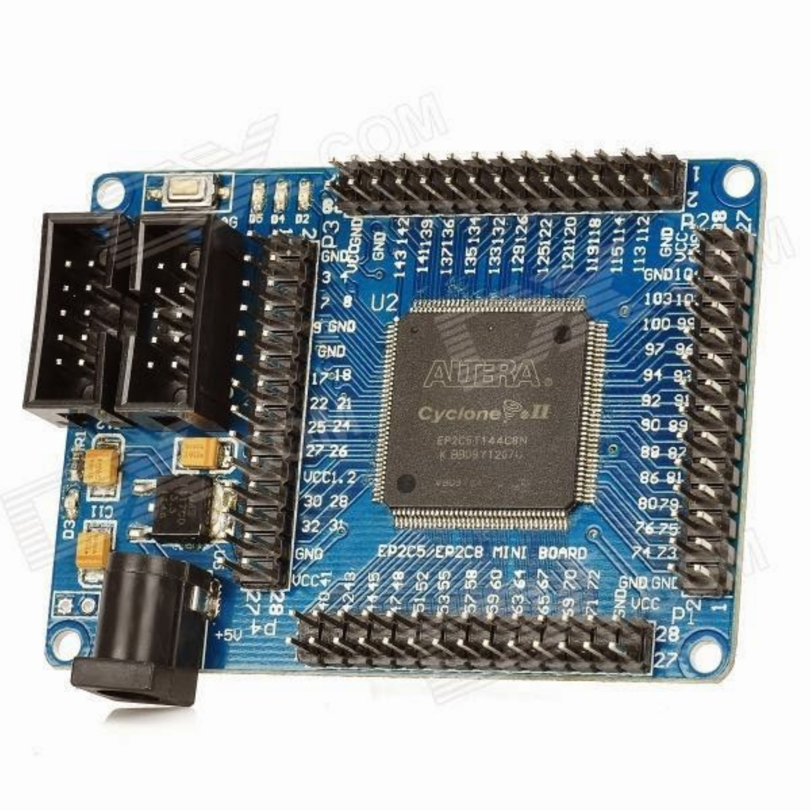
19th March 2014

Retro FPGA: Grant Searle's Multicomp



[http://3.bp.blogspot.com/-uA34gSLGjHU/UymNvbp37NI/AAAAAAAABBY/cMZs7H5Qcjw/s1600/EP2C5+Cyclone+II+Dev+Board.jpg]

A $35 FPGA board that can mimic capable Z80, 6809 or 6502 homebrew computers with serial ports, SD mass storage and even VGA & PS/2 keyboard connectors. Mix and match parts to create the computer you like - all in a simple VHDL file a beginner can understand. Brilliant! A bit like a Lego approach to retrocomputing. It is a great way to learn about programmable hardware, where you can start straight off with something interesting and then can climb the learning curve to extend it. The mind wanders... shall I add a MMU to the 6809? Or add a replica of Cromemco's disk controller so I can maybe, someday, run Z80 Cromix on this thing?

I had been wondering how it would be to create a Lego-like box of vintage parts in VHDL and make it into a sort of virtual electronics kit. But in retrocomputing, you have boys, men, Great Men, and then you have Grant Searle. He actually did it, and I stumbled upon his project site a few weeks ago.

There is little to add to his site, so this post is nothing more than how I replicated his project. His site is here: http://searle.hostei.com/grant/Multicomp/index.html [http://searle.hostei.com/grant/Multicomp/index.html]

