation:	T. D. Green

Release:	2.0
Revision Date:	22.11.97

We would like to thank:

Wolfram Franke, Frank Schneider, Lu Wangard, Georg Müller, Claudia Nähring, Wolfgang Düren, Drew Neumann, Geoff Farr, Siggi, Bonni, Hubi, Philipp, Rainer und Martin.

Waldorf Electronics GmbH, Neustraße 12, D-53498 Waldorf, Germany

4. Introduction

This handbook was written to help you become familiar with the Waldorf Pulse. It will also help experienced users with routine tasks.

To avoid confusion, the terminology in this manual is based on the Pulse parameter names. You will find a glossary at the end of the manual; it explains the various terms used herein.

We also used a uniform set of symbols to alert you to topics of particular interest or significance. Important terms are highlighted in bold letters.

4.1 Symbols

⚠ **Caution:** The comments that follow this symbol will help you avoid errors and malfunctions.

☞ **Instructions:** Follow these guidelines to execute a desired function.

Info: Additional information on a given topic.

Pulse Plus: Paragraphs marked with this symbol refer to the additional parameters and functions of the Pulse Plus.

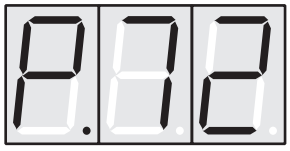
4.2 Highlighted Control Features and Parameters

All of the Pulse's keys, pots and parameters are highlighted in bold letters throughout the manual. Also every control element has an unique position no. ①...⑰ which refers to the diagrams on page 3.

Example: • Press the Mode key.

The Pulse's diverse modes and parameters are illustrated in a depiction of the display.

Example: Program 72 is active.



A given parameter's value range is indicated from low to high, with the two values separated by three dots.

Example: Semitone -48...+48

5. General Safety Guidelines

⚠ **Caution:** Please read the following safety tips carefully!
They include several precautions you should always observe when dealing with electronic equipment.
Read all of the instructions before operating your device.
Save these instructions for later reference.

5.1 Suitable Operating Conditions

- Use the device in enclosed rooms only.
- Never use the device under damp conditions such as in bathrooms, washrooms or around indoor swimming pools.
- Do not use the device in extremely dusty or dirty environments.
- Ensure adequate ventilation is available at all sides of the device, especially when you mount it in a rack.
- Do not place the device near heat sources such as radiators.
- Do not expose the device to direct sunlight.
- Do not expose the device to extreme vibrations.

5.2 Power Supply

- Use only the included AC adapter.
- Plug the adapter only into wall sockets that are properly grounded.
- Make sure the available power supply has the required rating indicated on the adapter. If you have any doubts, consult a qualified electrician.
- Never install a different plug. If the included cable is not equipped with a suitable plug for your local sockets, take it to a qualified electrician.
- Unplug the device when you are not using it for longer periods.
- Never touch the plug with wet hands.
- Always pull the plug when unplugging the device, never the cable.

5.3 Operation

- Never place objects containing liquids on or near the device.
- Place the device on a stable base only. Use a suitable platform or rack.
- Make sure no foreign objects find their way into the chassis. If for some reason this should occur, switch the power off, unplug the device and consult a qualified repair center.
- This device, used on its own or with amplifiers, speakers or headphones, can generate volume levels that may do irreparable damage to your hearing. For this reason you should keep the volume at tolerable levels.

5.4 Maintenance

- Do not open the device or remove the cover. Refer all service and repair tasks to qualified personnel. The interior of the chassis contains no components that require user maintenance.

- Use only a dry, soft cloth or brush to clean the device.
  Never use alcohol, cleaning solutions or similar chemicals. They will damage the surface of the chassis.

5.5 Proper Use

This device is designed exclusively to produce low-frequency audio signals for the purpose of generating sound. Any other use is prohibited and voids the warranty extended by Waldorf Electronics. Waldorf Electronics is not liable for damages due to incorrect use.

6. Setup and Operation

6.1 Inventory

The Waldorf Pulse comes complete with:

- the Waldorf Pulse
- 12V/500mA adapter
- warranty card
- this handbook

Please ensure all the items above were included. If something is missing, contact your local dealer.

We recommend that you save the original packing material for future transport.

⚠ **Caution:** Make sure you fill out the warranty card and send it to the appropriate distributor. The address is printed on the registration card. This is the only way we can keep you informed of upgrades and updates. Other available services are listed on the warranty card.

6.2 Setup

Place the Waldorf Pulse on a clean, even surface.
If you choose to take the device on the road, we suggest you mount it in a 19" rack. The Pulse takes up 89 mm, equivalent to two rack spaces.

6.3 Connections

In order to get started with your Pulse you will need an AC wall socket, a MIDI keyboard, a mixing console, an amp and an audio monitor such as a speaker cabinet.
You can also use a computer or sequencer rather than a MIDI keyboard.

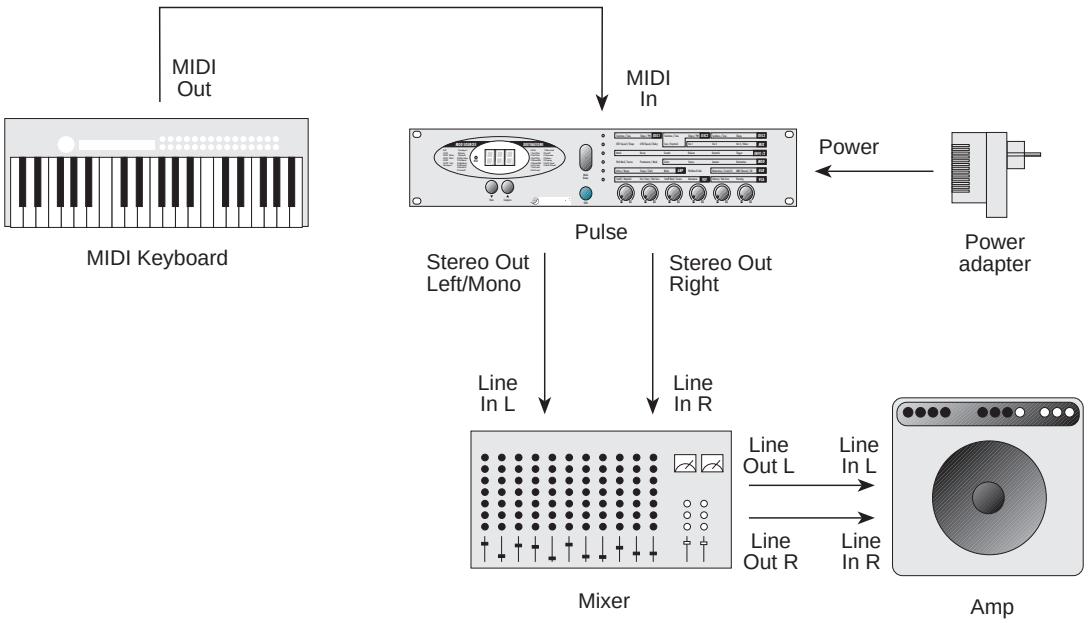


Diagram 1: Connections

☞ Follow these steps to connect the devices:

- Turn all devices off.
- Connect the Pulse's two audio ouputs Stereo Out Left/Mono ⑰ and Stereo Out Right ⑯ to your mixing console.

If you do not choose to connect a mixing console, you can patch the Pulse's output signals directly to an amp. Use an input usually called Aux or Tape input. If you do not want to send a stereo signal, use Stereo Out Left/Mono ⑰ output. If you do not insert a plug into Stereo Out Right ⑯, then the mono master signal is routed via the left output.

⚠ **Caution:** Never use the mic or phono input of the connected amp.

- Connect your keyboard's MIDI Out jack to the Pulse's MIDI In jack ⑫ .
- Connect the included adapter to the Pulse's power supply socket ⑮ .
- Insert the adapter plug in a suitable wall outlet.
- First switch on the connected MIDI keyboard and then the mixing console and amp.

⚠ **Caution:**

- Before connecting and disconnecting the Pulse to a power supply source, turn your amp's volume control all the way down to avoid damage due to on/off switching noise.
- The Pulse produces a high level output signal (see technical data). Please take care that the connected playback device is suitable for the high level of an electronic instrument.

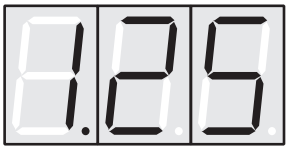
7. Operation

7.1 Powering Up

The Waldorf Pulse is not equipped with an AC power switch. The Pulse is automatically operational once you connect the Pulse to a wall socket.

First, the version number of the Pulse's operating software will in appear the display ③.

Version number of the operating software
Example: 1.25



After several seconds, a program number will appear in the display; the Pulse is now ready to be played.

7.2 Selecting Programs

Factory and User Programs

The Waldorf Pulse features 99 sound programs which are also called memory locations. Programs 1 through 40 are freely-programmable; programs 41 through 99 are permanent factory preset programs. When you first activate the Pulse, programs 1 through 40 are identical to factory preset programs 41 through 99.

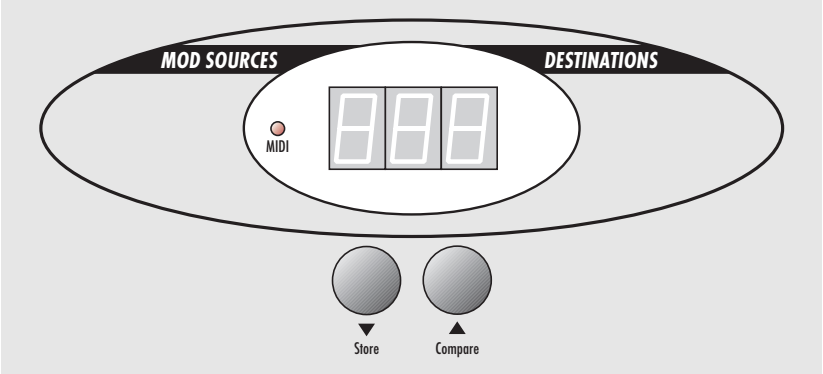
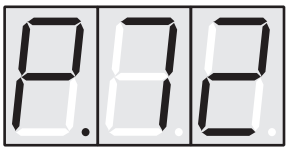


Diagram 2: Selecting programs

Use the Scroll keys ▲ ⑩ and ▼ ⑪ to select programs. The currently selected program is indicated by the display ③ .

Example: Program 72



☞ This is how you select a sound program.

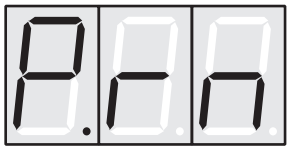
- Press ▲ ⑩ briefly to select the next program.
- Press ▼ ⑪ briefly to select the previous program.

To Scroll through a number of programs quickly, press the appropriate Scroll key and hold it down. After approx. 1 second, the display will Scroll faster. Once the desired program is indicated in the display, release the Scroll key. More acceleration can be archived by pressing down the opposite Scroll key while holding down the first Scroll key. In this case, the program no. is changed in steps of 10.

Random Program

If you Scroll beyond program 99, you will see the program P.rn, i.e. a random program. When you select this program, the Pulse will generate a sound at random.

Random program



When the Pulse switches off, its memory stores the last active program and reactivates this program when the Pulse switches back on. However, any edits you did not save are lost when the Pulse switches off.

7.3 Editing Sound Parameters

In order to change or edit a sound in the Pulse, you must access the appropriate parameters. These sound parameters are arranged in a matrix. Accessing parameters requires two steps: First you must select the desired parameter level. Then you can use the rotary pots located below the six columns to edit the parameter directly. The parameters and how they function are described in detail in the next chapter.

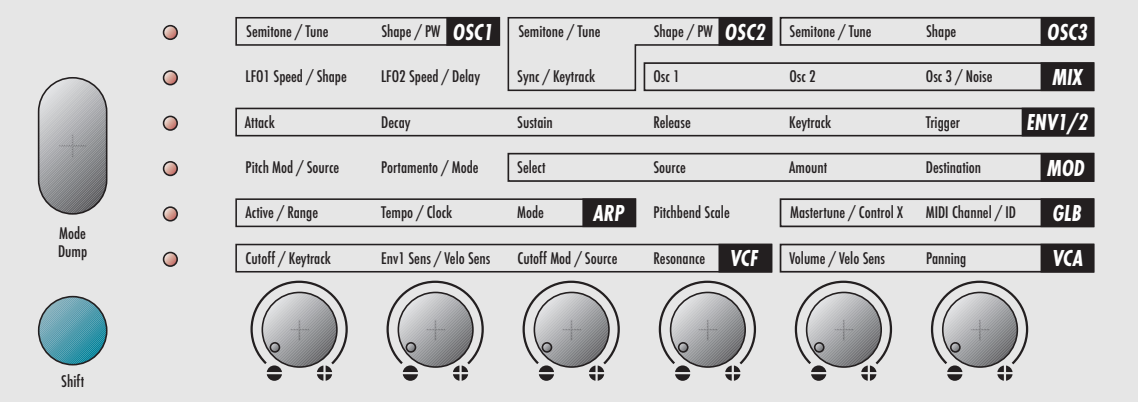
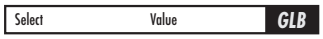


Diagram 3: Parameter matrix

According to the extended functionality of the Pulse Plus, the parameter groups *MIX* and *GLB* differ slightly from the shown diagram:

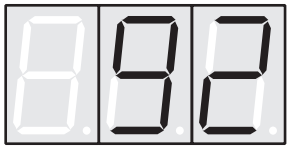


Please read the chapter about the corresponding parameter group in this manual.

This is how you access a desired parameter:

- Press the Mode key ⑤ repeatedly until the LED ⑥ next to the desired parameter level illuminates.
- Alternatively, you can press and hold the Mode key ⑤, and use the Scroll keys ▲ ⑩ and ▼ ⑪ to select the desired level.
- Press the control feature ⑧ located below the column ⑦ containing the desired parameter.

The display will indicate this parameter's current value.



Several parameter values are not indicated as numerals, but as alphabetic abbreviations. Please consult the chapter entitled "The Sound Parameters" for further information.

Several of the Pulse's sound parameters are accessed via the rotary pots' alternate functions. These parameters are identified in orange lettering on the front panel. You have two options for editing these parameters:

- Press and hold the Shift key ⑨ while adjusting the rotary pots ⑧ .
- You also can briefly press the Shift key ⑨.
  The LED ⑥ located next to this parameter level will flash. This indicates that the rotary pots now adjust the parameters marked in orange.
  Press the Shift key ⑨ again to return to the previous status.

When you change a parameter value, the current program is automatically in Edit mode. The letter E. will appear in front of the progam number in the display.

Example: Program 27 in Edit mode

The Pulse is equipped with a feature called an edit buffer. It enables you to activate other programs without deleting the changes you made to the current program. However, as soon as you begin editing another program, the modifications you made to the previous program are lost.

⚠ **Caution:** Make sure you save the modifications you made before you begin editing the next program. If you fail to save the changes, they will be irretrievably lost! The next section describes how to save modifications.

