WALDORF KB37 USER MANUAL

V1.1

Introduction

Thank you for purchasing the KB37 controller keyboard.

Like any Waldorf product, this KB37 has been developed and produced using advanced materials from outer space. We hope you enjoy it as much as we do.

Reading this user manual, you will discover all the device's features, learn its basic operation, and benefit from tips & tricks we discovered during product development.

Your Waldorf Team

Disclaimer

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http://www.waldorf-music.info

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Contents

1 General Safety Guidelines

Please read the following safety guidelines carefully!
They include precautions you should always observe when dealing with electronic equipment.

- Only use the device indoors in a dry atmosphere.

- Never use the device in damp conditions, such as in bathrooms or near swimming pools.

- Do not use the device in extremely dusty or dirty environments in order to preserve the device's surface finish.

- Ensure that adequate ventilation is available for the device to cool down. Do not place the device near heat sources, such as radiators.

- Do not expose the device to extreme vibrations.

- Unplug the device when not in use for longer periods.

- Never place objects containing liquids on top of or near the device.

- Ensure that no foreign objects find their way into the unit. If this occurs, switch the power off, unplug the device and consult an authorised repair centre.

When used with amplifiers, speakers or headphones, this device can generate volume levels that may result in **irreparable damage to human hearing,** so volume should be kept at moderate levels at all times.

This device is **designed exclusively** to generate low frequency audio signals for sound generation. Any other use is prohibited and voids the warranty extended by **Waldorf Music GmbH**. Damages due to incorrect use are not the responsability of **Waldorf Music GmbH**.

2 Device Maintenance

- Refer all service and repair tasks to qualified personnel.

- Use only a soft cloth or brush to clean the device surface.

- **Never use cleaning chemicals** as they will damage the device surface.

3 Package Contents

The KB37 package contains the following parts:

- KB37 controller keyboard

- AC power plug

A Phillips-head screwdriver (#0) is needed to mount your modules into the module frame. No additional tools are needed.

4 Device Overview

4.1 Module Frame with Bus Backplane

The module frame is the place where you mount your modules. Inside the frame there is a backplane with pin headers to connect the modules to the A-100 bus. The bus provides power as well as an interconnection for CV and Gate which can then be shared between the KB37 and certain modules.
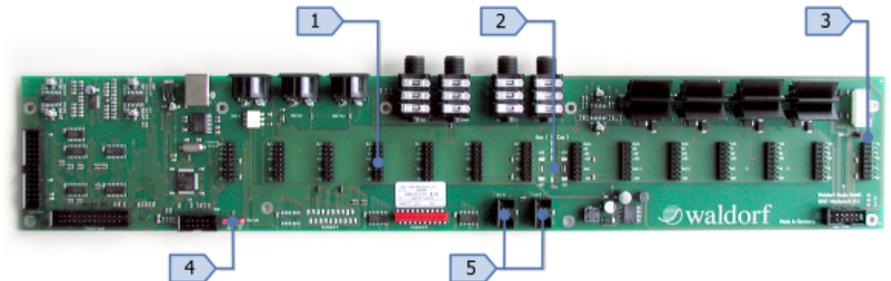
1   Pin headers for connecting the modules

2   LEDs for indicating +12V and -12V bus power

3   Ground link jumper for connection between internal ground and chassis (factory pre-installed)

4   Jumpers for linking the bus CV/Gate signals to the KB37 CV interface (factory pre-installed)

5   Extension connectors for option boards which may eventually be released before the strike of the next millenium

4.2 CV Panel

The CV panel on the left side of the unit provides jacks to access all control voltages as well as some illuminated buttons to set some configurations.
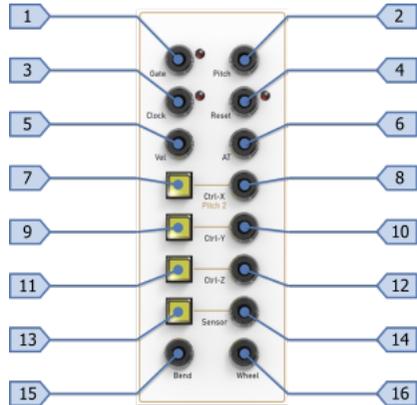
1   Gate output triggered on each note