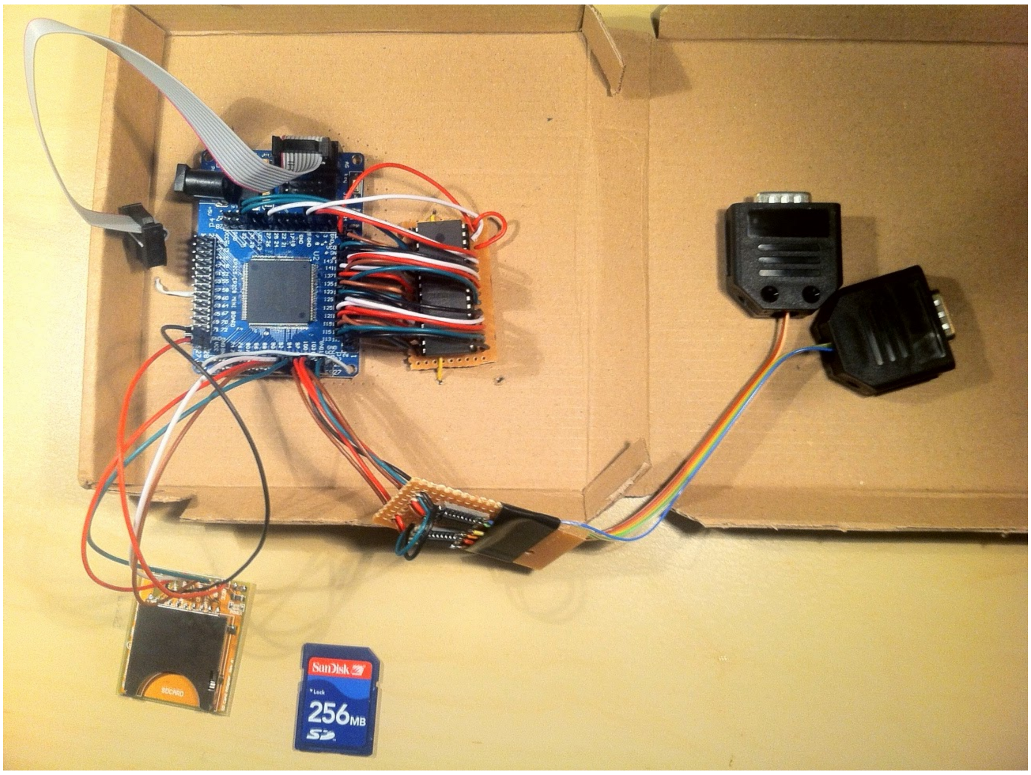
2016 update: $5 PCBs available at Retrobrew forum!

[https://www.retrobrewcomputers.org/forum/index.php?t=msg&th=111&start=0&]

This 1-day project turned out to be a introduction in VHDL, sure, but also a lesson in the economics of deflation. It is **amazing** how cheap stuff is these days. Here is my Bill of Materials:

- $23.59 Cyclone II dev board: example at DX (link) [http://dx.com/p/ep2c5t144-altera-cyclone-ii-fpga-mini-scm-development-board-148979]
- $15 Altera USB blaster, that's including shipping cost: example at Hobby Components (link) [http://hobbycomponents.com/index.php/dvbd/dvbd-altera/altera-fpga-cpld-usb-programmer-usb-blaster-compatible.html]
- $1.63 (x 2) for two TTL to RS-232 mini converters: example at DX (link) [http://dx.com/p/mini-rs232-to-ttl-converter-module-board-3-5v-132934]
- $2.51 for Breadboard wires: example at DX (link) [http://dx.com/p/30cm-breadboard-wires-for-electronic-diy-40-cable-pack-80207]
- $2.56 for a SD card connector board: example at DX (link) [http://dx.com/p/sd-card-reading-writing-module-for-arduino-148784] although I used one from my old parts box.

Grand total of less than $47... Add a 128K SRAM, two DB-9 serial connectors and a 5V wall wart from the spare parts box, and that's it! You do not even pay shipping costs at DX.com. So ordered, waited two weeks and once the parts came in, picked up a cardboard box from the bin to put it together temporarily. This is the glorious end result of an evening with the soldering iron:



[http://4.bp.blogspot.com/-oTOG1F0hukY/UymKTmUEdpI/AAAAAAAABBM/JpLA6Cr-Sbc/s1600/My+Multicomp.JPG]

What's to see here? To the right of the FPGA, there is a 128K SRAM chip ($3 or so) that is connected to the dev board. Below is a TTL-to-RS-232 board containing only two readymade converter board with MAX232s on them. To the left, a SD card connector.

The funny thing is that it takes so little effort. I used the single Female-to-Female breadboard wires by cutting them in half. The wire end then gets soldered to the little SRAM or Serial perfboard, the other end has a neat connector to plug into the dev board.

So:

- What does it do? Well, at the moment, it runs CP/M with a 10MHz Z80 and 128MB of mass storage. For a further $3 or so, I can add the VGA and PS/2 connectors so it does not need a serial terminal to operate.
- What can it do later on? Teach me VHDL whilst working from a starting point that I find interesting. Develop things like MMUs, so I can port OS/9 perhaps. Understand the inner logic in a UART.

Whatever. It is extremely Cool, so many thanks to Grant for this project! I hope it will become the launch platform for many interesting homebrewing hacks.