☞ Example: How to change a filter cutoff frequency:

- The desired parameter is entitled Cutoff and is located in the *VCF* group (bottom line).
- Press the Mode key ⑤ repeatedly until the LED ⑥ next to the bottom parameter level illuminates.
- The filter cutoff frequency, aptly entitled Cutoff is located in the first column. Turn the appropriate rotary pot ⑧ , i.e. the first one from the left.
- Observe the value as it changes in the display ③.

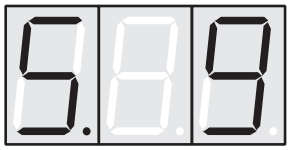
7.4 The Store Function

After you have finished editing a program, you must save it if you intend to use it again. The program memory locations 1 through 40 are available for this purpose.

☞ This is how you store a program:

- Press and hold the Shift key ⑨ .
- Briefly press the Scroll key ▼ ⑪. This Scroll key's alternate function is Store, indicated in orange lettering.
- Release the Shift key ⑨ .
- A flashing S. appears in front of the selected program number in the display:

Example: Program 9 is the selected memory location



The indicated memory location number will always be from 1 to 40, i.e. within the range of the freely programmable memory locations. If you have edited a factory preset program, it must be stored in one of these memory locations. The Pulse will suggest a program number equivalent to the original number plus 40.

Original Program	Suggested Program
1...40	1...40
41...80	1...40
81...99	1...19
P.rn	20

- If you want to store the program at a memory location other than the suggested one, use the Scroll keys ▲ and ▼ to select the desired program number.
- Press and hold the Shift key ⑨ and press the Store key ⑪ again.

You have now stored the program.
When you activate the Store function, Edit or Compare modes are terminated.

By pressing the Mode key ⑤ , you can terminate the process at any time before you press the Store key ⑪ for the final time.

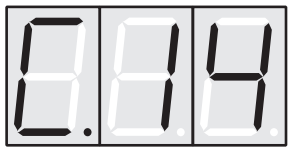
7.5 The Compare Function

The Compare function allows you to compare the edited sound parameters to their original values.

☞ This is how you activate the Compare function:

- Press and hold the Shift key ⑨ .
- Briefly press the Scroll key ▲ ⑩. This Scroll key's alternate function is Compare, indicated in orange lettering.
- Release the Shift key ⑨ .
- A flashing C. appears in front of the selected program number in the display ③ .

Example: Program 14 in Compare status



- You will now hear the unedited version when you play your MIDI keyboard.
- Press and hold the Shift key ⑨ and press the Compare key ⑩ again.
- The edited version of the program is now active.

Please note that parameters cannot be edited when the Compare function is active. If you select a new program while the Compare function is active, the Compare status is automatically terminated.

7.6 Deleting Edits

You can void edits at any time and return to the original program.

☞ This is how you delete the edits:

- Press the Shift key ⑨ and hold it down.
- Press the Compare key ⑩ and hold it down.
- After approx. 2 seconds, the C in the display is replaced by P.
- Release the Shift ⑨ and Compare ⑩ keys.

All edits have been deleted and the program is back in its original state.

7.7 Viewing Parameter Values

You can also view the value of a parameter without changing it.

☞ This is how you can check out a parameter value:

- Select the appropriate parameter via the Mode key ⑤.
- To view a parameter that is accessible via an alternate function, briefly press the Shift key ⑨ so that this parameter level's LED ⑥ illuminates.
- Press and hold the Mode key ⑤.
- Turn the parameter's rotary pot ⑧.
- The parameter value appears in the display ③.
  The value does not change when you turn the rotary pot.
- Release the Mode key ⑤.

If the currently active program is in Compare status, the original parameter value will appear in the display when you turn the pot.

8. Sound Parameters

8.1 Overview of Functions

The Waldorf Pulse consists of numerous sound-shaping components. The following overview gives you an idea of how the individual components interact:

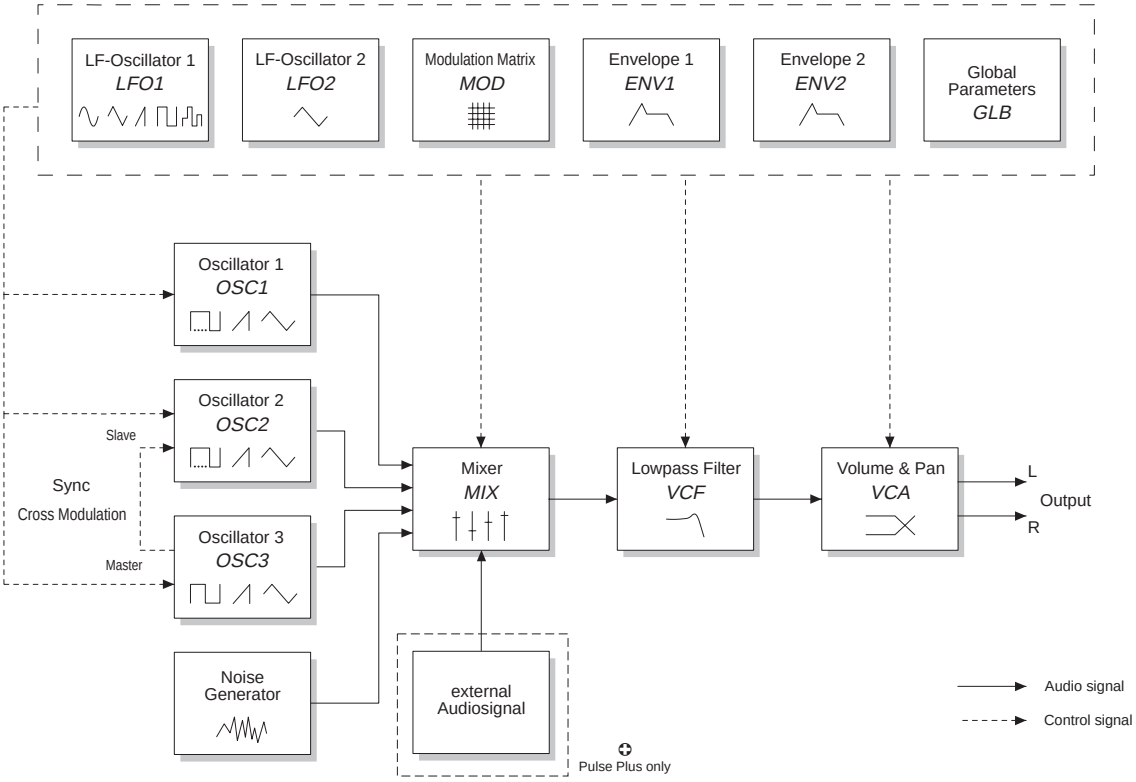


Diagram 4: Block schematic diagram for the Pulse

As you can see, the Pulse consists of two different types of components for sound generation and sound shaping:

- Oscillators, mixer, filter, VCA.
  Sound generation actually occurs within the oscillators. They produce square, sawtooth and triangular waveshapes. The mixer follows the oscillators in the signal chain, which is where the oscillators' output signals are mixed. Pink noise can also be added to the mix. The filter then shapes the sound by amplifying (boosting) or attenuating (dampening) certain frequencies. The VCA is located at the end of the signal chain. It is an amplifier that determines the overall volume and position of the signal within the stereo panorama.
- Modulators: LFOs, Modulation Matrix, Envelopes.
  The modulators are designed to manipulate or modulate the sound generating components to add dynamics to sounds. The low-frequency oscillators (LFOs) are designed for periodic or recurring waveshapes and envelopes for modulations that occur once within a given time frame. These generators are assigned to parameters via the modulation matrix and influence these parameters to alter a sound. Available modulations include pitch, waveshape, volume, filter settings, etc.

⊕ On the Pulse Plus, you can feed in an additional audio signal.

8.2 Oscillators

Oscillators are the heart of every synthesizer. They produce the sound that is later shaped by the filter and other components. The Waldorf Pulse is equipped with three oscillators, each of which has different features.

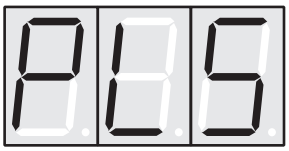
Oscillator 1

Oscillator 1 delivers a periodic oscillation where you can determine waveshape and frequency. The frequency is defined by the pitch of the notes that are sent via MIDI. Maximum pitch is approx. 8,5 kHz. The following parameters are available:

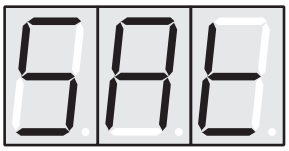
Semitone	-48...+48	Determines the pitch of the oscillator in semitone steps.
Tune	-32...+31	Fine-tunes the oscillator in increments of 64ths of a semitone.

Shape — Determines the type of waveshape to be generated. The following waveshapes are available:

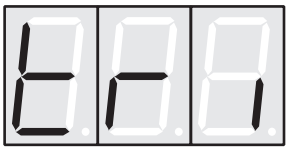
Pulse: square with variable pulsewidth



Sawtooth



Triangle



PW	0...127	Determines the pulsewidth of the square wave. If you select a waveshape other than pulse, than this parameter has no influence on that waveshape.

PW stands for pulsewidth. If you select a square waveshape, you can determine its pulsewidth. The value 0 is equivalent to a pulse ratio of 1%, the value 127 is equivalent to 50%.

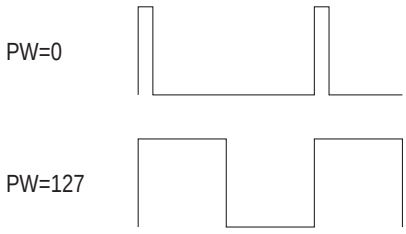
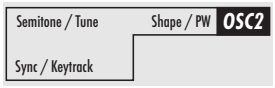


Diagram 5: Pulsewidth Modulation



Oscillator 2

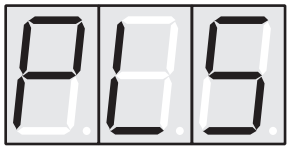
Similar to Oscillator 1, the second oscillator produces oscillations with variable waveshapes and frequencies. Available parameter settings are identical to those of Oscillator 1, with several additional options.

Semitone -48...+48 Determines the pitch of the oscillator in semitone steps.

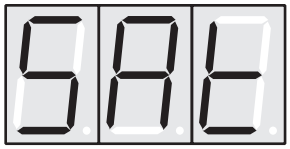
Tune -32...+31 Fine-tunes the oscillator in increments of 64ths of a semitone.

Shape Determines the type of waveshape to be generated.
The following waveshapes are available:

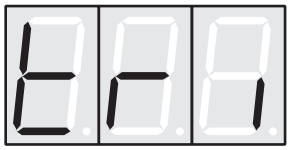
Pulse: square with variable pulsewidth



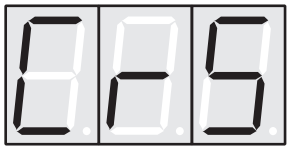
Sawtooth



Triangle



Crossmodulation



Crossmodulation is a XOR combination of the square waveshapes of Oscillators 2 and 3:

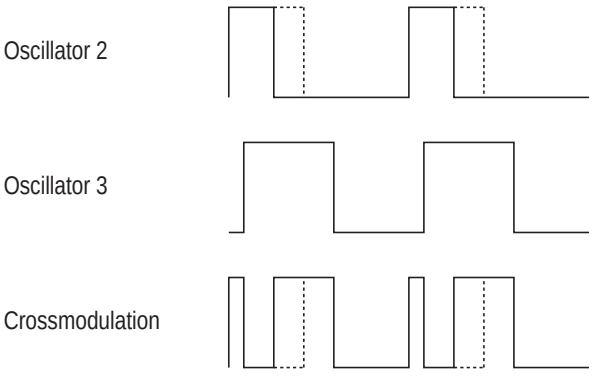


Diagram 6: Crossmodulation

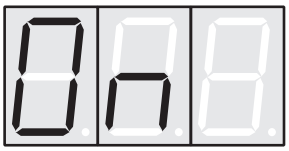
It produces a waveshape that contains the sum of as well as the difference between the two original waveshapes.

Although Oscillator 3's square waveshape is used for crossmodulation, it does not mean that this square waveshape must be used as the source signal. Because the crossmodulation is purely internal, you can select another waveshape for Oscillator 3 if you so desire. Please note that you can also modulate Oscillator 2's pulsewidth at any time. Additionally, you can switch synchronization on and off independently.

PW 0...127 Determines the pulsewidth of the square wave. If you select a waveshape other than pulse, than this parameter has no influence on that waveshape.

Sync Switches synchronization with Oscillator 3 on and off.

Synchronization on



Synchronization off

When the oscillators are in sync, Oscillator 2 is the slave and Oscillator 3 is the master, i.e. Oscillator 3 controls its counterpart. At each new periodic cycle of the master oscillator, the waveshape of the slave oscillator is also started, which leads to interesting effects. These are especially evident when the two oscillators are operating at different frequencies.

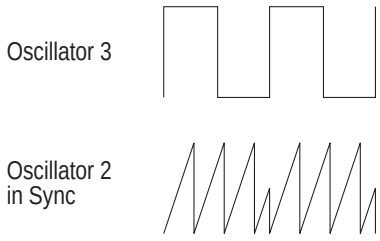
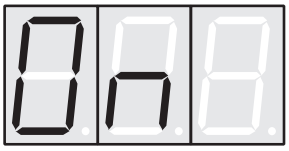


Diagram 7: Oscillator Synchronisation

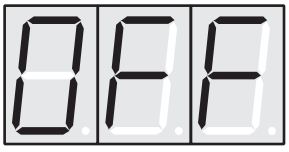
Synchronization is possible with all of Oscillator 2's waveshapes. You can also freely select the waveshape for Oscillator 3.

Keytrack Determines if the pitch of the oscillator is dependent on the MIDI note number.

Pitch changes in proportion to the incoming MIDI notes



The pitch remains at the value you entered for "Semitone" and "Tune", regardless of the note you play.



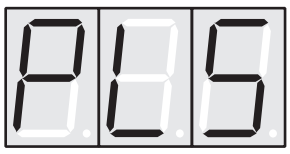
Oscillator 3

Similar to Oscillators 1 and 2, the third oscillator produces oscillations with variable waveshapes and frequencies. However, it does not feature variable pulsewidth. The oscillator's highest frequency lies an octave lower than that of Oscillators 1 and 2, at approx. 4,25kHz.

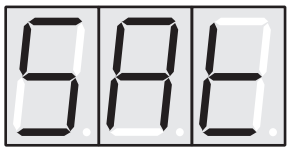
Semitone	-48...+48	Determines the pitch of the oscillator in semitone steps.
Tune	-32...+31	Fine-tunes the oscillator in increments of 64ths of a semitone.

Shape — Determines the type of waveshape to be generated.
The following waveshapes are available:

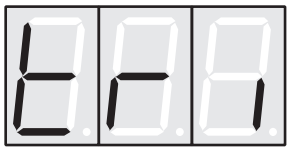
Pulse: square



Sawtooth



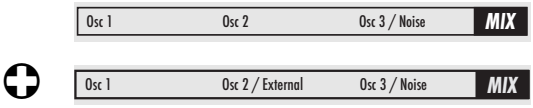
Triangle



Noise Generator

In addition to the oscillators, a noise generator that produces pink noise is available. The noise generator has just one parameter: volume. Volume is determined via the mixer.

