

# Audio Toolkit 2.0.0

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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/midi/>.

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# 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-2.0.0.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 Audio 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 `mididevlist` function.

MIDI devices can then be read using the `midisend` and `midirecieve` 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.Input1.ID, "output", devs.Output1.ID)

%% recieve data and echo it through the output port
while True
    msg = midirecieve(dev, 1);
    if !empty(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 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

#### Example

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.

#### 3.1.2 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*.

### 3.1.3 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 ("chanpressure", channel, chanpressure, 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 if the type of message to create, followed by the additional parameters for the message.

For each message type, the timestamp value if optional.

## Inputs

*type* - string message type.

*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 chanpressure message.

*pitchchange* - pitch change value when creating a pitch change 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 containign the midi data of the 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.

### 3.1.4 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 !empty(mx)
        % display message
```

```

        mx
    endif
endwhile

```

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

### 3.1.5 `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 `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)
```

**See also:** midiread, midisync.

### 3.2.2 midiid

```
[ctrlid dev] = midiid ()
```

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

Function will display a prompt for user to move the midi control and return when a control message 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.

## Examples

Monitor midi devices for first moving controller

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

**See also:** mididevinfo, midicontrols.

### 3.2.3 midiread

```
midiread (midicontrolsObj)
```

Read current values of midi controls

## Inputs

*midicontrolObj* - control object created using midicontrols

## Outputs

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

## Examples

Read current value of midicontrols with a ctrlid 2001.

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

**See also:** midicontrols, midisync.

### 3.2.4 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 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

**See also:** midifileread.

### 3.3.2 midifileread

`msg = midifileread (filename)`  
Read MIDI file into a midimsg

#### Inputs

*filename* - filename of file to open.

#### Outputs

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

**See also:** midifileinfo, midimsg.

### 3.3.3 midifilewrite

`midifilewrite (filename, msgs)`  
Write a midifile

#### Inputs

*filename* - filename of file to open.

*msg* - a midimsg struct containing data to write to file

#### Outputs

None

**See also:** midifileread, midimsg.

# Appendix A GNU General Public License

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