OSCILLATOR DEVICES

MIDI-Solutions and Custom FX

# Goblin-SPST 1.0.2 - Installation

Table of Contents

# 1   Introduction

1.1   Wait, what?!

The **Oscillator Devices Goblin** is a MIDI upgrade kit for effects devices. It consists of electronics that are installed in the effects device. These electronics then perform switching tasks controlled by MIDI. This ranges from switching the bypass, via MIDI clock synchronous operation of the tap tempo, to the operation of connections for external switches and even encoder buttons to select presets. The **Goblin** has three ports and can therefore take on three switching tasks at the same time. Due to the possibility of configuration, the **Goblin** works in almost every effect device.
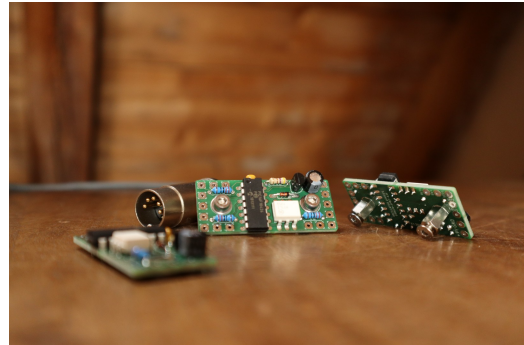
The **Goblin-SPST** is the variant for effects devices with soft switches (digital or relay-based). For effects devices with true bypass circuits that use a conventional 3PDT switch, there is the slightly larger **Goblin-3PDT**.

1.2   Mechanical Properties

The dimensions of the **Goblin** are 46 x 20 mm in the base area. When mounting with the supplied screws and bolts, the height in the mounted state is less than 15 mm. The holes are intended for M3 screws. The drill holes are symmetrical.
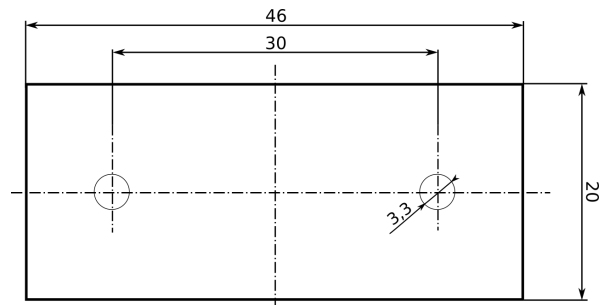
Drill holes of the Goblin-SPST

1.3   Electrical Properties

Electrical Properties	Min	Typ	Max	
Supply voltage	7	9	18	VDC
Current draw		8		mA
Maximum voltage at ports			5.3	VDC

1.4   MIDI Commands

For the full list of MIDI commands and how to set the MIDI channel see
https://oscillatordevices.com/doc/oscillator_devices_goblin-user_guide_en.pdf

2 Installation

The installation consists of two parts. The actual wiring, which is described in this chapter. And the configuration desacribed in chapter 3 Configuration.

2.1 Ports and Roles

The installation depends on how the 3 ports of the **Goblin** are to be used, i.e. what role they have.

- Role **Switch**: A switch is, for example, a conventional bypass switch. This means that it takes on the state "On" or "Off" and there is an LED as an indicator for this state.

- Role **Tap Tempo:** A tap tempo switch has no state. It is neither "On" nor "Off" and its LED flashes independently, or there is none at all.

- 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, or EXP). The two lines can be open or closed to GND. This way, external switch connections can be operated from inside the device.

- Role **Encoder**: In the role of *Encoder*, the **Goblin** controls an encoder wheel, as can be found in EHX POG2, Cathedral or Memory Man Hazarai.

The advantage of a **Switch** over **Tap Tempo** is that the switch can safely and reliably assume a state (on or off) at any time. If, for example, the switch is pressed with the foot during use with MIDI, it still knows what to do when it is again addressed via MIDI. In addition, it recognizes the state after powering on and can restore the last state before powering off.

All three ports are able to take on any role. If a bypass switch is available, port 1 should be used for this in order to make the configuration easier.
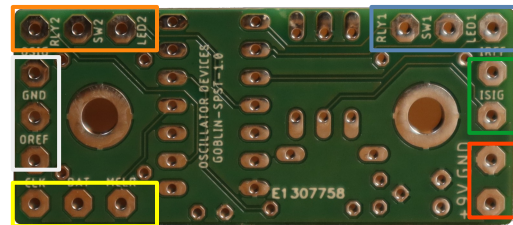
Name	Port	Function Role *Switch*	Function Role *Tap Tempo*	Function Role *TRS*	Function Role *Encoder*
SW1		Connection switch port 1	Connection switch port 1	N.A.	N.A.
RLY1	1	Connection FX port 1	Connection FX port 1	TRS1-Tip	N.A.
LED1		LED port 1	N.A.	TRS1-Ring	N.A.
SW2		Connection switch port 2	Connection switch port 2	N.A.	N.A.
RLY2	2	Connection FX port 2	Connection FX port 2	TRS2-Tip	Encoder push button
LED2		LED port 2	N.A.	TRS2-Ring	Encoder LED
MCLR (SW3)		Connection switch port 3	Connection switch port 3	N.A.	N.A.
DAT (RLY3)	3	Connection FX port 3	Connection FX port 3	TRS3-Tip	Encoder A
CLK (LED3)		LED port 3	N.A	TRS3-Ring	Encoder B
ISIG	MIDI In	MIDI In (Signal/Current Sink) - MIDI TRS-Type A Tip – Din Pin 5			
IREF		MIDI In (Reference/Current Source) - MIDI TRS-Type A Ring – Din Pin 4			
OSIG		MIDI Thru (Signal/Current Sink) - MIDI TRS-Type A Tip – Din Pin 5			
GND	MIDI Out	MIDI Thru (Shield/GND) - MIDI TRS-Type A Sleeve – Din Pin 2			
OREF		MIDI Thru (Reference/Current Source) - MIDI TRS-Type A Ring – Din Pin 4			
+9V	VCC	Supply Voltage 7-18V			
GND		GND			

