

1 Foreword

Software updates

Your Schaltwerk is supplied with the software version 1.xx (xx being the latest release of version 1). It has been extensively checked, both by ourselves and numerous beta-testers, and has proved to be bug free. Given the complexity of this new software, It is nevertheless possible that a hidden problem escaped our attention. We would be very pleased to hear from you in the event that you encounter such a problem. We'll then try to correct it as soon as possible.

To update your device at the current state you then had to contact your local dealer.

- However, this policy does not apply to the broadening of functions, not included in this software version, and not part of our advertisement. Only genuine software errors are covered.
- Software upgrades which expand the functionality are always offered at a charge.
- To update the software himself/herself, the customer has to open his/her machine to change the EPROM. This procedure is carried by the customer at his/her own risk and expenses, i.e., damage to the machine due to an improperly inserted EPROM is not covered by the warranty.

Changes in terminology

⇒ In order to comply with the good practice of a common terminology in all electronic music equipment, this manual is already using the terminology to be retained in future software releases of the Schaltwerk. Please take note that some terms appearing on the display can be different from those described herein. The following table gives you the correspondence of terms:

Display:	Manual:
Gate Time	Step Time
Note Time	Gate Time
Pendel 1	Alternate
Pendel 2	Pendulum

Legal aspects

- Throughout the manual there are mentions for products that are also registered trademarks, without any special indication. The lack of a ® symbol does therefore not imply that these brand names can be used freely. Neither, based on the applied terminology, can we conclude to the existence of patents, nor legally protected material.
- It is also explicitly to be noted that the company DOEPFER Musikelektronik GmbH, is not liable to any warranty nor legal responsibility regarding any damage resulting from the use of the machine, its hardware and software, or from the contents of the present users manual.
- The contents of the present users manual, the layout, design of the hardware and/or functions of the software, can be changed without prior notice. The company DOEPFER Musikelektronik GmbH is declining any responsibility whatsoever regarding the hereabove matters.
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1st English edition August 1996 by E. L-K.

Internet

During the course of 1997, we plan to expand our existing Internet pages through the addition of software information and update service. We would like to offer you not only detailed information about the various software releases, but also the possibility to download them. Anyhow, customers will be able to download the required software in order to burn it into an EPROM.

2 Table of contents

3 Precautions

3.1 Product liability and extent of the warranty

- Please comply to the following advice for using and handling the device. Only by respecting these recommendations can you expect a trouble-free operation of your machine.
- As this document is also concerning the product liability and extent of the warranty, it is mandatory to carefully read the whole document and to comply to all of its recommendations.
- Any claim for damage or replacement is in principle rejected if one, or several, of the recommendations detailed here are not followed.
- Moreover, the 6 month coverage of the warranty can be shortened by not complying to the recommendations.

3.2 Device purpose

This machine is only dedicated to the applications described in the present users manual, and cannot, for security reasons, be used for other purposes than those described here. It is recommended that you ask to a specialist if you are not sure about some specific application of this machine.

3.3 Operating voltage

The device is only to be used on mains supply or with the further described low voltage adaptor.

3.4 Opening of the device

To open the device it is mandatory to disconnect the power supply.

3.5 Warranty expiration

- Custom modifications made to the device without the manufacturer's consent make the warranty void.
- It goes the same for any intervention made to the device by a third party. Moreover, changes can only be

executed by a specialist complying to valid security regulations.

- Practically, these modifications will be done by the manufacturer or a manufacturer approved company, in order to maintain the warranty and its effects.

3.6 Operating environment

- The device should not be used in open air, but only in dry places indoors.
- Never use the device in moist or wet environment, nor close to flammable material.
- Do not use the device in close proximity of strong interference sources such as computers, monitors and power lines. These can cause perturbation leading to alteration of data in the memory of the device.
- Do not store the device in places where temperature is above +50°C (122°F), or below minus10°C (14°F). To use the device, a minimal temperature of +10°C (50°F) is recommended.
- Do not set the device in direct sunlight, or nearby a source of heat.

3.7 Operating control

- Do not spill any liquid or other conductive material onto the device. If this happens, disconnect immediately the supply of the device, and bring it for examination, cleaning, and possibly repair, to a qualified repairman.
- Do not lay any heavy object on top of the device.
- All cables should be regularly checked against defects, and changed as necessary, after confirmation from a qualified person.

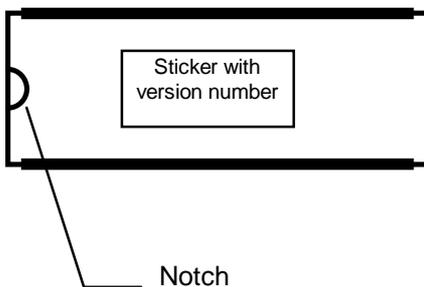
3.8. Transport

Transport the device carefully, do not drop it nor turn it upside down. Ensure that the unit sits firmly to prevent any fall, slip down or capsise. Only by respecting carefully these measures can injuries be avoided.

pins seem to match their holes, press down the EPROM slowly but firmly, using both thumbs.

3.9 Installation and removal of the EPROM

- The exchange of the EPROM in the unit can only be performed when the supply is disconnected.
- It is especially dangerous to use tools in and around an open device and wiring carrying mains voltage. After disconnecting the unit, allow some time for the capacitors of the power supply to discharge.
- Before removing the EPROM, check carefully which side has a notch on its end, as you will have to insert the new EPROM exactly the same way. Usually this notch is also to be seen on the socket when the component is removed.
- To remove the EPROM, it is recommended to lift it by both sides at once, using two screwdrivers placed under each end of the component, and then exert a gentle lever movement. The reason is twofold: too much force on one end could break the ceramic casing of the component, secondly, this parallel movement avoids bending the pins.
- Before inserting the EPROM it is recommended to check that the pin rows are parallel to each other, i.e., all pins point exactly the same direction and make an exact angle of 90° with the casing. This will facilitate the placement of the EPROM into its socket as each pin will fit perfectly in place without risking to bend the pins. Usually, the pin rows angle is somehow more opened than a right angle. If it is the case with your EPROM, the best way to align the pin rows is to hold the chip by both ends between your thumbs and forefingers, the pins of the chip facing outwards and parallel to a firm surface such as a table. Place the lower pin row flat on the table, then tilt slowly but firmly to narrow the angle. Do it step by step to avoid going beyond a right angle. Repeat the operation as necessary for the other row of pins.



- To insert the EPROM, it is crucial to match the notches present on the socket and the component. An EPROM inserted the wrong way is always destroyed and can cause serious damage to the surrounding circuitry.
- Place the EPROM on top of its socket. When the pins are aligned, they should slip into the holes perfectly. Check once again the orientation of the chip and, if all

3.10 Shipment

Send your machine in the original packing only. To return your machine for exchange, repair (under warranty or not), update or verification, it must be sent in its original packing! Shipments using any other packing will be refused. Be sure to keep the packing and documents in a safe place for later use.

4 Connection

All connectors described here are located at the back of the device.

4.1. Power supply

4.1.1. Version with external transformer

- For the export market, the Schaltwerk is to be used with an external power adaptor as it doesn't incorporate its own integrated mains supply. The connection for the adaptor is indicated "9V DC" and is located to the right of the 5 DIN connectors (MIDI & Sync).
- On request, we may deliver a 115V external transformer with "euro" type mains plug. Other mains voltages require that you purchase the appropriate adaptor in your own country. Only adaptors with a VDE or equivalent technical agreement are recommended. The output voltage should be around 9 Volts (ranging from 7 to 12 V.), unregulated DC, with a minimal output current of 500 mA (0.5 Amps). The polarity of the output plug should be: external ring = ground, inner ring = +7..12V. If the polarity is inadvertently inverted, the Schaltwerk will not function but won't be damaged as there is a built-in protection diode.
- The Schaltwerk is functional as soon as the adaptor is plugged into the mains outlet, and the low voltage plug is inserted at the back of the machine. There is no supply switch provided.

4.1.2 Version with built-in 230V. mains supply

- The Schaltwerk will enter in function as soon as the mains connector is hooked up at the rear of the machine, the mains plug is inserted in the outlet, and the mains switch is set to ON.

