RK05 Emulator FPGA Programming

To program the FPGA, use a Lattice software application called Diamond Programmer and a third-party USB ispDOWNLOAD Cable called “Lattice HW-USBN-2A”. There are many sellers offering these cables on eBay and AliExpress for about US $20 to $25. This is an example screen-capture photo of one of them:

The following instructions were adapted from the Lattice Semiconductor “iCEstick Evaluation Kit User's Guide”, steps 1 through 9 on pages 13 through 15.

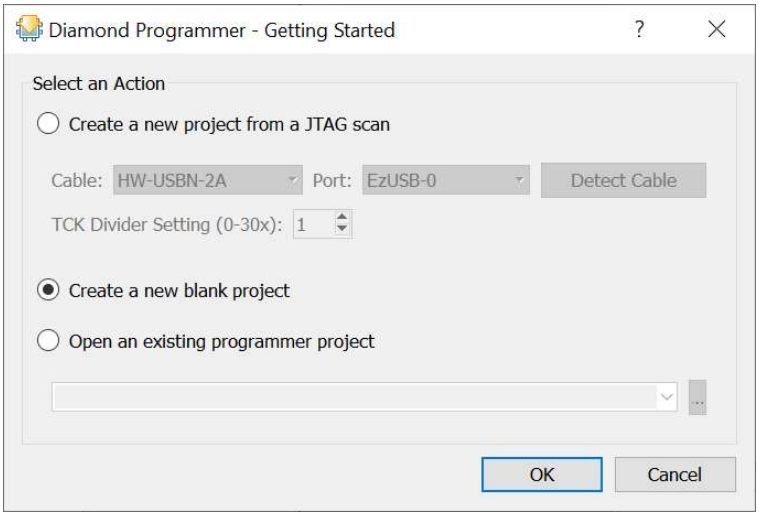
1. Plug the Lattice HW-USBN-2A cable into a USB port on your computer. The first time you connect the cable it might be necessary to configure the drivers. Some cables come with a tiny “Programming Cable Users Guide” that describes this process.

   Note: In my case, I had already been using the Lattice iCEstick with my computer which was disconnected prior to connecting the HW-USBN-2A cable. Initially, the behavior of USB enumeration was a bit strange. When the cable was first connected, I heard the standard Windows USB enumeration tones. Then after about a minute it seemed to disconnect repeatedly. I disconnected the cable from my USB hub and plugged the cable into a different port on the USB hub and it worked this time.

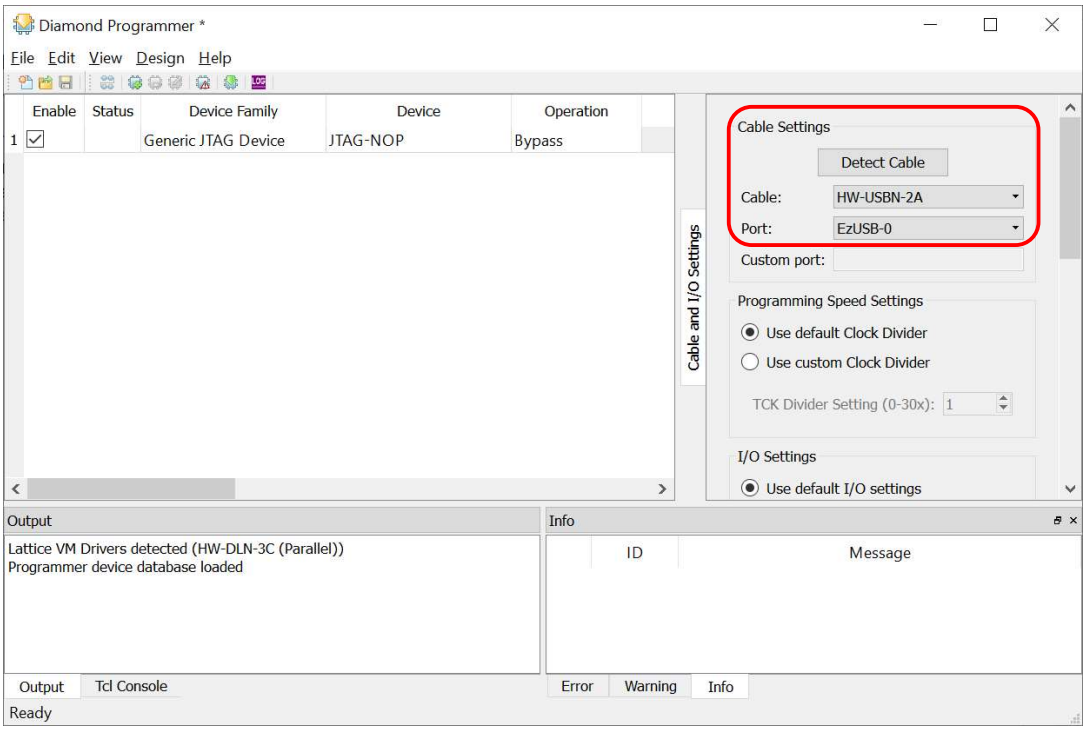
2. Use the gray flat-cable that comes with the HW-USB-2A cable to connect the HW-USB-2A to the FPGA Programming Connector, J1, on the RK05 Emulator. Ensure that the keying bump on the side of the flat-cable connector aligns with the similar feature in the J1 silkscreen on the RK05 Emulator. J1 is also labeled “FPGA PROGRAMMING”.

