COMPUTER CB SCANNER

How to use your computer to scan the CB channels

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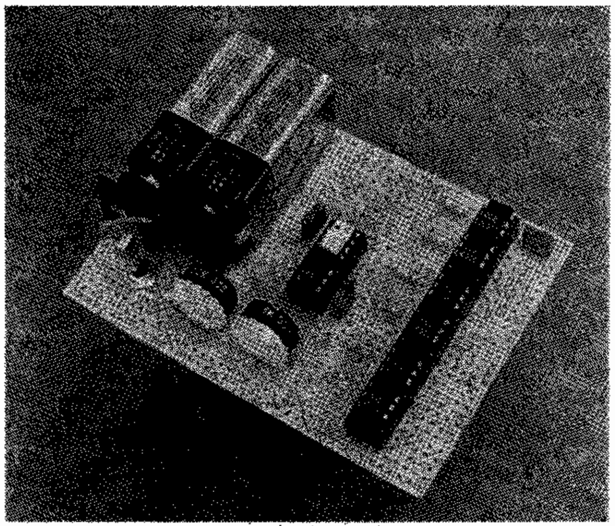


THE COMPLETE CIRCUIT, ready for installation and use. Wire wrap techniques were used by author, on perf board.

■Although the CB craze seems to be over, there continues to be a great deal of activity on the channels. In fact, now that the first rush has passed, activity seems to have become more serious. Fire up your transceiver, and you'll find social groups using the inexpensive conference-call, REACT on channel 9, your neighborhood townwatch, security at civic and sports events, hobbyists, local paging, and of course, the channel 19 circus. While your interest may be piqued, I suspect that you will soon rediscover why you abandoned CB in the first place. We grow weary of constantly flipping that 40-channel switch looking.

Use the computer

How much more convenient it would be if, using a home computer, we could directly access any channel from the computer's keyboard, or step through the channels one-at-a-time, or rapidly display the activity on all 40 channels (like an oscilloscope) or even scan a pre-set group of channels, stopping on one of them when there is activity (like a scanner)? If you have a recently-manufactured CB that uses a phase-locked loop integrated circuit (PLL IC) synthesizer instead of individual crystals, and a home computer, the above features are simple to implement. And if yours is a Commodore C64, SX64 or C128 computer, the programs are already written for you.

Locate the schematic diagram of your CB transceiver, or open the unit up and take a look around. Make sure you disconnect it from the power source first. Near the 40-channel selector switch, will be the PLL IC. Chances will be good that it is a type LC7131, used in many Cobra and Radio Shack units. Should it *not* be a 7131, don't worry. Although I will be describing the 7131, the basic principles are the same for all PLL IC's.

Note that there are six lines going from the selector switch to pins 1 through 6 of the 7131 chip. These lines contain the binary-coded decimal (BCD) value of the channel number, and hold the unit's digit, lines 5 and 6 hold the tens digit. As an example, channel 23 is coded:

PIN 65:4321 : DATA 10:0011 : CHANNEL 2: 3

Channel 40 is an exception, it is coded all zeroes. A data 1 means about 9 volts on that pin, a data zero is about 0 volts. So there is the plan, set the selector switch to channel 40, and have a home computer's peripheral port control these lines to select the desired channel. Then have the computer "read" the S-meter with the game paddle port. Any home computer will do, as long as it has a peripheral port and a game port that you can control.

Other chips?

If you found other chips than the 7131, such as the uPD2824 or the LC7132 used in some Radio Shack units, you're still in business. The 2824 is almost identical to the 7131. The 7132 uses 8 lines instead of 6 to control the channel, so the coding will be different from what I have previously described. Spend a few minutes with a voltmeter, and by changing the selector switch while you test pin voltages, you can figure out the coding for most any PLL IC.

