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FEBRUARY 1988
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THE MAGAZINE FOR TANDY COLOR COMPUTER® USERS.

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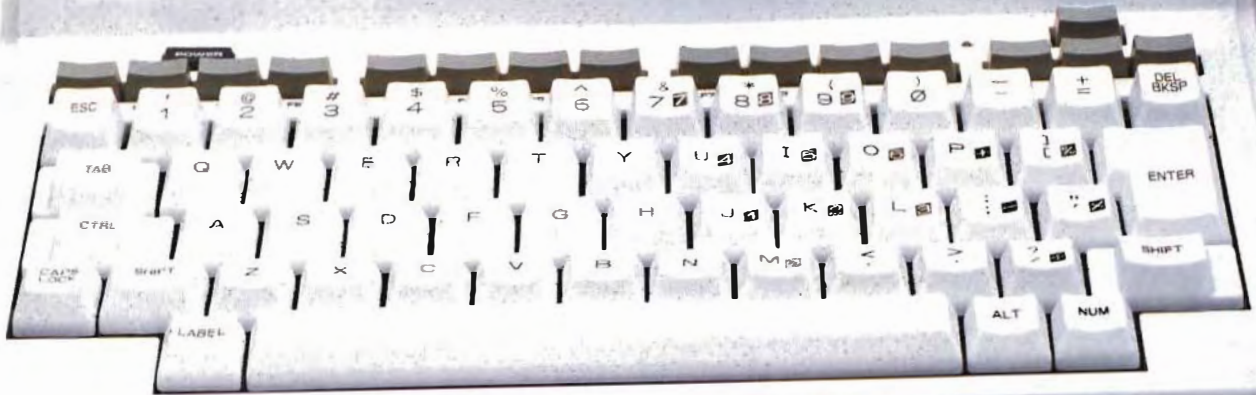
```

APP      PLAY      UPDATE  WORK
CALENDAR INVEN    SALES   WORK
          INVEN    SALES   WORK
TELCOM   COST      PROJECT RETAIL  WORK
PLAN     SCRAP

Microsoft(R) Works V1.28. Copyright (1984, 1985) Microsoft Corp.
> Copy Delete List Name Options [ESC] Set
Select option or type command letter
  1  2  3  4  5  6  7  8  9  10

```

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Finally—a portable that matches the performance of a desktop computer. Our new Tandy 600 features a 16-bit microprocessor, an 80-character by 16-line display, a built-in 3¹/₂" disk drive that stores 360K of data and 32K RAM (expandable to 224K*).

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* RAM upgrades are in banks of 96K each (26-3910, \$399.95). Prices apply at Radio Shack Computer Centers and participating stores and dealers. Multiplan and MS-Word/TM Microsoft Corp.

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JDOS

RS DOS

WD1773

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J2 IN—serial printer; OUT—parallel printer
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New JDOS 1.2

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- Double Side Memory Minder Package \$99

*OS/9 is a registered trademark of Microwave, Inc.

†Memory Minder is a registered trademark of J&M Systems, Inc.

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syllable adjectives that
end in **y** usually just add **ly**

Which has one syllable?

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- income averaging
- income splitting
- tax shelter

Which?

sister

smaller

One-syllable adjectives that end in **y** usually just add **ly**

Which has one syllable?

icy

sly

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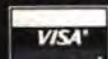
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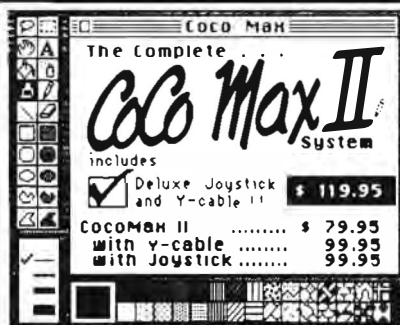
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Instant CoCo is a cassette tape containing the major programs from this issue of *HOT CoCo*. Its purpose is to save you the time and effort of typing long program listings into your Color Computer. You simply load the programs from the Instant CoCo tape using your cassette recorder. The instructions for operating each program are found in the corresponding *HOT CoCo* article. Both Basic and Assembly-language programs are included on the tape.

The Instant CoCo symbol appears in *HOT CoCo*'s table of contents and on the program listing for each article with a listing used on the Instant CoCo tape. As an added extra, each tape also contains a never-before-published Bonus Program, complete with instructions.

The directory below lists all programs included on this month's Instant CoCo cassette. Shown first are the name of the article with a descriptive blurb and its author, followed by the page number in this issue where the article appears. Next comes the file name of the program on cassette. Finally, there is a brief description of the Color Computer system needed to run the program.

This month's Instant CoCo cassette is available for just \$11.47, including postage and handling, from **Instant CoCo, 80 Pine St., Peterborough, NH 03458**. See our ad on p. 64 for more details.

Instant CoCo Directory February 1986

Side A

Article Name/Author/Description	Page #	File Name	System
Copyright Statement	--	TITLE	16K CB
Doctor ASCII/Jackson Transfer files CoCo to CoCo via modem.	10	BIT232	32K ECB
Mind busters/Ramella Hit the jackpot. Jerome.	16	SLOTMACH	16K ECB
Galactic Wars/Davis Defend the Federation and build an empire.	34	G-WARS	32K ECB
Swami Says/Simpson Crunch numbers via multiple regression analysis.	46	SWAMILD SWAMISEZ	16K ECB 16K ECB

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Programs to Boot/Wasserman Simplify execution of machine-language programs.	55	BOOTLDR	16KDECB
Cartooning and Animation/Myers A few Basic programming tricks will improve your graphics skills.	56	MICKEY MOONSET PA-DUTCH TRAIN BUGSPRAY BADGRMLN LILGRMLN WALKER	16K ECB 16K ECB 16K ECB 16K ECB 16K ECB 16K ECB 16K ECB 16K ECB

*** Bonus Programs ***

Missile Attack/Amelio Defend your cities.	--	ATTACK	16K ECB
Wizards/Dawson Battle opposing wizards with magic spells.	--	WIZTWO WIZONE	16KECB 16K ECB

CB = Color Basic, DECB = Disk Extended Color Basic, ECB = Extended Color Basic,
(m) = machine-language program (use CLOADM)

Back Issues

Yes, back issues of *HOT CoCo* are available for all months. This list shows the features in each issue:

October 1983—Animation techniques; ROM disassembly, part I.

November 1983—Nuclear submarine simulation; ROM-pack primer; banner printer.

December 1983—World capitals quiz program; talking-spelling tutor; vocabulary-building program.

March 1984—How a disk stores information; create your own wordsearch puzzles; dental/medical bill balancer.

June 1984—Horse-racing and stock-market simulators.

July 1984—Do-it-yourself lowercase mod; variable cross-referencer; the game, Python.

August 1984—Basic OS-9 review; database manager program; graphics tutorials; hurricane tracker.

September 1984—Educational software buyer's guide; typing-teacher program; the CoCo as a marketing aid.

November 1984—Personal money manager program; disk-file protection utility.

December 1984—Disk-drive timer; disk drive maintenance tips; full-featured text-editing program.

January 1985—Spreadsheet program; stock-charting program; make fancy graphics with your printer.

February 1985—Drawing program; user's group list; Space Hawks game.

March 1985—Universal screen-dump program; POKE list; utilities.

April 1985—Telewriter-64 mods; modem comparison; satellite-tracking program.

May 1985—Sound digitization; blackjack program; disk-based smart terminal programs compared.

June 1985—How to install 64K in any CoCo; pie-chart program; custom fonts for Gemini printers.

August 1985—Graphics utilities; auto-line-numbering program; how to connect the CoCo to a Model 100.

You'll also find in each issue our regular features, reviews of popular software and hardware, and dozens of useful programs that are yours for the typing in.

Each back issue costs \$3.50 plus \$1 shipping and handling. On orders of 10 or more back issues, there is a flat \$10 shipping and handling fee. Quantities are limited, and we cannot guarantee that all back issues are available. Send your orders to **HOT CoCo, Back Issue Orders, 80 Pine St., Peterborough, NH 03458**. ■

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The HJL Numeric Keypad
for Color Computers



Cuts number crunching down to size

Now you can enter and revise data twice as fast in spreadsheets, accounting and other number-intensive applications with the HJL numeric keypad, NumberJack.

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NumberJack has a streamlined, low-profile ABS enclosure that measures just 5-1/2 x 7-1/2 x 2-1/4 max. The full-travel keyswitches have the same comfortable feel and reliability that have made the HJL-57 everyone's favorite CoCo keyboard.

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HJL performance-- You can count on it

Bounce-Proof keyswitches are rated for 50 million cycles per key minimum and mounted on a solid aluminum baseplate. Contacts are covered by a protective membrane to guard against dirt, dust, and accidental spills. The NumberJack is built so well it carries a full,

one-year warranty and the exclusive HJL Products 15-day money back guarantee.

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Including Original, F-version, CoCo 2, TDP-100 and Dragon. Some CoCo 2 computers purchased after November, 1984 will require a special adapter (\$3.00); just let us know the model number and we will add it to your order if required.

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Letters To The Editor

About My MC-10

About My MC-10 is a newsletter supporting Tandy's MC-10 Micro Color Computer. We now share knowledge with over 100 contacts in four countries. I'll send you a sample issue if you send the postage. A year's subscription is \$10, and \$5 gets you 42 pages of back issues and a 100-program software catalog.

You might also be interested in one of these two MC-10 user groups:

Larry Allen
P.O. Box 103
Owensville, IN 47665

Jose Bray
4730 Cass St.
San Diego, CA 92109

Larry E. Haines
East 2924 Liberty
Spokane, WA 99207

More MC-10

There's still much to say about the MC-10—like 44K, for instance. If you have a Poco CoCo and want to use it, drop me a line. Let's get a user's group started.

H. Francisco
10226 North 29th St.
Tampa, FL 33612

Autonum Offering

I write my own software and often get great ideas from articles published in *HOT CoCo*. I recently typed in Jeff Mikel's Autonum ("The AUTO Difference," *HOT CoCo*, August 1985, p. 40) and found it to be an excellent

"Finding Firewood Best Buys" Fix

A mistake slipped by me as my article, "Finding Firewood Best Buys" (*HOT CoCo*, November 1985, p. 48), went to press. The word "multiply" in the fifteenth line up from the breakhead, Program Structure; on page 48 should be changed to "divide."

Delbert Baker
Albany, OR

The CoCo Exchange Club

The CoCo Exchange Club serves the Philadelphia area and is open to all CoCo owners. We offer a monthly newsletter and useful tips and programs. Send a self-addressed, stamped envelope for a free newsletter and more information.

Daniel Moore
2745 Old Cedar Grove Road
Broomall, PA 19008

Dayton CoCo User's Group

The Dayton CoCo User's Group now has a new address. Please reach us at the following address.

Dayton CoCo User's Group
Steve Lewis
4230 Cordell Drive
Dayton, OH 45439

Clubhouse

Penninsula Color Computer Club

The Peninsula Colour Computer Club meets the third Wednesday of each month at the Bruce Park Hall, Frankston, Victoria 3199, Australia. You can get details between meetings by visiting the Frankston Tandy store.

Gordon Chase
Baxter, Victoria
Australia

Fort Knox/Radcliff, KY

Our user's group serving the Fort Knox/Radcliff area meets on the first and third Thursdays of the month at 7:30 p.m. For more information, contact the local Radio Shack store.

Bruce Metcalf
Fort Knox, KY

Brownsburg Color Computer Club

The Brownsburg Color Computer Club meets at 6 p.m. on the first and third Saturday's of each month at the Brownsburg United Methodist Church on the corner of State Road 267 and Tilden St., one quarter of a mile south on Highway 136. Our business meeting is held on the first Saturday, and we reserve the third Sunday for demonstrations and learning.

Leroy Perry, President
Danville, IN

The Island CoCo Club

The Island CoCo Club serves Long Island, New York City, and the tri-state area. For more information, phone the Colorrama BBS at 516-277-1285, or write to the Island CoCo News, P.O. Box 1729, Huntington Station, Long Island, NY 11746.

Patrick Dwyer
Levittown, NY 11756

utility, except that you can initialize it more than once, and it will write over existing program lines. I offer the following changes to remedy the situation. They represent an additional 51 bytes.

George J.P. Dabbene
Ottawa, Ontario

```
00331 LDA #57 >RTS< OPCODE
00332 STA START INITIALIZATION JUST ONCE !

01201 BDLINE FCC 'DUPLICATE LINE'
01202 FCB 13
01203 FCB 0

01290 LBSR BIN2DC CONVERT TO DECIMAL AND PRINT
01291 STD <$2B SAVE FOR DUPLICATE CHECK

01411 PSHS A,B,U,X,CC SAVE REGISTERS
01412 JSR $AD01 ?LINE NUMBER USED IN PROGRAM
01413 BCS OKLINE GO IF NOT
01414 BRA DLERR ELSE DUPLICATE LINE ERROR
01415 OKLINE PULS A,B,U,X,CC RESTORE REGISTERS

01741 DLERR PULS A,B,U,X,CC RESTORE REGISTERS
01742 BSR PRNTRC PRINT CARRIAGE RETURN
01743 LDX #BDLINE X=ADDRESS OF "DUPLICATE LINE"

MESSAGE
01744 PRNTDL LDA ,X+ GET A CHARACTER OF THE MESSAGE
01745 BEQ BRKKEY IF END OF MESSAGE, EXIT
01746 JSR 41602 ELSE PRINT THE CHARACTER
01747 BRA PRNTDL AND CONTINUE THE LOOP

01770 PRNTRC LDA #13

02250 END START
02260 *EDTASM+ CSAVEM IN ZBUG
02270 *PNUMBRING 7DC8 7FCD 7DC8
```


Telewriter-64™

the Color Computer Word Processor

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- **Menu-driven disk and cassette I/O**
- **No hardware modifications required**

THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

...one of the best programs for the Color Computer I have seen...

— Color Computer News, Jan. 1982

TELEWRITER-64

But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command. The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVH/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminus, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block move, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

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— The RAINBOW, Jan. 1982

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Doctor ASCII

by Richard E. Esposito and Ralph E. Ramhoff

Having technical difficulties? Consult the Doctor for an answer. Due to the volume of mail Doctor ASCII receives, we cannot guarantee that your query will be published. Please send a self-addressed, stamped envelope with all letters to Doctor ASCII, c/o HOT CoCo, 80 Pine St., Peterborough, NH 03458.

Q. Is there any software that will allow the CoCo to function as a DEC VT100 terminal?—**Bernadine Esposito, Columbia, MD**
A. HSL Designs (Dept. CS, 1933 East Yale Drive, Tempe, AZ 85283) sells VT101/VT52 source code (Flex or OS-9; 8,000 lines for \$25) for their 6809E CRT terminal board. You could modify HSL's code for a CoCo running Word-Pak and an RS-232 ACIA module.

Q. How can I attach the newer CoCo keyboards with the transparent ribbon cable to my older grey CoCo?—**B. P. Samuel, Cincinnati, OH**

A. Contact Spectrum Projects (P.O. Box 21272, 93-15 86th Drive, Woodhaven, NY 11421, 718-441-2807). Explain that you need an adapter to connect a new-type keyboard to an older machine. These adapters are a Tandy product distributed for keyboard upgrades when the CoCo 2 was introduced.

Q. I use a black-and-white TV set with my CoCo. Will I get sharper letters if I switch to a direct-video monitor? How can I extend to 80 or 64 columns for word processing? Will Telewriter-64 give me the screen format I want?—**Howard D. Clark, El Paso, TX**

A. If you have a late-model TV that is in good shape, a monitor alone will not significantly increase display quality. If you plan to use your CoCo for extensive word processing, get PBJ's Word-Pak and a monochrome monitor with a bandwidth of at least 18 MHz. You could then use Stylograph III or Dynastar with Flex or OS-9, or the Word-Pak version of Elite-Word with Disk Extended Color Basic, and have a true 80-column display. Telewriter-64 gives a legible 51-column display and a marginal 64-column display.

Q. I purchased OS-9 and Basic-09. I find the documentation confusing and frustrating. Are there any publications that give a beginner a better chance?—**Ronald Mattfeld, Manchester, MD**

A. Add these two books to your library: *The Official OS-9 Tour Guide* (Microware Systems Corp., 1866 NW 114th St., Des Moines, IA 50322, 515-520-2535; \$18.95) and *The Complete Rainbow Guide to OS-9* (Falsoft Inc., The Falsoft Building, 9529 U.S. Highway 42, P.O. Box 385, Prospect, KY 40059, 502-228-4492; \$19.95). Dale Puckett wrote both books.

Eds. note—For those of you who missed our update in last month's Letters to the Editor, Doctor ASCII incorrectly stated in his October 1985 column (HOT CoCo, p. 13) and again in his Best Bets For Christmas (HOT CoCo, December 1985, p. 42) piece that SpectroSystem's ADOS only works with RSDOS version 1.0. However, ADOS is compatible with any version of Disk Basic.

Q. Is there a way to read the CoCo 2's serial I/O (input/output) port from either Basic or Assembly?—**Tom Bensy, Bakersfield, CA**
A. Yes. Program Listing 1, BIT232, is a Basic program that loads in a machine-language program to do just that. Since the CoCo uses software control of the RS-232 port, the timing is critical and Basic is just too slow for normal baud rates.

You can use BIT232 alone for chatting with a friend via modem, or you can use the LININ and LINOUT routines from a Basic program to input/output a line of up to 256 characters to or from the RS-232 port. The SETPAR routine lets you set parameters such as the baud rate, number of bits, and so on. A unique feature of SETPAR is its ability to change handshaking modes for the LINOUT routine. You can choose either a modem (CD line) or printer (busy check on the RS-232 IN line) handshake mode. Run the program for operating instructions.

```
10 ' BIT232.BAS V1.0
20 CLS:PRINT" BIT232 PROGRAM"
30 PRINT" BY
40 PRINT" J.W.JACKSON
50 PRINT" FOR
60 PRINT" HOT COCO
70 PRINT" <C> 1984
80 GOSUB430
90 CLS:PRINT" BIT232 INFORMATION
"
100 PRINT:PRINT" EXEC BB :
110 PRINT" MACHINE LANGUAGE CON
VERSANT MODE THAT WILL ENABLE YO
U TO CHAT WITH SOMEONE ELSE FROM
YOUR KEYBOARD VIA THE RS-232. Y
OU MAY EXIT THIS MODE BY PRESSIN
G <BREAK>.
120 PRINT" EXEC BB+3:
130 PRINT" SETPAR ROUTINE - DIS
PLAY/SET THE RS-232 PARAMETERS S
UCH AS BAUD RATE, PARITY,ETC.
140 GOSUB430:CLS
150 PRINT" EXEC BB+6:
160 PRINT" LININ ROUTINE - GETS
A LINE FROM THE RS-232 INPUT IN
TO RX$. YOU MUST HAVE DEFINED RX
$ IN YOUR BASIC PROGRAM. THE INP
UT IS TERMINATED BY A CARRIAGE R
ETURN OR 256 BYTES RECEIVED.
170 PRINT" EXEC BB+9:
180 PRINT" LINOUT ROUTINE - OUT
PUTS A LINE TO THE RS-232 OUTPUT
FROM TX$.
190 GOSUB430:CLS
200 PRINT" SAMPLE PROGRAM USING
BIT232
210 PRINT:PRINT" THE FOLLOWING P
ROGRAM IS AN EXAMPLE OF CALLING
BIT232'S ROUTINES FROM A BASIC P
ROGRAM.
220 PRINT" COCO SENDS DATA TO A
PRINTER/PLOTTER THAT HAS A BLOCK
```



```

PROTOCOL AS FOLLOWS:
230 PRINT " THE COMPUTER SENDS UP
TO 256 BYTES OF DATA, TERMINATE
D BY A CARRIAGE RETURN. IF THE P
RINTER/PLOTTER CAN RECEIVE MORE
DATA, IT SENDS A CARRIAGE RETURN
TO THE COMPUTER.
240 GOSUB430
250 CLEAR 700,&H6FFF' &H2FFF IF
16K
260 BB=&H7000' &H3000 IF 16K
270 L=&H789E-&H7000' LENGTH
280 GOSUB450' LOAD BIT232 INTO M
EMORY
290 SP=BB+3' SET PARAMETERS
300 LI=BB+6' RS-232 LINE INPUT
310 LO=BB+9' RS-232 LINE OUTPUT
320 PF=BB+18' PRINTER FLAG, IF N
ON-ZERO THE LINE OUTPUT ROUTINE
WILL CHECK USE THE RS232 INPUT L
INE AS PRINTER BUSY
330 REM THE LINE INPUT(LI) AND L
INE OUTPUT(LO) ROUTINES USE TX$
AND RX$ *** DO NOT RENAME THESE
340 TX$=STRING$(255,0):RX$=TX$
350 CLS
360 EXEC SP' SET BAUD RATE,ETC
370 PRINT:LINEINPUT" DATA TO SEN
D ";TX$
380 IF TX$=""THEN 440
390 EXEC LO
400 TX$=CHR$(13):EXEC LO' SEND C
ARRIAGE RETURN
410 EXEC LI' GET PRINTER'S RESPO
NSE
420 GOTO370
430 PRINT:INPUT" PRESS A KEY ";P
K:RETURN
440 END
450 CLS:PRINT"LOADING BIT232 INT
O MEMORY "
460 FOR I= BB TO BB+L
470 READ X
480 IF I/16 = INT(I/16) THEN PRI
NT".";
490 POKE I,X
500 NEXT I
510 PRINT:PRINT"DONE ":GOSUB430:
GOSUB520:RETURN
520 INPUT " SAVE PROGRAM <Y/N>"
";YNS=YNS$=LEFT$(YNS,1)
530 IF YNS<>"Y"THEN RETURN
540 INPUT" TO TAPE OR DISK <T/D>"
";TDS=TDS$=LEFT$(TDS,1)
550 LINEINPUT" FILENAME ? ";FS
560 IF TDS="T"THEN580
570 IF INSTR(1,FS,"/") = 0 THEN
FS=FS+"/BIN"
580 PRINT" ABOUT TO SAVE ";FS" T
O";
590 IF TDS="T" THEN PRINT"TAPE"
ELSE PRINT"DISK"
600 INPUT" IS THAT CORRECT ";YNS
:YNS$=LEFT$(YNS,1):IF YNS<>"Y" TH
EN 520
610 IF TDS="T" THEN CSAVEM FS,BB
,BB+L,BB ELSE SAVEM FS,BB,BB+L,B
B
620 GOSUB430:RETURN
630 DATA 32, 35, 1, 22, 2, 131,
22, 1
640 DATA 241, 22, 2, 53, 22, 1,
7, 22
650 DATA 1, 132, 0, 0, 22, 8, 1
, 0
660 DATA 0, 0, 0, 0, 176, 0, 88
, 0
670 DATA 44, 0, 22, 0, 5, 52, 1
19, 26
680 DATA 80, 127, 255, 64, 23,
2, 90, 48
690 DATA 141, 0, 99, 23, 0, 157
, 23, 0
700 DATA 193, 23, 0, 138, 23, 0
, 161, 38
710 DATA 14, 109, 140, 206, 38,
246, 134, 1
720 DATA 181, 255, 34, 39, 39,
32, 237, 173

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730 DATA 159, 160, 0, 129, 3, 3
9, 60, 109
740 DATA 140, 184, 39, 9, 246,
255, 34, 196
750 DATA 1, 193, 0, 38, 247, 23
, 1, 46
760 DATA 109, 140, 172, 38, 4,
173, 159, 160
770 DATA 2, 22, 255, 200, 23, 0
, 159, 38
780 DATA 195, 129, 32, 42, 15,
129, 13, 39
790 DATA 11, 129, 10, 39, 7, 12
9, 8, 39
800 DATA 3, 22, 255, 176, 173,
159, 160, 2
810 DATA 22, 255, 169, 53, 119,
57, 13, 10
820 DATA 32, 60, 66, 82, 69, 65
, 75, 62
830 DATA 32, 75, 69, 89, 32, 69
, 78, 68
840 DATA 83, 32, 80, 82, 79, 71
, 82, 65
850 DATA 77, 13, 10, 32, 32, 32
, 32, 32
860 DATA 32, 80, 82, 69, 83, 83
, 32, 65
870 DATA 32, 75, 69, 89, 32, 4,
134, 13
880 DATA 173, 159, 160, 2, 134,
10, 173, 159
890 DATA 160, 2, 57, 166, 128,
129, 4, 38
900 DATA 1, 57, 173, 159, 160,
2, 32, 243
910 DATA 52, 22, 134, 255, 72,
142, 255, 0
920 DATA 167, 2, 230, 132, 196,
127, 193, 127
930 DATA 38, 5, 73, 37, 243, 26
, 4, 53
940 DATA 22, 57, 173, 159, 160,
0, 39, 250
950 DATA 57, 173, 159, 160, 2,
129, 57, 47
960 DATA 4, 26, 4, 32, 8, 129,
48, 45
970 DATA 248, 128, 48, 28, 251,
57, 52, 20
980 DATA 111, 141, 254, 254, 14
1, 109, 246, 255
990 DATA 34, 197, 1, 39, 17, 23
0, 141, 254
1000 DATA 241, 202, 4, 231, 141
, 254, 235, 109
1010 DATA 141, 254, 231, 53, 20
, 57, 230, 141
1020 DATA 254, 219, 79, 141, 76
, 119, 255, 34
1030 DATA 18, 70, 90, 38, 246,
230, 141, 254
1040 DATA 204, 193, 8, 39, 4, 7
0, 92, 32
1050 DATA 248, 109, 141, 254, 1
95, 39, 24, 141
1060 DATA 48, 23, 0, 132, 246,
255, 34, 229
1070 DATA 141, 254, 182, 38, 10
, 230, 141, 254
1080 DATA 177, 202, 2, 231, 141
, 254, 171, 141
1090 DATA 24, 246, 255, 34, 197
, 1, 38, 10
1100 DATA 230, 141, 254, 158, 2
02, 1, 231, 141
1110 DATA 254, 152, 109, 141, 2
54, 148, 53, 20
1120 DATA 57, 141, 0, 174, 141,
254, 132, 48
1130 DATA 28, 48, 31, 38, 252,
57, 52, 22
1140 DATA 23, 0, 53, 246, 112,
21, 127, 255
1150 DATA 32, 141, 230, 73, 183
, 255, 32, 70
1160 DATA 18, 18, 18, 141, 220,
90, 38, 244
1170 DATA 109, 141, 254, 100, 3

```

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9, 9, 166, 141
1180 DATA 254, 95, 183, 255, 32
, 141, 202, 134
1190 DATA 2, 230, 141, 254, 81,
183, 255, 32
1200 DATA 141, 191, 90, 38, 248
, 53, 22, 57
1210 DATA 52, 2, 230, 141, 254,
66, 39, 31
1220 DATA 231, 141, 254, 61, 23
0, 141, 254, 53
1230 DATA 133, 1, 39, 4, 108, 1
41, 254, 49
1240 DATA 70, 90, 38, 244, 166,
141, 254, 41
1250 DATA 132, 1, 73, 167, 141,
254, 34, 53
1260 DATA 2, 57, 26, 80, 158, 2
7, 236, 132
1270 DATA 16, 163, 141, 0, 125,
39, 7, 48
1280 DATA 1, 156, 29, 47, 241,
57, 175, 141
1290 DATA 0, 116, 48, 4, 174, 1
32, 95, 134
1300 DATA 1, 181, 255, 34, 38,
251, 23, 254
1310 DATA 245, 129, 8, 38, 8, 9
3, 39, 239
1320 DATA 48, 31, 90, 32, 234,
167, 128, 92
1330 DATA 193, 255, 39, 6, 129,
13, 39, 2
1340 DATA 38, 221, 174, 141, 0,
72, 231, 2
1350 DATA 57, 26, 80, 158, 27,
236, 132, 16
1360 DATA 163, 141, 0, 56, 39,
7, 48, 1
1370 DATA 156, 29, 47, 241, 57,
175, 141, 0
1380 DATA 45, 230, 2, 39, 36, 2
31, 141, 0
1390 DATA 39, 48, 4, 174, 132,
95, 109, 141
1400 DATA 253, 168, 39, 9, 182,
255, 34, 132
1410 DATA 1, 129, 0, 38, 247, 1
66, 128, 23
1420 DATA 255, 28, 92, 225, 141
, 0, 9, 38
1430 DATA 229, 57, 82, 216, 84,
216, 0, 0
1440 DATA 0, 48, 141, 0, 188, 2
3, 254, 67
1450 DATA 23, 254, 103, 23, 254
, 48, 23, 3
1460 DATA 32, 57, 48, 141, 1, 6
3, 23, 254
1470 DATA 50, 23, 254, 86, 23,
254, 90, 39
1480 DATA 241, 129, 5, 46, 237,
74, 72, 48
1490 DATA 141, 253, 104, 174, 1
34, 175, 141, 253
1500 DATA 90, 57, 48, 141, 1, 1
60, 23, 254
1510 DATA 18, 23, 254, 54, 23,
254, 58, 39
1520 DATA 241, 129, 8, 46, 237,
129, 5, 45
1530 DATA 233, 129, 6, 39, 229,
167, 141, 253
1540 DATA 60, 23, 253, 234, 23,
253, 231, 57
1550 DATA 48, 141, 2, 82, 23, 2
53, 236, 23
1560 DATA 254, 16, 23, 254, 20,
167, 141, 253
1570 DATA 37, 23, 253, 210, 57,
48, 141, 1
1580 DATA 220, 23, 253, 215, 23
, 253, 251, 23
1590 DATA 253, 255, 129, 2, 46,
239, 167, 141
1600 DATA 253, 14, 23, 253, 185
, 57, 48, 141
1610 DATA 2, 67, 23, 253, 190,
23, 253, 226

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1620 DATA	173, 159, 160, 2, 129	4, 83, 13
70, 39, 5		2070 DATA
1630 DATA	129, 72, 38, 234, 79,	2, 32, 32
167, 141, 252		2080 DATA
1640 DATA	238, 23, 253, 154, 57	32, 32, 53, 32, 61, 3
48, 141, 2		2, 70, 73
1650 DATA	70, 23, 253, 159, 23,	2090 DATA
253, 195, 23		86, 69, 32, 32, 66, 7
1660 DATA	253, 199, 74, 43, 240	3, 84, 83
129, 2, 46		2100 DATA
1670 DATA	236, 167, 141, 252, 2	13, 10, 32, 32, 32, 3
05, 23, 253, 126		2, 32, 32
1680 DATA	57, 12, 13, 10, 13, 1	2110 DATA
0, 13, 10		32, 32, 32, 55, 32, 6
1690 DATA	13, 10, 13, 10, 13, 1	1, 32, 83
0, 32, 32		2120 DATA
1700 DATA	32, 32, 32, 32, 32, 3	69, 86, 69, 78, 32, 6
2, 66, 73		6, 73, 84
1710 DATA	84, 50, 51, 50, 13, 3	2130 DATA
2, 32, 32		83, 13, 10, 32, 32, 3
1720 DATA	66, 73, 84, 32, 66, 6	2, 32, 32
5, 78, 71		2140 DATA
1730 DATA	73, 78, 71, 32, 82, 8	32, 32, 32, 32, 56, 3
3, 45, 50		2, 61, 32
1740 DATA	51, 50, 13, 32, 32, 8	2150 DATA
2, 83, 45		69, 73, 71, 72, 84, 6
1750 DATA	50, 51, 50, 32, 67, 7	6, 73, 84
9, 77, 77		2160 DATA
1760 DATA	85, 78, 73, 67, 65, 8	83, 13, 10, 32, 32, 3
4, 73, 79		2, 32, 32
1770 DATA	78, 83, 13, 32, 32, 3	2170 DATA
2, 32, 32		32, 32, 32, 32, 4, 13
1780 DATA	32, 32, 80, 82, 79, 7	10, 13
1, 82, 65		2180 DATA
1790 DATA	77, 13, 32, 32, 32, 3	10, 32, 32, 32, 32, 3
2, 32, 32		2, 32, 32
1800 DATA	32, 32, 32, 32, 66, 8	2190 DATA
9, 13, 10		32, 83, 69, 76, 69, 6
1810 DATA	32, 32, 32, 32, 32, 7	7, 84, 32
4, 69, 83		2200 DATA
1820 DATA	83, 69, 32, 87, 46, 3	80, 65, 82, 73, 84, 8
2, 74, 65		9, 32, 66
1830 DATA	67, 75, 83, 79, 78, 3	2210 DATA
2, 13, 10		73, 84, 13, 10, 32, 3
1840 DATA	13, 10, 32, 32, 32, 3	2, 32, 32
2, 32, 80		2220 DATA
1850 DATA	82, 69, 83, 83, 32, 6	32, 32, 32, 32, 32, 4
5, 78, 89		8, 32, 61
1860 DATA	32, 75, 69, 89, 4, 13	2230 DATA
32, 66		32, 78, 79, 78, 69, 1
1870 DATA	65, 85, 68, 32, 82, 6	3, 10, 32
5, 84, 69		2240 DATA
1880 DATA	32, 83, 69, 76, 69, 6	32, 32, 32, 32, 32, 3
7, 84, 73		2, 32, 32
1890 DATA	79, 78, 32, 13, 10, 3	2250 DATA
2, 32, 32		49, 32, 61, 32, 79, 6
1900 DATA	32, 32, 32, 32, 32, 3	8, 68, 13
2, 49, 32		2260 DATA
1910 DATA	61, 32, 32, 51, 48, 4	10, 32, 32
8, 13, 10		2, 32, 32
1920 DATA	32, 32, 32, 32, 32, 3	2270 DATA
2, 32, 32		32, 32, 50, 32, 61, 3
1930 DATA	32, 50, 32, 61, 32, 3	2, 69, 86
2, 54, 48		2280 DATA
1940 DATA	48, 13, 10, 32, 32, 3	69, 78, 13, 10, 32, 3
2, 32, 32		2, 32, 32
1950 DATA	32, 32, 32, 32, 51, 3	2290 DATA
2, 61, 32		32, 32, 32, 32, 32, 4
1960 DATA	49, 50, 48, 48, 13, 1	13, 32
0, 32, 32		2300 DATA
1970 DATA	32, 32, 32, 32, 32, 3	32, 32, 69, 78, 84, 6
2, 32, 52		9, 82, 32
1980 DATA	32, 61, 32, 50, 52, 4	2310 DATA
8, 48, 13		78, 85, 77, 66, 69, 8
1990 DATA	10, 32, 32, 32, 32, 3	2, 32, 79
2, 32, 32		2320 DATA
2000 DATA	32, 32, 53, 32, 61, 3	70, 32, 83, 84, 79, 8
2, 52, 56		0, 32, 66
2010 DATA	48, 48, 13, 10, 32, 3	2330 DATA
2, 32, 32		73, 84, 83, 32, 4, 13
2020 DATA	32, 32, 32, 32, 32, 4	10, 13
13, 10		2340 DATA
2030 DATA	13, 10, 32, 32, 32, 8	10, 32, 70, 85, 76, 7
3, 69, 76		6, 32, 79
2040 DATA	69, 67, 84, 32, 78, 8	2350 DATA
5, 77, 66		82, 32, 72, 65, 76, 7
2050 DATA	69, 82, 32, 79, 70, 3	0, 32, 68
2, 68, 65		2360 DATA
2060 DATA	84, 65, 32, 66, 73, 8	85, 80, 76, 69, 88, 3
		2, 60, 70
		2370 DATA
		47, 72, 62, 32, 63, 3
		2, 4, 13
		2380 DATA
		10, 32, 83, 69, 76, 6
		9, 67, 84
		2390 DATA
		32, 79, 85, 84, 80, 8
		5, 84, 32
		2400 DATA
		77, 79, 68, 69, 32, 1
		3, 10, 32
		2410 DATA
		49, 46, 32, 77, 79, 6
		8, 69, 77
		2420 DATA
		13, 10, 32, 50, 46, 3
		2, 80, 82
		2430 DATA
		73, 78, 84, 69, 82, 1
		3, 10, 32
		2440 DATA
		32, 32, 89, 79, 85, 8
		2, 32, 67
		2450 DATA
		72, 79, 73, 67, 69, 3
		2, 63, 32
		2460 DATA
		4, 23, 0, 72, 23, 251
		59, 23
		2470 DATA
		251, 63, 129, 8, 39,
		26, 46, 241
		2480 DATA
		74, 43, 238, 48, 141,
		0, 32, 198
		2490 DATA
		3, 61, 173, 133, 48,
		141, 253, 240
		2500 DATA
		23, 250, 248, 23, 251
		28, 32, 217

