

MIDI Sniffer™

Musical Instrument Digital Interface Protocol Analyzer



Instruction Manual

TABLE OF CONTENTS

TABLE OF CONTENTS 2

OVERVIEW 4

Introduction4

Features4

Limitations4

Connections5

Data Flow5

NAVIGATION..... 5

Keypad.....5

SCREENS 6

Title Bar.....6

Main Menu7

Activity - Bars7

Activity - Tabular9

Activity - Bandwidth14

Activity - Setup14

CI – Compatibility Inquiry15

Control.....16

Device.....17

Record.....19

Settings.....23

Player	27
Ability	29
About	31
ADVANCED	31
USB Configuration	31
USB Host & Device Message Limiting	31
USB Device Descriptor	32
Debug Messages	32
MIDI Version Preference	32
POWER	33
FIRMWARE UPDATES	33
REFERENCES	33
TROUBLESHOOTING	34
MIDI Device Not Connecting	34
MIDI Host Not Connecting	34
LIMITED WARRANTY	34



OVERVIEW

INTRODUCTION

Thank you for purchasing the MIDI Sniffer. Here you will find all the necessary resources you will need to successfully operate and care for your MIDI Sniffer.

This product and manual assume you have a basic understanding of MIDI technology.

FEATURES

The MIDI Sniffer is a powerful handheld MIDI protocol analyzer. It can be used to test, control or troubleshoot your USB based MIDI equipment. Some key features include:

- ✓ 320 x 240 graphics color display
- ✓ 2 MB buffer for simultaneously recording USB host and device MIDI traffic
- ✓ 4 record buffer storage locations for recalling previous buffer data
- ✓ Hexadecimal or decimal number systems
- ✓ MIDI activity shown graphically (bar and histogram) and raw tabular
- ✓ Easy firmware updates
- ✓ Operates on 2 AA batteries (alkaline or lithium ion)
- ✓ Can be used standalone as a host controller or passthrough from a MIDI device to a host
- ✓ MIDI 2.0 support (in beta form)

LIMITATIONS

The MIDI Sniffer uses MITM (man in the middle) technology. This means when used as a passthrough analyzer, data is queued internally through the instrument which may create small latencies.

The MIDI sniffer does not work with USB hubs on the device side and must be directly connected to a MIDI device.

The MIDI Sniffer is not a USB protocol analyzer. It will not show low-level USB token data like SOF, IN, and OUT. However, all USB setup packets (post enumeration) are recorded and can be viewed in passthrough mode (device and host connected).

The device USB port runs max at full speed (12 Mbit/s) while the host USB port runs max at high speed (480 Mbit/s). The speed variations have minimal affect as most MIDI USB devices run at full/low speed and the USB ports are completely independent of each other.

The MIDI Sniffer can only supply up to 300 mA to a MIDI device in standalone mode. There is a setting to power the DEVICE through the HOST port which can supply up to 1A assuming the HOST port can supply that current.

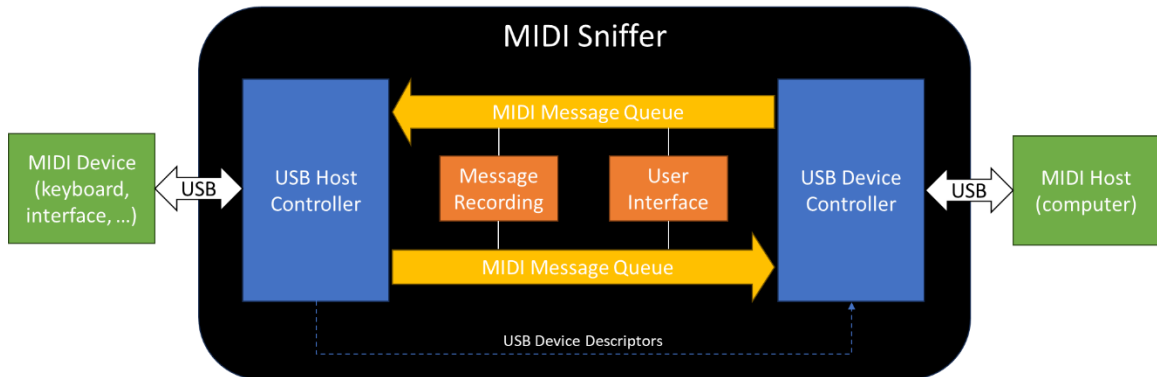
The MIDI Sniffer cannot simulate a MIDI device to a USB host without a MIDI device connected to the device port.

CONNECTIONS

The MIDI Sniffer cable connections are at the top of the instrument. There are two USB ports labeled DEVICE and HOST. The DEVICE port (USB Type A) should connect to a MIDI device and the HOST port (USB Type B) should connect to a computer or MIDI host controller.



DATA FLOW



The MIDI Sniffer data flow backbone is made up of MIDI message queues. The MIDI Sniffer treats moving data in and out of the queues the topmost priority. The Message Recording module is secondary, followed by the User Interface module.

Message Recording and User Interface modules simply tap into the data streams to gather/present data.

NAVIGATION

KEYPAD

The MIDI Sniffer keypad was designed with simplicity in mind. The self-describing keys allow for intuitive navigation. Use Table 1 below to visually link key images to their names for future reference while using this manual.









Key	Name	Description
	Backlight	Toggle the backlight on or off. Note, the backlight is turned to its lowest setting when "off".
	Power	Turn instrument on or off. When powering on, hold the power button until "The MIDI Sniffer" text appears on the display, at that time, release the button.
	Run/Stop	Record a MIDI stream or send MIDI events.
	Enter	Navigation, saving, or editing data.
	Left	Navigation left.
	Right	Navigation right.
	Up	Navigation up.
	Down	Navigation down.

Table 1

SCREENS

TITLE BAR

The blue title bar exists in every screen. It will display a title, describe a feature, show navigation and state. Below are examples of some different title bars.



MIDI 1.0 device connected



MIDI 1.0 device and host connected



MIDI 2.0 device connected, recording data



USB drive connected

MAIN MENU

The main menu screen will appear at power up.

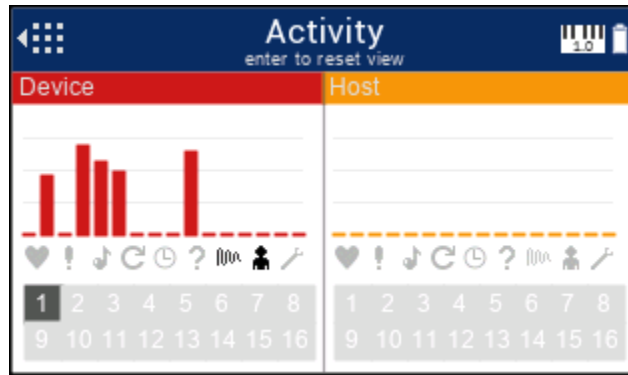
Use the arrow keys on the keypad to change the selection. Note a short description appear under “The MIDI Sniffer” title describing that feature. Press the enter key to enter the feature.



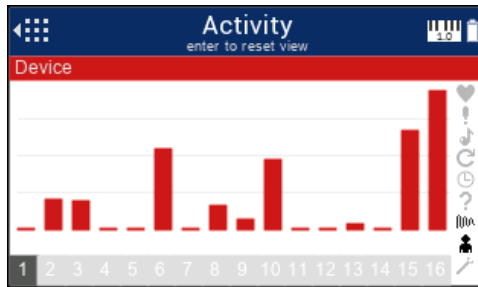
ACTIVITY - BARS

VIEWS

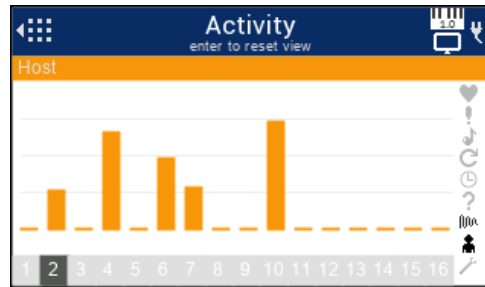
The Activity bars screen shows a graphical representation of the real-time MIDI data stream. Activity can be viewed simultaneously from the device and from the host.



Pressing the right key will change the view to displaying only device data. Pressing the right key again will change the view to only displaying host data. A third right key press will return to the dual display. Press the left key at any of these screens to return to the main menu.



