HAT REFERENCE GUIDE

VIA AI Transforma Model 1

ReSpeaker 2-Mics HAT

1.00-11212024

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Revision History

Version	Date	Remarks
1.00	21/11/2024	Initial release

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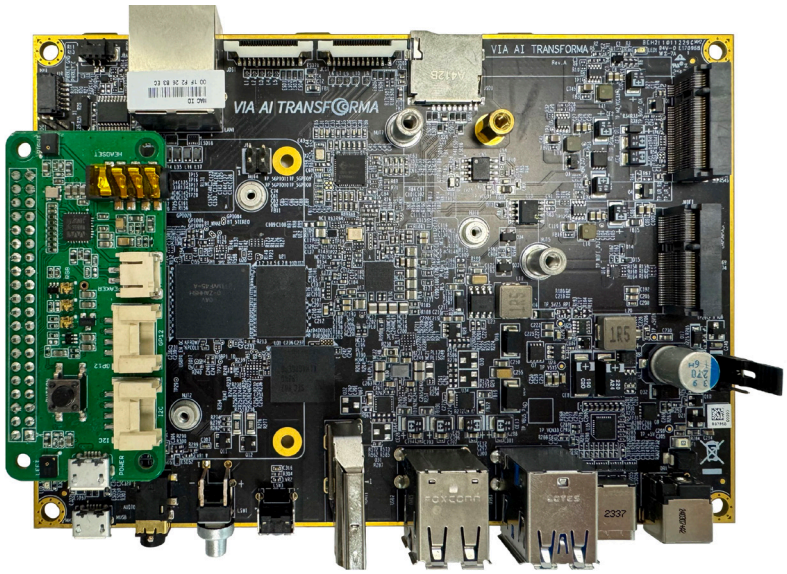
1. Introduction

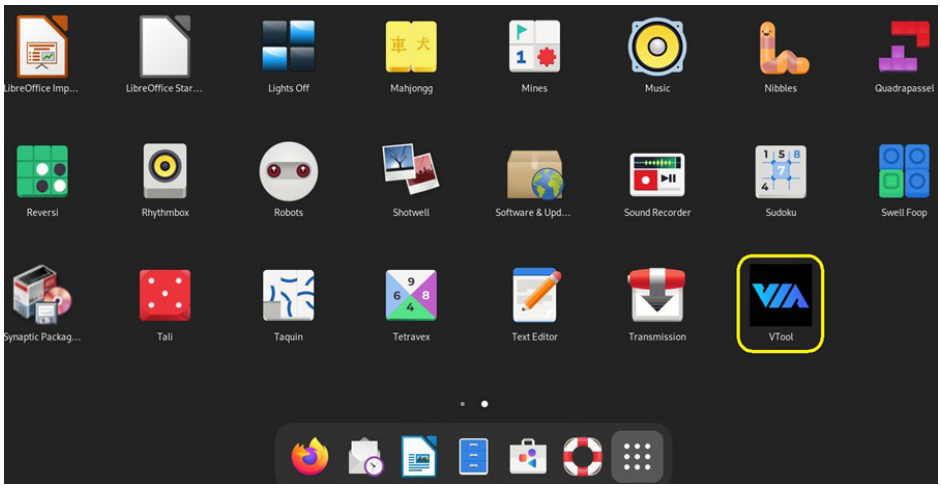
The ReSpeaker 2-Mics HAT is a dual-microphone expansion HAT. This guide explains how to install the necessary libraries, setup proper configurations and settings to have the ReSpeaker 2-Mics HAT work on the VIA AI Transforma Model 1 board.

