

Disclaimer, these are my notes whilst building the DSC3 board. The information provided in this note is only one way to assemble/test and put in operation the DSC3 board. You might have a better way. This is not advice on what you should do please use caution and mind any safety implications that might arise. Most of the information contained in this file are not original content but merely copied/pasted from the DSC forum or the audiodesignguide website (apologies will not refer/clarify all the specific instances in the note to keep my workload low).

I decided to write this guide to give some idea of what the process of building the card might look like because the lack of a guide has been the single most difficult barrier for me in the realisation of the DSC3 so I wanted to make this easier for the next person to build this beautifully sounding DAC as well as for record keeping.

Some of the information in this note might be obvious to you. In that case you know more than I do :)

MANUFACTURING/TESTING

Design Files:

Gerbers in post #2,090

<https://www.diyaudio.com/community/threads/signalyst-dsc1.254935/page-105>

BOM Rev 2 in post #2,114

<https://www.diyaudio.com/community/threads/signalyst-dsc1.254935/page-106>

PCB manufacturing:

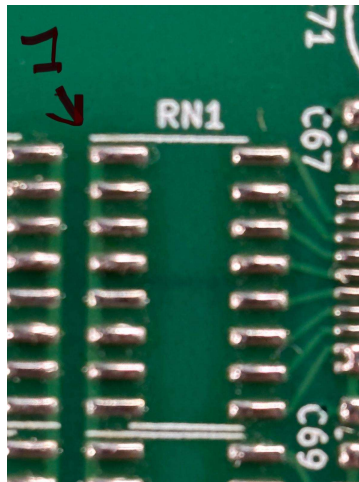
- Use your favourite PCB Manufacturing house, I use JLC PCB but you don't have to
- Use the copper thickness/surface finish you prefer. I am usually fine with standard 1.6mm FR-4, 1oz copper weight and HASL but you might want to go for something else.
- A solder paste stencil if you want to paste the board (only front side, there is only a switch in the back, easy to solder by hand)

Component Purchase:

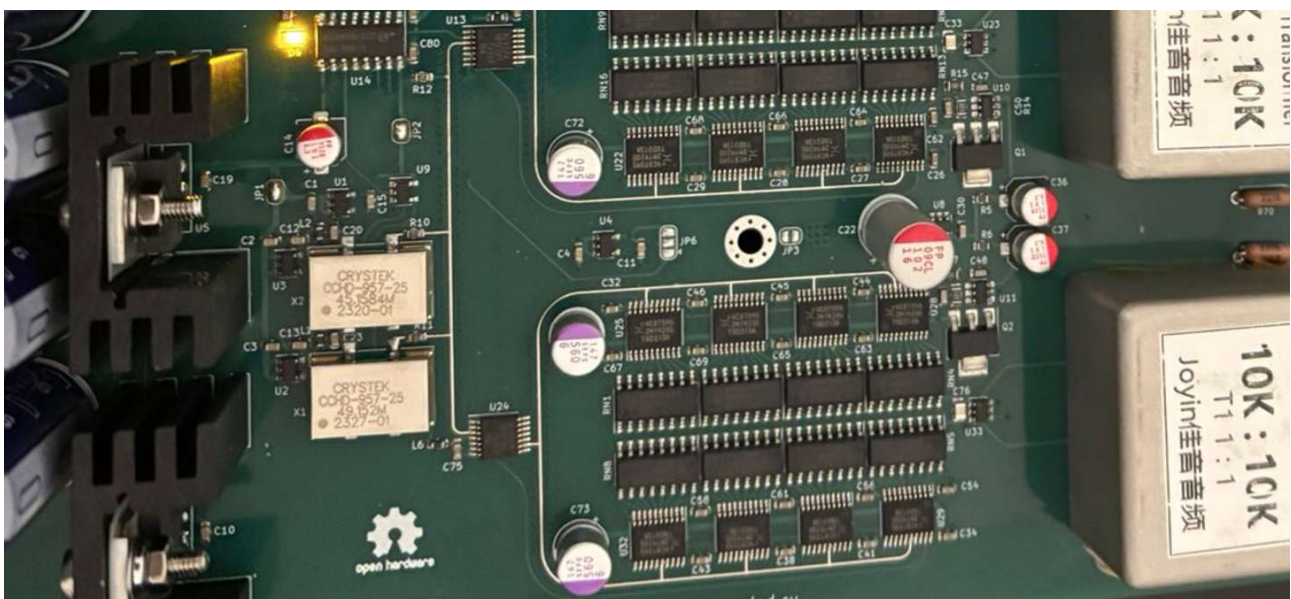
- I bought the components from Mouser. For cheap small components please purchase a few more, it is very easy for some of those components to fly away never to be seen again, especially if they are really small and you are using tweezers to position them. I bought a few more additional SMD capacitors/resistors as those have the highest "fly factor".
- Use the Rev 2 BOM
- Relays K1/K2 seem to be the wrong type to me. I believe that they should be IM03TS non latching (instead of IM43TS latching) – that is unless I am missing something.