4.2. MIDI connection

4.2.1. MIDI-IN connection

- The MIDI inputs 1 and 2 are dedicated to the control and synchronization of the Schaltwerk by external MIDI real-time messages, remote control of specific functions and effects through MIDI (effect menu, etc.) and reception of MIDI Sys-Ex Dumps.
- The MIDI inputs have no merge capability, i.e., The incoming MIDI information is not retransmitted to any of the MIDI outputs. If the data directed at the Schaltwerk should also be available to other MIDI devices, it is advised to use a MIDI-Thru-Box with several outputs. Should this MIDI data be merged with other MIDI information to jointly drive the same device, then an external MIDI-Merger is needed:

⇒ Doepfer MMR4/4

4.2.2. MIDI-OUT connection

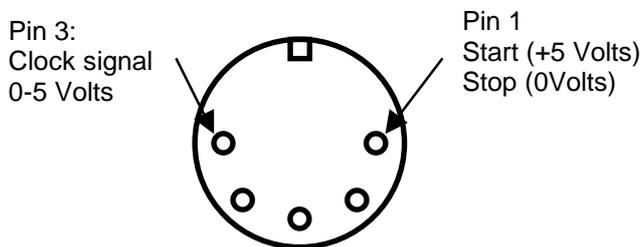
- The MIDI output 1 is dedicated to the Schaltwerk generated MIDI information and to the Schaltwerk issued MIDI-Real-time messages.
- To date, the MIDI output 2 is restricted to the transmission of Schaltwerk issued MIDI-Real-time messages.

4.2.3. MIDI in-out connection

- MIDI IN 1 and MIDI OUT 1 are thought as the main link with the outside world.
- In future software versions, MIDI IN 2 and MIDI OUT 2 are planned to be part of a communication network between various machines.

4.3. Sync-input/output

- To control/synchronize with a square signal.
- Can be configured as input or output.
- Normally, the SYNC connector of the Schaltwerk is configured as an output, i.e., A square signal is available at this connector. Sensibly, the device at the other end must be configured as an input (receiver) on its SYNC connector.
- To use the Schaltwerk as a SYNC receiver, its SYNC connector must be set as an input, and the other device must be set to transmit (output) a SYNC signal.
- The SYNC-signal is a simple square wave with a range of 0-5 Volts.



It is also possible to use an ordinary LFO from an analog synthesizer as a clock source.

This way, it is possible with the appropriate shaking in the control signal to get a “floating groove” in the Schaltwerk timing.

⇒ Note that in case of coupling with other devices, if both devices are set to input or output, there won't be any effective coupling.

4.4. CV/Gate connection

8 x CV1 (i.e., for pitch or controllers)

8 x CV2 (i.e., for velocity)

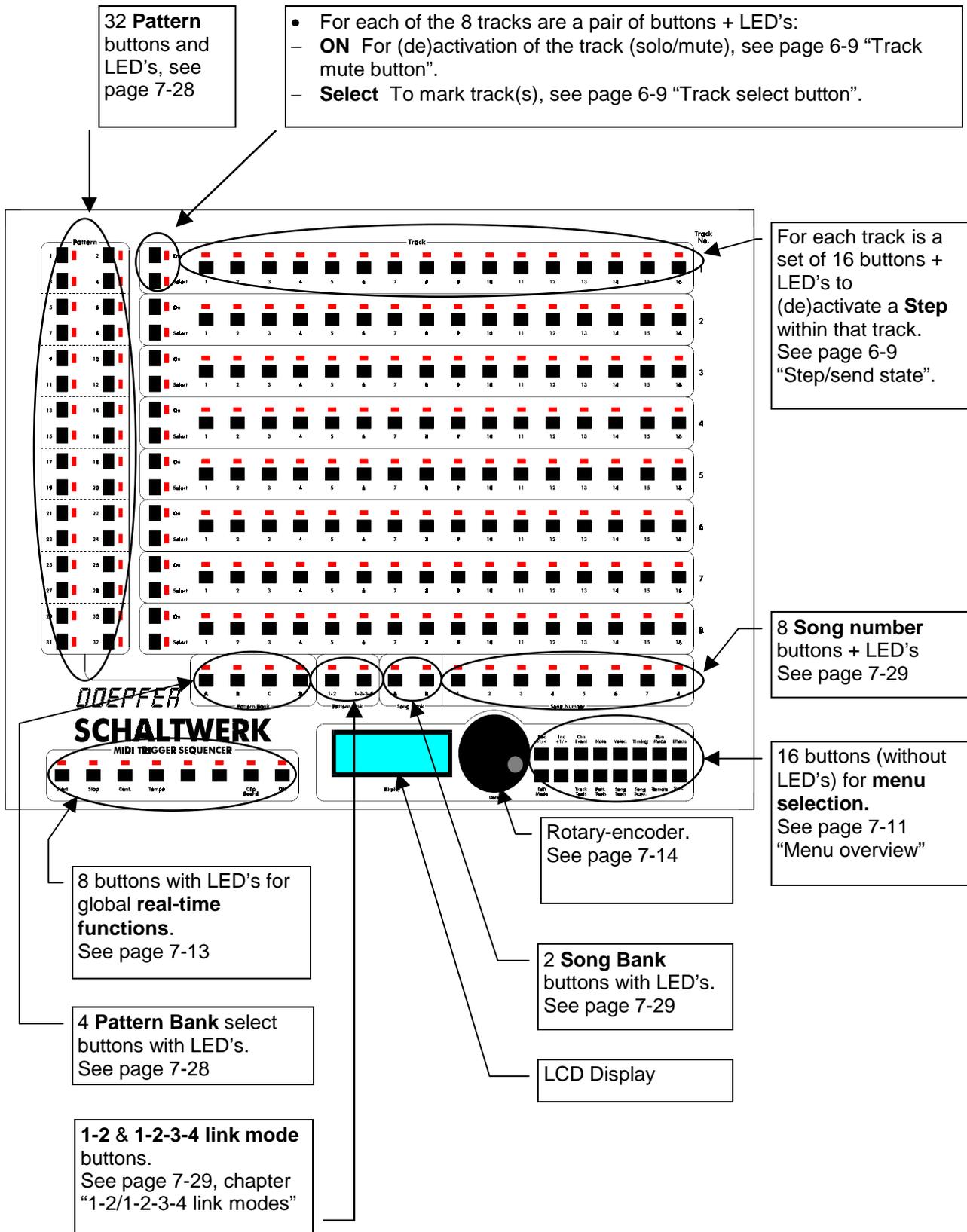
8 x Gate

⇒ The CV option does not work separately from the data sent in MIDI, but in parallel and thus simultaneously. Despite the limitation of the CV values being linked to their corresponding MIDI values, the number of voices under control of the Schaltwerk can be almost doubled.

- The 8 CV1 outputs are linked to the parameter “Note Number-Track/Step”, with CV1-1 to CV1-8 corresponding respectively to Track 1 up to Track 8.
- The CV's are covering a range from 0 to 5.6 Volts.
 - The curve characteristic of the CV follows a Volt/Octave ratio and is primarily dedicated to the control of the pitch.
 - The relation between the note numbers and the output voltage is: Note #36~100 = 0~5.6 Volts.
 - Going below (note # 0~35) or above (note # 101~127) the allowed range will clip the output voltage to the lowest/highest voltage possible, issuing valid CV's, which are nevertheless overlapping with the note range 36~100.

5 Front panel controls

The Schaltwerk sports the following controls:



What is the Schaltwerk

- The Schaltwerk is a complex sequential event generator for producing not only MIDI data but also Trigger, Sync and CV signals for analog systems.
- The Schaltwerk does not contain any sound generator but is simply a signal generator for MIDI receiving devices (MIDI equipment), for CV/Gate receiving devices, and a tempo generator for devices equipped with a SYNC input.
- The Schaltwerk offers effectively most of the aspects a MIDI software sequencer presents, but due to the strongly reduced variety of functions a direct comparison is not possible. In comparison with software sequencers, the Schaltwerk takes advantage of this reduction by offering much more dedicated controls for a direct access to all operations and the possibility to alter almost any parameter in real time.
- At best, the Schaltwerk brings to the mind the Drum Page of the Software sequencers

6.1 Main structural sections: General

⇒ A fairly good knowledge of MIDI is used here. To keep control and not get lost, we recommend you to go through some specialized literature on the subject, otherwise you will not be able to get the most out of MIDI and particularly of your Schaltwerk. A small selection is listed in the Literature chapter.

⇒ For Basic knowledge, please refer to chapter 10, MIDI 1.0 specifications: from page 10-33

6.2 Step

- This is the smallest organizational unit in the Schaltwerk and defines a MIDI event.

6.2.1 Step/Event Types

- Generally it will be a Note-Event. The Schaltwerk offers nevertheless the possibility to generate almost any type of meaningful MIDI message.

For example, it can also be:

- Controller Events
- Polyphonic-Aftertouch
- Monophonic-Aftertouch
- Program-Changes
- Pitch-Bend
- Such events are defined as Event Type, with their associated MIDI channel value, and one or two associated data values.
 - In the example of a Note-Event, there will be the definition of the pitch (note value), and the definition of the note level (note velocity).
 - For controllers, there will be a Controller Number (controller value).
 - The Monophonic-Aftertouch is defined as a value
 - The Polyphonic-Aftertouch is built around a note value and its associated pressure value.
 - Program-Change is a program select number.
 - The Pitch-Bend is made of two linked values; practically, one of them is always set to zero.

