Introduction to the MTL Touchscreen

This small instruction manual is intended to help you launch your first application with the Terasic MTL Touchscreen. No details about how the system works are given here, but you will get more information very soon.

You will see how to get the system ready, then you will be able to launch your first slideshow.

1 Getting ready

The following elements are needed:

– a MyPicCycloneNano system with a DE0-Nano and an MyPic32 board,

– a PICkit 3,

– a microSD card and, if needed, an adapter to plug it into your computer,

– an MTL touchscreen,

– a GPIO to IDE cable,

– a power supply for the MTL touchscreen together with an UK-EU adapter.

Once you have all of those elements next to you, you can follow the steps below in the given order.

1. Get your microSD card and plug it into your computer. Ensure it has been formatted in FAT32 and copy at the root the eight BMP files given in the folder `Slides/BMP`. Once it is done, you can plug the microSD card into the MyPic32 board. Please resist to the temptation to have a look at the BMP files now: it will be so much nicer displayed on the MTL touchscreen!

2. Program the PIC32 using the PICkit 3 with the application given in the folder `PIC32`.

3. Open the Quartus II software and launch the programmer. Delete the `DE0_NANO.sof` file from the list and, under `Add File...`, search for `my_slideshow_mtl.jic` in the `DE0_Nano` folder. Check all the boxes and click on `Start` to program the flash of the board. Your screen should look as in Fig. 1. You can now unplug the board.

   Programming first the flash with a .jic file[1] has two advantages. You won't have to reprogram the board each time you power it on and, more importantly, it acts as a security. The GPIO1 port has been especially configured under the Quartus Pin Planner to be the MTL port, so there is no risk to have conflicting outputs by making changes in the `SystemVerilog` code. By default, the board will always have the correct configuration on its GPIO1 port.

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[1]This .jic file has been generated from the .sof file in the `DE0_Nano` folder. If you wonder how to do this, you can refer to section 9.1 of the DE0-Nano datasheet given in the `Datasheets` folder.
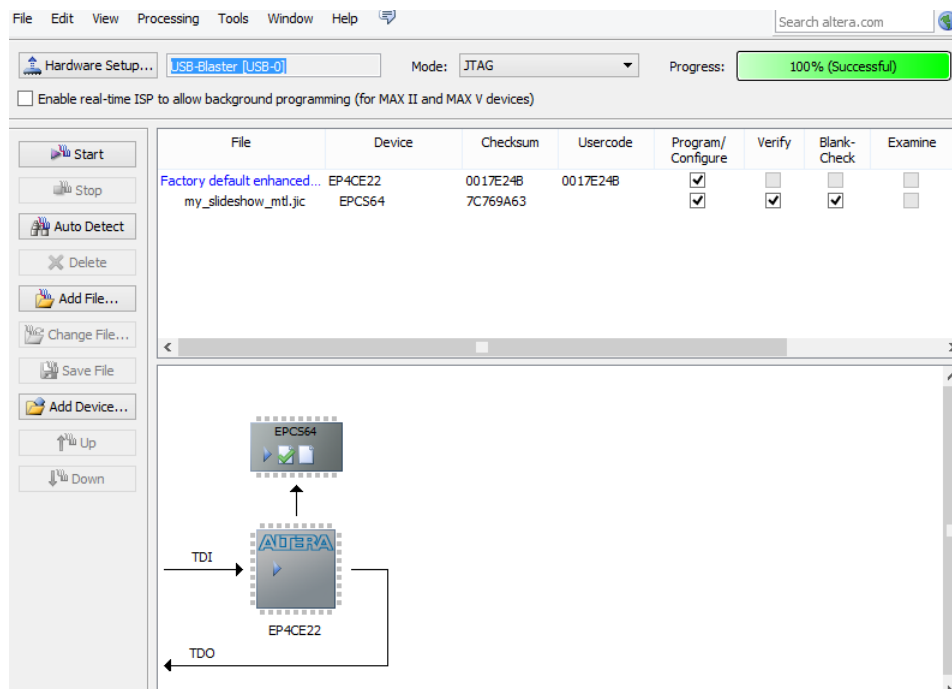
Figure 1: Overview of the Quartus programmer with the .jic file.

