

ULTIMATE CART FIRMWARE UPGRADE GUIDE

This guide is intended as a reference to help understand the firmware upgrade process for the Ultimate Cart and highlight potential issues. It is not a comprehensive step by step guide covering every possible detail. The guide provides some background information, gives some recommendations, and shows what to expect for those considering attempting the upgrade themselves. The guide focuses on installation using a 64 bit windows PC.

REQUIRED HARDWARE

To update the Ultimate Cart firmware you will need a JTAG programmer, a 5V power supply to use while programming, and PC. These instructions assume an Altera USB Blaster clone will be used. An authentic USB Blaster from Altera costs about \$300 USD. Clones on ebay or amazon run \$5-\$20 USD, but not all of the clones are created equal.

Here is one from ebay:



And another from Amazon:



Some research may be necessary to ensure you purchase your USB Blaster from a source that was known to work for others. However, this will not guarantee the USB Blaster you get will operate properly if the seller changes their supplier or had mixed stock. Both of these worked with Windows 8.1, 64-bit Quartus 15.1 programmer. I was unable to get these to work using Ubuntu Linux with the 14.1 or 15.1 programmer.

Don't plug the USB Blaster into the PC until after the programmer and tools software has been installed.

External power must be supplied to the Ultimate Cart during programming. Using a 5V battery operated power supply with an on/off switch is highly recommended. The ground/common side of a battery operated supply will adjust to match the voltage level of your computer USB port. Using a 5V power supply that plugs into the wall might cause the ground/common voltage levels to be unequal. This could result in an undesirable number of electrons flowing into or out of the USB port on the computer at a rate causing damage to any of the devices involved. The external 5V supply is connected to the external power jack on the back of the board. Not all of the Ultimate Cart sellers populated the power connectors due to concerns over short circuits. A [JST-XH jack and connector](#) would work if you don't have anything else on hand. The plastic housing shroud on the jack will obscure the the silkscreen labels on the PCB. Wires could be temporarily soldered to the board as well. An on/off switch is

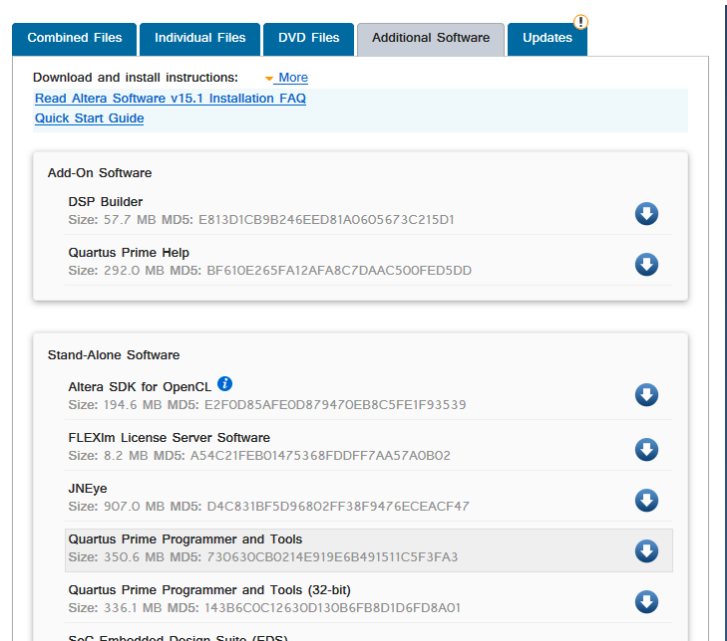
recommended so all the connections can be made prior to turning on the power supply. External power can also be supplied by an Atari, if the PC and Atari are close enough or can be relocated.

SOFTWARE

Download the “programmer and tools” software from the Altera website:

http://dl.altera.com/15.1/?edition=standard&platform=windows&download_manager=direct

15.1 is recommended for the XEX firmware. If you want to flash the original firmware on windows, programmer revision 14.1 is recommended. The option for a direct download saves the hassle of installing their download manager plugin. The Quartus prime software complete package is a several gigabyte download and takes even more space to install. The windows programmer and tools is still about 350 MB.

