Subject: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sat, 18 Jan 2020 17:44:33 GMT
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Having spent 2 years in the Z80 world, I'm returning to the 68K. Currently I'm working on a 68030 SBC, CB030, named after Cecil B. who is really enthusiastic about Tiny030 and want one even with all the jumpers. Unfortunately Tiny030 design is marginal and not producible so I redesigned it and added additional features specifically for Cecil.

I want CB030 to be simple, economical and build-able by hobbyists. For 68030 these are difficult requirements because 68030 is inherently not economical, simple nor easily assembled by hobbyists. However, it may be possible to meet these challenging requirements with a couple design compromises. The compromises are using a modest surface mount CPLD as the glue logic and using inexpensive commercial SIMM 72 as memory. Great deal of expensive and complex logic can be reduced with an economical CPLD; with vertical SIMM memory stick, the pc board shrink to the economical 100mm x 100mm size; the rest of components are all thru-hole technology so assembly become manageable. The one difficult-to-assemble CPLD is designed to be assembled and programmed first and the partially assembled pc board sold for about $15-20 so the end users can source their own components and finish assembling the board.

Here are features of CB030:
* Low cost 25MHz 68030
* 72-pin SIMM 16/64/128 meg DRAM
* CPLD glue logic
* 8-bit 512K boot EPROM
* 68681 DUART
* 44-pin IDE interface
* 8-bit I/O expansion connector
* 100mm X 100mm pc board
* CP/M68K ready

The 512K EPROM contains a simple monitor and CP/M68K BIOS/CCP/BDOS as well as few basic CP/M68K system files, enough to format new CF disk and transfer files from PC to CF using KERMIT. CP/M68K is a place holder operating system, what I hope for is a modern OS for CB030, but that's beyond my ability right now. Perhaps the low cost, hobbyist-friendly 68030 SBC can attract the software talents for more suitable operating systems.

CB030 is currently in rev0 prototype. It is functional, but there are several mistakes that'll require a new board revision. Of particular note is the DiskOnModule shown in the attached picture. The design calls for a CF disk, but because the connector layout was inadvertently mirrored which happens to match the mirrored pin assignment of DOM, the rev0 board uses DOM instead of CF disk for mass storage. Preliminary information:
https://www.retrobrewcomputers.org/doku.php?id=builderpages: plasmo:cb030spec

Bill

File Attachments

1) cb030_r0_annotated.jpg, downloaded 795 times
2) cb030_cpm_asciiart.jpg, downloaded 644 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by b1ackmai1er on Sun, 19 Jan 2020 05:09:56 GMT
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Hi Bill.

What was the run time on asciiart? Possibly limited by terminal speed?

Regards Phil

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by rwiker on Sun, 19 Jan 2020 08:27:08 GMT
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According to the "CB030 Development Blog" https://
www.retrobrewcomputers.org/doku.php?id=builderpages:plasmo:c b030, it was 24s.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 19 Jan 2020 12:35:43 GMT
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The BASIC compiler, CB68, running in CP/M68K is quite inefficient. It takes 70 seconds to run the same program that ran in 24 seconds with EhBasic. The speedup over 8MHz 68000 is only about 3 times. I think there are a number of performance issues I need to work on such as wait state accessing DRAM, enable I & D cache and enable cache burst fill.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 19 Jan 2020 14:05:22 GMT
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Look into the DRAM wait state and able to reduce the wait state from 2 to 0, and just barely meet timing requirements of 60ns DRAM with 24MHz 68030. With 0 wait state, ASCII mandelbrot runs 18 seconds in EhBasic and 51 seconds in CP/M68K's BASIC. At 18 seconds, the 38.4Kbaud serial starts to have an impact on the benchmark value. Another reason for the difference in performance is the instruction cache is turned on in EhBasic, but I still unable to turn on I cache in CP/M68K without getting privilege violation.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by etchedpixels on Mon, 20 Jan 2020 15:52:00 GMT
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You can only play with the caches in supervisor mode, so you either need to do it before CP/M starts up or through the CP/M traps to run your own supervisor stuff from a CP/M app.

You also have to be careful because the 68030 has a most spectacular hardware misfeature in the data cache. If you write to something like a device address and then read from it then even if the CIIN pin is asserted by the glue logic it will end up reading from the cache if the write itself can be stored (eg a 32bit aligned 32bit write with write allocate enabled). Setting sections of memory uncacheable using the MMU does work.

The 030 isn't actually much faster than an 020 unless you are using the new bus features or the MMU where it removes the MMU cost of the 68851 so your numbers sound sensible.

Alan

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by jcoffman on Mon, 20 Jan 2020 18:24:54 GMT
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Regarding use of /CIIN to disable the cache, the KISS-68030 asserts the signal as soon as /IORQ is decoded. Whether it works to disable the cache or not, no one has experienced troubles with CP/M-68 or Linux. If you say the signal does not work, then perhaps we've just been lucky; or the usage is such that there is no readback of anything that is output before the cache is overwritten.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 21 Jan 2020 04:39:53 GMT
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Alan,
The BDOS/CCP for CB030 already has the 68010 patch as described here:
https://www.retrobrewcomputers.org/doku.php?id=builderpages: rvumbaca:start
I do enable the instruction cache in the monitor before starting up CP/M68K. The curious thing about the privilege violation is it is flagged when cache is enabled going into CP/M68K, but if I disabled the cache before starting up CP/M, the CP/M program would run just fine. The instruction that's flagged with privilege violation is "move.w ccr,d0", but that is actually not a privileged instruction.

To accommodate 68010, the exception handler supooses to "dynamically change the "move from SR" instruction to the non-privileged "move from CCR" instruction. I need to investigate how that's done, perhaps it is a self modifying instruction that need to flush the cache first...

Thanks for the heads up about 32-bit I/O write that may actually be cache regardless of the CIIN

pin. Must be one of those race conditions involving write back of data when the data is also immediately read back. I do use CIIN signal to disable I/O caching, but all my I/O ports are 8-bit wide, so I shouldn't have that problem.

I do plan to turn on 030's synchronous termination along with burst mode filling feature. I'm interested to see what kind of performance improvement possible with that.
  Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by etchedpixels on Tue, 21 Jan 2020 15:23:25 GMT
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If it traps on move.w ccr then the CPU is seeing move.w sr still so I think you are right - CP/M is self modifying the instruction and restarting it. For 68030 you also need to ensure the data cache is written back before the instruction cache is flushed or your modification might not be seen by the i cache. Unlike x86 there is not a lot of coherency done in hardware on a 68K.

@jcoffman: I guess you've got no 32bit aligned/32bit wide I/O or you don't turn on WA ? It's very dependent upon what you are doing - when the Commodore Amiga went 68030 it caused a good deal of chaos.

Alan

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by jcoffman on Tue, 21 Jan 2020 20:47:52 GMT
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RE: I/O & /CIIN

Correct. There is no 32-bit I/O on the KISS-68030. All I/O is 8-bit in CP/M. Will would have to speak for Linux, but I believe the situation is the same.

--John

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 24 Jan 2020 04:17:49 GMT
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Status of CB030 and a question:

I received a couple 64 meg DRAM today and plug them in. They both work fine and pass memory diagnostic. These are 60nS DRAM so I'm able to run 0 wait state at 24MHz.

In term of producibility of rev0 CB030. I found it easy to build, in about 1 hour, and I've built 4 boards and got 4 working boards so the design seem to be producible.

Once I understood the privilege violation in CP/M68K with cache enabled, I just turn off 68030 cache when in CP/M68K. With cache off, it still run about 4 times faster than 8MHz 68000. I'm not too motivated to optimize CP/M68K for 68030 because I think it really should run more modern OS.

I'm ready to revise the board to fix known problems. The question I have is whether a FPU is absolutely needed to port Linux or other OS and how much RAM they need? I'm like fish out of water when it comes to Linux and BSD and modern OS in general.

Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by rwiker on Fri, 24 Jan 2020 08:23:55 GMT
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Steve Chamberlin used uCLinux for his 68-Katy - https://www.bigmessowires.com/68-katy/ - project, which used a 68000. It is likely that the MMU (which the 68030 has) is more important in terms of OS support than the FPU, although uCLinux was explicitly created for microcontrollers without MMUs.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by tobster on Fri, 24 Jan 2020 08:25:43 GMT
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Hi Bill

I can provide a couple of answers regarding Linux, as I do have some experience from my T030 project.

You don't need a FPU since FPU emulation is available in the Linux m68k port. It works fine albeit slow, but some of the more advanced functions like log10 and logn is not implemented and will throw a kernel message if called.

With the first prototype I have been able to get away with as little as 16 MB RAM with a simple BusyBox based root filesystem. The current version of the board (see my builder page) has 64 MB RAM. On one of my finished boards I have currently a PostgreSQL 9.6 database running on a dialed down Debian distribution. It is not fast but it works just fine.

With a modern OS you will probably want a network interface at some point. Do you have any

ideas for that on CB030 or will you perhaps just use SLIP on the second serial port?

Regards,
Tobias

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by etchedpixels on Fri, 24 Jan 2020 14:08:39 GMT
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I did sort of port Linux 5.x to the Tiny68K but the kernel is upwards of 5MB and it was clearly not going to be useful - going back to 2.0.x like 68-Katy did probably makes sense. Also picking a smaller core user space. On the 68K Mac 2.0.x with a user space from that period ran fine on a Mac II with 8MB RAM. It's not just the kernel that has grown hugely, the userspace - particularly the GNU command line tools are horribly bloated and full of features that nobody ever uses or needs but which in a world of gigabytes of RAM might as well be there.

For an MMU capable system given the fact you want it to run in what today is considered miniscule RAM it might actually be easier to use NetBSD.

It's certainly doable though, because it used to work long ago - 8Mb was enough to run X11 plus user space just about.

Alan

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 24 Jan 2020 15:05:37 GMT
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The memory requirement is more consistent with 68030 of the days, 64meg is a lot for a Mac 68030. 16 meg SIMM is so cheap ($2-3) that is no brainer to put it in CB030. 64 meg is a bit more (~$10), but I'm making the 16/64/128 meg selection jumper-able so the board can accommodate different size memory with a jumper change.

OK, it does seems FPU is not absolutely required and I'll do without FPU in the first iteration and keep the board cheap.

@tobster, CB030 has an 8-bit I/O expansion port, so I can add Ethernet and other peripherals. I'm going to try the Quad Serial port based on OX16C954 which has very deep FIFO and capable of megabit serial communication.
https://www.retrobrewcomputers.org/doku.php?id=builderpages: plasmo:quadser

@Alan, thanks for suggesting NetBSD, I'll take a look at it, although it will be like a babe-in-the-woods looking under the hood of a broken-down car--I doubt I'll know what I'm looking at.

Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by lowen on Sat, 25 Jan 2020 03:21:47 GMT
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Hi plasmo! To give something of a comparison, I had an Apollo DN3500 workstation network, and the typical workstation was an '030 at 25MHz and 8MB of RAM, running Domain/OS 10.2. When I consolidated from six workstations to one, I loaded that one to the gills with four 8MB boards for a whopping 32MB, and it was hard to fill half of that with a full GUI system and a dozen PADs open (Domain/OS GUI is not X, and a PAD is not an xterm....).

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sat, 25 Jan 2020 05:15:10 GMT
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lowen,
Thanks for the feedback. Good to know that 68030 can have a meaningful OS even with a cheap 16 meg RAM. The design works well with 64meg RAM and should also work with 128meg RAM. I am not going to worry too much about getting a 128Meg RAM and test it out before commit to next pc board revision.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by rwiker on Sat, 25 Jan 2020 09:07:56 GMT
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A few more datapoints: I ran NetBSD on a pc532 (NS32532) with 8MB of RAM, but that was text-only, via serial ports. I also ran FreeBSD on a 386DX with 16MB of RAM (I think - it may have been 64MB), running X11, Emacs, Apache and MySql relatively smoothly.

So, by picking the "right" version of an OS, it should be possible get something running well on the CB030 with a smallish amount of RAM.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Thu, 06 Feb 2020 22:44:38 GMT
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A quick question about the CB030 address map: did the EEPROM base address and RAM/ROM swap behaviour change to support 128M? There's not room to swap all 128M to 0 without having the EEPROM go somewhere else...

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 07 Feb 2020 03:14:25 GMT
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The swap register is a hack. I didn't want to deal with MMU translation initially, so I use swap register to exchange first 64meg memory with 2nd 64 meg memory. The first 64 meg is EPROM and DRAM starts from 2nd 64 meg. So if I do have 128meg of DRAM, then the memory map after swap is
lower half DRAM at 1st 64meg (0-3FFFFFF)
EPROM at 2nd 64 meg (4000000-7FFFFFF)
upper half DRAM at 3rd 64 meg (8000000-BFFFFFF)

The reason I don't just swap the first 128meg with 2nd 128 meg is because I ran out of pins so the total decoded memory space is 256meg and the top 64 meg is I/O space. I don't want to change I/O mapping when swapping.

Swap register probably won't be in use once MMU translation is turned on.

Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Fri, 07 Feb 2020 03:29:43 GMT
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That makes sense. Since you can relocate the vectors, I guess the only real reason for the swap would be to deal with software that assumes RAM at zero.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by norwestrzh on Fri, 07 Feb 2020 18:09:34 GMT
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Hi Bill,

So .... there is no VBR in the 6830x????

Roger

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 07 Feb 2020 18:22:36 GMT
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Roger,

68030 has VBR along with MMU that can remap address anywhere. It was because I'm not confident about programming the MMU and want to run CPM68K to prove the design, so it is easier for me to add a swap register in CPLD than figuring out all the new things that I'm not sure about. CPM68K is working, so I'll probably work on MMU next and then remove the swap register when all is working.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by UhClem on Sat, 08 Feb 2020 01:19:40 GMT
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I worked on a replacement for except10.s a while back but never tested it on a real 68020. This should provide you with a starting point for adding 68030 support to CP/M-68K.

File Attachments
1) except20.s, downloaded 485 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Sat, 08 Feb 2020 07:39:46 GMT
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One more memory map question:

```
CFdata  equ $FFFFE000      * CF data register
CFerr   equ $FFFFE001      * CF error reg
```

is the plan to stick with an 8-bit CF interface (I'm guessing pin restrictions again?)

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sat, 08 Feb 2020 14:36:33 GMT
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It is not so much a pin limitation than having more noise problem with 16-bit transfer. I have yet to achieve a 16-bit transfer arrangement that can handle all brands of CF disks. I have much better noise immunity and wider selection of CF disks with a 8-bit interface.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists

Posted by plasmo on Fri, 28 Feb 2020 04:29:26 GMT
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This is rev1 of CB030: https://www.retrobrewcomputers.org/doku.php?id=builderpages:plasmo:cb030:cb030_rev1

I built up 5 boards and all 5 are working. While the CF interface works with many brands of CF disks, it still won't work with all brands that I have on hand.

Made change to the way SIMM72 memory is interfacing so now it can handle 4/8/16/32/64/128 meg SIMM72 modules seamlessly, although for 8 and 32 meg memory, there are two blocks of non-contiguous memories that I still don't know how to fix automatically. I'm relying on 68030's MMU to fix that.

CP/M68K is ported, in fact, 384K of the 512K EPROM is a ROM disk containing few important CP/M68K files to allow a new CF disk to be initialized and uploaded with CP/M68K software. Lee Davison's EhBasic is ported as well.

Power consumption with 16meg SIMM72 is about 650mA at 5V.

Bill

File Attachments
1) CB030_rev1_annotated.jpg, downloaded 464 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by rwiker on Sat, 29 Feb 2020 16:31:12 GMT
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Very, very nice... are you planning to sell this (in either kit or assembled form)?

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 01 Mar 2020 03:02:45 GMT
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rwiker wrote on Sat, 29 February 2020 09:31Very, very nice... are you planning to sell this (in either kit or assembled form)?
Several people have asked about CB030 as kit or assembled board so I'll answer it here. The rev1 CB030 requires 2 jumpers that are a bit tricky to do, so right now I'm only making the assembled and tested CB030 available for $75 plus $5 shipping in USA. It includes a 16 meg DRAM and a 256meg CF disk with cpm 68k installed. I will make a small modification to the PC board design so I can offer rev1.1 CB030 as a partially assembled kit where CPLD will be soldered and programmed along with all SMT resistors and capacitors; buyer needs to provide his own 68030, 68681, CF disk, DRAM, oscillator and hardware. The partially assembled kits will be

available for $15 plus $5 shipping in USA.

I've shipped out 3 rev1 CB030, I still have 5 assembled/tested CB030.

Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by norwestrzh on Sun, 01 Mar 2020 17:35:28 GMT
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Hi Bill,

Please put me down for one of those partially assembled kits (ver 1.1??). I'd like to play with the '030. *grin*

Roger

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Tue, 03 Mar 2020 00:57:08 GMT
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What's the largest compact flash card you've been able to get to work? Make and model please so I can try to acquire one.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 03 Mar 2020 01:51:37 GMT
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Mike,
Most of CF I have on hand are 512Meg or smaller. I do have a 2G Verbatim that does NOT work. The 256 meg SanDisk seems most reliable so is 64 meg Toshiba. I will ship you another 256 meg SanDisk for backup.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 03 Mar 2020 03:24:32 GMT
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Verbatim 2G CF is readily available from Amazon for $13, so I'll make it a priority for CB030 to work correctly with Verbatim 2G CF disk.

Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by norwestrzh on Tue, 03 Mar 2020 03:45:51 GMT
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Hi Mike,

>> What's the largest compact flash card you've been able to get to work? Make and model please so I can try to acquire one.

You might want to give Transcend a try? I've had pretty good luck with their 2 and 4 GB models (133x). Can't vouch for the CB030, because I don't have one .... yet. BUT, I use Transcend on homebrew Z80's and 68000. In fact, I'm running a 4 GB one on Plasmo's "Tiny68k" and another 4 GB one on his "re-purposed Soneplex". Work great. No problems.

Roger

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Tue, 03 Mar 2020 04:33:23 GMT
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OK, maybe a simpler question: how do I copy the B: drive to another compact flash so that I can test that device?

I'm a complete CPM newbie. My level of CPM expertise is I can do 'b:<cr>dir<cr>' and that's about it. Is there a site detailing how to make a CPM68k "disk' on a CF? Maybe with some disk images that would work with the CD030?

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by norwestrzh on Tue, 03 Mar 2020 04:56:30 GMT
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>> OK, maybe a simpler question: how do I copy the B: drive to another compact flash so that I can test that device?

The way I do it is with "dd" on a Linux system. I think there are "dd" work-alikes for WinDoze, but I don't know anything about them.

1. figure out the length of your A: drive in 512b sectors. Call it 'X'
2. run "dd" as follows: dd if=<my_CF> ibs=512 of=b_drive obs=512 skip='X' count='X'
3. if your system swaps bytes, you might have to add conv=swab to the above to swap bytes.
4. at that point you have the "B" drive in the file "b_drive" (I'm assuming that the count of 512b

sectors in A == B).
5. copy "b_drive" (the file) to a new CF with: dd if="b_drive" ibs=512 of=<new CF> obs=512.

If you can set up the cpmtools application, you could extract the individual files from "b_drive", if you'd like to.

Roger

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 03 Mar 2020 04:58:21 GMT
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Mike,

You'll find the following files on drive A: which is a read-only drive reside on the EPROM, so they are always there even without a CF disk
A>dir
A: ME   68K : GKERMIT 68K : AS68SYMB DAT : DDT68000 68K : DDT   68K
A: PIP   68K : INIT   68K : STAT   68K : AS68   68K : LINK68   68K
A: DUMP   68K : LO68   68K : ED   68K : AR68   68K : MORE   68K
A: FIND   68K
A>

The three particularly useful files are PIP, INIT, and GKERMIT. When you insert a new CF disk, you first initialize it with "init b:", "init c:", init d:", and "init e:" to clear out the directories of four 8-meg disks on CF. Then you can do "pip b:=a:*.*[v]" to see if files can be copied correctly from ROM drive to CF drive. If that's successful, then you can use GKERMIT to transfer files from your PC to CF drives.

To use GKERMIT to transfer files from you existing CF disk to PC, type:
a:gkermit -s filename <- the filename can be wildcard, so it can be *.* to transfer the entire disk to PC
on terminal emulator, look for the kermit transfer protocol and enable file receive. For TeraTerm it is File->Transfer->Kermit->Receive

To transfer files from PC to CB030, type:
a:gkermit -r
on the terminal emulator, look for the kermit transfer protocol and select file send. For TeraTerm it is
File->Transfer->Kermit->Send then select the file(s) to send.

Bill

Subject: Re: CB030, A 68030 SBC for hobbyists

Posted by mikemac on Tue, 03 Mar 2020 05:44:38 GMT
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norwestrzh wrote on Mon, 02 March 2020 21:56>> OK, maybe a simpler question: how do I copy the B: drive to another compact flash so that I can test that device?

The way I do it is with "dd" on a Linux system. I think there are "dd" work-alikes for WinDoze, but I don't know anything about them.

1. figure out the length of your A: drive in 512b sectors. Call it 'X'
2. run "dd" as follows: dd if=<my_CF> ibs=512 of=b_drive obs=512 skip='X' count='X'
3. if your system swaps bytes, you might have to add conv=swab to the above to swap bytes.
4. at that point you have the "B" drive in the file "b_drive" (I'm assuming that the count of 512b sectors in A == B).
5. copy "b_drive" (the file) to a new CF with: dd if="b_drive" ibs=512 of=<new CF> obs=512.

If you can set up the cpmtools application, you could extract the individual files from "b_drive", if you'd like to.

Roger
Thanks. Yeah, I'm an long time Linux user/developer. So 'dd' is quite familiar to me. I was just thrown by the CF still mounting as a vfat partition under Linux when 8 8MB CPM 'disks' are on the CF someplace. And 'fdisk' states the vfat partition starts in the first sector, so either the CPM disks are located somewhere else on the CF or they're occupying the same sectors, which would be 'bad'. Your 'dd' parameters imply the latter.

I'll have to go find cpmtools jus for good measure.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Tue, 03 Mar 2020 05:53:24 GMT
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plasmo wrote on Mon, 02 March 2020 21:58Mike,

You'll find the following files on drive A: which is a read-only drive reside on the EPROM, so they are always there even without a CF disk
A>dir
A: ME   68K : GKERMIT 68K : AS68SYMB DAT : DDT68000 68K : DDT   68K
A: PIP   68K : INIT   68K : STAT   68K : AS68   68K : LINK68   68K
A: DUMP   68K : LO68   68K : ED   68K : AR68   68K : MORE   68K
A: FIND   68K
A>

The three particularly useful files are PIP, INIT, and GKERMIT. When you insert a new CF disk, you first initialize it with "init b:", "init c:", init d:", and "init e:" to clear out the directories of four 8-meg disks on CF. Then you can do "pip b:=a:*.*[v]" to see if files can be copied correctly from ROM drive to CF drive. If that's successful, then you can use GKERMIT to transfer files from your

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on terminal emulator, look for the kermit transfer protocol and enable file receive. For TeraTerm it is File->Transfer->Kermit->Receive

To transfer files from PC to CB030, type:
a:gkermit -r
on the terminal emulator, look for the kermit transfer protocol and select file send. For TeraTerm it is
File->Transfer->Kermit->Send then select the file(s) to send.

Bill

OK, thanks. I've used kermit on other non CPM systems before so I'm familiar with the concept. 'pip' is a new one for me. Sounds like a disk to disk copy command.

Copying B: to the PC and then back to a new B: using gkermit sounds like an overnight job. : 8o

Is copying A: to a new B: enough to verify the CF to be working? IE the CF that don't work would be detected by such an exercise?

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by etchedpixels on Tue, 03 Mar 2020 12:46:12 GMT
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If you are paranoid also try copying some worst case patterns in files (FF FF 00 00 repeated for 16bit and FF 00 FF 00 for 8bit) but it should find anything.

You should be able to use up to a 128GB card with most systems, above that needs LBA48 addressing which I've not seen supported by a CP/M BIOS. You'd still be able to access the lower 128GB but after that it'll silently wrap and corrupt.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 03 Mar 2020 15:17:32 GMT
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mikemac wrote on Mon, 02 March 2020 22:53

Copying B: to the PC and then back to a new B: using gkermit sounds like an overnight job. : 8o

Is copying A: to a new B: enough to verify the CF to be working? IE the CF that don't work would

be detected by such an exercise?
Mike,
Copying A: to new B: with verify flag is a reliable way of checking the compatibility of new CF disk. The command is:
pip b:=a:*.*[v]

gkermit is quite fast transfer a few files between PC and CB030. Transfer the entire CP/M68K distribution files take about 40 minutes.