2   Pitch CV output 1V/octave (level 0..+7V)

3   Clock output for syncing (generates a pulse on each clock signal)

4   Reset output (generates a pulse when a MIDI Stop message is received)

5   Note velocity CV output (level 0..+5V)

6   Aftertouch CV output (level 0..+5V)

7   Ctrl-X button for configuring to Ctrl-X output

8   Ctrl-X CV output for user-assignable MIDI CC messages (level 0..+5V)

9   Ctrl-Y button for configuring to Ctrl-Y output

10   Ctrl-Y CV output for user-assignable MIDI CC messages (level 0..+5V)

11   Ctrl-Z button for configuring to Ctrl-Z output

12   Ctrl-Z CV output for user-assignable MIDI CC messages (level 0..+5V)

13   Sensor button for configuring the sensor input scaling

14   Sensor CV output (level 0..+5V)

15   Pitchbend wheel CV output (level -5V..+5V)

16   Modulation wheel output (level 0..+5V)

4.3   Audio Panel

The audio panel on the right side of the unit is where you connect the output signals of your modules and set the volume for the main outputs and the headphones.
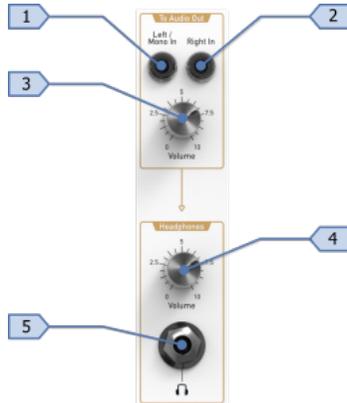
1   Left/Mono audio input for signals from modules

2   Right audio input for signals from modules

3   Level control for audio output jacks on the back panel

4   Headphones level control, independent of main output level setting

5   Headphones output

4.4   Controls Panel

The controls panel provides access to various functions of the KB37. You can set the behaviour of the CV/Gate generation or enable/disable the arpeggiator. It also includes the pitch and modulation wheels.
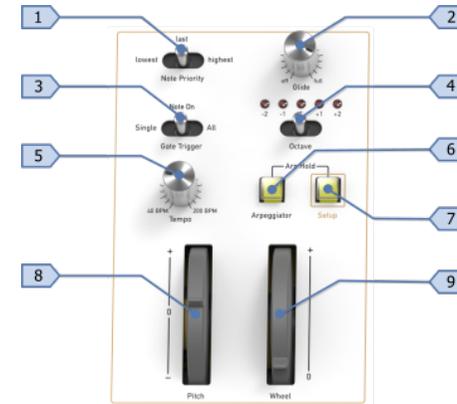
1   Note priority switch for selecting the note on pitch CV

2   Glide knob for setting portamento time on pitch CV

3   Gate trigger mode switch (determines when to generate a gate pulse)

4   Octave switch with LEDs for selecting the keyboards octave range

5   Tempo knob for settings the speed of the clock generator and/or arpeggiator (Clock master mode only)

6   Arpeggiator button for switching the arpeggiator on/off

7   Setup button for accessing alternate functions on the keyboard

8   Pitch wheel

9   Modulation wheel

4.5 Back Panel

The back panel provides the connectivity needed to integrate the KB37 into your setup.
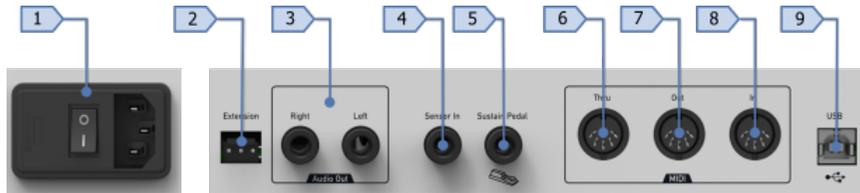
1 Mains socket with power switch and fuse

2 Extension connector

3 Audio outputs (stereo)

4 Sensor input (level 0..+5V)

5 Sustain pedal input (polarity is detected automatically)

6 MIDI Thru

7 MIDI Out

8 MIDI In

9 USB jack for host connection

5 Connections

5.1 Power

An AC power outlet is needed to power up your KB37. Make sure that the power switch on the back panel is turned off before you connect your unit. Use the cable supplied with the unit to make the connection.

> The KB37 uses an internal power supply unit that can be switched between 110V and 220V. To avoid any damage, ensure that the right voltage is selected for your region.

5.2 Audio

Connect the *audio outputs* on the back panel to a mixing console, audio interface or similar. The signal at these outputs is taken from the jacks at the audio panel on the right side of the unit, attenuated by the level pot.

The KB37 features a stereo signal path that is also buffered by an output stage. Even when you're using a mono setup within your module patches it's not a bad idea to make a two-channel connection to your mixer. As long as you use the *Left / Mono In* jack only on the front panel, the signal is sent to both outputs. This way you can switch between mono and stereo output quickly by just inserting a patch cable.

Before connecting and disconnecting the KB37 from a power supply source, turn your amp's volume control all the way down to avoid damage due to on/off switching noise. The KB37 produces a high-level output signal. Please take care that the connected playback device is suitable for the high level of an electronic instrument. Never use the mic or phono input of the connected amp!