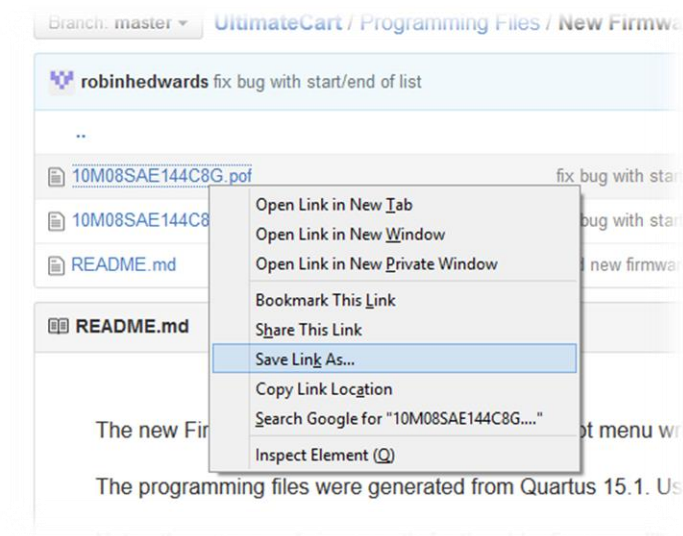


Save the installer to a convenient directory.

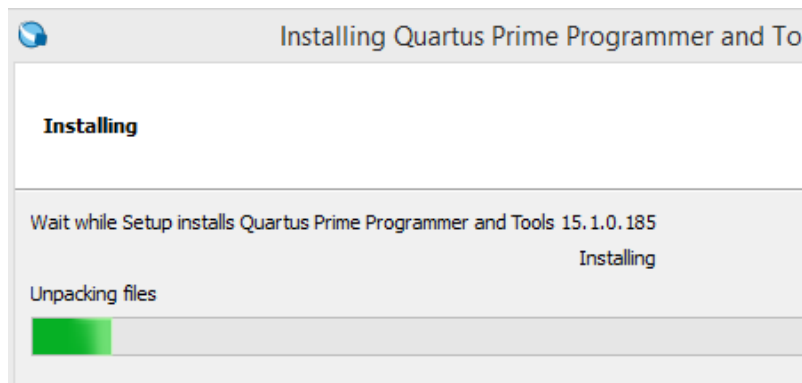
Download the desired firmware for the Ultimate Cart and save to this directory. The file that ultimately contains the firmware to download will end with a .pof extension. Two versions of the processor have been used to fabricate the Ultimate Cart, 10M08SAE144C8G and 10M08SAE144C8GES. Early boards used an “Engineering Sample” device; its part number ends in **ES**. Subsequent boards used the production version of the processor. When new .pof files are compiled from the source code, the generated output file will be specific for the production or ES processor. Download the correct file based on the part marking for the processor used to make your Ultimate Cart.

Released versions of the firmware are best downloaded from the Github repository. Beta versions have been posted to the relevant AtariAge forum posts. When downloading from Github find the desired .pof file in the “Programming Files” directory and then choose the option in your web browser to “Save Link As...” or equivalent.

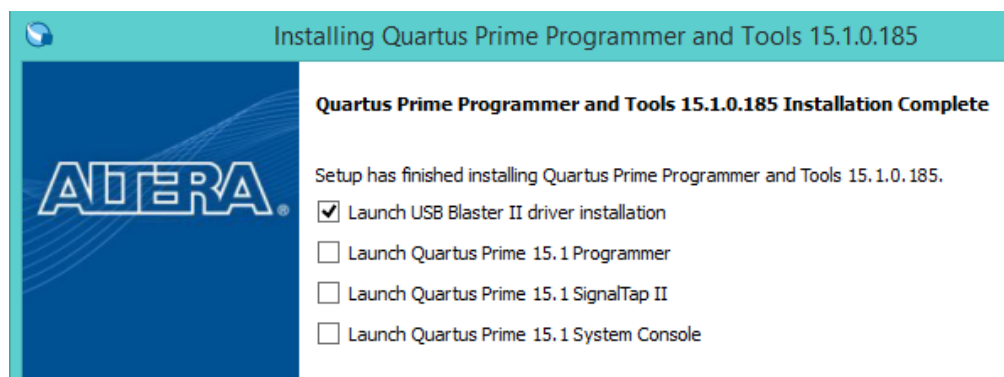
<https://github.com/robinhedwards/UltimateCart/tree/master/Programming Files/>



