OSCILLATOR DEVICES

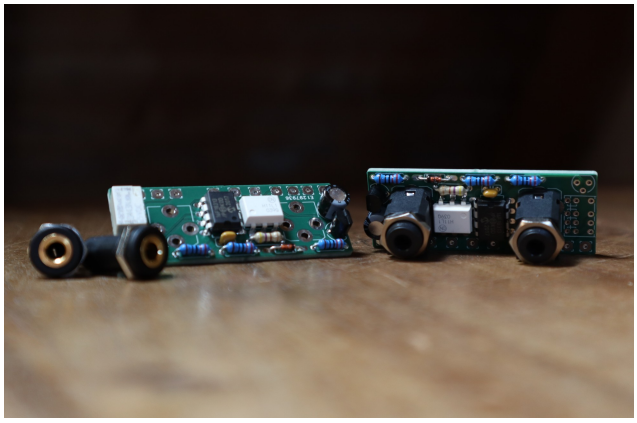
MIDI-Solutions and Custom FX

Imp-SPST 1.2 - Installation

1 Introduction

1.1 Wait, what?!

The ***Oscillator Devices Imp*** is a MIDI-capable module, just the size of a 9V block, which can take over switching tasks in guitar, bass and other effects devices. With the ***Imp*** it is therefore possible to switch an effects device on and off under MIDI control, to change the channel or to operate the tap tempo. The normal functionality is not restricted. On the contrary: old, loud and stiff 3PDT switches are being replaced by a modern, quiet, relay-based soft switch. The true bypass functionality is retained. The original switch is partially or completely replaced. There is basically compatibility with all 3PDT switches as well as a variety of SPST soft switch and tap-tempo circuits. In contrast to many relay-based soft switches, the ***Imp*** remembers the status after switching off. The ***Imp*** has MIDI In, MIDI Thru and understands MIDI Clock with different clock patterns. The MIDI channel can be configured via th switch.



Imp-3PDT loose assembly (l.) and Imp-SPST socket assembly (r.)

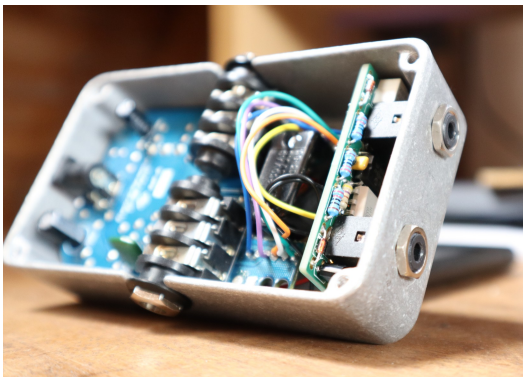
1.2 Variants

The Imp is available in two different versions, which - depending on the application - are equipped and programmed differently. If the existing effects device has a standard 3PDT switch, the ***Imp-3PDT*** is used. The 3PDT switch is then replaced by a soft switch and the ***Imp*** then brings its own relay in order to continue to retain the true bypass functionality. If the device already has an SPST soft switch, the ***Imp-SPST*** is used. The SPST-Soft-Switch is retained along with the relay, or the digital control unit.

This document describes the installation of the ***Imp-SPST***.

1.3 Assembly options

In the socket mounting variant, the Imp is equipped with two 3.5mm jack sockets and is fastened through holes in the housing of the effects device. This mounting option is ideal for devices that have space for a 9 V block in the lower area of the housing (e.g. Electro Harmonix and Earthquaker Devices). The ***Imp*** can also be used without soldererd sockets for free assembly.

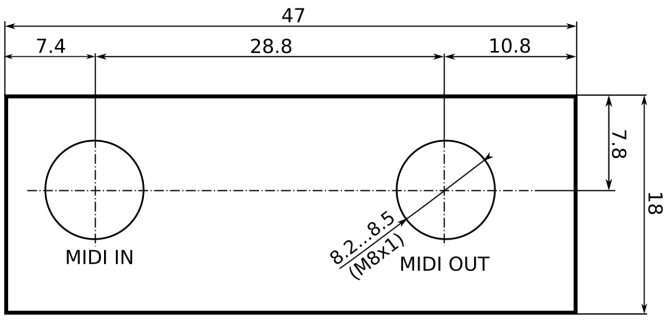


1.4 Electrical Properties

Electrical Properties	Min	Typ	Max	
Supply Voltage	7	9	18	VDC
Current Consumption	3		33	mA
Maximum voltage at LED, RLY and SW terminal			5	VDC

1.5 Mechanical Properties

The dimensions of the ***Imp*** are 47 x 18 mm in the base area. With pre-assembled sockets (socket assembly), the distance between the housing wall and the circuit board is 18 mm. The bore diameter for the sockets is 8.2 mm - 8.5 mm. With pre-assembled sockets, the hole spacing is 28.8 mm.



