Xerox 820-1 Compendium—Part 4

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More on Packet ICOM-2AT Xerox 820-1 Connection

Let's continue to learn more about Xerox 820-1 applications for the computer ham shack.[30] I hooked the user parallel port to my ICOM-2AT 2-meter hand-held transceiver and was able to control the transmit and receive frequency; the ICOM acted similar to a scanner. I hope to accomplish frequency hopping using my equipment as a spread-spectrum receiver to snatch the elusive AMRAD beacon out of the airwaves. My project was completed in four hardware stages. First, the ICOM connection.

Hardware Stage One—The ICOM Socket

I cut a rectangular hole in the back of my ICOM 2-meter radio to hold a 16-pin socket. Do not do this if you want to continue using the radio in the traditional handheld service (riding around on your belt). The socket is glued to the back of the unit using model cement. Fig 2 shows the wire connections that are added to the 16-pin socket inside the hand-held transceiver. An alternative method is to bring a ribbon cable out the side of the radio. Either method works, but you have to connect the wires to the IC-2AT to change the frequency by computer. Twelve wires go to the small PC board inside the radio. The board is recognizable because a cable runs from it to the thumbwheel switches at the top of the compartment; we parallel it. You may also want to cut the wire that ties the 4-MHz line high and add an 8-MHz solder bridge while you are working in this area. This is a good idea—we do not want the thumbwheels to control certain functions simultaneously with the Xerox.

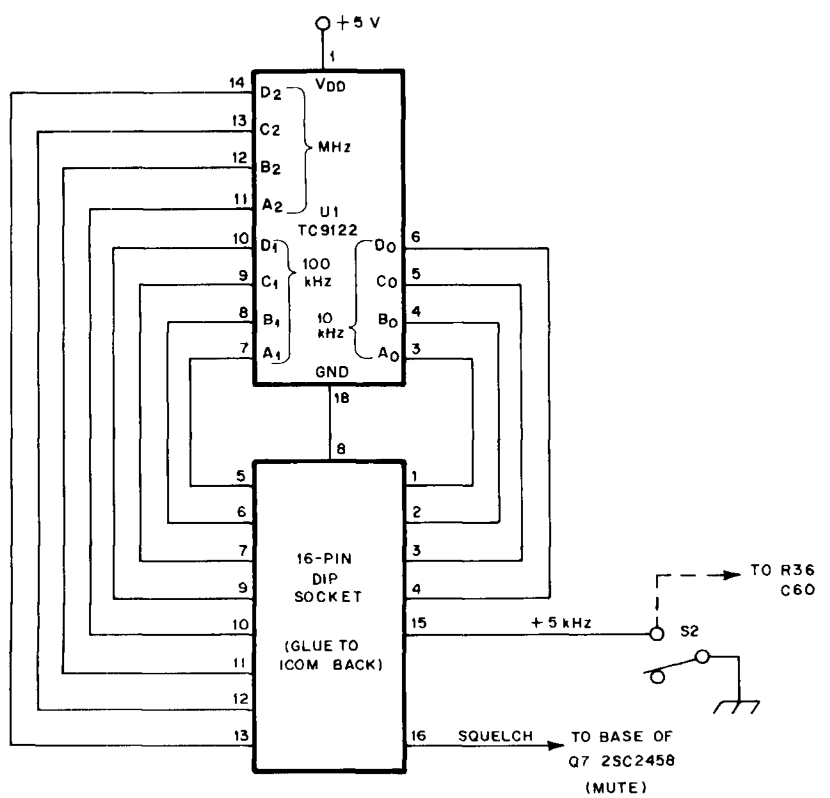

Fig 2—An ICOM IC-2AT is a perfect candidate for connecting the Xerox 820-1 board to for use on packet. The connections enable the hand-held transceiver to control the transmit and receive frequency when using the 820-1 with a computer.