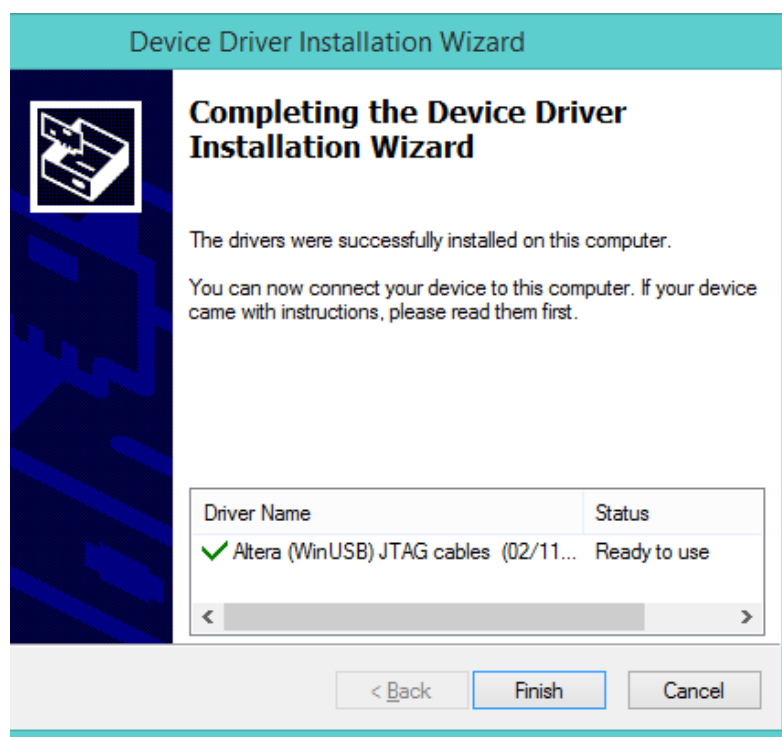
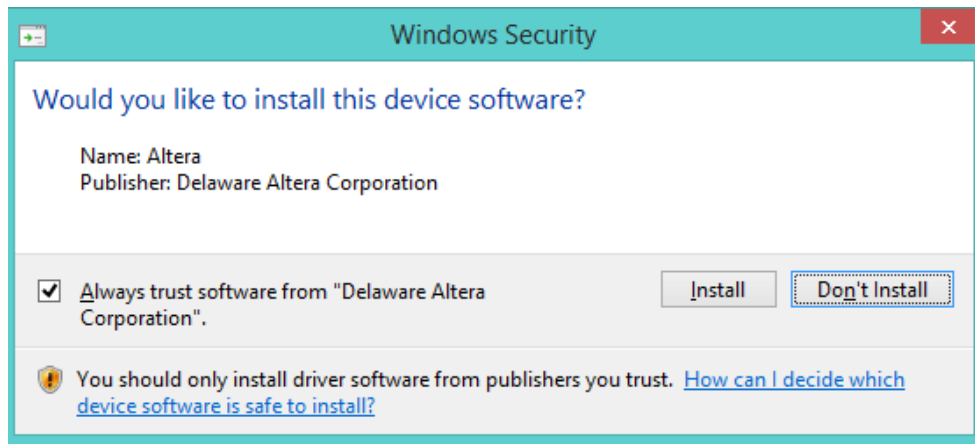
Run the installer for the Altera “programmer and tools”. There are no special options to select until the end.



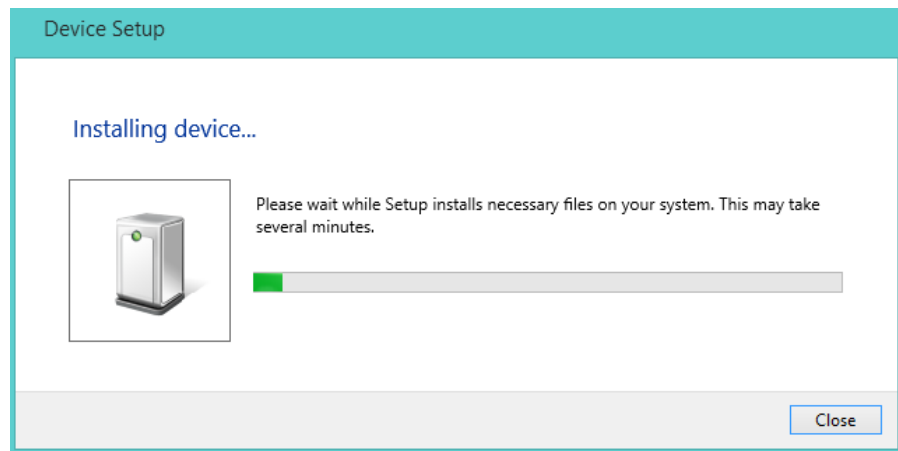
After installation is complete, drivers for the USB Blaster need to be installed. Let the installer launch the driver installation wizard. The others don't need to be launched at this time.



