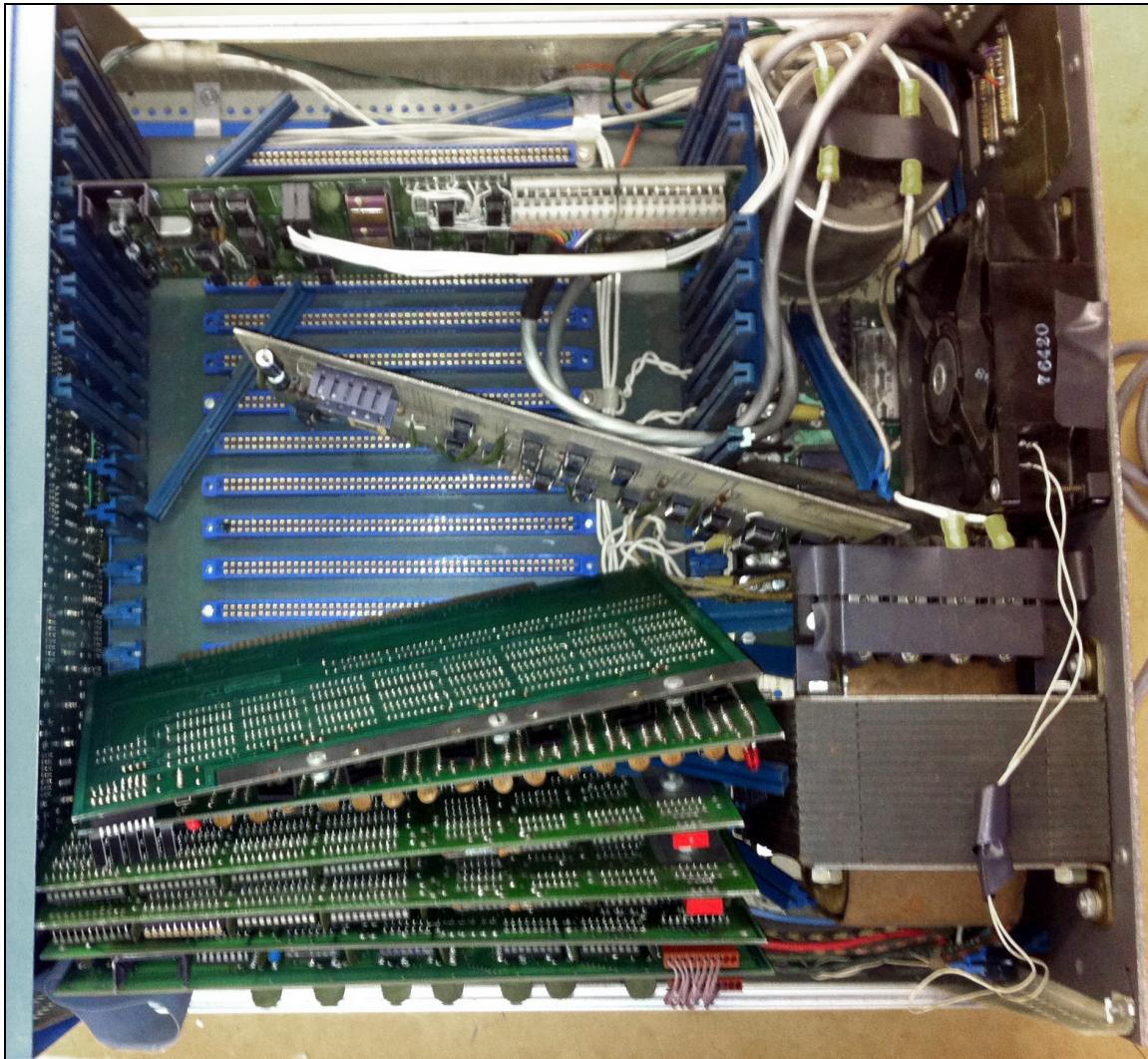


Altair 8800b Restoration

I purchased this Altair 8800b through eBay. This is a very heavy computer, especially in the corner with the enormous transformer. Unfortunately, the seller shipped the computer with all boards still inside the computer instead of packed in a separate box as I requested. This resulted in over half of the card guides being broken and the boards coming loose and inflicting some damage on each other.