251Ø DATA	48, 141, 2, 16Ø, 23,	9, 84, 32	
25Ø, 236, 23		296Ø DATA	83, 84, 79, 8Ø, 32, 6
252Ø DATA	251, 16, 129, 89, 38,	6, 73, 84	
2Ø3, 57, 22		297Ø DATA	83, 13, 1Ø, 32, 53, 4
253Ø DATA	Ø, 26, 22, 252, 165,	6, 32, 83	
22, 252, 194		298Ø DATA	69, 84, 32, 8Ø, 65, 8
254Ø DATA	22, 252, 229, 22, 252	2, 73, 84	
, 247, 22, 253		299Ø DATA	89, 13, 1Ø, 32, 54, 4
255Ø DATA	13, 22, 253, 41, 48,	6, 32, 83	
141, Ø, 194		3ØØØ DATA	69, 84, 32, 68, 85, 8
256Ø DATA	23, 25Ø, 2ØØ, 57, 23,	Ø, 76, 69	
Ø, 16, 23		3Ø1Ø DATA	88, 13, 1Ø, 32, 55, 4
257Ø DATA	Ø, 74, 23, Ø, 89, 23,	6, 32, 83	
Ø, 129		3Ø2Ø DATA	69, 84, 32, 77, 79, 6
258Ø DATA	23, Ø, 1Ø1, 23, Ø, 14	8, 69, 77	
7, 57, 48		3Ø3Ø DATA	47, 8Ø, 82, 73, 78, 8
259Ø DATA	141, 1, 17Ø, 23, 25Ø,	4, 69, 82	
173, 238, 141		3Ø4Ø DATA	32, 77, 79, 68, 69, 1
26ØØ DATA	249, 233, 48, 141, 24	3, 1Ø, 32	
Ø, 237, 79, 17		3Ø5Ø DATA	56, 46, 32, 69, 88, 7
261Ø DATA	163, 134, 39, 14, 76,	3, 84, 13	
76, 129, 8		3Ø6Ø DATA	1Ø, 32, 42, 42, 42, 4
262Ø DATA	47, 245, 134, Ø, 238,	2, 42, 42	
134, 239, 141		3Ø7Ø DATA	42, 42, 42, 42, 42, 4
263Ø DATA	249, 2Ø9, 48, 141, 1,	2, 42, 42	
158, 48, 134		3Ø8Ø DATA	42, 42, 42, 42, 42, 4
264Ø DATA	166, 128, 173, 159, 1	2, 42, 42	
6Ø, 2, 166, 132		3Ø9Ø DATA	42, 13, 1Ø, 13, 1Ø, 3
265Ø DATA	173, 159, 16Ø, 2, 48,	2, 32, 32	
141, 1, 15Ø		31ØØ DATA	32, 89, 79, 85, 82, 3
266Ø DATA	23, 25Ø, 12Ø, 57, 48,	2, 67, 72	
141, 1, 145		311Ø DATA	79, 73, 67, 69, 32, 6
267Ø DATA	23, 25Ø, 112, 166, 14	Ø, 49, 45	
1, 249, 174, 139		312Ø DATA	56, 62, 63, 32, 4, 13
268Ø DATA	48, 173, 159, 16Ø, 2,	, 1Ø, 13	
57, 48, 141		313Ø DATA	1Ø, 32, 66, 65, 85, 6
269Ø DATA	1, 148, 23, 25Ø, 94,	8, 32, 82	
166, 141, 249		314Ø DATA	65, 84, 69, 32, 32, 3
27ØØ DATA	157, 139, 48, 173, 15	2, 32, 32	
9, 16Ø, 2, 57		315Ø DATA	32, 61, 32, 4, 48, 51
271Ø DATA	48, 141, 1, 151, 23,	, 48, 54	
25Ø, 76, 48		316Ø DATA	49, 5Ø, 5Ø, 52, 52, 5
272Ø DATA	141, 1, 165, 166, 141	6, 48, 48	
, 249, 136, 39		317Ø DATA	4, 13, 1Ø, 32, 78, 85
273Ø DATA	4, 48, 141, 1, 16Ø, 2	, 77, 66	
3, 25Ø, 59		318Ø DATA	69, 82, 32, 79, 7Ø, 3
274Ø DATA	57, 48, 141, 1, 157,	2, 66, 73	
23, 25Ø, 51		319Ø DATA	84, 83, 32, 61, 32, 4
275Ø DATA	48, 141, 1, 171, 23Ø,	, 13, 1Ø	
141, 249, 112		32ØØ DATA	32, 83, 84, 79, 8Ø, 3
276Ø DATA	134, 6, 61, 48, 133,	2, 66, 73	
23, 25Ø, 35		321Ø DATA	84, 83, 32, 32, 32, 3
277Ø DATA	57, 48, 141, 1, 172,	2, 32, 32	
23, 25Ø, 27		322Ø DATA	61, 32, 4, 13, 1Ø, 32
278Ø DATA	48, 141, 1, 186, 166,	, 68, 85	
141, 249, 82		323Ø DATA	8Ø, 76, 69, 88, 32, 3
279Ø DATA	39, 4, 48, 141, 1, 18	2, 32, 32	
2, 23, 25Ø		324Ø DATA	32, 32, 32, 32, 32, 6
28ØØ DATA	1Ø, 57, 13, 1Ø, 13, 1	1, 32, 4	
Ø, 13, 1Ø		325Ø DATA	72, 65, 76, 7Ø, 4, 7Ø
281Ø DATA	13, 1Ø, 32, 32, 32, 3	, 85, 76	
2, 32, 77		326Ø DATA	76, 4, 13, 1Ø, 32, 8Ø
282Ø DATA	69, 78, 85, 32, 83, 6	, 65, 82	
9, 76, 69		327Ø DATA	73, 84, 89, 32, 32, 3
283Ø DATA	67, 84, 73, 79, 78, 8	2, 32, 32	
3, 13, 1Ø		328Ø DATA	32, 32, 32, 32, 61, 3
284Ø DATA	32, 42, 42, 42, 42, 4	2, 4, 78	
2, 42, 42		329Ø DATA	79, 78, 69, 32, 4, 79
285Ø DATA	42, 42, 42, 42, 42, 4	, 68, 68	
2, 42, 42		33ØØ DATA	32, 32, 4, 69, 86, 69
286Ø DATA	42, 42, 42, 42, 42, 4	, 78, 32	
2, 42, 42		331Ø DATA	4, 13, 1Ø, 32, 79, 85
287Ø DATA	13, 1Ø, 32, 49, 46, 3	, 84, 8Ø	
2, 83, 72		332Ø DATA	85, 84, 32, 77, 79, 6
288Ø DATA	79, 87, 32, 83, 69, 8	8, 69, 32	
4, 84, 73		333Ø DATA	32, 32, 32, 61, 32, 4
289Ø DATA	78, 71, 83, 13, 1Ø, 1	, 77, 79	
2, 5Ø, 46		334Ø DATA	68, 69, 77, 4, 8Ø, 82
29ØØ DATA	32, 83, 69, 84, 32, 6	, 73, 78	
6, 65, 85		335Ø DATA	84, 69, 82, 4, 13, 1Ø
291Ø DATA	68, 32, 82, 65, 84, 6	, 32, 65	
9, 13, 1Ø		336Ø DATA	82, 69, 32, 89, 79, 8
292Ø DATA	32, 51, 46, 32, 83, 6	5, 32, 83	
9, 84, 32		337Ø DATA	85, 82, 69, 32, 6Ø, 8
293Ø DATA	78, 85, 77, 66, 69, 8	9, 47, 78	
2, 32, 79		338Ø DATA	42, 62, 32, 63, 32, 4
294Ø DATA	7Ø, 32, 66, 73, 84, 8	, Ø, 236	
3, 13, 1Ø			
295Ø DATA	32, 52, 46, 32, 83, 6		

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Six months ago a terrorist group demanded to be designated the rulers of Alpha Sigma III, under the threat of world starvation on the planet Earth. The Federation denied their demands, so they released a biological weapon which has destroyed all known edible plant species from throughout the known galaxy. To date no plant life has been able to survive on Earth. Recently, Federation undercover agents have reported a story told by a roving space trader, of a planet with abundant edible plant life. These plants have a reputation of being able to survive in all climates and in fact, are supposed to grow at an incredible rate. The Federation is desperate! If Earth's food source is not replaced soon, the Federation will have to evacuate all animal and Human life. Your mission is to go to the planet Zephyr and obtain the seed of these plants and return to Earth. Several Federation agents have been sent to obtain the seeds and none has returned! Can you get the seed and survive??? GOOD LUCK!

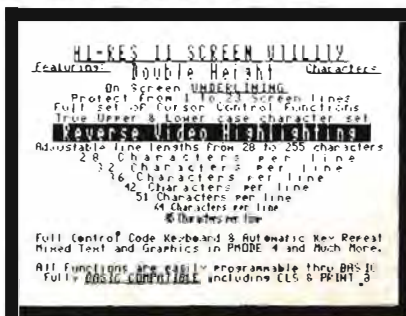
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Screen Enhancement PROGRAM FEATURES	HI-RES II NEW	HI-RES I OLD	BRAND X
Upper/Lower case characters	Yes	Yes	Yes
Mixed Text and Graphics	Yes	Yes	Yes
Separate Text & Graphics	Yes	Yes	No
Print @ fully implemented	Yes	Yes	Yes
Print @ on all line lengths	Yes	Yes	51 only (1)
Different line lengths	28 to 255 (9) 28 to 255 (9)	28 to 255 (9)	51 only (1)
Automatic Key Repeat	Yes	Yes	Yes
Adjustable Key Repeat	Yes	No	No
Auto Repeat Disable	Yes	No	No
Erase to end of line/screen	Yes	Yes	Yes
Home Cursor	Yes	No	Yes
Solid or Blinking Cursor	Yes	No	Yes
CLS command supported	Bull/Black	Bull/Black	Bull/Black
X/Y Coordinate Cursor	Yes	Yes	No
Positioning	Yes	Yes	No
Double Size Characters	Yes	Yes	No
Individual/Continuous	Yes	Yes	No
Highlighting	Yes	Yes	No
On Screen Underlining	Yes	Yes	No
Clear Key functional	Clear/L keys	Clear key	No
16/32 & 64K Supported	Yes	Yes	Yes
Green or Black Background Color	Yes	No	No
Dual Character sets for Enhanced 64 and 85 Characters per line display	Yes	No	No
Protected Screen Lines (programmable)	1 to 23	No	No
Full Control Code Keyboard for Screen control directly from the keyboard	Yes	No	No
Programmable Tab Character Spacing	Yes	No	No
Full Screen Reverse Function	Yes	Yes	No
Switch to & from the Standard 16 by 32 Screen for full compatibility	Yes	No	No
On Error Goto Function	No	No	Yes
Extended Basic Required	No	Yes	Yes
All Machine Language Program Yes	Yes	Yes	Yes
RAM Required in addition to Screen RAM	2K	2K	2K
Program Price (Tape)	\$24.95	\$19.95	\$29.95



VISA, MASTERCARD AND C.O.D. ACCEPTED

"The CBASIC Compiler"

Now anyone can create fast efficient Machine Language Programs Easily and Quickly without having to use an Editor/Assembler

CBASIC is a fully integrated, easy to use Basic program Editor and Compiler package. CBASIC is 99% syntax compatible with Disk Extended Color Basic programs, so most Basic programs can be loaded and compiled by CBASIC with little or no changes required. The compiler is an optimizing two-pass integer Basic compiler that can convert programs written in Disk Extended Color Basic into 100% pure 6809 Machine Language programs which are written directly to disk in a LOADM compatible format.

The programs generated by the compiler can be run as complete stand alone programs. A built-in linker/editor will automatically select one and only one copy of each subroutine that is required from the internal run-time library and insert them directly in the program. This eliminates the need for cumbersome, often wasteful separate "run-time" packages.

CBASIC WAS DESIGNED FOR BOTH BEGINNING & ADVANCED USERS

CBASIC is a Powerful tool for the Beginner or Novice programmer as well as the Advanced Basic or Machine Language programmer. The Beginner or Novice programmer can write and compile programs without having to worry about Stack Pointers, DP registers, memory allocation, and so on, because CBASIC will handle it for you automatically. All they have to do is write their programs using the standard Basic statements and syntax. For the advanced Basic and Machine Language programmers, CBASIC will let you take command and control every aspect of your program, even generating machine code directly in a program for specialized routines or functions.

CBASIC adds many features not found in Color Basic, like Interrupt, Reset, and On Error handling. It also has advanced programming features that allow machine level control of the Stack and Direct Page registers, variable allocation, automatic 64K RAM control, program origin and even multiple origins. It can even have machine language code generated within a program that executes just like any other Basic program line.

FULL COMMAND SUPPORT & SPEED

CBASIC features well over 100 Basic Commands and Functions that fully support Disk, Tape, Printer and Screen I/O. It also supports ALL the High and Low Resolution Graphics, Sound, Play and String Operations available in Extended Color Basic, and all with 99.9% syntax compatibility.

CBASIC is FAST. Not only will CBASIC compiled programs execute 10 to 1000 times faster than Basic, but the time it takes to develop a CBASIC program versus writing a machine language program is much, much shorter. A machine language program that might take several months to write and debug could be created using CBASIC in a matter of days or hours, even for a well experienced machine language programmer. We had a report from a CBASIC user that claimed "a Basic program that used to take 3 hours to run now runs in 7 to 8 minutes". Another user reported a program that took 1 to 1½ hours to run in Basic, now runs in 5 to 6 minutes!"

MORE THAN JUST A COMPILER

CBASIC has its own completely integrated Basic Program Editor. The Editor contained in CBASIC is used to create and/or edit programs for the compiler. It is a full featured editor with functions designed specifically for writing and editing Basic programs. It has built-in block Move and Copy functions with automatic program renumbering. Complete, easy to use inserting, deleting, extending and overtyping of existing program lines. It is also used for Loading, Saving, Appending (merging), Killing disk files and displaying a Disk Directory. It also has automatic line number generation for use when creating programs or inserting sequential lines between existing lines. You can set the printer baud rate and direct normal or compiled listings to the printer for hard copy. The built-in editor makes program corrections and changes as easy as "falling off a log". If CBASIC finds an error when compiling, it points to the place in the program line where the error occurred. All you have to do is tell the editor what line you want to start editing and when it is displayed, move the cursor with the arrow keys to the place where the error is and correct it. Just like that, it's simple.

HI-RES & 80 COLUMN DISPLAYS

CBASIC is the only Color Basic Compiler that includes its own Hi-Resolution 51, 64 or 85 by 24 line display. It is also the only compiler that supports both the PBJ "Word-Pak" and the Double Density 80 column cards. All of these display formats are part of the standard CBASIC compiler package. Not only can these display formats be used for normal program editing and compiling, but CBASIC will also include them in your compiled programs! If you want CBASIC to include the display driver in your program, all you have to do is use a single CBASIC command "HIRES". The run-time display driver that CBASIC includes in your program is not just a simple display, but a full featured display package. With the Hi-Resolution display package you can mix text & graphics, change characters per line, underline, character highlight, erase to end of line or screen, home cursor, home & clear screen, protect screen lines, and much more. All commands are compatible with our HI-RES II Screen Commander so you can easily develop screen layouts using HI-RES and Color Basic before you compile your program. The same applies to using the 80 column card drivers. What other Basic compiler offers you this kind of flexibility?

64K RAM SUPPORT

CBASIC makes full use of the power and flexibility of the 6883 SAM (Synchronous Address Multiplexer) in the Color Computer. It will fully utilize the 96K of address space available in the Color Computer (64K installed) during program Creation, Editing and Compilation. CBASIC has a special command for automatic 64K RAM control. When used in a program, it allows the user to use the upper 32K of RAM space automatically for variables or even program storage at run-time. It will automatically switch the ROMs in and out when needed. There are also two other commands that allow you to control the upper 32K of RAM manually, under program control. No other Color Basic compiler directly supports the use of 64K RAM like CBASIC.

ALL MACHINE LANGUAGE

CBASIC is completely written in fast efficient Machine Language, not Basic, like some other Color Basic compilers. Because of this, CBASIC can edit and compile very large programs. Even using the Hi-Resolution 51 by 24 line display, it can work with about a 34K program, and the 80 column card versions can handle almost 40K of program. Some of the other Basic compilers can only work with 16K or about 200 lines. Even working with large programs, CBASIC compiles programs with lightning fast speed. It will compile a 24K program to disk in less than 2 minutes! That's without a listing being generated. We've heard stories about some other compilers that take almost 10 minutes to compile a simple 2-3K program. You might inquire about this when you look at some of the other compilers available.

THE FINISHED PRODUCT

Since CBASIC contains statements to support ALL of the I/O devices (Disk, Tape, Screen & Printer), Hi-Res Graphics, Sound, and Enhanced Screen displays, it is well suited for a wide range of programming applications. It generates a complete, Ready to Run machine language program. The finished product or program does not have to be interfaced to a Basic program to perform some of its functions or commands. This may seem obvious to you, but some of the other Color Basic compilers don't necessarily work this way. Some of their compiler commands need a separate Basic program in order for them to work. In some cases, require that a separate Basic program be interfaced to the compiled program to perform I/O functions, like INPUT, PRINT and so on. CBASIC doesn't do this. ALL of its commands are compiled into a single machine language program that does not require any kind of Basic program to make it work.

COMPATIBILITY

You may be wondering about those statements we made earlier concerning 99% or 99.9% syntax compatibility. What does that other 1% consist of? The biggest part of that 1% has to do with string arrays and variables. CBASIC does not use a "String Pool" like Color Basic. It uses absolute memory addresses to locate string variables and arrays. This is why CBASIC's string processing is so fast, it also eliminates the time consuming "Garbage Collection" problem. When CBASIC allocates space for strings, it must know how much space to use for each string. When you Dimension a string variable in CBASIC, you must tell it how much space you want to save for each element. To Dimension an array of 40 strings, 64 characters each, you would DIM DAS(40,64). If a string is not dimensioned, CBASIC will automatically allocate 32 bytes for it. If you want a single string to have enough room for 200 characters you would DIM AX\$(200). For string arrays, you would still access the element you want, the same as Color Basic, to get string #30 from the array DAS, you would still use DAS(30), the only real change is in the DIM statement. For undeclared string arrays of 10 elements or less, CBASIC will automatically reserve space for 10 (0-9) strings of 32 characters. In some other Color Basic compilers, you have to declare EVERY string variable used in the program in a DIM statement. And, to create an array of 40 strings with 64 characters each, you would have to DIM AD\$(2560), and then to access string #30, you would have to multiply 30 x 64 and use a special variable name format or access it one character at a time. Not very compatible or convenient to use, and difficult at best.

CBASIC REQUIREMENTS

CBASIC requires a minimum of 32K RAM and at least one Disk drive. We strongly recommend that you have 64K. CBASIC is compatible with all versions of Color & Extended Basic and both Disk Basic V1.0 and V1.1. Programs compiled on either system will run on systems with different ROMs. CBASIC is NOT compatible with JDOS.

DOCUMENTATION

The Documentation provided with any program is very important to the user. This is especially true when you talk about a program as complete and complex as CBASIC. Even though CBASIC was designed to be the most User Friendly compiler on the market, we went to great lengths to provide a manual that is not only easy to use and understand, but comprehensive and complete enough for even the most sophisticated user. The manual included with CBASIC consists of approximately 120 pages of real information, not like some manuals that put just one or two short paragraphs on a page. If we did it that way, we could have easily created a three or four hundred page manual. The manual index breaks down each section of the manual and gives a 3 or 4 word description of each section and its items along with page numbers. The manual has three sections, the Editor, Compiler and Appendix. Each of these is divided into subsections, with Section and Subsection titles printed at the top of each page. If you want to, you could find the information you are looking for by simply flipping through the pages and scanning the Section titles on the top of the pages. The Manual itself is an 8½ by 11 Spiral Bound book with durable leather textured covers. Some of the reports we have had from CBASIC users describe the manual as being the Best program manual they have ever used.

COMPARE THE DIFFERENCE

CBASIC is not just another Color Basic Compiler. It is the only complete Basic Compiler System for the Color Computer. Compare CBASIC's features to what other compilers offer and you'll see the difference. When comparing CBASIC to other compilers, you might want to keep some of these questions in mind. Does it support I/O functions? You can't write much of a program without PRINT, INPUT and so on. What about complex string statements, or string statements at all? How large of a program can you write? Can you compile a complex string like: MID\$(RIGHT\$(DAS\$(VAL\$(D\$(LEN\$(L\$))),3,3)) Can you use two character variable names for string & numeric variables, like Basic. Does it support all the Hi-Res graphics statements including PLAY, DRAW, GET and PUT, using the same syntax as Basic? Do you ever have to use a separate Basic program? Can you take complete Basic programs and compile them without extensive changes? Will they work? How do you edit a program when it has errors compiling?

PRICE VERSUS PERFORMANCE

The price of CBASIC is \$149.00. It is the most expensive Color Basic Compiler on the market, and well worth the investment. We spent over 2 years writing and refining CBASIC, to make it the Best, most Compatible Color Basic compiler available. Most of our CBASIC users already bought one or more of the other compilers on the market and have since discarded them. We've even traded in a few of them. If you want a cheap compiler, we'll sell you one of those traded in, at a good price. Before you buy a compiler, compare the performance of CBASIC against any Color Basic compiler. Dollar for Dollar, CBASIC gives you more than any other Color Basic compiler available.

ORDERING INFORMATION

To order CBASIC by mail, send check or money order in the amount of \$149.00 plus \$3.00 for shipping and handling to the address to the address listed below.

To order by VISA, MASTERCARD or COD, call us at: (702) 452-0632 (Monday thru Saturday, 8am to 5pm PST)

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Mindbusters

by Richard Ramella

Hit the Jackpot!

When I was one-and-twenty
I heard a wise man say,
'Give pounds and crowns
and guineas
But not your heart away.

I have yet to decide whether by these words A.E. Housman meant: *Don't fall in love in a casino* or *Try to get the house to accept British currency for the favorable dollar exchange rate*. I think it's the former because I've never sensed anything near affection in a gambling den.

Consider, this month, the seemingly puzzle-like contraption known as the slot machine. Some people who enjoy puzzles are also attracted to lotteries and slots. They like to regard the latter device as a mechanical puzzle that can be beaten by brainpower—though, of course, it can't. In recent weeks I've had three requests for a puzzle with a slot-machine motif. I've succeeded in writing a slot-machine game like none you have ever seen. The program in the listing is called *Jackpot Jerome*.

When you've typed and debugged the listing (that is, if you have run it), type `POKE 65494,0` and press the enter key before trying to save it. This disables the high speed `POKE 65495,0`. If your computer won't work with the speed-up `POKE`, delete the statement from the beginning of line 140. With the speed `POKE` invoked, you can't `LLIST` the program to paper or `CSAVE` it to cassette. You might also have difficulty saving it to disk.

When you run *Jackpot Jerome*, you're instructed to press any key to start. This gives the randomizing routine the chance to theoretically make every run of the program different. Once you have pressed a key to begin the randomizing process, the program asks

you to be patient. A few seconds later the playing screen appears.

Jackpot Jerome is a small and friendly mechanical creature. On his chest appear three reels, each of which shows three vertical positions. In the upper right corner of the screen the figure 100 appears. Press the space bar to register a wager and select the number of rows on which you want to bet. With each press of the space bar, pointers in the shape of plus signs appear marking the rows of the three reels that must match for you to win. You can attempt to match one of one, two, or three rows. Press the space bar once followed by any key (except the break or shift keys) to bet on one row position. Press the space bar twice and any key to bet on two row positions. Pressing the space bar three times selects three positions. Each time you tap the space bar, the number in the upper right corner is reduced by one.

Once you've placed your bet, the reels spin. If you get three solid bars in a row, you win 50 points. With three open bars in a row you get 20 points. This is a true simulation. The reels have a definite arrangement, and the game works by spinning the reels randomly. I claim that the reels are arranged so you will more often go broke than raise your total to

200. It's up to you to prove me right or wrong. If you would prefer that *Jerome* pay out more than he takes in (something you won't find in world of casino gambling), insert this line:

```
625 IF P1 = 0 AND V1 = 5 AND P2 = 0 AND  
V2 = 5 THEN Q = 6
```

It makes *Jerome* pay six points for a row with consecutive open bars in the left and middle reels that ends with an empty space in the right reel.

To see the arrangement of the reels, insert the following line:

```
245 SCREEN 1,1:GOTO 245
```

When you type `RUN`, instead of the game you'll see the three reels as if they were uncoiled and laid flat on the screen. Each reel contains 19 positions made up of solid bars, open bars, and empty spaces. If three solids pay 50 and three opens pay 20, how much will you win or lose on the average for every 100 plays? For the purposes of this problem, let's assume that a hypothetical player wagers only one point (in other words, one row) on each play. I need a mathematical answer.

If this problem makes your temples pulse, be assured it has the same effect on me. If no one writes to me with the solution, the question might go forever unanswered. ■

System Requirements

16K RAM
Extended Color Basic

Write to Richard Ramella at 1493 Mt. View Ave., Chico, CA 95926.

Program Listing. Jackpot Jerome

```

100 REM * JACKPOT JEROME * TRS-8
0 EXTENDED COLOR BASIC 16K
110 REM * MINDBUSTERS/RAMELLA
120 DATA 15,10,15,30,15,50,25,30
,35,10,55,30,75,30,75,50,85,10,9
5,10,95,30,115,50,125,10,135,30,
145,10,175,10,175,30,175,50,185,
10
130 DATA 5,10,35,50,45,30,55,10,
105,50,115,10,115,30,145,50,155,
10,155,30,165,10,185,50
140 POKE 65495,0: CLS: PCLEAR 4:
PMODE 0,1: PCLS: COLOR 1,0: DIM
A(1,2),A(2,1,2),A(3,1,2),BN(1,30
),B(62),N$(10)
150 FOR X=1 TO 62: READ B(X): NE
XT
160 P$="T255V3105C": S=100: E$="
0123456789 ": SP$=CHR$(32)
170 N$(1)="C1R3U12C0E3D20L2R4":
N$(2)="C1U12C0E3R5F3D4G4L4G2D6R1
0"
180 N$(3)="C1U12C0E3R5F3D4G2L4R4
F2D6G2L6H2U2": N$(4)="C1U16C0D10
R12L4U10D20"
190 N$(5)="C1U15R10C0L10D8R6F4D4
G4L6": N$(6)="C1U12E3R6F3C0H3L6G
3D13F3R6E3U4H3L7"
200 N$(7)="C1U15C0R12D3G2D3G2D3G
2D5": N$(8)="C0U3E3R6L6H3U4E3R8F
3D4G3F3D4G3L8H3"
210 N$(9)="C0F4R6E3U13H3L6G3D4F3
R8": N$(0)="C0F4R6E4U13H3L6G4D13
"
220 PRINT "PRESS A KEY TO START"
230 L=RND(0): IF INKEY$="" THEN
230 ELSE PRINT: PRINT "P A T I E
N C E . . ."
240 FOR X=1 TO 61 STEP 2: CIRCLE
(B(X+1),B(X)),7,,.5: IF X>37 THE
N PAINT(B(X+1),B(X)),1: NEXT ELS
E NEXT
250 PCOPY 1 TO 4: PCLS
260 LINE(73,93)-(177,139),PSET,B
270 FOR N=78 TO 148 STEP 34: LIN
E(N,98)-(N+25,133),PSET,B: NEXT
280 J1=126: J=90: FOR V=143 TO 1
76 STEP 4: LINE(J,V)-(J+30,V),PS
ET: LINE(J1,V)-(J1+30,V),PSET: J
=J-1: J1=J1+1: NEXT
290 FOR V=60 TO 134 STEP 74: LIN
E(V,178)-(V+52,189),PSET,B: NEXT
300 CIRCLE(70,110),30,,.6,.5,.75
: CIRCLE(178,110),30,,.6,.75,1
310 DRAW"BM40,112;R30": DRAW"BM1
78,112;R30"
320 J1=186: J=44: FOR V=114 TO 1
50 STEP 4: LINE(J,V)-(J+16,V),PS
ET: LINE(J1,V)-(J1+18,V),PSET: J
=J-1.5: J1=J1+1.5: IF V>132 THE
N
J1=J1-3: J=J+3: NEXT ELSE NEXT
330 CIRCLE(48,150),10,,1,0,.5: C
IRCLE(192,150),10,,1,0,.5
340 CIRCLE(125,93),64,,1.3,.5,1:
PAINT(125,91),1,1
350 COLOR 0,1: FOR V=103 TO 146
STEP 43: CIRCLE(V,40),20,,.8: CI
RCLE(V,40),4,,2: PAINT(V,40),0,0
: CIRCLE(V,40),3,1: NEXT
360 CIRCLE(125,65),15,,.6
370 K=40: FOR V=70 TO 80: CIRCLE
(124,V),K,,.5,0,.5: K=K-2: NEXT
380 COLOR 1,0: DRAW"BM5,15;D3F1R
2E1U10L2R4": DRAW"BM13,19;U4E3U3
R2D3F3L6R6D4"
390 DRAW "BM25,19;R4L5U10R4": DR
AW"BM33,19;U10D5E5G4F5"
400 DRAW"BM43,19;U10R3F2D2G2L3":

```

```

DRAW"BM54,19;H2U6E2R4F2D6G2L4"
410 DRAW"BM67,19;U10L4R8": DRAW"
BM5,50;D3F1R4E1U20L2R4"
420 X$="R4L4U11R2L2U10R4": DRAW"
BM16,54;"+X$: DRAW"BM25,54;U21R4
F2D4G2L4R2F3D10"
430 DRAW"BM34,54;U21R6D21L6": DR
AW"BM44,54;U21F4E4D21": DRAW"BM5
7,54"+X$
440 COLOR 0,1: SCREEN 1,1: GOSUB
680: X1=165: Y1=X1: Z1=X1
450 JH=0
460 V$=INKEY$: IF JH>0 AND S=0 T
HEN H=0 ELSE IF S=0 THEN 460 ELS
E IF JH=3 THEN 470 ELSE IF V$=""
THEN 460 ELSE IF V$=CHR$(32) TH
EN JH=JH+1: S=S-1: GOSUB 680: GO
SUB 740: GOTO 460
470 IF JH=0 THEN 460
480 X2=10+INT(RND(30)/10): Y2=X2
+1+INT(RND(120)/10): Z2=Y2+10+I
NT(RND(220)/10)
490 FOR H=1 TO 22 STEP 10
500 FOR L=1 TO 10
510 PMODE 0,4
520 IF H<X2 THEN GET(0,X1)-(20,X
1+30),A1,G: X1=X1-5: IF X1=0 THE
N X1=160
530 IF H<Y2 THEN GET(20,Y1)-(40,
Y1+30),A2,G: Y1=Y1-5: IF Y1=0 TH
EN Y1=160
540 IF H<Z2 THEN GET(40,Z1)-(60,
Z1+30),A3,G: Z1=Z1-5: IF Z1=0 TH
EN Z1=160
550 PMODE 0,1
560 IF H>X2 THEN 570 ELSE PUT(80
,101)-(100,131),A1,PRESET
570 IF H>Y2 THEN 580 ELSE PUT(11
5,101)-(135,131),A2,PRESET
580 PUT(149,101)-(169,131),A3,PR
ESET
590 PLAY P$
600 NEXT L,H
610 FOR H=104 TO 124 STEP 10: F1
=F1+1: P1=PPOINT(84,H): P2=PPOIN
T(118,H): P3=PPOINT(152,H)
620 V1=PPOINT(88,H): V2=PPOINT(1
22,H): V3=PPOINT(156,H)
625 REM IF P1=0 AND V1=5 AND P2=
0 AND V2=5 THEN Q=6
630 IF P1=0 AND V1=5 AND P2=0 AN
D V2=5 AND P3=0 AND V3=5 THEN Q=
20 ELSE IF V1+V2+V3=0 THEN Q=50
640 IF Q>0 THEN GOSUB 750: Q=0
650 IF F1=JH THEN 660 ELSE NEXT
H
660 F1=0: F=0: FOR V=108 TO 140
STEP 32: FOR Q1=104 TO 124 STEP
10: CIRCLE(V,Q1),2,0: NEXT Q1,V
670 GOTO 450
680 COLOR 0,1: LINE(170,4)-(250,
30),PRESET,BF
690 S$=STR$(S): S$=MID$(S$,2): F=
LEN(S$): IF F<4 THEN S$=STRING$(
4-F,32)+S$
700 Y=1: FOR V=172 TO 244 STEP 2
0
710 K$=MID$(S$,Y,1): C=INSTR(E$,
K$): IF C=11 THEN 730
720 DRAW"BM"+STR$(V)+",24;"+N$(C
-1)
730 Y=Y+1: NEXT V: RETURN
740 T=94+(JH*10): CIRCLE(100,T),
2,1: CIRCLE(140,T),2,1: RETURN
750 FOR S=S+1 TO S+Q-1: GET(78,H
-3)-(170,H+6),BN,G: GOSUB 680
760 PUT(78,H-3)-(170,H+6),BN,PRE
SET: PLAY"T254O3CEG": NEXT S: S=
S-1: RETURN
770 REM * END OF LISTING

```

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CoCo Max

This is one of those rare programs that will captivate everyone in your family.... No one can see CoCo Max and not want to try it!



We are all witnessing an exciting revolution in microcomputers: a radically new kind of computer and software that opens a whole new world of creative power to computer users.

It was inevitable that this exciting approach would be brought to the CoCo. With this in mind, Colorware chose to go all out and maximize this new concept for the color computer. That meant designing not just software but hardware too. It meant thousands of hours of pure machine language programming. Rarely has this much effort been applied to one product for the Color Computer.



UNMATCHED CAPABILITY...

Because we took the maximum approach: highly optimized machine code combined with hardware, CoCo Max truly stands above the rest as the ultimate creative tool for the Color Computer. It's unrivaled performance lets you create with more brilliance and more speed than any similar system – much more than you ever imagined possible. And, you can do it in black & white or color.



All the sophisticated power of the bigger systems is there: *Icons, Pull-Down Menus, full Graphic Editing, Font Styles, and all kinds of handy tools and shortcuts.*

Plug your joystick, mouse or touch pad into CoCo Max's Hi-Res Input Unit. Then use a delightfully simple *Point-and-Click* method to get any of CoCo Max's powerful graphic tools. It has them all:

You can *Brush, Spray or Fill* with any *Color, Shading or Pattern*. Use *Rubber Band Lines and Shapes* (square, rectangle, circle, ellipse, etc.) to create perfect illustrations with speed and ease. There's a *Pencil*, an *Eraser* and even a selection of *Calligraphy Brushes*. And, as you can see, CoCo Max can do a lot with text. All of the newest special effects are there: *Trace Edges, Flip, Invert, Brush Mirrors*, etc. And all of the very latest super-capabilities like: *Undo*, which automatically reverses your mistakes, and *Fat Bits* which zooms you way in on any part of your subject to allow dot-for-dot precision.



THE BIG PICTURE

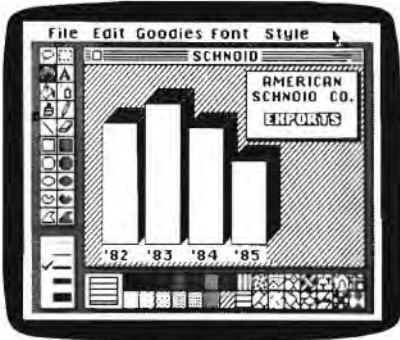
The large image box in the middle of the CoCo Max screen is actually only a window on an even larger image. Use the Point-and-Click "Hand" to effortlessly move your window over any portion of the larger image. You have a working area of up to 3-1/2 times the area of the window itself.

FLEXIBLE PRINTING...

CoCo Max gives you many ways to print. Fill a whole page with your image or condense two full CoCo screens to less than 1/4 page for a finely detailed copy. "Dump" your CoCo Max screen full size or shrink it to 1/8 page size.

FREEDOM TO CREATE...

Anyone who wants to create anything at all on their CoCo screen or printer will certainly be very glad to meet CoCo Max. CoCo Max's friendly yet sophisticated graphic and text capabilities let you almost instantly produce illustrations, diagrams, charts,



graphs, and computer art – for serious use or just for creative fun.



tion by using software schemes such as sliding windows. Although clever, these schemes yield sluggish and awkward results. Only CoCo Max does it the right way. The CoCo Max Hi-Res Input Unit plugs into your ROM slot and adds an entirely new joystick input to your computer – a precision one with a 49,152 point resolution to match the CoCo screen exactly.

Plug your same joystick, mouse or touch

You may then use CoCo Max's graphic magic on it. The DS-69 is available as an option from Colorware from \$149.95 complete with its own software on disk or tape. Using the DS-69 with a disk requires an RS multi-pak adaptor.



COCO MAX REQUIREMENTS

The CoCo Max System includes the Hi-Res Input Unit, software on disk or cassette (please specify) and user manual. It will work on any 64K Extended or non-

THE COCO MAX SYSTEM

AN ABSOLUTE GUARANTEE

CoCo Max is a hardware software system that no software-only system can match. Get CoCo Max and see your CoCo perform as it never could before. If you don't agree that CoCo Max is the ultimate creative tool for the Color Computer, simply return it within 20 days for a full, courteous refund from Colorware.

THE HARDWARE...

This is the key to CoCo Max's unmatched performance. Did you know the normal joystick input built into the Color Computer only allows access to 4,096 (64 x 64) points on the CoCo screen? Yet, the Color Computer's high resolution screen



has 49,152 (256 x 192) pixels. This means that a joystick, mouse or even a touch pad can, at best, only access about one tenth of the pixels on the CoCo screen.

Most graphic programs ignore this hardware limitation of the Color Computer and give you only low-res control. Others attempt to overcome the limita-

pad into this new input and you have a whole new kind of control. The difference is remarkable.



A DIGITIZER OPTION...

We studied all the video digitizers available and picked the best of them to link with CoCo Max. The DS-69 from Micro Works was our choice. This optional device lets you capture the image from any video source (video recorder, camera, etc.) on your Color Computer.



extended Color Computer. You'll need a Radio Shack or equivalent joystick, mouse or touch pad. Disk systems require a Multi-Slot Interface or Y Branching Cable.

THE COMPLETE COCO MAX SYSTEM, with software on **DISK** \$69.95

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The Computer Room

by Scott L. Norman

So Much Software, So Little Time

This last full-blown issue of *HOT CoCo* finds me with plenty of unfinished business. As always, I have a number of products on hand that I've only used for a short time. Some of the stuff promises to be useful, and although I haven't had a chance to really look it over, I'll use this column

to wrap up my impressions of some of the most promising new products.



I/O menu causes control to pass to the Telegraphics print routine. (Unfortunately, the new option doesn't actually appear on the menu.) If you have specified a default graphics file in the code, it will be printed; otherwise, you type in the required information at this point. You can return to the

word processor by pressing the 2 key.

Telegraphics works pretty well, although I haven't yet tried to interface it to Telewriter modified with Bob van der Poel's Teletatch—what I use every day. I'm sure it can be done.