Data streamed from the device on cable 1



Data streamed from the host computer on cable 2

BARS







Each bar represents a channel of data. Channel 1 is the far-left bar, channel 2 is the second bar from the left and so on through channel 16. The top of the bar represents the maximum value depending on the MIDI version and packet type (MIDI 1.0 = 7 bits, MIDI 2.0 = 7 bits, 16 bits or 32 bits). Activity on each bar represents the following MIDI events:

- NOTE ON
- NOTE OFF
- AFTERTOUCH
- CHANNEL PRESSURE

ICONS

Each icon represents a MIDI event. If the MIDI Sniffer encounters one of these events, it will activate the icon and hold it for one second after the event is complete. The following table shows each icon and the MIDI event(s) it represents.

Icon	MIDI Event
♥	SENSE
👤	CONTROLLER
🔧	PROGRAM CHANGE

Icon	MIDI Event
	PITCH WHEEL
	SYSTEM EXCLUSIVE
	QUARTER FRAME MESSAGE CLOCK
	SONG POSITION SONG SELECT TUNE REQUEST START STOP CONTINUE
	RESET
	UNKNOWN

CABLES & GROUPS

The light gray boxes with numbers represent streamed data on cable/group 1-16. When the light gray box turns dark gray, data is present. The indicator will set for one second.

SETTINGS

Note: filtering does not apply to this screen

DECAY RATE: *Settings -> Activity Settings -> Decay Rate*
Used to specify the rate at which the bar values drop back to zero.



ACTIVITY - TABULAR

VIEWS

The Activity tabular screen shows a raw representation of the real-time MIDI data stream. Activity can be viewed simultaneously from the device and from the host.

Data is displayed with the most current record at the top and can be viewed as raw bytes (basic) or the packet broken down into parts (detailed). Fields are separated by the “|” character. Timestamp format is in “seconds.milliseconds”.

Activity	
Device	Host
78.827 19 90 39 00	106.650 0B EF 79 00
78.801 1E E0 00 40	106.650 0B EF 78 00
78.785 19 90 3B 00	106.650 0B EF 7B 00
78.779 19 90 3C 00	106.650 0B EE 79 00
78.776 1E E0 08 3C	106.650 0B ED 79 00
78.743 19 90 40 00	106.650 0B EC 79 00
78.742 19 90 3E 00	106.650 0B EC 78 00
78.726 19 90 39 7A	106.650 0B EC 7B 00
78.703 1E E0 00 40	106.649 0B EB 79 00
78.702 1B B0 01 00	106.649 0B EA 79 00

Activity	
Device	Host
266.954 19 90 2E 00	282.648 0B EF 79 00
MIDI:NOTE ON CH:00	MIDI:CONTROLLER CH:0F
266.950 19 90 27 00	282.648 0B EE 79 00
MIDI:NOTE ON CH:00	MIDI:CONTROLLER CH:0E
266.949 19 90 29 00	282.648 0B ED 79 00
MIDI:NOTE ON CH:00	MIDI:CONTROLLER CH:0D
266.861 19 90 2E 72	282.648 0B EC 79 00
MIDI:NOTE ON CH:00	MIDI:CONTROLLER CH:0C
266.852 19 90 29 77	282.648 0B EB 79 00
MIDI:NOTE ON CH:00	MIDI:CONTROLLER CH:0B

MIDI 1.0 basic view (one record per line)

Device	Host
974.489 00 29 90 40 00 ..	974.490 00 29 90 40 00 ..
974.407 00 29 90 40 00 ..	974.408 00 29 90 40 00 ..
974.308 00 29 90 40 00 ..	974.310 00 29 90 40 00 ..
974.201 00 28 90 40 00 ..	974.202 00 28 90 40 00 ..
974.233 00 28 90 40 00 ..	974.233 00 28 90 40 00 ..
974.213 00 29 90 40 00 ..	974.213 00 29 90 40 00 ..
973.035 00 01 B0 40 B8 ..	973.036 00 01 B0 40 B8 ..
973.010 00 01 B0 40 F8 ..	973.012 00 01 B0 40 F8 ..
972.761 00 00 E0 40 00 ..	972.763 00 00 E0 40 00 ..
972.736 00 00 E0 40 B8 ..	972.737 00 00 E0 40 B8 ..

MIDI 2.0 basic view (one record per line)

MIDI 1.0 detailed view (one record spans 2 lines)

Device	Host
158.409 00 64 90 40 00 ..	150.532 03 FF 10 F0 00 ..
UMP:2.0 VOICE GRP:00	UMP:STRM 128 GRP:00
NOTE:64 VEL:0000 TYPE:0..	FUNC BLOCK:03 FILTER:FF
158.266 00 64 90 40 00 ..	150.529 01 01 00 F0 1F ..
UMP:2.0 VOICE GRP:00	UMP:STRM 128 GRP:00
NOTE:64 VEL:DF80 TYPE:0..	UMP MIN:01 UMP MAJ:01 F..
158.256 00 64 90 40 00 ..	146.065 03 FF 10 F0 00 ..
UMP:2.0 VOICE GRP:00	UMP:STRM 128 GRP:00
NOTE:64 VEL:0000 TYPE:0..	FUNC BLOCK:03 FILTER:FF

MIDI 2.0 detailed view (one record spans 3 lines)

Pressing the right key will change the view to displaying only device data. Pressing the right key again will change the view to only displaying host data. A third right key press will return to the dual display. Press the left key at any of these screens to return to the main menu.

Device
68.822 0E E0 00 40 CIN:PTCH END CBL:00
68.808 0B B0 01 00 CIN:CTL CHNG CBL:00
68.808 0B B0 01 00 CIN:CTL CHNG CBL:00
68.801 0E E0 35 22 CIN:PTCH END CBL:00
68.789 08 89 24 00 CIN:NOTE OFF CBL:00
68.782 0E E0 00 40 CIN:PTCH END CBL:00
68.772 08 80 41 00 CIN:NOTE OFF CBL:00
68.759 0B B0 01 7F CIN:CTL CHNG CBL:00
68.749 08 80 42 00 CIN:NOTE OFF CBL:00
68.738 0B B0 01 7D CIN:CTL CHNG CBL:00

MIDI 1.0 device basic view expanded

Host
668.485 08 80 5F 00 CIN:NOTE OFF CBL:00
668.359 09 90 5F 7F CIN:NOTE ON CBL:00
668.043 08 80 52 00 CIN:NOTE OFF CBL:00
667.989 09 90 52 7F CIN:NOTE ON CBL:00
667.807 08 80 49 00 CIN:NOTE OFF CBL:00
667.720 09 90 49 7F CIN:NOTE ON CBL:00
667.206 08 80 3B 00 CIN:NOTE OFF CBL:00
667.200 09 90 3B 7F CIN:NOTE ON CBL:00
667.027 08 80 33 00 CIN:NOTE OFF CBL:00
666.925 09 90 33 7F CIN:NOTE ON CBL:00

MIDI 1.0 host basic view expanded

Device
877.937 08 80 36 00 CIN:NOTE OFF CBL:00
MIDI:NOTE OFF CH:00 NOTE:36 VEL:00
877.901 09 90 36 30 CIN:NOTE ON CBL:00
MIDI:NOTE ON CH:00 NOTE:36 VEL:30
877.884 08 80 36 00 CIN:NOTE OFF CBL:00
MIDI:NOTE OFF CH:00 NOTE:36 VEL:00
877.866 09 90 36 7F CIN:NOTE ON CBL:00
MIDI:NOTE ON CH:00 NOTE:36 VEL:7F
877.866 08 80 38 00 CIN:NOTE OFF CBL:00
MIDI:NOTE OFF CH:00 NOTE:38 VEL:00

MIDI 1.0 device detailed view expanded

Host
921.159 08 80 55 00 CIN:NOTE OFF CBL:00
MIDI:NOTE OFF CH:00 NOTE:55 VEL:00
921.046 09 90 55 7F CIN:NOTE ON CBL:00
MIDI:NOTE ON CH:00 NOTE:55 VEL:7F
920.328 08 80 48 00 CIN:NOTE OFF CBL:00
MIDI:NOTE OFF CH:00 NOTE:48 VEL:00
920.241 09 90 48 7F CIN:NOTE ON CBL:00
MIDI:NOTE ON CH:00 NOTE:48 VEL:7F
920.005 08 80 34 00 CIN:NOTE OFF CBL:00
MIDI:NOTE OFF CH:00 NOTE:34 VEL:00

MIDI 1.0 host detailed view expanded

PACKET BREAKDOWN

CIN

MIDI Version(s): 1.0

Code Index Number and corresponding MIDI Sniffer text.

