

Goblin-3PDT

Installation, Configuration and Usage

This document describes the installation (page 2 - 5), configuration (page 6 - 7) and usage (page 8 - 10) of the Goblin-3PDT MIDI mod version 1.1.3/1.1.4. For a description of the product, its features and further information visit <https://oscillatordevices.com/goblin>

Electrical Properties

Electrical Properties	Min	Typ	Max	
Supply Voltage (+9V Terminal)	7	9	20	VDC
Current Consumption	3	10	50	mA
Maximum voltage at RLY, SW and LED (w/o relay) terminals			5	VDC
Output voltage at SW terminals			5	VDC
Maximum voltage at LED terminals (w/ relay)			18	VDC

The Goblin-3PDT has reverse polarity protection at the +9V terminal. Be careful nonetheless to not reverse polarity upon installation, as long as other wires are connected. Negative currents could flow through the microcontroller and damage it.

Attention: Digital signals, such as MIDI signals, can lead to crosstalk on other lines. This particularly applies to effects with multiple gain stages (distortion, fuzz, etc.). Pay attention to keep the MIDI wires as far away from the analog circuit as possible. Otherwise it can happen that a click can be heard in the audio signal with every MIDI command. To further reduce possible crosstalk, use shielded wires.

Overview

The Goblin-3PDT is made to replace 3PDT switches how they're found in guitar effects pedals. A typical wiring example is shown on the right. In the **"On"** state, **Jack In** is connected to **FX In**, **Jack Out** to **FX Out** and the **LED** to **GND**. In the **"Off"** state **Jack In** is connected to **Jack Out** via the bridge and the **LED** is left open.

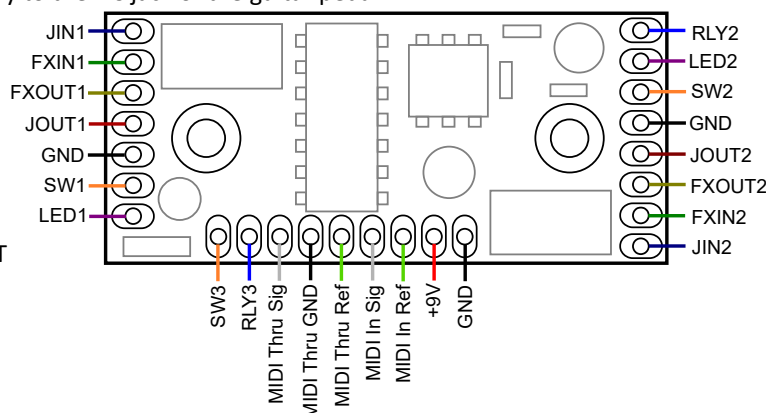
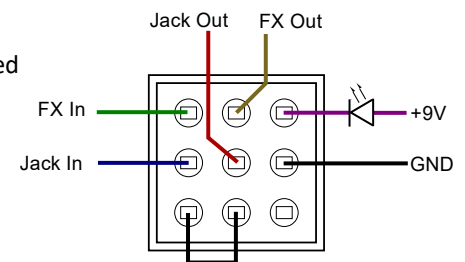
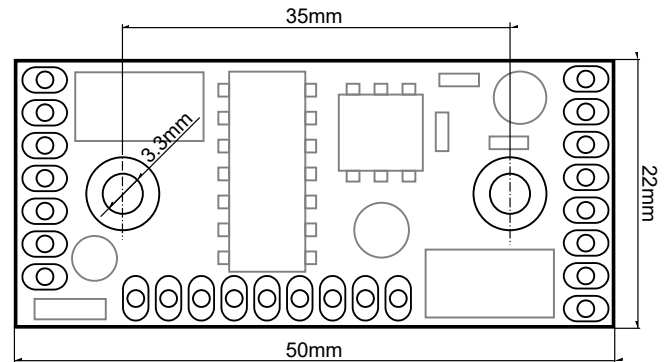
The Goblin-3PDT has either one or two relays, that replace such switches. Moreover, it can handle a variety of different additional functions, like SPST switches, external switch connections and encoder wheels, which are explained later.

The Goblin-3PDT has three ports. Port 1 is always populated with a relay, port 2 is an optional relay. Here's a quick overview over the connections:

- **+9V/GND:** This is the power supply. Connect them directly to the DC jack of the guitar pedal.
- **JIN/JOUT:** Connection to the in- and output jack
- **FXIN/FXOUT:** Signal that goes to/comes from the FX
- **SW:** This is where one side of a SPST foot switch, to operate the Goblin-3PDT manually, is connected. The other side has to be connected to the adjacent GND.
- **LED1/2:** This is the connection for the LED. It switches to GND, when the Goblin connects FXIN with JIN and FXOUT with JOUT or is used for status monitoring (role SW).
- **RLY2/3:** This is a connection that is used for additional functions
- **MIDI Sig:** This is the active MIDI signal. It is connected to **Pin 5** of a DIN 5-PIN MIDI Connector, or **Tip** if a TRS connector according to MIDI standard (Type A) is used.
- **MIDI Ref:** This is the reference MIDI signal. It is connected to **Pin 4** of a DIN 5-PIN MIDI Connector, or **Ring** if a TRS connector according to MIDI standard (Type A) is used.
- **MIDI GND:** This is the GND signal for MIDI Thru. It is connected to **Pin 2** of a DIN 5-PIN MIDI Connector, or **Sleeve** if a TRS connector according to MIDI standard (Type A) is used. Note that only MIDI Outputs have a connection to GND. Do not connect GND to the MIDI Input.

