Getting the 'Minimig ECS' core running on FleaFPGA Ohm

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What is Minimig and what are it's specs as ported to FleaFPGA Ohm?
Basically, Minimig is an FPGA-based compatible version of the legendary Commodore Amiga computer. Commodore Amiga once dominated the home gaming scene for the late-80's and early 90's

Minimig ECS 68k (as ported to FleaFPGA Ohm) Hardware specifications:

- 68000, 68010 and 68020(beta) selectable CPU options
- OCS/ECS selectable chipset
- From 0.5MB to 26MB configurable system RAM (many configurations possible)
- Support for four virtual floppy and two virtual Hard disk drives
- Video out via HDMI (576p video at non-standard pixel clock) with audio.
- Video out 15/30kHz rate selectable via GPIO (See Appendix 'A' for pin drawing).
- Provision for PS/2 Mouse on *USB1* port and PS/2 Keyboard on *USB2* port.
  NOTE: Minimig Ohm example supports PS/2-only keyboards and mice, as well as some (but not all) USB keyboards that can also speak PS/2.
- Two game ports wired to the GPIO (See Appendix 'A' for pin drawing).
- One serial UART wired to GPIO (See Appendix 'A' for pin drawing).
- Minimig system reset is accessed via FleaFPGA Ohm 2-pin 'RST' header.

Before you begin:
You will need:
1.) 1 x FleaFPGA Ohm board, configured with Minimig ECS core (See SETUP PROCEDURE).
2.) 1 x correctly-prepared micro-SDHC card (see SETUP PROCEDURE below).
3.) 1 x PS/2 keyboard and (optional) PS/2 mouse, including all necessary adapter cabling.
4.) 1 x mini-HDMI to HDMI cable.
5.) 1 x micro USB cable to power your Ohm board.
6.) HDMI compatible TV that is tolerant of the non-standard 576p timing generated by Minimig.

Files as found in this GitHub page:
- 'Minimig_ECS_Flash_Era_Prgm.vme' FPGA Configuration bit-file, allowing FleaFPGA Ohm to be configured as per the Minimig ECS example.

- 'OSD_CA01.sys' as needed by the On Screen Display (OSD) 2nd CPU of the Minimig to manage the system configuration as well as manage virtual floppy and hard drives (Note must be installed on a FAT32 formatted micro SDHC card, along with kick.rom and any .adf or .hdf files in the SD card root directory).

- 'Minimig_ECS_Diamond_Project.zip' Complete Minimig project for use with Lattice Diamond (saved in Diamond version 3.9). Includes all HDL sources for the ECS Minimig port to FleaFPGA Ohm. Has been saved as a Lattice Diamond Project archive and can be opened and modified under Lattice Diamond (to be uploaded to GitHub shortly).

- 'Minimig_setup_README.pdf' Document you are reading now ☺

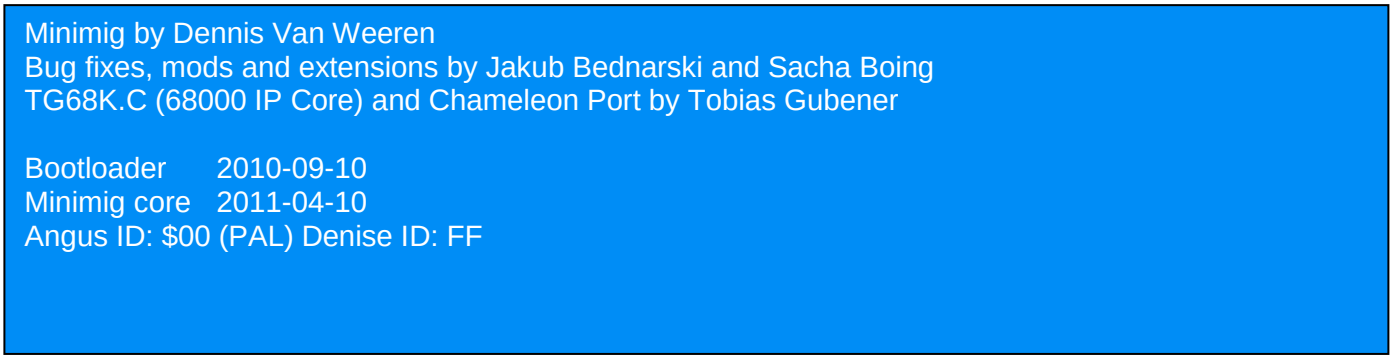
Not included in this GitHub page <u>but</u> needed for the micro-SD card:
- "kick.rom" Amiga Kickstart ROM raw binary image (normally either 256kBytes or 512kBytes in size, depending on kickstart ROM version...). NOTE: File MUST be named kick.rom otherwise the Minimig will NOT be able to boot.

- "mygame.adf" or "myhardfile.hdf" floppy or hard disk image file(s).

*** MINIMIG OHM SETUP PROCEDURE ***

Step 1.) Installing the 'Minimig_ECS_Flash_Era_Prgm.vme' file into the FleaFPGA Ohm board:

Please download and select the above-mentioned bit-file and program your bit-file as outlined in the FleaFPGA Ohm Quickstart Guide. Once you have done this, plug a PS/2 Keyboard and video display into your FleaFPGA Ohm and then cycle power to it.You should be greeted by a solid blue screen with following white message at the top of the display:



If you see the above message, you were successful! ☺ Power off your Ohm board and proceed to the next step…

Step 2.) Copy the required Minimig boot-up files to the SDHC card.

