

# Audio Toolkit 2.0.5

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Audio and MIDI functionality for GNU Octave.

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To download a copy of the GNU Octave Audio package, please visit <http://octave.sourceforge.net/audio/>.

# Table of Contents

<b>1</b>	<b>Installing and loading</b>	<b>1</b>
1.1	Windows install	1
1.2	Online Direct install	1
1.3	Off-line install	1
1.4	Loading	1
<b>2</b>	<b>Basic Usage Overview</b>	<b>2</b>
<b>3</b>	<b>Function Reference</b>	<b>3</b>
3.1	MIDI Device Interface	3
3.1.1	@octave_midi/hasdata	3
3.1.2	mididevice	3
3.1.3	mididevinfo	4
3.1.4	midiflush	5
3.1.5	midimsg	5
3.1.6	midireceive	7
3.1.7	midisend	8
3.2	MIDI Controller Interface	8
3.2.1	midicallback	8
3.2.2	midicontrols	9
3.2.3	midiid	10
3.2.4	midiread	10
3.2.5	midisync	10
3.3	MIDI File I/O	11
3.3.1	ismidifile	11
3.3.2	midifileinfo	11
3.3.3	midifileread	12
3.3.4	midifilewrite	12
3.4	Enumerations	12
3.4.1	midimsgtype	12
	<b>Appendix A GNU General Public License</b>	<b>14</b>
	<b>Index</b>	<b>24</b>

# 1 Installing and loading

The Audio toolkit must be installed and then loaded to be used.

It can be installed in GNU Octave directly from octave-forge, or can be installed in an off-line mode via a downloaded tarball.

The toolkit has a dependency on the RTMIDI library (<https://github.com/thestk/rtmidi>), so it must be installed in order to successfully install the toolkit.

For Fedora: `yum install rtmidi-devel`

For Ubuntu: `apt install librtmidi-dev`

The toolkit must be then be loaded once per each GNU Octave session in order to use its functionality.

## 1.1 Windows install

If running in Windows, the package may already be installed, to check run:

```
pkg list audio
```

Otherwise it can be installed by installing the requirements and then using the online or offline install method.

## 1.2 Online Direct install

With an internet connection available, the Audio package can be installed from octave-forge using the following command within GNU Octave:

```
pkg install -forge audio
```

The latest released version of the toolkit will be downloaded and installed.

## 1.3 Off-line install

With the Audio toolkit package already downloaded, and in the current directory when running GNU Octave, the package can be installed using the following command within GNU Octave:

```
pkg install audio-2.0.5.tar.gz
```

## 1.4 Loading

Regardless of the method of installing the Audio toolkit, in order to use its functions, the toolkit must be loaded using the `pkg load` command:

```
pkg load audio
```

The toolkit must be loaded on each GNU Octave session.

## 2 Basic Usage Overview

The Audio package must be loaded each time a GNU Octave session is started:

```
pkg load audio
```

The Audio toolkit provides 3 main types of MIDI functionality:

Device functions

These are functions that directly allow opening, sending and receiving MIDI messages.

Controller functions

Functions that provide a layer on top of the device functions for using MIDI controls.

File functions

Basic functions that allow read and write of MIDI files.

To read and write to a MIDI device, a MIDI device object must be created, using the name or id of a known MIDI device as provided by the `mididevinfo` function.

MIDI devices can then be read using the `midisend` and `midireceive` functions that use `midimsg` type to encapsulate the MIDI data.

```
% list the midi devices
devs = mididevinfo

% open a midi device, specifying the first input and output MIDI device
dev = mididevice("input", devs.input{1}.ID, "output", devs.output{1}.ID)

% receive data and echo it through the output port
while true
    msg = midireceive(dev, 1);
    if !isempty(msg)
        midisend(msg);
    endif
endwhile
```

An overview of the package can be displayed by running `help audio`

Help for each function can be displayed by `help thefunctionname`  
ie:

```
help mididevice
```

## 3 Function Reference

The functions currently available in the Audio toolkit are described below:

### 3.1 MIDI Device Interface

#### 3.1.1 @octave\_midi/hasdata

```
tf = hasdata (dev)
```

Return whether there is data available to read

#### Inputs

*dev* - a octave midi device opened using mididevice.

#### Outputs

*tf* - true if device has data available to read

See also: mididevice.

