



KOMA Elektronik BD101 Analog Gate / Delay

USER MANUAL version 2.1

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INTRODUCTION

Dear new KOMA User,

Thanks a lot for purchasing your new analogue monster: the KOMA BD101!

Analog delays have been a specialty in musicians effect artillery for a very long time. Being loved for their organic, physical sounds, these circuits deserve special attention....The way analog delays work is very similar to the old fashioned way of extinguishing a fire by means of a bucket bridge transferring water from the water source to the fire, therefor called bucket bridge delays (BBD). In these BBD effects the sound is literally 'poured' from one transistor into the next one. This process is clocked by a special bi-phase clock causing the first transistor to pass the signal to the second one exactly at the moment the second transistor just finished doing that to the third transistor and so on. Now imagine this procedure 2048 times in a row and you have successfully delayed your signal by simple analog means!

Amplitude modulation and gating as its most extreme form on the other hand are maybe one of the oldest tools in the musicians repertoire to express dynamics and tension in music with the tremolo of a violin possibly being the most classic example.

Now the KOMA Elektronik BD101 brings these great tools together and takes it one step further. The bi-phase clock of the BBD circuit on the BD101 can go into ranges never intended by the inventors of these chips, allowing you to go from super short delay pulses with chorus and flanger like sounds to enormously cut-up soundscapes. If you clock the BBD transistors in such a slow speed that the first transistor actually misses a part of the incoming sound in one clock phase you are able to rip the incoming signal completely apart. At times it might even sound like digital bit crushing. Because the gating/amplitude modulation circuit is placed before the analog delay, it allows you to cut away portions of your sound before the signal reaches the delay. That gives you the possibility to put focus on certain parts of your sound, e.g. a certain snare drum sound in your drum loop.

OK, these were the basics, now get your pedal, go to the next page and make some noise!

All the best from Berlin,

The KOMA Elektronik Team

GETTING STARTED

- 1) **Unpack your machine:** The package comes with the BD101 pedal, a +9VDC, 500mA, tip-negative power supply and this manual. Save the box and packing material in case you ever need to ship your pedal! Make sure that the power supply is rated for the line voltage of your country: 120 VAC for the USA, 220VAC for Europe and most other countries.
- 2) **Connect it:** Be sure your amp is turned off, then connect your instrument to the BD101 by using the AUDIO INPUT on the upper right of the patch bay. Connect the AUDIO OUT on the upper left of the patch bay to your amp. To connect the Motion Controller (the built-in expression function) plug in a 1/4 inch jack cable from SENSOR to DLYTIME CV on the patch bay.
- 3) **Set up the BD101 / Amp:** Set all the controls of the BD101 as in *Fig. 1*, see next page.
- 4) **Power up / Bypass:** Connect the BD101 power supply to the BD101 DC input on the backside of the pedal. The GATE SPEED indicator will light up periodically. When you press the bypass switch, the EFFECT ON/OFF led will light up, this means the effect is turned ON. Please wait with playing for 5 seconds, so the unit can warm itself up. Turn your amp on as well.
- 5) **Set levels:** Turn on your amplifier. Make sure the EFFECT ON/OFF indicator is OFF. Play your instrument and adjust the volume of the amplifier so it is at a comfortable level. Press the Bypass switch and the EFFECT ON/OFF indicator will turn on green which means the effect is now active.
- 6) **Play:** Now go nuts. If necessary, adjust the INPUT GAIN slider control to match the levels of the processed signal and the bypassed signal. The most predictable results will come from playing single note riffs or melodies. This is especially true when the DELAY BLEND slider control is set to WET. You can use the Motion Controller to adjust the DELAY TIME, GATE SPEED, GATE AMOUNT and CYCLE. Be sure to read through the Control Voltage Theory section to understand all CV features and their usage.

FEATURES



Fig.1 Front panel Features

Input Gain

The INPUT GAIN slider of the BD101 provides you with and adjustable gain for boosting low level input signals. By sliding from left to right you can boost your signal from zero gain to 100 gain (0 to +20dB).

Analog Gate / Amplitude Modulation

When the audio signal plugged into the AUDIO INPUT jack goes to into the BD101 it firstly arrives at the analog gate / amplitude modulation section where you can choose in which way you want to prepare your signal.