I'm working on improving the CF interface. I'm quite optimistic that I've found the solution. It has to do with the tail end of the CF access where CF read/write needs to be negated first before CF chip select negates. With that fix, I'm able to read/write many brands of CF including the 2G Verbatim disk. So far every CF disk I tried has worked. Unfortunately this requires a CPLD change; do you have an Altera CPLD programmer? If not, I'll ship you another CB030 with the CPLD fix after I've done a few days of testing.

Bill

PS, your current SanDisk 256meg CF disk should work just fine without the CPLD fix. It is a blazing fast disk that can handle the lack of hold time at the end of a CF access.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Tue, 03 Mar 2020 15:28:29 GMT
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I have a Terasic Blaster 3" from my keyboard as I type hooked up to a Altera MAX10 dev board.

And I have these versions of Quartus available on my machine:

Mercury=>ls /opt/Quartus/
total 28
drwxrwxr-x 6 mikemac mikemac 4096 Mar 9 2017 12.0sp2
drwxr-xr-x 8 mikemac mikemac 4096 Apr 19 2017 13.0sp1
drwxrwxr-x 8 mikemac mikemac 4096 Mar 9 2017 13.1
drwxr-xr-x 10 root root 4096 Mar 9 2017 16.1
drwxrwxr-x 10 mikemac mikemac 4096 May 9 2017 17.0
drwxrwxr-x 10 mikemac mikemac 4096 Feb 17 2019 18.1
drwxr-xr-x 10 mikemac mikemac 4096 Jan 16 19:40 19.1

One of my longer term goals for the CB030 is to muck around with the CPLD's config. Just to see if I can really muck it up! :d

I have a Transcend 4G 133X CF card coming today. I'm looking at using one of the larger CF cards as the disk for Linux. It's obviously gross overkill for CPM. Speaking of which, I did 'dd' the

B: drive to my Linux machine and back to an 8MB SanDisk card and it seems to work. CPM recognizes it and 'dir' works.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 03 Mar 2020 15:52:50 GMT
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Mike,
Great, give me a day or so to try out all the CF disks I have. I'll publish the revised CPLD equations on CB030 homepage:
https://www.retrobrewcomputers.org/doku.php?id=builderpages: plasmo:cb030:cb030_rev1

I'll provide an instruction on how to update it.
Bill

Edit: I don't have a Transcend 4G, but I do have a Silicon Drive 4G (SSD-C04G-3500) and it works with the fixed CPLD.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Tue, 03 Mar 2020 16:56:51 GMT
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That'll be great! I still have to find my stash of 29F040s from "safe keeping", verify my M68K gcc tool chain, build a boot loader, kernel, and initramfs all before I will really need big CF support.

Oh! And do a bit of "real" work too! :(

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Thu, 05 Mar 2020 03:05:28 GMT
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A couple of questions:

1 - I don't see the connector for the "Discrete I/O Port" in the schematics. I assume it's the output port from the 68681 but the number of pins don't quite match.

2 - On the 68681, you used A1-A4 for RS1-4. That makes each register separated by an empty byte. Was there a reason for using A1-4 instead of the more traditional A0-A3?

I finally got the right USB cables [USB A extension cables is what works] today. My 64MB 72 pin SIMM is supposed to be here on Friday. I've been able to build the T030 kernel. Starting configuring a kernel for the CB030. The IDE and serial drivers will need to be written/modified for the board. And I've started sketching out a boot ROM. I'm going to start with minimal functionality in it with the hope that it might get merged into your ROM so more people can play too.

3 - Will ST39SF040 flash ROMs work on the board? They're 5V and pin compatible. I used them in my 68SEC000 board without a problem. [ROM problem that is. Plenty of other problems with that board!]

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Thu, 05 Mar 2020 03:30:58 GMT
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Mike,
Attached is the discrete I/O port definition. I'll put it in the CB030 homepage as well.

The A1-A4 for RS1-4 is a holdover from Tiny68K which is based on 68000 and does not have dynamic bus sizing capability. With 68020/30, I probably should've use A0-A3.

ST39F040 should work just fine. I am ordering a few of them as well. I happened to have several hundred AT49F040 in PLCC package, so that's why I used them the way I did.

Feel free to modify the ROM code as you see fit. What I have is chaotic, messy code and probably should be abandon all together.
  Bill

File Attachments

1) Discrete I_O Definition.jpg, downloaded 400 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Thu, 05 Mar 2020 06:21:28 GMT
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Here's a script I wrote for deploying host-built binaries to a CP/M disk image for simulator testing; should work for CF images too. It needs cpmtools installed.

```
#!/bin/sh
#
# Create CP/M disk image from a master, adding files to the User 0 area.
#
# usage: <output disk image> <input file> [...]
#
master_disk=`dirname $0`/t68k_cpm_disk.bin
temporary_disk=`mktemp`
output_disk=$1
shift
input_files=$*
```

```
error() {
	echo $*
	exit 1
}

if [ -z $output_disk ]; then
	error 'missing output disk file name'
fi
if [ -z $input_files ]; then
	error 'missing input file name(s)'
fi

dd if=$master_disk of=$temporary_disk conv=swab

for ifile in $input_files; do
	cpmcp -f tiny68k $temporary_disk $ifile 0:`basename $ifile`
done

dd if=$temporary_disk of=$output_disk conv=swab
rm $temporary_disk
```

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Thu, 05 Mar 2020 06:25:48 GMT
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MIke,

I have a (slightly) modular bootloader I've been working on for Bill's family of boards. I've been busy de-Atari-ing Minix 1.6.25 (and a bunch of other projects) just recently, but I was planning on acquiring one of the CB030 boards and adding support eventually.

If you'd like to collaborate (or just get a jump start 8) https://github.com/John-Titor/68k_rom - I have a crosstool-NG config that generates a workable toolchain as well if you'd like.

= Mike

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Thu, 05 Mar 2020 16:39:43 GMT
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Thanks for the pinouts of the discrete I/O port.

One more question (for the moment):

4- Do you have any unused pins left on the 7128S? The CF/IDE interface doesn't have its IRQ signal attached to anything. I've never written a polling driver in Linux before. I don't know what issues will come up as a result.

5 - What are the IRQ assignments for the M68K? IRQ681! appears to be the only IQR on the system.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Thu, 05 Mar 2020 16:44:46 GMT
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mikesmith wrote on Wed, 04 March 2020 23:25MIke,

I have a (slightly) modular bootloader I've been working on for Bill's family of boards. I've been busy de-Atari-ing Minix 1.6.25 (and a bunch of other projects) just recently, but I was planning on acquiring one of the CB030 boards and adding support eventually.

If you'd like to collaborate (or just get a jump start 8) https://github.com/John-Titor/68k_rom - I have a crosstool-NG config that generates a workable toolchain as well if you'd like.

= Mike

Thanks for the code pointer. I'll definitely be looking it over.

I have both gcc 4.4.1 and gcc 6.1.0 built for the M68K. I also have the 'build_cross_gcc.sh' script so I can build other versions if needed. gcc 6.1.0 does compile the 4.9.156 Linux kernel so I should be good to go.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Thu, 05 Mar 2020 21:15:59 GMT
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mikemac wrote on Thu, 05 March 2020 08:39Thanks for the pinouts of the discrete I/O port.

One more question (for the moment):

4- Do you have any unused pins left on the 7128S? The CF/IDE interface doesn't have its IRQ signal attached to anything. I've never written a polling driver in Linux before. I don't know what issues will come up as a result.

5 - What are the IRQ assignments for the M68K? IRQ681! appears to be the only IQR on the system.
The answers are kind of related. Bill doesn't believe in autovectoring 8), and he'd need to drive the data lines to vector the CF interrupt, so no CF interrupt.

The '681 vector is whatever you choose to program into the chip at initialization time. Unless there's specific logic in the '030 to stop it, you could have it make a system call if you really wanted to...

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Thu, 05 Mar 2020 21:57:34 GMT
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mikesmith wrote on Thu, 05 March 2020 14:15mikemac wrote on Thu, 05 March 2020 08:39Thanks for the pinouts of the discrete I/O port.

One more question (for the moment):

4- Do you have any unused pins left on the 7128S? The CF/IDE interface doesn't have its IRQ signal attached to anything. I've never written a polling driver in Linux before. I don't know what issues will come up as a result.

5 - What are the IRQ assignments for the M68K? IRQ681! appears to be the only IQR on the system.
The answers are kind of related. Bill doesn't believe in autovectoring 8), and he'd need to drive the data lines to vector the CF interrupt, so no CF interrupt.

The '681 vector is whatever you choose to program into the chip at initialization time. Unless there's specific logic in the '030 to stop it, you could have it make a system call if you really wanted to...
He could map it to an IPL level like he does with the IRQ681 interrupt. (IPL = 0x3). If I'm careful not to plug anything into the ZBUS headers, I think I can connect the CF's INTRQ pin to INTX. Probably will have to pull R17 too. And then worry about whether it needs to be inverted or not.

Or run out of a RAM disk until I can figure it out.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by etchedpixels on Thu, 05 Mar 2020 21:57:43 GMT
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You don't need an IRQ for Linux for the classic old style ATA controller. Just set the IRQ to 0 (modern Linux) or NOIRQ aka -1 (old old Linux). For the cases where you disk is fast to respond to a command and your CPU is slow it's really not important. If you have a 16bit interface and want to use an IDE tape drive or IDE CD-ROM then it is useful but by no means essential. You could just wire it to a 68681 pin but I don't think it is worth it.

With really slow processors and CF it gets even weirder because you hit the point where the CF adapter is memory speed (or with DMA faster than CPU memory speed) and it becomes faster to read from the disk than cache stuff and so on.

Alan

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Fri, 06 Mar 2020 01:59:38 GMT
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Anyone ever use an Arduino or some such as an in circuit emulator of a 39F040 ROM? I've gotten spoiled by being able to update the firmware on one of my projects via JTAG. This physically prying the ROM out of the board, flashing (and verifying!) it, and carefully putting it back it over and over is so 1980's! :d I'll probably dust off the M68K emulator for some of the initial boot loader work.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 06 Mar 2020 04:20:33 GMT
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Mike,
Regarding the interrupt allocation on CB030:
68681 generates level 3 vectored interrupt. 68681 serves as an interrupt controller for serial port interrupts, timer interrupts and discrete input interrupts. There are two spare pins on the I/O expansion connector (pin 39 and pin 40) that are connected to 68681 discrete inputs IP1 and IP2 which can generate vectored interrupts through 68681. You are correct the CF interface does not generate interrupt as currently designed, but a jumper wire can be connected to IPx of 68681 to generate vectored interrupt.

Alternatively INTX (pin 22) of the I/O expansion connector generates level 4 autovectored interrupt so CF interrupt can also connect to INTX to generate autovectored interrupt. My gut feeling is the CF disk is so fast that interrupt service does not really speed up the file transfer significantly.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 06 Mar 2020 04:35:48 GMT
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mikemac wrote on Thu, 05 March 2020 18:59Anyone ever use an Arduino or some such as an in circuit emulator of a 39F040 ROM? I've gotten spoiled by being able to update the firmware on one of my projects via JTAG. This physically prying the ROM out of the board, flashing (and verifying!) it, and carefully putting it back it over and over is so 1980's! :d I'll probably dust off the M68K emulator for some of the initial boot loader work.
Mike,

AT49F040 can be programmed in-situ, so it should be possible to load the new ROM firmware in RAM to check it out and once the new ROM firmware is working correctly, it can be programmed into AT49F040 without removing it. I'm sure the same thing can be done with 39F040 as well.

I've done the in-situ programming of flash on the repurposed Soneplex MPU board, so let me see if I can port that code to CB030 in the next few days.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 06 Mar 2020 05:19:32 GMT
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mikemac wrote on Thu, 05 March 2020 09:39

4- Do you have any unused pins left on the 7128S? The CF/IDE interface doesn't have its IRQ signal attached to anything. I've never written a polling driver in Linux before. I don't know what issues will come up as a result.

Mike,
Returning to your original question about whether there are spare pins on CPLD for CF interrupt: yes, there are two spare pins; it is not difficult to wire CF interrupt to one of the spare pins; add a pull resistor; and modify the CPLD to add a level 2 autovector.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Fri, 06 Mar 2020 07:07:03 GMT
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plasmo wrote on Thu, 05 March 2020 22:19mikemac wrote on Thu, 05 March 2020 09:39

4- Do you have any unused pins left on the 7128S? The CF/IDE interface doesn't have its IRQ signal attached to anything. I've never written a polling driver in Linux before. I don't know what issues will come up as a result.

Mike,
Returning to your original question about whether there are spare pins on CPLD for CF interrupt: yes, there are two spare pins; it is not difficult to wire CF interrupt to one of the spare pins; add a pull resistor; and modify the CPLD to add a level 2 autovector.
Bill

I'll probably hold off on adding anything for the CF IRQ until I get to that point and it proves necessary. Adding a wire to INTX is probably easier than soldering directly to the CPLD's pin. At least for me.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Fri, 06 Mar 2020 23:34:37 GMT
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64MB DRAM?

I just got my 64MB EDO 60ns 72 pin SIMM. It doesn't seem to work. Don't know yet if it's the SIMM or my board. Someitmes I get this:

CB030Bug
2/26/20 v0.6, type "he" for help
>
Address Error!
Faulted address is: FE00056E
Program counter is: 162D0081

Sometimes I get the '?>' prompt and then it hangs. The Reset button isn't working 100% either. ???

Am I supposed to install the T7 jumper for the DRAM size? I don't see where the Mem64_n16 signal is being used in the CPLD code.

Any ideas on what I'm doing wrong? Or how to verify the 64MB SIMM? [I cheaped out and only bought the one stick. :cry:]

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 06 Mar 2020 23:49:34 GMT
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Mike,
That's bad. The RAM is definitely not working. You do not need to jumper the mem64_n16, CPLD should be able to,accommodate different size DRAM. Tell me where you bought it? Are you sure it is 5V DRAM? Many 64 meg operate with 3.3V.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists

Posted by mikemac on Fri, 06 Mar 2020 23:56:40 GMT
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plasmo wrote on Fri, 06 March 2020 16:49Mike,
That's bad. The RAM is definitely not working. You do not need to jumper the mem64_n16, CPLD should be able to,accommodate different size DRAM. Tell me where you bought it? Are you sure it is 5V DRAM? Many 64 meg operate with 3.3V.
  Bill
I bought it off Ebay from 1-800-4Memory. The invoice claims it's 5V. :x

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sat, 07 Mar 2020 00:02:35 GMT
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mikemac wrote on Fri, 06 March 2020 16:56plasmo wrote on Fri, 06 March 2020 16:49Mike,
That's bad. The RAM is definitely not working. You do not need to jumper the mem64_n16, CPLD should be able to,accommodate different size DRAM. Tell me where you bought it? Are you sure it is 5V DRAM? Many 64 meg operate with 3.3V.
  Bill
I bought it off Ebay from 1-800-4Memory. The invoice claims it's 5V. :x
The chips on the SIMM are MT4LC16M4H9, which the datasheet online claims is a 3.3V chip. So I think they sent me 3.3V SIMMs instead of the 5V ones I ordered. :x :x :x

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sat, 07 Mar 2020 00:31:24 GMT
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Mike,
Can you see voltage regulators and 5V-to-3V buffers? Sometimes they use 3.3V memory parts but translate 5V to 3V.
  Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sat, 07 Mar 2020 00:34:15 GMT
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plasmo wrote on Fri, 06 March 2020 17:31Mike,
Can you see voltage regulators and 5V-to-3V buffers? Sometimes they use 3.3V memory parts but translate 5V to 3V.
  Bill
There are 8 DRAM chips and one 3.3V regulator on the board. That's it.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sat, 07 Mar 2020 01:09:35 GMT
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Ouch, that's no good. Looked up MT4LC16M4H9 and it is 3.3V part, not 5V tolerant. That was a 3.3V 64meg SIMM and probably not doing it any good plugging into a 5V system.
  Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sat, 07 Mar 2020 03:18:45 GMT
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plasmo wrote on Fri, 06 March 2020 18:09Ouch, that's no good. Looked up MT4LC16M4H9 and it is 3.3V part, not 5V tolerant. That was a 3.3V 64meg SIMM and probably not doing it any good plugging into a 5V system.
  Bill
I'll give them a call tomorrow or Monday and see if they'll straighten it out. It's not the nine dollars as much as the missed opportunity of having it this weekend for pimping out my CB030 board. I can still make progress with the 16MB. Just disappointing.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sat, 07 Mar 2020 04:06:26 GMT
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This is a snippet of program to chip erase AT49F040 and copy program located in RAM 0x0-0x7FFFF to flash. It takes about 10 seconds to re-flash AT49F040.

Erase and reprogram the flash is the easy part, the trick is having the necessary functionalities to load & test an updated version of itself and re-flash the updated version of itself. I'll have the EPROM programmer as a backup just in case the program no longer able to update itself.
  Bill

```
; chip erase
        move.b #$aa,flash+$5555    ;chip erase command
        move.b #$55,flash+$2AAA
        move.b #$80,flash+$5555
        move.b #$aa,flash+$5555
        move.b #$55,flash+$2AAA
        move.b #$10,flash+$5555
pollbit7:
        btst.b #7,flash                ;data polling bit 7
        bne pollbit7

; now do byte programming
; copy RAM from 0x0 to 0x7FFFF to flash at 0xFE000000 to 0xFE07FFFF
        lea 0,a0                ;point to RAM starting from 0x0
```

```
        lea $fe000000,a1          ;point to beginning of flash
byteprog:
        move.b #$aa,flash+$5555    ;byte programming command
        move.b #$55,flash+$2AAA
        move.b #$A0,flash+$5555
        move.b (a0),(a1)
;data polling of bit 7
        move.b (a0)+,d0
        and.b #$80,d0              ;poll bit 7
pollb7:
        move.b (a1),d1
        and.b #$80,d1
        cmp.b d0,d1
        bne pollb7
        add.l #1,a1               ;program next flash byte
        cmp.l #$fe080000,a1       ;top of flash?
        bne byteprog

        rts                       ;return to calling program
```

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Fri, 13 Mar 2020 21:43:50 GMT
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mikemac wrote on Fri, 06 March 2020 20:18plasmo wrote on Fri, 06 March 2020 18:09Ouch, that's no good. Looked up MT4LC16M4H9 and it is 3.3V part, not 5V tolerant. That was a 3.3V 64meg SIMM and probably not doing it any good plugging into a 5V system.
  Bill
I'll give them a call tomorrow or Monday and see if they'll straighten it out. It's not the nine dollars as much as the missed opportunity of having it this weekend for pimping out my CB030 board. I can still make progress with the 16MB. Just disappointing.
I called 18004memory up on Monday and they sent a replacement on Tuesday. They were really nice about it. I got it a few minutes ago and the board still boots! Yippee!!!

```
T030 ROM BIOS v2.11 (c) 2018 Tobias Rathje
CB030 version ported by Mike McDonald 2020
----------------------------------------

Build: Mar 13 2020 12:46:11

#> ?
?  - Help
a  - Load and execute EhBasic
b  - Toggle heartbeat LED: b <val>
c  - Modify cache register: c <val>
```

d - Dump address: d <addr>
e - Force exception: e <num>
h - Perform hardisk command - h? for help
i - Set interrupt level: i <level>
g - Run: g <addr>
l - Load linux: l <cmdline> <ramdisk start addr> <ramdisk size>
m - Mandelbrot test: m <count>
q - Perform RAM check: q <mode> <address> <size> <count>
r - Dump registers
v - Load and execute Test BIOS from SD card
u - Run in user mode: u <addr>
w - Write single byte: w <addr> <data>
x - Transfer file with XMODEM: x <addr>
z - Soft reset
<#> - Run script "#"

#>

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sat, 14 Mar 2020 01:05:45 GMT
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Cool, I'm glad it works out.
  Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sat, 14 Mar 2020 22:39:35 GMT
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If one use a "magic" CF card:

T030 ROM BIOS v2.11 (c) 2018 Tobias Rathje
CB030 version ported by Mike McDonald 2020

Build: Mar 14 2020 15:29:15

#> hl

Volume label: Linux

----A 2020/03/14 15:25   118 1.CMD

```
----A 2020/03/14 15:26   2814888  LINUX.BIN
D-H-- 2020/03/14 15:25         0  FSEVEN~1
   2 File(s),   2815006 bytes total
   1 Dir(s),       4874KiB free

#> 1
 [ Load Linux image into RAM ]

0%_____________________________________________100%
##################################################

2814888 bytes read
 [ Starting Linux ]


Bootinfo address: 0x042b1000

Machine type: 13
Memory start: 0x04000000
Memory size: 64 MB

Loading Linux at 0x04001000
Exception #11 SR: 2704 PC: 04001004

#>
```

I know the load address and the memory start address are wrong. [They're for the T030 board.]
But making some progress. A bit flakey at times but nothing fatal yet.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 15 Mar 2020 14:39:08 GMT
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Mike,
That's very cool. I hope you'll post the CF image and the firmware so I can try it as well.
  Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sun, 15 Mar 2020 17:07:35 GMT
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plasmo wrote on Sun, 15 March 2020 07:39Mike,
That's very cool. I hope you'll post the CF image and the firmware so I can try it as well.

Bill
Once I get Linux running and Tobias confirms I haven't broken the T030, I intend on making the code available on a RBC builder's page or at the minimum, my website. Probably both.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sun, 15 Mar 2020 17:12:32 GMT
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mikemac wrote on Tue, 03 March 2020 08:28

I have a Transcend 4G 133X CF card coming today. I'm looking at using one of the larger CF cards as the disk for Linux. It's obviously gross overkill for CPM. Speaking of which, I did 'dd' the B: drive to my Linux machine and back to an 8MB SanDisk card and it seems to work. CPM recognizes it and 'dir' works.
Just a FYI followup, neither the new Transcend 4G 133X CF card nor my older Lexar 64MB CF card seem to work in 8bit mode. :(

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 15 Mar 2020 18:37:28 GMT
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The updated CPLD in CB030 homepage should fix the CF disk access problem. Download the .zip file, the .pof is included. Remove the CF disk, oscillator, SIMM memory and EPROM. Look at the 2x5 header carefully you should see silkscreen with '2' on one end and '10' on the other end. The color strip of the programming ribbon cable should be on the '2' side. Power up and program with the .pof file. Replace the components you've removed (watch for proper orientations), your board should work with the new CF now.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sun, 15 Mar 2020 23:13:35 GMT
View Forum Message <> Reply to Message

Getting closer:

T030 ROM BIOS v2.11 (c) 2018 Tobias Rathje
CB030 version ported by Mike McDonald 2020

Build: Mar 15 2020 10:53:20

#> 1
[Load Linux image into RAM]

```
0%_____100%
##################################################

2814856 bytes read
 [ Starting Linux ]


Bootinfo address: 0x002b1000

Machine type: 14
Memory start: 0x00000000
Memory size: 16 MB

Loading Linux at 0x00001000

ABC3GHIJK
Linux version 4.9.156-CB030 (mikemac@Altair.mikemac.com) (gcc version 6.1.0 (GCC) ) #4 Sun
Mar 15 16:01:06 MST 2020
bootconsole [cb030serial0] enabled
Built 1 zonelists in Zone order, mobility grouping off.  Total pages: 4060
Kernel command line: root=/dev/hda2 rw console=ttyS0,38400n8 earlyprintk=ttyS0,38400

PID hash table entries: 64 (order: -4, 256 bytes)
Dentry cache hash table entries: 2048 (order: 1, 8192 bytes)
Inode-cache hash table entries: 1024 (order: 0, 4096 bytes)
Sorting __ex_table...
Memory: 13420K/16384K available (1863K kernel code, 270K rwdata, 544K rodata, 64K init,
125K bss, 2964K reserved, 0K cma-reserved)
Virtual kernel memory layout:
    vector  : 0x0028175c - 0x00281b5c   (   1 KiB)
    kmap    : 0xd0000000 - 0xf0000000   ( 512 MiB)
    vmalloc : 0x01800000 - 0xd0000000   (3304 MiB)
    lowmem  : 0x00000000 - 0x01000000   (  16 MiB)
      .init : 0x002a1000 - 0x002b1000   (  64 KiB)
      .text : 0x00001000 - 0x001d2d48   (1864 KiB)
      .data : 0x001d5190 - 0x002a0bdc   ( 815 KiB)
      .bss  : 0x00281680 - 0x002a0bdc   ( 126 KiB)
NR_IRQS:200
unexpected interrupt from 256
unexpected interrupt from 256
unexpected interrupt from 256
...
```

Now I have to track down who is generating IRQ 256 and make them stop! :)

Unfortunately my 64MB SIMM seems flaky. I have a lot of issues loading the 2.8MB Linux kernel when it's in the board. I haven't had any issue with the 16MB SIMM Bill sent with the board. So for now I'm limited to 16MB. Should be enough to boot and run BusyBox. Fingers crossed!