5.3 MIDI

The DIN jacks provide the classic MIDI connectivity that has been used for lightyears. Any data received at the *MIDI In* jack is merged with USB MIDI and the *MIDI Out* delivers the same data as sent over USB. It's also noteworthy that *MIDI Thru* is hardwired to *MIDI In*, so there is no additional latency when chaining devices.

5.4 USB

Using a USB cable you can connect the KB37 to your computer when observing the following system requirements:

- Windows PC: Windows 7 or later is recommended, a USB port
- Linux PC: a USB port
- Apple Macintosh: Intel Mac with Mac OS X 10.6 or newer, a USB port

The USB connection can be used for:

- Transmitting and receiving MIDI data
- Dumping firmware updates

6 Attaching Modules

Before connecting modules, make sure that the KB37 is turned off. Please also disconnect the mains plug. You should follow this precaution to minimize the risk of damage to the unit and your precious modules.

6.1 Connecting Modules

The bus plane of the KB37 features 14 connectors in two sections that are regulated seperately to distribute the power dissipation more equally. Each section can deliver up to 1A of current, where a total limit of 1.5A must not be exceeded. Please consult the documentation of your modules' manufacturers for the power consumption of each device.

It is advisable that you also distribute the connectors of your modules over the whole bus plane, especially if you use modules that draw a lot of current. However, no damage can occur if you don't follow this advice.

After connecting all modules, check if the power LEDs at the backplane still light up when you switch on the unit. If not, there is either a short-circuit or the total consumption is too high. In both cases, try to find out the cause by disconnecting modules one a time.

6.2 Mounting Modules

To mount your modules use M3 x 6 screws. Is is advisable to use washers to protect the surface of your modules' front panels. The maximum depth of the modules that can be mounted is 65mm, including the bus connector. Please also note that modules that are mounted on the right side of the frame are limited to 25mm depth because of the power supply located below them.

7   CV/Gate Interface

The CV/Gate interface features various output jacks on the left side of the KB37. It also allows the KB37 to be configured in various ways via setup functions and the dedicated buttons next to the jacks.

The voltages and trigger signals generated on the jacks are based on MIDI events either generated when playing the keyboard or received by the MIDI or USB jacks at the back panel. The data from both DIN MIDI In and USB MIDI are merged together and not handled separately.

- Use the *MIDI RX* parameter to set the receive channel
- Use the *Local Control* parameter to enable/disable the connection between the CV interface and the keyboard controls

7.1   Gate

The Gate output delivers a High signal while notes are being played. It is usually used to trigger envelope modules. Depending on the position of the *Gate Trigger* switch, the output behaves differently:

Setting	Description
Single	The output is set High when the first note is started and goes Low again when the last note is released.
Note On	The output is set High on each Note On event.
All	The output is set High on each note event (on and off), as long as at least one note is played.

Note: The settings Note On and All Notes are retrigger settings. To achieve the desired functionality, the output signal has to go Low for a short amount of time before it rises again. Otherwise it would be impossible for a module to detect a trigger condition.

7.2   Pitch

The *Pitch* output delivers a signal according to the calculated note pitch and has a 1V/octave scaling. The maximum output level is +7V. When calculating the note pitch, the following is taken into account:

- The note number, which is also dependent on the *Octave* setting
- The current pitch bend value, dependent on the configured *Pitch Bend Range* parameter
- Portamento via the *Glide* knob setting
- The *Note Priority* switch setting

The *Note Priority* switch determines which note is taken for the pitch calculation:

Setting	Description
Lowest	The lowest note played
Last	The last note played
Highest	The highest note played

7.3   Clock

The *Clock* output delivers short +5V trigger pulses according to MIDI Timing Clock messages received either externally or generated by the internal clock generator. The number of clock pulses generated is dependent on the setting of the *Clock Division* parameter that can be configured via the setup functions. With the default clock divider of 6, a pulse is generated on each 1/16th note.

Note: when the unit is powered on, the clock source is always set to master (i.e. the internal clock generator). To use external MIDI Sync, switch the clock source setting to slave via the corresponding setup function.

7.4 Reset

The *Reset* output delivers a short +5V trigger pulse each time a MIDI Stop event is received.

7.5 Velocity

The *Vel* output delivers a signal in the range 0..+5V according to note velocity 1..127 (note velocity 0 means Note Off and is therefore not available).

7.6 Aftertouch

The *AT* output delivers a signal in the range 0..+5V that corresponds to the keyboard pressure (channel pressure) 0..127.

7.7 Ctrl-X / Pitch 2

This output delivers a signal in the range 0..+5V that corresponds to a user-definable MIDI control change message. The button on the left side next to the jack is used to learn the control change number.

Every time a valid MIDI CC message is received for this output, the LED inside the learn button will flash.

