Technical Correspondence

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C64 WEFAX IMPROVEMENTS

☐ Many amateurs have indicated a desire for additions to the material I presented earlier.[1] The requests include a simpler interface (that requires no external power supply), better resolution of the fine print on the WEFAX maps, the ability to copy satellite pictures with gray shading and—last, but by no means least—automatic synchronizing and map scheduling. To this list, I added my yearning for less paper consumption, given the limited space on my sailboat to store boxes of paper.

In order to display the gray shades in satellite pictures, we need to accurately measure the incoming audio frequency during each pixel period. The computer can easily do this by counting its own clock pulses between zero crossings of the audio signal. Because the pixel sampling cannot be synchronized with the varying audio frequencies, accommodation of the "slip" between them is needed, so two counting registers are used.

Refer to Fig 1. The Y register is used to store the count between the beginning of each pixel sample and the next audio-signal

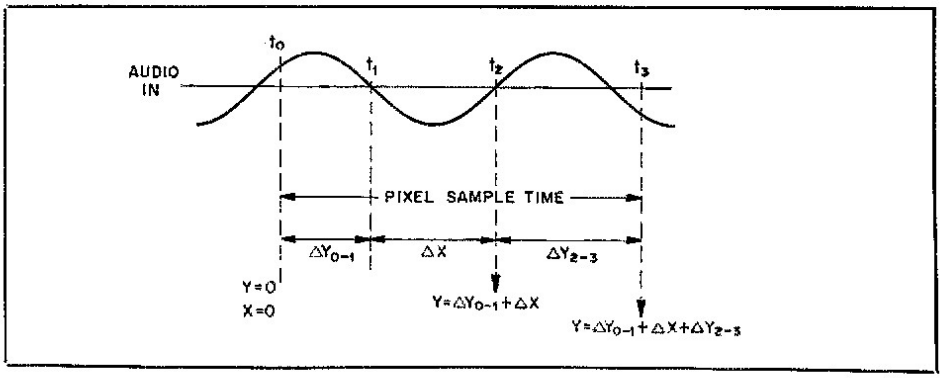

Fig 1—The X and Y registers are used to count the half-cycle period (X register) and the pixel sample time (Y register). ΔX is added to the Y register at t_2, and Y continues to count to t_3.

[1]B. Vester, "HF WEFAX For the IBM® PC, PCjr and C64," Technical Correspondence, May 1987 *QST*, pp 40-43.

