Programming the TLV320xxxEVM for PurePath Studio Graphical Development Environment and Control Software

v1.1.1
David Zaucha, Jorge Arbona
August 24, 2009

Before the TLV320xxxEVM-K can be used with PurePath Studio GDE or the Control Software, the TLV320xxxEVM's EEPROM must be programmed with the correct firmware. This is accomplished in two steps.

- The first two steps configure the EVM jumpers and load the appropriate Windows drivers to interface to the TAS1020 USB device.

- The third step is to program the EEPROM on the TLV320xxxEVM board.

The TLV320xxxEVM-K is comprised of two boards.

1) The TLV320xxxEVM daughterboard.
2) The USB-ModEVM motherboard.

To program the EVM firmware, you will need:

1) A Windows XP based PC.
2) The TLV320xxxEVM-K.
3) An "A plug" to "B plug" USB cable.

1. Background Information:

The USB-ModEVM (the EVM kit motherboard) has a USB controller (called the TAS1020B) that streams USB audio data and controls the device under evaluation. When USB power is provided to the EVM kit, the TAS1020B will look for an EEPROM device with I²C address equal to 0xA0 to load its data into memory. Once this data is loaded, the EVM kit will be recognized by the PC operating system as a Human Interface Device and as a USB Audio Device.

The TAS1020B provides all the necessary clocks (WCLK, BCLK and MCLK) to operate the device under evaluation. The default firmware operates at a sampling rate of 44.1kHz. By following the procedures in this guide it is possible to switch to different sampling rates by reprogramming it with a different firmware.

There are four things to consider when switching sampling rates:

1) The operating system must be aware of which sampling rate is the audio device operating at.
2) The clocks that are provided to the device under evaluation (i.e. the TLV320xxx) are at the correct frequency for a specific sampling rate.
3) The clock settings (i.e. PLL and clock divider settings for the TLV320xxx) must be correctly configured for a specific sampling rate.
4) The PurePath Studio code that is loaded into the miniDSP and its coefficients must be based on the desired sampling rate. This is covered in the Quick Start Guide.

Items 1 and 2, above, are automatically handled by the firmware. In fact, if a file of a different sampling rate than programmed is played with a media player, Windows will automatically convert the sampling rate to that of the EVM.

Item 3 requires that the registers of the TLV320xxx are programmed with correct divider values. Most PurePath Studio frameworks program the TLV320xxx for 44.1 kHz/48 kHz operation. Refer to the help document of each framework and the Quick Start Guide for frameworks that operate at a different sampling rate, such as AEC.

The next section of this guide explains how to install necessary drivers for the firmware update procedure as well as how to program the firmware for a specific sampling rate. If the firmware version that is loaded into the EVM is “USB-MODEVM V0201” or above, then a simpler firmware programming procedure can be used instead, which is available in the EVM’s Control Software. The Control Software is available in the EVM product folder at www.ti.com. The Control Software displays the version information. If the Control Software is used to upgrade the firmware, the next section can be skipped.

The Appendix section at the end of this document has additional information specifically related to the firmware images.

2. Installation:

The installation installs software and sets the drivers for the device. It is not required to follow sections 2.1 and 2.2 if the firmware has been previously installed on a particular PC.

2.1. Jumper Configuration:

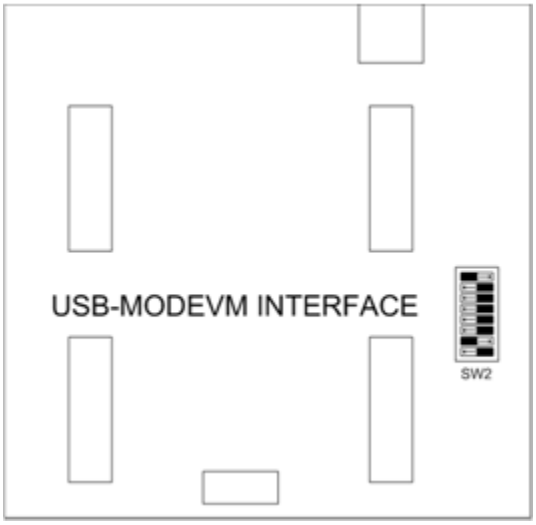
STEP 1: Disconnect the USB cable from the USB-ModEVM motherboard.

STEP 2: Remove the EEPROM jumper. The location of this jumper can be found in the List of Jumpers and Switches table in the EVM User's Guide. For example, the TLV320AIC3204/54 EVM's EEPROM jumper is W13, as shown below:

Table 2. List of Jumpers and Switches (continued)