   Note: Version v0 of the RK05 Emulator has different signal mapping for J1. To program a v0 board it is necessary to use the fly-wire cable with the HW-USB-2A*. Connection instructions for the v0 board are provided in a separate document. RK05 Emulator versions v1 and newer can use the gray flat-cable connection described above, which is much easier to connect. There are only five version v0 boards that exist, so this is not common.*

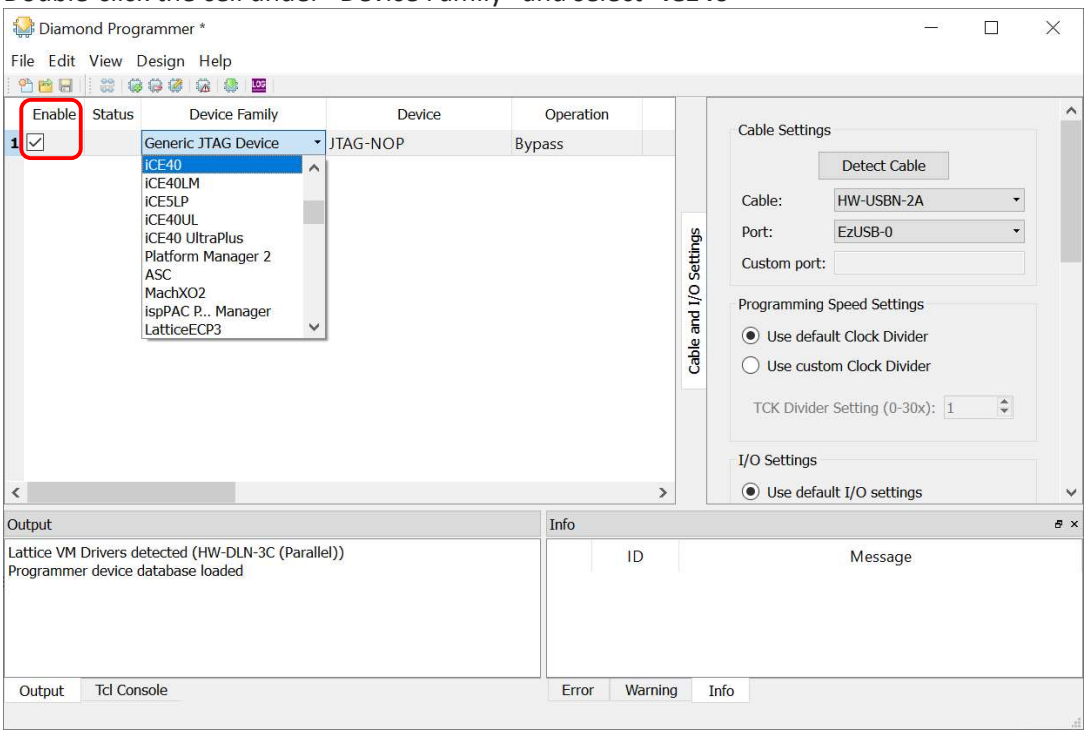
3. Run the Diamond Programmer application. The “Diamond Programmer Getting Started” window opens. Under “Select an Action”, click “**Create a new Blank Project**”, then click “**OK**”. If you try to create a new blank project from a scan, you will receive an error. Please select “**Create a new Blank Project**”.