#### 3.1.2 mididevice

```
dev = mididevice (mididev)
```

```
dev = mididevice (mididir, mididev)
```

```
dev = mididevice ("input", midiindev, "output", midioutdev)
```

Create a midi device using the input parameters.

When a single device name or id is provided, attempt to create the midi device using the same name for both input and output.

Otherwise, use the name or device id for the given input or output direction.

#### Inputs

*mididev* - name or id of device to load.

*mididir* - midi direction of "input" or "output"

*midiindev* - midi input name or id

*midioutdev* - midi output name or id

#### Outputs

*dev* - octave\_midi class for opened device

#### Properties

*Input* - Input device name (read only).

*Output* - Output device name (read only).

*InputID* - Input device id (read only).

*OutputID* - Output device id (read only).

#### Examples

Open midi device with ID of 0.

```
> dev = mididevice(0);
```

```

mididevice connected to
  input: "SparkFun Pro Micro:SparkFun Pro Micro MIDI 1 20:0" (1)
  output: "SparkFun Pro Micro:SparkFun Pro Micro MIDI 1 20:0" (0)

```

Open a named midi device:

```
> dev = mididevice("SparkFun Pro Micro:SparkFun Pro Micro MIDI 1 20:0");
```

```

mididevice connected to
  input: "SparkFun Pro Micro:SparkFun Pro Micro MIDI 1 20:0" (1)
  output: "SparkFun Pro Micro:SparkFun Pro Micro MIDI 1 20:0" (0)

```

See also: `mididevinfo`.

### 3.1.3 `mididevinfo`

```
devlist = mididevinfo ()
```

```
mididevinfo ()
```

Retrieve the midi devices detected within the system.

The list will be stored with variable *devlist* as either a input or output device. If no output variable is provided, the devices will be displayed.

#### Inputs

None

#### Outputs

*devlist* - a structure containing the midi device information

#### Examples

Display the known devices of the system.

```
> mididevinfo
```

```

MIDI devices available
ID Direction Interface  Name
0 output   Alsa         Midi Through:Midi Through Port-0 14:0
1 output   Alsa         Ensoniq AudioPCI:ES1371 16:0
2 output   Alsa         SparkFun Pro Micro:SparkFun Pro Micro MIDI 1 20:0
3 input    Alsa         Midi Through:Midi Through Port-0 14:0
4 input    Alsa         Ensoniq AudioPCI:ES1371 16:0
5 input    Alsa         SparkFun Pro Micro:SparkFun Pro Micro MIDI 1 20:0

```

Assign variable *mididevices* with the values from the known devices

```
> mididevices = mididevinfo
```

```

mididevices =
  scalar structure containing the fields:
    input =
      {
        [1,1] =
          scalar structure containing the fields:
            Name = SparkFun Pro Micro:SparkFun Pro Micro MIDI 1 20:0

```



```

        Interface = Alsa
        ID = 0
    }
    output =
    {
        [1,1] =
            scalar structure containing the fields:
                Name = SparkFun Pro Micro:SparkFun Pro Micro MIDI 1 20:0
                Interface = Alsa
                ID = 1
    }

```

**See also:** `mididevice`.

### 3.1.4 midiflush

`midiflush (dev)`

Flush the receive buffers on a midi device

#### Inputs

*dev* - midi device opened using `mididevice`

#### Outputs

None

#### Examples

Flush a midi device

```
midiflush(dev);
```

**See also:** `mididevice`, `midireceive`.

### 3.1.5 midimsg

```

msg = midimsg (0)
msg = midimsg (type ....)
msg = midimsg ("note", channel, note, velocity, duration, timestamp)
msg = midimsg ("noteon", channel, note, velocity, timestamp)
msg = midimsg ("noteoff", channel, note, velocity, timestamp)
msg = midimsg ("programchange", channel, prog, timestamp)
msg = midimsg ("controlchange", channel, ccnum, ccval, timestamp)
msg = midimsg ("polykeypressure", channel, note, keypressure, timestamp)
msg = midimsg ("channelpressure", channel, chanpressure, timestamp)
msg = midimsg ("localcontrol", channel, localcontrol, timestamp)
msg = midimsg ("pitchbend", channel, pitchchange, timestamp)
msg = midimsg ("polyon", channel, timestamp)
msg = midimsg ("monoon", channel, monochannels, timestamp)
msg = midimsg ("omnion", channel, timestamp)
msg = midimsg ("omnioff", channel, timestamp)
msg = midimsg ("allsoundoff", channel, timestamp)
msg = midimsg ("allnotesoff", channel, timestamp)