One word of caution: When you print a letterhead, Telewriter has no way of knowing that you have used up part of a page. You have to adjust the page length (in lines) with the format menu to avoid having your text run off the bottom. That's not a problem with short notes, but you'll have to watch it with multipage documents.

Graphics with Telewriter

Derringer Software's Telegraphics is a new utility that prints the displays that general-purpose graphics editors produce. Several routines can do that much, but Telegraphics includes the ability to interface with Basic programs. Once you realize that Telewriter's I/O menu routines are written in Basic, you can appreciate what this can lead to: Telegraphics gives Telewriter the ability to print graphics as well as text, although not in one unbroken stretch. You have to temporarily break out of the main program to call the graphics printing subroutine, but that's a minor inconvenience. At least you don't have to reload Telewriter and your text file after the image is printed.

Although Telegraphics can handle images that occupy all eight of the CoCo's graphics pages, most people will probably use it with small illustrations to produce customized stationery. You can design your own letterhead with a graphics processor and store the image as a binary disk file. Telegraphics can then convert the file to a special ASCII form that can be read and passed to your printer without disturbing anything in the CoCo's graphics area—such as Telewriter text. Users of Derringer Software's Master Design will recognize Telegraphics as the earlier program's letterhead utility.

A Basic subroutine package handles Telegraphics' printing. You have to merge it with your own Basic applications program (Telewriter's I/O menu routine, in my example) and save the modified version after setting things up for your printer's control codes. If you use a nonstandard baud rate to communicate with your printer, you'll have to insert a POKE 150 command somewhere. I put mine at the very beginning of the subroutine.

Once you have taken care of all the housekeeping, pressing L from Telewriter's binary

A Couple from Computerware

I usually ignore commercial personal-finance software, since I use a specialized program of my own to handle the Norman family finances. There seems to be an endless market for ready-made products of this kind, however, so I'm happy to report that Computerware's personal finance system, PFS, is a handy, easy-to-use addition to the ranks.

PFS combines a family checkbook/budget keeper with a financial calculator for doing loan and investment computations. It requires 32K and at least one disk drive; you can record 1,300 transactions on the program disk, and about 3,000 on a separate data disk in a two-drive system. Either figure should be enough for the average family, since the program requires that you use a separate disk for each year's activity.

You create a new checkbook file by specifying a file name and an opening balance. Next, you set up what an accountant would call a chart of accounts: a listing of up to 48 categories by which you would like to keep track of your checks and deposits. Typical examples include salaries, rent or mortgage payments, and credit cards. At the same time, you can designate a monthly budget for each account. Knowing that you can change any of the information at any time makes this a low-pressure affair.

It's impossible to remember all those account numbers, but you can get a printed list, complete with a record of all activity for the current month, as soon as you enter your first transaction. I haven't found a way to get the list without the transaction history.

Once you've established a PFS checkbook, making an entry is simply a matter of responding to prompts and typing in the date, check number (#0 is reserved for deposits), account number, amount, and payee or income source. A given check number can be used for more than one transaction, in case you want to split a payment between several accounts. The example mentioned in the manual is a gasoline credit-card bill, which might represent both fuel and repair costs; you might like to keep separate records for the two.

You can call for a variety of reports and budget comparisons at any time. Unlike business programs, PFS doesn't get involved with closing the books at the end of the accounting period. Unfortunately, you have to wait for the entire printed version of a report; there doesn't seem to be any way to get a quick preview on the screen.

The loan and investment calculator features are easy to use. I especially appreciate the fact that they don't force you to use a weekly payment schedule. When I borrow money from my employer's credit union, I have to repay the loan from a biweekly paycheck, so I have to calculate things in terms of 26 payments per year rather than 12 or 52. PFS has no problem with that.

Another Computerware program I've had occasion to check out recently is Merge 'n Mail, a mailing-list manager. It seems functionally identical to an older product called VersaMail, with the manual cleaned up to reflect changes in the screen displays.

Merge 'n Mail can handle 700 names on a single-drive system, and 2,500 or so on four drives. It can prepare address labels for all or part of your list, using database-like commands to select entries on the basis of any data field. The fields themselves can contain either conventional name/address/telephone information, or user-defined codes for recording special pieces of data: special interests or membership status of people on a club roster, for instance. You can even print special messages on your labels.

The program also has the unique ability to find records by matching the *sound* of the last name; that is, by attempting to match the phonetic spelling. I can't imagine using this feature every day, but it just might come in handy once in a while—especially if you have a poor memory for names.

I suspect that most people will get more use out of Merge 'n Mail's ability to interface

with any word processor that produces an ASCII text file. You simply use a special set of imbedded codes to denote where data from your mailing list should be inserted into a document, and presto! instant junk mail.

And a Hard One to Find

My last little enthusiasm presents a bit of a challenge; since the original vendor (Ilume Design, of Montreal) has slipped beneath the waves, anyone interested in buying it will have to bug the author, Jorge Mir. He may never forgive me.

The subject is Datafile, another one of those free-form data managers for which I have often expressed a weakness. It is an electronic notepad that doesn't require you to define any record structure in advance. If you can manage to keep some semblance of order in the way you enter data, however, you'll find Datafile versatile enough to sort your file, search for specified character strings, and find totals for records that contain dollar values.

The program can generate three types of printouts, including mailing labels, and lets you select the records to be printed. You can even send control codes to your printer to spruce up the appearance of the reports: an

unusual feature for this type of program.

Datafile is written in Basic, so it's not the quickest thing around. It can capitalize on the CoCo's high-speed POKE if your machine can handle it, though. I also wonder if the program wouldn't benefit from being run through a good Basic compiler.

That sounds like an interesting project, but one that will have to wait just a bit. Meanwhile, if you're interested in acquiring a useful little filing program for keeping track of hobby collections, notes for school assignments, or other personal applications, you should check with Jorge Mir on the possibilities of reviving Datafile. You can reach him at 12851 West Balboa Drive, New Berlin, WI 53151.

Out of String Space

I'm not about to let HOT CoCo undergo its transformation without saying how much I've enjoyed doing these columns. I have to assume that someone has been reading them, too, because some of you have been good enough to write and tell me so. I doubt that my family could have forged all the letters. My track record for answering mail is far from spotless, but I do want you to know that I've appreciated your comments and

tips. Some of you have no doubt seen the results in subsequent issues.

If you still have an appetite for this sort of thing, you should know that I'll be continuing the column (or something very much like it) in 80 Micro's Color Computer section. That will be a homecoming for me: It's where I first started writing about personal computing five years ago. See you there, I hope.

Meanwhile, will the last person out of the Computer Room please turn out the lights? ■

Scott Norman is the manager of solid-state science at GTE Laboratories in Waltham, MA. Write to him at 8 Doris Road, Framingham, MA 01701.

Vendors Mentioned in The Computer Room

Derringer Software
P.O. Box 5300
Florence, SC 29502-5300

Computerware
4403 Manchester Ave.
Suite 102/Box 668
Encinitas, CA 92024

FANTASTIC NEW GRAPHICS PROGRAMS!



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PIXGEN is a revolutionary new idea in graphics creation for your Tandy Color Computer! Unlike most graphics utilities which let you draw a picture, and then save the screen as binary data, **PIXGEN** lets you design pictures and then AUTOMATICALLY compiles the machine language source code needed to redraw your picture!

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Reviews

edited by J. Scot Finnie

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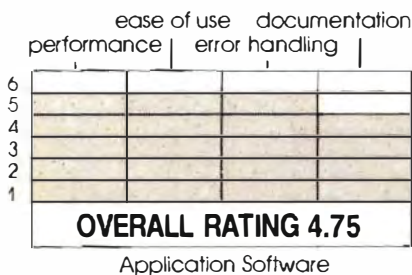
Review-Ratings Key

6	Unsurpassed
5	Excellent
4	Above Average
3	Acceptable
2	Needs Improvement
1	Unsatisfactory

Ed. note—The overall ratings that appear in the review-rating graphs are an average of the ratings for all the categories rounded to the nearest quarter of a rating point.

Clear It with the Databank Manager

by Jeffery S. Parker



Databank Manager is produced by Computerware, 4403 Manchester Ave., Suite 102, Box 668, Encinitas, CA 92024, 619-436-3512. The program requires 64K, a disk drive, and Disk Extended Color Basic. It sells for \$79.95

If you've been frustrated trying to find software for the CoCo that will let you define a database and then manipulate the data in many useful ways, Computerware's Databank Manager could be the answer. More than just a database, this software lets you actually change field data and print out a wide range of reports that can plot and combine derived information any way you want.

There are several features of this software that make it different from other databases available for the CoCo. It runs under OS-9 and makes use of that operating system's power-

ful file-handling capabilities. Users who do not have OS-9 should not balk at this; the database comes with its own OS-9 driver. And you do not need to be familiar with OS-9 procedures because the program appears to run like any other Color Computer program.

Another aspect of Databank Manager's difference from the run of the mill is that it is designed to show you information in various orders and combinations as well as hold it the way a file cabinet does. Database managers are designed to combine one set of data with another in order to derive or create more meaningful information. Databank Manager does this especially well, and it is not limited to merely emulating a filing cabinet.

If you are familiar with OS-9, you will recognize Databank Manager's use of menus as you go from screen to screen. The program only presents you with those menu options that are available at any given time. It also has excellent built-in error-trapping features, such as internal validation within data fields.

The documentation accompanying the program is very difficult reading for the novice, and requires full concentration for the experienced user. A tutorial of a sample database that is included with the program helps a good deal, but examples within the text would have been even more helpful. The tutorial is unquestionably required reading.

Some of what makes Databank Manager so powerful is the large number of options it offers for entering, storing, formatting, integrat-

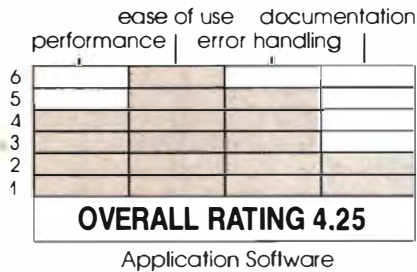
ing, and printing data. Menu areas are provided for defining a record, defining display formats, defining report formats, defining data-access methods, updating records, printing records, interfacing with the operating system (for OS-9 users who want a larger storage buffer, different directory, a shell command, and so on), and management utilities options. Be careful with this last set of options. It allows you to restructure, delete, rename, or copy a Databank Manager file. A nice aspect of these options is that they support input and output of Dynacalc files. There is also a replication feature that allows the user to repeat data fields, such as for mailing labels on tractor-feed paper.

Databank Manager is a powerful and sophisticated data-management tool. It is more easily compared with a business database-management system than with most database programs available for the CoCo. An important note to remember about this program, and what might be its biggest limitation, is that it will not sort and cannot be accessed by a derived field. The computer writes derived-field data as it runs and does not store derived data in a permanent file.

With all the capabilities of Databank Manager, if you have a need for sophisticated data management, this software is probably for you. While it is not a program that novices will learn quickly, once learned, it really becomes a powerful tool for managing data. I recommend it for serious data-management use. ■

Seeing What CBasic Is Made Of

by Gary W. Clemens



The CBasic Compiler and Program Editing System is produced by Cer-Comp, 5566 Ricochet Ave., Las Vegas, NV 89110, 702-452-0632. The program requires 32K. Disk Extended Color Basic, and a disk drive. It sells for \$149 plus \$3 for shipping.

Remember the opening scene of the Superman TV series? "...It's a bird; it's a plane; no, it's Superman!" Well, even though the CBasic compiler and editor from Cer-Comp can't fly, like Clark Kent—it has a great many super abilities. If Lois Lane did some investigative reporting on CBasic, this is what she might find.

Operation and Performance

CBasic has a built-in high-resolution program editor that is the normal mode for the entire editing and compiling process. The editor won't do the writing for you, but it provides just about every other feature that you could ask for. It supports a variety of screen formats, arrow-key editing, block move and copy, insert, delete, automatic line numbering, and overtyping. It also has I/O (input/output) commands to append, kill, and list files, though it does not have a Free command. You can change the printer baud rate, force line feeds, change the key-repeat delay, and set compiler directives. Although CBasic is copy protected, the package provides a means of restoring a crashed disk. And if all else fails, you can obtain a replacement for a small fee.

Cer-Comp claims that CBasic runs 10 to 1,000 times faster than interpreted Basic, so I devised several programs for testing this difference in speed. The short program in Listing 1 POKEs each graphic character to every position on the screen—about 64,000 operations. For the sake of perspective I compared routines in home-brew machine language, Basic, and CBasic. Their times were 1.5 seconds, 265 seconds, and 4.5 seconds,

respectively. CBasic is about 59 times faster than the interpreted Basic program.

Another test (Listing 2), multiplies each number from one to 1,000 by a constant and then prints it to the screen. Basic took 22.67 seconds and CBasic took 5.5 seconds to complete this task, a 4-to-1 ratio of difference in speed. The same program required 8.37 seconds of Basic and .5 seconds of CBasic without printing the numbers to the screen, a difference of 17 times.

Input/output operations show the least difference in speed because hardware is the limiting factor, not software. The program in Listing 3 reads every sector on the disk and prints it to the screen. It took Basic 172.43 seconds to run and CBasic 133.65 seconds, a 1.3 to 1 ratio of difference in speed.

The manual states that a straight FOR...NEXT loop executes almost 1,000 times faster than interpreted Basic. My check (Listing 4) executed only 31 times faster. Although according to my tests CBasic isn't as fast as its advertisements claim, it is still fast enough. It compiled a 7,311-byte program to disk in 142 seconds. Maybe it can't compete with a speeding bullet, but then, neither can machine language.

CBasic supplements Disk Extended Color Basic with several new statements, which

are listed in Table 1. You can incorporate the hi-res text screen in your program, use the upper 32K of memory, PEEK and POKE 16-bit words, have full error control, disable reset, control the stack and registers, and incorporate machine language in the program. Other statements swap variable contents, enable or disable the ROMs, and delete trailing blanks in a string. You can also chain programs together and jump to external machine-language subroutines. The PRINT@ statement works for the entire screen in any resolution.

The hi-res screen package includes more than 30 features, including protected lines, home cursor, double-size characters, underlining, and reverse characters. The cursor can be destructive or nondestructive. The hi-res screen displays 24 lines with nine optional screen widths ranging from 28 to 255 characters per line plus the standard 32-by-16 text screen. One drawback is that formats exceeding 64 characters in width are unreadable. Other screen options include selectable background colors in the hi-res format and a variable scroll rate for PBJ's Word-Pak 80-column card. CBasic also supports Double Density's Double 80 Plus 80-column card.

CBasic has a couple of weaknesses that are apparent right off the bat. It doesn't support some Extended Color Basic program statements that could be important to some users. (See Table 2.) And because CBasic is an integer compiler, it doesn't support trig, log, or floating-point statements.

Ease of Use

Comparing Extended Color Basic's edit mode to CBasic's text editor is like comparing a World War II jeep to a modern sedan. Both get you to your destination, but what a difference in the ride. Cer-Comp souped up its editor with automatic line numbering, arrow-key editing, two-character commands, and single-key LIST control. Global commands include search and replace; block commands include copy, move, and delete. The editor has two modes, line edit and auto edit. However, there isn't much difference between them. Both accept arrow-key movement, forward and reverse scrolling, typeover, insert, and delete. The scrolling feature is similar to that of EDTASM+, with the next line always printed at the bottom of the screen whether you are scrolling toward the beginning or the end of the file. The editor also improves printer control. You can set the baud rate and direct all output to the printer with keyboard commands.

CBasic doesn't need a phone booth to change from editor to super compiler, just

BASE	BUF	CALL
CHAIN	DPEEK	DPOKE
DPSET	ERL ERR	FIRQ
GEN	HIRES	IRQ (ON/OFF)
MODULE	NMI	ON ERR
ON FIRQ	ON IRQ	ON NMI
ON NOVR	ON OVR	ON RESET
ON SWI	ORG	OVEREM
RAM (ON/OFF)	RAM64K	RETI
RND	STACK	SWAP
SWI	SWITCH	SWITCH\$
TRM\$		

Table 1. New Commands from CBasic

ASC	ATN	AUDIO
CLOAD	COS	CSAVE
DEF	DEFUSR	EXP
FILES	FIX	LOAD
LOG	MEM	MERGE
NEW	PRINTUSING	RENAME
SAVE	SIN	SKIPF
SQR	TAN	USR

Table 2. The List of All Extended Color Basic Commands Missing from CBasic

type CBASIC and watch the compiler spring into action. If you don't set any external compiler directives, CBASIC will use default values. Some of the compiler options are 64K mode, program-start address, variable storage in the upper 32K, and stack preservation. To compile a program, just select disk or memory mode (for debugging only) and whether you want a printed listing. CBASIC checks each program line for errors and prints troublesome lines with corresponding error codes, putting arrows below the mistakes. Then the compiler lists the entire program, showing the starting memory location in front of each program line. The listing ends with a summary of the number of errors, memory allotted for variables, the memory address of each variable, program-end address, and program length.

CBASIC's syntax is nearly always the same as the respective Basic statements. The major difference occurs in defining string variables and arrays. Because of the way memory is allocated, you must define each string variable or array that exceeds 32 characters in length. Some of the Boolean operators function the same as in Extended Color Basic but use different symbols.

Compiling programs that weren't written specifically for CBASIC is more difficult than

the advertising implies. I have only been able to compile two of more than a dozen commercial programs without a fair amount of rewriting. The string variables will almost always have to be initialized and dimensioned, all loops must have a common exit, and timing loops must be rewritten. Because CBASIC doesn't have a `USR` command, imbedded machine-language routines can be a problem. It is virtually impossible to pass data to them unless you can rewrite the machine language in the routines.

Error Handling

CBASIC handles goofs as easily as Superman dealt with his arch foe, Lex Luther, who always came to see the error of his ways. The editor seems crashproof. It rejects unknown or misspelled commands and locks out unused keys, replying with a beep when you use them. The only way I know of to crash the editor is to load in a program that is in binary instead of ASCII (American Standard Code Information Interchange) format.

I wasn't able to crash the compiler either, although I once had it go into an endless loop while compiling an error-laden program. What happened was that it listed the lines with errors in normal fashion and then began

listing the program over and over again. This is annoying but not a big problem because pressing the break key returns you to the ready mode. I haven't isolated the reason for this, but I think it occurred because of too many undimensioned string variables.

Speaking of errors, CBASIC has several error-handling program statements that supplement Disk Extended Color Basic. With these you can direct program flow to a specified line when an error condition occurs and receive an error-code number.

Documentation

CBASIC's manual is easy to read and written with a minimum of technicalese. It covers editor commands, I/O, statement syntax, and compiler options. Appendices discuss CBASIC differences, a language summary, error codes, and hi-res function codes. Each program statement, including proper usage and correct syntax, is described in the manual. The statement descriptions are adequate, but if you are just beginning to learn Basic, you'll need to study the manuals that came with your CoCo, too. CBASIC's documentation consists of a reference manual, not a programming tutorial.

The editor section of the manual was writ-

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ten under the assumption that readers have some familiarity with either Extended Color Basic's editor or a text editor. It provides explanations of all the commands, including purpose and proper syntax, although some might require experimentation to determine correct usage.

There are a few important aids to understanding this program that have been left out of the documentation. It lacks an index, reference sheet or card, and a glossary of terms. The manual contains a list of supported statements, but not the page numbers where descriptions of them can be found.

My initial experiences using CBasic serve as a good example of the incompleteness of the documentation. The manual's introductory pages make several references to loading in your program, so I did. But when I tried to edit, the screen was filled with a wild graphics display of rapidly changing text sizes, colors, and scrolling screens. Then I discovered that you must load your program in ASCII.

Final Thoughts

CBasic is powerful, easy to use, and yet sometimes frustrating. I need some of those commands that have been left out. It is, however, one of the best integer Basic compilers

available. It is as powerful as the best of its competition and very easy to use. The price tag it carries seemed a bit steep for an integer compiler on first glance, but when you add 64K, hi-res drivers, and full-screen editing,

CBasic begins to look more like a bargain. This program has a few drawbacks, but then even Superman had a near fatal flaw in Kryptonite. ■

Listing 1. ScrnPOKE

```
10 FOR X = 128 TO 255:FOR Y = &H404
    TO &H5FF
20 POKE Y,X
30 NEXT Y:PRINT@0,X:NEXT X
40 END
```

Listing 2. Addnumb

```
10 CLS
20 FOR X = 1 TO 1000
30 Y = X * 11
40 PRINT@ 335,Y
50 NEXT X
60 SOUND 150,10
70 CLS
80 PRINT@ 400,"END OF TEST"
90 END
```

Listing 3. Readdisk

```
10 DIM A$(1,128),B$(1,128)
20 FORT = 0 TO 34
30 FOR S = 1 TO 18
40 DSKI$ I,T,S,A$,B$
50 PRINT A$:B$
60 NEXT S:NEXT T
70 SOUND 150.5:CLS:PRINT@ 330,
    "DONE"
80 END
```

Listing 4. Fornext

```
10 CLS
20 FOR X = 1 TO 32000
30 NEXT
40 SOUND 150,10
50 END
```

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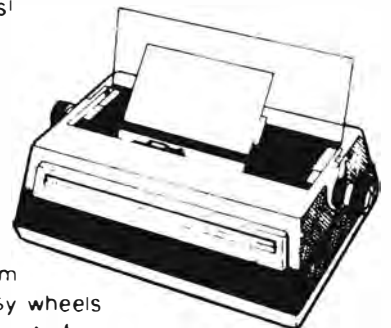


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Print Master is manufactured by Dataman International, 420 Ferguson Ave. North, Hamilton, Ont., L8L 4Y9, Canada, 416-529-1319. The product requires 32K and a mouse or joystick. It sells for \$29.95 on cassette or disk plus \$2.50 for shipping. The Canadian price is \$39.95.

First there came Graphic Master and Text Master. Now comes Print Master. This entry packs the same power of the other Master series programs, offering a versatile and adaptable printer driver that will work with any printer on the market.

Print Master was written by Scott Nudds and is actually two programs incorporated in one package. The first part, Print Master, handles the basics of loading, moving, and printing graphics. The second part, called the Customizer, allows you to set up Print Master for any printer. It customizes Print Master to match your brand of printer and lets you make other changes in the way the utility prints your files.

I was impressed with the professional packaging that Dataman provides with Print Master. It comes with a small three-ring vinyl binder that has an inside pocket for the disk. The software is equally impressive. By "pointing and clicking" with a joystick or mouse, you move through the program quickly and efficiently. All features are menu driven and lightning fast. Keyboard entry in Print Master is kept to a minimum.

On startup, the program displays a colorful title screen. It also makes good use of the CoCo's sound capabilities. There are four menus: Main Menu, File I/O, Image Dump, and Dump-a-Screen. Each of these is pictured and explained in the manual, and some are self-explanatory.

Problems

Despite what seems to be a well-organized package, Print Master has some problems.

There are times when it becomes confusing to use. For example, in Main Menu, the first selection is "dump a picture." However, when you click this selection you get the Image Dump menu. This kind of inconsistency should be cleared up with more careful titling of menus and instructions that mean something to the user. The Image Dump menu might better be termed the Dump Options menu. You don't really dump an image from it, you just set the options for the dump.

The manual is not much help. It shows the Image Dump screen, but the text beside it calls it the Dump Menu. The explanation in this section states "The Image Dump menu is available from both the Main Menu and the File I/O menu. If the listed parameters are correct you may click on the menu title (Image Dump) and proceed to the next level." There is no indication in the manual what the next level is or why you might want to proceed there. What the authors are trying to say is that when you are in the Image Dump menu, you can take a shortcut to the Dump-a-Screen menu by positioning the cursor directly on the words "Image Dump" and pressing the button. It is important to read the manual thoroughly before getting started. Although operation is simple, you will find the options and features confusing without doing so.

Screens are sent to the printer from the Dump-a-Screen menu. In this section you are given many options on how much of the screen you want printed. For example, you might dump a working screen, a stored screen, or part of a screen: view the working screen; select PMODE; choose text size; go back to the File I/O menu; or return to the Image Dump menu. If you have a 64K CoCo, you can also save and retrieve screens from high memory or print several screens from high memory together. Features in Print Master that don't require 64K include 90-degree rotation of pictures, the option to customize text titles for pictures, expandable height for handling CoCo Max files (a graphics program from Colorware Inc.), setting of pixel size in both height and width, and the modulus mode. The last option permits shading and changing patterns for achieving different gray scales.

The Customizer

Print Master comes with a list of several printers in its disk directory. If yours is listed there, you will not have to customize Print Master to work with your printer. If, however, you own a printer the program does not list, you'll have to use the Customizer to set up a

driver. The printers listed in the program's directory include the CGP-115, CGP-220, DMP-105, DMP-110, DMP-200 from Tandy; Star Micronics' Gemini; and the Apple Image Writer among others.

The Customizer has features that let you do the following: change the baud rate, set the number of wires (pins) in the print head, remap the print head, add bytes to the output, set bits to remain on during output, reset the graphics mode, define a color set, define tab strings, define custom strings, isolate and replace bad output, and test or save your custom file. Although the manual touches upon each of these features, it could explain them better.

The customize feature can also be used by both 32 and 64K CoCo owners to design custom strings for producing various effects. You need a thorough working knowledge of the printer in question and a little patience to get through these features. The Customizer makes Print Master the most versatile driver on the market. It works on some of the most difficult printers to drive, including the Okidata 92/93 and color printers such as the Tandy CGP-115.

Although it is not easy to set up a custom file in Print Master, it is difficult to endow a program with powerful features and also make it easy to use. One point in the program's favor is that Dataman is helpful and courteous when you have questions or problems. I was often able to reach the author of the program directly by telephone. I've found few companies that offer Dataman's high level of service after a sale. They win my Atlas Award for the best customer support I've come across.

The Last Word

I have mixed feelings about Print Master. With a few improvements in documentation and menus, it would be easy to give this package a very high overall rating. But because of the confusion of the documentation and the lack of consistency in the menu titles, I'll reserve that rating for later versions. Despite the program's problems, however, I have never seen a more powerful or versatile printer driver for the Color Computer. If you have several printers or one to which it is difficult to dump graphics, this may be the solution. You might also consider that if you buy new printers, owning Print Master means that you won't have to write your own driver or wait for one to be developed. And given the level of customer support from Dataman, you are likely to get this program working whatever the printer or conditions. ■

Disk Fix and OS-9 Utilities

by Bruce N. Warner

	ease of use	documentation	performance	error handling
6				
5				
4				
3				
2				
1				
OVERALL RATING 5.00				
Application Software				

Disk Fix and OS-9 Utilities are available from Computerware, 4403 Manchester Ave., Suite 102, Box 668, Encinitas, CA 92024, 619-436-3512. The program requires 64K, OS-9, and a disk drive. It sells for \$29.95 plus \$2 for shipping.

There are a lot of new utilities for your CoCo, and many of them are for OS-9. The reason for this is that Tandy Corp. announced that they plan to strongly support OS-9 in future models of the CoCo. But will new versions of the Color Computer have 40-track, double-sided disk drives like the latest Model 4's? Or will Tandy continue in their single-sided vein? There have been several fixes released for solving the CoCo's single-sided storage problems, but all the effective ones have had drawbacks, too. Enter Disk Fix and OS-9 Utilities from Computerware.

Disk Fix

One program I've used for this purpose works well but has an annoying characteristic. If I want to share software I've written with friends who have single-sided, 35-track CoCos, I have to reset my system so that at least one drive is defined in the single-sided format and another is defined as a double-sided drive. Disk Fix provides a cure for this by taking on the form of a new command, NEWFMT, which lets you change the format of a disk directly from the command line, despite the predefined format of your system.

The best application I've found for this concerns the OS-9 Users' Group Library. I have permission to make copies of software from this library for the Northern Virginia Color Computer Club, of which I am a member. Many of the club members have single-sided, 35-track systems. In the past, in order to copy the entire disk for these members, I had to reboot my system to recognize the second drive as single sided and then DSAVE the the entire disk piped through a shell. Disk Fix lets me format the second disk as single sided

and then use Dircopy. The real beauty of this is that there is no rebooting. And OS-9 assigns files by the file-allocation table on the destination disk, which keeps the disk from even looking at the second side.

The Rest of the Utilities

This package contains seven program utilities, seven procedure files, a device driver, and a note on using four disk drives (which can only be set up when all four drives are single sided). The procedure files do most of the work involved with installing a new OS-9 system of double-sided and/or 40-track drives. By following the directions, you'll soon find you can take full advantage of OS-9 and its storage capabilities.

Dircopy is one of the most useful of the utilities you'll find in this package. It is a cross between the COPY, DSAVE, and BACKUP commands. The differences are in its built-in flexibility. Dircopy, unlike DSAVE, allows you to perform either a partial or complete backup of one disk to another. It can also let

**"Disk Fix and OS-9 Utilities
has become a welcome
addition to my OS-9
library."**

you choose particular files for copying, copy the data directory only, provide an interactive option, automatically overwrite existing files, sort files in the directory into alphabetical order, copy only those files that are newer than the existing file of the same name, and update files while maintaining the date of creation and the last time the file was updated or modified. Most of these options execute by themselves once they are selected.

If you choose Dircopy's interactive mode, the utility prompts you for all options and can provide you with a help menu. Although Dircopy allows you to rewrite existing files with the automatic rewrite option, if you choose not to use this option, the utility prompts you to rewrite a file if another exists with the same name. This allows you to decide whether or not you want to rewrite a file. I found this feature to be extremely useful

when copying files onto another executable disk that already contained the OS9Boot file.

Patch is basically an interactive debug program. Its command line is executed simply by calling Patch with the file to be worked on. The best part about Patch is that it allows you to change a small portion of a program without having to examine the entire source code. By using Patch in conjunction with the standard OS-9 dump module, you can create a small debugger/disassembler.

Filelook is similar to OS-9's MDIR command. When you call MDIR with the E option, you can get a great deal of useful information on a file. Under OS-9, the DIR command does not give you quite the same detail of a file. But Filelook lets you read many of the MDIR E items without first loading the file into memory. The extra details are the size, type, revision number and name of any module contained in a disk file.

The compare command compares a disk file and memory-resident module, byte for byte. It is most useful when you are examining a module that has been changed.

Dmode lets you change the mode of any of your disk device descriptors to single- or double-sided drives; select 6-, 12-, 20-, or 30-millisecond step rates; choose from one to 40 tracks per side; and set the verify command on or off. Dmode even addresses the fact that the CoCo OS-9 device driver does not check for double-sided drives or increased step rates; Disk Fix and OS-9 Utilities provides its own Ccdisk module.

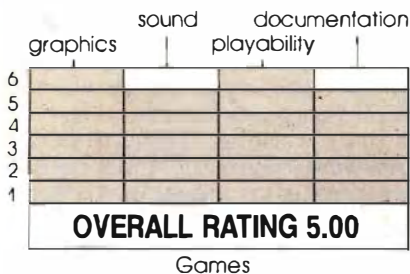
Dblboot moves the OS-9 boot file created by OS9Gen or Cobbler to the correct physical track of the drive. This is absolutely necessary for double-sided drive users.

Some Final Thoughts

With all it has to offer, you might think that there is nothing wrong with Disk Fix and OS-9 Utilities, and you'd be almost right. The only aspect of the package that I could find fault with is that on page 14 of the manual the authors describe a process of pressing the space bar to continue after each screen fills with text. I prefer to enter the "Tmode-pause" command prior to using the Dircopy command. This will turn off the terminal's pausing after filling each screen of text. I could find nothing else that I would change in the program or its documentation. The directions are clear and to the point in all other respects. Disk Fix and OS-9 Utilities has become a welcome addition to my OS-9 library. If you decide that you want to go a step further with your disk system than Tandy has designed OS-9 to go, this is it. ■

Getting into Alphabet Stew

by Richard Ramella



Alphabet Stew was created by Triad Pictures, P.O. Box 1299, Sequim, WA 98382, 206-683-6459. It comes in two versions for 16 or 32K, which come on the same cassette for \$17.95. It requires Extended Color Basic.

A 3-year-old girl just happened to be in the house the day Alphabet Stew ar-

rived. The program delighted her so much that she had to be taught not to bang on the keyboard. And though I am chronologically an adult, Triad Pictures' gently humorous alphabet program also charmed me.

With close supervision, children as young as 1 or 2 years might derive fun and valuable experience from this easy-to-use sampler. Want to hear music and see bright screens . . . follow along as a pair of cartoon legs aptly illustrate the meaning of the word *zip*. . . watch a volcano blow its top? It's all here in Alphabet Stew.

If I can find fault anywhere in this program, it's that the same graphics are used in some instances to illustrate more than one letter. A comical sour face depicts the meaning of both *grumpy* and *yuck*, and other pictures also do double duty. Despite my concern, this didn't seem to bother the 3-year-old.

Play of this game is simple, yet it gives very young players a nice sense of control over the

proceedings. To see a well-done example of the word *x-ray*, press the X key; or to see the *moon*, for example, press the M key. The pictures are accompanied by snippets of music and sound effects. The punctuation characters offer various bits of music. Players can also work out tunes by pressing the 1 through 0 keys, which form an octave plus two notes. The program's brief instruction booklet includes tunes children can play by pressing particular number keys. The difference between the 16 and 32K versions is that the longer program has two or more examples for each letter. The 16K version has only one.

Alphabet Stew could well be a toddler's best introduction to both the alphabet and the computer. The colorful, musical, ever-changing events of this whimsical game have a knack for maintaining a youngster's interest. And the techniques of animation are worth study by aspiring programmers. I recommend it all around. ■

Three from Dorsett

by Dennis W. Peterson

Intermediate Mathematics, United States Government, and Energy and the Environment are manufactured by Dorsett Educational Systems, P.O. Box 1226, Norman, OK 73070, 800-654-3871, 405-288-2301 in OK. They require 16K, Color Basic, and come on cassette for \$59.90 each plus \$2.50 for shipping.

A major credit-card company instructs you not to leave home without its card. Teachers could say the same about Dorsett programs: Don't go to school without one. Students buy them for home use. And common sense tells you that they offer a good

value. Each \$59.90 package comes with 16 programs, one on each side of eight cassettes that come attractively packaged in a text-book-size carrying case. Dorsett even sells the cassettes separately for \$8.88 each. The company also sells 16 study booklets and 32 pre-post tests to go along with their software for \$15.95. Dorsett's library of educational software is worth checking into.

Getting Started

The only documentation that comes with most Dorsett programs is a half sheet of typing paper that contains loading instructions and whatever information you can glean from the Dorsett courseware catalog. (An additional paragraph of information on each program comes with the Intermediate Mathematics package.) Despite this paucity of instruction,

the documentation provides all the information you need to know. Once loaded, the programs do the rest. Be sure that you have not left a disk-drive controller in your CoCo's ROM port: these cassette-based programs will not run with the controller connected.

Dorsett programs turn your computer into something like a knowledgeable lecturer. Material is presented by a pleasant, prerecorded narrator's voice that is matched by attractive screen graphics. Just as good teachers jot important points on the blackboard, the program displays them on the screen in easy-to-read print. It also keeps a record of student responses as a means of monitoring learning. The scoreboard at the end of each program reports the number of questions asked, the number of correct first-trial answers, and the total number of incorrect replies.

**“Dorsett programs turn your computer
into something like
a knowledgeable lecturer.”**

Intermediate Mathematics

	meets objective	maintains interest	documentation ease of use
6			
5			
4			
3			
2			
1			
OVERALL RATING 4.25			
Educational Software			

This package of programs is intended for students in grades four through eight. Along with providing typical addition, subtraction, multiplication, and division lessons, it offers concepts such as weight conversion, the metric system, interpolation, and an introduction to logarithms. Forgotten your logarithms? Well Dorsett wants to teach them to your eighth grader, and why not? Maybe you could use a little boning up, too. Just because these are intermediate math programs does not mean that high schoolers and adults can't use them. Also, Dorsett doesn't expect that a seventh grader who is having trouble with decimal division should plunge headlong into interpolation with negative numbers. There is a program for decimal division, too. Intermediate Mathematics does not contain lessons on fractions, but Dorsett has another set of programs that deal with that topic.

Don't expect your student math scholar to understand everything perfectly after one trip through any of these tapes. Sometimes repeating just a portion of a tape is a better idea than running the whole thing. Some questions the programs put to students seem more intent on seeing if they are awake than stimulating serious thought. For example, the logarithms tape asks, "What is the second part of a logarithm," and offers the possible answers *mantle*, *mattress*, and *mantissa*. The second answer could be the correct one if the logarithm segment puts you to sleep. But these tapes are far more exciting to kids than the dronings of a math instructor on a sunny spring afternoon are apt to be.

United States Government

	meets objective	maintains interest	documentation ease of use
6			
5			
4			
3			
2			
1			
OVERALL RATING 4.00			
Educational Software			

This series offers students in the seventh through twelfth grades a strong outline of federal, state, and local governmental systems. It also explores the two-party system, taxation, naturalization, voting, international affairs, and the creation of the Constitution. While the scope of these programs is not on a par with that usually aimed at by 700-page-textbook writers, they do cover the essentials thoroughly and serve as a good introduction to the concepts of government for future voters in your family or classroom.

Because the lessons in this package are well organized, they help students who have difficulty culling out the most important information from textbook pages by creating an ordered mental outline. Even college students might benefit by going over these tapes. The structure they provide is excellent preparation for a political-science course. And new U.S. citizens might find this series to be invaluable.

Energy and the Environment

	meets objective	maintains interest	documentation ease of use
6			
5			
4			
3			
2			
1			
OVERALL RATING 4.00			
Educational Software			

The Energy and the Environment package targets sixth- through twelfth-grade students, but adults who are interested in ecology will find them to be informative, too.

Fifth-grade teachers might find parts of the series to be a help to their students if they relate specifically to classroom topics.

