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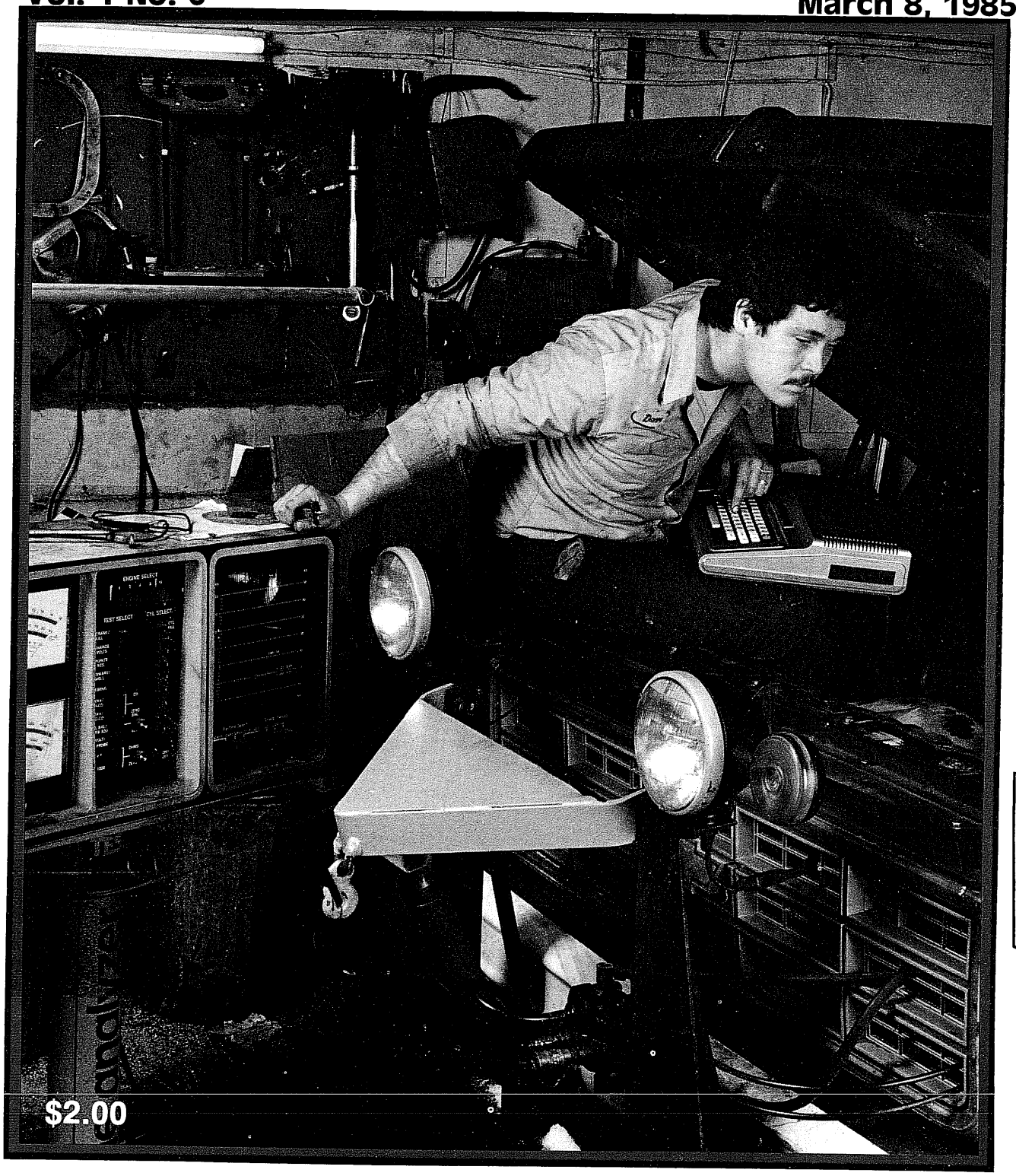

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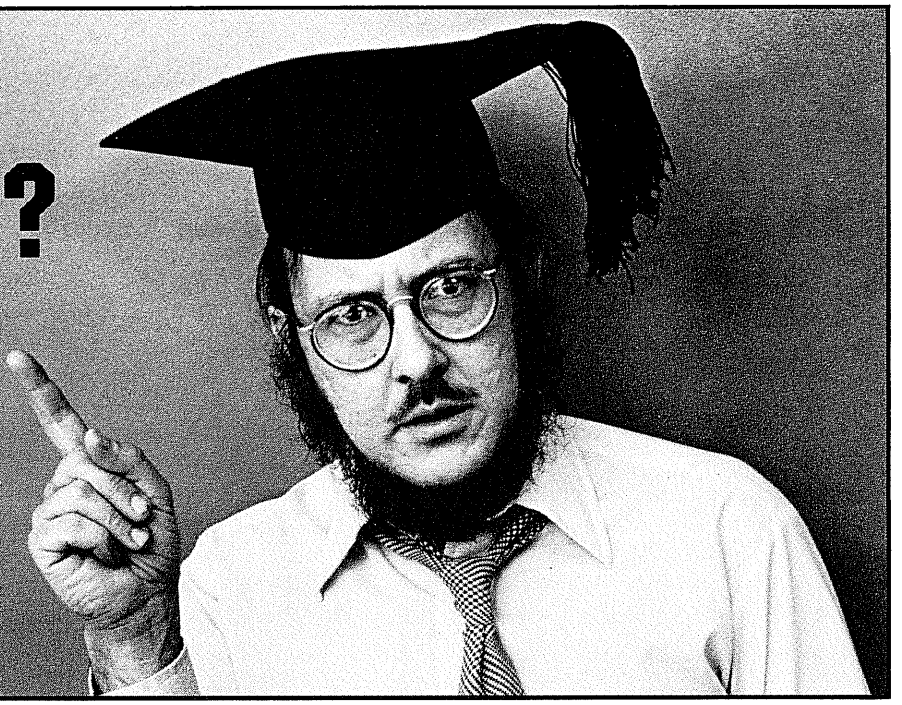

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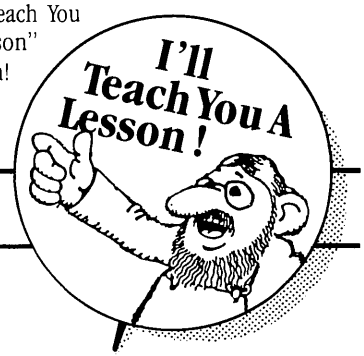

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Defuse

By Terry Kepner

I have a 32K Extended Basic Color Computer, revision E, and I've heard that the chips are actually 64K but you can only access 32K. When I looked in the October '83 TCCM, I found the 64K upgrade. When I opened my CoCo I found all the steps except for 7#10 already done. My RAM chips are marked MCM66331AP20. Are they 64K chips? What can I do, if they are 64K, to access most or all of it?

Also, I want to know if my CoCo is compatible with Color Basic 1.2 and Extended Basic 1.1, and where I could get these IC's.

I saw a CPU called a 68B09E. Is it better than the original, and is it compatible?

Alan Salisbury
Lorton, VA

Yes, the chips are 64K. If you want access to the full RAM, finish steps 7–10 in Dennis Kitsz's article on upgrades. You won't be able to access the upper bank of 32K unless you use a special assembly language driver, such as Dr. Preble's VDOS, or Spectrum Projects (P.O. Box 21272, Woodhaven, NY, 11421) 64K Utilities.

The other Basics just correct minor errors with the previous versions; other than that they perform exactly alike. If you really want to upgrade your computer to the newer ROMs, you can buy them from Spectrum Projects.

The 68B09E is a faster version of the standard 6809E. Since the upper speed limit of the Color Computer is determined by external chips and the SAM or 6809E, getting the new "B" chip really wouldn't be much help.

You once said to cut out C85 to get the Vitamin E POKE. After you cut it out, should you leave it open, or attach a shorting wire?

I have an interference problem with my computer. In my disk manual it says this is because of grounding clips not installed in earlier model Color Computers. The manual states that Radio Shack will install the grounding clips free of charge, but so far two Radio Shacks have refused to work on it because I didn't purchase it from their stores. Can you tell me how to get the grounding clips and where to install them, without dealing with Radio Shack?

My printer has a feature in it that allows a hex dump of all data coming into it. It is put into this mode by pressing the FF (form feed) button while turning the printer on. Every time I attempt to print in this mode I get normal printer characters, not the hexadecimal numbers I expect. How do I fix this problem?

And finally, I was wondering if it is possible to somehow turn off Disk Basic after a program is loaded from disk, or at least recover the area of memory after the text screen and before the graphics pages.

I have a 32K Disk Basic Color Computer with an E board and an Epson RX-80 printer with an SP-2 interface at 9200 baud from CNR engineering.

Cyrus Dadgar
Lafayette, IN

Leave the removed capacitor open—don't wire it closed or you'll damage your computer.

Radio Shack stores are supposed to provide service to all owners of their computers, regardless of where they were purchased. I would first ask for the store manager, and if I got no satisfaction, ask him for his district manager so you can file a complaint. In any case, the grounding clips are available from Tandy National Parts, 900 E. Northside Drive, Fort Worth, TX 76102, 817-870-5662. Mastercharge and Visa are accepted and each order includes a $1.50 handling charge. The instructions are included (the clips are installed on either side of the ROM cartridge connector on the Color Computer circuit board).

It sounds like you have a printer problem, not a computer problem.

To disable Disk Basic: POKE 298,0:POKE303,0. This won't give you more RAM but you can now use the area between the video display and the graphics pages for other purposes. (It also disables the PCLEAR command).

We are subscribers to the RCA Computer-Oriented Telex Service and are currently using Nelson's Super Color Terminal 2.0 (C) tape version in our 64K TRS-80 Color Computer. Unfortunately, this program does not give us a printed copy of what we are sending, and we were wondering if you could suggest a program on tape which would have this additional feature.

Hans W. Koch
Hans W. Koch Co.
Hanover, PA

That depends on what you need: do you want only hardcopy of what you transmit? Or do you want hardcopy of everything received and sent?

In the first case all you need is a printer capable of operating at the RS-232C parameters used for telecommunication (the R/S printers are all set to 600 baud, two stop bits, and no parity checking, instead of the 300 baud, one stop bit, and even parity typically used for BBS work), and a 4-pin Y cable (one end plugs into the Color Computer, the other two ends can be plugged into two different devices).

If you have these two items, plug one end of the Y into your printer cable, the other to your modem. By turning on your printer (and setting its parameters to match the program) everything you send out from Super Color Terminal will be picked up and printed by the printer.

Another choice is the Radio Shack Deluxe RS-232C ROMpak, which doesn't hog the normal RS-232 port and echoes received data out that line to your printer.

Otherwise you have to get a hardware printer-port device and software that will echo everything to that port for printing. Ultra Term + (Double Density Software, 920 Baldwin Street, Denton, TX, 76205, $55.95 disk), with the PBJ (P.O. Box 813, N. Bergen, NJ, 07047) 80-column board ($139.95) and Parallel Printer Port ROMpak, will do the job, but the total combination is expensive.

Oefusr

Can you or any of your readers tell me how compatible the Tano Dragon (64K) is with the TRS-80 Color Computer? As far as I can see, Basic and the memory map are the same. Plug pin-outs are different and the Dragon has a built-in parallel port and video monitor output, but the plugs are easy to fix. What I'm really wondering about is the compatibility of some of the peripherals advertised.

Also, where can I find a list of the command and function tokens (or their addresses in memory) and after I get them, is there any way except typing out the words to access them? Without rewiring the board, that is.

Billy R. Pogue
Thatcher, AZ

The Basics are identical. As long as you stay with Basic programs, you'll have no trouble. The only source for the information about the tokens and such is the Tano Corporation. Write to them with your questions, as they do have the technical manuals available and will sell them if you need a copy or two.

The command and function tokens are only available through machine code programming. Trying to use them from Basic (except for the Disk ROM hooks) will just lock up the computer.

The peripherals should all work exactly the same, since the expansion port of the Tano is identical to the Expansion port of the Color Computer. If you aren't sure about a product, contact the company that makes the peripheral and see if they have tried to match their product with the Tano Dragon.

The only problem you'll have will be with software that directly addresses the RS-232 line looking for the printer, and the sound, keyboard, and video addresses. These are different from the Color Computer. Again, the manuals explaining the differences are available from Tano.

Good luck.

I recently purchased "Color Computer Programming" which you recommended in the July 1984 issue of The Color Computer Magazine. *You said the book would be good for getting started in assembly language, which I would like to learn more about. Unfortunately, it has left me with a lot of questions. Do you have to buy EDTASM + to run the programs listed in the book, and if so, where can you get EDTASM + for a good price? If not, how do you run the programs?*

K.B.
Waldoboro, ME

EDTASM + isn't required, but some type of assembly language editor/assembler is. EDTASM + is sold by Radio Shack and is the cheapest one available. It's sold as either a ROMpak or on a disk. The disk version is more powerful.

A better all-round editor/assembler is available from Cer-Comp (5566 Ricochet Ave., Las Vegas, NV, 89110), but it costs more.

I have recently purchased a TRS-80 16K with Extended Basic that I would like to interface with a Canon AP300 electronic typewriter. This would be a serial-to-serial connection. Do you know anyone who would make the interface cable at a modest cost, other than Canon, as the Canon cable is relatively high ($400 in Canada)?

Tom Hunter
Beaver Lodge, Alta. Canada

Something is wrong there. The serial-to-serial cable shouldn't cost more than $50 at the most, if both machines are using the RS-232 standard. I think the box Canon sells converts parallel output from a computer to serial data acceptable to the Canon printer.

The cable from the Color Computer is easy to make: just get a DB-25 connector (male or female) that fits the Canon, and the Radio Shack Color Computer RS-232 4-pin DIN cable. Cut one end off the cable and solder the four wires as follows: Ignore TRS-80 pin 1, TRS-80 pin 2 to DB25 pin 20, TRS-80 pin 3 to DB25 pin 1, and TRS-80 pin 4 to DB25 pin 3. Tis DB25 pins 4, 5, 6, and 8 together.

That should do the job.