CIN	Classification	MIDI Sniffer Text
0x0	Miscellaneous function codes. Reserved for future extensions.	MISC
0x1	Cable events. Reserved for future expansion.	CABLE

0x2	Two-byte System Common messages like MTC, SongSelect, etc.	2 COMN
0x3	Three-byte System Common messages like SPP, etc.	3 COMN
0x4	SysEx starts or continues	SYSEX
0x5	Single-byte System Common Message or SysEx ends with following single byte.	1/SYSX-1
0x6	SysEx ends with following two bytes.	SYSEX-2
0x7	SysEx ends with following three bytes.	SYSEX-3
0x8	Note-off	NOTE OFF
0x9	Note-on	NOTE ON
0xA	Poly-KeyPress	KEY PRSS
0xB	Control Change	CTL CHNG
0xC	Program Change	PRG CHNG
0xD	Channel Pressure	CHN PRSS
0xE	PitchBend Change	PTCH BND
0xF	Single Byte	SINGLE

CBL

MIDI Version(s): 1.0

Cable (1-16)

GRP

MIDI Version(s): 2.0

Group (1-16)

UMP

MIDI Version(s): 2.0

Universal MIDI Packet and corresponding MIDI Sniffer text.

UMP	Classification	MIDI Sniffer Text
0x0	Utility Messages	UTILITY
0x1	System Real Time and System Common Messages (except System Exclusive)	SYSTEM
0x2	MIDI 1.0 Channel Voice Messages	1.0 VOICE
0x3	Data Messages (including System Exclusive)	DATA 64
0x4	MIDI 2.0 Channel Voice Messages	2.0 VOICE
0x5	Data Messages	DATA 128
0x6	Reserved for future definition by MMA/AMEI	UNKNOWN
0x7	Reserved for future definition by MMA/AMEI	UNKNOWN
0x8	Reserved for future definition by MMA/AMEI	UNKNOWN
0x9	Reserved for future definition by MMA/AMEI	UNKNOWN
0xA	Reserved for future definition by MMA/AMEI	UNKNOWN
0xB	Reserved for future definition by MMA/AMEI	UNKNOWN

0xC	Reserved for future definition by MMA/AMEI	UNKNOWN
0xD	Flex Data Messages	FLEX 128
0xE	Reserved for future definition by MMA/AMEI	UNKNOWN
0xF	UMP Stream Messages	STRM 128

MIDI

MIDI Version(s): 1.0, 2.0

MIDI Message and corresponding MIDI Sniffer text.

MIDI Code	MIDI Sniffer Text
0x8X	NOTE OFF
0x9X	NOTE ON
0xAx	AFTERTOUCH
0xBx	CONTROLLER
0xCx	PROGRAM CHANGE
0xDx	CHANNEL PRESSURE
0xEx	PITCH WHEEL
0xF0	SYSEX START
0xF1	QUARTER FRAME
0xF2	SONG POSITION
0xF3	SONG SELECT
0xF6	TUNE REQUEST
0xF7	SYSEX END
0xF8	CLOCK
0xFA	START
0xFB	CONTINUE
0xFC	STOP
0xFE	SENSE
0xFF	RESET
?	UNKNOWN

PAUSING

As MIDI records can stream quickly, it is easy to miss them. When needed, it is possible to pause the data stream so the records can be reviewed. To do this, press the enter key and use the up and down keys to scroll through the data. Press the enter key to resume capture.

CLEARING

To clear the buffer, press and hold the enter key for 3 seconds, release when the screen has cleared.

FILTERING

The MIDI Sniffer allows filtering of MIDI messages. See the settings section below to configure. These filters are available (single or combined):

1. Cable (Group for MIDI 2.0)
 - a. Disabled – Cable filter disabled
 - b. Include – View messages only on specified cable
 - c. Exclude – View messages on all cables except specified
2. CIN (MIDI 1.0 only)
 - a. Disabled – CIN filter disabled
 - b. Include – View messages only with specified CIN code
 - c. Exclude – View messages with all CIN codes except specified
3. MIDI Event
 - a. Disabled – MIDI event filter disabled
 - b. Include – View messages only with specified MIDI event
 - c. Exclude – View messages with all MIDI events except specified
4. UMP (MIDI 2.0 only)
 - a. Disabled – UMP filter disabled
 - b. Include – View messages only with specified UMP
 - c. Exclude – View messages with all UMP except specified

NOTES

1. The screen buffer is local only to this tabular view so will only update when on this screen
2. The screen buffer is 400 MIDI 1.0 or 160 MIDI 2.0 messages deep
3. The screen buffer will not be updated during a pause (will not collect data)
4. Pausing does not affect normal recording

SETTINGS

CABLE FILTER ENABLED:	<i>Settings -> Activity Settings -> Cable Filter Enabled</i> Options: Disabled, Include, Exclude
CABLE FILTER:	<i>Settings -> Activity Settings -> Cable Filter</i> Options: 1-16
CIN FILTER ENABLED:	<i>Settings -> Activity Settings -> CIN Filter Enabled</i> Options: Disabled, Include, Exclude
CIN FILTER:	<i>Settings -> Activity Settings -> CIN Filter</i> Options: See CIN table
MIDI FILTER ENABLED:	<i>Settings -> Activity Settings -> MIDI Filter Enabled</i> Options: Disabled, Include, Exclude
MIDI FILTER:	<i>Settings -> Activity Settings -> MIDI Filter</i> Options: See MIDI table
TABULAR VIEW:	<i>Settings -> Activity Settings -> Tabular View</i> Options: Basic, Detailed
UMP FILTER ENABLED:	<i>Settings -> Activity Settings -> UMP Filter Enabled</i> Options: Disabled, Include, Exclude

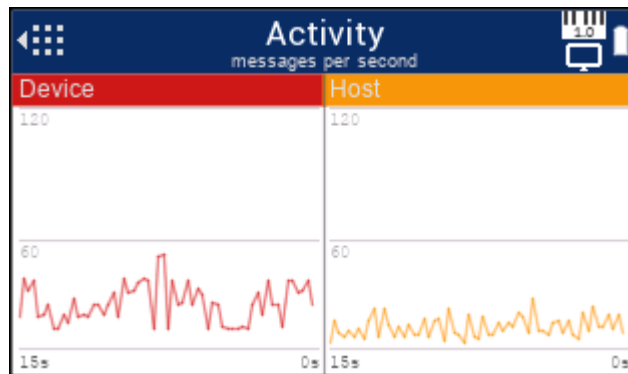
UMP FILTER: *Settings -> Activity Settings -> UMP Filter*
Options: See UMP table



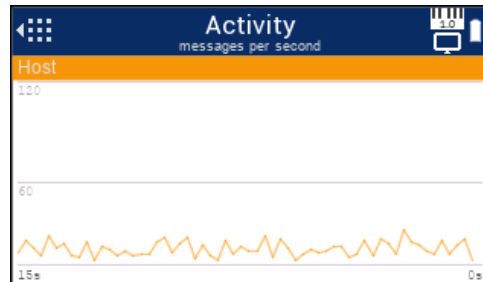
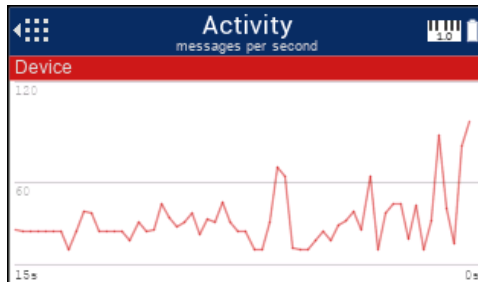
ACTIVITY - BANDWIDTH

VIEWS

The Activity bandwidth screen shows a historical, graphical representation of the real-time MIDI data stream in messages per second (one MIDI 1.0 message is a 4-byte packet, one MIDI 2.0 message is a 4, 8, 12, or 16 byte UMP packet). Activity can be viewed simultaneously from the device and from the host.



Pressing the right key will change the view to displaying only device data. Pressing the right key again will change the view to only displaying host data. A third right key press will return to the dual display. Press the left key at any of these screens to return to the main menu.



NOTES

1. The screen buffer is local only to this history view so will only update when on this screen.
2. The screen buffer contains only 15 seconds worth of message statistics.
3. The screen will automatically scale depending on the message rate.

