SYMPL ISA 128-bit Compute Engine
Alpha Evaluation Release Version 1.05a July 30, 2021
with **Bluetooth Classic**

Quick-Start Instructions

This demo is similar to the previous release Version 1.04a, except instead of the debugger and the target application sharing the same Tera Term display window and USB COM port, the USB port is dedicated to the debugger exclusively, while the target application uses Bluetooth coupled to a COM port tied to its own Tera Term instance.

Thus, this demo employs two instances of Tera Term: one instance for the debugger tied to the USB COM port and a second instance for the target application tied to a Bluetooth (Classic) COM port. Since the target side employs a Bluetooth-enabled COM port for use with Tera Term, the target side instance of Tera Term can be running on the same or different computer than the debugger instance of Tera Term is running on.

To get your SYMPL ISA 128 Evaluation up and running in the ULX3S, follow these easy steps:

1) Open SWITCHes 1 thru 4 on the ULX3S board by sliding them all the way down towards the SDRAM device. Note: only SW4 is used by this implementation. Connect micro USB cable to ULX3S connector US1 and USB connector of host computer used for debugger side.

2a) Download and install Fujprog USB FPGA flashing utility from the following link:

https://github.com/kost/fujprog/releases

2b) Place the "SYMPL_demo1_BT.bit" file in the Fujprog folder then from Windows command line, enter the following command to flash the implementation into the Lattice FPGA:

fujprog-v48-win64.exe -j flash SYMPL_demo1_BT.bit

Note: the Lattice device must be a ECP5 85F size. If you don't have a ULX3S board, you can order one online from Mouser Electronics at the following link:

https://www.mouser.com/ProductDetail/Crowd-Supply/CS-ULX3S-03?qs=hWgE7mdIu5SAh1Tg%2FLbSUg%3D%3D

3a) If you don't already have a copy of Tera Term VT100 terminal emulator installed, visit the following website, download it, and install it:

https://osdn.net/projects/ttssh2/releases/

3b) For Linux users, D EMARD has demonstrated the debugger and target application working with xterm, with binary uploads being accomplished using the newest version of Fujprog. For specifics, contact D EMARD. I've seen screen snapshots of it and it looks pretty good.

4) Launch Tera Term and under Setup, configure the serial port for 115200 baud rate, 1 stop, no parity. The preferred font is “Consolas”, size 12, 11, or 10. Select the USB COM port that the ULX3S connected to.

5) Press button B0 (PWR) on the ULX3S board to initiate a reset.

6) Once you see the power-up message, press <cr> to get the Help Menu.

7) When you are ready, press <cr> again to go to the debugger window.

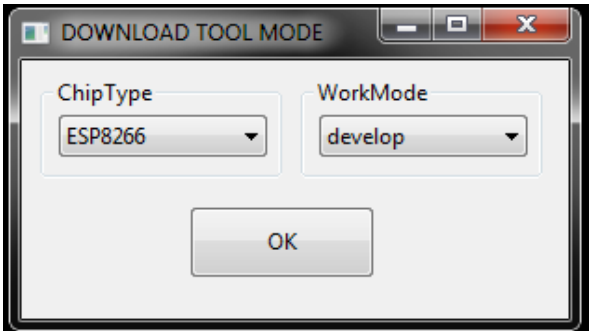
8) Now that you have verified that the FPGA has been successfully flashed, it is time to flash your ESP32 WROOM 32 chip for Bluetooth Classic. To properly configure the USB connection for flashing the ESP32, exit Tera Term and then close SWITCH 4 by sliding it away from the SDRAM chip towards the “ON” position.

9) Once SWITCH 4 is in the ON position, hold down on button B1 and then press BO for one second and release B0, then release B1. This action places the ESP32 device in flash programming mode.