Along with my 32K Color Computer (revision E board), I also own a TRS-80 LP VII dot-matrix printer, and the TRS-80 Modem I. I use the Deluxe RS-232 Program Pak to operate my modem. I enjoy the features of the modem software package, one which enables me to print out any received information. I have one problem with this. The computer receives the information faster than my printer can print it. The result is that the buffer loses information while trying to keep up with the computer. The result—a print-out with a lot of words and lines missing. I am thinking of buying a serial-to-parallel interface for my printer, but I'm not sure that this will end my problem. Please tell me if there is any cure for this type of problem.

Also, where can I get a durable, standard Color Computer keyboard, with function keys, and a reasonably good manual explaining how to operate the function keys, all at a great price?

Todd Phelps
Effingham, IL

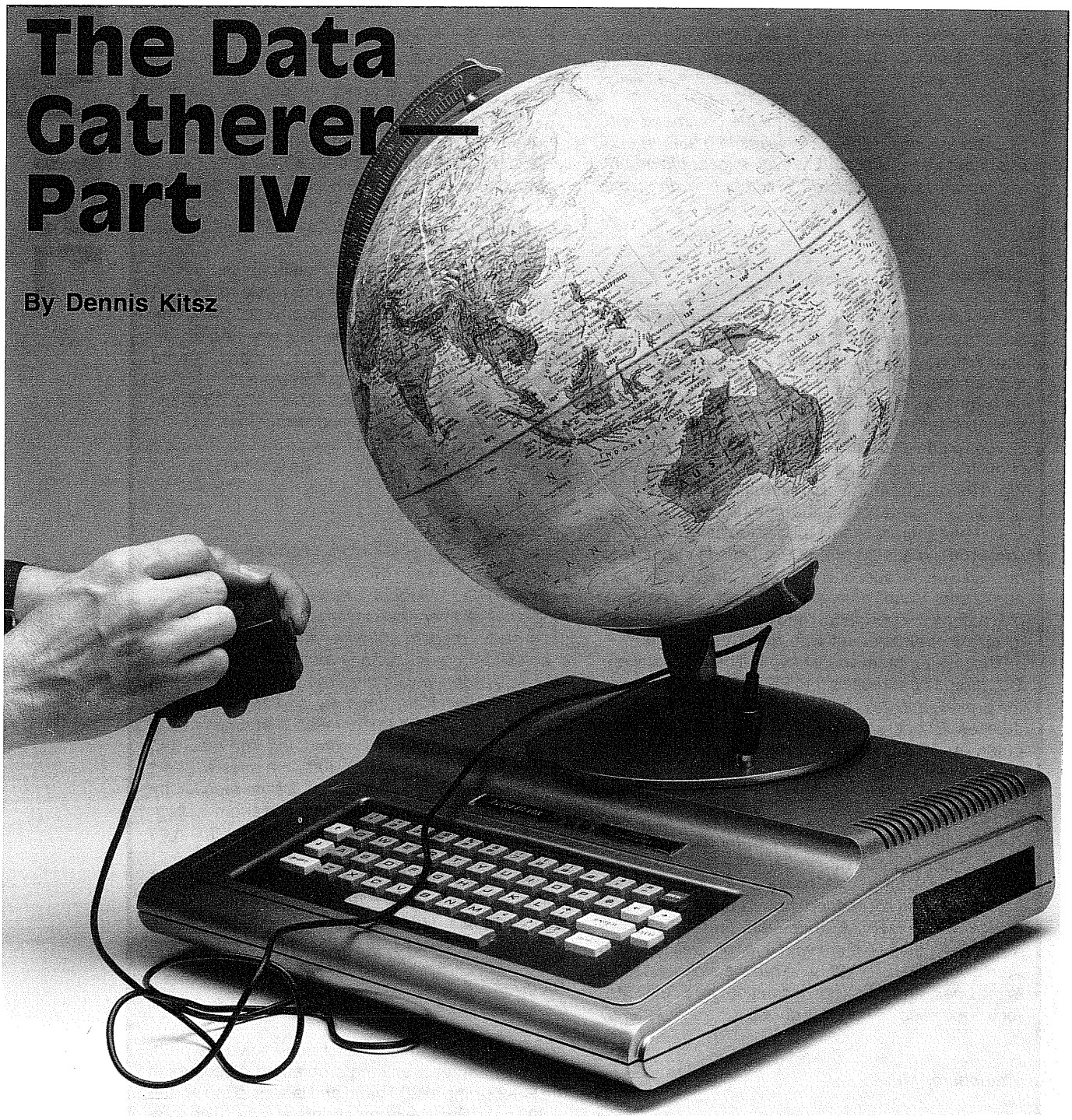
Simply switching to parallel won't solve the problem. The printer is still the problem (data comes in the RS-232 line at 300 baud and is sent to the printer at 600 baud, but the printer prints at only 30 characters per second). To cure the problem you need a faster printer, or a printer-spooler. The printer-spooler would store the data as it comes in and send it to the printer only when the printer is ready.

At the moment those are your only choices. Sorry.

Which of the replacement keyboards is best is a subjective decision. If you want to use special function keys, the software must be "told" they exist. In other words, just because a keyboard has function keys doesn't mean the software knows how to use them.

The Data Gatherer— Part IV

By Dennis Kitsz



If you have a parallel printer, or wish to have digital input/output lines available for experimentation, you should install the printer module.

The printer module consists of one 6821 peripheral interface adapter (U3, a PIA) and a connector. Use a socket for U3. According to Fig. 1, wire the eight data lines from the computer, along with A0, A1, R/W*, E*, and RESET*. CS2 comes from the decoder module. Be sure to include the decoupling capacitor C3, plus power and ground. The connector I suggest is a "3M type" latching connector, similar to the printer connector used in some of Radio Shack's other computers such as the Model 100. I chose a 34-pin type for later off-board expansion for other projects.

Install U3 in the socket. After construction, turn on the power and quickly re-examine the system; try the clock test listing once again. This module will be tested fully next time when the DGOS software is published.

The D/A Converter Module

You've arrived at the "deep breathing" section of construction. Take a break before continuing, and start fresh.

There is something special about this module: it isn't all digital. I'm repeating the obvious because construction here demands a little rethinking and a lot of care. Not only must

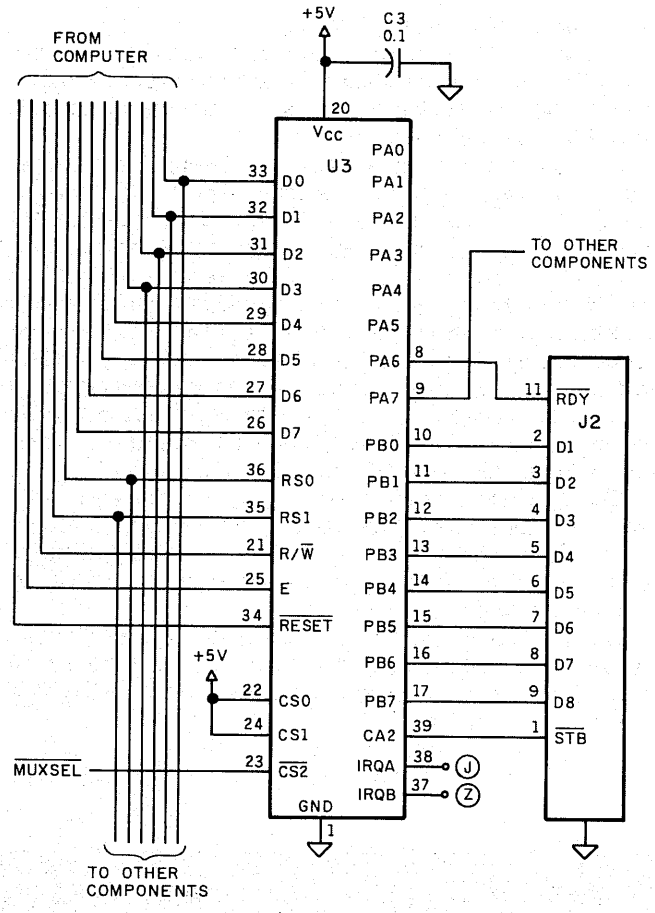


Figure 1. Printer module has eight data lines, plus strobe (STB*) and ready/busy (RDY*).

you be careful to wire correctly (that D/A converter sure is expensive!), but how you wire affects how accurate a result you'll get. Try to think small, get a good light and a magnifying glass, plus a glass of anything that helps you work comfortably.

Use a small piece of fiberglass perfboard for construction, and a high-quality socket for the AD667 digital-to-analog converter U4. Leave room for the board for the variable resistors, a jumper, and for the later installation of U13 and its associated components.

Wire the 6821 PIA (U2) according to Fig. 2; use a socket for U2. Next place a 28-pin socket for D/A converter U4 within about 1 inch of the 40-pin socket for U2. Place the *left* side of U2 facing the *right* side of U4; that is, pins 1–20 of U2 should face pins 15–28 of U4. This is very important, because these are the digital signal lines, which must be kept as far as possible from the analog lines to prevent their noisy activity from influencing the accuracy of the D/A converter. (Remember, a 12-bit D/A converter like this one can provide an output accurate to within .0012 volts!)

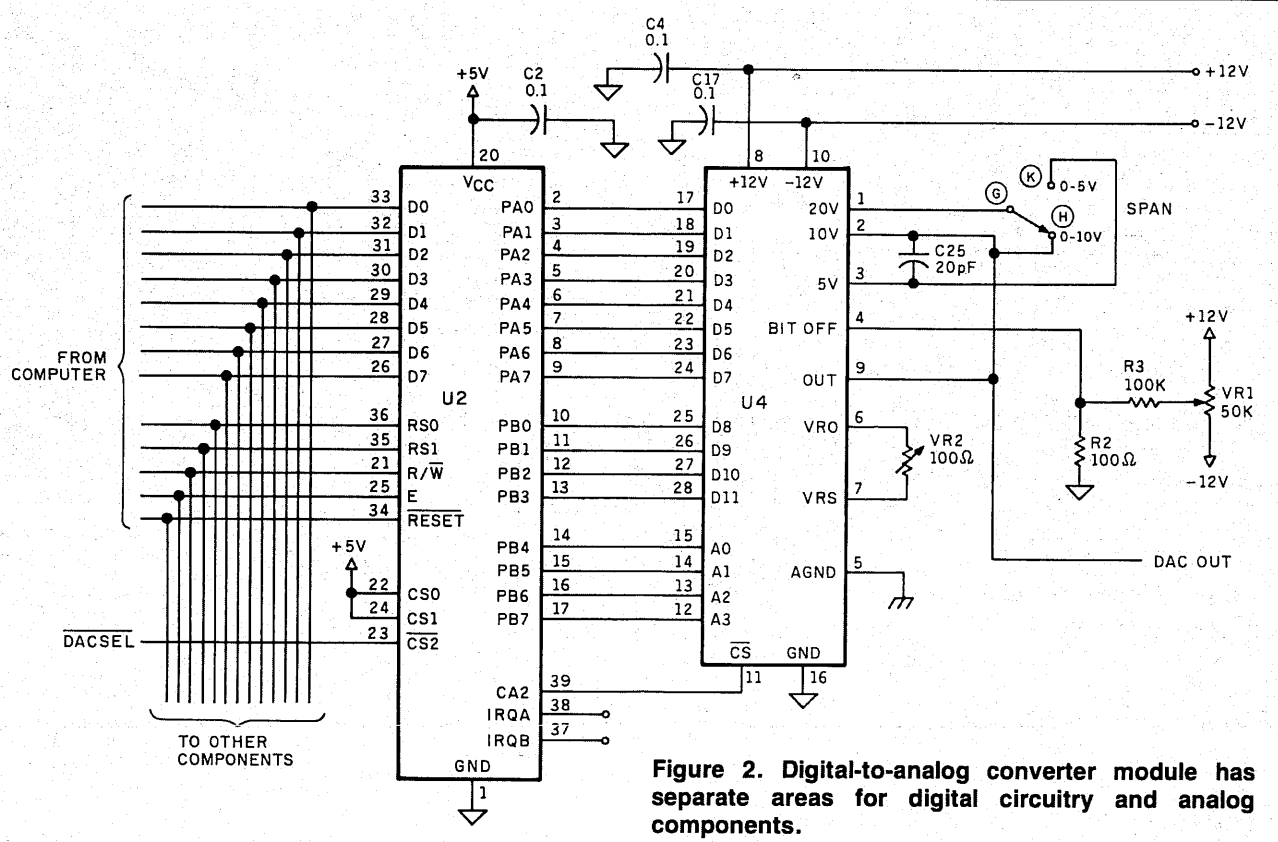


Figure 2. Digital-to-analog converter module has separate areas for digital circuitry and analog components.

Now wire only pins 11–15 and 17–28 of the U4 socket to their respective pins on the U2 socket. Double-check their accuracy, then wire U4 pin 16 (ground), pin 8 +(12 volts) and pin 10 (−12 volts). Keep these wires very short, and keep clear of the area of U4 pins 1–7 and 9.

Place C25, VR1, VR2, R2 and R3 close to the body of the U4 socket and wire them as shown. Keep the wires very short (ideally, bend over the leads of the parts themselves). Use good solder and clean this section with flux remover when you're done. Apply power and measure pins 8 and 10 with a voltmeter to make sure they are receiving the proper +12 and −12 volts. Temporarily jumper pin 1 to pin 2, and hook pin 9 to a digital voltmeter. Finally, run analog ground pin 5 to a small metal shield, and place this shield under the five components you've just assembled, plus the far end of the shield to the digital ground on pin 16 (be careful not to short any parts with the shield).

After a thorough double-check, install U2 (6821) and U4 (AD667), apply the power, and enter and run Listing 1. As this test runs you should observe the voltage slowly rise (in .0025 volt increments). Ideally, you should be examining this rise with a storage oscilloscope to observe any jumps or dips in the output; a miswiring in the least-significant-bit area can be invisible on an ordinary meter, but result in spurious results at the output. (The preceeding statement brought to you courtesy of Personal Experience, Inc.)

An accurate, smoothly rising output from the D/A converter qualifies you to proceed with . . .

The Analog Multiplexer Module

As the Firesign Theatre once said, "It's all downhill from here." The analog multiplexer's purpose is to permit one of 16 possible analog signals to cross into the Data Gatherer, and Fig. 3 tells the tale.