```

```

msg = midimsg ("resetallcontrollers", channel, timestamp)
msg = midimsg ("start", timestamp)
msg = midimsg ("stop", timestamp)
msg = midimsg ("continue", timestamp)
msg = midimsg ("systemreset", timestamp)
msg = midimsg ("activesensing", timestamp)
msg = midimsg ("timingclock", timestamp)
msg = midimsg ("systemexclusive", timestamp)
msg = midimsg ("systemexclusive", bytes, timestamp)
msg = midimsg ("eox", timestamp)
msg = midimsg ("data", bytes, timestamp)
msg = midimsg ("songselect", song, timestamp)
msg = midimsg ("songpositionpointer", songposition, timestamp)
msg = midimsg ("tunerequest", timestamp)
msg = midimsg ("miditimecodequarterframe", timeseq, timevalue, timestamp)

```

Create a midimsg object

If the input parameter is 0, create an empty midi message object Otherwise the first variable is the type of message to create, followed by the additional parameters for the message.

For each message type, the timestamp value is optional.

## Inputs

*type* - string message type or a midimsgtype.

*timestamp* - optional seconds time stamp for the event

*channel* - the channel to use for the message (1..16)

*note* - the value of the note to play/stop

*velocity* - the velocity value for a note on/off, with 0 stopping a note from sounding.

*duration* - seconds between starting and stopping a note when created a 'note' message.

*prog* - program number when doing a program change message.

*ccnum* - control change control number.

*ccval* - control change control value.

*keypressure* - key pressure value when creating a key pressure message.

*chanpressure* - channel pressure value when creating a channelpressure message.

*pitchchange* - pitch change value when creating a pitch bend message.

*localcontrol* - boolean value when creating a localcontrol message.

*monochannels* - channels specified for a mono on message.

*bytes* - array of data in range of 0 to 127 specified as part of a data message or system exclusive message.

*song* - song selection number for a song selection message.

*songposition* - song position value for a song position message.

*timeseq* - timecode sequence number for a miditimecodequarterframe message.

*timevalue* - timecode value number for a miditimecodequarterframe message.

## Outputs

*msg* - a midimsg object containing the midi data of the message

## Properties

*timestamp* - timestamp of the message, or an array of timestamps if the the message is a compound message.

*msgbytes* - the raw message bytes that make up the MIDI message.

*nummsgbytes* - the number of message bytes that make up the MIDI message.

*type* - string or midimsgtype that represents the message type.  
*channel* - the channel number for message.  
*note* - the note value for message (Only valid for noteon/off and polykeypressure).  
*velocity* - the velocity value for message (Only valid for noteon/off).  
*keypressure* - the keypressure value for message (Only valid for polykeypressure).  
*channelpressure* - the chanpressure value for message (Only valid for channelpressure).  
*localcontrol* - the localcontrol value for message (Only valid for localcontrol messages).  
*monochannels* - channels specified for a mono on message.  
*program* - program number specified for a program change message.  
*ccnumber* - control change number specified for a control change message.  
*ccvalue* - control change value specified for a control change message.  
*song* - song number for a song selection message.  
*songposition* - song position value for a song position message.  
*pitchchange* - pitch change value for a pitch bend message.  
*timecodesequance* - timecode sequence number for a miditimecodequarterframe message.  
*timecodevalue* - timecode value number for a miditimecodequarterframe message.

## Examples

Create a note on/off pair with a duration of 1.5 seconds

```
msg = midimsg('note', 1, 60, 100, 1.5)
```

Create a separate note on/off pair with a time between them of 1.5 seconds

```
msg = [midimsg('noteon', 1, 60, 100, 0), midimsg('noteoff', 1, 60, 0, 1.5)]
```

Create a system reset message

```
msg = midimsg('systemreset')
```

**See also:** midifileread, midisend, midireceive, midimsgtype.

### 3.1.6 midireceive

```
midimsg = midireceive (dev)
```

```
midimsg = midireceive (dev, maxmsg)
```

Attempt to receive midi messages from a midi device.

## Inputs

*dev* - a octave midi device opened using mididevice.

*maxmsg* - Maximum number of messages to retrieve. If not specified, the function will attempt to get all pending.

## Outputs

*midimsg* - a midimsg containing the messages retrieved from the device.

If no messages are available, *midimsg* will be empty.