The SPEED knob sets the speed of the LFO (low frequency oscillator) that controls the amplitude modulation. If turned fully counter clockwise, the speed is slowest, if turned fully clockwise you select the highest speed. Together with the RANGE switch you can choose between three different speed ranges.

With the gate SHAPE switch you can set the shape of the amplitude modulation / gate, selecting either ramp, square or sawtooth shape. The amplitude modulation/gate will follow the selected envelope.

After having selected a speed range with a respective clock speed and a gate shape you can choose the impact of the gate / amplitude modulation section on your sound by turning the AMOUNT knob. When turned fully counter clockwise your input signal isn't affected at all by the LFO. The more you turn the knob in clockwise direction the more the LFO affects your signal, going from a slight tremolo to severe amplitude modulation to completely gating your signal.

Analog Delay Section

After passing through the amplitude modulation / gate section your signal flows into the analog delay (BBD) section of the pedal. You have two main controls to influence the processing of your sound here.

First you can select the delay time with the TIME knob. Turning it fully counter clockwise will give you a super short delay of 1ms. Turning it more clockwise will give you longer delay times. At around 100ms you will notice slight degradation of the overall sound comparable to digital bit crushing effects. The further you turn the knob clockwise the harsher, noisier and more hearable this effect will become.

This pseudo-bit crushing effect is a side effect of clocking the BBD chips slower than it is actually intended

to be (see introductory notes about analog delay chips on page 3). Also be aware of the fact that the clock of the BBD chip used in the BD101 will appear as a function of your input signal, sitting on top of your waves. We don't consider this as a bug or malfunction but think that whoever is brave enough to turn the TIME knob further than 100ms will either not care about this side effect or love its sound as we do at KOMA Elektronik.

The second control in the delay section is the knob labeled CYCLE which controls the amount of delayed and amplitude modulated signal flowing back into the delay circuit, therefor representing the amount of feedback in the delay circuit.

Delay Blend

The last feature influencing your sound in the signal processing chain is the DELAY BLEND slider. You can choose how much of the delay signal is applied to your (amplitude modulated) input signal. The slider is an equal-power panning slider which means that you go from completely dry – no delay signal at all – to completely wet – only delayed signal – with no gain loss over the whole range of the slider.

Sensor

One of the features on your BD101 you won't find in any other pedal is the possibility to control the features of the pedals with the on board motion controller. Since its working with infra red LEDs we call it the SENSOR. The motion controller can be used in many different ways. Technically speaking, it emits a CV signal (control voltage) which can be patched up with any CV receptive socket on the KOMA pedals and f.i. on your modular system. By moving your hand over the sensor you can control the parameters of the CV input you patched it up to. With the trimmer on the back of the pedal (it says SENSOR) you can change the sensitivity of the motion controller. For more information about Control Voltage, check out the section Control Voltage Theory of this manual.

Internal Low Pass Filter

Inside the pedal there is an option to activate a low pass filter after the delay section to make the delay more suitable for low impedance instruments (e-guitars etc.). If you unscrew the four screws on the bottom of the BD101 you will see two green printed circuit boards (PCBs). On the PCB that contains the potentiometers and sliders on the left you will find a text saying 'Lowpass Filter' with a line pointing towards two pins. If you put the jumper that shipped with the BD101 onto those two pins you activated the lowpass filter. Decide for yourself if the effect is more suitable for you like this.



CONTROL VOLTAGE THEORY

The concept of control voltage (CV) is not hard to understand: Instead of turning a knob on your pedal you simply connect a voltage – the control voltage – to the corresponding CV input that does the job for you. So for example if you want to have quickly varying GATE AMOUNT you don't have to turn that knob all the time back and forth fast until your fingers fall off but simply connect an alternating CV to the AMOUNT CV input.

You can take control signals from any source for controlling the inputs of the BD101. All of the CV inputs theoretically accept control voltages from -100V to +100V though a range from -5V/-12V/-15V to +5V/+12V/+15V is more common and usable.