U3, half of which has already been used for the printer port, is connected to open-collector buffer U9, and each output of U9 is "pulled up" to +12 volts with a resistor. U9 is called "open collector" because its outputs have an unconnected transistor inside. The pull-up resistors permit current to flow through U9's output transistor from the power source of your choice rather than from U9's own +5 volt power supply. This is necessary because U5 and U6 will be run on the +12 volt power supply—this lets signals of up to 10 volts pass through to the analog-to-digital converter section. Be sure to use those pull-up resistors to +12 volts, or analog multiplexers U5 and U6 won't respond!

Definitely use sockets for U5 and U6, and be very careful with them. Like the clock/calendar, these are static-sensitive CMOS integrated circuits, and must be handled in a static-free environment. Don't forget that these two integrated circuits are powered by +12 volts.

Connect a digital voltmeter to U5 or U6 pin 9 or 10 (they are all connected together), hook a known voltage from 0–10 volts to each of the sixteen inputs, and run the Listing 2 to test your installation.

The voltage appearing at each input should be passed in turn to the output of the multiplexers. The unusual data

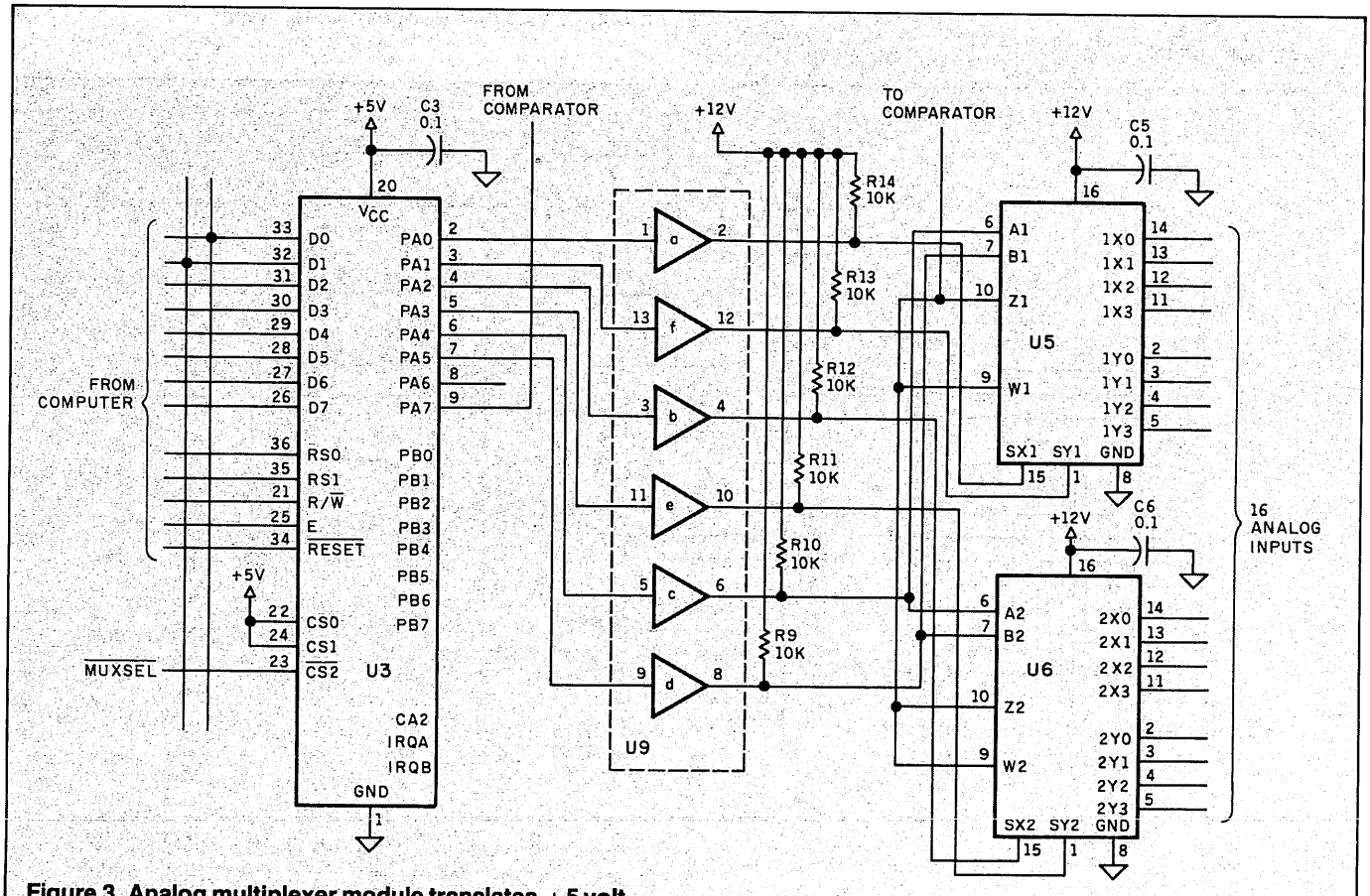


Figure 3. Analog multiplexer module translates +5 volt logic to +12 volts for switching the CMOS multiplexers.

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statements in the listing, by the way, can be examined in binary form—c'mon, do it!—to see how they switch inputs A, B, SX and SY.

The Voltage Comparator

The final module is the voltage comparator, which compares the known voltage output by the D/A converter with the unknown voltage traveling in from the multiplexer. It is shown in Fig. 4.

This is another sensitive analog circuit, so keep connections short and clean. All the parts should be quite close to the body of U13, particularly C2 and C20, which must be soldered right to the socket pins. Use a small (10mm) trimmer for VR3 if possible, or its offset balancing purpose will be defeated.

Place the comparator module between the D/A converter and the analog multiplexer, and keep interconnection wires short. Hook a known voltage from 0–10 volts to input 2, set VR3 to its center position, and run Listing 3.

Your know voltage should appear on the screen after the slow Basic program finds a match. Examine Listing 3 at your leisure, and notice how the channel is selected, how the PIAs are set up to accept the output voltage to the D/A converter, and how the 12-bit value itself is broken into two pieces for the 8-bit Color Computer to use. Make a note of how long this process takes; consider that the assembly language conversion takes just 1.6 milliseconds!

Next time: Final alignment, plus the Data Gatherer Operating System (DGOS). *(end)*

Reminder: Data Gatherer assembled, kit, or parts are available from Green Mountain Micro, Bathory Road, Roxbury, Vermont 05669, 802-485-6112. Assembled, $330. Kit, $220. DGOS EPROM, $35. PC Board, $35. Documentation, $15. Board, documentation, software, $80. Board, documentation, software, hard-to-get parts, $180. Individual parts sold separately.

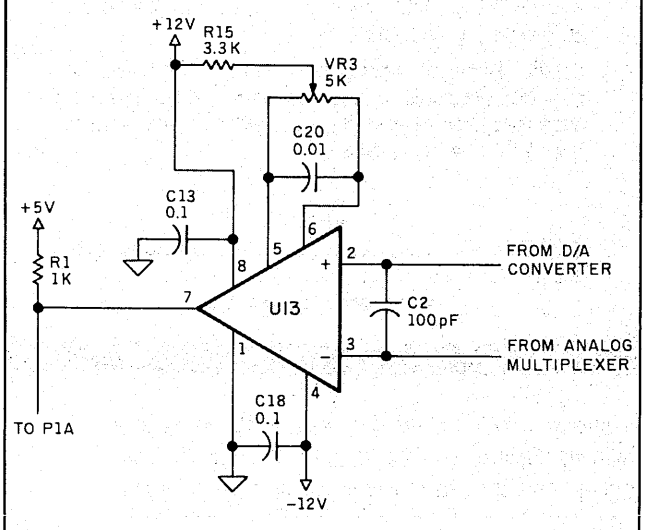


Figure 4. Voltage comparator is small but requires attention to physical placement of components.

Listing 1. D/A converter test slowly outputs a rising voltage through the converter.

```
1 X=&HFF50            :'DAC  PORT
2 LS = &H34           :'LO STROBE
3 HS = &H3C           :'HI STROBE
4 POKE X+1,&H38       :'OPEN PORT
5 POKE X  ,&HFF       :'8 OUTPUTS
6 POKE X+1,HS         :'SHUT PORT
7 POKE X+3,&H38       :'OPEN PORT
8 POKE X+2,&HFF       :'8 OUTPUTS
9 POKE X+3,HS         :'SHUT PORT
10 FOR VH = 0 TO 15   :'M.S. BYTE
11 FOR VL = 0 TO 255  :'L.S. BYTE
12 VX = 0             :'TEMP.  VH
13 POKE X,VL          :'SEND  LSB
14 VX = VH OR &H80    :'1000 XXXX
15 POKE X+2,VX        :'SEND  MSB
16 POKE X+1,HS        :'HI STROBE
17 POKE X+1,LS        :'LO STROBE
18 POKE X+1,HS        :'HI STROBE
19 VX = VX OR &HF0    :'1111 XXXX
20 POKE X+2,VX        :'SEND  MSB
21 VX = VX AND &H7F   :'0111 XXXX
22 POKE X+2,VX        :'2nd  RANK
23 POKE X+1,HS        :'HI STROBE
24 POKE X+1,LS        :'LO STROBE
25 POKE X+1,HS        :'HI STROBE
26 NEXT VL            :'NEXT  LSB
27 NEXT VH            :'NEXT  MSB
```

Listing 2. Switch test cycles through all 16 inputs, permitting voltage to flow through the multiplexers.

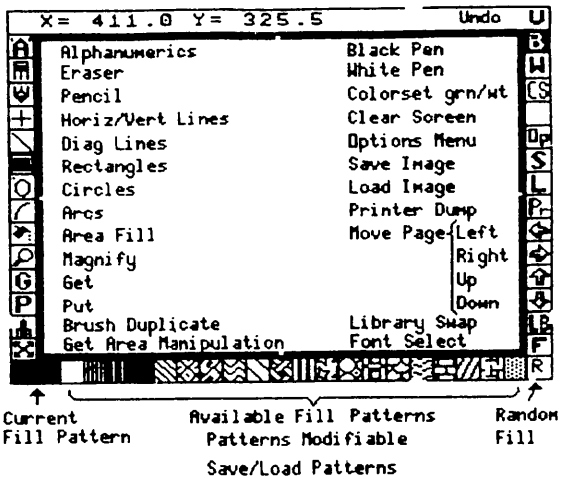
```
1 DIMA(16):X=&HFF54:POKEX+1,&H38
2 POKEX,&H3F:POKEX+1,&H3C
3 DATA00,01,11,21,31,02,12,22
4 DATA32,04,14,24,34,08,18,28,38
5 FORX=0TO16
6 READA$:A(X)=VAL("&H"+A$):NEXT
7 FORX=0TO16
8 A$=INKEY$:IFA$=""THEN8
9 POKEX,A(X):PRINTX;:NEXT
```

Listing 3. A/D conversion test works its way from zero until it finds a match to the unknown voltage.

```
10 CLS:X=&HFF50:LS=&H34:HS=&H3C
11 POKEX+5,&H38:POKEX+4,&H3F
12 POKEX+5,HS:POKEX+4,&H11
13 A$="#.###":T=X+1:POKET,&H38
14 POKEX,&HFF:POKET,HS
15 POKEX+3,&H38:POKEX+2,&HFF
16 POKEX+3,HS
17 FORVH=0TO15:FORVL=0TO255
18 VX=0:POKEX,VL:VX=VH OR&H80
19 POKET+1,VX:POKET,HS:POKET,LS
20 POKET,HS:VX=VX OR&HF0
21 POKET+1,VX:VX=VX AND&H7F
22 POKET+1,VX:POKET,HS:POKET,LS
23 POKET,HS:I=&H80:D=409.6
24 IF(PEEK(X+4)ANDI)=I THEN26
25 NEXT:NEXT:GOTO17
26 PRINT"VOLTAGE =";
27 PRINTUSINGA$;(VH*256+VL)/D
28 GOTO17
```

VIZIDRAW 1.0

BY GEORGE ZIDIENICZ AUTHOR OF COLOR TOOLKIT



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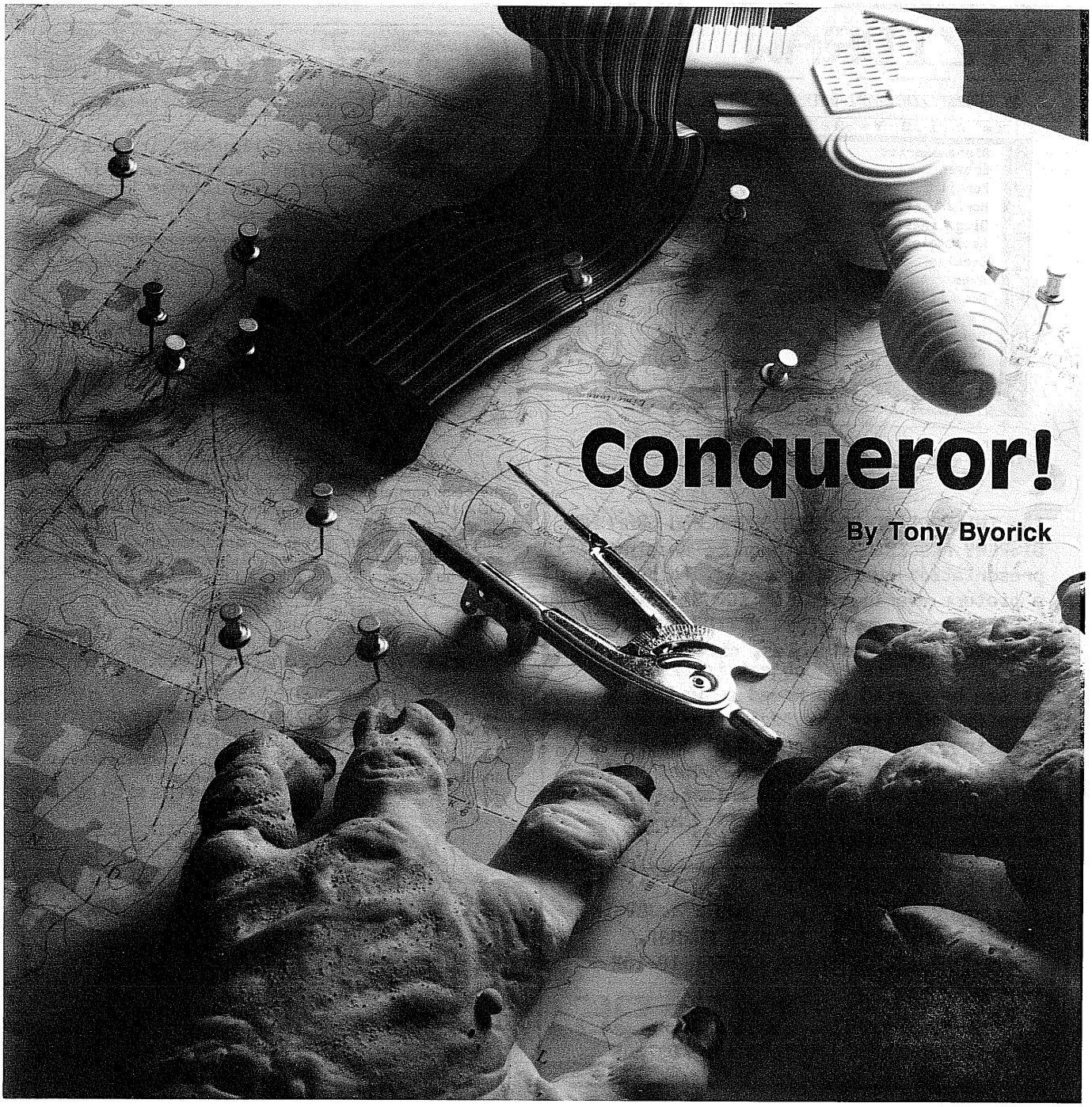

Conqueror!

