QSG DAC1x08D+ECP3 DB

Quick Start Guide DAC1x08D + ECP3 demo board

Rev. 1.1 — 28 July 2010

Document information

Info	Content
Keywords	DAC1x08D, ECP3 FPGA
Abstract	NXP has designed a USB powered demo board, to demonstrate the interoperability of Lattice ECP3 FPGAs with NXP DAC over the JESD204A serial interface. This document describes the basic steps to operate this board driven by a Personal Computer.

Revision history

Rev	Date	Description
1.0	20100628	Draft version

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1. Introduction

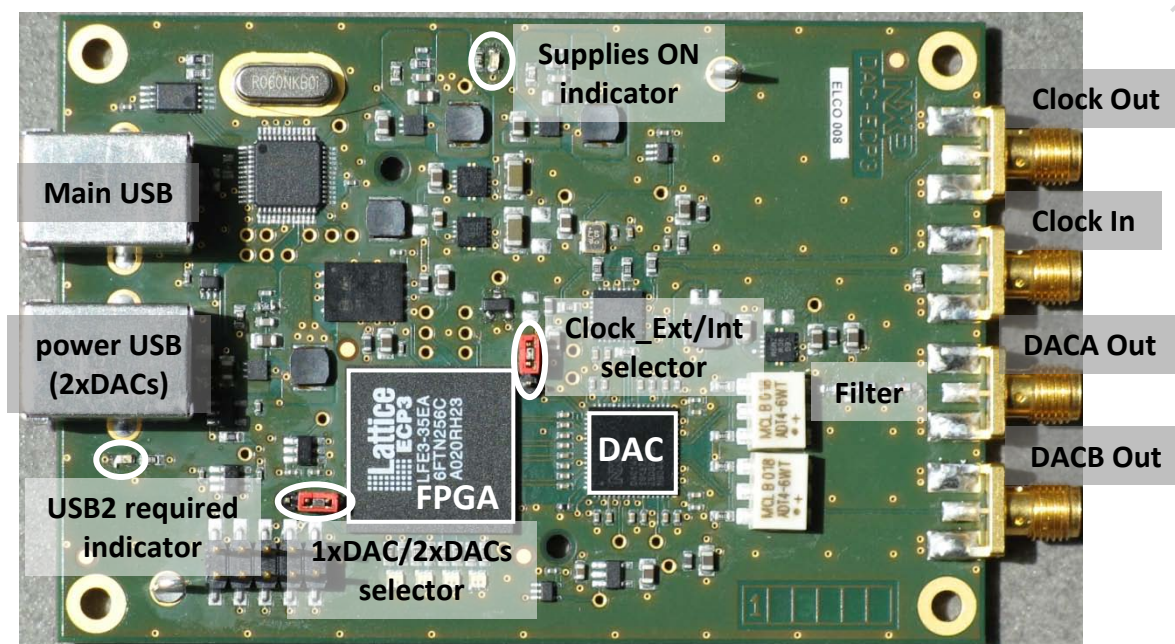## 1.1 Demoboard overview:

Fig 1. Demo Board top view

NXP has designed a USB powered demo board to demonstrate the interoperability of Lattice ECP3 FPGAs with NXP DAC over the JESD204A serial interface.

This board has 2 main modes of operation:

1. Using one single USB cable, it has to be configured so that only one DAC output is active, in order to keep the power below the USB limit (500mA). This is achieved thanks to the "1xDAC/2xDACs" jumper selector. At power-up, only the DAC output A is active; it can be changed to DAC output B later on thanks to the software running on a PC.

2. If the 2 outputs of the DAC (A & B) need to be used, it is necessary to properly configure the "1xDAC/2xDACs" jumper selector and to connect a second USB cable which is used for supply only.

In order to keep the demo set-up as simple as possible, an on-board 60MHz oscillator is used to clock the FPGA, the JESD204A link and to drive the Sampling clock of the DAC.

It is also possible to use an external clock, to have more freedom and better jitter performance. This is configured thanks to the Clock_Ext/Int jumper selector. It is advised to use the 2xDACs configuration (2 USB cables) when testing the external clock mode, since the power consumption is rising when increasing the frequency and the USB limit (500mA) might be crossed at high frequency.

The board has been successfully tested up to 200MHz. See Chapter 5 "5.Using an external clock reference" for more details.