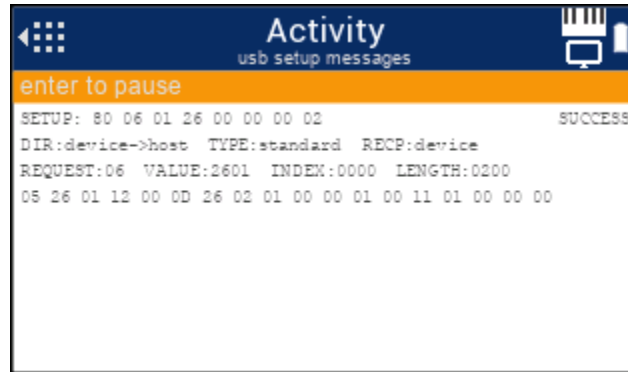


ACTIVITY - SETUP

VIEWS

The Activity setup screen shows raw USB setup packets sent from the host to the device when in passthrough mode. The screen will show the raw 8-byte packet, a breakdown of the packet contents and raw payload bytes for either direction (host->device or device->host).

SUCCESS or FAILURE will appear in the upper right depending if the device replied to the request.



PAUSING

As USB setup packets can stream quickly, it is easy to miss them. When needed, it is possible to pause the data stream so the records can be reviewed. To do this, press the enter key and use the up and down keys to scroll through the data one packet at a time. Press the enter key to resume capture.

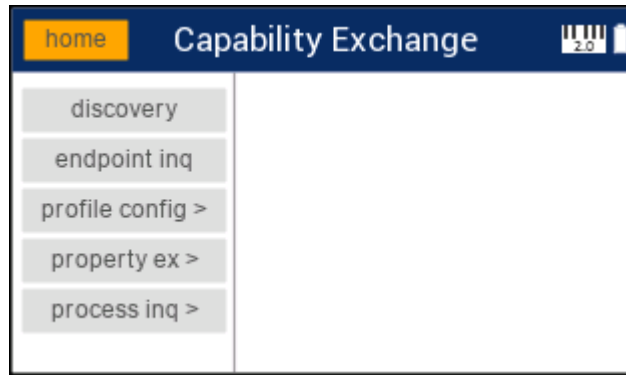
NOTES

1. The screen buffer is 100 USB setup messages deep
2. The screen buffer will not be updated during a pause
3. Pausing does not affect normal recording
4. The max USB setup packet size is 128 bytes

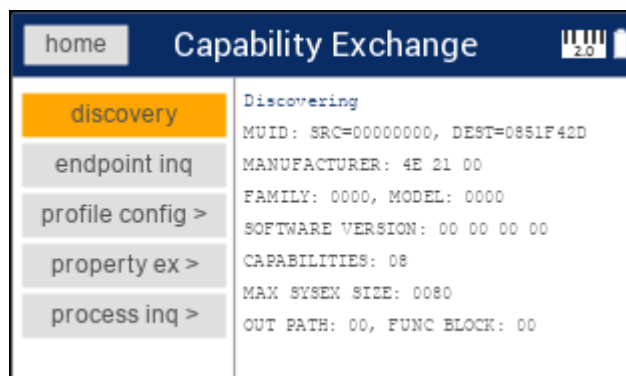


CI – COMPATIBILITY INQUIRY

The CI (compatibility inquiry) screen is only compatible with a MIDI 2.0 device. **It is in beta form until further development and testing has been done.** The CI screen allows for simple device inquiries for testing purposes. This view will not show CI activity between a host and device, it is designed to be the master only.



Feature access is on the left and results will appear on the right. Consult the latest MIDI 2.0 CI specification for details on CI.



Example of CI discovery result

NAVIGATION

The screen will be blank if a MIDI 2.0 device is not connected.

To exit this screen, use the up and down keys to highlight the “home” button, then press the enter key.

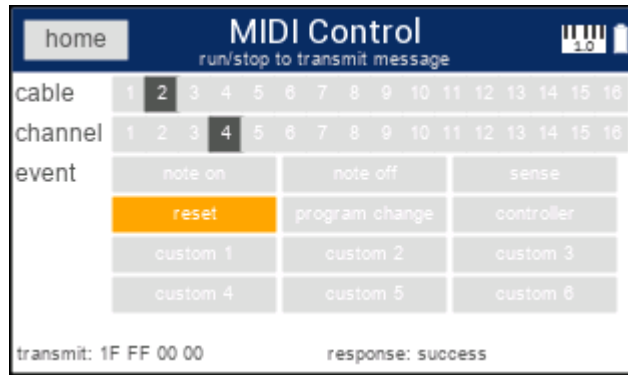
To select a feature, use the up and down keys to highlight the feature, then press the enter key. On screen buttons that have a “>”, indicate there is a submenu that can be accessed. To leave a submenu, highlight the “< back” button, then press enter.



CONTROL

The MIDI Sniffer control screen is a simple “quick pick” list of basic MIDI messages that can be sent to a MIDI device for test purposes. User can choose the cable (or group), channel and a built-in event or custom 4-byte message.

The screen will remain blank until a USB MIDI 1.0 or USB MIDI 2.0 device is connected.



Example MIDI reset message sent on cable 2

Transmit the selected message simply by pressing the run-stop button.

Event values can be customized in settings, see the settings section below.

MIDI 2.0 event messages (except custom) are packaged into UMP system and 1.0 channel voice messages.

NAVIGATION

Using the arrow keys, navigate to any gray box and press the enter key to select (just highlighting the box does not select it, you must press enter).

To exit this screen, use the arrow keys to highlight the “home” button, then press the enter key.

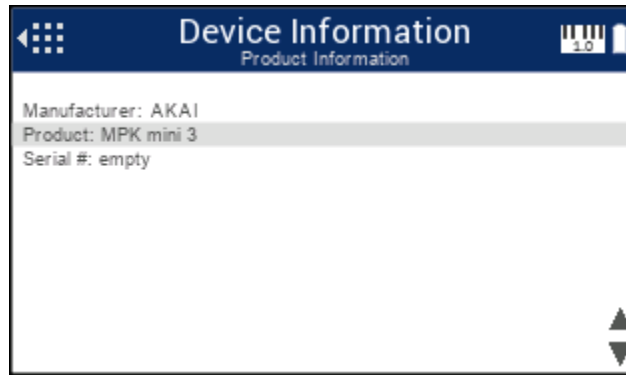
SETTINGS

- NOTE ON: *Settings -> Control Settings -> Note On*
Options: byte 1 (0-127), byte 2 (0-127)
- NOTE OFF: *Settings -> Control Settings -> Note Off*
Options: byte 1 (0-127), byte 2 (0-127)
- PROGRAM CHANGE: *Settings -> Control Settings -> Program Change*
Options: byte 1 (0-127)
- CONTROLLER: *Settings -> Control Settings -> Controller*
Options: byte 1 (0-127), byte 2 (0-127)
- CUSTOM X (1-6): *Settings -> Control Settings -> Custom X*
Options: byte 1 (0-255), byte 2 (0-255), byte 3 (0-255), byte 4 (0-255)



DEVICE

The MIDI Sniffer device screen is an informational view of any connected USB device.



Sample product information

The screen will be blank if a USB device is not connected.

Below is the sequence of screens that can be navigated to with the up and down keys depending on the device connected.

MIDI 1.0	MIDI 2.0	Other
Product Information	Product Information	Product Information
Device Descriptor	Device Descriptor	Device Descriptor
Raw Device Descriptor	Raw Device Descriptor	Raw Device Descriptor
Configuration Summary <i>Enter for more information</i>	Configuration Summary <i>Enter for more information</i>	Configuration Summary <i>Enter for more information</i>
Raw Configuration <i>Enter for more information</i>	Raw Configuration <i>Enter for more information</i>	Raw Configuration <i>Enter for more information</i>
Audio Control Header	Audio Control Header	
MIDI Stream Header	MIDI Stream Header	
MIDI In Jack(s) <i>Enter for more information</i>	Terminal Block(s) <i>Enter for more information</i>	
MIDI Out Jack(s) <i>Enter for more information</i>	Endpoint Info	
	Device Identity	
	Endpoint Name	
	Product Instance ID	
	Function Block(s) <i>Enter for more information</i>	

NAVIGATION

Press the up or down arrow keys to navigate to other information screens.

Press the left key return to the main menu.