SMD Component Positioning:

- I pasted the board with 63/37 solder paste (Qualitek DSP 619D) to keep the joint strong whilst having a low melting point, mind that leaded products are poisonous so use the appropriate handling precautions. Stencil positioning is a little bit of a faff but really important.
- I then positioned the component, use tweezer/pixel pump/Pick and place machine, whatever you fancy or most likely have access to. Note that the paste “abandon time” is about 4 hour. The longer you leave the paste on the PCB the more the solder paste will dry and will make it difficult to “stick” the components on the board so this is not a start/stop kind of job.
- Given that there is not a lot of time for positioning components, I would advise that you have all of the assembly components ordered and ready to go. I numbered all of the bags (using the BOM ref. no) and then order them in a box.
- Make sure that you understand positioning of the ICs before you start. Each IC has a PIN 1 designation. Pin 1 is also designated on the board (silkscreen line extends in front of PIN 1 (see picture below)).



- Some ICs are really small, make sure that you have a microscope/magnifying glass to be able to see the pin 1 marking!
- Crystals are positioned like this (position them the right way up):



- Then I used a re-flow oven to solder the board. After a PCB inspection I realised that there were no tombstoned components or solder bridges. Success! You might be less lucky and some rework might be required, such is life.
- you might want to solder the components with a different method, this is perfectly fine, some alternative methods that spring to mind are with a hot plate or an old fashion soldering iron and a lot of flux. Some of the packages have pins very close together, it is very easy to create solder bridges, just be aware.

Through-hole components:

- I generally go shorter first and then taller.
- No need to isolate U5/U6 from the heat sink. Use either thermal compound or a thermal pad.
- There is a small mechanical interference issue between T1 and R71 if both are mounted from the top. I used kapton tape to isolate the transformer metal can and moved the resistor as further away from the can as I could. It is probably better to mount the resistors on the bottom of the board.

Cleaning the PCB:

You can do as you prefer here. I did not clean the PCB because I was worried that the ultrasonic bath would damage the crystals/oscillators. I did not feel like washing the PCB with IPA because I could not be excited about it (IPA smells a lot and my lab is small).

Testing the PCB:

A multimeter is essential, an oscilloscope is highly recommended (especially for troubleshooting).

After board assembly check the following:

- Do a visual inspection! Again a microscope might help here. I also checked that the joints were "SOLID".
- Do not connect the Amanero or the Beaglebone boards to start off
- Suggest to connect a current limited DC PSU to 1~ 1~ (14V DC about 300mA current limit or even less)
- Check 5V
- Suggest to connect a current limited DC PSU to 2~ 2~ (14V DC about 300mA current limit or even less) use a different PSU channel to keep the grounds isolated
- Check +5(r)
- Check +5(l)
- Check +3.3(b)
- Remove power to board
- Solder JP1 (if not done so already). Provides the supply to the final 3.3V LDO as well as the LDOs supplying the clock generators
- Solder JP2 (if not done so already)
- Provide power to board
- Check 3.3(a)
- Check the clock from X1 with an oscilloscope
- Not easy to check functioning of X2 at this point so I just checked that the crystal was getting the required supply voltage.