Mechanical Properties

Height is approx. 10mm. If using the Goblin Screw set, account at least for 15mm height.



Installation

The installation consists of two parts. The actual wiring, which is described in this chapter, and the configuration described in chapter Configuration.

Ports and Roles

The installation depends on how the three ports of the Goblin are used, i.e. what *Role* they have.

- Role **Relay**: The standard role for the Goblin-3PDT. This means that there is a physical relay that switches the signals of the effects device on the terminals JIN, JOUT, FXIN and FXOUT and also takes over the switching of the LED. Port 1 always has a relay installed, the relay of port 2 is optional. If there is no relay on port 2, it can be used for one of the following roles.
- Role **Switch**: This role is for controlling SPST switches, like channel switches, or tap tempo.
- Role **TRS**: In the role of *TRS*, the Goblin imitates an external switch with “Ring” and “Tip” (often marked with Footswitch, Ext-Ctl, CTL, EXT). The two lines can be open or closed to GND. This way, external switch connections can be operated from inside the device.
- Role **Encoder**: This is specifically made for the encoder wheel of the EHX POG2.

Following, there is a table that shows the usage of the particular connections in dependency of the role.

Name	Port	Function Role <i>Relay</i>	Function Role <i>Switch</i>	Function Role <i>TRS</i>	Function Role <i>Encoder</i>
SW1	1	Connection of port 1 switch	N.A.	N.A.	N.A.
LED1		LED port 1	N.A.	N.A.	N.A.
JIN1		Jack in port 1	N.A.	N.A.	N.A.
FXIN1		FX in port 1	N.A.	N.A.	N.A.
FXOUT1		FX out port 1	N.A.	N.A.	N.A.
JOUT1		Jack out port 1	N.A.	N.A.	N.A.
SW2	2	Connection of port 2 switch	Connection of port 2 switch	N.A.	N.A.
RLY2		N.A.	Connection FX port 2	TRS2-Tip	Encoder push button
LED2		LED port 2	LED port 2 (Status monitoring)	TRS2-Ring	Encoder LED
JIN2		Jack in port 2	N.A.	N.A.	N.A.
FXIN2		FX in port 2	N.A.	N.A.	N.A.
FXOUT2		FX out port 2	N.A.	N.A.	N.A.
JOUT2		Jack out port 2	N.A.	N.A.	N.A.
DAT (SW3)	3	N.A.	Dual LED port 2 (Status monitoring)	TRS3-Tip	Encoder A
CLK (RLY3)		N.A.	N.A.	TRS3-Ring	Encoder B

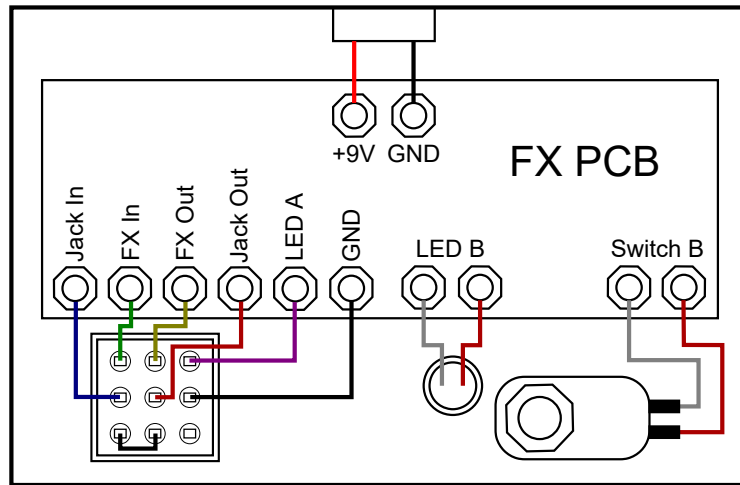
Wiring of 3PDT Switches

The wiring of 3PDT switches can vary greatly, but you almost always find the 5 signals LED, Jack IN, Jack Out, FX IN and FX Out. If the wiring isn't clear, grab a DMM and proceed as follows:

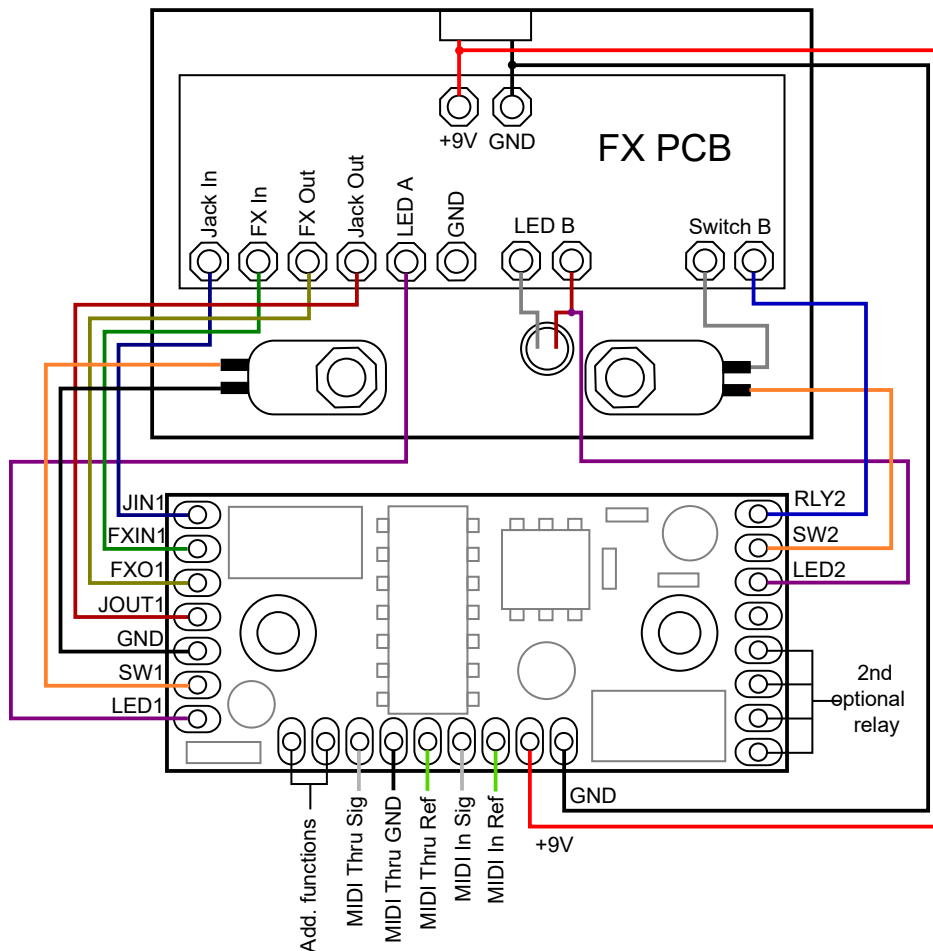
- Plug patch cables into the input and output jack, so the sockets aren't shorted to GND.
- Switch the effect **Off** and measure which pins of the switch connect to the in and output jack. This should be at least four pins. Write them down. One of them is **Jack In** and one of them **Jack Out**
- Switch the effect **On** and measure which pins are connected to the input jack. These should be two pins. **Jack In** and **FX In**. **Jack In** is one of the pins of the previous step. **FX In** is the other. Do the same with the output jack.
- Switch the effect **Off** and locate the LED. Check which pin is connected to one of the pins of the LED.

Installation for Role Relay

In the images below you can see an example of a typical effects device with a 3PDT bypass switch (l.) and a second SPST channel switch (r.). The first image depicts the device before installation, the image after that shows the wiring for that particular case, using a Goblin-3PDT with a single relay.



Effects Device with a 3PDT bypass switch (l.) and a SPST channel switch (r.)



Effects Device with a 3PDT bypass switch (l.) and a SPST channel switch (r.) and a Goblin-3PDT - Single relay

In that particular case port 1 has the role “Relay” and port 2 has the role “Switch”. Port 3 is unused.

In case of port 1, the existing 3PDT is removed and the 5 lines are connected as shown in the image. The 3PDT switch is replaced by a non-latching, Normally Open, SPST switch. This new switch is connected to SW as well as the adjacent GND terminal.

The LED input does not have a series resistor. This must be present on the effects device. The LED input switches to GND when the relay is closed. This behaviour can be inverted with the LED Polarity configuration. The LED input is the only input - and only in the role of Relay - suitable for voltages higher than 5V. 18V should not be exceeded, though.

If port 2 is role relay, too, the wiring is exactly like port 1. In that case leave additional RLY2 connection unconnected.

Installation for Role Switch

In the above example, port 2 is used for controlling a SPST switch. This is similar to the functions of the Goblin-SPST and the Goblin-EXP.