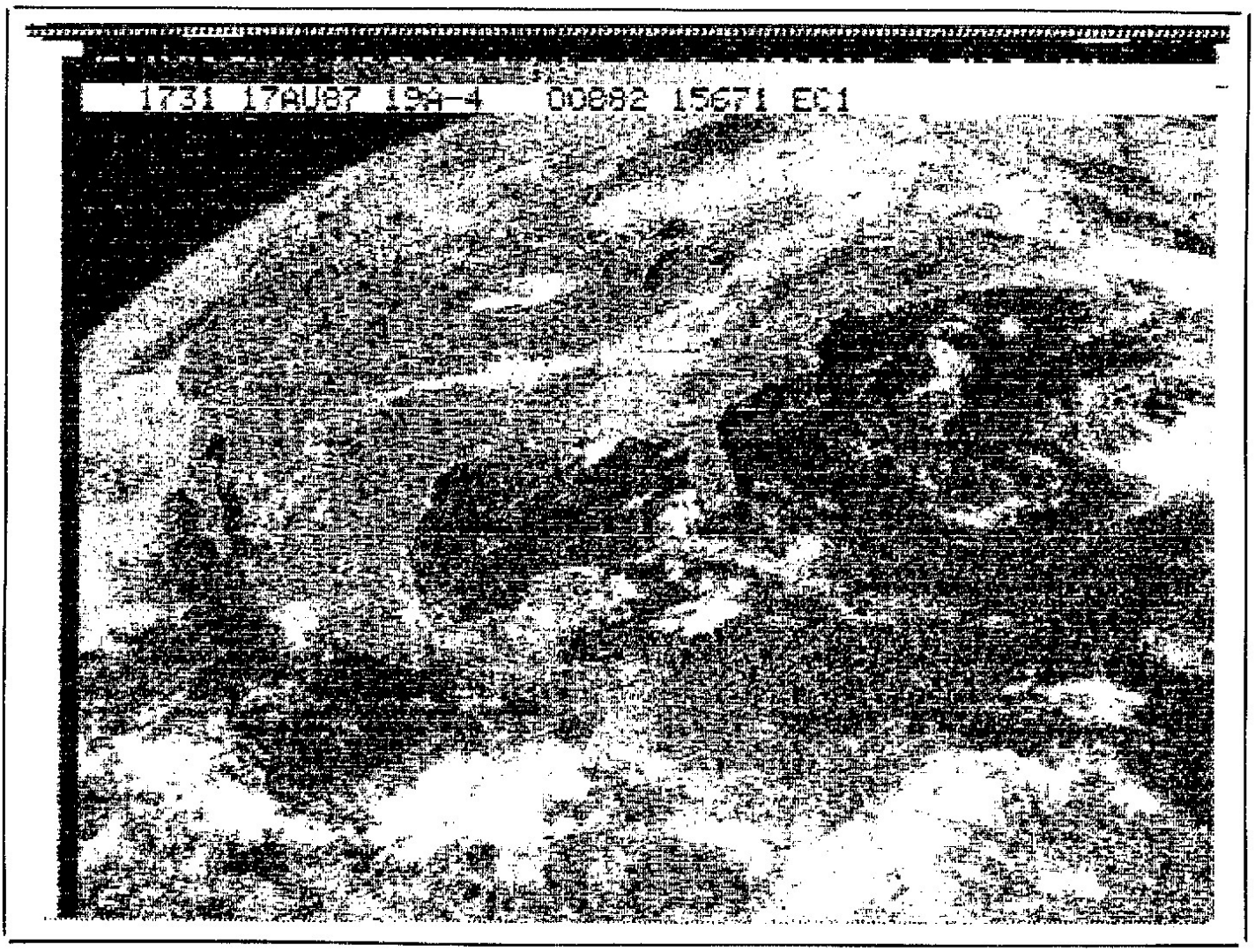

Fig 2—Typical satellite picture with five shades of gray. The weight of dot density v frequency was not yet optimized. This picture was printed with the dot density equal to the linear functions of X (ie, half-cycle period).