- Either provide 3.3_ (3.3V digital) with a PSU or connect a Beaglebone with onboard LDO and check the supply voltage across C124.

I am sure that more could be checked but at this point I felt confident that the board was ok and there were no major issues with it. Again, please familiarise yourself with the circuit, do not just blindly follow what I am saying, make sure you understand and agree before undertaking any testing.

DSC3 with the Beaglebone board

Download and install software version (v2)

<https://puredsd.ru/> → “Software for new DSC2 and PPY’s ReClocker” section.
<https://puredsd.ru/Pure.gz>

Follow the instruction on the site, but in essence flash the ISO on the SD using balena etcher or similar, insert the SD in the beaglebone and then power the module (NOTE: no need to press S2 as mentioned on the website, this is not required) just make sure that the beaglebone has an active Ethernet cable connected.

Go to <http://pure.local/> In system select SD → eMMC.

Jumpers:

- At this point you have hopefully either removed the output relays K1/K2 and added jumpers on pins 4-3 and 5-6 or you have installed the IM03TS (note that I have not tried this relay at the time of writing). Avoid yourself the trouble going mad because of this ;)

- Something very important to realise is that the MUTE_DSD is logic high when the DSD is not muted and logic low when the DSD is muted. So the LED is only ON when the DSD is NOT muted.

- the Pure manual mentions the following

When working via I2S, it is possible to use two types of mute signal

1. Signal generated by the driver - 27 pin P9
 2. The signal generated by the system based on data from the players and the Alsa subsystem - 28 pin P9.
- Setting in the script /opt/mutedsc2.sh

