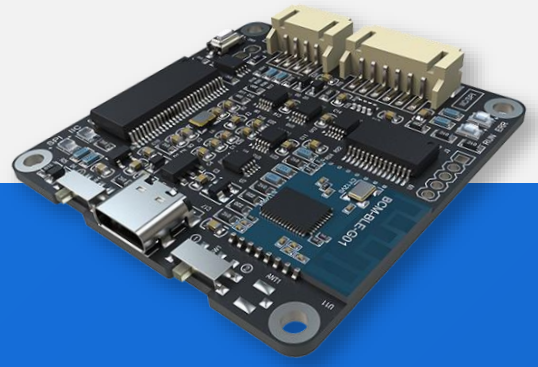
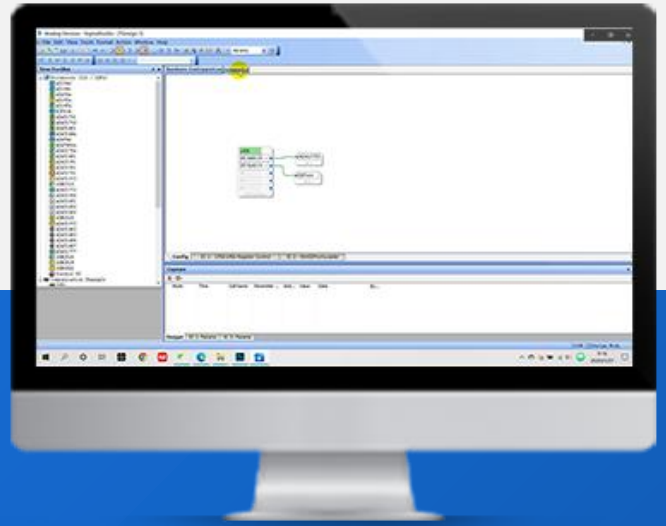
How to Program WONDOM ADAU1701 DSP Unit with SigmaStudio





Before Reading

Powered by ADAU1701 DSP, this preamp unit is an unbalanced 2-in, 4-out digital signal processor with 2-way crossover. To cater to a wide range of audio systems, we have carefully crafted the 4-out section, which consists of two channels dedicated to delivering exceptional bass reproduction, while the remaining two channels handle the mid-range signals. With four potentiometers on the front panel function as HPF/LPF filter and volume, system control is hassle-free.

The purpose of this document is to give you instructions on how to program this DSP unit with SigmaStudio.

SYSTEM CONNECTION

In this part, we will introduce how to achieve SigmaStudio programming of this DSP unit with WONDOM ICP5 step by step.

CORRESPONDENCE

It is essential to know the correspondence relationship between the resources of hardware and ADAU1701 program before you want to re-write the program.

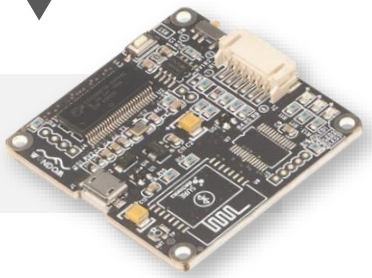
Preparations

We will need the following stuff at hand before we start.

1 AA-AP23123 & ICP5/ICP1

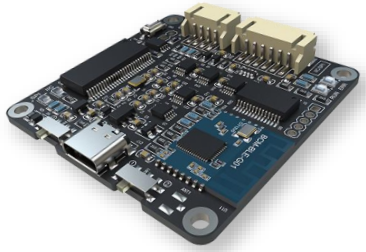
AA-AP23123

ICP1



OR

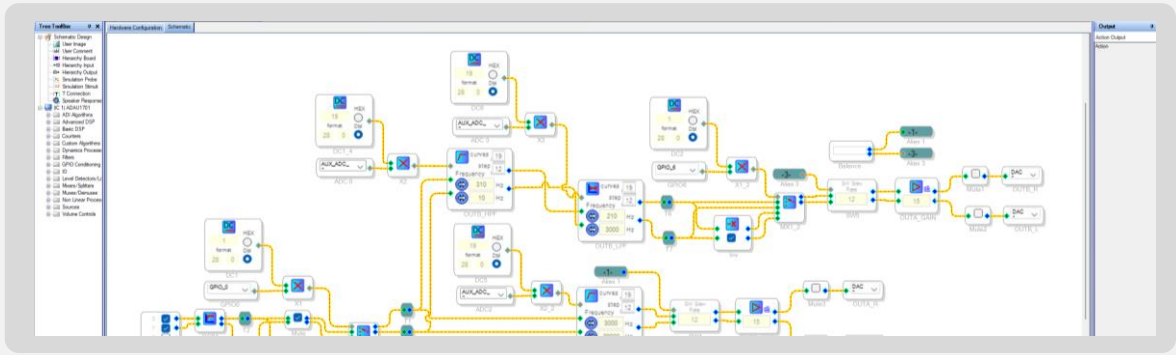
ICP5



2 SigmaStudio Software

Analog Devices, Inc.
SigmaStudio™

3 Demo Program of DSP preamp



You can see the hardware configuration and schematic in the demo program. Click HERE to download.

Programming Steps – Install SigmaStudio

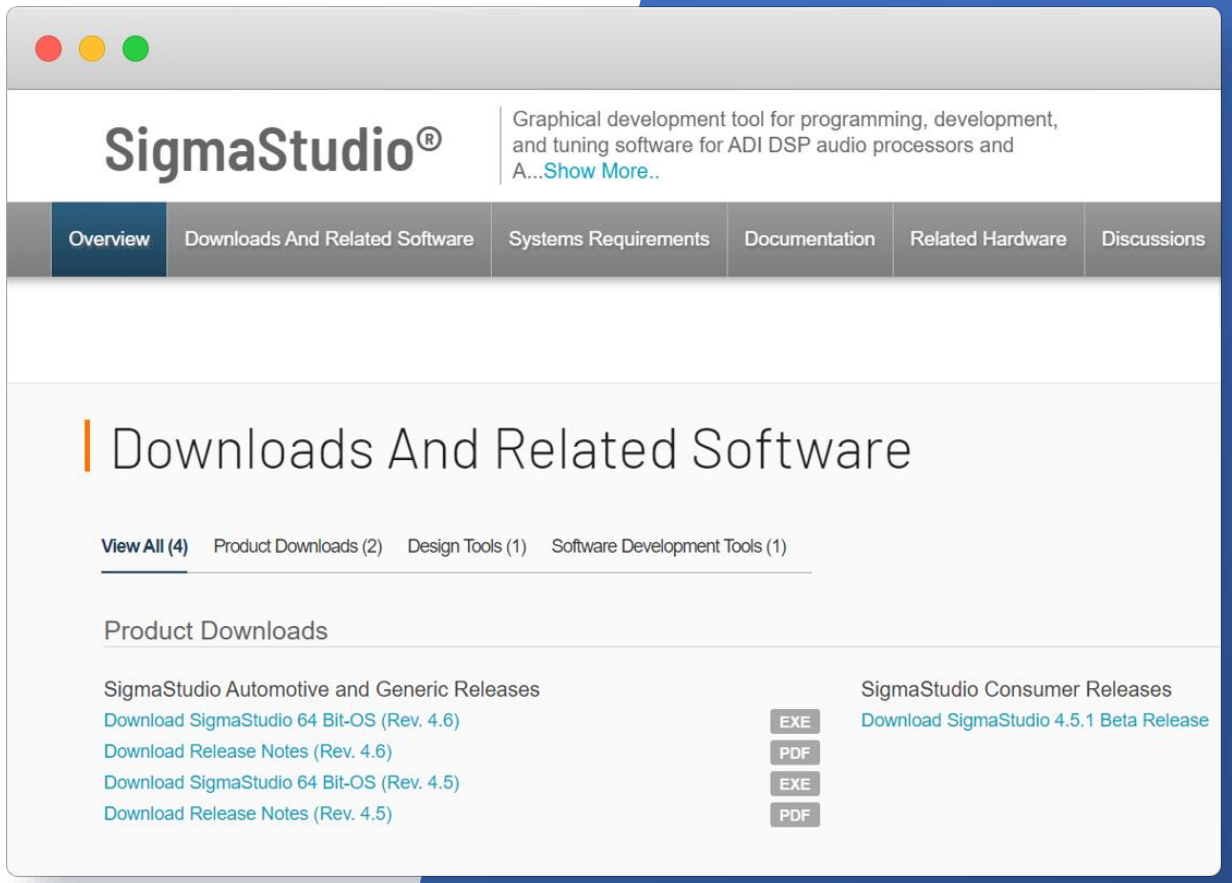
We will use the ICP5 as an example to show you how to achieve SigmaStudio programming function.
The operations for ICP1 is similar.

