Sixense MIDI Controller

The SixenseMIDIController (SMC) is an application that generates MIDI control and note messages based on movements of a Sixense-powered motion control system.

Features:

- SMC sends generic midi control and note messages so it is usable with any DAW or directly with standalone VST instruments.
- Three unique modes of operation:
 - o In Freeform Wand Mode 3D movements of the controller map to MIDI controls.
 - In Single-Hit Drum Mode the controller can be swung like a drumstick to trigger samples.
 - o In **Xylophone Mode** the controller is used like a xylophone mallet to trigger and bend notes along a scale.
- Multiple SMC instances can be run at the same time, mapping different aspects of the
 controllers to different applications or VSTs. For example, one instance can send motion inputs
 from the right controller to an FM synth plugin, while another SMC instance receives button
 presses from the right controller and sends messages to a sequencer.

MIDI

VIRTUAL MIDI PORT SETUP

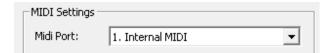
The SMC generates MIDI messages that must be routed to compatible applications and plugins, but most PCs do not have the built-in capability to route MIDI messages from one application to another. To do this, a third-party application such as LoopBe1 (http://www.nerds.de/en/loopbe1.html) is required. A free version of LoopBe1 is available for non-commercial use. Once installed, LoopBe1 provides a virtual MIDI port into which the SMC can be routed, and to which the DAW or VST plugin can listen.

Note: If you are using LoopBe1 for routing MIDI messages, be sure to turn off the "Enable Shortcut Detection" checkbox in the systray configuration options. Otherwise the SMC will generate MIDI messages that shortcut detection can confuse as being a feedback loop.

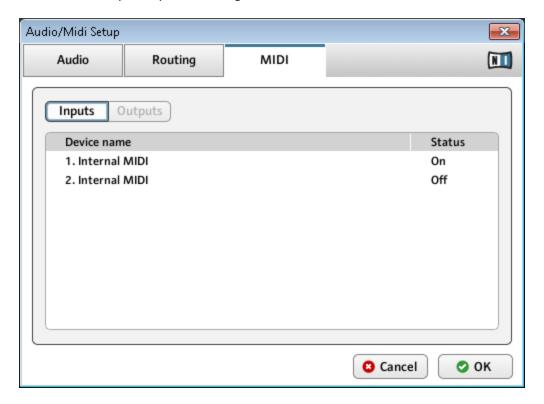
While the SMC currently runs only on Windows, you can use a virtual Ethernet MIDI port such as ipMIDI (http://www.nerds.de/en/ipmidi.html) to send messages from a Windows PC running the SMC to a Mac that is running the music software.

MIDI CONFIGURATION

After running SMC, select the MIDI OUT port for it to use. You do this with the "MIDI Port" pulldown in the MIDI Settings section. You should see the desired MIDI output port listed ("1. Internal MIDI" if using LoopBe1):



You should also see this port listed as a MIDI input port in your DAW or VST plugin. Here is a screenshot from Massive's options panel running in standalone mode:

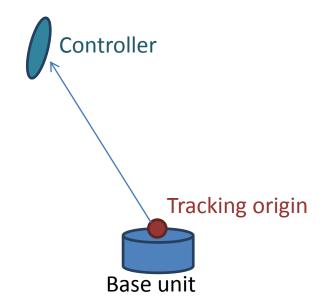


SMC messages will arrive over the "1. Internal MIDI" port as if it were a MIDI keyboard.