8.3 Mixer



The mixer is used to determine volume for the three oscillators and the noise generator.

On the Pulse Plus you can also set the volume of the external audio signal.

Osc1	0...127	Volume of Oscillator 1
Osc2	0...127	Volume of Oscillator 2
Osc3	0...127	Volume of Oscillator 3
Noise	0...127	Volume of the Noise Generator
External	0...127	Volume of the external audio signal

The mixer's output sends the signal to the filter's input. The Pulse is designed to enable you to overdrive this signal. Saturation occurs at the following values:

- If you program a sound using just one oscillator, then the signal is overdriven somewhere in the volume value range of 40.
- If you use more than one oscillator, a volume value of approx. 30 is the overdrive threshold for each oscillator.

The option of overdriving the signal vastly enhances the variety of sounds the Pulse can produce. The Pulse is an analog device, so we can't give you a precise value when a signal will be overdriven. As the volume increases, the signal becomes slightly saturated and flows seamlessly into total disortion.
An overdriven signal has a richer sound, as overtones are added to the clean signal. This is especially interesting in conjunction with sawtooth and triangular waveshapes, as square waveshapes are inherently very similar in structure to other overdriven waveshapes.
Distortion is most audible when you drastically detune several oscillators in relation to each other, especially over a range of several octaves. This effect is even more interesting when you tune the pitch of one oscillator a semitone or several semitones above or below the true octave.

8.4 Low-frequency Oscillators (LFOs)

In addition to the main oscillators, the Pulse is equipped with two low-frequency oscillators which are also used for modulation purposes. The acronym "LFO" has become the standard term for low-frequency oscillators.

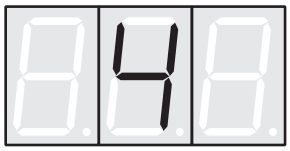
LFO 1

Similar to the oscillators, the first LFO generates periodic waveshapes with variable frequency and waveshape. These are determined by the following parameters:

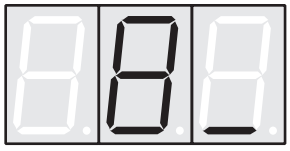
LFO1 Speed 0...127 — Determines the frequency. A value of 0 is equivalent to 0.0008 Hz, i.e. one cycle in two minutes. A value of 127 is equivalent to 261.6 Hz, i.e. the frequency of the middle C on a MIDI keyboard (C3). Within the value range of 16 to 127, the LFO is scaled in semitone increments. For instance the value 115 is equivalent to 130.8 Hz or C2. 10 is equivalent to G1 or 98 Hz.

If you use a MIDI Sync Mode via the LFO1 Shape parameter, you can determine the LFO speed by the note length in a range from thirty-second notes to 8 bars. Also dotted values are availiable. As long as the arpeggiator is active, the LFO will synchronise to the internal clock. However, if the arpeggiator itself is in MIDI Sync, the LFO uses the external clock too.

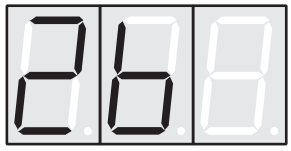
Example: 1/4



Example: 1/8 dotted

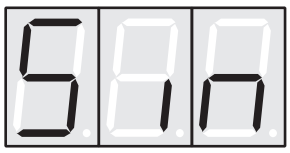


Example: 2 bars

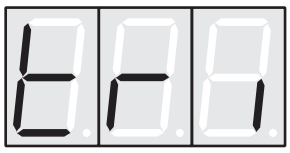


LFO1 Shape Determines the type of waveshape to be generated.

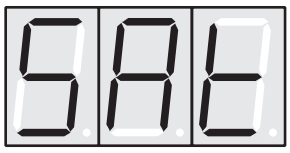
Sine



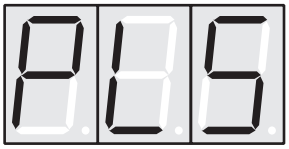
Triangle



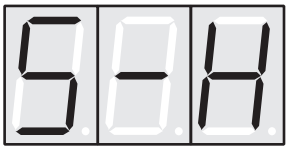
Sawtooth



Pulse



Sample & Hold



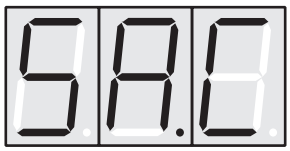
Sample & Hold samples a random value and holds it until the next LFO cycle begins. If LFO1 Speed has a value of 0, then a random value is generated for each new incoming MIDI note.

You can modulate the frequency of LFO 1 while you are playing. For instance, you can use the modulation sources Keytrack and Pitch Follow to change the pitch of the current note via the LFO, just as you would for an oscillator.

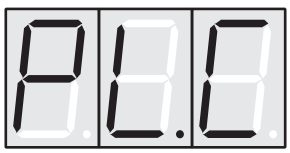
For the waveshapes triangle, sawtooth and pulse there is an additional MIDI Sync Mode, which is used to synchronise the LFO speed to MIDI Clock. Therefore the LFO can follow a given song tempo and all tempo changes are recognised, too.

Triangle with Clock:

Sawtooth with Clock:



Pulse with Clock:



Please read the paragraph about the parameter LFO1 Speed. You'll get some additional information there.

When MIDI Sync is used for the LFO, the speed can not be modulated via the modulation matrix.

LFO 2

The second LFO also generates periodic waveshapes with variable frequency. However, the waveshape is not variable; it is always a triangular wave. As an added feature, this oscillator is equipped with a variable startup delay function.

LFO2 Speed	0...127	Determines the frequency. A value of 0 is equivalent to 0.0008 Hz, i.e. one cycle in two minutes. A value of 127 is equivalent to 261.6 Hz, the frequency of the middle C on a MIDI keyboard (C3). In the value range of 16 to 127, the LFO is scaled in semitone increments. For instance the value 115 is equivalent to 130.8 Hz or C2. 10 is equivalent to G1 or 98 Hz.
LFO2 Delay	1...127	Delays the start of oscillation from 2 milliseconds to one minute after an incoming MIDI note has been received.
	Delay off	

The amount delay before oscillation sets in depends on the parameter setting for Env 1 Trigger Mode; in other words, the trigger mode of the filter envelope. In the two Single Trigger modes, LFO 2 oscillation is not delayed at all when you play legato notes. Use this effect for typical keyboard solos.

8.5 Envelopes

The Pulse's envelopes allow you to manipulate the sound parameters via rate or timed modulations. These envelopes feature ADSR characteristics.

Most analog synthesizers feature ADSR envelopes. These envelopes are made up of four parameters that determine their response: Attack, Decay, Sustain and Release. The following diagrams illustrate the structure of an ADSR envelope:

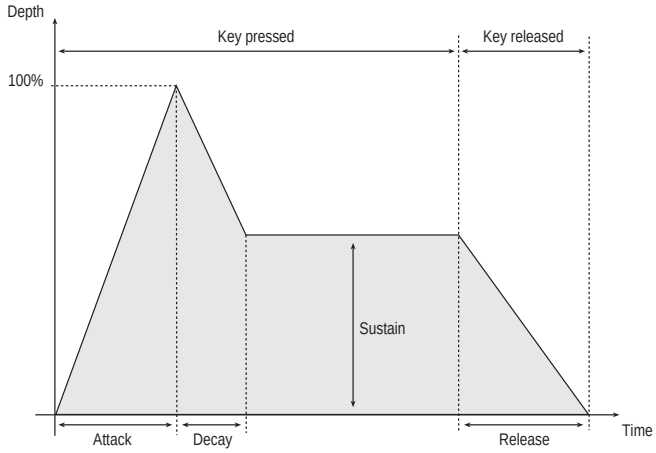


Diagram 8: Structure of an ADSR envelope

The envelope is started by pressing a key. It ascends to its maximum value at the rate determined by the Attack parameter. It then descends at the rate determined by the Decay value until it reaches the predetermined Sustain value. It remains at this value until the key is released. The envelope then descends to zero at the rate determined by the Release parameter.

Envelope 1

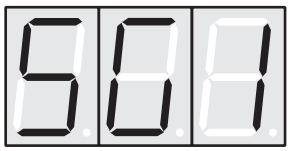
The first envelope is designed to control the filter (VCF) but can also be used for other modulations. The following parameters determine the envelope's response.

Attack	0...127	Determines the attack rate or amount of time it takes for a signal's volume to go from zero to maximum level. A value of 0 is equivalent to less than two milliseconds and 127 is equivalent to approx. 1 minute.
Decay	0...127	Determines the decay rate or amount of time it takes for a signal to reach the sustain phase. The values are the same as for attack. Note that Sustain values near zero reduce the duration of this phase.
Sustain	0...127	Determines the sustain level which is held until a note ends.
Release	0...127	Once the note has ended, the release phase begins. During this phase, the envelope fades to zero at the rate determined by the release value. The values are the same as for attack. Note that a sustain value other than zero reduces the length of this phase.

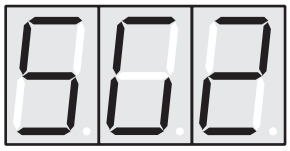
Keytrack	-64...+63	Determines the amount of influence the note number has on the duration of all phases. The duration of phases is not influenced when this value is 0. Positive values have the following effect: all notes higher than E4 (note number 64) increase the duration of the phases proportionally; the notes lower than E4 decrease the duration of the phases. For negative values, notes lower than E4 than produce longer envelopes.

Trigger — Four different types of triggers determine how and when an envelope is started.

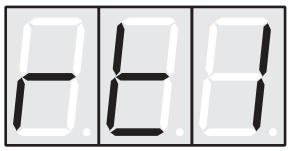
Single Trigger 1:
The first note starts the envelope. All other notes do not restart while a note is sustained. The release phase is not started until all keys are released.



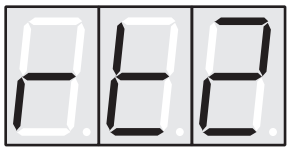
Single Trigger 2:
Essentially the same as Single Trigger 1, except that the envelope is started at the current value rather than reset to zero at every new start.



Retrigger 1:
The envelope is restarted with every incoming note.



Retrigger 2:
The envelope is restarted with every incoming note, but is not reset to zero.



Envelope 2

The second envelope is designed to control the volume (VCA), but can also used for other modulations.

Its parameters are identical to those of Envelope 1.

8.6 Modulations

In this context, modulation can be described as the following process: A modulation source influences a modulation destination. The extent of the modulation, i.e. the amount, is variable. Both the source and amount of the modulation can have positive and negative values. If both values are negative, then the modulation is positive just as the product of two negative numbers is positive when they are multiplied.

The Pulse features different types of modulations:

- Four modulation chains with freely assignable sources, amounts and destinations. The modulation matrix consist of these types of modulations.
- Two modulations with fixed destination: Pitch and Cutoff.
- Additionally, there are several common modulations with fixed destinations and fixed sources, e.g. Note Number (Keytrack) modulates the envelope rate and Envelope 1 modulates the cutoff frequency.

Modulation Matrix

The four freely-assignable modulation units offer the most unusual options. These are edited in the *MOD* group of Parameter Level 4.

Select 1...4 Selects one of the modulation units.

⚠ **Caution:** Select is not a sound parameter and is therefore not stored with a sound program.

Source S.00...S.15 Defines the modulation source. Each source appears as a number in the display. The table below depicts the assignments. This table is also printed on the chassis of the device for easy reference ①.

0	Off	Modulation off
1	LFO1	LFO 1 signal
2	LFO1*Modw.	LFO 1 signal multiplied by the Modulation Wheel value (MIDI Controller 1)
3	LFO1*Aftert.	LFO 1 signal multiplied by the MIDI Aftertouch value
4	LFO2	LFO 2 signal
5	LFO2*Env1	LFO 2 signal multiplied by Envelope 1
6	Envelope 1	Envelope 1 signal
7	Envelope 2	Envelope 2 signal
8	Velocity	MIDI Note Velocity
9	Keytrack	MIDI Note Number
10	Pitch follow	Same as Keytrack, but with portamento and pitchbend
11	Pitchbend	MIDI Pitchbend signal
12	Modwheel	MIDI Modulation Wheel (Controller 1)
13	Aftertouch	MIDI Aftertouch
14	Breath Ctr.	MIDI Breath Control (Controller 2)
15	Control X	Freely assignable MIDI Controller (see Global Parameters)

Table 1: Modulation sources

Amount -64...+63 Determines the amount of modulation in a value range of -64 to +63.

The intensity of the modulation Amount depends on the type of modulation source you select:

- For the so-called unipolar modulation sources Env1, Env2, Modwheel, Aftertouch, Velocity, Breath Control and Control X, the modulation amount lies within the range of 0...1.
- For the so-called bipolar modulation sources LFOs, Keytrack and Pitch Follow, the modulation amount lies within the range of -1...0...+1. Please note that the linked modulation sources LFO1*Modwheel, LFO1*Aftertouch and LFO2*Env1 are also bipolar modulation sources.
- For the modulation sources Keytrack and Pitch Follow, a value of +45 represents 100% of the scale.

The following table illustrates the relationship between the modulation amount and significant musical intervals. For bipolar sources, the interval is doubled.

Interval in semitones	***Interval***	***Mod Amount***
1	small Second	6
2	large Second	8
3	small Mediant	10
4	large Mediant	12
5	small Subdominant	13
6	large Subdominant	14
7	Dominant	15
...	...	...

Table 2: Modulation amount scale

For intervals greater than a fifth (tonic to mediant), the Amount is proportional.

Destination 0...15 Destinations are assigned in the same manner as sources. The available destinations are also printed on the front panel ④.

0	Pitch
1	Osc 1 Pitch
2	Osc 2 Pitch
3	Osc 3 Pitch
4	Pulsewidth 1
5	Pulsewidth 2
6	Osc 1 Level
7	Osc 2 Level
8	Osc 3 Level
9	Noise Level
10	Cutoff
11	Resonance
12	Volume
13	Panning
14	LFO 1 Speed
15	Mod 1 Amount

Table 3: Modulation destinations

Here are some examples of modulation assignments:

No	*Name*	*Route the ModSource to ...**	*... to archieve the following effect:*
1	LFO1	Pitch Mod or Pitch Volume Filter Pulsewidth 1	Pitch vibrato Tremolo effect Auto wah-wah effect Pulsewidth modulation of Oscillator 1
2	LFO1*Modw.	Pitch Mod or Pitch	Classic pitch vibrato controlled via the Modwheel
3	LFO1*Aftert.	Cutoff Volume	Filter frequency modulation, controlled via Aftertouch Controllable via Aftertouch Tremolo effect similar to woodwind instruments
4	LFO2	Pitch Mod or Pitch Pulsewidth 2	Oscillating pitch vibrato Pulswidth modulation of Oscillator 2
5	LFO2*Env2	Panning	Shifting stereo position, intensity controlled by Envelope 2
6	Envelope 1	Pitch Mod or Osc1, 2 or 3 Pitch with negative Amount LFO1 Speed	Gliding pitch Modulates LFO speed
7	Envelope 2	Resonance	Modulates the filter resonance
8	Velocity	Pulsewidth 1 oder 2 Osc2 Pitch in a sync- oder crossmodulations sound	Modulates pulsewidth in response to Velocity Changes the sound- in response to Velocity
9	Keytrack	Osc2 Pitch with negative or positive Amount Panning	Alters the pitch of Oscillator 2, especially interesting with sync or crossmodulation sounds Position of the sound within stereo panorama is determined by the MIDI notes.