1.Open the downloaded zip file and extract the files to your computer. Alternately, insert the SigmaStudio CD into the PC optical drive and select the SigmaStudio folder.

https://www.analog.com/en/design-center/evaluation-hardware-and-software/software/ss_sigst_02.html#software-overview

2.Install Microsoft . NET Framework version 2.0, if it has not been previously installed. To do so, double-click “dotnetfx.exe”.

3.Double-click “setup.exe” and following the prompts.



Programming Steps – ICP5 Settings

2. Set Switches on ICP5

Since we want to realize SigmaStudio programming function, we need to set SW1 of ICP5 at ① “USBi” at first.

SW1	MODE	FUNCTION
①	**USBi**	**SigmaStudio Programming**
②	Remote	APP Control / PC UI Control

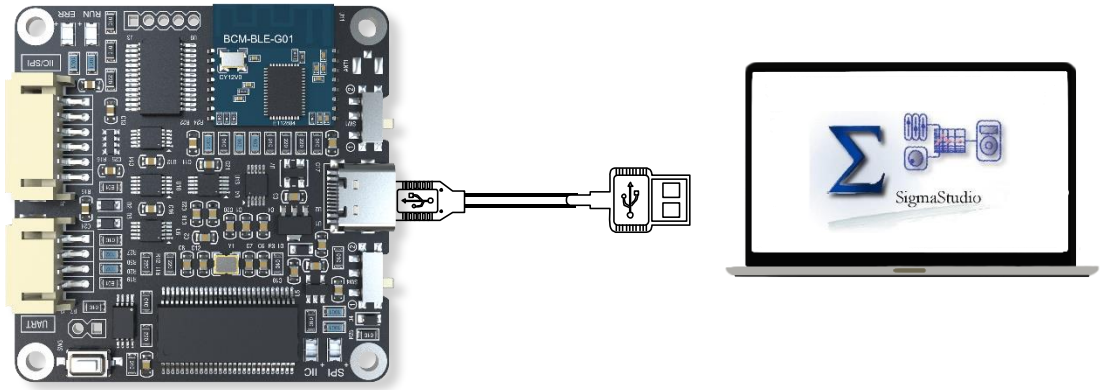
As the DSP chip of the target product is ADAU1701, we need to set SW4 at ② “IIC”.

SW4	MODE	FUNCTION
①	SPI	For WONDOM Products with ADAU1452
②	**IIC**	**For WONDOM Products with ADAU1701**

3. Connect ICP5 to computer

Do not connect ICP5 with target product now.

Connect ICP5 to the computer with a Type-C cable.



After connection, run SigmaStudio software and create a new project.

Programming Steps – ICP5 Settings

3. Check if ICP5 is successfully recognized

Select “USBi” from the list on the left and drag it to the blank area on the right.
Repeat the action to move “ADAU1701” and “E2Prom” to the right. Complete the logic connection.

Then we need to check whether the ICP5 is recognized by the computer.

If the underpainting of the “USB” turns green, it represents the ICP5 is successfully recognized. See figure 1.

If it turns orange, it means ICP5 is not recognized. Please check the switches and reconnect the ICP5 until it turn green.

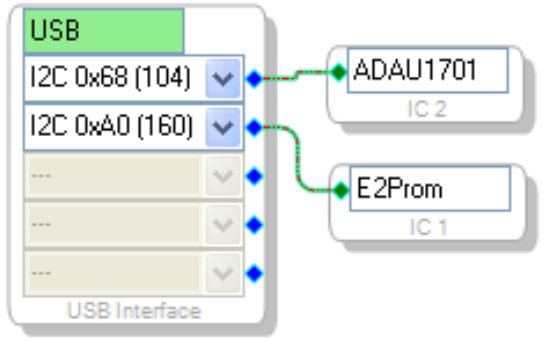
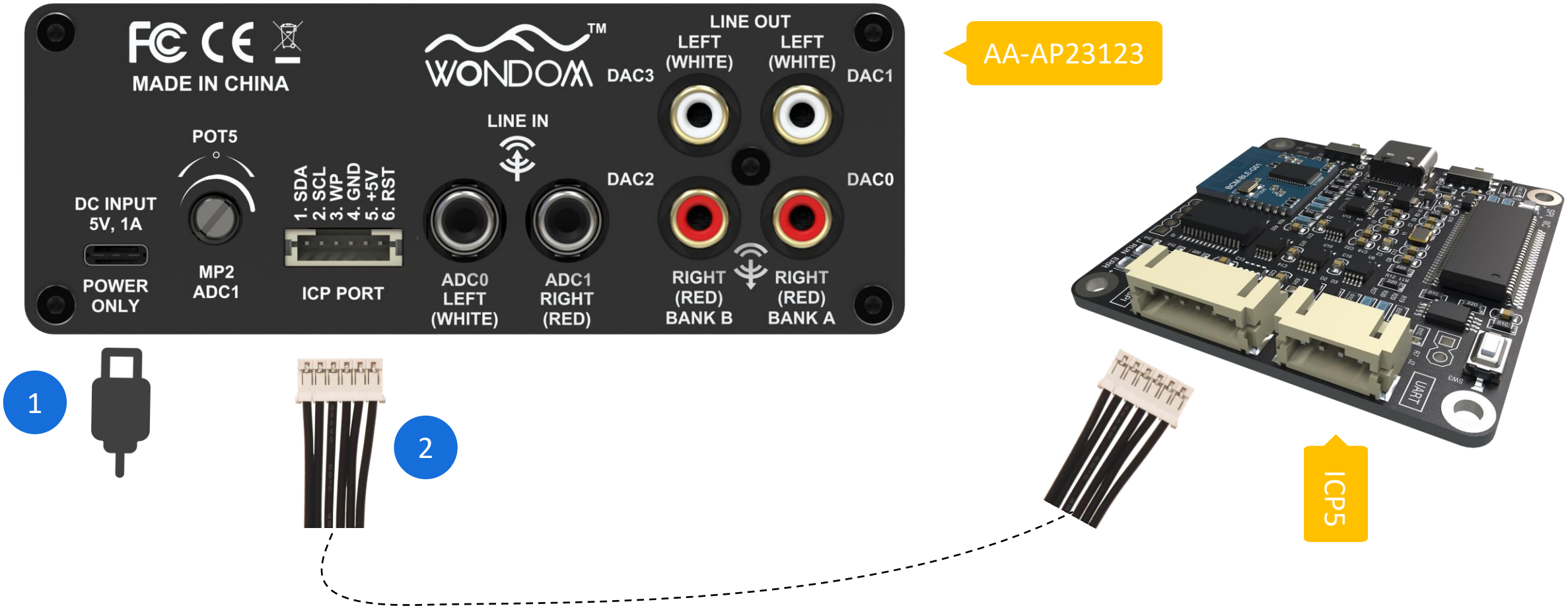