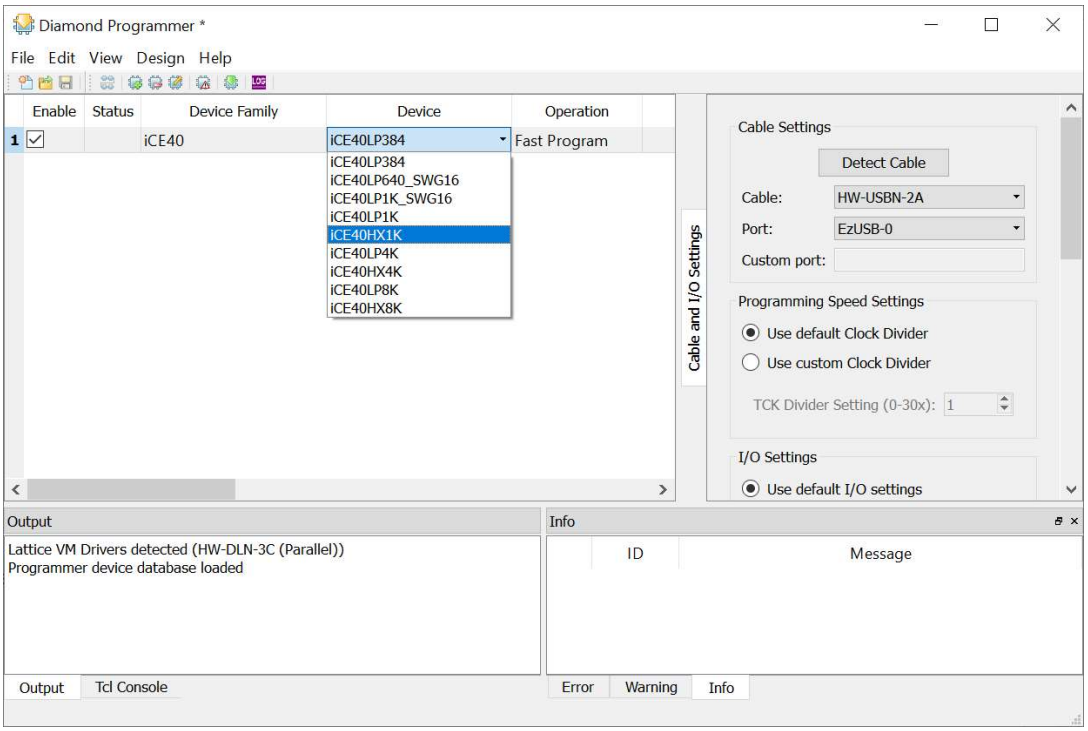
4. The Diamond Programmer interface window opens. Under “Cable Settings”, in the “Cable” menu select “**HW-USBN-2A**”. In the “Port” menu, select “**EzUSB-0**”. You can also click “**Detect Cable**” to set the correct cable and port. Just ensure that Cable: “**HW-USBN-2A**” and Port: “**EzUSB-0**” are selected.