Look at interface circuit, Fig. 1., showing the optocoupling to pins 1 through 6 on the 7131 PLL IC. A data zero on the cathode of optocoupler OC1 allows

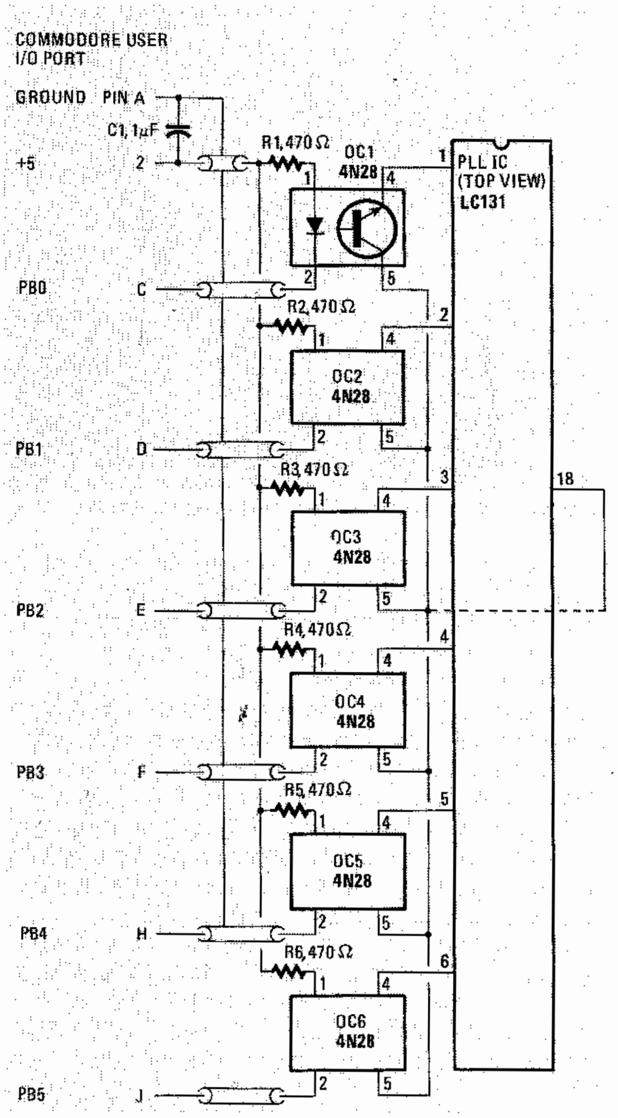


FIG. 1—SCHEMATIC DIAGRAM of the interface circuit, linking the computer's peripheral port to the PLL IC in a CB transceiver.

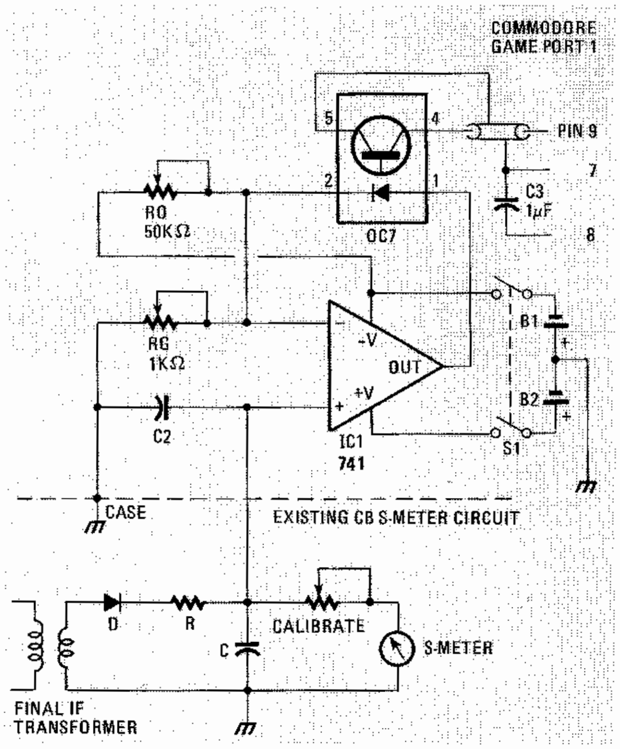
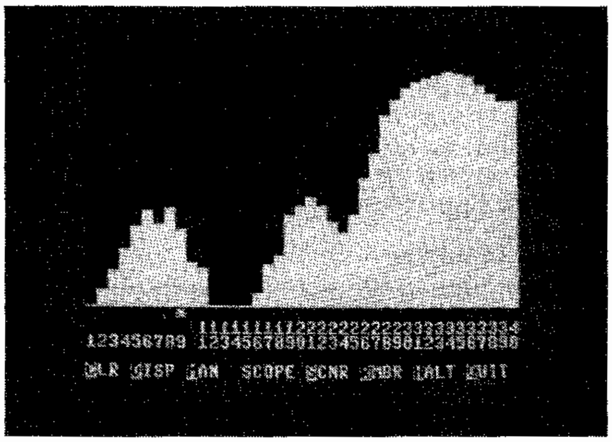