Figure 1

Programming Steps – Connect ICP5 with DSP Unit

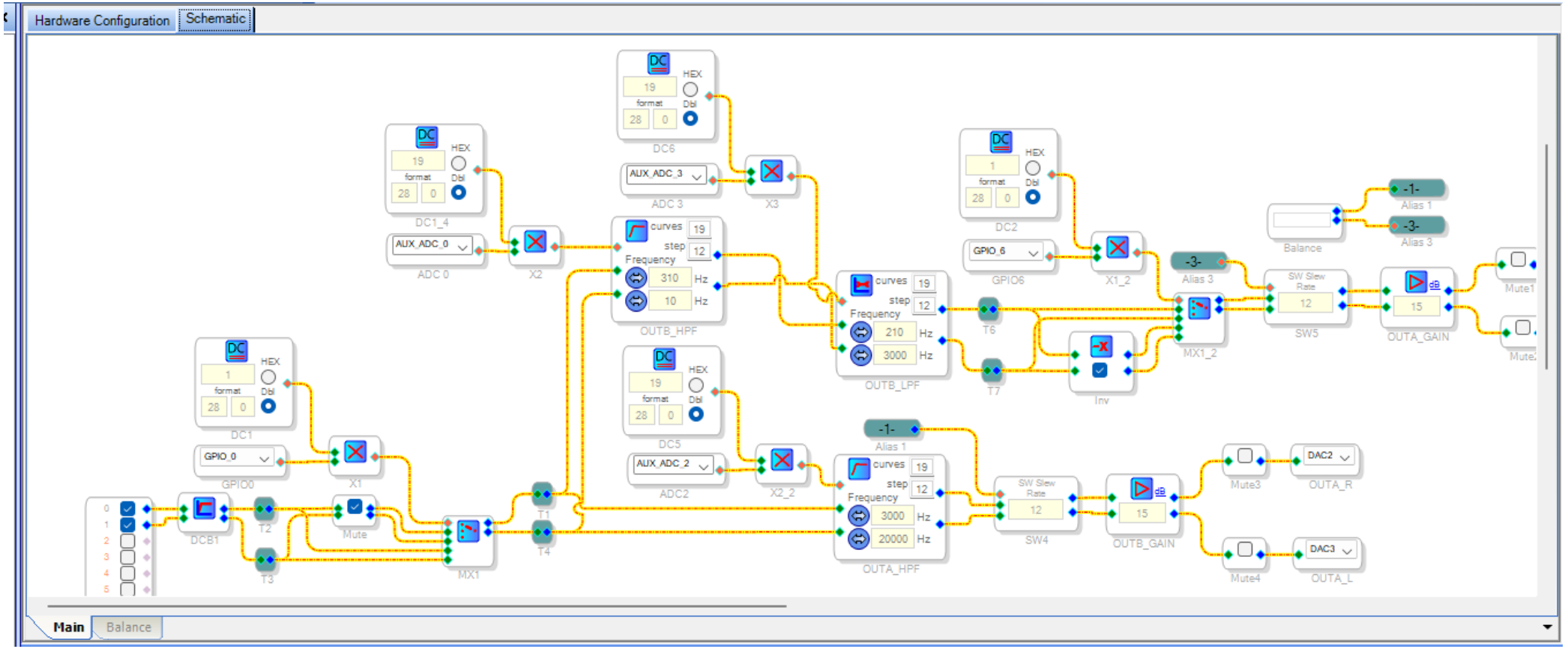
If the ICP5 has been recognized successfully, we can move on to power up the DSP unit and connect ICP5 with the DSP unit.



Programming Steps – Program

Now you can start to write program now. It's highly suggested to program based on the provided Demo program.
Click HERE for the demo program explanation.

Click "File" --> "Open" to open the demo program. If you want to write a new program, choose "New Project". Here is the basic programming guide for your reference.



Programming Steps – Online Debugging

During Programming process, we can make use of online debug mode to observe the effects.

The step is as follows.
- Click “Link Compile Connect” (see figure 2) and you will find “Ready: Compiled” in the lower right corner of your computer.
- Then click the “Link Compile Download” (see figure 3) and you will find “Active: Compiled” in the lower right corner of your computer.

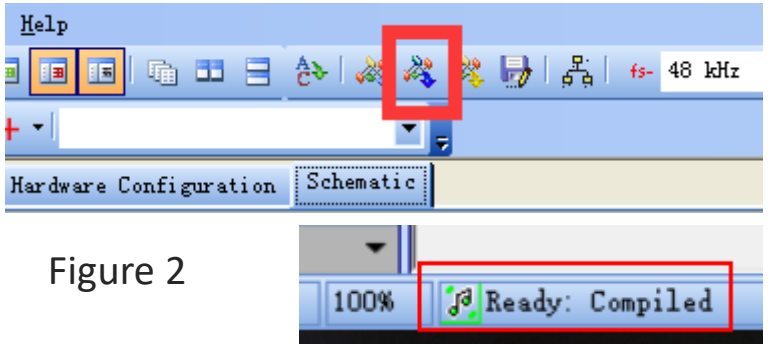


Figure 2

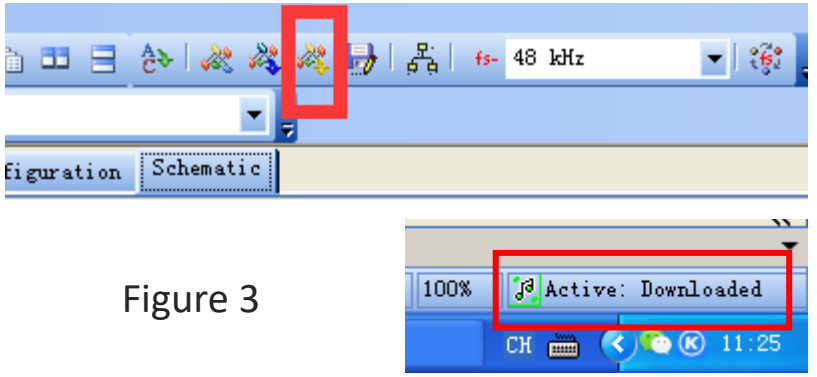


Figure 3

Please note, this is online debug mode, that means, the program will be lost once you re-power on.
If you want to run the program offline, you need to write the program into ADAU1701.

Programming Steps – Write Program into DSP

To write program into ADAU1701, please do as follows.

Enter “Hardware Configure” page and right-click the “ADAU1701”, then select “Write Latest Compilation to E2PBOM” to download the program (see figure 4). you will see a prompt window, choose the “I2C” on the right and click “OK” (see figure 5).