This is how you set the control change number for this output:

- Press and hold the button next to the output

- Send the desired control change message via MIDI.

- Release the button again

Hint: You can also assign the KB37's modulation wheel to this output which will then duplicate the signal of the *Wheel* output.

The default control change number for this output is CC# 2.

Alternatively, *Ctrl-X* can be used as second pitch CV output for duophonic setups. In this case, the output delivers a control voltage corresponding to a second voice that can be patched to a separate oscillator.

This is how you enable/disable the output for Pitch 2:

- Press and hold the *Setup* button

- Press the *Ctrl-X* button next to the output

- Release both buttons again

In Pitch 2 mode, the LED inside the *Ctrl-X* button will blink.

The output signal is dependent on the setting of the *Note Priority* switch and tries to provide a useful complement to the signal on the main *Pitch* output:

Setting	Pitch	Pitch 2
Lowest	Lowest note	Highest note
Last	Last note	Second to last note
Highest	Highest note	Lowest note

Note: The *Pitch 2* signal will also respect glide and pitch bend wheel.

Hint: If you prefer to only have one pitch output affected by the wheel, set the *Pitch Bend Range* to 0 and patch the *Bend* output signal seperately.

7.8 Ctrl-Y

This output behaves in the same way as described above for *Ctrl-X*.

The default control change number for this output is CC# 4.

7.9 Ctrl-Z

This output behaves in the same way as described above for *Ctrl-X*.

The default control change number for this output is CC# 11.

7.10 Bend

The *Bend* output delivers a bipolar signal in the range -5V..+5V according to the MIDI Pitch Bend 14-bit value.

7.11 Wheel

This output delivers a signal in the range 0..+5V that corresponds to the modulation wheel, which is effectively a MIDI controller with CC# 1 with its usual value range 0..127.

7.12 Glide

The *Glide* knob provides a portamento effect, enabling continuous gliding from one note to another. Low values allow a short glide time in a range of milliseconds that applies a special character to the sound. High values will result in a long glide time which can be useful for solo and sound effects.

The behaviour of the glide function is dependent on the *Gate Trigger* setting:

- In *Single* trigger mode, portamento is only applied when notes are played legato (also known as fingered portamento)

- In *Note On* and *All* mode, portamento is always applied

8   Arpeggiator

The arpeggiator splits up chords played on the keyboard or via incoming MIDI messages into single notes and plays them as a sequence.

Functionally, it sits between the MIDI input from the keyboard, USB or MIDI and the processing of the messages. It is driven by clock events, which can either be generated by KB37's internal clock generator or received by MIDI.

8.1   Switching on/off

The control panel features a dedicated *Arpeggiator* button for quickly turning the arpeggiator on and off. The button has an internal LED that will blink when the arpeggiator is enabled.

This is how you enable/disable the arpeggiator:

- Press the *Arpeggiator* button once briefly to turn the arpeggiator on

- Press the *Arpeggiator* button again to turn it off

- When disabled: press and hold the *Arpeggiator* button for about one second to enable the arpeggiator in hold mode (described below)

8.2   Play Parameters

Besides enabling/disabling and hold mode, which can be directly accessed via the control panel, the arpeggiator's play parameters are set by pressing a key on the keyboard while holding the *Setup* button. This is similar to the setup functions described later.

Hint: You can also change a play parameter when holding a chord with the right hand. The position of the *Setup* key and the assignment on the keybed is designed so that it can be operated with only the left hand.

```
┌─ Arpeggiator ─────────────────────────────────────────────────────┐
│  1/8 — 3 — 1/16 — 3 — 1/32  │  ↓      ↑↓      ↑  │  random   ordered  │  1 Oct    2 Oct    3 Oct    4 Oct  │
└───────────────────────────────────────────────────────────────────┘
```

8.2.1 Clock

Select the note value for the steps between 1/2, 1/4, 1/8, 1/16 and 1/32 notes.

To select 1/4 note as clock value, you have to press and hold the *Setup* key, the 1/8 key and then press the 1/32 key. Similar to get 1/2 notes, press and hold *Setup*, 1/32 and then press 1/8. It's all about the order.

Note: The Clock parameter of the arpeggiator is independent of the unit's *Clock Division* setting. This allows you to use a different clock division than the arpeggiator's to drive a sequencer module or for modulation purposes.

8.2.2 Direction

This parameter sets the note order that is used to play the arpeggio.

Setting	Description
Down	The note list is played backwards and the octaves are transposed downwards. The arpeggio starts in the highest octave and goes down to the original octave. Then the arpeggio is repeated.
Up	The note list is played forwards and the octaves are transposed upwards. The arpeggio starts in the original octave and goes down to the lowest octave. Then the arpeggio is repeated.
Alt	The note list is first played forwards and the octaves are transposed upwards. After reaching the last note, the note list is played backwards and the octaves are transposed downwards again to the original octave. Then the arpeggio is repeated.
Random	The note list is played in random order.
Ordered	The note list is played in the order as played on the keyboard.