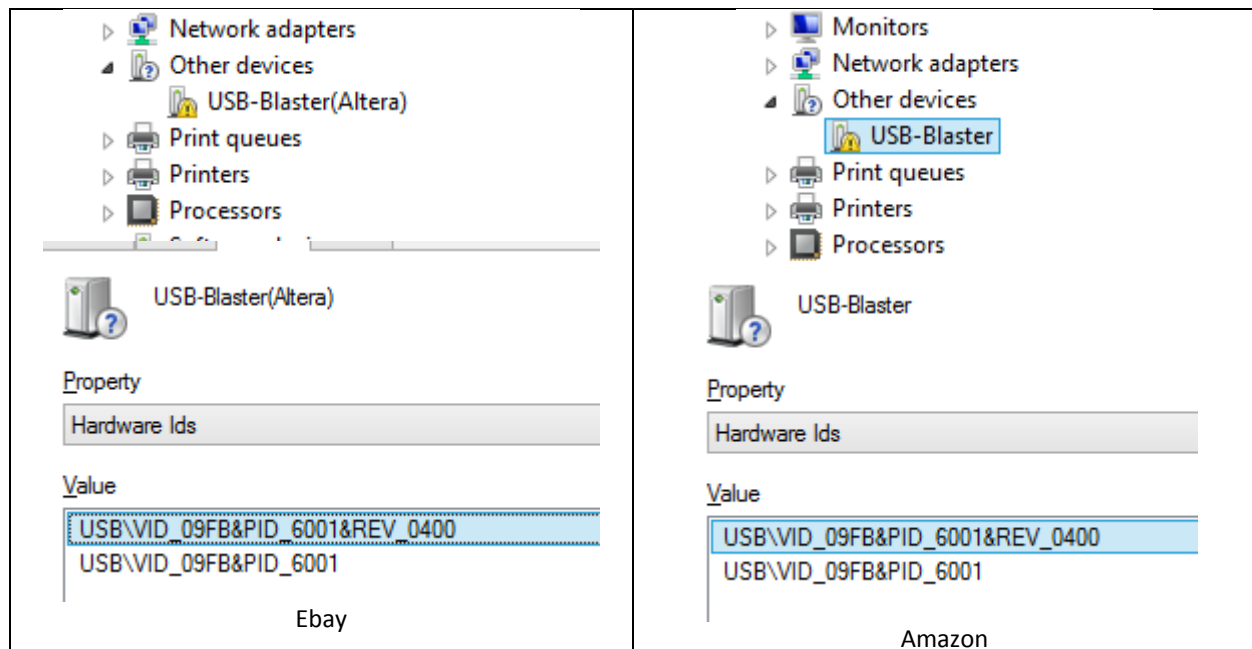
Click through the wizard to install the USB Blaster drivers.



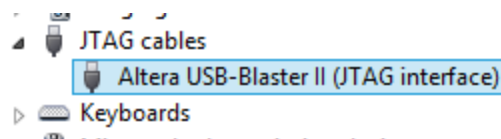
Now the USB Blaster can be connected to the PC USB port. Windows has another progress bar while the device is installed. Remember what USB port you connect the device. Always using the same USB port might help to avoid fighting with the drivers in the future.



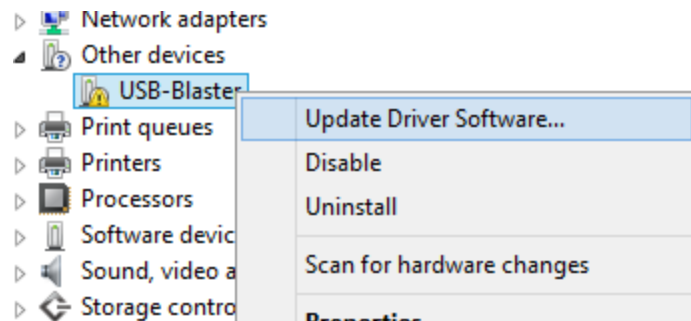
Now is a good time to open up the windows device manager to see if the USB Blaster is recognized and driver properly installed. Neither the ebay or amazon USB Blaster had the drivers work right from the start. Both have the same hardware Ids even though the Device Descriptions are different.



The goal is to get the USB Blaster drivers installed properly for the hardware (no yellow explanation warning). Once it is installed properly, you can proceed to starting the programmer to flash the firmware.



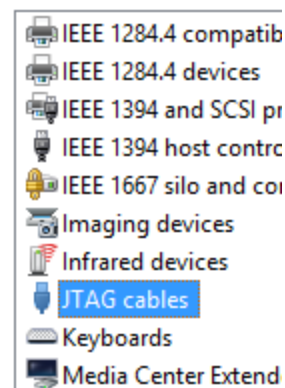
Right click on the USB Blaster in the device manager and pick Update Driver Software...