By Tony Byorick

Conqueror! may be played with from two to six players. Each player starts with one planet and a supply of ships. By attacking and conquering other planets in the galaxy, any player may become the conqueror. A galaxy is composed of from 10 to 26 planets, each planet garrisoning up to 95 fleets. Some planets can produce a limited number of fleets each stardate. Generated fleets are added at the end of each stardate to the arsenal of the player who owns the planet.

Another planet is attacked by sending an armada of fleets to it. Fleets may travel only at the speed of light, and so might take several stardates to get from one planet to another. Once launched, a fleet may not be recalled. Upon arrival at an enemy planet, attacking fleets automatically engage defending fleets. Battle continues until one player withdraws or is wiped out. You may reinforce a planet in your possession by sending fleets to it.

The winner is the last player on the board, or owns the most planets when the turn counter runs out.

A turn is taken in three parts: arrival phase, command phase, and production phase. During arrival fleets arrive at destination planets. If the destination planet is owned by another player or is a neutral planet, conflict begins. During battle, you may have to input commands. Both attacker and defender have the option of disengaging.

This phase is followed by the command phase. Use the map chart.

To begin the game, load and type RUN. Follow the prompts. ID letters follow sequentially—remember yours! There is no limit to number of turns. Planet range is 10–26. Begin each player's turn by hitting the up arrow. Right arrow starts the game over. Fleets travel from source to destination. Enter source first, destination second, and number of fleets third. An OK prompt follows—commands are not shown on screen. A command will not be accepted if the source planet is not owned by the commanding player, or the number of fleets being sent exceeds the number stationed at the

source planet. The down arrow key advances the player counter and lets the next player enter moves.

As battle commences, there will be a display: the names of the combatants; the name of the planet under attack; the gunnery rating of each fleet; and the number of fleets on each side. A short pause ensues; this is the time to withdraw if desired "Status" represents the efficiency of the gun crews, and effects how many hits the opposing fleet will take, determined by random. The attacker withdraws by hitting the A key, and the defender by hitting the ; key. You may also withdraw at any time during battle. Withdrawn fleets are automatically routed to the nearest friendly planet. If there are no friendly planets, withdrawing is not allowed. If neither player withdraws, battle continues until one player's fleets are gone, and possession of the planet passes to the winner. Defenders fire first.

Conqueror! is mostly Basic, with additional assembly language subroutines for easy mixing of text and graphics. The subroutine appeared in the April 1983 issue of *The Color Computer Magazine,* in an article entitled "Reformat Your Video" by Steve Odneal. A change to Steve's original screen expander is replacement of the character table. Those of you using Telewriter 64 with Dean Rector's "Wizard" upgrade may recognize the script-like characters; Dean kindly gave permission for use of his character set in this one program. To use the program listing you will need a copy of the screen expander. Any screen expander should work as long as it uses CHR$(11) for implementing x/y cursor positioning. *(end)*

***Arrival:** Fleets are reinforced or battle begins. Either player may disengage.

***Command:**

(1) Star Map shows planet's physical positions.

(2) Strength Map shows fleet strength on each planet.

(3) Production Map shows fleet production per stardate.

(4) Status Map shows ownership. Neutral planets designated by +.

Up Arrow Key and *numerical keys* 1–4 change map display. *Up Arrow alone* for move entry. *Down Arrows* for next player. *Right Arrow* for new game.

***Production:** Fleets built on production planets. No planet can support more than 95 fleets for more than one stardate.

Program Listing. Conqueror!

```
80 ML=PEEK(&H1B)*256+PEEK(&H1C)-&H715:DEFUSR0=ML
90 A=USR0(C)
100 GOSUB 3470 : PMODE 4,1 : PCLS(5) : SCREEN1,1
110 DIM NA$(6)
120 GOTO 340
130 *************** SUBROUTINES **************
140 DRAW"C0BM30,20":GOSUB 4720 '   -R-
150 DRAW"BM55,20":  GOSUB 4750 '   -A-
160 DRAW"BM75,20":  GOSUB 4780 '   -I-
170 DRAW "BM95,20":  GOSUB 4800 '  -D-
180 DRAW"BM120,20": GOSUB 4820 '   -E-
190 DRAW"BM145,20": GOSUB 4720 '   -R-
200 DRAW"BM30,60": GOSUB 4840 '  -O-
210 DRAW"BM55,60": GOSUB 4860 '  -F-
220 DRAW"BM30,100": GOSUB 4720 '  -R-
230 DRAW"BM50,100": GOSUB 4780 '  -I-
240 DRAW"BM70,100": GOSUB 4880 '  -G-
250 DRAW"BM95,100": GOSUB 4820 '  -E-
260 DRAW"BM123,100":GOSUB 4900 '  -L-
270 GOSUB 4910
280 FORJ=1TO3000:NEXTJ:RETURN
290 '
300 '   ***POSITION CURSOR***
310 PRINTCHR$(11);CHR$(X);CHR$(Y);:RETURN
320 '
330 '************* CONT. INITIALYZING *********
340 GOSUB 140
350 PCLS(5)
360 PRINT
370 PRINT "                    ENTER PLAYER NAMES"
380 NA$(0)="BOBO"
390 FOR X=1 TO 6
400 PRINT "                        ";
410 INPUT NA$(X)
420 IF NA$(X)="" THEN X=X-1 : GOTO 450
430 NEXT X
440 X=X-1
450 NP=X
460 '
470 PRINT
480 PRINT "                    How many turns "
490 PRINT "                       ";:INPUTTN
500 IF TN<1 THEN TN=5
510 PRINT : PRINT "                        How many planet
s "
520 PRINT "                       ";:INPUTPN
530 IF PN>26 THEN PN=26
540 IF PN<10 THEN PN=10
550 '
560 '       ********** ARRAYS ***********
570 DIM X(PN), Y(PN), PRO(PN), STR(PN), OWN(PN)
580 DIM DSC(PN)
590 DIM AL$(PN), ARR(25), SGT(25), DES(25), PLR(25)
600 GOSUB3470:X=15:Y=12:GOSUB3560:PRINT"One moment
please ...      ";
610 FOR J=1TO25:ARR(J)=0:NEXTJ
620 '*******************************************

630 '**            CREATE GALAXY               **
640 '**                                        **

650 '*******************************************

660 '
670 '    == INIT ALPHA ==
680 RESTORE
690 DATA A,B,C,D,E,F,G,H,I,J,K,L,M,N
700 DATA O,P,Q,R,S,T,U,V,W,X,Y,Z
710 FOR J=1 TO PN
720 READ AL$(J)
730 OWN(J)=0 : DSC(J)=0
740 T1=RND(16)-1:T2=RND(10)-1
750 IF T1<1 THEN 740
760 FOR K=1 TO J
770 IF X(K)=T1 AND Y(K)=T2 THEN 740
780 IF Y(K)=T2 AND X(K)=T1-1 THEN 740
790 IF Y(K)=T2 AND X(K)=T1+1 THEN 740
800 NEXT K
810 X(J)=T1:Y(J)=T2
820 NEXT J
830 '********
840 FOR J=1 TO NP:PRO(J)=9+RND(2):STR(J)=80+RND(19)
850 OWN(J)=J : DSC(J)=1
860 NEXT J
870 FOR J=NP+1 TO PN
880 PRO(J)=5*RND(2)-5:STR(J)=5*RND(4)-5
890 NEXT J
900 '
```

```
910 '       === DRAW STAR MAP ===
920 GOSUB 3700: GOSUB 3490
930 '*****************************************
940 '**          MAIN PLAY LOOP               **
950 '*****************************************
960 TC=0
970 D1=0
980 TC=TC+1
990 '            === ANY ARRIVALS ? ===
1000 FORK=1 TO 15:IF ARR(K)=TC THEN PTR=K:GOTO1530

1010 NEXT K
1020 GOSUB 4970 '  DISPLAY DATE
1030 GOSUB 4300 '    CHECK FOR PLAYER OUT
1040 IF GC=NP-1 THEN 2730
1050 '           === GET PLAYER COMMANDS ===
1060 FOR PLR=1 TO NP
1070 IF NA$(PLR)="DONE" THEN 2390
1080 X=20:Y=20:GOSUB3560:PRINT"Commander ";NA$(PL);

1090 '             === SOURCE ===
1100 X=20:Y=21:GOSUB3560:PRINT"from ? ";
1110 GOSUB 3720
1120 IF L=10 THEN 2360
1130 IF L=94 THEN 2470
1140 IF L>90 OR L<65 THEN 1110
1150 SRC=L-64
1160 IF SRC>PN THEN 1110
1170 IF NOT OWN(SRC)=PLR THEN 1110
1180 PRINT " OK";
1190 PLAY"O5L64A"
1200 '             === DESTINATION ===
1210 X=20:Y=22:GOSUB3560:PRINT"to ? ";
1220 GOSUB 3720
1230 IF L=94 THEN 2320
1240 IF L>90 OR L<65 THEN 1220
1250 DES=L-64
1260 IF DES=SRC THEN 1220
1270 IF DES>PN THEN 1220
1280 PRINT " OK";
1290 PLAY"O5L64A"
1300 '     ===== GET STRENGTH ======
1310 X=20:Y=23:GOSUB3560:PRINT"strength ? ";
1320 GOSUB 3770
1330 IF SGT>STR(SRC) THEN 1320
1340 PRINT " OK";
1350 '      === X DIS ===
1360 XD=ABS(X(SRC)-X(DES))
1370 '      === Y DIS ===
1380 YD=ABS(Y(SRC)-Y(DES))*4
1390 '      === TOT DIS ==
1400 TD=SQR((XD*XD)+(YD+YD))
1410 TD=FIX(TD)
1420 '      === TRAV TIME ===
1430 IF TD<2 THEN TRAV=1 : GOTO 1460
1440 TRAV=FIX(TD/2)
1450 '   ======== UPDATE ARRAYS =======
1460 GOSUB 3890 '    ENTRY TO SCHEDULE IN 'J'
1470 ARR(J)=TC+TRAV
1480 SGT(J)=SGT
1490 DES(J)=DES
1500 PLR(J)=PLR
1510 STR(SRC)=STR(SRC)-SGT
1520 GOTO 2320
1530 GOSUB 4470:FORN=1TO100:NEXTN
1540 '*****************************************
1550 '**                                     **
1560 '**       BATTLE/ARRIVAL PHASE          **
1570 '**                                     **
1580 '*****************************************
1590 '
1600 '         == FRIEND OR FOE PLANET ? == ==
1610 IF PLR(PTR)=OWN(DES(PTR)) THEN 2150
1620 '          ===  INIT BATTLE VARIABLES ===
1630 B1$=NA$(PLR(PTR))
1640 B2$=NA$(OWN(DES(PTR)))
1650 B3=RND(99):IF B3<25 THEN B3=25
1660 B4=RND(99):IF B4<35 THEN B4=35
1670 B5=SGT(PTR)
1680 B6=STR(DES(PTR))
1690 B7$=AL$(DES(PTR))
1700 GOSUB 4070' CLEAR SCREEN AND PRINT BATTLE
                 READ OUTS.
1710 '     === FIRE DEFENDER SHIPS ===
1720 FOR K=1 TO B6 : SH=RND(200)
1730 L$=INKEY$:IFL$="A"ORL$=";"THENL=1:GOTO2900:' R
ETREAT
1740 PLAY "O4L128C"
1750 FORN=1TO2:NEXTN
1760 IF SH<B4 THEN 1870
1770 NEXT K
1780 '     === FIRE ATTACKER SHIPS ===
1790 FOR K=1 TO B5 : SH=RND(200)
1800 L$=INKEY$:IFL$="A"ORL$=";"THENL=0:GOTO2900:'RE
TREAT
1810 PLAY "O4L128C"
1820 FORN=1 TO 2:NEXTN
1830 IF SH<B3 THEN 1910
1840 NEXT K
1850 GOTO 1720
1860 '
1870 B5=B5-1 : GOSUB 3940 : PLAY "O5L128EO2F"
1880 IFB5<1 THEN 2010
1890 GOTO 1770
1900 '
1910 B6=B6-1: GOSUB 3960 : PLAY "O5L128EO2F"
1920 IFB6<1 THEN 1960
1930 GOTO 1840
1940 '       === UPDATE ARRAYS ===
1950 '       === ATTACKER WINS ===
1960 OWN(DES(PTR))=PLR(PTR)
1970 WI$=B1$
1980 STR(DES(PTR))=B5
1990 GOTO 2040
2000 '       == DEFENDER WINS ==
2010 STR(DES(PTR))=B6
2020 WI$=B2$
2030 '       ==UPDATE ARRIVAL ==
2040 DSC(DES(PTR))=1 'PLANET MAY NOW PRODUCE FLEETS

2050 ARR(PTR)=0:SGT(PTR)=0:DES(PTR)=0:PLR(PTR)=0
2060 GOSUB 5280 ' CLEAR LOWER BOX
2070 X=23:Y=20:GOSUB3560:PRINT"Commander";
2080 X=25:Y=21:GOSUB3560:PRINT WI$;
2090 X=25:Y=22:GOSUB3560:PRINT"wins";
2100 X=23:Y=23:GOSUB3560:PRINT"planet ";B7$;
2110 FOR K=1 TO 1200:NEXT K
2120 GOSUB 4660 '    ** PACK ARR TABLE **
2130 DM=1:GOSUB 5280:GOTO1000
2140 '   == REINFORCEMENTS ==
2150 '======= REINFORCEMENT =========
2160 GOSUB5240: '  CLEAR BOX
2170 X=24:Y=20:GOSUB310:PRINT"ARRIVAL";:PLAY"O5L128
     F":FOR K=1 TO 600:NEXT K
2180 X=24:Y=22:GOSUB310:PRINT "Planet ";
2190 PLAY"G"
2200 X=26:Y=23:GOSUB310:PRINT AL$(DES(PTR));"    ";

2210 X=2:Y=20:GOSUB310:PRINT"Commander ";NA$(PL(PT)
);
```