8.2.3 Octave Range

Determines the range of the single notes in octaves. When it is set to 1, the note list will be played back in the same octave as originally entered. Greater values mean that the note list is repeated in higher octaves.

Note: Please keep in mind, that the available range of the *Pitch CV* signal is limited - not only by what the KB37 can deliver, but also what your modules can process. You can easily run out of CV when using a high octave range on higher notes.

8.3 Setting the Tempo

The tempo of the arpeggiator can be either controlled locally on the KB37 or by MIDI sync. For local tempo control, the *Clock Source* has to be set to *Master*. This is also the default when you power on the unit. You can then set the tempo via the *Tempo* knob at the control panel or by tapping as described in the according chapter of the setup functions.

8.4 Hold

The hold function allows you to release the keys on the keyboard without stopping the arpeggio. This is useful for keeping your hands free for additional functions when performing.

There are two different ways to deal with the hold function:

- Enabling the arpeggiator's hold mode

- Using a sustain pedal

8.4.1 Hold Mode

In hold mode the arpeggio changes every time a new chord is played. A chord change is detected when new notes arrive after all previous ones are released.

The hold mode can be activated or deactivated on the control panel:

- Press and hold the *Arpeggiator* button for more than half a second when the arpeggiator was previously disabled

- Press the *Arpeggiator* button while holding the *Setup* button. This way you can also toggle the mode when the arpeggiator is already running.

In this mode, the LED inside the *Arpeggiator* button will be lit constantly while it blinks in normal mode.

8.4.2 Hold via Sustain Pedal

Using a sustain pedal is a comfortable way to control the hold functionality. While the pedal is pressed, hold is enabled. Releasing the pedal disables it immediately.

8.5 Sending Generated Notes over MIDI

Optionally, the arpeggiator can send its generated notes over MIDI. You can either set a dedicated channel for the transmission in the setup functions or disable it completely.

Note: When sending the arpeggio on the same MIDI channel as the keyboard, only the arpeggiated notes are sent when the arpeggiator is enabled.

8.6 Parameter Control via MIDI

You can control the play parameters of the arpeggiator via MIDI control change messages. These messages are processed on the channel configured in the setup functions and may be on same channel as the CV interface.

The following table shows the assignments of the control change numbers to the parameters:

CC#	Parameter	Value range
20	Enable	0/1
21	Hold	0/1
22	Clock	0..9 (see clock table below)
23	Octaves	1..4
24	Direction	0..4 (see direction table below)

Clock table:

Value	Note length
0	1/1
1	1/2
2	1/4
3	1/8 dotted
4	1/4 triplet
5	1/8
6	1/8 triplet
7	1/16
8	1/16 triplet
9	1/32
10	1/32 triplet
11	Max

Direction table:

Value	Direction
0	Down
1	Up
2	Alternating
3	Random
4	Ordered

9 Setup Functions

The setup functions are used to access the KB37's configuration settings. Most of these settings are memorized permanently when the unit is switched off. Those few settings that are not stored between sessions ensure that the unit is always fully functional after power-on.

To access the setup functions, press and hold the *Setup* button on the controls panel. Then press the key on the keyboard which is labelled for the function you want to access.

A few functions require more than one keypress while *Setup* is held down. This is noted in the corresponding description below.

9.1 Clock

9.1.1 Division

This parameter determines the clock divider for the MIDI clock messages that generate the pulses on the *Clock* output of the CV interface. Since MIDI clock is specified with 24ppq (pulse per quarter), the following table gives the relationship between the divider and musical values:

Note value	PPQ	Divider
1/4	1	24
1/8	2	12
1/16	4	6
1/32	8	3
Max	24	1

Default value: 1/16

Note: This setting is stored permanently on shutdown.

9.1.2 Source

This setting determines if the clock for the arpeggiator and the *Clock* output is derived from the internal clock generator or externally. When Auto is selected, the clock is automatically switched from master to slave as soon as an external clock is detected via MIDI or USB. If the external clock stops, the source is switched back to master.

Default value: Auto

Note: This setting is not stored permanently on shutdown and reset to the default value each time the unit is started.

9.1.3 Tap Tempo

This function allows you to set the tempo of the clock generator by tapping. At least 3 taps are required to set a new tempo. You need to hold down the *Setup* button while tapping.

> Hint: Since the tapped tempo is overridden when turning the *Tempo* knob, it's advisable to turn the *Tempo* knob fully up or down before you start the tapping. By doing this, you'll prevent accidental tempo changes due to vibration.

Note: Tap Tempo is only enabled when the *Clock Source* is set to *Master*.

