OSCILLATOR DEVICES

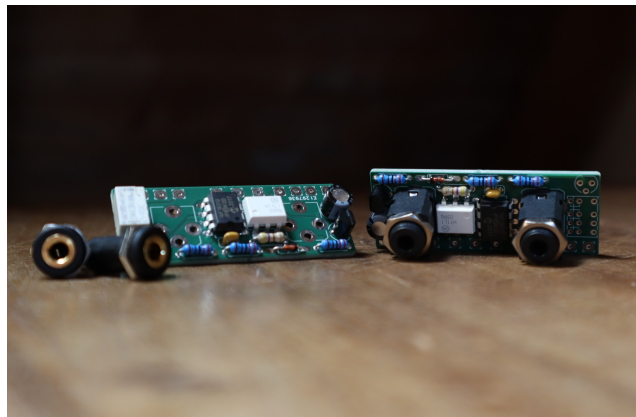**MIDI-Solutions and Custom FX**

Imp 1.1

Contents

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

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

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.

1.2   Variants

The ***Imp*** *i*s 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, it is replaced by a soft switch. The ***Imp*** then brings its own relay in order to retain the true bypass functionality. If the device already has a SPST soft switch, it will be retained along with the relay, or the digital control unit.

Variant	Requirement	Description	Chapter
Imp-3PDT	3PDT true bypass switching with LED control	Replaces the 3PDT with a relais based soft switch. True bypass is retained.	2.3
Imp-SPST	SPST soft switch, „Normally Open" or „Normally Closed"	The SPST, along with the realais or digital control is reatained	2.4
	SPST soft switch for tap tempo control, „Normally Open" or „Normally Closed"	Der SPST, sowie die digitale Schaltung, wird beibehalten	2.5

1.3   Scope of Delivery

Included in the delivery are:

- Imp
- Switch (optional)
- Sockets (only socket assembly or loose assembly)
- Shrinking tube (only loose assembly)

1.4   Assembly options

There are - regardless of the variant - different options for mounting the electronics in the effects device.

1.4.1   Socket assembly

Ideally, the **Imp** is equipped with two 3.5mm jack sockets with **MIDI TRS Type A**. The electronics are 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).
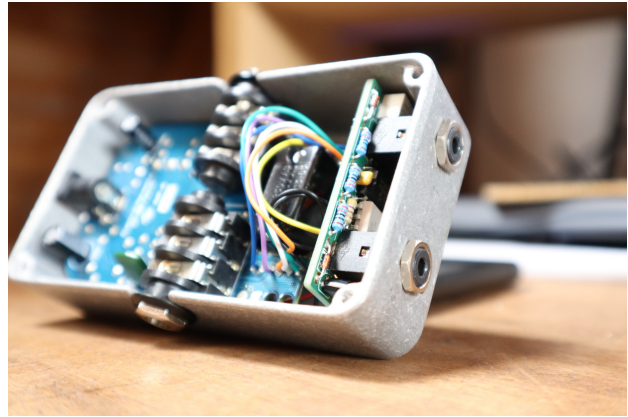

1.4.2   Loose assembly

If the installation via the sockets is not possible, the option remains to pack the **Imp** electrically insulated in a shrink tube. Packed like this it can be put into any free space inside the effects device. Then external sockets are used and the connections are then made via cables.

1.5   Electrical Properties

Electrical Properties	Min	Typ	Max	
Supply Voltage	7	9	18	VDC
Current Consumption	3		33	mA

1.6   Mechanical Properties

The dimensions of the **Imp** are 51 x 20 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 28.5 mm.
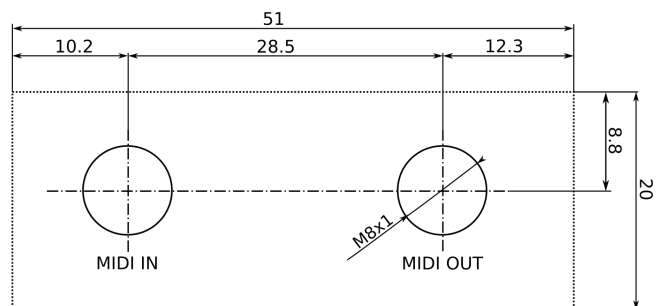
Drawing of the Imp seen from the component side. All dimensions in mm

2   Assembly

2.1   Preparations

To install the **Imp** you need a soldering iron, wire stripper, needle-nose pliers, side cutters and some wires. In addition, a drilling machine and a metal drill with a diameter of 8.2 – 8.5 mm. A multimeter is also required for the **Imp-SPST**.

If the socket for the power supply is not accessible from the inside, the effects device must be completely dismantled. Most of the time, the soldering points for the hollow socket are on the underside of the board.

2.2   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. The **Imp** is designed for a supply voltage of up to 18 V.