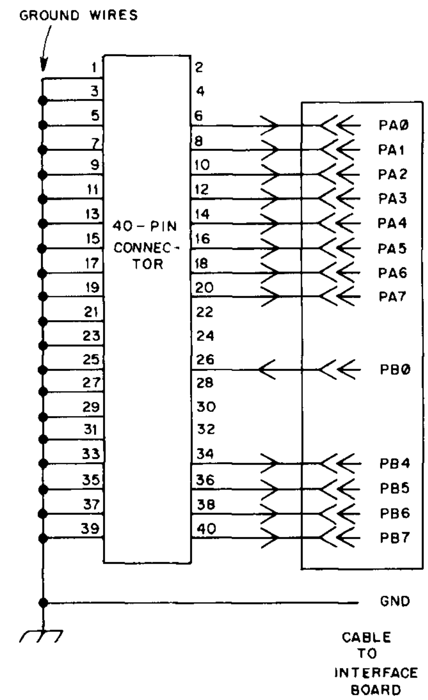

Fig 3—The 16-pin connector cable is wired from the Xerox at point J8 to the interface board. The ground wires must be added because Xerox omitted them.

What we have here are three BCD digits, four binary lines each. When a line is tied high (+5 V), that line is selected. The first BCD digit is MHz, the second is hundreds of kHz and the third is tens of kHz. While you are inside the transceiver, connect the squelch mute line (wire 13), ground (wire 14), and the 5-kHz line (wire 15) to the 16-pin socket. Leave one spare socket pin for future expansion. Next, use a 16-pin cable with DIP plugs at both ends to connect the 2-meter transceiver to the interface board.

Hardware Stage Two—Cable to Xerox

Obtain a 40-pin, 0.1 CTR Contact Socket connector (female). These connectors are available in grab bag type packages. This is plugged into the Xerox board at J8. Pin connections are shown in Fig 3. The 16-pin ribbon cable is wired from J8 to the interface board.

Notes appear on p 13.

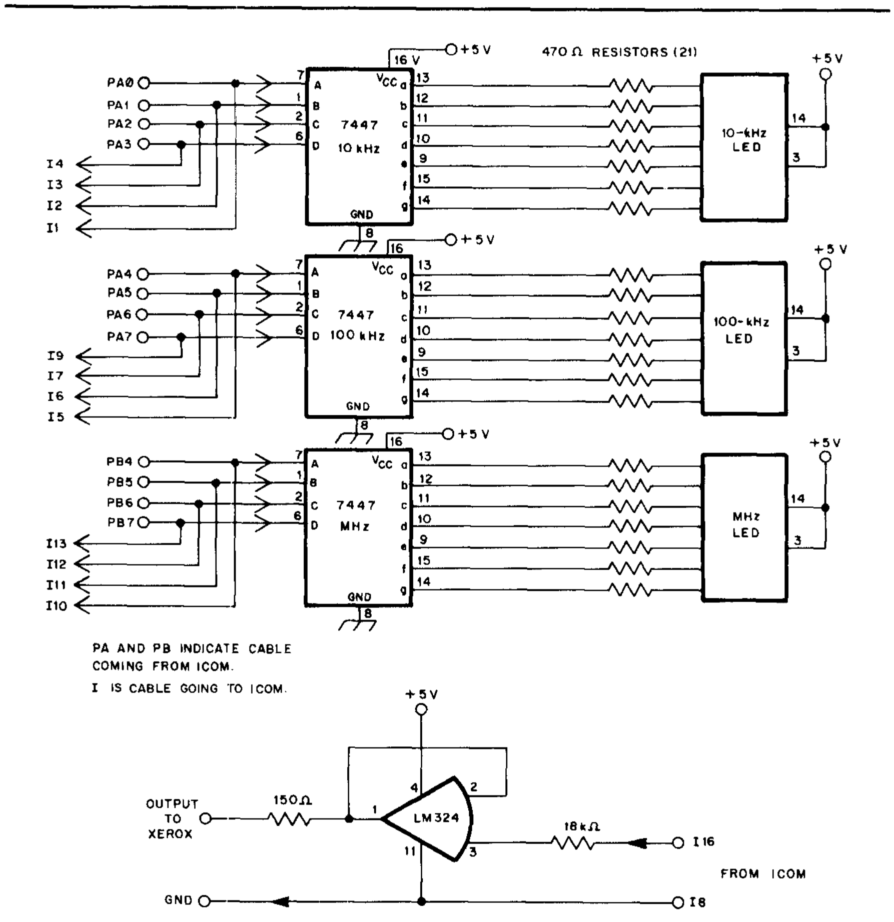

Fig 4—A frequency display board connected between the Xerox and IC-2AT tells the user where he or she is operating.