1.1 Install and Setup the HAT

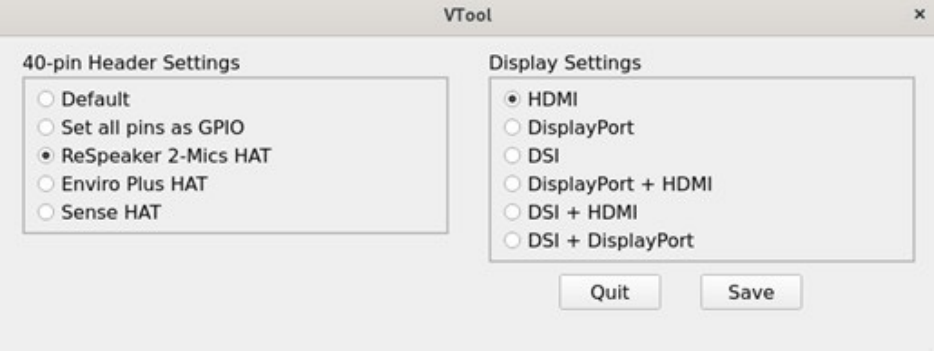
1. Mount the ReSpeaker 2-Mics HAT to the 40-pin headers on the VIA AI Transforma Model 1 board, making sure that the board is powered off and the pins are properly aligned when stacking the ReSpeaker 2-Mics HAT.



2. Boot up the board to the desktop and open up the applications tab. Double click on “VTool”, a utility for users to change hardware configurations.



3. Select the radio button beside“ReSpeaker 2-Mics HAT”, then click on “Save”and reboot the system.



4. After rebooting, the ALSA (Advanced Linux Sound Architecture) mixer needs to be reconfigured in order for the microphone and audio output on the Respeaker 2-Mics HAT to work properly. There are two ways to configure the ALSA mixer settings, through the graphical program “alsamixer”, or through the command line tool “amixer”.

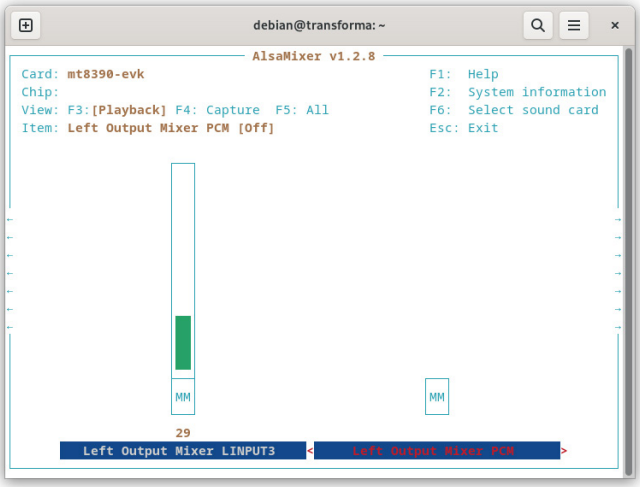
1.1.1 Configure Sound Settings with alsamixer

The alsamixer program is a GUI mixer that provides an easy way to configure sound settings and adjust output volume.

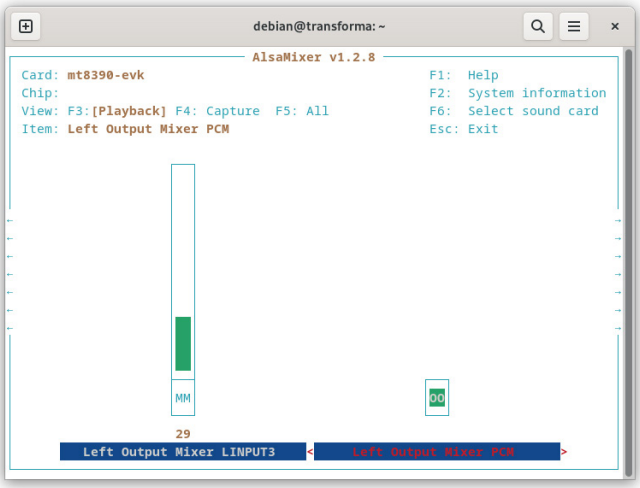
1. Execute alsamixer with the following command:

```
debian@transforma:~$ sudo alsamixer -c 0
```

