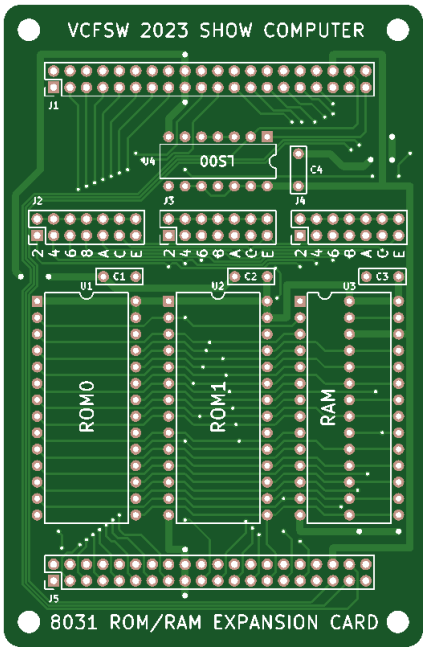
VINTAGE COMPUTER FESTIVAL VCF-SW SOUTHWEST

8031-Based Single Board Computer
CamelForth Expansion

June 2024



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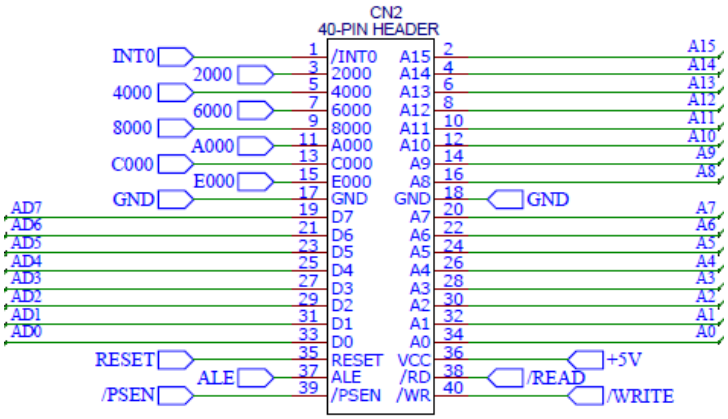
Thank you for your purchase of the CamelForth expansion to the show computer kit for the 2023 Vintage Computer Festival Southwest expo! This PCB was designed for the show with a few goals in mind:

- Easy to find parts
- Reusable parts
- Easy to build: No surface mount parts
- Customizable
- Expandable

Most of these requirements were easy to meet. The PCB connects with an inexpensive, short crimped ribbon cable. All parts are easy to source and solder in and the ROM and RAM addressing is flexible with the decoded address ranges chosen via jumpers. This allows for other uses besides running CamelForth.

The expansion makes use of BASIC-52's capabilities to have the recognizable key words extended. This allows for the command "CAMEL" to be added to launch the CamelForth software.

The module plugs into the expansion interface, labeled CN2. The kit makes use of the address and data busses, the control signals, and the decoded chip selects at 8K boundaries. Also, the expansion port is carried through the PCB to make it easier to add on additional circuits.



The reusable parts goal was easy to meet with the idea to use what was on-hand and minimize ordering of new parts from distributors such as Mouser and Digi-key. For example, the .6" DIP sockets were surplus from the days of the First Saturday Sale in Dallas. The .3" DIP sockets were surplus from Silicon valley.. The EPROMs were salvaged from scrapped PCBs. The RAMs surplus from when Tanner Electronics closed and the PCB will take RAMs of either .600" or .300" wide. The pink anti-static bags were military surplus and came from Computer Reset.

I would like to give a shout out to Will Tooker from the DFW Retro Computing group for interpreting my hand-written schematics and doing the board layout. A special thanks

goes to the late Richard Byron and his daughter Noelle Yingling for the amazing place called Computer Reset.

This project is partially on GitHub with the gerbers being uploaded after the show for anyone to build their own at: https://github.com/channelmaniac/VCF_8031/tree/main. Look for the Expansion PCB directory for the files related to this kit.

Good luck with the build!