1.6 MIDI Commands

For the full list of MIDI commands and how to set the MIDI channel see
https://oscillatordevices.com/imp

2 Assembly

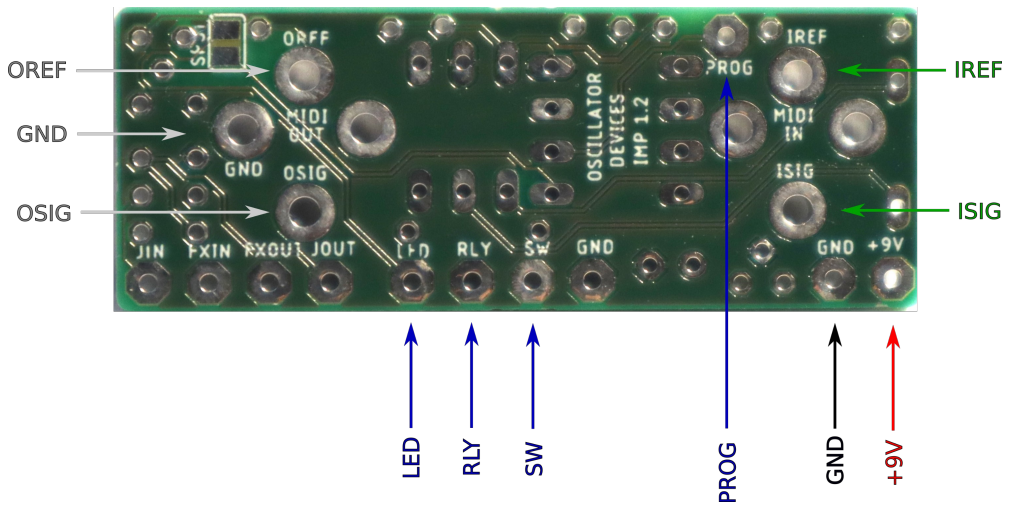
2.1 Voltage Supply

The electronics are supplied via the effects device's supply. In order to minimize interactions with the effects device, the supply for the ***Imp*** 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.

Attention! The ***Imp*** has no polarity reversal protection. The correct polarity should be checked before the first start-up.

2.2 Wiring

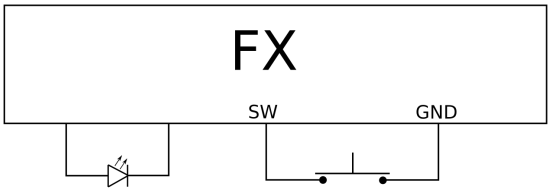
The implementation of soft switches in effects devices can be done in a wide variety of ways. The ***Imp-SPST*** is very flexible and can handle most circuits, but requires a configuration for exotic circuits.



Signal	Description
LED	Anode of the LED
SW	Soft switch
RLY	+5V side which was connected to the soft switch
PROG	Only for use case Tap Tempo (see 2.2.3 Wiring LED for use case Tap Tempo)
GND	GND
+9V	Supply voltage (9 V…18 V DC)
IREF	MIDI In (Reference/Current Source) - MIDI TRS-Type A Ring – DIN Pin 4
ISIG	MIDI In (Signal/Current Sink) - MIDI TRS-Type A Tip – DIN Pin 5
OREF	MIDI Thru (Reference/Current Source) - MIDI TRS-Type A Ring – DIN Pin 4
GND	MIDI Thru (Shield/GND) - MIDI TRS-Type A Sleeve – DIN Pin 2
OSIG	MIDI Thru (Signal/Current Sink) - MIDI TRS-Type A Tip – DIN Pin 5

2.2.1 Wiring Switch

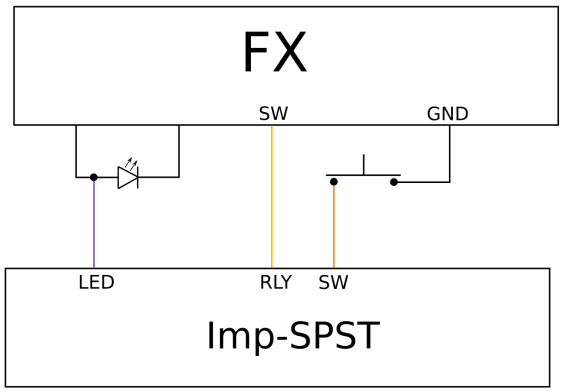
There are two types of switches, normally open and normally closed. The ***Imp-SPST*** can handle both, but Normally Closed requires a special configuration (see Chapter **3.1 Configuration Bits**).



SPST before assembly of the Imp-SPST

The SPST soft switch has two connections. It is assumed that one side of the switch is connected to +5 V via a pull-up resistor and the other side to GND. With the effects device switched on, it must be determined which of the two connections is connected to +5 V. In the case of a normally closed switch, this must be determined when the switch is pressed.

The +5V line of the switch is unsoldered directly at the switch contact and connected to *RLY*. The now free pin of the switch is connected to *SW*.