Table 4: Examples of modulation assignments

No	*Name*	*Route the ModSource to ...**	*... to archieve the following effect:*
9	Keytrack	LFO1 Speed	The speed of LFO1 is determined by the MIDI notes (increase or decrease). An Amount of +45 is equivalent to a ratio of 1:1 between the LFO speed and a given note.
10	Pitch Follow	Cutoff	Melodically tuned filter; especially interesting at high Resonance settings. The filter frequency also applies to portamento effects.
11	Pitchbend	Osc2 Pitch	A Pitchbend range of 0 for sync or crossmodulation sounds produces interesting tremolo and pitchbend effects.
12	Modwheel	Cutoff	Opening/closing the filter frequency.
		Noise Level	Adds noise to the signal.
		Pulsewidth 1 or 2	Changes the pulsewidth.
13	Aftertouch	Osc 1, 2 or 3 Level	Use Aftertouch to overdrive the oscillators. This sound is similar to the feedback produced by an electric guitar.
		Cutoff	Opens the filter when you press a key with more pressure.
14	Breath Ctr.	Volume	Typical setting for sounds that are played via the Breath Controller.
15	Control X	Resonance	Changes the filter resonance.

* Unless stated otherwise, these examples apply to a positive value for "Amount" (01...63).

Table 4: Examples of modulation assignments (continued)

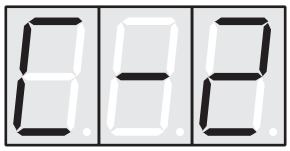
Routing a Modulation Source to CV 2 Out

On the Pulse Plus, one of the 16 modulation sources can be routed to the CV 2 Out jack with variable amount. In this case, the control voltage is treated as a kind of destination in the modulation matrix.

☞ This is how you route a modulation source to CV 2 Out:

- Choose the modulation unit for the control voltage by means of the Select parameter:

Control Voltage CV 2



- Adjust the values for the source and the amount parameters in the same way as it's done at the other modulation assignments.

Pitch Modulation

In addition to the modulation matrix, Pitch Modulation is available as a fixed assignment. This gives you another modulation option without having to assign a matrix path.

Pitch Mod	-64...+63	Determines the amount of modulation.
Source	S.00...S.15	Determines the modulation source. Sources are assigned in the same manner as in the matrix.

Pitchbend

Most MIDI keyboards are equipped with a device that allows you to alter the pitch. These are capable of sending MIDI Pitchbend messages and are usually called pitch wheels or pitch benders.
In the Pulse, Pitchbend messages can be used to modulate the pitch for all oscillators.

Pitchbend Scale	0...24	Determines the intensity of the pitchbend in semitones via the Pitchbend messages.

Portamento

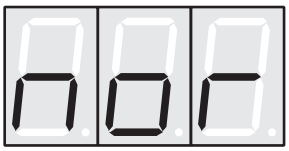
Portamento is a continuous gliding from one note to another as some string and brass instruments are capable of (e.g. trombone). The following two parameters are used to determine the type of portamento the Pulse can produce.

Portamento	1...127	Determines the duration of a glide.

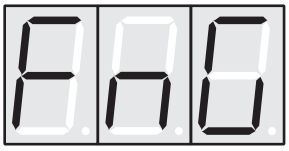
Portamento off

Mode — This parameter determines the type of portamento.

normal: portamento from the previous note to the next.



fingered: portamento on sustained (legato) notes only.



8.7 Filter

Once the audio signal leaves the mixer, it is sent to a variable analog low-pass filter. This filter is a component that has significant influence on the Waldorf Pulse's sound characteristics.

A low-pass filter dampens frequencies that lie above a defined cutoff frequency. Frequencies below this threshold are hardly affected. The frequency range below the cutoff frequency is called the band-pass range, the frequencies above are called the stop-band range. The Pulse's filter dampens stop-band frequencies by 24dB per octave. This means that the volume of a frequency that lies an octave above the cutoff frequency will be 24dB less than those frequencies of the signal that fall into the band-pass range. To give you an idea of the extent of dampening, consider this: A reduction of 24 dB reduces the original volume by approx. 94%. The dampening factor two octaves above the cutoff frequencies reduces the original volume by more than 99%, which in most cases means this portion of the signal is no longer audible. The Pulse's low-pass filter also features a resonance parameter. Resonance in this context means that a narrow frequency band around the cutoff frequency is amplified. If this frequency is amplified to a great extent, then the filter will begin self-oscillation, i.e. the filter oscillates audibly even when it does not receive an incoming signal.

The parameters of the Pulse filter:

Cutoff	0...127	Determines the cutoff frequency. Tuning is scaled roughly in semitone steps. At a value of 57 and a Keytrack value of 32, the filter cutoff frequency is equal to the pitch of a given MIDI note. If the tuning is not scaled correctly, please refer to the chapter about the filter tune function.
Keytrack	-64...+63	Allows the filter cutoff frequency to be influenced by the MIDI note number. Negative values reduce the cutoff frequency, positive values increase it. A value of +32 is a equivalent to a ratio of 1:1, i.e. the filter cutoff frequency changes by an octave for every octave interval you play. A value of +63 is equivalent to a change of 200%, all other values change proportionally, e.g. +16 equals 50%, -32 equals -100% etc.
Env1 Sens	-64...+63	Determines the amount of influence the modulation source Envelope 1 has on the cutoff frequency.
Velo Sens	-64...+63	Determines the amount of influence Envelope 1 has on the filter cutoff frequency based on key velocity.
Cutoff Mod	-64...+63	Determines the amount of modulation.
Source	S.00...S.15	Selects the modulation source. Sources are assigned in the same manner as in the matrix.
Resonance	0...127	Filter resonance parameter.

8.8 VCA

The final component in the Pulse's signal chain is the VCA (voltage-controlled amplifier) The VCA determines master volume and the stereo position. The signal is then sent to the two outputs, where you can patch it to other devices.

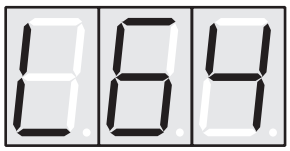
An important factor in understanding how the VCA works is the fact that Envelope 2 is always the volume modulation source. Consequently, if Envelope 2 is closed, the Pulse cannot deliver an output signal.

The VCA is a stereo component, so you can determine the position of the signal within the stereo panorama. You also have the option of a panaroma modulation. For this purpose, you must define the modulation in the modulation matrix.

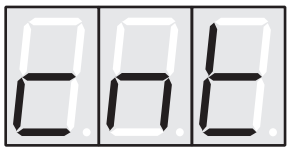
The parameters:

Volume	0...127	Determines the master volume of the sound program.
Velo Sens	-64...+63	Determines the amount of influence key velocity has on the volume.
Panning	L64...R63	Determines the postion of the signal within the stereo panorama. The following illustrations depict the extreme settings. All other values lie within this range.

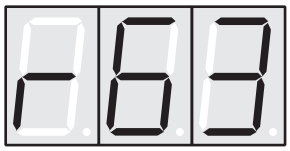
Far left



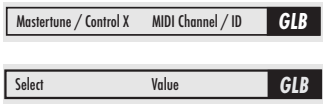
Center



Far right



8.9 Global Parameters



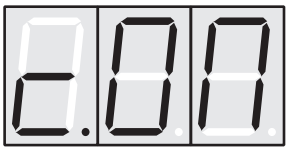
Global parameters are settings that influence the Pulse's general response. These are determined separately from the sound programs and are stored in special memory locations. Global parameters are stored automatically when you modify them, so you are not required to save them separately.

The Pulse Plus has an extended set of global parameters, requiring a different setting procedure. Please read the chapter „Additional Functions of the Pulse Plus“, which contains an overwiew of all global parameters and the setting procedure.

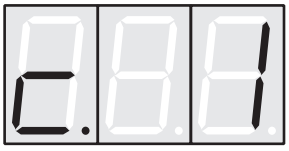
Mastertune	430...450	Determines the Pulse's overall pitch. The reference pitch is A' (MIDI note A3). The preset value is 440 Hz.
Control X	0...127	Control X is used to define a modulation source that is actually a freely assignable MIDI Controller. The parameter determines the MIDI Controller number. Once you have assigned a source, Control X can be used for any modulation destination. The factory preset is 4 (Foot Control).

MIDI Channel Determines the Pulse's send and receive channels.

Omni Mode:
The Pulse receives messages on all 16 channels. Channel 1 is the send channel.

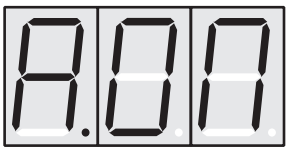


Channel 1...16 for sending and receiving MIDI messages.
Example: MIDI Channel 1

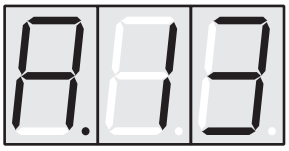


Additionally, there is another mode available where the notes generated by the Arpeggiator and MIDI Clock are sent via MIDI Out.

Arpeggiator Omni Mode:
Signals are received via all channels. Channel 1 is the send channel.



Channels 1...16 are for sending and receiving MIDI messages, to include sending of Arpeggiator notes and MIDI Clock. Example: MIDI Channel 13



The unit is factory-preset to the normal Omni Mode.

ID	0...126	This is where you enter the device identification number for system exclusive data transmission. The factory preset is 0.

9. MIDI Control

This chapter describes the options you have available to control the Pulse via MIDI.

You will find a glossary at the end of the manual. It explains the various terms used herein. If you have any questions about MIDI and MIDI messages, consult the glossary.

9.1 Calling Programs via Program Change

All of the Pulse's sound programs can be called via MIDI Program Change messages. As the device contains 100 program locations, it recognizes program numbers 1...100. Program number 100 is a random program.

The Pulse has a special feature: A sound is not interrupted during program changes. This feature can be used creatively. Please note that a program change takes approx. 40ms.

9.2 Influencing Sounds via Control Change Messages

There are two ways MIDI Controllers influence sounds:

- Controllers can be used as modulation sources.
- Controllers can change sound parameters directly.

Controllers as Modulation Sources

The Controllers Modwheel and Breath Control are always used as modulation sources. The freely definable Control X function can also be used as a modulation source. The X stands for a globally defined Controller number 1...127. The following parameters are suitable for this application:

Cutoff Mod Source, Pitch Mod Source, Mod Unit 1...4 Source

Changing Sound Parameters

Every parameter is assigned a Controller number through which the parameter can be changed. If a parameter is changed at the device, then this change is sent along with the appropriate Controller number via MIDI. This is especially helpful when you want to record changes you made at the Pulse to a sequencer.

All controller messages are sent and received via the channel defined in the MIDI Channel parameter. The appendix of this manual contains a table listing the Controller numbers and the sound parameters they are assigned to.

9.3 Pitchbending

The Pitchbend Scale lets you define to what extent a pitchbend message influences the pitch of the Pulse. Pitchbend is also available as a modulation source.

9.4 Aftertouch as a Modulation Source

Aftertouch and the product of Aftertouch and the LFO1 signal are available as modulation sources in the Pulse. They can used for any application where Control Change messages are accepted.

9.5 System Exclusive Data Transmission

System exclusive data transmission lets you send and receive the contents of the Pulse's memory via MIDI (dump).

The following types of dump are supported:

- Program Dump — Transfer of an individual program
- Program Bulk Dump — Transfer of all sound programs for backup
- Global Parameter Dump — Transfer of the global parameters

The appendix contains a table with detailed information on the diverse dump formats.

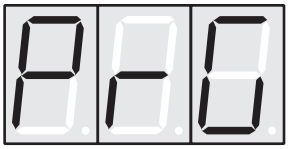
Sending System Exclusive Data

When you activate the send functions, the Pulse sends the contents of its memory to the MIDI Out jack. Using a sequencer, you can record and archive these data.

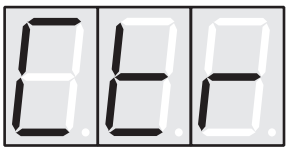
☞ This is how you activate the Dump function:

- Press and hold the Shift key ⑨.
- Press the Mode key ⑤. This key's alternate function, indicated by the orange lettering, is Dump.
- Release the Shift key ⑨.
- Use the Scroll keys ▲ / ▼ ⑩ and ⑪ to select the desired Dump function.

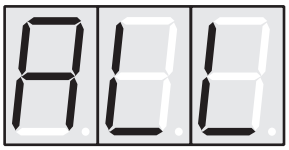
Program Dump:
The current program is sent.



Controller Dump:
Transmits all parameters of the current program as control change messages.



All Dump:
A global parameter dump is sent, followed by a polyphony parameter dump, a CV/Gate interface parameter dump (Pulse Plus only), and a bulk dump for each program.



- Press Dump ⑤ again while holding the Shift key ⑨ down.

ℹ The dump may take a few seconds. The Pulse cannot be played during this time.

Receiving System Exclusive Data

You are not required to activate a special receive mode at the Pulse in order to receive system exclusive data via MIDI. The transmission is activated via a Dump Request command originating at the device that is sending the messages.
However, there are a few steps you must execute prior to the transmission.

☞ This is how you prepare the Pulse for receiving system exclusive data:

- Check out the parameter Device ID. Data transmission will only be executed successfully if the receiver and sender setting coincide.
- Make sure none of the Pulse's programs are in Edit mode. All edits that were not stored prior to the dump will be irretrievably lost!
- Activate the Dump command at the sender device.
- The Pulse will now receive data and store these in its memory.

⚠ **Caution:** Data transfer may take up to 20 seconds, depending on the type of dump. Do not under any circumstances switch the device off, as this can cause total data loss.

The next step depends on the type of dump you are dealing with:

- If you have executed a program dump, than the incoming program is in Edit mode. Use the Store command to save the program in the memory location of your choice.
- All data are stored directly in the appropriate memory locations for a bulk dump and a global parameter dump. You are not required to activate a separate Store command.

When the Pulse receives a Sysex dump with the Device ID 127, it automatically loads this data to its memory regardless of the Device ID the Pulse happens to be set to.
Device ID 127 is a so-called "Broadcast" ID that addresses all connected Pulses.
A checksum of 127 is ignored. In this case, the dump is always accepted as valid.
The Pulse can receive from other devices, but it cannot send a Broadcast ID to other devices. This function is limited to special computer software.

9.6 Controller Dump

The Pulse features a special dump format that allows you to transmit all parameter values as Control Change messages. The Controller number and the Controller value of each sound parameter are sent via the MIDI Out port. This function is designed for pre-initializing editor software, etc. The dump can be activated in two ways:

- From the front panel. Please refer to paragraph "Sending System Exclusive Data" for further information.
- Via MIDI Dump Request. See Appendix for details.