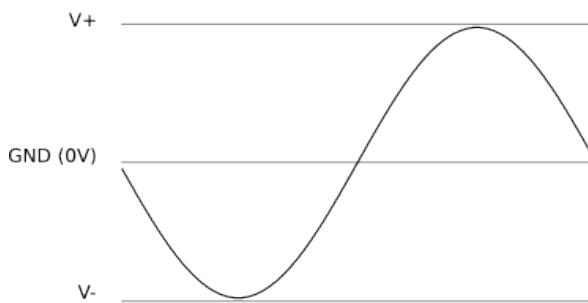
Since the BD101 is running on a +9V power supply you might wonder how you can use a signal as large as -15V to +15V. The answer is simple: We provide you with a trimmer for each CV input on the backside of the panel.



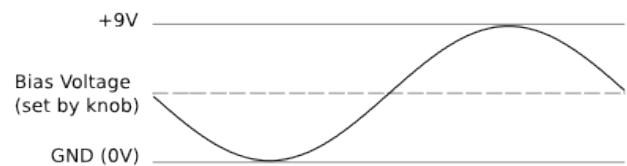
So whenever you notice a significant distortion or clipping in your control signal waveform or strange CV behavior simply turn the trim pot counter-clockwise (towards the word 'CV') until you hear your desired result. By turning it counter-clockwise you attenuate the incoming CV signal. Fully counter-clockwise means that the incoming CV signal is completely gone, whereas fully clockwise means that the incoming CV signal is arriving to the circuit unattenuated.

In addition to that you can set an offset voltage to your control voltage to adjust the CV signal to your needs. The offset voltage is set by the corresponding knob on the front panel. There's also a distinction between bipolar and unipolar signal. This is best explained with a few pictures, see next page.

Bipolar CV Signals



Original CV Signal



CV Signal inside the BD101

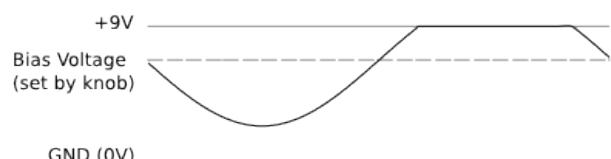
So, what happens? The incoming CV signal is shifted around the voltage that you select with the corresponding knob. Example: if you insert a -5V to +5V sine wave into the CYCLE CV jack you will get the following results while turning the CYCLE knob:

Bipolar CV Signals



CV Signal inside the BD101

Low Bias Voltage

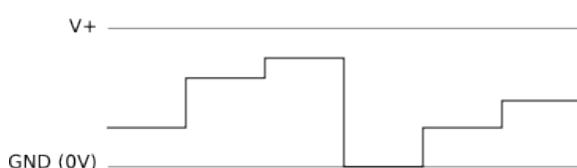


CV Signal inside the BD101

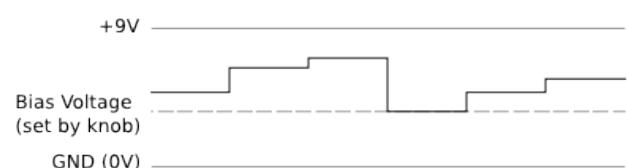
High Bias Voltage

A similar thing happens to unipolar CV signals: Their point of origin (0V) is shifted by the amount set with the corresponding knob. In other words: You add the voltage of your knob to the voltage of your incoming unipolar CV signal.

