MIDI Sniffer™

Musical Instrument Digital Interface Protocol Analyzer

Instruction Manual

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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

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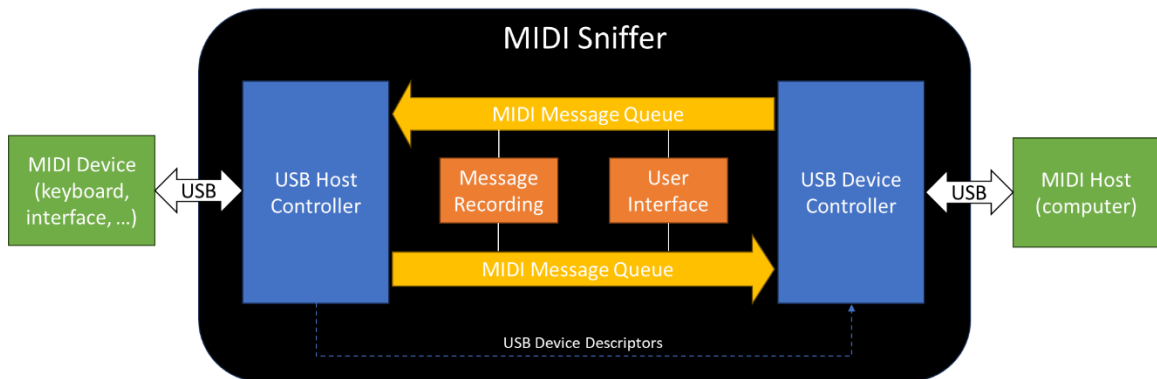
The MIDI Sniffer data flow backbone is made up of MIDI message queues. The MIDI Sniffer treats moving data in and out of the queues the topmost priority. The Message Recording module is secondary, followed by the User Interface module.

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

The MIDI Sniffer
graphical view of real-time stream

Activity 📊	CI ⇄	Settings ⚙
Activity ☰	Control 🎚	Player ♪
Activity 〰	Device ⓘ	Ability 〰
Activity 🔧	Record ▶■	About ❓

MIDI 2.0 device connected, recording data

The MIDI Sniffer
graphical view of real-time stream

Activity 📊	CI ⇄	Settings ⚙
Activity ☰	Control 🎚	Player ♪
Activity 〰	Device ⓘ	Ability 〰
Activity 🔧	Record ▶■	About ❓

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.

The MIDI Sniffer
graphical view of real-time stream

Activity 📊	CI ⇄	Settings ⚙
Activity ☰	Control 🎚	Player ♪
Activity 〰	Device ⓘ	Ability 〰
Activity 🔧	Record ▶■	About ❓

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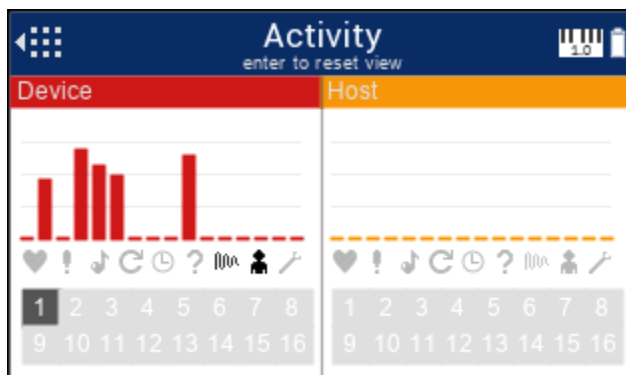
Pressing the right key will change the view to displaying only device data. Pressing the right key again will change the view to only displaying host data. A third right key press will return to the dual display. Press the left key at any of these screens to return to the main menu.
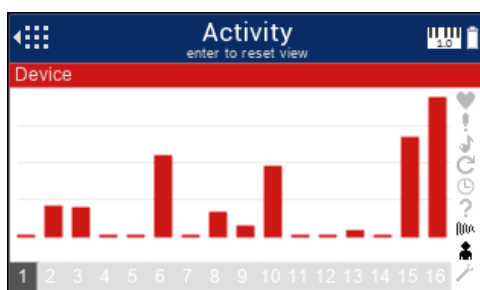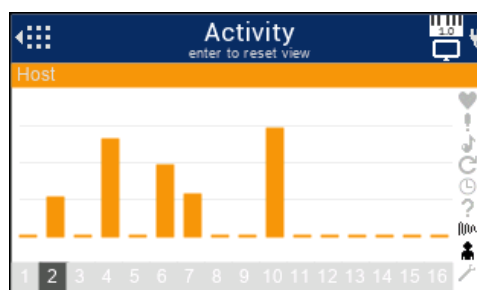

Data streamed from the device on cable 1

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".