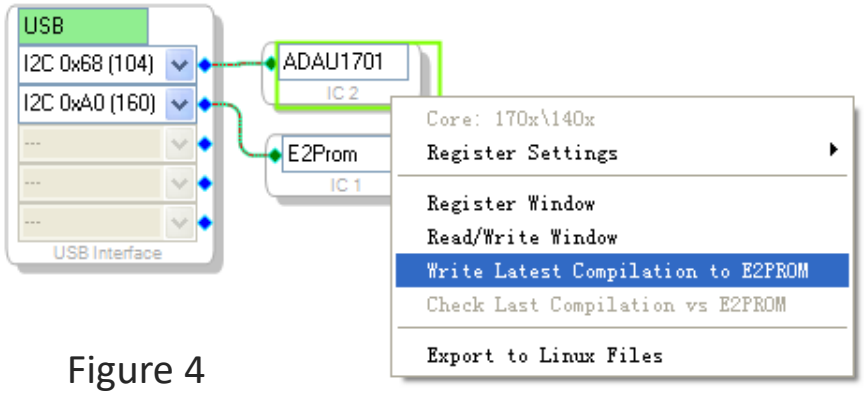
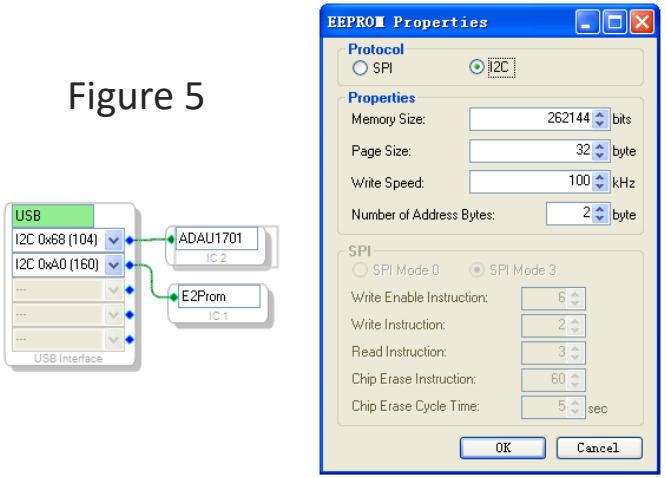


Figure 4

Figure 5



If it shows “Design Mode” in the lower right corner, you need to click “Link Compile Download” at first. When it shows “Active: Compiled”, you can move on to write program into ADAU1701.

Programming Steps – Restore Factory Settings

In case of accidental programming errors, a HEX file is available to restore the unit to its factory settings.

1. Right click the “E2Prom” (see Figure 6) and click “Read/Write Window”. You will see the following interface (Figure 7).