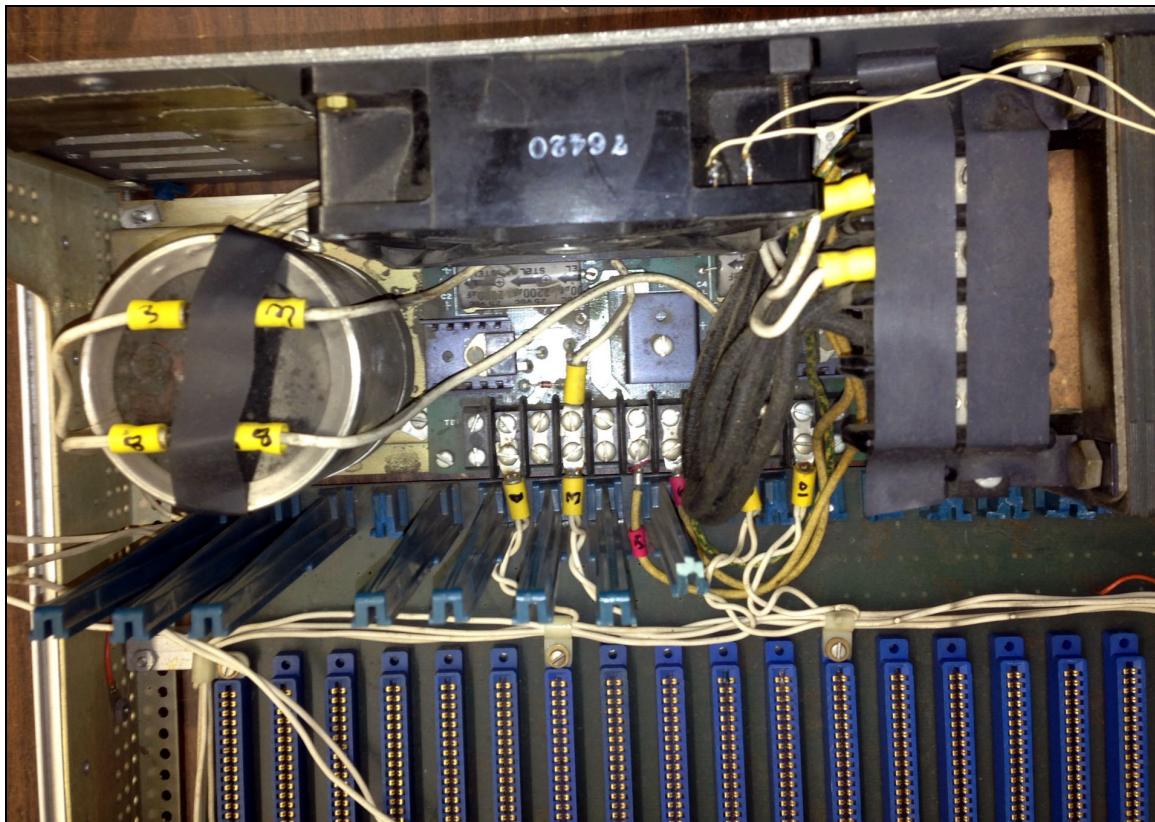
The computer came with the interface board (connects the front panel to the main bus), the 8800b CPU board, two MITS 16K static RAM boards, one Godbout Econoram IV 16K static RAM board, one DRC 16K static RAM board, one 88-VI/RTC vectored interrupt board, and one 88-2SIO board. The original owner wired the baud rate jumpers on the 88-2SIO board to a DB-25 connector on the rear panel where wire jumpers were used in the connector to select baud rates.

Motherboard

I removed the motherboard so I could unscrew and remove the broken card guides. I decided to remove even the unbroken card guides to make access to boards, the power supply, and the back side of the front panel easier. In general, there is no issue with running the computer without card guides on installed boards.

Power Supply

The -16v supply in the computer was not working. The +/-16v supplies are generated by a power supply board. This board can be seen in the picture below between the large filter capacitor on the left and the transformer on the right.

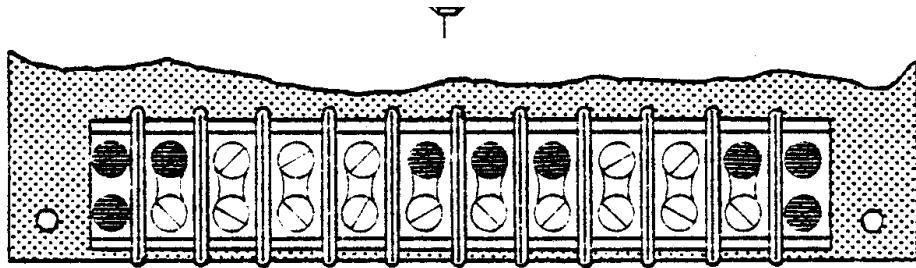


Pass transistor Q1 for the negative supply had failed. I replaced the original TIP145 with a TIP147. The TIP147 is the same as the TIP145 with a higher voltage rating. The TIP147 is also much more readily available these days. Likewise, a TIP142 can be used to replace the original TIP140 for the +16v supply. These parts are now in a full plastic case (the metal tab package is no longer made), but the lead dimensions and hole location are still the same.