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Mon, 16 Mar 2020 02:35:42 GMT
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Mike,
On the CB030 homepage are memory diagnostic for 16meg and 64meg DRAM. The 16meg DRAM test runs fairly fast, about 45 seconds per pass. The 64 meg test takes 4 times longer. You should see console messages like below.
Bill

File Attachments
1) cb030_64meg_test.jpg, downloaded 939 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Mon, 16 Mar 2020 04:31:26 GMT
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plasmo wrote on Sun, 15 March 2020 19:35Mike,
On the CB030 homepage are memory diagnostic for 16meg and 64meg DRAM. The 16meg DRAM test runs fairly fast, about 45 seconds per pass. The 64 meg test takes 4 times longer. You should see console messages like below.
Bill

I'm going to try testing the 64MB SIMM once I've updated the CPLD to your latest version. But that may be after I figure out who is triggering the IRQ 256. I think it's the 68681 timer left on from the boot loader. The 68681 UART is run mostly in PIO mode so it's probably not it. And I think those are the only two interrupts in the system. So hopefully it's one or the other.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Mon, 16 Mar 2020 13:59:49 GMT
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Mike,
The 68681 timer interrupt is turned on in iDUART routine which is called very early on by the monitor (it is the first subroutine called). Attached is the iDUART routine. You can see the timer

is set to interrupt at 10mS which is the basic clock tick driving the wall clock and event clocks.
The rotating 7-segment display is driven by the timer interrupt.
  Bill

```
*
* initialize the DUART 68692, only lower byte is connected to data bus d0-d7
* interrupt is connected to PB8 of 68302, nIACK is tied to VCC, need manual service
* of interrupt
iDUART:
 move.b #$13,MRA  * write to MR1A as follow:
   * no RxRTS, RxRDY int, Char error, no parity, 8 bits
 move.b #$07,MRA  * now write to MR2A as follow:
   * normal, no TxRTS, no CTS, 1 stop
 move.b #$0,IMRD  * mask off interrupt
 move.b #$81,IVRD * vector number 0x81 is where DUART ISR is located
 move.b #0,OPCR  * make output register general purpose
 move.b #$ff,SETOPR * clear display
 move.l #$20000,d0 * diagnostic, let it show for a while
iduartspin1:
 sub.l #1,d0  * diagnostic
 bne iduartspin1  * diagnostic
 move.b #$de,CLROPR * drive the value '9' on a 7-seg display
 move.b #$70,ACR  * clear ACR[7] bit, timer mode, 16x prescaler
 move.b #$80,CTLR * to get 10ms interrupt, timer preload value is 0x480
 move.b #$4,CTUR
 move.b #$CC,CSRA * 38.4K baud
 move.b STOPCTR,d0 * read clear the interrupt bit associated with timer
 move.b #$A,CRA  * disable Chan A transmit and receive
 bsr iduartspin8  * delay loop
 move.b #$ff,SETOPR * clear display
 move.b #$e,CLROPR * write '7'
 bsr iduartspin8  * delay loop
 move.b #$ff,SETOPR * clear display
 move.b #$cc,CLROPR * write '4'
 bsr iduartspin8  * delay loop
 rts
```

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Mon, 16 Mar 2020 15:57:01 GMT

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plasmo wrote on Mon, 16 March 2020 06:59Mike,
The 68681 timer interrupt is turned on in iDUART routine which is called very early on by the monitor (it is the first subroutine called). Attached is the iDUART routine. You can see the timer is set to interrupt at 10mS which is the basic clock tick driving the wall clock and event clocks.
The rotating 7-segment display is driven by the timer interrupt.
  Bill

Remember, I'm running the T030 boot loader so it's a completely different code base. But it does essentially the same thing.

I think I'm just not registering the IRQ handler at the correct number in Linux. Hopefully I find out later today.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Tue, 17 Mar 2020 04:29:11 GMT
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mikemac wrote on Sun, 15 March 2020 21:31plasmo wrote on Sun, 15 March 2020 19:35Mike,
On the CB030 homepage are memory diagnostic for 16meg and 64meg DRAM. The 16meg DRAM test runs fairly fast, about 45 seconds per pass. The 64 meg test takes 4 times longer. You should see console messages like below.
Bill

I'm going to try testing the 64MB SIMM once I've updated the CPLD to your latest version. But that may be after I figure out who is triggering the IRQ 256. I think it's the 68681 timer left on from the boot loader. The 68681 UART is run mostly in PIO mode so it's probably not it. And I think those are the only two interrupts in the system. So hopefully it's one or the other.

The dram64m.txt file is in Motorola S-REC format. When I convert it to binary, I get:

```
Altair=>od -t x1 dram64m.bin |p                          03/16 9:18:24pm
0000000   46  fc  20  00  43  fa  02  b4  10  3c  00  0e  4e  4f  26  3c
0000020   00  00  1e  4f  74  01  4e  7b  20  02  42  86  45  f9  00  00
0000040   32  f8  24  3c  03  ff  f0  00  28  03  24  c4  d8  bc  00  00
0000060   26  f5  b5  c2  66  f4  45  f9  00  00  32  f8  24  3c  03  ff
0000100   f0  00  2a  03  28  1a  ba  84  67  00  00  54  52  46  43  fa
0000120   02  7d  10  3c  00  0e  4e  4f  20  05  61  00  01  88  43  fa
0000140   01  bc  10  3c  00  0e  4e  4f  43  fa  02  6d  10  3c  00  0e
0000160   4e  4f  20  04  61  00  01  6e  43  fa  01  a2  10  3c  00  0e
0000200   4e  4f  43  fa  02  67  10  3c  00  0e  4e  4f  20  0a  59  80
0000220   61  00  01  52  43  fa  01  86  10  3c  00  0e  4e  4f  da  bc
```

That doesn't look like a proper M68K ROM. I'd expect a SP,PC combo to start with.

The dram64m.txt file starts with:

```
S0100000433A4452414D36344D2E48455884
```

S120300046FC200043FA02B4103C000E4E4F263C00001E4F74014E7B200242864527
S120301DF9000032F8243C03FFF000280324C4D8BC000026F5B5C266F445F900004C
S120303A32F8243C03FFF0002A03281ABA8467000054524643FA027D103C000E4E95
S12030574F20056100018843FA01BC103C000E4E4F43FA026D103C000E4E4F200442
S12030746100016E43FA01A2103C000E4E4F43FA0267103C000E4E4F200A59806193

What might I be doing wrong? It doesn't seem top work for me if I go ahead on load and run it.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 17 Mar 2020 13:29:58 GMT
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Mike,
The RAM diagnostic is meant to run as a program under CB030bug monitor. The S record is loaded by the monitor at 0x3000 and auto-execute after the loading is completed. Since you are using the T030 bootloader and it appears to have a S record loader, it should be able to load the memory diagnostic. The memory diagnostic tests the entire memory except the program itself and the stack/global variable area. In T030 bootloader, the monitor/stack/global area are likely to be different. Let me take a look of the T030 bootloader, I should be able to re-assemble the memory diagnostic to fit it.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Tue, 17 Mar 2020 14:51:56 GMT
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:blush: Whoops! :blush:

I still have your CB030Bug ROM so I swapped it back in along with the 64MB SIMM. But I don't see a xmodem download command in CB030Bug. What's the procedure for downloading over the serial port?

I'm guessing this 64MB SIMM that's giving me problems isn't quite 60ns. It works some of the time but gets bit rot. I had put it in my old Macintosh Centris 610 just for kicks and it works fine there. At least as far as I can tell. Or it could be I wasn't exercising the SIMM to trip it up.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 17 Mar 2020 15:28:41 GMT
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Mike,
While at the CB030bug monitor prompt, just send the S record to CB030 as text file. In TeraTerm the command is File -> Send file...-> (pick dram64.txt in the drop down menu)
  Bill
PS, do you have a slower oscillator? you can try the 64meg RAM again with slower clock.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Tue, 17 Mar 2020 16:18:58 GMT
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Ah! According to your RAM test, it's good:

?> g 3000
64-meg of DRAM longword tested OK
64-meg of DRAM byte tested OK
64-meg of DRAM longword tested OK

With a 16MHz crystal, I still get flaky results when I read the CF into RAM:

T030 ROM BIOS v2.11 (c) 2018 Tobias Rathje
CB030 version ported by Mike McDonald 2020

Build: Mar 16 2020 21:24:09

#> 1
 [Load Linux image into RAM]

0%_____100%
##f_read error: 2

114688 bytes read
 [Stasting Linux]

#>

If I put the 24MHz crystal and the 16MB SIMM back in, it's off to the races:

```
T030 ROM BIOS v2.11 (c) 2018 Tobias Rathje
CB030 version ported by Mike McDonald 2020
----------------------------------------

Build: Mar 16 2020 21:24:09

#> 1
 [ Load Linux image into RAM ]

0%_____________________________________________100%
##################################################

2814824 bytes read
 [ Starting Linux ]


Bootinfo address: 0x002b1000

Machine type: 14
Memory start: 0x00000000
Memory size: 16 MB

Loading Linux at 0x00001000

ABC3GHIJK
Linux version 4.9.156-CB030 (mikemac@Altair.mikemac.com) (gcc version 6.1.0 (GC0
bootconsole [cb030serial0] enabled
Built 1 zonelists in Zone order, mobility grouping off.  Total pages: 4060
Kernel command line: root=/dev/hda2 rw console=ttyS0,38400n8 earlyprintk=ttyS0,0
PID hash table entries: 64 (order: -4, 256 bytes)
Dentry cache hash table entries: 2048 (order: 1, 8192 bytes)
Inode-cache hash table entries: 1024 (order: 0, 4096 bytes)
Sorting __ex_table...
Memory: 13420K/16384K available (1861K kernel code, 272K rwdata, 544K rodata, 6)
Virtual kernel memory layout:
    vector  : 0x0028175c - 0x00281b5c   (   1 KiB)
    kmap    : 0xd0000000 - 0xf0000000   ( 512 MiB)
    vmalloc : 0x01800000 - 0xd0000000   (3304 MiB)
    lowmem  : 0x00000000 - 0x01000000   (  16 MiB)
      .init : 0x002a1000 - 0x002b1000   (  64 KiB)
      .text : 0x00001000 - 0x001d26d8   (1862 KiB)
      .data : 0x001d4b20 - 0x002a0bb0   ( 817 KiB)
      .bss  : 0x00281680 - 0x002a0bb0   ( 126 KiB)
NR_IRQS:200
prandom: fast init done
random: crng init done
```

It's pretty repeatable. I haven't had a load error from the CF if I have the 16MB SIMM in place. The 64MB almost always fails to load the whole 2.8MB Linux kernel image.

Too much current load? Voltage spike? Wrong kind of magic pixie dust? I don't have a clue. So I'll stick to the 16MB SIMM for now.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 17 Mar 2020 16:55:20 GMT
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Mike,
Low voltage is a possibility. The memory diagnostic turns on the instruction cache and runs the diagnostic with lower power consumption than normal. What kinda supply are you using? What's the voltage reading when Linux application is running?

The 16meg memory space is repeated 4 times in the 64 meg space; I'm struggling to come up with a situation where program would run in 16 meg but not 64 meg.

Have you updated the CPLD? The new CPLD equations improves the CF interface significantly.

I would like to try your software on my 64meg setup and see if I encountered the same problem.
  Bill

PS, exciting work you are doing!

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Tue, 17 Mar 2020 17:44:03 GMT
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plasmo wrote on Tue, 17 March 2020 09:55Mike,
Low voltage is a possibility. The memory diagnostic turns on the instruction cache and runs the diagnostic with lower power consumption than normal. What kinda supply are you using? What's the voltage reading when Linux application is running?

The 16meg memory space is repeated 4 times in the 64 meg space; I'm struggling to come up with a situation where program would run in 16 meg but not 64 meg.

Have you updated the CPLD? The new CPLD equations improves the CF interface significantly.

I would like to try your software on my 64meg setup and see if I encountered the same problem.
  Bill

PS, exciting work you are doing!
Should I wait for four complete iterations of the dram64 test to complete? Since it's appeared to rerun the long word test, I thought it was done and stopped it.

I haven't updated the CPLD yet. I'm trying to break only one thing at a time! :) I'll move it up on my To-Do list.

I'm using a 5V 1A wall wart that came with my BeagleBone. It has the right size barrel connector on it. :) I think I have a 2A one around but it'll need an adapter cable to fit the fat plug on the CB030.

It is exciting when things progress. When weird things happen, I lose even more of my thinning hair! :)

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Tue, 17 Mar 2020 22:13:56 GMT
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I've tried two different 5V2A wall warts and they both continue to have issues using the 64MB SIMM.

Could it be a DRAM refresh issue?

I'm wondering because I keep seeing things like this:

T030 ROM BIOS v2.11 (c) 2018 Tobias Rathje
CB030 version ported by Mike McDonald 2020

Build: Mar 16 2020 21:24:09

#> 1
[Load Linux image into RAM]

0%_____100%
####################f_read error: 9

1093632 bytes read
f_close error: 9
[Sparting Linux]

"Sparting Linux"?? That's a 't' (0x74) changing into to a 'p' (0x70). That's a single bit flipping.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Tue, 17 Mar 2020 22:41:51 GMT
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mikemac wrote on Tue, 17 March 2020 15:13"Sparting Linux"?? That's a 't' (0x74) changing into to a 'p' (0x70). That's a single bit flipping.
Is it always a 1 becoming a 0?

FWIW, it's pretty unlikely to be refresh. DRAM retention at room temperature is waaaay longer than you might think. Nominal refresh timing is spec'ed at TJmax for worst-corner parts, which is orders of magnitude worse than a nominal part at room temperature.

If you're really concerned, hit the stick with a good blast of freeze spray (air duster can inverted will do the trick) and see if it changes anything. Colder -> slower leakage.

= Mike

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Tue, 17 Mar 2020 22:53:04 GMT
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mikesmith wrote on Tue, 17 March 2020 15:41mikemac wrote on Tue, 17 March 2020 15:13"Sparting Linux"?? That's a 't' (0x74) changing into to a 'p' (0x70). That's a single bit flipping.
Is it always a 1 becoming a 0?

FWIW, it's pretty unlikely to be refresh. DRAM retention at room temperature is waaaay longer than you might think. Nominal refresh timing is spec'ed at TJmax for worst-corner parts, which is orders of magnitude worse than a nominal part at room temperature.

If you're really concerned, hit the stick with a good blast of freeze spray (air duster can inverted will do the trick) and see if it changes anything. Colder -> slower leakage.

= Mike

Hard to tell if it's always as most of the time it's not printed text strings that are corrupted. But of the ones I've detected, it appears to be 1's getting flipped to 0's. Here's another example:

2814824 bytes read
[Stabting Linux]

That's a 'r' 0x72 getting changed to a 'b' 0x62.

Oh! And I've updated to the latest version of the CPLD FW.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Wed, 18 Mar 2020 01:28:47 GMT
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Mike,
At 24MHz clock, the refresh rate for 64meg DRAM is 43mS. Most 64meg DRAM needs a 64mS refresh rate although some parts may need faster refresh rate, but like Mike Smith said, the refresh rate is extremely conservative; it is only an issue in extreme process/voltage/temperature corner. You should not have refresh issue in room temperature.

Do run the memory test multiple iterations. Each iteration uses a different seed values so each iteration tests different population of memory cells.

Perhaps we can swap 64meg; I can ship you a 64 meg SIMM that I believe is working and you can ship your questionable 64meg SIMM to me. I'll PM you my address

Bill

PS, with updated CPLD are you able to run Transcend CF disk and other disk you had problems with?

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Fri, 27 Mar 2020 18:57:33 GMT
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Thanks to Plasmo and Tobster for their help and their willingness to listen to my ramblings:

T030 ROM BIOS v2.11 (c) 2018 Tobias Rathje
CB030 version ported by Mike McDonald 2020

RAM (hard coded): 64MB
Build: Mar 26 2020 21:33:30

#> hr initrd.gz 0x400000

```
0%_____100%
##################################################

1135583 bytes read

#> hr linux.bin 0x1000
0%_____100%
##########################################################

2814920 bytes read

#> l "root=/dev/ram0 rw console=ttySC0,38400n8r" 0x400000 140000

Bootinfo address: 0x002b1000

Ramdisk start: 0x00400000
Ramdisk size: 1310720

Machine type: 14
Memory start: 0x00000000
Memory size: 64 MB

Loading Linux at 0x00001000

ABC3GHIJK
Linux version 4.9.156-CB030 (mikemac@Altair.mikemac.com) (gcc version 6.1.0 (GCC
) ) #152 Fri Mar 27 11:40:03 MST 2020
bootconsole [cb030serial0] enabled
initrd: 00400000 - 00540000
Built 1 zonelists in Zone order, mobility grouping on.  Total pages: 16240
Kernel command line: root=/dev/ram0 rw console=ttySC0,38400n8r
PID hash table entries: 256 (order: -2, 1024 bytes)
Dentry cache hash table entries: 8192 (order: 3, 32768 bytes)
Inode-cache hash table entries: 4096 (order: 2, 16384 bytes)
Sorting __ex_table...
Memory: 60824K/65536K available (1863K kernel code, 270K rwdata, 544K rodata, 64
K init, 125K bss, 4712K reserved, 0K cma-reserved)
Virtual kernel memory layout:
    vector  : 0x0028175c - 0x00281b5c   (   1 KiB)
    kmap    : 0xd0000000 - 0xf0000000   ( 512 MiB)
    vmalloc : 0x04800000 - 0xd0000000   (3256 MiB)
    lowmem  : 0x00000000 - 0x04000000   (  64 MiB)
      .init : 0x002a1000 - 0x002b1000   (  64 KiB)
      .text : 0x00001000 - 0x001d2c30   (1864 KiB)
      .data : 0x001d5070 - 0x002a0bf0   ( 815 KiB)
      .bss  : 0x00281680 - 0x002a0bf0   ( 126 KiB)
NR_IRQS:200
pcb030_sched_init(0x00004b84)
```

```
Console: colour dummy device 80x25
Calibrating delay loop... 5.35 BogoMIPS (lpj=26752)
pid_max: default: 32768 minimum: 301
Mount-cache hash table entries: 1024 (order: 0, 4096 bytes)
Mountpoint-cache hash table entries: 1024 (order: 0, 4096 bytes)
devtmpfs: initialized
clocksource: jiffies: mask: 0xffffffff max_cycles: 0xffffffff, max_idle_ns: 1911
2604462750000 ns
futex hash table entries: 256 (order: -1, 3072 bytes)
FS-Cache: Loaded
Trying to unpack rootfs image as initramfs...
rootfs image is not initramfs (no cpio magic); looks like an initrd
random: fast init done
Freeing initrd memory: 1280K
workingset: timestamp_bits=27 max_order=14 bucket_order=0
io scheduler noop registered (default)
uart-sccnxp sc68681.0: Using default clock frequency
sc68681.0: ttySC0 at MMIO 0xfffff000 (irq = 8, base_baud = 230400) is a SC68681
console [ttySC0] enabled
console [ttySC0] enabled
bootconsole [cb030serial0] disabled
bootconsole [cb030serial0] disabled
sc68681.0: ttySC1 at MMIO 0xfffff000 (irq = 8, base_baud = 230400) is a SC68681
mc68681_irq_unmask(8)
uart-sccnxp sc68681.0: IRQ 8 registered. ret = 0
brd: module loaded
Uniform Multi-Platform E-IDE driver
ide-gd driver 1.18
RAMDISK: gzip image found at block 0
EXT4-fs (ram0): couldn't mount as ext3 due to feature incompatibilities
EXT4-fs (ram0): mounting ext2 file system using the ext4 subsystem
EXT4-fs (ram0): mounted filesystem without journal. Opts: (null)
VFS: Mounted root (ext2 filesystem) on device 1:0.
devtmpfs: mounted
Freeing unused kernel memory: 64K
This architecture does not have kernel memory protection.
Trying /sbin/init

************************
* CB030 SBC            *
************************

Linux CB030 4.9.156-CB030 #152 Fri Mar 27 11:40:03 MST 2020 m68k GNU/Linux

Model:         CB030
System Memory:  65536K
```

```
Please press Enter to activate this console.
/bin/sh: can't access tty; job control turned off
~ # ls
ls
bin         dev         lost+found  proc        sbin
boot        etc         mnt         run         sys
~ # random: crng init done
ls /proc
ls /proc
1           34          buddyinfo   hardware    kpageflags  stat
10          35          bus         ide         loadavg     swaps
11          36          cmdline     interrupts  locks       sys
12          4           consoles    iomem       meminfo     sysvipc
13          45          cpuinfo     ioports     misc        thread-sel
f
14          5           crypto      irq         modules     timer_list
15          6           devices     kallsyms    mounts      tty
2           7           diskstats   kcore       pagetypeinfo uptime
3           8           driver      key-users   partitions  version
31          85          execdomains keys        self        vmallocinf
o
32          86          filesystems kmsg        slabinfo    vmstat
33          9           fs          kpagecount  softirqs    zoneinfo
~ # cat /proc/hardware
cat /proc/hardware
Model:          CB030
System Memory:  65536K
~ # uname -a
uname -a
Linux CB030 4.9.156-CB030 #152 Fri Mar 27 11:40:03 MST 2020 m68k GNU/Linux
~ #
```

The CF driver will require a hardware modification to enable the CF IRQ. The Linux ATA driver requires a working IDE interrupt during the drive setup.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by tingo on Fri, 27 Mar 2020 22:45:02 GMT
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Oh... nice, very nice!

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by etchedpixels on Sat, 28 Mar 2020 15:33:56 GMT

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Ah you are using the legacy IDE code. Be warned that will go away at some point. You should be using drivers/ata not drivers/ide.

Take a look at drivers/ata/pata_platform.c

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sat, 28 Mar 2020 16:35:29 GMT
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etchedpixels wrote on Sat, 28 March 2020 08:33Ah you are using the legacy IDE code. Be warned that will go away at some point. You should be using drivers/ata not drivers/ide.

Take a look at drivers/ata/pata_platform.c
Thanks for the pointer. I was basing the CB030 CF support on what the T030 and KISS-030 boards used for their HD support. I'm not overly concerned at this point that IDE may someday go away. I'm more concerned about the lack of an IRQ (which pata_platform claims to handle) and the 8 bit data path of the CB030 CF interface. I haven't seen anything suggesting Linux supports 8 bit only devices. Everything has been choosing between 16 and 32 bits.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sun, 29 Mar 2020 00:16:24 GMT
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Yeah, libata doesn't have any 8bit xfer routines. But pata_pcmcia does! And pata_platform is based upon pata_pcmcia! So I made a copy of pata_platform and added the 8bit xfer stuff from pata_pcmcia. And my new pata_cb030 driver can read the IDENTIFY results! Yipppee!

Except:

ata1.00: CFA: TS4GCF133, 20110407, max UDMA/66
ata1.00: 7831152 sectors, multi 0: LBA
ata1.00: Drive reports diagnostics failure. This may indicate a drive
ata1.00: fault or invalid emulation. Contact drive vendor for information.

So libata-sff marks the interface as having no drive connected. :(

Since only the IDENTIFY (0xec) command has been sent so far, there must be some bit in the returned info that libata-sff doesn't like.

So more digging. Unless someone knows a trick or two for fooling the Linux ATA subsystem into thinking the drive is real and working.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sun, 29 Mar 2020 01:32:03 GMT
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Uh, it helps if you remember to include SCSI disk support! Duh!