Unipolar CV Signals

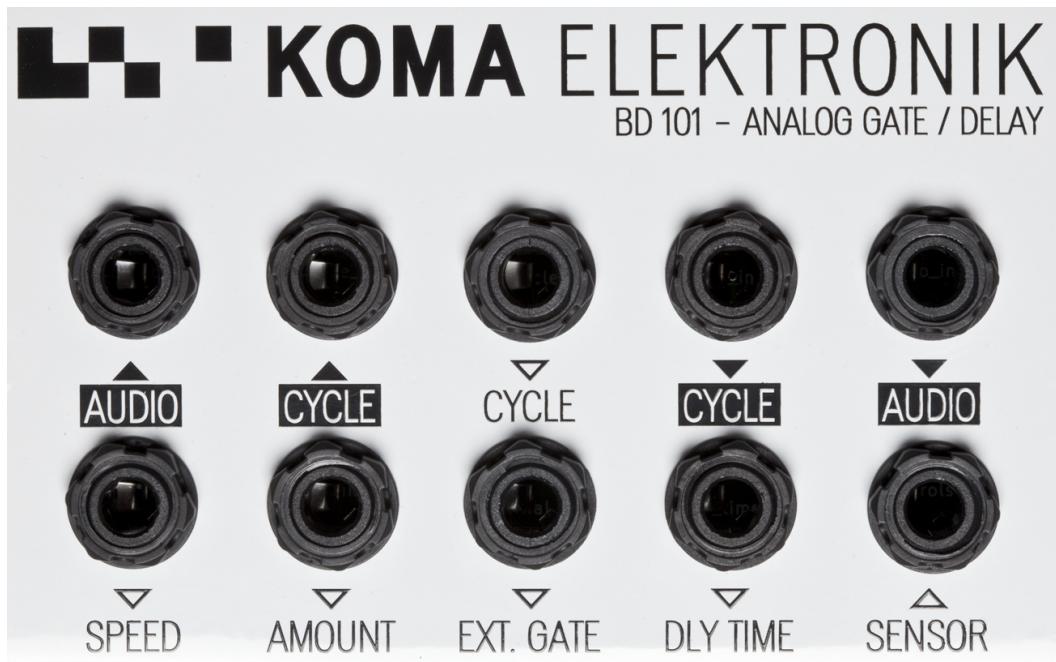


Original CV Signal



CV Signal inside the BD101

Now you know more about CV, let's see what the patch bay of the BD101 can offer!



The patch bay consists of ten 1/4" jack sockets which you can use for receiving and sending various audio or control voltage signals. Blank arrows mark CV inputs/outputs, black arrows mark audio inputs/outputs. If the arrow is pointing towards the jack socket it shows you that this is an output, if the arrow is pointing away from the jack socket it is an input.

All the CV inputs in the KOMA Elektronik pedals accept bi-polar control voltages. Since the pedal runs on +9V every time you plug in a control voltage to one of the CV accepting inputs, the respective knob (e.g. SPEED knob or SPEED IN (CV input) determines the offset voltage of your CV input signal.

Let's start from right to left in the upper row.

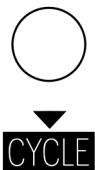
AUDIO IN (audio input)

This is the main audio input of the BD101. The sound source plugged in here will go through the whole effect section.



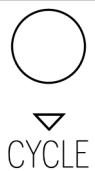
CYCLE IN (audio input)

The sound source plugged in here will arrive at the feedback insert point of the BD101 delay section. You will mostly use this insert point together with the CYCLE OUT to change the behavior/sound of your feedback cycle. This is a switching jack which means that you break up the internal feedback circuit by plugging a sound source into this jack.



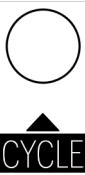
CYCLE IN (CV input)

This CV input accepts control voltages from 0 – 9V, affecting the amount of feedback in the delay section. When you insert a control voltage into this input the CYCLE knob determines the offset voltage (see Control Voltage Theory section)

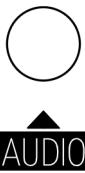


CYCLE OUT (audio output)

This output provides you with the audio signal after the delay section, before the DELAY BLEND slider. If you send this output to an external effect like an EQ, Filter, another delay unit etc. and plug the processed signal back into the CYCLE IN (audio input), you can control the sound of the feedback. The volume of this signal is determined by the setting of the CYCLE knob.

**AUDIO OUT** (audio output)

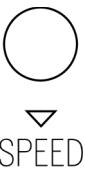
The main audio output of the BD101, plug your amplifier here, enjoy.



Left to right, lower patch bay row:

SPEED (CV input)

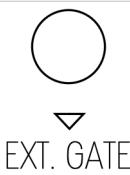
The SPEED CV input controls the speed of the amplitude modulation/gate LFO therefore plugging a CV signal into this jack will change the speed of the LFO. When you insert a control voltage into this input the SPEED knob determines the offset voltage (see Control Voltage Theory section, pp 7).

**AMOUNT** (CV input)

The AMOUNT CV input controls the amount of amplitude modulation/gate applied to your incoming audio signal. When you insert a control voltage into this input the AMOUNT knob determines the offset voltage (see Control Voltage Theory section).