In the role Switch a port of the Goblin-3PDT is able to take control over effects devices that are controlled with non latching SPST (or (ON)-OFF) switches. The original switch is connected to the Goblin and the Goblin is connected to the effects device instead. The Goblin then emulates a footswitch. The effects device can then be triggered via MIDI or with the foot switch. Here is how the single connections work:

Switch Connection (SW)

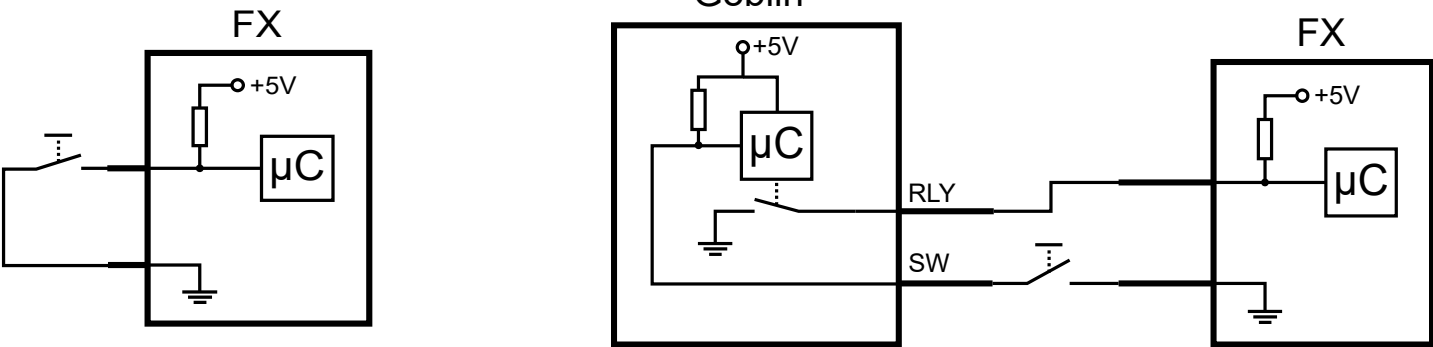
The connection SW is for connecting a non latching SPST switch. All SW terminals have internal 5V pull ups. The other side of the switch has to be connected to GND, so the switch connects SW to GND, when closed.

For regular cases, like the one above, the active (or high) side of the switch has to be disconnected from the effects device and connected to the Goblin, while the GND side stays connected. Measure both sides with a DMM, do not rely on wire colors.

Most switches are normally open. In rare cases there are normally closed switches. Refer to chapter Configuration for further information.

PCB connection (RLY)

The connection RLY emulates a switch. For that it connects to GND for a brief moment. In the picture on the left you can see a typical effects device switching scheme. A microcontroller detects the switching, when the 5V line is pulled to GND via the switch. On the right you can see how the Goblin connects to that scheme. Instead of the switch, the internal microcontroller of the Goblin pulls the line to GND.



Before connecting the Goblin it is important to control, that the voltage on the effects device does not exceed 5V. Everything below is fine.

Status monitoring connection (LED)

With the connection SW and RLY the FX device can be switched by the Goblin. If you're dealing with a Tap Tempo switch, or anything else that doesn't have a particular state, like on or off, you're done now.

If you're dealing with say, a bypass switch, simple switching is not enough. The state is important and the Goblin needs to know that state to carry out an "on" or "off" command. For that the Goblin can measure a voltage and determine the current state with that. The only thing needed for that is a voltage that changes with the state of the effects device and is not higher than 5V. In most cases the voltage of the LED is perfect for that.

To find out to which pin of the LED the Goblin has to be connected to, proceed as follows:

1. Switch the effects device **on** and measure the voltage on both pins of the LED relative to GND.
2. Switch the effects device **off** and measure the voltage on both pins of the LED relative to GND.
3. On one of the pins the voltage changes. Connect this pin to LED on the Goblin. Write down the measured voltages, we need them later.

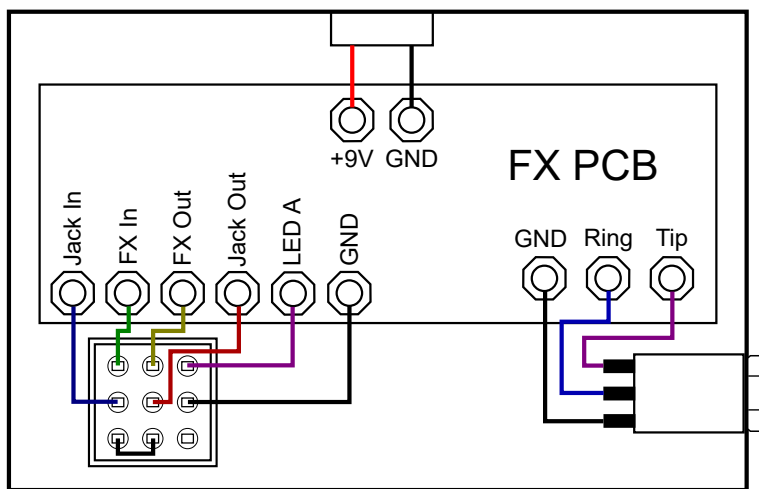
Here is a real world example of the EQD White Light. Two pins of the LED (called A and B) are measured to GND:

	Effects device on	Effects device off
Pin A	0V	0V
Pin B	1.8V	0V

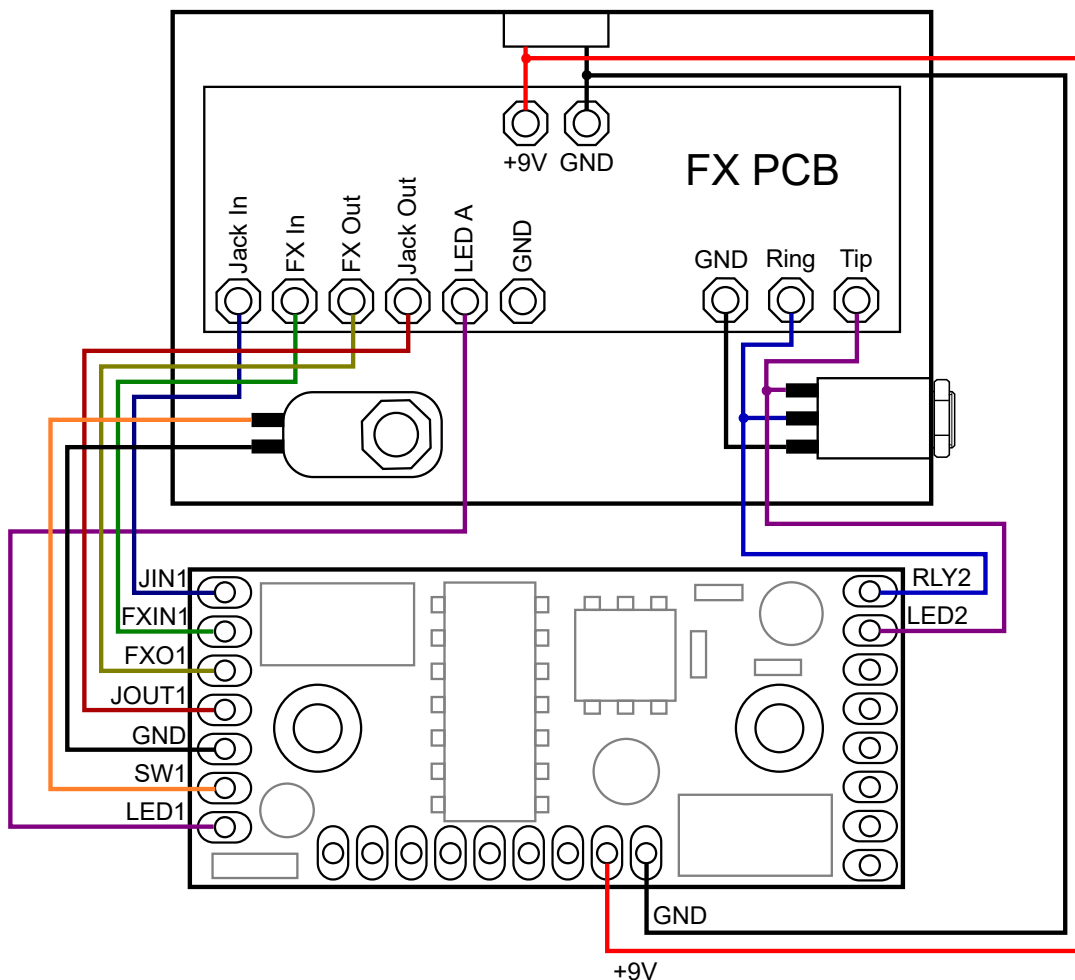
For this example, Pin B would be used for the LED connection.

Installation for Role TRS

Besides foot switches, the Goblin-SPST can control external foot switch connections, like connections for external tap tempo switches, Strymon FAV-Switches etc. In the image below is a typical effects pedal with a bypass foot switch (left) and a TRS socket for an external foot switch (right).



Effects Device with 3PDT Foot Switch and External TRS Connector



Effects Device with 3PDT Foot Switch and External TRS Connector and Goblin-3PDT - Single Relay

For a Port in the Role TRS the wiring is very simple. The corresponding lines are soldered to the pins of the socket. To operate the switch, the Goblin either leaves the lines open (switch open) or closes them to GND (switch closed).

TRS can be configured as *Normally Open* and *Normally Closed*. With *Normally Open*, the two lines are open at system start and pulses are executed as Open → Closed → Open. With *Normally Closed*, the lines are closed to GND at system start and pulses are executed as Closed → Open → Closed.