Uniform Multi-Platform E-IDE driver
ide-gd driver 1.18
pata_cb030 pata_cb030: pata_cb030_probe 0
scsi host0: pata_cb030
ata1: PATA max PIO0 no IRQ, using PIO polling mmio cmd 0xffffe000 ctl 0xffffe00e
ata1.00: CFA: TS4GCF133, 20110407, max UDMA/66
ata1.00: 7831152 sectors, multi 0: LBA
ata1.00: configured for PIO
scsi 0:0:0:0: Direct-Access ATA TS4GCF133 0407 PQ: 0 ANSI: 5
sd 0:0:0:0: [sda] 7831152 512-byte logical blocks: (4.01 GB/3.73 GiB)
sd 0:0:0:0: [sda] Write Protect is off
sd 0:0:0:0: [sda] Write cache: disabled, read cache: enabled, doesn't support DP
O or FUA
sda: sda1 sda2 sda3
sd 0:0:0:0: [sda] Attached SCSI removable disk
RAMDISK: gzip image found at block 0
EXT4-fs (ram0): couldn't mount as ext3 due to feature incompatibilities
EXT4-fs (ram0): mounting ext2 file system using the ext4 subsystem
EXT4-fs (ram0): mounted filesystem without journal. Opts: (null)
VFS: Mounted root (ext2 filesystem) on device 1:0.
devtmpfs: mounted
Freeing unused kernel memory: 72K
This architecture does not have kernel memory protection.

****
* CB030 SBC *
****

Linux CB030 4.9.156-CB030 #181 Sat Mar 28 18:26:28 MST 2020 m68k GNU/Linux

Model: CB030
System Memory: 65536K

CB030 login: root
****
* CB030 SBC *
* by Plasmo (Bill Shen) *
* T030 Boot loader *
* by Tobster (Tobias Rathje) 2016 *
* CB030 Boot loader *
* ported by mikemac (Mike McDonald) 2020 *

```
*****************************************


login[52]: root login on 'ttySC0'
~ # mount /dev/sda1 /mnt/tmp
~ # ls /mnt
0.cmd      1.cmd      2.cmd      initrd.gz  linux.bin
~ # umount /mnt
~ # mount /dev/sda3 /mnt
EXT4-fs (sda3): couldn't mount as ext3 due to feature incompatibilities
EXT4-fs (sda3): couldn't mount as ext2 due to feature incompatibilities
EXT4-fs (sda3): Filesystem with huge files cannot be mounted RDWR without CONFIG
_LBDAF
mount: mounting /dev/sda3 on /mnt failed: Invalid argument
~ #
```

Guess it doesn't like my 3+GB main partition (sda3). But it reads the boot partition (sda1)!!!!

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 29 Mar 2020 01:35:55 GMT

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Wow! I was going to say something about PIO mode and set FEATURE command, but never mind!
  Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sun, 29 Mar 2020 02:15:51 GMT

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And if you track down the suggested option:

```
CB030 login: root
*****************************************
* CB030 SBC                             *
*   by Plasmo (Bill Shen)               *
* T030 Boot loader                      *
*   by Tobster (Tobias Rathje) 2016     *
* CB030 Boot loader                     *
*   ported by mikemac (Mike McDonald) 2020 *
*****************************************
```

```
login[52]: root login on 'ttySC0'
~ # mount /dev/sda3 /mnt
EXT4-fs (sda3): couldn't mount as ext3 due to feature incompatibilities
EXT4-fs (sda3): couldn't mount as ext2 due to feature incompatibilities
EXT4-fs (sda3): mounted filesystem with ordered data mode. Opts: (null)
~ # df
Filesystem           1K-blocks      Used Available Use% Mounted on
/dev/root                 2456      1599       732  69% /
devtmpfs                 30272         0     30272   0% /dev
/dev/sda3              3697868    346936   3143376  10% /mnt
~ # random: crng init done

~ # ls /mnt
bin         etc         lost+found  opt         run         sys         var
boot        home        media       proc        sbin        tmp
dev         lib         mnt         root        srv         usr
~ # ls /mnt/etc
adduser.conf              insserv.conf              rc0.d
alternatives              insserv.conf.d            rc1.d
apt                       iproute2                  rc2.d
bash.bashrc               issue                     rc3.d
bash_completion.d         issue.net                 rc4.d
bindresvport.blacklist    jupp                      rc5.d
calendar                  kernel                    rc6.d
cron.d                    ld.so.cache               rcS.d
cron.daily                ld.so.conf                resolv.conf
cron.hourly               ld.so.conf.d              rmt
cron.monthly              libaudit.conf             rpc
cron.weekly               localtime                 screenrc
crontab                   login.defs                securetty
debconf.conf              logrotate.conf            security
debian_version            logrotate.d               selinux
default                   mc                        services
deluser.conf              mke2fs.conf               shadow
dhcp                      mkshrc                    shells
dpkg                      modprobe.d                skel
environment               modules                   ssh
fstab                     motd                      ssl
gai.conf                  motd.tail                 staff-group-for-usr-local
group                     network                   subgid
gshadow                   networks                  subuid
gss                       newt                      sysctl.conf
host.conf                 nologin                   sysctl.d
hostname                  nsswitch.conf             syslog.conf
hosts                     opt                       syslog.d
hosts.allow               os-release                systemd
hosts.deny                pam.conf                  terminfo
```

```
inetd.conf              pam.d                   timezone
init                    passwd                  tmpfiles.d
init.d                  perl                    ucf.conf
initramfs-tools         profile                 udev
inittab                 profile.d               wgetrc
inputrc                 protocols
insserv                 rc.local
~ #
```

And Plasmo, that's without any hardware modifications! Just 'cb030_r1_release_cf_fix_new100hz_irq' for the CPLD!

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 29 Mar 2020 02:26:49 GMT
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Very very wow!

I'm looking at the design and believe I can wire in 8 wires from high byte of the IDE interface to corresponding data lines on 68030 and get it to work in 16-bit mode. I can also enable the CF interrupt. I thought I'll modify one CB030 to the 16-bit mode with interrupt and sent it to you to try out. If the improvement is worth it, I can upgrade the CB030 design and figure out how to deal with 16-bit CF interface issues.

I assume you are using your own (Transcend?) 4G CF disk. So it must be working pretty reliably?

Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sun, 29 Mar 2020 03:29:44 GMT
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plasmo wrote on Sat, 28 March 2020 19:26Very very wow!

I'm looking at the design and believe I can wire in 8 wires from high byte of the IDE interface to corresponding data lines on 68030 and get it to work in 16-bit mode. I can also enable the CF interrupt. I thought I'll modify one CB030 to the 16-bit mode with interrupt and sent it to you to try out. If the improvement is worth it, I can upgrade the CB030 design and figure out how to deal with 16-bit CF interface issues.

I assume you are using your own (Transcend?) 4G CF disk. So it must be working pretty reliably?

Bill

I put some Amiga Linux file system image (Ara2015A.tar.gz) on the Transcend so I'd have something to start with. I thought it was supposed to be a Debian based m68k fs but there's some references to openbsd in the init files so I'm not sure. It sure is trying to start up a bunch of stuff a poor little 030 system really doesn't need. Like I had to add networking support to the kernel so that udev would crash the system! Yuck! :)

Anyway, a 16bit CF interface would double the speed of disk IO! And as slow as 8bit PIO is, we can use every bit of speed we can reasonably get. I'd love to try a 16bit CF interface if you can come up with one.

So far, the only difference between supporting an 8bit interface and a 16bit interface is whether your read/write bytes or shorts to the DATA register. And don't enable 8 bit mode in the init code! But then I'm doing block reads/writes all of the time. If CPM does something other than 512 byte accesses, then you might have a bit more work. But as long as it's not doing odd length accesses, it shouldn't be too much work. Says the guy who knows NOTHING about CPM!! But if you add the extra data lines but don't change your code, 8bit mode should still work for you.

Anyway, this fs image bites:

```
VFS: Mounted root (ext4 filesystem) on device 8:3.
devtmpfs: mounted
Freeing unused kernel memory: 80K
This architecture does not have kernel memory protection.
Mount failed for selinuxfs on /sys/fs/selinux:  No such file or directory
INIT: version 2.88 booting
random: crng init done
[....] Setting hostname to 'CB030.retrobrewcomputers.org'...done.
[....] Files under mount point '/run' will be hidden. ... (warning).
[....] Starting the hotplug events dispatcher: udevdsystemd-udevd[166]: starting version 215

. ok
[....] Synthesizing the initial hotplug events...done.
[....] Waiting for /dev to be fully populated...done.
[....] Activating swap:swapon /dev/sda2
swapon: /dev/sda2: found swap signature: version 1d, page-size 4, different byte
 order
swapon: /dev/sda2: pagesize=4096, swapsize=74027008, devsize=74027520
Adding 72288k swap on /dev/sda2.  Priority:-1 extents:1 across:72288k
. ok
EXT4-fs (sda3): re-mounted. Opts: (null)
[....] Will now check root file system:fsck from util-linux 2.25.2
[/sbin/fsck.ext4 (1) -- /] fsck.ext4 -y -C0 /dev/sda3
e2fsck 1.42.12 (29-Aug-2014)
root: clean, 18760/239040 files, 118138/955867 blocks
. ok
EXT4-fs (sda3): re-mounted. Opts: (null)
[....] Will now activate lvm and md swap:done.
[info] Will now check all file systems.
```

fsck from util-linux 2.25.2
Checking all file systems.
[....] Done checking file systems. A log is being saved in /var/log/fsck/checkfs if that location is writable.. ok
[....] Cleaning up temporary files...find: cannot search `.': Inappropriate ioctl for device

Data write fault at 0xc018fffc in Super Data (pc=0x4000)
BAD KERNEL BUSERR
Oops: 00000000

I don't know what device the 'inappropriate' IOCTL is being sent to. ???

And swapping to the CF probably isn't a good idea either. :)

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 29 Mar 2020 03:47:35 GMT
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OK, I'll work on a 16-bit CF interface with interrupt capability.

CP/M BIOS needs to change to work with 16-bit interface, but that's very simple to do and have been done before.

I don't understand this line at the end: Data write fault at 0xc018fffc in Super Data (pc=0x4000)
There isn't anything at 0xc018fffc.

Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sun, 29 Mar 2020 04:43:29 GMT
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plasmo wrote on Sat, 28 March 2020 20:47

I don't understand this line at the end: Data write fault at 0xc018fffc in Super Data (pc=0x4000)
There isn't anything at 0xc018fffc.

Bill
That's the kernel starting a Oops as a result of the 'inappropriate' IOCTL on some critical device. There is actually a long dump trace in the output after that point. I just cut it off for simplicity. I haven't tried analyzing the back trace yet to see if I can figure out the root cause. It's already been a long day and I need to save something for tomorrow! :)

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Thu, 02 Apr 2020 16:00:46 GMT
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OK, I've created a builder's page to hold all of the CB030 Linux stuff and I've uploaded the initial release: https:// www.retrobrewcomputers.org/doku.php?id=builderpages:mikemac: cb030

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 03 Apr 2020 02:21:53 GMT
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Mike,
Wow! Most excellent!!

However, since I'm not a Linux user, I'll need more help...

My setup is CB030 with 64 meg DRAM, I have the new100Hz interrupt CPLD. My CF disk is a 2G Verbatim. I burn a EPROM with EPROM binary from CB030bios-64.bin.zip. It boots and here is the dialog:

T030 ROM BIOS v2.11 (c) 2018 Tobias Rathje
CB030 version ported by Mike McDonald 2020

RAM (hard coded): 64MB
Build: Mar 30 2020 10:09:47

#> ?
? - Help
a - Load and execute EhBasic
b - Toggle heartbeat LED: b <val>
c - Modify cache register: c <val>
C - Checksum RAM: C <addr>
d - Dump address: d <addr>
e - Force exception: e <num>
h - Perform hardisk command - h? for help
i - Set interrupt level: i <level>
g - Run: g <addr>
l - Load linux: l <cmdline> <ramdisk start addr> <ramdisk size>
m - Mandelbrot test: m <count>
q - Perform RAM check: q <mode> <address> <size> <count>
r - Dump registers
v - Load and execute Test BIOS from SD card
u - Run in user mode: u <addr>
w - Write single byte: w <addr> <data>
x - Transfer file with XMODEM: x <addr>
z - Soft reset

<#> - Run script "#"

#> hl

Volume label:

  0 File(s),   0 bytes total
  0 Dir(s),   1949472KiB free

#>

So it can read the CF disk. Now I assume the disk needs to be formatted as FAT partition and files 0.cmd, initrd.gz, and linux.bin copied into the partition? Do I need to do that with a Linux system? What command I should issue at the #> prompt to boot up Linux?
  Bill

PS, In case I haven't said "Wow!", here it is: WOW!!!

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 03 Apr 2020 02:35:07 GMT
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Mike,
Never mind! I format the 2G CF disk in Windows as FAT32, copied 0.cmd, initrd.gz, and linux.bin. Power it up and this is what I got:

I think I need to partition the CF disk so I have a FAT32 partition and other partitions you've described.
  Bill

T030 ROM BIOS v2.11 (c) 2018 Tobias Rathje
CB030 version ported by Mike McDonald 2020

RAM (hard coded): 64MB
Build: Mar 30 2020 10:09:47

Init script found, press enter to abort.....

Running init script:

 [Load initrd.gz into RAM]

0%_____100%
##

1132600 bytes read
 [Load linux.bin into RAM]

0%_____100%
##

3124952 bytes read
 [Starting Linux]

Bootinfo address: 0x002fc000

Machine type: 14
Memory start: 0x00000000
Memory size: 64 MB

Ramdisk start: 0x00400000
Ramdisk size: 1310720
Loading Linux at 0x00001000

ABC3GHIJK
Linux version 4.9.156-CB030 (mikemac@Altair.mikemac.com) (gcc version 6.1.0 (GCC)) #190 Sun Mar 29 22:53:56 MST 2020
bootconsole [cb030serial0] enabled
initrd: 00400000 - 00540000
Built 1 zonelists in Zone order, mobility grouping on. Total pages: 16240
Kernel command line: root=/dev/ram0 rw console=ttySC0,38400n8r
PID hash table entries: 256 (order: -2, 1024 bytes)
Dentry cache hash table entries: 8192 (order: 3, 32768 bytes)
Inode-cache hash table entries: 4096 (order: 2, 16384 bytes)
Sorting __ex_table...
Memory: 60524K/65536K available (2075K kernel code, 286K rwdata, 608K rodata, 72K init, 130K bss, 5012K reserved, 0K cma-reserved)
Virtual kernel memory layout:
    vector : 0x002c96fc - 0x002c9afc   (1 KiB)
    kmap   : 0xd0000000 - 0xf0000000   (512 MiB)
    vmalloc : 0x04800000 - 0xd0000000   (3256 MiB)
    lowmem : 0x00000000 - 0x04000000   (64 MiB)
      .init : 0x002ea000 - 0x002fc000   (72 KiB)
      .text : 0x00001000 - 0x00207fdc   (2076 KiB)
      .data : 0x0020a500 - 0x002e9e84   (895 KiB)
      .bss : 0x002c9620 - 0x002e9e84   (131 KiB)
NR_IRQS:200
pConsole: colour dummy device 80x25
Calibrating delay loop... 5.35 BogoMIPS (lpj=26752)
pid_max: default: 32768 minimum: 301
Mount-cache hash table entries: 1024 (order: 0, 4096 bytes)
Mountpoint-cache hash table entries: 1024 (order: 0, 4096 bytes)

```
devtmpfs: initialized
clocksource: jiffies: mask: 0xffffffff max_cycles: 0xffffffff, max_idle_ns: 19112604462750000 ns
futex hash table entries: 256 (order: -1, 3072 bytes)
SCSI subsystem initialized
FS-Cache: Loaded
random: fast init done
Trying to unpack rootfs image as initramfs...
rootfs image is not initramfs (no cpio magic); looks like an initrd
Freeing initrd memory: 1280K
workingset: timestamp_bits=27 max_order=14 bucket_order=0
io scheduler noop registered (default)
uart-sccnxp sc68681.0: Using default clock frequency
sc68681.0: ttySC0 at MMIO 0xfffff000 (irq = 8, base_baud = 230400) is a SC68681
console [ttySC0] enabled
console [ttySC0] enabled
bootconsole [cb030serial0] disabled
bootconsole [cb030serial0] disabled
sc68681.0: ttySC1 at MMIO 0xfffff000 (irq = 8, base_baud = 230400) is a SC68681
brd: module loaded
Uniform Multi-Platform E-IDE driver
ide-gd driver 1.18
pata_cb030 pata_cb030: pata_cb030_probe 0
scsi host0: pata_cb030
ata1: PATA max PIO0 no IRQ, using PIO polling mmio cmd 0xffffe000 ctl 0xffffe00e
ata1.00: CFA: CF Card, Ver6.05, max UDMA/133
ata1.00: 3902976 sectors, multi 1: LBA48
ata1.00: Drive reports diagnostics failure. This may indicate a drive
ata1.00: fault or invalid emulation. Contact drive vendor for information.
ata1.00: configured for PIO
scsi 0:0:0:0: Direct-Access     ATA      CF Card          .05  PQ: 0 ANSI: 5
sd 0:0:0:0: [sda] 3902976 512-byte logical blocks: (2.00 GB/1.86 GiB)
sd 0:0:0:0: [sda] Write Protect is off
sd 0:0:0:0: [sda] Write cache: enabled, read cache: enabled, doesn't support DPO or FUA
 sda: sda1
sd 0:0:0:0: [sda] Attached SCSI disk
RAMDISK: gzip image found at block 0
EXT4-fs (ram0): couldn't mount as ext3 due to feature incompatibilities
EXT4-fs (ram0): mounting ext2 file system using the ext4 subsystem
EXT4-fs (ram0): mounted filesystem without journal. Opts: (null)
VFS: Mounted root (ext2 filesystem) on device 1:0.
devtmpfs: mounted
Freeing unused kernel memory: 72K
This architecture does not have kernel memory protection.

*****************************************
* CB030 SBC                             *
*   by Plasmo (Bill Shen) 2020          *
* T030 Boot loader                      *
```

```
*   by Tobster (Tobias Rathje) 2016       *
* CB030 Boot loader                       *
*   ported by mikemac (Mike McDonald) 2020 *
*******************************************

Linux CB030 4.9.156-CB030 #190 Sun Mar 29 22:53:56 MST 2020 m68k GNU/Linux

Model:          CB030
System Memory:  65536K


CB030 login:
```

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 03 Apr 2020 02:40:22 GMT
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Mike,
Psst! What's the login and password?
  Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Fri, 03 Apr 2020 02:41:11 GMT
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Congrats!

By default, the boot loader will run the "0.cmd" script off the first partition if one exists. You can hit Enter to opt out and get the the boot loader prompt.

The only account in the initrd is "root". So type "root" [without quotes!] at the login prompt and you should get a shell where you can do a lot of normal Linux stuff. [Exercise left to the reader!) :)]

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 03 Apr 2020 03:13:36 GMT
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Love it! Surprisingly responsive. vi works just as I've remembered...
  Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Wed, 08 Apr 2020 17:39:56 GMT

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Does Linux run on the rev1 board or does it require a hardware bodge for 16-bit PCMCIA CF card access?

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Wed, 08 Apr 2020 18:34:10 GMT
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Linux runs fine on rev1 pc board and does not require 16-bit CF interface. It does require a new boot loader. Do you have an EPROM programmer?
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Wed, 08 Apr 2020 18:43:52 GMT
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Great! I don't have an EEPROM programmer for the AT49 but I'm looking around if there's a way to build one using an Arduino or Raspberry Pi (since I do have those on-hand).

I also dug though my stuff and couldn't find my DIMM stash - I think I sold it at a Hamfest last year. Guess I'm off to ebay for a 64 MB RAM DIMM.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Wed, 08 Apr 2020 19:02:36 GMT
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quarterturn wrote on Wed, 08 April 2020 11:43Great! I don't have an EEPROM programmer for the AT49 but I'm looking around if there's a way to build one using an Arduino or Raspberry Pi (since I do have those on-hand).

I also dug though my stuff and couldn't find my DIMM stash - I think I sold it at a Hamfest last year. Guess I'm off to ebay for a 64 MB RAM DIMM.

I never figured out how to reprogram Plasmo's little flash board either. My programmer knows about a AT49F040 but insists it shoudl be in the PLCC adapter, not the DIP board. If I tell it to go ahead anyway, it claims to erase, blank verify, program, and verify successfully but the flash wouldn't work in the board anymore. So I don't know if I fried them or what. The fact that the programmer claims it verified things confuses me!

Luckily I had a couple of SST39SF040s on hand and they worked like a charm!

When ordering your SIMMs off of Ebay, make sure you buy 5V ones and then double check them when they arrive. My first one turned out to be a 3V 72 pin SIMM and it doesn't work in the

CB030. Luckily the supplier sent me the correct one without delay.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by norwestrzh on Wed, 08 Apr 2020 19:05:28 GMT
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Hi Bill,

You spoke (a while ago) about making a 68030 partially assembled "kit" for sale. Is that still in the works? Are they available? I'm anxious to try out Linux on a 68030. *grin*

Roger

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Wed, 08 Apr 2020 23:22:23 GMT
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norwestrzh wrote on Wed, 08 April 2020 13:05Hi Bill,

You spoke (a while ago) about making a 68030 partially assembled "kit" for sale. Is that still in the works? Are they available? I'm anxious to try out Linux on a 68030. *grin*

Roger

Roger,
The rev 1 board appears to work well. I currently have 6 boards available, I'm going to order more this week. The partially assembled board is available to USA buyer for $15 plus $5 shipping. You can see a picture of it in this assembly guide I'm currently working on:
https://www.retrobrewcomputers.org/doku.php?id=builderpages:plasmo:cb030:cb030_rev1:pictorial_guide

The reason I'm only offer it to USA buyers right now is because I want to help fixing unexpected problems so if a buyer has problems that can't be fixed over email, he can ship it back at his expense; I'll fix it for free and return it back to the buyer at my expense. This process is too expensive for international buyers.

I also offer assembled and tested CB030 for $75 plus shipping. The unit will have 16meg DRAM, 256meg CF disk and an USB-to-serial adapter.

When the design is more mature and I have more boards and parts, I'll list CB030 partially assembled board and fully assembled/tested board under Single Board Computers of RetroBrew Computers Wiki page.

Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Wed, 08 Apr 2020 23:31:53 GMT
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mikemac wrote on Wed, 08 April 2020 13:02
I never figured out how to reprogram Plasmo's little flash board either. My programmer knows about a AT49F040 but insists it shoudl be in the PLCC adapter, not the DIP board. If I tell it to go ahead anyway, it claims to erase, blank verify, program, and verify successfully but the flash wouldn't work in the board anymore. So I don't know if I fried them or what. The fact that the programmer claims it verified things confuses me!

Mike,
That flash board adapter is a kludge. I'm able to program it on TL866II either as DIP or PLCC. I have purchased a batch of SST39SF040 so that's what I'll be using from now on.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Wed, 08 Apr 2020 23:47:29 GMT
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Mike,
This is CB030 modified to have 16-bit CF interface. I updated CP/M68K to handle the 16-bit interface and it appears to work well. I also hook up the CF interrupt line, but have not test it right now. I can ship it to you if you like to try Linux on it.
Bill

File Attachments
1) DSC_56410330.jpg, downloaded 341 times
2) DSC_56530401.jpg, downloaded 392 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Thu, 09 Apr 2020 00:07:36 GMT
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Thanks for the photos! I'll give it a try on my board.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by norwestrzh on Thu, 09 Apr 2020 18:01:37 GMT
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Hi Bill,

I'm wondering about sources for the DRAM and the 68030 socket? Do you have extras? If you supply them, how much would it add to the cost?

Roger

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Thu, 09 Apr 2020 20:26:27 GMT
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I bodge-wired mine for 16-bits CF but it's prone to crashing. Maybe half the time it'll make it through a run of 'asciiart'. Maybe it doesn't like the unequal wire lengths. I've tried lifting up the wires to get them away from the rest of the traces on the board, but it doesn't change it much. Unfortunately I'm out of wire-wrap wire, and stripping the enameled wire is a pain.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Thu, 09 Apr 2020 21:19:18 GMT
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Bodge-wire update:
After removing all the wires, it still crashed!
I tried a different power supply, and sure enough it was back to solid. I reinstalled all the bodge wires and it's still solid. Hmm!

I've never looked at it with a scope, but I guess my desktop UPS USB power jacks put out really crappy power. Currently running it with a $14 walmart 2.4A output 10Ah USB battery pack. I wouldn't have expected it, but that cheap thing is fine.