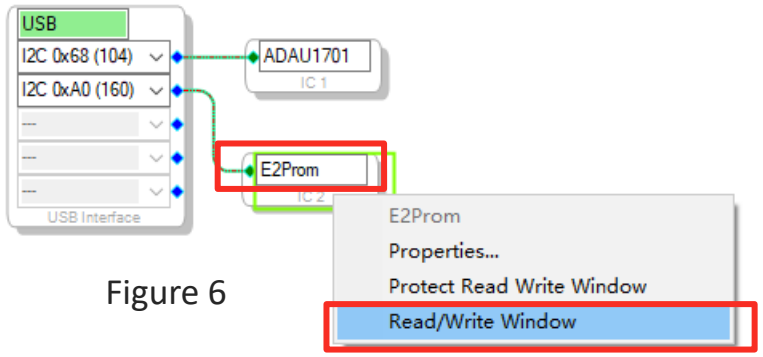


Figure 6

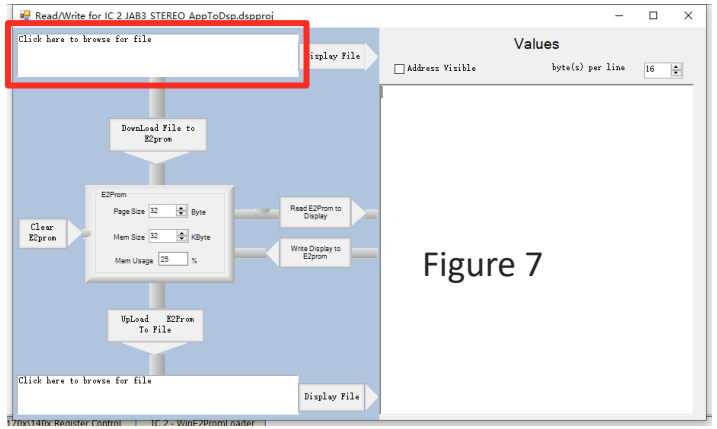


Figure 7

2. Click ‘Click here to browse for file’ and select firmware file (Figure 8). Then click “Display File“ like Figure 9.

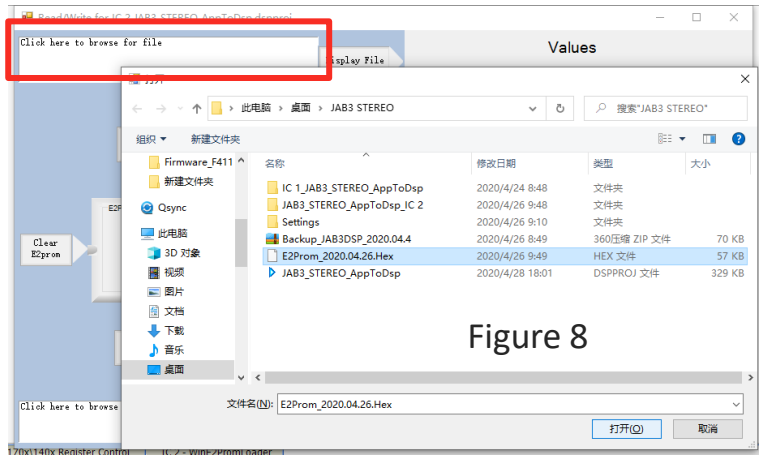


Figure 8

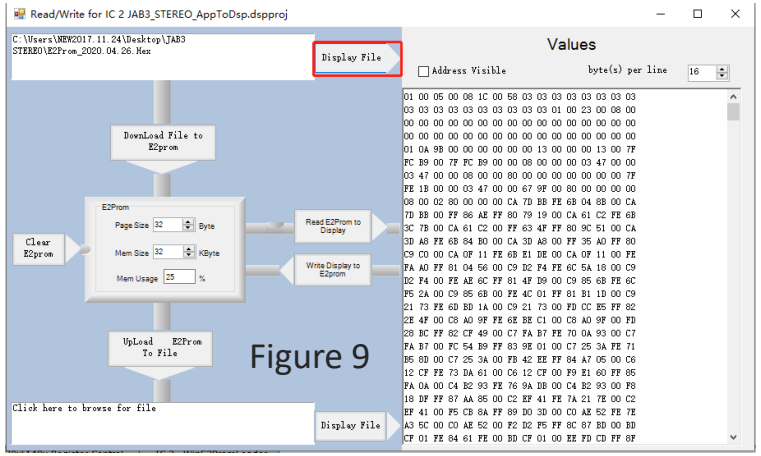


Figure 9

Programming Steps – Restore Factory Settings

3. Click ‘Write Display to E2prom’ then click ‘OK’ of the prompt box (Figure 10).

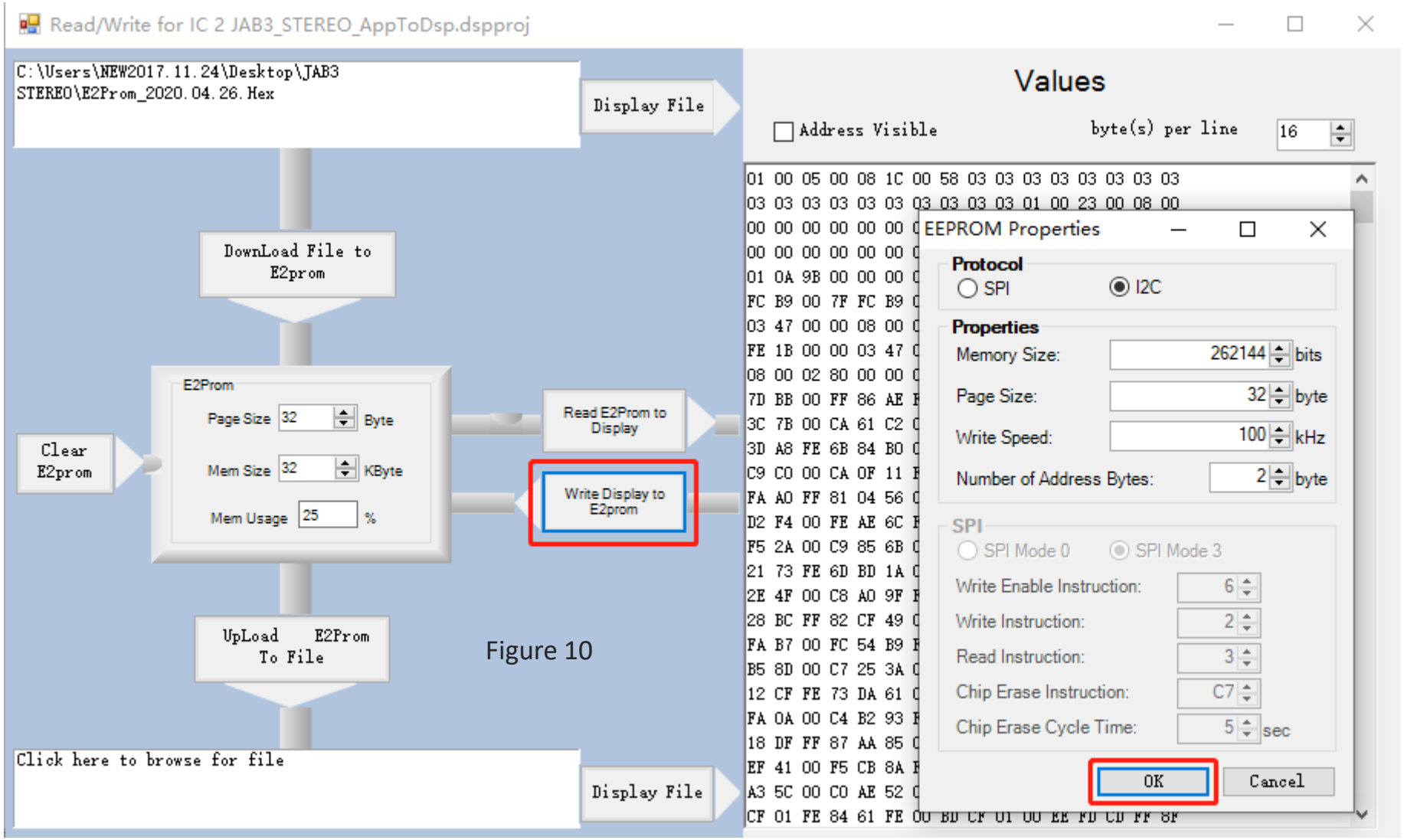


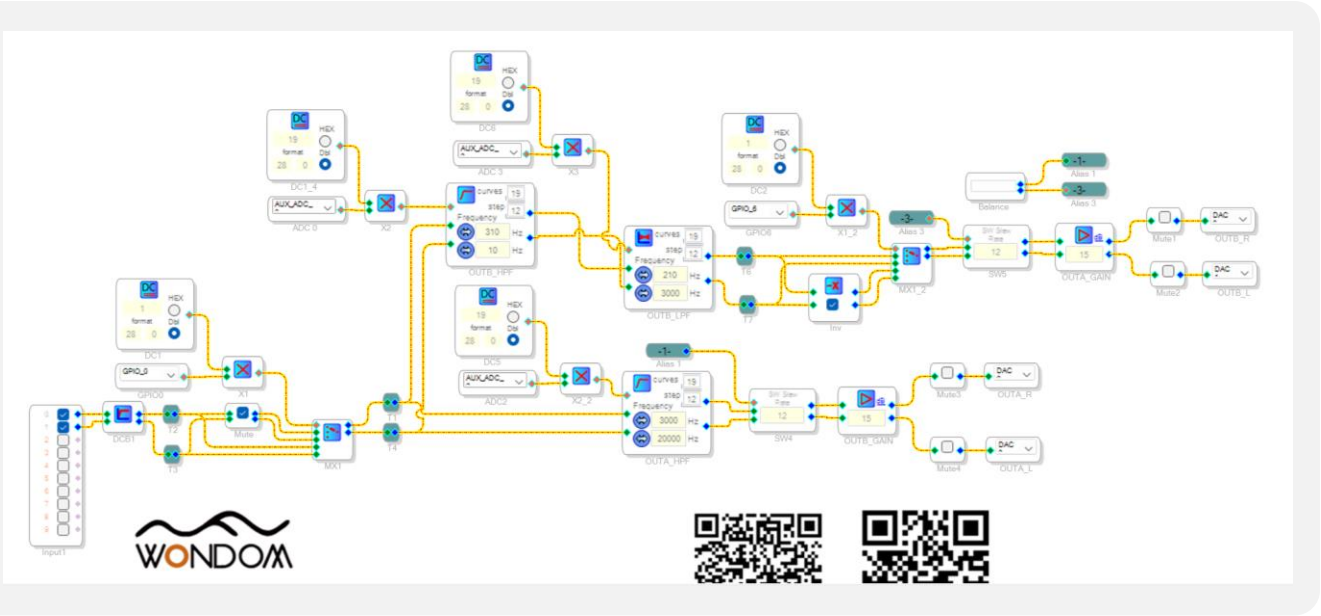
Figure 10

Programming Trouble Shooting

TROUBLE	HOW TO SOLVE
ICP5 cannot be recognized by PC	➢ Make sure the Type-C cable is of good quality and supports data communication ➢ Make sure ICP5 is not connected to target device when connected to PC
Cannot writing the program into target product successfully	➢ Make sure the ICP5 be recognized by PC ➢ **Make sure the SW1 of ICP5 is at ① (USBi) and the SW4 on ICP5 is set at ② (IIC)** ➢ **Make sure it shows "Active: Downloaded" in the lower right corner in SigmaStudio**
DSP unit cannot work normally (cannot play music) under powering condition when connected with ICP5	➢ Make sure the connection steps are correct and check the input/output cables ➢ Disconnect with ICP5 and re-power target products