Configuration

In order to be able to adapt the Goblin to as many effects devices as possible, various parameters can be set via the configuration procedure. **The configuration is always carried out via MIDI CC messages and consist of 4 messages per parameter.** The actual configuration message, two passcode messages and a save message. The configuration messages are described below. For passcode and save message, see chapter Saving the Configuration.

Roles

The role of a port describes the function that the Goblin performs. For a detailed explanation, see chapter Ports and Roles.

CC	#	Function
Port 1: 27 Port 2: 47 Port 3: 67	0	Disabled
	1	Relay (Default for Port 1 and Port 2 Dual Relay)
	2	Switch (Default for Poert 2 Single Relay)
	3	Tap Tempo (Like Switch, but w/o defined state)
	4	TRS Normally Open
	5	TRS Normally Closed
	6	Encoder

LED Polarity

In Switch or Encoder role, the polarity must be set according to the measured values from chapter Status monitoring connection (LED).

- Low Active: Voltage below the LED threshold is recognized as "On".
- High Active: Voltage above the LED threshold is recognized as "On".

In the example above, the LED polarity is "High Active" because when the effects device is active, the voltage is high.

CC	#	Function
Port 1: 28 Port 2: 48 Port 3: 68	0	Low Active
	1	High Active (Default setting)

In role Relay this config command can be used to invert the LED input, so it switches to GND when the relay is open instead of closed.

LED Threshold

The Goblin monitors the voltage on the active side of the LED for the Switch and Encoder role. Depending on whether the threshold is exceeded or not, the status is recognized as "on" or "off". Since LED voltages can vary greatly, the threshold can be set for each port.

The Threshold must be set according to the measured values in chapter Status monitoring connection (LED). Set it to half way between the on and off value. In the example above the LED threshold would be half way between 0V and 1.8V, that'd be 0.9V.

CC	#	Function
Port 1: 29 Port 2: 49 Port 3: 69	n	LED threshold in 0.05V steps. Default is 24 (=1.2V)

MIDI Channel via MIDI command

The MIDI channel can easily be set with one of the footswitches. If that's not possible, it can be set with MIDI commands.

CC	#	Function
6	0	Set MIDI channel to Omni (reacts to every channel)
6	1...16	Set MIDI channel to channel 1...16

MIDI Channel via Switch

When setting the MIDI channel with one of the foot switches, port 1 is used by default. If another port is to be used, this can be set with the following command.

CC	#	Function
7	1/2/3	Change the port for the MIDI channel setting to port 1, 2, or 3

For the instructions to set the MIDI channel using the switch, see the User Guide at: <https://oscillatordevices.com/goblin>

Startup Delay

Some effects devices need some time to power up. This ranges from a few milliseconds to several seconds. So the Goblin can correctly restore the last state and the boot process of the effects device is not disturbed, a delay at the beginning can be useful.

CC	#	Function
8	n	Startup delay n*100 ms (Default n = 5)

Please note that a pressed button is immediately processed as soon as the Goblin is connected to the supply voltage, regardless of the startup delay, but depending on the polarities set.

Sensitivity of the MIDI Clock Detection

For commands that use automatic MIDI Clock detection, the sensitivity for resending the pulses can be set or the feature can be deactivated entirely. Raising the sensitivity is only necessary for systems with very high MIDI clock jitter.

CC	#	Function
5	0-16	Sensitivity (default = 12) 0 = Deactivated 1 = Very low sensitivity 16 = Very High sensitivity

Switching Speed of the Encoder

With the encoder role, the switching speed of the encoder can be slowed down.

CC	#	Function
4	n	0 = Normal switching speed 1 = Switching speed slowed down by factor 2 2 = Switching speed slowed down by factor 3 n = Switching speed slowed down by factor n+1

Configuration bits

The following configuration bits are only necessary in extremely exceptional cases. They allow more in-depth configuration. Each port has a set of identical configuration bits. Some settings are available as single commands. The following 5 parameters are set with a 7-bit word:

CC	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2-0
	POL-LED	FX-DRIV	POL-FX	POL-SW	ROLE
Port 1: 19 Port 2: 39 Port 3: 59	Polarity of the LED 0 = Low Active 1 = High Active (*)	Driver function of port 0 = Push Pull 1 = Open Drain (*)	Polarity of FX 0 = Normally Closed 1 = Normally Open (*)	Polarity of Switch 0 = Normally Closed 1 = Normally Open (*)	Role of the port 0 (000): Disabled 1 (001): Relay (*) 2 (010): Switch (*) 3 (011): Tap Tempo 4 (100): TRS Normally Open 5 (101): TRS Normally Closed 6 (110): Encoder

(*) = Default setting

- **ROLE:** The role of the port. See Roles
- **POL-SW:** Switch polarity. *Normally open* switches are used most of the time.
- **POL-FX:** Polarity of the FX. Usually this value is set to the same value as *POL-SW*. Only for role *Switch* and *Tap Tempo*.
- **FX-DRIV:** The FX side (connection RLY) usually expects a positive voltage of 5V or lower, that is briefly pulled to GND in order to switch the effect. If this is not the case (e.g. OBNE Dark Star) the Goblin can drive the + 5V high state itself. To do this, set this bit to *Push Pull*. Only for role *Switch* and *Tap Tempo*.
- **POL-LED:** The LED Polarity. See LED Polarity

It should be noted that these settings must always be made together. The entire word is always used.