SPST after assembly of the Imp-SPST

2.2.2 Wiring LED

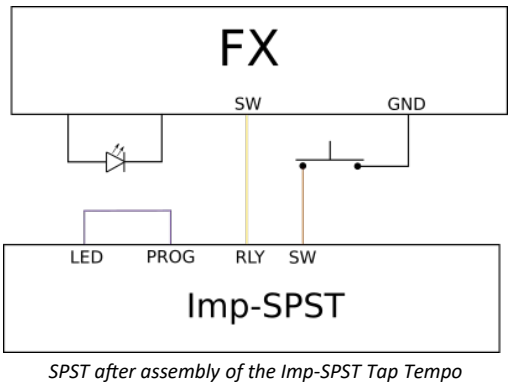
The ***Imp*** uses the LED to compare its internal state with the state of the effects device. It measures the voltage on the LED and uses this to decide which state the effects device is in. For wiring of the LED, when using **the *Imp-SPST* as Tap Tempo** controller see 2.2.3 Wiring LED for use case Tap Tempo.

In order for the ***Imp*** 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 value changes is the one where the wire is soldered.

The configuration (see Chapter 3 Configuration) is carried out using the two voltage values (effect on and effect off). The mean value of the two voltages is the LED threshold value (3.2 LED Threshold). If the voltage is higher when switched off than when switched on, the polarity (see 3.1 Configuration Bits- *POL-LED*) must be inverted.

2.2.3 Wiring LED for use case Tap Tempo

When using it as a tap tempo controller, it does not make sense to monitor the LED, as it flashes in time and does not represent a status. For correct function, the *LED* connection must be bridged with the *PROG* connection.



SPST after assembly of the Imp-SPST Tap Tempo

2.3 MIDI Signals

With ***MIDI-TRS TYPE A***, the MIDI reference signal (or current source) is placed on *ring*, MIDI signal (or current sink) is placed on *tip*. With MIDI Out, the shield is placed on the sleeve.

In order to isolate the GND of the devices, the sleeve for MIDI IN must remain open and the socket must be isolated from the housing!

Digital signals, such as MIDI signals, can lead to crosstalk on other lines. Pay particular attention to this when laying the MIDI cables. In the case of MIDI signals, it can otherwise happen that a click can be heard in the audio signal with every MIDI command. This particularly applies to effects with multiple gain stages (distortion, fuzz, etc.).

To avoid this, the lines for the MIDI signals should be as short as possible and, if possible, not laid along the electronics of the effect. In this respect, socket mounting is the preferred mounting option.

3 Configuration

The ***Imp-SPST*** is tailored to a large variety of effects devices. The ***Imp-SPST*** can handle almost any circuit, but configurations are necessary for special cases.

If the effects device in which the ***Imp*** is installed has a „normally open“ switch, and the measurements of the LED have shown a voltage of over 1.5V when switched on and 0V when switched off, nothing further needs to be done (e.g Earthquaker Devices).

Caution: The following settings, if used incorrectly, can result in the device no longer working properly.

There is a spreadsheet to help with calculation of the configuration bits and LED threshold.

3.1 Configuration Bits

The type of switch connected and how the LED behaves are set using non-volatile configuration bits. The following 4 parameters are set using a 7-bit word.

CC	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1-0
	N.A.	POL-LED	FX-DRIV	POL-FX	POL-SW	N.A.
19	Not used	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 (*)	Not used

(*) = Default setting

- **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*.
- **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 ***Imp*** can drive the + 5V high state itself. To do this, set this bit to *Push Pull*.
- **POL-LED**: Polarity of the LED. If the wiring of the LED requires it, you can set here that the value below the LED threshold is recognized as "On". (See **2.2.2**). If the voltage at the LED is higher when it is switched off than when it is switched on, this bit is set to 0.

It should be noted that these settings must always be made together. The entire word is always used. Before the bits take effect, the setting must be saved (see chapter **Saving the Configuration**) and the device restarted.

3.2 LED Threshold

The LED monitoring controls the voltage on the LED. If there is a voltage that exceeds the LED threshold value (or falls below it, depending on the Polarity), the state is registered as "On". Since LED voltages can vary widely, the threshold value can be set for each port.

CC	#	Function
29	n	LED threshold in 0.05V steps. Default is 24 (=1.2V)

These settings also have to be saved (see chapter **Saving the Configuration**).

3.3 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 ***Imp*** 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 ***Imp*** begins its work. Therefore a delay at the beginning can be useful. This setting must also be saved, see chapter **Saving the Configuration**.

CC	#	Schalter
8	n	Startup delay n*100 ms

Please note that a pressed button is immediately recognized and accepted by the ***Imp*** 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.

3.4 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.

CC	#	Funktion
9	18	1. passcode for the saving sequence
9	52	2. passcode for the saving sequence
9	n	n=0: Saving the Startup delay n=1: Saving the configuration bits n=2: Saving the LED threshold

3.5 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 it acknowledges either the on or the off command with uncontrolled flashing. 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