**EXT. GATE** (CV input)

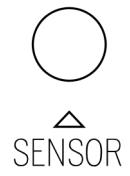
The EXT. GATE CV input goes directly to the VCA controlling the amount of the amplitude modulation/gate, bypassing the SPEED and AMOUNT knobs and CVs which means that any appropriate signal applied to this input will result in an according amplitude modulation of your incoming signal.

**DLY TIME** (CV input)

The DLY TIME CV input controls the delay time of the delay circuit in the BD101. When you insert a control voltage into this input the TIME knob determines the offset voltage (see Control Voltage Theory section).

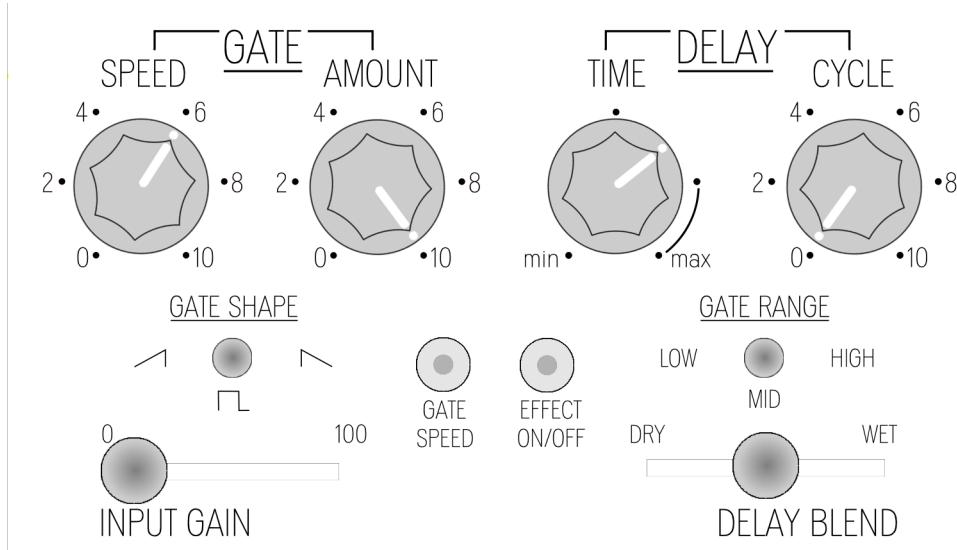
**SENSOR** (CV output)

This is the CV output of the infrared motion sensor. The closer you move something towards the sensor, the higher the CV raises. You can set the sensitivity of the sensor with a small trimmer on the background called 'Sensor'. The sensor output is 0 – 9V.