Currently building this: http://danceswithferrets.org/geekblog/?p=496 so I can program EEPROMs.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 10 Apr 2020 03:08:43 GMT
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Oops, the pictures I provided were not the latest. There are additional modifications beyond the 8 data lines. Because the data port is now 16-bit wide, the address lines need to start from A1 to A3 instead of A0-A2 of the original design. This changes the memory map associated with CF interface. I also need to make change in CPLD to tell 68030 that CF is 16-bit wide port. So you'll need to reprogram the CPLD and reprogram the EPROM.

Give me a day or so to come up with an engineering change detailing all the changes needed to convert 8-bit CF interface to 16-bit.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 10 Apr 2020 03:17:09 GMT
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norwestrzh wrote on Thu, 09 April 2020 12:01Hi Bill,

I'm wondering about sources for the DRAM and the 68030 socket? Do you have extras? If you supply them, how much would it add to the cost?

Roger

Roger,
I have a few 68030 sockets and many 16 meg SIMM72 DRAM. The only place I can find 68030 sockets is on eBay, https://www.ebay.com/itm/2pcs-Brand-New-128pins-PGA-Socket-1 3x13-for-68030/233521674187 I bought 6 of them and I should still have 2 left. It is $8 each. The 16-meg SIMM72 DRAM is readily available from many vendors under $5. You need 60nS EDO 5V and no parity. If you want me to provide one, it is $4. Let me know if you need other parts.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Fri, 10 Apr 2020 03:58:08 GMT
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plasmo wrote on Thu, 09 April 2020 20:08Oops, the pictures I provided were not the latest. There are additional modifications beyond the 8 data lines. Because the data port is now 16-bit wide, the address lines need to start from A1 to A3 instead of A0-A2 of the original design. This changes the memory map associated with CF interface. I also need to make change in CPLD to tell 68030 that CF is 16-bit wide port. So you'll need to reprogram the CPLD and reprogram the EPROM.

Give me a day or so to come up with an engineering change detailing all the changes needed to convert 8-bit CF interface to 16-bit.
Bill

Likewise the Linux kernel and boot loader will need to be updated before they'll work with the modifications.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Fri, 10 Apr 2020 04:06:47 GMT
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mikemac wrote on Thu, 09 April 2020 20:58
Likewise the Linux kernel and boot loader will need to be updated before they'll work with the modifications.

Hmm. It may still work but in 8 bit mode. The boot loader does issue the command to put the CF in 8 bit mode. So it "should" work just without any benefit.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Fri, 10 Apr 2020 12:41:23 GMT
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Bill,

I'll have to look into what it takes to program the Altera CPLD. Hopefully it's something cheap. I finished up my Arduino Mega EEPROM programmer last night and scrounged up a suitable EEPROM to test it with. It's just a little 8K chip but it'll do for testing.

Where did you source your 68030 CPUs? Looking on eBay, it is mostly remarked chips sold at very inflated prices. I have a legitimate 68030RC40 in my CPU collection but I think it's going to be tough to find its genuine 68882 counterpart in ceramic PGA without paying a fortune.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 10 Apr 2020 13:51:35 GMT
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There are lots of eBay sellers of USB blaster clone. I bought mine several years back but I can't find the seller anymore. Mine looks just like this one:
https://www.ebay.com/itm/altera-Mini-Usb-Blaster-Cable-For-C
PLD-FPGA-NIOS-JTAG-Altera-Programmer/181930051137

68030 ceramic gold (-RC) is really expensive, over $25. The plastic version (-RP) is under $15. I have several tubes of known-good 68030 that I would solder directly to save the cost of a socket. Once that is exhausted, I will have to install 68030 sockets and try my luck on the grey market. I would probably start with UTSource. In fact I just searched UTSource and the first item is MC68030RP33C for $9.72 in quantity of 10. A very good price, hmmm.

Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Fri, 10 Apr 2020 14:23:09 GMT
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Thanks for the recommendation. I saw a post saying the clones may have weak outputs so I'm curious if you ran into that issue? I guess for the price I could try a couple different ones.

Utsource has pretty good 68030 selection in QFP. Any reason you don't use QFP, other than maybe you have PGA on-hand? I'd think QFP is easier to solder, though possibly there's layout issues in the small 2-layer board which PGA helps with.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 10 Apr 2020 14:54:03 GMT
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I do have a batch of 68030 PGA I want to use so that's part of the design decision. PGA is easier to debug and have greater appeal to the hobbyists. For 2-layer pc board, PGA takes about the same amount of board space as QFP.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sat, 11 Apr 2020 13:55:39 GMT
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Added instructions on how to modify CF interface to 16-bit. Also added the corresponding CPLD equations. Still need to upload the CP/M68K BIOS, modified memory map, and modified schematic.
https://www.retrobrewcomputers.org/doku.php?id=builderpages:plasmo:cb030:cb030_rev1:16-bit_cf_upgrade
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Sat, 11 Apr 2020 15:22:39 GMT
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I got a TTL866CS EEPROM programmer and an Altera "USB Blaster" clone on order. I just went with aliexpress since apparently all the eBay sellers just drop-ship from China anyway, and I was able to get both items from the same store.

Interesting you can't find a super-cheap parallel EEPROM programmer, as compared to all the other programming things. I guess it's a low-interest item now and the sellers know they're being compared to old-fashioned $300 parallel-port programmers.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by explodinglemur on Sun, 12 Apr 2020 05:13:50 GMT
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plasmo wrote on Sat, 11 April 2020 06:55Added instructions on how to modify CF interface to 16-bit. Also added the corresponding CPLD equations. Still need to upload the CP/M68K BIOS, modified memory map, and modified schematic.
https://www.retrobrewcomputers.org/doku.php?id=builderpages:plasmo:cb030:cb030_rev1:16-bit_cf_upgrade
Bill
I'm incorporating those changes into the 4-layer design I messaged you about. With pin 24 on the CPLD repurposed for the CF card interrupt, I assume the memory size selection jumper is deprecated?

Also, probably stupid question on the SDRAM, how does addressing/mapping work out with RAS0/RAS2 and RAS1/RAS3 tied together? I can lay out PCBs, and I can write some code, but I've got a big knowledge gap in the middle I'm trying to bridge :)

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 12 Apr 2020 11:28:02 GMT
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Earlier on I didn't know how to automatically select different size SIMM72 memory so the size select was for selecting 16meg or 64 meg SIMM, but since then I have figured out memory size can be automatically selected by interleaving the high order addresses in the row and column addresses mux. So the size selection jumper is no longer in use.

In SIMM72 the byte selects are done with CAS0/1/2/3. RAS0/RAS2 select low/high 16-bit words of one bank while RAS1/RAS3 select low/high 16-bit words of the 2nd bank. 4/16/64meg SIMM have one bank, 8/32/128meg SIMM have two banks. Tying RAS0&RAS2 means the full 32-bit long word of a bank is always enabled which probably draw more power, but does save me a pin.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by explodinglemur on Wed, 15 Apr 2020 16:33:19 GMT
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Got it, thanks!

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Sat, 18 Apr 2020 04:47:01 GMT
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plasmo wrote on Sat, 11 April 2020 06:55Added instructions on how to modify CF interface to

16-bit. Also added the corresponding CPLD equations. Still need to upload the CP/M68K BIOS, modified memory map, and modified schematic.
  https://www.retrobrewcomputers.org/doku.php?id=builderpages:plasmo:cb030:cb030_rev1:16-bit_cf_upgrade
  Bill

Argh! Spent the day pulling my hair out as none of the results I was getting from the new 16 bit CF interface made sense to me. In 8 bit PIO mode, it should "just work" but it was failing with the data never ready after the read command was sent. I finally switched out my Transcend 4G card for my 64M. Same problem. Swapped it out for the 256M card that has CPM on it. Works like a charm! Swapped that out for another SanDisk 8M card and it works too.

Enable the 16 bit mode and both SanDisk cards work. The 4G and 64M ones still fail. Both of those should have worked at least in 8 bit mode. I'm at a loss as to why they don't. Unless the fact that the IRQ line is now connected to something [GND via a 10K resistor] causes the card to intialize into a different mode.

That's all in the boot loader, BTW.

Using the 8M card, it does boot into Linux. Quickly too! Linux currently craps out once the CF device driver gets initialized because of the new IRQ that the old driver isn't expecting. That should be pretty easy to fix. [Knock on wood!]

I'm not sure I'm going to be able to produce a single set of binaries that'll work on CB030s with and without the 16bit CF mod. At least not without some major work to the CF driver in the boot loader.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Tue, 16 Jun 2020 22:23:12 GMT
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Mike, I've modded my CB030 with the 16-bit CF interface changes and flashed my EEPROM with your Linux BIOS. I did not, however, update the CPLD. When attempting to boot I get "f_mount error: 3". I see this if I run 'hl', even if I swap the CF card back to the CP/M68K one from Bill. I'm pretty sure I have the filesystems properly. I am using a 16 GB Transcend CF150 card. It's not an "Ultra" card, if that matters.

I've looked over the wiring changes to the board carefully and they appear to match what Bill has posted. Does the CPLD need updating to make it work?

Very excited to see the CB030 run Linux!

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Wed, 17 Jun 2020 03:08:00 GMT
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I missed the part about you going to 16-bit CF interface, so yes, you'll need new CPLD program because the original CPLD has 8-bit interface. Are you still not able to talk to CPLD with your JTAG programmer?
  Bill

PS, this is the link to 16-bit CF upgrade, just in case you don't have it:
https://www.retrobrewcomputers.org/doku.php?id=builderpages:plasmo:cb030:cb030_rev1:16-bit_cf_upgrade

---

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Wed, 17 Jun 2020 13:11:35 GMT
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I got the USB Blaster clone to be recognized by the computer and Quartus (it needed a driver). I'm opening the unzipped "cb030_r1_cpld_16bitcf_enablecfirq_100hz" directory as a project, selecting "top.pof" in Quartus, then clicking the "programmer" button.

However, when I click "Start" to (presumably) program it, it fails. I've got the cable with the red stripe next to the "p2" text on the PCB. I've tried it the other way as well, same deal.

My CB030 has a pin missing from the JTAG header, not sure if that's intentional or part of the problem. My CB030 is working, so it not that the CPLD is failed. Also, the board is being supplied power.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Thu, 18 Jun 2020 00:47:03 GMT
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Are you able to do "auto detect" and see the programmer recognize the CPLD?

The missing pin is pin 10 which is the 2nd ground. It is not needed for programmer to work.

I generally remove the SIMM module and oscillator when I program CB030 to reduce the likelihood of bus contention.
  Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Thu, 18 Jun 2020 18:01:25 GMT
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Auto-detect works.

I've also removed the SIMM and oscillator.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Thu, 18 Jun 2020 18:02:53 GMT
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Oh man, I'm dumb. I needed to check "Program/Configure" since the default is just "Verify". It has now programmed successfully.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Thu, 18 Jun 2020 18:32:33 GMT
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it's booting, but still giving the same error:

#>
T030 ROM BIOS v2.11 (c) 2018 Tobias Rathje
CB030 version ported by Mike McDonald 2020

RAM (hard coded): 64MB
Build: Mar 30 2020 10:09:47

#> hl
f_mount error: 3

I'm pretty sure everything's formatted and labeled correctly on the CF card, but I'm waiting on a USB CF reader to come in since the old one died and the workaround was using a REALLY old laptop with a PCMCIA slot adapter. Could also be it doesn't like the CF card. I have a couple of others I could try but again for practicality I have to wait on the new USB reader.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 19 Jun 2020 00:35:33 GMT
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I assume you do have a 64meg DRAM and it is passing memory diagnostic?

CF can be a potential program since 16-bit CF interface is quite a bit noisier than 8-bit interface.
I'm using Verbatim 2GB CF I bought from Amazon--it is the cheapest CF for about $11.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Fri, 19 Jun 2020 15:00:46 GMT
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what are the options here:
q - Perform RAM check: q <mode> <address> <size> <count>

not sure what 'mode' wants or if 'size' is bytes or accepts an 'M' or whatnot.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Fri, 19 Jun 2020 17:34:00 GMT
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first 16 MB is OK:
#> q 1 0 65536000 1
Checking extended RAM: 16384 KB OK

not sure how to test the rest

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by explodinglemur on Mon, 22 Jun 2020 01:12:46 GMT
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I took the 16-bit CF redesign schematic, drew it up in KiCAD, and ran the autorouter (forgive me) on a 4-layer stackup with power/ground inner layers. I'm hoping that plus 45-degree trace bends helps with noise immunity. JLCPCB will have 10 boards to me in a week or two. plasmo of course you get some (is 3 enough?) and I'll keep one or two, the rest are up for grabs for anyone in the US (so I can drop them in the mail easily). If this batch works I can run more off.
https://pbs.twimg.com/media/EbE5FvtU0AI2pLC?format=jpg&n ame=large
https://pbs.twimg.com/media/EbE_9czUMAAFB1c?format=png&n ame=large

I've uploaded the design files to https://github.com/ExplodingLemur/cb030

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Mon, 22 Jun 2020 02:47:54 GMT
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Thank you for tackling the 16-bit CF version in 4-layer pc board. I'm busy tackling a couple house jobs right now. I'll take a close look in a couple days. My first impression is it looks great. The autorouter did a good job (BTW, I ALWAYS use autorouter). I would like to have 2 boards, please. Feel free to sell your boards as you see fit.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Wed, 24 Jun 2020 13:45:40 GMT
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Does 16-bit work for anybody with a 2-layer board? I don't think my issue is noise, since it never, ever works for me.

Hopefully my new USB CF card reader will arrive today and I can set up some other CF cards to test.

I'd be interested in a 4-layer board once it's verified working.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Thu, 25 Jun 2020 00:31:44 GMT
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I don't have Linux working with 16-bit CF, but there is a version of CPM68K that works with 16-bit CF interface. The software is at the bottom of this page:
https://www.retrobrewcomputers.org/doku.php?id=builderpages:plasmo:cb030:cb030_rev1:16-bit_cf_upgrade
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Thu, 25 Jun 2020 05:37:34 GMT
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Sorry for the slow response, I went on vacation last week.

I have a version of the T030 boot loader that works with the 16 CF interface but Linux does not work. During initialization, Linux does something that causes the CF to go into the error state where it stays. I need to hook up the logic analyzer and twiddle the I/O lines on the 7 segment display to try to narrow down when and where this initialization is occurring.

Unfortunately, I've been busy with other projects like finding a new job. I got furloughed at the end of April. But the Linux 16 bit CF driver is still on my to do list. It's just going to take longer than any of us would have preferred.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Wed, 01 Jul 2020 12:49:19 GMT
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Thanks for the response, Mike. I'll go back to 8-bit wiring. BTW where does linux.bin go? Boot filesystem or /? I stuck it in both for the time being.

I'll give the CPM68K for 16-bits a try though.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Wed, 01 Jul 2020 14:42:23 GMT
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I've flashed cb030bug_r0_5_CBBIOS16_EhBasic.BIN to the EEPROM, keeping the "cb030_r1_cpld_16bitcf_enablecfirq_100hz" on the CPLD. It powers up to the monitor, but won't boot to the CP/M on the EEPROM:

CB030Bug
2/26/20 v0.5, type "he" for help
> bo
CB030Bug
2/26/20 v0.5, type "he" for help
>

'eh' does bring me to the enhanced basic prompt.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Wed, 01 Jul 2020 15:27:07 GMT
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quarterturn wrote on Wed, 01 July 2020 05:49Thanks for the response, Mike. I'll go back to 8-bit wiring. BTW where does linux.bin go? Boot filesystem or /? I stuck it in both for the time being.

I'll give the CPM68K for 16-bits a try though.

linux.bin, initrd.gz, and 0.cmd should go in the first partition.

https://www.retrobrewcomputers.org/doku.php?id=builderpages: mikemac:cb030

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Thu, 02 Jul 2020 11:26:28 GMT
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quarterturn wrote on Wed, 01 July 2020 08:42I've flashed cb030bug_r0_5_CBBIOS16_EhBasic.BIN to the EEPROM, keeping the "cb030_r1_cpld_16bitcf_enablecfirq_100hz" on the CPLD. It powers up to the monitor, but won't boot to the CP/M on the EEPROM:

CB030Bug
2/26/20 v0.5, type "he" for help
> bo
CB030Bug
2/26/20 v0.5, type "he" for help
>

'eh' does bring me to the enhanced basic prompt.
The CP/M BIOS/CCP/BDOS should all reside in the EPROM using the "cb030bug_r0_5_CBBIOS16_EhBasic.BIN" image. "go 15000" is same as "bo" command; does "go 15000" makes any difference? I know you've made some mod for 16-bit CF interface so tell me about your current hardware configuration.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Thu, 02 Jul 2020 20:33:54 GMT
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It does the same thing:

?> go 15000
CB030Bug
2/26/20 v0.5, type "he" for help
>

I've attached a couple of photos of my wiring work, though it shouldn't interfere with the EEPROM.

File Attachments
1) IMG_7391.JPG, downloaded 345 times
2) IMG_7390.JPG, downloaded 321 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 05 Jul 2020 11:20:34 GMT
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My apology, I was puzzled and set aside the problem and then got distracted. Please load the attached 16-bit CP/M BIOS and see if it runs correctly.

Your hardware modification are correct for 16-bit CF interface.

Bill

File Attachments
1) cbbios16.hex, downloaded 401 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by Yves-D. on Wed, 08 Jul 2020 18:52:12 GMT
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@Plasmo

Just to let you know: another CB030 is alive, currently running the 16MB RAM test-routines.
I'm enjoying EhBasic for the moment :lol: , the CF-adapter is on order for putting the Linux port on it.

I've slightly overclocked the CPU with the 24.57MHz oscillator I had on hand.
I didn't check but remember reading that the RAM-refresh cycle is already tight with 60nS Rams at 24MHz. But it's stable so far in the RAM check.

I had a hard time getting some output from the serial port as I didn't notice the RTS/CTS pins from the USB-TTL-adapter being soldered to point T4 / T11.
It's visible your pictures, if you know where to look. :d
You could add a note for people using other USB-TTL-adapters that T11 must be connected to CTS and T4 to RTS.
On the logic analyser I saw the 68681 chip-select being busy and the chip responded with DTACK, i was pretty confident that the cb030 was up and running.
Just something with the output being wrong.
The Aha-moment came after reanalysing the annotated pictures and hardware handshake being mentioned in the BIOS notes. I only had GND,RX,TX connected - so that had to be it.

Thanks for your nice work being offered to the community

PS: the cb030 is sitting near my 68SEC000-Altoirola in Altoids tin-can-format, don't ask - someone had to do it :roll: , for footprint comparison
It's a 5V 12MHz 512kb Flash / 128k RAM board, using CMOS 68C681 and low power GAL - yielding around 50mA total current consumption. The GAL being responsible for 40mA alone.
It's quite amazing what they did at the end of the 68000 life-cycle.
I'll also try to construct a 3.3V variant of the same board: the 68SEC000 is 3.3V capable, I've got 3.3V RAM, Flash and GAL.
Then there's a specific Philips DUART (SC28L92) being 3.3/5V capable, 99% pin compatible (not 100%) and 99% software compatible - some changes are necessary

Kind regards,
Yves

File Attachments
1) cb030-altoirola.jpg, downloaded 1045 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by Yves-D. on Wed, 08 Jul 2020 18:58:59 GMT
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Oh yes, I forgot:
If somebody in Europe is interested in building a cb030 (i'm based in Luxembourg), i've 3 bare cb030 boards rev1.1 that I can pass along.

I've also 3 bare boards of Tobias Rathje's T030 Mk.II (Tobster here on the forum) to pass along - this one will be the next on my building list

Please PM me if there's interest.

Yves

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Thu, 09 Jul 2020 12:07:02 GMT
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Yves,

Excellent!

The monitor (rev 0.6) on the CB030 homepage requires RTS/CTS handshake, but I've found out that RTS/CTS handshake is not really needed, so I'll post an earlier version (rev 0.5) that does not require hardware handshake. I'll also make better notation of the serial adapter interface as you've mentioned.

There is a small plug-in board with a 7-segment display that indicates the software operating status. It is an useful visual indication. It is on my 'to do' list but I'll get it published soon.

Your 68K in Altoids reminds me of Kuno that's based on P90CE201, a 68000 look-alike. It also has 512K EPROM, 128K RAM and a CPLD. The board is 93mm x 53mm, it is designed for the Arduino Mega enclosure. I need to publish the Kuno design as well. Sigh, you'll think I'll have more time in retirement...

The hard part about CB030 is assemble and program EPM7128SQC100. I hope you will consider offering CB030 board with EPM7128SQC100 assembled and programmed at whatever price you like. It will make the boards more attractive to hobbyists, especially in Europe since shipping from US is expensive and slow and there are VAT expense.

Bill

File Attachments
1) Kuno_P90CE201_Arduino.jpg, downloaded 947 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Sat, 11 Jul 2020 15:50:01 GMT
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Thanks Bill! I've been away on vacation but I'll try it soon.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Sun, 12 Jul 2020 16:08:14 GMT
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Bill,

the cbbios16.hex doesn't work for me. There's no animation of the 7-segment and no response on serial. It's only a 3K file, vs the others which have been 512K.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 12 Jul 2020 20:17:55 GMT
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Sorry I wasn't clear on how to use cbbios16.hex. It is not a replacement for the EPROM image, it is a patch of the existing image. To use the cbbios16.hex patch, boot up using the 512K EPROM image that you have had problem with 16-bit CPM, and then load cbbios16.hex which will overwrite the existing CP/M BIOS with the new patch and automatically run CP/M. This patch does not write over the original image in EPROM, only in RAM. Since every rest or power cycle reload the memory with the original EPROM image, this loading of cbbios16.hex need to be done every reset or power cycle. This is not a permanent solution. I just want to check whether your issue was due to incorrect version of CPM bios. Thanks,
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Mon, 13 Jul 2020 21:40:46 GMT
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I sent the file using RealTerm. It seems to accept the upload as an S record but doesn't reboot into CP/M:

> X
Valid S record received, executing from starting address
CB030Bug
2/26/20 v0.5, type "he" for help
> bo
CB030Bug
2/26/20 v0.5, type "he" for help
>

I guess I could program the CPLD and EEPROM back to the 8-bit versions and undo my wiring changes. I really only went with the 16-bit mod as I thought it was needed to run the linux port, but if it isn't, I'll just go back to 8-bit CF interface.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Tue, 14 Jul 2020 18:05:35 GMT
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I undid the 16-bit hardware changes on my CB030 and flashed the CPLD and EEPROM with what I think are the 8-bit versions. I still can't "bo" to CP/M in the EEPROM, though.

I'm guessing I've missed a step. I've flashed the EEPROM with "cb030_r0_6_hardware-handshake_CPM_EhBasic.bin" file and the CPLD with "cb030_r1_release_cf_fix_new100hz_irq"

CB030Bug
2/26/20 v0.6, type "he" for help
> bo
CB030Bug
2/26/20 v0.6, type "he" for help
>

Bill, can you give me a link to the files you put on the CF card?

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Wed, 15 Jul 2020 01:07:43 GMT
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I verified on my working lab hardware that CPLD is indeed "cb030_r1_release_cf_fix_new100hz_irq" and the EEPROM is "cb030_r0_6_hardware-handshake_CPM_EhBasic.bin".

Do a dump of location 0x1b000

du 1b000 10

> du 1b000 10
0001B000 60 04 30 2E 36 00 11 FC 00 00 F0 0A 46 FC 27 00   `.0.6..|..p.F|'.
0001B010 70 08 4E 7B 00 02 21 FC 00 01 B0 4C 00 8C 61 00   p.N{..!|..0L..a.
0001B020 00 22 11 FC 00 E0 E0 06 11 FC 00 01 E0 01 11 FC   ."..|.``..|..`..|
0001B030 00 EF E0 07 61 00 00 0C 11 FC 00 40 E0 06 42 80   .o`.a....|.@`.B.
0001B040 4E 75 08 38 00 07 E0 07 66 F8 4E 75 0C 40 00 17   Nu.8..`.fxNu.@..
0001B050 64 00 00 0A E5 48 20 7B 00 06 4E 90 4E 73 00 01   d...eH {..N.Ns..
0001B060 B0 00 00 01 B0 BA 00 01 B0 C0 00 01 B0 D2 00 01   0...0:..0@..0R..
0001B070 B0 DE 00 01 B0 EC 00 01 B0 EE 00 01 B0 F0 00 01   0^..0l..0n..0p..
0001B080 B0 F8 00 01 B1 00 00 01 B1 22 00 01 B1 2A 00 01   0x..1...1"..1*..
0001B090 B1 36 00 01 B1 3E 00 01 B1 F4 00 01 B0 F2 00 01   16..1>..1t..0r..
0001B0A0 B1 32 00 01 B1 36 00 01 B2 B0 00 01 B2 B8 00 01   12..16..20..28..
0001B0B0 B2 BA 00 01 B2 AC 00 01 B2 BC 4E F9 00 01 50 BC   2:..2,..2<Ny..P<
0001B0C0 08 38 00 00 F0 02 67 00 00 06 70 01 4E 75 42 80   .8..p.g...p.NuB.
0001B0D0 4E 75 61 EC 4A 40 67 FA 10 38 F0 06 4E 75 08 38   NualJ@gz.8p.Nu.8
0001B0E0 00 02 F0 02 67 F8 11 C1 F0 06 4E 75 4E 75 4E 75   ..p.gx.Ap.NuNuNu
0001B0F0 4E 75 10 3C 00 FF 4E 75 42 79 00 01 B2 DA 4E 75   Nu.<..NuBy..2ZNu

You should see above output. I'm checking to see whether BIOS are present in your EPROM.