There is a [spreadsheet](#) to help with calculation of the configuration bits and LED threshold.

Saving the Configuration

In order to save the above configurations, the following three commands must be called immediately one after the other. If another command is sent in between, the saving sequence is aborted. The effects device must be restarted for the changes to take effect.

CC	#	Function
9	18	1. passcode message for the saving sequence
9	52	2. passcode message for the saving sequence
9	0-10	Saving the Startup delay 1 Saving the role, led polarity and configuration bits of port 1 2 Saving the role, led polarity and configuration bits of port 2 3 Saving the role, led polarity and configuration bits of port 3 4 Saving the LED threshold of port 1 5 Saving the LED threshold of port 2 6 Saving the LED threshold of port 3 7 Saving the port for the MIDI channel setting with a switch 8 Saving the MIDI channel from command CC 06 9 Saving the Sensitivity of the MIDI Clock detection 10 Saving the encoder switching speed

Example: To set an LED threshold of 1.8V on port 2, the following four commands are sent back-to-back:

CC 49 36 -> CC 09 18 -> CC 09 52 -> CC 09 05

Dual Color LEDs

If the indicator LED is dual color, the LED inputs of port 2 and port 3 can be used together on port 2. One color is then connected to *LED2* and the other to *SW3*. To activate this feature, the role of **port 3 must be Disabled** and the **LED threshold value of port 3 must be set to 0**.

Usage

MIDI Channel

The *Goblin*'s MIDI channel is selectable. To change the MIDI channel, proceed as follows

1. Disconnect the device from the power supply
2. Press the button of the configuration port (normally port 1) and restore the power supply while it is pressed. The device starts to flash its LED after the startup delay has elapsed.
3. Press the button according to the number of the desired channel (e.g. twice for channel 2). The Goblin acknowledges this by emitting short flashing impulses according to the number of the channel.
4. Once the desired channel is set, press the button and hold it down until the Goblin switches off completely.
5. Disconnect supply voltage. The next time the Goblin is started, it reacts to the selected MIDI channel.

To put the Goblin in omni mode (i.e. it responds to every channel) skip step 3.

MIDI Commands for Role Relay and Switch

It is possible to switch all three ports to a defined state at the same time. If one or more ports are not switches, they are ignored. If one of the switches doesn't have a defined state, use Role *Tap Tempo* to prevent it from switching when using this command.

CC	#	Port1	Port 2
00	00	Off	Off
	01	On	Off
	02	Off	On
	03	On	On
	04	Off	Off
	05	On	Off
	06	Off	On
	07	On	On

In addition, the ports can be controlled individually. The command "Hold", or MIDI clock synchronous commands, are interrupted by pressing the switch.

CC Port1	CC Port2	CC Port3	#	Function	#	Function
10	30	50	00	Port off	15	Toggle to the beat of the MIDI clock in 1/32 notes
			01	Port on	16	Toggle to the beat of the MIDI clock in 1/2 notes
			02	Port toggle (e.g. Tap Tempo)	17	Toggle to the beat of the MIDI clock in whole notes
			03	Port hold (Corresponds to a pressed and held switch)	18	Toggle to the beat of the MIDI clock every 2nd whole note
			04	Port release (Release held switch)	19	Toggle to the beat of the MIDI clock every 3rd whole note
			10	Toggle to the beat of the MIDI clock in 1/4 notes	20	Toggle to the beat of the MIDI clock every 4th whole note
			11	Toggle to the beat of the MIDI clock in 1/8 notes	21	Toggle to the beat of the MIDI clock every 5th whole note
			12	Toggle to the beat of the MIDI clock in triplet notes	22	Toggle to the beat of the MIDI clock every 6th whole note
			13	Toggle to the beat of the MIDI clock in 1/16 notes	23	Toggle to the beat of the MIDI clock every 7th whole note
			14	Toggle to the beat of the MIDI clock in dotted 1/8 notes	24	Toggle to the beat of the MIDI clock every 8th whole note

Some effects devices react strangely when a tap tempo signal is constantly being sent. There is the possibility to only give a limited number of impulses. Enough for the effect to take over the beat. With these commands, an automatic MIDI clock detection is carried out. If the MIDI clock changes by more than approx. 1%, the pulses are sent again. The sensitivity of the MIDI clock detection can be configured (see chapter Sensitivity of the MIDI Clock Detection).