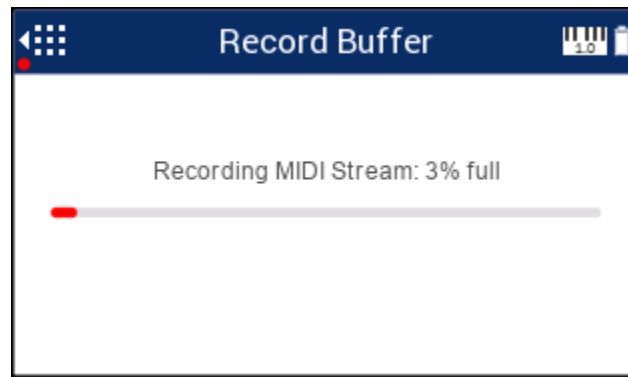
Where there is more information available to view, a prompt will appear on the screen to press enter to cycle through that information.



RECORD

The MIDI Sniffer record screen is a view into a recorded MIDI stream. It is only possible to view recorded data while in the stopped state (not currently recording).

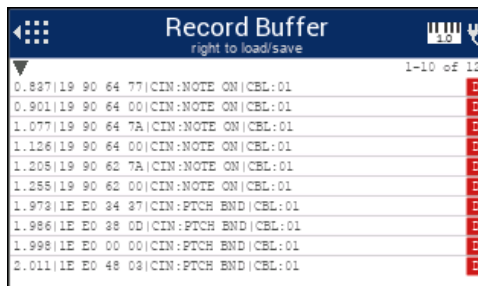
To record a MIDI stream, press the play-stop key from the main menu or activity screens. A small red circle will appear on the left side of the title bar indicating it is recording. It is possible to navigate to activity screens while recording.



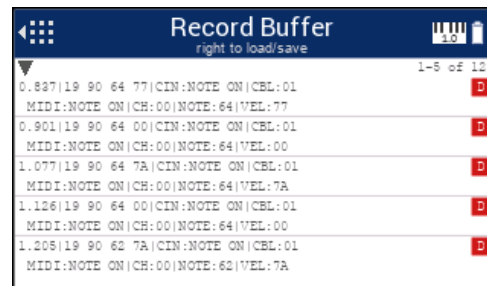
Recording progress

After recording, MIDI data is displayed in tabular format depending on the type of view selected, basic or detailed. MIDI device records show a square red “D” to the right of the record, MIDI host records show a square orange “H” to the right of the record.

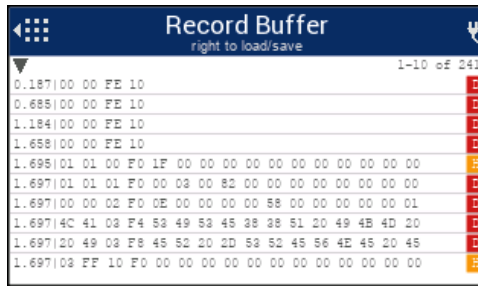
Use the up and down arrow keys to scroll through the data. Pressing and holding the up or down arrow keys will cause faster scrolling.



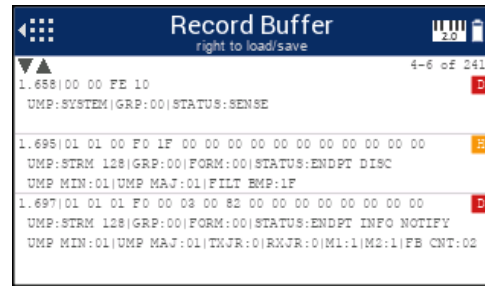
MIDI 1.0 basic view (one record per line)



MIDI 1.0 detailed view (one record spans 2 lines)



MIDI 2.0 basic view (one record per line)

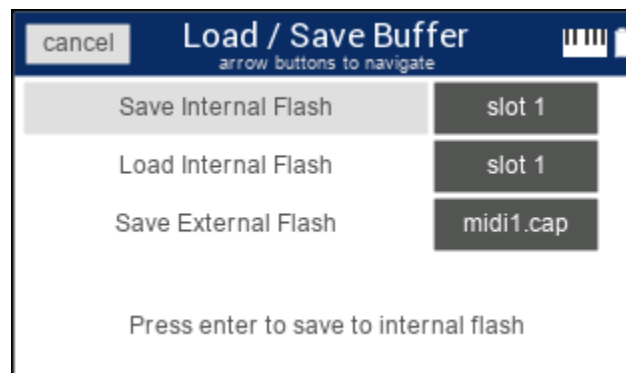


MIDI 2.0 detailed view (one record spans 3 lines)

SAVE DATA INTERNAL

To save recorded data to internal flash:

1. Press the right arrow key to view the “Load / Save Buffer” screen.
2. Use the up and down arrow keys to navigate to the “Save Internal Flash” selection.
3. Choose the slot (1-4) by pressing the right arrow key to highlight “slot x” then press the up or down arrow keys to assign the slot. Note the bottom of the screen shows if data already exists in the selected slot. If data exists in the selected slot, it will be overwritten.
4. Press the left arrow key to return to “Save Internal Flash”.
5. Press the enter key to save.

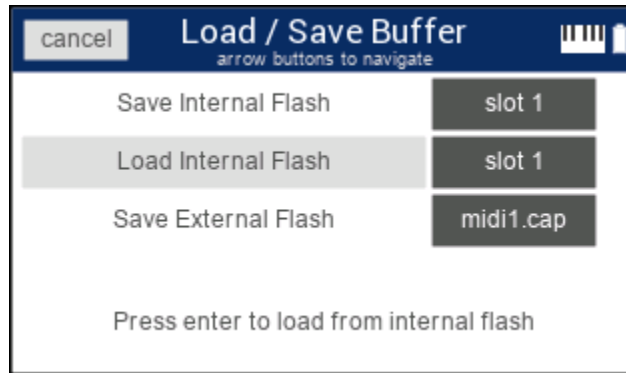


Save to internal flash selected waiting for user to press enter

LOAD DATA INTERNAL

To load previously recorded data from internal flash:

1. Press the right arrow key to view the “Load / Save Buffer” screen.
2. Use the up and down arrow keys to navigate to the “Load Internal Flash” selection.
3. Choose the slot (1-4) by pressing the right arrow key to highlight “slot x” then press the up or down arrow keys to assign the slot. Note the bottom of the screen shows if data exists in the selected slot.
4. Press the left arrow key to return to “Load Internal Flash”.
5. Press the enter key to load.

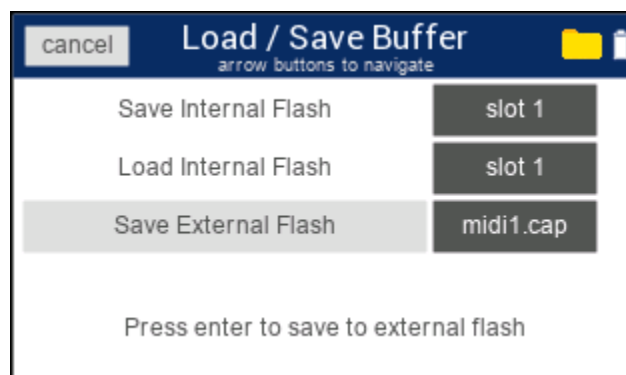


Load from internal flash selected waiting for user to press enter

SAVE DATA EXTERNAL

To save recorded data to a USB flash drive:

1. Press the right arrow key to view the "Load / Save Buffer" screen.
2. Use the up and down arrow keys to navigate to the "Save External Flash" selection.
3. Choose the slot (1-4) by pressing the right arrow key to highlight "midix.cap" then press the up or down arrow keys to assign the slot.
4. Press the left arrow key to return to "Save External Flash".
5. Press the enter key to save. User will be notified when the save is completed.
 - a. Note: without a USB drive inserted, pressing enter will do nothing.
 - b. Note: choose the export format type in *Record Settings* -> *Export Format*. Options are CSV, PCAP and Custom.
 - c. Note: depending on the amount of data recorded, it may take up to a minute to write to the USB drive.