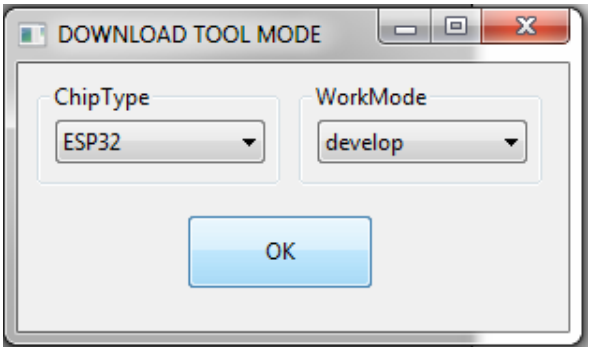
10) Launch Espressif Flash Download Tool. If you do not already have it installed, visit the following link, download it, install it, and launch it:

https://www.espressif.com/sites/default/files/tools/flash_download_tool_v3.8.8_0.zip

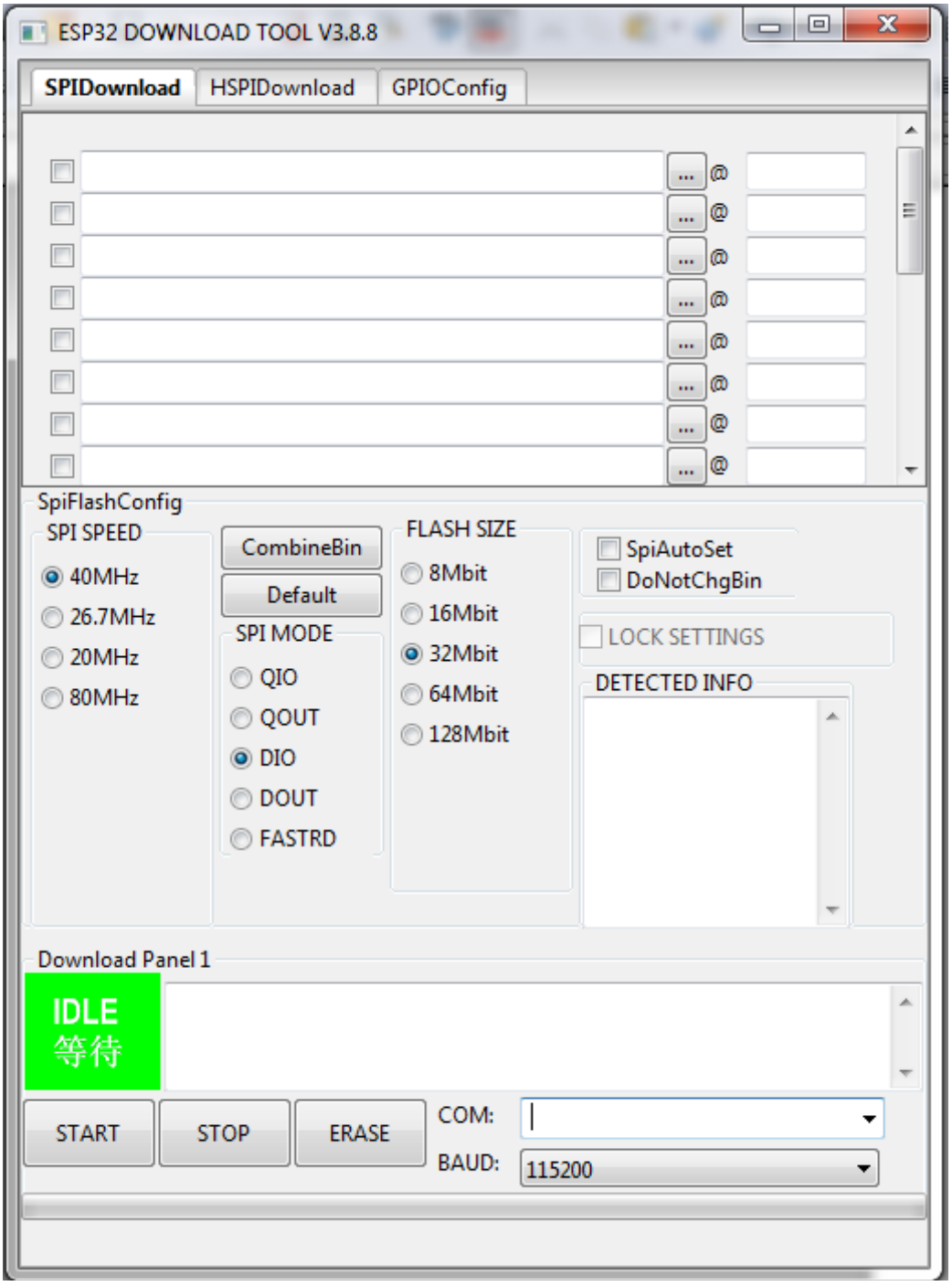
11a) When launched, you should get the following dialog:



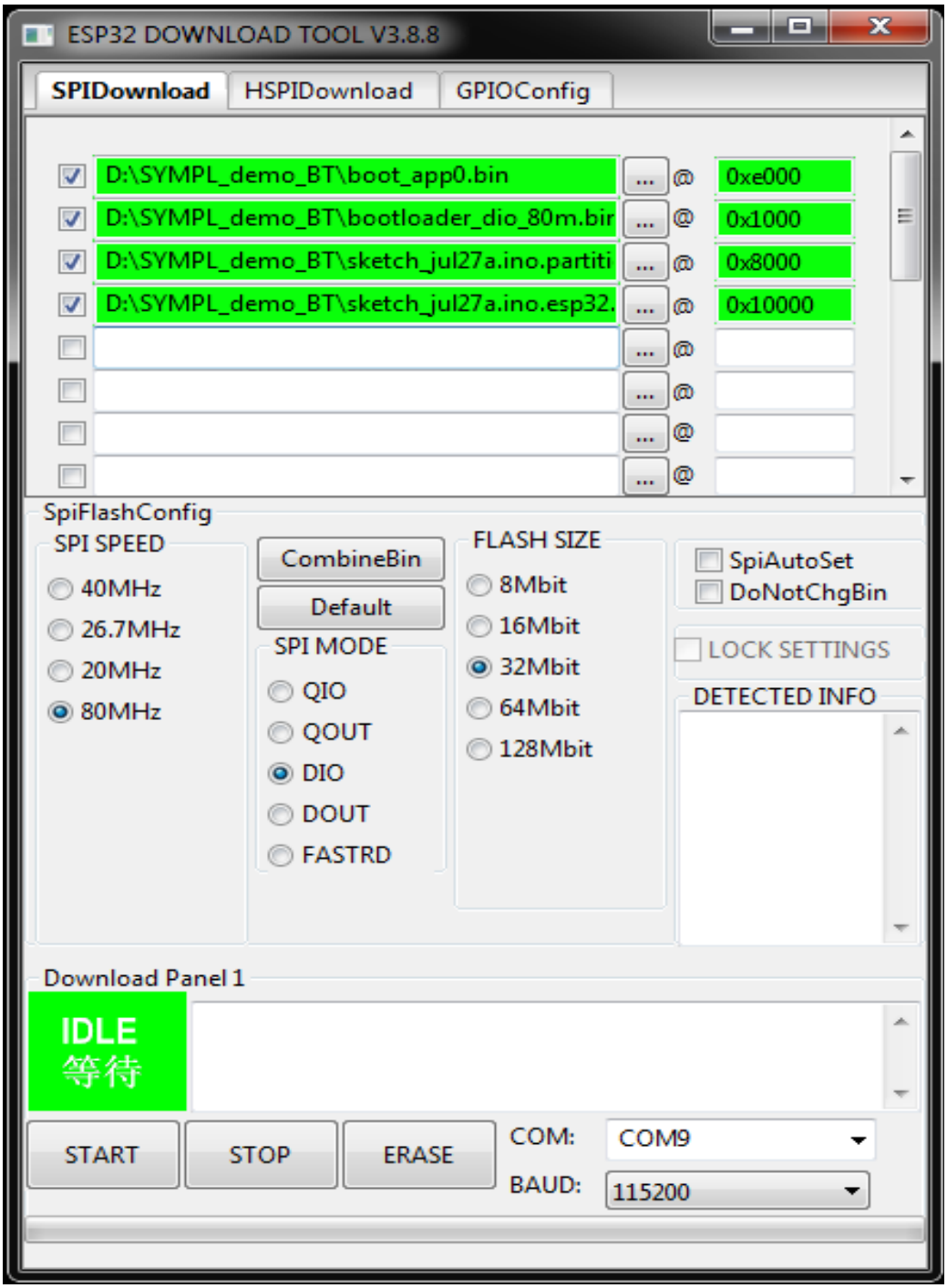
11b) Under ChipType, select “ESP32” and click on OK:



11c) After clicking OK, the main ESP32 Download Tool dialog should pop up as shown below:



11d) Select 80Mhz, DIO, 32Mbit and select the same COM port number used when previously flashing .bit file into the FPGA along with baud rate of 115200 as shown below. Also enter the four .bin files provided in the SYMPL_demo_BT folder at the SYMPL_demo_BT repository, being sure that the boxes at the left of each is checked and all checked fields are highlighted in green as shown below. Note: sometimes the fields do not always highlight in green when expected. If this happens, simply either click in that field or click in the field below it and the previous field should turn green.