9.7 Panic Function

The Panic function sends and executes an "All Notes Off" command. It is used to terminate stuck notes. To activate this function, simply press the scroll key ▼ ⑪ while holding the Mode key ⑤ down.

9.8 Special Features

The Pulse processes incoming Active Sensing messages in accordance with the MIDI specification. However, Active Sensing messages are not sent.

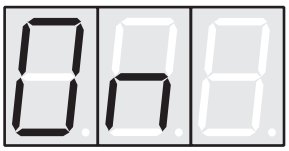
10. The Arpeggiator

An arpeggiator is a device that breaks an incoming MIDI chord down into single notes and plays them rhythmically. Different sequence modes can be defined for the arpeggiator. In addition to the synthesis features, the Pulse is equipped with an arpeggiator. It can be programmed and stored individually for every sound program.

The arpeggiator parameters:

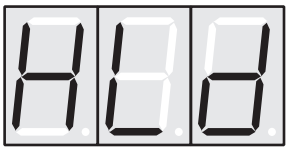
Active Switches the arpeggiator on and off or activates the Hold Mode.

Arpeggiator on



Arpeggiator off

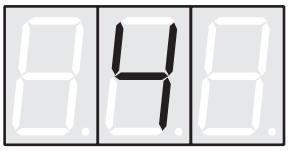
Hold Mode



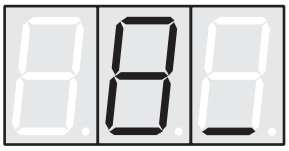
Range 1...10 Determines the range of the single notes in octaves.

Clock 1/1...1/32 Determines the note value for whole notes to thirty-second notes. The basis is a 4/4 beat. Triplets and dotted notes are available for every value.

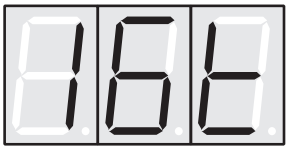
Example: 1/4



Example: 1/8 dotted

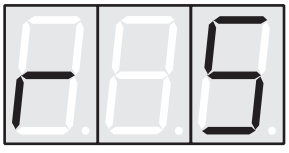


Example: 1/16 triplet



Additionally, the Arpeggiator features 16 preset rhythm patterns. These are entitled r1 through r16.

Example: Rhythm Pattern r5



Here is an overview of the Arpeggiator patterns:

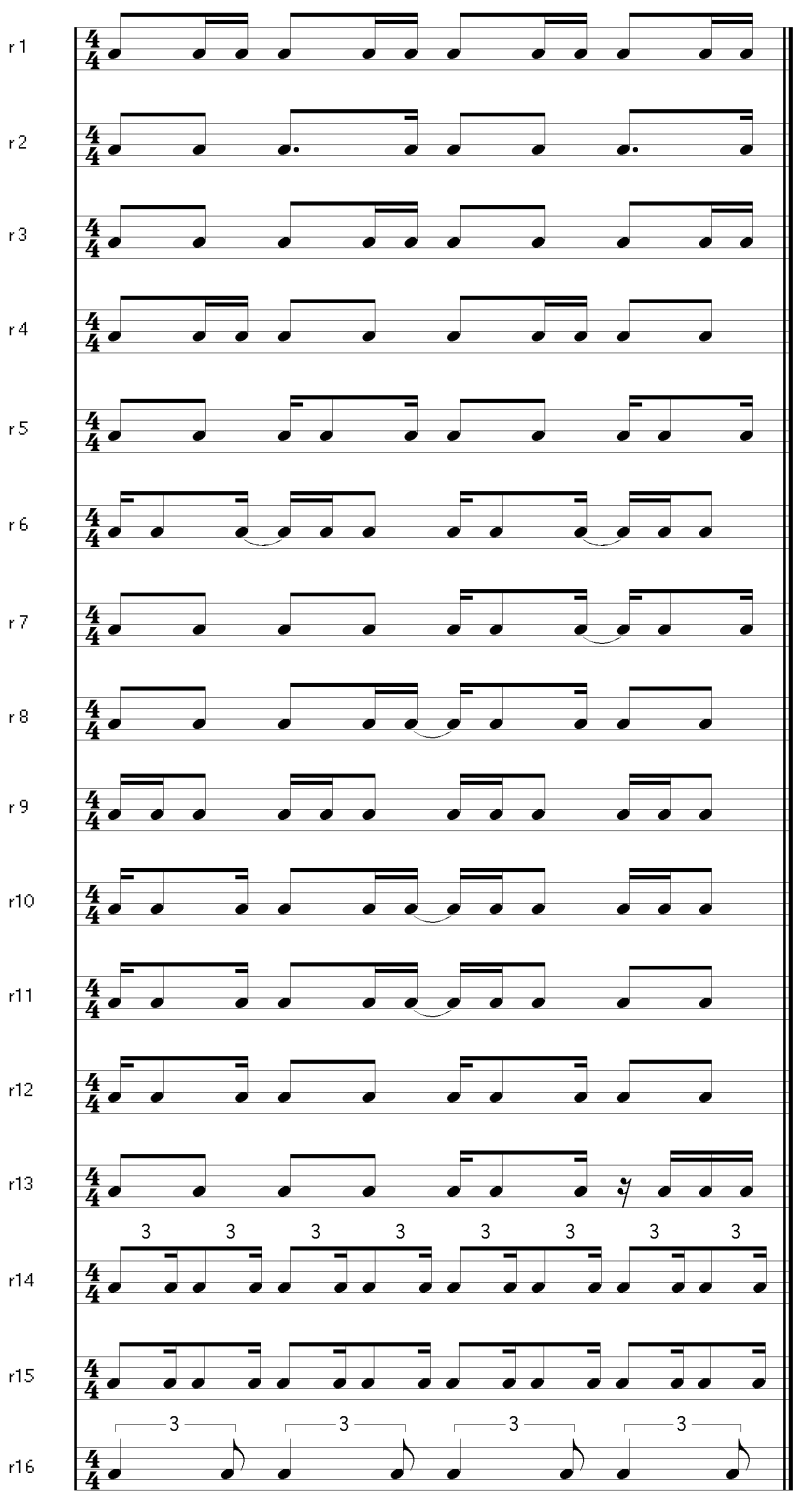
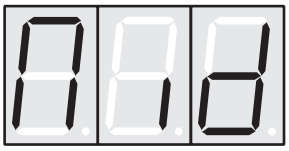


Diagram 9: Arpeggiator patterns

Pattern r15 is a shuffle groove with a swing factor of 58%.

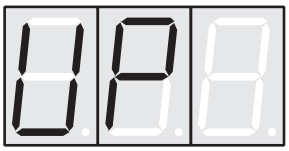
Tempo	48...300	The arpeggiator's basic tempo. Can be defined manually in BPM (beats per minute) or via MIDI Clock.

Synchronization via MIDI Clock

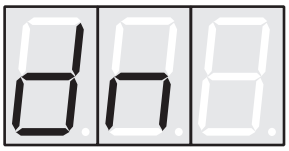


Mode — Selects arpeggiator modes. Determines the sequence of generated notes according to pitch.

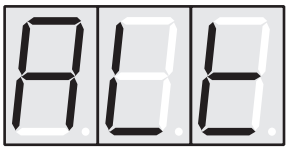
Up



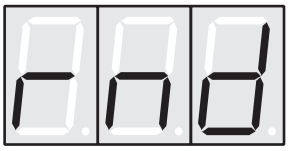
Down



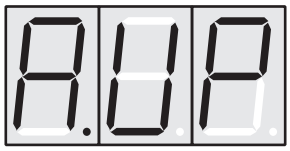
Alternating (up and down)



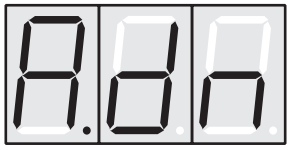
Random



Assign Mode up:
A maximum number of 10 notes will be played upwards, according to their incoming order.



Assign Mode down:
As described above, however notes are played in downwards direction.



Assign Mode alternate:
As described above, however notes are played alternately up and down.

10.1 Arpeggiator Synchronization via MIDI Clock

The Pulse's Arpeggiator can be used as a master as well as a slave via the MIDI Clock:

- When you use the Arpeggiator as the master, set its speed via the "Tempo" parameter. The "Global MIDI Channel" parameter must then be set to a value within the range of A.01...A.16 or A.on. The Pulse will send the Arpeggiator notes and the MIDI Clock signal via MIDI Out.
- When you use the Arpeggiator as a slave, an external device (e.g. sequencer) determines the tempo of the Arpeggiator. Set the "Tempo" parameter to "Mid" as described above. Here too notes and MIDI Clock information can be activated to control other devices. In this mode, the MIDI Song Position Pointer is also recognized.

10.2 The Hold Mode

If you set the Active parameter to Hld, the Arpeggiator is in Hold mode. This means that the incoming MIDI chords generate continuous arpeggios. The Pulse will continue to do so until you play a new chord or set the parameter back to Off or On. You can also stop the arpeggiator by performing the panic function or sending an All Notes Off message from your sequencer.

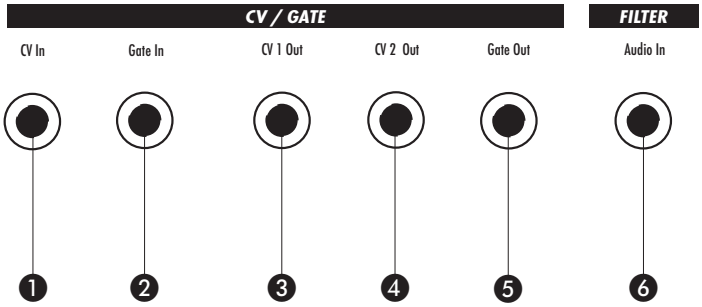
11. Additional Functions of the Pulse Plus

The Pulse Plus has some additional features for connecting external devices. The extension consists of:

- An audio input for feeding in external signals
- A CV/Gate interface for connecting analog synthesizers

11.1 Connections

The following additional jacks are located on the rear panel of the Pulse Plus.



❶ CV In Jack

❷ Gate In Jack

❸ CV 1 Out Jack

❹ CV 2 Out Jack

❺ Gate Out Jack

❻ Audio In Jack

Abb. 10: Additional Connectors of the Pulse Plus

⚠ **Caution:** Before connecting external components, please make sure that these units are compatible with the technical specification listed in the appendix. Waldorf Electronics is not responsible for any kind of damage on the Pulse or connected devices caused by improper use.

11.2 Audio Input

Via the Audio In jack ❻ an external audio signal can be fed into the mixing section. Therefore it's possible to process the signal by the filter and the VCA. The volume of the fed in signal is determined by the parameter External of the parameter group *MIX* .

Please keep in mind, that an incoming signal can get to the output section only when the VCA is triggered. This means that the volume envelope *ENV2* has to be started by an MIDI note. This can be archived by playing on a keyboard or by activating the built-in arpeggiator.
For this reason, please check the MIDI connections and signal flow first, when you are not able to hear to external audio source.

Like all other sound parameters, the External value is saved when you store it's corresponding program. It's also possible to use a MIDI Controller to change it.

The sensitivity of the audio input is designed as follows: At a setting of 127 for External, a signal level of about 250mVeff (about -10dBV, = 0dB semiprofessional level) can be processed with out any audible distortion. Up to 1Veff signal level can be used in this way by reducing the External setting. Higher level always cause distortion.

11.3 CV/Gate Interface

Via the CV/Gate interface analog synthesizers can be connected to the Pulse Plus. By offering input and outputs, the Pulse can control a device on one hand, on the other hand, it can be controlled by a external device. There are also two ways of using the interface: in combination with the internal sound generation or without.

In detail the following connectors are availiable:

- 1 control voltage input CV In ❶
- 1 gate input Gate In ❷
- 2 control voltage outputs CV 1 Out ❸ and CV 2 Out ❹
- 1 gate output Gate Out ❺

Via the inputs CV In ❶ und Gate In ❷ the control voltage of an external keyboard or synthesizer can be transformed into MIDI data. The notes generated on this way can be used to trigger the sound generation of the Pulse. Also they can be sent out at the MIDI Out jack for recording and postprocessing.

The output stage of the interface has two seperate connectors, which are designed for different purposes:
The control voltage at CV 1 Out ❸ is following the pitch. It can be scaled linear or logarithmic and is intended to be used for controlling oscillating devices.
CV 2 Out ❹ is an additional control voltage output for modulation controls. It can be routed to a choosable modulation source of the Pulse. A possible application for using this output is controlling the cutoff frequency of a connected synthesizer.

Gate In ❷ and Gate Out ❺ have a separately switchable polarity parameter. At the output the level can be switched between 5V and 12V. This provides the most possible flexibility.

The parameter setting of the CV/Gate interface consists of two main areas:

- Sound parameters for modulation assignment: CV 2 Source and CV 2 Amount. They are stored in their corresponding program. Please read the chapter „Modulation“ to get more information.
- Global parameters for configuration and adjustment: CV/Gate Channel, CV In Adjust, CV In Transpose, Gate In Polarity, Gate Out Polarity, CV Out Curve, CV Out Adjust, CV Out Offset. They are not depending on the programs.

For troublefree operation of the interface, the proper setting of the discribed global parameters is required.

You can also use a foot switch at Gate In ❷ to trigger the interface. Use a stereo phone jack with the following wiring: Tip and Ring connected (Ring is pulled up to +5V-Level), Switch between Tip/Ring and Ground. In this case the parameter Gate In Polarity should be set to up.

11.4 Global Parameters

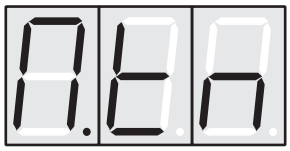
Setting

According to the extended number of global parameters on the Pulse Plus, a different setting procedure is required.

☞ This is how you make changes to the global parameters:

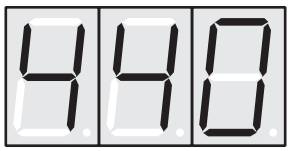
- Press the Mode key ⑤ repeatedly until the LED ⑥ next to parameter group *GLB* (Line 4) illuminates.
- Turn the rotary ⑧ below the parameter Select (knob 5).

The display now shows the code of the currently chosen parameter.
Example: Mastertune



- To change the chosen parameter, turn the rotary ⑧ below Value (knob 6).

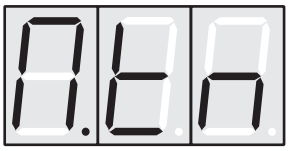
The display now shows the value of the desired parameter.
Example: 440Hz for Mastertune



- If you want to setup more global parameters, just repeat the last two steps.

MIDI-/System Parameters

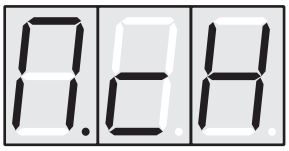
Mastertune



Mastertune of the Pulse. The reference pitch is A' (MIDI note A3).

430...450Hz Preset value is 440Hz

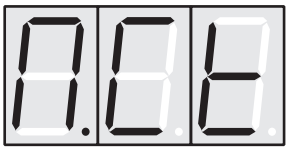
MIDI Channel



Determines the Pulse's send and receive channel.