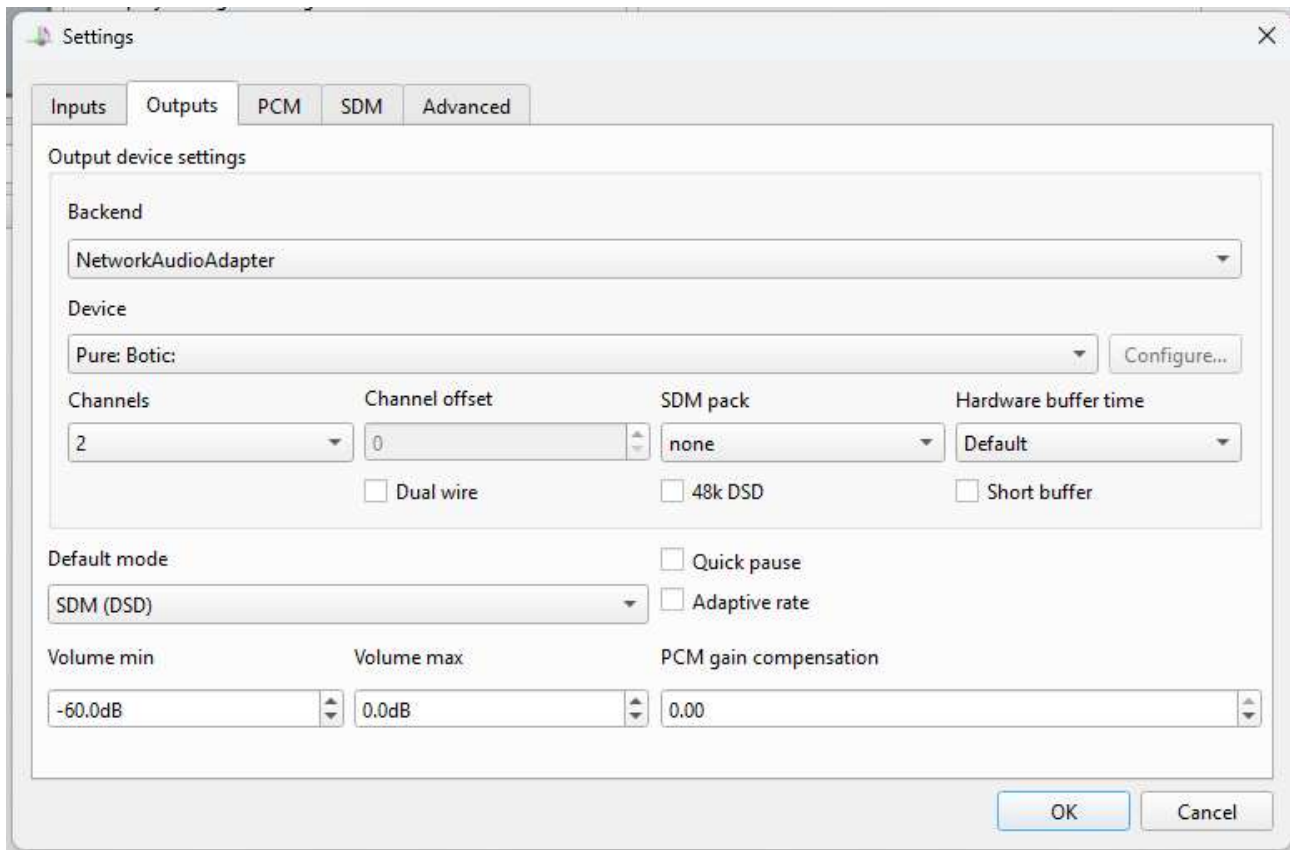
However I ultimately cut the pre-connect JP5 link to P28 (pins 1 and 2) with a knife blade and connected the MUTE circuit to P27 (pin 2 and 3). I am confident that P28 might also work but I found that P27 was working ok for me.

- JP7 has been left as is with the BeagleBone board (this circuit is only relevant to the Amanero board).

- JP6 left untouched.