CC Port1	CC Port2	CC Port3	#	Function	#	Function
11	31	51	0-19	1-20 times toggle to the beat of the MIDI clock in 1/4 notes	100-104	1-5 times toggle to the beat of MIDI clock 1/2 notes
			20-39	1-20 times toggle to the beat of the MIDI clock in 1/8 notes	105-109	1-5 times toggle to the beat of the MIDI clock every whole n.
			40-59	1-20 times toggle to the beat of the MIDI clock in triplet notes	110-114	1-5 times toggle to the beat of MIDI clock every 2nd whole n.
			60-79	1-20 times toggle to the beat of the MIDI clock in 1/16 notes	115-119	1-5 times toggle to the beat of MIDI clock every 4th whole n.
			80-99	1-20 times toggle to the beat of the MIDI clock in dot. 1/8th n.	120-124	1-5 times toggle to the beat of MIDI clock every 8th whole n.

MIDI Commands for Role TRS

If the port is in the role of an external switch (TRS, EXT, CTL etc.), this port then has two lines, referred to as "Tip" and "Ring", which emulates a plugged in external switch. This switch can be *Normally Open (NO)* or *Normally Closed (NC)*, which is set during configuration (see chapter Roles).

Line-specific Commands

Each line has a set of identical commands.

CC Tip	CC Ring	#	Function	#	Function
Port2: 30 Port3: 50	Port2: 40 Port3: 60	00	Set „Open“		
		01	Set „Closed“		
		02	Single pulse		
		03	Toggle		
		10	Pulse MIDI clock 1/4	30	Toggle MIDI clock 1/4
		11	Pulse MIDI clock 1/8	31	Toggle MIDI clock 1/8
		12	Pulse MIDI clock triplets	32	Toggle MIDI clock triplets
		13	Pulse MIDI clock 1/16	33	Toggle MIDI clock 1/16
		14	Pulse MIDI clock dotted 1/8	34	Toggle MIDI clock dotted 1/8
		15	Pulse MIDI clock 1/32	35	Toggle MIDI clock 1/32
		16	Pulse MIDI clock 1/2	36	Toggle MIDI clock 1/2
		17	Pulse MIDI clk every whole note	37	Toggle MIDI clock every whole note
		18	Pulse MIDI clk every 2nd whole note	38	Toggle MIDI clock every 2nd note
		19	Pulse MIDI clk every 3rd whole note	39	Toggle MIDI clock every 3rd note
		20	Pulse MIDI clk every 4th whole note	40	Toggle MIDI clock every 4th note
		21	Pulse MIDI clk every 5th whole note	41	Toggle MIDI clock every 5th note
		22	Pulse MIDI clk every 6th whole note	42	Toggle MIDI clock every 6th note
		23	Pulse MIDI clk every 7th whole note	43	Toggle MIDI clock every 7th note
		24	Pulse MIDI clk every 8th whole note	44	Toggle MIDI clock every 8th note

Pulse

It is also possible to send a certain number of pulses, e.g. to select a preset.

CC-Tip	CC-Ring	#	Function
Port2: 31 Port3: 51	Port2: 41 Port3: 61	0	1 pulse
		1	2 pulses
		n	n+1 pulses
		127	128 pulses

MIDI Clock Pulse

Some Tap Tempo effects react strangely when the Tap Tempo Pulse is sent continuously. It is therefore possible to only send a limited number of pulses until the effects device has recognized the tempo. With these commands, an automatic MIDI clock detection is carried out. If the MIDI clock changes by more than approx. 1%, the pulses are sent again automatically. The sensitivity of the MIDI clock detection can be configured (see chapter Sensitivity of the MIDI Clock Detection).

CC-Tip	CC-Ring	#	Function	#	Function
Port2: 32 Port3: 52	Port2: 42 Port3: 62	0-19	1-20 pulses MIDI clock 1/4 notes	100-104	1-5 pulses MIDI clock 1/2 notes
		20-39	1-20 pulses MIDI clock 1/8 notes	105-109	1-5 pulses MIDI clock every whole note
		40-59	1-20 pulses MIDI clock triplet notes	110-114	1-5 pulses MIDI clock every 2nd whole note
		60-79	1-20 pulses MIDI clock 1/16 notes	115-119	1-5 pulses MIDI clock every 4th whole note
		80-99	1-20 pulses MIDI clock dotted 1/8 notes	120-124	1-5 pulses MIDI clock every 8th whole note

Pulse Length

The standard length of a pulse is approx. 80 ms. If this is too short for some devices, the pulse length can be set in 10 ms steps.

CC-Tip	CC-Ring	#	Function
Port2: 35 Port3: 55	Port2: 45 Port3: 65	n	Pulse length in 10ms steps

Port as Encoder

Only Port 2 can act as Encoder.

CC		Function
30	0	Preset decrement
	1	Preset increment

To select a certain preset, the PC command is used.

PC	Function
0	Leave preset mode
1...n	Select preset n