Omni, 1...16, Arp. Omni, A1...16

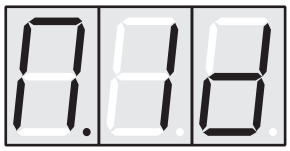
MIDI Control X



No. of the free assignable Controller, used as modulation source Control X.

0...126

MIDI Device ID

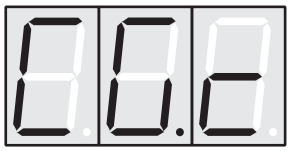


Device-ID for system exclusive data transmission.

0...126 Preset value is 0

CV/Gate Parameters

CV/Gate Channel

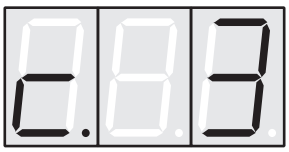


MIDI send and receive channel for the CV/Gate interface

Off, 1...16

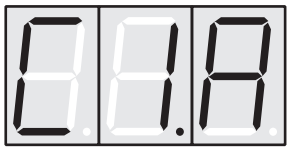
Off

Example: Channel 3



When this parameter is set to Off, the Pulse sends out the played notes via CV 1 Out ❸ and Gate Out ❺. An incoming control voltage at CV In ❶ and Gate In ❷ triggers the sound generation of the Pulse.
When the parameter is set to 1...16, the CV/Gate interface is operating independently. Received notes on the selected Channel are sent out as control voltages via CV 1 Out ❸ and Gate Out ❺. Incoming control voltages at CV In ❶ and Gate In ❷ are transformed into notes and sent on the selected channel. The internal sound generation will not be affected.

CV In Adjust

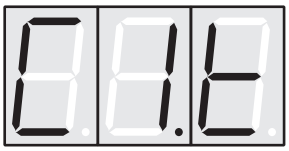


Adjust parameter for the CV In input.

-64...+63

To proceed the adjustment, connect the CV output of the keyboard to the CV In input ❶ of the Pulse. Connect the Gate jacks in the same way. Now adjust the parameter to a value, that causes the Pulse to generate a proper tune on the played notes.
Please note that the CV In input can operate with linear scaled control voltages of 1V/Octave only.

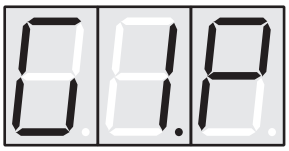
CV In Transpose



Determines the tranposition of the notes received via CV In.

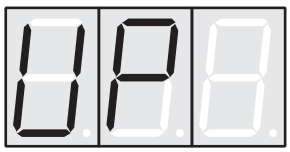
-36...+36

Gate In Polarity

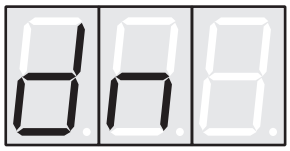


Determines the active polarity of the Gate In input.

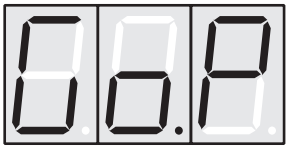
positive (high level):



negative (low level):

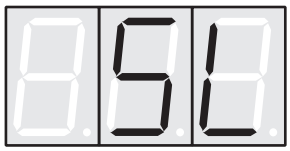


Gate Out Polarity

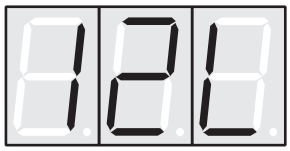


Determines the active level and polarity of the Gate Out output.

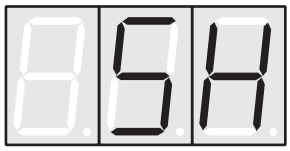
5V, active low:



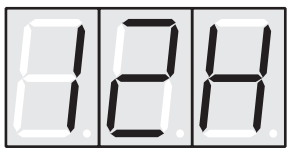
12V, active low:



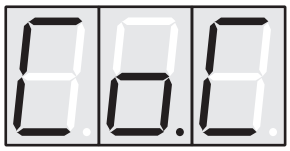
5V, active high:



12V, active high:

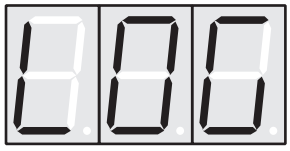


CV Out Curve

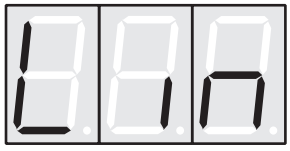


Determines the scaling method of the CV 1 output.

Logarithmic (1V/Octave):

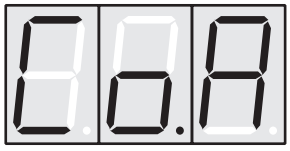


Linear (V/Hz):



Please note, that the scaling method is depending on the type of connected synthesizer. When using the wrong setting, the adjustment described below can not be proceeded correctly.

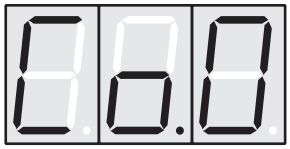
CV Out Adjust



Adjust parameter for the CV 1 Out output (Spread).

-64...+63

CV Out Offset



DC Offset for CV 1 Out and CV 2 Out.

-64...+63

To proceed the adjustment, connect the CV Out 1 output ❸ of the Pulse to the CV input of the synthesizer. Connect the Gate jacks in the same way. What to do next depends on the scaling method of the output signal, which is controlled by the parameter CV Out Curve:

- On linear scaling, first set both CV Out Adjust and CV Out Offset to 0. Now change the spread via CV Out Offset until the synthesizer plays a tempered scale. Then tune the absolute pitch via CV Out Adjust.
- On logarithmic scaling, first adjust the spread via CV Out Adjust. Then use CV Out Offset to fine tune the pitch.

The parameters of the CV/Gate interface can be transmitted as a seperate sysex dump. By forcing an All Dump manually or via a Dump Request message, the CV/Gate Interface Parameter Dump will be transmitted. The corresponding data format is described in the appendix.

12. Stacking two or more Pulses

The Pulse offers a special function that makes it possible to combine two or more Pulses and play them polyphonically.

The basic steps for achieving this are:

- Make sure all Pulses have a software release 2.00 or higher
- Connect all Pulses' audio outputs to a mixer or a summing amp
- Chain all Pulses via MIDI thru/in just like normal synthesizers
- Set all Pulses to the same MIDI channel
- Assign each Pulse a unique identification.

Assigning a unique Identification to each Pulse

To ensure proper operation, each Pulse must have a unique indentification number.

☞ This is how you set each Pulse's identification number:

- Press and hold the Shift key ⑨.
- Press the Mode key ⑤. This key's alternate function, indicated by the orange lettering, is Dump.
- Release the Shift key ⑨.
- Use the Scroll keys ▲ / ▼ ⑩ and ⑪ until the display shows alternating: "`1 of 1`". This means "I am Pulse #1 of a stack of #1 Pulses". This is the same as one monophonic Pulse.
- Use the both leftmost rotary pots to alter these values. In case you have three Pulses, the display must show this:

Pulse #1:	`1 oF 3`	(Pulse #1 of 3)
Pulse #2:	`2 oF 3`	(Pulse #2 of 3)
Pulse #3:	`3 oF 3`	(Pulse #3 of 3)

or in case you have five, they should show this:

Pulse #1:	`1 oF 5`	(Pulse #1 of 5)
Pulse #2:	`2 oF 5`	(Pulse #2 of 5)
Pulse #3:	`3 oF 5`	(Pulse #3 of 5)
Pulse #4:	`4 oF 5`	(Pulse #4 of 5)
Pulse #5:	`5 oF 5`	(Pulse #5 of 5)

- Press Dump ⑤ again while holding the Shift key ⑨ down in order to synchronize the voice allocation.

Playing the polyphonic Stack

For the first try, select a sound program that has no arpeggiator active, same for all Pulses (e.g. factory preset #51). By sending MIDI data, you are now finally ready to play a polyphonic stack of Pulses. Each Pulse will play one note of an incoming chord.

Editing Sound Parameters for the whole Stack

You will notice, that as soon as you edit one of your Pulses, the sound will only change for that particular voice. There are two ways to get around this:

- If you use a computer, connect the MIDI out from one of your Pulses, but **not** the first one marked " `1 oF` ...“, to a MIDI input of your computer and merge the controller data to the MIDI output that goes to the other Pulses. In case of Program Change, be sure all Pulses contain the same soundset or send the new sound as SysEx or as Controller dump from this special Pulse.
- If you do not use a computer or you have no more MIDI input, simply connect **MIDI in** of the second Pulse to **MIDI out** of the first one instead of MIDI thru. The received Notes, Pitch-Bend messages and Controller data are also sent to MIDI out of the first Pulse. In addition, on each Program Change, the first Pulse sends the new patch either as controller data or, if it is a factory preset, as a Program Change message. This way, all editing, Program selecting is done by the first Pulse and all others are always playing exactly the same sound. Be sure to have Arpeggiator Note sending disabled, this will destroy the voice allocation. If, for any reasons, some Notes are playing on two Pulses and others are not playing at all, the voice allocation is confused. Simply execute the Panic Function on the first Pulse, this will send some All-Notes-Off messages and all Pulses will reinitialize their voice allocation.

13. Tips and Tricks

Here are a few tips that will help you make the most of your Pulse.

- The lower the input signal, the greater the effect the filter has on the overall sound. If you want a heavily filtered sound, set the oscillators' volume parameters to low values in the mixer. On the other hand, high oscillator levels produce purer sounds.
- If you want a more aggressive sound, simply turn up the oscillator volume levels so that they are just below the saturation point. The mixer's output signal will crosstalk with the filter frequency and produce a rougher sound.
- You can achieve typical analog synthesizer distortion by overloading the connected mixing console's input. You can also experiment by patching effects processors between the Pulse and your mixer.
- Try using an LFO to modulate the panorama position. This produces interesting stereo effects, especially at high LFO frequencies.
- The Pulse's output signal is not interrupted when you change programs. Try exploiting this feature by using MIDI program change messages to line up a series of different sounds.
- Change the relative pitches of the oscillators at musical intervals. Thirds (mediant), fifths (dominant) and sevenths (subtonic) are suitable for this application.
- Self-oscillation of the filter at high resonance values produces sounds that are great for soloing.
- Modulate the oscillator's pitch drastically so that the upper frequency threshold is exceeded. This will produce interesting results.
- Program a pitch modulation in musical intervals. The section entitled "Modulations" contains an assignment table listing the Mod Amount parameters and the corresponding semitone intervals. For example, you can modulate from a major chord to a minor chord via the mod wheel.
- Assign a Keytrack modulation to the LFO speed. It should modulate the LFO in proportion to the incoming note. You can thus achieve even frequency fluctuations over a wide range of your keyboard.
- Modulate the pitch of an oscillator via Keytrack. Set the modulation "Amount" so that this value is numerically equal to the "Tune" value of the oscillator, but make one value positive and the other negative. This generates frequency fluctuations that oscillate at the same speed throughout the range of the keyboard. Experiment with different Amount values by alternating low and high notes.

14. Trouble-Shooting

If you run into any problems with your Pulse, please consult the checklist below. Many perceived errors are just minor oversights that can be corrected quickly. If you still can't solve the problem, please contact a qualified repair center or Waldorf Product Support. The address and telephone number are printed on the warranty card.

Error	Corrective Action
The device does not respond to MIDI data.	Check the MIDI channel setting in the MIDI Channel parameter. Note that this parameter is a global parameter and consequently pertains to all programs
The device does not respond properly to the parameter values you have entered, e.g. the filter significantly dampens the signal even at maximum cutoff setting.	Make sure a modulation is not influencing a parameter. In this example, an envelope with a negative modulation value could be lowering the filter cutoff frequency.
The filter is not tuned properly.	Ensure the parameter values for the filter's Cutoff and Keytrack are correct. If you cannot correct the error, call up the Filter Tune function.
Pulse Plus only: The Pulse is playing after powering up or notes are hanging.	Change the setting of the Gate In Polarity parameter.

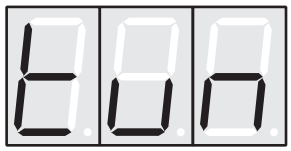
14.1 Tuning the Filter

The filter is tuned at the factory prior to shipping and, as a rule, is very stable. However, the Pulse is an actual analog synthesizer, so diverse factors may cause slight tuning problems. Therefore we recommend that you re-calibrate it from time to time. On demand, the Pulse executes this function automatically.

☞ This is how you activate the Filter Tune function:

- Press the Shift key ⑨ and hold it down.
- Briefly press the Mode key ⑤. You are now at level at which Sysex data transfer is executed. The Filter Tune function is also located here.
- Release the Shift key ⑨.
- Use the scroll key ▲ ⑩ to call up the Filter Tune function. It is located right after the All Dump function.

Filter Tune:



- Press Dump ⑤ again while holding the Shift key ⑨ down.

The filter is tuned automatically.

This process can take up to 30 seconds. The following functions are executed:

- First, the filter is tuned to its fundamental frequency. This means the filter is adjusted to 440Hz at maximum oscillation of the resonance frequency. The display indicates the current value for the filter cutoff frequency.
- Then the filter is tuned an octave above the fundamental frequency, i.e. to 880Hz.

The Pulse's audio output is switched off during the filter tuning process. Once the filter has been tuned properly, the Pulse is ready to be played.
The Filter Tune function can also be activated via a MIDI Tune Request command. Conversely, the Pulse sends a MIDI Tune Request when the "Tune" function is activated.