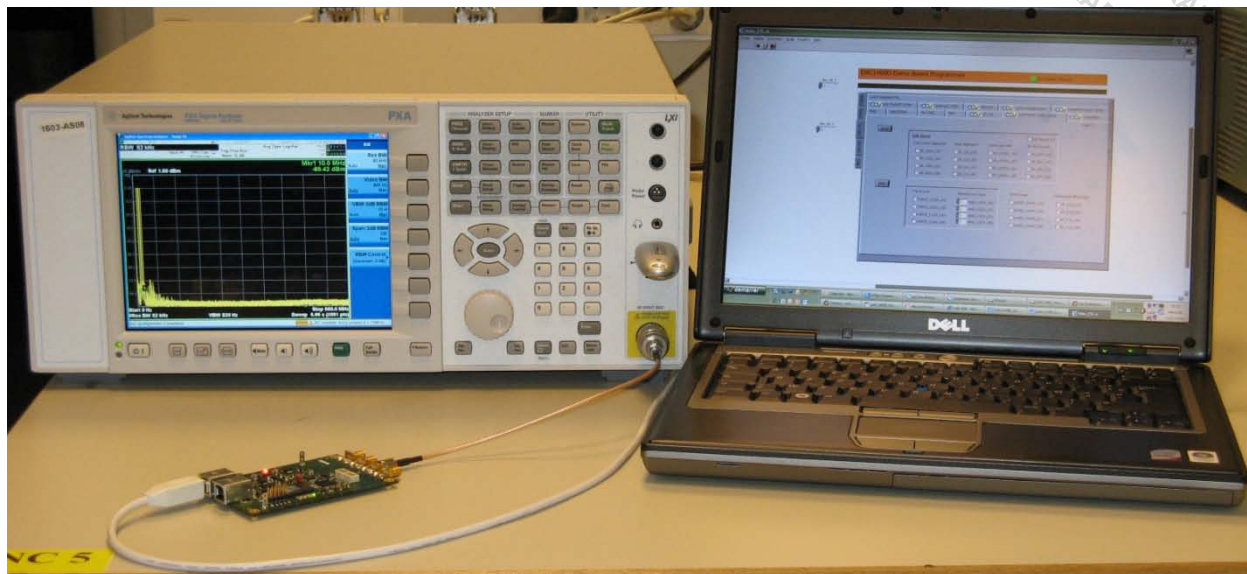## 1.2 Typical demonstration set-up : 1 USB cable => 1xDAC

Fig 2.   Picture of a typical demo set-up for 1xDAC

(Here the spectrum analyser displays the filtered DAC A output.)

The list of equipment needed is as follows:

- ✓   1 PC
- ✓   1 USB cable
- ✓   1 SMA-SMA cable
- ✓   The NXP **DAC1x08D650+ECP3-35EA** demo board
- ✓   1 spectrum analyzer

1.3 Typical demonstration set-up : 2 USB cables, 2xDACs

Fig 3.   Picture of a typical demo set-up for 2xDACs

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(Here the spectrum analyser displays the un-filtered DAC B output, where spurs are visible centered at the sampling frequency)

The list of equipment needed is as follows:

- ✓ 1 PC
- ✓ 2 USB cables
- ✓ 1 SMA-SMA cable
- ✓ The NXP **DAC1x08D650+ECP3-35EA** demo board
- ✓ 1 spectrum analyzer

In addition, a dedicated software is necessary to drive the FPGA & the DAC from the PC. This software has been developed thanks to LabView, which means that at least the LabView Runtime needs to be installed on the LapTop PC or the LabView environment itself (v8.6).

These software tools are delivered by NXP either on a CD-ROM or through an internet-based remote server.

!! Warning !!

Please read carefully the following instructions before you start plugging the demo board to the PC. It is especially necessary that you have the CD-ROM ready to install the USB driver when you first plug the demo board to the PC.

2. Installing the software tools

2.1 LabView 8.6 Run-time environment:

Use the NXP CD-ROM to access the "LVRTE861STD.exe" file: open the folder named "LabView_Runtime_v8.6" and double click on the .exe file in order to install the LabView Runtime program.
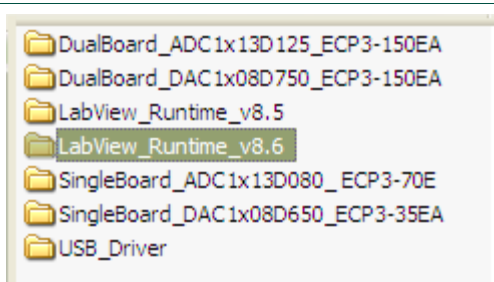

Fig 4.   LabVIEW 8.6 Run-time folder

2.2 USB drivers:

2.2.1 Step 1:

Connect the device to a USB port on your PC. Windows '**Found New Hardware Wizard**' will be launched. Select '**No, not this time**' from the options available and then click '**Next**' to proceed with the installation.