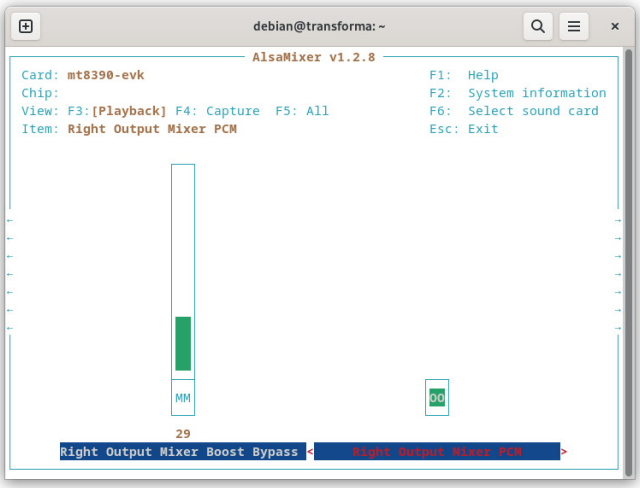
A graphical interface will be displayed within the same command line window as follows:



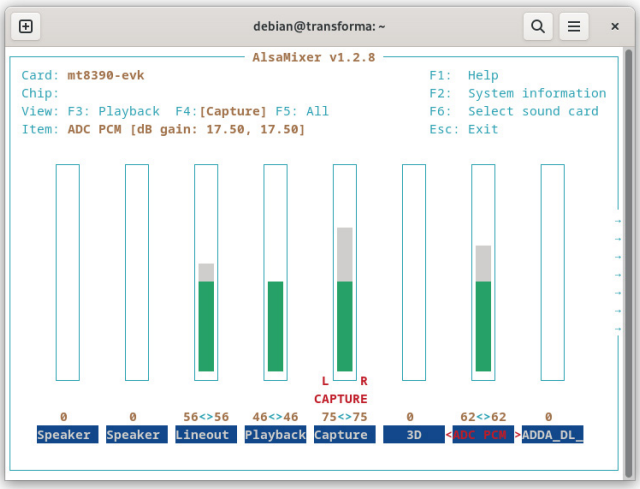
2. Use the left and right arrow keys on the keyboard to select “Left Output Mixer PCM”. Left Click on the "MM" icon to enable the left audio output channel.



3. Repeat the steps for “Right Output Mixer PCM” to enable the right audio output channel.

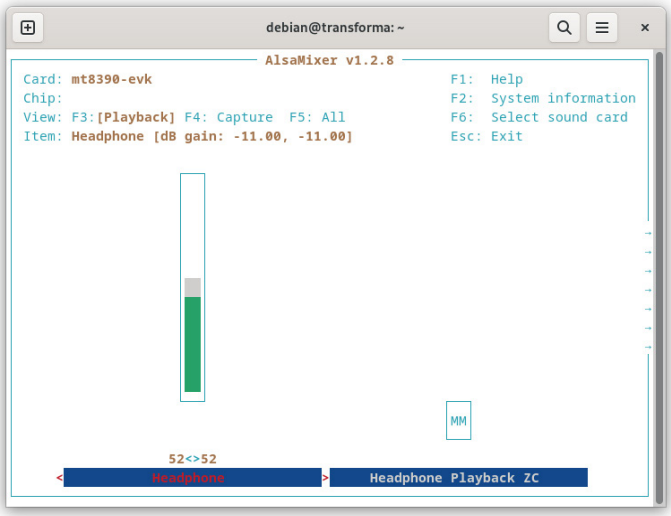


4. Press F4 to switch to the Capture menu. Use the left and right arrow keys to select "Capture" and use the up and down arrow keys to adjust its volume.



5. Repeat the steps above and select "ADC PCM" and adjust its volume.

6. Press F3 to switch to the Playback menu and select "Headphone" to adjust its volume.



7. Quit the program by hitting the Esc key.

1.1.2 Configure Sound Settings with amixer

The amixer command line tool is an alternative way to configure sound settings and adjust output volume.