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

2.3   Variant with Relais (Imp-3PDT)

In the variant with relay (**Imp-3PDT**), an existing 3PDT is replaced. The terminals are connected to the **Imp** as follows, whereby one side of the soft switch is connected to the additional GND connection.
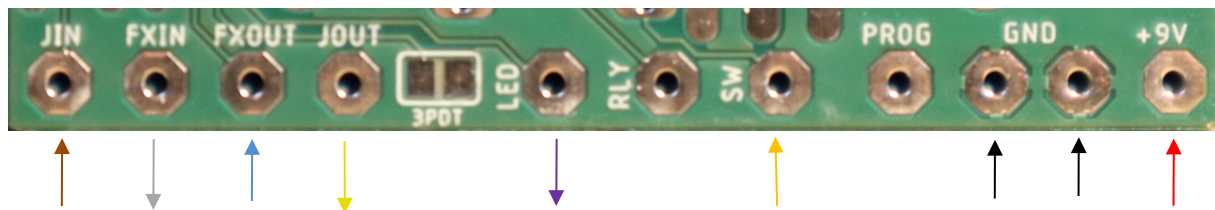
Bezeichnung	Farbe	Beschreibung
JIN	Brown	Jack in/from instrument
FXIN	Gray	FX in/to effects
FXOUT	Blue	FX out/from effects
JOUT	Yellow	Jack out/to amplifier
LED	Purple	LED, which was connected to the 3PDT
RLY	-	Not used in this variant
SW	Orange	Soft switch (2nd contact of switch goes to additional GND terminal)
GND	Black	GND
+9V	Red	Voltage supply (7 V…18 V DC)
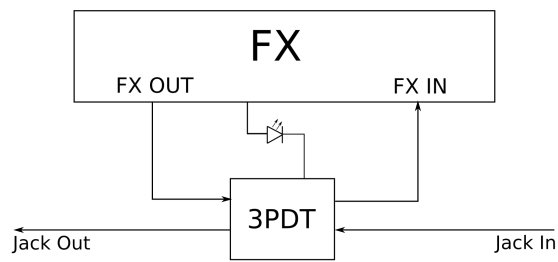
3PDT before assembly of the Imp
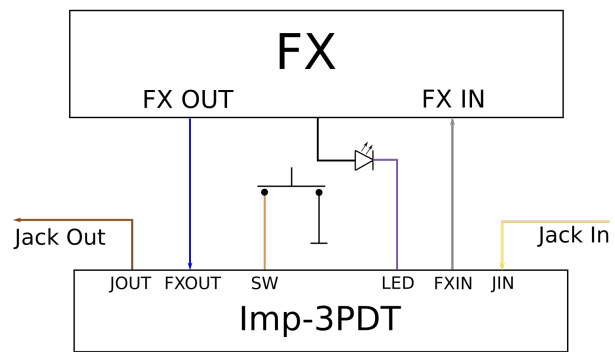
3PDT after assembly of the Imp

If the **Imp** is delivered without MIDI sockets, or if the sockets are not soldered to the circuit board, see section **2.6 Wiring of the MIDI sockets**.

2.4 Variant Without Relais (Imp-SPST)

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 configuration for exotic circuits.

Attention: If a value above 5.2V is measured in one of the following measurements, the **Imp-SPST** cannot be installed.

2.4.1 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 **4**).

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*.

2.4.2 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.

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 4) 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 (4.2 LED Threshold). If the voltage is higher when switched off than when switched on, the polarity (see 4.1 Configuration Bits- *POL-LED*) must be inverted.

