The Xerox 820-1 Compendium—Part 2

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Smoke Test No. 1:

After you have obtained some of the parts mentioned in part 1 of this Compendium, test the switching power supply.[22] Check that the input strap (if any) is set for 110 V. Connect some wire-wound resistors to the various output lines (150 ohms between each of the 12-V lines and ground, and 5 ohms, 5 watts on the 5-V line). Turn on the power supply and measure the voltages to be sure they are correct. (Without a load, the switching supply will not produce the correct voltages.) You may want to let the power supply "cook" for several hours, but it should remain cool. Two potentiometers are available (one on some models) for making adjustments. One is used to adjust the output voltage of all the lines simultaneously, and the other serves as the overcurrent protection. Note that if the control for the overcurrent protection is backed off too far, the power supply will not be able to handle the starting load when the disk drive is activated, and the diskette will not boot.

Smoke Test No. 2:

If everything appears in order, connect the power supply, keyboard and a video monitor to the board. (The pin out and Dave Borden's, K8MMO, suggestions for these two cables will appear in another part of this Compendium.) When power is applied, the following message should appear on the screen:

...XEROX 820 VER. 2.0...
A - BOOT SYSTEM
T - TYPEWRITER

If something else appears on your monitor, push the reset button on the board's back panel. Type A. The screen should display: "disk error 80 UFF TOO SOO." This occurs because a disk drive is not connected. If you type T, the Xerox computer will lock and you will have to reboot the system. The "typewriter" option would operate if a printer were connected to the board. The original purpose of this command was to allow text typed on the keyboard to be sent directly to the printer: ie, an address on an envelope. This text does not appear on the video monitor.

Smoke Test No. 3:

To test all the RAM memory chips, type: XOOOO,EFFF<RETURN>. The screen will show a "+" sign for each memory location successfully checked. On initialization, the monitor routine that resides in ROM loads itself in RAM locations FOOO through FFFF, from where the test is run. Testing that portion of RAM should not be attempted. To test each location takes about 3 seconds. This is a good time to let the computer run for 72 hours.

If a bad memory chip is present, a message such as:

AAAA DD should = XX

will appear. AAAA is the bad memory location, DD is the data read, and XX is the data written there during the test. If such a message appears, locate the faulty chip and replace it. Cut the chip pins as close as possible to the chip. The pins can be removed from the board using solder-wick and a fine-tip soldering iron. Install an IC socket and insert a new 4116 chip.

Smoke Test No. 4:

Turn everything off and connect the disk drive(s). If you have only one drive, the 150-ohm termination resistors should be in place on the drive. (These terminations are about the size of a microchip. On some drives they are actually encapsulated in a DIP module.) If you have two drives, these resistors should be removed from drive 1 (A). The resistors on drive 2 (B) should be left in place. Also, the microswitches or straps should be configured so that the correct bit is selected for each drive: This is what tells each drive whether it is A or B. (I call the first drive "1" or "A" and the second drive "2" or "B". Radio Shack calls its first drive "0" and its second drive "1".)

Insert a SSSD (single-side single-density) CP/M® diskette in drive 1 (A) and type A <RETURN>. The screen will display the following message:

CP/M REG TM 2.2 SY 3.00
A>

Congratulations! Half of your headaches are over! Type DIR <RETURN>: The CP/M software on that diskette will be listed on the screen and you should be able to run it. (Refer to the CP/M Primer for more details.)

To use both sides of the diskette, modify the BIOS portion of your CP/M (per Dave Borden's, K8MMO, article in an upcoming installment).

If you are experiencing disk-drive problems, see note 23. Before incriminating your disk drives, remember that excessive heat tends to warp the diskettes, whereas if the air is too dry, you could encounter electrostatic problems. Now that your computer operates properly, Terry Fox, WB4JFI, and David Borden, K8MMO, offer application suggestions for your Xerox board.

