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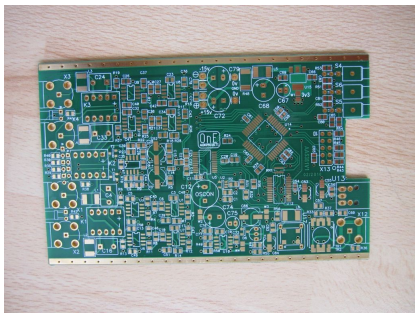
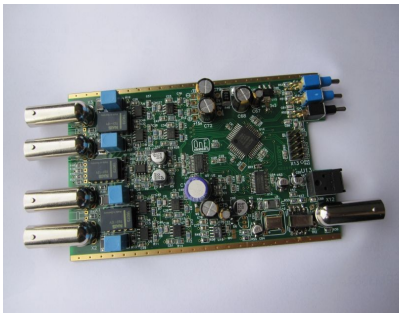
How to use the AA5381 ADC.


First, what is it ?

The AA5381 ADC is a high- performances stand alone analog to digital converter, using a flagship CS5381 IC from Cirrus Logic.

What does it do ?

I have designed it as a lab tool, to do very accurate measurements in the range of audio frequency. Using it with one of many available audio analysis software, you can get an extremely powerfull audio tool that can rival with ten'th thousands USD stand-alone analyzers.

But, a sound-card input does same ?

Yes...But, not.
The AA5381 design has some big advantages :

- ✔ Fully isolated design, preventing any ground loop issue.
- ✔ External shielded enclosure with high EMC immunity.
- ✔ Easy measurement connexions with BNC connectors.
- ✔ High-performance ADC IC (CS5381) with state of the art design.
- ✔ Differential or single-ended inputs.
- ✔ Ultra-low noise high impedance input buffer.
- ✔ +/- 10V full-scale input sensitivity.
- ✔ Bandwidth measurements extend from DC to Fs/2

1. General Specifications.

- *2 analog inputs*
- *48k, 96k or 192kHz sampling rates.*
- *+/- 10Vpeak full scale input (7.07Vrms).*
- *24 bits digital conversion*
- *differential or single-ended inputs.*
- *overload detection for each channel*
- *DC or AC input coupling.*
- *DC calibration at startup and manually.*
- *high input impedance (1Mohms)*
- *need +/-12 to +/-15Vdc power supply.*
- *SPDIF digital isolated outputs, optical (TOSLINK) and coaxial (RCA).*
- *Analog & digital high-pass filter (HPF).*
- *Offset calibration.*
- *Very compact design 78 x 27 x155 mm max.*

2. Requirements.

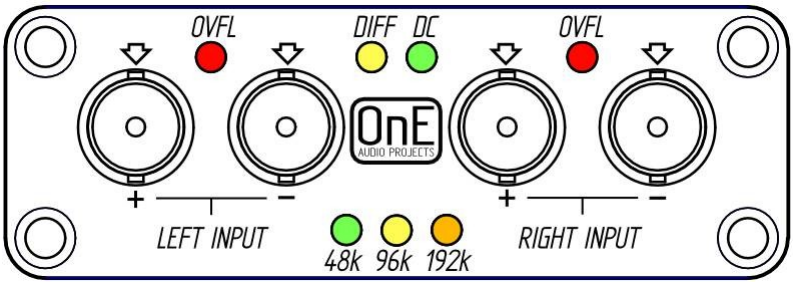
To operate, the AA5381v1 must be supplied with +/12V to +/-15VDC (regulated).
For the best performances, the regulated DC power supply must have low noise and low output impedance.
(for example JSR06 or SSR01-02 from P.Sjostrom).

Two digital outputs are available at rear of the AA5381v1.
One optical (TOSLINK) and one coaxial with BNC connector (75 Ohms).
Each of these connection is fully isolated from the AA5381.(optically or by transformer).

In order to perform any treatment of the digital SPDIF stream, you need to send data to a computer.
For that, you can use a PC sound card with digital INPUT, optical or coaxial.
Be careful when you choose the sound card, not all of them allow high sampling rate as 96k and 192kHz !