The -16v supply was most likely damaged by a shorted tantalum capacitor on the -9v supply on the front panel board. See the “Front Panel Repairs” section for details.

I have learned two things about working on the power supply board: First, the simplest way to get to the board is to remove the four screws that hold the rear panel on the chassis, then tilt the rear panel down and away. Much simpler than removing the motherboard to get to the power supply board.

Second, if you are removing/attaching wires to/from the power supply board barrier strip, do not loosen/use the screws shown in black in the figure below. These screws have nuts on the back side of the board and you'll have to disassemble the computer and remove the power supply board in order to re-tighten them properly.



**5-41. Power Supply Terminal Block
Screw Insertion**

Front Panel Repairs

The front panel power switch had been replaced with a switch that has the shorter, round baton found on the original 8800. I replaced the switch with a power switch that matched the long flat baton of the other 8800b switches. I also replaced one of the address switches that was defective.

Front panel switches are “American Switch” brand (later purchased and manufactured by APEM). Unfortunately, the switches are no longer made, but can occasionally be found on eBay. The power and address switches are model ST1-1 followed by a number of different option codes. The power switch has silver contacts and is rated for 3 amps. Ideally, the address switches are gold contacts rated at 0.4VA. The momentary switches are ST1-3 with (ideally) gold contacts.

For example, ST1-1F2MCB=gold, Q=silver, G=gold/silver, N=econ gold, T=econ silver. Search eBay for ST1-1 or ST1-3 under American Switch and APEM, then look closely at pictures for baton size (some flats are shorter), terminal type, etc.

The front panel PCB required replacement of C2 (22uf tantalum on the -9v regulator). The original cap had burnt completely. This failure is most likely what took out the computer's -16v supply.



Front Panel with New Switches

Several front panel functions were flakey or didn't work. Since all IC's on the front panel board are socketed, age and oxidation resulted in poor contact between many IC legs and the socket contacts. Cycling all IC's in/out of their sockets a few times fixed all front panel functions.

After many hours of use, I noticed occasional problems that seemed related to the MWRITE signal on the bus. Looking with a scope, the MWRITE signal was very ugly with ringing and a low output in the 0.8v-1.2v range (too high). The signal is driven by IC "H" on the interface board. However, IC "H" was not the problem. MWRITE also looked bad at IC "A" that drives IC "H."

After replacing IC "A," the problem still remained. One of the inputs to IC "A" is the DEP signal from the front panel when DEPOSIT or DEPOSIT NEXT is pressed. This signal was not properly going < 0.8v when asserted low. I replaced IC "J" on the front panel board that drives this signal, but the bad looking DEP signal remained.

Using a meter, I found the resistance across the conductor in the ribbon cable that connects the DEP signal between the front panel and interface board was $> 40\Omega$. I re-squeezed the IDC connectors at both ends of the ribbon cable that connects the interface board to the front panel board and the resistance dropped down to $< 1\Omega$ as expected. This, in turn, cleared up the MWRITE problem. This is most likely a temporary fix. I'll need to re-build these ribbon cables one day.

CPU Board

Based on experience with sockets on the front panel board, I cycled all IC's in/out of their sockets several times on the CPU board to improve pin to socket connections.

After many hours of use, the computer worked reliably with the majority of board configurations I loaded in the computer. However, I occasionally had flakey behavior with a thin load of boards like shown below. After studying symptoms and bus signals, I isolated the problem to IC "P" on the CPU board (an 8T97) that drives A15,13,11,9 and D0,D2 on the bus. I replaced the 8T97 with a 74LS367 and the problems went away. I've seen failed or marginal 8T97's in a number of computers. The 74LS367 is a good drop-in replacement.

In the picture shown below, boards from left to right are: Altair FDC+ (includes RAM and ROM), 88-2SIO, 8800b CPU, Front Panel Interface

The housing and pins used in the short ten pin jumper from the CPU board to the display interface board are: Molex 22-01-2101 (housing, was 2695-10) and Molex 08-56-0110 or 08-65-0814 (pins, was 2759 series).