In using this package, students learn about the traditional sources of energy, their impact on the environment, alternative energy sources, and future energy needs. The lessons objectively outline the problems that must be overcome in turning to different energy sources. The overall tone is one of practical optimism, and the series explores many different energy options.

One tape, for example, treats wind energy. It points out that the wind can be harnessed to provide electrical energy, but not always at the times when it is needed. The lessons suggest that wind-generated energy could be stored by using it to convert water to hydrogen, which is then stored for future fuel use. The tape doesn't stop there, however, leaving students with too rosy a picture. It continues by pointing out the problems and disadvantages of storing hydrogen. Energy and the Environment consists of practical and objective lessons that treat a sometimes controversial topic factually.

Conclusions

These new Dorsett educational series are packed with great graphics, print style, and layout. It is difficult to come up with suggestions for improvement. It would be better if the narrator could slow down a little, but only if he can do so without sacrificing the well-organized information found on each cassette. In rare instances I found that the tapes dropped a narrated word or two; apparently these slips are at points where bits of the computer program have been patched to provide the computer with information.

Intermediate Mathematics, United States Government, and Energy and the Environment deal with subjects that some students might find less than interesting. But they cover these topics in a way that is much more likely to maintain interest than a chalk-and-chat session with a teacher. Compared with filmstrip and audio-tape packages, these programs are dollar savers. And since they are computer programs, they provide more student interaction than many other teaching methods—especially when they are used independently in a learning center or at home. ■

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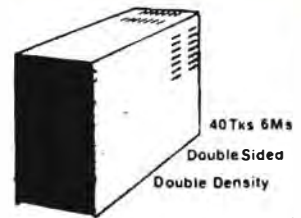
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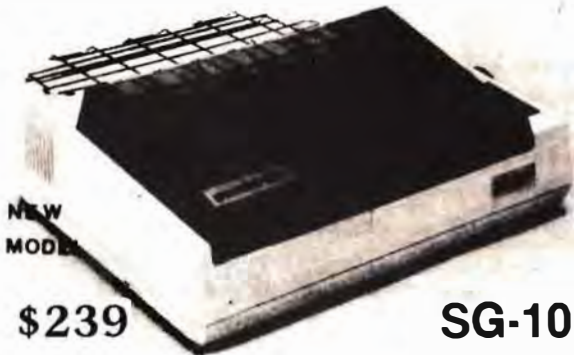
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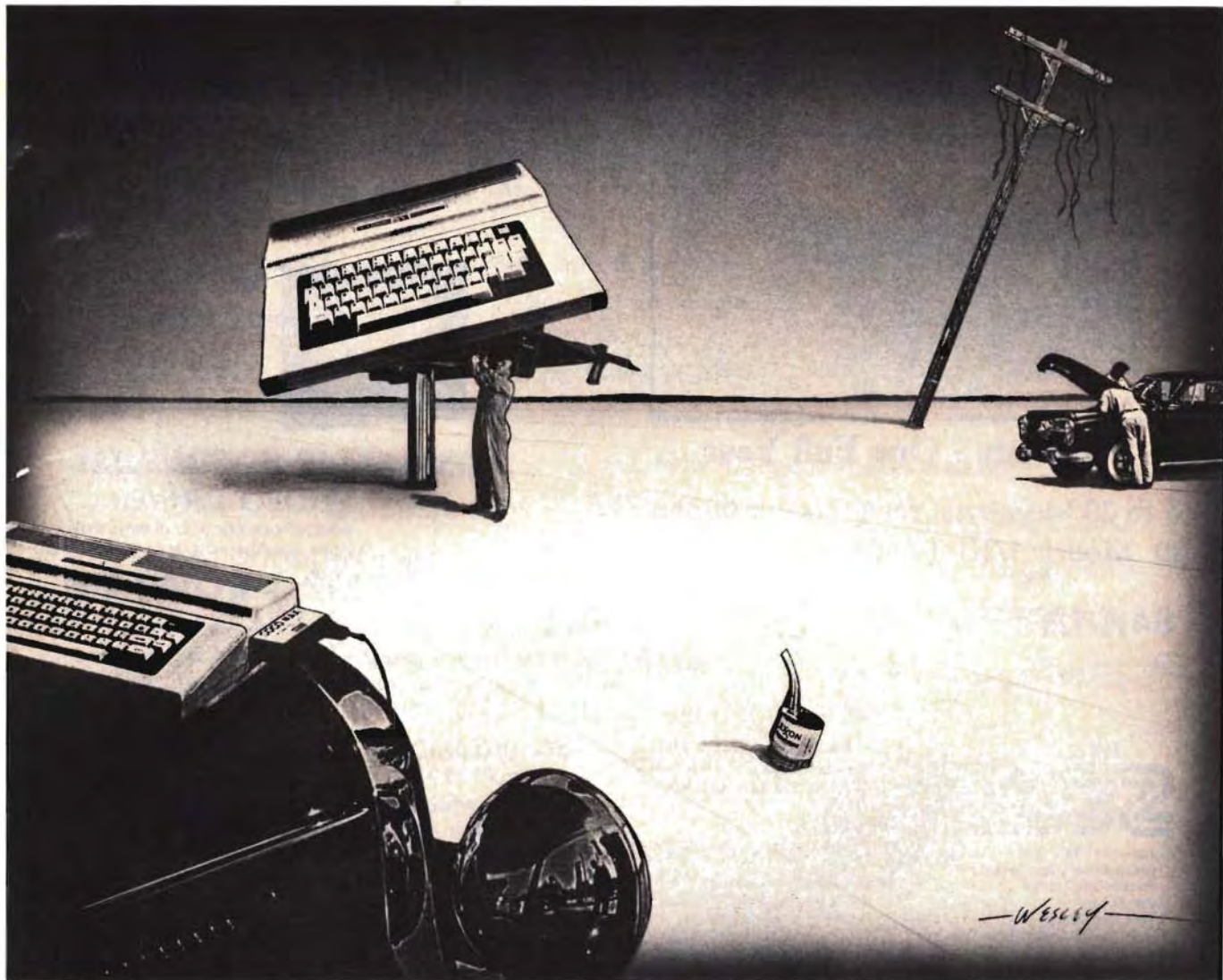


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HARDWARE

by Robert Gault



The Final Fix

A couple of heatsinks or Tandy's Final Fix Kit might be the answer to your overheated CoCo.

Some model CoCos suffer from an intermittent problem. After the machine has been on for 30 minutes or more, random characters begin to appear in the second and ninth screen positions. These characters then become orange graphics blocks, and the cursor moves to the upper left corner of the screen, leaving an image behind. Pressing a key or the reset button locks up the CoCo, and you can only regain control by shutting the power off for several seconds.

Several explanations for the problem have been published and most blame the synchronous address multiplexer (SAM) chip. However, I've found that the culprit is the horizontal synchroniz-

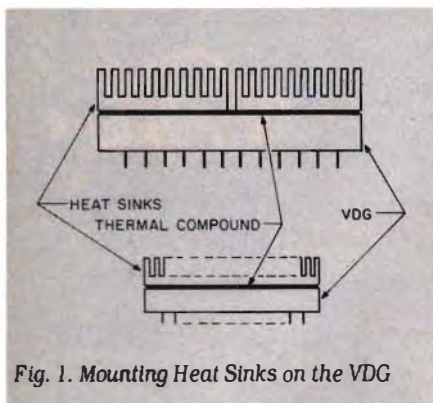


Fig. 1. Mounting Heat Sinks on the VDG

ation (HS) pulse in the video-display generator (VDG). The HS pulse is sent to the television or monitor and is crucial to the SAM's ability to coordinate the actions of memory refresh, the VDG, and the central processing unit (CPU).

Eight sequential addresses are refreshed after the high-to-low transition of the HS pulse while the monitor is in horizontal blanking. The VDG address control is modified on the rising edge of the HS pulse during the vertical-blanking pulse. (The blanking pulse turns off the monitor's electron beam until the beam reaches the start of a new line or screen.)

If the HS pulse becomes too wide, extra memory addresses are refreshed. Due to the symptoms, the nature of the fix, and the SAM and VDG specification sheets, I believe that the HS pulse is not stable enough during warmup.

Tandy's solution is to install their Final Fix Kit, a pulse generator that uses a logic gate and a binary counter. This extra circuitry is set to give a clean pulse exactly four CPU-E clock cycles wide, synchronized to the falling edge of the E clock cycle. (The original cycle is about 4.5 cycles wide.) The new circuit actually divides the VDG 3.58-MHz clock by 16 to produce the desired affect.

If your CoCo is still under warranty, you should let Tandy repair it for you. If it's not, you might try the fix I've come up with. I found that my CoCo didn't lock up when I ran it with the cover off. If it did lock up with the cover on, quickly pressing the on/off switch sometimes stabilized the machine while I was using it. Directly cooling the SAM chip with heatsinks does not correct the problem. The SAM synchronizes on the HS pulse for memory refresh; therefore, I found it necessary to stabilize the HS pulse by cooling its source (VDG). It also helps to correct the cooling flow into the computer.

You can cool the VDG by using thermal compound (Radio Shack catalog no. 276-1372) to stick two type TO-220 heatsinks (Radio Shack no. 276-1363) to the integrated circuit (see Fig. 1). If you move your computer around often, make sure that the heatsinks

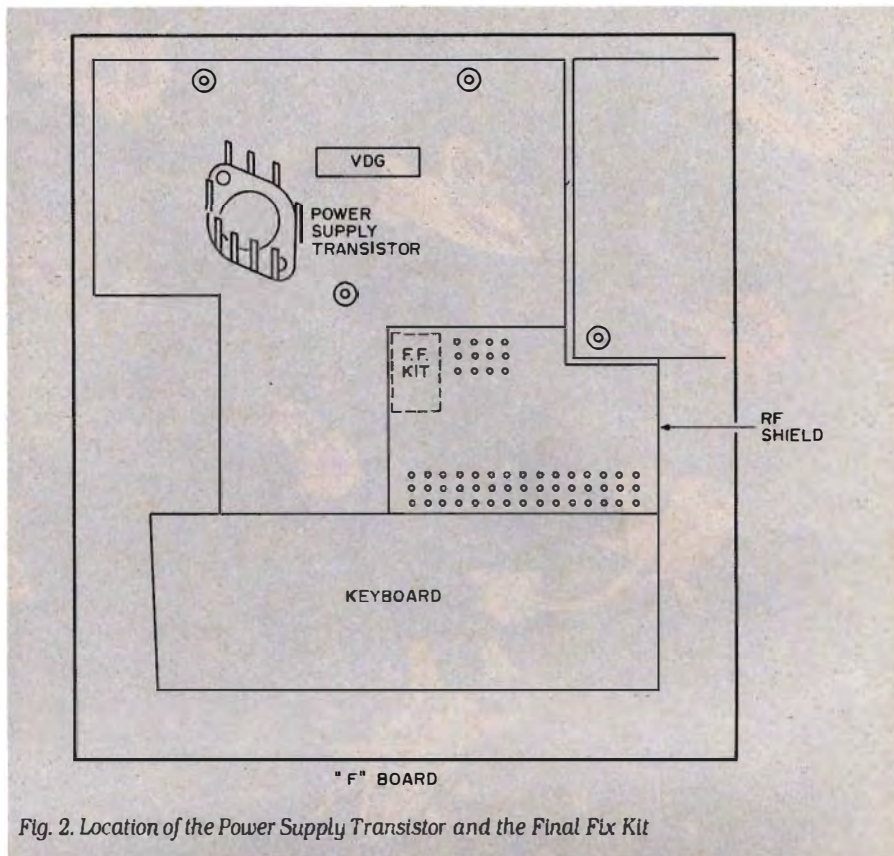


Fig. 2. Location of the Power Supply Transistor and the Final Fix Kit

don't become unglued, because they can cause dangerous short circuits if they fall off.

The only significant source of heat in a CoCo is the pass transistor in the power supply (see Fig 2). It's easy to spot by its large heatsink. Ideally, this transistor should vent directly out of the case. Instead, the heat flows through the entire unit, heating other components before escaping out the side slots. I drilled a pattern of 1/4-inch holes in the case above the transistor (see Fig. 3). Or, you could drill a 2-inch hole and cover it with wire mesh.

Using the Tandy Kit

If you want to use Tandy's Final Fix Kit but want to do the work yourself, you can order the service bulletin and kit from Radio Shack National Parts (900 East Northside Drive, Fort Worth, TX 76102). Table 1 shows the parts you should receive.

Technical Bulletin CC:20
26-3003B logic board AX-7089
SN74LS12 triple-input NAND open collector IC
SN74LS393 dual 4-bit binary counter.

Table 1. Final Fix Kit Parts List

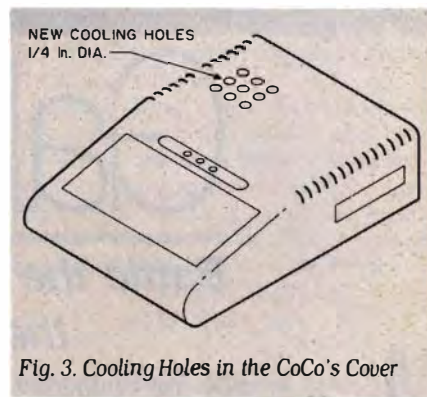


Fig. 3. Cooling Holes in the CoCo's Cover

The kit is a 1 1/2- by 1-inch printed circuit board that contains two integrated circuits, two resistors, and one capacitor. It is easy to install: You cut one trace, bend one SAM leg, and solder five connections. The bulletin is clear and you install all parts under the RF shield (see Fig. 2).

The service bulletin refers only to F-board versions of the CoCo. If you have a different version that you feel needs the fix, you will have to use a technical service manual to locate the soldering points. ■

Address correspondence to Robert Gault, 832 North Renaud, Grosse Pointe Woods, MI 48236

by Lynn H. Davis



Galactic Wars

Battle the dreaded Enbots and rise through the ranks of The Federation.

My name is Hawk, Admiral Hawk. I earned my commission fighting the savage Kryons in CompuServe's MegaWars. In saving the Colonists, I fired photon torpedoes, captured planets, attacked bases, and reduced more than one enemy ship to space dust. If, like me, you enjoy strategy war games, then a bright future in the Federation could await you in Galactic Wars.

The game's objective is to accumulate points toward promotion and more powerful ships. The gameboard is 44 rows by 44 columns; the computer randomly places 50 neutral planets, 50 stars, six Enbot bases, three Enbot ships (the fighter Centauri, the destroyer Antares, and the battle cruiser Denton), six Federation bases, and three Federation ships (the destroyer Polaris, the battle cruiser Nimitz, and the Reliant).

Before entering the program, you must free extra memory by typing:

```
POKE 25,6: POKE 26,1:POKE 1536,0:NEW
You can omit the REM statements to free more memory. After running the program, it asks whether you wish to load a previously saved score and prompts for your name. You start out as a cadet. Pressing H gives you a help screen. Press enter to begin the game.
```

Commanding the Reliant

Once the galaxy is complete, you are in control of the Reliant. The scanner on the left

of the screen is blank. The screen's right side contains the command line, the report section, and the Reliant's status indicators. A yellow report section signifies your turn. Cyan indicates that other ships are taking their turns; you receive reports on their activities. The Reliant has 2,000 force-field energy units (U shows that the shield is up, D signifies down), 3,000 maneuvering and phaser energyunits, and eight photon torpedoes (T).

You have 11 options: scan, move, force field, torpedo, phaser, capture, build, dock, list, help, and save. Firing torpedoes or phasers, capturing planets, building bases, or docking advances play. You can call the other options as often as you wish (if you have the energy) without ending your turn.

Scan: Pressing S draws a map of the area around your ship. Blue squares are empty

System Requirements

32K RAM
Extended Color Basic



space, white squares are stars, green squares are neutral planets, orange squares are Federation planets, and red squares are Enbot planets. Orange rectangles are Federation bases and red rectangles are Enbot bases. Federation ships (R, P, and N) and Enbot ships (C, A, and D) are green. A black "Forbidden Zone" surrounds the galaxy.

The Reliant always appears in the middle of an 11 by 11 grid. You move, attack, and capture by designating coordinates. Coordinate 1 is the appropriate number from the column on the left; coordinate 2 is the appropriate number from the row at the top.

Move: Press M, and then type the coordinates of your destination square, pressing enter after each. A cadet can move only within scanner range, and you cannot move onto an occupied space. Each move uses 250 energy units, 200 if your shield is down.

Force Field: Pressing F raises or lowers your shield and uses 100 energy units. Keeping the shield up reduces damage from attacks by Enbot ships, bases, and planets.

Torpedo: Press T, and then enter the coordinates for where you want to direct your fire. Torpedos are effective only within scanner range and pack a destructive punch of 500 units. One torpedo will destroy Enbot and neutral planets. Two will destroy an Enbot base, providing you issue no other commands between firings, as Enbot bases can rebuild themselves. If a neutral or Enbot planet fires back at you, it won't miss.

If you hit a star, it will explode, destroying everything in the immediate area. You can use this tactic to destroy Enbot bases, but don't let the Reliant get too close. The Reliant's crew prevents you from firing on Federation ships, planets, or bases. However, aborted attempts constitute a turn. Firing at an empty space costs you a torpedo. You always hit the desire coordinates, even if an object blocks the torpedo's path.

Phasers: Pressing P fires a phaser blast. Cadets are limited to 300 units. You must have enough energy to fire a phaser. You cannot fire at an empty space or outside the scanner's range. Phaser power can damage only Enbot ships, planets, and bases.

Capture: Maneuver the Reliant next to a neutral or Enbot planet or an Enbot base. Press C and provide the coordinates to attempt capture. Some planets and bases are more heavily fortified than others and might repel your attack. Each

Rank	Ship Type	Sector Moves	Shield Energy	Engine Energy	Phaser Energy	Number of Torpedos
Cadet	Trainer	5	3000	2000	300	8
Lieutenant	Fighter	5	3500	2500	400	10
Commander	Destroyer	6	4000	3000	400	10
Admiral	Battle Cruiser	7	4500	3500	500	12

Table 2. Rank and Ship Power

attempt uses 100 energy units. The planet or base becomes orange if you are successful.

Build: Press B and follow the capture procedure to convert a Federation planet to a base. There is no chance of being repelled. It takes 300 energy units to build a base, and only six bases are allowed at one time.

Dock: Place the Reliant next to a friendly planet or base and press D to dock and replenish your energy. Docking with a Federation planet supplies four torpedoes and 1,200 energy units for the shields and engines; docking with a Federation base provides four torpedoes and 1,500 energy units. You can dock only once per turn, but repeated dockings to obtain a maximum load are allowed.

List: Press L for a report on the number of Federation and Enbot ships, planets, and bases. You will also see the number of neutral planets and your score.

Help: Pressing H brings up a brief summary of each command.

Quit: To quit the game, press the shift and zero keys simultaneously to enter reverse video; then press X. A game summary appears, and the program gives you the option to save your score on tape. Be sure to press the shift-zero combination to answer questions.

The Other Ships

The other ships can move up to seven sectors at a time, battle another ship (including the Reliant), build planets and bases, and de-

stroy enemy planets and bases. The other ships' scanning range is the same as the Reliant's, but they do not have to dock to refuel. Instead, they must capture a neutral planet to replenish their shield energy. If a ship is destroyed, it loses a turn while the fleet builds a new one and commissions it in a new location.

Winning and Losing

To win, you must convert all planets and bases to the Federation. If the Reliant is destroyed or no Federation planets or bases remain, you lose. To improve your rank and command more powerful ships, you must accumulate game points by saving them on cassette and loading them in at the start of each new game. You are a cadet if you have earned zero to 10,000 points, a lieutenant with 10,001 to 50,000 points, a commander with 50,001 to 100,000 points, and an admiral with over 100,000 points. Table 1 gives points and penalties for outcomes of moves, and Table 2 shows how points affect the type of ship you command.

If you accidentally press the break key during a game, type GOTO 490 and press enter. You will be back in the battle without losing points or changing the status of the gameboard. If you want to speed up the action of the other ships and your CoCo accepts the high-speed POKE, add these two lines:

```
3765 POKE 65495,0
4625 POKE 65494,0
```

Becoming an Admiral

To be successful playing Galactic Wars, you must develop an overall plan of attack. You must decide, for example, whether to try to accumulate points by engaging in battles with enemy ships or by capturing planets. My one hint is to plan early for the closing moments of the game. Your ship has plenty of destructive power; fuel for the engines is the limiting factor. The more expertly you handle immediate and long-range planning, the sooner you will become an admiral for the Federation. ■

Lynn Davis has written articles for 80 Micro, Color Computer News, 80 U.S., and The Color Computer Magazine. Write him at 4316 Amblewood Lane, Clay, NY 13041.

Points	Action
- 50	Blow up a star
- 50	Failed attempt at capturing a planet
- 500	Destroy a neutral planet
- 1000	Destroy a Federation planet
- 1000	Quitting the game or losing the galaxy to Enbots
- 1500	Destroy a Federation base
+ 50	Each phaser or torpedo hit on Enbot base or ship
+ 100	Destroy an Enbot planet
+ 300	Destroy an Enbot base or ship with a torpedo
+ 300	Capture a planet or base
+ 400	Destroy an Enbot base or ship using phaser power
+ 600	Build a Federation planet into a base
+ 1000	Win the game

Table 1. Points Gained or Lost by the Reliant

Program Listing. Galactic Wars

```

10 DIM GA(44,44)
20 DIM IS(5,3):DIM P(11)
30 CLS(0):C1=0:R=RND(-TIMER):RS=
0
40 GOSUB 5690
50 GOTO 5850
60 PL(2)=6:PL(4)=6:PL(5)=50:PL(6
)=3:PL(7)=3
70 REM galaxy
80 CLS:PRINT0,STRINGS(96,175);:
PRINT039,"creating";CHR$(128);"t
he";CHR$(128);"galaxy";
90 C=0
100 C=C+1
110 IF C=1 THEN X=193:Y=50:PRINT
@128,"CREATING STARS"
120 IF C=2 THEN X=129:Y=50:PRINT
"CREATING PLANETS"
130 IF C=3 THEN X=255:Y=6:PRINT"
CREATING BASES AND SHIPS"
140 IF C=4 THEN X=191:Y=6
150 IF C=5 THEN X=82:Y=1
160 IF C=6 THEN X=80:Y=1
170 IF C=7 THEN X=78:Y=1
180 IF C=8 THEN X=67:Y=1
190 IF C=9 THEN X=65:Y=1
200 IF C=10 THEN X=68:Y=1
210 FOR G=1 TO Y
220 S1=RND(44):S2=RND(44)
230 IF GA(S1,S2)>0 THEN 220
240 GA(S1,S2)=X
250 IF C>4 THEN 260 ELSE 290
260 C1=C1+1
270 IS(C1-1,2)=S1:IS(C1-1,3)=S2
280 IS(C1-1,0)=X
290 IF C=10 AND G=Y THEN 320
300 IF G=Y THEN 100
310 NEXT G
320 FOR X2=1 TO 4
330 FOR Y2=1 TO 7
340 RB=RB+1
350 READ GA(RB,0)
360 NEXT Y2,X2
370 FOR X3=1 TO 28
380 IF GA(X3,0)=RK THEN 390 ELSE
400
390 GA(0,0)=GA(X3,0):GA(0,1)=GA(
X3+1,0):GA(0,2)=GA(X3+2,0):GA(0,
3)=GA(X3+4,0):GA(0,4)=GA(X3+5,0)
:IS(0,1)=GA(X3+3,0)
400 NEXT X3
410 IS(1,1)=GA(18,0):IS(2,1)=GA(
25,0)
420 IS(3,1)=GA(11,0):IS(4,1)=GA(
18,0):IS(5,1)=GA(25,0)
430 RESTORE
440 DATA 1,5,3000,2000,300,8,0
450 DATA 2,5,3500,2500,400,10,10
001
460 DATA 3,6,4000,3000,400,10,50
001
470 DATA 4,7,4500,3500,500,12,10
001
480 REM computer display
490 CLS(0)
500 PRINT0,STRINGS(15,175);:PRI
NT032,STRINGS(15,175);
510 FOR C=64 TO 480 STEP 32
520 PRINT0C,CHR$(175);:PRINT0C+1
4,CHR$(175);
530 NEXT C
540 PRINT0481,STRINGS(13,175);
550 FOR C=15 TO 79 STEP 32
560 PRINT0C,STRINGS(17,191);
570 NEXT C
580 FOR C=111 TO 399 STEP 32
590 PRINT0C,STRINGS(17,159);
600 NEXT C
610 FOR C=1455 TO 1471
620 POKE C,207:POKE C+32,207:POK
E C+64,207
630 NEXT C
640 PRINT03,"scanner";:PRINT016,
"command";:PRINT047,"> READY":PR
INT0112,"report";:PRINT0432,"sta
tus";
650 SH$="U"
660 PRINT0464,"U:"::PRINT0472,"T
":
670 PRINT0496,"E:"::PRINT0504,"R
ELIANT";
680 R$=INKEY$
690 PRINT0466,IS(0,1);:PRINT0475
,GA(0,4);:PRINT0498,GA(0,2);
700 IF FLAG=0 THEN BS=1000
710 IF R$="S" AND FLAG=1 THEN FL
AG=0
720 IF R$="S" THEN 910
730 IF R$="M" AND FLAG=1 THEN FL
AG=0
740 IF R$="M" THEN GOSUB 1380
750 IF R$="F" AND FLAG=1 THEN FL
AG=0
760 IF R$="F" THEN GOSUB 1560
770 IF R$="T" THEN GOSUB 1650:GO
SUB 3760
780 IF R$="P" THEN GOSUB 2480:GO
SUB 3760
790 IF R$="C" AND FLAG=1 THEN FL
AG=0
800 IF R$="C" THEN GOSUB 2980:GO
SUB 3760
810 IF R$="L" AND FLAG=1 THEN FL
AG=0
820 IF R$="L" THEN GOSUB 3230
830 IF R$="D" AND FLAG=1 THEN FL
AG=0
840 IF R$="D" THEN GOSUB 3370:GO
SUB 3760
850 IF R$="B" AND FLAG=1 THEN FL
AG=0
860 IF R$="B" THEN GOSUB 3610:GO
SUB 3760
870 IF R$="H" THEN GOSUB 4700
880 IF R$="X" THEN ME=7:GOTO 482
000
890 GOTO 680
900 REM scanner
910 PRINT049,"SCAN"
920 GOSUB 4640
930 LA=IS(0,2)-5:LO=IS(0,3)-5
940 FOR TR=65 TO 449 STEP 32
950 PRINT0TR,STRINGS(13,163);
960 NEXT TR
970 CS=99:SM=0:SR=0
980 FOR SM=LA TO LA+10
990 CT=0
1000 FOR SR=LO TO LO+10
1010 CT=CT+1
1020 IF SM<1 OR SM>44 THEN P(CT)
=128:GOTO 1050
1030 IF SR<1 OR SR>44 THEN P(CT)
=128:GOTO 1050
1040 P(CT)=GA(SM,SR)
1050 NEXT SR
1060 CR=0
1070 CS=CS+32
1080 FOR CQ=CS TO CS+10
1090 CR=CR+1
1100 IF P(CR)=0 THEN PRINT0CQ,CH
R$(161); ELSE PRINT0CQ,CHR$(P(CR
));
1110 NEXT CQ
1120 NEXT SM
1130 CT=LA-1
1140 PL=1089
1150 POKE PL,43:POKE PL+1,43:POK
E PL+32,43:POKE PL+33,43
1160 FOR PP=128 TO 448 STEP 32
1170 CT=CT+1
1180 IF CT<1 OR CT>44 THEN PRINT
@PP+1,CHR$(128);:PRINT@PP+2,CHR$
(128);:GOTO 1220
1190 CT$=STR$(CT)
1200 PRINT@PP,CT$;:PRINT@PP,CHR$
(175);
1210 IF CT<10 THEN PRINT@PP+2,CH
R$(128);
1220 NEXT PP
1230 CT=0
1240 CT=LO-1
1250 FOR PP=67 TO 77
1260 CT=CT+1
1270 CT$=STR$(CT)
1280 PRINT@PP,MID$(CT$,2,1);
1290 IF CT<1 OR CT>44 THEN PRINT
@PP,CHR$(128);:PRINT@PP+32,CHR$(
128);:GOTO 1320
1300 IF CT<10 THEN PRINT@PP+32,C
HR$(128);:GOTO 1320
1310 PRINT@PP+32,MID$(CT$,3,1);
1320 NEXT PP
1330 FOR C5=128 TO 448 STEP 32
1340 PRINT0C5,CHR$(175);:PRINT0C
5+14,CHR$(175);
1350 NEXT C5
1360 GOTO 680
1370 REM move
1380 PRINT049,""
1390 GOSUB 4640
1400 PRINT049,"MOVE SHIP"
1410 PRINT0143,"NAVIGATION READY
"
1420 GOSUB 4650
1430 IF T1<1 OR T1>44 THEN PRINT
@271,"OUT OF GALAXY":PRINT0303,"
MOVE ABORTED":GOTO 1540
1440 IF T2<1 OR T2>44 THEN PRINT
@271,"OUT OF GALAXY":PRINT0303,"
MOVE ABORTED":GOTO 1540
1450 IF IS(0,2)-T1>IS(0,2) OR IS
(0,2)-T1<-GA(0,1) THEN PRINT0271
,"OUT OF RANGE":PRINT0303,"MOVE
ABORTED":GOTO 1540
1460 IF IS(0,3)-T2>GA(0,1) OR IS
(0,3)-T2<-GA(0,1) THEN PRINT0271
,"OUT OF RANGE":PRINT0303,"MOVE
ABORTED":GOTO 1540
1470 IF GA(T1,T2)>0 THEN PRINT02
71,"COLLISION COURSE":PRINT0303,"
MOVE ABORTED":GOTO 1540
1480 GA(IS(0,2),IS(0,3))=0
1490 IS(0,2)=T1:IS(0,3)=T2:GA(T1
,T2)=IS(0,0)
1500 PRINT0271,"MOVED TO";T1:T2
1510 IF SH$="D" THEN GA(0,2)=GA(
0,2)-200 ELSE GA(0,2)=GA(0,2)+25
0
1520 IF GA(0,2)<1 THEN ME=1:GOTO
4820
1530 RETURN
1540 GOSUB 4680:RETURN
1550 REM shields
1560 GOSUB 4640
1570 PRINT049,"FORCE FIELD"
1580 PRINT0143,"UP OR DOWN";:INP
UT SH$
1590 IF IS(0,1)<100 THEN PRINT02
07,"NOT ENOUGH ENERGY";:GOTO 164
0
1600 IF SH$="U" THEN PRINT0464,"
U";:PRINT0239,"SHIELDS UP"

```



```

161Ø IF SH$="D" THEN PRINT@464,"
d";:PRINT@239,"shields down"
162Ø IS(Ø,1)=IS(Ø,1)-1ØØ
163Ø REM torpedo
164Ø RETURN
165Ø PRINT@49,"TORPEDO"
166Ø GOSUB 464Ø
167Ø IF GA(Ø,4)=Ø THEN PRINT@143
,"NO TORPEDOES":PRINT@175,"LEFT,
SIR!":GOSUB 468Ø:RETURN
168Ø PRINT@143,"TORPEDO"
169Ø GOSUB 465Ø
170Ø IF T1<1 OR T1>44 OR T2<1 OR
T2>44 THEN PRINT@271,"OUT OF GA
LAXY":GOSUB 468Ø:RETURN
171Ø IF IS(Ø,2)-T1>5 OR IS(Ø,2)-
T1<-5 OR IS(Ø,3)-T2>5 OR IS(Ø,3)
-T2<-5 THEN PRINT@271,"OUT OF RA
NGE":GOSUB 468Ø:RETURN
172Ø IF GA(T1,T2)=Ø THEN PRINT@2
71,"TORPEDO LOST":PRINT@3Ø3,"@";
T1;T2:GA(Ø,4)=GA(Ø,4)-1:GOSUB 46
8Ø:RETURN
173Ø IF GA(T1,T2)=193 THEN 174Ø
ELSE 2Ø1Ø
174Ø GA(T1,T2)=Ø:GA(Ø,4)=GA(Ø,4)
-1:PLAY S2$
175Ø GA(Ø,5)=GA(Ø,5)-5Ø
176Ø PRINT@271,"STAR @";T1;T2
177Ø PRINT@3Ø3,"GOES NOVA"
178Ø SM=Ø:SR=Ø
179Ø FOR SM=T1-1 TO T1+1
180Ø FOR SR=T2-1 TO T2+1
181Ø IF SM<1 OR SM>44 OR SR<1 OR
SR>44 THEN 197Ø

```

```

182Ø IF GA(SM,SR)>Ø THEN PRINT@3
67,CHR$(128);CHR$(GA(SM,SR));CHR
$(128);"destroyed":GOSUB 468Ø
183Ø IF GA(SM,SR)=193 THEN GA(Ø,
5)=GA(Ø,5)-5Ø
184Ø IF GA(SM,SR)=129 THEN GA(Ø,
5)=GA(Ø,5)-5ØØ:PL(5)=PL(5)-1
185Ø IF GA(SM,SR)=241 THEN GA(Ø,
5)=GA(Ø,5)-1ØØØ:PL(1)=PL(1)-1
186Ø IF GA(SM,SR)=255 THEN GA(Ø,
5)=GA(Ø,5)-15ØØ:PL(2)=PL(2)-1
187Ø IF GA(SM,SR)=177 THEN GA(Ø,
5)=GA(Ø,5)+1ØØ:PL(3)=PL(3)-1
188Ø IF GA(SM,SR)=191 THEN GA(Ø,
5)=GA(Ø,5)+5ØØ:PL(4)=PL(4)-1
189Ø IF GA(SM,SR)=8Ø OR GA(SM,SR
)=78 THEN GA(Ø,5)=GA(Ø,5)-15ØØ:P
L(7)=PL(7)-1
190Ø IF GA(SM,SR)>64 AND GA(SM,S
R)<69 THEN GA(Ø,5)=GA(Ø,5)+5ØØ:P
L(6)=PL(6)-1
191Ø IF GA(SM,SR)>64 AND GA(SM,S
R)<81 THEN 192Ø ELSE 195Ø
192Ø FOR A=1 TO 5
193Ø IF IS(A,Ø)=GA(SM,SR) THEN I
S(A,1)=Ø
194Ø NEXT A
195Ø IF GA(SM,SR)=82 THEN PRINT@
367,"reliant destroyed";:GOSUB 4
68Ø:ME=2:GOTO 482Ø
196Ø GA(SM,SR)=Ø
197Ø NEXT SR
198Ø NEXT SM
199Ø GOSUB 468Ø
200Ø RETURN

```

```

201Ø IF GA(T1,T2)=177 OR GA(T1,T
2)=129 THEN 2Ø2Ø ELSE 215Ø
2Ø2Ø GA(Ø,4)=GA(Ø,4)-1:PLAY S2$
2Ø3Ø IF GA(T1,T2)=177 THEN GA(Ø,
5)=GA(Ø,5)+1ØØ ELSE GA(Ø,5)=GA(Ø
,5)-5ØØ
2Ø4Ø R=RND(1Ø):IF R<=4 THEN 2Ø5Ø
ELSE 211Ø
2Ø5Ø PRINT@271,"PHASER HIT ON"
2Ø6Ø PRINT@3Ø3,"RELIANT, SIR!"
2Ø7Ø PLAY S1$
2Ø8Ø IF SH$="U" THEN IS(Ø,1)=IS(
Ø,1)-45Ø ELSE IS(Ø,1)=IS(Ø,1)-35
Ø
2Ø9Ø PRINT@466,STRING$(5,191);:P
RINT@466,IS(Ø,1);
210Ø IF IS(Ø,1)<=Ø THEN PRINT@36
7,"RELIANT DESTROYED";:GOSUB 468
Ø:ME=3:GOTO 482Ø
211Ø IF GA(T1,T2)=177 THEN PL(3)
=PL(3)-1 ELSE PL(5)=PL(5)-1
212Ø GA(T1,T2)=Ø
213Ø PRINT@335,"planet destroyed
!";:GOSUB 468Ø
214Ø RETURN
215Ø IF GA(T1,T2)=191 THEN 216Ø
ELSE 23ØØ
216Ø GA(Ø,4)=GA(Ø,4)-1:PLAY S2$
217Ø FLAG=1:BS=BS-5ØØ
218Ø GA(Ø,5)=GA(Ø,5)+5Ø
219Ø R=RND(1Ø):IF R<=4 THEN 22ØØ
ELSE 226Ø
22ØØ PRINT@271,"TORPEDO HIT ON"
221Ø PRINT@3Ø3,"RELIANT, SIR!"
222Ø PLAY S2$

```

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```

223# IF SH$="U" THEN IS(Ø,1)=IS(
Ø,1)-25Ø ELSE IS(Ø,1)=IS(Ø,1)-5Ø
Ø
224# PRINT@466,STRING$(5,191);:P
RINT@466,IS(Ø,1);
225# IF IS(Ø,1)<=Ø THEN PRINT@33
5,"RELIANT DESTROYED";:GOSUB 468
Ø:ME=3:GOTO 482Ø
226# IF BS<=Ø THEN PRINT@335,"ba
se destroyed":PL(4)=PL(4)-1:GA(T
1,T2)=Ø:GA(Ø,5)=GA(Ø,5)+4ØØ
227# IF BS>1 THEN PRINT@335,"BAS
E @"BS
228# IF BS>1 THEN PRINT@367,"ENE
RGY UNITS."
229# GOSUB 468Ø:RETURN
230# IF GA(T1,T2)>64 AND GA(T1,T
2)<69 THEN 231Ø ELSE 242Ø
231# PLAY S2$
232# IF GA(T1,T2)=67 THEN K1=3
233# IF GA(T1,T2)=65 THEN K1=4
234# IF GA(T1,T2)=68 THEN K1=5
235# IS(K1,1)=IS(K1,1)-5ØØ
236# IF IS(K1,1)<=Ø THEN 237Ø EL
SE 239Ø
237# PRINT@271,CHR$(GA(T1,T2));"
destroyed!":GA(T1,T2)=Ø:GA(Ø,5)
=GA(Ø,5)+4ØØ
238# PL(6)=PL(6)-1:GA(Ø,4)=GA(Ø,
4)-1:GOSUB 468Ø:RETURN
239# PRINT@271,CHR$(GA(T1,T2));"
@"T1;T2
240# PRINT@3Ø3,"STRENGTH"IS(K1,1
)

```