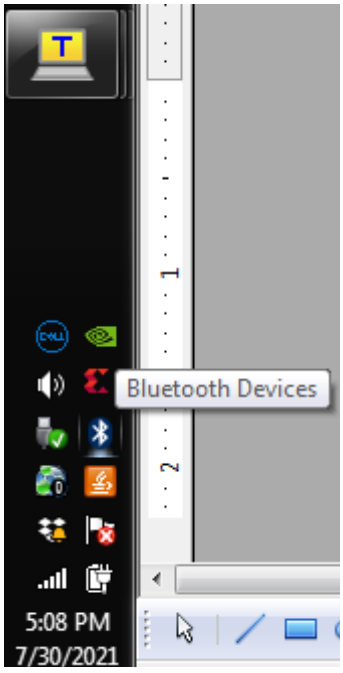
11e) Click on the ERASE button and wait for IDLE to change to FINISH, indicating it's done erasing. Then click on the START button to begin flashing the ESP32 chip and wait until IDLE changes to download then to FINISH.

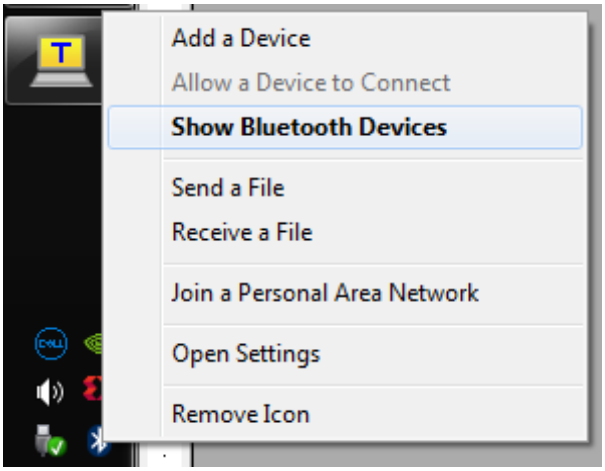
11f) Press and release button B0 (PWR) briefly to do a hard reset on the ESP32 chip.

11g) Open SWITCH 4 by sliding it all the way down towards the SDRAM chip. At this point, you should see the LEDs down-count to 0 (all off), indicating that the SYMPL debugger core has come out of reset and is now running.