5. Select the “**Enable**” check box.
6. Double-click the cell under “Device Family” and select “**iCE40**”

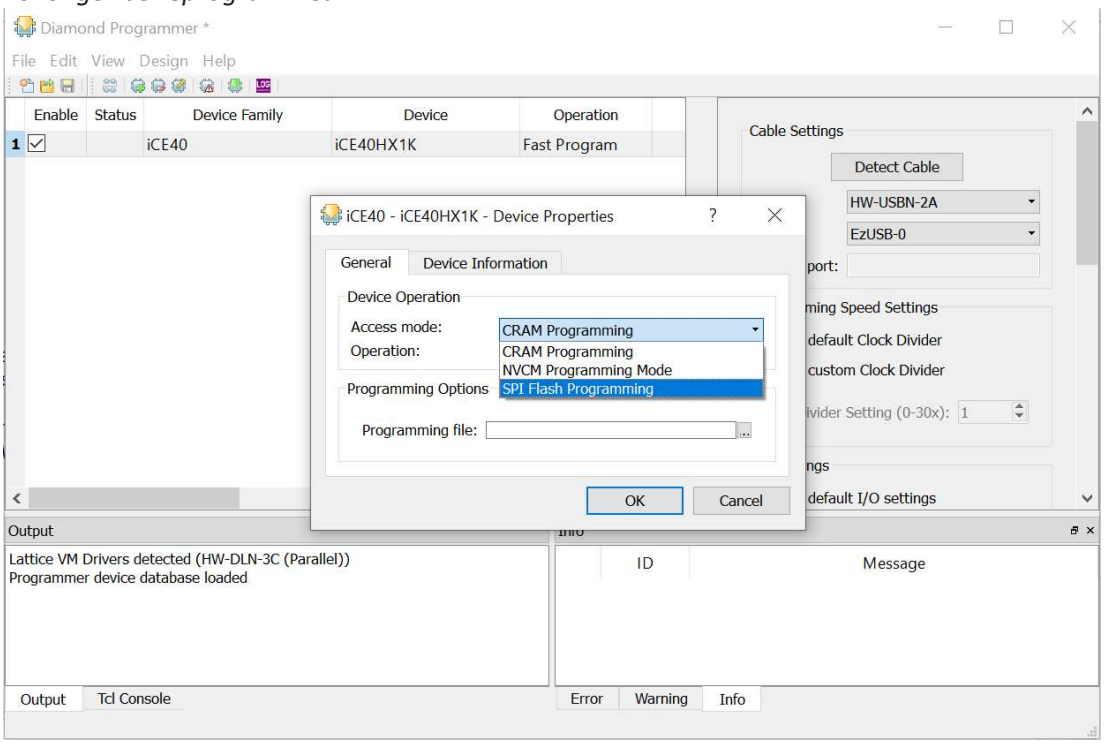


7. Double-click the cell under “Device” and select “**iCE40HX1K**”.

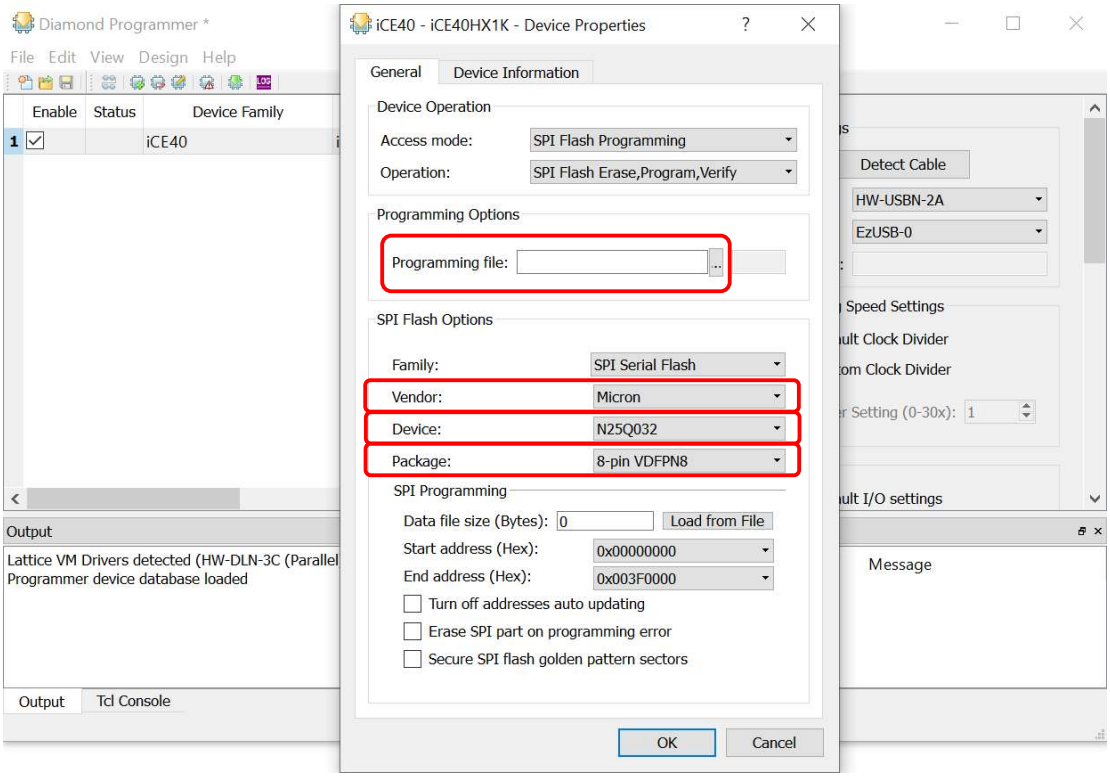


8. Double-click the cell under “Operation”. The “Device Properties” dialog box opens as shown. On the “Access mode” menu, click “**SPI Flash Programming**”. Click “**OK**”.