```

241# GA(Ø,5)=GA(Ø,5)+5Ø:GA(Ø,4)=
GA(Ø,4)-1:GOSUB 468Ø:RETURN
242# IF GA(T1,T2)=8Ø OR GA(T1,T2
)=78 THEN PRINT@271,"ATTEMPTING
TO HIT";:PRINT@3Ø3,"FRIENDLY SHI
P!":PRINT@335,"torpedo strike":P
RINT@367,"aborted!":GOSUB 468Ø:R
ETURN
243# IF GA(T1,T2)=255 OR GA(T1,T
2)=241 THEN PRINT@271,"ATTEMPTIN
G TO HIT";:PRINT@3Ø3,"FRIENDLY P
LANET!":PRINT@335,"torpedo strik
e":PRINT@367,"aborted!":GOSUB 46
8Ø:RETURN
244# IF GA(T1,T2)=82 THEN PRINT@
271,"ATTEMPTING TO HIT";:PRINT@3
Ø3,"YOUR OWN POSITION";
245# PRINT@335,"torpedo strike":
PRINT@367,"aborted!"
246# GOSUB 468Ø:RETURN
247# REM phasers
248# PRINT@49,"PHASERS"
249# GOSUB 464Ø
250# IF GA(Ø,2)-GA(Ø,3)<=Ø THEN
PRINT@143,"NOT ENOUGH ENERGY";:P
RINT@175,"LEFT, SIR!":GOSUB 468Ø
:RETURN
251# PRINT@143,"PHASERS"
252# GOSUB 465Ø
253# IF T1<1 OR T1>44 OR T2<1 OR
T2>44 THEN PRINT@271,"OUT OF GA
LAXY":GOSUB 468Ø:RETURN
254# IF IS(Ø,2)-T1>5 OR IS(Ø,2)-
T1<-5 OR IS(Ø,3)-T2>5 OR IS(Ø,3)

```

```

-T2<-5 THEN PRINT@271,"OUT OF RA
NGE":GOSUB 468Ø:RETURN
255# IF GA(T1,T2)=Ø THEN PRINT@2
71,"NO TARGET":PRINT@3Ø3,"@";T1;
T2:GOSUB 468Ø:RETURN
256# IF GA(T1,T2)=193 THEN PLAY
S1$:PRINT@271,"STAR UNAFFECTED":
PRINT@3Ø3,"BY PHASER BLAST!":GA(
Ø,2)=GA(Ø,2)-GA(Ø,3):GOSUB 468Ø:
RETURN
257# IF GA(T1,T2)=129 OR GA(T1,T
2)=241 OR GA(T1,T2)=255 THEN PLA
Y S1$:PRINT@271,"PHASER ENERGY":
PRINT@3Ø3,"NEUTRALIZED BY":PRINT
@335,"FRIENDLY PLANET.":GA(Ø,2)=
GA(Ø,2)-GA(Ø,3):GOSUB 468Ø:RETUR
N
258# IF GA(T1,T2)=8Ø OR GA(T1,T2
)=78 THEN PLAY S1$:PRINT@271,"PH
ASER ENERGY":PRINT@3Ø3,"NEUTRALI
ZED BY":PRINT@335,"FRIENDLY SHIP
.":GA(Ø,2)=GA(Ø,2)-GA(Ø,3):GOSUB
468Ø:RETURN
259# IF GA(T1,T2)=82 THEN PRINT@
271,"ATTEMPTING TO HIT";:PRINT@3
Ø3,"YOUR OWN POSITION";:PRINT@33
5,"phaser strike":PRINT@367,"abo
rted!":GOSUB 468Ø:RETURN
260# IF GA(T1,T2)=177 THEN 261Ø
ELSE 272Ø
261# GA(Ø,2)=GA(Ø,2)-GA(Ø,3):PLA
Y S1$
262# GA(Ø,5)=GA(Ø,5)+1ØØ
263# R=RND(1Ø):IF R<=4 THEN 264Ø
ELSE 269Ø

```

Continued on p. 68

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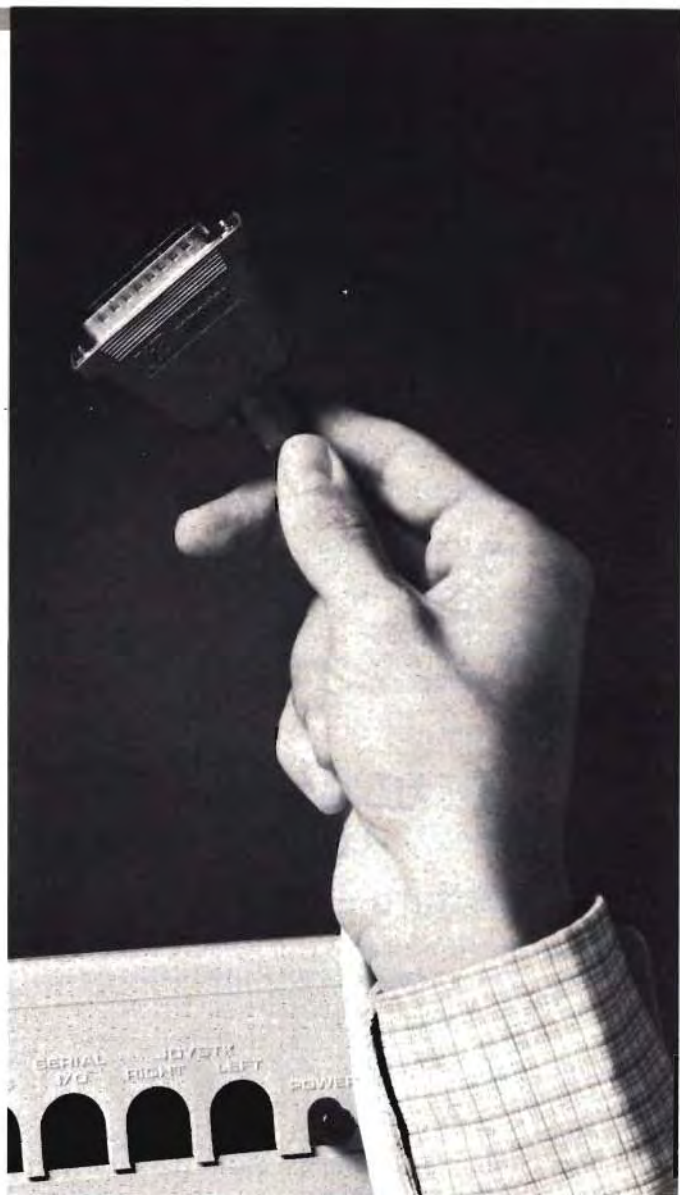
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by Fred Blechman

Making the Connection



Have you ever tried to connect anything but a Tandy Corp. printer to your CoCo? If so, you may have run into difficulties. But there are ways around many of the interfacing woes you might encounter with a non-Tandy printer. This article tells you how to connect and operate almost any printer with your CoCo.

The truth is that it's not possible to promise successful interfacing with every brand of printer, because, among peripherals, the printer might well be the least standardized in its connections and operations. Furthermore, the various mysteries often associated with printer interfacing are compounded by the design of the Color Computer, which has a nonstandard serial port and no parallel port. Nevertheless, the technical explanations that follow describe both serial and parallel printer operation and should offer insight into your interfacing problems. More details can be found in books devoted to these subjects.

Serial Transmission

The flow of serial data between a computer and printer takes place on only two wires. A series of pulses are sent one at a time in a defined sequence at a specific rate. Figure 1 shows the serial pulses that in this case define the letter Z.

Eight or more *bits* (a term that came from the words *binary digits*) are usually necessary for defining a character in serial transmission. A *start bit* defines the beginning of a character transmission, followed by the *data bits*, of which there are usually seven or eight, and 1 or 2 *stop bits*. In some configurations, a *parity bit* is included as a simple

method of error checking. Together, these different kinds of bits are called the *word format*. For the CoCo, the 10-bit format is 1 start bit, 7 data bits, 2 stop bits, and no parity bit.

In order for serial transmission to work, all the pulses must be sent by the computer and received by the printer at the same speed, called the *baud rate*. The term baud rate actually means bits per second. For the CoCo, the normal or default baud rate is 600 baud (although that can be changed). Because there are 10 bits in the CoCo's character format, the transmission rate is 60 characters per second.

Data bits are usually transmitted in a standardized code called ASCII, an acronym that stands for American Standard Code for Information Interchange. In Fig. 1, the 7 data bits from left to right are 1, 0, 1, 1, 0, 1, and 0. In binary code, 1011010 is decimal 90, which represents capital Z in ASCII.

There is another thing to consider for serial transmission: Printers are notoriously slow in comparison with computers, so there must be

**Face it, connecting the CoCo to a third-party printer can be a chore.
Read on to learn a few tricks of the trade.**

a way to turn off the flow of data from a computer when the printer can't keep up. Some printers are equipped with a 2K memory buffer or more, but even this is not always enough. The solution is *handshaking*. This is merely a voltage carried from the printer on a third wire that indicates to the computer that the printer is ready to receive. Without this go-ahead, the CoCo cannot transmit bits from the serial port.

The computer and printer must be configured for the same baud rate, word format, physical pin connections, and voltages. The computer industry often refers to these as RS-232C, a 25-wire standard for serial transmission that was originally conceived for modem communication. The problem, as mentioned above, is that many computer and printer manufacturers, Tandy included, deviate widely from the RS-232C standard.

The CoCo Serial Interface

You don't have to know all the details because the CoCo and printer do all the coding, transmission, reception, and decoding. However, you do need to make the physical connections between the computer and printer and check to be sure they respond to each other properly. The CoCo is equipped with a four-pin serial I/O (input/output) socket. Although this socket can also be used to interface with modems or other serial devices, the focus here is on printers. The unique aspect of the CoCo's four-pin DIN socket is that it is entirely unconventional for an RS-232C interface connector. Most computers use a 25-pin DB-25 connector for serial interfacing.

Figure 2 shows the CoCo's four-pin serial socket, indicating the function of each pin. Pin 1, carrier detect, is used for modems and not for printers. Pin 2, receive data, is the handshaking pin. There must be +3 volts or more on this pin to allow serial transmission. Pin 3 is the ground. Pin 4 is the transmit-data pin.

Connecting the CoCo to most Tandy printers is easy because they also have the four-pin DIN socket. Radio Shack stores sell an inexpensive cable (catalog no. 26-3020) that plugs easily into both computer and printer. Beyond that, the only concerns are checking to be sure that the baud rate of the printer is set at 600 baud and the word format is set to 7 data bits with 1 start bit and 2 stop bits (if this is adjustable). The printer will supply the necessary handshaking voltage.

The CoCo's baud rate is easy to change with POKE statements from the keyboard or from a Basic program. Table 1 shows the POKES for setting the CoCo's baud rates. Don't imagine that a faster baud rate will increase printer output proportionally. Interrupt signals, carriage returns, and line feeds all slow down the printer. I found that when I could adjust the printer baud rate, 1,200 baud gave me the fastest "throughput" with the printers I tested.

A Quick Test

To test things out, use the short



The Model 770 Serial-to-Parallel Converter from Tigertronics

program that follows. Change PRINT# - 2 to LPRINT for the MC-10.

```

10 PRINT"TESTING "; X
20 PRINT# - 2, "TESTING"
30 X = X + 1
40 GOTO 10

```

When you run this program, you'll see "TESTING 0" displayed on

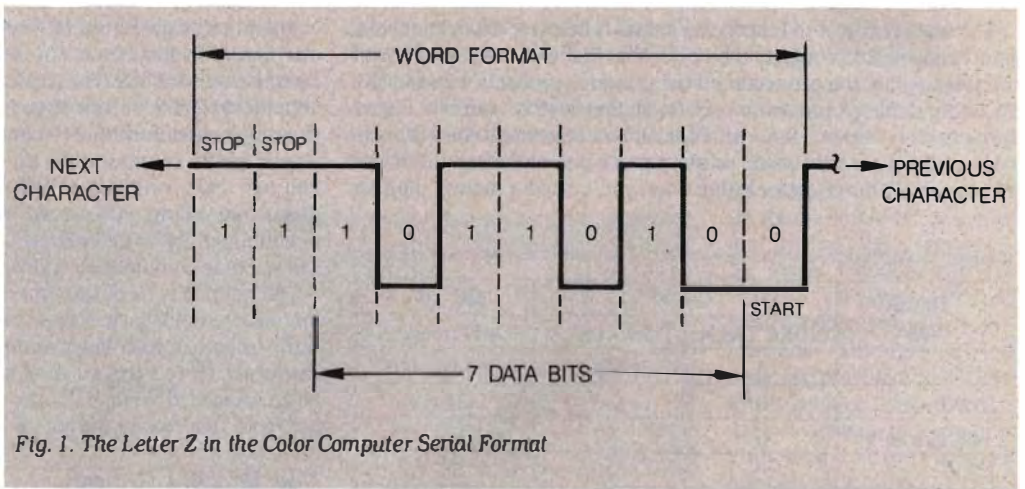


Fig. 1. The Letter Z in the Color Computer Serial Format

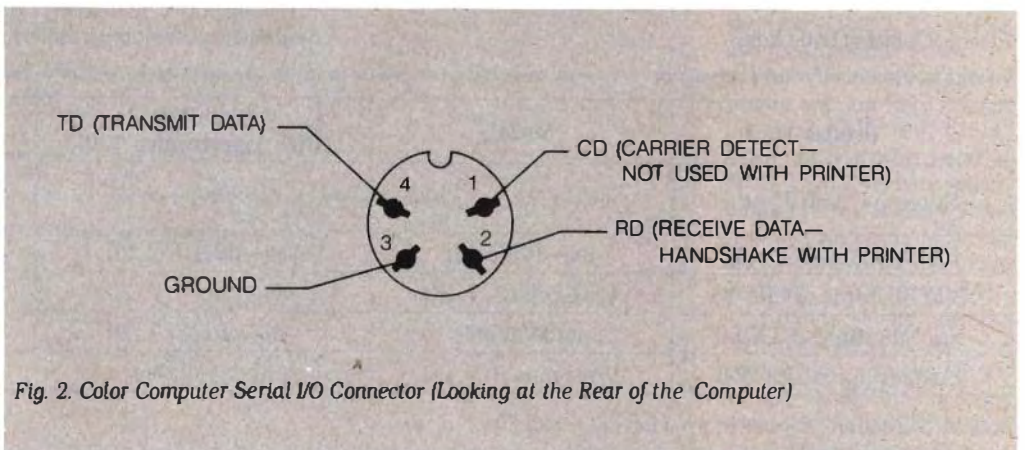


Fig. 2. Color Computer Serial I/O Connector (Looking at the Rear of the Computer)

the screen. If the printer is not providing the proper handshake, nothing else happens. If all is working correctly, the printer will print "TESTING" and the screen will continue showing the word with an ascending count.

Make sure that your printer is set to the proper interface mode. Most printers that have both serial and parallel interfaces use a switch to select one or the other. The Color Computer automatically issues a line feed with a carriage return. Check to be sure that your printer is set correctly for line feed. Switches for this are usually marked Auto LF, CR/LF, LF, or NL (new line).

If the characters printed by your printer in the quick test are incorrect, check the baud rate and word format. Sometimes the printer will work better (especially with graphics) if it is set to 8 data bits, 1 stop bit, and no parity. If the printer does not operate at all, check to see that the power is on, paper is loaded, and any switch that controls "on line" is on. If all else fails, make sure the positive voltage of the printer-ready handshake is getting back to pin 2 on the computer. Pins 3 and 4 must be connected to their corresponding numbers on the printer. Unless the cable is defective, if all these items check out, the computer and printer should be properly connected.

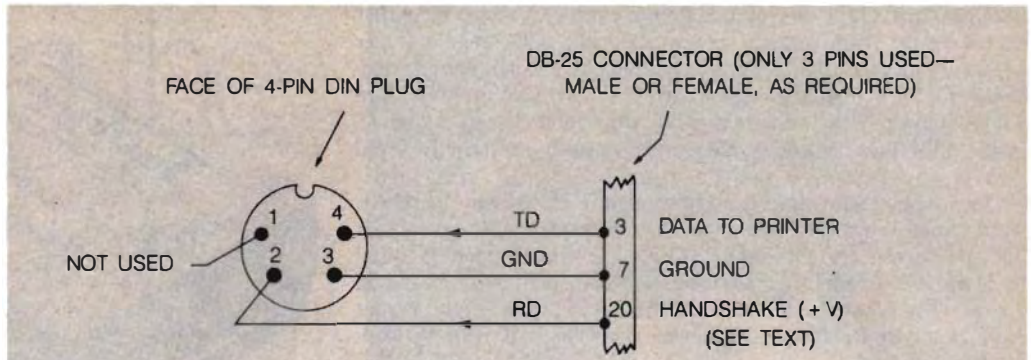


Fig. 3. Serial Printer Adapter Cable

Calling Up the Standard

The real challenge to interfacing comes when you try to connect a non-Tandy serial printer to the CoCo. The first thing that grabs your attention is that the connector on the printer is probably a 25-pin DB-25, so the cable you got from your Radio Shack store won't fit. Figure 3 shows the solution. You can either buy a separate 4-pin DIN connector and three-wire cable or simply cut one end from the Radio Shack serial printer cable. Either way, you'll need a mating plug for

the printer. Because most serial printers use a female DB-25 socket, you'll probably need a DB-25 male plug for your cable.

Wire the adapter cable as shown in Fig. 3. Pin 3 of the DB-25 connector is the data-input line and pin 7 is the ground on most printers. Pin 20 is usually (but not always) the handshaking line. If this doesn't work with your printer, use a voltmeter to find a positive voltage (no more than +12 volts with respect to ground) that is active when the printer is ready. Then connect this pin instead of pin 20 to pin 2 on the CoCo's serial I/O port. Use the listing and testing procedure above to check printer operation.

The Smart Cable

The Smart Cable from IQ Technologies (Model 817) allows you to interface with just about any serial printer. The universal RS-232C interface sells for \$89.95 and plugs into the CoCo's serial port with an adapter cable like the one shown in Fig. 3. The Smart Cable is a hardware logic module with a 6-foot ribbon cable that has both male and female DB-25 connectors on the end that attaches to your printer. It has two slide switches and five LEDs (light-emitting diodes): two green, two yellow, and one red. With the printer on and the computer directing output to the printer, you move the switches and watch the LEDs. Some combination will work.

The main benefit of the Smart Cable is derived when you need to interface various devices to a computer's serial output and you don't want to bother with determining the wiring for custom cables. Because only three wires are used with the CoCo, the Smart Cable might be an unneeded luxury. But it's nice to know that there is something out there that can do the job for you.

The Parallel Course

The majority of non-Tandy printers use another standard called the Centronics-compatible parallel interface. With this form of data trans-

Baud Rate	CoCo		MC-10
	POKE 149.X	POKE 150.X	POKE 16932.X
110	1	246	not available
300	0	180	244
600 (default)	0	87	118
1,200	0	40	56
2,400	0	18	26 or 27

Table 1. Changing Baud Rates

Printer	Serial	Parallel (with Tigertronics 770)	Remarks
Super 5 CP-80 Type 1	yes—pins 3, 7, 20	no	no voltage on pin 18. serial interface optional.
Radio Shack CGP-115	yes—R/S cable	yes—pins 3, 7, 20	600 baud only
Star Micronics Delta-10	yes—pins 3, 7, 20	yes—pins 3, 7, 20	best speed at 1,200 baud.
Star Micronics STX-80	not available	yes—pins 3, 7, 20	best speed at 1,200 baud.
Scope Data Series 200	yes—pins 3, 7, 20	not available	best speed at 1,200 baud.

Table 2. Test Results from Interfacing the CoCo with Five Printers



The CP-80 Dot-Matrix Printer Shown with Separate Interface Available from Everett Charles Marketing Services



The Star Micronics STX-80 Thermal Printer

mission, 8 data bits are sent simultaneously over eight wires and control functions are sent over additional wires. See Fig. 4 for a diagram of parallel data transmission. Many Tandy printers have parallel interfaces in addition to their serial ports.

Because most new printer manufacturing (except that for Apple computers) is moving toward parallel operation, it makes sense to be able to connect your CoCo to a parallel printer. This requires a special hardware device called a *serial-to-parallel interface*, which decodes the computer's serial data and transmits it in parallel form to the printer. The output attachment of the device is a Centronics-compatible connector that plugs into any parallel printer port.

If you are in the market for a serial-to-parallel converter, try to select one that has the CoCo's unconventional four-pin DIN plug for its input connector. Otherwise, you will need the adapter described above. And be sure that if the interface is adjustable, you have it set to the baud rate and word format used by your computer. Several companies manufacture serial-to-parallel interfaces; look for their advertisements in *HOT CoCo*.

Some serial-to-parallel interfaces use external power and some depend on the +5 volts of power emanating from the printer at pin 18 of the parallel connector. Because some Epson and Mannesmann-Tally printers, among others, do not output this voltage, you might need an external power source. Connections for this purpose are usually supplied with the interface or available as an option.

Testing in the Real World

I tested five different printers with the CoCo, in most cases using serial and parallel interfacing. For serial interfaces I used either the regular Radio Shack cable or the adapter cable shown in Fig. 3. For parallel interfacing I used a Model 770 Serial to Parallel Converter by Tigertronics, which sells for \$99.95 including parallel cable.

The Model 770 does not have the CoCo's four-pin DIN input plug; it uses a standard DB-25 female socket for signal input. I used the adapter cable. Although the Model 770 is more expensive than some other brands, it can be set to any standard baud rate and word format.

As a result, it is more universal than a converter designed just for the CoCo. However, the Model 770 does not provide the +5 volts of external power necessary with some printers. Although instructions are provided for adding this capability, I did not make the conversion, so I was unable to drive one printer through its parallel interface.

The results of the tests are shown in Table 2. Comments about each printer follow.

The CP-80 dot-matrix printer appears to be a Mannesmann-Tally Spirit marketed under another name at \$250. The CP-80 uses square pins and a mylar-film ribbon. It is not generally found in stores or magazine ads but is available directly from Everett Charles Marketing Services Inc. The CP-80 does not provide the +5 volts on pin 18 of its parallel interface, but it worked fine with the optional \$70 serial interface.

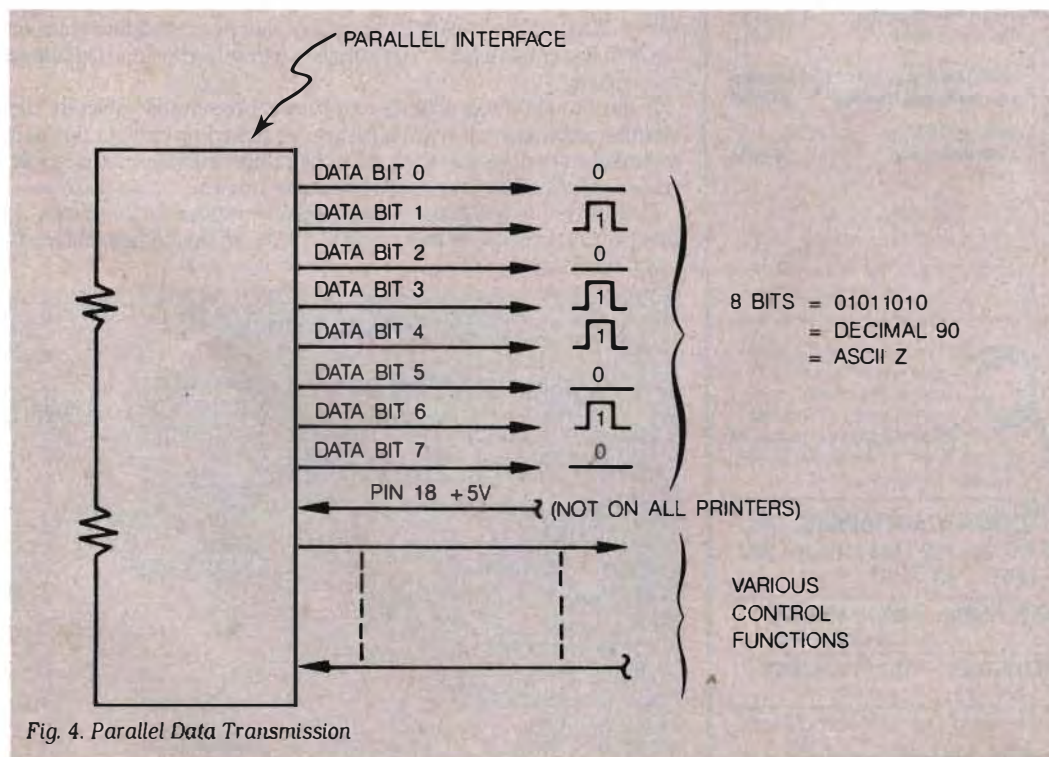


Fig. 4. Parallel Data Transmission

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The Tandy CGP-115 (catalog no. 26-1192) four-color graphics printer/plotter produces 40 or 80 columns of print or graphics and comes with both a four-pin DIN serial port and Centronics-compatible interface built in. The printer/plotter was listed at \$199 in catalog no. RSC-12 but was recently discounted and sold out for \$89.95.

The Star Micronics Star Delta-10 comes with both a DB-25 serial interface and a Centronics parallel port. It was introduced several years ago and has since been replaced by the SD-10 printer, which sells for \$449. The company also makes the Gemini-10X and the SG-10, the latter of which is currently listed at \$299. The STX-80 is a thermal dot-matrix printer that is small and simple with few features. It comes with a parallel interface only and sells for \$199. All these Star Micronics printers offer a parallel interface with the proper voltage at pin 18.

The Scope Data Series 200 electrostatic printer was available with a DB-25 serial interface only. This "dinosaur" industrial printer of the 1970s is a representative of the days when serial transmission was the most common means of interfacing. Before it went out of business, Scope Data was a subsidiary of Scope Inc. of Reston, VA.

Recommendations

If you are not handy with a soldering iron and a voltmeter, you are better off with a Tandy printer and the Radio Shack four-pin DIN serial cable than third-party printers. The next best thing is a serial-to-parallel interface converter made to work with the CoCo and a parallel printer.

The biggest challenge comes when you try to interface with serial printers that don't use the four-pin DIN connector. This could be a problem, but the adapter cable from Fig. 3 is a simple solution in most cases. The areas that can cause difficulty are the variability of printer protocols (including switch settings for baud rate, word format, and line feeds) and unconventional handshaking arrangements.

When you have looked at interfacing from all sides, the controlling factor should be the features you require of your printer. The newer dot-matrix printers available from third-party manufacturers might offer particular features and a level of readability that you can't find in combination or at the same price in your Radio Shack store. These are most likely to have parallel interfaces. Many third-party daisy-wheel printers come with only RS-232C serial interfaces, although this is changing. You might have another computer in addition to your CoCo that requires a particular interface. These are the kinds of things to consider.

If you can get away with it, your Tandy printer and cable are the simplest alternative. If not, I hope you've picked up enough tips and instructions here to help you set up the printer interface you need. ■

Fred Blechman has been writing magazine articles for 25 years. Address correspondence to him c/o HOT CoCo, 80 Pine Street, Peterborough, NH 03458.

List of Manufacturers

Everett Charles Marketing Services
6101 Cherry Ave.
Fontana, CA 92335
714-899-2411

Tandy Corp.
1400 One Tandy Center
Fort Worth, TX 76102

IQ Technologies
11811 N.E. First St.
Bellevue, WA 98005
206-451-0232

Tigertronics
2734-C Johnson Drive
Ventura, CA 93006
805-658-7466

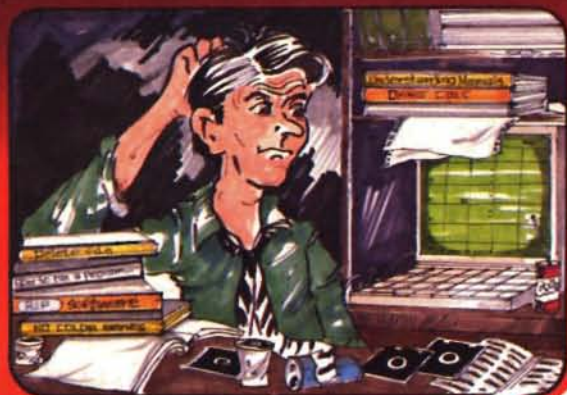
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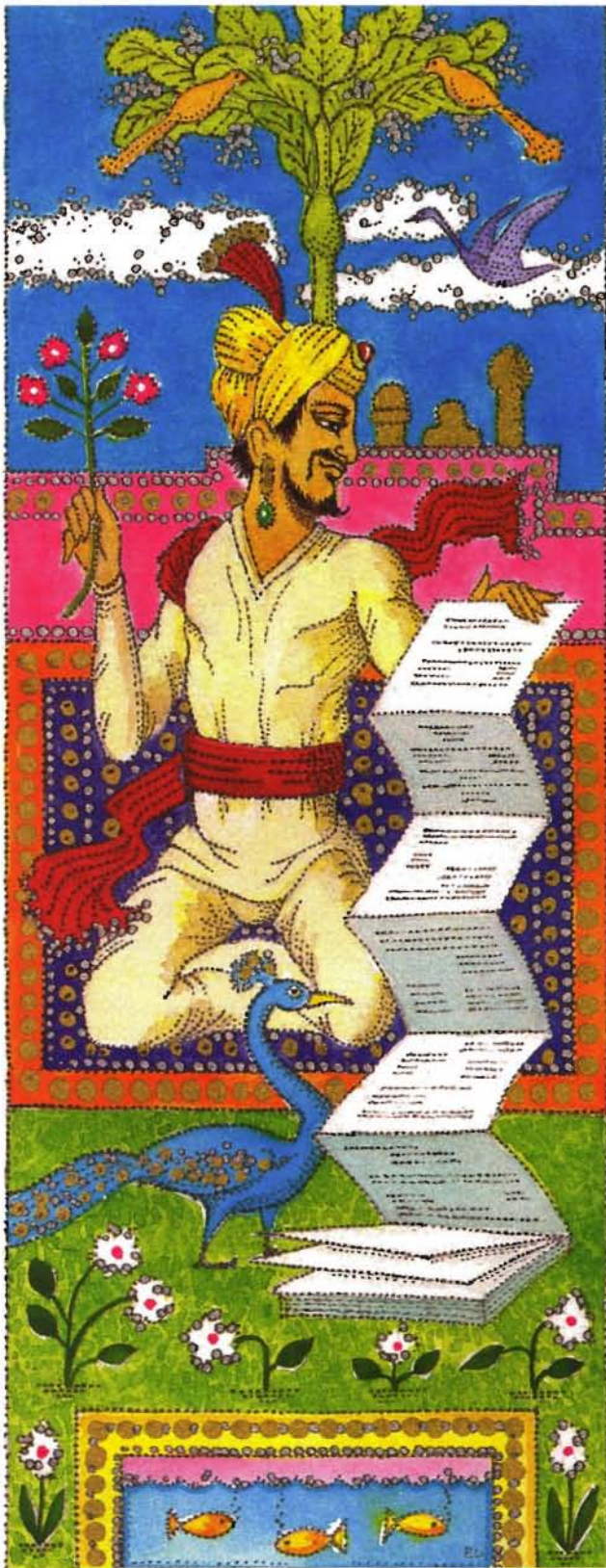


Illustration by Parker Leighton

Swami Says

Make sense out of numerical data using regression analysis.

The Great CoCo Swami tells you how.

The Great CoCo Swami can solve many of your problems. He studies the facts that you give him, and then he answers your question. By plugging the various factors into an equation, Swami can come up with a probable solution.

In truth, Swami doesn't really answer questions very well. His real forte is in analyzing numbers and making predictions based on numerical relationships. He uses a technique called regression analysis.

Swami loves to take data (facts such as: a 2-inch beam supports 2,828 pounds, a 3-inch beam supports 5,196 pounds, a 4-inch beam supports 8,000 pounds, and a 5-inch beam supports 11,000 pounds) and determine how the data sets (beam size and load rating) relate to each other. Once the relationship is established, Swami can predict the relationship of additional data sets—in this case, the load rating of other beam sizes.

Swami will give you the equation that describes the data's relationship, the constants that make the equation work, and a graphic plot of the curve the equation describes. And, if you ask politely, Swami will print out your input data and a copy of the regression-curve data. Swami will also work with a screen-dump program to produce a print-out of the data and curve graphic plot.

Program Organization

Swami is not one, but two programs. I wrote Swami for a 16K Extended Basic CoCo, and he uses almost all the memory. In fact, as one



program. Swami would require a 32K computer. Program Listing 1 is Swami Load. It sets up a machine-language text routine that Swami's graphic-plot section uses. This routine is actually a modified version of "Unforgettable Characters," by William Barden, Jr., published in the November and December 1983 issues of *The Color Computer Magazine*. Swami Load automatically loads Swami (Program Listing 2) if you follow the directions as they appear on the screen.

Swami performs the analyses and all input/output functions, except for the graphics-screen printouts. The program generates a graphics screen that is stored in memory so that you can use any one of several screen-dump programs to send it to the printer. To merge a screen-dump program with Swami, edit line 5120. If, for example, you have the Gemprint program for a Gemini printer, type:

```
5120 CLEAR 200,15439:CLOADM
      "GEMPRINT":EXEC 15440:STOP
```

Change the line to accommodate your particular screen-dump program. Table 1 provides a line-by-line description of Swami.

Hardcopy, Program Listing 3, is a screen-dump program I developed for use with a DMP-120 printer. Swami, as it appears here, automatically loads Hardcopy when needed (line 5120). Swami stores the graphics screen in addresses 1536-7679. You can load another program to dump the screen as long as it does not override Extended Basic's default to PCLEAR 4.

Using Swami

The first task at hand is entering data (lines 1000-1080). Swami can accommodate up to 60 sets of X,Y data points. All zero values are set to .000000000001 to prevent FC errors, which will result from division and exponentiation operations involving zero. Next, Swami asks you to title the graph. You can use up to 40 characters in upper- or lowercase. Lines 1200-1310 and the subroutine at line 5300 then print out your input data, if you desire.

Before Swami can go to work, you must tell him what to do. There are four different types of curves that can describe the relationships of your data sets: linear, exponential, logarithmic, and power. Swami asks you to select one of these curves.

You will want to try all four curves, so enter any one. Swami then displays the equation for the curve you choose, the curve's constants (A and B), the number of data sets you entered (n), the maximum values of X and Y, and the correlation factor (r) for the analysis.

The correlation factor is the most important information at this point, because it describes how well the data sets fit the curve you chose. A correlation factor of 1.0 is a perfect match with the equation. A -1.0 factor is a perfect inverse match. The closer the correlation factor is to zero, the worse the match. Therefore, you must try all four curves to find the one with the best correlation factor.

You can do as many analyses as you wish. Enter N when you are through, and then enter a value for X. Swami gives you the corresponding value for Y, making his predictions based on the information you have given him. The purpose of this step is to determine the largest values of X and Y that will be plotted on the graph.

Swami next plots a graph that includes the input data sets and the best-fit curve you selected. Since Swami's memory is limited, you must give him information about how you want to plot the graph. First, you enter the number of divisions you want on each axis. Second, enter the end-of-scale value for each axis. Both scales always start at zero. Next, Swami asks you to name the horizontal and vertical axes.

Finally, you must tell Swami where to place the data, since the

program could otherwise write over parts of the graph. You have four choices—one for each corner of the graph. Swami has completed his job.

Sample Run

- Load and run Swami Load.
- Follow the screen instructions and Swami will load automatically. Once loaded, run Swami.

- Enter the data:
 - 2, 2828 (press enter)
 - 3, 5196 (press enter)
 - 4, 8000 (press enter)
 - 5, 11000 (press enter)

0, 0 (press enter; zero indicates end of data entry)

- Press P to get a copy of the input data. (See top of Fig. 1.)

- Press a number, 1 to 4, to select a regression analysis. For example, try 1 for linear regression. Swami will display the general equation for a straight line, the constants (A and B), the number of data points (n), X's maximum value and Y's associated value, and most importantly, the regression coefficient (r). Note that r equals .998626—almost 1.0. It looks like you indeed have a linear curve.

Just for fun, look at the other curves, too. Press Y and enter 2 for an exponential curve. Now r equals .989717—not quite as close as a linear curve. Press Y and 3 for a logarithmic curve. This sets r equal to .98257—still further away. Finally, press Y and 4 for a power curve. The result is that r equals .99995—closer to the 1.0 than the linear curve. You now see that the input data was set up on a power curve.

But go back to the linear curve for now. Press Y and enter 1. Since you don't want to try another regression, press N. Enter 15 (X's maximum value) to find the strength of a 15-inch beam. Swami gives 38,174 as Y's value. Now go back to the power curve and enter 15 for X's maximum value. This time, Swami gives a result of 56,634—a big difference from the prediction made under linear regression.

The point is that you must check all four regressions and use the one with the r value closest to 1.0. If there is a lot of "scatter" in your input data, r's range could be from .6 to .8, or any other range for that matter. Remember, the further away the r value is from 1.0, the less accurate the prediction.

- Press Q when you are ready to create a graph of the results.

- Enter the number of scale divisions you want on each axis of the graph. Since X's maximum value is 15, use five divisions on the X axis. Since Y's maximum value is 56,634, use 60,000 for the full scale and six divisions on the Y axis.

- Enter the full-scale values: 15 for the X axis and 60,000 for the Y axis.

- Identify the units on the X axis—"Thickness in Inches" in this case.

- Identify the units on the Y axis—"Strength in Lbs" in this case. Note the length limitations, which keep everything on the screen.

- Locate the equation and constants on the graph. They take up an area approximately one-third the height and one-half the graph's width. You must therefore locate them so they do not overwrite the curve—in this case to the top left corner. Press the 1 and enter key combination twice.

- You are now at the output screen. Press 1 to admire your handiwork on the screen. If you see something you don't like—a spelling error on

System Requirements

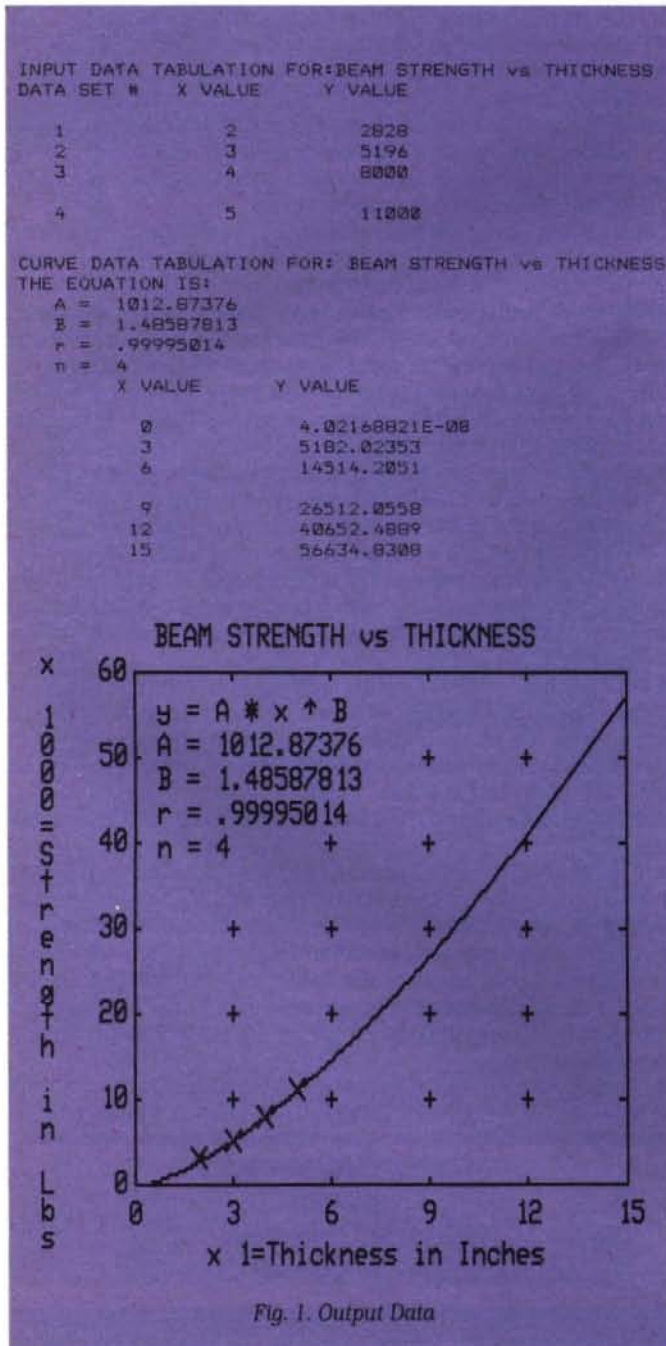
16K RAM
Extended Color Basic
Printer Optional

a label for instance—press 2. This returns you to the regression-analysis portion of the program so that you can repeat the graph with the input data already stored in memory. Pressing 3 gives you a printout of the equation, its constants, and X and Y data points for the curve. (See the middle of Fig. 1.) With this information you can plot the curve by hand.

The last step is to press 4, which accesses Hardcopy (or your own screen-dump routine). Press enter to proceed with Hardcopy. If you pressed 4 by mistake, press the clear key to return to the output screen. Once Swami starts the automatic loading of Hardcopy, he erases all memory except for the graphics screen, which is protected by Extended Basic's default to PCLEAR 4. It is important that any screen-dump program you use contains a PCLEAR 4.

Run Hardcopy once it is loaded and sit back and watch your printer. It should take about seven minutes to get a graph like the one at the bottom of Fig. 1.

If you have any problems or questions, I'll be glad to help you. ■



Address correspondence to Milton Simpson, 831 Hillcrest Drive, Martinsburg, WV 25401. Include a self-addressed, stamped envelope for a reply.

Program Listing 1. Swami Load

```
10 'SWAMILD**MACHINE CODE LOADER
   FOR SWAMISEZ (REGRESSION ANALYSIS
   AND GRAPHING PROGRAM)**
20 CLS:PRINT@128," SETTING-UP T
EXT M/L ROUTINE"
```

Lines	Description
1000-1080	Data-entry routine
1200-1310	Print out data
and 5300	
2000-2180	Loop that allows repetition of the various regression-analysis computations
2190-2280	Linear-regression computation
2290-2380	Exponential-regression computation
2390-2470	Logarithmic-regression computation
2480-2560	Power-regression computation
2570	Compute constants for all regressions
2620-2650	Compute value of Y for a given X for various regressions
2660	Compare present value to stored maximum value and save the larger of the two
3000-3040	Input for number of divisions on each axis and end-of-scale values for each axis
3050	Outline graph
3070	Draw tic marks on top and bottom
3090-3100	Draw crosses at horizontal and vertical division intersections
3130	Draw tic marks on sides
3150	Direct selected curve plotting
3160-3240	Plot linear-regression curve
3250-3340	Plot exponential-regression curve
3350-330	Plot logarithmic-regression curve
3440-3550	Plot power-regression curve
3560-3610	Draw an X at each input data point
4000-4070	Locate title above graph's center
4080-4170	Select scales and multipliers for both axes
4190-4210	Calculate number of scale increments to be labeled on the horizontal axis
4230	Compute value of each label
4250	Limit length of each label to three digits
4260	Compute position of label's first character
4320	Place label information on screen
4340	Position next character of label
4360-4510	Handle vertical axis labels in same way that lines 4190-4350 handled the horizontal axis
4530	Ask for horizontal axis name
4550	Add axis name to scale multiplier
4560-4620	Place axis information on the screen at the graph's bottom
4630	Ask for vertical axis name
4630-4720	Do the same for vertical axis as lines 4530-4620 did for the horizontal axis
4740-4970	Complete plotting of the graph
5000-5330	Perform output operations
6000	Translate ASCII character code to an index number
6070	Use index number to retrieve character data from memory and place it at the screen location calculated in lines 4020-4030

Table 1. Swami Line Description


```

30 CLEAR10,&H3C9F
40 FORI=&H3CA0 TO &H3F6F:READA:P
OKEI,A:NEXT
50 DATA0,0,0,0,0,0,0,0
60 DATA31,31,31,31,31,31,31,31
70 DATA0,4,8,31,8,4,0,0
80 DATA0,4,2,31,2,4,0,0
90 DATA0,4,4,21,14,4,0,0
100 DATA4,4,4,4,4,0,4,0
110 DATA17,17,17,0,0,0,0,0
120 DATA10,10,31,10,31,10,10,0
130 DATA4,15,20,14,5,30,4,0
140 DATA12,13,2,4,8,19,3,0
150 DATA8,20,20,8,21,18,13,0
160 DATA12,12,8,16,0,0,0,0
170 DATA2,4,8,2,8,4,2,0
180 DATA8,4,2,2,2,4,8,0
190 DATA4,21,14,31,14,21,4,0
200 DATA0,4,4,31,4,4,0,0
210 DATA0,0,0,0,12,12,8,16
220 DATA0,0,0,31,0,0,0,0
230 DATA0,0,0,0,12,12,0,0
240 DATA0,1,2,4,8,16,0,0
250 DATA14,17,19,21,25,17,14,0
260 DATA2,6,2,2,2,2,7,0
270 DATA14,17,1,14,16,16,31,0
280 DATA14,17,1,6,1,17,14,0
290 DATA2,6,10,18,31,2,2,0
300 DATA31,16,30,1,1,17,14,0
310 DATA6,8,16,30,17,17,14,0
320 DATA31,1,2,4,8,16,16,0
330 DATA14,17,17,14,17,17,14,0
340 DATA14,17,17,15,1,2,12,0
350 DATA0,12,12,0,12,12,0,0
360 DATA0,12,12,0,12,12,8,16
370 DATA2,4,8,16,8,4,2,0
380 DATA0,0,31,0,31,0,0,0
390 DATA8,4,2,1,2,4,8,0
400 DATA14,17,1,2,4,0,4,0
410 DATA14,17,1,13,21,21,14,0
420 DATA4,10,17,17,31,17,17,0
430 DATA30,9,9,14,9,9,30,0
440 DATA14,17,16,16,16,17,14,0
450 DATA30,9,9,9,9,9,30,0
460 DATA31,16,16,30,16,16,31,0
470 DATA31,16,16,28,16,16,16,0
480 DATA15,16,16,19,17,17,15,0
490 DATA17,17,17,31,17,17,17,0
500 DATA14,4,4,4,4,4,14,0
510 DATA1,1,1,1,1,17,14,0
520 DATA17,18,20,24,20,18,17,0
530 DATA16,16,16,16,16,16,31,0
540 DATA17,27,21,21,17,17,17,0
550 DATA17,25,21,19,17,17,17,0
560 DATA14,17,17,17,17,17,14,0
570 DATA30,17,17,30,16,16,16,0
580 DATA14,17,17,17,21,18,13,0
590 DATA30,17,17,30,20,18,17,0
600 DATA14,17,16,14,1,17,14,0
610 DATA31,4,4,4,4,4,4,0
620 DATA17,17,17,17,17,17,14,0
630 DATA17,17,17,10,10,4,4,0
640 DATA17,17,17,17,21,27,17,0
650 DATA17,17,10,4,10,17,17,0
660 DATA17,17,10,4,4,4,4,0
670 DATA31,1,2,4,8,16,31,0
680 DATA4,14,21,4,4,0,0,0
690 DATA0,0,14,1,15,17,15,0
700 DATA16,16,22,25,17,25,22,0
710 DATA0,0,14,17,16,17,14,0
720 DATA1,1,13,19,17,19,13,0
730 DATA0,0,14,17,31,16,14,0
740 DATA2,5,4,14,4,4,4,0
750 DATA0,0,13,19,19,13,17,14
760 DATA16,16,22,25,17,17,17,0
770 DATA4,0,12,4,4,4,14,0
780 DATA0,1,0,1,1,1,17,14
790 DATA16,16,18,20,24,20,18,0
800 DATA12,4,4,4,4,4,14,0
810 DATA0,0,26,21,21,21,21,0
820 DATA0,0,22,25,17,17,17,0

```

```

830 DATA0,0,14,17,17,17,14,0
840 DATA0,0,22,25,25,22,16,16
850 DATA0,0,13,19,19,13,1,1
860 DATA0,0,22,25,16,16,16,0
870 DATA0,0,15,16,14,1,30,0
880 DATA4,4,31,4,4,4,4,0
890 DATA0,0,17,17,17,19,13,0
900 DATA0,0,17,17,17,10,4,0
910 DATA0,0,17,17,21,21,10,0
920 DATA0,0,17,10,4,10,17,0
930 DATA0,0,17,17,31,1,17,14
940 DATA0,0,31,2,4,8,31,0
950 DATA206,63,240,166,66,198,32
,61,227,69,52,6,230,65,84,84
960 DATA84,79,227,225,31,1,230,6
5,196,7,52,4,198,7,224,224
970 DATA92,52,4,52,4,230,196,79,
88,73,88,73,88,73,227,67
980 DATA31,2,95,166,71,89,202,1,
74,38,250,83,134,255,88,73
990 DATA106,228,38,250,52,6,198,
8,52,4,166,100,167,99,230,160
1000 DATA79,88,73,106,99,38,250,
52,6,166,132,164,99,170,228,167
1010 DATA132,166,1,164,100,170,9
7,167,1,48,136,32,50,98,106,228
1020 DATA38,216,53,178
1030 FORI=&H3F70 TO &H3FE3
1040 READA:POKEI,A:NEXT
1050 POKEI200,40
1060 CLS:PRINT" SWAMI SEZ AND M/
L TEXT LOADER":PRINT" BY: MIL
TON T. SIMPSON":PRINT"*****AC
KNOWLEDGEMENT*****"
1070 PRINT"THE TEXT ROUTINE USED
IN THIS PROGRAM IS A SLIGHTLY
MODIFIED VERSION OF 'UNFORGETT
ABLE CHAR- ACTERS' BY MR. WILLIA
M BARDEN, JR., WHICH WAS PUBLIS
HED IN THE NOVEMBER AND DECEMBER
, 1983 ISS-UES OF 'THE COLOR COM
PUTER' MAG-AZINE."
1080 PRINT"*****"
1090 PRINT"PRESS play ON THE TAP
E RECORDER.NOW SEARCHING FOR AND
LOADING: SWAMI SEZ ":PRINT"ENT
ER <RUN> AT THE 'OK' PROMPT";
1100 CLOAD "SWAMISEZ"

```

Program Listing 2. Swami

```

10 'SWAMISEZ BY MILTON T. SIMPSON
20 CLEAR150,&H3C9F
30 DIMP(60),Q(60)
50 PMODE4,1
60 DEFUSR0=&H3F70
1000 K=0:CLS
1010 K=K+1
1015 KK=K:IFKK=61THEN PRINT"MAX
DATA INPUT REACHED":GOTO1100
1020 PRINT "THIS IS DATA SET# ";
K
1030 PRINT"ENTER DATA: X,Y TO EN
D ENTER 0,0"
1040 INPUTP(K),Q(K)
1050 IFP(K)=0AND Q(K)=0THEN1100
1060 IFP(K)=0THENP(K)=.0000000000
001
1070 IFQ(K)=0THENQ(K)=.0000000000
001
1080 GOTO1010
1100 INPUT"ENT GRAPH TITLE 40 CH
AR M":FS
1110 IF(LEN(FS))>40THEN1100
1200 INPUT"ENTER P TO HARDCOPY I
NPUT; ANY OTHER KEY TO SKIP";AS

```

```

1210 IFAS<>"P"ANDAS<>"p"THEN2000
1220 PRINT#-2,CHR$(27);CHR$(19)+
CHR$(30)
1230 PRINT#-2,"INPUT DATA TABULA
TION FOR: "FS
1240 PRINT#-2,"DATA SET # X VA
LUE Y VALUE":PRINT#-2,""
1250 FORN=1TO K-1
1260 NS=STR$(N):XS=STR$(P(N)):YS
=STR$(Q(N))
1270 J=LEN(NS):V=LEN(XS)
1280 GOSUB5300
1290 PRINT#-2,S$;NS;T$;XS;"
";YS
1300 IF(N/3)=INT(N/3)THENPRINT#-
2,""
1310 NEXT
2000 PCLS:CLS:PRINT" SEL REGRES
SION"
2010 PRINT@96,"LIN ENT 1":PRINT
"EXP ENT 2":PRINT"LOG ENT 3":P
RINT"PWR ENT 4"
2020 INPUT"CHOICE":I
2030 IFI>4OR I<1THEN2000
2040 O=0:G=0:L=0:M=0:Z=0:A=0:S=0
2050 ONI GOSUB2190,2290,2390,248
0
2060 CLS:PRINT" A=";D;" B=";E;"
n=";N;" r=";C:PRINT"MAX X=";A;"
MAX Y=";B
2070 AX=D:BX=E:RX=C:NX=N
2080 PRINT"EQUATION:";ES
2090 PRINT"DO ANOTHER? (Y/N)"
2100 AS=INKEY$
2110 IFAS=""THEN2100
2120 IFAS="Y"OR AS="y"THEN2000
2130 IFAS<>"N"AND AS<>"n"THEN210
0
2140 PRINT"TO GET LGST <Y>, ENT
LGST <X>ENT'Q' TO QUIT";:INPUTXS
2150 IFXS="Q"ORXS="q"THEN3000ELS
EX=VAL(XS)
2160 ONI GOSUB2620,2630,2640,265
0
2170 IFX>A THEN A=X:IFY>B THENB=
Y
2180 GOTO2060
2190 FORN=1TO KK-1
2200 O=O+P(N)
2210 G=G+Q(N)
2220 L=L+P(N)*Q(N)
2230 M=M+P(N)*P(N)
2240 Z=Z+Q(N)*Q(N):GOSUB2660
2250 NEXT
2260 GOSUB2570
2270 ES="y = A + B * x"
2280 RETURN
2290 FORN=1TO KK-1
2300 O=O+P(N)
2310 G=G+LOG(Q(N))
2320 L=L+P(N)*LOG(Q(N))
2330 M=M+P(N)*P(N)
2340 Z=Z+LOG(Q(N))*LOG(Q(N)):GOS
UB2660:NEXT
2350 GOSUB2570
2360 D=EXP(1)^D
2370 ES="y = A * e ^ (B * x)"
2380 RETURN
2390 FORN=1TO KK-1
2400 O=O+LOG(P(N))
2410 G=G+Q(N)
2420 L=L+LOG(P(N))*Q(N)
2430 M=M+LOG(P(N))*LOG(P(N))
2440 Z=Z+Q(N)*Q(N):GOSUB2660:NEX
T
2450 GOSUB2570
2460 ES="y = A + B * ln (x)"
2470 RETURN
2480 FORN=1TO KK-1
2490 O=O+LOG(P(N))

```

```

2500 G=G+LOG(Q(N))
2510 L=L+LOG(P(N))*LOG(Q(N))
2520 M=M+LOG(P(N))*LOG(P(N))
2530 Z=Z+LOG(Q(N))*LOG(Q(N)):GOS
UB2660:NEXT
2540 GOSUB2570
2545 D=EXP(1)^D
2550 E$="y = A * x ^ B"
2560 RETURN
2570 N=KK-1
2580 E=(N*L-O*G)/(N*M-O*O)
2590 D=(G-E*O)/N
2600 C=(N*L-O*G)/SQR((N*M-O*O)*(
N*Z-G*G))
2610 RETURN
2620 Y=D+E*X:RETURN
2630 Y=D*EXP(1)^(E*X):RETURN
2640 Y=D+E*LOG(X):RETURN
2650 Y=D*X^E:RETURN
2660 IFP(N)>A THENA=P(N)
2670 IFQ(N)>B THENB=Q(N)
2680 RETURN
3000 R=200:S=150
3010 INPUT"ENT # H(20M) & V(15M)
DIV":XD,F
3015 IF XD>20OR F>15THEN3010
3020 INPUT"ENT H & V SCALES":G,J
3040 IFG<A THENPRINT"SCALE MUST
BE > LGST VALUE":GOTO3020
3050 SCREEN1,1:LINE(41,164)-(242
,14),PSET,B
3060 FORU=1TO XD-1
3065 M=INT(41+(U*200/XD))
3070 LINE(M,14)-(M,16),PSET:LINE
(M,164)-(M,162),PSET
3080 FORV=1TO F-1
3085 O=INT(14+(V*150/F))
3090 LINE(M,O-2)-(M,O+2),PSET
3100 LINE(M+2,O)-(M-2,O),PSET
3110 NEXT:NEXT
3120 FORV=1TO F-1
3125 O=INT(14+(V*150/F))
3130 LINE(41,O)-(43,O),PSET:LINE
(239,O)-(241,O),PSET
3140 NEXT
3150 ONI GOTO3160,3250,3350,3440
3160 FORL=41TO41+R*A/G
3170 X=L-40
3180 GOSUB2620
3190 Y=165-D*S/J-(Y-D)*(S/R)*(G/
J)
3200 IFY<(165-S)THEN3230
3210 IFY>164THENY=164
3215 IFY<14THENY=14
3220 PSET(L,Y)
3230 NEXT
3240 GOTO3560
3250 LINE(41,164)-(41,163),PSET
3260 W=0
3270 FORL=41TO41+R*A/G
3280 X=W
3290 GOSUB2630
3300 W=W+G/200
3310 Y=164-Y*S/J
3315 IFY<14THENY=14
3320 LINE-(L,Y),PSET
3330 NEXT
3340 GOTO3560
3350 LINE(41,164)-(42,164),PSET
3360 FORL=41TO41+R*A/G
3370 X=(L-40)*G/R
3380 GOSUB2640
3390 Y=164-INT(Y*S/J)
3400 IFY>164THENY=164
3405 IFY<14THENY=14
3410 LINE-(L,Y),PSET
3420 NEXT
3430 GOTO3560
3440 C=G/A
3450 X=R/C
3460 GOSUB2650
3470 Z=Y
3480 LINE(41,164)-(42,164),PSET
3490 FORL=41TO41+R/C STEP6
3500 X=L-40
3510 GOSUB2650
3520 Y=164-INT(Y*S*B/(J*Z))
3525 IFY<14THENY=14
3530 X=40+X
3540 LINE-(X,Y),PSET
3550 NEXT
3560 FORN=1TO KK-1
3570 X=INT(41+P(N)*R/G)
3580 Y=INT(164-Q(N)*S/J)
3590 LINE(X-3,Y-3)-(X+3,Y+3),PSE
T
3600 LINE(X-3,Y+3)-(X+3,Y-3),PSE
T
3610 NEXT
4000 E$=F$
4010 K=LEN(E$):L=K/2
4020 Y=0
4030 FORX=125-L*6TO119+L*6STEP6
4040 A$=LEFT$(E$,L)
4050 K=K-1:E$=RIGHT$(E$,K)
4060 GOSUB6000:GOSUB6070
4070 NEXT
4080 IFG=<100THENR=G:C=1
4090 IFJ=<100THENB=J:S=1
4100 IFG>100AND G=<1000THENR=G/1
0:C=100
4110 IFJ>100AND J=<1000THENB=J/1
0:S=100
4120 IFG>1000AND G=<10000THENR=G
/100:C=1000
4130 IFJ>1000AND J=<10000THENB=J
/100:S=1000
4140 IFG>10000AND G=<100000THENR
=G/1000:C=10000
4150 IFJ>10000AND J=<100000THENB
=J/1000:S=10000
4160 IFG>100000AND G=<1000000THE
NR=G/10000:C=100000
4170 IFJ>100000AND J=<1000000THE
NB=J/10000:S=100000
4180 GOTO4530
4190 FORMX=1TO9:XX=XD/MX
4200 IFXX=INT(XX)AND XX=<10THEN4
220
4210 NEXT
4220 Y=169:FORZ=38TO248STEP200/X
X
4230 E$=STR$(Z-38)*R/200
4240 L=LEN(E$)
4250 IFL>3THENE$=LEFT$(E$,3):GOT
O4240
4260 X=Z-(L*3+2)
4270 N=L
4280 IFZ=238THENX=X+2
4290 FORM=1TON
4300 A$=LEFT$(E$,L)
4310 L=L-1
4320 GOSUB6000:GOSUB6070
4330 E$=RIGHT$(E$,L)
4340 X=X+6
4350 NEXT:NEXT
4360 FORM=1TO9:XX=F/MX
4370 IFXX=INT(XX)AND XX=<10THENF
=XX:GOTO4390
4380 NEXT
4390 Z=36:FORY=160TO10STEP-150/F
4400 E$=STR$(160-Y)*B/150
4410 L=LEN(E$)
4420 IFL>5THENE$=LEFT$(E$,5):GOT
O4410
4430 X=Z-L*6
4440 N=L
4450 FORM=1TO N
4460 A$=LEFT$(E$,L)
4470 L=L-1
4480 GOSUB6000:GOSUB6070
4490 E$=RIGHT$(E$,L)
4500 X=X+6
4510 NEXT:NEXT
4520 GOTO4740
4530 SCREEN0:INPUT"ENT X UNITS 3
3 CHAR M":E$
4540 L=LEN(E$):IFL>33THEN4530
4550 SCREEN1,1:E$="x"+STR$(C)+"=
"+E$
4560 K=LEN(E$):L=K/2
4570 Y=181
4580 FORX=137-L*6TO131+L*6STEP6
4590 A$=LEFT$(E$,L)
4600 K=K-1:E$=RIGHT$(E$,K)
4610 GOSUB6000:GOSUB6070
4620 NEXT
4630 SCREEN0:INPUT"ENT Y UNITS 1
6 CHAR M":E$
4640 L=LEN(E$):IFL>16THEN4630
4650 SCREEN1,1:E$="x"+STR$(S)+"=
"+E$
4660 K=LEN(E$):L=K/2
4670 X=0
4680 FORY=96-L*8TO95+L*8STEP8
4690 A$=LEFT$(E$,L)
4700 K=K-1:E$=RIGHT$(E$,K)
4710 GOSUB6000:GOSUB6070
4720 NEXT
4730 GOTO4190
4740 PRINT"POSITION EQN&CONSTS":
INPUT"TOP=1; BOTTOM=2":H:INPUT"L
EFT=1; RIGHT=2":J
4750 IFH<1OR J<1OR H>2OR J>2THEN
4740
4760 IFJ=1THEN J=48ELSE J=124
4770 IFH=1THEN H=22ELSE H=110
4780 SCREEN1,1
4790 FORY=H TO40+H STEP10
4800 IFY=H ANDI=1THENGOSUB2270
4810 IFY=H ANDI=2THENGOSUB2370
4820 IFY=H ANDI=3THENGOSUB2460
4830 IFY=H ANDI=4THENGOSUB2550
4850 IFY=H+10THENE$="A =" +STR$(A
X)
4860 IFY=H+20THENE$="B =" +STR$(B
X)
4870 IFY=H+30THENE$="r =" +STR$(R
X)
4880 IFY=H+40THENE$="n =" +STR$(N
X)
4890 L=LEN(E$)
4900 K=L
4910 FORX=J TO J+6*(L-1)STEP6
4920 Y=Y+2:N=0:GOSUB6070
4930 Y=Y-2
4940 A$=LEFT$(E$,L)
4950 GOSUB6000:GOSUB6070
4960 K=K-1:E$=RIGHT$(E$,K)
4970 NEXT:NEXT
5000 CLS:PRINT"VIEW SCREEN 1":PR
INT"ANOTHER GRAPH 2"
5010 PRINT"HARDCOPY DATA 3":PRIN
T"HARDCOPY SCREEN 4"
5020 INPUT"<CLEAR> TO RETURN HER
E":N
5030 ONN GOTO5040,2000,5130,5070
5040 SCREEN1,1
5050 A$=INKEY$
5060 IFA$<>CHR$(12)THEN5050ELSE5
000
5070 PRINT"<ENTER> LOADS HARDCOP
Y PROGRAM; <CLEAR> ABORTS LOAD"
5080 A$=INKEY$
5090 IFA$=" "THEN5080
5100 IFA$<>CHR$(13)THEN5000
5110 CLS:PRINT"LOADING HARDCOPY,
ENT 'RUN' @ OKPROMPT"
5120 CLOAD"HARDCOPY"
5130 PRINT#-2,CHR$(27);CHR$(19)+
CHR$(30)
5140 PRINT#-2,"CURVE DATA TABULA
TION FOR: " F$

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5150 PRINT#-2,"THE EQUATION IS:
"GS
5160 PRINT#-2," A = "STR$(AX)
5170 PRINT#-2," B = "STR$(BX)
5180 PRINT#-2," C = "STR$(RX)
5190 PRINT#-2," n = "STR$(NX)
5200 ZZ=0:PRINT#-2," X VA
LUE Y VALUE":PRINT#-2,"
5210 FORX=0TO101+G STEP1/XD
5220 ZZ=ZZ+1
5230 ONI GOSUB2620,2630,2640,265
0
5240 H=LEN(STR$(INT(X))):J=1
5250 GOSUB5300
5260 PRINT#-2,T$;STR$(INT(X));"
";STR$(Y)
5270 IFZZ/3=INT(ZZ/3)THENPRINT#-
2," "
5280 NEXT
5290 GOTO5000
5300 R$=" ":S$=" ":T$=" ":U$=" "
5310 FORM=1TO5-J:S$=S$+R$:NEXT
5320 FORM=1TO12-H:T$=T$+R$:NEXT
5330 RETURN
6000 N=ASC(A$)
6010 IFN=32THENN=0:RETURN
6020 IFN=>8ANDN=<10THENN=N-6
6030 IFN=>33ANDN=<90THENN=N-28
6040 IFN=94THENN=63
6050 IFN=>97ANDN=<122THENN=N-33
6060 RETURN
6070 POKE&H3FFF,N:POKE&H3FF1,X
6080 POKE&H3FF2,Y:POKE&H3FF7,6
6090 POKE&H3FF3,6:POKE&H3FF4,16
0
6100 POKE&H3FF5,6:POKE&H3FF6,0
6110 A=USR0(0)
6120 RETURN

```

Program Listing 3. Hardcopy

```

10 ' HARDCOPY (HARDCOPY GRAPHICS
SCREEN TO PRINTER) BY: MILTON T
. SIMPSON
20 CLEAR0,0,&H3442
30 CLS:PRINT@64,"ENTER (L) TO LO
AD MACHINE LANGUAGE ROUTINE. E
NTER ANY OTHER KEY IF IT IS AL
READY LOADED":INPUTA$
40 IFA$<"L"THEN1000
50 CLS:PRINT@64,"LOADING MACHINE
LANGUAGE ROUTINE"
60 FORI=&H3443 TO &H386C:READA:P
OKEI,A:NEXT
100 DATA142,61,255,111,128,140,6
3,255,37,249,127,60,226,127,60,2
28
110 DATA127,60,235,134,48,183,60
,225,142,60,255,191,60,236,127,6
0
120 DATA224,134,7,183,60,230,134
,1,183,60,234,142,60,240,111,128
130 DATA140,60,248,37,249,134,32
,246,60,224,251,60,225,61,251,60
140 DATA226,31,1,166,132,183,60,
227,124,60,224,182,60,224,129,2
150 DATA44,6,182,60,228,183,60,2
29,124,60,229,122,60,230,142,60
160 DATA240,134,128,183,60,231,1
6,142,0,8,198,1,247,60,232,246
170 DATA60,227,134,7,183,60,233,
244,60,231,182,60,232,61,84,182
180 DATA60,233,128,1,183,60,233,
38,245,182,60,234,61,235,132,231
200 DATA1,49,63,38,202,182,60,23
4,72,183,60,234,182,60,233,39
190 DATA132,182,60,231,68,183,60
,231,182,60,232,72,183,60,232,48
210 DATA13,182,60,229,129,1,39,1

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```

60,127,60,229,126,52,120,142,60
220 DATA240,166,132,16,190,60,23
6,167,164,49,33,16,191,60,236,48
230 DATA1,140,60,248,37,235,124,
60,226,182,60,226,129,32,16,37
240 DATA255,60,127,60,226,134,25
4,151,111,142,61,255,16,142,62,0
250 DATA166,132,23,2,137,166,132
,230,164,183,60,238,247,60,239,1
29
260 DATA0,16,39,2,8,161,164,16,3
9,2,2,193,0,16,39,1
270 DATA252,132,1,129,1,38,38,19
6,1,193,1,39,32,230,164,196
280 DATA6,193,6,38,24,166,132,13
2,6,129,6,39,16,182,60,238
290 DATA138,2,183,60,238,246,60,
239,202,1,247,60,239,166,132,230
300 DATA164,132,3,129,3,38,38,19
6,3,193,3,39,32,230,164,196
310 DATA12,193,12,38,24,166,132,
132,12,129,12,39,16,182,60,238
320 DATA138,4,183,60,238,246,60,
239,202,2,247,60,239,166,132,230
330 DATA164,132,6,129,6,38,70,19
6,6,193,6,39,64,230,164,196
340 DATA1,193,1,38,24,166,132,13
2,1,129,1,39,16,182,60,238
350 DATA138,1,183,60,238,246,60,
239,202,2,247,60,239,230,164,196
360 DATA24,193,24,38,24,166,132,
132,24,129,24,39,16,182,60,238
370 DATA138,8,183,60,238,246,60,
239,202,4,247,60,239,166,132,230
380 DATA164,132,12,129,12,38,70,
196,12,193,12,39,64,230,164,196
390 DATA3,193,3,38,24,166,132,13
2,3,129,3,39,16,182,60,238
400 DATA138,2,183,60,238,246,60,
239,202,4,247,60,239,230,164,196
410 DATA48,193,48,38,24,166,132,
132,48,129,48,39,16,182,60,238
420 DATA138,16,183,60,238,246,60
,239,202,8,247,60,239,166,132,23
0
430 DATA164,132,24,129,24,38,70,
196,24,193,24,39,64,230,164,196
440 DATA6,193,6,38,24,166,132,13
2,6,129,6,39,16,182,60,238
450 DATA138,4,138,60,238,246,60,
239,202,8,247,60,239,230,164,196
460 DATA96,193,96,38,24,166,132,
132,96,129,96,39,16,182,60,238
470 DATA138,32,183,60,238,246,60
,239,202,16,247,60,239,166,132,2
30
480 DATA164,132,48,129,48,38,70,
196,48,193,48,39,64,230,164,196
490 DATA12,193,12,38,24,166,132,
132,12,129,12,39,16,182,60,238
500 DATA138,8,183,60,238,246,60,
239,202,16,247,60,239,230,164,19
6
510 DATA64,193,64,38,24,166,132,
132,64,129,64,39,16,182,60,238
520 DATA138,64,183,60,238,246,60
,239,202,32,247,60,239,166,132,2
30
530 DATA164,132,64,129,64,38,38,
196,64,193,64,39,32,230,164,196
540 DATA48,193,48,38,24,166,132,
132,48,129,48,39,16,182,60,238
550 DATA138,32,183,60,238,246,60
,239,202,64,247,60,239,166,132,2
30
560 DATA164,132,96,129,96,38,38,
196,96,193,96,39,32,230,164,196
570 DATA24,193,24,38,24,166,132,
132,24,129,24,39,16,182,60,238
580 DATA138,16,183,60,238,246,60

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,239,202,32,247,60,239,23,0,117
590 DATA182,60,238,141,105,182,6
0,239,141,100,48,1,49,33,16,140
600 DATA62,255,16,38,253,207,166
,164,141,84,134,13,173,159,160,2
610 DATA142,61,255,16,142,62,255
,166,128,167,160,140,62,255,37,2
47
620 DATA142,60,255,16,142,61,255
,166,128,167,160,140,61,255,37,2
47
630 DATA182,60,228,76,124,60,235
,183,60,228,129,2,39,11,182,60
640 DATA225,139,3,183,60,225,126
,55,183,127,60,228,182,60,225,13
9
650 DATA4,183,60,225,182,60,235,
129,55,16,38,252,155,57,139,128
660 DATA173,159,160,2,57,166,132
,230,164,132,96,196,96,129,96,38
670 DATA38,193,96,38,3,126,56,26
,230,169,255,0,196,3,193,3
680 DATA38,53,230,137,255,0,196,
3,193,3,39,43,246,60,239,202
690 DATA64,247,60,239,126,56,26,
193,96,38,28,230,137,255,0,196
700 DATA3,193,3,38,18,166,169,25
5,0,132,3,129,3,39,8,182
710 DATA60,238,138,64,183,60,238
,166,132,230,164,132,3,196,3,129
720 DATA3,38,38,193,3,38,3,126,5
6,100,230,169,1,0,196,96
730 DATA193,96,38,53,230,137,1,0
,196,96,193,96,39,43,246,60
740 DATA239,202,1,247,60,239,126
,56,100,193,3,38,28,230,137,1
750 DATA0,196,96,193,96,38,18,16
6,169,1,0,132,96,129,96,39
760 DATA8,182,60,238,138,1,183,6
0,238,57
1000 PMODE4,1
1010 CLS:PRINT" CHECK THE PRINTE
R'S FUNCTION SWITCHES. SWIT
CH #4 MUST BE 'ON' (UP) AND #1
, #2, & #3 MUST BE 'OFF' (D
OWN)":PRINT:PRINT" PRESS ANY
KEY TO CONTINUE"
1020 POKE150,40
1030 A$=INKEY$
1040 IFA$=" THEN1030
1050 PRINT:PRINT" TO COPY ONTO
PRINTER ENTER 1 TO DISPLAY VI
DEO DATA ENTER 2"
1060 PRINT:PRINT" PRESS <CLEAR>
TO RETURN HERE."
1070 INPUT "CHOICE";C
1080 IFC<1 ORC>2THEN CLS:GOTO105
0
1090 ONC GOTO1000,1220
1100 PRINT#-2,CHR$(27);CHR$(20)+
CHR$(18)
1110 SCREEN1,1
1120 EXEC&H3443
1130 SCREEN0
1140 CLS
1150 PRINT" "
1160 PRINT" CHECK THE PRINTER'S
FUNCTION SWITCHES. SWITCHES
#3 & #4 MUST BE 'ON' (UP) AN
D #1 & #2 MUST BE 'OFF' (DOWN)
":PRINT:PRINT" PRESS ANY KEY TO
CONTINUE"
1170 POKE150,87
1180 A$=INKEY$
1190 IFA$=" THEN1180
1200 PRINT#-2,CHR$(30)
1210 END
1220 SCREEN1,1
1230 A$=INKEY$:IFA$=" THEN1230
1240 CLS:GOTO1050

```

END

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Programs to

Load and execute machine-language programs with one command.

Boot

There is a quicker way to load and execute machine-language programs. My Boot-Loader Maker (BLM) program (see Listing) lets you do so with a simple RUN"file name" command. You must sacrifice one block of disk space for each program for which you create a boot loader. BLM will work with most machine-language programs, but not all. If you have trouble making a working boot loader for a particular program, simply KILL the boot loader.

After you run BLM, it asks you if you want

to make boot loaders for all the machine-language programs on the disk. If you answer "yes," BLM automatically generates a boot loader for every program with a .BIN extension. If you answer "no," BLM asks if you

want to create boot loaders for each program with a .BIN extension one at a time.

BLM creates Basic boot loader programs saved in the ASCII format. The short program contains the commands:

LOADM"file name" EXEC

Despite its limitations, BLM is a practical, easy-to-use utility. ■

Address correspondence to Richard Wasserman, 2795 East 63rd St., Brooklyn, NY 11234.

System Requirements

16K RAM

Disk Extended Color Basic

Disk Drive

Program Listing. Boot Loader Maker