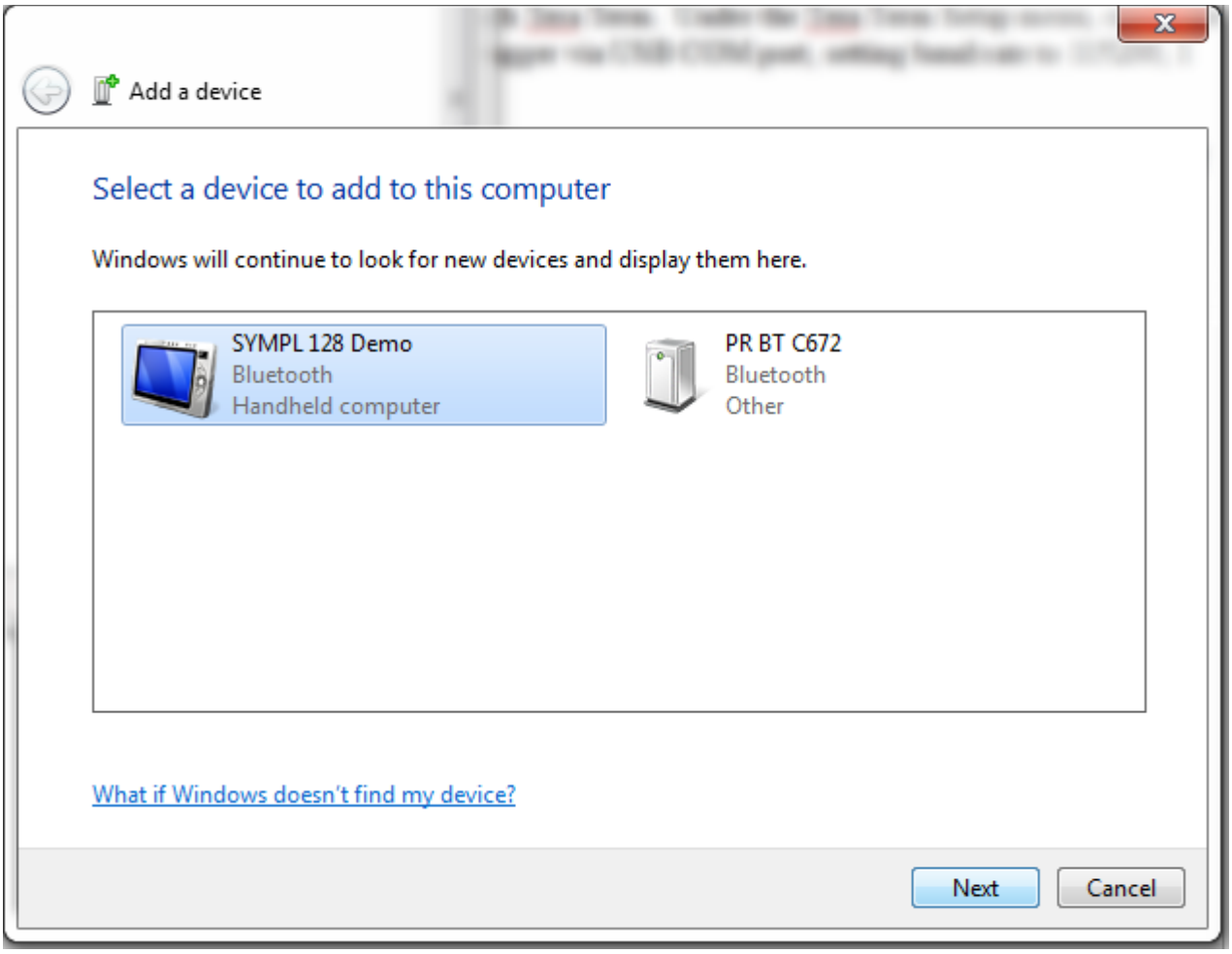
12) Exit the ESP32 Download Tool and launch Tera Term. Under the Tera Term Setup menu, configure this instance of Tera Term for use by the debugger via USB COM port, setting baud rate to 115200, 1 stop bit and no parity. Make sure to select the USB COM port that the ULX3S is connected to on your computer.

13a) Next, click on the highlighted Bluetooth icon displayed in your Windows System Tray section of your Windows TaskBar and select "Add a Device" as shown below:

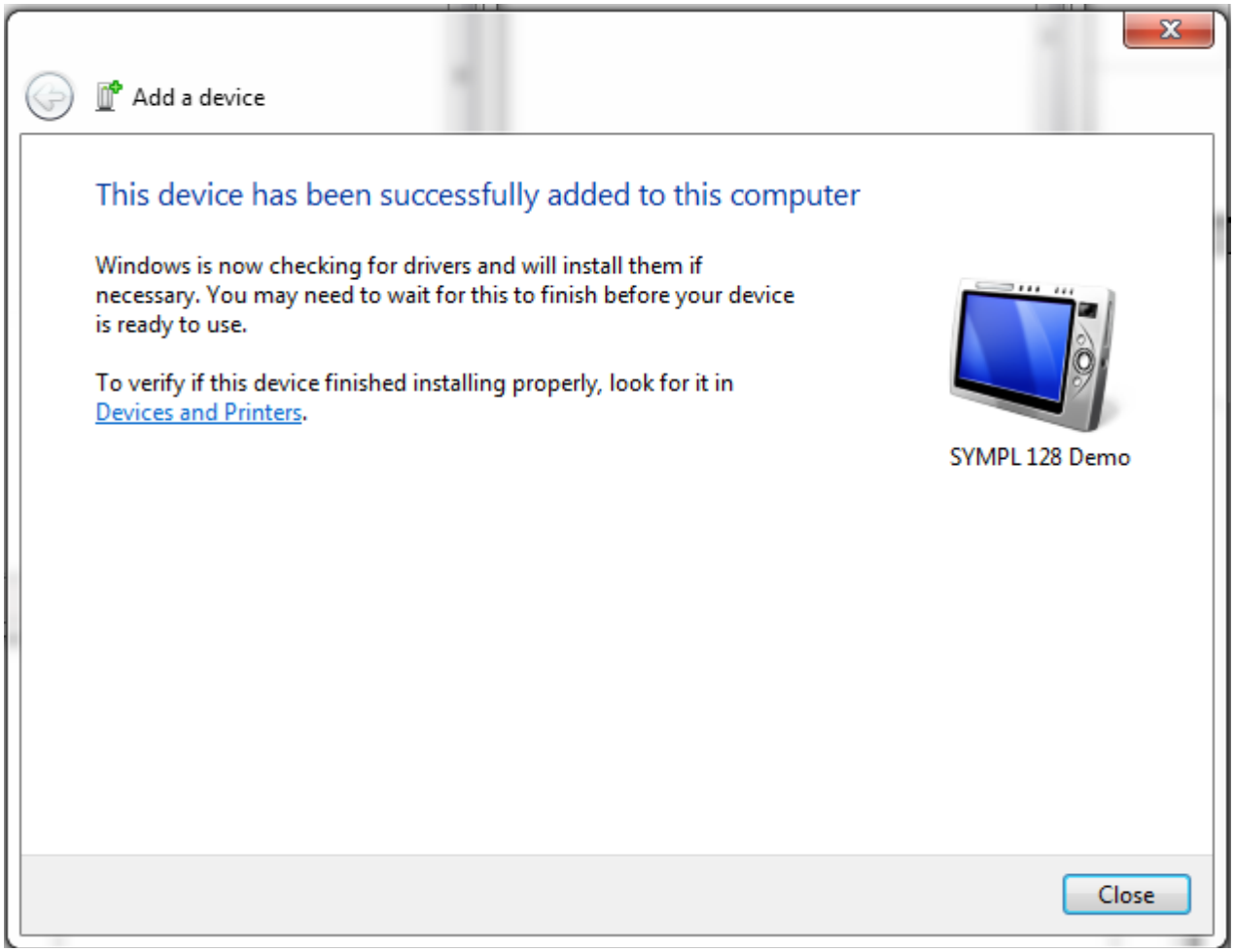




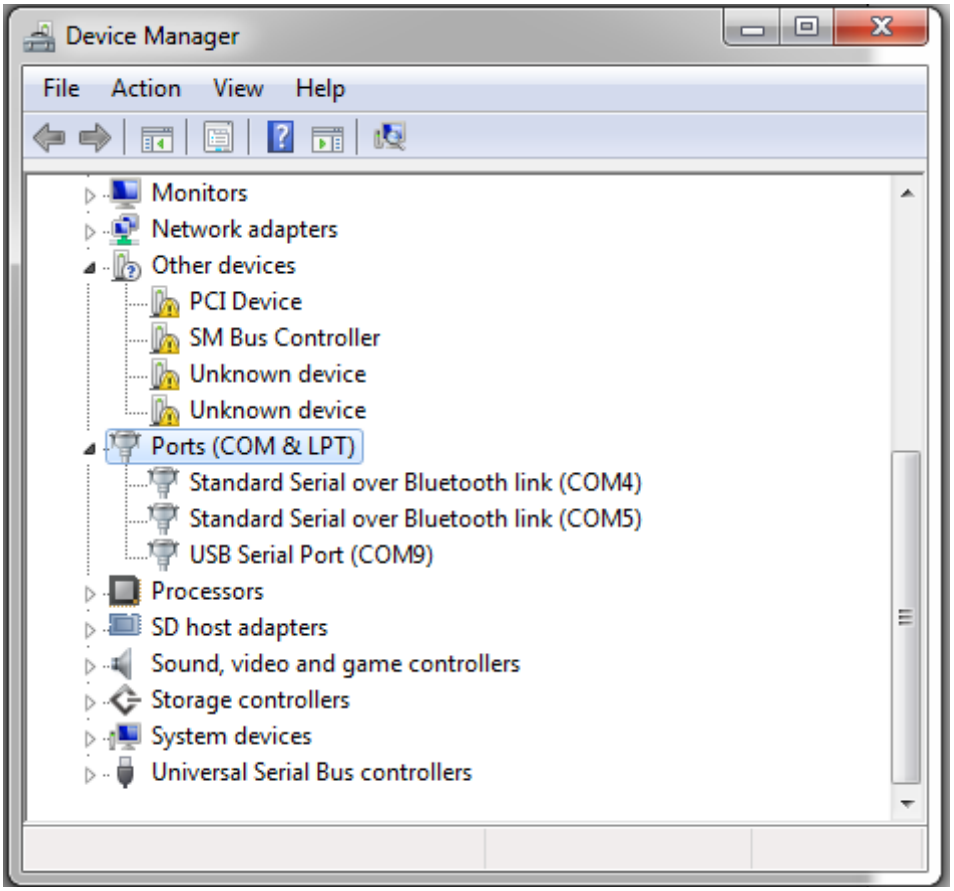
13b) If your Bluetooth-enabled system detects the ESP32 Bluetooth feature you previously flashed into it, you should see the following dialog box with the SYMPL 128 demo icon. Click on the icon, then click on “Next” as shown below:



13c) If your system is successful in adding the new device, you should get the following dialog. At this point, simply click on the “Close” button”:



13d) Under Windows-->Start-->Control Panel-->Hardware and Sound, select Device Manager and the following dialog should pop up. Under Ports (COM & LPT), inspect to make sure that you have two Standard Serial over Bluetooth links as shown below. There should be two links, one for transmit and one for receive. If you don't see any or you only see one of them, be patient and wait for the links to be established, which can sometimes take a while, possibly up to a minute or more.



14a) Once your two serial Bluetooth COM port links are established, launch your first instance of Tera Term and go into the Setup menu to configure the USB serial port for 115200 baud, 8 data, 1 stop and no parity. Then press button B0 (PWR). At this time you should see the debugger power-up message in this Tera Term instance.

14b) Finally, launch a second instance of Tera Term and configure it also for 115200 baud, 8 data, 1 stop and no parity. Select the first Bluetooth COM port link as it appears in the Device Manager shown previously. If all goes well, a Bluetooth link will be established between the target Bluetooth application and Tera Term.

15) Click on the debugger instance of Tera Term and press <cr> once to proceed to the debugger help menu, then press <cr> again to enter the debugger. Press G <cr> to launch the application. Once pressed, the Bluetooth application instance of Tera Term should pop up with the application menu. Simultaneously, the application instance will also pop up a blank TEK 4010 graphic display window. Click on the application instance of Tera Term and then press a numeric key to select the graphic image to display.

NOTE: Once the ESP32 WROOM 32 device is flashed for Bluetooth, you should not ever have to re-flash it. If you do re-flash it, you will need to remove the previous association of SYMPL128_demo by clicking on the Bluetooth icon in the System Tray, then click on "Show Bluetooth Devices, then click on the SYMPL128_demo icon, then click on "Remove." Once removed, it must be re-installed by following the same procedure described previously, before the Bluetooth application can be used again.

16) Also provided is a copy of the assembly language source file for the demo being run on the target processor, which you can edit and re-assemble. A copy of the object listing file is provided in case you would like to have a symbolic listing of the code in the debugger. To load the listing file, click on the debugger instance of Tera Term and type UL<cr>. When prompted, select the file name under the File menu and be sure to check "Binary."

17) Study the help menu to discover features and capabilities of the debugger.

18) I will be writing a more detailed user manual in the next few weeks. In the meantime, if you have questions, email me.

19) A copy of the assembler can be purchased online for $99.00US at:
https://www.cdadapter.com/cross32.htm

20) This particular implementation is 128-bit integer only. It has the following memory-mapped integer arithmetic operators. I will be adding more integer and floating-point operators in the coming weeks:

AND
OR
XOR
SHIFT
ADD
ADDC
SUB
SUBB

21) For specifics on their use, download and study the provided instruction table and UFP_ISA document at this address:

https://github.com/jerry-D/HedgeHog-Fused-Spiking-Neural-Network-Emulator-Compute-Engine/blob/master/UFP_ISA.pdf