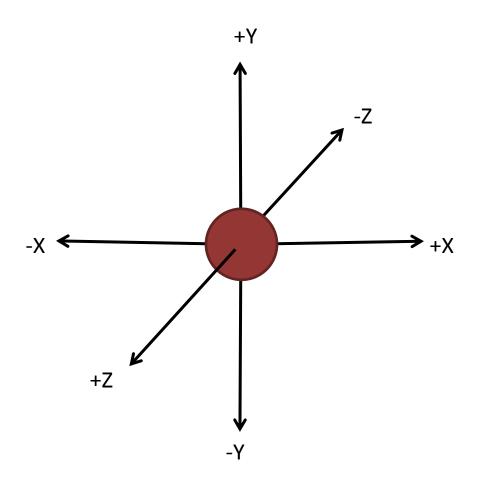
Wand Mode

WAND MODE COORDINATE SYSTEM

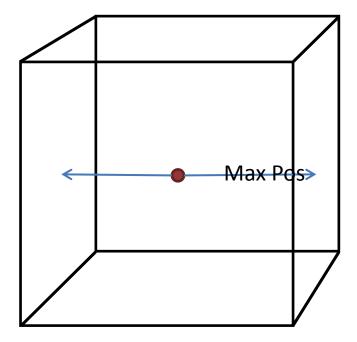
When in Wand Mode, the SMC generates MIDI control messages based on the controller's coordinates in space. These coordinates are measured from a fixed point in space which we will refer to as the Tracking Origin, and which at startup is located at the Base Unit. It is possible to move the Tracking Origin to a different position; instructions for doing so are listed below.



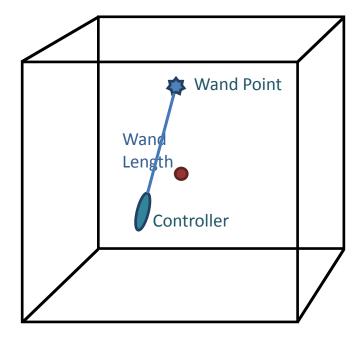
Before we describe what the set of control messages is, it will be useful to describe the coordinate system used by the system. The controller's position is measured in an X Y Z coordinate system from the Tracking Origin, where the positive X axis is to the right, the positive Y axis is up, and the positive Z axis is facing out towards the front of the base unit. All positions are in millimeters.



Just as a slider control on a physical MIDI keyboard has a maximum and minimum value, the controller positions have a maximum and minimum position. The size of the volume that is mapped to max and min is configurable through the "Max Pos" slider in the Parameters.



The position of the controller is not measured directly to the body of the controller, but instead to a position offset in front of the controller. Imagine that the controller has a virtual wand sticking out the front. The length of this wand is configurable in the Parameter section of the SMC. The point at the end of the wand is called the Wand Point.



Changing the length of this wand changes how the user effects controller movement. For example, if the wand length is very short, you have to wave your hand through the space to change the measured

position. If the wand length is very long, you can hold the position steady and just rotate the controller as if you were waving a long stick.

WAND MODE CONTROL MESSAGE NUMBERS

The SMC sends 20 different messages to the MIDI port. These do not all have to be used in any given configuration; the user can pick and choose which controller motions to bind to dials. For example, you may simply bind the X position to the fader and the Rotation in Z to the pitch, while ignoring all other control messages.

Here is a table of the control messages that are sent each frame and their corresponding index:

Position in X direction	0
Position in Y direction	1
Position in Z direction	2
Rotation Angle in X	3
Rotation Angle in Y	4
Rotation Angle in Z	5
Total Velocity	6
Velocity in X direction	7
Velocity in Y direction	8
Velocity in Z direction	9
Total Acceleration	10
Acceleration in X direction	11
Acceleration in Y direction	12
Acceleration in Z direction	13
Trigger position	18
Distance to Tracking Origin	19
Aiming at base	20
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The purpose of the "Base Control Num" is to avoid sending values that collide with those sent by other devices. The SMC adds the index listed for each message to the Base Control Num to determine exactly which MIDI CC message will be sent for that controller movement. The default Base Control Num is 14:



In this case the "Total Velocity" for the controller will be sent as CC # 14 + 6 = 20.

You simply change the Base Control Number if the default values of 14-34 are being used by another device.

Note that the SMC has a MIDI "Learn Mode" that makes it easy in most applications to bind a controller's movement to MIDI control without having to know the CC numbers directly.

CONTROLLER NUMBER

This radio box selects which controller the SMC is listening to. Each instance of SMC can only listen to one controller, but you can run multiple instances of the SMC, one for each hand.

WAND MODE CONTROL MESSAGE DESCRIPTIONS

Following is a more detailed description of each of the Wand Mode control messages. Note that all messages are sent with a value between 0 and 127, just like a dial or slider on a keyboard.

Position in X, Y and Z

The position of the Wand Point in front of the controller is measured from the Tracking Origin each frame. The measured position is fit into the space described by the Max Pos parameter and scaled from 0 to 127. This means that when the Wand Point is very near the Tracking Origin the CC value will be in the middle, or near 64. When the Wand Point moves to the right and approaches Max Pos (which is by default 2 meters), the CC value will increase until reaching its maximum value of 127. Moving to the left will cause the X position to go to 0. All positions are in millimeters.

