

Preparing the Terasic DE-1 and an SD Card for Self-Booting NitrOS-9

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Hello my Friends. This procedure was put together to help a close friend of mine get NitrOS-9 to self-boot from the SD Card on his Terasic DE-1 FPGA Cyclone II Evaluation Board. This was put together from the many emails I have been exchanging lately. Here is the entire email put into a pdf file. As you follow these steps, please let me know if I need to make any corrections, additions for new platforms, additional needed material, missing material, etcetera. The following is my response to his email question. It is my hope and prayer that you will be able to use this detailed guide and procedure to get the wonderful NitrOS-9 6809 v3.3.0 Operating System Originally written to run on Radio Shack's Color Computer line and ultimately for the Coco3 to run and self-boot on the Terasic DE-1 platform with Ed's Analog board attached that you have recently acquired. All positive feedback is very much appreciated. Now, get your favorite drink handy, sit down at your favorite table, workbench or computer desk with your brand new Terasic DE-1 Board and Ed's Analog Board securely attached setup. You are about to embark on a wonderful, bold new journey into the Wide Wonderful World of the Coco3FPGA – A Place where many have gone before and have had loads of FUN! Engage!

Email: Ok, I have these.

Question: What the heck do I do with them?

:) <Big Grin> Now that is the correct question to ask!

I will attempt to describe the entire process from nothing to booting NitrOS-9 from the SD Card. This is going to be a very long email. Get your favorite drink and sit down. You might need it. :) The process is easy to do. It's just very long and tedious.

First assemble the two boards. :) This is so obvious that you probably have already done so.

Now you need to get some software packages to get the Coco3FPGA POF file and the Coco3 ROM files into your DE-1.

First you need to program the pof file permanently into your DE-1, so go to Terasic's web site at the following url and download the Quartus II Web Version 13.0SP1 software package. Be sure to select the 13.0SP1 version in the dropdown menu.

<

[http://dl.altera.com/13.0sp1/?edition=web&platform=windows&download_manager=direct&direct_download=1&version_number=13.0sp1&description=Quartus+II+Web+Edition+Software+\(Device+support+included\)&download_method=download&filesize=4715202560&direct_file=Quartus-web-13.0.1.232-windows.tar#tabs-1](http://dl.altera.com/13.0sp1/?edition=web&platform=windows&download_manager=direct&direct_download=1&version_number=13.0sp1&description=Quartus+II+Web+Edition+Software+(Device+support+included)&download_method=download&filesize=4715202560&direct_file=Quartus-web-13.0.1.232-windows.tar#tabs-1)>

Next, determine whether you have the new or old sram. This determines which Coco3FPGA Prerelease file you will need for your DE-1 board.

(Get old and new sram part numbers and put them here.)

Download the latest Coco3FPGA Release version of the pof files from the files section appropriate for your sram on the DE-1.

This is the url for the files folder in the Coco3FPGA Yahoo Group.

<<https://groups.yahoo.com/neo/groups/CoCo3FPGA/files>>

This url contains every release and prerelease of the .sof and .pof files Gary Becker has ever released plus many other files as well.

There is now a new full release called “Coco3FPGA 4.1 Extra Builds” which contains .pof files for all versions of the Terasic DE-1 with Gary’s or Ed’s Analog board. Download this file at the following link and unzip it to find the particular version of the .pof file you need for your hardware.

<https://xa.yimg.com/df/CoCo3FPGA/CoCo3FPGA_4.1_Extra_Builds.zip?token=18KyeuDKaRk3H0wPWU26QI3t8XDWe3P8LOGT_Vkkjo7bVEq-NnQpYq8xzycPpnEEkPRoo_afPTnC382BpGajKQE8v9YkDfZLCdGYTFWbgLMMNBZPolpnNA3JZEJ_u&type=download>

Connect up the DE-1 USB port to the PC. Connect the VGA and PS/2 keyboard ports. You don’t need any serial ports connected yet. Do not power up the DE-1 yet.

On the left edge of the board between the RED power switch and the SW9 switch is a two position switch labeled RUN/PROG. Move it to PROG. This is necessary to program the pof file.

Power up the DE-1.

Once you have the Quartus II software downloaded, use 7-ZIP to unzip it to a folder and install it.

Once Quartus II is installed, start it up and X out of the opening dialog window. Look for the Programmer icon on the tool bar. The programmer icon is 4 icons in from the right. Click it.