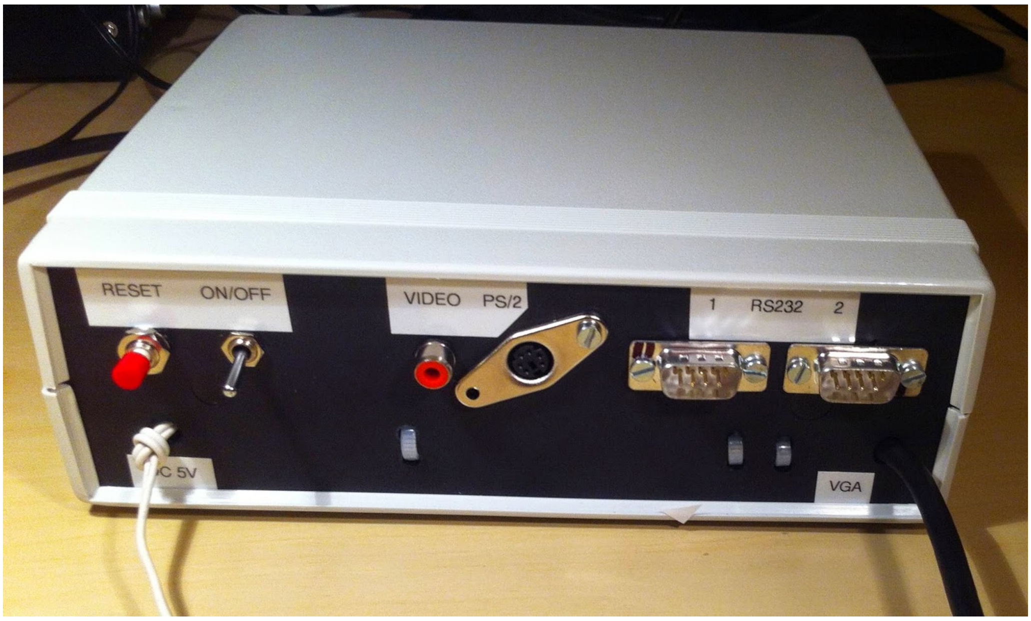
UPDATE:

I made a disk image with all major CP/M software for the FPGA Multicomp. You can find it on my main site, here: http://obsolescence.wix.com/obsolescence#!multicomp-fpga-cpm-demo-disk/c1fom [http://obsolescence.wix.com/obsolescence#!multicomp-fpga-cpm-demo-disk/c1fom]

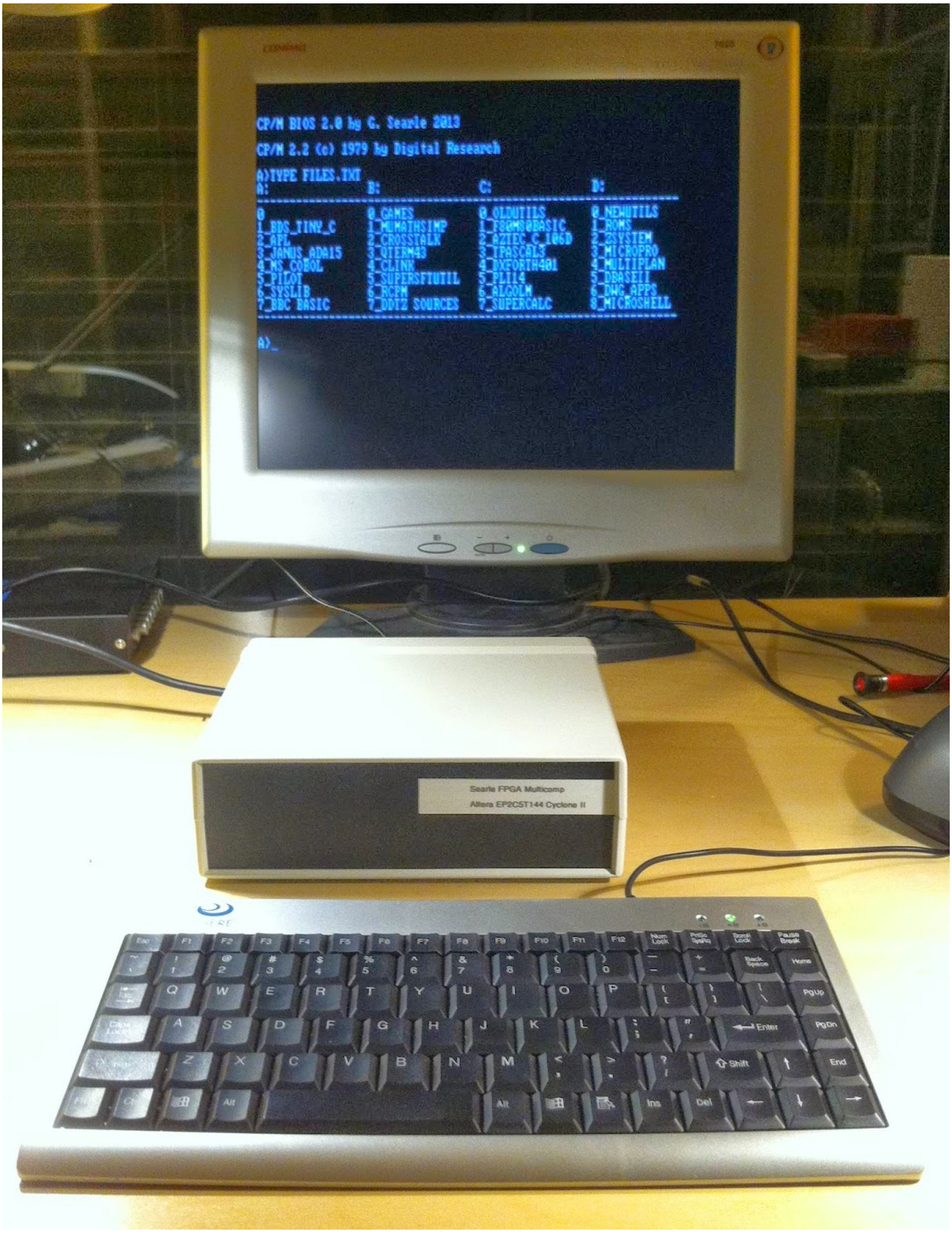
UPDATE 2:

It was time to put the Multicomp in a proper box. Here's how it looks now - and with the DIY done, it is time to dive into VHDL...

[http://4.bp.blogspot.com/-FcRFqd3EuaA/UzsxUY2tylI/AAAAAAAABDk/1fz8jJ81yy8/s1600/front.jpg]



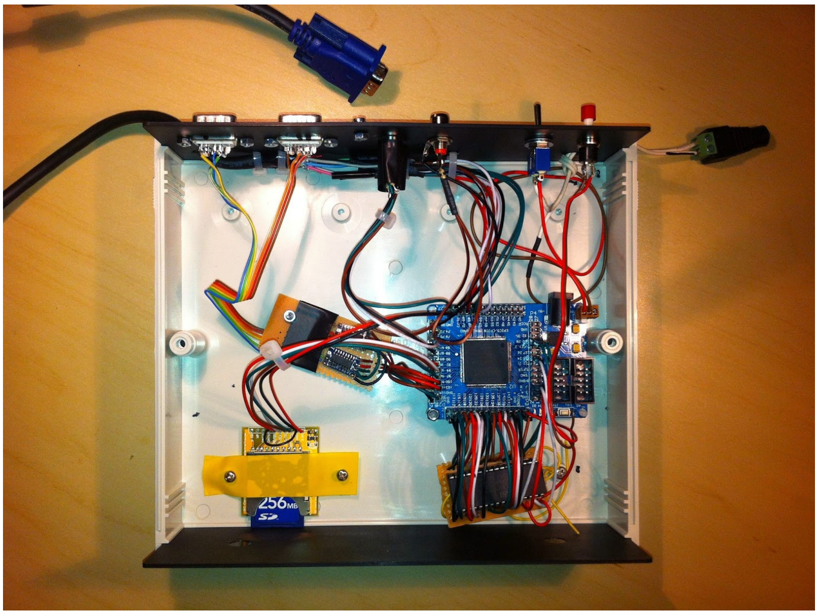
[http://3.bp.blogspot.com/-3tED_JPCVxU/UzsxhQUevBI/AAAAAAAABDo/Uz_wcsGXBu8/s1600/back.jpg]