4. Ensure that everything is unplugged. You can now connect the GPIO to IDE cable to the DE0-Nano board and to the MTL screen. The IDE connector on the MTL side is shown in Fig. 2(a). On the DE0-Nano side (Fig. 2(b)), be very careful not to plug anything wrong:

   – the side of the cable you need to connect is the one with the small ITG adapter,

   – the GPIO1 port is the one at the *opposite side* of the LEDs,

   – check that the key drawn on the ITG adapter is aligned with the slot in the plexiglas of the DE0-Nano board.
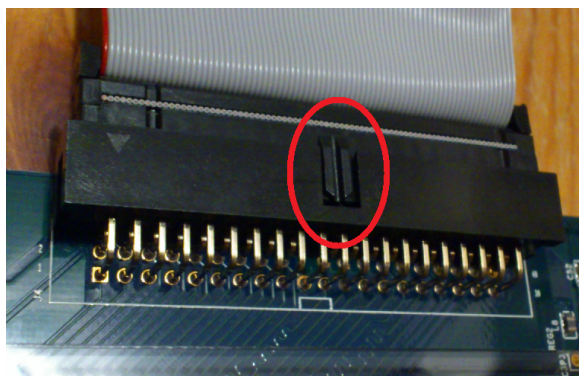
(a) Connection on the screen/IDE side
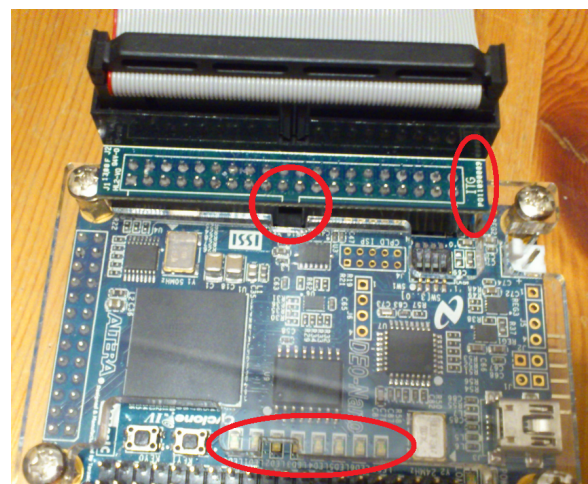
(b) Connection on the GPIO side

Figure 2: Connection schemes of the GPIO to IDE cable.

5. Always with the MyPicCycloneNano system powered off, plug the USB side of the MTL power supply into the screen (next to the IDE connector), then into the electrical outlet. The screen should turn on, but as its input are still floating, it displays random data.

   Be careful that the screen must be powered by its dedicated power supply before turning on the MyPicCycloneNano system. If the GPIO ports of the DE0-Nano have their own 5V supplies, the power consumption of the MTL ranges from 500 to 700 mA, which is far above the limit of 200 mA given in the DE0-Nano datasheet. The screen will still turn on if you try to switch on the MyPicCycloneNano system without the MTL dedicated power supply (so it may seem to work at first), but it might not last very long...

6. Still with the MyPicCycloneNano off, connect a USB cable to the console output of the MyPic32 board and open your favourite terminal emulator. If you use Tera Term, go to `Setup` and select `Terminal`. In `New-line`, select `AUTO` for `Reception` in place of `CR`. It will get you a nicer display with the right indentation.

7. You can now turn on the MyPicCycloneNano system. Be sure to make a reset. The MTL screen must be completely white after a short time, otherwise there has been a problem while programming the DE0-Nano board. You should also see the LED's of the DE0-Nano blinking and get the usual messages in the console telling you that the initializations done in the Pic32 have gone well. You are now ready to get your first slideshow on the MTL touchscreen!

2 Displaying a slideshow

We now enter the application itself. With some simple commands telling the Pic32 what it has to load, a whole slideshow will be acquired from the SD card and then displayed on the screen; the steps are given below.

1. After the Pic32 has successfully been initialized, you can enter the command `MySlideshow`. The console should now look as in Fig. 3.

Figure 3: Example of a console output when launching the `MySlideshow` command.

2. For the number of slides, enter `8`. Then, you can enter `SLIDE` as the base name. There is no problem if you make a typing error, the system will just not find the file. You can then restart from step 1.

3. The system is now reading and acquiring the BMP files in the SD card. You will have to wait about two minutes, as reading from the SD card eight files of nearly 1 MB each is not especially fast. During this time, you should now see that the screen displays "Loading..." while the console tells you the current progress of the slideshow acquisition.

4. As soon as the slideshow has been acquired, the screen should display the first slide. Congratulations: you have loaded your first slideshow! You can now skim through the eight slides by sliding a finger on the screen, like you would do with a tablet. You can go to the next slide or come back to the previous one.

In fact, those eight slides will now give you an overview of concretely *how* this whole system works. Take your time and, once you have read them, you can dive into the code to see how it has been implemented: there are a lot of comments. If you later have a doubt and need to come back to these slides, a pdf version is available in the folder `Slides/PDF`.

You can of course create your own slideshow, just ensure that your images are in the 24-bit BMP file format and that their size is 800x480 pixels.

Enjoy!

Important note: When you will need to modify the Quartus II project and recompile it, you must add the license corresponding to the touch controller IP core. Under Quartus, in `Tools`, select `License Setup`. For the license path, give the path to `license_multi_touch.dat`, located in the `DE0_Nano/License` folder. Just click on `OK`, you will then be able to recompile the project.