Fig 5.   New Hardware Wizard starting page

2.2.2 Step 2:

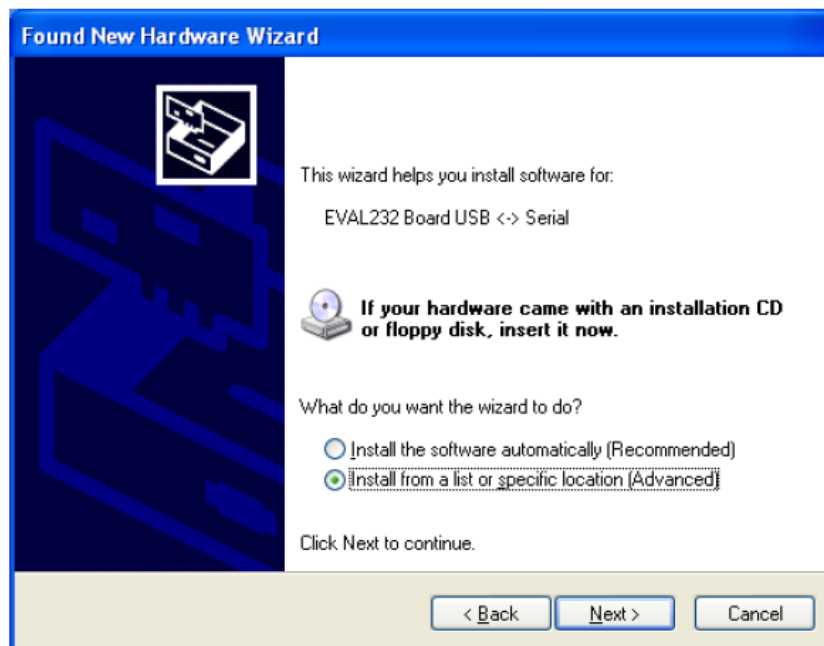Select '**Install from a list or specific location (Advanced)**' as shown below and then click '**Next**'.

Fig 6.   New Hardware Wizard: configure

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2.2.3 Step 3:

Select '**Search for the best driver in these locations**' and enter the file path of the folder : **\USB Driver \driver_d2xx**' in the combo-box or browse to it by clicking the browse button.

Once the file path has been entered in the box, click '**next**' to proceed.
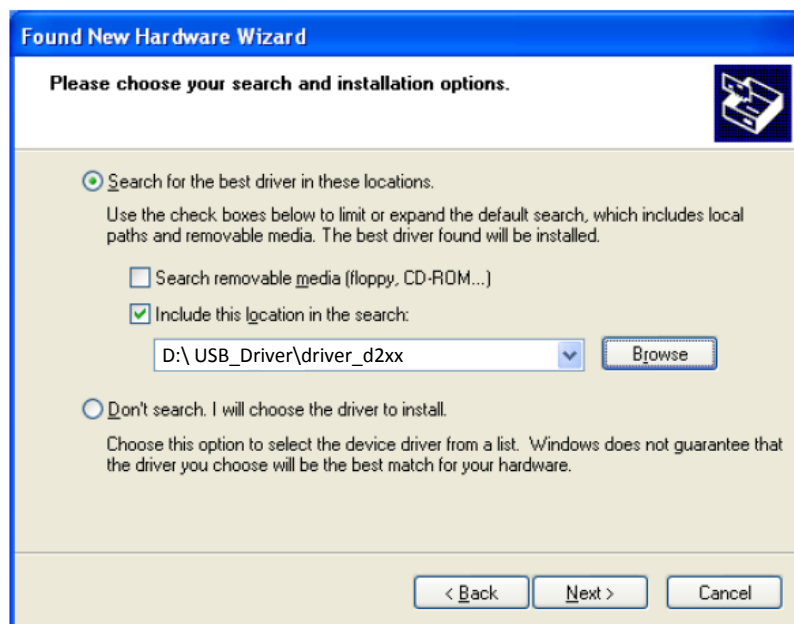
Fig 7.   New Hardware Wizard: select driver location

2.2.4 Step 4:

Windows should then display a message indicating that the installation was successful. Click '**Finish**' to complete the installation for the first port of the device.

Fig 8.   New Hardware Wizard: completion

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2.3 NXP DAC1x08D control application:

Using again the CD-ROM delivered by NXP, open now the folder "SingleBoard_DAC1x08D650_ECP3-35EA", then the folder "DAC1x08D650_ECP3-35EA _PC-Software":
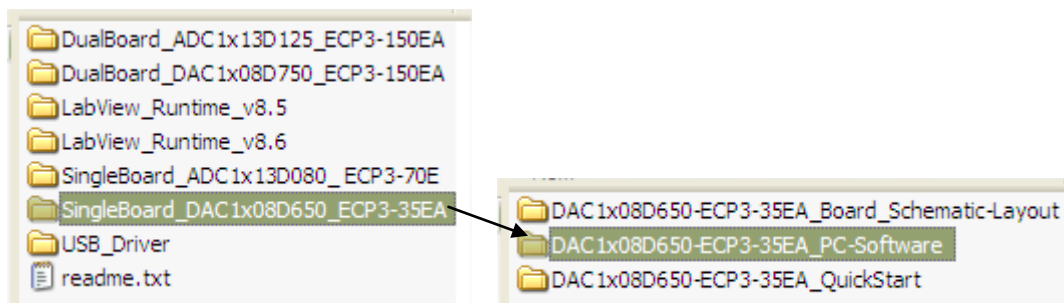
Fig 9.   **Application software folder**

The following files are now accessible:
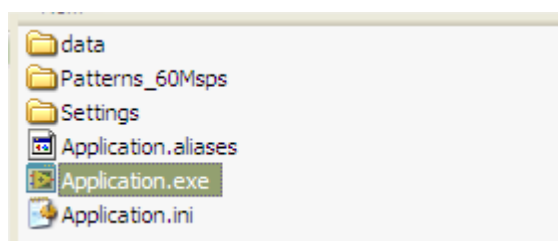
Fig 10.   **Application software required files**

There is no additional software to install here: double clicking on "Application.exe" will directly start the application. You can alternatively copy the whole folder on your PC if you don't want to keep the CD-ROM.