Relevant parameters: Max Pos, Wand Length

Rotation Angle in X, Y and Z

If a control is bound to one of these parameters, it will move between min and max as the controller rotates from side to side or up and down. All three axes will be at the 'center' CC value when the controller is pointing directly forward. For the X coordinate, min is when the controller is turned 90 degrees to the left, and max when 90 degrees to the right. The Y coordinate increases and decreases as the controller tilts up and down, and the Z as the controller is rolled to the left and right.

Relevant parameters: None

Velocity

As the controller moves through space, its velocity is tracked in 3D space. There are 4 different controls bound to the velocity: the overall velocity magnitude, and the velocity in each of the 3 major directions. The velocity is measured as an absolute value, so when the controller is not moving, the CC values are 0, and when the controller is moving in any direction (i.e. left OR right for X) the CC value goes up to 127. The Max Velocity parameter controls how fast the controller has to be moving before reaching 127. All positions are in millimeters.

Relevant parameters: Wand Length, Max Velocity

Acceleration

Acceleration is treated identically to Velocity, except the value is based on the acceleration of the controller through space rather than its velocity. This mode is useful for detecting the controller's being shaken like a maraca. All positions are in millimeters.

Relevant parameters: Wand Length, Max Accel

Trigger Position

The CC value is based on how far in the analog trigger is pressed, ranging from 0 to 127.

Relevant parameters: None

Distance to Tracking Origin

The distance from the Wand Point to the Tracking Origin is measured, and sent as a CC value. The value ramps from 0 when the Wand Point is near the Tracking Origin to 127 when it is Max Dist to Base millimeters away. All positions are in millimeters.

Relevant parameters: Max Dist to Base

Aiming at base

The control value sent varies between 0 and 127 as the controller rotates from pointing directly at the base unit to pointing directly away.

Relevant parameters: None

MIDI LEARN MODE

While the SMC is running, it is continuously sending CC messages associated with many different control values. Because of this, you cannot use the "Midi Learn Mode" available in most software because these listen for the next incoming message, which would likely refer to a different control value. In order to bind a specific Wand Mode motion parameter to a control, first select the desired motion from the "Learn Mode" pulldown:



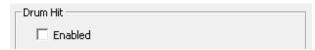
Then click the "Learn" button to enable learn mode. While enabled, the SMC will only send messages on the selected control number, and will oscillate back and forth between 0 and 127. You can then tell your DAW to learn a control and the correct motion will be bound. Click the learn button again to disable learn mode.

LOAD / SAVE

You can load or save all of the parameters in the SMC to a file. This can be useful when you run multiple SMC instances at once (for example one instance bound to the left controller's velocity and one instance bound to the right controller's for sample triggers).

DRUM HIT MODE

DRUM HIT ENABLE



When the "Enabled" checkbox is clicked, Drum Hit mode is enabled and Wand Mode is disabled. All Wand Mode control messages will stop.

Drum Hit mode causes the SMC to generate MIDI Note On and Off messages as the controller is swung like a drumstick. It works best when the controller is swung down and flicked as if it hit a surface.

HOLD NOTE



When Hold Note is not checked, the note is released automatically after press. If enabled, the note will be held 'on' for as long as the controller is held lower than the point where it was triggered.

The radio selection below the Hold Note checkbox controls the behavior of the SMC while a note is being held down. Radio values include Hold, Bend, and Slide.

Hold

Just hold the note.

Bend

When the controller is moved left or right while held down, 'pitch bend' commands are generated allowing the note to be bent up or down.

Slide

When the controller is moved left or right the previous note is released and a new note is hit. In this mode you can hit a note then slide the controller left or right like sliding your finger up and down the keyboard.

NOTE CONTROL



This radio controls what notes are hit when in Drum Hit mode.

Single

Just that note is used regardless of where the controller is. This is useful for binding to a sequencer for playing a single sample.

Xylophone

In Xylophone mode the drum hit selects a note on hit based on the controller's left-right position in space, relative to the Tracking Point. In the example above, imagine space from 1 meter to the left of the base to 1 meter to the right being divided into 30 keys, starting with C1 on the left. Positions are in millimeters.