

Programming a New Ozymandius (Ozy)

HPSDR PROJECT

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Background Information:

This information is current as of May, 2009. As the software in HPSDR evolves, it may be necessary to update this document again, from time to time. This document is written for Windows XP. Procedures for Vista should be identical, but have not been tested.

Thanks, and credit to Phil Covington, N8VB, who wrote the original 2006 document and developed the original programming and download process.

Mercury and Penelope currently load their FPGA's at every power-up from an on board EEPROM. The software image for the FPGA resides in this EEPROM permanently; at least until the next software revision is installed in the EEPROM.

Ozy currently works differently. Although it has an onboard EEPROM for holding the FPGA programming image, it is NOT used currently. Instead, the FPGA code is downloaded into the FPGA from PowerSDR, via the USB connection and FX2 USB processor, anytime that PowerSDR is run, and PowerSDR sees that the FPGA is empty. It will be empty anytime after power has been turned off for Ozy.

In order for a PC to recognize what kind of USB hardware application it is talking to, the computer uses an identifier pair called a VID/PID. In the case of Ozy, the unique HPSDR USB identifier pair is resident in the EEPROM memory inside the FX2 USB processor on the Ozy card.

If a unique VID/PID has not been programmed into the FX2, then it reverts to a default factory identifier for the FX2. The unique HPSDR-Ozy VID/PID that identifies the Ozy as an HPSDR application, and a short program telling it where to find it is the only information that needs to be programmed into an Ozy, to enable it to function in the system and be recognized by PowerSDR.

So, the steps will be to access the blank FX2 using the default factory VID/PID, then once in communication, download a program that tells the FX2 to use the unique identifier in the EEPROM memory, and then to install the unique HPSDR VID/PID. After this occurs, and the Ozy is power cycled, PowerSDR will recognize it as an HPSDR Ozy, and it should work normally.

This document assumes the user has basic knowledge of use of the “Command Prompt” command line accessory built into Windows.

This document also assumes that the HPSDR hardware has never been run on the computer you are using. If you have already installed the HPSDR drivers, then you can skip the associated driver installation instructions, and just go straight to the step of verifying the proper installation.

Pre-requisites

You must have both Microsoft .NET Framework 1.1 and Microsoft .NET Framework 2.0 installed on your computer. These can be downloaded from the Microsoft web site. They can both exist on the same computer without problems.

Collect the following files, and place them in a folder that can be easily located using the instructions in the command line utility built into Windows. (I created a folder called OzyUSBLib on the desktop.)

All of these files should be in the “.zip” file associated with this document.

- HPSDR_USB_LIB_V1.1.dll
- HPSDR_USB_LIB_V1.dll
- libusb0.dll
- libusb0.sys
- loadFW.exe
- OZY_HOST_LOAD.cat
- OZY_HOST_LOAD.inf
- ozyfw-sdr1k.hex
- program_OZYEEPROM.exe
- write_EEPROM.exe

Programming sequence

1.0 Overview Information

Initially the OZY board will have a blank EEPROM installed. When the FX2 on the OZY enumerates on USB, it will have the default VID of 04b4 and PID of 8613, whenever the EEPROM is missing or not programmed properly. We then need to program the on board EEPROM with a "C0" load which tells the FX2 to get its new VID and PID from the EEPROM instead of using the defaults of 04b4 and 8613. For the "Host Assisted Firmware Load" (the ongoing PowerSDR download method) we will use a VID of FFFE and a PID of 0007.

2.0 Installing the "default" driver.

Power up, and connect the OZY to the USB. Windows should start the "New Hardware Wizard." When the New Hardware Wizard comes up you need to point it to the OZY_HOST_LOAD.inf file.

Select not to search for the driver. Select to choose to install the driver. Select "Have Disk." Navigate to the folder where you placed the libusb0.sys and OZY_HOST_LOAD.inf files and select the OZY_HOST_LOAD.inf file. Click "Open," then complete the normal driver installation procedure. If a window pops up warning that the driver is unsigned, click "install anyhow."

Open the computer's "Device Manager" and verify that there is an entry for "LibUSB-Win32 Devices" and under that entry you see "OZY FX2LP - EEPROM missing" device. This message verifies that you have properly installed the driver for the default VID/PID. The VID of 04b4 and PID of 8613 are now associated with the libusb0.sys driver. The next step is to program the EEPROM on OZY.

3.0 Programming the OZY EEPROM

We will now load the "C0" program into the FX2. A copy of it is inside the overall Ozy firmware file named "ozyfw-sdr1k.hex."

Open the "Command Prompt" accessory (command line) and navigate to the folder where you saved the OZY utility files. Once there, at the command prompt type:

```
load_FW 0x04b4 0x8613 ozyfw-sdr1k.hex
```

Upon successful download of the firmware to the OZY, you will hear the OZY's FX2 enumerate again.

Now that OZY is running the firmware we can program the EEPROM. At the command prompt type:

```
program_OZYEEPROM 0xfffe 0x0007
```

The OZY EEPROM should now be programmed with the VID of 0xFFFE and PID of 0x0007.

Unplug OZY from the USB and turn off power to the OZY. Turn the power for Ozy back on, and plug the USB connector back in.

4.0 Getting Ozy to talk to the PC and PowerSDR

The OZY should now enumerate with the new (permanent HPSDR) VID/PID.

If you have never run an HPSDR system on your computer, then Windows will again ask to install a driver. Perform the same steps as above. Tell it you have the disk, and point the Device Driver Wizard at the file [OZY_HOST_LOAD.inf](#).

After completion of the driver installation, again open the computer's "Device Manager" and verify that there is an entry for "LibUSB-Win32 Devices." This time, underneath that device, the entry should read "OZY Host Assisted Firmware Load."

This is the permanent Ozy driver, and you should now be able to open PowerSDR, and following the instructions for PowerSDR, control the HPSDR hardware properly.

The first time you press the "Start" button for each session, you will see the PowerSDR download the proper FPGA control code for the FPGA in Ozy. This FPGA code is updated and maintained as part of the PowerSDR software releases.

5.0 Notes

Performing the above steps will inherently install the USBIO driver for PowerSDR to control Ozy and the rest of the HPSDR hardware, so you should not have to repeat this driver installation if you are following the Quick Startup Guide.

http://hpsdr.org/wiki/index.php?title=Quick_Startup_Guide

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