Hardware Stage Three—The Interface Board

Fig 4 shows a frequency display board I built from Radio Shack parts. Basically, the BCD digits I mentioned earlier are displayed. You must set the IC-2AT's thumbwheels to 000 (to prevent burning up your rig) and control the frequency from Xerox software, otherwise you may not know what frequency you are operating on. Elton "Sandy" Sanders, WB5MMB, dreamed up this gadget which he calls the ICOM simulator. It was to be used in place of the hand-held transceiver until the software was running correctly. I leave my unit in the line between the radio and the Xerox at all times to display the current frequency. The gadget simplifies the software. I added the op amp to read the squelch line and report any found signal to the Xerox for the software to look at. The frequency display could be eliminated and the frequency displayed on the Xerox monitor screen instead.

Port Initialization Software

You can use different kinds of software with this project. I first used Microsoft BASIC. The Xerox 820 PIO user port is initialized as follows:

```
 10 REM INIT XEROX 820 GENERAL
      USER PARALLEL PORT
 20 REM SET PORT A TO BIT MODE
      (MODE 3)
 30 REM 110001111
 40 OUT 9,2007
 50 REM SET PORT 1 TO ALL OUTPUT
      BITS
 60 REM 0000000
 70 OUT 9,0
 80 REM DISABLE INTERRUPTS ON
      PORT A
 90 REM 010000000
100 OUT 9,64
110 REM SET PIO PORT B TO BIT
      MODE (MODE 3)
120 REM 11001111
130 OUT 11,207
140 REM SET PORT B TO UPPER
      OUTPUT LOWER INPUT
150 REM 00001111
```

DIGITAL DEVELOPMENT CONTINUED...

```
160 OUT 11,15
170 REM DISABLE INTERRUPTS ON
      PORT B
180 REM 01000000
190 OUT 11,64
200 REM CLEAR ALL LINES
210 REM 00000000
220 OUT 8,0
230 REM 00000000
240 OUT 10,0
250 PRINT "INTIALIZATION OF THE
      PIO HAS OCCURRED"
260 STOP
```

After turning on the Xerox board and IC-2AT, run this program to initialize the PIO. Be ready to control the frequency.

Hand Setting Frequency Software

The following program allows me to hand set my transceiver to the desired frequency. Do not forget that the transceiver's thumbwheels are set to 000 for these tests! Failure to do so could result in a fried radio as both the thumbwheel's 5 volts and the computer's 5 volts attempt to set the frequency simultaneously.

```
   5 PRINT "AMRAD XEROX ICOM
       HAND SET PROGRAM"
  10 PRINT "ENTER MHZ-"
  20 INPUT MEGA
  30 PRINT "ENTER KHZ-"
  40 INPUT HUN
  45 PRINT "ENTER KT-"
  50 INPUT KT
  55 GOSUB 1000
  60 GOTO 5
1000 MH = MEGA*16
1010 KH = HUN*16
1020 KH = KH + KT
1030 OUT 10,MH
1040 OUT 8,KH
1050 RETURN
```

Scanner Software

The following program scans the 146.00- to 147.99-MHz frequency range to look for active signals. When one is found, the program stops for eight seconds and samples the find, then moves on. Stop the program with a Control-C and enter a small number (ie, 10)for "speed" if you want fast scanning. Enter a big number (like 200) if you want slow scanning. I discovered one drawback. When an active signal is detected, the radio stops for eight seconds, then continues, but there is a squelch tail. Thus, the next frequency to be detected, whether active or inactive, is also sampled and many an eight seconds may be wasted. Some software changes are called for to correct this problem.

```
 10 PRINT "AMRAD XEROX ICOM
      SCANNER PROGRAM"
 20 PRINT "SPEED="
 30 REM SPEED IS THE AMOUNT TO
      DELAY BETWEEN HOPS
 40 INPUT SPEED
 50 REM SAMPLE 146.00 TO 147.99
 60 FOR MEGA = 6 TO 7
 70 FOR HUN = 0 TO 9
 80 FOR KT = 0 TO 9
 90 REM GO OFF AND SET THE ICOM
      TO DESIRED FREQ
100 GOSUB 210
```