3. Demo set-up connection

3.1 1xDAC Connection diagram:

You are now ready to complete the demo set up connection. Please follow the connections diagram as defined below:
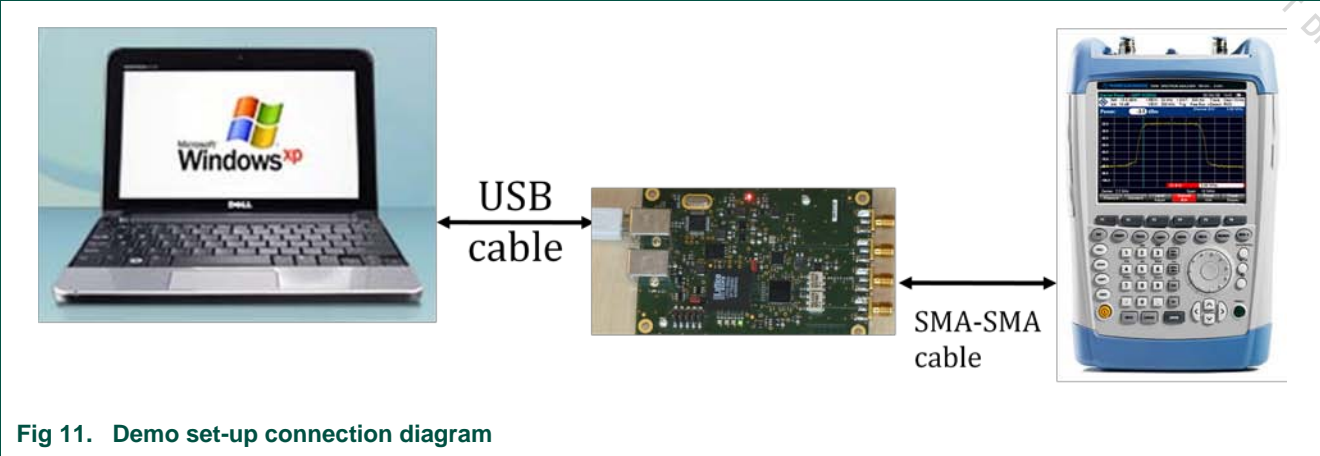
Fig 11. Demo set-up connection diagram

3.2 1xDAC Jumpers setting:

Looking at the demo board, the jumpers have to be positioned exactly as displayed on the picture: they configure the board for 1xDAC only, clocked by the on-board 60MHz oscillator.
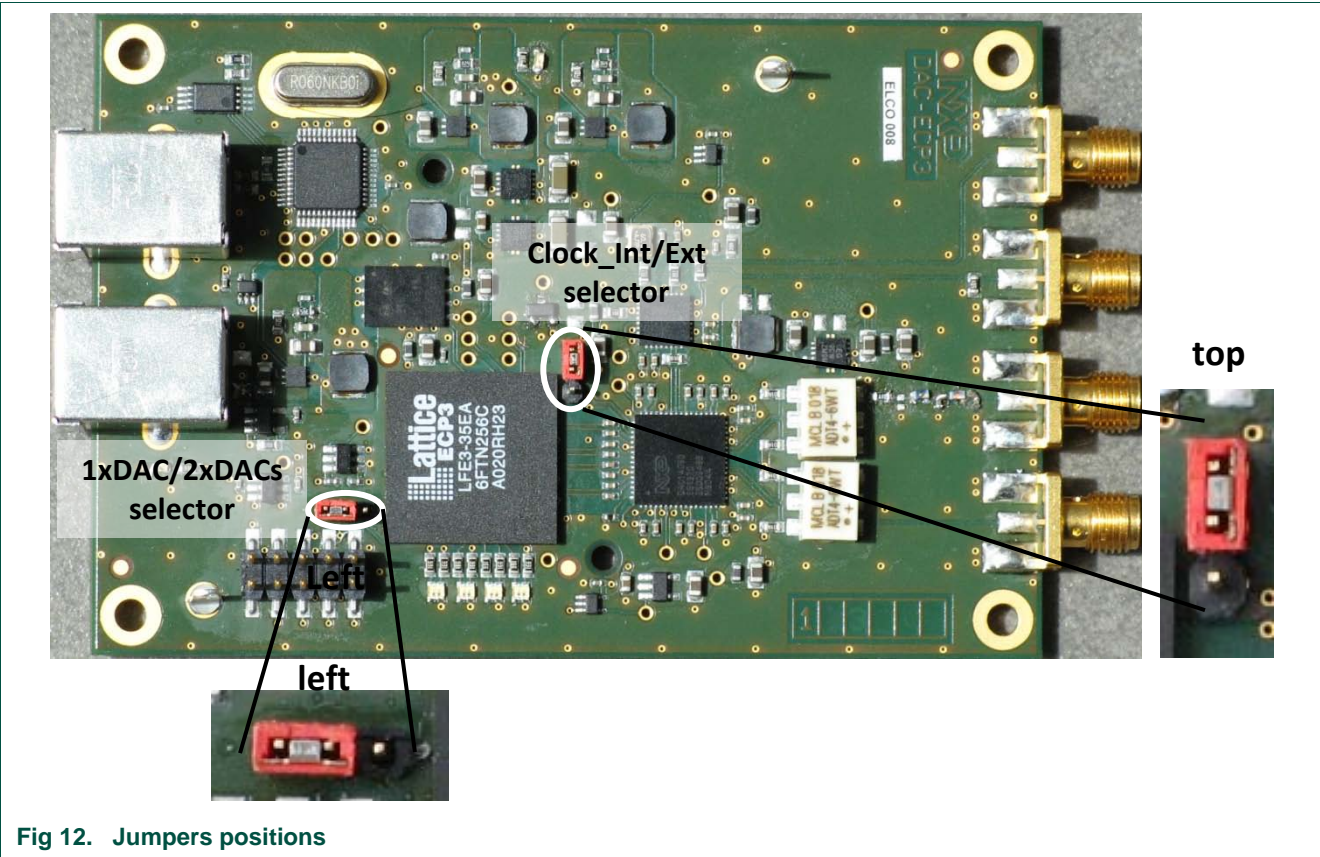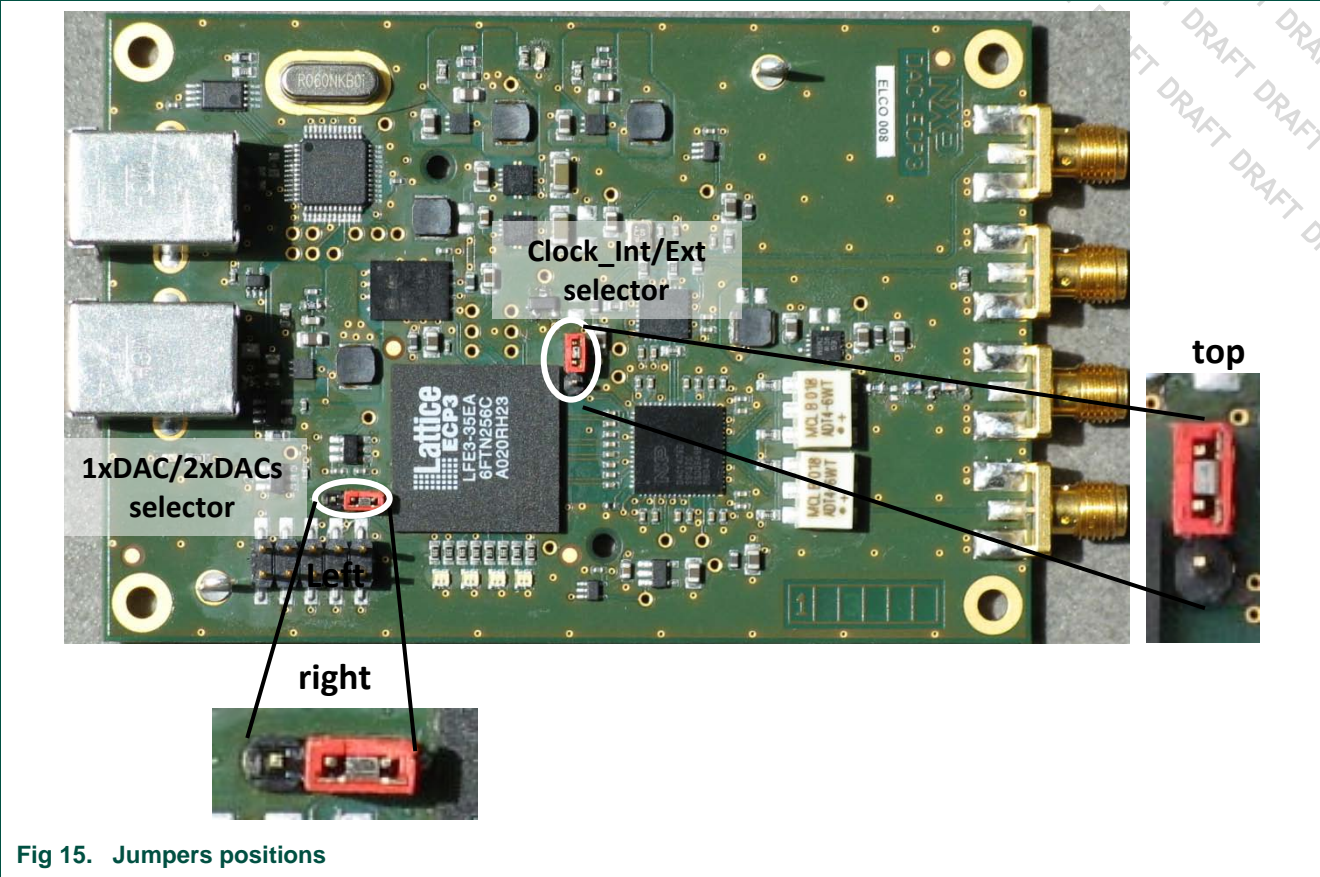