6.2.2 Step/Duration

- Apart from defining in which order the MIDI events are organized, the steps are controlling the duration of the event. (It is important to note that an event is actually 2 events tied, namely SOUND-ON at the beginning of the step, and SOUND-OFF at the end of the step)

6.2.3 Step/Condition

- Beside this, there is also for each MIDI event another important aspect, if not the most important stylistic attribute the Schaltwerk offers, namely, the fact whether each prearranged MIDI event will be sent or not.
 - There is for each step a dedicated LED, indicating whether the related event at that particular place in the row, will be sent (LED on) or not (LED off).
 - With that, it is now possible to make quick changes on the fly, as each step has also a button dedicated, with which the event can be switched on or off. These push-buttons work in a toggle manner, that is, if a step is currently switched on and the button is depressed, the step will be switched off, and vice-versa.

⇒ In special editing modes, these dedicated Step buttons can also be used to call the step to edit.

- The Step LED's have some additional functions,
 - as the report of the currently active step = run through or blink very slowly,
 - The report of the Step edit values (related notes & velocity values) = fast blinking.
 - And the step position in Rec-Step-Mode = slow blinking.

6.3. Track

- In the upper organization level, 16 steps are grouped to make a track.

6.3.1 Global Track parameters

- A track has several parameters which are global for the 16 steps, these are:
 - The MIDI Event Type,
 - its MIDI channel,
 - the base note number,
 - base velocity,
 - Step time,
 - Gate length,
 - Delay time,
 - Start & End steps,
 - Run mode, and
 - various effect parameters

All 16 steps of a track share this common set of parameters, an individual setting of each step is not possible. Nevertheless, this set of global parameters can be different for each track.

6.3.2 Track Select button

- For that purpose, each track possesses a Track Select button and an associated LED. Through them, a track can be immediately selected, as it is confirmed by the illumination of the appropriate LED. All the track edit operations apply to the track whose LED is currently lit. (In special edit modes, there can be several tracks selected simultaneously)

6.3.3 Track mute button

- This second main control available for each track is the On button. Its use is a matter of taste and depends also on the mode setting. The function is always the same: The tracks whose On LED's are lit will transmit their MIDI data, when their LED's are off, the tracks will run as usually but no data is transmitted. Switching On and Off is accomplished by pressing the appropriate On button.

⇒ The well-known Mute function is available if, while in the Edit Mode menu, [mutemode:multi] is selected, and will act as a solo function when [mutemode:single] is selected.

6.4 Pattern

- A complete setting for all 8 tracks, together with their 8 x 16 steps and all related parameters constitute a Pattern.

6.4.1 Pattern number/memory

- The Schaltwerk contains 130 pattern storage locations,
 - 128 non-volatile pattern locations,
 - 1 Edit-Pattern, and
 - 1 pattern clipboard

6.4.2 Pattern edit

- The pattern to edit is the one that is currently appropriate and can be edited.

⇒ When you call back one of 128 patterns, it is not possible to edit it immediately, it must be first copied into the Edit-Pattern.

- The Edit-Pattern can be now modified at your will (naturally, also in real-time), and saved into one of the 128 available locations before switching off the unit, should it be recalled later.
- The Edit-Pattern is changed at each working step, i.e., completely overwritten (when selecting a pattern, 1~2, 1~2~3~4, or Song-Mode play), so that its content is volatile.

6.4.3. Pattern Clipboard

- The Pattern clipboard is almost the 129th pattern location, in which the Edit-Pattern can be temporarily stored. This is, for example, necessary to keep a freshly edited pattern while a free location to store it has to be found. Recalling one of the 128 patterns will inevitably destroy the Edit-Pattern. Another use for the clipboard is to compare the original pattern with the edited pattern, etc.
- A separate button is dedicated to the Pattern Clipboard (see 14 -- Global real time keyboard). When it is pressed, the currently edited pattern is copied into the clipboard. To confirm that the clipboard is now full, its LED blinks.
- To copy the content of the clipboard back into the Edit-Pattern, press the clipboard button once more. The

pattern is now back into the Edit-Pattern, the LED goes out and the clipboard is ready to receive a new pattern.

6.5 Song

6.5.1 Capabilities of a song

- A song is a succession of patterns.
- This sequence can be made up of a maximum of 128 patterns, called automatically one after the other, and where each pattern recalled can be played repeatedly up to 127 times.
- Not only will the song data instruct which pattern should be played and how many times, but will also take care of the variations in the prearranged On-settings.
- In addition, it is also possible to jump to any position within the song to realize complex loops.

6.5.2 Song number/memory

- The Schaltwerk holds a maximum of 16 songs of 128 steps each (these 128 song-steps are not to be mistaken with the 16 track-steps)

7 Users manual

7.1 Powering the unit

- At power-on, the unit will show the following message on its display:

```
SCHALTWERK VX.XX  
DOEPFER(c) [date]
```

Vx.xx is a synonym. Here should appear the actual software release version implemented.

In place of "[date]" you should read a date in the format day/month/year, such as 210397 for the 21st of March 1997.

- At the same time, pattern 1 is loaded in the Edit-Pattern buffer of the Schaltwerk hence the illuminated LED belonging to pattern 1. All other LED's, functions and parameters are reflecting the state in which pattern 1 was configured previously.

⇒ Pattern 1 is the default pattern at power-on.

- The respective step positions (at power-on, step 1 from all rows) will blink slowly. The running indication is flashing faster at the current step position when the sequencer is running.

7.2 Menu structure

- The organization of the menu structure of the Schaltwerk relates to the 16 buttons located nearby the rotary encoder. Since the device is not equipped with LED's to indicate which functions are activated, the corresponding parameters are shown on the second line of the LCD display.
- The editing of parameters applies to single or multiple tracks. In order to edit the tracks, they have to be activated through the 8 Select upper buttons.

The confirmation of the selected tracks can be checked on their related Select LED and by the message in the upper row of the display.

```
Track >_2_____m<
```

- This means, for example, that track 2 is now selected and its set of parameters is available for editing.

When no select LED is lit, there is no track selected. The display will then show:

```
Track >_____m<  
No Trk. selected
```

- In most menus, there are sets of related parameters, known as parameter groups. These can be accessed by pressing several times the related menu button. Individual parameters are accessed in rotation.

7.3 Menu overview

- Here is a first glance at the various menus (a.k.a. parameter groups) available.

⇒ In forthcoming software releases, the various menus may be expanded through the addition of related parameters.

- The order of the buttons located nearby the rotary encoder follows a numbering sequence: from 1 (upper left) to 8 (upper right), and from 9 (lower left) to 16 (lower right).

The main menus of the parameter groups are:

- See chapter 5 - Controls of the front panel, page 7, drawing, lower right, close to the rotary encoder:
 - 16 buttons for menu selection.
- The buttons located in the first row (1-8) apply to all currently selected tracks, to the exception of buttons 1 & 2 (dec/inc).
 - (1) step left / decrement (one step to the left, select a particular step, also required in most menus)
 - (2) step right / increment (same as (1), but to the right)

- (3) Chn Event

MidiChannel:

- The MIDI channel of the related MIDI event

MidiEvent:

- The type of related MIDI event

-->PrgChange:

- The program number

- (4) Note

NoteNr:

- The global value of the MIDI event

SNo-0XX:

- The number applying to individual steps

- (5) Veloc

MainVel:

- The global velocity

sve-0XX:

- The velocity applying to individual steps

- (6) Timing

StepTim:

- The global Step time for all 16 steps

GateTim:

- The global Gate time for all 16 steps

DelayTi:

- The global delay for all 16 steps

- (7)

EndStep:

- The last step in the track

StartStep:

- The first step in the track

Mode:

- The play mode of the track

- (8)

Arpeggiator:

Record-Step:

Overdub-Rec:

Transpose:

Gater

ChordTrig:

- The next menu items, which are located in the second row (buttons 9 to 16), do not apply to a specific set of tracks but are global in their action. The track selection displayed is irrelevant in this case.