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)

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.

MIDI 1.0 device basic view expanded   MIDI 1.0 host basic view expanded

MIDI 1.0 device detailed view expanded   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: *Settings -> Activity Settings -> Cable Filter Enabled*
                            Options: Disabled, Include, Exclude
CABLE FILTER: *Settings -> Activity Settings -> Cable Filter*
                            Options: 1-16
CIN FILTER ENABLED: *Settings -> Activity Settings -> CIN Filter Enabled*
                            Options: Disabled, Include, Exclude
CIN FILTER: *Settings -> Activity Settings -> CIN Filter*
                            Options: See CIN table
MIDI FILTER ENABLED: *Settings -> Activity Settings -> MIDI Filter Enabled*
                            Options: Disabled, Include, Exclude
MIDI FILTER: *Settings -> Activity Settings -> MIDI Filter*
                            Options: See MIDI table
TABULAR VIEW: *Settings -> Activity Settings -> Tabular View*
                            Options: Basic, Detailed
UMP FILTER ENABLED: *Settings -> Activity Settings -> UMP Filter Enabled*
                            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.
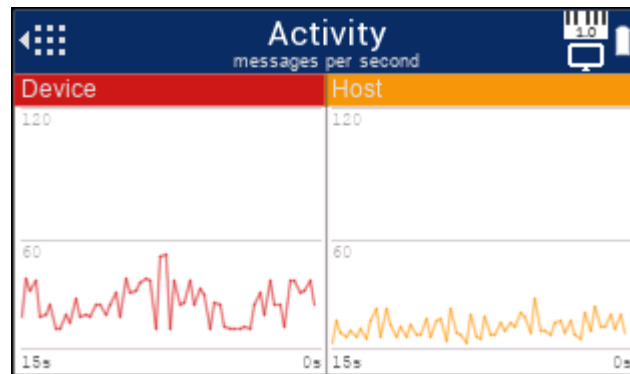
Pressing the right key will change the view to displaying only device data. Pressing the right key again will change the view to only displaying host data. A third right key press will return to the dual display. Press the left key at any of these screens to return to the main menu.
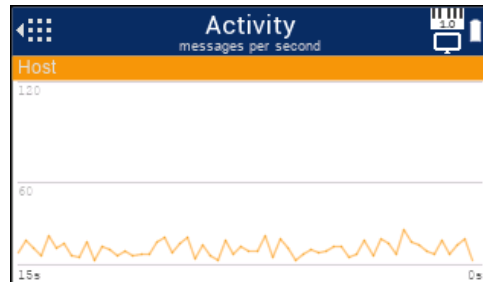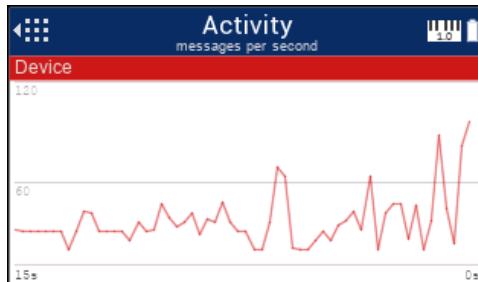
NOTES

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.
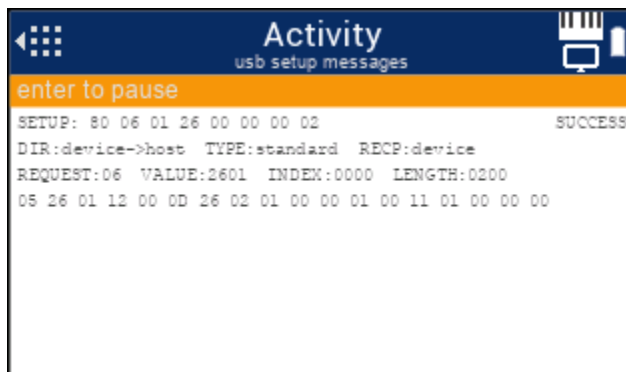
PAUSING