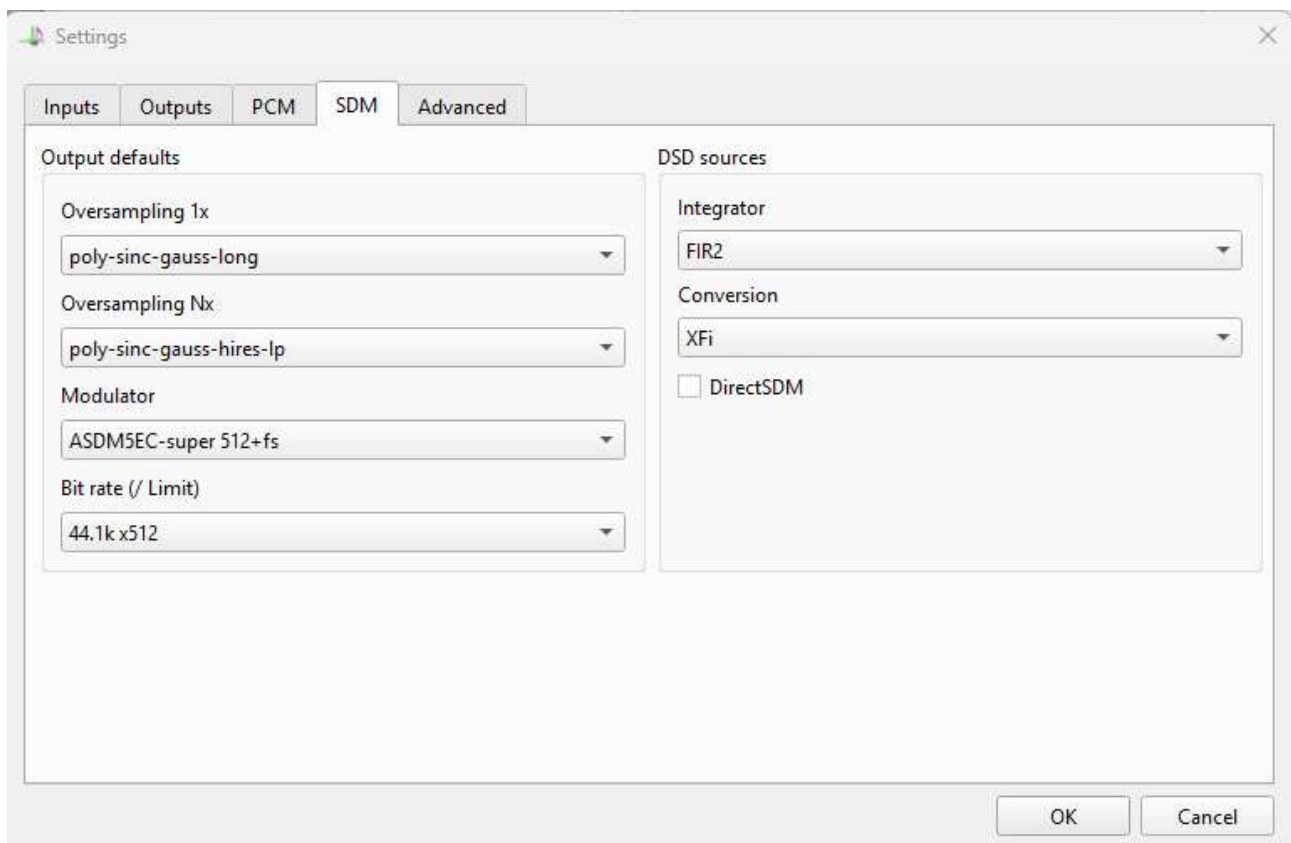
Configuring HQ player:

Files → settings → output



Make sure that Pure Botic is selected as output (i.e. beaglebone board).

- On the SDM tab there are a lot of settings and these are beyond this memo. However modulator set to ASDM5EC – super 512+fs has a better bass than the default value (in my opinion). Also I have set the Bit rate to 512.



DSC3 with the AMANERO Board

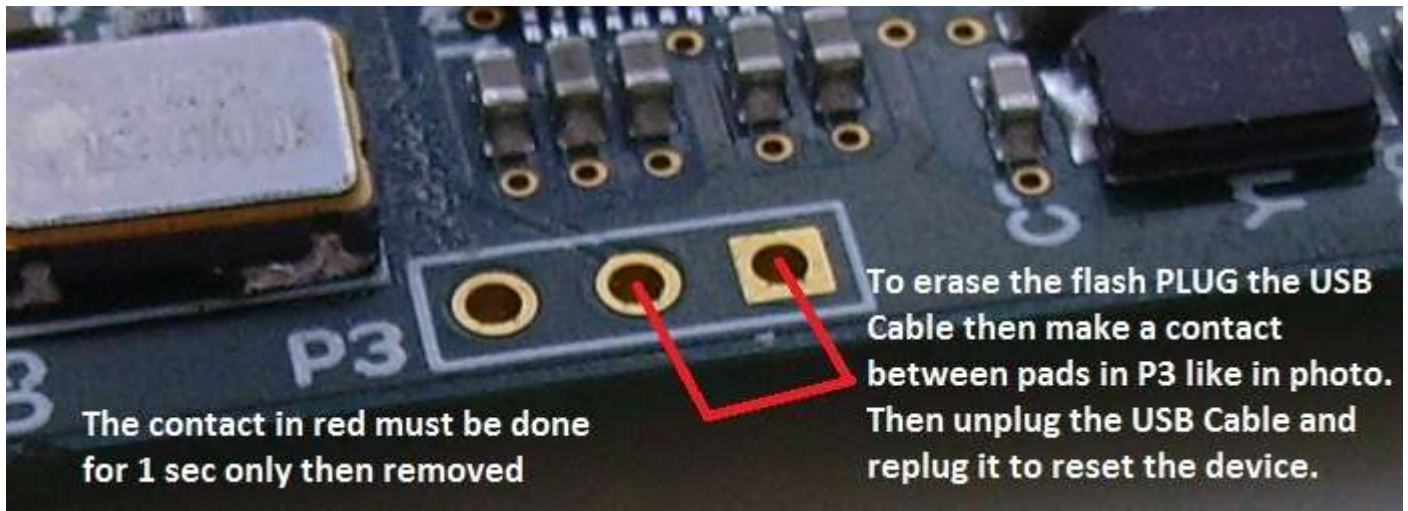
Note I am yet to get the Amanero module working so these instructions are only according to my research, your mileage might vary. Also I only have an original Amanero board so I am not sure how it will work with clones.