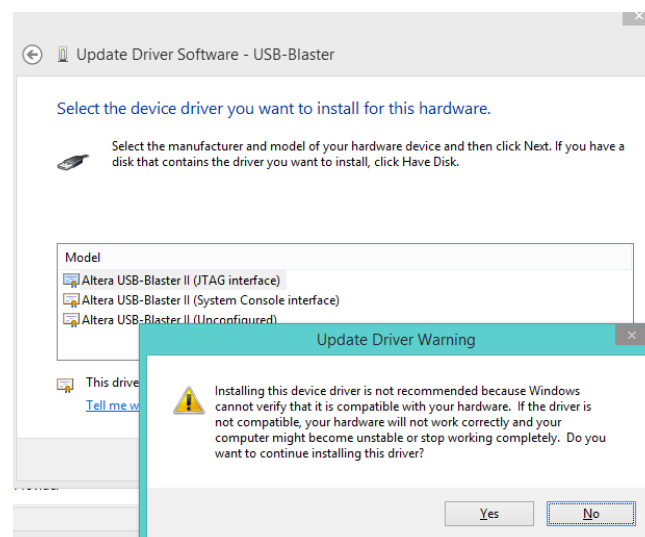
Select the options to pick from list of device drivers on my computer...

Select your device's

Common hardware types

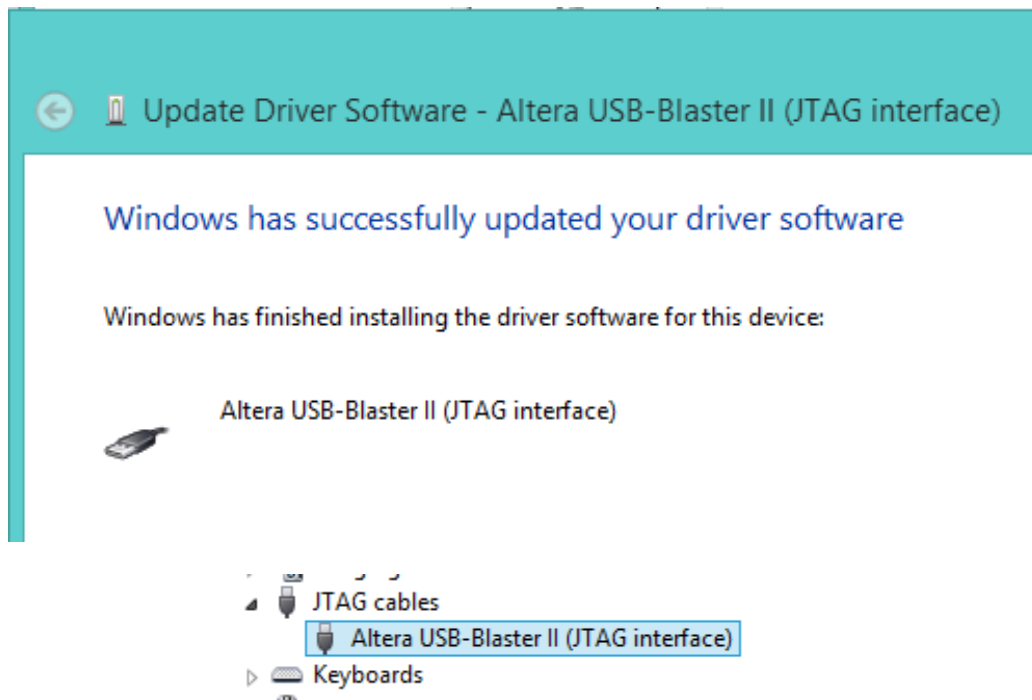


And select JTAG cables



Select the option for the model for the USB Blaster (JTAG interface) and acknowledge the warning.

Hopefully, this is successful:

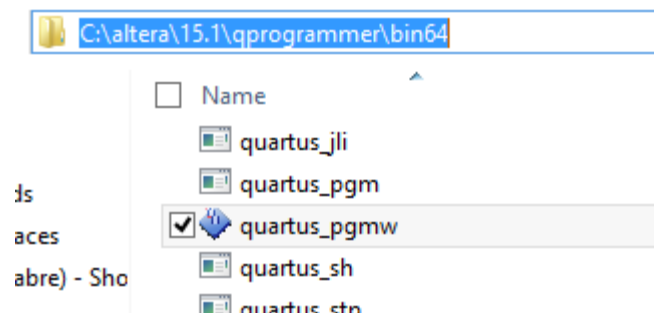


The Altera literature for installing the USB Blaster drivers is available here. It might help troubleshoot any issues encountered. Steps should be pretty similar for other versions of windows.