2.4.3 Overview Wiring
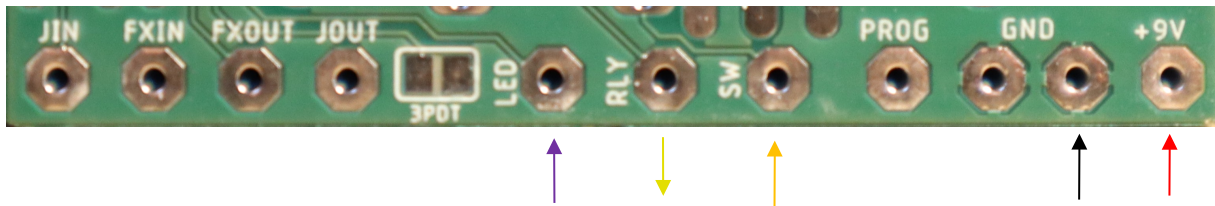
Bezeichnung	Farbe	Beschreibung
JIN	-	Not used in this variant
FXIN	-	Not used in this variant
FXOUT	-	Not used in this variant
JOUT	-	Not used in this variant
LED	Purple	Anode of the LED
RLY	Yellow	+5V side which was connected to the soft switch
SW	Orange	Soft switch
GND	Black	GND
+9V	Red	Voltage Supply (7 V…18 V DC)
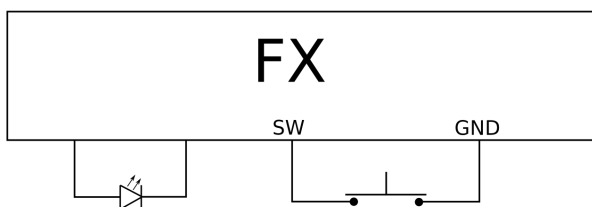
SPST before assembly of the Imp-SPST
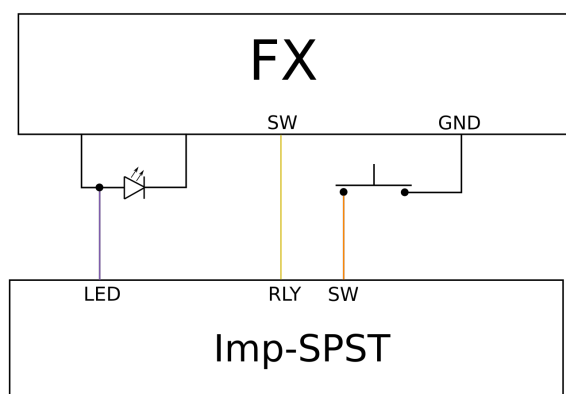
SPST after assembly of the Imp-SPST

If the **Imp** is delivered without MIDI sockets, or if the sockets are not soldered to the circuit board, see section **2.6 Wiring of the MIDI sockets**.

2.5   Variant Without Relay for Tap-Tempo (Imp-SPST)

The variant without relay for tap-tempo purposes differs only in the lack of LED monitoring. The installation is done exactl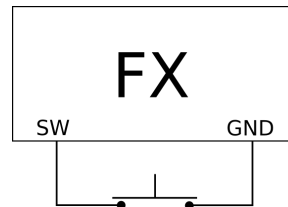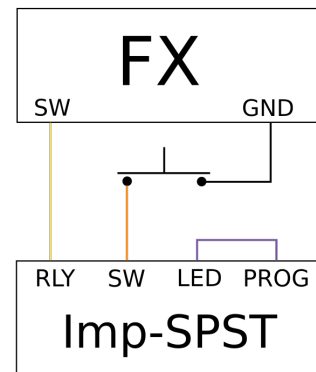y as in **2.4 Variant Without Relais (Imp-SPST)**, with the difference that the LED connection is bridged with the PROG connection.

Tap Tempo before installation of the Imp-SPST

Tap Tempo after installation of the Imp-SPST

2.6   Wiring of the MIDI sockets

If the MIDI sockets are not already fitted, the assignment is as follows:

Signal	Function	MIDI In				MIDI Out		
		Color	TRS Type A	5-Pin DIN		Color	TRS Type A	5-Pin DIN
MIDI Ref	Current Source	Green	Ring	Pin 4		Green	Ring	Pin 4
MIDI Sig	Current Sink	White	Tip	Pin 5		White	Tip	Pin 5
GND	Shield	-	N.C.	-		Black	Sleeve	Pin 2

Shield

MIDI OUT Sig   MIDI OUT Ref

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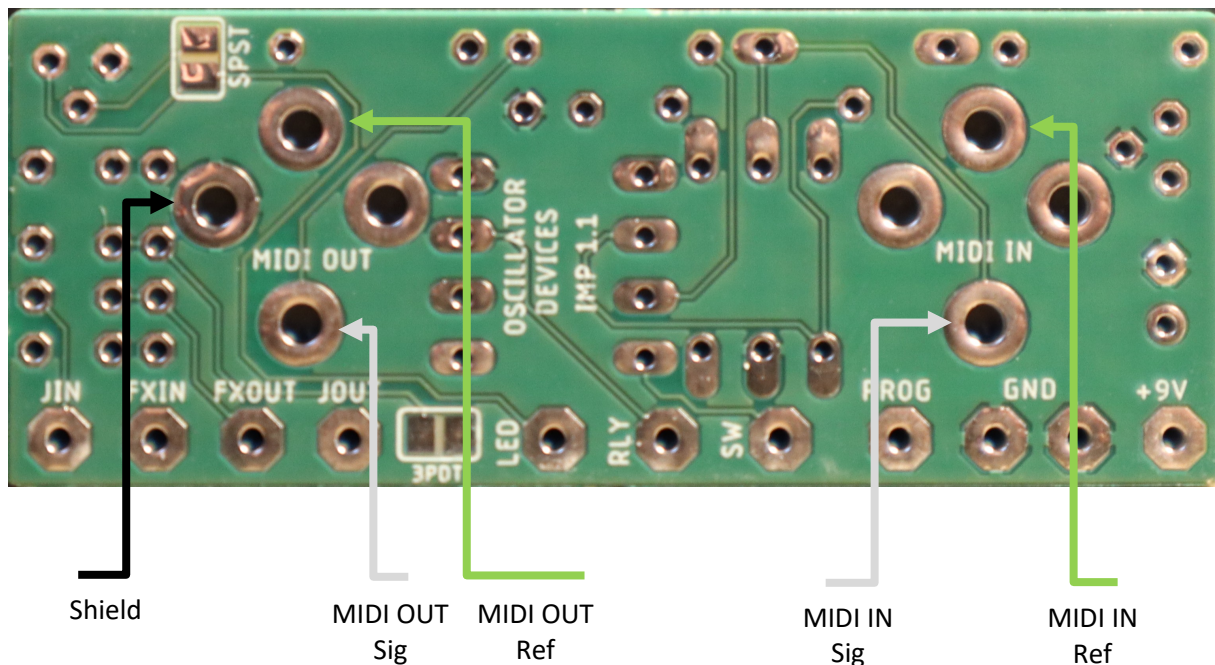
With **MIDI-TRS TYPE A**, the MIDI reference signal (or current source) is placed on *ring*, MIDI signal (or current sink) is placed on *tip*. With MIDI Out, the shield is placed on the sleeve.