Download the update tool

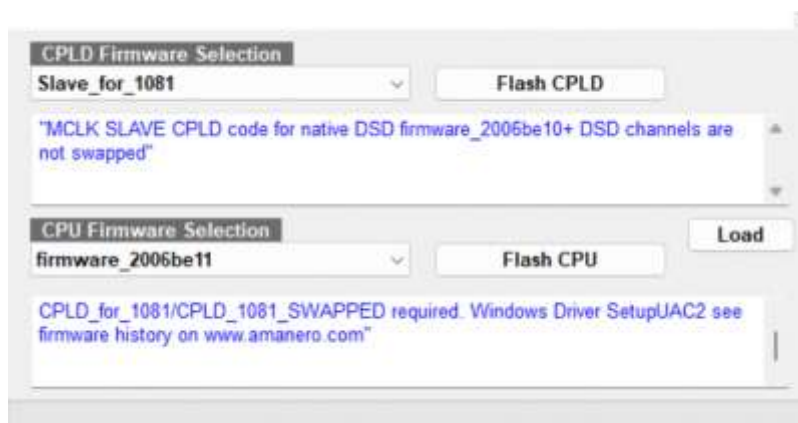
https://www.amanero.com/combo384_firmware.htm

Combo384 firmware history				
CPLD	Remark	CPU	Maintenance tool for options	Recommended
CPLD_for_1080	MCLK Pin6 output 22.5792 MHz / 24.576 MHz - Prescaler -	DSD512x48x44	oem tool 118	Async DAC
Slave_for_1080	MCLK Pin6 Input 22.5792 MHz / 24.576 MHz - Prescaler -	DSD512x48x44	oem tool 118	Async DAC
CPLD_1081 or CPLD_1081_SWAPPEDSD	native DSD512 on Linux/Windows	firmware_2006be11	oem tool 118	Async DAC
native DSD512 Linux/Windows firmware_2006be1x Windows 10 Driver Setupuac2.1.1.0.81 Change Log				
Master2224	MCLK Pin6 output 22.5792 MHz / 24.576 MHz	Firmware 1.074	oem tool 118	Sync DAC
Slave2224	MCLK Pin6 Input 22.5792 MHz / 24.576 MHz	Firmware 1.074	oem tool 118	Sync DAC
MasterDF1706	MCLK variable Pin6 output - 44.1kHz to 96kHz MCLK=11.2896MHz/12.288MHz - 176.4kHz/192kHz MCLK=22.5792MHz/24.576MHz	Firmware 1.074	oem tool 118	Sync DAC
i2s_4ch	I2S 4channels - I2S_DATA=1/2 channels DSDOE=3/4 channels - NoDSD	i2s_4ch	oem tool 118	Async-Sync DAC

Erase the flash – for these steps it is not required to install the Amanero board installed on the DSC3 board.