Correspondence

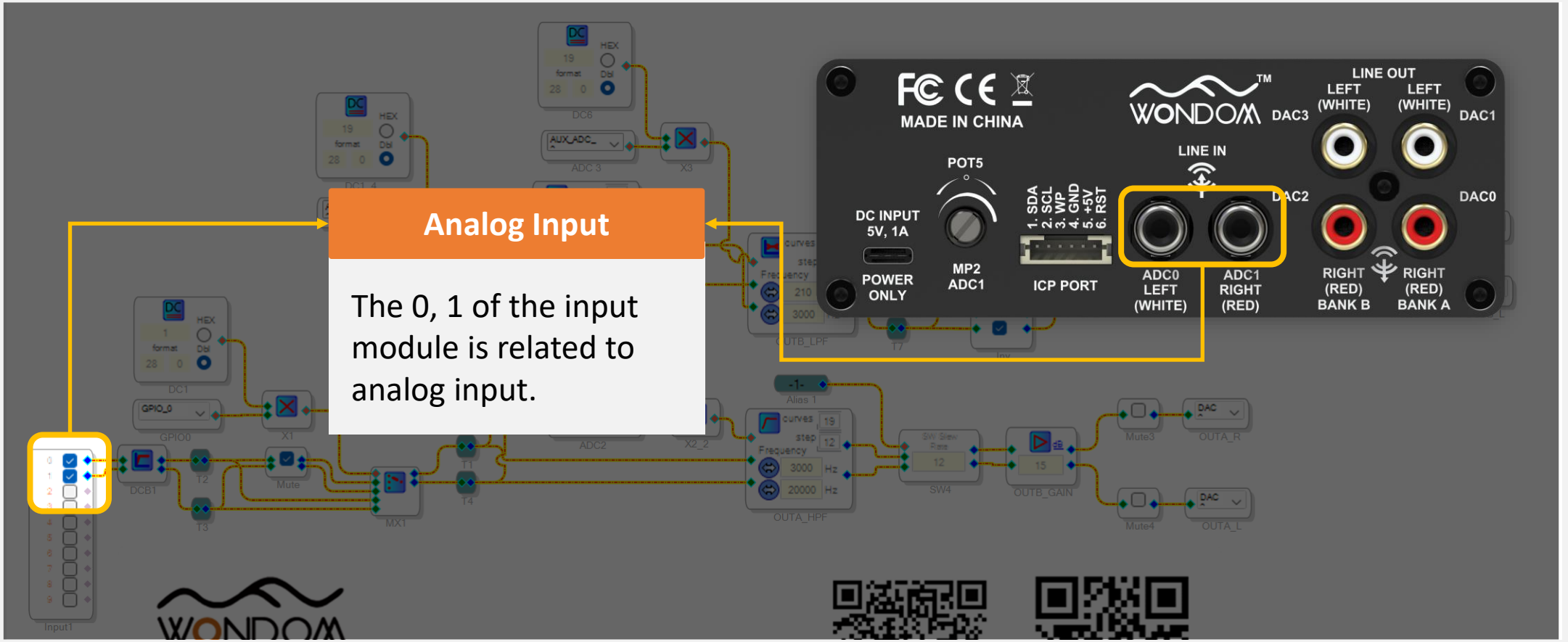
To make it more instinct and easier for understanding, we will make use of the demo program of DSP preamp to explain the relationship of the hardware and ADAU1701 program.



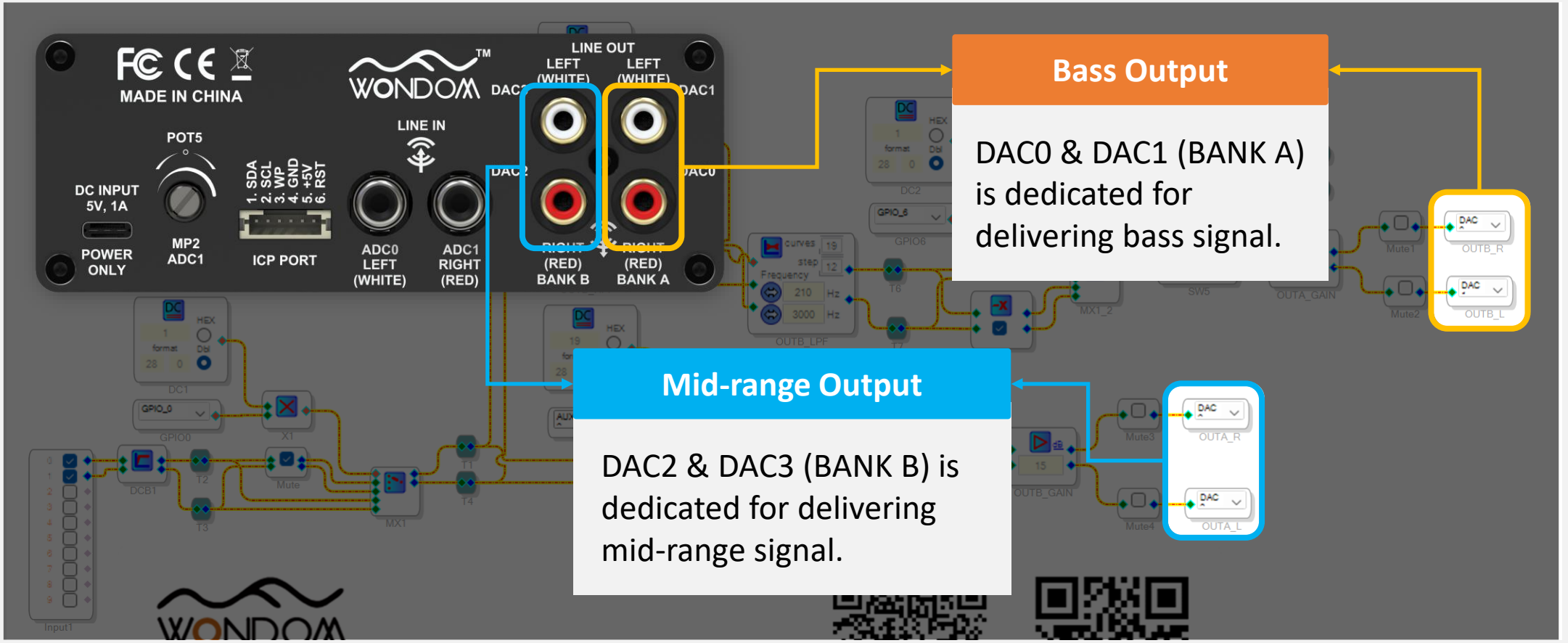
This is the demo program in the SigmaStudio. We will introduce to you in the following order.