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!

3   Operation

3.1   MIDI channel

To configure the MIDI channel, proceed as follows

1. Disconnect the device from the supply voltage
2. Hold the switch
3. Restore supply voltage. The *Imp* is now in configuration mode. This is indicated by switching it on and off every second
4. Press the switch according to the number of the desired channel (e.g. twice for channel 2). The *Imp* acknowledges this by emitting short switching impulses corresponding to the number of the channel.
5. Once the desired channel is set, press the button and hold it down until the *Imp* switches off completely.
6. Disconnect supply voltage. The next time the *Imp* starts, it reacts to the selected MIDI channel.

To put the *Imp* in omni mode (i.e. it responds to any MIDI channel), skip step 4.

The feedback via switching impulses does not work in tap-tempo applications. The process remains the same, but must be performed blindly.

3.2   Bypass and MIDI Clock

Control Change (CC) message 10 is used to switch the *Imp* via MIDI or to configure its respone to MIDI clock.

| CC	#	Function
10	00	Off
	01	On
	02	Toggle (On to off or off to on)
	03	Hold (Corresponds to a pressed and held switch)
	04	Release (Release held switch)
	10	Toggle to the beat of the MIDI clock in 1/4 notes
	11	Toggle to the beat of the MIDI clock in 1/8 notes
	12	Toggle to the beat of the MIDI clock in tripletnotes
	13	Toggle to the beat of the MIDI clock in 1/16 notes
	14	Toggle to the beat of the MIDI clock in dotted 1/8 notes

3.3   Tap Tempo Compatibility

When used as a tap tempo switch, e.g. in delays, the problem sometimes arises that the effect is disturbed with continuous clock generation (e.g. EHX Memory Man Hazarai). Every time you press the Tap Tempo button of the effect, its internal clock generator is reset, which leads to unclean sound reproduction. This is why there is the option of only emitting a limited number of pulses in MIDI clock mode, until the delay has taken over the timing.

CC Port1	#	Function
11	0-19	1-20 times toggle to the beat of the MIDI clock in 1/4 notes
	20-39	1-20 times toggle to the beat of the MIDI clock in 1/8 notes
	40-59	1-20 times toggle to the beat of the MIDI clock in triplet notes
	60-79	1-20 times toggle to the beat of the MIDI clock in 1/16 notes
	80-99	1-20 times toggle to the beat of the MIDI clock in 1/32 notes

3.4   Puls-Pause Ratio

It is possible to adjust the pulse-pause ratio. For example, with the same period duration, the "on phase" can be longer than the "off phase". This is done with Control Change 12.

CC Port1	#	Function
12	0-19	On-phase is shorter than Off-phase
	20-39	On-phase and off-phase are of the same length
	40-59	On-phase is longer than Off-phase
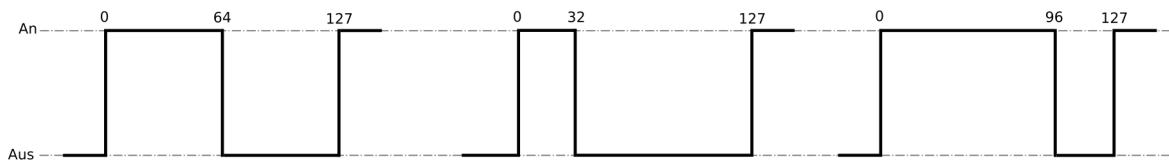
4 Configuration (only Imp-SPST)

While the application for the **Imp-3PDT** is very limited, 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.

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

4.1 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 **2.4.2**). 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.

4.2   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**).

4.3   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.

4.4   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