Save to external flash selected waiting for user to press enter

SETTINGS

- CABLE FILTER ENABLED: *Settings* -> *Record Settings* -> *Cable Filter Enabled*
Options: Disabled, Include, Exclude
- CABLE FILTER: *Settings* -> *Record Settings* -> *Cable Filter*
Options: 1-16

CIN FILTER ENABLED: *Settings -> Record Settings -> CIN Filter Enabled*
Options: Disabled, Include, Exclude

CIN FILTER: *Settings -> Record Settings -> CIN Filter*
Options: See CIN table

MIDI FILTER ENABLED: *Settings -> Record Settings -> MIDI Filter Enabled*
Options: Disabled, Include, Exclude

MIDI FILTER: *Settings -> Record Settings -> MIDI Filter*
Options: See MIDI table

EXPORT FORMAT: *Settings -> Record Settings -> Export Format*
Options: CSV, PCAP, CUSTOM

VIEW: *Settings -> Record Settings -> Tabular View*
Options: Basic, Detailed

UMP FILTER ENABLED: *Settings -> Record Settings -> UMP Filter Enabled*
Options: Disabled, Include, Exclude

UMP FILTER: *Settings -> Record Settings -> UMP Filter*
Options: See UMP table

EXPORT FILE FORMATS

CSV

One record per line with format: source,milliseconds,byte 1,...,byte N

Source = device or host

Milliseconds = starting at zero from when record was started

Bytes = 4 – 16 bytes depending on MIDI version and packet type

PCAP

See Wireshark documentation: <https://wiki.wireshark.org/Development/LibpcapFileFormat>

CUSTOM

Single file header followed by multiple file records. Data packed little endian.

File Header

Item	Length (bytes)	Notes
File Version	4	Current version = 0x00000001
MIDI Version	4	MIDI 1.0 = 0x00010000 MIDI 2.0 = 0x00020000
Record Count	4	Total MIDI messages in file
Reserved	16	Reserved for future

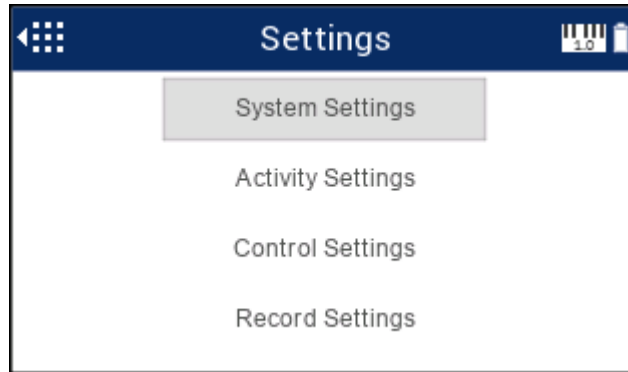
File Record

Item	Length (bytes)	Notes
Milliseconds	4	Timestamp in milliseconds
Flags	4	Device record = 0x00000001 Host record = 0x00000000
Record Length	4	MIDI 1.0 = 4 MIDI 2.0 = 4, 8, 12, 16



SETTINGS

The MIDI Sniffer settings screen is the central location for accessing all settings. Settings are grouped by feature.

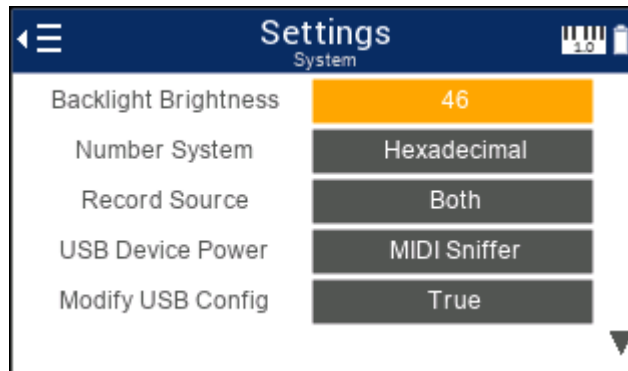


Settings main screen with system settings group highlighted

NAVIGATION

Press the up or down arrow keys to highlight a group then press the enter key to select.

To edit a setting inside a group, use the up or down arrow keys to highlight a selection then press the right arrow key to highlight the setting. Use the up or down arrow keys to change the value. Press the left arrow key to return to the setting highlight. Press the left key to return to the settings main menu.



Settings system screen with backlight brightness value highlighted

SETTINGS TABLE

The settings table shows possible settings and value ranges. Details of each setting can be found in related chapters in this manual.

Group	Settings	Values
-------	----------	--------

System Settings	Backlight Brightness	10-100
	Number System	Decimal Hexadecimal
	Record Source	Device Host Both
	USB Device Power	Off MIDI Sniffer Host
	Modify USB Config	True False
	USB Host Msg Limit	0-63
	USB Device Msg Limit	0-63
	Modify USB Dev Desc	True False
	MIDI Version Pref	MIDI 1.0 MIDI 2.0
	Player Cable/Group	0-15
	Factory Reset	True False
	Log Level	Error Warning Info Verbose
	Activity Settings	Cable Filter Enabled
Cable Filter		Cable 0 – Cable 15
CIN Filter Enabled		Disabled Include Exclude
CIN Filter		MISC CABLE 2 COMN 3 COMN SYSEX 1/SYSX-1 SYSEX-2 SYSEX-3 NOTE OFF NOTE ON KEY PRSS CTL CHNG

		PRG CHNG CHN PRSS PTCH BND SINGLE
	MIDI Filter Enabled	Disabled Include Exclude
	MIDI Filter	NOTE OFF NOTE ON AFTERTOUCH CONTROLLER PROGRAM CHANGE CHANNEL PRESSURE PITCH WHEEL SYSEX START QUARTER FRAME SONG POSITION SONG SELECT TUNE REQUEST SYSEX END CLOCK START CONTINUE STOP SENSE RESET
	Decay Rate	Slow Medium Fast
	Tabular View	Basic Detailed
	UMP Filter Enabled	Disabled Include Exclude
	UMP Filter	Utility Stream Flex Data 128 2.0 Voice Data 64 1.0 Voice System
Control Settings	Note On	Note (0-127) Velocity (0-127)

	Note Off	Note (0-127) Velocity (0-127)
	Program Change	Program (0-127)
	Controller	Controller (0-127) Value (0-127)
	Custom X (1-6)	Byte 1 (0-255) Byte 2 (0-255) Byte 3 (0-255) Byte 4 (0-255)
Record Settings	Cable Filter Enabled	Disabled Include Exclude
	Cable Filter	Cable 0 – Cable 15
	CIN Filter Enabled	Disabled Include Exclude
	CIN Filter	MISC CABLE 2 COMN 3 COMN SYSEX 1/SYSX-1 SYSEX-2 SYSEX-3 NOTE OFF NOTE ON KEY PRSS CTL CHNG PRG CHNG CHN PRSS PTCH BND SINGLE
	MIDI Filter Enabled	Disabled Include Exclude
	MIDI Filter	NOTE OFF NOTE ON AFTERTOUC CONTROLLER PROGRAM CHANGE CHANNEL PRESSURE PITCH WHEEL SYSEX START QUARTER FRAME

		SONG POSITION SONG SELECT TUNE REQUEST SYSEX END CLOCK START CONTINUE STOP SENSE RESET
	Export Format	CSV PCAP
	View	Basic Detailed
	UMP Filter Enabled	Disabled Include Exclude
	UMP Filter	Utility Stream Flex Data 128 2.0 Voice Data 64 2.0 Voice System



PLAYER

The MIDI Sniffer offers a MIDI file player to send test streams to MIDI devices. It is limited to format 0 (zero) MIDI files only and currently only supports importing one file.

Note: Playback timing is not guaranteed. Use the player only to test a known stream of MIDI messages.

Note: The cable (MIDI 1.0) or group (MIDI 2.0) that is streamed can be changed in settings.



MIDI player main screen

IMPORTING

As the MIDI Sniffer can only have a single device connected at a time, importing a MIDI file to its own flash is required first. It will retain the file through power cycles.

To import:

1. Use the up and down arrow keys to highlight “import”.
2. Insert a USB drive and press the right arrow key until the desired MIDI file is found. Note that all files use DOS 8.3 format.
3. Press the enter key to import.
 - a. If the file is not format 0, an error will be displayed.
 - b. If a MIDI file is already imported, it will be overwritten.



MIDI player import file example

PLAYBACK

After importing a format 0 MIDI file, it can now be played. By default, the playback is sent out cable/group 0 (zero), see settings below to change.

To play:

1. Use the up and down arrow keys to highlight “play”.
2. To control the playback:
 - a. Press the play/stop button to start/stop playback.

- b. Press the enter button to pause/resume playback.
- c. Press the right button to speed up the playback. Note the tempo change on the display (range - 20 to 20).
- d. Press the left button to slow down the playback. Note the tempo change on the display (range - 20 to 20).