Audio Input → Audio Output → Potentiometers → Switch

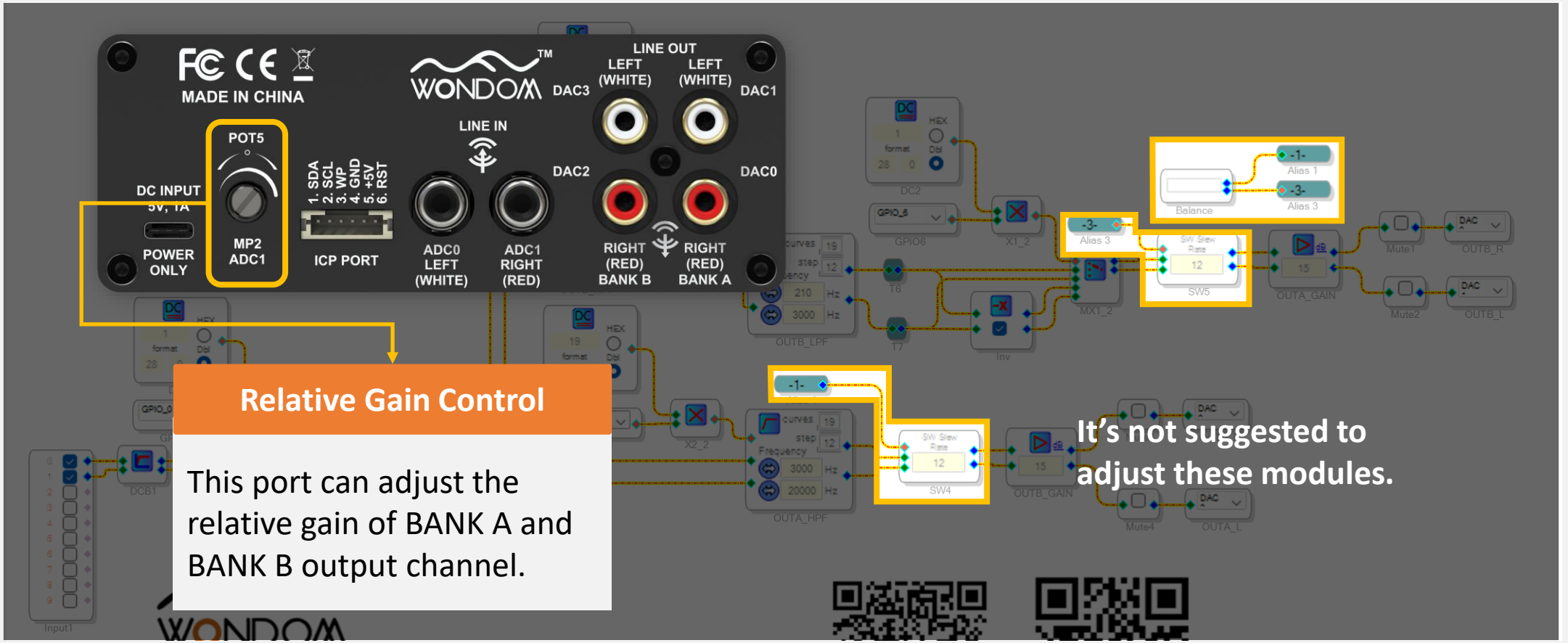
Audio Input – 2CH Input



Audio Output – 4CH Output w 2-way Digital Crossover



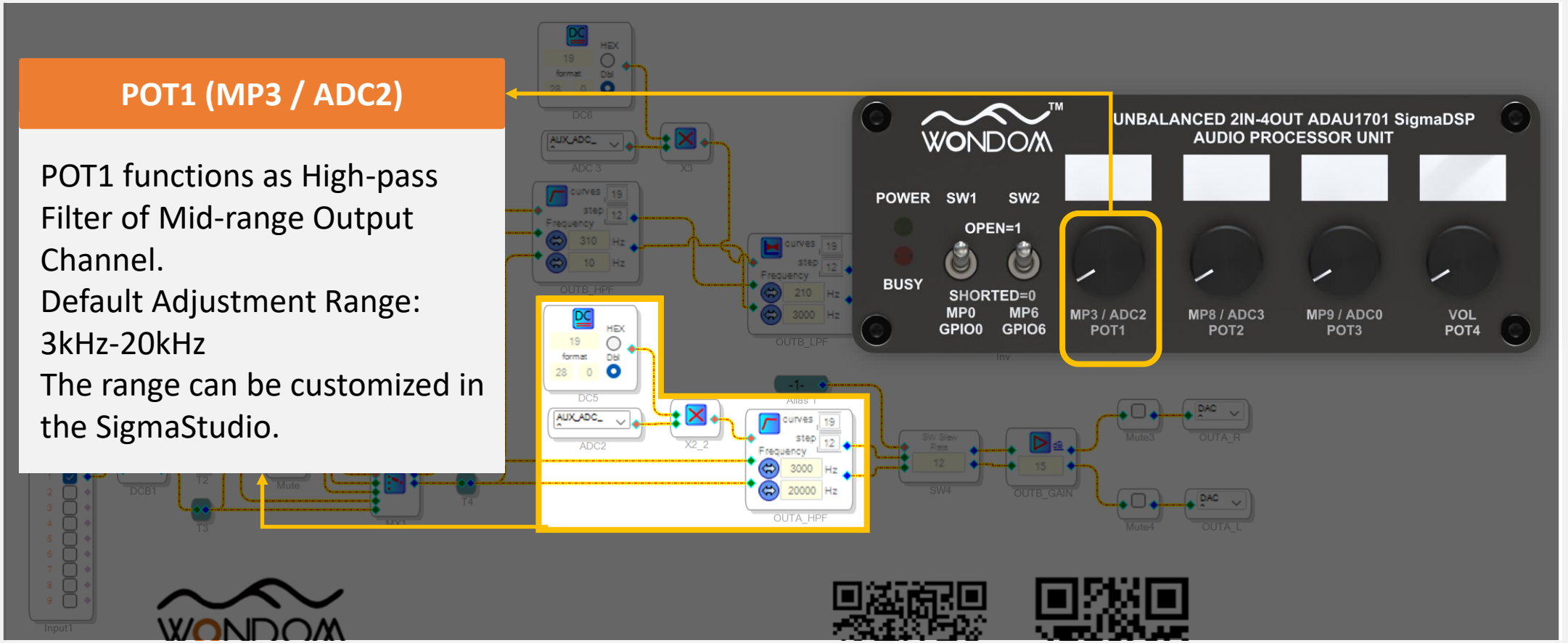
Relative Gain Control



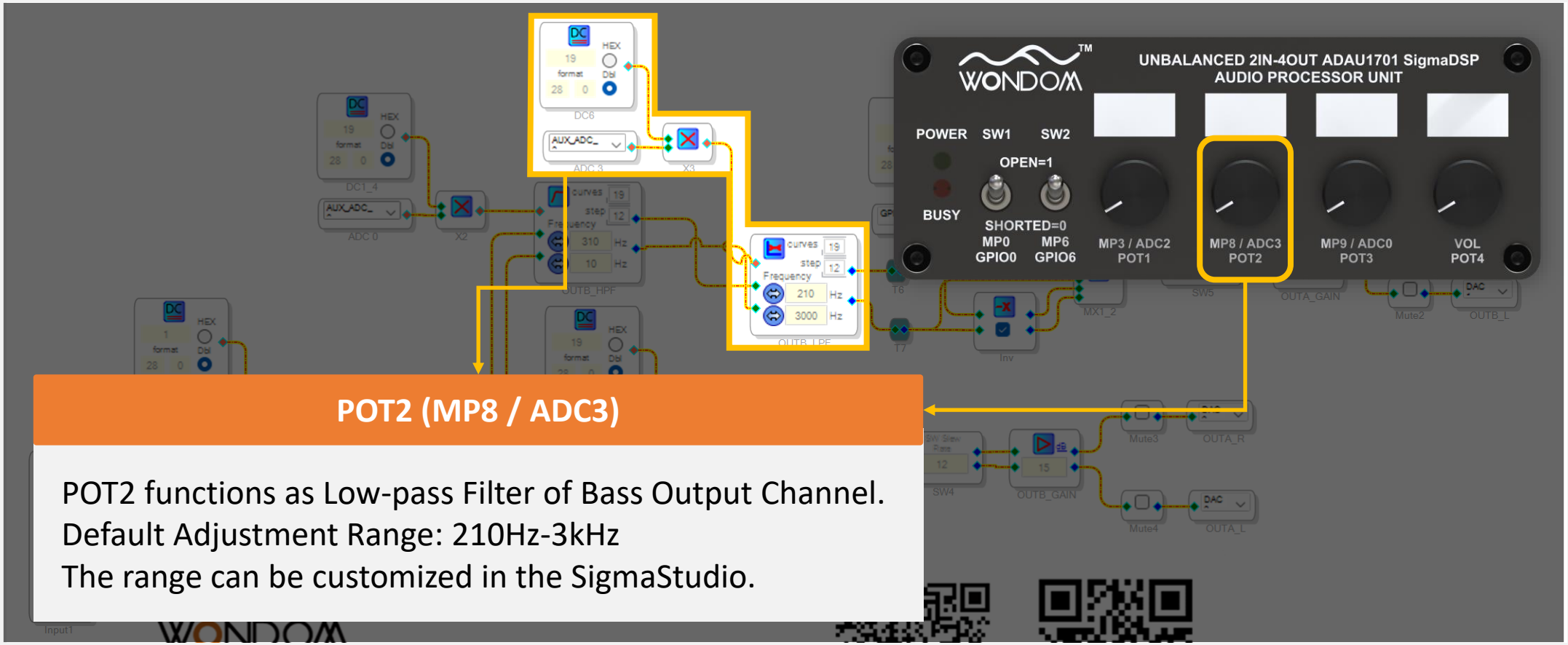
Potentiometers – POT1

POT1 (MP3 / ADC2)

POT1 functions as High-pass Filter of Mid-range Output Channel.
Default Adjustment Range: 3kHz-20kHz
The range can be customized in the SigmaStudio.