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. 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.
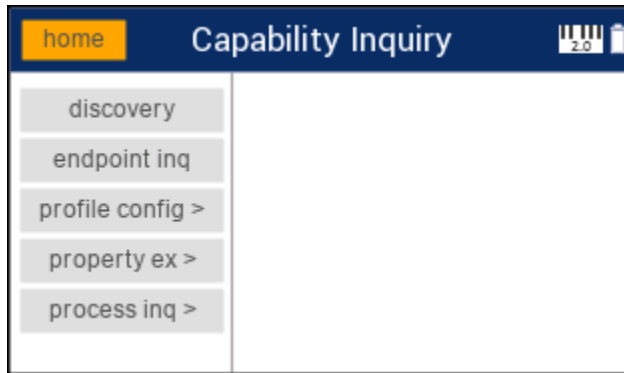
Feature access is on the left and results will appear on the right. Consult the latest MIDI 2.0 CI specification for details on CI. All CI messages are sent to the specified group in settings (default is 0).
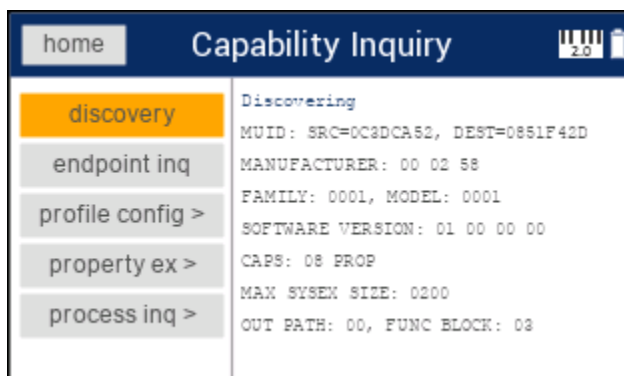
Example of CI discovery result

A discovery is required to be performed first. The connected device will then return with its MUID. This device MUID will then be used for all other CI messages.

The MIDI Sniffer profile and process inquiries simply inquire and show results. To inquire, highlight "profile config" or "process inq" using the up or down keys then press enter. When in the submenu, use the up or down arrow keys to highlight "inquiry" and press the enter. The inquiry results will appear to the right. To leave the submenu, highlight the "< back" button and press the enter key.

The MIDI Sniffer property exchange feature shows more details. To view options, highlight "property ex" using the up or down keys then press enter.

To inquire, use the up or down arrow keys to highlight "inquiry" and press the enter. The inquiry results will appear to the right.
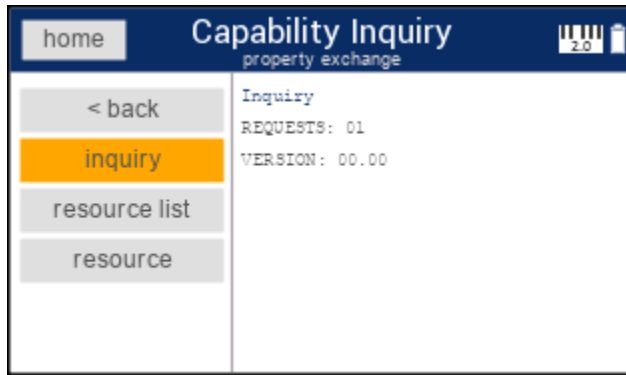
Example of CI property exchange inquiry result

To view the resource list raw JSON, use the up or down arrow keys to highlight "resource list" and press the enter. The resource list will appear to the right. Note, if the result extends beyond the display, an arrow will appear on the display indicating pressing the right arrow will page the results.
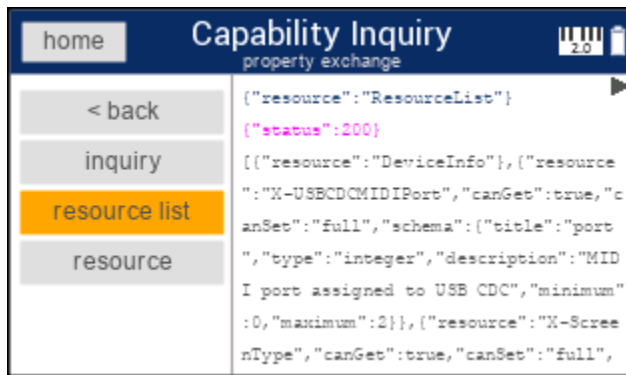
Example of CI property exchange resource list result