MIDI player play in stopped state



MIDI player play in play state

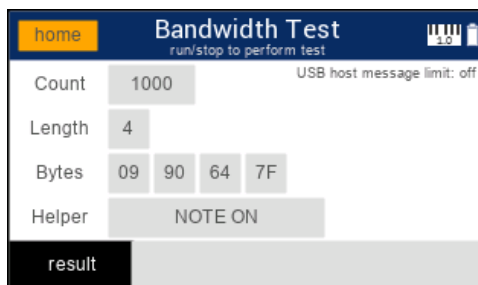
SETTINGS

PLAYER CABLE/GROUP: *Settings -> System Settings -> Player Cable/Group*
Options: 0-15

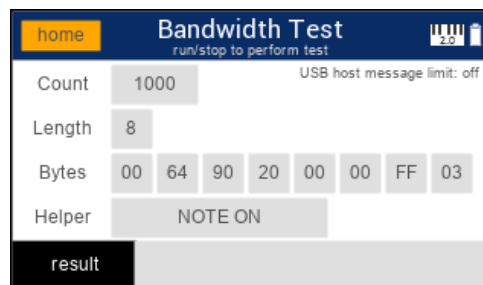


ABILITY

The MIDI Sniffer offers a bandwidth test feature called “Ability”. Here the MIDI Sniffer will send MIDI 1.0 (4 bytes) or MIDI 2.0 (4 bytes or 8 bytes) messages as fast as it can to the connected device and provide a bandwidth result when complete. This is a useful tool for calculating bandwidth and testing buffer overflow conditions on the connected MIDI device.



Ability test with 4 bytes



Ability test with 8 bytes

Count value can be adjusted from 10-100000 in grouped steps.

Length value is fixed at 4 for MIDI 1.0 devices and can be set to 4 or 8 for MIDI 2.0 devices.

Bytes can be adjusted individually from 0-255. The ordering from left to right is: BYTE 0, BYTE 1, BYTE 2, BYTE 3, BYTE 4, BYTE 5, BYTE 6, BYTE 7. **Be aware, it is possible to create invalid MIDI messages.**

The Helper feature assists as a starting point for creating a valid message to test with. Depending on the connected device (MIDI 1.0 or MIDI 2.0), the message Bytes will be populated as the table below. After selecting a message type, it possible to return to the Bytes and modify as needed. Use the Helper as a starting point to build messages.

MIDI Version	Helper Message	Length	Default Bytes (hex)
1.0	NOTE ON	4	09 90 64 7F
1.0	NOTE OFF	4	08 80 00 00
1.0	PROGRAM CHANGE	4	0C C0 00 00
1.0	CONTROLLER	4	0B B0 07 0F
2.0	NOTE ON	4	7F 64 90 20
2.0	NOTE OFF	4	00 64 80 20
2.0	PROGRAM CHANGE	4	00 00 C0 20
2.0	CONTROLLER	4	0F 07 B0 20
2.0	NOTE ON	8	00 64 90 40 00 00 FF 03
2.0	NOTE OFF	8	00 64 80 40 00 00 00 00
2.0	PROGRAM CHANGE	8	00 00 C0 40 00 00 00 00
2.0	CONTROLLER	8	00 0F B0 40 00 00 00 00

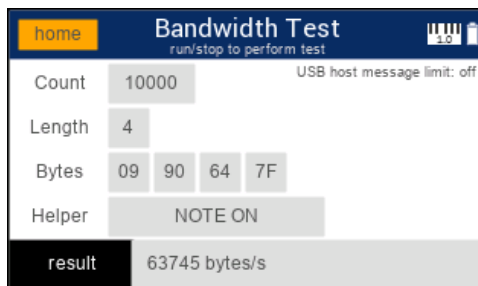
NAVIGATION

Press the up or down arrow keys to highlight an item then press the right arrow key to highlight the setting. Use the up or down arrow keys to change the value. Press the left arrow key to return to the item highlight.

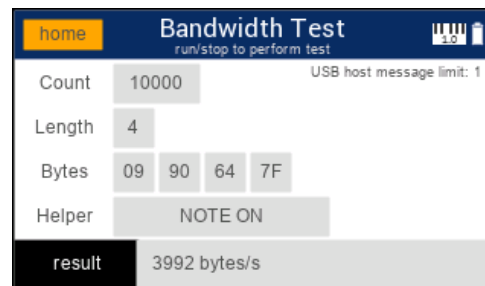
To exit, press the up arrow repeatedly until “home” is selected, then press the enter key.

TESTING

Press the run/stop key to start the test. To cancel a running test, press the run/stop key again. The calculated bandwidth will appear in the gray bar at the bottom of the screen. Higher count values will result in more accurate results.



Ability test result with no USB packet size limiting



Ability test with single MIDI message USB packet limiting

See *USB Host & Device Message Limiting* for adjusting the message limiting.

Note: Count, Length and Bytes will persist between power cycles of the MIDI Sniffer.



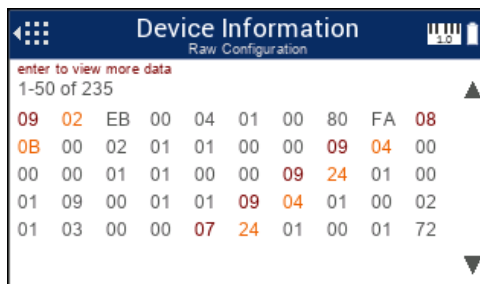
ABOUT

The MIDI Sniffer about screen shows a simple product overview, version, and option to update the firmware.

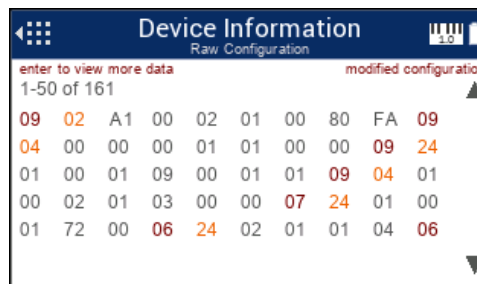
ADVANCED

USB CONFIGURATION

The MIDI Sniffer is designed to “sniff” out MIDI USB traffic only. Some complex USB MIDI devices also expose themselves as a HID and/or streaming audio device (or other interfaces). If the MIDI Sniffer is used as a passthrough for these devices, there may be a chance for failure when the host controller (on the host side) tries to open/access a non-MIDI endpoint. That is because the MIDI Sniffer only emulates MIDI endpoints. To get around this issue, it is possible to have the MIDI Sniffer automatically strip out all interfaces from the USB configuration except MIDI and AUDIO control. View the settings section below to enable this setting.



Example raw configuration from a MIDI device



Example modified configuration from the same MIDI device

It is possible to view the modified configuration by pressing the right key in the “Device” screen. Note, this does not change the setting, it only allows the user to view the modified configuration.

SETTINGS

MODIFY USB CONFIG: *Settings -> System Settings -> Modify USB Config*
Options: True, False

USB HOST & DEVICE MESSAGE LIMITING

Some MIDI products may not be able to handle multiple MIDI messages within the same USB packet. For example, if an endpoint specifies a max packet size of 16 bytes, in theory it should be able to handle four MIDI 1.0 messages within the same packet. Unfortunately, this is not always the case and the MIDI device is limited to X messages per USB packet (or will only process the first message in the packet). By default, the MIDI Sniffer will package up as many available MIDI messages as it can into a USB packet. When that behavior is not desired, the MIDI Sniffer has settings to limit the amount of MIDI messages per USB packet.

MIDI message limiting can be adjusted on the host and device sides. A value of zero, indicates no limit.

NOTE: The host setting can greatly affect the ability (bandwidth) test and limit instrument throughput.

SETTINGS

USB HOST MSG LIMIT: *Settings -> System Settings -> USB Host Msg Limit*
Options: 0-63

USB DEVICE MSG LIMIT: *Settings -> System Settings -> USB Device Msg Limit*
Options: 0-63

USB DEVICE DESCRIPTOR

When used as passthrough (MIDI Sniffer connected to a MIDI device and host simultaneously), the MIDI Sniffer acts transparently from a USB standpoint. This means the MIDI sniffer uses exact copies of the device descriptors and presents them to the host computer.

