Digitizer v4.x/4.0x
I-CubeX Reference

I-CubeX: The ultimate MIDI controller!

27 November 2002

Customize your own perfect interface

Performer-activated lighting and sound cues

Interactive trade-show displays

music synchronization for dance

greater accessibility via alternate controllers

I-CubeX Digitizer v4.x/4.0x

The hardware

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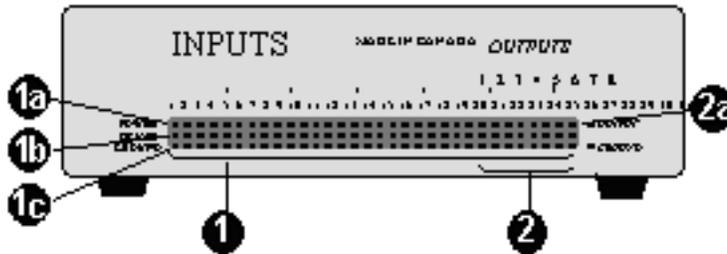
(1) Sensor inputs (12 bit resolution)
(1a) Sensor power supply (5VDC / 30mA for each sensor)
(1b) Sensor signal input
(1c) Sensor ground
(2) Actuator outputs (power supplies of last 8 sensor inputs)
(2a) Actuator signal output (5VDC / 30mA for each actuator)

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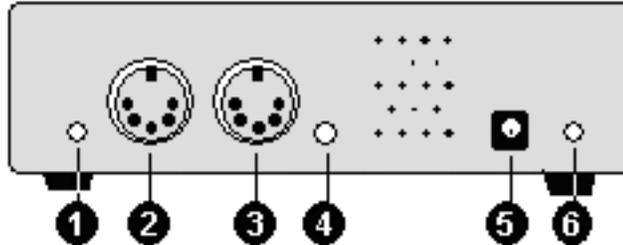
(1) MIDI output indicator
(2) MIDI output (also MIDI Thru) jack
(3) MIDI input jack
(4) MIDI input indicator
(5) Power supply socket (7.5VDC / 1A)
(6) Power indicator

Fig. 3: Sensor Connector
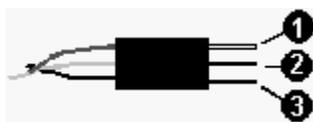
(1) Power pin (+) - red wire
(2) Signal pin (signal) - white or grey wire
(3) Ground pin (-) - black wire

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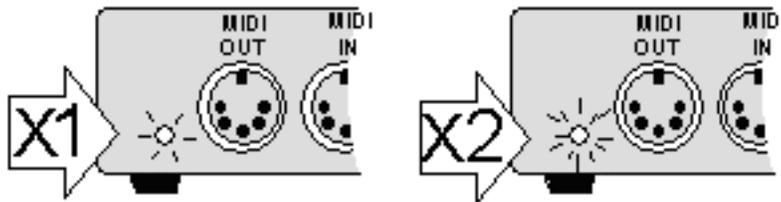
Fig. 4: Number of flashes of the Digitizer MIDI out LED on power-up indicates the mode. Host mode is indicated by one green flash during power up. Stand alone mode is indicated by two green flashes during power up.

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

	active inputs (signal processing set to continuous)							
	1	*1-2*	*1-4*	*1-8*	*1-16*	*1-24*	*1-32*	
stand alone mode								
control	244	225	154	95	48	32	24	Hz (max)
pitch	240	192	125	74	37	n/a	n/a	Hz (max)
host mode								
7 bit	244	244	244	238	138	93	83	Hz (max)
12 bit	244	244	200	149	82	56	45	Hz (max)

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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