- (9)

EditMode:

MuteMode:

- (10) Reserved for future extension

- (11)

**Copy Track:XXX
to Track:XXX**

**Exch.Track:XXX
with Track:XXX**

Init Track:XXX

- (12) Pattern tools

**Store Pattern
to Pattern:XXX**

Copy Pattern:XXX

to Pattern:XXX

Exch.Pattern:XXX
with Pattern:XXX

SYSEX-Transfer
Pattern:

Init Pattern

SongChannel:XXX

Pattern:XXX
-->PrgChange:XXX

Midi-Assign-Menu
ArpHoldCtrl :XXX

Midi-Assign-Menu
ChordHoldCtr:XXX

– (13) Song Tools

Store Song
to Song:XXX

Copy Song:XXX
to Song:XXX

Exch.Song:XXX
with Song:XXX

SYSEX-Transfer
Song:

Init Song

– (14) Song Sequence

Song0XX Step:XXX
Patt.XXX -*:XXX

Song0XX Step:XXX
Patt.End > XXX

Song0XX Step:XXX
Insert-Steps:XXX

Song0XX Step:XXX
Delete-Steps:XXX

– (15) Remote

Midi-Assign-Menu
PatternChann:XXX

Midi-Assign-Menu

– (16) Sync

Sync-Intern/Ext.
Mode:

- The 8 buttons with LED's for global real-time functions (from left to right):
- See chapter 5. Controls of the front panel, page 7, Drawing, lower left nearby the rotary encoder:
 - Buttons with LED's for global real-time functions
 - (17) START button (no display indication): Start of the Schaltwerk from the respective Track begin, and sending of the MIDI real-time "start" message.
 - (18) STOP button (no display indication): Stop of the Schaltwerk, sending of the MIDI real-time "stop" message.
 - At the first activation of this button, the Stop LED is flashing. This is to inform the user that the button can be pressed a second time.
 - At the second consecutive activation of the button, the LED stops flashing and becomes permanently ON. Simultaneously this command will clear the internal buffer of the Schaltwerk (i.e. the chord trigger buffer & arpeggio buffer) and issue an all-notes-off message, for all 16 MIDI channels, at MIDI out 1.
 - (19) Cont. (continue) button (no display indication). Start of the Schaltwerk from the current position. Transmission of the "continue" MIDI real-time message.
 - (20) Tempo button. Setting of the Schaltwerk internal tempo (50~240 BpM - Beats per Minute) (This parameter is stored with the Pattern)
 - By pressing the tempo button more than once it is possible to activate/deactivate the Master-Tempo function (LED on/off). When active, the LED is on. When inactive (normal mode), the LED is off.

- The tempo is stored along with each Pattern, and is restored when a pattern is recalled from memory. This can be sometimes annoying, especially in the case of linked patterns (1~2, 1~2~3~4, and Song-Modes), where the tempo will change successively according to each pattern recalled. If the Master-Tempo function is activated, the Pattern related tempo will not be accounted anymore; the currently set tempo will be used instead.

- (21) Reserved for future extension

- (22) Reserved for future extension

- (23) Clipboard pattern memory

- (24) Enter/OK button for functions requiring an explicit confirmation

⇒ The buttons (17)~(24) and their related functions can be activated from any editing situation. Displaying & editing the tempo will simply overwrite the current message in the display.

- (25) Rotary Encoder. To change the values: clockwise = increment, counterclockwise = decrement.

7.4 Menus in detail

7.4.1 Step left/Decrement

One step to the left, specifies a precise step - used additionally in many menus. i.e. decrease a value.

7.4.2 Step right/Increment

Same as above but to the right and value increase.

7.4.3 MIDI Channel/MIDI Event

- Pressing this button may bring the following message:

No Trk. Selected

- As stated previously, the track(s) you want to modify must be specified prior to any editing.

- You should thus press the Select button of the track(s) you want to edit

If for example, you press the Track select button of track 2, you will get the following message in the display:

Track >_2_____m<

(“m” relates to the Mastertrack, which, if active, is indicated by a capital “M” in the display)

- Press now, once more, the button (3) of the menu:

Track >_2_____m<
MidiChannel:010

If for example, the channel is set to 10 (usually assigned to drums), this value can be changed to any other in the range 1~16, with the rotary encoder.

If you press the menu button (3) once again, you will see:

Track >_2_____m<
MidiEvent:NoteEv

In the present case, the type of MIDI event selected for this track is Note-Event.

- With the rotary encoder the Setting can go through the following list:

- “NoteEv” - Note-Event (Note-On + Note-Off)

- “PolyAft” - Polyphonic-Aftertouch

- “Contrl” - Controller

- “MonAft” - Monophonic-Aftertouch

- “PitchB” - Pitch-Bend

One more press of this button will bring:

```
Track >_2_____m<
-->PrgChange:OFF
```

Access to this parameter was added from version 1.1 upwards. Machines with version 1.0 do have an "OFF" as normal condition.

⇒ If you are the owner of a version 1.0 machine that you have updated to 1.1, you should check this parameter for all 8 tracks of each pattern to ensure that it is effectively set to "OFF", or set it to "OFF" otherwise.

- With this parameter, you can now set a Program-Change message and simultaneously transmit it on the MIDI channel selected for that track. (A setting of 1~128 = MIDI Program-Change 1~128)
- By calling (selecting) a pattern, its preset Program-Change is sent out automatically.

⇒ Care should be taken not to send more than a single Program-Change per MIDI channel. Multiple sends will override the previous ones, only the last one being effective. If you get the wrong sound when recalling a pattern, the cause might be that different Program-Changes in multiple tracks have been set with the same MIDI channel value.

⇒ Program-Changes are putting a load on the sound generators, especially if fast streams of notes are simultaneously playing. Then, depending on the device, slight or even strong timing problems can occur, causing disturbance in the sound.

⇒ The behavior of this function is strongly dependent of the sound generator used. Its functioning cannot be guaranteed to 100%, and in extreme cases, such as linking of patterns (1~2, 1~2~3~4, or Song-Modes), it should be left OFF if problems subsist.

7.4.4 Note Number - Track/Step

Besides being instructed about dealing with MIDI data, the information still needs to be expanded in some practical messages, among which:

- Note-Events - Which note (pitch) to deal with.
- likewise for the Polyphonic-Aftertouch.
- Which controller is the information for, and what's its controller number.
- For Program-Change there is a location with its particular number.

- For Pitch-Bend, the actual pitch inflection value must be set (a value of 64 is the neutral value, and thus equates to no Pitch-Bend)
- For Monophonic-Aftertouch is this value unimportant.
- This value is adjusted in the Note Number Menu.

This brings us to the following message:

```
Track >_2_____m<
Note Nr:036=C
```

As the value 36 appears, a "C" will be sent.

⇒ Of course, the name of this value depends on the MIDI Event Type, In case of a controller, this will be "controller number" and the indication "C" will be superfluous. For simplification, this information is always displayed. It is relevant for note values only, which is the case in 99% of applications. For events, other than Notes, don't be confused by the note name displayed, and only take into account the numerical value, "036" in this example.

⇒ This global value is effective for all 16 steps of a track.

- By multiple press on the menu button, you should come to the following indication:

```
Track >_2_____m<
SNo-001:000=C3
```

- With this feature, the Schaltwerk doesn't offer a global note number for each track, but rather a note per step. These individual note number values are added to the global value. When dealing with notes, it works as a transposition.
- The default value should always be 0, which is also a "no transpose", making now the global note number value effective.
- To adjust these values, you should also take care of specifying for which of the 16 steps the setting is currently done.
- It is make use of the buttons (1) Step left/dec. , (2) Step right/inc. or directly the corresponding Step button. In these menus, the 8×16 Step buttons are not used to (de)activate the steps, but simply to select them.
- To help you locate which step is currently selected, its LED will flash at a fast pace.
- To get an idea of how this system works, you could choose a pattern without any step selected, and select

them alternatively with the +/- buttons and the rotary encoder.

Furthermore, the step position is also shown in the display:

```
Track >_2_____m<
SNo-001:000=C3
```

In this example, the step position 1 is selected.

“SNo” is the abbreviation of Step Note, after the colon comes the value of the Note number.

⇒ These values can be set separately for each of the 16 steps of a track.

7.4.5 Velocity Track/Step

- Besides instructing which MIDI event, note/controller/etc. is handled, this information must be expanded into a threefold data stream.
 - Namely, for Note-Events, their velocity (volume level) should also be defined.
 - For Controllers, their controller value
 - For Polyphonic & Monophonic-Aftertouch, the strength of the aftertouch.
 - For Program-Change messages is this parameter useless.
- This value is located in the Velocity menu, with the following display:

```
Track >_2_____m<
MainVel:127=100%
```

The velocity value is 127, which translates to a level of 100%.

⇒ This global value controls all 16 steps simultaneously.

Similarly to the setting of Note numbers, the Velocity value can be adjusted for each step.

```
Track >_2_____m<
Sve-001:127=100%
```

- The Step Velocity is not added to the value of the Global-Velocity setting, but is rather multiplied with it to get a useful result.

- This way, the multiplication of 100% by 100% results in 100%. If one or both of the input values are smaller than 100%, the end result will also be smaller than 100%.
- So that a crossed master/slave rule is established through this function.

⇒ These values can also be set independently for each of the 16 steps of a track.

7.4.6 Step, Gate & Delay time

- For each track, it is possible to adjust the time spacing between the events in MIDI-Clock units (Din-Sync units). This setting results in defining a tempo master reference, obtained by dividing the MIDI clock or the internally generated tempo clock.
- The Step time is the duration between two similar events, i.e. between two successive Note-On messages.
- Additionally, for Note-Events, the time between Note-On and Note-Off (note length) is also adjustable.