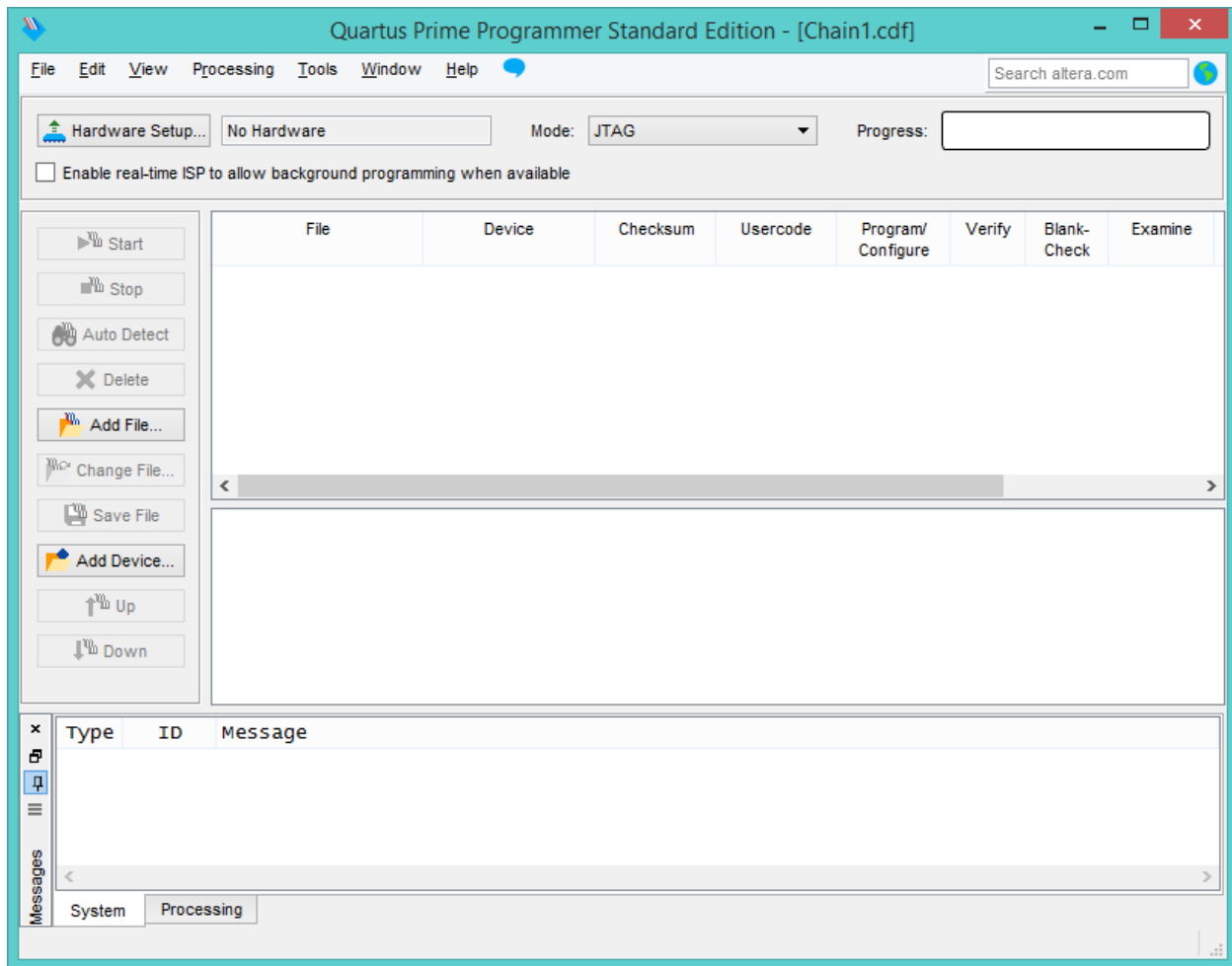
https://www.altera.com/content/dam/altera-www/global/en_US/pdfs/literature/ug/ug_usb_blstr_ii_cable.pdf

