Digitizer v4.x/4.0x
I-CubeX Reference

I-CubeX: The ultimate MIDI controller!

Infusion Systems Ltd.
P.O.Box 16178
North Vancouver, BC
Canada V7J 3S9
Tel: (604) 983-3640
Fax: (604) 648 8012
Email: info@infusionsystems.com
http://www.infusionsystems.com

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I-CubeX Digitizer v4.x/4.0x

The hardware

Fig. 1: Front View

(1) Sensor inputs (12 bit resolution)
(1a) Sensor power supply (5VDC / 30mA for each sensor)
(1b) Sensor signal input
(1c) Sensor ground
(2) Actuator outputs (power supplies of last 8 sensor inputs)
(2a) Actuator signal output (5VDC / 30mA for each actuator)

Fig. 2: Back View

(1) MIDI output indicator
(2) MIDI output (also MIDI Thru) jack
(3) MIDI input jack
(4) MIDI input indicator
(5) Power supply socket (7.5VDC / 1A)
(6) Power indicator

Fig. 3: Sensor Connector

(1) Power pin (+) - red wire
(2) Signal pin (signal) - white or grey wire
(3) Ground pin (-) - black wire
Modes of operation

The I-CubeX Digitizer can function in one of two modes - host and stand alone. Unless you have software that can send and receive the MIDI system exclusive messages required for host mode (such as the iCube and oCube objects used within the Max programming environment), your Digitizer should remain in stand alone mode.

To check whether the I-CubeX is in host or stand alone mode, observe the green MIDI output LED (at the side of the Digitizer, to the left of the MIDI output port) when powering up.

**Host mode** is indicated by **one green flash** during power up (see [Fig. 4](#)).

**Stand alone** mode is indicated by **two green flashes** during power up (see [Fig. 4](#)).

![Fig. 4: Number of flashes of the Digitizer MIDI out LED on power-up indicates the mode. Host mode is indicated by one green flash during power up. Stand alone mode is indicated by two green flashes during power up.](image)

**Stand alone mode**

Stand alone mode allows you to use the I-CubeX Digitizer directly with any MIDI device (keyboard, module, sequencer, light controller, drum machine, micro wave oven). As the Digitizer has no front panel controls, all editing must be performed using the I-CubeX editor. An edited sensor configuration is stored in the Digitizer's memory and remains there even after power down. This allows you to edit the Digitizer, plug it directly into your MIDI equipment, and go!

Stand alone mode allows the Digitizer to map any sensor input to a standard MIDI message (note-on/off, key-pressure, control-change, program-change, after-touch or pitch-bend). In addition, the 8 actuator outputs (ie. the power supplies of sensor inputs 25 to 32) can be turned on and off using MIDI note-on/off, key-pressure or control-change messages. While not quite as flexible as host mode, stand alone mode maximizes portability of your sensor setup.
Technical specifications

Version hardware v4.0x, firmware v4.0 or v4.1

Sensor input
Number of inputs 32 (power supplies of inputs 25-32 are also outputs)
Range 0 to 5 Volt
Resolution 12 bit or 7 bit (user selectable)
Sampling interval programmable from 4 ms (minimum) - 16380 ms (maximum) in steps of 4 ms
(actual sampling rate below)
Sampling rate

<table>
<thead>
<tr>
<th>active inputs (signal processing set to continuous)</th>
<th>1</th>
<th>1-2</th>
<th>1-4</th>
<th>1-8</th>
<th>1-16</th>
<th>1-24</th>
<th>1-32</th>
</tr>
</thead>
</table>
| stand alone mode
| control                                            | 244| 225 | 154 | 95  | 48   | 32   | 24   |
| pitch                                             | 240| 192 | 125 | 74  | 37   | n/a  | n/a  |
| host mode
| 7 bit                                              | 244| 244 | 244 | 238 | 138  | 93   | 83   |
| 12 bit                                            | 244| 244 | 244 | 200 | 149  | 82   | 56   |

Sampling latency 1.5 ms (min) - 4.0 ms (max) (one active input without signal processing)

Signal processing functions
inversion
scaling (0.04 Volt minimum range, leaving 5-bit resolution)
threshold detection (0.04 Volt minimum step)
peak/dip detection (over 16 samples maximum)
averaging (over 16 samples maximum)
differentiation (between 2 consecutive samples only)
noise gate (5 Volt maximum range)

Supply voltage 5 Volt
Supply current 30 mA per sensor (typical)

Actuator output
Number of outputs 8 (power supplies of inputs 25 - 32)
Range 0 to 5 Volt
Resolution 1 bit (off = 0 Volt, on = 5 Volt)
Switching rate 1540 Hz (maximum)
Switching latency 1.3 ms (minimum)
Output current 30 mA per actuator (maximum)
Communications data format

Host mode MIDI system exclusive protocol

Standalone mode

MIDI pitch-bend (12 bit resolution, up to 16 inputs), note-on/off, key-pressure, control-change, program-change or after-touch (7 bit resolution) messages for sensor data mapping
MIDI note-on/off, key-pressure or control-change for actuator output control

Connectors

Sensor / actuator 3 pin row (2.54 mm / 0.1” spaced)
MIDI 5 pin DIN (input, output with software switch-able thru)
Power 2.1mm / 5.0mm (inner/outer diameter) coaxial plug with center positive

Form

Dimensions 121 mm x 94 mm x 34 mm (4.75” x 3.75” x 1.3”)
Weight 0.180 kg (0.39 lbs.)
Known bugs

Digitizer hardware version 4.01, firmware version 4.1

We are not aware of any bugs at this time. Please notify us of any bugs you may encounter.

Digitizer hardware version 4.01, firmware version 4.0

**Constant + Invert unstable**
Setting the Constant and Invert features both to active, a Constant value smaller than Threshold and applying a sensor value close to the threshold results in the output of many MIDI messages alternating between the Constant value and zero at a rate determined by the sampling interval.
Fix: n/a. To avoid confusing results, this combination cannot be set with editor v2.00, nor can the Constant value be set (it is set default to 127).

**CLEAR CONFIG sets Continuous to active**
Using the CLEAR CONFIG (105) system exclusive MIDI message will set all inputs with Continuous to active. When loading the configuration into the editor, all inputs will appear active (on), but none of the monitors show any activity.
Fix: Use the Configure | Reset configuration (editor version 2.0x) or File | New (editor version 1.5x/2.0x) feature.

**Invert + Dip outputs 127 at Top**
When setting Invert and Dip to active and using any MIDI map except pitch-bend, the Digitizer will output the maximum MIDI value (127) when the sensor value is exactly equal to the Top value.
Fix: Use a MIDI filter to filter out the maximum MIDI value. Since the bug only occurs when the sensor value is EXACTLY (within 12 bits resolution) equal to the Top value it will occur only rarely.

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