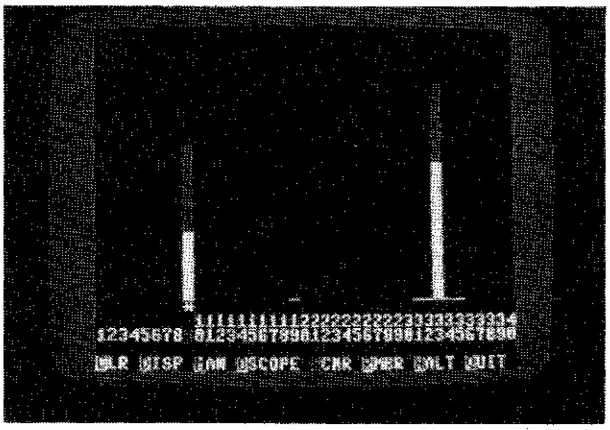
FIG. 2—S-METER buffer amplifier interface circuit is shown here schematically.

current to flow from the +5 volt supply from the computer into the peripheral port (PBO on the Commodore). That turns the transistor on, allowing current to flow from pin 18 to pin 1 of the PLL IC, placing a data 1 there. The 6 optocouplers are required to isolate the computer's from the transistor's differing voltages, as well as to prevent the RF hash from the computer from interferring with CB reception. Even so, be sure to use shielded cable from the peripheral port to the optocouplers, as shown in the schematic.

The S-meter level is communicated to the computer's game paddle input by a simple 741 op-amp and another optocoupler. The circuit is shown in Fig. 2. A typical S-meter circuit consists of a diode detector on the final IF transformer, and a smoothing



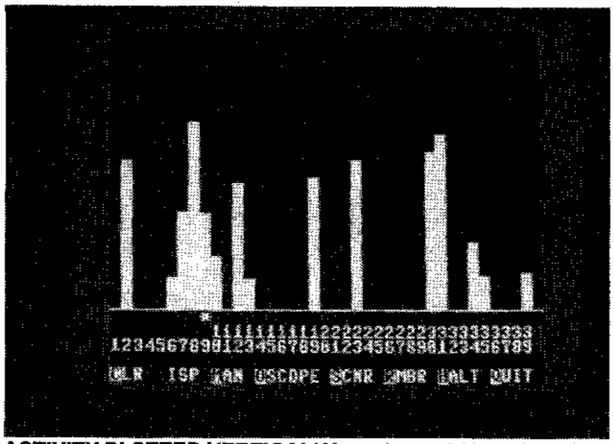
THE COMPUTER MONITOR, showing display of activity plotted vertically on the 40 channels. Observe the bleed-over on channel 8 to adjacent channels caused by overmodulation.