2.2 Warning notice

There is +5V at the connections *SW1/2/3*. These connections must not be connected to the circuit board of the effects device. They are only intended for connecting a switch.

For reasons of space, the **Goblin-SPST** does not have reverse polarity protection. The correct polarity should be checked before the first start-up. Never trust the colors of the lines.

Under no circumstances should the voltage at the inputs of the **Goblin-SPST** exceed 5.3V.

2.3 Voltage Supply

The electronics are supplied via the effects device's supply. In order to minimize interactions with the effects device, the supply for the **Goblin** should be soldered directly to the socket for the power supply of the effects device. In principle, other points for tapping are also conceivable, such as, e.g. the reverse polarity protection diode.
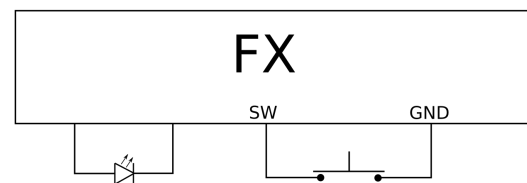
2.4 Wiring of Switch

For the *Switch* role, the positive wire of the switch is unsoldered and connected to *SW* on the **Goblin**. The line that was previously at the switch is connected to *RLY*.
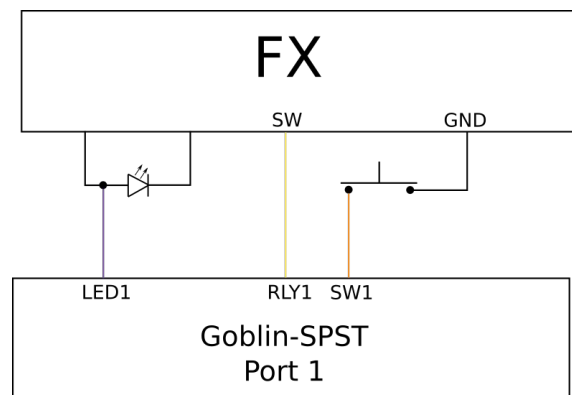
The **Goblin** uses the LED to compare its internal state with the state of the effects device. It measures the voltage on the LED and uses this to decide which state the effects device is in.

In order for the **Goblin** to correctly identify the state, the side of the LED must be found where the voltage changes when the state of the LED changes. To do this, each side of the LED is measured to GND. Once when the LED is on and once when the LED is off. The side where the voltage changes is the one where the wire is soldered.

Role Switch before installation

Role Switch with the Goblin-SPST

The two voltage values (effect on and effect off **measured to GND**) are needed for the configuration of the **Goblin** (see Chapter 3 Configuration). The mean value of the two voltages is the LED threshold value (3.3 LED Threshold). If the voltage is higher when switched off than when switched on, the polarity is set to *Low Active* (see 3.2 LED Polarity).
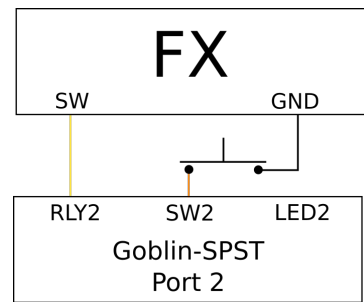
2.5   Wiring of Tap Tempo

The wiring of a tap tempo switch works similarly to that of the *Switch*, with the difference that the LED line is omitted.
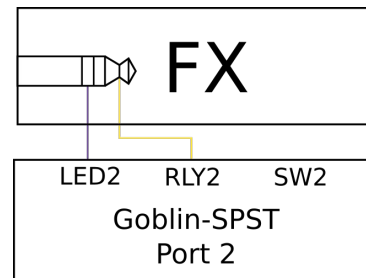

Role Tap Tempo with the Goblin-SPST

2.6   Wiring of TRS

The wiring of the TRS is very easy. The corresponding lines are soldered to the pins of the socket. The **Goblin** either leaves the lines open or closes them to GND (and thus the switch).

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*.