1. Execute amixer with the following commands to turn on the playback channels:

```
debian@transforma:~$ sudo amixer -c 0 cset name='Left Output Mixer PCM Playback Switch' on
debian@transforma:~$ sudo amixer -c 0 cset name='Right Output Mixer PCM Playback Switch' on
```

2. Check the volume of the Capture channel and its minimum/maximum value with the following command:

```
debian@transforma:~$ sudo amixer -c 0 cget name='Capture Volume'
```

The output will tell you the current volume and the minimum/maximum you could apply to the channel:

```
numid=344,iface=MIXER,name='Capture Volume'
  ; type=INTEGER,access=rw---R--,values=2,min=0,max=63,step=0
  : values=39,39
  | dBscale-min=-17.25dB,step=0.75dB,mute=0
```

3. Once you identified the minimum/maximum value the channel could receive, use the following command to set the desired value for the channel:

```
debian@transforma:~$ sudo amixer -c 0 cset name='Capture Volume' 55
```

4. Repeat the steps above and replace the highlighted "name=Captured Volume' with one of the following items listed bleow and adjust the volume accordingly:

- ADC PCM Capture Volume
- Playback Volume
- Headphone Playback Volume

1.1.3 Store Audio Settings

After configuring the audio settings with either of the tools above, use the “alsactl” command to store the audio settings:

```
debian@transforma:~$ sudo alsactl store -f /var/lib/alsa/asound.state
```

Load and apply the settings manually with the following command or reboot the system to automatically apply the settings.

```
debian@transforma:~$ sudo alsactl restore -f /var/lib/alsa/asound.state
```

2. Examples

There are 4 examples under the "/usr/local/lib/python3.11/dist-packages/mic_hat"folder.

2.1 Download and Install Libraries

Before running ReSpeaker 2-Mics HAT examples on the VIA AI Transforma board, users must download and install the necessary libraries and reference code.

```
# Download necessary libraries
debian@transforma:~$ sudo apt update
debian@transforma:~$ sudo apt install git python3-spidev python3-transforma-gpio python3-
pyaudio
```

2.1.1 Download Source Code

Download code from https://github.com/respeaker/mic_hat.git with the following commands:

```
# Download ReSpeaker sample codes
debian@transforma:~$ cd /usr/local/lib/python3.11/dist-packages

# Under "debian@transforma:/usr/local/lib/python3.11/dist-packages"
$ sudo git clone https://github.com/respeaker/mic_hat.git
$ cd mic_hat
$ sudo apt-get install portaudio19-dev libatlas-base-dev
$ sudo pip3 install -r requirements.txt
```

Modify the example code as follows:

```
Modify "/usr/local/lib/python3.11/dist-packages/mic_hat/interfaces/apa102.py"
as below:
Modify Line 81:
order='rgb', bus=0, device=1, max_speed_hz=8000000):
--->
order='rgb', bus=0, device=0, max_speed_hz=8000000):
```

```
Modify "/usr/local/lib/python3.11/dist-packages/mic_hat/recording_examples/record.py" as
below:
Line 4:
RESPEAKER_RATE = 16000
--->
RESPEAKER_RATE = 48000

Modify Line 8:
RESPEAKER_INDEX = 1  # refer to input device id
--->
RESPEAKER_INDEX = 8  # refer to input device id
```

```
Modify "/usr/local/lib/python3.11/dist-packages/mic_hat/recording_examples/play.py" as
below:
Modify Line 7:
RESPEAKER_INDEX = 1
--->
RESPEAKER_INDEX = 2
```

You can check the device indexes with the following command:

```
debian@transforma: /usr/local/lib/python3.11/dist-packages/mic_hat$ sudo python3 recording_
examples/get_device_index.py
```