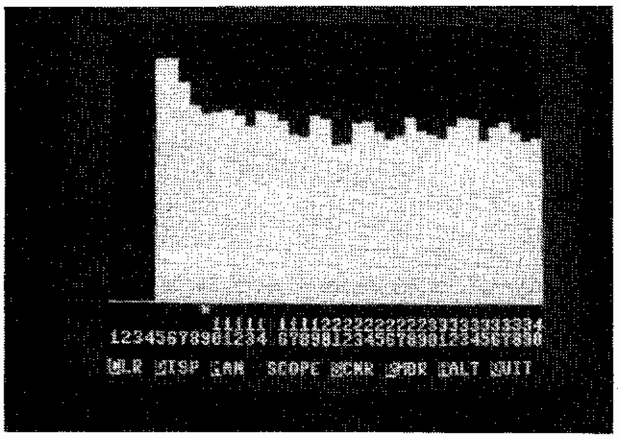
VERTICAL PLOT OF ACTIVITY ON CHANNEL 15 plotted as a function of time (horizontal). A transmitter has just keyed up. Notice the overshoot of the receiver's automatic gain control (AGC).

filter, R and C. The attack time constant is T = RC seconds (without C2). We sample the voltage V on C with the op-amp, which forces a current i = V/Rg through the optocoupler diode. Thus, trimpot Rg sets the gain of the circuit. Offset current is provided by trimpot Ro. These gain and offset levels will be set later so the range S1 through S9 + 30 dB on your S-meter results in the correct display range on your computer. Also, C2 must be chosen so that T is about twice as long as the digitization speed of the computer's paddle port. For the Commodore, a reading is completed every 512 phase-two cycles, about 0.0005 second. So choose C2 so that T = RC + C2) = 0.001 second. If you cannot determine R and C for your CB, a good value to try is 1 microfarad. The resulting current through the optocoupler diode varies the resistance between the collector and the emitter of the transistor, functioning like a variuable resistance paddle. That resistance is digitized by the computer.

The cost of these materials is less than $15., depending on how fancy an enclosure you buy. You can use simple point-to-point wiring on perf board. Wire wrap is particularly easy with the IC socket pins, and these can be tack-soldered to the foil side of your CB. You can tap the S-meter voltage between C and



ACTIVITY PLOTTED VERTICALLY on channel 10 against time (horizontal). A distant transmitter is seen fading in and out, indicating poor skip conditions.



SCANNER OPERATION. Channels 9, 19, and 31-35 have been programmed. Channel 33 was last active, but has timed out. Channel 9 is presently being monitored.

transceiver ground, from the C-side of R or the calibrate trimpot.

PARTS LIST

Semiconductors
OC1 - OC7—4N28 Optocouplers
IC1—741 Op-Amp

Resistors
(All resistors ¼ watt, 10% unless otherwise specified)
R1 - R6—470 ohms
Rg—1000 ohm gain trimpot
Ro—50,000 ohm offset trimpot

Capacitors
C1, C3—1μF ceramic, 50V
C2—See text

Miscellaneous
B1, B2—9-volt batteries
S1—DPST or DPDT switch
24-pin female edge connector for Commodore I/O port, 9-pin DB9 female connector for Commodore game I/O port, enclosure, shielded microphone cable, IC sockets.

The software

Once you have the circuit working poroperly, you will need to work on the software. Initially, you can use simple POKE's and PEEK's from BASIC to see if the coding for the PLL IC is correct. A complete program should enable to you to:

-directly access any channel by using the keyboard digits
-step up or down a channel at a time
-display the activity on any all 40 channels
-display, in oscilloscope fashion, the activity on a channel
-scan a programmable set of channels, stopping to monitor whenever the activity exceeds a threshold.

If you have a Commodore computer and wish to avoid re-inventing the wheel, I can send you a machine language routine which implements the above functions. Just send a *new, formatted* but otherwise *blank* diskette with your name and address *on the disk* and a sturdy, stamped, self-addressed envelope to: Dr. F. P. Maloney, Department of Astronomy and Astrophysics, Vilannova University, Villanova, PA 19085. The disk and full operating instructions will be returned to you.