To simplify the problem, I like you to remove the CF disk and do 'bo' again. You should be able to boot into CP/M to drive A without CF disk
---
I have a couple questions:
* CB030 can consume quite a bit of current, up to 750mA at 5V. How is your board powered?
* What is your EPROM?

Could you send me a picture of your board?

Bill

Edit: The files on CF drive are here:
https://www.retrobrewcomputers.org/lib/exe/fetch.php?media=builderpages:plasmo:cb030:cb030_rev1:cpm68k_distro.zip

There are quite a number of files there so you should use gkermit to transfer multiple files to your new CF disk.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Wed, 15 Jul 2020 12:49:48 GMT
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Grrrr my 5V 1A wall-wart was only delivering 4.6V at the jack! I had extended its cable to reach

my desktop and that was probably too thin wire causing the voltage drop. Once I went back to the original cable length it does indeed 'bo' to an 'A>' prompt.

Time to reflash the EEPROM with the Linux BIOS and see if it works. Also time to order a 5V supply with a 120v cord for the computer desk since I don't wish to use my CB030 in my lap due to the short wall-wart cord!

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Wed, 15 Jul 2020 17:44:42 GMT
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Booted nearly into Linux! I hang here:

```
Linux version 4.9.156-CB030 (mikemac@Altair.mikemac.com) (gcc version 6.1.0 (GCC
) ) #190 Sun Mar 29 22:53:56 MST 2020
bootconsole [cb030serial0] enabled
initrd: 00400000 - 00540000
Built 1 zonelists in Zone order, mobility grouping on.  Total pages: 16240
Kernel command line: root=/dev/ram0 rw console=ttySC0,38400n8r
PID hash table entries: 256 (order: -2, 1024 bytes)
Dentry cache hash table entries: 8192 (order: 3, 32768 bytes)
Inode-cache hash table entries: 4096 (order: 2, 16384 bytes)
Sorting __ex_table...
Memory: 60524K/65536K available (2075K kernel code, 286K rwdata, 608K rodata, 72
K init, 130K bss, 5012K reserved, 0K cma-reserved)
Virtual kernel memory layout:
    vector  : 0x002c96fc - 0x002c9afc   (   1 KiB)
    kmap    : 0xd0000000 - 0xf0000000   ( 512 MiB)
    vmalloc : 0x04800000 - 0xd0000000   (3256 MiB)
    lowmem  : 0x00000000 - 0x04000000   (  64 MiB)
      .init : 0x002ea000 - 0x002fc000   (  72 KiB)
      .text : 0x00001000 - 0x00207fdc   (2076 KiB)
      .data : 0x0020a500 - 0x002e9e84   ( 895 KiB)
      .bss  : 0x002c9620 - 0x002e9e84   ( 131 KiB)
NR_IRQS:200
pConsole: colour dummy device 80x25
Calibrating delay loop... 5.35 BogoMIPS (lpj=26752)
pid_max: default: 32768 minimum: 301
Mount-cache hash table entries: 1024 (order: 0, 4096 bytes)
Mountpoint-cache hash table entries: 1024 (order: 0, 4096 bytes)
```

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Wed, 15 Jul 2020 21:51:05 GMT

It looks like it's about to unpack the initrd.gz image as the root file system. Did you load the initrd.gz at 0x400000 with the boot loader before loading and launching the kernel? The whole log from the start of the boot loader to the point were it hangs is most helpful.

As log of a successful boot is here:

https://www.retrobrewcomputers.org/forum/index.php?t=msg&th=442&goto=7335&#msg_7335

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Thu, 16 Jul 2020 19:49:52 GMT

Here's what I usually see:

T030 ROM BIOS v2.11 (c) 2018 Tobias Rathje
CB030 version ported by Mike McDonald 2020

RAM (hard coded): 64MB
Build: Mar 30 2020 10:09:47

Init script found, press enter to abort.....

Running init script:

[Load initrd.gz into RAM]

0%_____100%
##

1132600 bytes read
[Load linux.bin into RAM]

0%_____100%
##

3124952 bytes read
[Starting Linux]

Bootinfo address: 0x002fc000

Machine type: 14
Memory start: 0x00000000
Memory size: 64 MB

Ramdisk start: 0x00400000
Ramdisk size: 1310720
Loading Linux at 0x00001000

ABC3GHIJK
Linux version 4.9.156-CB030 (mikemac@Altair.mikemac.com) (gcc version 6.1.0 (GCC
)) #190 Sun Mar 29 22:53:56 MST 2020
bootconsole [cb030serial0] enabled
initrd: 00400000 - 00540000
Built 1 zonelists in Zone order, mobility grouping on. Total pages: 16240
Kernel command line: root=/dev/ram0 rw console=ttySC0,38400n8r
PID hash table entries: 256 (order: -2, 1024 bytes)
Dentry cache hash table entries: 8192 (order: 3, 32768 bytes)
Inode-cache hash table entries: 4096 (order: 2, 16384 bytes)
Sorting __ex_table...
Memory: 60524K/65536K available (2075K kernel code, 286K rwdata, 608K rodata, 72
K init, 130K bss, 5012K reserved, 0K cma-reserved)
Virtual kernel memory layout:
    vector : 0x002c96fc - 0x002c9afc   (1 KiB)
    kmap   : 0xd0000000 - 0xf0000000   (512 MiB)
    vmalloc : 0x04800000 - 0xd0000000   (3256 MiB)
    lowmem : 0x00000000 - 0x04000000   (64 MiB)
      .init : 0x002ea000 - 0x002fc000   (72 KiB)
      .text : 0x00001000 - 0x00207fdc   (2076 KiB)
      .data : 0x0020a500 - 0x002e9e84   (895 KiB)
      .bss : 0x002c9620 - 0x002e9e84   (131 KiB)
NR_IRQS:200
pConsole: colour dummy device 80x25
Calibrating delay loop... 5.35 BogoMIPS (lpj=26752)
pid_max: default: 32768 minimum: 301
Mount-cache hash table entries: 1024 (order: 0, 4096 bytes)
Mountpoint-cache hash table entries: 1024 (order: 0, 4096 bytes)

if I interrupt the initscript and do it manually, same result:

l "root=/dev/ram0 rw console=ttySC0,38400n8r" 0x400000 140000

Occasionally I'll get a panic:

T030 ROM BIOS v2.11 (c) 2018 Tobias Rathje

CB030 version ported by Mike McDonald 2020

RAM (hard coded): 64MB
Build: Mar 30 2020 10:09:47

Init script found, press enter to abort.....

Running init script:

 [Load initrd.gz into RAM]

0%_____100%
##

1132600 bytes read
 [Load linux.bin into RAM]

0%_____100%
##

3124952 bytes read
 [Starting Linux]

Bootinfo address: 0x002fc000

Machine type: 14
Memory start: 0x00000000
Memory size: 64 MB

Ramdisk start: 0x00400000
Ramdisk size: 1310720
Loading Linux at 0x00001000

ABC3GHIJK
Linux version 4.9.156-CB030 (mikemac@Altair.mikemac.com) (gcc version 6.1.0 (GCC
)) #190 Sun Mar 29 22:53:56 MST 2020
bootconsole [cb030serial0] enabled
initrd: 00400000 - 00540000
Built 1 zonelists in Zone order, mobility grouping on. Total pages: 16240
Kernel command line: root=/dev/ram0 rw console=ttySC0,38400n8r
PID hash table entries: 256 (order: -2, 1024 bytes)
Dentry cache hash table entries: 8192 (order: 3, 32768 bytes)
Inode-cache hash table entries: 4096 (order: 2, 16384 bytes)
Sorting __ex_table...
Memory: 60524K/65536K available (2075K kernel code, 286K rwdata, 608K rodata, 72
K init, 130K bss, 5012K reserved, 0K cma-reserved)

Virtual kernel memory layout:
    vector : 0x002c96fc - 0x002c9afc   (1 KiB)
    kmap   : 0xd0000000 - 0xf0000000   (512 MiB)
    vmalloc : 0x04800000 - 0xd0000000   (3256 MiB)
    lowmem : 0x00000000 - 0x04000000   (64 MiB)
      .init : 0x002ea000 - 0x002fc000   (72 KiB)
      .text : 0x00001000 - 0x00207fdc   (2076 KiB)
      .data : 0x0020a500 - 0x002e9e84   (895 KiB)
      .bss : 0x002c9620 - 0x002e9e84   (131 KiB)
NR_IRQS:200
pConsole: colour dummy device 80x25
Calibrating delay loop... 5.35 BogoMIPS (lpj=26752)
pid_max: default: 32768 minimum: 301
Mount-cache hash table entries: 1024 (order: 0, 4096 bytes)
Mountpoint-cache hash table entries: 1024 (order: 0, 4096 bytes)
devtmpfs: initialized
clocksource: jiffies: mask: 0xffffffff max_cycles: 0xffffffff, max_idle_ns: 1911
2604462750000 ns
futex hash table entries: 256 (order: -1, 3072 bytes)
Data read fault at 0xûûûûûûû3 in Super Data (pc=0xûûûûû2)
BAD KERNEL BUSERR
Oops: 00000000
Modules linked in:
Modules linked in:
PC: [<00ûûûûû2>] strlcpy+0x·2/0x·4
SR: ûûû0 SP: 0ûûûûûû4 a2: 0ûûûûûû0
d0: 00000003   d1: 000000ûe   d2: 0000000e   d3: 00000002
d4: 00ûûûûû2   d5: 00ûûûûû4   a0: 00ûûûûûb   a1: 00ûûûûûd

Frame format=B ssw=0ûûd isc=ûûû0 isb=ûûûf daddr=ûûûûûûû3
dobuf=00000002
Process swapper (pid: 1, task=0ûûûûûû0)
Stack from 0ûûûûûûc:
        00000002 00000003 000ûûûû8 00ûûûûûd 00ûûûûû4
0ûûûûûûc 00ûûûûûd 00000003
        000000û7 00000005 000ûûûûc 00000000 00ûûûûû4 00ûûûûûc
00ûûûûûc 0ûûûûûû0
        ûûûûûûûe ûûûûûûû4 0000ûûûc 00000000 00000000 00000000
00ûûûûû2 00ûûûûû8
        000ûûûûc 00ûûûûûc 00ûûûûû6 000000ûc 00000000 000ûûûû0
0000ûûû8 0000ûûû0
        000000û7 00000005 000ûûûûc 00ûûûûû8 00000000 00000000
00ûûûûûc 00ûûûûûc
        00ûûûûûc 00000000 00000000 00ûûûûû8 00ûûûûû0
00ûûûûûc 0000ûûû8 00ûûûûûa
Frame format=B ssw=0ûûd isc=ûûû0 isb=ûûûf daddr=ûûûûûûû3
dobuf=00000002
Call Trace: [<000ûûûû8>] add_sysfs_param.isra.4+0x0/0xŠŠa

baddr=00ûûûûûc dibuf=00000000 ver=f
Stack from 0ûûûûûc:
00000002 00000003 000ûûûû8 00ûûûûûd 00ûûûûû4
0ûûûûûc 00ûûûûûd 00000003
000000û7 00000005 000ûûûc 00000000 00ûûûûû4 00ûûûûc
00ûûûûc 0ûûûûûû0
ûûûûûûe ûûûûûûû4 0000ûûc 00000000 00000000 00000000
00ûûûûû2 00ûûûûû8
000ûûûûc 00ûûûûc 00ûûûûû6 000000c 00000000 000ûûûû0
0000ûûû8 0000ûûû0
000000û7 00000005 000ûûûc 00ûûûûû8 00000000 00000000
00ûûûûc 00ûûûûc
00ûûûûc 00000000 00000000 00ûûûûû8 00ûûûûû0
00ûûûûc 0000ûûû8 00ûûûûûa
Call Trace: [<000ûûûû8>] add_sysfs_param.isra.4+0x0/0xŠŠa
[<00ûûûûû4>] param_sysfs_init+0x„„0/0x„„c
[<000ûûûc>] parse_args+0x0/0x~~8
[<00ûûûûû4>] param_sysfs_init+0x0/0x„„c
[<0000ûûc>] trap+0xx4/0xx8
[<00ûûûûû2>] uid_cache_init+0x0/0x,0
[<000ûûûc>] parse_args+0x0/0x~~8
[<00ûûûûc>] uid_cache_init+0x,a/0x,0
[<000ûûûû0>] sysfs_show_available_clocksources+0x•8/0x•4
[<0000ûûû8>] do_one_initcall+0xƒ0/0xƒƒ0
[<0000ûûû0>] do_one_initcall+0xƒ8/0xƒƒ0
[<000ûûûc>] parse_args+0x0/0x~~8
[<00ûûûûû8>] strcpy+0x0/0xz2
[<0000ûûû8>] do_one_initcall+0x0/0xƒƒ0
[<000ûûûû4>] update_wall_time+0x„„2/0x„„2
[<00ûûûûû6>] percpu_enable_async+0x‡4/0x‡‡c
[<0000ûûû8>] do_one_initcall+0x0/0xƒƒ0
[<00ûûûûû6>] percpu_enable_async+0x‡4/0x‡‡c
[<00ûûûûû4>] param_sysfs_init+0x0/0x„„c
[<000ûûûû2>] kfree+0x0/0xy8
[<00ûûûûûe>] init_pointer_table+0x0/0x†c
Code: ûûûc ûûû0 ûûû0 ûûû0 ûûû3 ûûû3 0ûû9 ûûûb <0ûû9>
00û8 ûûû4 ûûû3 ûûû0 ûûûf 00
0c ûûû2 ûûûf 0ûûc ûûû5 ûûû2 ûûû3 ûûû9 ûûûb ûûû9

[<0000ûûûc>] ret_from_kernel_thread+0xc/0xŠ2

I wonder if it doesn't like my 64MB SIMM?

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Fri, 17 Jul 2020 01:03:37 GMT
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I'm guessing either your SIMM is bad or your initrd.gz image is corrupted. I had issues with my SIMM too and it would result in seemingly random failures.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Fri, 17 Jul 2020 15:33:50 GMT
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Do you know how to use the 'q' RAM test command? I can only get it to test the first 16MB of RAM.

I have a 64 MB 60ns EDO 8-chip SIMM installed.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Sun, 09 Aug 2020 22:16:36 GMT
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I went back to the 16 MB SIMM which originally came with the CB030 and flashed the 16 MB BIOS to the EEPROM. It boots!

```
*****************************************
* CB030 SBC                             *
*   by Plasmo (Bill Shen) 2020          *
* T030 Boot loader                      *
*   by Tobster (Tobias Rathje) 2016     *
* CB030 Boot loader                     *
*   ported by mikemac (Mike McDonald) 2020 *
*****************************************
```

Linux CB030 4.9.156-CB030 #190 Sun Mar 29 22:53:56 MST 2020 m68k GNU/Linux

Model: CB030
System Memory: 16384K

Very nice! Something's amiss with 'sh' though:

while true; do printf '.'; sleep 1; done

produces the following segfault:

Oops: 00000000
Modules linked in:
PC: [<00007326>] fp_normalize_ext+0x0/0xc
SR: 2010 SP: 00cd1f3c a2: 0063f0a0
d0: 0063f494   d1: 00000002   d2: f23c5538   d3: 8002b32c
d4: 8000d8f4   d5: 00000002   a0: 0000000e   a1: 0063f438
Process sleep (pid: 122, task=0063f0a0)
Frame format=B ssw=074d isc=0c40 isb=7fff daddr=0000000a dobuf=00cd1fbc
baddr=0000732a dibuf=00000000 ver=f
Stack from 00cd1fc4:
        00007ab8 00006956 00000064 8002a818 8002b32c 8000d8f4 00000002 efca1f88
        8013efef efca1f86 00000001 ffffffff 00000000 00048011 8668002c
Call Trace: [<00007ab8>] fp_finalrounding+0x6/0x1a
 [<00006956>] fpu_emu+0x1e/0x2c
 [<00048011>] show_modinfo_srcversion+0x1/0x26
Code: 660a 7001 5188 4e75 e388 67f2 4280 60f4 <2018> 0c40 7fff 677e 2010 6a04 59
88 4e75 660c 2028 0004 6638 4260 5588 4e75 edc0
Segmentation fault
.
Data read fault at 0x0000000a in Super Data (pc=0x7326)
BAD KERNEL BUSERR
Oops: 00000000
Modules linked in:
PC: [<00007326>] fp_normalize_ext+0x0/0xc
SR: 2010 SP: 00e63f3c a2: 0063f0a0
d0: 0063f494   d1: 00000002   d2: f23c5538   d3: 8002b32c
d4: 8000d8f4   d5: 00000002   a0: 0000000e   a1: 0063f438
Process sleep (pid: 123, task=0063f0a0)
Frame format=B ssw=074d isc=0c40 isb=7fff daddr=0000000a dobuf=00e63fbc
baddr=0000732a dibuf=00000000 ver=f
Stack from 00e63fc4:
        00007ab8 00006956 00000064 8002a818 8002b32c 8000d8f4 00000002 efb05f88
        8013efef efb05f86 00000001 ffffffff 00000000 00048011 8668002c
Call Trace: [<00007ab8>] fp_finalrounding+0x6/0x1a

I wonder what's up with that?

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Sun, 09 Aug 2020 22:17:56 GMT
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'sleep' seems be the culprit:

Oops: 00000000
Modules linked in:
PC: [<00007326>] fp_normalize_ext+0x0/0xc
SR: 2010 SP: 00cd1f3c a2: 0063f0a0
d0: 0063f494   d1: 00000002   d2: f23c5538   d3: 8002b32c
d4: 8000d8f4   d5: 00000002   a0: 0000000e   a1: 0063f438
Process sleep (pid: 122, task=0063f0a0)
Frame format=B ssw=074d isc=0c40 isb=7fff daddr=0000000a dobuf=00cd1fbc
baddr=0000732a dibuf=00000000 ver=f
Stack from 00cd1fc4:
        00007ab8 00006956 00000064 8002a818 8002b32c 8000d8f4 00000002 efca1f88
        8013efef efca1f86 00000001 ffffffff 00000000 00048011 8668002c
Call Trace: [<00007ab8>] fp_finalrounding+0x6/0x1a
 [<00006956>] fpu_emu+0x1e/0x2c
 [<00048011>] show_modinfo_srcversion+0x1/0x26
Code: 660a 7001 5188 4e75 e388 67f2 4280 60f4 <2018> 0c40 7fff 677e 2010 6a04 59
88 4e75 660c 2028 0004 6638 4260 5588 4e75 edc0
Segmentation fault
.
Data read fault at 0x0000000a in Super Data (pc=0x7326)
BAD KERNEL BUSERR
Oops: 00000000
Modules linked in:
PC: [<00007326>] fp_normalize_ext+0x0/0xc
SR: 2010 SP: 00e63f3c a2: 0063f0a0
d0: 0063f494   d1: 00000002   d2: f23c5538   d3: 8002b32c
d4: 8000d8f4   d5: 00000002   a0: 0000000e   a1: 0063f438
Process sleep (pid: 123, task=0063f0a0)
Frame format=B ssw=074d isc=0c40 isb=7fff daddr=0000000a dobuf=00e63fbc
baddr=0000732a dibuf=00000000 ver=f
Stack from 00e63fc4:
        00007ab8 00006956 00000064 8002a818 8002b32c 8000d8f4 00000002 efb05f88
        8013efef efb05f86 00000001 ffffffff 00000000 00048011 8668002c
Call Trace: [<00007ab8>] fp_finalrounding+0x6/0x1a

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by Yves-D. on Mon, 10 Aug 2020 11:29:00 GMT

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On my CB030 under Linux the timekeeping of the kernel is way off . The BogoMips / MHz value doesn't match either.
The Linux clock runs to fast (1.5x off nominal). The CPU oscillator and 68681 crystal have the exact value of the BOM.
I guess the Linux timer tick is generated by the 68681.
Perhaps your sleep issue is also related to timer imprecisions.

Check your timer precision with repetitive "date" commands under Linux, to see if you have time deviations.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikemac on Mon, 10 Aug 2020 19:29:31 GMT
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Linux should be using the 100Hz signal from the CPLD as the clock.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by newjes250 on Thu, 13 Jan 2022 02:46:42 GMT
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@plasmo,
Question about CB030's RC2014 addressing support: could it accept something like your VGAARC video card?
Adr wise if for 8bit cpu support: maybe 64kb? Since the upper 64MB if available would require it own adr decoder for a card; I noted that you
have a photo of a quad serial card, but that probably only uses a few bytes of adr space. Very interested in a video capability for the CB030.

Thanks,
newjes250

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Thu, 13 Jan 2022 05:12:30 GMT
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I'm currently working on several VGA solutions; my designs are evolving rather quickly and the documentations are sadly lagging. VGARC is for Z80/Z280 family; it took advantage of Z80's extended 64K I/O space and mapped 4K of the extended I/O space to the dual port RAM that held text and font memories. The scheme worked well for Z80/Z280, but does not work for 680x0 and 65xx families.

I'm currently working on VGA text and graphic for 6502 product line that should be compatible with CB030, but I have not spent the time to check it out with CB030. The VGA text board is VGA6448; it is checked out for 6502 and 65816. I'm currently working on an idea combining text with graphic, but it is at design stage. 680x0 has much larger memory space, so while it may reuse the text/graphic board for 65xx in the near term, the better solution is really a fully memory mapped graphic card.

I know my efforts are not at all focused, but I do have an overall goal of making my existing 680x0/65xx/Zx80 into standalone computers.

Bill

You may also find this VGA piggybacked on RAM interesting; it snoops a 4K region of RAM and converts it to 64 col x 48 row VGA texts. I just finished up a design tonight to make it looks more like the original piggyback prototype.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by quarterturn on Thu, 27 Jan 2022 21:32:49 GMT
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Not to derail your efforts, but you may wish to check out the Xosera project
https://github.com/XarkLabs/Xosera
It's being used in the Rosco M68K computer, and will be used for Ross' future 68030 "Rosco Pro".

