Raspberry Pi 5 + ReSpeaker 4-Mic Array Setup Guide

Prepared for Raspberry Pi 5 + Bookworm OS

✓ Overview

This guide prepares your **Raspberry Pi 5** running **Raspberry Pi OS Bookworm (64-bit)** to fully support the **Seeed Studio ReSpeaker 4-Mic Array HAT**. Includes driver compilation, kernel module loading, ALSA setup, and audio testing.

Prerequisites

- Raspberry Pi 5
- Raspberry Pi OS Bookworm (64-bit)
- ReSpeaker 4-Mic Array HAT
- Internet connection
- Basic terminal familiarity

Step-by-Step Installation

1. Update System

```
sudo apt update && sudo apt full-upgrade -y
sudo reboot
```

Example Output:

```
Get:1 http://archive.raspberrypi.com/debian bookworm InRelease [29.9 kB]
...
Fetched 15.3 MB in 8s (1,912 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
```

2. Enable I2S and I2C

Edit config:

```
sudo nano /boot/firmware/config.txt
```

Add or uncomment:

```
dtparam=i2c_arm=on
dtparam=i2s=on
```

Save → Reboot:

```
sudo reboot
```

3. Install Build Tools

```
sudo apt install -y git bc bison flex libssl-dev gcc make i2c-tools
```

Example Output:

```
The following NEW packages will be installed:
  bc bison flex git i2c-tools libssl-dev ...
0 upgraded, 12 newly installed, 0 to remove
Need to get 12.4 MB of archives.
After this operation, 58.7 MB of additional disk space will be used.
Setting up git (1:2.39.2-1) ...
```

4. Clone Driver (Match Kernel)

Check kernel:

```
uname -r
```

Example Output:

```
6.6.20+rpt-rpi-v8
```

Clone matching branch:

```
git clone -b v6.6 https://github.com/respeaker/seeed-voicecard.git
cd seeed-voicecard
```

Example Output:

```
Cloning into 'seeed-voicecard'...
remote: Enumerating objects: 2145, done.
remote: Total 2145 (delta 0), reused 0 (delta 0), pack-reused 2145
Receiving objects: 100% (2145/2145), 1.23 MiB | 2.1 MiB/s, done.
Resolving deltas: 100% (1203/1203), done.
Note: switching to 'v6.6'.
```

5. Patch for Pi 5

Backup:

```
cp install.sh install.sh.bak
```

Edit:

```
nano install.sh
```

Locate the `case "$model"` section and add:

```
"Raspberry Pi 5 Model B Rev"*)
    BOARD=pi5
    ;;
```

Tip: Confirm your Pi model string first:

```
cat /proc/device-tree/model
```

Example Output:

```
Raspberry Pi 5 Model B Rev 1.0
```

6. Run Installer

```
sudo ./install.sh
sudo reboot
```

Example Success Output:

```
================================================
Install seeed-voicecard drivers for pi5 board
================================================
```

```
...
make[1]: Leaving directory '/usr/src/linux-headers-6.6.20+rpt-rpi-v8'
Install success!
Please reboot your raspberry pi to apply all settings.
Enjoy!
```

✓ Look for: `Install success!`

7. Connect HAT and Reboot

1. Power off: `sudo poweroff`
2. Attach HAT to GPIO header
3. Power on the Pi

Post-Install Verification

A. Check Overlay Loaded

```
dtoverlay -l
```

Expected Output:

```
0: seeed-4mic-voicecard
```

B. Check I2C Devices

```
sudo i2cdetect -y 1
```

Expected Output:

```
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- 1a -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- 3a -- -- -- -- --
...
```

Addresses: `1a` = WM8960, `3a` or `3b` = AC108

C. Check ALSA Capture Device

```
arecord -l
```

Expected Output:

```
**** List of CAPTURE Hardware Devices ****
card 2: seeed4micvoicec [seeed-4mic-voicecard], device 0: bcm2835-i2s-ac108
    ↪ -codec0 ac108-hifi-0 []
  Subdevices: 1/1
  Subdevice #0: subdevice #0
```

D. Check Kernel Modules Loaded

```
lsmod | grep -E "(ac108|wm8960)"
```

Expected Output:

```
snd_soc_ac108           20480  1
snd_soc_wm8960          28672  2
```

E. Check Kernel Logs

```
dmesg | grep -i "ac108\|wm8960"
```

Expected Output:

```
[    5.123456] ac108 1-003a: AC108 detected at address 0x3a
[    5.234567] wm8960 1-001a: wm8960 found at address 0x1a
[    5.345678] seeed-voicecard soc:sound: seeed_audio_card initialized
```

Record and Playback Test

Record 5 seconds of 4-channel audio:

```
arecord -D plughw:seeed4micvoicec,0 -f S32_LE -r 16000 -c 4 -d 5 test.wav
```

Expected Output:

```
Recording WAVE 'test.wav' : Signed 32 bit Little Endian, Rate 16000 Hz,
    ↪ Channels 4
##### (silence while recording) #####
^C Aborted by signal Interrupt...
```

Playback via HAT (if headphones/speakers connected):

```
aplay -D hw:seeed4micvoicec,0 test.wav
```

Or via system default (HDMI/analog):

```
aplay test.wav
```

Troubleshooting

"Device or resource busy" → PipeWire/PulseAudio is locking the device.

Fix: Use plughw: prefix (already shown above) or temporarily stop audio servers:

```
systemctl --user stop pipewire pipewire-pulse
```

No sound? → Check mixer levels:

```
alsamixer -c 2   # Use card number from arecord -l
```

→ Press **F6**, select `seeed-4mic-voicecard`, adjust "Mic" and "Speaker" volumes with arrow keys.

✓ DONE! Your Pi 5 is now fully controlling the ReSpeaker 4-Mic Array.