A new window will appear.

In the upper right hand side of the screen will be a dropdown menu showing JTAG. Change it to Active Serial Programming.

Click ADD FILE and navigate to the Coco3FPGA pof file. Double click it.

Click Start to begin programming the DE-1 board. When successfully completed, close out the programmer window and exit Quartus II. The FPGA chip will now know how to configure itself after power is cycled.

Power down the DE-1 board BEFORE switching the RUN/PROG switch back to RUN.

Once the DE-1 is off, switch the RUN/PROG switch back to RUN.

Now you are ready to power up your DE-1 and proceed to the next step.

We are not done yet. The Coco3FPGA has no roms yet, so all you will get displayed on the screen will be whatever is already stored in the sram most likely.

Now we need to get the DE-1 Control Program to program the Flash memory chip with the DE1_Flash Roms Shorten version.bin file. Go to the following url to get the DE-1 Control Panel v2.1.0 software package.

< <http://www.terasic.com.tw/cgi-bin/page/archive.pl?Language=English&CategoryNo=165&No=83&PartNo=4>>

Unzip the DE-1 Control Panel zip file into a folder. No installation is necessary. Run the DE-1 Control Panel exe file.

After the control panel connects to the DE-1 successfully, click the memory button located in the bottom left portion of the control Panel window.

In the Memory Type section on the middle right hand side of the window, change the dropdown menu to read FLASH (200000h WORDS, 4MB).

In the sequential write section on the right, leave the starting address at \$000000. Check file length. Click the button Write a file to memory. In the dialog box that opens, navigate to the DE_1_flash shorten version.bin file. It is attached to this email for your convenience. Programming of the flash chip should begin.

Once finished, power off the DE-1 and power it back on.

You should now be looking at the DECB power on message and see the colors flashing in the cursor. If not, switch SW2 and SW3 on and power cycle again.

We are still not done yet. The last file to program into the flash is the rom.img file to enable your Coco3FPGA to directly boot NitrOS-9 on the SD Card.

The control panel uses 16-bit words so the correct address to burn the rom.img file to is $\$3FC000/2=\$1FE000$ so in the Sequential Write section enter 001FE000. Again click file length. Click the button Write a file to memory. Navigate to the rom.img file and double click it. This file is also attached to this email. The programming will begin. When complete your Coco3FPGA DE-1 is now ready to be used.

The next set of steps will prepare your SD Card.

It was suggested to me to read my SD Card, zip it up and make it available so the steps that follow that make NitrOS-9 bootable from the SD Card can be bypassed. Here is the link to that file. The NitrOS-9 SD Boot.zip file is about 83MBs.

< <https://www.dropbox.com/s/qtv51guxciolpoo/NitrOS-9%20SD%20Boot.zip?dl=0> >

Unzip the file to a folder. Use Rawrite32 in Windows to get the NitrOS-9 SD Card Image file onto the SD Card in Windows. Use the DD command in Linux. Somewhere in an email is the proper command syntax to use for the DD command.

I have attached to this email all the files you will need to get your DE-1 up and running except the SD Card image zip file due to its size.

If you wish to create your own version of NitrOS-9 on the SD Card, the following steps will prepare the SD Card to boot NitrOS-9.

You can use the scrap.dsk image file to initially prepare a blank SD Card for use with NitrOS-9.

Switch SW2 & SW3 to the on position to boot into DECB.

To get NitrOS-9 onto the SD Card, you will need to connect the DE-1 serial port to your PC. Use whatever serial cable is appropriate for your particular setup.

Prepare Drivewire 4 to communicate with the DE-1 by running the Simple Config Wizard.

Click Tools, then Simple Config Wizard.

Select the Coco3FPGA DE-1 Board Icon in the middle of the far right column.

Click next.

Select the Com port for Drivewire 4 to use.

Click next.

Select the proper baud rate. In the beginning, you can leave it at 115200 baud for the initial communications test. After you know the connection between the DE-1 serial port and the PC is good, you can up it to run at the fastest speed possible with your setup. I'm currently running 460800 baud on both Serial ports. For 115200 baud, switches SW7 & SW8 are off. For 460800 Baud, SW7 is off and SW8 is on. To use the DE-1 serial port, switch SW9 is off. To use the serial port on the Analog Board, SW9 is on.

Click next to continue the Simple Config Wizard setup or click finish to end the wizard.

Drivewire 4 is now ready to communicate with the DE-1.