To view the individual resources as raw JSON from the resource list, use the up or down arrow keys to highlight "resource" and press the enter. The resource will appear to the right. Pressing the enter key again will retrieve the next resource in the list and will wrap to the beginning when the end of the list is encountered. *Notes: The resource list must be retrieved before requesting the resource values. Setting values is not supported.*
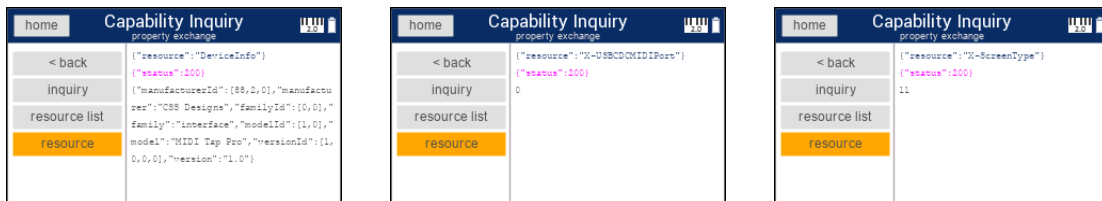
Example of CI property exchange resource results

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.

SETTINGS

CI GROUP: *Settings -> System Settings -> CI Group*
                               Options: 0-15

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	Configuration Summary	Configuration Summary
Enter for more information	*Enter for more information*	*Enter for more information*

Raw Configuration *Enter for more information*	Raw Configuration *Enter for more information*	Raw Configuration *Enter for more information*
Audio Control Header	Audio Control Header	
MIDI Stream Header	MIDI Stream Header	
MIDI In Jack(s) *Enter for more information*	Terminal Block(s) *Enter for more information*	
MIDI Out Jack(s) *Enter for more information*	Endpoint Info	
	Device Identity	
	Endpoint Name	
	Product Instance ID	
	Function Block(s) *Enter for more information*	

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.
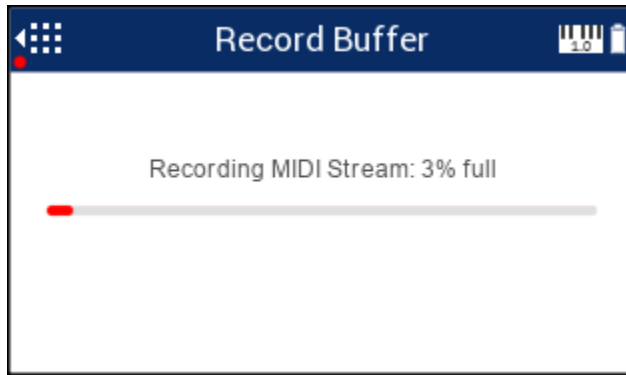
Recording progress

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.
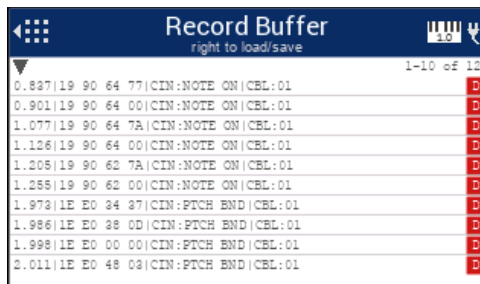
MIDI 1.0 basic view (one record per line)
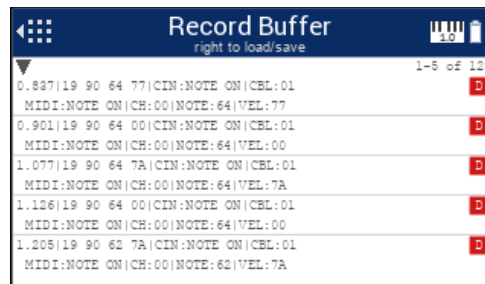
MIDI 1.0 detailed view (one record spans 2 lines)
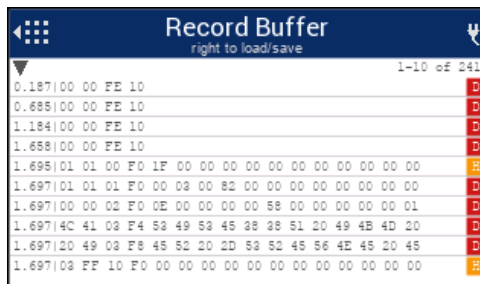
MIDI 2.0 basic view (one record per line)
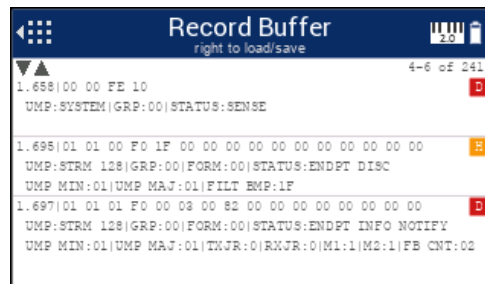
MIDI 2.0 detailed view (one record spans 3 lines)