For example, the Step time could be set to:

```
Track >_2_____m<
StepTim:006=1/16
```

- The “006” value means that, altogether, 6 MIDI clocks should elapse before the next event occurs, i.e. going a step further in the track.
- The indication “1/16 refers to musical time duration notation, where 6 MIDI clocks are defined to be value for 1/16 of a bar. To ease the musical use, this notation is used wherever appropriate.
- Similarly, the Gate time is the duration between the Note-On message and its accompanying Note-Off message. This parameter is only relevant to Note-Events.

For example:

```
Track >_2_____m<
GateTim:003=1/32
```

- With the Delay time it is possible to define for each track a delay interval.

```
Track >_2_____m<
DelayTi:000=
```

- This time will elapse after a start message (and only then), when the sequence should normally start.
- This delay will not be summed up for each round of the track, otherwise it would increase over time.
- So that, while the sequence is running, you can simulate a different start time for each track by changing this value on the fly.
- In the latter case, the delays will be added, and generally, any change to parameters in these menus will alter the true predictability of the values.
- To ensure a totally predictable result, the sequencer must be stopped and restarted.

⇒ All 3 parameters are global and valid for all 16 steps of the track.

7.4.7. End step/Start step/Run mode

- In this menu, the last and first step of a track can be set. After reaching the last step defined, the sequence will jump to the first step defined.

For example:

```
Track >_2_____m<
EndStep:015
```

```
Track >_2_____m<
StartStep:008
```

The track will start playing from step 8 up to step 15, and then loop back to step 8.

- The desired operation mode can also be set for each track.

Forward

```
Track >_2_____m<
Mode:Up
```

```
Track >_2_____m<
Mode:Up X-Octave
```

Where “X” can be any value in the range 1~5.

Backward

```
Track >_2_____m<
Mode:Down
```

```
Track >_2_____m<
Mode:Down X-Oct.
```

Where “X” can be any value in the range 1~5.

Alternate

```
Track >_2_____m<
Mode:Alt.
```

```
Track >_2_____m<
Mode:Alt. X-Oct.
```

Where “X” can be any value in the range 1~5.

Pendulum

```
Track >_2_____m<
Mode:Pend.
```

```
Track >_2_____m<
Mode:Pend.X-Oct.
```

Where “X” can be any value in the range 1~5.

- The indications Up and Down are taken from the arpeggio vocabulary, where they were defined initially. With these modes it is easy to create very interesting arpeggio-like patterns.
- With Alternate, the first and last step will be played twice each, with Pendulum mode, they will be played only once.
- Beside the basic pattern-play modes (Up, Down, Alternate and Pendulum), various modes can be chosen. The Schaltwerk can automatically transpose the tracks: For a 1 octave range, after playing the track the “normal” way, this will be repeated with a note offset of +12 (1 octave). Followed again by the original tone range and so on. For 2 octaves, the order is: original, original +12, original +24, original, etc.
- These functions inspired by the arpeggio world do offer here a similar and excellent service.

- For the time being, the Up/Down mode known in arpeggiators, is not available.
- Alternate and Pendulum modes go through a complete run, back and forth, before transposing up or down the next progression.

7.4.8 Effect menu

- In this menu, various functions of the Schaltwerk are joined, automated and made widely controllable, while offering among the most interesting functions of the machine.
- It is important to understand that all effects are realized with the resources of the Schaltwerk described until now, whereby all resources remain available and all kinds of intervention are always possible.

⇒ As you could activate these effect macros separately per track, you are in control of, not only one, but up to 8 Arpeggiators / Chord-Triggers / Gaters / Transposers / Record-Step's.

- To date, 6 Effect macros are available
- To the exception of the Gater, all of these effects combine their parameters with MIDI messages, so that the input for the incoming MIDI data should also be specified.
 - "IN1" for MIDI input 1
 - "IN2" for MIDI input 2
 - "IN12" for MIDI inputs 1 and/or 2
 - "OFF" for neither input, i.e. the function is disabled
- For the Gater there is no ON/OFF setting
- Beware that only MIDI events sharing the same MIDI channel as the related tracks are accounted.

7.4.8.1. Arpeggiator Modes

- To say that the Schaltwerk includes an arpeggiator is not exactly right.
- But rather, that the sequence control of the individual tracks is applied to the incoming Note-Events, so that arpeggio-like effects are rendered.
- Furthermore, the notes of the arpeggio are directly put into the step note memory location, so that they are immediately processed, and can be individually (de)activated. The difficult task of developing simple arpeggiated polyrhythmic structures can be carried very simply.
- Qualify this effect as an arpeggio was the closest word available at hand.
- You should take note that this effect is not a cleverly custom designed arpeggiator but rather a byproduct of the Schaltwerk concept.
- You will perhaps miss some typical arpeggio-like functions, but the wide offering and possibilities of functions previously unavailable in this form, will present a fair match.
- To use this effect, you connect a master keyboard at the input 1, make it send its data on MIDI channel 1, and set the same channel to a free track of the Schaltwerk i.e. track 2.
- To proceed, you adjust the note number to 0 (zero), so that the arpeggio sequence will not be transposed yet, something you can change later for an even more pleasant effect.
- In the effect menu you should set the arpeggiator to MIDI input 1.

Track >_2_m<
Arpeggiator:IN1

- You can now start the Schaltwerk and press a key on the keyboard.

The note will play repeatedly at the Schaltwerk tempo. In accordance, the arpeggiator will set the first step, so that you should normally hear something.

- When you release the key, the sound stops. You can check that the note in step 1 is still available. Releasing all the keys will switch back to step 1.
- If you now press 3 keys, you will see the position indicator run from step 1 to step 3 repeatedly.
- Therewith, to hear the complete arpeggio pattern, the steps 2 and 3 must also be switched on.
- Release now the keys successively and the running span of the Step cursor will shrink accordingly, down to step 1.

- If you set the arpeggiator to OFF while holding some keys, their notes will continue to be sequenced, even when releasing them.
- When you take a look at the End Step parameter, this one is now set to 3.
- If you now check the 3 note values, these are exactly the last ones played on the keyboard.
- The arpeggiator is realized through the simple system of checking an incoming note and assign it to the next Step position available. The End Step counter is also incremented by 1. This system works up to 16 notes.
- By releasing a key, the End Step counter is simply decremented.
- The Step-Note values remain unaffected but stop playing because of the decrease in the End Step counter.
- Not only are the Step Note values taken into consideration but also their velocities which are assigned to their respective Step Velocity locations, to get a very lively arpeggio.
- If no new notes are received while the arpeggiator is active, all Step Notes & Velocities are held and can be further processed.
- You can, for example, set the End Step to a higher value and the previously hidden notes will reappear in the arpeggio sequence.
- You can also try to (de)activate various steps to see what kinds of polyrhythmic patterns are possible with this stylistic approach.
- You can also change the operating mode of the track from “UP” to “UP-1 Oct.” or “UP-2 Oct., etc.
- Doing so, will also make the arpeggiator musical results correspondingly complex and rich.
- A hold function is available for the arpeggiator through the sending of a ArpHoldController (see MIDI-Remote-Menu). If an “ON” message (controller value higher than 63) is received on the appropriate MIDI channel, the arpeggio will be held as long as the message is effective. New notes won’t be taken into account as long as an “OFF” message is not received.
- The “ON” message is indicated in the menu by a “!” sign at the end of the line.

7.4.8.2. Record Step mode

- Another mode similar to arpeggio, but offering an entirely different set of effects, is the Record-Step-Mode.

```
Track >_2_____m<
Record-Step:IN1
```

- With this mode, the Step Note values and velocities of the previously described tracks will be continuously updated with the notes received from the MIDI input 1.
 - After recording each new note in a Step-Position, the Record-Position will move to the next Step.
 - What follows are only suggestions. You can for example record a sequence in Down-Mode, what will of course produce entirely new effect types.
 - With this effect, the incoming notes are incorporated in the sequence, reminding the operating mode of typical software sequencers, where this function is often described.
- On one hand, the Schaltwerk can be used as a simple and quick “step-by-step” sequencer to be played from a MIDI keyboard.
- On the other hand, this effect can also be used dynamically to mimic the Record-Overdub function of a Track-Loop sequencer.
- The position for the recording of the next note is indicated by the slow (but faster than the position cursor) flashing of the related Step LED.
 - In addition, it is also possible to move manually through the steps, without recording a note, by pressing the Step Right/Inc button.
 - All of these functions are located in the Step-Rec-Menu whose button is shared with other functions.

7.4.8.3. Overdub Record

Another mode to transfer individual notes from the MIDI input to the Step-Memory is the Overdub-Mode.

```
Track >_2_____m<
Overdub-Rec:IN1
```

In this mode, in contrast to the Record-Step-Mode, the sequencer behaves “normally” and attempts to catch the “separately played” notes on the fly and assign them to the current Step position, while running.