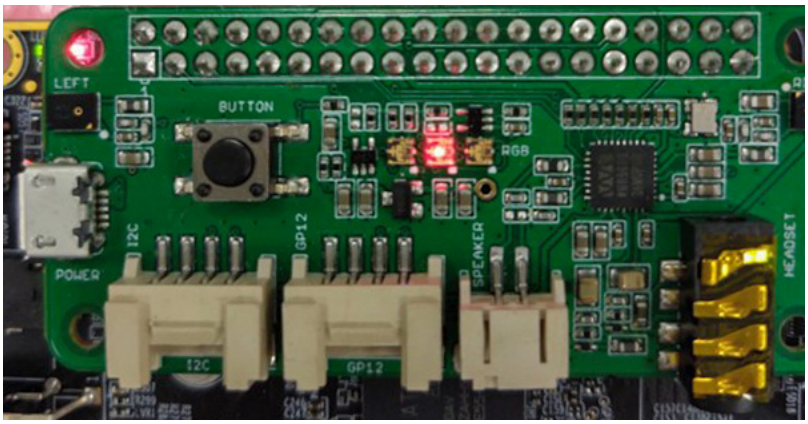
2.2 Example 1: APA102 RGB LEDs

This example shows how to control the RGB LEDs on the board. Execute the following command to turn on the LEDs":

```
debian@transforma: /usr/local/lib/python3.11/dist-packages/mic_hat$ sudo python3 interfaces/
pixels.py

Press Ctrl+C to exit!
```

You will see the LEDs turn on as below.



Press "Ctrl" + "C" to stop the example.

2.3 Example 2: Button

This example shows how to monitor the button status. Execute the following command and the button status will be printed onto the command line console:

```
debian@transforma: /usr/local/lib/python3.11/dist-packages/mic_hat$ sudo python3 interfaces/
button.py

off
off
off
off
off
off
on
on
on
on
off
off
off
off
^CTraceback (most recent call last):
  File "/usr/local/lib/python3.11/dist-packages/mic_hat/interfaces/button.py", line 15, in
<module>
    time.sleep(1)
KeyboardInterrupt

debian@transforma:/usr/local/lib/python3.11/dist-packages/mic_hat$
```

"on" will be shown when the button is pressed and "off" will be shown when the button is released. Press "Ctrl" + "C" to stop the example.

2.4 Example 3: Record Audio with the Microphone

This example shows how to record audio with the microphones on this HAT to a file named“output.wav”under the same folder. You can change the recording parameters by modifying the source code. Execute the following command to record audio:

```
debian@transforma: /usr/local/lib/python3.11/dist-packages/mic_hat$ sudo python3 recording_
examples/record.py

Cannot connect to server socket err = No such file or directory
Cannot connect to server request channel
jack server is not running or cannot be started
JackShmReadWritePtr::~JackShmReadWritePtr - Init not done for -1, skipping unlock
JackShmReadWritePtr::~JackShmReadWritePtr - Init not done for -1, skipping unlock
* recording
* done recording
debian@transforma:/usr/local/lib/python3.11/dist-packages/mic_hat$
```

2.5 Example 4: Playback Audio

This example shows how to play a WAV audio file and output through the headphone jack on the HAT. You can use it to check the audio recorded in the example shown above.

Execute the following command to check audio output from the headphone jack on the HAT.

```
debian@transforma: /usr/local/lib/python3.11/dist-packages/mic_hat$ sudo python3 recording_
examples/play.py output.wav

Cannot connect to server socket err = No such file or directory
Cannot connect to server request channel
jack server is not running or cannot be started
JackShmReadWritePtr::~JackShmReadWritePtr - Init not done for -1, skipping unlock
JackShmReadWritePtr::~JackShmReadWritePtr - Init not done for -1, skipping unlockdebian@
transforma:/usr/local/lib/python3.11/dist-packages/mic_hat$
```

3. References

Details of this HAT could be acquired from:

https://wiki.seeedstudio.com/ReSpeaker_2_Mics_Pi_HAT/

https://pinout.xyz/pinout/respeaker_2_mics_phat

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