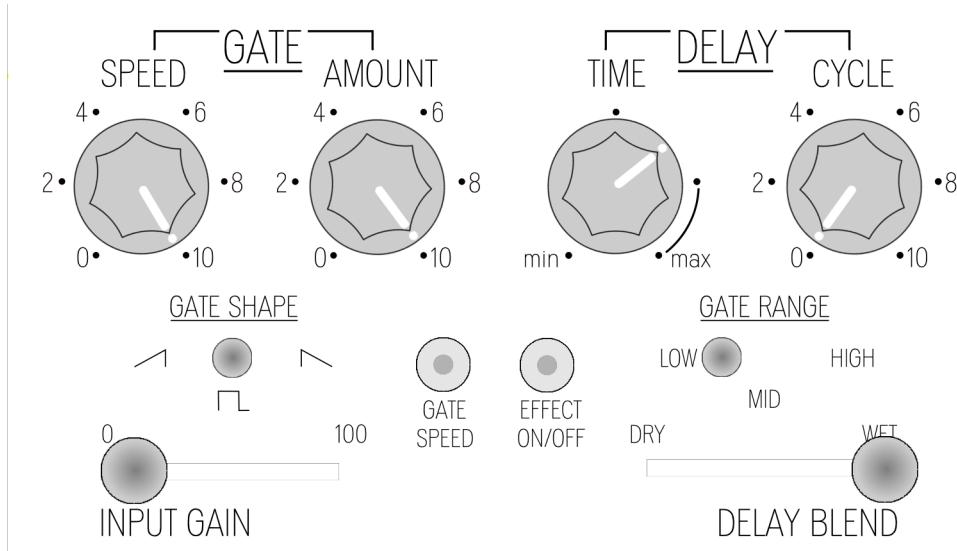


BASIC SETTINGS AND EXAMPLES

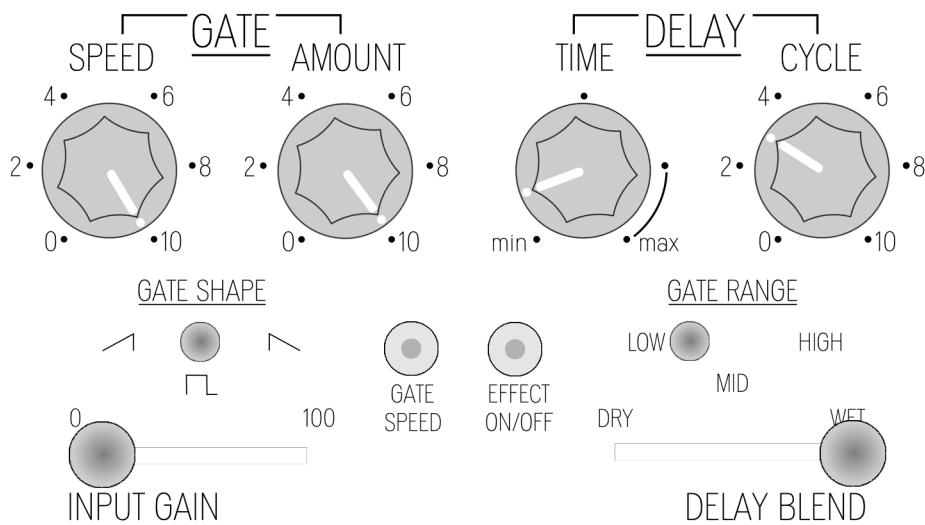
Chop your sound apart:



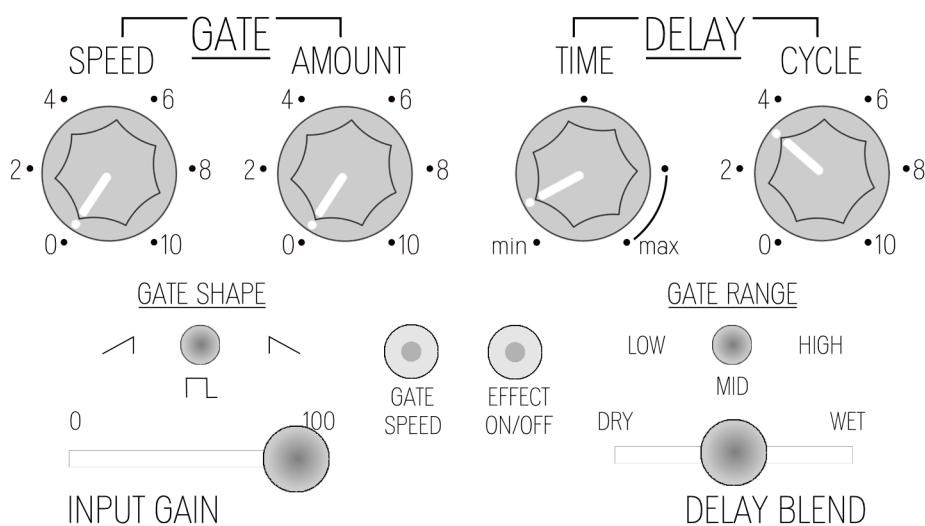
Completely ripped apart:



Fast gate, short delay:



Karplus:



TECHNICAL SPECIFICATIONS

GENERAL

Casing:	Powder coated aluminum casing, silk screened text and wooden side panels.
Dimensions:	23 cm x 15 cm x 5 cm (L x W x H) / 9" x 6" x 2" (L x W x H).
Net. Weight:	850 gr / 1.8 lb.
Shipping Weight:	1 kg. / 3.0 lb including power adapter and instruction manual.
Power requirements:	9V DC power adapter, 500mA min, center polarity negative (only use the KOMA adapter shipped with the pedal).