It has a nice feature set, and uses relatively cheap hardware ($30 Upduino 3.0 and $10 for the Digilent VGA adapter).
The developer is the creator of some well-known Amiga games, so he's built it to be like the old Amiga video hardware.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 28 Jan 2022 15:40:50 GMT
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There are many interesting video development in the retro community. I'm mostly interested in RC2014-compatible format and the equivalent RC6502 format. My goal is standalone computers with PS2 keyboard and text-based VGA, although I'm also looking into CGA style graphic. This is the latest set of boards I received from JLCPCB. The graphic+text video board is the center-bottom board.
Bill

File Attachments
1) DSC_67550126.jpg, downloaded 246 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Mon, 01 Aug 2022 05:35:32 GMT
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OS-9/68K System Bootstrap
Now trying to download from ROM.
Now searching memory ($FE000000 - $FE07FFFF) for an OS-9 Kernel...

```
An OS-9 kernel module was found at $FE018000
A valid OS-9 bootfile was found.
pd: can't open current directory. $ mfree
Current total free RAM:  15992.00 K-bytes
$ mdir -e
  Addr     Size      Owner    Perm Type Revs  Ed #  Lnk  Module name
-------- -------- ----------- ---- ---- ---- ----- ----- --------------
00005b00    28476     0.0     0555 Sys  a000   375     2 kernel
0000ca3c     5660     0.0     0555 Sys  a000    37     1 ioman
0000e058      330     0.0     0555 Sys  8000    51     1 init
0000e1a2      406     0.0     0555 Sys  a000    25     1 syscache
0000e338     1908     0.0     0555 Sys  a000    41     1 ssm
0000eaac    12848     0.0     0555 Sys  a000    18     1 fpu
00011cdc      276     0.0     0555 Sys  a000    11     1 tkcb030
00011df0     2280     0.0     0555 Fman a000    51     2 scf
000126d8      182     0.0     0555 Driv a000     2     0 null
0001278e      120     0.0     0555 Desc 8000     4     0 nil
00012806     3324     0.0     0555 Fman a000    63     0 pipeman
00013502      102     0.0     0555 Desc 8000     3     0 pipe
00013568     2020     0.0     0555 Driv a000    40     2 sc68681
00013d4c      126     0.0     0577 Desc 8000     7     2 term
00013dca      124     0.0     0577 Desc 8000     7     0 t1
00013e46     9638     0.0     0555 Fman a000   104     0 rbf
000163ec      210     1.0     0555 Prog 8000    10     1 sysgo
000164be    84330     1.0     0555 Prog c001   140     1 mshell
0002ae28    48366     1.0     0555 Trap c00a    25     2 csl
00036b16     3172     1.0     0555 Prog c001    23     0 date
0003777a     3336     1.0     0555 Prog c001    16     0 devs
00038482     9302     0.0     0555 Prog c001    50     0 dir
0003a8d8     3576     1.0     0555 Prog c001     9     0 events
0003b6d0     6386     1.0     0555 Prog c001    11     0 irqs
0003cfc2     5922     1.0     0555 Prog c001    28     1 mdir
0003e6e4     4192     1.0     0555 Prog c001    31     0 mfree
0003f744     4312     1.0     0555 Prog c001    30     0 pd
0004081c     7242     1.0     0555 Prog c001    29     0 procs
00042466     4780     1.0     0555 Prog c001    40     0 setime
00043712     8944     1.0     0555 Prog c001    31     0 tmode
$ irqs
CB030  OS-9/68K V3.2  (max devs: 32, max irqs: 32)

 vector prior port addr data addr  irq svc    driver   device
------- ----- --------- --------- ---------  --------- ------
 26 (2)    5  $fffff000 $00ffde70 $00013ada  sc68681   term
 30 (6)    5  $ffff9000 $00000000 $00011ddc  tkcb030
$ procs -b
 Id PId Grp.Usr  Prior  MemSiz Sig S    CPU Time   Age Module & I/O
       Aging   F$calls I$calls Last      Read Written
  2   0   0.0     128    4.00k   0 w       0.00   ??? sysgo <>>>term
```

```
        128        3       0 Wait        0       0
  3   2   0.0     128   52.00k   0 w       0.08   ??? mshell <>>>term
        128       50      91 Wait       30      40
  8   3   0.0     128   24.00k   0 *       0.03   ??? procs <>>>term
        128       17      11 GPrDsc      0     374
$ devs
CB030  OS-9/68K V3.2  (32 devices max)

  Device     Driver    File Mgr   Data Ptr  Links
---------- ---------- ---------- --------- ------
term       sc68681    scf        $00ffde70      2
$
```

Still needs a disk driver and some source tidyup...

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Mon, 01 Aug 2022 10:14:49 GMT
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Great! I don't know OS9, but it looks like lots of works are coming together.
  Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by e2k on Mon, 01 Aug 2022 17:58:19 GMT
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mikesmith wrote on Sun, 31 July 2022 22:35
[code]OS-9/68K System Bootstrap
An OS-9 kernel module was found at $FE018000

Very interesting ...

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Mon, 01 Aug 2022 19:08:18 GMT
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plasmo wrote on Mon, 01 August 2022 03:14Great! I don't know OS9, but it looks like lots of works are coming together.
One of the nicer things about OS-9 is that there's been quite a lot written about it, so good tech info isn't too hard to come by.

Peter Dibble's "OS-9 Insights" is pretty good, and Microware / Radisys' documentation isn't too shabby either.

http://os9projects.com/CD_Archive/TUTORIAL/OS9/OS9INSIGHTS/OS-9%20Insights%20ed3%20Cover.pdf

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Tue, 02 Aug 2022 08:29:43 GMT
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@plasmo Bill,

I'd really like to add an RTC to CB030, which got me wondering what changes RC2014 cards need to work with it? I have a backplane and a small pile of them already, and I see RTC kits available...

The alternative would seem to be bit-banging SPI with the '681, which is doable but hackish.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 02 Aug 2022 11:21:48 GMT
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CB030's expansion connector is similar to RC2014, but few control signals are different. What RC2014 RTC board are you looking at? It may be possible to make small modification to make it work with CB030's expansion connector.

Since 68681's discrete I/O are available on a connector that also has VCC and GND, it is probably easier to hack up a I2C interfaces using 2 discrete outputs and 1 discrete input.

Which RTC are you thinking of? I may have it and can prototype a small board either for the CB030 expansion connector or using the 68681 discrete I/O port.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Tue, 02 Aug 2022 16:41:32 GMT
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I haven't picked a specific device; availability is a bit patchy at the moment. Anything that keeps time and that might be available for other folks to add to their boards would do. Extra bonus if it has a little non-volatile storage.

A luxury option would be the Mikroe 12 Click board, which is available, 5V compatible, 4-wire SPI with 96B of NVRAM. Having a module with an integrated battery is obviously desirable.

I looked at the '681 OP bits but couldn't come up with a way to make it do I2C without extra

hardware. Do you have something cunning in mind?

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 02 Aug 2022 21:51:57 GMT
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I'm thinking of the ubiquitous DS1302 RTC with battery backup which is readily available on eBay for $1. DS1302 also has nonvolatile RAM.

I thought 68681 output has open-collection capability, but with more careful reading I see the open-collector features are tied to special-purpose functions. Oh well, I suppose I can emulate open-collector with a Schottky diode and pull up resistor.

I'll build a prototype board (replacing the 7-segment display) to check out the I2C possibility.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Wed, 03 Aug 2022 03:32:59 GMT
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> I'll build a prototype board (replacing the 7-segment display) to check out the I2C possibility.

There's even a fancier version with an I2C EEPROM for a few cents more. 8)

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Wed, 03 Aug 2022 18:59:40 GMT
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Since I have DS1302 on hand, I wired up a RTC prototype based on DS1302. The signal assignments to 68681 I/O are arbitrary, whatever convenient for hand wiring. If it works, I'll build another prototype and ship it to you to try.
Bill

File Attachments
1) CB030RTC_scm.pdf, downloaded 256 times
2) DSC_70110802.jpg, downloaded 1024 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 05 Aug 2022 01:37:51 GMT
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Got it working. DS1302 is actually not I2C; it is 3-wire interface with chip select, clock, and data. I'm able to set the clock and observe the second ticking up. Picture shows the RTC prototype plugged into the 68681 discrete I/O port. I attached the simple test program. I don't like the chip_select, clock, and data pin assignments so the prototype board I sent you will have updated assignment and correspondingly updated software.
Bill

File Attachments
1) DSC_70130804.jpg, downloaded 181 times
2) test_CB030RTC_prototype.zip, downloaded 169 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Fri, 05 Aug 2022 05:27:38 GMT
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Sounds good - I am working my way through writing an OS-9 CompactFlash driver. Init and identify work, just having some trouble getting through the format procedure. One or more magic numbers aren't quite right, and the RBF (block storage file manager) is taking a bus error. Going to take a little debugging I think...

building media bitmap...
System state exception.
(Bus/Access Fault) Vector number=#2 68020/68030 Long format (B)
Data Fault addr=0xFF000058
ssw=74D (DF,Read,Long) sr=3009 fc:5=SD
ipsC=6216 ipsB=B4A9 dob=48FE000E dib=FF004800 sba=00015F62
pc=0x00015F5C >B8A90010 cmp.l 16(a1),d4
dn: 00000008 00000001 00000002 00000000 00000001 00000001 00000000 00000001
an: 00000000 FF000048 FF000070 001900FE 00000001 00FF4D78 00004800 00FF4CE8
pc: 0000EA22 sr:3000 (--SM-0-----)t:OFF usp:00FEC40C isp:00FFFAF0 ^msp^
0x0000EA22 >48E78086 movem.l d0/a0/a5-a6,-(a7)
RomBug:

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 05 Aug 2022 23:47:04 GMT
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Didn't notice your updated screenshot until now. It says "Data fault address=0xFF000058". There is no device mapped to FF000058 so bus error will occur, as expected.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Sat, 06 Aug 2022 03:00:52 GMT
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Absolutely, the question of course being "why is it trying to access that space?".

The answer in this case, "because Mike does not understand how to allocate memory for per-drive data structures". Managed to work that one out and the formatter completes OK. Not having any luck making it read the filesystem though, more learning to be done...

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 07 Aug 2022 00:16:17 GMT
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I built up and tested the 2nd prototype. I'll send it out to you Monday. I use DS1302's burst read feature which can read all timing values quite quickly.
Bill

File Attachments
1) CB030RTC_Show_rev0_3.zip, downloaded 171 times
2) CB030RTC_show displays DS1302 time.jpg, downloaded 824 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Sun, 07 Aug 2022 21:09:25 GMT
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Nice! Should be a handy addition.

I've made some more progress on the CF driver; slowly getting the 68k assembly skills back, though I'm still making a few rookie mistakes. Formatting, making directories all works now. Next up, installation tools. Right after I work out why the ticker has stopped working...

[edit: removed exuberant terminal pasting..]

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 09 Aug 2022 01:18:32 GMT
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Shipped the prototype DS1302 to you. Currently the 68681 discrete I/O port only has one row of header soldered. For DS1302 to work, the 2nd row of header needs to be installed. I included a header that needs to be soldered to the 2nd row of 68681 discrete I/O port.

I don't know how you boot OS-9; whether you've created a new EPROM or you are loading the OS-9 bootstrap using my existing monitor. If you are loading OS-9 using my existing monitor, you may be interested in the attached flash programmer software which can erase a flash sector and copy RAM content to the flash sector so after a reset, the RAM content is restored. The attached software is hardwired to RAM locations 0x14000-0x14FFF where DS1302 clock display software is stored, but you can modify it to store your OS-9 bootstrap into flash so it can be restored back to RAM after reset. You may be interested in the flash programmer in any case because it may save you the trouble of removing flash, programming it externally, and re-inserting the flash.
Bill

File Attachments
1) sect_prog_RAMtoSST39040.zip, downloaded 173 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Tue, 09 Aug 2022 02:02:58 GMT
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Thanks!

Right now I'm building an OS-9 ROM from their SDK and loading it into an EPROM emulator. This is the "normal" OS-9 68K approach; the bootloader does a modest amount of system setup before it jumps to the kernel, and they provide all of this as source in the SDK.

It wouldn't be too hard to build a variant of the OS-9 ROM that could be chain-loaded from your monitor in the same fashion as you do for CP/M or EHBasic. Right now with the integrated debugger it's about 90k; not sure how tight that would be with your other components. [edit: without the debugger it's less than 20k]

Alternatively, the kernel hand-off protocol isn't *too* complex if you wanted to load it directly; that would mean adding the ability to handle a small amount of the (well documented) RBF disk format.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Wed, 10 Aug 2022 03:43:42 GMT
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OS-9 port for CB030 (and other boards, hopefully) here:
https://github.com/John-Titor/os9-m68k-ports

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by simonj5 on Wed, 10 Aug 2022 08:38:14 GMT
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Exciting times, Mike.

Thanks.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Wed, 10 Aug 2022 22:20:09 GMT
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Cool!
Downloaded your CB030 port from GitHub and also downloaded OS9 68K SDK V1.2 from https://github.com/HoldcroftJ/os9_68k_sdk_v12

Look like I have a bit of reading to do. I'll document my journey of OS9 for CB030 for a newbie.
  Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by newjes250 on Fri, 12 Aug 2022 03:31:10 GMT
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@Plasmo,

I have been looking at your nice DRAM 32bit interface: could it be piggybacked by one or more Dual-port SRAMs?
MA lines are there for RAS/CAS latching to the dram chips. But they could be latched for other purposes.
32 Data lines are just begging to be used. Your other video designs grab off a copy of data for text-video use,
using it for graphics use would be terrific!

Collecting parts just in case.

newJes250

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Fri, 12 Aug 2022 08:13:44 GMT
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RTC working nicely:

$ setime -s
August 12, 2022 Friday 2:12:49 am

File Attachments
1) Screen Shot 2022-08-12 at 1.12.50 AM.png, downloaded 1556 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 12 Aug 2022 16:33:50 GMT
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newjes250 wrote on Thu, 11 August 2022 21:31@Plasmo,

I have been looking at your nice DRAM 32bit interface: could it be piggybacked by one or more Dual-port SRAMs?
MA lines are there for RAS/CAS latching to the dram chips. But they could be latched for other purposes.
32 Data lines are just begging to be used. Your other video designs grab off a copy of data for text-video use,
using it for graphics use would be terrific!

Collecting parts just in case.

newJes250
CB030 has a 8-bit RC2014-like expansion port, but I have not thought about 32-bit wide expansion nor a connector for it, mainly because it takes too much PCB real-estate. Since the DRAM interface is already there, it is intriguing to think about interfacing to video RAM (VRAM) for graphic application. Tiny68K has the same DRAM interface and additional DRAM interface in the form of an edge connector. I also have a prototype board designed quite a while ago specifically for Tiny68K's DRAM edge connector. I should look into the possibility of graphic function for Tiny68K.
  Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 12 Aug 2022 16:39:57 GMT
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mikesmith wrote on Fri, 12 August 2022 02:13RTC working nicely:
Good, I think I will design a small PCB to support the DS1302 RTC. It will have the original 7-segment display connector so the existing display adapter can piggyback over the RTC.
  Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Fri, 12 Aug 2022 22:11:20 GMT
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I'd definitely be in line for any expansion hardware you happen to cook up. I'm also still curious

about the "differences" in timing vs. "standard" RC2014 that you've mentioned.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Mon, 15 Aug 2022 02:11:21 GMT
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I downloaded the latest version of OS-9 this afternoon and was successful in compiling the software. I took the ROM binary in CB030\CMDS\BOOTOBJS\ROMBUG\romboot and burn that into a SST39SF040 flash. Insert the ROM in CB030 and power up, I got this (at 9600 baud) on the console:

OS-9/68K System Bootstrap
Now trying to boot from CompactFlash.
CF: DRQ/BSY timeout
Cannot read bootfile.
This error occurred during the boot driver!
The OS-9 error code is: #000:244.

Now trying to download from ROM.
Now searching memory ($FE000000 - $FE07FFFF) for an OS-9 Kernel...

No OS-9 kernel was found.
This error occurred during the boot driver!
The OS-9 error code is: #000:221.

Now trying to reset the system.

This message repeats every few seconds. Apparently it is looking for a boot file in the CF disk. So I formatted a CF disk on my PC and copied CB030\CMDS\BOOTOBJS\BOOTFILES\diskboot.bf to the newly formatted CF disk. Power up CB030, but still received the same repeating error message. So what do I need to do to boot OS-9?
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Mon, 15 Aug 2022 03:46:02 GMT
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plasmo wrote on Sun, 14 August 2022 19:11
This message repeats every few seconds. Apparently it is looking for a boot file in the CF disk. So I formatted a CF disk on my PC and copied

CB030\CMDS\BOOTOBJS\BOOTFILES\diskboot.bf to the newly formatted CF disk. Power up CB030, but still received the same repeating error message. So what do I need to do to boot OS-9?

romboot will look for a bootfile either in ROM or on a CF disk. On disk it's looking for an OS-9 formatted disk with the bootfile installed; you can see the workflow for this in the dist/deploy.sh script. It depends on having built the toolshed binaries, or a bit of a chicken-and-egg game regenerating the bootfile from modules in RAM. I have a TODO to include Windows toolshed binaries in the package but I'm still tinkering with the workflow and that part's not really ready for primetime yet (I need to switch from a Bash script to a Windows batchfile, specifically).

The easiest way to get started, though, is just to flash a ROM image that contains a built-in bootfile; ports/CB030/CMDS/BOOTOBJS/ROMBUG/romimage.dev is probably the most interesting one. That has many of the interesting modules already loaded.

For more detail on the boot process, chapter 2 "Porting OS-9 for 68K" of MWOS/DOC/PDF/68k_oem.pdf has a pretty reasonable overview. It does rather gloss over the "magic" of building a bootfile (literally just concatenating the modules together), and you have to dig a bit further to get to how the booter knows where to look, but most of it is in there. 8)
The System Overview chapter of MWOS/DOC/PDF/68k_tech.pdf has some useful conceptual information about modules as well.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 16 Aug 2022 02:29:06 GMT
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mikesmith wrote on Sun, 14 August 2022 21:46
The easiest way to get started, though, is just to flash a ROM image that contains a built-in bootfile; ports/CB030/CMDS/BOOTOBJS/ROMBUG/romimage.dev is probably the most interesting one. That has many of the interesting modules already loaded.

I programmed & installed a flash with romimage.dev as you suggested which allows CB030 to boot into OS9 successfully. Not knowing anything about OS9 I tried a number of utility commands described in doc/pdf/68k_use.pdf The CF disk related utilities do not work, but I was able to run "date", "setime", "mfree", "procs", "set" utilities. I'm happy to see setime command can change and display DS1302 RTC values. I assume many utilities are not working because the porting of OS9 is on-going. I'm happy to be a beta tester for your OS9 port to CB030.
Bill

File Attachments
1) OS9_boot_CB030.jpg, downloaded 1492 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Tue, 16 Aug 2022 04:01:35 GMT
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Which utilities did you try? OS-9 disk stuff is a bit... interesting. More reading may make things clearer, but basically for the CF disk there are two parts; the driver module (cfide) and the descriptor modules (c0, c0_fmt and dd) that configure it.

For a simple test, insert a CF card and type 'dump /c0@'. That should give you a raw hexdump of the contents of the card, starting at block 0. 'c0' is the descriptor name, '/' means to look for a device rather than a file, and '@' means to open it raw rather than to try to mount the filesystem. You can think of '/c0' as a drive specifier like 'A:'.

'dd' is just 'c0' but with the "default" disk name (dd = default disk). c0_fmt is c0 but it allows writing to LBA0, which is required to format the disk or install a bootfile.

Here's a transcript of me formatting a CF card and installing a bootfile on it, with contents from the ROM bootfile. This depends on the 'save' and 'build' commands being in the ROM bootfile that you start with - you can add these by editing ports/CB030/BOOTFILE/dev.bl. I'll add them to the github repo shortly and add a version of this to the README.

```
$ format c0_fmt
 ... blah blah ...
Formatting device:  c0_fmt
proceed?  y
this is a HARD disk - are you sure? y
physical format desired?  n
physical verify desired?  n
volume name:  boot
building media bitmap...
 ... blah blah ...
writing root directory structure
$ chd /c0_fmt
CompactFlash driver build 39
$ save -f=OS9Boot kernel ioman init syscache ssm fpu tkcb030 rtclock scf null nil pipeman pipe
sc68681 term t1 rbf cfide dd sysgo mshell csl pd
$ os9gen -e /c0_fmt -q=OS9Boot
$ makdir SYS
$ chd SYS
$ build startup
? chd /dd
? chx /dd/CMDS
?
$
<<< board reset >>>
OS-9/68K System Bootstrap
Now trying to boot from CompactFlash.
A valid OS-9 bootfile was found.
```

pd: can't open current directory. $ mdir -e

Addr	Size	Owner	Perm	Type	Revs	Ed #	Lnk	Module name
00007100	28476	0.0	0555	Sys	a000	375	2	kernel
0000e03c	5660	0.0	0555	Sys	a000	37	1	ioman
0000f658	330	0.0	0555	Sys	8000	51	1	init
0000f7a2	406	0.0	0555	Sys	a000	25	1	syscache
0000f938	1908	0.0	0555	Sys	a000	41	1	ssm
000100ac	12848	0.0	0555	Sys	a000	18	1	fpu
000132dc	276	0.0	0555	Sys	a000	11	1	tkcb030

... etc. but see these low addresses - these modules are in RAM where the bootfile was loaded from CF

00038920	4312	1.0	0555	Prog	c001	30	0	pd
fe026986	148	0.0	0555	Desc	8000	26	1	c0
fe026a1a	152	0.0	0555	Desc	8000	26	0	c0_fmt
fe0471dc	4838	1.0	0555	Prog	c001	39	0	attr
fe0484c2	2756	0.0	0555	Prog	c001	10	0	break
fe048f86	2670	1.0	0555	Prog	c001	24	0	build

... see how these have been discovered from the bootfile that's in ROM, because the bootloader told the kernel to look there as well. They will run just fine out of the ROM (slowly, of course).

fe0721e6	13838	1.0	0555	Data	8001	1	0	basic68k.stb

... still debugging this one

You can use 'save' to copy program modules from the ROM into /dd/CMDS and then flash NOBUG/romimage.diskboot. When you boot, it will run /SYS/startup which in the example above will change your data directory (chd) to /dd and your execution directory (chx) to /dd/CMDS. At that point, any commands you type will run off the CF rather than from the in-memory sticky copies (the diskboot ROM does have a few emergency commands in it).

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 16 Aug 2022 20:18:51 GMT
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Thanks for the detailed instruction. Wow, that's definitely very obscure; I'd never figure it out by myself. So I edited ports/cb030/bootfile/dev.bl and added "save", "build" as well as "os9gen", and "help". With that I'm able to duplicate your results.

Having a working procedure is very helpful. For example I didn't know what you mean when you said Quote: It does rather gloss over the "magic" of building a bootfile (literally just concatenating the modules together) , but now I do.

Thanks!
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Wed, 17 Aug 2022 16:01:08 GMT
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I've been working on a more comprehensive install procedure (updated instructions in README.md in the repo), but having issues with uploads; somewhere between the zip file on my host disk, and reading it back, things are getting corrupted.

I've seen two different sets of errors, but I'm still trying to narrow down where things are going wrong. The archive looks OK on the host, and the ZModem transfer completes without errors so I am assuming that the bytes arrive on the board OK. Something between there and unzip seems to be the problem...

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by Yves-D. on Fri, 19 Aug 2022 06:26:57 GMT
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Keep up the good work on OS/9 for 68k platforms.
I'm definitely interested in your work reviving an other operating system than CPM for the 68030.
Unfortunately my programming skills in OS porting are rather inexistent, so I'd only quality as beta tester.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Sun, 21 Aug 2022 04:15:31 GMT
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The OS-9 porting process was 90% learning, and 10% (tops) actually writing any code. I must say that I have a slightly better appreciation of the claim that OSK was killed off because maintaining a system written in assembler was too difficult; debugging things when you mess up is quite hard. Especially without kernel sources.

Hopefully I can work out the corruption problem, but after that there's a short laundry list of things that would be nice to have:

- A copy of the 1.3 SDK.
- An ELF to ROFF converter, or ROFF support ported from old BFD (the Amiga folks have done the work getting support for A5 as frame pointer, so the last missing piece for a working GCC is the ability to produce OS-9 binaries).

- Ports of some newer utilities (I had to scrounge to find a working zip / zmodem).
- A bit-bang SPI driver.
- Some sort of file interchange story.

...

I'm looking for other platforms to add to the to-be-ported list, if folks have suggestions. P90MB is coming along so far; I think it'll be interesting to see how well things run with 512K of RAM...

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 21 Aug 2022 12:37:35 GMT
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I can send you a complimentary MPU302 if you like. It is a reverse-engineered commercial board (ADC Soneplex MPU) with 16mhz 68302 (68000 core), 1 Meg RAM, 2.25 meg flash, RTC, 5 serial channels (68692+68302 internal serials), PIO, etc. I've added a CF disk interface to the PIO and ported CPM68K. They used to be dirt cheap as surplus boards, but not any more. Discussion and homepage are here:

https://www.retrobrewcomputers.org/doku.php?id=builderpages: plasmo:spx-mpu

https://www.retrobrewcomputers.org/forum/index.php?t=msg&amp ;amp ;th=201&prevloaded=1&&start=0
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Sun, 21 Aug 2022 22:03:21 GMT
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mikesmith wrote on Sat, 20 August 2022 21:15
Hopefully I can work out the corruption problem
In all cases, I'm seeing bits geting set in the high nibble: d->f, b->f, 5->7, a->e. No obvious address sensitivity. The rate is low; those are 6 samples out of a 690k file.

Interestingly, it always looks like bits that are getting set were 1s in the previous byte:

50,bb -> 50,fb
24,5f -> 24,7f
56,a3 -> 56,e3

Copying the file many times (i.e. exercising the CF read / write path) doesn't seem to introduce any new corruption, so that seems to exonerate the filesystem / disk.