## Examples

Open device 0, and poll and display read messages

```
dev = mididevice(0);
while true
```

```

    mx = midireceive(dev);
    if !isempty(mx)
        % display message
        mx
    endif
endwhile

```

**See also:** mididevice, midisend.

### 3.1.7 midisend

`midisend (dev, msg)`

`midisend (dev, ...)`

Send a midimsg to a midi device

#### Inputs

*dev* - midi device opened using mididevice

*msg* - a midi message class with messages to send to the midi device

If the *msg* isn't a midimsg class, the input data is expected to be in same format as the inputs to a midimsg object.

#### Outputs

None

#### Examples

Send a note on/off command to a opened midi device *dev*

```
midisend(dev, midimsg("note", 1, 60, 100, 2.0));
```

**See also:** midimsg, mididevice, midireceive.

## 3.2 MIDI Controller Interface

### 3.2.1 midicallback

`oldhandle = midicallback (midicontrolsObj, functionHandle)`

`oldhandle = midicallback (midicontrolsObj, [])`

`currhandle = midicallback (midicontrolsObj)`

Get, set or clear the midicontrol object callback.

#### Inputs

*midicontrolObj* - control object created using midicontrols.

*functionHandle* - function handle to set for call back. If it is [], the callback function will be cleared.

**NOTE:** currently anonymous functions will not work.

**NOTE:** callbacks should be cleared before losing all references to the midicontrols object.

#### Outputs

*oldhandle* The previously set midicallback function handle when setting a new callback.

*currhandle* The current set midicallback function handle.

## Examples

Set a callback on a midicontrols object

```
ctrl = midicontrols(2001)
function dispCallback(ctrl),disp(midiread(ctrl)),endfunction;
midicallback(ctrl, @dispCallback);
```

Clear the callback on a midicontrols object

```
ctrl = midicontrols(2001)
midicallback(ctrl, []);
```

Get the current callback on a midicontrols object

```
ctrl = midicontrols(2001)
cb = midicallback(ctrl);
```

**See also:** midicontrols, midisync, midiread.

### 3.2.2 midicontrols

```
obj = midicontrols ()
obj = midicontrols (ctrlid)
obj = midicontrols (ctrlid, initialvalues)
obj = midicontrols (--, propertyname, propertyvalue)
```

Create a midi controls object

#### Inputs

*ctrlid* - single control id or array of control ids to monitor, or [] to use any controller.

*initialvalues* - initial values to use for controls. It should be the same size as *ctrlid*

*propertyname*, *propertyvalue* - properties to set on the controller. If a device is not specified the value from `getpref("midi", "DefaultDevice", 0)` will be used.

Known properties are:

*mididevice*

name of the mididevice to monitor.

*outputmode*

the scaling mode for values: 'rawmidi' will return values between 0 .. 127, 'normalized' will use values between 0 .. 1.

#### Outputs

*obj* - returns a midicontrols object

## Examples

Create a midicontrols object monitoring control id 2001 on the default midi device

```
ctrl = midicontrols(2001)
```

Create a midicontrols object monitoring control id 2001 on a non default device

```
ctrl = midicontrols(2001, 'mididevice', 1)
```

**See also:** midiread, midisync.

### 3.2.3 midiid

`[ctrlid, dev] = midiid ()`

Scan for control messages from midi devices to get the id of the device

Function will display a prompt for the user to move the midi control and return when a control messages is detected or ctrl-C is pressed.

#### Inputs

None

#### Outputs

*ctrlid* - control id made from the controller channel \* 1000 + controller number.

*dev* = name of the midi device the controller was detected on.

#### Examples

Monitor midi devices for first moving controller

```
[ctrlid, devname] = midiid()
```

**See also:** mididevinfo, midicontrols.

### 3.2.4 midiread

*val* = midiread (*midicontrolsObj*)

Read current values of midi controls

#### Inputs

*midicontrolObj* - control object created using midicontrols

#### Outputs

*val* single value or array of current values from the midi device.

