Internet radio: How to connect I2S DAC to Raspberry Pi

To build your DIY internet radio, you connect Raspberry Pi to some DAC (digital - analog converter) and add any audio speakers with amplifier. To play music use any ‘headless’ music player you like (volumio (https://volumio.org/), rune audio, max2play etc). You control this players from your phone, so no need in any knobs on the intenet radio box, you can hide it somewhere.

You need DAC because Raspberry Pi has very poor sound quality from integrated 3.5mm headphones jack.

Alternative if you do not want to mess with I2S DAC

You can use any HDMI-Video/audio adapter (search on aliexpress (https://www.aliexpress.com) for “hdmi rca”. This is a small box with HDMI input and RCA output (yellow for video, red and white for audio). With HDMI cable this is the same money as I2S DAC.

In this case you connect Raspberry Pi HDMI to this adapter and select in your music player to output sound to HDMI.

I2S DAC PCM5102 on aliexpress

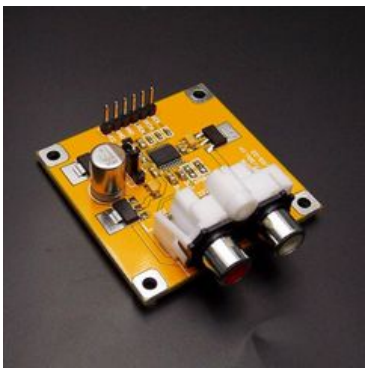
Search on aliexpress (https://www.aliexpress.com) for “Raspberry Pi PCM5102”.

Of cause you can buy HiFiBerry (https://www.hifiberry.com/) for $35. But aliexpress models four(!) times cheaper.

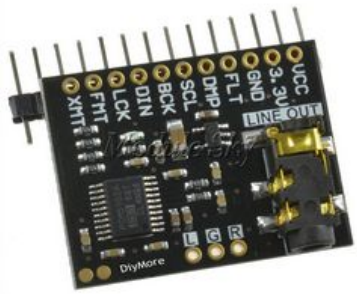
PCM5102 vs PCM5122

Chinese boards are based on the same IC (PCM5102) as early HiFiBerry (`DAC`). New HiFiBerry (`DAC+`) is based on PCM5122 the main difference in witch is hardware volume control. If you control volume from your amplifier (the best for sound quality) you do not need the option. If you want to control volume from your volumio or other music player you can switch on `software volume control` . In theory this is bad for sound quality but in practice I do not think you will see the difference.

RCA



3.5mm headphones jack



Sellers claim that this is Raspberry Pi HAT extensions, but that is not true. You connect them to HAT socket on Raspberry Pi, but you need some wiring, you cannot just insert them as HiFiBerry.

Raspberry Pi A/B

On the very early Raspberry Pi version the pins that you need to connect I2S DAC were somethere on the board, but not in any socket. I do not think that you have such an old board so below I describe more modern ones.

Raspbery Pi before "+" version has the pins on 8-pins `P5` socket, which is below main HAT 26-pins socket `P1`.

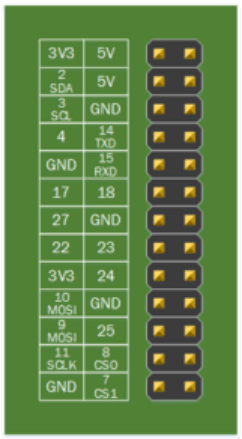
In many cases you have to solder `P5` for yourself: video from HiFiBerry (https://www.hifiberry.com/solder-the-p5-header-to-your-raspberry-pi-model-ab/).

Take into account that it is supposed to be soldered on back side of the board (in the video above they solder it on opposite front side). Because of that odd/even pins in `P5` is opposite as in `P1`. You can check youself - on `P5-1` pin should be 5v, on `P5-2` 3.3v, and last pins of `P5`, `P5-7` & `P5-8` are ground.

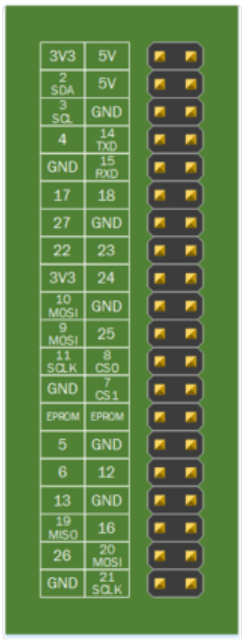
Raspberry Pi A+/B+, Raspberry Pi 2, Raspberry Pi 3, Raspberry Pi Zero

All pins you need for I2S DAC are in main 40-pins HAT socket. It's name now `J8` and it consists of all 26 pins from old `P1`, and additional pins.

Models A & B



Models A+, B+ & Pi2



How to connect I2S DAC to Raspberry Pi

1st DAC version (with fewer pins):

DAC	Pi A/B	Pi A+/B+, Pi2, Pi3, PiZ	PCM5102
Vcc (+5v)	P5-1	J8-2	
+3.3v (not used, just to check youself)	P5-2	J8-1	
BCK	P5-3	J8-12	Audio data bit clock input
LRCK(LCK)	P5-4	J8-35	Audio data word clock input
DATA(DIN)	P5-6	J8-40	Audio data input
Gnd	P5-7	J8-39	

In the board description aliexpress seller wrote that BCK & DATA marked inverse. But in fact I connected them as marked (BCK is the last pin in DAC's socket) and everything works fine.

2nd DAC:

Connect additional pins as:

DAC	Pi A/B	Pi A+/B+, Pi2, Pi3, PiZ	PCM5102

DAC	Pi A/B	Pi A+/B+, Pi2, Pi3, PiZ	PCM5102
GND	P1-6	J8-6	
FLT (gnd)	P1-14	J8-14	Filter select : Normal latency (Low) / Low latency (High)
DMP (gnd)	P5-8	J8-20	?De-emphasis control for 44.1kHz sampling rate(1): Off (Low) / On (High)
SCL	P1-5	J8-5	?System clock input
FMT (gnd)	P1-18	J8-18	Audio format selection : I2S (Low) / Left justified (High)
XMT (3.3v)	P1-1	J8-1	

If you want here is all pins description: RPi Low-level peripherals (http://elinux.org/RPi_Low-level_peripherals).

PCM5102 datasheet (/files/pcm5102.pdf)

How to setup I2S DAC in Volumio

- Open volumio web-interface - if you have only one volumio in your network you can use http://volumio.local (http://volumio.local)
- Press on cog on the top right corner of volumio window
- Select `Playback` menu item
- Switch on I2S DAC and for I2S driver select `Generic I2S DAC`
- Press `Apply`
- Volumio ask to reboot raspberry pi - answer yes

Written on April 30, 2017

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2017.12.13 08:24

JB Marce
In case of SCL change to pin 5 and everything else equal also works. Do not forget to put Vcc to 5V but the card is not activated.

2017.12.28 22:12

M-H
Thanks! just completed the setup of this one : https://www.aliexpress.com/item/1PCS-Interface-I2S-PCM5102-DAC-Decoder-GY-PCM5102-I2S-Player-Module-For-Raspberry-Pi/32840255905.html?spm=a2g0s.9042311.0.0.lBPM3m, based on your info. Just a tip, mine needed XSMT to be connected to 3.3 volts at power on tpo enable sound. Setup in PCP is through generic 5102 driver provided in image.

(mailto:anso@mail.ru) (https://github.com/masterandrey) (https://www.linkedin.com /in/masterandrey) (https://www.twitter.com/andreyamoney) (http://stackoverflow.com/users/4790975 /masterandrey) (https://github.com/masterandrey/masterandrey.com)