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```
110 REM NEW FREQ NOW SET, WAIT
    HERE "SPEED"
120 FOR Y = 1 TO SPEED
130 NEXT Y
140 REM DELAY OVER, SAMPLE
    SQUELCH FOR SIGNAL
150 GOSUB 280
160 IF (SIGNAL = 1) THEN GOSUB 330
170 NEXT KT
180 NEXT HUN
190 NEXT MEGA
200 GOTO 60
210 REM SET THE ICOM TO THE
    DESIRED FREQ
220 MH = MEGA*16
230 KH + HUN*16
240 KH = KH + KT
250 OUT 10,MH
260 OUT 8, KH
270 RETURN
280 REM SAMPLE SQUELCH LINE
    FOR SIGNAL
290 SIGNAL = INP(10)
300 REM MASK OFF THE MEGAHERTZ
    OUTPUT PART
310 SIGNAL = SIGNAL AND 1
320 RETURN
330 REM SIGNAL DETECTED,
    ANNOUNCE FREQ AND DELAY
340 PRINT MEGA, HUN, KT
350 FOR Z = 1 TO 2000
360 NEXT Z
370 RETURN
```

A FAD and A Modem

By Terry Fox, WB4JFI, AMRAD

TAPR has available an 8530 SCC (serial-communications controller) daughterboard for the Xerox 820-1.[31] It is called the frame assembler/disassembler, or FAD board. This board replaces the spare PIO on the 820.

The FAD board is not for everyone. It requires some modification of the 820 board and is handy for those who write code for the SCC for other devices (such as the PAD and IBM HDLC boards). TAPR has made the daughterboard available to aid in network development. Some operators will want to use the FAD, while others may wish to use the NRZI circuit K8MMO described in Part 3.

A Modem for the FAD

Fig 5 shows how to interface the AMD7910 World-Modem Chip® to either the 8530 SCC or the Zilog SIO. It assumes a direct connection to the SCC or SIO, not RS-232-C. This is the interface I use on my Xerox 820-1 board and it has a FAD board installed. I put the modem circuitry in the kludge area of the FAD board to conserve space.

Most of the interface circuit is based on the one in *The 1985 ARRL Handbook*. The serial signals are TTL levels directly from the SCC or SIO. If the modem is used with the FAD board, the modem clock (X1) can be derived from the SCC clock (pin 26, TRXC). If the modem is to be used with the SIO or another application where 2.4576 MHz is not available, a crystal of that frequency should be placed between X1 and X2. (It may be necessary to add two 15 pF capacitors, one between each end of the crystal and ground for stability.)

S1 and S2 are used to determine the mode of operation of the modem chip. S2 determines whether the modem operates in the Bell 103 (closed) or the 202 (open) mode. In the 103 mode, the modem is placed in loop-back operation to allow the same tones to be used for both transmit and receive. In the 103 mode, S1 is used