Appendix

(A) Technical Data

Power Supply

Nominal voltage:	DC 12V
Maximum current consumption:	500mA
Maximum power consumption:	6W

Audio Outputs

Nominal level:	+4dBV
Maximum level:	+14dBV
Signal-to-noise ratio:	~ -80dBV

Dimensions and Weight

Width:	483mm
Height:	89mm
Depth (w. control features):	83mm
Total weight:	2,7kg

Pulse Plus

Audio Input

Nominal level:	0dBV
Input impedance:	1MOhm

CV Input

Max. input level:	0...+5V
Input impedance:	1MOhm

Gate Input

Input level:	0...+12V
Input impedance:	100kOhm

CV Output

Output level:	-0,5...+5,5V
Output impedance:	250Ohm

Gate Output

Output level:	0...+11V
Output impedance:	250Ohm

(B) MIDI Controller Assignments

Contr. No.	Range	Parameter	Value Range
1	0...127	Mod Wheel	0...127
2	0...127	Breath Control	0...127
5	0...127	Portamento Time	0...127
7	0...127	Main Volume	0...127
10	0...127	Panning	L64...R63
14	0...127	Env1 Attack	0...127
15	0...127	Env1 Decay	0...127
16	0...127	Env1 Sustain	0...127
17	0...127	Env1 Release	0...127
18	0...127	Env2 Attack	0...127
19	0...127	Env2 Decay	0...127
20	0...127	Env2 Sustain	0...127
21	0...127	Env2 Release	0...127
⊕ 22	0...15	CV 2 Source	see Table
⊕ 23	0...127	CV 2 Amount	-64...+63
24	0...127	LFO1 Speed	0...127
25	0...7	LFO1 Shape	0: Sine 1: Triangle 2: Sawtooth 3: Pulse 4: Sample & Hold 5: Triangle Sync 6: Sawtooth Sync 7: Pulse Sync
26	0...127	LFO2 Speed	0...127
27	0...127	LFO2 Delay	0...127
28	0...127	Env1 Keytrack	-64...+63
29	0...3	Env1 Trigger	0: Single-Trigger 1 1: Single-Trigger 2 2: Retrigger 1 3: Retrigger 2
30	0...127	Env2 Keytrack	-64...+63
31	0...3	Env2 Trigger	0: Single-Trigger 1 1: Single-Trigger 2 2: Retrigger 1 3: Retrigger 2

	32	16...112	Osc1 Semitone	-48...+48
	33	0...127	Osc1 Tune	-32...+31
	34	0...2	Osc1 Shape	0: Pulse 1: Sawtooth 2: Triangle
	35	0...127	Osc1 PW	0...127 0: 1% 64: 25% 127: 50%
	36	16...112	Osc2 Semitone	-48...+48
	37	0...127	Osc2 Tune	-32...+31
	38	0...3	Osc2 Shape	0: Pulse 1: Sawtooth 2: Triangle 3: Cross Modulation
	39	0...127	Osc2 PW	0...127 0: 1% 64: 25% 127: 50%
	40	0...1	Osc2 Keytrack	0: off 1: on
	41	0...1	Osc2 Sync	0: off 1: on
	42	16...112	Osc3 Semitone	-48...+48
	43	0...127	Osc3 Tune	-32...+31
	44	0...2	Osc3 Shape	0: Pulse 1: Sawtooth 2: Triangle
	45	0...127	Osc1 Level	0...127
	46	0...127	Osc2 Level	0...127
	47	0...127	Osc3 Level	0...127
	48	0...127	Noise Level	0...127
⊕	49	0...127	External Signal Level	0...127
	50	0...127	Cutoff Frequency	0...127
	51	0...127	Cutoff Keytrack	-64...+63
	52	0...127	Cutoff Env1 Sens	-64...+63
	53	0...127	Cutoff Velo Sens	-64...+63
	54	0...15	Cutoff Mod Source	see Table
	55	0...127	Cutoff Mod Amount	-64...63
	56	0...127	Resonance	0...127
	57	0...127	Volume	0...127
	58	0...127	Volume Velo Sens	-64...+63

60	0...15	Pitch Mod Source	see Table
61	0...127	Pitch Mod Amount	-64..+63
62	0...1	Portamento Mode	0: normal 1: legato
63	0...24	Pitchbend Scale	0...24
64	0...127	Sustain Switch	0...127
102	0...2	Arpeggiator Active	0: off 1: on 2: Hold
103	0...9	Arpeggiator Range	1...10
104	0...31	Arpeggiator Clock	see Table
105	0...127	Arpeggiator Tempo	0: external 1...127: 48...300 BPM
106	0...6	Arpeggiator Mode	0: up 1: down 2: alternating 3: random 4: Assign up 5: Assign down 6: Assign alternating
108	0...15	Mod Unit 1 Source	see Table
109	0...127	Mod Unit 1 Amount	-64...+63
110	0...15	Mod Unit 1 Destination	see Table
111	0...15	Mod Unit 2 Source	see Table
112	0...127	Mod Unit 2 Amount	-64...+63
113	0...15	Mod Unit 2 Destination	see Table
114	0...15	Mod Unit 3 Source	see Table
115	0...127	Mod Unit 3 Amount	-64...+63
116	0...15	Mod Unit 3 Destination	see Table
117	0...15	Mod Unit 4 Source	see Table
118	0...127	Mod Unit 4 Amount	-64...+63
119	0...15	Mod Unit 4 Destination	see Table
121	0	Reset All Controls	
123	0	All Notes Off	

(C) System Exclusive Data Format

Program Dump

Byte No	Value	Parameter	Description/Range
0	$F0	Exclusive Status	SysEx transfer start
1	$3E	Manufacturer ID	Waldorf Electronics GmbH
2	$0B	Model ID	Pulse ID
3	0...126	Device ID	Equivalent to the global parameter device ID
4	$00	Function Code	Dump type, in this case program dump
5	0...99	Program No	P.1 ... P.99 / P.rn
6	16...112	Osc1 Semitone	-48...+48
7	0...127	Osc1 Tune	-32...+31
8	0...2	Osc1 Shape	0: Pulse 1: Sawtooth 2: Triangle
9	0...127	Osc1 PW	0...127
10	16...112	Osc2 Semitone	-48...+48
11	0...127	Osc2 Tune	-32...+31
12	0...3	Osc2 Shape	0: Pulse 1: Sawtooth 2: Triangle 3: Cross Modulation
13	0...127	Osc2 PW	0...127
14	0...1	Osc2 Keytrack	0: off 1: on
15	0...1	Osc2 Sync	0: off 1: on
16	16...112	Osc3 Semitone	-48...+48
17	0...127	Osc3 Tune	-32...+31
18	0...2	Osc3 Shape	0: Pulse 1: Sawtooth 2: Triangle
19	0...127	Osc1 Level	0...127
20	0...127	Osc2 Level	0...127
21	0...127	Osc3 Level	0...127
22	0...127	Noise Level	0...127
23	0...127	LFO1 Speed	0...127
24	0...7	LFO1 Shape	0: Sine 1: Triangle 2: Sawtooth 3: Pulse 4: Sample & Hold 5: Triangle Sync 6: Sawtooth Sync 7: Pulse Sync
25	0...127	LFO2 Speed	0...127
26	0...127	LFO2 Delay	0...127

27	0...127	Env1 Attack	0...127
28	0...127	Env1 Decay	0...127
29	0...127	Env1 Sustain	0...127
30	0...127	Env1 Release	0...127
31	0...127	Env1 Keytrack	-64...+63
32	0...3	Env1 Trigger	0: Single-Trigger 1 1: Single-Trigger 2 2: Retrigger 1 3: Retrigger 2
33	0...127	Env2 Attack	0...127
34	0...127	Env2 Decay	0...127
35	0...127	Env2 Sustain	0...127
36	0...127	Env2 Release	0...127
37	0...127	Env2 Keytrack	-64...+63
38	0...3	Env2 Trigger	0: Single-Trigger 1 1: Single-Trigger 2 2: Retrigger 1 3: Retrigger 2
39	0...127	Pitch Mod Amount	-64..+63
40	0...15	Pitch Mod Source	see Table
41	0...127	Portamento Time	0...127
42	0...1	Portamento Mode	0: normal 1: legato
43	0...24	Pitchbend Scale	0...24
44	0...15	Mod Unit 1 Source	see Table
45	0...127	Mod Unit 1 Amount	-64...+63
46	0...15	Mod Unit 1 Destination	see Table
47	0...15	Mod Unit 2 Source	see Table
48	0...127	Mod Unit 2 Amount	-64...+63
49	0...15	Mod Unit 2 Destination	see Table
50	0...15	Mod Unit 3 Source	see Table
51	0...127	Mod Unit 3 Amount	-64...+63
52	0...15	Mod Unit 3 Destination	see Table
53	0...15	Mod Unit 4 Source	see Table
54	0...127	Mod Unit 4 Amount	-64...+63
55	0...15	Mod Unit 4 Destination	see Table

	56	0...2	Arpeggiator Active	0: off 1: on 2: Hold
	57	0...9	Arpeggiator Range	1...10
	58	0...31	Arpeggiator Clock	see Table
	59	0...127	Arpeggiator Tempo	0: external 1...127: 48...300 BPM
	60	0...6	Arpeggiator Mode	0: up 1: down 2: alternating 3: random 4: Assign up 5: Assign down 6: Assign alternating
	61	0...127	Cutoff Frequency	0...127
	62	0...127	Cutoff Keytrack	-64...+63
	63	0...127	Cutoff Env1 Sens	-64...+63
	64	0...127	Cutoff Velo Sens	-64...+63
	65	0...15	Cutoff Mod Source	see Table
	66	0...127	Cutoff Mod Amount	-64...+63
	67	0...127	Resonance	0...127
	68	0...127	Volume	0...127
	69	0...127	Volume Velo Sens	-64...+63
	70	0...127	Panning	L64...R63
⊕	71	0...127	External Signal Level	0...127
⊕	72	0...15	CV 2 Source	see Table
⊕	73	0...127	CV 2 Amount	-64...+63
	74	0	reserved	
	75	CHK	Checksum	Checksum via bytes 6 through 74, bit 7 cleared
	76	$F7	EOX	End of SysEx message

Program Bulk Dump

Byte No	Value	Parameter	Description/Range
0	$F0	Exclusive Status	SysEx transfer start
1	$3E	Manufacturer ID	Waldorf Electronics GmbH
2	$0B	Model ID	Pulse ID
3	0...126	Device ID	Equivalent to the global parameter device ID
4	$01	Function Code	Dump type, in this case program bulk dump
5	0...39	Program No	P.1 ... P.40
6	16...112	Osc1 Semitone	-48...+48
7	0...127	Osc1 Tune	-32...+31
8	0...2	Osc1 Shape	0: Pulse 1: Sawtooth 2: Triangle
9	0...127	Osc1 PW	0...127
10	16...112	Osc2 Semitone	-48...+48
11	0...127	Osc2 Tune	-32...+31
12	0...3	Osc2 Shape	0: Pulse 1: Sawtooth 2: Triangle 3: Cross Modulation
13	0...127	Osc2 PW	0...127
14	0...1	Osc2 Keytrack	0: off 1: on
15	0...1	Osc2 Sync	0: off 1: on
16	16...112	Osc3 Semitone	-48...+48
17	0...127	Osc3 Tune	-32...+31
18	0...2	Osc3 Shape	0: Pulse 1: Sawtooth 2: Triangle
19	0...127	Osc1 Level	0...127
20	0...127	Osc2 Level	0...127
21	0...127	Osc3 Level	0...127
22	0...127	Noise Level	0...127
23	0...127	LFO1 Speed	0...127
24	0...7	LFO1 Shape	0: Sine 1: Triangle 2: Sawtooth 3: Pulse 4: Sample & Hold 5: Triangle Sync 6: Sawtooth Sync 7: Pulse Sync
25	0...127	LFO2 Speed	0...127
26	0...127	LFO2 Delay	0...127

27	0...127	Env1 Attack	0...127
28	0...127	Env1 Decay	0...127
29	0...127	Env1 Sustain	0...127
30	0...127	Env1 Release	0...127
31	0...127	Env1 Keytrack	-64...+63
32	0...3	Env1 Trigger	0: Single-Trigger 1 1: Single-Trigger 2 2: Retrigger 1 3: Retrigger 2
33	0...127	Env2 Attack	0...127
34	0...127	Env2 Decay	0...127
35	0...127	Env2 Sustain	0...127
36	0...127	Env2 Release	0...127
37	0...127	Env2 Keytrack	-64...+63
38	0...3	Env2 Trigger	0: Single-Trigger 1 1: Single-Trigger 2 2: Retrigger 1 3: Retrigger 2
39	0...127	Pitch Mod Amount	-64..+63
40	0...15	Pitch Mod Source	see Table
41	0...127	Portamento Time	0...127
42	0...1	Portamento Mode	0: normal 1: legato
43	0...24	Pitchbend Scale	0...24
44	0...15	Mod Unit 1 Source	see Table
45	0...127	Mod Unit 1 Amount	-64...+63
46	0...15	Mod Unit 1 Destination	see Table
47	0...15	Mod Unit 2 Source	see Table
48	0...127	Mod Unit 2 Amount	-64...+63
49	0...15	Mod Unit 2 Destination	see Table
50	0...15	Mod Unit 3 Source	see Table
51	0...127	Mod Unit 3 Amount	-64...+63
52	0...15	Mod Unit 3 Destination	see Table
53	0...15	Mod Unit 4 Source	see Table
54	0...127	Mod Unit 4 Amount	-64...+63
55	0...15	Mod Unit 4 Destination	see Table

	56	0...2	Arpeggiator Active	0: off 1: on 2: Hold
	57	0...9	Arpeggiator Range	1...10
	58	0...31	Arpeggiator Clock	see Table
	59	0...127	Arpeggiator Tempo	0: external 1...127: 48...300 BPM
	60	0...6	Arpeggiator Mode	0: up 1: down 2: alternating 3: random 4: Assign up 5: Assign down 6: Assign alternating
	61	0...127	Cutoff Frequency	0...127
	62	0...127	Cutoff Keytrack	-64...+63
	63	0...127	Cutoff Env1 Sens	-64...+63
	64	0...127	Cutoff Velo Sens	-64...+63
	65	0...15	Cutoff Mod Source	see Table
	66	0...127	Cutoff Mod Amount	-64...+63
	67	0...127	Resonance	0...127
	68	0...127	Volume	0...127
	69	0...127	Volume Velo Sens	-64...+63
	70	0...127	Panning	L64...R63
⊕	71	0...127	External Signal Level	0...127
⊕	72	0...15	CV 2 Source	see Table
⊕	73	0...127	CV 2 Amount	-64...+63
	74	0	reserved	
	75	CHK	Checksum	Checksum via bytes 6 through 74, bit 7 cleared
	76	$F7	EOX	End of SysEx message

Global Parameter Dump

Byte No	Value	Parameter	Description/Range
0	$F0	Exclusive Status	SysEx transfer start
1	$3E	Manufacturer ID	Waldorf Electronics GmbH
2	$0B	Model ID	Pulse ID
3	0...126	Device ID	Equivalent to the global parameter device ID
4	$08	Function Code	Dump type, in this case global parameter dump
5	0...99	Startup Program	P.1 ... P.99 / P.rn
6	54...74	Master Tune	430...450 Hz
7	0...127	Control X	0...127
8	0...16	MIDI Channel	0: omni 1...16: Channel 1-16 17: A. omni 18...33: A.1...16
9	0...126	Device ID	0...126
10	CHK	Checksum	Checksum via bytes 5 through 9, bit 7 cleared
11	$F7	EOX	End of SysEx message

✪ CV/Gate Interface Parameter Dump

Byte No	Value	Parameter	Description/Range
0	$F0	Exclusive Status	SysEx transfer start
1	$3E	Manufacturer ID	Waldorf Electronics GmbH
2	$0B	Model ID	Pulse ID
3	0...126	Device ID	Equivalent to the global parameter device ID
4	$08	Function Code	Dump type, in this CV/Gate Interf. parameter dump
5	0...16	CV/Gate Channel	0: off 1...16: 1...16
6	0...127	CV In Adjust	-64...+63
7	0...72	CV In Transpose	-36...+36
8	0	reserved	
9	0...1	Gate In Polarity	0: up 1: down
10	0...3	Gate Out Polarity	0: 5L 1: 12L 2: 5H 3: 12H
11	0...1	CV Out Curve	0: logarithmic 1: linear
12	0...127	CV Out Adjust	-64...+63
13	0...127	CV Out Offset	-64...+63
14	0	reserved	
15	CHK	Checksum	Checksum via bytes 5 through 14, bit 7 cleared
16	$F7	EOX	End of SysEx message