The Xerox 820 Big Board
By David W. Borden, K8MMO, AMRAD

During 1985, Xerox sold a single-board computer (similar to the Texas Big Board) for $50. By the end of April, they were sold out! Many AMRAD members bought an 820, but were faced with one problem—how to get them working. Briefly describing the Xerox board: It has a Z80® central processing unit, 2-kbyte EPROM, 64-kbyte of memory, floppy disk controller, SIO (one user port and one printer port) and video and keyboard circuits. I connected a monitor, keyboard, floppy disk and power supply to my board and doctored it to working condition. My board arrived with a bad memory chip. I applied video modifications that I received from R. Dunbar, WØPN. I am providing this same information here so that you may get your board operating. First, I obtained the documentation from Ferguson Engineering, PO Box 300085, Arlington, TX 76010. They offer many other products for the Xerox board such as the CRT connector, CBIOS source, and so on. Write for details.

Xerox Video Modifications

Obtain a 10-pin video connector. You can either buy it or make one by taking a standard floppy disk cable connector (one that goes on the controller end) and cut it with a hacksaw or file it to 10 pins. These connectors are 0.1 inch pin to pin and 0.1 inch row to row. I used the hacksaw technique because I had extra floppy connectors.

I took the Zenith ZVM131 monitor that I used with my C 64 and connected it to the Xerox board. It had RGB input and separate horizontal and vertical sync inputs which is what Xerox provides. Correct the overscan by changing R10 from 180 kilohms to 22 kilohms, and R11 from 47 kilohms to 82 kilohms. If you have

[22]Notes appear on page 8

a monitor similar to my Zenith, connect the horizontal sync from the Xerox to positive horizontal sync input on the monitor. Link the vertical sync to the negative vertical sync on the monitor, and connect the video output from the Xerox to either RED, BLUE, or GREEN input on your monitor. The Xerox operates with +12, -12 and +5 volts (at 3 to 5 amps). Applying the power is another problem. The Molex® connector is a 9 pin type, available from many sources. I borrowed a matching power supply. If you use a monitor like mine, connect the floppy and go to work. If not, produce composite video as follows:

1. Remove R58, 150 ohms, near pin 7 of J1.
2. Remove R60, 150 ohms, between U106 and U117 near U105.
3. Cut trace from U117-10 near the pin on the bottom of the board.
4. Solder a 39-ohm resistor (use insulation tubing) between U117-10 and the right hole from where R60 was removed (it goes to J7-5).
5. Using one lead of a 100-ohm resistor, jumper J7-3,4,5 together and connect the other end of the resistor to J7-10 (ground).
6. Reverse the horizontal sync polarity by cutting trace to U15-4 (on top of board) between that pin and the adjacent feedthrough. Route a feedthrough to U15-13.
7. Check your sync pulse lengths. HSYNC should be 5.0 μs and VSYNC should be 400 μs.

When the Xerox board is converted to produce composite video, the display may "swim" slowly from side to side. This is because the vertical oscillator frequency is 58.76 Hz rather than 60 Hz, and this oscillator "beats" with the 60-Hz line frequency, causing the swimming video. This can be fixed with the following modification:

1. Cut the trace from U36-2 to U53-5.
2. Add a jumper from U36-2 to U53-4.

This changes the vertical frequency from 58.76 Hz to 59.96 Hz. This is a very simple modification, and can even be done on the top of your board if you already have it installed in a case.

You will now have composite video on J7-3,4,5 and ground on J7-8,9,10. Dunbar advises that if you have dc coupled input on your monitor, you may wish to couple the video through a 100-μF capacitor shift in the black level. He recommends a Zenith ZVM-122A amber/green monitor.

Xerox 820 Software

Concerning software: The CBIOS can be purchased from Ferguson Engineering. Install the new CBIOS on your current CP/M (you should buy another copy to use on this board). This gets you up and running using DDT and SYSGEN to get the board onto tracks 0 and 1 of an eight-inch disk. Boot the system by typing an "A" after pressing the reset switch. The Xerox 820 is a great buy and a quick way to CP/M.