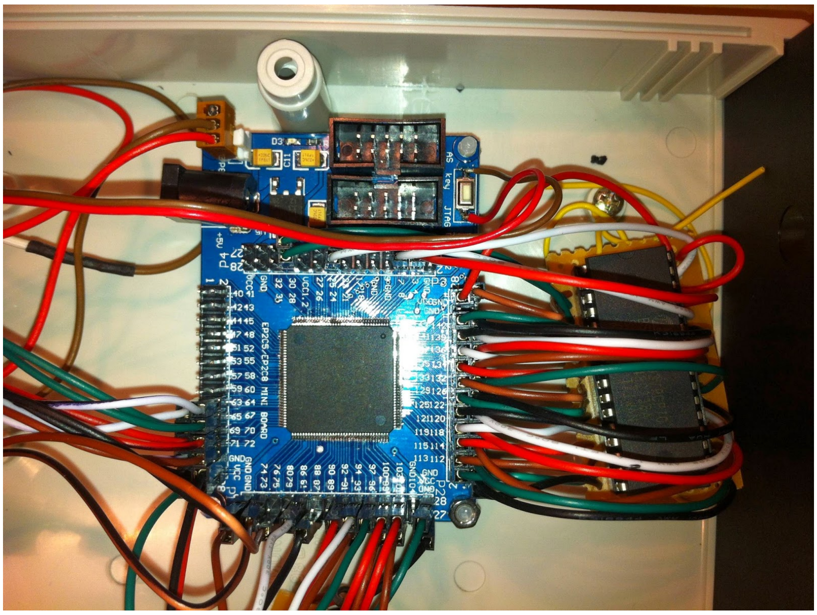
```
CP/M BIOS 2.0 by G. Searle 2013

CP/M 2.2 (c) 1979 by Digital Research

A>TYPE FILES.TXT
A:                B:                C:                D:
-------------------------------------------------------------------
0                 0_GAMES           0_OLDUTILS        0_NEWUTILS
1_BDS_TINY_C      1_MUMATHSIMP      1_F80M80BASIC     1_ROMS
2_APL             2_CROSSTALK       2_AZTEC_C_106D    2_ZSYSTEM
3_JANUS_ADA15     3_QTERM43         3_TPASCAL3        3_MICROPRO
4_MS_COBOL        4_CLINK           4_DXFORTH401      4_MULTIPLAN
5_PILOT           5_SUPERSFTUTIL    5_PLI14           5_DBASEII
6_SYSLIB          6_RCPM            6_ALGOLM          6_DWG_APPS
7_BBC BASIC       7_DDTZ SOURCES    7_SUPERCALC       8_MICROSHELL
-------------------------------------------------------------------

A>_
```

[http://4.bp.blogspot.com/-jidyKz5aLQI/UzsxKZg5TYI/AAAAAAAABDY/54IxN5lsOqc/s1600/FPGA_Multicomp+2.jpg]

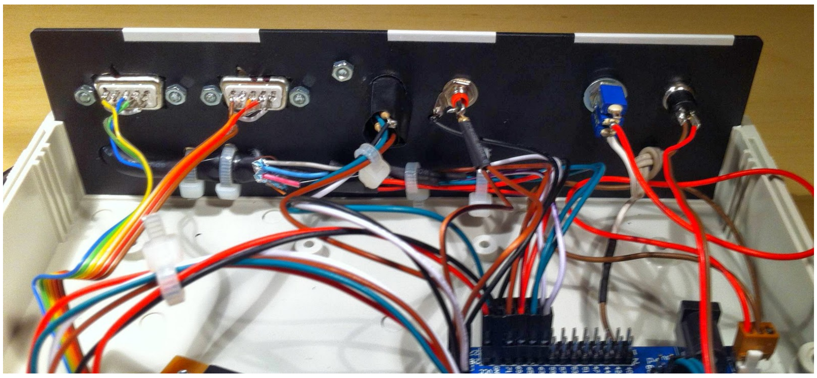
Inside, a lovely Homebrew mess of wires. The Homebrew look is not intentional - it just reflects my skill set. To my defense, I only wanted to use parts that were already in the junk box. For instance, I chopped off a VGA cable rather than order a VGA connector.



[http://4.bp.blogspot.com/-8l6d2nCUQk0/Uzszep_4TlI/AAAAAAAABD0/hV9x7eHCxz0/s1600/inside2.jpg]



[http://4.bp.blogspot.com/-yqlvUy-LRU8/UzszmNmGzXI/AAAAAAAABD8/m4PJhbg-nOQ/s1600/bigmessofwires.jpg]



[http://3.bp.blogspot.com/-iYDr4tU_Fes/UzszsK3SCAI/AAAAAAAABEE/SbCVXLB-b1g/s1600/insidebackpanel.jpg]

[http://1.bp.blogspot.com/-FcRFqd3EuaA/UzsxUY2tyII/AAAAAAAABDg/D4o-Uo2I4vM/s1600/front.jpg]

Posted 19th March 2014 by Unknown

View comments