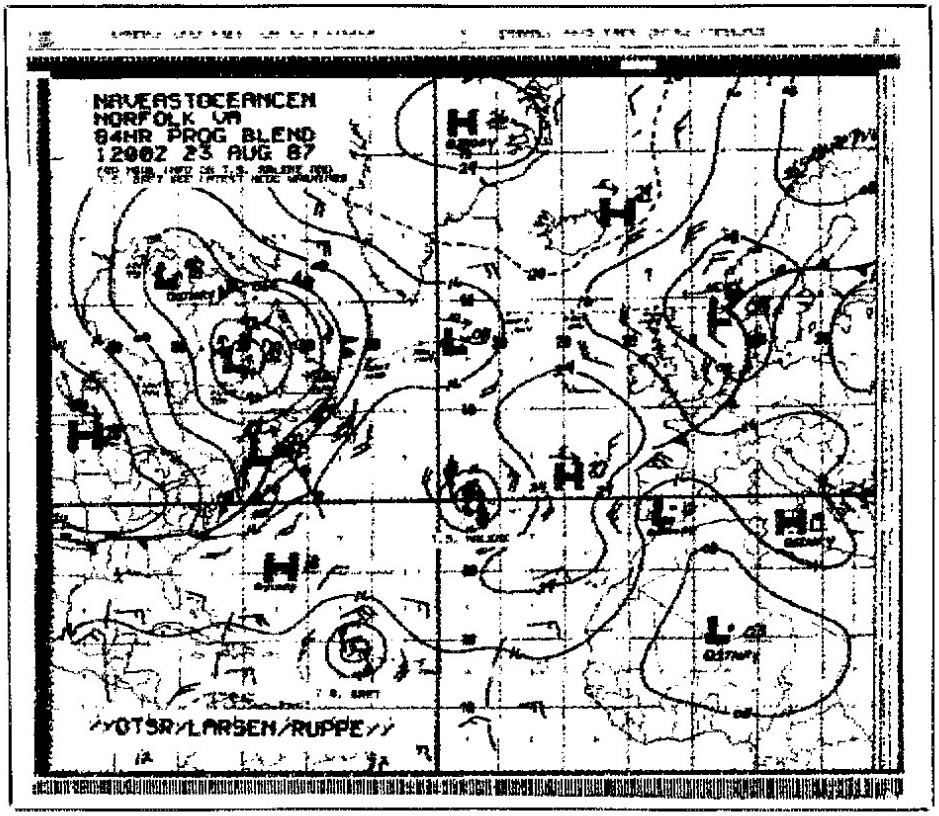

Fig 3—Tropical storms Arlene and Bret pass in the mid-Atlantic. Bret is coming in on the Easterlies, and Arlene is going out on the Westerlies.

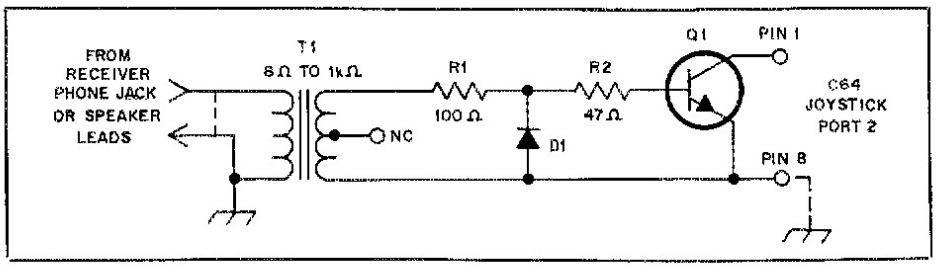

Fig 4—The interface between the receiver and computer can be boiled down to the simple clipper circuit shown here. Because you can't tell on which half-cycle (positive or negative) each pixel measurement will be made, you want symmetrical clipping. Q1 shorts the joystick pin to ground on the positive half of each audio cycle. Parasitic suppressor R2 should be connected to Q1 with short leads. You can even eliminate T1, but with some loss of symmetry and the possibility of injecting hum from ground currents between the computer and receiver.

Q1 can be any transistor with a beta greater than 100. D1 can be any general-purpose silicon diode (such as a 1N914). The values of R1 and R2 can be selected to optimize clipping symmetry (using the TUNE program). T1 is a miniature, 8-Ω: 1-k Ω audio-output transformer (RS 273-1380).

zero crossing. The X register holds the count between this zero crossing and the next one (ie, the half-cycle period), and its value is stored as the audio frequency reciprocal for that pixel. Then, the X-register value is added to that of the Y register, and the Y register continues to accumulate the count to a number dictated by the desired pixel size. At the lowest audio frequency (1200 Hz), this barely fits into a pixel period for 600 pixels per half-second line. The count is kept to that within the capacity of one register (256 counts) by actually making one count every nine machine cycles.

To print maps, the X register count for each pixel is compared to a single number, and the resulting 1 or 0 rolled into the byte stream that goes to the printer (or screen). To print satellite pictures, each pixel is made up of four adjacent dots—two down and two across. This provides five possible gray shades. By comparing the X register count for each pixel with four different threshold values, a decision is made as to which dots will be printed.

A large X-register value (the black level equates to the low frequency on USB) will exceed all four thresholds and all four dots are printed. Mid-range X-register values will cause only one, two or three dots to print. My reason for choosing four dots per pixel (instead of the six that are available in the near-letter quality, NLQ, mode with the same pixel size) is that my Seikosha 1000I printer isn't fast enough to lay down that many dots per line in real time. See Fig 2 for a sample picture.

In the map modes, I chose to use the printer's NLQ capabilities to print the dots closer together—three times more dense vertically and twice as dense horizontally. This allows the use of every other line (instead of every third line) of the incoming data stream, and results in a 50% increase in vertical resolution. To maintain proper perspective (have circles print as circles), the horizontal dots work out to 528 pixels, which matches the possible audio-measuring period very nicely. A sample of this is shown (full size) in Fig 3.