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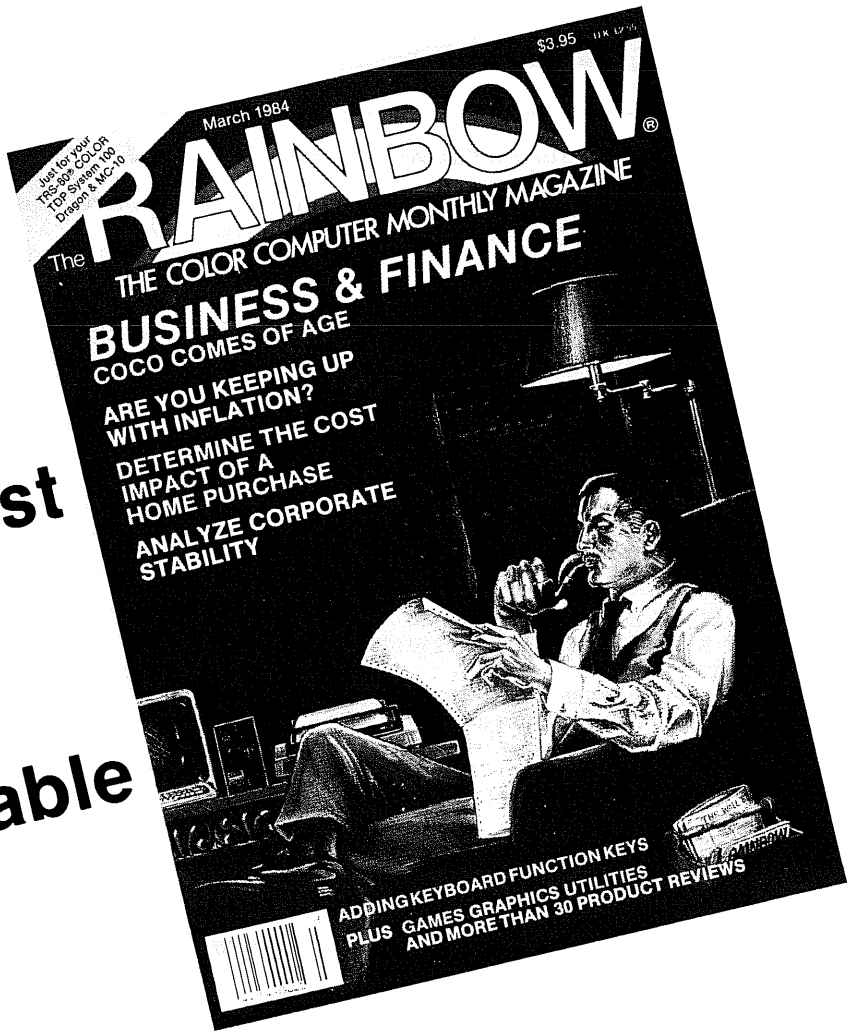

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```
2220 X=2:Y=22:GOSUB310:PRINT"old strength= ";
2230 PRINT STR(DES(PTR));
2240 STR(DES(PTR))=STR(DES(PTR))+SGT(PTR)
2250 X=2:Y=23:GOSUB310:PRINT"new strength= ";
2260 PRINT STR(DES(PTR));
2270 FORK=1TO2600:NEXTK
2280 ARR(PTR)=0
2290 GOTO 2130
2300 '       REPEAT
2310 '       ERASE OLD BOX INFO
2320 X=20:Y=21:GOSUB 3560:PRINT"                    "

2330 X=20:Y=22:GOSUB 3560:PRINT"                    "

2340 X=20:Y=23:GOSUB 3560:PRINT"                    "
;
2350 GOTO 1100
2360 '    =====  NEXT PLAYERS TURN =====
2370 PLAY"O4L16C" : GOSUB4250
2380 IF NOT DM=1 THEN GOSUB 5240:GOSUB 3490
2390 NEXT PLR
2400 IF TC>TN-1 THEN GOSUB 5100:GOTO2800
2410 '      == REINFORCEMENTS ==
2420 FORK=1TOPN : IFDSC(K)=1 THEN STR(K)=STR(K)+PRO
(K)
2430 IFSTR(K)>95 THEN STR(K)=95
2440 NEXT K
2450 GOTO980
2460 '       ==== DIRECTIVE PROCESSOR ====
2470 X=2:Y=22:GOSUB 3560:PRINT"Directive?";
2480 GOSUB 3720
2490 IFL=94THEN 2650                    CONTINUE
2500 IFL=9 THEN GOTO 600
2510 IFL=52 THEN 2670
2520 IFL=50THENGOTO2590 '          INTELLIGENCE
2530 IFL=49THENGOTO2620 '          STAR MAP
2540 IFL=51 THEN GOTO2690 '          PRODUCTION
2550 L=1
2560 X=12:Y=22:GOSUB3560
2570 GOTO2480
2580 '  = INTELL =
2590 '
2600 DM=2:GOSUB 5240: GOSUB3640:GOTO2560
2610 '  = MAP =
2620 '
2630 DM=1:GOSUB 5240:GOSUB3490:GOTO2560
2640 '      == CONT ==
2650 X=1:Y=22:GOSUB3560:PRINT"          ";:GOTO1100

2660 '     == STATUS ==
2670 GOSUB 5240: GOSUB3980: GOTO2560
2680 '         === PRODUCATION ===
2690 GOSUB 5240: GOSUB 3590 : GOTO 2560
2700 '
2710 '    ***:CHECK FOR PLAYERS OUT:***
2720 '       ***:GAME OVER:****
2730 GOSUB 5240 : ' CLEAR BIG BOX
2740 GOSUB 3980 '  STATUS DISPLAY
2750 GOSUB 5280 : ' CLEAR LITTLE BOX
2760 FOR K=1 TO NP
2770 IF NOT NA$(K)="DONE" THEN 2800
2780 NEXT K
2790 PRINT "ERROR";
2800 X=23:Y=20:GOSUB310:PRINT"Game over";
2810 X=23:Y=21:GOSUB310:PRINT"Commander";
2820 X=25:Y=22:GOSUB310:PRINT NA$(K);
2830 X=19:Y=23:GOSUB310:PRINT"Rules the galaxy";
2840 FOR J=1TO 10000:NEXT J:PCLS(5):GOSUB140
2850 Z$=INKEY$:IF Z$=""THEN 2850
2860 RUN
2870 '*****************************************

2880 '************ DISENGAGEMENT *****************

2890 '*****************************************

2900 IF L$="A" THEN 2920
2910 DIS=OWN(DES(PTR)) : AMT=B6 : GOTO 2940
2920 DIS=PLR(PTR) : AMT=B5
2930 '      ==== ANY PLANETS LEFT ? ====
2940 '
2950 IF DIS=0 THEN 3420
2960 FOR M=1 TO PN
2970 IF DES(PTR)=M THEN 2990
2980 IF OWN(M)=DIS THEN 3020
2990 NEXT M
3000 GOTO 3420
3010 '       ==== FIND NEAREST PLANET ====
3020 SD=200
3030 SRC=DES(PTR)
3040 FOR DES=1 TO PN
3050 IF NOT OWN(DES)=DIS THEN 3120
3060 IF DES=SRC THEN 3120
3070 '      ==== FIND DISTANCE ====
3080 XD=ABS(X(SRC)-X(DES))
3090 YD=ABS(Y(SRC)-Y(DES))*2
3100 TD=SQR((XD*XD)+(YD*YD))
3110 IF TD<SD THEN SD=TD:FPN=DES
3120 NEXT DES
3130 TD=FIX(SD)
3140 IF TD<2 THEN TRAV=1:GOTO 3160
3150 TRAV=FIX(TD/2)
3160 TIME=TC+TRAV
3170 '     ==== FIND LOSSES ====
3180 DL=RND(30)/100
3190 LOSS=FIX(AMT*DL)
3200 AMT=AMT-LOSS
3210 '     ==== UPDATE ARRAYS ====
3220 GOSUB 3890 :'   FIND ENTRY
3230 ARR(J)=TIME
3240 SGT(J)=AMT
3250 DES(J)=FPN
3260 PLR(J)=DIS
3270 IF L$="A" THEN 3300
3280 OWN(DES(PTR))=PLR(PTR)
3290 '      ==== INFORM PLAYERS ====
3300 '********:X=22:Y=20:GOSUB310:PRINT"DISENGAGE";

3310 PLAY"O5L128F":FORB=1TO400:NEXTB:'********
3320 PLAY "L12805G"
3330 X=22:Y=20:GOSUB310:PRINT"Commander";
3340 PLAY "G"
3350 X=25:Y=21:GOSUB310:PRINT NA$(DIS);
3360 PLAY "G"
3370 X=23:Y=22:GOSUB310:PRINT"withdraws";
3380 PLAY "G"
3390 X=22:Y=23:GOSUB310:PRINT AMT;" fleets";
3400 FOR D=1 TO 1600: NEXT D
3410 IF L$="A" THEN 2010 ELSE 1960
3420 IF L=1 THEN 1740 ELSE 1810
3430 '*****************************************

3440 '**                SUBROUTINES            **

3450 '*****************************************

3460 '                  == CLS ==
3470 PRINTCHR$(12);CHR$(16):RETURN
3480 '               == DRAW PLANETS ==
```

****
*** NEWS FROM UNDER COLOR **** NEWS FOR UNDER THE COLORS ***
********** Compiled February 27, 1985 **********
** Send news to: Under Color, Box 6809, Roxbury, VT 05669 **
********** CompuServe 70136,1257 **********
****

WHAT'S UP WITH THE 09? Normally CIA-secretive Tandy Towers has been leaking like a sieve about the rumored Model 09 Color Computer. UNDER COLOR can't validate these Tandy rumors, but here they are: The 09 will be OS-9 ONLY, with NO BASIC ROM. This is a departure from the Tandy medium-priced computer line. There will be a SOFTWARE SELECTABLE 1 or 2 MHz clock. But -- alas -- use of the Motorola RMS CHIP SET HAS APPARENTLY BEEN SCRAPPED. The high-powered 640x400 resolution RMS set, new baby of the Motorola graphics people, has been SET BACK 6 TO 9 MONTHS and is back to the drawing board. Apparently the second silicon of RMS CAME UP FULL OF BUGS. Since the Model 09 will be in the stores between September '85 and March '86, RMS won't be ready for it. Instead, Tandy execs have honeyed the path for some Motorola engineers, who left the RMS project to devote their time to A CUSTOM VLSI GRAPHICS CHIP for the Model 09.

* * * * *

Update on the NEW WD 1773 DISK CONTROLLER that's giving software protection schemes a lot of headaches: The good doctor reports that the 1773 -- which appears in the newer CoCo controllers -- is more likely to err on read address commands and single-density write sector commands. Computize and Mark Data products are also fighting with the 1773.

* * * * *

More about COCOMAX, the "Macpaint" clone for the Color Computer ... UNDER COLOR has reported the good news, but here's the bad news: The manufacturer of CoCoMax has SCOURED THE NUMBERS OFF THE MICROCHIPS INSIDE THE PACKAGE. UNDER COLOR has sneered at such clumsy hardware protection efforts before, and once again chuckles over this MISPLACED ATTEMPT. However, here's good news to counter the bad news: the missing numbers are 74LS00 and 74LS133, plus National Semiconductor's ADC0809CCN. For more details, sign on CompuServe and G PCS-126.

* * * * *