Copy the following files mentioned over the previous pages to your micro SDHC card:
- kick.rom
- OSD_CA01.sys
- Virtual floppy or hard disk (.adf/.hdf) files that may be optionally loaded and run on Minimig

*Recommended ways to get a copy of Amiga Kickstart boot ROM (renamed to 'kick.rom' as required by Minimig) are either to purchase a copy of Amiga Forever by Cloanto *or* obtain a binary image from the physical ROM chips off a real Amiga computer that you own.* DO NOT ASK ME FOR THE KICKSTART ROM FILE NEEDED BY MINIMIG!

Step 3.) Ohm-Minimig initial power-up

Install the SDHC card into FleaFPGA Ohm, plug your PS/2 keyboard into 'USB2' port on FleaFPGA Ohm and apply power. Assuming the files were copied successfully, you should see a the classic amiga boot splash screen (white screen with a static hand holding up a floppy disk if using Kickstart ROM version 1.3, or a purple screen with animated disk floating into a disk drive if using Kickstart ROM 3.1 etc.).

Minimig can be configured, or manage installed virtual mass storage media by summoning an on-screen menu (OSD). To toggle the On-Screen Display menu Press 'F12' on the keyboard, you should see a small menu appear in the center of the screen. Use the keyboard's arrow keys and spacebar to navigate the menu and select system preferences or to load/run .adf files (Virtual floppy disk images) into the Minimig. Note: Correct or optimal configuration of the Minimig core is beyond the scope of this startup guide. Some links are provided below, should the reader wish to know more about Minimig.

If you got this far: Congratulations! You have just completed your basic Minimig install! ☺

OK… So where to from here?

To know more about the Minimig, or for Minimig specific help, users are encouraged to visit the following websites:
http://www.minimig.net/
http://eab.abime.net/

There are also various Miniming tutorials or discussions that may be found on YouTube and elsewhere online.

Advanced users are free to browse the related Minimig HDL source archive, found in the same GitHub repository where this document was found. Thankyou! ☺

About the Minimig core

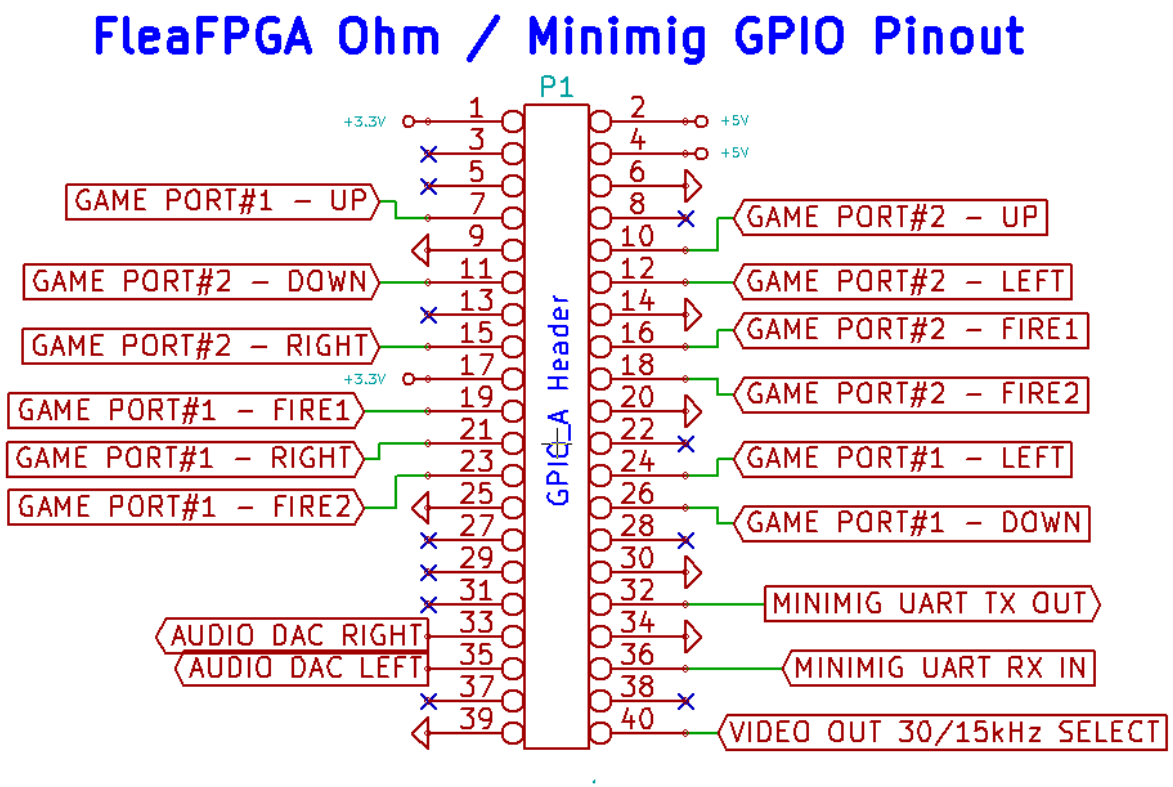
- Minimig verilog sources and on-screen menu firmware were originally created by Dennis Van Weeren and published under GPL3
- TG68 (68k CPU core for FPGA) and fAMpIGA extensions were originally created by Tobias Gubener and also published under GPL3
- HDMI and related audio modules were published under 2-clause BSD by Mike field and Ingo Korb.

Sources for the Minimig On-Screen-Display (OSD menu) firmware may be found here:
https://github.com/robinsonb5/minimig_tc64/

Well that's it for now - Good luck and (as always) Happy Experimenting! ☺

Regards,
Valentin Angelovski

APPENDIX 'A': Minimig GPIO Header pin drawing (Game Ports, UART, etc.)



Game port Pins: Connect to GND to trigger

Audio Out Pins: Refer to following schematic

SCANRATE SELECT PIN: SHORT TO GND FOR 15kHz VIDEO OUT