Fig 12. Jumpers positions

3.3 1xDAC LED status when powered-up:

Once connected to the PC, and once the USB driver is installed, the LED status should be as follows:

**RED LED ON :
Supplies ON**

**green LED ON :
JES204A aligned**

**green LED blinking @ ~1Hz :
On-board 60Mz oscillator alive**
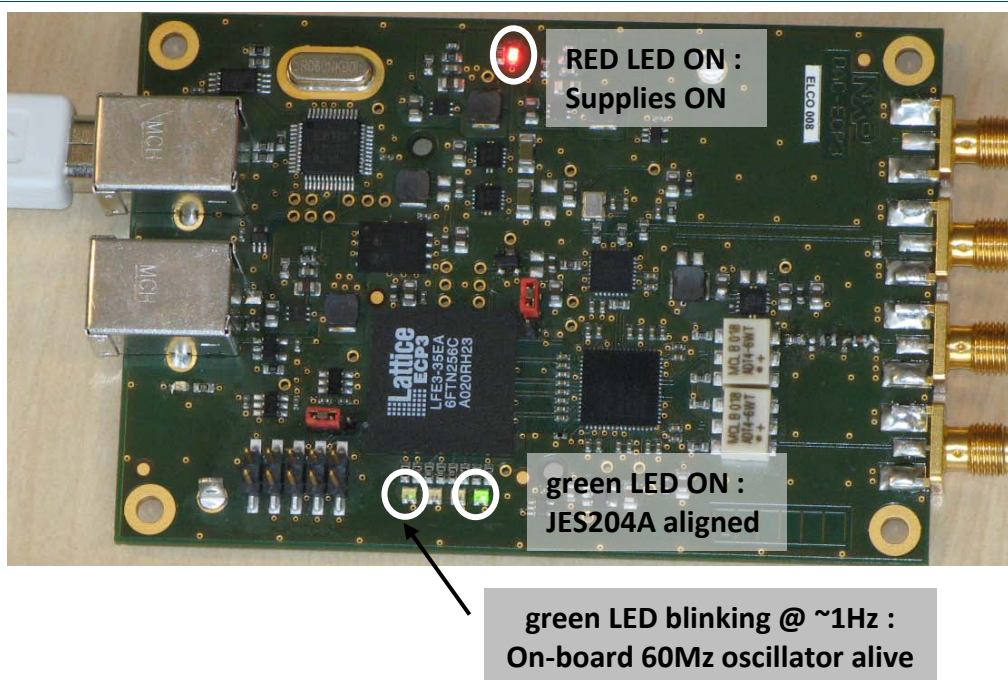
Fig 13.   LEDs status at power-up

3.4 2xDACs Connection diagram:

You are now ready to complete the demo set up connection. Please follow the connections diagram as defined below:
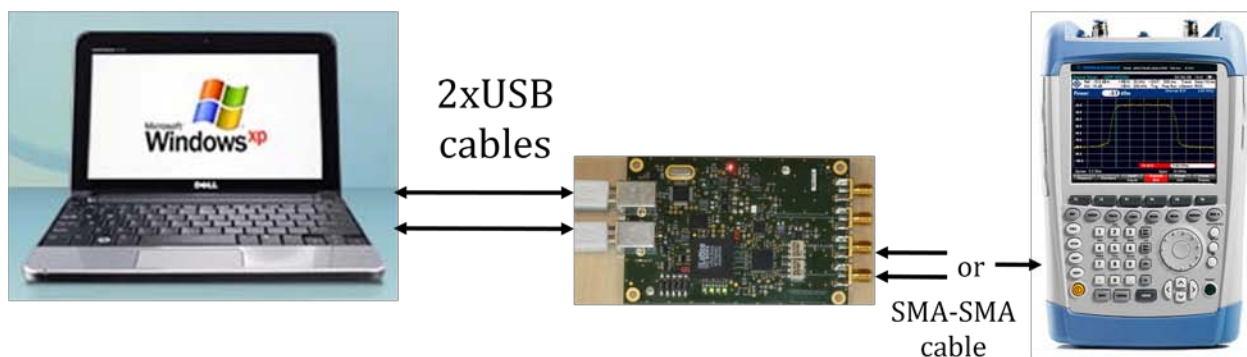
Fig 14.   Demo set-up connection diagram

3.5 2xDACs Jumpers setting:

Looking at the demo board, the jumpers have to be positioned exactly as displayed on the picture. they configure the board for 2xDACs, clocked by the on-board 60MHz osc.