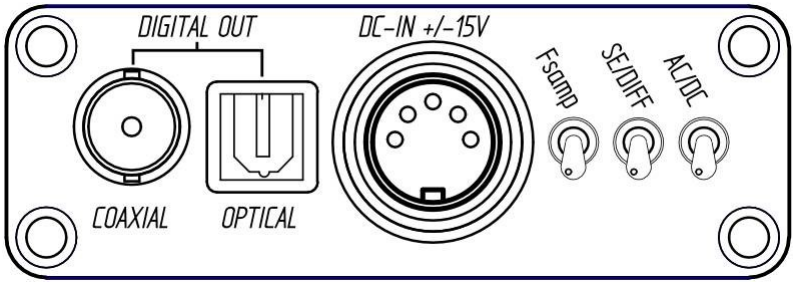
For operation up to 192kHz, i recommend the Juli@ from ESI.
It allows operation at any sampling rate and its drivers are very stable.
Therfore, this sound card works on Linux computer.
It's a PCI sound card, and It costs about 90€. Many info about it ares available on Internet.
Any sound card can do the job if it has a digital input supporting what sampling rate you want use.

3. Front panel.



- **"OVFL"** Red leds indicate for each channel an overflow condition.
  (It is the state when input voltage saturates the ADC, input voltage is too high).
- **"DIFF"** yellow led indicates if the input is in a single-ended or differential mode.
  on = differential , off = single-ended.
- **"DC"** green led indicates if input coupling is in AC or DC mode.
  on = DC , off = AC.
- **"48k/96/192k"** leds. indicates which sampling rate is selected by the rear switch.
- **"LEFT and RIGHT INPUT"** , The 4 BNC input connectors.
  Two BNC are used for each input, because it allows connection in full differential mode.
  In differential mode ("DIFF"=on), each center connection of the two BNC is the hot signal (+in / -in),
  and the shielding of each BNC is the ground (0v).
  In single ended mode("DIFF"=off), the center connection of the BNC**+** is the hot signal +in,
  and the shielding of BNC**+** is the ground (0v).In this mode nothing must be connected to the BNC**- .**

4. Rear panel.



- **"DC-IN +/-15V"**, is the main power supply input connector.
  A +/-15V with about +300mA/-100mA low noise PSU is needed.
- **"DIGITAL OUT - COAXIAL",** is the SPDIF digital output on BNC coaxial connector.
  Impedance is 75 Ohms and it is transformer isolated from the ADC.
  NOTE :Use only BNC câble when you use this output.(Don't use an audio analog cable with RCA connectors , it's not inteded for high speed digital signal !)
- **"DIGITAL OUT - OPTICAL",** is the SPDIF digital output on TOSLINK optical connector.
  For high sampling rate operation, a short and good optical cable is highly recommended.
- **"Fsamp"** tri-positions stable switch. This switch allow to select sampling rate:
  The positions are : down=48kHz, middle =96kHz, up=192kHz
- **"SE/DIFF"** 2 positions astable switch. Toggle it to select single-ended or differential mode.
  (It's state can be read on the front panel “DIFF” yellow led)
- **"AC/DC"** 2 position astable switch. This toggle switch allow to select the coupling mode and the digital high-pass filter operation. The AC or DC coupling state can be read on the front panel "dc" green led. (For detailed operation, please read next chapter "Others functions" below.)

5. Others functions.

5.1 DC calibration

At each startup, the AA5381v1 perform a DC calibration.
The OVFL and sampling rate leds are blinking during this process. It takes about 5 seconds.

The DC calibration can be performed also manually at any time.
To run DC calibration, toggle switch SE/DIFF and AC/DC at the same time.

In DC coupling mode, because calibration process set the input offset voltage on ADC input as the "0" level , it is important to disconnect all inputs of the ADC during calibration process.

5.2 Digital high-pass filter operation

The toggle switch AC/DC has many different functions.
At startup, the AA5381v1 is in DC mode state (led "DC" on).
When you toggle the switch, you pass through those steps :

- Initial startup = Digital high-pass filter is OFF- led "DC" is ON – This is the real full DC mode !
- 1st toggle = Digital high-pass filter is ON - led "DC" is ON -- Only digital HPF ON, it's an AC mode !
- 2nd toggle = Digital high-pass filter is OFF- led "DC" is OFF-- Passive HPF mode.
- 3th toggle = return to initial startup state.

You must understand that in "AC" mode a C/R derivator at the input adds a passive high-pass filter with cutoff frequency of about 0.1Hz.(for 1Mohms +1uF at inputs)
In "DC" mode (led DC on), this filter is bypassed by a relay.

The digital high-pass filter of the ADC allow to suppress all DC signal from the whole signal chain.
Of course, no DC measurements can be done when HPF is active !

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