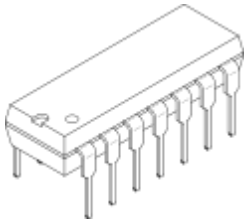
Raymond Jett
Owner, Arcadecomponents.com

The Expansion Kit for the 2023 VCF Southwest show includes the following parts:

- 1 Printed circuit board
- 1 Pre-programmed 27C64
  - BASIC-52 Extensions
- 1 Pre-programmed 27C64
  - CamelForth 1.6
- 1 8K x 8 Static RAM
- 1 74LS00 Quad NAND Gate
- 2 28-pin .6” dual-wipe sockets
- 1 28-pin .3” dual-wipe socket
- 1 14-pin dual-wipe socket
- 1 40-pin ribbon cable
- 4 .100 jumpers / shunts
- 4 .1uf monolithic capacitors

You will need some simple tools to build this computer, including a soldering iron, solder, multimeter, and small diagonal cutters to trim component leads. To fix any mistakes a spring and plunger desoldering tool or desoldering braid can be used, but a desoldering iron will make it easier. Please ensure that your solder matches the capabilities of the soldering iron – use lead or lead-free with an iron designed for it. Don’t use lead-free solder with an old iron as it won’t provide enough heat to properly solder the components to the PCB. A temperature-regulated iron is preferred and will make the build easier, but the idea behind the kit is to use what you have.

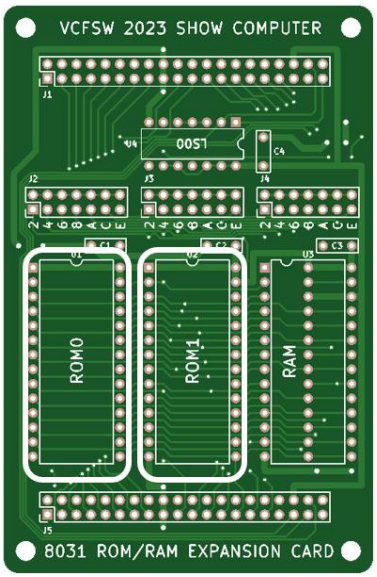
The IC chips are polarized and must be installed in the circuit in the correct orientation or they may be damaged when power is applied. The IC chips and sockets will have a notch on one end. The PCB silkscreen will show which way to orient them. The chip may also have a dot signifying pin 1. Line up the notches / dots and they can be installed correctly.



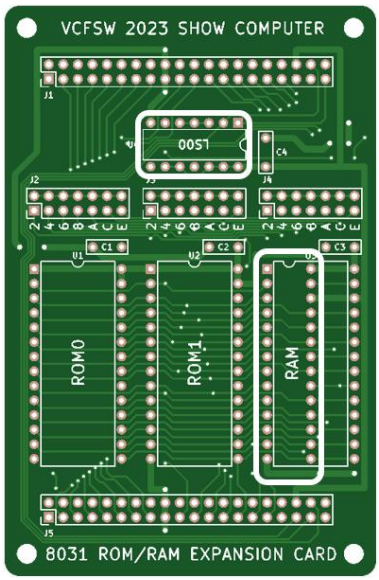
IC image from PNGEgg.

All components included in this kit will be installed from the top side of the PCB and soldered on the bottom.

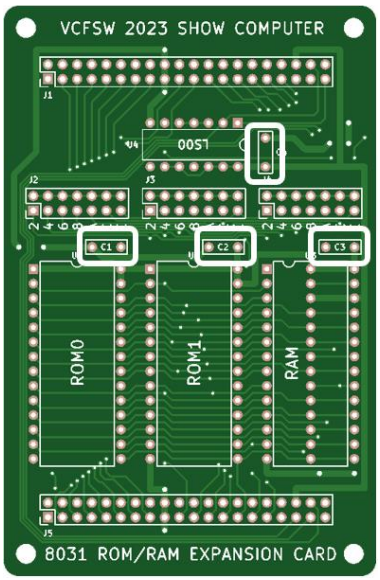
1. (____) Solder in both 28-pin .6” sockets at ROM0 and ROM1. Be sure to orient the notch in the end of each socket with the notch on the PCB silk screen.



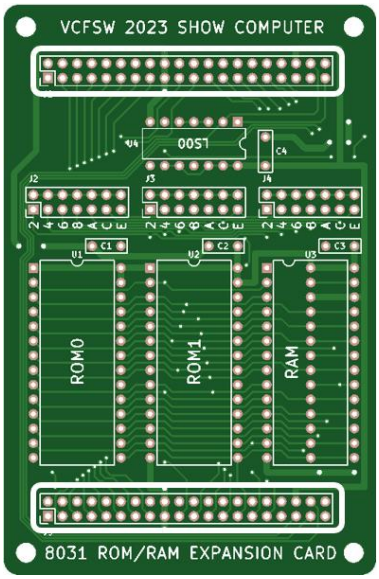
2. (____) Solder in the 28-pin .3” socket at RAM and the 14-pin socket for the LS00. Be sure to orient the notch in the end of each socket with the notch on the PCB silk screen.