9.2 MIDI

9.2.1 Send and Receive Channels

This parameter group determines the MIDI send and receive channels for the keyboard, the CV interface, and the arpeggiator.

Setting one of the parameters requires two consecutive keypresses while holding the *Setup* button: the first keypress selects the parameter you want to change, the second one sets the value for this parameter. The values are

printed as secondary labels in a lighter color on the lower part of the keyboard.

Label	Description	Default
MIDI TX	Transmit channel of the keyboard	1
MIDI RX	Receive channel for the CV interface	1
ARP TX	Transmit channel for arpeggiator notes	off
ARP RX	Receive channel for arpeggiator parameter control	16

The receive channel for the CV interface can also be set to omni, which means it processes incoming messages on all MIDI channels.

The arpeggiator transmit and receive channels can also be set to off, which means disabling the functionality.

Note: By setting different channels for MIDI send and receive, the CV outputs still respond to the keyboard controls. If you want to disable this behaviour, set *Local Control* to off via the corresponding setup function.

Note: These settings are stored permanently on shutdown.

9.2.2   Local Control

This setting determines if the CV interface is directly connected to the keyboard controls. You may want to disable this link when using a setup with an external sequencer.

Default value: On

Note: Local control can also be enabled/disabled via MIDI CC# 122.

Note: This setting is not stored permanently on shutdown and reset to the default value each time the unit is started.

9.3   Pitch Bend Range

This parameter determines the amount of modulation that is applied to the *Pitch* output of the CV interface when using the *Pitch Wheel*.

Default value: 12 semitones

Note: This setting is stored permanently on shutdown.

9.4   Reference Note

This setting determines the note number that corresponds to 0V at the *Pitch* CV output.

Setting this parameter requires two consecutive keypresses: first enable the function while holding the *Setup* button down, then set the desired note after releasing the *Setup* button again.

Hint: The *Octave* setting is taken into account when setting the note. Therefore you should first switch the keyboard to the right range before performing this function.

Note: The *Pitch* CV output can only generate positive voltages. Therefore it's not possible to set the pitch CV for any note lower than this setting.

Default value: Note no 48 (lowest key when *Octave* is set to 0)

Note: This setting is stored permanently on shutdown.

9.5   Wheels Calibration

The pitch and modulation wheels of the KB37 are factory calibrated so regular servicing is normally not necessary. If, however, you find that the wheels do not work properly then you can re-initiate the process.

Calibrating the wheels is advised when:

- the center position of the pitch wheel is not correct

- a wheel's value does not reach its limit

- a wheel's value reaches its limit way to early

Checking the wheels' values should be done by looking at the generated MIDI messages.

To perform the calibration, perform the following steps:

- Press the key labeled *Calibrate Wheels* while holding the *Setup* button

- The two outer *Octave* LEDs will blink

- Release the *Setup* button

- Move both wheels across their full mechanical range

- Store the calibration data by pressing *Setup* and the *Calibrate Wheels* key again

- The two inner *Octave* LEDs will flash once to indicate that the calibration was stored

> Hint: You can cancel the process by pressing any other key on the keyboard before proceeding the final save operation. This is useful when you accidentally run into calibration mode.

Note: For safety, the calibration will only be performed when the wheels' movement covers a minimal range.

Note: There is a small dead zone at the margin of both wheels as well as at the center of the pitch wheel. This is intentional as it garantees stability of the control voltages when the wheels are at their extreme positions and prevents accidental generation of MIDI messages.

Note: The calibration is stored separately from the configuration parameters and not affected when performing a factory reset.

9.6 Panic

The panic function allows you to send an *All Notes Off* message to the CV/Gate interface and all MIDI ports to cut off hanging notes. This can be very useful when performing live.

10 Sensors

The KB37 features a *Sensor* input on the back panel that can be used to attach analog control devices. In the simplest case, you can plug in an expression pedal. By utilizing the learn function, the range of the input signal is then mapped to the full modular signal level at the Sensor output of the CV panel.

10.1 Learn Function

The principle of operation of the learn function is quite simple: it samples the signal levels on the tip and the ring of the jack twice. The first measurement is taken when you press the *Sensor* button and the second one when you release it again. Afterwards it takes either the tip or the ring signal, depending where a larger voltage difference was detected. The measured range is then scaled to the full 0..5V output range for use with your modules.

Example: learning an expression pedal:

- Move the pedal to its minimum position

- Press and hold the *Sensor* button

- Move the pedal to its maximum position

- Release the *Sensor* button

Note: To avoid accidental operation and noisy output signals, the learn function uses an internal threshold for a minimal signal change. If learning a sensor doesn't work, it probably does not provide enough level variation.