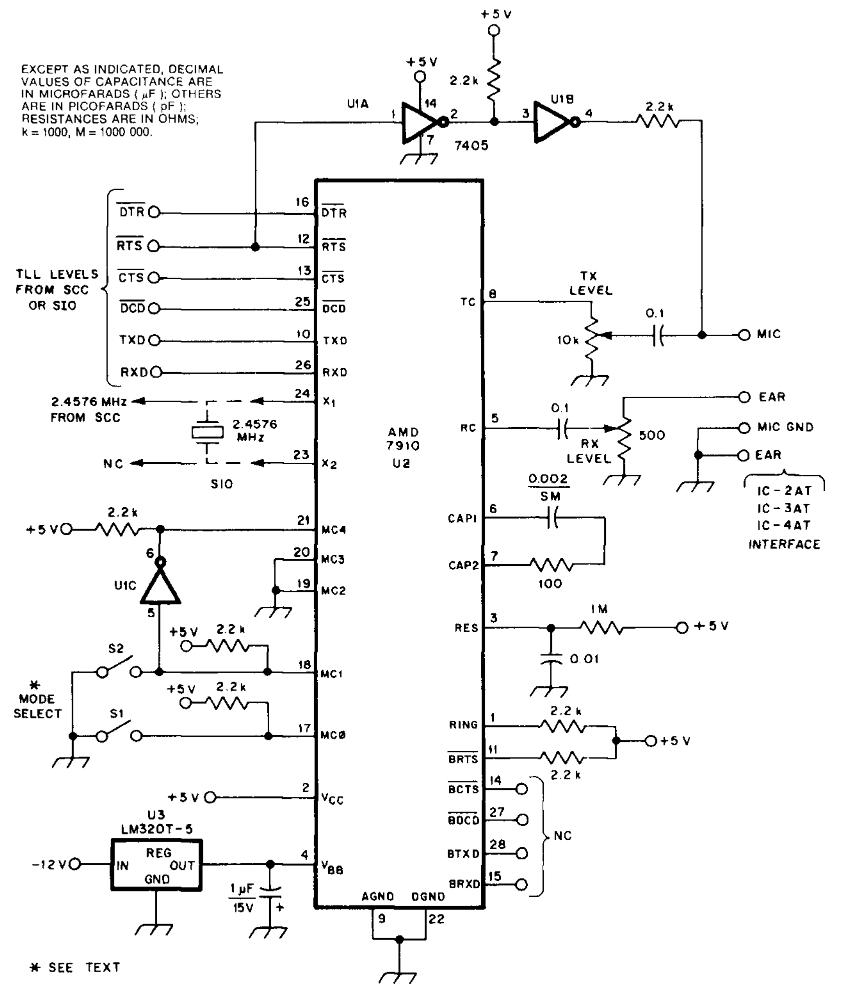

Fig 5—The schematic diagram shows how to interface the AMD7910 World- Modem Chip to either an 8530 SCC or a Zilog SIO.

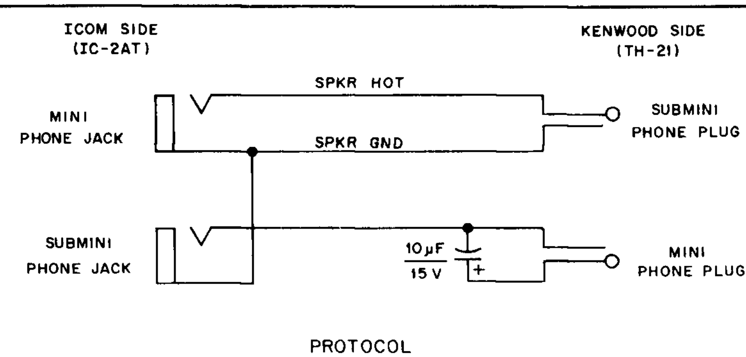

Fig 6—An ICOM-to-Kenwood interface.

to determine whether originate (closed) or answer tones (open) are used.

When S2 is open, the 202 mode is selected. In the 202 mode, S1 is used to enable/disable frequency equalization. I haven't determined that this makes much of a difference, so I leave S1 on; this switch position turns off the equalization.

The output interface drives an ICOM IC-2AT type radio. I use a Kenwood TH-21AT for my main radio, delegating my IC-2AT to packet work. Since I normally use the IC-2AT, most of my packet systems have ICOM interfaces. One day I was stuck with just the Kenwood HT, and had to devise a way to make it packet. In addition to the connectors being backwards, the Kenwood uses a different microphone interface. Fig 6 shows the ICOM-to-Kenwood translator I used. It looks strange, but it works.

I now send and receive frames using the FAD board with the described modem. The only requirement is that the radio used have a squelched speaker line, otherwise the 7910 carrier detect finds a carrier all the time in the noise.

Double-Sided Disk Drive BIOS Information

When you obtain a CP/M® system to run on your Xerox 820-1, and if you are intent on using 5¼ inch disk drives, check your BIOS (Basic Input/Output System) for single- or double-sided drives. You may have an old BIOS that only does double-sided drives by the A B C D system (80 kbytes per drive) instead of two large drives (170 kbytes per drive). To get the correct configuration, check your disk parameter block and header table. They may require modification.

[In our next installment, Dave Borden, K8MMO, relates to us his experiences with Fred and PACANSWR.]

Notes

[30]Parts 1 through 3 of this article appear in *QEX* issues for June, July and August 1986.
[31]TAPR, PO Box 22888, Tucson, AZ 85734

Bits

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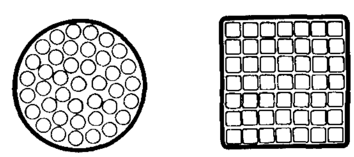

(A) (B)

Illustration of cross-section of typical coil winding using round magnet wire (A). Illustration of cross-section of coil winding using MWS Microsquare magnet wire demonstrates improved winding uniformity and maximum use of space (B). ***(graphic courtesy of MWS Wire Industries)***

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