Polyphony Parameter Dump

Byte No	Value	Parameter	Description/Range
0	$F0	Exclusive Status	SysEx transfer start
1	$3E	Manufacturer ID	Waldorf Electronics GmbH
2	$0B	Model ID	Pulse ID
3	0...126	Device ID	Equivalent to the global parameter device ID
4	$0A	Function Code	Dump type, polyphony parameter dump
5	0...11	Number of Pulses	Total number of Pulses-1 in stack
6	0...11	Identification Number	Identification number of Pulse-1 in stack
7	$F7	EOX	End of SysEx message

Program Dump Request

Byte No	Value	Parameter	Description/Range
0	$F0	Exclusive Status	SysEx transfer start
1	$3E	Manufacturer ID	Waldorf Electronics GmbH
2	$0B	Model ID	Pulse ID
3	0...126	Device ID	Equivalent to the global parameter device ID
4	$40	Function Code	Dump type program dump request
5	0...99	Program No	P.1 ... P.99 / P.rn
6	$F7	EOX	End of SysEx message

Program Bulk Dump Request

Byte No	Value	Parameter	Description/Range
0	$F0	Exclusive Status	SysEx transfer start
1	$3E	Manufacturer ID	Waldorf Electronics GmbH
2	$0B	Model ID	Pulse ID
3	0...126	Device ID	Equivalent to the global parameter device ID
4	$41	Function Code	Dump type program bulk dump request
5	0...99	Program No	P.1 ... P.99 / P.rn
6	$F7	EOX	End of SysEx message

Global Parameter Dump Request

Byte No	Value	Parameter	Description/Range
0	$F0	Exclusive Status	SysEx transfer start
1	$3E	Manufacturer ID	Waldorf Electronics GmbH
2	$0B	Model ID	Pulse ID
3	0...126	Device ID	Equivalent to the global parameter device ID
4	$48	Function Code	Dump type global parameter dump request
5	$F7	EOX	End of SysEx message

CV/Gate Interface Parameter Dump Request

Byte No	Value	Parameter	Description/Range
0	$F0	Exclusive Status	SysEx transfer start
1	$3E	Manufacturer ID	Waldorf Electronics GmbH
2	$0B	Model ID	Pulse ID
3	0...126	Device ID	Equivalent to the global parameter device ID
4	$49	Function Code	Dump type CV/Gate interf. param. dump request
5	$F7	EOX	End of SysEx message

Controller Dump Request

Byte No	Value	Parameter	Description/Range
0	$F0	Exclusive Status	SysEx transfer start
1	$3E	Manufacturer ID	Waldorf Electronics GmbH
2	$0B	Model ID	Pulse ID
3	0...126	Device ID	Equivalent to the global parameter device ID
4	$4B	Function Code	Dump type controller dump request
5	$F7	EOX	End of SysEx message

Polyphony Parameter Dump Request

Byte No	Value	Parameter	Description/Range
0	$F0	Exclusive Status	SysEx transfer start
1	$3E	Manufacturer ID	Waldorf Electronics GmbH
2	$0B	Model ID	Pulse ID
3	0...126	Device ID	Equivalent to the global parameter device ID
4	$4A	Function Code	Dump type polyphony parameter dump request
5	$F7	EOX	End of SysEx message

Glossary

Aftertouch

The majority of contemporary keyboards are capable of generating aftertouch messages. On this type of keyboard, when you press harder on a key you are already holding down, a MIDI Aftertouch message is generated. This feature makes sounds even more expressive (e.g. through vibrato).

Amount

Describes to which extent a modulation influences a given parameter.

Attack

An envelope parameter. "Attack" is a term that describes the ascent rate of an envelope from its starting point to the point where it reaches its highest value. The Attack phase is initiated immediately after a trigger signal is received, i.e. after you play a note on the keyboard.

Control Change (Controllers)

MIDI messages enable you to manipulate the response of a sound generator to a significant degree.

This message essentially consists of two components:

- The Controller number, which defines the element to be influenced. It can be between 0 and 127.
- The Controller value, which determines the extent of the modification.

Controllers can be used for effects such as slowly swelling vibrato, changing the stereo panorama position and influencing filter frequency.

CV

CV is the abbreviation for control voltage. In analog synthesizers, control voltages are used to control sound parameters like pitch, cutoff frequency etc. E.g. to get a tremolo effect, the output signal of a LFO must be routed to the CV input of an (or several) oscillator(s).

Decay

"Decay" describes the descent rate of an envelope once the Attack phase has reached its zenith and the envelope drops to the level defined for the Sustain value.

Filter

A filter is a component that allows some of a signal's frequencies to pass through it and stops other frequencies. The most important aspect of a filter is the filter cutoff frequency. Filters generally come in four categories: low-pass, high-pass, band-pass, and band-stop. A low-pass filter dampens all frequencies above the cutoff frequency. A high-pass filter in turn dampens the frequencies below the cutoff. The band-pass filter allows only those frequencies around the cutoff frequency to pass, all others are dampened. A band-stop filter does just the opposite, i.e. it dampens only the frequencies around the cutoff frequency. The most common type is the low-pass filter.

Filter Cutoff Frequency

The filter cutoff frequency is a significant factor for filters. A low-pass filter dampens the portion of the signal that lies above this frequency. Frequencies below this value are allowed to pass through without being processed.

Envelope

An envelope is used to modulate a sound-shaping component within a given time frame so that the sound is changed in some manner. For instance, an envelope that modulates the cutoff frequency of a low-pass filter opens and closes this filter so that some of the signal's frequencies are filtered out. An envelope is started via a trigger, usually a fixed trigger. Normally, the trigger is a MIDI Note. The classic envelope consists of four individually variable phases: Attack, Decay, Sustain and Release. This sequence is called an ADSR envelope. Attack, Decay and Release are time or slope values, and Sustain is a variable volume level. Once an incoming trigger is received, the envelope runs through the Attack and Decay phases until it reaches the programed Sustain level. This level remains constant until the trigger is terminated. The envelope then initiates the Release phase until it reaches the minimum value.

Gate

The term „Gate“ has different meanings in a technical context. Like a real gate, it describes something, that can be open or closed, or - to use a technical term - active or inactive. A gate in sense of a device is a unit, that damps a throughpassing signal corressponding to some specific conditions. E.g. in a noise gate a signal is cut off, when its level falls above a predetermined threshold.
Gate stands also for a control signal of analog synthesizer systems. A keyboard generates an active gate signal as long as a key is held down. When the key is released, the gate signal becomes inactive again. An envelope generator can use this signal for its trigger purposes, and as a result a VCA unit can be controlled.

LFO

LFO is an acronym for low-frequency generator. The LFO generates a periodic oscillation at a low frequency and features variable waveshapes. Similar to an envelope, an LFO can be used to modulate a sound-shaping component.

Low-pass Filter

Synthesizers are often equipped with a low-pass filter. A low-pass filter dampens all frequencies above its cutoff frequency. Frequencies below the cutoff are not affected.

MIDI

The acronym MIDI stands for "musical instrument digital interface." It was developed in the early '80s so that diverse types of electronic musical instruments by different manufacturers could interact. At the time a communications standard for heterogeneous devices did not exist, so MIDI was a significant advance. It made it possible to link all devices with one another through simple, uniform connections.
Essentially, this is how MIDI works: One sender is connected to one or several receivers. For instance, if you want to use a computer to play the Pulse, then the computer is the sender and the Pulse acts as the receiver. With a few exceptions, the majority of MIDI devices are equipped with two or three ports for this purpose: MIDI In, MIDI Out and in some cases MIDI Thru. The sender transfers data to the receiver via the MIDI Out jack. Data are sent via a cable to the receiver's MIDI In jack.
MIDI Thru has a special function. It allows the sender to transmit to several receivers. It routes the incoming signal to the next device without modifying it. Another device is simply connected to this jack, thus creating a chain through which the sender can address a number of receivers. Of course it is desirable for the sender to be able to address each device individually. Consequently, there is a rule which is applied to ensure each device responds accordingly.

MIDI Channel

This is a very important element of most messages. A receiver can only respond to incoming messages if its receive channel is set to the same channel as the one the sender is using to transmit data. Subsequently, the sender can address specific receivers individually. MIDI Channels 1 through 16 are available for this purpose.

MIDI Clock

The MIDI Clock message determines the tempo of a piece of music. It serves to synchronize processes based on time.

Modulation

A modulation influences or changes a sound-shaping component via a modulation source. Modulation sources include envelopes, LFOs or MIDI messages. The modulation destination is sound-shaping component such as a filter or a VCA.

Note on / Note off

This is the most important MIDI message. It determines the pitch and velocity of every generated note. The time of arrival is simultaneously the start time of the note. Its pitch is derived from the note number, which lies between 0 and 127. The velocity lies between 1 and 127. A value of 0 for velocity is similar to „Note Off“.

Panning

The process of changing the signal's position within the stereo panorama.

Pitchbend

Pitchbend is a MIDI message. Although pitchbend messages are similar in function to control change messages, they are a distinct type of message. The reason for this distinction is that the resolution of a pitchbend message is substantially higher than that of a conventional Controller message. The human ear is exceptionally sensitive to deviations in pitch, so the higher resolution is used because it relays pitchbend information more accurately.

Program Change

These are MIDI messages that switch sound programs. Program numbers 1 through 128 can be changed via program change messages.

Release

An envelope parameter. The term "Release" describes the descent rate of an envelope to its minimum value after a trigger is terminated. The Release phase begins immediately after the trigger is terminated, regardless of the envelope's current status. For instance, the Release phase may be initiated during the Attack phase.

Resonance

Resonance is an important filter parameter. It emphasizes a narrow bandwidth around the filter cutoff frequency by amplifing these frequencies. This is one of the most popular methods of manipulating sounds. If you substantially increase the resonance, i.e to a level where the filter begins self-oscillation, then it will generate a relatively clean sine oscillation.

Sustain

An envelope parameter. The term "Sustain" describes the level of an envelope that remains constant after it has run through the Attack and Decay phases. Sustain lasts until the trigger is terminated.

System Exclusive Data

System exclusive data allow access to the heart of a MIDI device. They enable access to data and functions that no other MIDI messages are able to address. "Exclusive" in this context means that these data pertain only to one device type or model. Every device has unique system exclusive data. The most common applications for SysEx data include transfer of entire memories and complete control of a device via a computer.

Trigger

A trigger is a signal that activates events. Trigger signals are very diverse. For instance, a MIDI note or an audio signal can be used as triggers. The events a trigger can initiate are also very diverse. A common application for a trigger is when it is used to start an envelope.

VCA

VCA is the acronym for voltage-controlled amplifier. A VCA is a component that influences the volume level of a sound via a control signal. This control voltage is often generated by an envelope or an LFO.

VCF

VCF is the acronym for voltage-controlled filter. It is a filter component that allows you to manipulate the filter parameters via control voltages.

Volume

The term describes a sound's output level.

(D) MIDI Implementation Chart

Date: 25.03.96

Model: Waldorf Pulse/Pulse+ MIDI-Implementation Chart Version: 1.37

Function		Transmitted	Recognized	Remarks
Basic	Default	1-16	1-16	
Channel	Channel	1	1	
	Default	x	x	No Modes
Mode	Messages	x	x	supported
	Altered	x	x	
Note		0-127	0-127	
Number	True Voice	x	0-120	OSC3 up to #108
Velocity	Note ON	o	o	
	Note OFF	x	x	
After	Key's	x	x	
Touch	Ch's	x	o	
Pitch Bender		x	o	
	1	x	o	Modwheel
	2	x	o	Breath Control
	5	o	o	Portamento Time
Control	7	x	o	Master Volume
Change	10	o	o	Panning
	14-63	o	o	Parameters
	64	x	o	Sustain Pedal
	102-119	o	o	Parameters***
Prog		x	o	Programs 1-99,
Change	True #	x	1-100	100: Program P.rn
System Exclusive		o	o	
System	: Song Pos	x	o	
	: Song Sel	x	x	
Common	: Tune	o	o	
System	: Clock	o	o	
Real Time	: Commands	o	o	
Aux	: Local ON/OFF	x	x	
Mes-	: All Notes Off	x	o	
sages	: Active Sense	x	o	
	: Reset	x	x	
Notes		./.	./.	*** See Chapter 8 for Parameters Control X is assignable to 0-127

Mode 1: OMNI ON, POLY Mode 2: OMNI ON, MONO o : Yes

Mode 3: OMNI OFF, POLY Mode 4: OMNI OFF, MONO x : No

CE

EG-Konformitätserklärung
Declaration of Conformity

Für das folgend bezeichnete Erzeugnis

For the following named product

Waldorf Pulse

wird hiermit bestätigt, daß es den Schutzanforderungen entspricht, die in der Richtlinie 89/336/FWG des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit festgelegt sind; außerdem entspricht es den Vorschriften des Gesetzes über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 30. August 1995.

will be hereby declared that it conforms to the requirements of the Council Directive 89/336/FWG for radio frequency interference. It also complies with the regulations about radio interference of electronic devices dated on August 30th, 1995.

Zur Beurteilung des Erzeugnisses hinsichtlich der elektromagnetischen Verträglichkeit wurden folgende einschlägige harmonisierte Normen herangezogen:

The following standards have been used to declare conformity:

- EN 50 082-1 : 1992 , EN 50 081-1 : 1992 , EN 60065 : 1993

Diese Erklärung wird verantwortlich für den Hersteller abgegeben:

This declaration has been given responsibly by the manufacturer:

Waldorf Electronics GmbH
Neustraße 12
D-53498 Waldorf

Waldorf, 18.10.97

Wolfgang Düren, Geschäftsführer
Wolfgang Düren, Managing Director

FCC Information (U.S.A.)

1. 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 Waldorf may void your authority, granted by the FCC, to use this product.
2. 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 authorisation to use this product in the USA.
3. 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 harful interference with other electronic devices. This equipment generates/uses radio frequencies and, if not installed and used according to the instructions found in the users 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 determinated 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.
Utilise power outlets that are on branch (Circuit breaker or fuse) circuits or 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 co-axial type cable.
If these corrective measures do not produce satisfactory results, please contact the local retailer authorised to distributed this type of product.

The statements above apply ONLY to products distributed in the USA.

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 present appareil numerique n’emet pas de briut radioelectriques depassant les limites apllicables aux appareils numeriques de la „Classe B“ prescrites dans la reglement sur le brouillage radioelectrique edicte par le Ministre Des Communications du Canada.

This only applies to products distributed in the USA.
Ceci ne s’applique qu’aux produits distribués dans Canada.

Other Standards (Rest of World)

This product complies with the radio frequency interference requirements of the Council Directive 89/336/EC.

Cet appareil est conforme aux prescriptions de la directive communautaire 89/336/EC.

Dette apparat overholder det gaeldenda EF-direktiv vedrørendareadiostøj.

Diese Geräte entsprechen der EG-Richtlinie 89/336/EC.

Waldorf Electronics GmbH • Neustraße 12 • D-53498 Waldorf • Germany • http://www.waldorf-gmbh.de

CE