Role TRS with the Goblin-SPST

2.7   Wiring Encoder

In the case of the *Encoder* role, ports 2 and 3 are used together.

The encoder wheel, as used in the EHX POG2 etc., has a push button function. The positive side (+ 3.3V ... 5V) of the push button is connected to *RLY2* (green in the example image).

In addition, the first LED of the LED strip is monitored as a reference. The pin of the LED, which changes its voltage when the LED is switched, is connected to *LED2*. On the POG2 this is the pin that can be found next to resistor *R12* (purple in the picture).
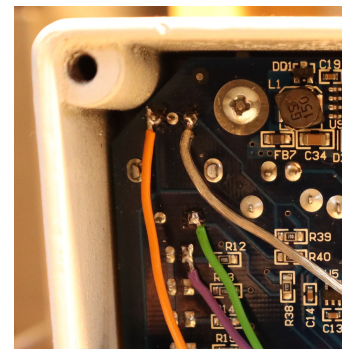
Wiring Encoder in a POG2

The two encoder pins are connected to *CLK (RLY3)* and *DAT (SW3)*. With the POG2, the one pointing to the input is to be connected to *DAT* (orange in the picture), the one pointing to the output is to be connected to *CLK*. These can be interchanged on different PCB revisions or devices.

2.8   Wiring of MIDI

The wiring of the MIDI ports is done according to the table in 2.1. If the included sockets are not used, make sure that the *MIDI In* socket is isolated from the housing.

Caution: The MIDI-In socket must not be connected to GND in order to not connect the GND potentials of the MIDI devices.

3   Configuration

In order to be able to adapt the **Goblin** to the conditions of as many effect devices as possible, various parameters can be set via the configuration. The configuration is always carried out via MIDI CC messages and consists of 4 messages per parameter. A configuration message, two passcode messages and a save message. The configuration messages are described below. For passcode and save message, see 3.7 Saving the Configuration.

3.1   Roles

The role of the ports describes the basic function that the **Goblin** performs. For a detailed explanation of the roles, see 2.1 Ports and Roles

CC	#	Funktion
	0	Disabled
	1	N.A.
Port 1: 27	2	Switch (Default setting)
Port 2: 47	3	Tap Tempo
Port 3: 67	4	TRS Normally Open
	5	TRS Normally Closed
	6	Encoder

3.2   LED Polarity

In the *switch* or *encoder* role, the polarity must be set according to the measured values from 2.4 Wiring of Switch

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

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

3.3   LED Threshold

The **Goblin** monitors the voltage on the active side of the LED for the roles *switch* and *encoder*. Depending on whether the threshold is exceeded or not, the status is recognized as "on" or "off" depending on the LED polarity. Since LED voltages can vary greatly, the threshold can be set for each port.

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

3.4   MIDI Channel

The MIDI channel can either be set via a switch (role S*witch or Tap Tempo*), or via a MIDI command.

3.4.1   MIDI Channel via MIDI command

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

3.4.2 MIDI Channel via Switch

The MIDI channel can be easily changed from the outside using key combinations. Port 1 is used for this by default. If another port is to be used, this can be set with the following command.

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

The instructions for setting the MIDI channel using the switch see the User Guide at:
https://oscillatordevices.com/goblin

3.5 Startup Delay

Some effects devices need some time after being connected to the supply voltage before they are ready for operation. This ranges from a few milliseconds to several seconds. So that the **Goblin** can correctly restore the last state and the boot process of the effects device is not disturbed, the effects device should first be ready for operation before the **Goblin** begins its work. Therefore a delay at the beginning can be useful.

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

Please note that a pressed button is immediately recognized and accepted by the **Goblin** when it is connected to the supply voltage. This happens regardless of the start delay, but depending on the polarities set in the configuration bits. In this way, the configuration modes of the effects devices can still be used.

3.6 Configuration bits

The following configuration bits are only necessary in extremely exceptional cases. They allow more in-depth configuration, or setting more parameters with fewer messages. Each port has a set of identical configuration bits. 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 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 3.1 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 awaits a + 5V line, which 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 3.2 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.

3.7 Saving the Configuration

In order to save the configuration bits and the start delay, the following three commands must be called immediately one after the other. If another command is sent in between, the storage sequence is aborted. The effect device must then be restarted for the changes to take effect.

CC	#	Funktion
9	18	1. passcode message for the saving sequence
9	52	2. passcode message for the saving sequence
9	0	Save messages: 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

Example: To set an LED threshold of 1.8V for port 2, the following four commands are sent back-to-back: CC 49 36, CC 09 18, CC 09 52, CC 09 05.

3.8 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 *DAT(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**.

3.9 Troubleshooting

The most common mistake during installation is the wrong configuration of the LED threshold value and/or the LED polarity. If this is not set correctly, the effect can be operated with the switch, but via MIDI the on and off command doesn't work properly. In this case, check the configuration and repeat the measurement if necessary. Also make sure that you have measured against GND!

To help with the configuration you can use the spreadsheet at:
https://oscillatordevices.com/doc/oscillator_devices_configuration_helper.xlsx