Mount scrap.dsk in Drivewire 4 Drive 0.

If you do not have a blank SD Card of 4GBs or greater inserted into the SD Card Interface, power down the DE-1 and insert the SD Card you wish to Build NitroOS-9 on. To use all 4 - 1GB partitions, you will probably need an 8GB SD Card just to be safe.

Once an SD Card is safely inserted into the DE-1, power it back on.

In DECB, type DOS.

NitroOS-9 should boot from Drivewire 4 Drive 0. If not, check your setup.

Once NitroOS-9 is booted, you have 4 Drives defined that will eventually exist on the SD Card. The 4 drives are called /sd for the root bootable partition. The other three are called /sd1, /sd2 & /sd3. Each partition or drive is 0.993GBs in size. I used an 8GB card as that was the cheapest I could find at the time, but I would imagine that a 4GB card will do as well. Format the /sd partition with the following command.

Format /sd

Make sure you answer NO to the "Both PHYSICAL and LOGICAL format?" and "Physical Verify desired?" Questions or you will be waiting a loooooong time for the format to complete. The format will take only a few seconds answering no to both questions since the integrity of the SD Card does not need verifying.

Now use this dsave command to copy all the files from the scrap.dsk image file in Drivewire 4 drive 0 to the sd card partition 0.

```
Cd /dd
```

```
dsave /sd #44k ! shell -p
```

One of the main differences between scrap.dsk and scrap_kip.dsk is /dd on scrap.dsk is Drivewire 4 Drive 0 and /dd on scrap_kip.dsk is your SD Boot partition 0. Cool huh! You can verify this by issuing a free command and checking the capacity of the partition. If the capacity is 4,165,632 sectors then /dd is the SD card. If the capacity is 18,432 sectors, then /dd is Drivewire 4 Drive 0.

There is now a new scrap_kip_rtc.dsk file included that is identical to the scrap_kip.dsk file EXCEPT that the new RTC and RAMD drivers and R0 device descriptor have been added to the OS9Boot file. If you would like the new drivers and descriptor installed on your CoCo3FPGA then use the scrap_kip_rtc.dsk file in place of the scrap_kip.dsk file in all of the following instructions. If you do not want the new drivers and descriptor then just use scrap_kip.dsk as the instructions dictate.

Now remove scrap.dsk from Drivewire drive 0 and insert scrap_kip.dsk (or scrap_kip_rtc.dsk) into Drivewire 4 Drive 0. Now power cycle your Coco3FPGA.

Once you have booted NitroS-9 from scrap_kip.dsk (or scrap_kip_rtc.dsk), we can proceed to copy the rest of NitroS-9 to the SD Card. To make tasks easier, I have attached all the appropriate files to this email.

Insert the latest nos96809l2v030300coco3_80d.dsk file into Drivewire 4 Drive 1. dsave everything on /x1 to /dd with the following commands.

```
cd /x1
```

```
dsave /dd #44k ! shell -p
```

This will take a while, but once you are done, the SD card partition 0 or /dd is a full NitroS-9 Repo distribution.

Once this is done, there is one last file to copy and that is the OS9Boot file from scrap_kip.dsk (or scrap_kip_rtc.dsk). Use the following command to get OS9Boot onto the SD card partition 0.

```
Cd /x0
```

Copy OS9Boot /dd/OS9Boot

Now you should be done. To check your work, you can try booting directly from the SD card.

Power off the Coco3FPGA.

Move sw2 to the edge of the board. This activates Slot 3 which contains the rom.img that is instrumental in booting NitrOS-9 on the SD Card.

Power the Coco3FPGA back on.

You should be greeted with a self-booting NitrOS-9 Operating System running on your brand new Coco3FPGA! Hurray! You have done well. If NitrOS-9 did not boot, then check your work.

Make sure all appropriate files have been programmed into your Coco3FPGA and the SD Card is setup properly, cables connected properly and power supplies plugged in and turned on as the case may be. I can't tell you how many times I have forgotten to plug the A/C cable back in to a PC I was working on.

If you have any questions, send me an email and I'll do my best to help you with your problem. If you would like to use Skype or Google Hangouts to talk, I can do that as well. Please send me a private email so we can make arrangements.

Once you get up and running, we are going to have to get our Coco3FPGAs online so we can play!

Most of all, have FUN!!! Take care my friend.

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http://www.cocopedia.com/wiki/index.php/Kip_Koon