#### Examples

Read current value of midicontrols with a ctrlid 2001 on the default midi device.

```
ctrl = midicontrols(2001)
val = midiread(ctrl);
```

Read current value of midicontrols with a ctrlid 2001 on a non default midi device.

```
ctrl = midicontrols(2001, 'mididevice', 1)
val = midiread(ctrl);
```

**See also:** midicontrols, midisync.

### 3.2.5 midisync

midisync (*midicontrolsObj*)

midisync (*midicontrolsObj*, *ctrlvalues*)

Send the values of control object to the control, using *ctrlvalues* values if specified instead

## Inputs

*midicontrolObj* - control object created using midicontrols

*ctrlvalues* - values to send to the controls instead of initial values

## Outputs

None

## Examples

Send sync command to a midicontrols with a ctrlid 2001 to set a value of 1

```
ctrl = midicontrols(2001)
midisync(ctrl, 1);
```

**See also:** midicontrols.

## 3.3 MIDI File I/O

### 3.3.1 ismidifile

*ismidi* = ismidifile (*filename*)

Check if *filename* is a midi file.

The function only checks whether it is an existing file and the file starts with a valid 'MThd' header.

Non existing files, or files that do not meet the header criteria will return false.

## Inputs

*filename* - filename of file to check.

## Outputs

*ismidi* - true if it is a midi file, false otherwise

**See also:** midifileread, midifilewrite.

### 3.3.2 midifileinfo

*info* = midifileinfo (*filename*)

Read MIDI file and display information about the tracks and data

## Inputs

*filename* - filename of file to open.

## Outputs

*info* - structure of the midi file data with the following fields:

filename	the name of the file
header	The header block information
track	An array of tracks read from the file
other	An array of non-track midi blocks read from the file

**See also:** midifileread.

### 3.3.3 midifileread

`msg = midifileread (filename, [propertyname, propertyvalue ...])`  
 Read MIDI file into a midimsg

#### Inputs

*filename* - filename of file to open.

*propertyname, propertyvalue* - optional propertyname/value pairs.

Known property values are:

*includemetaevents*

A True/False value to include MetaEvents in the out message list.

#### Outputs

*msg* - a midimsg struct containing the messages read from the file

**See also:** midifileinfo, midimsg.

### 3.3.4 midifilewrite

`midifilewrite (filename, msgs)`  
`midifilewrite (filename, msgs, optionname, optionvalue)`  
 Write a midifile

#### Inputs

*filename* - filename of file to open.

*msg* - a midimsg struct or a cell array of midimsg containing data to write to file

*optionname, optionvalue* - option value/name pairs

Known options are:

*format*      MIDI file format number. (0 (default), 1, 2)

Where *format* is 0, if a cell array is passed to `midifilewrite`, the `midimsg` values will be concatenated together before saving.

Where *format* is not 0, the cell array is treated as tracks of `midimsg`.

#### Outputs

None

**See also:** midifileread, midimsg.

## 3.4 Enumerations

### 3.4.1 midimsgtype

`midimsgtype`

A `midimsg` type enumeration for values of the `midimsg` type.

Enumeration values are:

Data	Stop	SongPositionPointer
PolyOn	PolyKeyPressure	NoteOff
EOX	ActiveSensing	SongSelect



MonoOn	ChannelPressure	ControlChange
TimingClock	SystemReset	AllSoundOff
OmniOn	PitchBend	ProgramChange
Start	TuneRequest	ResetAllControllers
OmniOff	Undefined	SystemExclusive
Continue	MIDITimeCodeQuarterFrame	LocalControl
AllNotesOff	MetaEvent	

The enumeration value can be used instead of a string in midimsg creation.

## Examples

Use both a string and a midimsgtype for the type parameter of a midimsg.

```
# both statements are equivalent
msg = midimsg('NoteOn', 1, 60, 100);
msg = midimsg(midimsgtype.NoteOn, 1, 60, 100);
```

**See also:** midimsg.

# Appendix A GNU General Public License

Version 3, 29 June 2007

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# Index

## B

Basic Usage Overview ..... 2

## C

copyright ..... 14

## E

Enumerations ..... 12

## F

Function Reference ..... 3

## H

hasdata ..... 3

## I

Installing and loading ..... 1

ismidfile ..... 11

## L

Loading ..... 1

## M

MIDI Controller Interface ..... 8

MIDI Device Interface ..... 3

MIDI File I/O ..... 11

midicallback ..... 8

midicontrols ..... 9

mididevice ..... 3

mididevinfo ..... 4

midifileinfo ..... 11

midifileread ..... 12

midifilewrite ..... 12

midiflush ..... 5

midiid ..... 10

midimsg ..... 5

midimsgtype ..... 12

midiread ..... 10

midireceive ..... 7

midisend ..... 8

midisync ..... 10

## O

Off-line install ..... 1

Online install ..... 1

## W

warranty ..... 14

Windows install ..... 1