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.
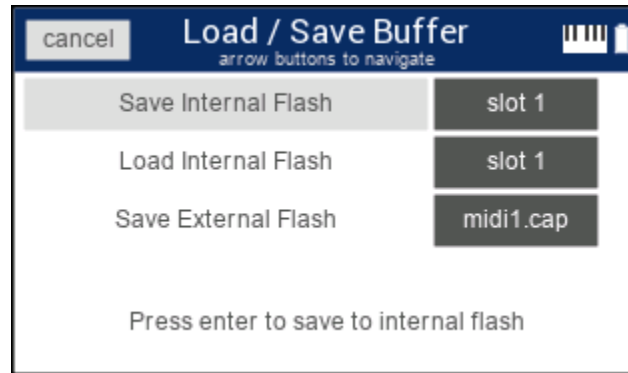
Save to internal flash selected waiting for user to press enter

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.
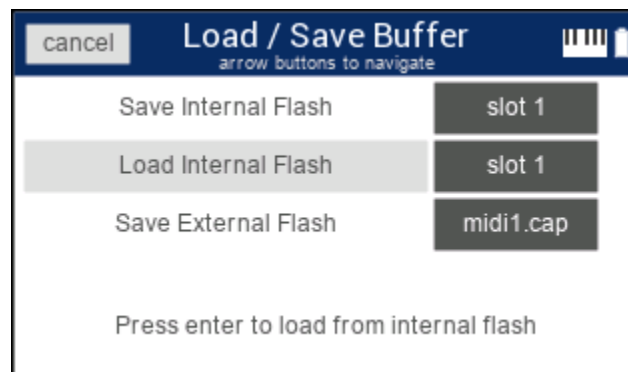
Load from internal flash selected waiting for user to press enter

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.
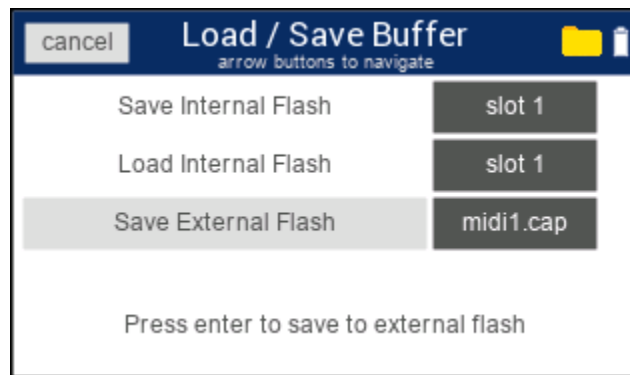
Save to external flash selected waiting for user to press enter

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

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.
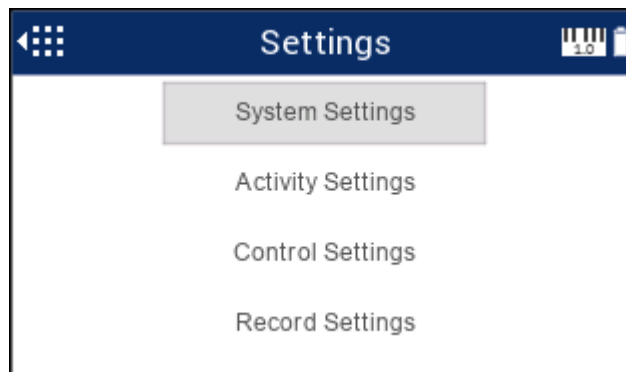
NAVIGATION