The 820 and Packet Radio

By Terry Fox, WB4FJI, AMRAD

Latest Development Hardware

One agreement made at the 1985 ARRL ad-hoc digital committee was to standardize on the surplus Xerox 820 computer boards for developing network layer systems. These boards were available from the Xerox surplus center in Texas, in an assembled format, but not guaranteed. They make a great inexpensive computer to be run on packet radio.

AMRAD has received a disk that contains Z80 assembly language routines to make our Xerox 820 into a full-blown X.25 DTE device, including levels 1, 2 and 3. This code was written by Eduardo Elizondo, and is available on a non-commercial-use basis. We are looking into modifying this code to support the Amateur AX.25 protocol.

Another way to make the 820 packet is to remove the PIO chip, and install a daughter board that has a Zilog 8530 SCC chip on it and some timing logic. This board was designed by Howard Goldstein, N2WX, of the Florida Amateur Digital Communications Association (FADCA), and is being made available by Tucson Amateur Packet Radio (TAPR).[24,25]

I am using one of the Xerox boards, and have added a new level of hardware to it. I have placed an AMD 7910 world modem chip on another board that fits above the N2WX daughter board. This chip is driven by channel B of the SCC chip and works great as long as a squelched radio is used (the 7910 carrier-detect logic is easily fooled by noise).

The 8530 SCC is the same chip I am using in the design of the AMRAD PAD. The use of the SCC on the Xerox 820 may help the PAD tremendously. I can now generate and debug code on the Xerox under CP/M, and move it to the PAD when debugged. This eliminates a lot of EPROM burning. The main problem with the PAD is that there has been no code for it, but now there may be a way out.

Part 3 of the Xerox 820-1 Compendium will appear in the August issue of *QEX*. An article and the schematic diagram for a Xerox packet interface board will be featured, and K8MMO discusses the Xerox 820 packet radio software.

Notes

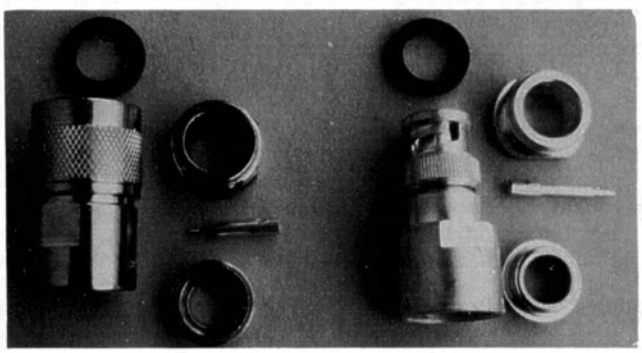
[22] A. Kesteloot, "Xerox 820-1 Compendium," *QEX*, Jun 1986, p 7.
[23] M. Mlinar, "The Xerox Column," *MicroCornucopia*, Apr-May 1985, no. 23.
[24] FADCA, 812 Childers Loop, Brandon, FL 33511
[25] TAPR, PO Box 22888, Tucson, AZ 85734

Bits

Nemal Offers New Connector Line

Nemal Electronics International of Florida has introduced a new line of connectors designed to fit the Belden 9913 and 8214 type cables. The connectors are available from stock both type N (part no. NE720) and BNC (part no. NE860) series and will accommodate the 9-1/2- to 11-gauge center conductors in these and similar cables.

Both series of connectors meet the electrical and mechanical requirements of MIL-C-39012 and incorporate silver-plated contacts and Teflon insulation. Each is fully compatible with other standard connectors in its series. For further information on this line of connector, contact Nemal Electronics International, 12240 NE 14th Ave, North Miami, FL 33161, tel 305-893-3924.—*KA1DYZ*



(Photo courtesy of Nemal Electronics Intl)