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Fig 15. Jumpers positions

3.6 2xDACs LED status when powered-up:

The LED status will depend here on the USB connection:

If only 1 USB cable is plugged on the main USB connector, the LED status is as follows:
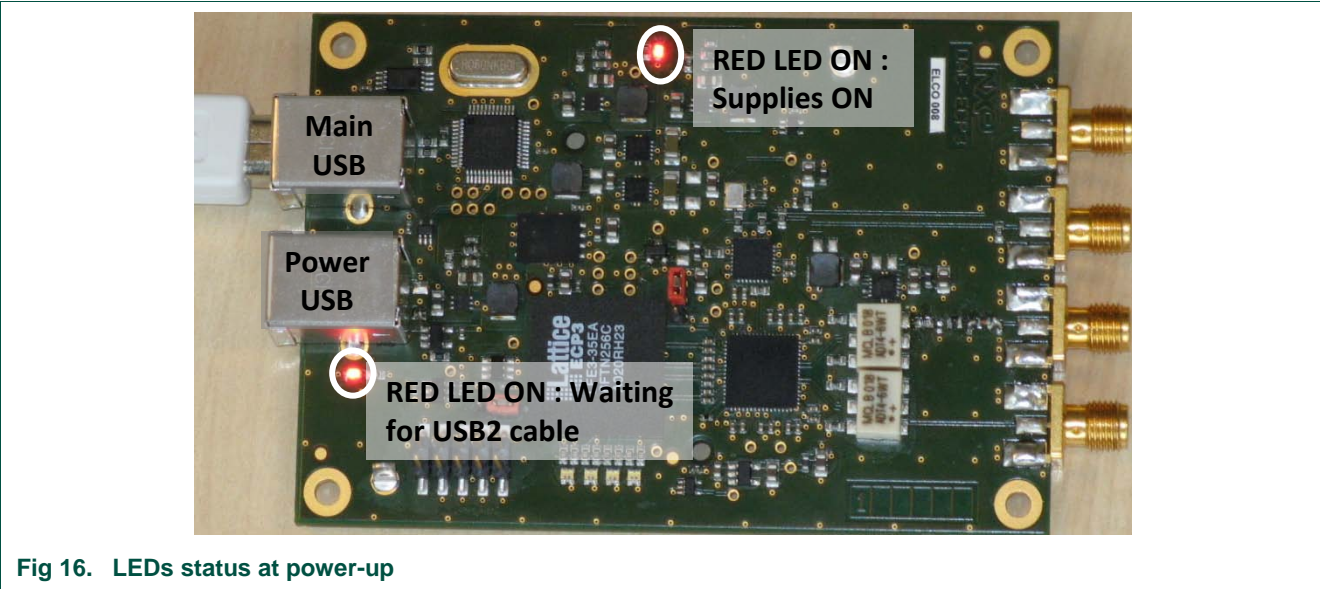
Fig 16. LEDs status at power-up

Once you have connected the 2nd USB cable, the LED status is as follows:

Main USB

Power USB

RED LED ON : Supplies ON

green LED ON : JES204A aligned

green LED ON : 2xDACs config

green LED blinking @ ~1Hz : On-board 60Mz oscillator alive
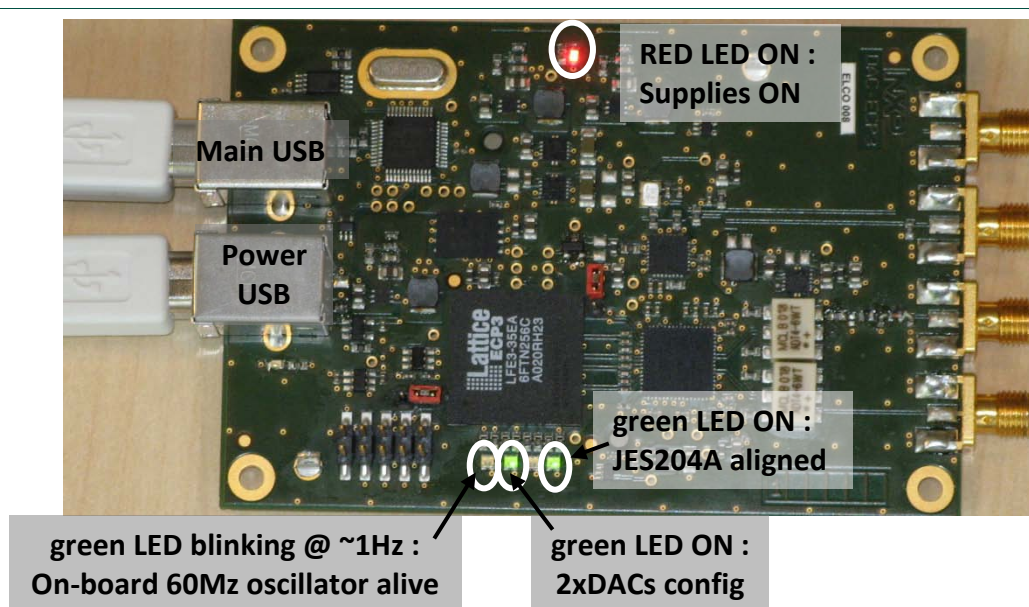
Fig 17.   LEDs status at power-up

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4. NXP_DAC1x08D application user guide

4.1 Front panel:

First, launch the Lattice.exe file from a file explorer (see §2.3).