FLASHING THE FIRMWARE

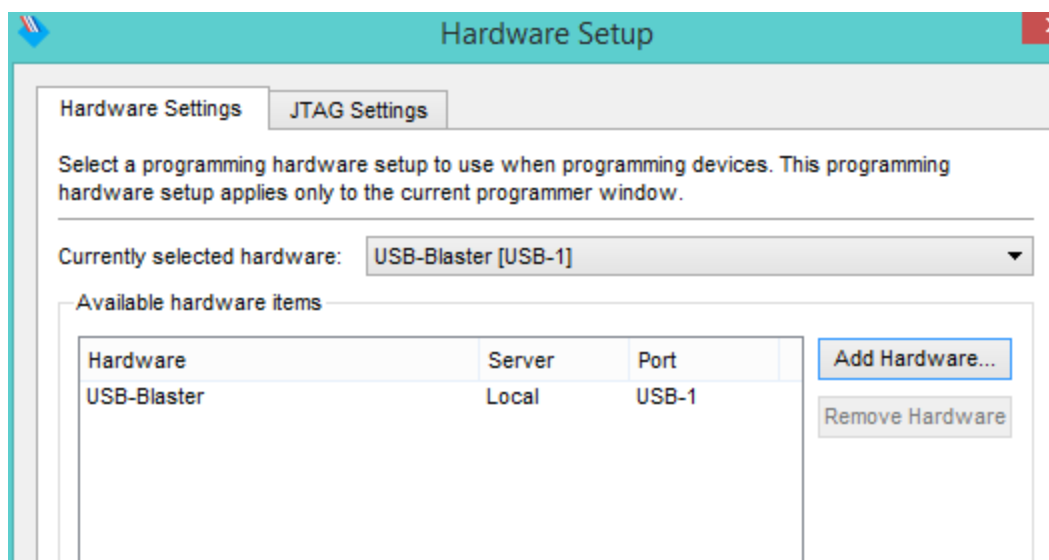
Open the Quartus Prime Programmer. The installer adds a shortcut to the Windows start menu. This is the default location the application is installed:



This opens the main programmer application window.