10.2 Internal Wiring

The sensor input uses resistor dividers to attenuate 0..5V input signals down to the 3.3V range of the analog-to-digital converters. Additionally there is a pullup resistor on the tip input line that makes it possible to power passive components like pedals and other low-consumption circuitry.

Ignoring some protection elements, this is what it basically looks like:
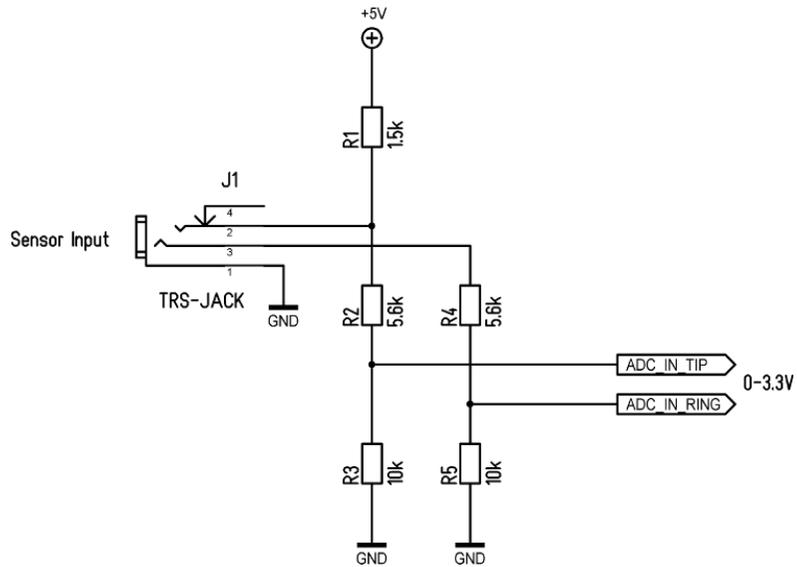
10.3.2 Touch Sensor
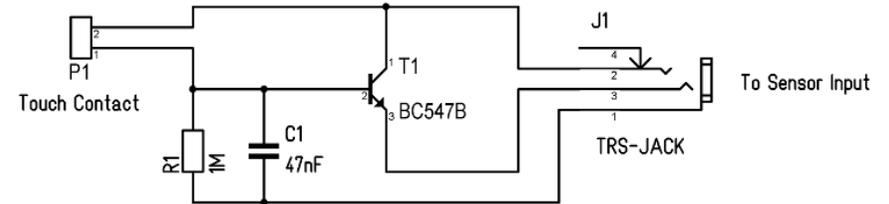
This circuit can be used to convert skin resistance to a control voltage. You may want to vary R1 to adjust the sensitivity. The capacity C1 is intended for filtering since your body will probably pick up more noise than desired.
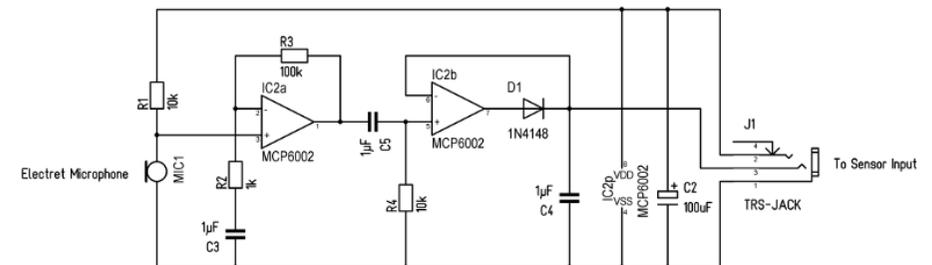
10.3 Example Circuits

Below you'll find some example circuits that can be attached to the sensor input. Please regard them as a starting point that can be improved and tweaked to your needs.

### 10.3.1 Light Sensor with Photo Transistor
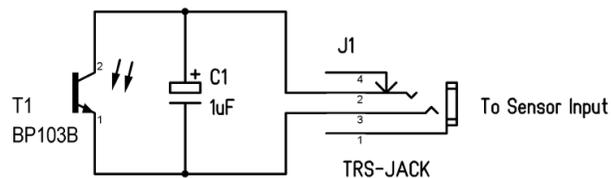
Various types of photo transistors will work. The capacitor C1 is used to suppress mains frequency modulation that will be captured when using LED or fluorescent lighting.

10.3.3 Microphone

This example circuit shows that you can even power a low-current opamp via the sensor input's pullup resistor. It consists of a microphone amplifier and a rectifier with a hold capacitor. You can use this to generate a trigger signal by clapping your hands, for example. Adjust C4 for your preferred decay time.