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.
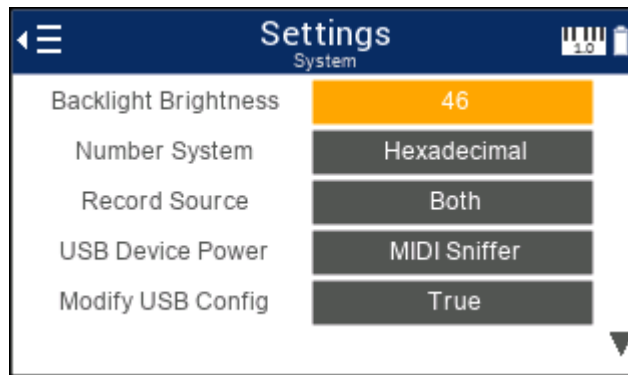
Settings system screen with backlight brightness value highlighted

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
	MIDI Host Loopback	Enable
		Disable
	CI Group	0-15
Activity 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
		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
		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
	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.
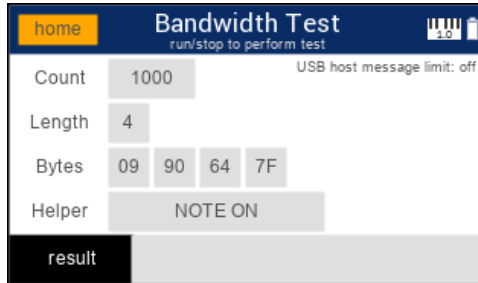
Ability test with 4 bytes
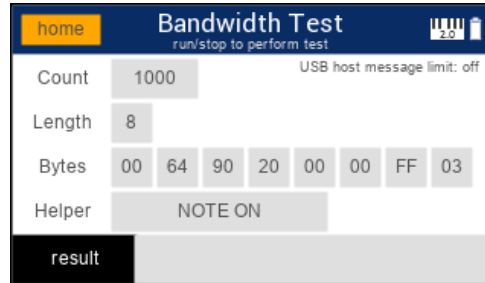
Ability test with 8 bytes

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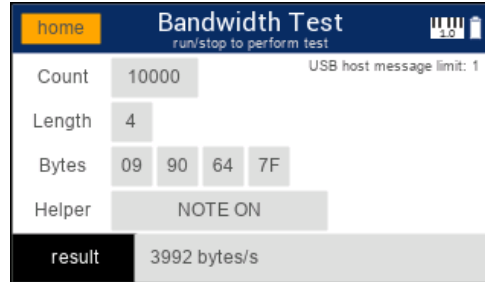
To exit, press the up arrow repeatedly until "home" is selected, then press the enter key.

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.
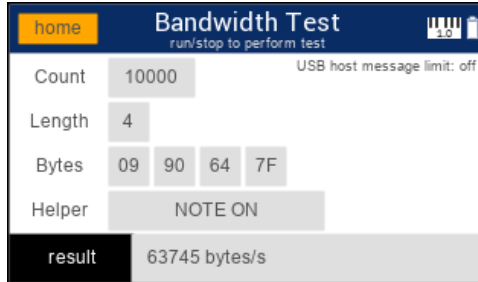
Ability test result with no USB packet size limiting   Ability test with single MIDI message USB packet limiting

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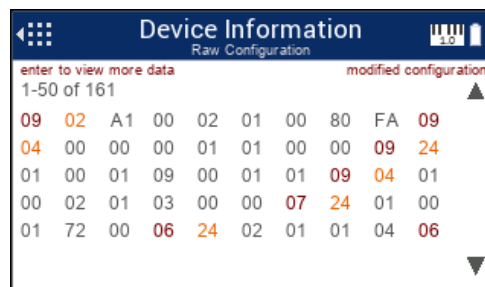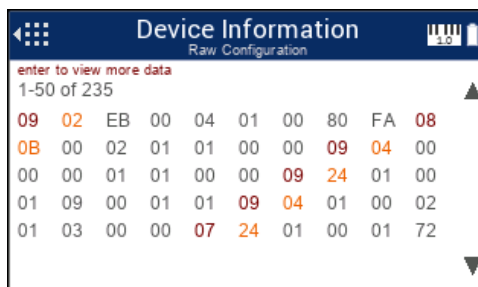
It is possible to view the modified configuration by pressing the right key in the "Device" screen. Note, this does not change the setting, it only allows the user to view the modified configuration.

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.

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.

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 (this may affect performance)
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

MIDI HOST LOOPBACK

The MIDI Sniffer has the ability to operate as a loopback host. This means every MIDI (1.0 or 2.0) message received by the device is sent back.

See settings below to modify the value.

SETTINGS

MIDI VERSION PREF: *Settings -> System Settings -> MIDI Host Loopback*
                                Options: Enable, Disable

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

may 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)

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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

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