```

10 CLEAR 10000
20 CLS
30 PRINT"      ML BOOT-LOADER MA
KER"
40 PRINT"      BY RICHARD WASSER
MAN"
50 PRINTSTRING$(32,"-");
60 INPUT"WOULD YOU LIKE TO MAKE
BOOT-STRAP LOADERS FOR
ALL OF THE ML PROGRAMS ON YOUR
DISK (Y/N)";QS
70 IF QS="Y" THEN HI=110
80 INPUT"INSERT TARGET DISK AND

```

```

PRESS          <ENTER>";QS
120 FOR Y=3 TO 11
130 DSKI$ = 0,17,Y,A$,B$
140 A$=A$+LEFT$(B$,114)
150 FOR P=0 TO 7
160 V=P*32
170 W$=MID$(A$,V+1,8)
180 T$=MID$(A$,V+9,3)
190 IF ASC(MID$(A$,V+1,1))=0 THE
N 250
200 IF ASC(W$)=255 THEN 260
210 PRINTW$;"/";T$;
220 O$=W$+"/"+T$
230 IF RIGHT$(O$,3)="BIN" THEN G
OSUB 270
240 X=X+1

```

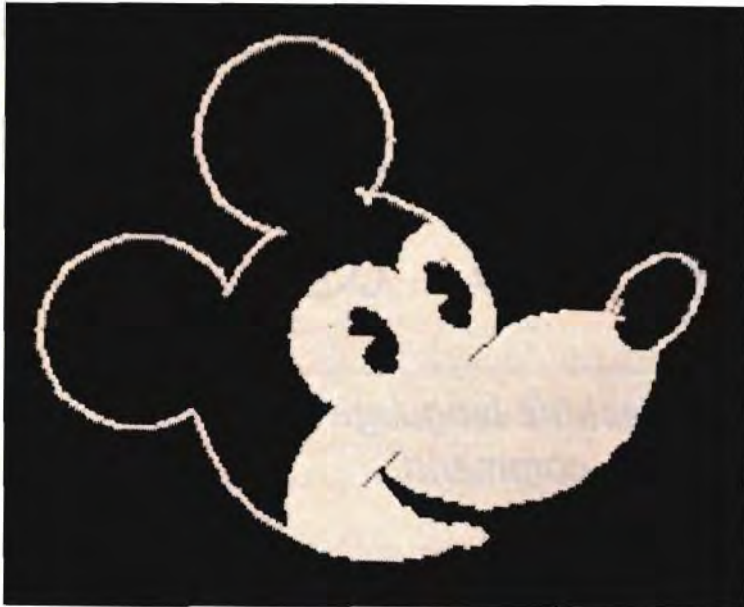
```

250 NEXT P:NEXT Y
260 STOP
270 IF HI<>110 THEN PRINT"MAKE B
OOT LOADER FOR ";O$;" (Y/N)";
280 IF HI<>110 THEN INPUT QW$
290 IF HI<>110 THEN IF QW$="Y" TH
EN 300 ELSE RETURN
300 CLS:PRINT"WORKING WITH...";O
$
310 J$=LEFT$(O$,8)+".BAS"
320 OPEN"O",#1,J$
330 PRINT#1,"10 LOADM"+CHR$(34)+
O$+CHR$(34)
340 PRINT#1,"20 EXEC"
350 CLOSE #1
360 RETURN
END

```

by Dick Myers

Cartooning and Animation



*It takes just
a little knowledge
and practice to be a
graphics master.*

You would be surprised by the pleasing amount of animation and drawing that you can do with only a 16K Extended Color Basic CoCo. I'm going to show you three ways to draw figures and three ways to animate them.

First the drawing, Listing 1, Mickey, required the most difficult, time-consuming method, but it is the best for obtaining an accurate figure. You draw this type of figure by matching up curves, circles, ovals, arcs, and straight lines.

To watch Mickey grow line by line, first type in line 40, and then line 370. Now run the program. You will see the first ear. Continue typing in lines 50, 60, and so on, and run the program after entering each line. You will see Mickey build step by step.

One little trick: After you enter and run line 340, you'll notice that the PAINT command has erased two important little lines—one by the corner of the mouth and one under the right eye. By using PRESET instead of PSET in lines 350 and 360, these lines are "erased" back into the PAINTed area.

If you would like to do more of this type of drawing, go to your local art store and purchase the following:

- a pad of 12- by 9-inch tracing paper;
- a cheap compass (the kind in which you stick a pencil); and
- two or three transparent circle templates

with circles ranging from $\frac{1}{8}$ to 3 inches, showing centerline marks around the circles.

Now for the procedure. Draw or trace the picture you want to reproduce on a sheet of tracing paper. But first turn to the graphic worksheet on page 173 of your *Going Ahead with Extended Color Basic* manual. Tape the drawing to the worksheet, making sure that your drawing does not go beyond the lines of

the worksheet. Imagine this worksheet as your video screen.

If you want to avoid ruining your manual's worksheet, carefully cut it out and make an adequate supply of copies. Then tape the original worksheet back in the manual and do your work on the copies.

After you've drawn your picture and centered and taped it to your worksheet, all the X,Y coordinates will show through on the drawing. These could be line or circle-center coordinates. Use the templates to find centers of circles and arcs. Try something simple first, such as a large figure 8. I recommend that you reread pages 41-45 of the Extended Basic manual if you have a problem.

Moonset, Listing 2, is an interesting scenic program made almost entirely of circles. (See Photo 1.) Most of the circles are squished so that they are hardly recognizable as circles, but you can see the remarkable effects of using the CIRCLE commands "oval" feature. The last lines of Moonset create the stars in the sky. Line 1080 confines the stars' area and line 1090 places them. Line 1070 calls for 200 stars. You can experiment with the number of stars.

System Requirements

16K RAM
Extended Color Basic

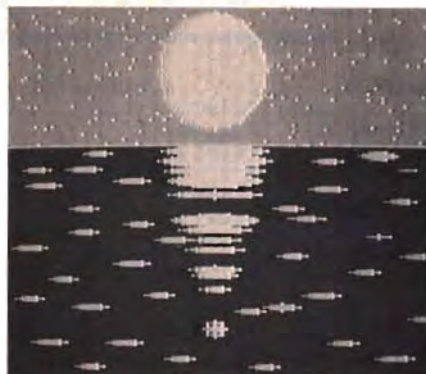


Photo 1. Moonset

Character Drawing

Most of the programs here shift your computer into the graphics mode, as indicated by



Photo 2. Pennsylvania Dutch

the PMODE and SCREEN commands at the beginning of each. But you can "draw" while still in the text mode. I call it character drawing because you do it entirely with the graphics blocks called by the CHR\$ statement. Page 276 of *Getting Started with Color Basic* shows these blocks and page 277 displays the PRINT@ screen locations where you can place them.

Type in and run Listing 3. Pennsylvania Dutch. It has a sort of needlepoint effect. (See Photo 2.) Pages 175-178 in the Color Basic manual describe the technique I used to create Listing 3. However, I did use one trick not mentioned in the manual. Page 177 tells you to character and color numbers within the parentheses after the CHR\$ statement, but I put the sum of these two numbers within parentheses.

Note the clever use of strings in lines 425-440. Line 425 sets D\$ equal to a row of five green squares. Line 430 sets E\$ equal to D\$ plus D\$, or 10 green squares. Line 435 sets F\$ equal to E\$ plus E\$, or 20 green squares. Line 440 prints F\$ (20 green squares), which appears on the screen as the tree branch. Can you see the possibilities? You can follow each step of the program by first entering line 10, and then line 1000. Next, enter lines 15, 20, 25, and so on, running the program after entering each line.

The DRAW Method

The third technique is the DRAW method. This time I will add some animation and sound, so turn up your volume. I suggest a quick review of the DRAW command by reading pages 53-56 of the Extended Basic manual. Look at Listing 4, Train. You can draw a line step by step in any of eight directions. In

this program, line 10 sets up the graphics mode, lines 20-50 draw the train body, line 60 draws the window using the magic of the "filled box," lines 70-90 draw the tracks, and lines 100-170 draw the wheels.

Now for some action: You must heat up the boilers, so I'll show smoke building up at the stack. This is merely a series of off-center circles placed in line 180-240. Lines 250 and 260 set up and play the train whistle. Lines 270-290 outline and turn on the headlight.

Lines 300-410 move the drive shaft and are a continuous loop. The PSET command places the line at, say, 12 o'clock on the wheels. The FOR...NEXT loop holds it on the screen long enough for you to see it. Then the PRESET command erases the line. This process repeats, positioning the line at 3, 6, and finally at 9 o'clock on the wheels. The program then goes back to line 300 and start the four-position process over again. This is called PSET-PRESET animation.

GET-PUT Animation

Listing 5, Bugspray, has sound, so turn up your volume. I drew Bugspray using the same technique as I did with Train, but this time I used GET-PUT animation. GET-PUT animation has a "jerky" effect, which makes my program spookier. You might want to study pages 66-70 of your Extended Basic manual before trying this type of programming.

Line 20 warns of an array or "invisible box" coming up. Lines 30-140 draws a spider within this array. Line 150 locates and defines the array, and 160-510 uses PUT statements between delay lines to lower the array, or spider, on a strand of web that gets longer each move. PCLS3 clears the screen for the kill scene.

I used the DRAW method on the hand and spray can and the PSET-PRESET animation technique for the spray movement. The

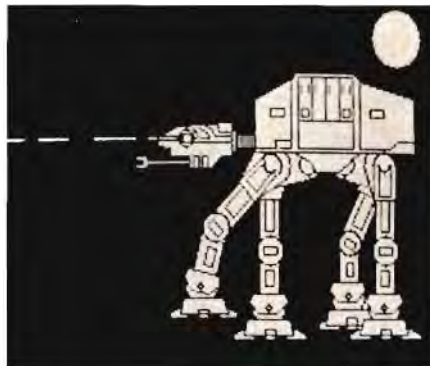


Photo 3. Walker

FOR...NEXT loops are delays, and lines 1190 and 1200 add the song.

Any-Angle Drawing

In all the previous programs, you pushed an imaginary pencil point around the screen to create a picture. But there was one drawback: You could move in only eight different directions. Now I will use a slightly different method using X,Y coordinates. This method, in effect, tells the computer to move to point X,Y draw to another point X,Y, then draw to yet another point X,Y, and so on. For example, clear your computer and type in this:

```
10 PMODE 4,1:SCREEN 1,1:PCLS
20 DRAW"BM12,96; U20; E20; R20; F20;
   D20; G20; L20; H20; U20"
30 GOTO 30
```

Run this program; you will see an octagon composed of one line in each direction in which you are capable of going with the DRAW method discussed previously. This method tells the computer to move so many spaces up, so many spaces left, so many spaces down, and so on.

To illustrate the second DRAW method, clear your computer and type in the following:

```
10 PMODE 4,1:SCREEN 1,1:PCLS
20 DRAW"BM109,90; M123,90; M128,77;
   M133,90; M148,90; M136,99; M141,112;
   M128,103; M115,112; M120,99; M109,90"
30 GOTO 30
```

Run this program; you will see a star containing lines at angles not possible with the first DRAW method. Note that I used the letter M before the coordinates to indicate "move to." You can use the blank line, no-move line, color, and scale features discussed on pages 53-60 of the Extended Basic manual with this method, too.

Listings 6, Badgrem, and 7, Lilgrem, illustrate the any-angle DRAW method.

By throwing together most of the aforementioned rules, I created the last program, Walker, complete with the theme song from the movie, *Star Wars*. (See Listing 8.)

If all this drawing and animating excites you, I suggest you read *Color Computer Graphics*, by William Barden, Jr. It is available through Radio Shack stores (catalog no. 62-2076). ■

Address correspondence to Dick Meyers,
1403 Hidden Timber Drive, Pittsburgh, PA
15220.

Program Listing 1. Mickey

```

5 REM MICKEY
1Ø PMODE 4,1
2Ø PCLS
3Ø SCREEN 1,1
4Ø CIRCLE(44,96),3Ø,,.9Ø,.16,.93
5Ø CIRCLE(88,42),3Ø,,.9Ø,.28,.12
6Ø CIRCLE(144,12Ø),86,,.9Ø,.58,.
64
7Ø CIRCLE(118,1Ø3),6Ø,,.9Ø,.19,.
46
8Ø CIRCLE(1Ø8,95),44,,.9Ø,.76,.Ø
1
9Ø CIRCLE(18Ø,14Ø),6Ø,,.9Ø,.63,.
79
1ØØ CIRCLE(112,96),23,,.9Ø,.3Ø,.
85
11Ø CIRCLE(136,76),15,,.9Ø,.46,.
73
12Ø CIRCLE(132,142),42,,.9Ø,.47,
.65
13Ø CIRCLE(15Ø,94),53,,.9Ø,.Ø1,.
39
14Ø CIRCLE(145,149),6,,.5,.65,.4
5
15Ø CIRCLE(14Ø,126),25,,.85,.22,
.51
16Ø CIRCLE(214,94),3Ø,,.9Ø,.55,.
68
17Ø CIRCLE(187,73),3Ø,,.9Ø,.Ø2,.
16

```



```

18Ø CIRCLE(2Ø6,78),1Ø,,.9Ø,.63,.
12
19Ø CIRCLE(197,89),1Ø,,.9Ø,.13,.
63
2ØØ CIRCLE(141,9Ø),5,,.9Ø,.9Ø,.4
Ø
21Ø CIRCLE(132,77),5,,.9Ø,.4Ø,.9
Ø
22Ø CIRCLE(11Ø,9Ø),5,,.9Ø,.4Ø,.9
Ø
23Ø CIRCLE(119,1Ø3),5,,.9Ø,.9Ø,.
4Ø
24Ø CIRCLE(126,88),2Ø,,.9Ø,.83,.
99
25Ø CIRCLE(1Ø4,1Ø2),2Ø,,.9Ø,.83,
.99

```

```

26Ø CIRCLE(125,91),2Ø,,.9Ø,.33,.
49
27Ø CIRCLE(148,78),2Ø,,.9Ø,.33,.
49
28Ø LINE (1Ø8,96)-(114,96),PSET
29Ø LINE-(1Ø9,1Ø2),PSET
3ØØ LINE(13Ø,84)-(136,84),PSET
31Ø LINE-(131,9Ø),PSET
32Ø PAINT(152,112)
33Ø PAINT(111,97)
34Ø PAINT(133,86)
35Ø LINE(153,93)-(144,1Ø1),PRESE
T
36Ø LINE(123,127)-(113,136),PRES
ET
37Ø GOTO 37Ø

```

Program Listing 2. Moonset

```

5 REM MOONSET
1Ø PMODE 3,1:PCLS:SCREEN 1,1
2Ø LINE(Ø,72)-(256,72),PSET
3Ø CIRCLE(128,35),3Ø,8
4Ø PAINT (128,35),8,8
5Ø PAINT (4Ø,2Ø),3,4
6Ø PAINT(128,191),2,4
7Ø CIRCLE(128,75),3Ø,4,.11
8Ø PAINT(128,75),8,8
9Ø CIRCLE(128,8Ø),32,4,.11
1ØØ PAINT(128,8Ø),8,8
11Ø CIRCLE(128,85),28,4,.11

```

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12Ø PAINT(128,85),8,8	45Ø PAINT(196,76),5,5	78Ø PAINT(216,14Ø),5,5
13Ø CIRCLE(128,9Ø),26,4,.14	46Ø CIRCLE(2Ø4,84),1Ø,5,.2Ø	79Ø CIRCLE(16Ø,148),8,5,.18
14Ø PAINT(128,9Ø),8,8	47Ø PAINT(2Ø4,84),5,5	8ØØ PAINT(16Ø,148),5,5
15Ø CIRCLE(128,97),26,4,.Ø8	48Ø CIRCLE(228,92),1Ø,5,.2Ø	81Ø CIRCLE(2ØØ,154),1Ø,5,.18
16Ø PAINT(128,97),8,8	49Ø PAINT(228,92),5,5	82Ø PAINT(2ØØ,154),5,5
17Ø CIRCLE(128,11Ø),24,4,.15	5ØØ CIRCLE(232,84),8,5,.18	83Ø CIRCLE(236,15Ø),8,5,.18
18Ø PAINT(128,11Ø),8,8	51Ø PAINT(232,84),5,5	84Ø PAINT(236,15Ø),5,5
19Ø CIRCLE(128,115),2Ø,4,.Ø8	52Ø CIRCLE(2Ø,84),4,5,.18	85Ø CIRCLE(224,172),1Ø,5,.19
2ØØ PAINT(128,115),8,8	53Ø CIRCLE(86,1Ø4),8,5,.18	86Ø PAINT(224,172),5,5
21Ø CIRCLE(128,12Ø),14,4,.11	54Ø PAINT(86,1Ø4),5,5	87Ø CIRCLE(2ØØ,184),8,5,.18
22Ø PAINT(128,12Ø),8,8	55Ø CIRCLE(76,1Ø9),1Ø,5,.14	88Ø PAINT(2ØØ,184),5,5
23Ø CIRCLE(128,125),16,4,.1Ø	56Ø PAINT(78,1Ø9),5,5	89Ø CIRCLE(18Ø,172),1Ø,5,.2Ø
24Ø PAINT(128,125),8,8	57Ø CIRCLE(64,8Ø),8,5,.18	9ØØ PAINT(18Ø,172),5,5
25Ø CIRCLE(128,135),14,4,.15	58Ø PAINT(64,8Ø),5,5	91Ø CIRCLE(148,18Ø),8,5,.18
26Ø PAINT(128,135),8,8	59Ø CIRCLE(36,118),7,5,.18	92Ø PAINT(148,18Ø),5,5
27Ø CIRCLE(128,138),12,4,.14	6ØØ PAINT(36,118),5,5	93Ø CIRCLE(12,16Ø),8,5,.18
28Ø PAINT(128,138),8,8	61Ø CIRCLE(16,128),8,5,.18	94Ø PAINT(12,16Ø),5,5
29Ø CIRCLE(128,145),8,4,.18	62Ø PAINT(16,128),5,5	95Ø CIRCLE(28,18Ø),1Ø,5,.2Ø
3ØØ PAINT(128,145),8,8	63Ø CIRCLE(152,12Ø),1Ø,5,.18	96Ø PAINT(28,18Ø),5,5
31Ø CIRCLE(128,165),6,4,.75	64Ø PAINT(152,12Ø),5,5	97Ø CIRCLE(68,148),1Ø,5,.2Ø
32Ø CIRCLE(128,165),5,4,.85	65Ø CIRCLE(172,112),8,5,.2Ø	98Ø PAINT(68,148),5,5
33Ø PAINT(128,165),8,8	66Ø PAINT(172,112),5,5	99Ø CIRCLE(1ØØ,184),8,5,.18
34Ø CIRCLE(36,77),1Ø,5,.25	67Ø CIRCLE(2Ø4,116),8,5,.19	1ØØØ PAINT(1ØØ,184),5,5
35Ø PAINT(36,77),5,5	68Ø PAINT(2Ø4,116),5,5	1Ø1Ø CIRCLE(1Ø8,156),8,5,.18
36Ø CIRCLE(64,94),1Ø,5,.18	69Ø CIRCLE(236,124),1Ø,5,.18	1Ø2Ø PAINT(1Ø8,156),5,5
37Ø PAINT(64,94),5,5	7ØØ PAINT(236,124),5,5	1Ø3Ø CIRCLE(9Ø,154),1Ø,5,.22
38Ø CIRCLE(25,1ØØ),8,5,.18	71Ø CIRCLE(44,136),8,5,.19	1Ø4Ø PAINT(9Ø,154),5,5
39Ø PAINT(25,1ØØ),5,5	72Ø PAINT(44,136),5,5	1Ø5Ø CIRCLE(56,172),8,5,.18
4ØØ CIRCLE(176,9Ø),1Ø,5,.18	73Ø CIRCLE(84,128),8,5,.19	1Ø6Ø PAINT(56,172),5,5
41Ø PAINT(176,9Ø),5,5	74Ø PAINT(84,128),5,5	1Ø7Ø FOR X=1 TO 2ØØ
42Ø CIRCLE(2Ø4,1Ø4),8,5,.2Ø	75Ø CIRCLE(176,132),1Ø,5,.17	1Ø8Ø S1=RND(256):S2=RND(72)
43Ø PAINT(2Ø4,1Ø4),5,5	76Ø PAINT(176,132),5,5	1Ø9Ø PSET(S1,S2,5):NEXT X
44Ø CIRCLE(196,76),8,5,.18	77Ø CIRCLE(216,14Ø),8,5,.18	11ØØ GOTO 11ØØ

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Program Listing 3. Pennsylvania Dutch

1 REM PA-DUTCH

5 CLS(0)

10 PRINT @ 10,CHR\$(193);
 15 PRINT @ 11,CHR\$(193);
 20 PRINT @ 18,CHR\$(225);
 25 PRINT @ 19,CHR\$(227);
 30 PRINT @ 20,CHR\$(227);
 35 PRINT @ 21,CHR\$(147);
 40 PRINT @ 22,CHR\$(147);
 45 PRINT @ 43,CHR\$(207);
 50 PRINT @ 44,CHR\$(203);
 52 PRINT @ 45,CHR\$(210);
 55 PRINT @ 50,CHR\$(229);
 60 PRINT @ 51,CHR\$(239);
 65 PRINT @52,CHR\$(231);
 70 PRINT @53,CHR\$(156);
 75 PRINT @ 54,CHR\$(156);
 80 PRINT @ 55,CHR\$(154);
 85 PRINT @ 75,CHR\$(221);
 90 PRINT @ 76,CHR\$(223);
 95 PRINT @ 77,CHR\$(223);
 100 PRINT @ 82,CHR\$(159);
 105 PRINT @ 83,CHR\$(159);
 110 PRINT @ 84,CHR\$(154);
 115 PRINT @109,CHR\$(220);
 120 PRINT @ 110,CHR\$(210);
 125 PRINT @ 113,CHR\$(183);
 130 PRINT @ 114,CHR\$(191);
 135 PRINT @ 115,CHR\$(191);
 140 PRINT @ 116,CHR\$(186);

145 PRINT @ 141,CHR\$(222);
 150 PRINT @ 142,CHR\$(212);
 155 A\$=CHR\$(191)+CHR\$(191)+CHR\$(191)
 156 PRINT @ 145,A\$;
 160 PRINT @ 144,CHR\$(183);
 165 PRINT @ 148,CHR\$(186);
 170 PRINT @ 175,CHR\$(183);
 175 PRINT @ 206,CHR\$(183);
 180 PRINT @ 176,A\$;
 185 PRINT @179,CHR\$(191);
 190 PRINT @ 180,CHR\$(186);
 195 PRINT @ 143,CHR\$(210);
 200 PRINT @171,CHR\$(209);
 205 PRINT @ 172,CHR\$(223);
 220 PRINT @ 203,CHR\$(213);
 225 PRINT @ 204,CHR\$(223);
 230 PRINT @ 235,CHR\$(222);
 235 PRINT @ 207,A\$;
 240 PRINT @ 210,CHR\$(255);
 245 PRINT @211,CHR\$(255);
 250 PRINT @ 237,CHR\$(183);
 255 PRINT @ 238,A\$;
 260 PRINT @ 241,CHR\$(255);
 265 PRINT @ 242,CHR\$(255);
 270 PRINT @ 243,CHR\$(250);
 275 PRINT @268,CHR\$(183);
 280 PRINT @ 269,A\$;
 285 C\$=CHR\$(255)+CHR\$(255)+CHR\$(255)
 290 PRINT @ 272,C\$;
 300 PRINT @ 300,CHR\$(247);
 305 PRINT @ 301,C\$;

310 PRINT @304,CHR\$(255);
 315 PRINT @ 305,CHR\$(255);
 320 PRINT @ 331,CHR\$(245);
 325 PRINT @ 332,C\$;
 330 PRINT @ 335,CHR\$(255);
 335 PRINT @ 336,CHR\$(159);
 340 PRINT @ 337,CHR\$(159);
 345 PRINT @ 368,CHR\$(159);
 350 PRINT @ 400,CHR\$(159);
 360 PRINT @ 431,CHR\$(156);
 365 PRINT @ 433,CHR\$(156);
 370 PRINT @ 330,CHR\$(207);
 375 PRINT @ 362,CHR\$(207);
 380 PRINT @ 363,CHR\$(207);
 385 PRINT @ 364,CHR\$(207);
 390 PRINT @ 395,CHR\$(207);
 395 PRINT @ 394,CHR\$(207);
 400 PRINT @ 331,CHR\$(207);
 405 PRINT @329,CHR\$(195);
 410 PRINT @361,CHR\$(207);
 415 PRINT @ 393,CHR\$(204);
 420 PRINT @360,CHR\$(207);
 425 D\$=CHR\$(220)+CHR\$(220)+CHR\$(220)+CHR\$(220)+CHR\$(220)+CHR\$(220)+CHR\$(220)
 430 E\$=D\$+D\$
 435 F\$=E\$+E\$
 440 PRINT @ 453,F\$;
 450 PRINT @ 430,CHR\$(147);
 455 PRINT @ 422,CHR\$(217);
 460 PRINT @ 275,CHR\$(217);
 465 PRINT@308,CHR\$(217);
 470 PRINT @341,CHR\$(217);
 475 PRINT @ 437,CHR\$(215);

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- Programs can use all 64k of RAM for either program storage or for large numbers of variables and arrays like A(20000)
- Full Floating Point arithmetic expressions with functions
- SUBROUTINE and CALL commands allows for structured programming and more independent program development
- Full sequential and direct access disk files allowed
- BASIC source and M.L. output I/O to disk, tape or memory
- Many new commands that expand your programming capability

Commands Supported

1. I/O -Commands

CLOSE	CLOADM	CSAVEM	DIR	DRIVE	DSKIS
DSKO\$	FIELD	FILES	GET	INPUT	KILL
LSET	OPEN	PRINT	PUT	RSET	
2. Program Control Commands

CALL	END	EXEC	FOR	STEP	NEXT
GOSUB	GOTO	IF	THEN	ELSE	ERROR
ON..GO	RETURN	STOP	SUBROUTINE		
3. Math Functions

ABS	ASC	ATN	COS	CVN	EOF
EXP	FIX	INSTR	INT	LEN	LOG
LOC	LOF	PEEK	POINT	PPOINT	RND
SGN	SIN	SQR	TAN	TIMER	VAL
4. String Functions

CHR\$	INKEY\$	LEFT\$	MID\$	MKNS	RIGHT\$
STR\$	STRING\$				
5. Graphic/Sound Commands

COLOR	CLS	CIRCLE	DRAW	LINE	PAINT
PCLEAR	PCLS	PLAY	PMODE	PRESET	PSET
RESET	SCREEN	SET	SOUND		
6. Other/Special Commands

DATA	DIM	LLIST	MOTOR	POKE	READ
REM	RESTORE	RUN	TAB	VERIFY	DLD
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```

480 PRINT @ 406,CHR$(214);
485 PRINT @487,CHR$(215);
490 PRINT @ 374,CHR$(217);
495 PRINT @ 343,CHR$(214);
500 PRINT @ 312,CHR$(214);
505 PRINT @ 313,CHR$(223);
510 PRINT @ 279,CHR$(223);
515 PRINT @ 280,CHR$(207);
520 PRINT @ 281,CHR$(199);
525 PRINT @ 456,CHR$(223);
530 PRINT @ 423,CHR$(217);
535 PRINT @390,CHR$(223);
540 PRINT @389,CHR$(220);
1000 GOTO 1000

```

Program Listing 4. Train

```

5 REM TRAIN
10 PMODE 4,1:PCLS:SCREEN 1,1
20 DRAW "BM44,142;E16R10E10R70U3
4R40D10L6D40"
30 DRAW "BM44,142;R20U8R22BR20R6
BR20R26BR20R6U2"
40 DRAW "BM150,98;L8U10L14D10L40
U12E5L20F5D12L6G5D16F5"
50 DRAW "BM66,107;L4D8R4"
60 LINE(156,92)-(180,108),PSET,B
F
70 LINE(0,146)-(256,146),PSET
80 LINE(0,153)-(256,153),PSET
90 LINE(0,148)-(256,148),PSET
100 CIRCLE(96,136),10

```

```

110 CIRCLE(122,136),10
120 CIRCLE(168,136),10
130 CIRCLE(74,140),5
140 CIRCLE(96,136),3
150 CIRCLE(122,136),3
160 CIRCLE(168,136),3
170 CIRCLE(74,140),1
180 LINE(122,130)-(168,130),PSE
T
190 X=76:Y=82
200 SP=0:EP=0
210 FOR R=1 TO 24 STEP .05
220 EP=EP+.02:IF EP>1 THEN EP=0
230 CIRCLE(X+R,Y-R),R,5,1,SP,EP
240 NEXT R
250 AS="L2;B;P10;L8;B;B"
260 PLAY AS
270 LINE(0,92)-(62,107),PSET
280 LINE(0,130)-(62,115),PSET
290 PAINT(30,111)
300 LINE(122,130)-(168,130),PSE
T
310 FOR J=1 TO 5:NEXT J
320 LINE(122,130)-(168,130),PRES
ET
330 LINE(116,136)-(162,136),PSE
T
340 FOR J=1 TO 5:NEXT J
350 LINE(116,136)-(162,136),PRES
ET
360 LINE(122,142)-(168,142),PSE
T
370 FOR J=1 TO 5:NEXT J

```

```

380 LINE(122,142)-(168,142),PRES
ET
390 LINE(128,136)-(174,136),PSE
T
400 FOR J=1 TO 5:NEXT J
410 LINE(128,136)-(174,136),PRES
ET
420 GOTO 300

```

Program Listing 5. Bugspray

```

5 REM BUGSPRAY
10 PMODE 4,1:PCLS3:SCREEN 1,1
20 DIM V(43,23)
30 CIRCLE(128,18),10,0,.6
40 CIRCLE(128,16),5,0
50 PRESET(126,16)
60 PRESET(130,16)
70 PAINT(128,22),0,0
80 DRAW "BM135,18;C0;E6R2F6"
90 DRAW "BM135,18;C0;R6F2D6"
100 DRAW "BM135,18;C0;F6D6"
110 DRAW "BM 121,18;C0;H6L2G6"
120 DRAW "BM121,18;C0;G6D6"
130 DRAW "BM121,18;C0;L6G2D6"
140 LINE(128,0)-(128,12),PRESET
150 GET(107,9)-(150,32),V,G
160 PCLS3
170 LINE(128,0)-(128,22),PRESET
180 PUT(107,19)-(150,42),V,PSET
190 PCLS3
200 LINE(128,0)-(128,32),PRESET

```

ADOS ENHANCED, EPROM-ABLE DISK BASIC

Now, you can supercharge Basic with an impressive array of extra features WITHOUT sacrificing compatibility! ADOS is compatible with virtually 100% of commercial software. Customizing utilities are provided to allow user-defined command abbreviations, baud rate, step rate, tracks per disk (35 or 40), support of double-sided drives, and more. After customizing ADOS, you can have it burned into an EPROM that plugs into the Disk Basic ROM socket, or just use it in RAM as a 64K disk utility (EPROM + burning will cost about \$20; we provide information concerning how you can have this done). Features include: * repeat and edit of the last direct-mode command * 26 definable control-key abbreviations * automatic line-number prompts * DOS command + lowercase command entry (a line complement to a Lowerkit or PBJ WordPak) * COPY (filename) to (drive number) * AE error override option * RAM command (64K) * RUNM command * text echoing to printer * ML monitor * text file scan * enhanced directory * error trapping * hires text utility included (42, 51, or 64 characters per line).