7.4.8.4. Transpose mode

- One further press on the Effect button brings the following message:

```
Track >_2_____m<
Transpose:OFF
```

It means that the transpose function for the selected track is currently switched off. Of course, you can, as in the previous menus, set the function to achieve a transposition of the Note-Events with the data coming from MIDI in 1, MIDI in 2, or both.

- In this context, transposing means that the value of the note coming at the activated MIDI input will be added to the value of the present note, if their MIDI channels match.
- It is recommended to adjust the keyboard or any other MIDI-note generating device to a very low range (usually through its own transpose function), otherwise the sum of the note numbers will quickly reach very high values, translating to very high pitched notes.

⇒ All effects have a lower processing priority than the primary tasks of the Schaltwerk, so that under high load conditions, such as fast note changes or great amount of incoming MIDI data, noticeable delays could be heard.

- Stricto sensu, the hereabove described transpose function only applies to tracks 1 to 7. The transpose function of the Master Track (8) is working in a special way.
- With the present transpose function, it becomes very difficult to get a simultaneous transpose of multiple tracks with different MIDI channels, as it will be the case with most multitimbral MIDI setups. To do that, you should own a Master Keyboard able to send the same note on multiple MIDI channels at once, a feature you won't usually dedicate entirely to transpose the tracks of the Schaltwerk.
- To circumvent this shortcoming, instead of offering the same transpose function as for tracks 1~7, the Master Track, when activated, can transpose all other activated Tracks. The tracks you wish to transpose must have their various transpose parameters (MIDI channel, Input) activated, to the exception of the transpose value which becomes irrelevant as this information will be carried from the Master Track. It should be noted that there won't be a double transposition as you were perhaps presuming.
- The transpose of master track is not linked to the transpose values of the other tracks, but replaces them.

7.4.8.6. Chord Trigger

The next press of the button will bring:

```
Track >_2_____m<
Chord-Trig:OFF
```

7.4.8.5. Gater

- The next press of the Effect-Menu button will bring you the next message:

```
Track >_2_____m<
Gater:OFF
```

- To the exception of the Note-Event where a Note-Off will be sent after its related Note-On, all other Event Type will send only their own event data.
- If the Gater is activated, with an Event Type other than a Note-Event, at the place where a Note-Off would appear, the same Event Type as the one selected will be sent with a fixed value of zero.
- Setting the Event Type to Controller and the Note Number (in fact the controller number) to 7, which is the standard MIDI volume controller, sustained notes played on the same MIDI channel will be minced.
- These notes can be generated by the Schaltwerk itself or come from any other source, in which case a merger is required, as the Schaltwerk will not retransmit the MIDI events present at its input.
- In this example, the Gater works as a MIDI-triggered Noise-Gate. Producing sustained chords, rhythmically chopped, without retriggering the keys, are not a problem anymore.
- Other applications can be done very easily by selecting a different Controller number or a different Event Type.

- This effect is also dependent on external MIDI Note-Events and requires to have a MIDI input specified.
- The Chord-Trigger beats the sustained notes automatically according to the track rhythm.
- The note values are transposed with the values taken from the respective steps and their velocities are multiplied by the step's ones accordingly.
- At first sight, you can easily differentiate the Chord-Trigger functions from the note transposition and velocity multiplication functions also found in the Gater. In contrast, no controller value, nor controller value zero are offered, but for each step a whole packet of Note-Events can be sent. This function is restricted to Note-Events, while the Gater function can rhythmically control almost any type of MIDI event.
- Contrary to the Gater, the sound is retriggered with the Chord Trigger and does not hold. Furthermore, a MIDI merger is not necessary as the Note-Events are directly produced by the Schaltwerk.

⇒ You can experience timing inaccuracies and a shaking feel if a huge quantity of Note-Events must be produced in a single step. In the Gater there is a limit of 2 events per step per track, while the theoretical limit for the Chord Trigger is of 2 × 128 Note-Events per step.

- A hold function is available through the sending of the Chord-Hold-Controller (see page 26). While an ON-message is received and active, so will all received Note-On messages (and their corresponding Note-Off messages) until nothing else is registered, or an OFF-message arrives.
- The "ON" message is indicated in the menu by a "!" sign at the end of the row.

- The Arpeggio effect and Chord trigger are sharing the same cache memory where note messages to be sent are stored.
- The Hold effect of the Chord-Trigger also prevents the forwarding of new notes in the Arpeggio effect.
- On the other hand, the Arpeggio-Hold message has no influence on the Chord mode, so that only the transmission of incoming notes to the step positions will be locked. Therefore: Chord-Hold-On: No further notes are stored in the cache.
- By Note-On, and we mean newly pressed notes, these will not be accepted anymore in the Chord-Trigger.
- By Note-Off, we mean released keys, provided that they were struck previously, so that their state is valid as they were effectively played.
- Chord-Hold-Off: All Note-On and Note-Off messages are accepted again in the cache memory.
- Through purposeful sending of Chord-Hold-On/Off messages you can, for example, build stacks of complicated chord patterns.
- Turning off the notes can be obtained by sending the corresponding Note-Off messages or else by pressing the Stop button twice.
- The cache memory (stacking of notes via the cache memory with the help of the Chord-Hold message) is also working when the sequencer is stopped, and allows you to tweak the chord patterns in dry run conditions.

7.4.8.7 Effects combination

- With the techniques seen in the menus, almost all effects can be activated simultaneously.

⇒ Gater-Mode & Chord-Mode are mutually exclusive.
When one of these modes is activated, the other one is not available anymore. If the currently used mode is no longer needed, it has to be switched off, before access to the other one is possible.

- As some parameters are common to both effects, editing one of these effects could overwrite the data in the other one.
- While it is normally avoided to manipulate the parameters this way, this can bring very interesting results anyway.
- It is however important to know with which priority the effects are processed.
- The processing order of the effects is: The Arpeggio comes first, then the Record-Step, the Transpose calculation follows, and the Overdub capture is closing the list.

- Both the Gater and the Chord-Trigger run from the first effects mentioned in the previously explained independent settings.
- A note change in the Chord-Trigger function will not be effective on the chords already struck, but from the next occurrence onwards.

7.4.9. Edit/Mute mode

- This menu handles the behavior of the Track-Select & Mute buttons.
- Normally, you will select or mute a specific track by pressing its accompanying button. This is the “Single Mode” for which these buttons were planned.

```
Track >_2_____m<
EditMode:Single
```

- Changing this mode to “multi” allows you to activate multiple buttons simultaneously. This is the default mode for the Mute buttons.

```
Track >_2_____m<
MuteMode:Multi
```

The third possibility is:

```
Track >_2_____m<
MuteMode:SingInv
```

- Where all buttons will be selected to the exception of the one just depressed. This setting of the mute mode is corresponding to a Solo function.
- You may find another mode such as “Single” very useful too.
- With “Multi” you can select and edit multiple tracks at once. In this case, the edited values will be identical in the different tracks.
- It offers you a simple and fast way of realizing horizontal editing, without calling, and editing each track repeatedly.
- Cleverly changing and combining the various edit modes can spare you a lot of work.

7.4.10 Unused

- To date this button is unused. It could be assigned to new functions to be implemented in forthcoming versions of the software (such as V2.XX, where XX

replaces the actual release number of a version 2 software). The present device will of course receive the appropriate text layout on its front panel.

- For all users of previous versions, the update package will include the stickers for the casing. These will be applied at the remaining free locations of the front panel.

7.4.11 Track tools

- This menu is here to simplify your work with tracks.
- With it, you can:
 - Copy a track to another
 - Swap tracks
 - Initialize a track i.e. quickly set its default parameters.

```
Copy Track:001
to   Track:002
```

- Select this menu, then press consecutively on the Track Select buttons 1 & 2. Additionally, an entry cursor will blink in the display.
- Simultaneously, the LED of the OK button is flashing to show clearly that the completion of the task requires the activation of this button. When the OK button is pressed, the appropriate function is executed and a report confirming the completion is shown on the lower line of the display.
- The above procedure is valid for swapping tracks. This is done with the Exchange function whose operation is identical to the Copy function

```
Exch.Track:001
with Track:002
```

- To initialize a track, it should be selected with one of the Track Select buttons:

```
Init Track:005
```

Will initialize Track 5.

7.4.12 Pattern tools

- The four pattern-bank select buttons are used jointly with the 32 pattern buttons to select any of the 128 available patterns. ($4 \times 32 = 128$)
- Copy and Exchange of Patterns share the same approach as the Track functions.

Copy Pattern:001
to Pattern:002

Exch. Pattern:001
with Pattern:002

Init Pattern:001

In addition, it is allowed to

Store Pattern
to Pattern:001

- The temporary working memory is stored in one of the 128 non-volatile Pattern memory locations.

⇒ Contrary to software version 1.0, the Store function is now located first in the menu selection, and is thus immediately available.

- In addition to these menu functions, it is also possible to dump in SysEx format from MIDI out 1, any one of the four Pattern Banks (1~32, 33~64, 65~96, 97~128), or any single Pattern.