The following window pops-up:
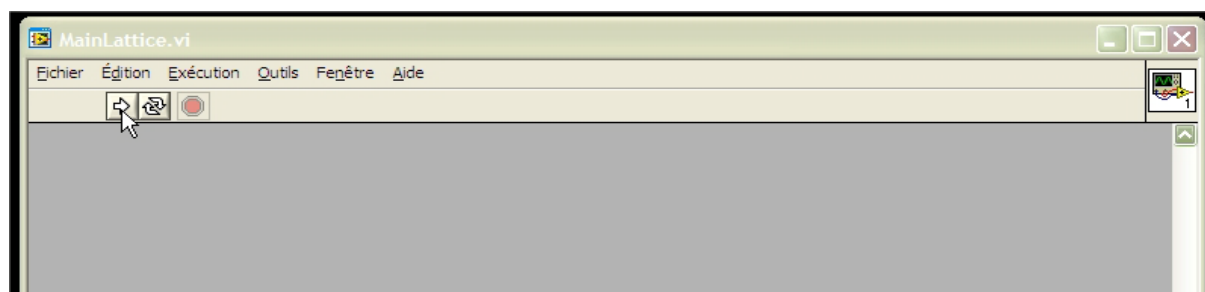
Fig 18. LabView start window

Click on the white arrow in order to launch the ADC_Run application.

You now get the following front panel:

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5. Using an external clock reference

5.1 Configuring the board:

You have to configure the 2 jumpers as defined on the following picture:
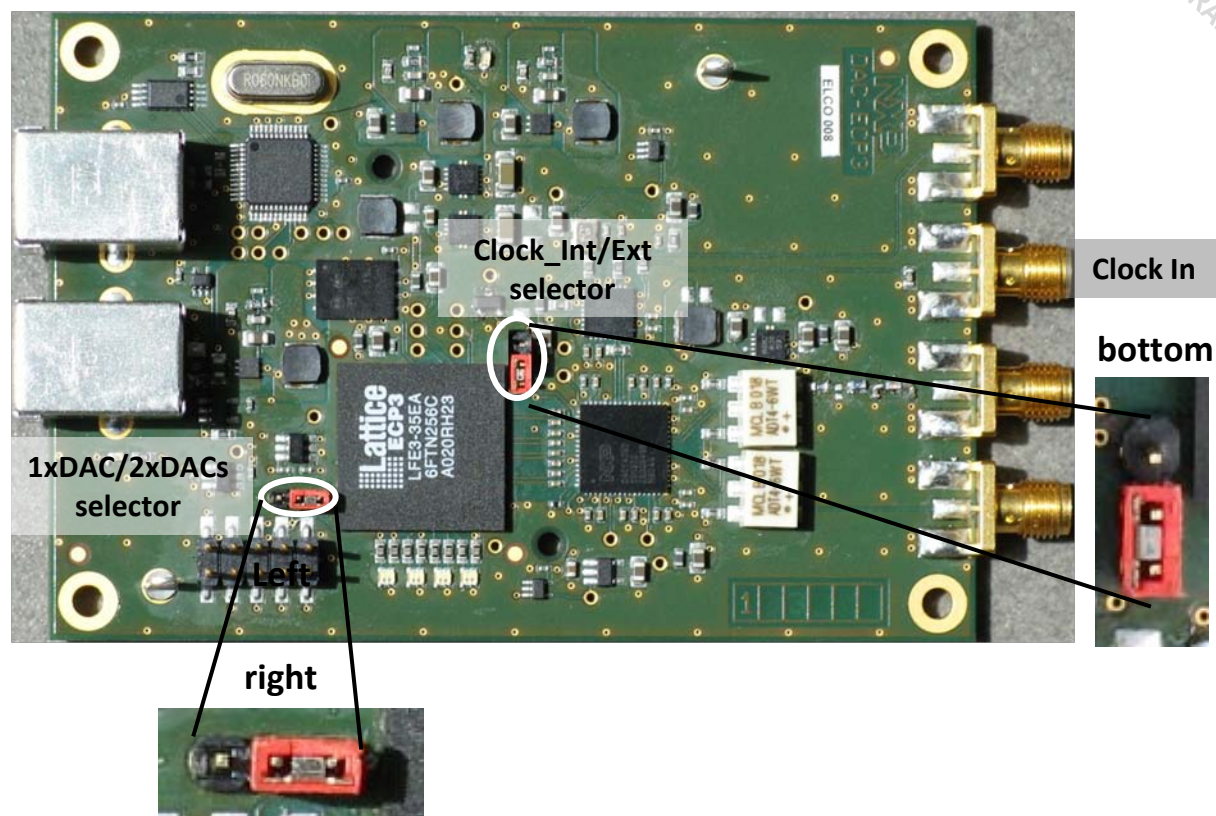
Fig 19.   Jumpers positions

The board is now configured for 2xDACs active (=> 2 USB cables required) and an external clock is required.

You might face initialization issues at power-up, depending on the supply/clock sequence. Simply plug/unplug one of the USB cables once the clock is applied on the board and the initialization of the board will restart.

Please keep the input frequency below 200MHz and make sure that the sampling frequency of the DAC is below 650MSPS, so properly configure the interpolation ratio (x2, x4 or x8).

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