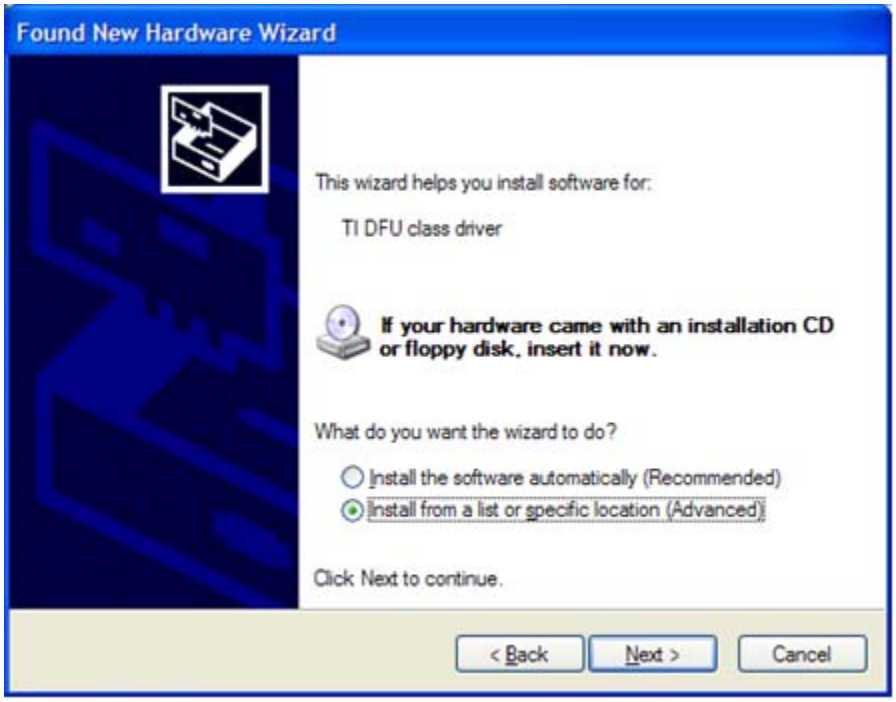
Jumper	Default Position	Jumper Description
W13	Installed	When installed, it selects onboard EEPROM as firmware source.

STEP 3: Ensure that the USB-ModEVM's SW2 switch is set as shown below (SW2.2 and SW2.8 to the right):



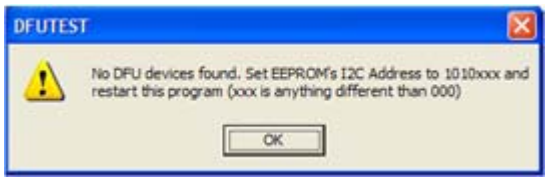
2.2. Device Firmware Update (DFU) Driver Installation

STEP 1: Connect a USB cable to the USB-ModEVM motherboard. A window similar to the one below should appear. Search for the TI DFU class driver (DFUUSB.sys) in the "[Installation Folder]\USBfirmware" directory.

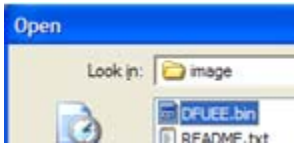


2.3. EEPROM Programming

STEP 1: Go to the "[Installation Folder]\USBfirmware\" directory and open the "DFUTEST.exe" program. If the message below appears, ensure that the steps in 2.1 and 2.2 were done correctly and re-open the "DFUTEST.exe" program.



STEP 2: Click the **Program EVM** button. Browse for the **DFUEE.bin** file located in the "[Installation Folder]\USBfirmware\image" directory, as shown below. Click Open.



STEP 3: The following message will appear. At this moment, **insert** the **EEPROM jumper**, and then click OK.

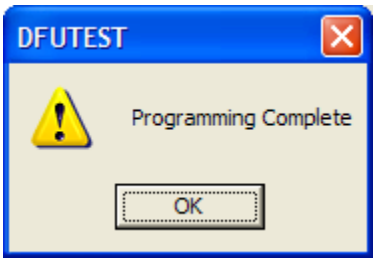
STEP 4: A "Download completed" message will appear. Click OK.

STEP 5: A "Device was succesfully reset. Please..." message will appear. Wait 2-3 seconds before clicking OK. If a "Found new hardware wizard appears, install the DFU driver as explained in Section 2.2.

STEP 6: A "Detach call succeeded. Please..." message will appear. Wait 2-3 seconds before clicking OK. If a "Found new hardware wizard appears, install the DFU driver as explained in Section 2.2.

STEP 7: Browse for the desired firmware image file (e.g. USBMODEVMxxxx_441KHZ.bin) located in the "[Installation Folder]\USBfirmware\image" directory. Click Open.

STEP 8: Click OK in the next two windows. The last window will look like the one below.



STEP 9: Click OK and close the DFUTEST program.

STEP 10: Disconnect and re-connect the USB cable. Upon re-connection, if, desired, the sampling rate and firmware version can be verified in the Control Software.

STEP 11: The EVM kit is now ready to be used with PurePath Studio GDE.

Appendix

A.1. Firmware Clock Frequencies

The table below shows the I^2S clock frequencies generated by the TAS2010B USB Controller. The USB descriptor is also configured such that the operating system recognizes a USB Audio Device operating at the WCLK sampling rate.

Firmware Image Filename	MCLK	BCLK	WCLK
USBMODEVMxxxx_8KHZ.BIN	4.096 MHz	512 kHz	8 kHz
USBMODEVMxxxx_16KHZ.BIN	4.096 MHz	1.024 MHz	16 kHz
USBMODEVMxxxx_24KHZ.BIN	12.288 MHz	1.536 MHz	24 kHz
USBMODEVMxxxx_32KHZ.BIN	12.288 MHz	2.048 MHz	32 kHz
USBMODEVMxxxx_48KHZ.BIN	12.288 MHz	3.072 MHz	48 kHz
USBMODEVMxxxx_11025KHZ.BIN	5.6448 MHz	705.6 kHz	11.025 kHz
USBMODEVMxxxx_2205KHZ.BIN	11.2896 MHz	1.4112 MHz	22.05 kHz
USBMODEVMxxxx_441KHZ.BIN	11.2896 MHz	2.8224 MHz	44.1 kHz

Document Version Information:

V1.1.1 - 09/24/2009

- Added 24 kHz firmware information to Firmware Clock Frequencies table.

V1.1.0

- Initial Release.