Update the firmware for the CPLD, and the CPU. If the system tells you that you need to erase the flash when updating the CPU just disconnect the module and re-connect it. NOTE: select Slave for the CPLD as the clock signal is provided by the oscillators on board of the DSC3



Manually change the value in the title box from 071a to 0a23 (edit the box, otherwise it given an error). Then configure the settings as follows (remember slave mode as the card needs the clock from the DSC3 crystals)

The screenshot shows the 'Maintenance tool 1.18' window. At the top, the 'Audio Device' section displays 'vid_16d0&p_d_0a23' (highlighted with a red circle) and 'combo384'. Below this are four tabs: 'Firmware Programming', 'I2C Actions Setup', 'Advanced', and 'Configuration bits'. The 'Configuration bits' tab is active, showing various settings:

- Prescaler:** Radio buttons for MCLK /1, **MCLK /2** (selected), and MCLK /4.
- Word length:** Radio buttons for **32 bit (64fs)** (selected), 24 bit (64fs), and 16 bit (32fs).
- Stream format:** Radio buttons for **I2S** (selected), Left justified, and Right justified.
- Bit Offset:** A text box containing '0'.
- Slave Mode (MCLK Input):** A checked checkbox.
- Pin 1 clock selector Map:** Radio buttons for USB Plugged and **22.5792Mhz selector** (selected).
- Pin 11 clock selector Map:** Radio buttons for **MUTE** (selected) and 24.576 Mhz selector.
- Other options:** PCM Channels SWAP, DSD Channels SWAP, Disable DoP detector, Start up Delay 500 ms, and Enable F0,F1,F2,F3 functions (all unchecked).
- Write Flash:** A button at the bottom right.

MCLK/2 because the DSC on board clock frequencies are double that of the Amanero
Pin 1 needs to be configured to select clock 2 and pin 11 is MUTE.

Install the ASIO drivers on the PC

https://www.amanero.com/combo384_firmware.htm


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native DSD512 Linux/Windows firmware_2006be1x Windows 10 Driver Setuppac2.1.1.0.81 Change Log				
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The boards by default are programmed with CPLD_for_1080 and firmware DSD512x48x44 it requires to download [the main drivers](#)