I have NLQ condensed-mode programs for use with the Sueker[2] interface and the simple clipper circuit of Fig 4. With the same resolution parameters, the simple interface gives better readability of the fine print on the maps than does the Sueker interface (less horizontal smear). A comparison is shown in Fig 5. (Table 1 shows coding changes to the original Sueker pro-

Table 1

Code Changes To Original Sueker Program

```
2536  LDY #$00
2538  LDX #$00
253A  LDA $DC00
253D  INY              Count loop Y
253E  CMP $DC00
2541  BEQ $253D
2543  LDA $DC00
2546  INX              Count loop X
2547  CMP $DC00
254A  BEQ $2546
254C  STX $43FE        Add X to Y
254F  TYA
2550  ADC $43FE
2553  TAY
2554  CLC              Count loop
2555  INY              Y to $5B
2556  CPY #$5B
2558  BCC $2554
255A  CLC
255B  CPX #$22
```

Replaces:

```
205A  LDA $DC00
205D  ROR
2061  JSR $2130
```

The extra lines of code in the C64 program (2536-255B) are substituted for those shown in Sueker's program (205A-2061) and eliminate the need for the Sueker interface. (The code shown is not directly transferable to Sueker's program.) Line 255B (205D in Sueker's program) results in the carry bit being set to 1 when the pixel is black. The joystick port address is $DC00; $5B is the pixel period; $22 is the black-level threshold.

[2]K. Sueker, "Real-Time HF WEFAX Maps on a Dot-Matrix Printer," Mar 1986 *QST*, pp 15-20.

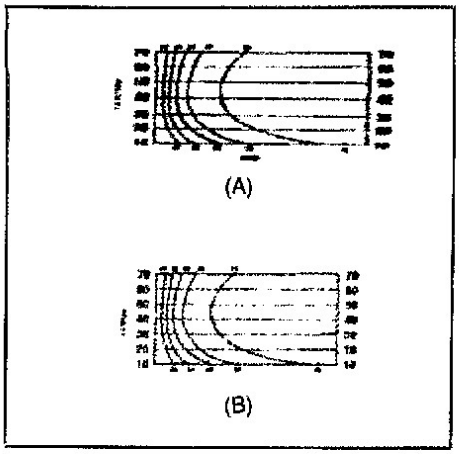

Fig 5—A comparison of picture sections made with the Sueker interface (A) and the simple interface (B).

gram to allow the use of the simpler interface.) These two picture samples were taken at noon to minimize multipath smear. The condensed mode, incidentally, is more readable than the full-width mode even though it is smaller. (The difference is comparable to that of NLQ v draft printing.) I do, however, occasionally have to use a magnifying glass to read the map. The condensed mode uses paper at half the rate of the full-width mode, and each map has a convenient note space next to it.

An automatic synchronizing code measures the black-dot count per line to detect the repeated 95% black lines during the sync period. The code then actuates the left edge of the picture just as a white tick occurs.

The scheduling program simply uses the computer's clock to turn the copying program on and off at whatever times you enter. A TUNE program is included to set up the receiver tuning before each copying period. This program also directly measures the clipper asymmetry so you can adjust the audio level for best results.

All of the accompanying pictures were made with an 8-dot, IBM-compatible printer using the Cardco + G printer interface with the C64. (The Xetec printer interface should also be compatible.) As is, the program should work with any printer using the 960-dot line command: CHR($27);"L";CHR$(n1);CHR$(n2), and the command CHR$(27);"J";CHR$(n) to advance the printer platen by n/216 inch. You can POKE in your own printer commands by merely adding a program line to the BASIC program used to control the whole operation.

Because a lot of folks still have 7-dot printers and may be interested in using the simple interface of Fig 4, I developed a program to accommodate them. Of course, the condensed mode and gray shades require an 8-dot NLQ printer, so are not available with the 7-dot program. (A good medium-resolution screen display program is included on the disk.)