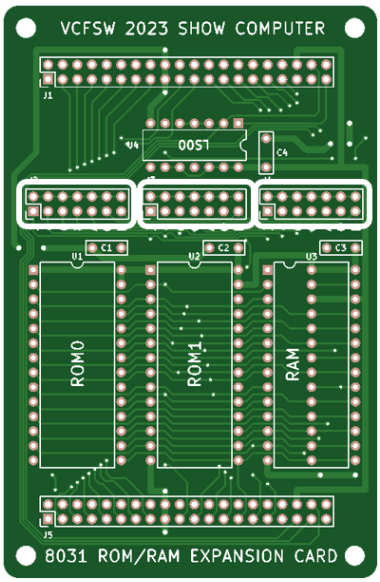
3. (____) Install the 4 .1uf monolithic capacitors at C1, C2, C3, and C4. Carefully trim the excess leads after soldering. Take care when doing this as the leads can fly across the room when clipped.



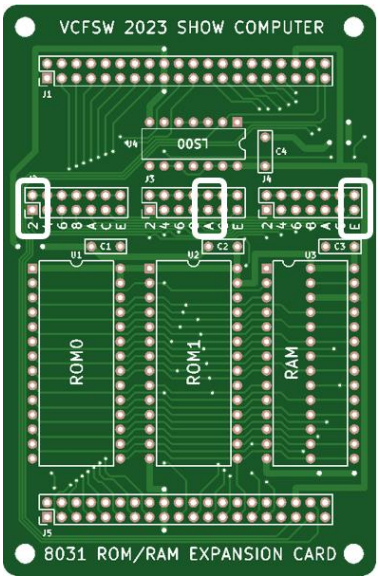
4. (____) Install the large double-row header pins at J1 and J5.



5. (____) Install the smaller 2x7 pin headers at J2, J3, and J4.



6. (____) Install the .100” jumper shunts at “2” for J2 to place the BASIC Extensions ROM at address 2000H, “A” for J3 to place the CamelForth ROM at address A000H, and “E” for J4 to place the 8K of RAM at $E000H



Ensure all the component leads are properly trimmed. Look the board over for solder shorts, poor solder joints, and improperly installed components. Use a multimeter to verify there are no shorts between +5 and ground.

Power up the PCB with the included DC adapter and verify +5v output on the voltage regulator. Power down the PCB and insert the IC chips into their sockets: ROM0 is BASIC Extensions and ROM1 is the CamelForth 1.6 ROM, while the RAM and 74LS00 chip finish out the install. Some ICs will have legs that bend slightly outward from vertical and may need careful coaxing to plug into the sockets. Be careful to orient them correctly to the notch on the sockets and to not bend the pins on the ICs to where they fold under the chip instead of going into the sockets. Connect the kit to your 8031 Computer's 40-pin expansion port and connect that computer to your computer and terminal software of choice. Open the terminal program, power up the computer, and press the space bar. The computer will respond with `*MCS-51(tm) BASIC V1.2a*`

If that response is not seen, press the reset button, wait a second, then press the space bar. If that is still not seen, disconnect the Expansion Kit from the computer and try again. If it works without the expansion kit then you'll need to troubleshoot the kit. First check pin alignment on the ribbon cable. Then ensure the ROMs, RAM, and 74LS00 are installed correctly and that there are no pins folded under any of the ICs. Also look for solder shorts.

At the > prompt, type 'CAMEL' (without the quotes, case insensitive) and press <enter>. The computer should respond with '8051 CamelForth v1.6 18 Aug 1999" and a block cursor.

Now you can enter a simple program.

```
: HELLO
CR ." Hello, World! " CR ;
```

Now type in `: "HELLO"<enter>` and the computer will respond with: `"Hello, World!"`

If you wish to copy and paste commands to the 8031 computer, beware that the prompt isn't returned in the same time after each line of code is entered. Sometimes there is a slight delay, which can be seen after entering line 10 of the program above. Set a Transmit Delay on the Serial Port Setup of Tera Term for 10msec/char and 1500 msec/line to slow down how fast Tera Term tries to send the data to the computer. Be sure to set that 1500 msec/line setting back down when finished or Tera Term will give you a 1.5 second delay after pressing enter when you are typing commands manually on the computer before you get the next > prompt.

Congratulations! You've successfully built and tested the computer expansion kit!