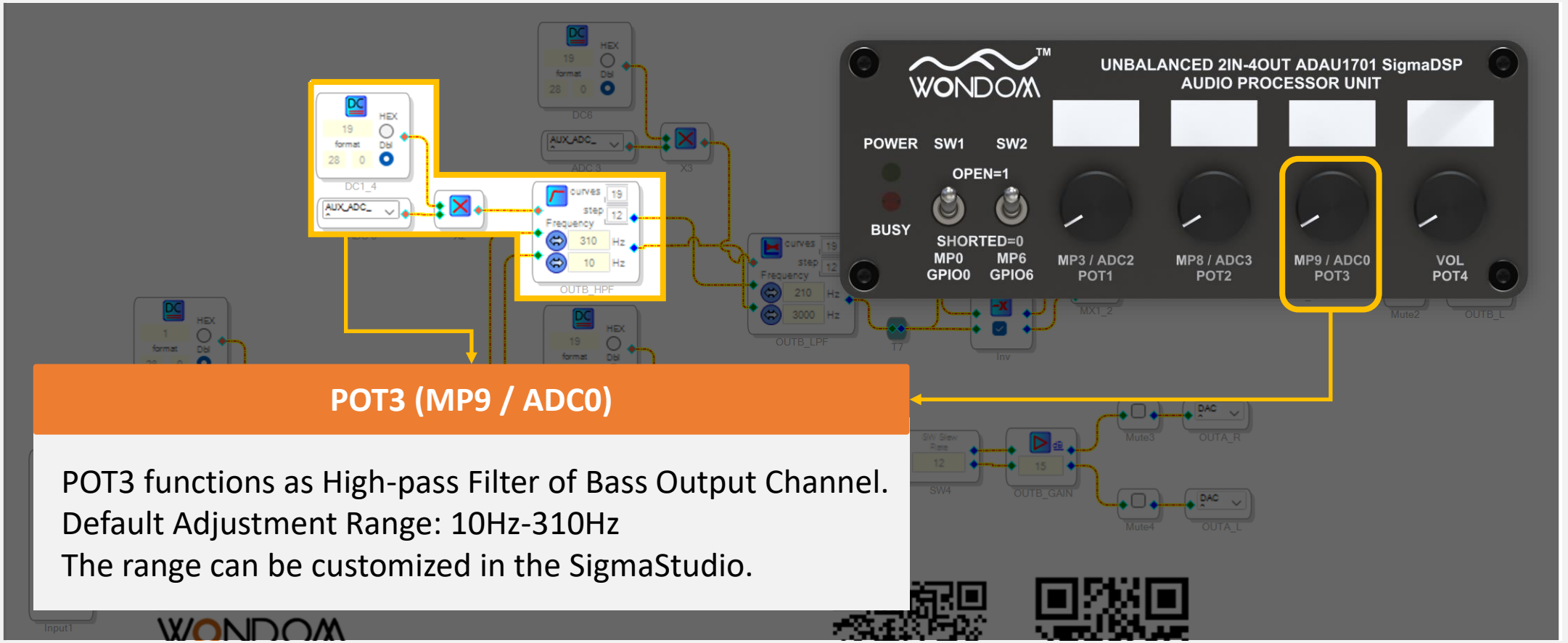
Potentiometers – POT2



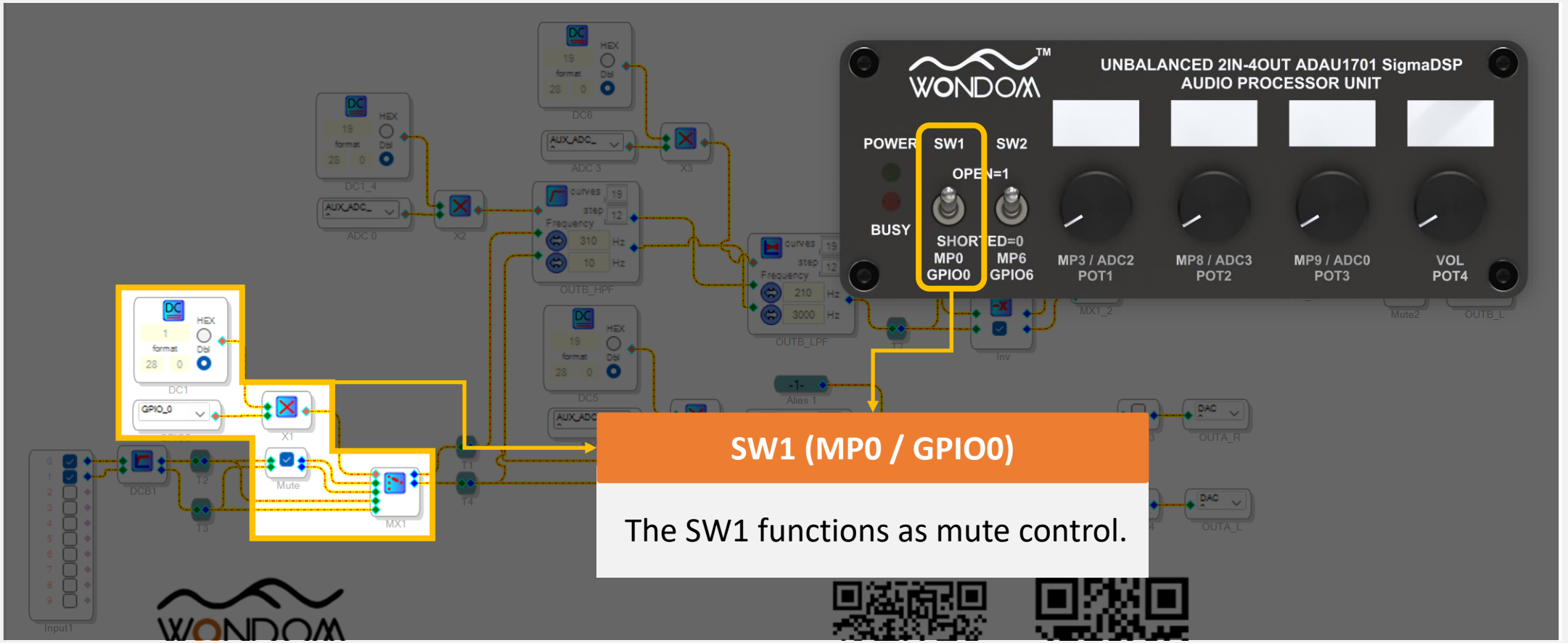
POT2 (MP8 / ADC3)

POT2 functions as Low-pass Filter of Bass Output Channel.
Default Adjustment Range: 210Hz-3kHz
The range can be customized in the SigmaStudio.

Potentiometers – POT3



Switch – SW1



Switch – SW2