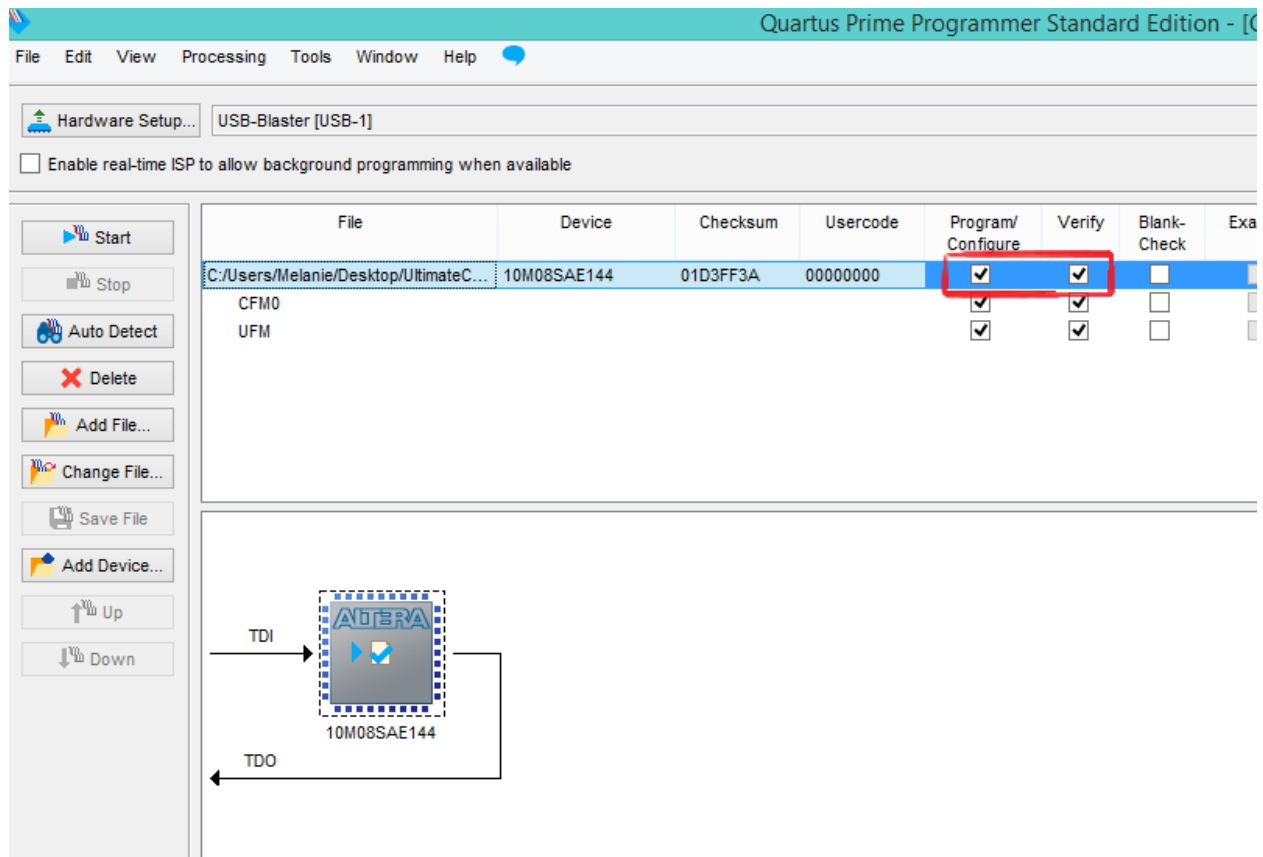


Next the hardware needs to be selected. Click the Hardware Setup button in the upper left. The following dialog box opens:



Select USB Blaster from the drop down selection box and close the dialog box.

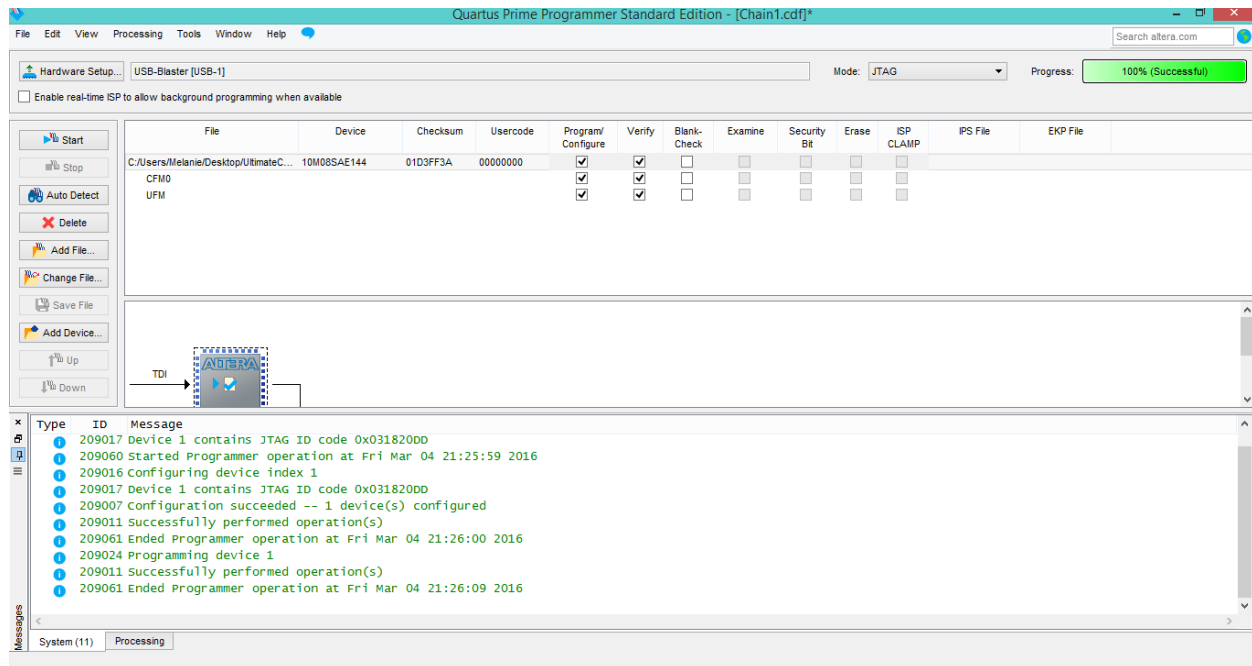
In the main window select the “Add File...” button from the left hand side and select the .pof file. The file will be displayed in the programmer window. Select the indicated check boxes to Program/Configure and Verify.



Remove the SD card from the Ultimate Cart, and connect the USB Blaster 10 pin ribbon cable to the Ultimate Cart programming header (and the USB Blaster). The shroud is keyed so it only fits on in one direction. Finally, connect the 5V power supply to the Ultimate Cart (double check it is not hooked up reversed), and turn the power supply on if necessary.

Everything is now setup, select the Start button to perform the programming.

The progress bar in the upper right hand corner will indicate when the programming has been completed. Programming takes about 10 to 30 seconds. I noticed one of the programmers was a bit faster. Review the message log for any errors once complete.



To disconnect the Ultimate Cart, first turn off and remove the 5V supply. Then unplug the USB cable from the PC and finally disconnect the 10 pin programming cable. The programmer software can be closed. No need to save the configuration file on the PC.

If everything updated okay, replace the SD card and test it in the Atari.