Open the configurator and select a latency of 15ms

All
Apps
Documents
Email
Web
More
Feedback


Best match


Amanero ASIO
App

Search the web

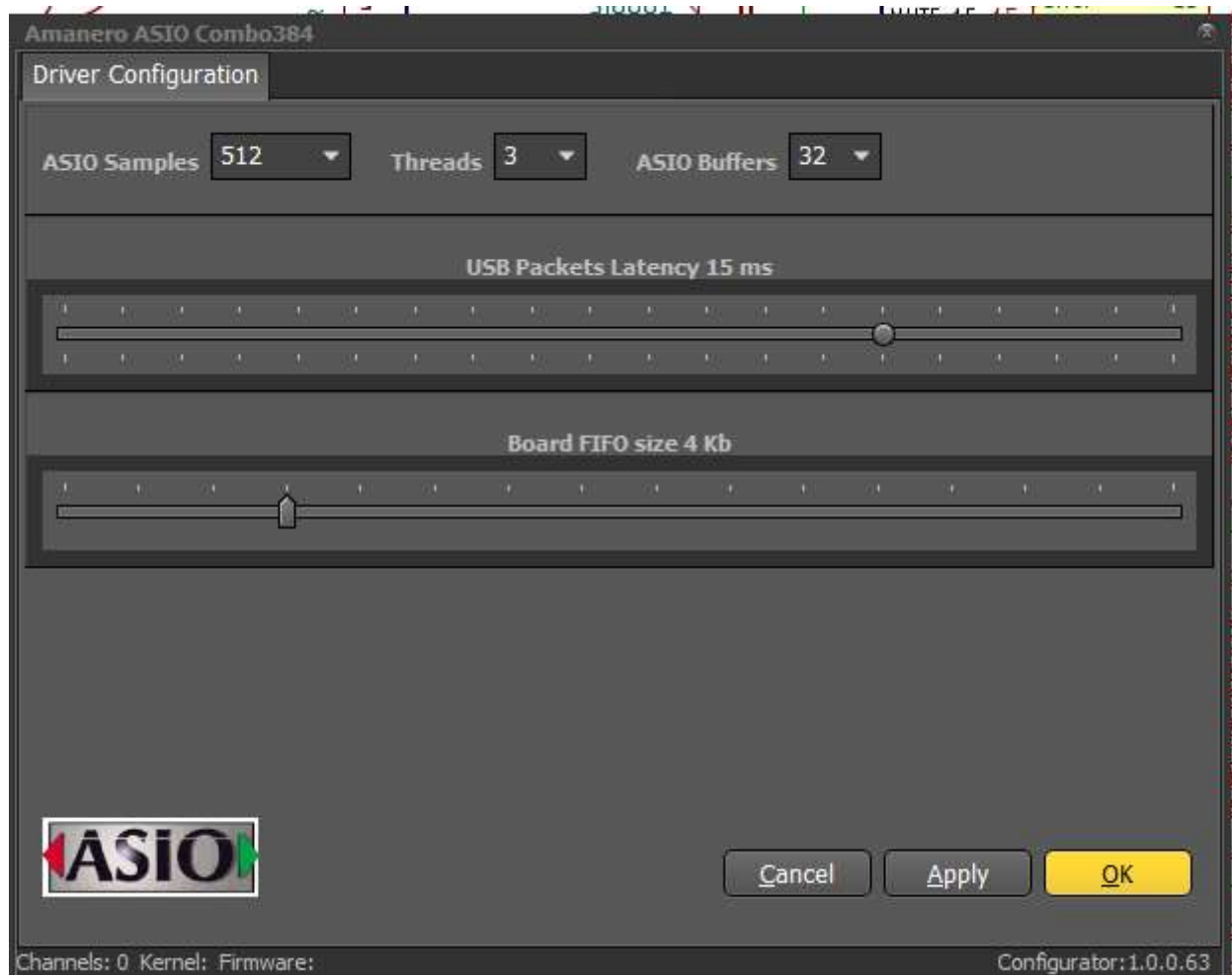
asi - See web results

Documents (6+)


Amanero ASIO
App

Open
Run as administrator
Open file location
Pin to Start
Pin to taskbar
Uninstall

asi



Configure the Jumpers on the DSC3:

- Note: this note assumes that only the Amanero is installed in this configuration.
- Jumper JP4 would need to be soldered so that the Amanero 3.3V LDO provides power to the DSC3 +3.3V_. This is unless an external 3.3V supply is used for the digital circuitry.
- With regards to Jumper JP7 pins 1-2 are connected together by default. This looks ok. Connecting Pins 2-3 together would set MUTE_ to zero when the Amanero board is connected to a USB cable (i.e. 3.3V supply available). Likely both options are equally ok.
- JP6 left untouched.

Troubleshooting:

- If no sounds come out of the Board I would trace back and check that all voltages are available (including +3.3V_)
- Then check that there is a clock signal on "C" (check with oscilloscope, it should be 45.1584 Mhz by default). Also check "MCLK_"
- If this is ok and a signal is being sent the MUTE LED should light up.
- If still no sound check that data is being sent to the DAC. I would start probing pins 12 and 14 of U14 with an oscilloscope (note: use the correct ground reference for the oscilloscope probe i.e. analogue ground)
- Check that "MUTE_SW" is logic "0"
- If all of this looks good then check is there is a signal across R70/R71 (the I to V resistors). If signal is there but not at the output the output relays (if installed) are not working correctly.

- There might be other troubleshooting steps that you might want to take if everything else fails. The advice is to start breaking down the system and verify if each element works to understand where the issue lies.

Enjoy this beautifully sounding DAC. Ivan