We found on occasion; some host computers do not complete USB enumeration due to setup packet sizes other than 64 bytes (a hardware limitation on the MIDI Sniffer, not an issue with the host computer). To get around this issue, the MIDI sniffer has a setting to override the MIDI device setup packet size in the default device descriptor to 64 bytes. This does not affect performance in any way, it simply allows the MIDI Sniffer to complete USB enumeration with the host.

SETTINGS

MODIFY USB DEV DESC: *Settings -> System Settings -> Modify USB Dev Desc*
Options: True, False

DEBUG MESSAGES

The MIDI Sniffer performs many operations while it is connected to MIDI equipment and a host. On occasion it may encounter issues. To help identify what went wrong, the MIDI Sniffer places log messages into a message queue that can be viewed. To enter this debug message viewer, go to About, then press the down arrow key. Press the up or down arrow keys to page. Press the left arrow key to leave the debug view.

By default, only errors are logged. To change the type of logging to view, see settings below. The level chosen also includes the levels above. For example, if Info is chosen, that also includes Warning and Error messages.

Error: Critical error(s) encountered that will affect operation

Warning: Non-critical error(s) that *may* affect current operation

Info: Extra information logged

Verbose: Maximum information logged (this may affect performance)

SETTINGS

LOG LEVEL: *Settings -> System Settings -> Log Level*
Options: Error, Warning, Info, Verbose

MIDI VERSION PREFERENCE

When a MIDI 1.0 (alternate interface 0) & MIDI 2.0 (alternate interface 1) device is connected, the MIDI Sniffer can set which device it will select through a USB "set interface" command.

See settings below to modify the value.

SETTINGS

MIDI VERSION PREF: *Settings -> System Settings -> MIDI Version Pref*
Options: MIDI 1.0, MIDI 2.0

POWER

The MIDI Sniffer can be powered from AA alkaline batteries or from a USB host. When plugged into a USB host, the MIDI Sniffer automatically switches to power from the USB host (no power will be drawn from the batteries).

By default, the MIDI Sniffer powers the USB device with its own 5V supply. **The MIDI Sniffer 5V supply can only drive up to 300 mA.** It is possible to change the power source to use the USB host instead which will maybe be able to drive more current (no more than 1A through the MIDI Sniffer). See settings below to change the USB device power source.

SETTINGS

USB DEVICE POWER: *Settings -> System Settings -> USB Device Power*
Options: Off, MIDI Sniffer, Host

FIRMWARE UPDATES

The MIDI Sniffer firmware is updatable and recommended to be kept up to date to have fixes and added features.

To update the firmware:

1. Download the latest firmware update file (ms2_usb.upd) from our website.
2. Copy the update file to root of a USB drive that is formatted as FAT32.
3. Insert the USB drive into the MIDI Sniffer device port, note the folder icon appear in the upper right corner. If the folder icon does not appear, the USB drive may not be formatted as FAT32 or the USB drive is not compatible.
4. From the main menu screen, select "About".
5. In the About screen, press the right arrow key to navigate to the Update screen.
6. Press the enter key to load and validate the file.
7. Press the enter key to copy the file to internal flash memory.
8. Press the power key to turn off the device.
9. Remove the USB drive.
10. Press the power key to turn on the device, the screen should show it is updating.
11. After the update, press the power key to turn off the device.
12. Press the power key to turn on the device.
13. Update is complete, verify the new version in "About".

REFERENCES

<https://midi.org/specs>

<https://wiki.wireshark.org/Development/LibpcapFileFormat>

TROUBLESHOOTING

MIDI DEVICE NOT CONNECTING

If a MIDI device is not connecting (piano icon not appearing on the title bar), check the following:

1. USB Cable fully seated into the MIDI Sniffer and MIDI device
2. Try a different USB cable
3. MIDI device is powered on
4. MIDI device has a setting to enable USB communication
5. Check MIDI device supports MIDI 1.0 or MIDI 2.0
 - a. From the MIDI Sniffer main menu, select "Device"
 - b. If the screen shows "Disconnected...", the MIDI Sniffer was not able to enumerate, stop here, there is a hardware issue
 - c. If the screen shows device information, the MIDI Sniffer was able to enumerate, press up or down to view further information about the device, the device may not be MIDI 1.0 or MIDI 2.0 compatible

MIDI HOST NOT CONNECTING

If a MIDI host is not connecting (computer screen icon on the title bar), check the following

1. A MIDI device is properly already connected to the MIDI Sniffer (the MIDI Sniffer will not communicate with the host without a device connected)
2. USB Cable fully seated into the MIDI Sniffer and MIDI host
3. Try a different USB cable
4. Try to modify the device descriptor setting (see USB Device Descriptor)

LIMITED WARRANTY

1. CSS DESIGNS WARRANTS THAT ALL PRODUCTS SOLD WILL BE FREE OF DEFECTS IN MATERIALS AND WORKMANSHIP FOR A PERIOD OF TWELVE (12) MONTHS FROM DATE OF DELIVERY. THE FOREGOING TWELVE (12) MONTH WARRANTY SHALL NOT BE EXTENDED OR CHANGED BY CSS DESIGNS FURNISHING ANY REPLACEMENTS, ADDITIONS, ATTACHMENTS, ACCESSORIES OR REPAIRS TO THE PRODUCT SUBSEQUENT TO THE DATE OF DELIVERY OR ACCEPTANCE. THE FOREGOING WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY OF CSS DESIGNS REGARDING THE PRODUCT.
2. OTHER THAN THE FOREGOING WARRANTY, THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OR ANY AFFIRMATIONS OF FACT OR PROMISES BY CSS DESIGNS WITH RESPECT TO THE PRODUCT. CSS DESIGNS DISCLAIMS ANY WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, NOT SPECIFICALLY SET FORTH ABOVE. WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, CSS DESIGNS EXPRESSLY DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR

ANY PARTICULAR PURPOSE, INFRINGEMENT OR ANY REPRESENTATIONS OF FACT OR QUALITY NOT EXPRESSLY SET FORTH HEREIN.

3. CSS DESIGNS' SOLE RESPONSIBILITY AND LIABILITY INCURRED AS A RESULT OF THE SALE AND/OR USE OF THE PRODUCT, AND THE PURCHASER'S EXCLUSIVE REMEDY AGAINST CSS DESIGNS UNDER ANY WARRANTY SHALL BE LIMITED TO THE REPAIR OR REPLACEMENT, AT CSS DESIGNS' OPTION, OF PRODUCT COMPONENTS NOT CONFORMING TO THE WARRANTY. THE TOTAL LIABILITY OF CSS DESIGNS SHALL IN NO EVENT EXCEED THE AMOUNT ACTUALLY PAID TO CSS DESIGNS BY PURCHASER WITH RESPECT TO THE PRODUCT. THIS LIMITATION OF REMEDY IS INTENDED BY THE PARTIES TO SURVIVE EVEN IF THE REMEDY IS CLAIMED TO HAVE FAILED OF ITS ESSENTIAL PURPOSE. PURCHASER'S FULL AND COMPLETE PERFORMANCE OF ALL OBLIGATIONS OF PURCHASER RECITED IN THIS AGREEMENT IS A CONDITION PRECEDENT TO CSS DESIGNS' WARRANTY OBLIGATIONS AND LIABILITIES HEREIN.
4. IN NO EVENT SHALL CSS DESIGNS BE LIABLE TO PURCHASER, ITS ASSIGNS OR AGENTS, FOR ECONOMIC LOSS, INCIDENTAL OR CONSEQUENTIAL DAMAGES, IN CONTRACT OR IN TORT, INCLUDING BUT NOT LIMITED TO, ANY DAMAGES FOR LOST PROFITS, DOWN-TIME, LOST PRODUCTION, FAILURE TO MEET PURCHASER'S SALES CONTRACTS, OR DEFECTS IN PURCHASER'S MATERIALS OR WORKMANSHIP ARISING DIRECTLY OR INDIRECTLY FROM THE USE OF THE PRODUCT.

FCC Compliance Statement

CAUTION: The manufacturer is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Supplier's Declaration of Conformity
47 CFR § 2.1077 Compliance Information

Product Name: MIDI Sniffer

Product Model: MIDI Sniffer

Manufacturer:

CSS Designs

7755 W Lake Pointe Dr

Franklin, WI 53132

contact@cssdesignllc.com

www.cssdesignllc.com

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CSS Designs

Franklin, WI 53132

<http://www.cssdesignllc.com>

The information contained in this document is subject to change without notice. CSS Designs, LLC makes no warranty of any kind with regard to this material.

CSS Designs shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance or use of this material.