10.3.4 Distance Sensor
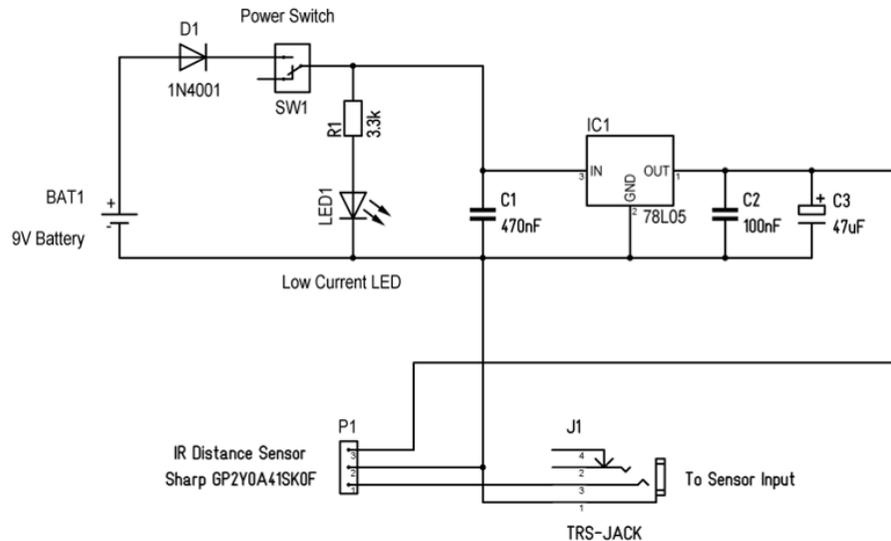
Infrared distance sensors are very popular and even used in commercial products from a well-known Japanese company. This is how you can attach them to the KB37. Please note that you need an additional battery to power the sensor because it draws a notable amount of current and requires a stable 5V supply. Of course you can omit the power switch and the LED to make it simpler.

11 Firmware Update

The unit's internal firmware can be updated over USB. To perform this operation, the KB37 has to be put in bootloader mode at startup. Then the firmware file has to be send via MIDI SysEx from your computer.

This is how you update the firmware:

- Switch off the unit in case it is powered on

- Press and hold the *Setup* button on the controls panel

- Switch on the unit

- The *Setup* button LED as well as the *Octave* LEDs will blink

- Open the SysEx transfer utility on your computer

- Send the file containing the new firmware code

- While receiving the data, the *Octave* LEDs will indicate the progress

- After the new firmware was successfully transferred, the KB37 will reboot

We recommend using either SysEx Librarien on OS X or MIDI-OX on Windows. Both applications are free of charge and we found that they work well with their default settings.

In case of an error, the unit will not reboot and may show an error condition via a blinking *Octave* LED. If no error is indicated and the unit just stalls, it's likely that the data stream was interrupted unexpectedly.

Please check the following and retry the transfer:

- Make sure the KB37 is in bootloader mode before launching the SysEx transfer utility. Otherwise it may not find the right MIDI port.

- Check if SysEx data is sent to the correct output port

- Try to reduce the transfer speed. The host software usually offers a delay parameter for that.

12   Factory Reset

In case you fully messed up the configuration of your KB37 or you want to reset it to a clean state, you can do a factory reset of all stored parameters.

This is how you do the factory reset:

- Switch off the unit in case it is powered on

- Press and hold the *Ctrl-X, Ctrl-Y,* and *Ctrl-Z* buttons on the CV panel

- Switch on the unit

- The LEDs inside the pressed buttons will be lit

- Wait until the LEDs will go out again

- Release the buttons

Note: The wheels' calibration data is not affected when a factory reset is performed.

13   Troubleshooting

13.1   Modules power fail

- Check the orientation of the pin headers on your modules

- Check if the total power consumption of all modules is within the KB37's specifications

13.2   Keyboard-to-CV not working

- Make sure that the unit is not switched to *Local Off* mode via the setup parameters or MIDI CC# 122

13.3   Arpeggiator not running

- Check if *Clock Source* is either set to *Master* or an external clock is received

13.4   Pitch CV not covering the full keyboard range

- Make sure the *Reference Note* is set correctly. It must not be higher than the notes you're playing on the keyboard

13.5   Wheels not behaving properly

- Recalibrate the wheels as described in the corresponding chapter

13.6   Sensor output signal not working as expected

- Check if the sensor is wired correctly

- Make sure the sensor signal covers a sufficient range

13.7   Sustain pedal shows reversed behaviour

- Make sure the pedal is already connected when the unit is powered on

14 Specifications

14.1 Power Supply

Input Voltage: 110/220V AC (switchable at PSU)

Power Consumption: 10W (idle, no modules attached)

Bus Power: +12V/1.5A, -12V/1.5A

14.2 Dimensions and Weight

Width: 656mm

Depth: 334mm

Height: 122mm

Total Weight: 8.5kg

Module Frame Width: 543mm (107 HP)