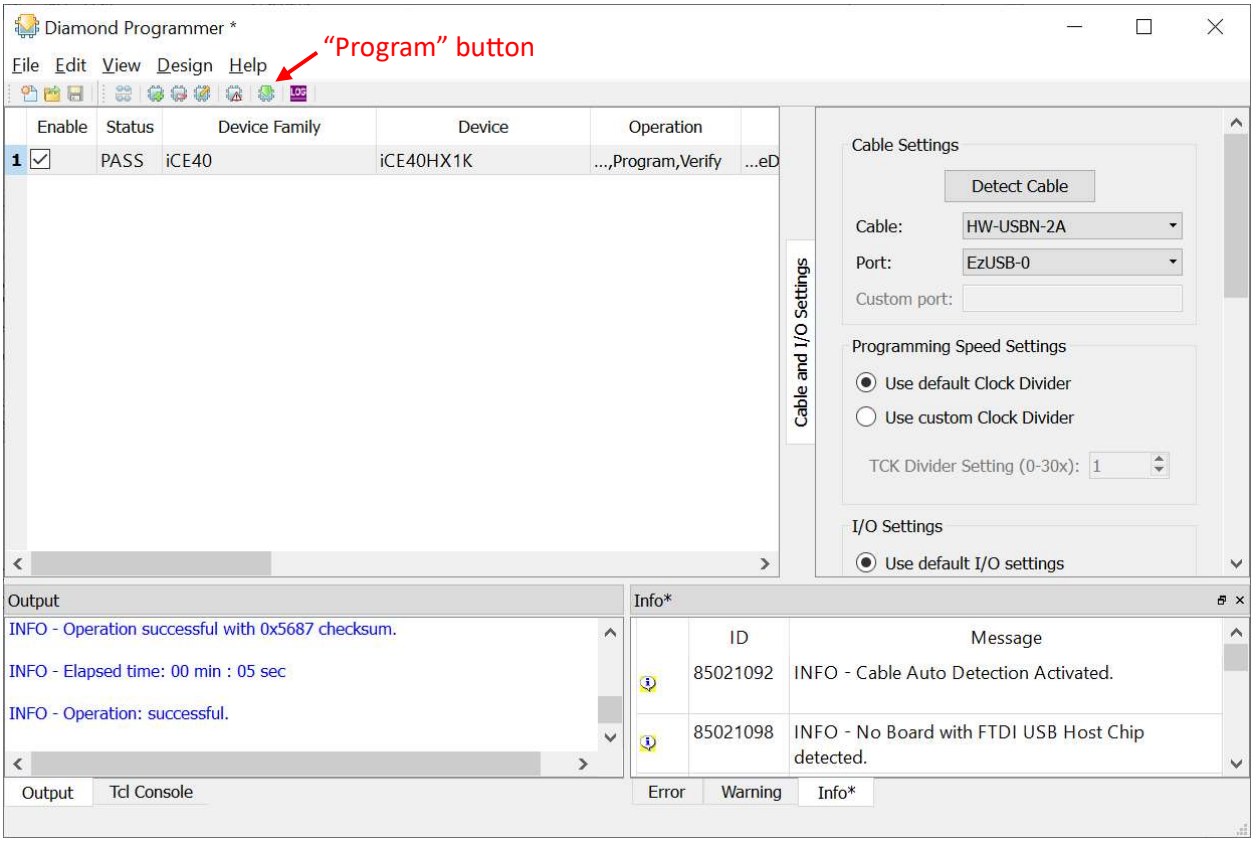
   <u>Warning</u>: NVCM Programming is NOT recommended. NVCM Programming is one-time programming. If you use NVCM Programming to program the iCE device, then the iCE device can no longer be reprogrammed.



9. After performing step 8, the “Device Properties” dialog box opens larger to allow selection of more options. Under “SPI Flash Options”, in the “Vendor” menu select “**Micron**”. In the “Device” menu, select “**N25Q032A**”. In the “Package” menu select “**8-pin VDFPN8**”. Also, under “Programming Options”, select the “Programming File” by clicking the three dots to the right of the filename box and then select the bitmap file in the file selection dialog. Once done, click “**OK**”.



10. On the Diamond Programmer toolbar, click the "**Program**" button to initiate the download. "Program" is the tiny green icon on the toolbar, just below the "p" in the "Help" menu. The bitstream starts downloading to the iCE device. The little "Output" box (lower left) displays erasing, programming, verifying, and then what it shows below… "INFO – Operation successful". Sometimes there's a bit of a delay until anything appears in the Output box, so give it a chance to finish.



11. Disconnect the gray flat cable from J1 on the RK05 emulator and cycle the power on the RK05 emulator before using it.