SysEx Transfer
Pattern:[VALUE]

Where [VALUE] can be any of:

Bank1 ~ Bank4

or pattern number

001 ~ 128

- These dumps can be stored with any suitable program, such as a conventional sequencer program, and archived for later use.
- Should these Dumps be sent back to any MIDI in of the Schaltwerk at any time, they will be transferred to the appropriate Pattern memory locations where they will

replace the previous data, as long as no failure occurs during the transfer.

⇒ You should take note that sending back Dumps of one or several Patterns/Songs into the Schaltwerk while it is running may strongly affect its timing accuracy. It is therefore recommended to stop the sequencer before this operation. In extreme cases, it is possible that the data dumped will not be received correctly. This will be displayed as a failure.

⇒ When a faulty transfer occurs, the memory locations related to the Pattern/Song data just sent, will always be only partially updated. Be sure that there are no illegal values lying in the memory as there could be a mismatch between old and new Pattern/Song data.

7.4.13 Song tools

- All of these functions work similarly to those available for Patterns, with the difference that there is a maximum of 16 songs. To select them, there are 2 Song-bank buttons associated to a row of 8 dedicated Song Select buttons. ($2 \times 8 = 16$)

Store Song

Copy Song:001

Exch. Song:001

SysEx Transfer

Init Song

7.4.14 Song menu

- The Schaltwerk offers 16 Song memory locations.
- When the Song-Mode is desired, one of the Song-Bank or Song buttons must be pressed, and as their LED's are lit, the Song-Mode is now enabled.
- To quit the Song-Mode, press one of the active Song or Song-Bank buttons. Both LED's will go out, and the Song-Mode is now disabled.

⇒ Caution: To play in Song-Mode the Pattern-Edit buffer is used and overwritten. It is therefore recommended to avoid activating inadvertently the Song-Mode while valuable Pattern data is held in the buffer. The latter should be saved in a Pattern memory location prior to the execution of the Song-Mode.

- Each Song is made of a list defining the Pattern sequence chain. This list will be executed according to:
 - Play from the beginning with Start
 - restart from the present position with Continue
 - execute the current Pattern content
 - repeat it a number of times as predefined
 - take care of the individual mute switches status
- Each Song has memory for 128 Pattern steps.
 - The pattern defining each Song step can be repeated up to 127 times.
 - Each Song-Step can store the individual ON/OFF track mute status for all 8 tracks in each Pattern. This can be different from the default value of the Pattern.
- At any location in the step sequence it is allowed to have
 - an end marker to stop the song
 - a jump instruction

⇒ All changes are done in the Song-Edit-Buffer only. Should you want to keep these changes, it is then necessary to explicitly store the data in one of the 16 Song memory locations.

⇒ Recalling a Song will load it in the Song-Edit-Buffer, overwriting its current content. It is therefore recommended to save any valuable data present in this buffer as it is the case with the Pattern buffer

```
Song001 Step:001
  Patt.001  -*:002
```

- The Song we are editing here comes from Song memory location 1 and is held in the Song buffer. It will execute its first step by playing the pattern 1 twice.
- The instructions for Song1 are based on the data present in the Song-Edit-Buffer and cannot be edited from this menu.

⇒ To prevent an inadvertent overwrite of the Song-Edit-Buffer while in this menu, all song buttons are disabled.

- The step position can be selected through the Step Left & Right buttons.
- Any Pattern can be directly selected with its dedicated buttons while standing at the step position.
- The number of iterations each pattern has to play is adjusted with the rotary encoder.
 - When the number of iterations is set to zero, it becomes an End Marker. The pattern is then canceled, and the display shows:

```
Song001 Step:001
  Patt.END  -*:000
```

- Should this End Marker be canceled, a repeat value different from zero is displayed, and a pattern has to be selected.
- When a Pattern is selected, its track mute settings are recalled automatically.
- In each step, the mute settings can be modified freely. This “other” mute configuration is nevertheless only effective in Song-Mode. The actual mute setting of the pattern remains unaffected.

The activation of the Song Seq. Menu leads us to:

7.4.14.1 Editing of the Song buffer


```
Pattern:001
-->PrgChange:001
```

In this example, the pattern 1 will be called upon reception of Program-Change #1

- Similarly, by pressing a Song button (and Song-Bank button), that specific song can be linked to a given Program-Change.

```
Song:001
-->PrgChange:001
```

It is also possible to set a controller for the arpeggio and chord functions.

```
MIDI-Assign-Menu
ArpHoldCtrl :064
```

```
MIDI-Assign-Menu
ChordHoldCtr:066
```

These Arpeggio and Chord controllers are set to activate a hold function upon reception of the corresponding MIDI message.

Usually, master keyboards are equipped with a set of pedals used for Sustain and Sostenuto (controller # 64 & 66). If your keyboard is only able to manage a single pedal, you can assign any other controller, such as the modulation wheel (controller # 1) in replacement of the second pedal.

⇒ In version 1.0 of the software, the controller values for Arpeggio and Hold were predefined as Sustain and Sostenuto. From software version 1.1 onwards, these can be freely defined by the user.

⇒ All the settings done in this menu are automatically saved in non-volatile memory.

7.4.16 Sync menu

In most applications the Schaltwerk is working with its own timebase.

```
Sync-Intern/Ext.
Mode:Intern
```

The Schaltwerk can however follow an external clock.

- from MIDI input 1

```
Sync-Intern/Ext.
Mode:Ext.MCL1
```

- from MIDI input 2

```
Sync-Intern/Ext.
Mode:Ext.MCL2
```

- or from a non-MIDI clock

```
Sync-Intern/Ext.
Mode:ExtDinSync
```

- incoming at the DIN synchronization connector.

- In internal clock mode, the Schaltwerk sends the following MIDI real-time messages:
 - Start (\$FA),
 - Continue (\$FB),
 - Stop (\$FC),
 - and MIDI-Clock (\$F8)
- at both MIDI outputs.
- A synchronized pulsed signal is issued at the DIN-Sync connector.
- In external MIDI mode, the Schaltwerk will respond to MIDI real time messages received at its MIDI inputs 1 and/or 2.
- In external DIN Sync mode, the DIN connector is switched to input, so that the Schaltwerk can be controlled by external pulsed clock signal and start/stop control.

- A further Sync parameter related to external MIDI clock control defines the behavior of the Schaltwerk regarding incoming MIDI Continue messages.

**Sync-Intern/Ext.
Mode:Start; Cont**

- Only incoming Start messages will play the tracks from their first step.
- Continue messages will make them play from their current step position.

**Sync-Intern/Ext.
Mode:Start=Cont**

- Both the Start and Continue messages will make the tracks play from the beginning i.e. first step.
- Normally, MIDI real-time MIDI messages are sent simultaneously at both MIDI outputs. There are however some configurations where this may cause trouble. This is why the option is offered to individually enable them.

Mode:MCL1

Mode:MCL2

Mode:MCL1 & MCL2

Mode:no MCL-Out

The default setting is no MIDI real-time messages at none output.

⇒ All settings in the Sync menu are volatile, and should be reestablished each time the device is switched on.

7.5 Typical operation

7.5.1 Loading of pattern in the Pattern edit buffer

- At startup, pattern 1 is automatically loaded in the pattern edit buffer.
- During normal use, this temporary edit buffer can be overwritten by any one of the 128 pattern presets.
 - This is done by pressing one of the dedicated 32 pattern buttons, which,
 - in conjunction with one of the 4 Pattern-Bank buttons allow a range of $32 \times 4 = 128$ patterns to be covered.

7.5.2 Song-Mode inactive

- No song LED is lit
- Song-Mode is inactive at power-up
- When a Pattern (Pattern-Bank) button is pressed, the related pattern is loaded in the Pattern-Edit-Buffer.

If the same operation was to be performed while the sequencer is running, the new pattern would instantly replace the one in the buffer, resulting at best in a glitch in the rhythm flow, and at worst, in hanging notes, etc. The human reaction time and behavior of the pattern buttons are by far too inaccurate to ensure a proper chaining of patterns.

- This is why a master track system was adopted. Therefrom, the currently playing pattern has to elapse before the new one plays in turn seamlessly.

⇒ The master track is locked to track 8.

Track > _____ m<

The character “m” in the display is for the master track, which, when selected is indicated by a capital “M” instead of number “8”.

- Until the end of the currently playing pattern is reached, its LED remains steady lit, while the LED of the newly called pattern is flashing.
- At the transition time, the ending pattern LED goes off, and the starting pattern LED goes on.