```
3490 GOSUB 3570:PRINT"Star Map       ";:DRAW"C0;BM0
,0D155R255U155"
3500 DM=1
3510 FORJ=1TOPN:X=X(J)*2+X(J):Y=Y(J)*2:GOSUB310
3520 PRINTAL$(J);:NEXTJ
3530 DRAW"C0;BM0,0D155R255U155": RETURN
3540 '               == POSITION CURSOR ==
3550 PRINTCHR$(11);CHR$(X);CHR$(Y+1);:RETURN
3560 PRINTCHR$(11);CHR$(X);CHR$(Y);:RETURN
3570 PRINTCHR$(11);CHR$(2);CHR$(20);:RETURN
3580 '               == DRAW PRODUCTION ==
3590 GOSUB 3570:PRINT"Production";:DRAW"C0;BM0,155R
255U180"
3600 DM=3
3610 FORJ=1TOPN:X=X(J)*2+X(J)-1:Y=Y(J)*2:GOSUB310
3620 PRINTPRO(J);:NEXTJ: DRAW"C0;BM0,155U180" : RET
URN
3630 '              == DRAW STRENGTH ==
3640 GOSUB 3570:PRINT"Strength      ";:DRAW"C0;BM0,
155R255U180"
3650 DM=2
3660 FORJ=1TOPN:X=X(J)*2+X(J)-1:Y=Y(J)*2:GOSUB310
3670 A=STR(J)
3680 PRINTA;:NEXTJ:DRAW"C0;BM0,155U180":RETURN
3690 '             === CLS (NO HOME) ===
3700 X=0:Y=22:GOSUB3560:PRINTCHR$(12):RETURN
3710 '             === PLAYER INPUT ===
3720 L$=INKEY$
3730 IF L$="" THEN 3720
3740 L=ASC(L$)
3750 RETURN
3760 '            === STRENGTH INPUT ===
3770 GOSUB 3720 '   GET 'L'
3780 PLAY"O5L64A"
3790 IF L>57 OR L<30 THEN 3770
3800 L=L-48 : L1=L
3810 '
3820 GOSUB 3720 '   GET 'L'
3830 PLAY"O5L64A"
3840 IF L=13 THEN SGT=L1 : GOTO 3870
3850 IF L>57 OR L<48 THEN 3820
3860 L1=L1*10 : L2=L-48 : SGT=L1+L2
3870 RETURN
3880 '       ==== FIND ENTRY ===
3890 FOR J=1 TO 25
3900 IF ARR(J)=0 THEN RETURN
3910 NEXT J
3920 J=1 : RETURN
3930 '     === UPDATE ATTACTKER ===
3940 X=10:Y=23:GOSUB3560:PRINTB5;:RETURN
3950 '     === UPDATE DEFENDER ===
3960 X=45:Y=23:GOSUB3560:PRINTB6;:RETURN
3970 '          ==== DRAW STATUS =====
3980 GOSUB 3570:PRINT"Status       ";:DRAW"C0;BM0,0
D155R255U155"
3990 FORJ=1 TO PN
4000 DM=4
4010 K$=AL$(OW(J))
4020 IFOWN(J)=0 THEN K$="+"
4030 X=X(J)*2+X(J):Y=Y(J)*2:GOSUB3560
4040 PRINTK$;:NEXTJ
4050 DRAW"C0;BM0,0D155R255U155":RETURN
4060 '         === DRAW NEW BATTLE SCREEN ====
4070 GOSUB5280
4080 X=22:Y=20:GOSUB3560:PRINT"CONFLICT";
4090 PLAY"L12805F":FORK=1 TO 400:NEXT K
4100 X=23:Y=22:GOSUB3560:PRINT"Planet";
4110 X=25:Y=23:GOSUB3560:PRINTB7$;
4120 FORK=1 TO 500:NEXTK
4130 X=2:Y=20:GOSUB3560:PRINT"Attacker";
4140 X=3:Y=21:GOSUB3560:PRINTB1$;
4150 X=2:Y=22:GOSUB3560:PRINT"Status= "B3;;
4160 X=2:Y=23:GOSUB3560:PRINT"Fleets= "B5;
4170 '[][][][][][][][][][][][][][][][][][[
4180 X=39:Y=20:GOSUB3560:PRINT"Defender";
4190 X=40:Y=21:GOSUB3560:PRINTB2$;
4200 X=37:Y=22:GOSUB3560:PRINT"Status= "B4;
4210 X=37:Y=23:GOSUB3560:PRINT"Fleets= "B6;
4220 FOR K=1TO 2600:NEXTK
4230 RETURN
4240 '        ====ORASE OLD BOX INFO====
4250 X=20:Y=20:GOSUB3560:PRINT"                    ";

4260 X=20:Y=21:GOSUB310:PRINT"                     ";
4270 X=20:Y=22:GOSUB310:PRINT"                     ";
4280 RETURN
4290 '       ==== CHECK FOR PLAYER OUT ====
4300 GC=0
4310 FOR N=1 TO NP
4320 IF NA$(N)="DONE" THEN GC=GC+1 : GOTO 4400
4330 FOR K=1 TO PN
4340 IF OWN(K)=N THEN GOTO 4400
4350 NEXT K
4360 FOR K=1 TO 15
4370 IF PLR(K)=N THEN GOTO 4400
4380 NEXT K
4390 NA$(N)="DONE"
4400 NEXT N
4410 GC=0
4420 FOR N=1 TO NP
4430 IF NA$(N)="DONE" THEN GC=GC+1
4440 NEXT N
4450 RETURN
4460 '       === FLASH PLANET ===
4470 A$=AL$(DES(PTR))
4480 X=X(DES(PTR))
4490 X=X*2+X
4500 Y=Y(DES(PTR))
4510 Y=Y*2
4520 A=ASC(A$) : B=A+128
4530 FOR N=1 TO 5
4540 GOSUB 310 : PRINT " ";
4550 FOR J=1 TO 20: NEXT J
4560 GOSUB 310 : PRINT CHR$(A);
4570 FOR J=1 TO 20: NEXT J
4580 NEXT N
4590 RETURN
4600 '        ==== NORMAL PLANET ====
4610 X=X(DES(PTR)):X=X*2+X
4620 Y=Y(DES(PTR)):Y=Y*2
4630 GOSUB310 : PRINT AL$(DES(PTR));
4640 RETURN
4650 '         ==== PACK ARRIVAL TABLE ====
4660 FOR J=1 TO 25
4670 IF ARR(J)=0 THEN PLR(J)=0
4680 NEXT J
4690 RETURN
4700 '          ==== DRAW TITLE PAGE ====
4710 '          == R ==
4720 DRAW "D30R1U30R6D1L5R8L3D1R4G1R2G1R3G1R1G1R2G1
R2D5U4L1D6H1D2H1D2H1D4F1D1F1D1F2D1F2D1F1L2U2L1U1L1U
2L1U1L1U2L1U2L1U3L2F1L8R5D1L5"
4730 RETURN
4740 '          == A ==
4750 DRAW "BD30U2D2R1U5D3R1U6D4R1U7D4R1U6D3R11U1L10
U5D3R1U6D3R1U6D3R1U6D3R1U7E1D2D6U3R1D6U3R1D6U3R1D5U
3R1D7U4R1D6U2R1D5U3R1D6U3R1D5R1U2"
4760 RETURN
4770 '          == I ==
4780 DRAW "BR9D30R1U30" : RETURN
```

```
4790 '          == D ==
4800 DRAW "D30R1U30R8L7D1R9L2D1R4L2D1R4L2D1R2GR2GR2
GRGRD2U2RD15U13RD10L2D5U3LD4HD2HD2HLDL3R3DL10DR7U2R
5"    : RETURN
4810 '          == E ==
4820 DRAW "D30R19UL18U14R13UL13U13R18UL19" : RETURN

4830 '          == O ==
4840 DRAW "BD3D23FU25FU2FUER11L11DR13GR2GR2D23U23LD
24HD2HDGL11R11UL13EL2EL2" : RETURN
4850 '          == F ==
4860 DRAW "D29RU17R13UL13U10R19UL19" : RETURN
4870 '          == G ==
4880 DRAW "BR19BD3D3LU4GU2GLELUL10R10DL11FL3FLFL2GD
21U21RD22ED2ED2ED2R11L11UR13L2UR3HRHR2U6L6DR5D5":
     RETURN
4890 '          == L ==
4900 DRAW "D30R19UL18U29" : RETURN
4910 X=6:Y=18:GOSUB310:PRINT"An intergalactic game
of strategy by ";
4920 X=18:Y=20:GOSUB310:PRINT"Tony Byorick";
4930 PRINTCHR$(16);
4940 DRAW "BM90,168R60"
4950 RETURN
4960 '      ========== DISPLAY DATE =========
4970 D1=D1+1
4980 IF D1>9 THEN 5000
4990 GOTO 5050
5000 D1=0 : D2=D2+1
5010 IF D2>9 THEN 5030
5020 GOTO 5050
5030 D2=0 : D3=D3+1
5040 IF D3>9 THEN D3=0
5050 X=43:Y=20:GOSUB310:PRINT"Date";
5060 P1=(D2*10)+D1
5070 X=40:Y=21:GOSUB310:PRINTD3;":";D2;D1;
5080 RETURN
5090 '      ========== CHECK FOR WINNER =========
5100 FOR L=1 TO NP:STR(L)=0:NEXT L ' RESET STR
5110 FOR J=1TONP
5120 FOR L=1TOPN
5130 IF OWN(L)=J THEN STR(J)=STR(J)+1
5140 NEXT L:NEXT J
5150 H=0 : FOR J=1 TO NP
5160 IF STR(J)>H THEN K=J:H=STR(J)
5170 NEXT J
5180 GOSUB 5240 '  CLEAR BIG BOX
5190 GOSUB 3980'  STATUS DISPLAY
5200 GOSUB 5280 '  CLEAR SMALL BOX
5210 RETURN
5220 '
5230 '***** CLEAR BIG BOX *****
5240 DRAW "C5"
5250 RETURN
5260 '
5270 '***** CLEAR LITTLE BOX *****
5280 DRAW "C5"
5290 FOR Y=160 TO 190
5300 LINE(3,Y)-(250,Y),PSET
5310 NEXT Y
5320 RETURN
TUS DISPLAY
5200 GOSUB 5280 '  CLEAR SMALL BOX
5210 RETURN
5220 '
5230 '***** CLEAR BIG BOX *****
5240 DRAW "C5"
5250 RETURN
5260 '
5270 '*
```

Info:

*Just got 1st issue of *Under Color* . . . some very interesting stuff. I don't know who you use as a communications consultant, but he has some gaps in his knowledge. Maybe I can help a little in this instance, but of course Wayne Day is probably your best bet for most stuff. What I'm getting at is the letter from Samuel Murphy. (DEFUSR, issue 1). He asks if the "radial-Vac" (sic) modem (Model VA2450) can be used with the Color Computer.

Actually, he is talking about "Racal-Vadic," the first company to come out with a 1200 baud full duplex dial-up modem (it was just Vadic back then). The Vadic 2450 uses a *different* modulation scheme than the now more-common Bell 212 1200 baud modem. Unlike the 212, which can also operate at 300 baud, the Vadic modem only operates at 1200 baud. So, to use it with the CoCo, first of all you must be sure you have a terminal program that will run at 1200 baud. For reliable operation, this means using a hardware UART, such as the Tandy RS-232 pak. Secondly, you have to find out if the service/BBS that you want to call uses Vadic modems. If not, you're out of luck. It is very unlikely that any free BBS uses Vadic modems. CompuServe, and to a greater extent, Tymnet, have some Vadic ports. They are specifically noted in our access number list as "1200 Vadic." As for cables, I believe the 2450 takes a standard 25-pin connector.

I'd suggest he not attempt to use the Vadic modem for BBS access, and instead buy a low-cost 300 baud modem for this purpose. There are rumors that a number of companies soon will be selling modems under $50.—Sandy Trevor

*I have been playing around with speech. I have three versions of it going. One uses the SC-01, two use the SPO256-117 IC (clock) and the third uses the SPO256-AL2 (allophones). The real big difference is the I/O, as I am using the serial port for all three.

At the present, I have about twenty pages of "how to build it and use it" written for the SC-01 and would be able to put at least that much together for the two SPO256 packages.

Please find enclosed a short listing that I use to check out the SPO256 packages. This may give you a little better idea of what my serial speech is all about.

That reminds me, can and would you modify the remote keyboard program as was in the *Rainbow* (Nov. '83) issue so that what is received is not sent back out? This would enable me to use the S600 typewriter as a real keyboard and allow the composition of programs away from the CoCo.

One way of getting a good (real ACIA) serial port is with the RS Deluxe RS-232 Program Pak #26-2226. Of course you have to have the Multi-Pak Interface to have it with disk and etc. The rub comes in that the pak was intended for tape use and there doesn't seem to be any patches to put it on line with the disk as they both use &HC000. Sure would be nice to use the remote keyboard through this ACIA port. (hint, hint)

In your future articles if you use any Disk ROM routines please include the addresses for the 1.1 version. Some of the programs as featured in other magazines don't tell which version was used but I've come to assume 1.0!—Michael J. Lill

*I keyed in Dennis' interrupt driven real time clock program (Issue 1). It's nice but I had to make some changes. Since I have Disk Basic, my interrupt vector was not the same as that in the article. I added the following lines to pick up the existing vector and plant it after a JMP at the end of the routine:

```
LDX  $010D      GET THE CURRENT VECTOR
STX  JUMP+1     JUMP IS THE LABEL OF THE EXIT
                INSTRUCTION
LDX  #$START    GET SERVICE ENTRY POINT
STX  $010D      REPLACE CURRENT VECTOR
```

The label Jump looks like this:

```
JUMP JMP $FFFF $FFFF TO USE EXTENDED ADDRESSING
```

I also had to remove the line that read from the PIA port and cleared the interrupt flag. I guess the Disk Basic checks it later because it prevented the normal IRQ routine from turning off the disk drive.

The routine has a drawback when used with disk. The disk routine masks the interrupts for much more than one tick. Any disk I/O therefore slows down the clock. OS-9 has the same problem. The thing to do would be to modify the disk routine to bump up the clock count after every sector read or write in order to compensate for the slowdown.—Joseph M. Miller

Ideas:

*I also have an MC-10 and would enjoy articles on them, especially memory expansion past 8K. Radio Shack did it with their memory module. They must have disabled the LS155 on the board and used another chip for device selection.

I know Dennis is a music person: ever thought about software for the RS Voice Pak?—Joseph M. Miller

*I pick up a *Computer Shopper*, now and then, and find pages and pages of ads on disk drives. They list them by number or if they work on a PC. They almost ignore "Radio Shack People." I know it if works on any TRS-80, it should work on the CoCo. I think that many RS stores imply that you must use CoCo drives with the CoCo, even the right color. So, how do I tell if an advertised drive will work with my CoCo? "Ain't no bargain if it don't work . . ."

How about a home brew modem? I don't have enough interest to pay $100–$200 for one. A friend suggested using the PC board out of a $10 telephone, a XR2206 and a few OP-AMPS & etc., and be on line for $25 or so. Could be hand-wired on a perf-board. They can't put you in jail if you don't sell them, can they? The telephone PC board would by "type approved . . ."—Bill Frame

Box 809

Comments:

*I received the 64K upgrade and the Memory program and everything worked out very well. That 37 hours test is a long one to sit back and wait for. Come to think about it, I should be telling this to the "Old man on the Green Mountain." Please pass this along to Dennis and Company.

I have read Dennis' material in *80-Micro* and in *Color Computer* and appreciate his writings. Naturally, Bill Barden and Terry Kepner are also a welcome sight . . .—V.K. Hatfield

*Heighdy! Glad to see everyone survived the crash of the Hindenburg. Fie to the feudal lords Ziff and Davis, a pox on both their houses (They bought an article and ate it when *CCM* folded—now I'll never see print.).—Fred Toon

*I am extremely interested in information on new models and revisions of the Color Computer and possible enhancements like expanded memory and graphics, such as the Motorola RMS chip set. That new SAM chip and the 16K x 4 memories is particularly intriguing; wish there was more information. I think it would make a good series of articles to cover each model of the Color Computer, to explore and compare the differences. Your coverage of the differences in this first issue was very helpful and interesting and I hope you'll keep up this practice in the future.

My system looks like this: I started with a used 4K CoCo about two years ago. It now has a homebrew video output and Zenith green screen monitor, 64K plus the DSL 128K mod (just installed), two 40 track DSDD drives and one 80 track DSDD, an Okidata 92 printer, a Multipak, and a WorkPack II. Not bad for a "game" computer!

Disk operating systems are ADOS and OS-9, the latter with D.P. Johnson's SDISK. I just got Basic09 this week and am very excited with it—this from someone who hates programming! I bought the C compiler a long time ago but have never been able to figure out how to program in C; it makes little sense to me but I intend to try again since that's the operating system we're going over to where I work. Again, I hope you'll provide lots of coverage for OS-9 and the available languages.

My main use of the system at present is as a word processor. As such, it has been such a valuable aid that I consider it worth all the money spent on hardware improvements to date and will likely always spend more time writing correspondence and fiction than actual programming. Can't emphasize this enough.

Telewriter 64 is my favorite program; Dynastar is cumbersome and clunky by comparison, although the Wordpack II is going to make it much more useable. The main problem with Dynastar was that I was limited to a one-way-only window of 15K of text, couldn't page backward through a disk file, which is a fatal flaw for my needs. By freeing up the memory space used for O-Pak and deleting unnecessary OS-9 modules like PIPES and RS-232 I now have as much as 143 pages of contiguous free memory and about 26K or so of text buffer. This is not enough, but it is a major improvement. I need more text buffer! Do wish Telewriter could be put on OS-9 and use WordPack, as it stands it is a very easy-to-use and powerful word processing program for creative writing—especially for those on a limited budget!

Hopefully the do-it-yourself move to 128K (and more) will spur software development to complement it, just as the move to 64K did. More articles and coverage on this important development, please?

Dream Dept: how about an upgraded Color Computer that's a *real* improvement? The idea is to keep the powerful 6809 up and software that's already been developed for it. Going to a 68008 might be desirable since it already has the extended addressing range, but since it is not code-compatible one has to almost start over with the software. At the risk of sentimentality, I'd like to keep the good ol' 6809.

My wish list goes like this: a fully decoded keyboard with all the keys we need, serial and parallel hardware I/O, let's not give the CPU any more overhead than we have to. Disk controller already on the board as a standard feature (What's the point of a CoCo for OS-9 or Flex if it doesn't have a built-in disk controller?). Leave the joysticks out, add them and/or a mouse as optional items where they'd be needed. I'm not opposed to games, it's just not a major need on my computer. Ditto for a cassette interface.

We never have enough memory: let's start with *at least* 128K expandable to 1000K and an extended addressing range preferably via a 6829 MMU or some other hardware memory controller, optionally some kind of bank-switched arrangement. I think some sort of piggy-back board arrangement for the additional memory might be better than trying to cram it all onto the main board. I don't know whether to go with 64K chips or bite the cost bullet and go 256K chips. Too early for the 1M chips . . .

Improved graphics display with its own memory such as the Motorola RMS set—one thing I do like about the Macintosh is its graphics. Internal expansion slots for nice things like hard disk controllers, modems, and additional I/O. Better interrupt handling and DMA for faster hard disk transfers. All of this built into a Model 4-like enclosure, or with exterior video monitor.

What do we get? Probably something expensive, but it'd be one heck of a single-board microcomputer. . . . I've a feeling though that the 6809 simply isn't going to carve out the niche it deserves and that the 68000 family ought to be regarded as the proper and desirable successor. After all, OS-9 has been implemented for it, so there is at least some familiar software support.—Damon Hill

*Was just about to write and ask where the new mag was when it arrived in the mail . . . looks good. I hope that you leave the games to *Rainbow* and *Hot CoCo*. Dennis was the best thing in the *C C Mag*. Lost a year on a renewal but don't think Ahl's rag is worth the postage. My preference is utilities, hardware and Q & A spots like Kepner's. *The Color Computer News* was great . . . some were better than

Box 6809

Rainbow . . . still get them out on a rainy day and find something new.

For the record, I have a 64K E, (my up-date), CTR-80A, Oki 82A, 2 TEAC drives and Bill Vergona's Cer-Comp DOS and "bare board" PJC six-slot expansion port. On the shelf is a 16K D Basic and a spare F? board. Transformer hole is in a different spot . . . plan to move the transformer and junk the D board . . . some day . . .

The Cer-Comp DOS works fine. It is much better than the RS . . . but . . . I do not have enough smarts to convert many of the programs that I would like to use. Just ordered the HDS bare board for Xmas . . .—Bill Frame

Questions:

*What is the *real* reason for using a printer in your magazine that has 0 and O as the same character?

Other magazines have this same problem!—William H. Link

William—the real *reason is that, so far, no line printer font is available that includes every character and spacing any computer magazine needs. Choosing a font that doesn't differentiate between a slashed-zero and the letter O saves us from some other, more confusing, problem.—D.M.*

From the Editor:

• OK, calm down. We missed it—Figure 4 from Dennis' Part I of the real-time talking clock was, indeed, missing from issue 1. Just proves I'm not *quite* perfect . . . . Anyway, the figure will be found floating somewhere (and duly identified) in issue 5.

• Those of you who have been struggling with Dennis' memory tester from the last issue of *TCCM:* The final test takes about 37 (not a misprint) hours to run. That's why you don't get results if you're impatient. Just let it run . . .

• Several folks have asked if their subscriptions to *UC* can start with issue 1. We will start all subscriptions with #1 until the printed copies of #1 run out. After that, subs will start with the earliest available copy, giving as many folks as possible as complete a set of the mag as possible. Incidentally, there's only about 500 more of issue 1, so tell those laggard friends of yours to hustle . . .

• Those of you missing items from *TCCM* days—I'll be happy to make copies of any articles in any *TCCM* I still have copies of, if you'll send money for copying and postage. Be as accurate as you can with *what* you want and *when* it appeared: memory fades as time passes . . .

• Finally, rumor has it that if you persist long enough, refunds will be received from Ziff-Davis: Persevere!

Clubs:

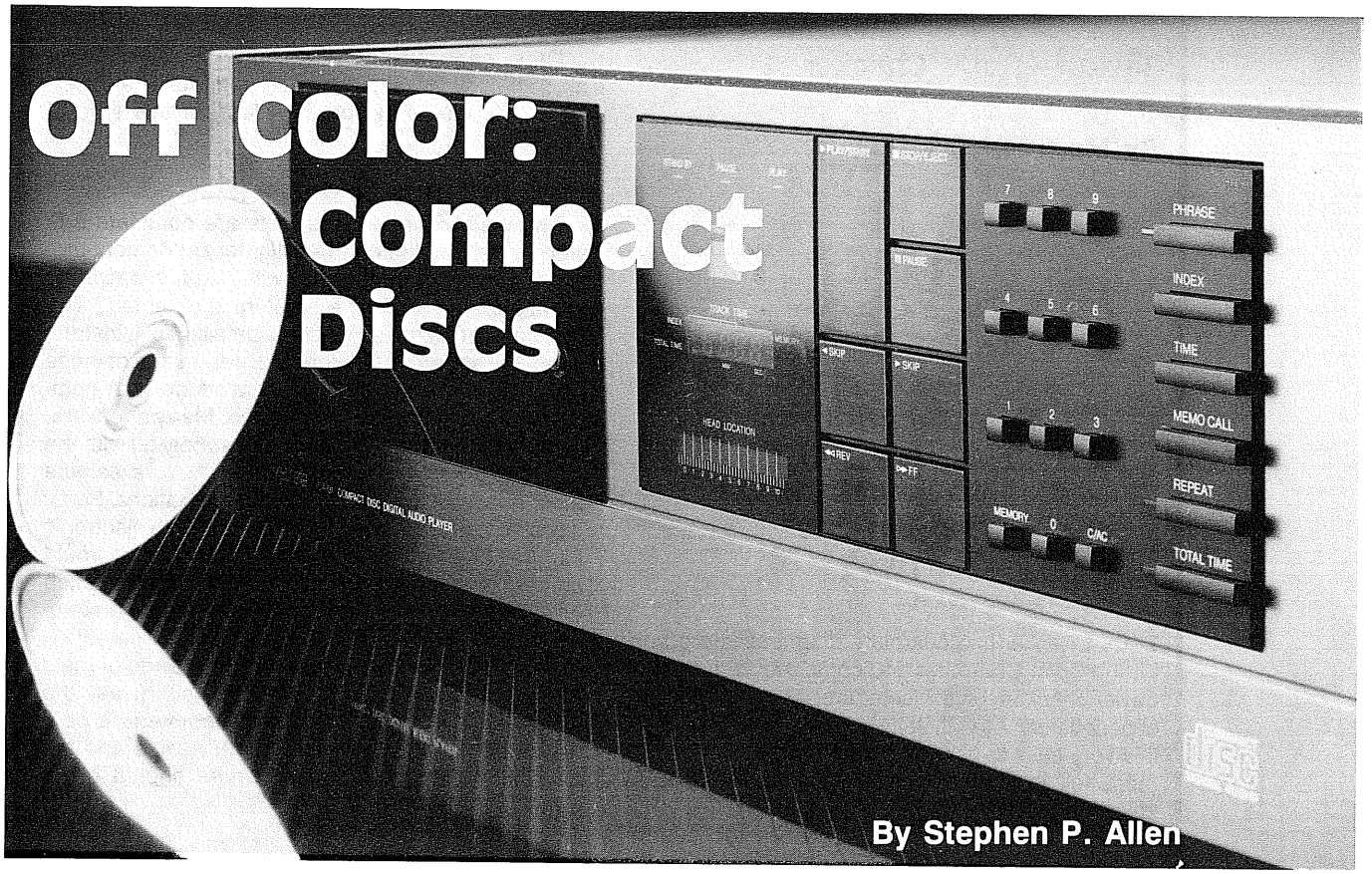
*OCOCO is the other CoCo club of Atlanta, GA. Meetings are every fourth Tuesday in each month at the DeKalb Community College Central Campus in Clarkton, GA. Dues are $10 a year; meetings begin at 7 PM.

For more information call (404)396-5395 or CHIPS Inc. at (404)457-2447, or write to David Fresch, 4923 Mill Brook Dr., Dunwoody, GA 30338.

From Manufacturers:

*Bob Rosen of Spectrum Projects offers the following POKEs to modify the "problem" ROMpaks "Downland" and "Stellar Lifeline." He notes that the programs are to be used with Spectrum's "Multipak Crak," 64K disk and RS Multipak required.

Off Color: Compact Discs



By Stephen P. Allen

The Color Computer is a powerful machine that does some pretty fancy things, but let's face it—when it comes to digital sound, even with four-part harmony the CoCo is in the minor leagues compared to the latest in dedicated digital audio equipment.

I've had a Compact Disc Player for about two months now; I can confidently tell you that digital sound is everything it's cracked up to be. (Now I'm trying to save enough to beef up the rest of my stereo system so my neighbors can enjoy it, too!)

Apart from its astonishing music capabilities (96dB S/N, inaudible flutter and distortion) the CD presents a great potential as a ROM for microcomputers. Consider:

Each second of sound in a CD represents two stereo tracks, each comprising 44.1K 16-bit words. This works out to 176.4K 8-bit bytes each second. If you were to dump the equivalent amount of memory to your printer at the rate of 40 bytes per line with 66 lines per page, it would take almost 67 pages to represent one second of CD audio! The theoretical storage limit for CDs is 74 minutes—a fully loaded disc could hold over 780 Megabytes of computer data!

As it happens, a standard format exists for computer storage on Compact Disc. It's called CD-ROM, and it's being developed right now. Offering 333,000 sectors of 2048 bytes each, the maximum data storage potential of a formatted disc approaches 682 Megabytes. Here's the breakdown for a sector:

FIELD	LENGTH
Synch	12 bytes
Header	4 bytes
User Data	2048 bytes
Aux. Data	288 bytes

The Auxiliary Data field is used for extensive error-detection and correction. Current plans call for two levels of error-detection. The first would be low-level (one bit in 10 billion). This is compatible with current home players. A second, higher level would require circuitry not found in the home CD player, but would detect errors at a bit rate between 10^{-16} and 10^{-17}, which approaches the theoretical limit of error-detection.

With so much storage available the question becomes, "What would be stored?" This may be the most difficult question to answer. Information changes rapidly these days, and the cost of CD production is still high enough that there aren't many reasonable microcomputer applications. (Face it, would you rather have the Encyclopedia Britannica on your computer monitor or in books?)

One possibility suggested is for microcomputer programs. Putting out a program disc with versions for all compatible computers would be a snap. (And when the software has to be updated or otherwise patched, of course the customer would pay. Ah, well . . .)

Industrial uses are easier to envision. How about the master catalog of General Motors Parts? With every part ever made by GM and subsidiaries? With full graphics? The only problem would be getting someone to compile the beast. How about a *very* comprehensive Intelligent Law Library complete with database management program?

Sony has just announced its lowest-priced CD player yet: about $210 suggested retail. This is as cheap as a floppy drive, and brings an absolutely stunning technology even closer to the ill-heeled computer or audio hobbyist.

Actually, the technology that has a greater possibility for home computers might be the Digital Audio Cassette. Clever engineers are working on the miniature helical-scan tape head; I'm confident that it's only a matter of time.

And so, the computer revolution continues. Just when you think you've got the situation pretty well doped out, along comes another breakthrough and it's time to sit up and think again. . . . Meanwhile, Franck's *Second Symphony* (or Schubert's *Ninth* or *Steps Ahead*) sounds glorious when translated from ones and zeros. *(end)*

Review—CoCo Checker

By Mark Haverstock

PRODUCT
CoCo Checker
by Jeff Francis
Tape or disk
Spectrum Projects
P.O. Box 21272
Woodhaven, NY 11421
(718) 441-2807
$19.95

CoCo Checker is a complete diagnostics program for the Color Computer and compatibles. It lets the owner check up on the computer itself and a range of peripherals. As with Jeff Francis's other programs, it is very easy to use. Once the program is loaded, menu selection is made using the up and down arrow keys.

Starting from the inside out, several test options are available. The 6809's timing accuracy, video display generator, PIAs, disk controller, sound multiplexer, ROM and RAM chips may be tested individually, letting the user diagnose most of the main components of the computer without having to physically open the case and substitute chips on a trial and error basis until the problem is found. The ROM and RAM checks deserve special mention, as they perform informative multiple checks in a speedy manner. All three ROMs—Basic, Extended, and Disk—are checked and identified by version. The test recognizes the versions currently in use, and will print checksums of all the data in an 8K ROM if it doesn't recognize the version of Basic you have. This could be useful for custom-made ROMs. RAM checks has three options: fast, slow and slowest. Even the slowest of these took only about 46 seconds to complete. However, if one or more of the RAM chips is bad, you'll have to resort to the plug and substitute method until the test runs error-free. There is no facility available to locate the faulty chip.

The keyboard test will check standard Color keyboards, as well as the add-on varieties. One nice feature is that it will check keyboards with function keys, such as the HJL and others. A keyboard is displayed on the screen during the test, and the corresponding number or letter will flash when pressed if the key is functioning properly.

Disk and cassette I/O are checked by writing and reading sample data to each and comparing for accuracy. Caution! Remove the program disk after the test is loaded. When performing these tests, use a blank tape or blank formatted disk. During the disk test, disk speed is measured. Also, a map is drawn on the screen indicating CRC errors, I/O errors, and verify errors.

Other peripheral items that may be checked include the joysticks, printer port and Multi-Pak Interface. The Multi-Pak test is a first for this type of program.

If There is a Problem

The instructions for the tests are complete and well-written, including the obligatory statement that opening the computer, etc. will void the warranty. What should you do if a problem is detected? The documentation doesn't include detailed fix-it instructions, nor should it. Obviously, if you're one of those persons who have experience working with computer circuitry, by all means do so. Many suppliers, including Spectrum Projects, can supply ou with the necessary parts to make repairs. Also, a service manual is available from Radio Shack National Parts. If you've had little experience working with electronic circuitry or your unit is still under warranty, it would be best to send it to a qualified repair facility, such as a Radio Shack Computer Center. Your "diagnosis" may help a repair technician save time.

The CoCo Checker has a broader range of tests than other available programs, such as the Diagnostics ROMpak. I would recommend it as a reasonably priced utility that both novice and experienced Color Computer owners should have. *(end)*

Review—Calc Comparison

By Jeffrey S. Parker

PRODUCT
VIP Calc
Softlaw Corp.
132 Aero Camino
Goleta, CA 93117
805-968-4364
$69.96 tape or disk
disk: requires 32K minimum,
at least one drive

DynaCalc V 5.0:3
Computer Systems Center
13461 Olive Blvd.
Chesterfield, MO 63017
$99.95 disk
64K and one disk drive

Anyone who has ever balanced a checkbook has used a spreadsheet. *Spreadsheet:* this frightening phrase was first coined by accountants working with huge rectangular worksheets, on which they kept track of the ledgers for companies. With these "spreadsheets," they could track the past financial

history of their companies and extrapolate as to what might occur in the future if they were to take certain action or make certain investments.

Working with an eight-foot piece of paper can have its drawbacks; to improve conditions someone invented a pen with erasable ink. Computers have changed all that. Gone are the huge rolls of spreadsheet paper—now there are high resolution monitors, and Visicalc. I mention Visicalc because it has become an industry standard, and has been around for many years now. It is also the program which both Dynacalc and VIP Calc are modeled after. They are "look-alikes"; they both look and run very similarly to Visicalc.

Each of these programs will be evaluated for their own merit, in terms of error handling, ease of use, documentation and performance. I would like to remind the reader that after reading this article, you should not leap to a conclusion and rush to go buy a program. You should evaluate carefully and thoroughly what you need and how much you want to spend, and what is right for you. I cannot judge these programs and say, "this is better, this is the one for you"; I can give assistance to readers so they in turn can make a well thought-out and educated decision as to which program is best for their needs.

If it weren't for Dynacalc, VIP Calc would probably be the finest spreadsheet program available for the Color Computer. VIP Calc is powerful enough to handle all home uses and capable enough to handle some professional uses, too. One of the nicest features about VIP Calc is its command format, which is in some ways identicle to, and as easy to use as, the other programs in the VIP Library. At this writing, the VIP Library has just come out in a one-disk package, which in some ways makes it resemble a Lotus 1 2 3 for the Color Computer.

VIP Calc is loaded and auto executes. The first screen shows the spreadsheet, and VIP Calc is in the enter mode. Like Visicalc and Dynacalc, VIP Calc has help screens for every mode, and gives the user a command summary and the function of each command. This extensive on-line help menu can be of great assistance to the new user, and is a welcome change from the other VIP Library programs which have few or no on-line help menus. VIP Calc has nearly all the features of Dynacalc, with the exception of high resolution graphics capabilities. Some of its features are unique, such as extensive printer formatting, a 256 character type-ahead buffer, and transferability to other VIP programs. That is to say, one could create a spreadsheet using VIP Calc and save it in ASCII form, then load it into a report being prepared with VIP Writer. This report could then be sent via VIP Terminal to a home office, or a business associate in California.

VIP Calc, while strongly resembling many other spreadsheets on the market, does have some special features worth paying attention to. Of these special features, one of the most notable is VIP Calc's ability to provide the user with an extensive array of printing options and formats. VIP Calc will let the user print any or all parts of a spreadsheet, virtually any way the user wants to. Another very important feature of VIP Calc is its windowing capability. VIP Calc can divide the screen of a 32K machine into eight horizontal windows, and the 64K machine can provide up to 16 windows. This means that the user can view up to 16 different areas of a spreadsheet at a time, and have them scroll either synchronously or independently. The results of calculations performed near the beginning of the sheet can be viewed near the farther end of the sheet: change an investment for January, and see what you wind up with in December!

Yet another feature of VIP Calc is double-precision mode. While taking up to twice as long to calculate as single precision, the double precision feature lets the user calculate figures to 16 digits instead of the Color Computer's usual eight digit numbers.

Screen default sizes and options, like in other VIP Library programs, are another nice feature of VIP Calc. The user can select between 32, 51, 64 wide and narrow, and 85 column displays. In addition, 21 or 24 rows can be selected, as well as screen color and inverse video.

VIP Calc does have some drawbacks, and four problems in particular stand out. The first of these is speed. VIP Calc takes a very long time to screen update, particularly when it is doing a horizontal screen update. The average screen update time is six seconds, which can be extremely frustrating to wait for after every cursor movement or recalculation. The reason for this delay is the way the program writes its hi-res graphics screen. The time factor is an important one, particularly where one is dealing with many calculations. Mitigating this is a toggle to turn off auto recalculate, after which you may either recalculate manually or wait to recalculate until a large number of entries have been made. Single precision is slow, but double precision can take as long as a minute and a half to complete a large worksheet of recalculations.

VIP Calc has a workspace in a 64K machine of 22,118 bytes of RAM after it is initialized. As in other spreadsheets, one has to give up some feature to get more workspace—in this case the hi-res screen feature. Once the Dump command has been executed, you get about 8700 more bytes, but you cannot get the hi-res screen back without saving the work in progress and restarting VIP Calc. The default screen size is 32 × 16, and the speed factor does increase substantially.

Another drawback is VIP Calc's help menus. They are somewhat less than extensive; sufficient is a good way to describe them. The help tables list the commands, but they do not go into any kind of explanation of the given command, nor give any detailed information about the command. There is no option to delete the help commands—they are stored on disk file, and can either be used or not.

VIP Calc has a good error handling routine, which makes it difficult to destroy entered data or carelessly wipe a spreadsheet clean.

Last but not least, VIP Calc comes with the most complete set of documentation Softlaw has produced thus far. This is to say that it is a very well-organized manual, in the form of a tutorial, and provides a detailed explanation of VIP Calc's commands, features and functions. The text of the tutorial does contradict the text of the command summary section in

several places, which can get confusing, but on the whole the manual is very usable documentation. Further explanation and simplification would be nice to see in a future version of the manual.

All in all, VIP Calc is a very powerful software package for the Color Computer. While by no means the finest spreadsheet available for the CoCo, it is quite capable of handling both personal and professional spreadsheet needs, and includes some unique features not found on other spreadsheets.

Dynacalc is one of the most powerful programs for the Color Computer to come along. There is no finer example of integrated software for the CoCo to date. Dynacalc is a spreadsheet which incorporates an integrated high resolution graphics package in its design. A thorough manual and the most extensive on-line help menus thus far developed for the Color Computer round out the package.

Dynacalc is head and shoulders above the rest, with or without its graphics. The only close contender on RS-DOS is VIP Calc. Dynacalc was written for Flex also, but the RS-DOS version appears to be somewhat more orderly in its command design, and slightly fuller featured.

Like VIP Calc, Dynacalc uses a hi-res screen display, which is 51 × 24 and is not user definable. Again, the user must deal with the element of recalculation time with Dynacalc. While taking some time (average 10–20 seconds) for recalculation, on the whole Dynacalc is substantially faster than VIP Calc.

Dynacalc's hi-res display cannot be dumped to provide extra memory, but by deleting the very extensive help menus, composed of about eight pages of video RAM, one can restore an additional 8500 bytes of RAM. These help menus are available for every mode of Dynacalc, and not only give the command summary, but also give a full explanation of what each command does, and a full explanation of each formula, too. This is very much like having the manual on-line.

The manual itself should be mentioned here. While it is somewhat rigorous, it is quite thorough in detail and explanation, and even a novice could understand its easy to follow language.

For those users wishing to really fly around a spreadsheet, there are options allowing cursor control by means of a mouse or joystick. This is user selectable, and you may toggle back and forth between joystick/mouse and keyboard whenever you wish. The cursor is a very large oscillating line on the screen, which gives one a feeling of confidence watching it move, and tells the user where they are located on a given worksheet very rapidly. Dynacalc is also capable of windows, though limited to two windows maximum at any one time. These can be formatted either vertically or horizontally, and can scroll either synchronously or independently. Dynacalc has superb error handling, making it almost impossible to destroy data accidentally, and alerting you when you make an illegal command entry.

And now to graphics! What a selection! Line graphs, bar graphs, high/low/close graphs, pie charts—all drawn in high resolution graphics, all ready to be printed on a dot-addressable dot matrix printer. Printer drivers are developed from the master disk using a program feature called "Create," which lets the user create bootable back-up copies of Dynacalc with a printer driver installed on that disk for a given printer (such as Gemini, C. Itoh, Nec, etc.). Labels and captions can be added to any graph anywhere, and any graph can be defined by any range or part of a spreadsheet. These fully integrated graphics, combined with windowing features, are what people find on 16-bit machines.

There are far too many features of the program to go into in this article. Thirty-six mathematical and logical functions, autorepeat, output to ASCII/text files for word processors, all of these functions and more are available with Dynacalc. If one is using Visicalc at work, this is a superb program for home expenses, but the power shouldn't be wasted there. Compared to Dynacalc, Visicalc is somewhat limited . . .

As can be seen, by sheer magnitude alone Dynacalc emerges as a Jaguar compared to the VIP Calc Cadillac. Both built for performance, designed for elegance and appearance, but the Jaguar, a sleek, dynamic, integrated art form in motion, will win out in the long run.

This is not to say which is the best; that product could be announced tomorrow. This is not to say which you should buy; that decision is up to the reader, and as personal as a choice in fine automobiles. Cost must be weighed, type of use, design features, etc. One very important question to ask, before getting carried away with Dynacalc, is will there ever be a need for graphics in a given use? Are all those fancy bells and whistles needed? This is VIP Calc, this is Dynacalc; now it's up to you. You be the final reviewer: you decide. *(end)*

Programming—Rather than using INKEY$ and a loop when you want the computer to wait before continuing, use EXEC 44539 in your program. It's shorter and faster. The computer will pause until any key is pressed, then continue.

Printer—Here's a two line program to screen dump graphics modes 0, 2, and 4 to a DMP-100:

```
10 SCREEN1,0:FOR X=1 TO 4:PRINT#-2,CHR$(18):NEXT X: FOR X=0
TO 191 STEP 7:PRINT#-2,CHR$(27);CHR$(16); CHR$(0);CHR$(112);:FOR
Y=0 TO 255:G=128:FOR Z=0 TO 6:IF X+Z◄192 AND POINT (Y,X+Z)
THEN G=G+2 C
20 NEXT Z:PRINT#-2,CHR$(G);:NEXT Y:PRINT#-2, CHR$(13);:NEXT
X::PRINT#-2,CHR$(30)
```

Programming—To locate the IRQ vector, type PRINT HEX$(PEEK(&H010D)); HEX $(PEEK(&H010E)).

Disk Basic—To detect the presence of disk drives on a Color Computer from within a program, PEEK(&HC000) should return decimal (&H44) if the disk ROMpak is in place.

Programming—Edit has three additional commands not mentioned in the manual: A, cancel all changes, list line, and stay in edit mode; Q, cancel all changes, leave edit mode (leaves variables' values unchanged); and E, keep changes and leave edit mode (same as pressing Enter).

Programming—Want to know what all those hexadecimal numbers mean in decimal? Type PRINT &Hxxxx, where xxxx is the hex number. Going the other way is just as simple: PRINT HEX$(decimal).

Hardware—Need to drive a separate audio amplifier? Pin 3 on the RF modulator, teamed with a ground line from the main circuit board, will provide the necessary connections. Pin 3 is the third pin from the rear of the computer on the RF modulator.

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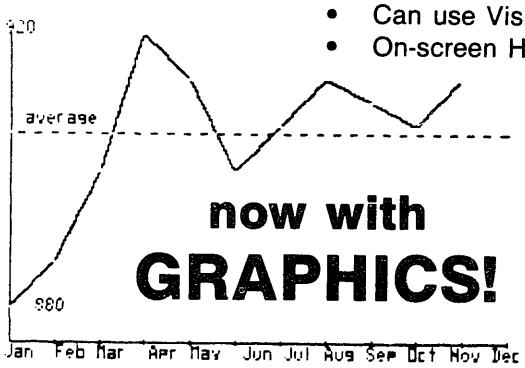

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