I'll be on a sailing cruise when this information is published, so I've arranged for the New Bern Amateur Radio Club to provide disks to interested readers; their fee is $10 per disk. Be sure to specify which printer you're using (7- or 8-dot), and which interface (Sueker or simpler clipper) you plan to use. You can obtain the disks by contacting the New Bern ARC, PO Box 2483, New Bern, NC 28561.—*Ben Vester, K3BC, 4921 Bonnie Branch Rd, Ellicott City, MD 21043*

TANDEM MATCH CORRECTIONS

☐ There are six errors in the schematic diagram of "The Tandem Match—An Accurate Directional Wattmeter," Jan 1987 *QST*, pp 18-26. These errors are all located in the signal-processing portion of the circuit (p 23) and occurred from my incorrect tracing of the maze of wires on the original breadboard. The corrections include:

- The 330-kΩ resistor should be connected between the −2.5 V supply and the cathode of D14 (TP 9), not pin 6 of U4B.
- Change the diagram to show pins 4 and 7 of U7 to the 2.2-kΩ resistor attached to pin 1 of U3A; pin 8 of U7 connected to pin 2 of U3A.
- Insert a 1N914 diode in the line between the collector of Q4 and the circuitry associated with U3D and U7. The anode of the diode is connected to the collector of Q4, the diode cathode attaches to pin 13 of U3D.
- The 1-kΩ resistor and D10 connected between U4A pin 1 and the two 100-kΩ resistors should be eliminated and replaced by a direct connection between these two points.
- The jacks on the right-hand side of the diagram (p 23) labeled J1 and J2 should be labeled J3 and J4, respectively.
- On p 20, Fig 5, the 57-Ω resistor should be labeled 50-Ω.

Radio Shack no longer lists ICs U1-U4 numbered 276-1749 and 276-1750. Some stores may still have them in stock, however. There are other sources of supply for various items. The TLC27L2, TLC27L4 and CA3146 ICs can be purchased from Newark Electronics, 4801 N Ravenswood St, Chicago, IL 60640, tel 312-784-5100. The 1N5711 diodes are available from Surplus Sales, 2412 Chandler Rd, Bellevue, NE 68005, tel 402-733-9190. The LM334, LM336, 1% tolerance resistors and trimmer potentiometers are carried by Digi-Key Corporation, 701 Brooks Ave South, PO Box 677, Thief River Falls, MN 56701, tel 800-344-4539.

I've received many inquiries concerning the T-50-3 toroid material used for transformers T1 and T2 mentioned on p 24; the number is correct. Type 3 material is required to obtain sufficient inductance for the transformers to work on 160 meters. If Type 2 or 6 material is used, the directional coupler will not work on 160 meters, and may not work on 80 meters. Type 3 material works fine through 50 MHz, and at 50 MHz, the difference in performance between Type 3 and Type 6 material cannot be measured.

On p 26, the date in note 8 should be corrected to read 1964.

My thanks to Dick Green, KA1LBW, who spent much time and effort working with me to locate the errors, and who provided the list of parts vendors. Lastly, please make note of my new address. —*John Grebenkemper, KI6WX (ex-KA3BLO), 19490 Miller Ct, Saratoga, CA 95070*

[Editor's Note: Photocopies of the corrected schematic diagram (p 23) for The Tandem Match are available free of charge from the Technical Department Secretary, ARRL, 225 Main St, Newington, CT 06111. Please identify your request as Corrected Tandem Match Schematic Diagram, QS-01/87.]

Note: All correspondence addressed to this column should bear the name, call sign and complete address of the sender. Please include a daytime telephone number at which you may be reached if necessary.

Feedback

☐ In "Amateur Radio and the Blind, Part 1," Oct 1987 *QST*, please make this change to the sidebar on p 28, left-hand column, fifth entry. The correct spelling of Bill's last name is Gerrey, and his call sign is WA6NPC. (Tnx to Ricardo J. Alfano II, W6FWX, for this information.)

☐ Author Steve Stuntz provides us with the following corrections to his article, "A Packet Terminal for Atari Computers," Nov 1987 *QST*, p 17, Fig 4. On the DB-25 connector, the TRANSMIT DATA line should be shown connected to pin 2 (not pin 1); the RECEIVE DATA line connects to pin 3 (not pin 2).

Strays

I would like to get in touch with...

☐ anyone with a schematic/parts list for a Knight KG663 regulated power supply. Lyle Seehorn, W7YKA, 3625 SW 328th St, Federal Way, WA 98023.

☐ anyone with a schematic and parts list for a Midland Model 13-500 2-meter rig. Harold McCullen, K8LNR, 2215 N Charles St, Saginaw, MI 48602.