Now I need to find a way to validate the file transfer path. ZModem is fairly aggressive with its checksumming, so that doesn't leave a whole lot of options.

[edit]

Looks like serial reception is unreliable at 9600bps, and there's enough corruption that occasionally we hit a CRC collision and ZModem lets the corrupted bits through. Uploading at 4800bps is reliable, but obviously that's no fun. Going to have to see if I can work out if the UART FIFO is being overrun, or if something else is going on. I had the UART configured at IPL2, which would have been a problem, but after looking at the CPLD and moving it to 3 that hasn't helped.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Mon, 22 Aug 2022 23:24:15 GMT
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Mike,
A couple thoughts:
1. DUART has handshake signal that I brought to the serial connector but didn't use because gkermit is fast enough without hardware handshake. I know the handshake does work. You may be able to run ZMODEM with hardware handshake at higher baud.
2. I have a quad serial board that works with CB030's expansion bus. It is based on OX16C954 where transmit/receive channels are backed with 128-byte FIFO. I can send you a Quad serial board if you like to try it. https://www.retrobrewcomputers.org/doku.php?id=builderpages:plasmo:quadserplcc
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Tue, 23 Aug 2022 01:36:08 GMT
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Bill,

Thanks for the thoughts. I did wire up hardware flow and enable it in the OS-9 driver, and I've verified that at least my desktop is respecting the signal by unplugging the wires. That didn't help. I also noticed the OS-9 driver only took one byte from the FIFO per interrupt rather than draining it - patched that too. Still no joy. The driver has a lot of "extra" features (error reporting, Xon/Xoff flow control, etc.) that might be making it slow. Tonight's experiment is going to be to save the overflow status somewhere to test the hypothesis that the problem is actually interrupt latency.

I'd definitely be happy to buy a quad serial board off you and add support for it, but for obvious reasons I also want to fix this so that folks that aren't so lucky have a sensible file transfer option.

... and thankyou for reminding me about Kermit. It works fine at 38.4kbps, so go figure. Either it's doing a better job of correcting the errors, or there's something wrong with the ZModem receive

app. Either way, victory!

[edit] I've updated the installation instructions and done a little more tinkering. I think things are looking pretty OK. Would be interested to hear how folks are getting along, and whether maybe I should start another thread...

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by e2k on Tue, 23 Aug 2022 06:33:41 GMT
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mikesmith wrote on Sat, 20 August 2022 21:15T
I'm looking for other platforms to add to the to-be-ported list, if folks have suggestions. P90MB is coming along so far; I think it'll be interesting to see how well things run with 512K of RAM...

https://hackaday.io/project/164305-roscom68k
Has a mc68010, and a 68681, so it should be fairly easy ...

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Wed, 24 Aug 2022 02:40:45 GMT
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e2k wrote on Mon, 22 August 2022 23:33mikesmith wrote on Sat, 20 August 2022 21:15T
I'm looking for other platforms to add to the to-be-ported list, if folks have suggestions. P90MB is coming along so far; I think it'll be interesting to see how well things run with 512K of RAM...

https://hackaday.io/project/164305-roscom68k
Has a mc68010, and a 68681, so it should be fairly easy ...
I was too slow catching them before they sold out. Now that the maker is apparently working on an '030 board...

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by e2k on Thu, 25 Aug 2022 05:53:48 GMT
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mikesmith wrote on Tue, 23 August 2022 19:40e2k wrote on Mon, 22 August 2022 23:33mikesmith wrote on Sat, 20 August 2022 21:15T
I'm looking for other platforms to add to the to-be-ported list, if folks have suggestions. P90MB is coming along so far; I think it'll be interesting to see how well things run with 512K of RAM...

https://hackaday.io/project/164305-roscom68k
Has a mc68010, and a 68681, so it should be fairly easy ...
I was too slow catching them before they sold out. Now that the maker is apparently working on an '030 board...

Where are you located?
I could probably help you out with one ...

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by newjes250 on Sat, 27 Aug 2022 21:06:43 GMT
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@Plasmo,

Oh Oh! Do I see a nice SMD to DIP adapter among your recent boards?

I purchased some adapter boards from Ebay for "32pin smd to 32pin DIP" but the width turned out to be .800", instead of the .600" that
I really wanted. If that board is added to your builderpages under Misc along side your PLCC to DIP adapter, I would be most interested!!

Second Question: I read that your "QuadSer-plcc" design listed jumper options for both Intel and Motorola signaling, with the MB030 listed
for 680x0 usage - does that also include the MB020 as well?

My interest is because I would like to add a DIY RC2014 bus to a 32bit project I am working on using an Amiga A1200 blank board using the
68ec020 on it: adding the QuadSer for a Serial communication to that project.

Jesse (newjes250)

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Sun, 28 Aug 2022 01:47:47 GMT
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newjes250 wrote on Sat, 27 August 2022 15:06

Oh Oh! Do I see a nice SMD to DIP adapter among your recent boards?

I have a PLCC32 to DIP32 adapter, but that's already listed under my MISC page. You must meant the SOJ32-to-DIP32 board for my piggyback VGA design?

I have been slow in getting my designs documented. I just created a page for the non PS2 version of the piggyback VGA design which include the SOJ32-to-DIP32 adapter. The board is wider than 600mil because the RAM signals are connected to the top board via outer two rows of

pins.
https://www.retrobrewcomputers.org/doku.php?id=builderpages:plasmo:vgaxram:2-boards:no-ps2

QuadSer PLCC as well as QuadSer QFP (latest is rev2 but not yet published) should work with MB020. I will do testing on MB020 to make sure it really does work.
Bill

File Attachments

1) 2-board_VGAxRAM+PS2.jpg, downloaded 1195 times
2) 2-board_VGAxRAM.jpg, downloaded 1196 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 30 Aug 2022 02:19:56 GMT
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Picture shows a quad serial rev2 board plugged into CB030. Quad serial board can be configured for Z80, Z280, and 68K computers with RC2014 expansion bus. I verify it will also work on MB020. I'm catching up with my documentation. Quad serial rev2 homepage is here. It is still under construction.
https://www.retrobrewcomputers.org/doku.php?id=builderpages:plasmo:quadser:rev2:quadser_r2

Attached is a simple diagnostic to exercise Quadser's port0 and its interrupt handling feature.
Bill

File Attachments

1) QuadSer_on_CB030_F.jpg, downloaded 1131 times
2) test_Quad_serial_board_on_CB030.zip, downloaded 171 times

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by computerdoc on Mon, 12 Sep 2022 01:47:33 GMT
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How do I compile OS9 68K for my Tink68K or MB012?

I'd like to try it on both boards.

Is CB030 ready to order?

Kip

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Mon, 12 Sep 2022 20:59:45 GMT
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Tiny68K and MB012 are essential the same design. Once you've ported to one then it should work on the other one. MB012 does have two RC2014-like expansion busses that can accommodate additional hardware like Quad serial and video/keyboard interfaces.

Two assembled and tested CB030 boards are available, but I'm too busy this month and most of October to support other CB030 options or more assembled CB030 beyond the two existing boards.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Tue, 13 Sep 2022 18:31:19 GMT
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I don't have a Tiny68k port for OS-9 done yet. You could mostly copy the CB030 port, with appropriate changes to use the 68k rather than '030 kernel, etc. The biggest difference will be a new tick driver to use the 68681 timer instead of the CPLD timer. That's not super difficult, but there's a bit of a learning curve involved. You could steal the CPLD timer from CB030 and backport it to the Tiny68k CPLD, if that was more your style.

The Tiny68K EEPROM is very small, so you'll be stuck booting from CF without the ROM-based debugger, and doing a fair bit of plug/unplug cycling with the EEPROM unless you have a SPI ROM emulator / in-circuit programmer.

I'm currently spending my available time on the QuadSer driver. Tiny68k was in the queue sometime after P90MB; I would probably do most of the development in my emulator to avoid lots of ROM bouncing.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Tue, 13 Sep 2022 23:54:34 GMT
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Something that would really help OS-9 would be someone able to port patches from an old binutils (2.5.2) forward to modern binutils. That's really the major obstacle to getting gcc support for this platform.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by computerdoc on Tue, 14 Mar 2023 18:50:05 GMT
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Hi Mike!
I downloaded OS9 68K from your github repository a few minutes ago. I intend to port it to the Tiny68K. Changing '030 to '000 or '010 sounds easy. What I don't yet know how to do is write a tick timer. Back porting the CPLD tick timer from the CB030 sounds doable. How different is the Tiny68K tick timer from the CB030 tick timer?
I'm excited to eventually get a CB030 board! I can almost taste it! Bill, please put me on your list for the 4 layer version of your CB030 board when it is ready!
Is there anything else I need to know to port this thing over to the Tiny68K / MB012?
I feel fun times ahead! :)
Oh, by the way, any OS9 68K help you need, let me know. I don't know 68K assembler as of yet, but I'm sure I'm going to find out! I'm sure the loud yell while pulling out hair is coming too I expect. I come from a 6809 background from the days when the Cocos were new! I still remember buying OS/9 v01.00.00 for my Coco 1 F board! Those were great times! Some pointers are always welcome. <big grin>
I'm running Linux Mint on my HP mobile server laptop and if memory serves I have already successfully compiled the OS9 68K rom image a year or two ago. I just didn't have a clue where to go from there. I noticed that your Github repository for OS9 68K is only a few hundred kilobytes so I expect it is just the source code for the rom image?
I have also downloaded the OS9 68K v1.2 sdk from the link Bill provided. I'll be trying my hand at compiling your updates to OS9 68K.
Roger Hanscom has designed and built several iterations of a 68000 SBC with 1MB of flash eeproms and 2MB of SRAM with 2 serial ports, a 68681 I/O port, 2 16-bit parallel ports if memory serves as well as a CF card interface using an 8255 and another drive interface with just 5 pins, but I don't remember the name of the drive. I'm sure I'm leaving something else or 2 out, but I'm writing this from memory as I have built several of them. I would love to see OS9 68K running on these boards as well.
Now that my Dell Poweredge servers are basically completed, I'll have more time to build some more 68K SBCs and run OS9 68K on them. CP/M 68K is currently running on my Tiny68K, but I don't know much about CP/M of any flavor. I cut my computer OS teeth very early on with OS/9 6809 version and there was a long steep learning curve. It was definitely worth learning though. I have never forgotten how I used OS/9 to use my ASR-33 Teletype to print something for the very first time! The Coco didn't output LFs to the serial port! Ugh!
Kip

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by computerdoc on Tue, 14 Mar 2023 19:08:34 GMT
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Hi Bill,
Do you have any MB020 boards? I'd like to buy one.
Kip

Subject: Re: CB030, A 68030 SBC for hobbyists

Posted by computerdoc on Tue, 14 Mar 2023 19:14:06 GMT
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Hi Bill,
Are all the RC2014 daughter boards grouped in one place or do I continue to peruse your entire set of build pages?
Kip

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 14 Mar 2023 20:30:59 GMT
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Kip,
Both MB020 and CB030 pc boards are on their way from JLCPCB. I have picked the "slow boat from China" shipping option so they won't be here until next week.

All my RC2014 modules are under one section in my homepage:
https://www.retrobrewcomputers.org/doku.php?id=builderpages:plasmo:start#rc2014-compatible_modules
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by marcopolo on Wed, 15 Mar 2023 11:42:43 GMT
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Hi Bill,

I'm going to start building a CB030, it's a nice card and with OS-9 it's going to be great.
Thank you for providing all the information to build it.
I didn't see any speed indication for the MAX7000 CPLD, are all versions compatible with the CB030?

You suggest UTSource as a supplier, I had quite a few problems with them a long time ago (fake RF transistors and HD63C09).
Did you buy your EPM7128 from them? If so, new or used?

Thanks,
Marc

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Wed, 15 Mar 2023 13:45:26 GMT
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Hi Marc,
I replied to your email, but I just received an unable-to-deliver notice from my email server. Here was my reply:

10ns EPM7128SQC100 is what I used for CB030. I believe 15nS part should also work. All my EPM7128SQC100 are from one lot that I purchased used on eBay years ago. Most of them were removed from existing boards, but some were new/unused parts. I have purchased a number of EPM7128SLC84 from UTSource and they all worked. I do agree many were blacktopped but I've been fortunate that they at least do work. I don't think I've ever purchased new CPLD from UTSource; I always purchased used parts.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by norwestrzh on Wed, 15 Mar 2023 16:21:03 GMT
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>> ... 1MB of flash eeproms and 2MB of SRAM with 2 serial ports, a 68681 I/O port, 2 16-bit parallel ports if memory serves as well
>> as a CF card interface using an 8255 and another drive interface with just 5 pins, but I don't remember the name of the drive.

The 5-pin device is the "uDrive", Kip. It was produced by 4D Systems (in Australia), but they sold off the design a number of years ago to a company in England(?). It might be unobtainium at this point .... unfortunately.

Roger

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by computerdoc on Wed, 15 Mar 2023 22:38:36 GMT
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Mike,
I am setting up the OS9 68K SDK v12 compile package. I have unzipped os9_68k_sdk_v12.zip and put the contents in "M:\MWOS".
Do I put the contents of os9-m68k-ports-main.zip in M:\MWOS as well?
Then follow the readme.md file?
I need a bit more instructions than your OS9 68K repository readme on github describes. It has been quite a while since I last did this.
Kip

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by computerdoc on Wed, 15 Mar 2023 22:40:22 GMT
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Roger,
Thanks for the udrive description. By the way what is the actual 5 pin interface?
Could we use it in some way for other devices?
Kip

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by computerdoc on Wed, 15 Mar 2023 22:47:47 GMT
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Mike,
I am going to try compiling the CB030 OS9 first to make sure I have the OS9 tool chain setup properly. Once the CB030 OS9 compile is successful, I want to copy the CB030 folder to Tiny68K folder and try to port it, of course, to the Tiny68K, MB012 and T68KRC boards. Anything special I need to know about making these changes. I have never done this before so please include every little detail if possible. Thanks a bunch, Mike!
Kip

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by computerdoc on Wed, 15 Mar 2023 22:49:27 GMT
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Bill,
How did you setup the OS9_68K_SDK_v12 tool chain with Mike's CB030 folder?
Kip

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by computerdoc on Wed, 15 Mar 2023 23:23:26 GMT
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I just ran a compile for CB030 and I think it was successful. I have both the romimage.diskboot and diskboot.bf files.
Next I duplicated the CB030 folder to a Tiny68K folder, made the changes and I have a good compile for the Tiny68K.
After flashing the romimage.diskboot to the CF card, how do I "install" the bootfile.bf onto the CF card?

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Thu, 16 Mar 2023 00:23:53 GMT
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Kip,
I believe MikeSmith had said OS9 for CB030 won't run on Tiny68K without some changes so it is unlikely the 68030 binary you've compiled can run on Tiny68K. The other difference is CB030 has a 1/2meg flash for various OS9 bootstrap files whereas Tiny68K/T68KRC/MB012 only have small 32KB serial flash that will require a CF disk loaded with OS9 files to boot successfully. I simply don't know enough about OS9 to solve these problems.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by norwestrzh on Thu, 16 Mar 2023 16:00:02 GMT
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>> By the way what is the actual 5 pin interface?

Tx, Rx, +5v, Gnd, and reset*

>> Could we use it in some way for other devices?

Sure! It's just TTL level serial. It uses a micro SD card with a FAT formatted file system on it. There is no hardware control of the interface (which is a bad thing). That necessitates fairly small transmitted packets. BUT it works!

Roger

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by computerdoc on Tue, 21 Mar 2023 02:01:51 GMT
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Hi Mike,
The boards I have completed are the Tiny68K and the MB012 boards running CPM 68K. I have ordered the 4.7K x7 resistor network to complete the T68KRC board this evening. I expect it to be able to boot CPM 68K soon.
Would one of the "Frugal RAM/ROM 512K" or the "Improved 512K RAM/ROM" RC boards and my MB012 board with 2 RC slots be enough to boot OS9 68K from the flash memory and be up and running to access the OS9 filesystem on the CF Card?
Kip

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by computerdoc on Thu, 30 Mar 2023 22:43:29 GMT

Bill,
Have you thought of the MC68080 CPU IP designed by the Apollo team which is used in the Vampire MC68080 for the Amiga 3000 and 4000? I was reading about the Apollo team thinking about or are releasing it for free. I wonder if it is usable in some form in the Pathfinder Projects as a KK080MB board. 8) :d :roll: Here is the link:
https://amitopia.com/free-68080-fpga-core-license-by-apollo- team-is-great/.
Here is a quote from the linked web page.

"
Gunnar von Böhn which is the head of Apollo Team offers regarding this a1k.org post, to make his 68080 reimplementation of a 68k processor available to other hardware manufacturers. 68080 is available as part of the "Apollo Cores" on the Vampire Accelerator cards

Currently, the 68080 is available as part of the "Apollo Cores" on the Vampire Accelerator cards, which are available for the Amiga 500, Amiga 1000, Amiga 2000, and Amiga 600 cards. Also 68080 is announced for the Amiga 1200 and the Vampire V4 stand-alone version. For the Amiga 3000, Amiga 4000 or even Amiga 4000T Amigas, nobody had ever offered appropriate solutions. But now Gunnar von Böhn gives other a chance to do so.

From Böhn's offer provides that a hardware manufacturer can license a free version of the 68060, which is throttled after booting to the speed of a real 68060 processor, but otherwise has the full range of features of the 68080. This "shareware output" of the CPU could then end users by acquiring a Keycode from Böhn from throttling.
Apollo Team makes their creation Available for even more audience

This offer would enable manufacturers in the Amiga to offer fast speed cards despite the very high prices or unavailability of the 68060. By Böhn himself this is opening up new markets, as, for example, manufacturers such as Jens Schönfeld from Individual Computers or other great hardware people could offer processor cards for Amiga 3000 and Amiga 4000 users, whose users may well be interested in unlocking the extra speed for their Amigas.

The offer refers only to the CPU of the Apollo Core by Apollo Team. Other components contained there such as SAGA or a possible chipset emulation are excluded in this free offer from Gunnar von Böhn.

Interesting move by Apollo Team. Focusing on the low-cost Amigas and the stand-alone Vampire V4 is a good move. Why Amiga 3000 and Amiga 4000 is removed from the plan, we don't know yet. It's most about time and money spent on this project for sure. We are looking forward with this project. Also the fact that A1200.net guys got a Vampire V4 as a gift at Amiga32 was a nice move by the team. Maybe these two can team up and make the ultimate Amiga V5000 in the end toghether?

Source
amiganews.de
"

What do you think? If so, what would be needed to obtain it?

Kip

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Fri, 31 Mar 2023 00:58:48 GMT
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Since 68080 targets FPGA, my guess it can be implemented in a FPGA board with SDRAM and SD disk. Such boards are likely available, possibly cheaply, so no reason to design our own.

Shareware 68080 is throttled to 68060's performance, so might as well design a 68060 or 68040 retro board. Designing a 68060 is on my bucket list but 060 is very expensive so it is unlikely to have much general interests.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by coolbear on Mon, 19 Jun 2023 16:01:18 GMT
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Hello all, I'm back at it taking a stab at getting OS9 running on one of my CB030s. I have a few questions:

Does the OS9 port require any hardware mods - notably the 16-bit CF mods?
What about the timer?
I have the MWOS structure, but where can one find the branch for the CB030?

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by plasmo on Tue, 20 Jun 2023 18:42:14 GMT
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I don't know anything about OS9 on CB030 so I was hoping someone better qualified can answer these questions. Here is my attempt:
Since 68030 has dynamic bus sizing capability, 8-bit CF interface works just like 16-bit CF interface except 8-bit is slower in data transfer. MC68681 in CB030 has a 16-bit counter/timer. CB030 CPLD also have a 100Hz level 2 interrupt source that can be software enabled. CB030 branch on MWOS structure is beyond me.
Bill

Subject: Re: CB030, A 68030 SBC for hobbyists

Posted by marcopolo on Fri, 23 Jun 2023 06:48:36 GMT
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https://github.com/John-Titor/os9-m68k-ports

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by coolbear on Wed, 28 Jun 2023 01:58:42 GMT
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Well, that helped a bit but my feeble brain hasn't been able to wrap itself around the environment set up. At least not yet. I did try Windows, but the tools are all written for Win32, and I don't have a physical machine for that. I tried a Windows XP/32 VM, but os9make has a hard time finding all its dependencies. I also tried wine, but that turned out to be the least successful.

It seems like there's a pretty steep curve.

Is there any chance that I could wimp out and just get a copy of the ROM images?

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Tue, 05 Dec 2023 23:09:12 GMT
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Apologies @coolbear, work and other hobbies took over and I haven't had time to keep in touch. Some of that pressure is off, so hopefully I can spend a little more time tinkering with retro stuff again.

I'm sorry I don't have much in the way of suggestions for getting the tools running on anything other than macOS; I will take a stab at getting a Windows system up and see if I can come up with a recipe, but someone more familiar with the platform is likely to be more useful there. In theory modern Windows should still run older stuff, as long as you can find / install the required runtime libraries.

To some of the other questions:

Quote:
I am setting up the OS9 68K SDK v12 compile package. I have unzipped os9_68k_sdk_v12.zip and put the contents in "M:\MWOS".

Do I put the contents of os9-m68k-ports-main.zip in M:\MWOS as well?

You can check out the ports repo more or less anywhere, but make sure that there are no spaces in any of the parent directory names. Using the zip archives is less than ideal, as it makes it very hard for you to keep track of your own changes at the same time as taking in new changes that might happen upstream.

Quote:
I want to copy the CB030 folder to Tiny68K folder and try to port it, of course, to the Tiny68K, MB012 and T68KRC boards. Anything special I need to know about making these changes. I have never done this before so please include every little detail if possible.

That would be essentially the same as doing the work from scratch... but off the top of my head, you would want to at least:

adjust ROM_CBOOT/sysinit.a to perform the correct (possibly minimal) early startup tasks
adjust the bootfile lists to select the correct kernel and other system modules
adjust systype.d to select the correct CPU type, I/O addresses, vectors, CFIDE configuration, etc.
write a new ticker driver to use the 68681 timer and sort out any conflicts with the (nigh-unreadable) OS-9 68681 serial driver
adjust the RTC driver as required; either to stub it out so that the system will prompt for the time / date at bootup, or to read the time/date from some other RTC of your choosing (IIRC there are issues with Bill's board layout that make the tiny68k onboard RTC non-functional, you could use the RTC he designed for CB030).
adjust the bootfiles and probably other Makefiles so that only the bootloader goes in the serial ROM
add new disk image generation logic / config as required to build a bootable CF image

There's probably more; I am still paging all of this back in. I have a sneaking suspicion that I convinced myself that using the '681 timer for the ticker was going to cause problems, but I don't see it in my notes and it's not immediately obvious what it would be, so it might? work.

Quote:
Would one of the "Frugal RAM/ROM 512K" or the "Improved 512K RAM/ROM" RC boards and my MB012 board with 2 RC slots be enough to boot OS9 68K from the flash memory and be up and running to access the OS9 filesystem on the CF Card?

I would expect that a basic MB012 would be plenty to run OS-9, without needing any additional memory boards. It'd need a little tinkering to get there from a tiny68k port, and it would have the same basic set of prerequisites.

Quote:
Does the OS9 port require any hardware mods - notably the 16-bit CF mods?
What about the timer?

You need the 100Hz tick version of the CPLD. It's best to have one of Bill's realtime clock modules, since OS-9 likes to know the time / date at boot.
The CB030 port configures the CF driver in 8-bit mode. I don't know if this would conflict with the 16bit mod, I don't think I ever looked to see.

Hopefully this helps a little. I will probably have more to share in a bit when I have refreshed everything and got myself up and going again.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by mikesmith on Wed, 06 Dec 2023 03:04:18 GMT
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Quote:
Shareware 68080 is throttled to 68060's performance, so might as well design a 68060 or 68040 retro board. Designing a 68060 is on my bucket list but 060 is very expensive so it is unlikely to have much general interests.

I'd obviously be down for one. I have an MVME177 already, something else with some documentation wouldn't be hated.

The "68080" is also missing some important parts; it should really be called "68EC080" if they were being honest.

Subject: Re: CB030, A 68030 SBC for hobbyists
Posted by denis2342 on Mon, 05 Feb 2024 19:38:21 GMT
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I would also join in, I have already a rev.6 MC68060 waiting for it.