7.5.3 Song-Mode active

- The accompanying Song LED is lit

- While in Song-Mode, the temporary Song-Edit-Buffer can be overwritten at any time by one of the 16 song presets.
- For this purpose, a set of 8 dedicated song buttons is used in conjunction with
- 2 Song-Bank buttons to offer the total of $2 \times 8 = 16$ songs available.
- As soon as a song or Song-Bank button is pressed, the related song is loaded in the Song-Edit-Buffer, and, provided that the sequencer is running, it will be processed.
- The change of pattern in Song-Mode works exactly like in manual mode, and thus is also synchronous to the master track.
- It goes the same in case of song chaining while the sequencer is running:
- The currently running song LED is lit while the next song LED is flashing. At the switching time, they become respectively off and steady on.

⇒ The editing of patterns is possible in Song-Mode. The changes will nevertheless be overwritten each time a new pattern is fetched.

7.5.4 Modes 1~2 and 1~2~3~4

- The possibility to chain patterns by 2 or 4 allows to create “mini songs”.
- This is done by chaining any pattern in the left column with the corresponding one in the right column, and so, make them play alternatively.
- In mode 1~2, the patterns in the first column (1, 3, ...), can be coupled with those of the second column (1, 4, ...).
- In mode 1~2~3~4, two of the previous pairs are joined in a single quadruple-pattern chain. (1, 2, 3, 4 or 5, 6, 7, 8 and so on)
- These modes are mutually exclusive. When a dual pattern chain is set within a group of four patterns, it is not possible to set a quad chain anymore within that group. Only the second possible dual chain can be set.

⇒ Should a quad chain be set in a pattern group where dual chains already exist, these must be deactivated prior to setting the quad chain.

- The dual and quad pattern links can be played as songs on their own, but also included in songs where they

will count as single patterns, while playing their whole link.

- Practically, these song macros will be used to realize patterns with more than 16 steps: 32 steps with mode 1~2, and 64 steps with mode 1~2~3~4.
- While these 2 and 4 pattern sets are effectively operating as single patterns, all patterns constituting them should nevertheless be edited and saved separately. By contrast, they are not accessible individually during play, as they are chained automatically.

⇒ The pattern editing capability is disabled during play, as the potential changes are temporary and overwritten by fetching the next pattern to play.

- To confirm that a pattern is part of a 1~2 or 1~2~3~4 link, the relevant link LED will lit when such a pattern is called.
- The link modes can be (de)activated at any time by pressing the relevant link mode button.
- This link information is global and stored in non-volatile memory.
- When linked patterns are used in a song, their link status is respected in executing the song.
- The link starts by playing the pattern called and thus not automatically the first pattern within the link, it will however always end with the last pattern in the link.

8. Appendix

8.1 Activity display during SysEx reception:

- When a pattern SysEx is received faultlessly and written successfully in memory, the display will show the next message:

```
Receive Pat:xxx
```

- Similarly, when receiving a song:

```
Receive Song:xxx
```

- In case of error during the reception, the existing Song or Pattern memory will not be overwritten, and the display will show the following message:

```
MidiReceiveError  
SysExDump
```

- The cause of such error can be in an erroneous dump format, or an excessive data density for proper processing by the Schaltwerk. In this case, it is recommended to insert small pauses between the 32 data chunks constituting the complete message.
 - This could also be the case when the machine is already in a heavy processing load condition, running many events at high tempo, while processing dumps and lot of data from both MIDI inputs, leading the internal buffer to overflow.
- These error messages are temporary, and overwritten during the next operation.

8.2 Complete initialization

- The Schaltwerk can be completely initialized.

This may be needed

- At first use.
- In case of data corruption by a mains failure
- In case of corrupted data that cannot be processed properly.
- The reset procedure is done by holding down the Start button while applying the power to the machine.

The following warning is then displayed:

```
Init Menu! <OK>  
FormatPresetRAM
```

- After pressing the OK button (whose LED is not flashing as usual), the following message appears:

```
Format total RAM  
FormatPresetRAM
```

Afterward, the entire memory is erased and initialized.

- This will take a few seconds, afterwards the Patterns and Songs will be loaded with default parameters.

```
Init Part:1-128  
Init Song:1-16
```

- To close the procedure, the Schaltwerk will return to its normal power-on status.

⇒ This procedure will irremediably delete all information contained in the Schaltwerk. This function is normally reserved for servicing purpose, or for users who want to quickly restore the machine in start-up condition. It is in all cases strongly recommended to save through SysEx-Dump any data that you may want to use at a later time.

9 Troubleshooting

- If you experience any of the following difficulties while using the Schaltwerk, look at this troubleshooting guide to help you remedy the problem.
- Apparent failures are often related to the particular behavior of the machine. A deeper understanding of the functioning circumvents or avoids these troubles.
- If you can not come to a satisfying solution, then maybe are you encountering a real hardware or software problem.
- In this case, it is recommended that you take contact with your retailer, distributor or the factory. We will try to solve your problem in the shortest delay.

9.1 Cabling problems

- MIDI data cannot be sent or received.
 - Check first that your setup is properly connected.
 - Ensure to use only authentic MIDI cables instead of the hi-fi, or home-made variety, that could differ from the MIDI specifications.
 - Try swapping cables to identify if one of them is not faulty. Especially all cables presenting dents, notches, cuts or perforations, as well as badly soldered contacts.
- There is no Sync signal sent nor received.
 - MIDI cables cannot be used to convey the Sync signal. While they are both of the same mechanical type, their inner cabling differs. Nevertheless, cables offering the complete inner cabling do exist, and can be used for both applications.
 - When connecting to external devices, both devices cannot be set simultaneously to input or to output. They should be set differently to get a functional coupling.

9.2 Reception problems

- If data seems to come in, but leads to strange tuning results.
 - The receiving device is not set to input mode
 - The Schaltwerk and the receiving device are set to different MIDI channels.
 - The receiving device is muted by another message sent out inadvertently (Volume off: control 7 with value 0), etc.
- Data seems to be sent by the Schaltwerk, but leads to strange results.
 - Different MIDI channels are set for the different functions of the Schaltwerk.
 - The various functions of the Schaltwerk are not activated properly, set to OFF, or are listening to the wrong MIDI inputs.
- The MIDI data present at the MIDI inputs is not available at the MIDI outputs.
 - The Schaltwerk has no Merge function. The incoming data is not sent along the onboard generated data to the outputs. If all you need is to have the data sent to the Schaltwerk be available to other devices, a THRU box allows you to have multiple flows of the same data going to separate MIDI connectors. If you want your receiving devices to be controlled both by the Schaltwerk and another source simultaneously, you need to combine several MIDI flows into one. This is the work of a Merge box, such as the:

⇒ DOEPFER MMR4/4

9.3 The Start, Stop, & Continue buttons “do not react”

- All tracks are muted, and no data is sent despite the sequencer is running.
- All steps are switched off, and no data is sent despite the sequencer is running.
- Due to the effects (Arpeggiator, Gater, Record-Step, ...) currently activated, the tracks do not send data because they need incoming MIDI data to play.
- Start & End step values are set to the same step position, which if muted will send no data, even if other steps are ON.
- Individual parameters (Step, Gate, Delay, Midi-Event, ...) are set to extreme settings. These values, while being sent correctly, may not be recognized by some devices, may be ineffective, or out of range to bring useful results.
- Electric and lightning perturbation on the mains can alter the contents of the non-volatile memory of the Schaltwerk, leading to inconsistent data in the Pattern presets. This can be especially annoying for Pattern 1, as it is the default pattern at power-on. By running the sequencer, this faulty data is processed and can lead to erratic behavior. Try to correct the parameters in editing mode **before** starting the sequencer. If you can not correct the problem, the last solution is to save the remaining patterns through SysEx, and then reinitialize the Schaltwerk.

9.4 Changes made to a Pattern/Song are not retained.

- You forgot to save your changes into one of the 128 Pattern /16 Song memories after the editing, or you have missed to confirm explicitly the save operation with the OK button. As when selecting one of the 128 patterns/16 Songs, they can not be directly edited until a copy is brought into the Pattern-Edit-Buffer. Changes are only possible onto this copy and must be saved back into a memory location again.

9.5 Problems to edit parameters in the menus

- If you enter an edit menu while several tracks are selected, all parameters accessed will be set equal in all these tracks with the value currently displayed, even if you just take a look at the parameters without changing them.

- The editing of parameters with the buttons and the rotary encoder is very slow, laborious and disjointed.
- When editing values while the sequencer is running, you should keep in mind that, as the inner computer job priority for editing is lower than that of the play functions, there could be some laziness in the reaction time of the menus, especially with complex sequences or fast tempo being at work.
- The indication of the Step-LED/running cursor does not match 100% to the actually expected position, or particular interference effects can be seen.
- Here too, is the software strategy at cause. The display and LED's have a lower priority than the processing of higher priority tasks, such as the real time processes: MIDI in and out, values fetching and issuing, timing control, ...that suffer no delay without audible results.

9.6 Individual buttons react differently

- Due to the big quantity of buttons used in this single device, there could be a slight disparity in production. These small differences can lead to subtle variations in the behavior of the buttons.
- Provided that this effect is slight, it is perfectly normal considering the goal of high production to keep the cost down.