FEATURES

INPUT GAIN	Slide control which allows the user to set the input gain of the plugged in instrument or line audio signal, 0 to +20dB variable gain.
DELAY BLEND	slide control to set the amount of processed delay signal within your overall sound from completely dry to completely wet.
GATE SPEED	rotary control to adjust the speed of the gate.
GATE AMOUNT	rotary control which adjusts the amount of the gate signal applied to the audio input signal, going from not influenced at all to amplitude modulated to completely gated.
CYCLE	rotary control to adjust the amount of processed signal fed back into the signal chain. Going from no signal being fed back to 'usual' feedback sounds creating overtones and/or karplus-effects to going completely nuts with feedback.
DELAY TIME	rotary control to set the delay time. Please note that the delay chip used in this circuit was never meant to go anywhere near the settings between 6 - 10 where serious bit-crushing like effects and other odd sounds start to appear.
GATE SHAPE	3 pole toggle switch to switch between the 3 different shapes of the gate: ramp, pulse and sawtooth.
GATE RANGE	3 pole toggle switch to switch between high, mid or low speed range for the gate.
GATE SPEED LED	indicates the speed and shape of the gate clock.
EFFECT ON LED	indicates if the effect is switched on or bypass.
FOOTSWITCH	Heavy duty Alpha foot switch.Turning the effect on or off.
2 IR EMITTERS, 1 IR RECEIVER	calculates the distance between an object and the pedal and generates a CV signal according to the measured distance.The CV output of this sensor appears as a CV output on the patch bay from where you can route it to the CV input of your desired, to-be-modulated feature

PATCH BAY INS AND OUTS

AUDIO IN	- plug your sound source here.
AUDIO OUT	- listen to what you created here.
CYCLE OUT	- you can grab your processed signal here before it is being fed back into the circuit here. By sending this signal into external effect units (e.g. filters or EQs) you can change the sound being fed back into the pedal through plugging your externally processed sound into CYCLE IN.

CYCLE IN	- by plugging an externally processed sound into this jack you break the internal CYCLE circuit, thus being able to change the feedback sound in any way you desire.
CYCLE IN	- CV input to control the amount of (internally or externally) processed signal being fed back into the circuit.
SPEED	- CV input to control the speed of the gate.
AMOUNT	- CV input to control the amount of gate being applied to the plugged in signal.
EXT. GATE	- CV input that allows you to control the gate by external gate and/or CV signals.
DLY TIME	- CV input to set the delay time.
SENSOR	- CV output of the on board motion sensor for usage with CV inputs on the pedal, other KOMA Elektronik pedals or other voltage-controlled devices.

All patch bay inputs and outputs are mono 1/4" phone jacks.

BACKPANEL

DC POWER INPUT	- accepts standard 9 volt power adapters, center pin negative, 500mA min. (KOMA Elektronik power adapter included).
CV TRIMMERS	- The sensitivity of the CV inputs and outputs as well as the sensitivity of the motion sensor can be adjusted with attenuators which are mounted on the back of the pedal.

WARRANTY

KOMA Elektronik warrants its products to be free of defects in materials / workmanship and conforming to specifications at the time of shipment for a period of two years from the date of purchase. During the warranty period any defective products will be repaired or replaced at KOMA Elektronik's option on a return-to-factory basis. This warranty covers defects that KOMA Elektronik determines are no fault of the user.

Returning Your Product?

You must obtain prior approval in the form of an RMA (Return Material Authorization) number from KOMA Elektronik before returning any product. Email us at support@koma-elektronik.com to request the RMA number .All products must be packed carefully and shipped with the KOMA Elektronik supplied power adapter. Sorry, the warranty will not be honored if the product is not properly packed. Once you have received the RMA#, write it on the box together with the word: **WARENRUCKSENDUNG** and carefully pack your product, ship the product to KOMA Elektronik with transportation and insurance charges paid, and include your return shipping address.

What will we do?

Once received, we will examine the product for any obvious signs of user abuse or damage as a result of transport. If the product has been abused, damaged in transit, or is out of warranty, we will contact you with an estimate of the repair cost. Warranty work will be performed and KOMA Elektronik will ship and insure your product to your European / USA address free of charge.

How to initiate your warranty?

Please initiate your warranty online by sending an email to [support@koma-elektronik.com!](mailto:support@koma-elektronik.com)

IMPRINT

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Registernummer / Registration Number: HRB 145453
Umsatzsteuer ID / VAT ID Number: DE285522050

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