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```

21# PUT(1#7,29)-(15#,52),V,PSET
22# PCLS3
23# LINE(128,#)-(128,42),PRESET
24# PUT(1#7,39)-(15#,62),V,PSET
25# PCLS3
26# LINE(128,#)-(128,52),PRESET
27# PUT(1#7,49)-(15#,72),V,PSET
28# PCLS3
29# LINE(128,#)-(128,62),PRESET
30# PUT(1#7,59)-(15#,82),V,PSET
31# PCLS3
32# LINE(128,#)-(128,72),PRESET
33# PUT(1#7,69)-(15#,92),V,PSET
34# PCLS3
35# LINE(128,#)-(128,82),PRESET
36# PUT(1#7,79)-(15#,1#2),V,PSET
37# PCLS3
38# LINE(128,#)-(128,92),PRESET
39# PUT(1#7,89)-(15#,112),V,PSET
40# PCLS3
41# LINE(128,#)-(128,1#2),PRESET
42# PUT(1#7,99)-(15#,122),V,PSET
43# PCLS3
44# LINE(128,#)-(128,112),PRESET
45# PUT(1#7,1#9)-(15#,132),V,PSET
46# PCLS3
47# LINE(128,#)-(128,122),PRESET
48# PUT(1#7,119)-(15#,142),V,PSET
49# PCLS3
50# LINE(128,#)-(128,132),PRESET
51# PUT(1#7,129)-(15#,152),V,PSET
52# DRAW "BM184,54;C#;E25F1G25BE
1F44G1F1E25H1G25BE24H3#BH9H5BH1G
3L1#G7D12"
53# DRAW "BM192,35;C#;H4G2F4BH4E
4H8G6F8E2"
54# CIRCLE(175,2#),6,#,1,.125,.5
55# CIRCLE(17#,6),2#,#,1,.#8,.1
3
56# CIRCLE(19#,#),16,#,1,.15,.3
57# CIRCLE(221,8),22,#,1,.31,.4
8
58# CIRCLE(212,33),6,#,1,.84,.1
8
59# CIRCLE(228,72),37,#,1,.6,.7
#
60# CIRCLE(2#3,52),4,#,1,.125,.6
25
61# CIRCLE(2#6,49),4,#,1,.625,.
125
62# LINE(2#1,5#)-(2#4,47),PRESET
63# LINE(2#5,54)-(2#8,51),PRESET
64# CIRCLE(191,13),45,#,1,.125,.
21
65# LINE(2#4,22)-(2#8,33),PRESET
66# LINE(212,32)-(216,28),PRESET
67# LINE(222,44)-(237,3#),PRESET
68# CIRCLE(242,41),12,#,1,.625,.
82
69# CIRCLE(246,7),24,#,1,.1,.24

```

```

9
70# CIRCLE(185,33),22,#,1,.62,.
7
71# CIRCLE(19#,23),17,#,1,.62,.7
2
72# CIRCLE(2#9,98),95,#,1,.71,.7
8
73# LINE(22#,4)-(256,9),PRESET
74# LINE(256,9)-(256,19),PRESET
75# LINE(213,35)-(217,31),PRESET
76# CIRCLE(224,19),24,#,1,.#8,.
2
77# CIRCLE(243,56),19,#,1,.58,.
7
78# CIRCLE(166,7),15,#,1,.#2,.2
2
79# PRESET(181,3#)
80# CIRCLE(18#,31),4,#,1,.625,.1
25
81# FOR I=1 TO 2#:#NEXT I
82# LINE(18#,31)-(72,118),PRESET
83# LINE(18#,31)-(164,172),PRESET
84# COLOR 5
85# FOR I=1 TO 2#:#NEXT I
86# LINE(18#,31)-(72,118),PSET
87# LINE(18#,31)-(164,172),PSET
88# FOR I=1 TO 2#:#NEXT I
89# LINE(18#,31)-(72,118),PRESET
90# LINE(18#,31)-(164,172),PRESET
91# COLOR 5
92# FOR I=1 TO 2#:#NEXT I
93# LINE(18#,31)-(72,118),PSET
94# LINE(18#,31)-(164,172),PSET
95# FOR I=1 TO 2#:#NEXT I
96# LINE(18#,31)-(72,118),PRESET
97# LINE(18#,31)-(164,172),PRESET
98# COLOR 5
99# FOR I=1 TO 2#:#NEXT I
100# LINE(18#,31)-(72,118),PSET
101# LINE(18#,31)-(164,172),PSET
102# DRAW "BM135,183;C#;F6R2E6"
103# PCLS3
104# LINE(8,188)-(248,188),PRESET
105# CIRCLE(128,183),1#,#,.#6
106# CIRCLE(128,184),5,#
107# PAINT(122,183),#,#
108# PAINT(134,183),#,#
109# DRAW "BM121,183;C#;G6L2H6"
110# DRAW "BM121,183;C#;L6H2U6"
111# DRAW "BM121,183;C#;H6U6"
112# DRAW "BM135,183;C#;F6R2E6"
113# DRAW "BM135,183;C#;R6E2U6"
114# DRAW "BM135,183;C#;E6U6"
115# DRAW "BM128,144;C#;E4H4E4H4E
4H4E4H4"
116# DRAW "BM128,144;C#;F4G4F4G4
"
117# DRAW "BM12#,138;C#;H4E4H4E4H
E4E"
118# DRAW "BM14#,138;C#;H4E4H4E4H
E4E"
119# X$="L4;F;L2;F;L4;F;L2;F;L4;
F;L2;F;L4;G+;L2;G+;L4;G;L2;G;L4;
F;L2;F;L4;E;L2;F"
120# PLAY X$
121# GOTO 121#

```

Program Listing 6. Badgrem

```

5 REM BAD GREMLIN
1# PMODE 4,1:PCLS1:SCREEN 1,#
15 DRAW "BM45,53;C2;M4#,52;M37,4
4;M35,36;M36,24;M37,12;M39,8;M42
,2;M47,3;M48,8;M47,11;M56,24;M6#
,32;M64,36;M68,38"
2# DRAW "BM46,55;C2;M41,45;M4#,4#
;M39,35;M39,28;M4#,2#;M4#,18;M42
,12;M46,7"
25 DRAW "BM56,41;C2;M68,38;M71,35
;M7#,34;M71,35;M7#,34;M71,31;M7#
,3#;M71,27;M7#,26;M72,25;M74,26;
M76,25;M78,27;M78,25;M8#,27;M82,
26;M84,3#;M86,29;M88,32;M92,37;M
94,39;M96,38"
3# DRAW "BM96,38;M1#5,37;M1#9,38;
M111,37;M113,41;M114,42;M118,4#;
M119,42;M118,44;M122,43;M118,47;
M115,49;M1#5,52;M1#7,54;M1#7,59;
M1#8,62;M1#6,64;M1#4,68;M1#1,66;
M99,69;M98,68;M96,7#;M96,68;M92,
72"
35 DRAW "BM119,46;C2;M12#,47;M122
,48;M128,5#;M13#,49;M135,5#;M139
,47;M141,49;M137,55;M128,6#;M126
,64;M123,65;M12#,64;M121,6#;M124
,57;M128,55;M133,53;M137,5#;M134
,5#"
4# DRAW "BM123,64;C2;M112,71;M11#
,71;M1#8,73;M1#6,75;M1#3,77;M1##
,75;M92,73;M94,78;M92,81;M9#,82;
M88,83;M89,8#;M86,77"
45 DRAW "BM72,64;C2;M74,64;M73,59
;M71,61;M68,57;M67,52;M64,55;M62
,52;M61,48;M6#,52;M58,5#;M57,48;
M56,44;M55,4#"
5# DRAW "BM96,38;C2;M95,33;M94,27
;M93,22;M92,28;M9#,22;M89,28;M87
,21;M86,28;M84,22;M83,28;M8#,22;
M79,24"
55 DRAW "BM73,64;C2;M76,68;M77,7
2;M76,76;M74,78;M8#,77;M82,71;M8
3,76;M8#,8#;M78,82;M83,81;M86,78
"
6# DRAW "BM7#,46;C2;M76,43;M8#,42
;M84,42;M88,43;M88,41;M9#,4#;M93
,42;M95,41;M96,43;M1##,43;M1#1,4
5;M99,46;M1##,5#;M1#2,52;M1#3,56
;M1#2,59;M98,62;M96,64;M94,67;M9
#,68;M88,67;M84,64;M8#,59;M75,52
;M72,47;M7#,46"
65 DRAW "BM91,43;C2;M91,45"
7# DRAW "BM96,45;C2;M96,46"
75 DRAW "BM7#,46;C2;M76,48;M82,5#
;M86,51;M92,51;M96,52;M1##,56;M1
#2,59"
8# DRAW "BM74,47;C2;M77,45;M83,44
"
85 DRAW "BM8#,49;C2;M82,46;M85,45
"
9# DRAW "BM82,5#;C2;M87,46"
95 DRAW "BM87,5#;C2;M89,47"
1# DRAW "BM9#,51;C2;M91,48"
1# DRAW "BM95,51;C2;M94,48"
11# DRAW "BM99,55;C2;M97,49"
115 DRAW "BM8#,3#;C2;NM8#,36;NM79
,36;M78,31;M76,33;M78,35;M8#,36;
M82,36;M83,35;M83,33;M82,32;M8#,
3#"
12# DRAW "BM8#,3#;C2;M76,3#;M72,2
9;BM79,36;M77,36;M73,34;M71,32"
125 DRAW "BM11#,48;C2;M112,48;M11

```


4,49"
 130 DRAW"BM112,43;C2;M114,45;M116,47"
 135 DRAW"BM104,43;C2;M106,42;M110,42;M112,44;M111,46;M108,48;M107,47;NM107,42;NM108,42;M106,46;M105,45;M104,43"
 140 PAINT(111,47),0,0
 145 PAINT(74,32),0,0
 150 PSET(90,56):PSET(90,55)
 155 PSET(90,54):PSET(90,53)
 160 PSET(90,57):PSET(90,58)
 165 PSET(91,57):PSET(92,56)
 170 PSET(92,55):PSET(93,54)
 175 PSET(94,55):PSET(95,56)
 180 PSET(95,57):PSET(95,58)
 185 PSET(95,59):PSET(95,60)
 190 PSET(96,59):PSET(97,58)
 195 PSET(97,57):PSET(98,58)
 200 PSET(99,59):PSET(89,53)
 205 PSET(88,53):PSET(87,54)
 210 PSET(87,55):PSET(86,56)
 215 PSET(86,57):PSET(86,56)
 220 PSET(85,55):PSET(84,54)
 225 PSET(84,53):PSET(83,53)
 230 PSET(82,52):PSET(81,53)
 235 PSET(80,54):PSET(80,53)
 240 PSET(80,52):PSET(79,52)
 245 PSET(78,52):PSET(77,52)
 250 PSET(80,57):PSET(80,56)
 255 PSET(82,55):PSET(82,56)
 260 PSET(82,56):PSET(82,57)

265 PSET(83,58):PSET(84,59)
 270 PSET(85,60):PSET(86,60)
 275 PSET(87,59):PSET(87,60)
 280 PSET(87,61):PSET(87,62)
 285 PSET(87,63):PSET(88,64)
 290 PSET(89,63):PSET(89,62)
 295 PSET(90,61):PSET(91,60)
 300 PSET(91,61):PSET(91,62)
 305 PSET(91,63):PSET(92,64)
 310 PSET(93,63):PSET(94,62)
 315 PSET(95,63):PSET(96,64)
 320 DRAW"BM48,56;C2;M47,55;M47,54;M49,53;M48,52;M48,51;M52,50;M55,52;M58,53;M61,55;M64,57;M67,60"
 325 DRAW"BM20,104;C2;M28,108;M33,110;M36,109;M44,110;M48,112;M52,117;M54,118;NM56,114;M56,119;NM58,118;M60,122;M64,124;M67,125;NM67,122;M71,126;M74,126;M67,122;BM70,122;M69,121;M68,120;M64,119;M60,116;M59,113;M56,112;M55,108;M52,106"
 330 DRAW"BM45,62;C2;M44,61;M44,60;M46,59;M45,58;M45,57;M47,56"
 335 DRAW"BM45,62;C2;M48,64;M51,65;M53,67;M56,70;M59,72"
 340 DRAW"BM46,59;C2;M49,61;M52,62;M55,64;M58,67;M61,69"
 345 DRAW"BM47,56;C2;M50,58;M53,59;M56,61;M59,63;M62,65"
 350 DRAW"BM48,53;C2;M51,55;M54,5

6;M57,58;M60,60;M63,62"
 355 DRAW"BM59,72;C2;M60,71;M60,69;M63,67;M61,65;M65,66;M63,62;M66,64;M67,62;M66,60"
 360 DRAW"BM45,62;C2;M43,64;M39,68;M36,69;M32,73;M30,76;M26,79;M22,82;M18,86;M14,88;M13,91;M12,94;M12,98;M15,102;M20,104"
 365 DRAW"BM55,106;C2;M63,105;M65,106;M66,108;M70,109;M72,114;M76,116;M75,115;M75,111;M76,116;M79,114;M78,113;M80,118;M82,115;M80,112;M80,109;M78,108;M77,108;M70,105;M69,105;M69,107;M70,103;M68,102;NM67,104"
 370 DRAW"BM58,72;C2;M52,78;M48,86;M44,88;M40,90;M34,93;M35,97;M37,99;M39,100;M43,99;M47,97;M51,97;M55,94;M59,93;M60,92;M62,92;M63,93;M74,95;NM72,97;M75,94;M77,96;NM75,98;M80,99;M81,102;M78,100;M76,99;M74,101;M72,99"
 375 DRAW"BM66,102;C2;M64,101;M60,101;M58,100;NM57,103;M55,101;M51,100"
 380 DRAW"BM56,99;C2;M60,98;NM60,95;M60,99;M62,99;M62,98;M72,99"
 385 DRAW"BM63,92;C2;M73,95"
 390 DRAW"BM95,77;C2;M98,78;M100,80;M101,82"
 395 DRAW"BM94,79;C2;M97,80;M99,82;M100,84"

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400 DRAW"BM93,81;C2;M96,82;M98,8
4;M99,86"
405 DRAW"BM92,83;C2;M95,84;M97,8
6;M98,88"
410 DRAW"BM98,88;C2;M94,88;M94,9
0;M92,92;M88,94;M87,97"
415 DRAW"BM71,118;C2;M75,114;BM7
7,108;M82,104;M85,100;M87,97"
420 DRAW"BM20,104;C2;M13,108;M21
,107;M16,111;M22,109;M20,114;M25
,110;M24,114;M28,111;M28,114;M31
,110"
425 DRAW"BM98,88;C2;M102,84;M106
,86;M108,88;M110,92;M112,95;M116
,94;M120,93;M124,92;M128,93;M136
,94;M146,92"
430 DRAW"BM90,93;C2;M94,100;M98,
102;M105,104;M108,108;M112,111;M
118,109;M139,102;M146,103;M151,1
02"
435 DRAW"BM146,90;C2;M142,89;M14
4,87;M144,84;M142,82;M138,83;M14
1,84;M141,88;M142,89;M138,88;M13
8,84;M144,83;M148,82;M152,86;M15
8,85;NM156,86;M162,86;M163,90;M1
58,92;M154,96;M153,95;M155,93;M1
55,90;M153,90;M152,93;M150,94;M1
48,95;M152,96"
440 DRAW"BM146,90;C2;M148,96;M15
0,100;M154,103"
445 DRAW"BM155,88;C2;M153,88;M15
1,90;M150,92"
450 DRAW"BM140,91;C2;NM141,89;NM
138,89"
455 DRAW"BM158,92;C2;M163,94;M16
4,96;M163,100;M163,104;M164,106;
M159,107;M158,104;M154,103;M155,
105"
460 DRAW"BM159,107;C2;M157,108;M
154,109;M155,106"
465 DRAW"BM154,101;C2;M156,100;M
157,97;M156,95"
470 DRAW"BM44,88;C2;M40,99"
475 DRAW"BM118,109;C2;M114,114;M
120,110;M120,114;M123,113;M124,1
10;M125,112;M128,108;M128,111;M1
32,106;M132,110;M136,103"
480 DRAW"BM71,118;C2;M77,121;M8
3,121;M80,125;M78,126;M74,128;M8
4,136;M88,139;M90,150;M87,156"
485 DRAW"BM81,123;C2;M87,123;M85
,125;M84,128;M78,130;BM85,125;M9
1,125;M88,130;M83,134"
490 DRAW"BM95,88;C2;M92,86;M90,8
4"
495 DRAW"BM60,136;C2;M62,140;M59
,144;M56,146;M52,147;M42,144;M48
,146;M56,150;M59,152;M61,150;M60
,144"
500 DRAW"BM39,148;C2;M44,140;M48
,137;M50,132;M53,126"
505 DRAW"BM32,190;C2;M31,186;M26
,184;M28,182;M31,183;M32,186;M32
,190;M32,186;M35,184;M29,180;M29
,176;M26,174;M29,178;M34,181;M37
,180;M40,180;M41,183;M42,180;M39
,177;M36,176;M34,178;M37,180;M36
,176;M32,174;M28,168;M30,164;M36
,159;M38,151;M39,148"
510 DRAW"BM109,169;C2;M113,168;M
116,170;M120,175;M114,173;M113,1
71;M116,170;M116,174;M110,175"
515 DRAW"BM36,110;C2;M37,116;M32
,124;M29,128;M28,135;M26,144;M20

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,156;M17,164;M17,170;M15,174;M8,
182;M7,186;M8,188;M8,186;M10,184
;M7,183;M8,182;M12,181;M12,184;M
11,186;M15,187;M18,184;M20,180;M
22,184;M30,188"
520 DRAW"BM93,174;C2;M100,176;M1
07,176;M112,178;M110,175;M107,17
2;M103,170;M104,172;M107,176;M11
0,175;M111,172;M109,169;M105,168
;M100,170;M95,168;M92,164;M88,16
0;M87,156"
525 DRAW"BM82,176;C2;M81,172;M83
,170;M85,172;M87,180;NM88,171;M9
0,176;M93,174;M92,170;M88,168;BM
90,176;M90,172;M88,171;M85,172"
530 DRAW"BM51,130;C2;M54,133;M64
,138;M72,139;M79,140;M78,146;M79
,152;M73,156;M71,160;M72,164;M73
,167;M75,164;M76,163;M80,166;M78
,170;M82,176"
535 DRAW"BM97,131;C2;NM85,137;M9
0,130;BM82,176;M86,177"
540 DRAW"BM98,135;C2;NM89,139;M9
0,135"
545 DRAW"BM99,143;C2;NM90,143;M9
4,138"
550 DRAW"BM98,147;C2;NM90,147;M9
4,143"
555 LINE (175,126)-(172,127),PSE
T
560 LINE-(204,166),PSET
565 LINE-(244,139),PSET
570 LINE-(244,160),PSET
575 LINE-(204,188),PSET
580 LINE-(172,152),PSET
585 LINE-(172,127),PSET
590 LINE (204,189)-(204,166),PSE
T
595 LINE (244,139)-(237,133),PSE
T
600 LINE-(240,132),PSET
605 LINE-(240,127),PSET
610 LINE-(210,100),PSET
615 LINE-(172,117),PSET
620 LINE-(172,122),PSET
625 LINE-(204,149),PSET
630 LINE-(240,132),PSET
635 LINE (172,117)-(204,144),PSE
T
640 LINE-(240,127),PSET
645 LINE (204,144)-(204,149),PSE
T
650 CIRCLE(200,154),4,0
655 CIRCLE(210,154),4,0
660 CIRCLE(200,154),1,0
665 CIRCLE(210,154),1,0
670 PAINT(215,152),0,0
675 DRAW"BM190,64;R4U2L4U2R4BR3N
R4D2NR3D2R4BR3NR4U2NR3U2R4BR3BD2
R4BR3BU2D4R4U4"
680 DRAW"BM192,72;U4F4U4BR3NR4D2
NR3D2R4BR3BU4F2NE2NG2F2BR5U4BL2R
4"
685 DRAW"BM183,80;U4R4D2L4BR7BU2
ND4R4D2L3F2BR5U4R4D4L4BR7BU4NR4D
4R4U2L2BR5BD2U4R4D2L3F2BR3E4F3NL
5F1BR2U4F2E2D4"
690 DRAW"BM210,84;D10NH5NE5"
695 DRAW"BM204,118;U2R5D5L5D4BD3
RID1L1U1"
700 DRAW"BM36,124;M40,122;M44,12
2;M47,126;M49,129"
705 DRAW"BM34,128;M38,126;M41,12
7;M44,129;M46,132"
710 DRAW"BM33,131;M37,129;M40,13

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0;M44,135"
715 DRAW "BM31,135;M34,134;M39,1
35;M41,140"
720 DRAW"BM31,139;M35,138;M38,14
1"
725 DRAW"BM30,142;M34,143;M36,14
5"
730 DRAW"BM28,146;M32,145;M34,14
8"
735 GOTO 735

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Program Listing 7. Lilgrem

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5 REM LITTLE GREMLIN
10 PMODE 4,1:PCLSL:SCREEN 1,0
15 DRAW"BM0,40;C2;M3,42;M5,42;M7
,47;M26,62;M28,64;M26,68;M24,69;
M23,72;M20,74;M18,76;M14,80;M11,
80;M6,81;M0,82"
20 DRAW"BM0,61;C2;M6,63;M3,68;M0
,69"
25 DRAW"BM23,72;C2;M27,74;M22,75
;M25,76;M20,77;M23,78;M22,78;M17
,79;M20,80;M14,81;M19,82;M12,81;
M11,80"
30 DRAW"BM7,80;C2;M8,84;M11,92;M
16,97;M18,100;M19,108;M23,120;M2
5,124;M28,129;M30,132;M32,136;M3
3,140;M34,143;M40,148;M41,151;M4
2,152;M43,156;M42,156;M40,154;M3
7,153;M34,154;M32,152;M29,149;M2
8,146;M28,154;M24,157;M20,157"
35 DRAW"BM40,154;C2;M38,152;M38,
150;M41,151"
40 DRAW"BM20,161;C2;M20,157;M23,
153;M21,152;M19,153;M18,156;M18,
158;M20,161;BM17,157;M16,154;M16
,152;M19,149;M21,146"
45 DRAW "BM20,149;C2;M16,150;M13
,149;M15,148;M14,146;M12,147;M9,
148;M9,151;M11,150;M14,146;M17,1
44;M20,154;M20,137;M16,133;M13,1
28;M11,124;M10,120;M7,115;M0,109
"
50 DRAW"BM0,48;C2;M6,46;BM0,46;M
5,44;BM0,44;M3,42"
55 LINE(0,0)-(256,192),PSET,B
60 DRAW"BM0,95;C2;M5,93;M8,94BM0
,103;M3,98;M7,96;M10,97;BM4,106;
M6,101;M9,100;M12,101;BM7,109;M9
,105;M13,106;BM9,112;M12,108;M15
,109"
65 LINE(168,114)-(208,95),PSET
70 LINE-(240,128),PSET
75 LINE-(200,152),PSET
80 LINE-(168,114),PSET
85 LINE-(168,139),PSET
90 LINE-(200,173),PSET
95 LINE-(240,150),PSET
100 LINE-(240,128),PSET
105 LINE (200,152)-(200,173),PSE
T
110 LINE(208,95)-(208,115),PSET
115 LINE-(228,135),PSET
120 LINE (208,115)-(180,129),PSE
T
125 DRAW"BM180,164;C2;M180,169;M
139,186;NM139,181;M112,158;M112,
153;M139,181;M180,164"
130 DRAW"BM180,164;C2;M148,138;N
M148,143;M112,153;M116,156;M148,

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143;M176,166"
135 DRAW"BM78,32;C2;M86,31;M94,3
Ø;M1Ø2,32;M1Ø8,34"
14Ø DRAW"BM148,34;C2;M154,32;M16
2,3Ø;M17Ø,3Ø;M178,32
145 DRAW"BM1Ø8,34;C2;M11Ø,32;M11
2,33;M114,32;M116,33;M118,32;M12
Ø,31;M122,32;M124,31;M128,3Ø;M13
Ø,3Ø;M132,31;M134,32;M136,31;M13
8,3Ø;M14Ø,3Ø;M142,31;M144,32LM14
6,33;M148,34"
15Ø DRAW"BM78,32;C2;M78,34;M8Ø,3
6;M82,38;NM88,34;M82,4Ø;M85,41;N
M9Ø,37;M85,42;M88,43;NM93,39;M88
,46;M9Ø,46;NM95,42;M9Ø,48;M92,49
;NM96,46;M92,51;M95,51;NM99,49;M
96,54;M98,54;M1Ø3,51"
155 CIRCLE(118,42),6,Ø
16Ø CIRCLE(138,42),6,Ø
165 CIRCLE(118,41),4,Ø
17Ø CIRCLE(138,41),4,Ø
175 CIRCLE(118,41),3,Ø
18Ø CIRCLE(138,41),3,Ø
185 CIRCLE(118,41),2,Ø
19Ø CIRCLE(138,41),2,Ø
195 PRESET(118,41,1)
2ØØ PRESET(119,41,1)
2Ø5 PRESET(138,41,1)
21Ø PRESET(139,41,1)
215 CIRCLE(128,48),3,Ø,1,.5,.Ø
22Ø DRAW"BM13Ø,48;C2;M132,49;M13
3,51"
225 DRAW"BM126,48;C2;M124,49;M12
3,51"
23Ø PSET(127,5Ø)
235 PSET(13Ø,5Ø)
24Ø DRAW"BM119,55;C2;M121,56;M12
3,56;M125,55;M127,54;M129,53;M13
1,53;M133,54;M135,55;M138,56;M13
8,53;M137,52;M135,51"
245 DRAW"BM122,51;C2;M121,5Ø;M12
Ø,51;M118,55"
25Ø CIRCLE(128,49),13,Ø,1,.1,.42
255 DRAW"BM178,32;C2;M176,36;M17
3,37;NM166,33;M172,4Ø;M171,41;NM
163,37;M17Ø,43;M168,44;NM16Ø,4Ø;
M166,47;M165,48;NM157,44;M164,51
;M162,52;NM155,49;M161,55;M159,5
6;NM152,51"
26Ø DRAW"BM1Ø2,54;C2;M1Ø4,57;M1Ø
4,59;M1Ø6,61;M1Ø8,63;M11Ø,65;M11
2,65;M114,66;M116,67;M118,67;M12
Ø,68;M122,69;M124,7Ø;M126,71;M12
8,71;M13Ø,71;M132,7Ø;M134,68;M13
7,67;M14Ø,66;M142,64;M144,63;M14
6,6Ø;M148,59;M15Ø,56;M152,55"
265 DRAW"BM1Ø6,62;C2;M1Ø2,66;M98
,68;M96,7Ø;M95,72;M94,76;M92,79;
M92,8Ø;M91,84;M91,85;M95,84;M96,
83;M99,86;M1Ø1,84;M1Ø4,85;M1Ø6,8
6;M1Ø8,85;M11Ø,81;M112,78;M114,7
7;M115,74;M116,72;M118,71"
27Ø DRAW"BM94,84;C2;M96,89;M99,8
9;M1ØØ,9Ø;M1Ø2,9Ø;M1Ø4,88;M1Ø3,8
6;M1Ø2,84"
275 DRAW"BM1Ø4,88;C2;M1Ø3,92;M1Ø
2,96;M1Ø2,1ØØ;M1Ø3,1Ø8;M1Ø4,112;
M1Ø5,115;M1Ø3,118;M1Ø5,121;M1Ø8,
12Ø;M112,119;M115,12Ø;M116,118;M
12Ø,12Ø;M122,119;M122,114;M121,1
12;M12Ø,1Ø6;BM117,1Ø2;M116,99;M1
14,98;M112,96;M112,95;M11Ø,94;M1
Ø8,92;M1Ø7,9Ø"
28Ø CIRCLE(1Ø9,123),1,2,2.1
285 CIRCLE(113,124),1,2,2.1

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29Ø CIRCLE(117,123),1,2,2.1
295 DRAW"BM1Ø6,121;C2;M1Ø8,123;M
11Ø,123;M112,124;M114,124;M116,1
23;M118,123;M12Ø,12Ø"
3ØØ DRAW"BM12Ø,1Ø6;C2;M122,1Ø8;M
123,1Ø6;M124,1Ø8;M125,1Ø6;M126,1
Ø8"
3Ø5 DRAW"BM134,98;C2;M132,1ØØ;M1
28,1Ø4;M126,1Ø8;M126,112;M128,11
5;M132,118;M136,119;BM134,116;NM
138,119;BM137,115;NM139,119;BM13
9,114;M143,118;M14Ø,116"
31Ø DRAW"BM13Ø,1Ø9;C2;M132,111;M
134,11Ø;M136,112;M137,11Ø;M14Ø,1
1Ø;M142,1Ø8;M144,1Ø5;M146,1Ø3;M1
46,1ØØ;M145,96;M145,92;M144,87"
315 DRAW"BM2Ø8,32;C2;R5U4L5U4R5B
R4NR5D4NR4D4R5BR3NR5U4NR4U4R5BR6
D8R1U8BD1ØBLR2D2L2U2"
32Ø DRAW"BM143,116;M14Ø,113;M13
8,111"
325 DRAW"BM14Ø,8Ø;C2;M143,85;M14
5,89;M147,91;M148,92;M146,96;M14
8,98;M151,98;M153,97;M154,96;M15
5,95;M154,94;NM148,92;M157,91;M1
58,89;M156,85;M154,82;M153,78;M1
5Ø,74;M148,71;M144,66"
33Ø FOR I=1 TO 5ØØ:NEXT I
335 DRAW"BM14Ø,8Ø;C5;M143,85;M14
5,89;M147,91;M148,92;M146,96;M14
8,98;M151,98;M153,97;M154,96;M15
5,95;M154,94;NM148,92;M157,91;M1
58,89;M156,85;M154,82;M153,78;M1
5Ø,74;M148,71;M144,66"
34Ø DRAW"BM141,66;C2;M148,68;M15
2,69;M156,7Ø;M16Ø,69;M164,68;M16
6,67;M168,68;M168,69;M172,69;M17
4,7Ø;M175,72;M176,74;M174,76;M17
2,77;M169,76;NM158,69;M167,78;M1
64,79;M16Ø,8Ø;M156,8Ø;M152,81;M1
48,82;M145,82;M144,83;M144,87"
345 FOR I=1 TO 5ØØ:NEXT I
35Ø DRAW"BM141,66;C5;M148,68;M15
2,69;M156,7Ø;M16Ø,69;M164,68;M16
6,67;M168,68;M168,69;M172,69;M17
4,7Ø;M175,72;M176,74;M174,76;M17
2,77;M169,76;NM158,69;M167,78;M1
64,79;M16Ø,8Ø;M156,8Ø;M152,81;M1
48,82;M145,82;M144,83;M144,87"
355 GOTO 32Ø

```

Program Listing 8. Walker

```

5 'THE IMPERIAL WALKER W/SOUND!
1Ø PMODE 4,1:PCLS3:SCREEN 1,1
2Ø DRAW"BM168,38;C2;M2Ø2,38;M2Ø6
,42;M238,5Ø;M238,78;M145,78;M145
,52;M168,4Ø;M168,38"
3Ø DRAW "BM17Ø,4Ø;C2;M2Ø2,4Ø;M2Ø
2,76;M17Ø,76;M17Ø,4Ø"
4Ø DRAW "BM17Ø,62;C2;M178,62;NU2
2;M186,62;NU22;M194,62;NU22;M2Ø2
,62"
5Ø DRAW "BM154,56;C2;M162,56;M16
2,6Ø;M154,6Ø;M154,56;BM172,56;M1
76,56;M176,6Ø;M172,6Ø;M172,56;BM
196,56;M2ØØ,56;M2ØØ,6Ø;M196,6Ø;M
196,56;BM212,56;M22Ø,56;M22Ø,6Ø;
M212,6Ø;M212,56"
6Ø DRAW"BM172,44;NM172,48;BM176,
44;NM176,48;BM18Ø,44;NM18Ø,48;BM
188,44;NM188,48;BM196,44;NM196,4
8;BM2ØØ,44;NM2ØØ,48"
7Ø DRAW"BM145,76;C2;M157,76;M157
,72;M166,72;M166,42"
8Ø DRAW" BM159,76;C2;M166,76;M16
6,7Ø"
9Ø DRAW "BM2Ø6,42;C2;M2Ø6,76;M22
4,76;M228,72;M238,72"
1ØØ DRAW "BM168,78;M177,83;M18Ø,
88;M194,88;M2Ø6,78"
11Ø DRAW "BM132,67;C2;M134,67;M1
34,78;M132,78;BR2;BU2;M145,76;M1
45,69;L2;ND7;L2;ND7;L2;ND7;L2;ND
7;L2;ND7"
12Ø DRAW "BM132,67;C2;M132,63;M1
Ø1,65;M9Ø,71;M9Ø,75;M97,76;M97,8
Ø;M1Ø8,8Ø;M1Ø8,86;M12Ø,86;M126,8
Ø;M132,8Ø;M132,67"
13Ø DRAW"BM11Ø,86;C2;U6;R3;D6;R2
;U6;R3;D6"
14Ø DRAW"BM1Ø8,82;C2;M84,82;M84,
8Ø;L6;D2;R4;D2;L4;D2;R6;U2;R24"
15Ø CIRCLE(1Ø6,71),5,Ø
16Ø LINE (1Ø3,69)-(1Ø9,73),PSET,B
17Ø LINE(84,7Ø)-(1Ø4,72),PSET,B
18Ø LINE(1Ø8,73)-(132,73),PSET
19Ø DRAW "BM116,64;C2;M12Ø,66;M1
22,69;M122,7Ø;R9"
2ØØ CIRCLE (1Ø6,71),7,Ø,1,.87,.9
9
21Ø CIRCLE (111,75),1Ø,Ø,1,.8,.9
2
22Ø LINE (114,71)-(119,71),PRESE
T
23Ø DRAW "BM124,64;C2;D4;R7"
235 COLOR 2,Ø
24Ø LINE(24,7Ø)-(41,72),PSET,B
25Ø LINE(54,7Ø)-(78,72),PSET,B
26Ø LINE(Ø,7Ø)-(17,72),PSET,B
27Ø CIRCLE (176,84),6,Ø,1,.1,.62
5
28Ø CIRCLE (176,84),8,Ø,1,.1,.23
29Ø CIRCLE (197,84),6,Ø,1,.9,.37
5
3ØØ CIRCLE(197,84),8,Ø,1,.27,.4
31Ø CIRCLE(22Ø,84),12,Ø,1,.52,.6
Ø
32Ø CIRCLE(22Ø,84),12,Ø,1,.92,.9
8
33Ø LINE (214,1Ø2)-(226,1Ø2),PSE
T
34Ø LINE(214,1Ø2)-(214,84),PSET
35Ø LINE(227,1Ø2)-(227,84),PSET

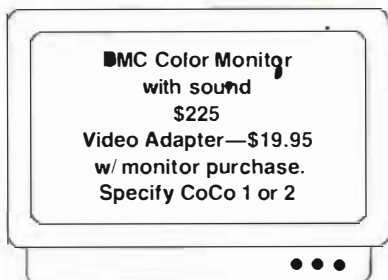
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36Ø CIRCLE (22Ø,84),7,Ø,1,.5Ø,.9
37Ø CIRCLE(22Ø,84),4,Ø,1,.Ø1,.5
38Ø LINE (218,1ØØ)-(224,1ØØ),PSE
T
39Ø LINE(217,1ØØ)-(217,84),PSET
40Ø LINE(224,1ØØ)-(224,84),PSET
41Ø DRAW "BM215,1Ø2;CØ;D2ØBR11U2
ØL3D16L5U16"
42Ø DRAW "BM2Ø8,84;C2;M214,1Ø2;B
R12;M232,84"
43Ø LINE(197,92)-(21Ø,95),PSET
44Ø CIRCLE(221,128),8,Ø
45Ø DRAW "BM217,13Ø;U4R8D4L8"
46Ø DRAW "BM215,134;C2;D16R11U16
BD4BL3L5D8R5U8"
47Ø DRAW "BM212,15Ø;C2;M229,15Ø;
M231,154;M225,16Ø;M214,16Ø;M2Ø9,
154;M212,15Ø"
48Ø DRAW "BM2Ø6,171;C2;M2Ø8,163;
M232,163;M234,171;M2Ø6,171"
49Ø CIRCLE(22Ø,157),2,Ø
50Ø CIRCLE(221,157),9,Ø,1,.99,.1
Ø
51Ø CIRCLE(219,157),9,Ø,1,.4Ø,.5
1
52Ø DRAW "BM212,171;C2;M212,173;
M2ØØ,173;M2ØØ,171;M2Ø7,167"
53Ø DRAW"BM218,173;C2;U5R6D5L6"
54Ø DRAW "BM23Ø,171;C2;D2R12U2;M
235,168"
55Ø CIRCLE (154,85),12,Ø,1,.9,.1
2
56Ø LINE(136,93)-(145,1Ø3),PSET
57Ø LINE(136,93)-(145,78),PSET
58Ø LINE(162,92)-(145,1Ø3),PSET
59Ø LINE(156,96)-(176,92),PSET
60Ø LINE (148,1Ø2)-(16Ø,1Ø2),PSE
T
61Ø LINE(16Ø,1Ø2)-(162,96),PSET
62Ø CIRCLE (154,85),7,Ø,1,.62,.1
2
63Ø CIRCLE (154,85),4,Ø,1,.12,.6
2
64Ø DRAW"BM136,93;C2;M149,81;M15
1,83;M14Ø,92;M146,98;M155,88;M15
7,9Ø;M145,1Ø3"
65Ø CIRCLE(123,116),8,Ø
66Ø DRAW"BM148,1Ø2;C2;D21BR11U21
BL3D16L5U16"
67Ø CIRCLE(154,128),8,Ø
68Ø DRAW "BM15Ø,13Ø;U4R8D4L8"
69Ø DRAW "BM148,134;C2;D16R11U16
BD4BL3L5D8R5U8"
70Ø DRAW "BM145,15Ø;C2;M162,15Ø;
M164,154;M158,16Ø;M147,16Ø;M142,
154;M145,15Ø"
71Ø DRAW "BM139,171;C2;M141,163;
M165,163;M167,171;M139,171"
72Ø CIRCLE(153,157),2,Ø
73Ø CIRCLE (154,157),9,Ø,1,.99,.
1
74Ø CIRCLE(152,157),9,Ø,1,.4Ø,.5
1
75Ø DRAW "BM145,171;M145,173;M13
3,173;M133,171;M14Ø,167"
76Ø DRAW"BM151,173;C2;U5R6D5L6"
77Ø DRAW "BM163,171;C2;D2R12U2;M
168,168"
78Ø DRAW "BM136,94;G14BF9E14H2G1
ØH5E1Ø"
79Ø DRAW "BM118,115;E3F6G3H6"
80Ø LINE (1Ø9,137)-(125,141),PSE
T
81Ø DRAW"BM11Ø,138;C2;M116,115;B
M128,122;M123,14Ø;BL2;BU4;M123,1
27;M118,126;M116,135;M12Ø,136"
82Ø LINE (1Ø8,137)-(1Ø5,141),PSE
T
83Ø LINE-(1Ø9,148),PSET
84Ø LINE-(119,15Ø),PSET
85Ø LINE-(125,146),PSET
86Ø LINE-(125,141),PSET
87Ø CIRCLE(114,146),2,Ø
88Ø LINE (1Ø4,152)-(126,152),PSE
T
89Ø DRAW"BM1Ø5,152;C2;M1Ø3,16Ø;M
13Ø,16Ø;M127,152"
90Ø DRAW"BM113,162;C2;U4R6D4L6"
91Ø CIRCLE(115,145),1Ø,Ø,1,.37,.
5
92Ø CIRCLE(115,145),1Ø,Ø,1,.Ø5,.
12
93Ø DRAW "BM1Ø4,156;C2;M97,16Ø;M
97,162;R1ØU2BR1ØD2R1ØU2;M128,156
"
94Ø CIRCLE(2ØØ,124),7,Ø
95Ø LINE(2Ø6,98)-(196,118),PSET
96Ø LINE (2Ø7,124)-(214,1Ø8),PSE
T
97Ø LINE(2Ø6,94)-(2Ø4,96),PSET
98Ø LINE-(211,1ØØ),PSET
99Ø DRAW "BM2Ø9,99;C2;M2Ø1,114;M
2Ø7,117;M214,1Ø2"
100Ø DRAW "BM198,121;C2;M2Ø4,124
;M2Ø2,128;M197,125;M198,121"
101Ø DRAW "BM194,128;C2;D16R11NU
16BL3BU3U7L4D7R4"
102Ø DRAW "BM191,144;C2;R16;M2Ø9
,148;M2Ø4,154;M193,154;M188,148;
M191,144
103Ø CIRCLE(199,151),2,Ø
104Ø CIRCLE(199,152),1Ø,Ø,1,.4,.
55
105Ø DRAW "BM21Ø,158;C2;M188,158
;M186,166;M2Ø8,166"
106Ø CIRCLE(199,152),1Ø,Ø,1,.94,
.12
107Ø DRAW "BM187,162;C2;M182,166
;M182,168;M194,168;M194,166;BR4D
2R6U6L6D4"
1072 CIRCLE(228,2Ø),15,Ø
1075 PAINT(5Ø,191),Ø,Ø
1078 PAINT(21Ø,12Ø),Ø,Ø
1079 CIRCLE(228,2Ø),15,Ø
108Ø A\$="T3O3L2GO4L1D"
109Ø B\$="T3O4L4CO3L8BAO4L2GL1D"
110Ø C\$="T3O4L4CO3L8BO4L8CO3L1AL
3A"
111Ø D\$="T3O4L4DL3EO5L8CO4L8BAGG
BAEL4F#D"
112Ø E\$="T3O4L3EO5L8CO4L8BAGL4DL
4AA"
113Ø F\$="T3O4L8GFE-DCO3L8B-AGO4L
1DL2DL4D"
114Ø G\$="T3O4L4DO3L3GO4L1DL4CO3
L8BAL3GO4L3GL1GO5L1DL1DL1DL1DL1D
"
115Ø PLAY A\$
1155 PLAY B\$
116Ø PLAY B\$
117Ø PLAY C\$
118Ø PLAY A\$
119Ø PLAY B\$
120Ø PLAY B\$
121Ø PLAY C\$
122Ø PLAY D\$
123Ø PLAY E\$
124Ø PLAY D\$
125Ø PLAY F\$
126Ø PLAY A\$
127Ø PLAY B\$
128Ø PLAY B\$
129Ø PLAY C\$
130Ø PLAY G\$
140Ø GOTO 140Ø

END

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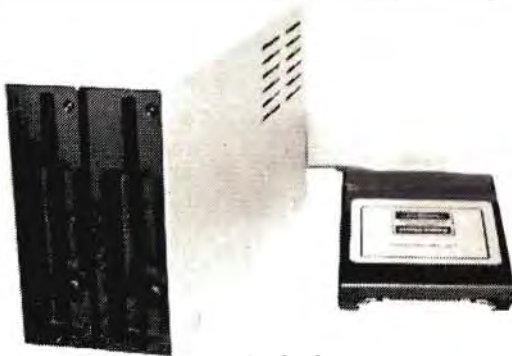


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Continued from p. 38

```

264Ø PRINT@271,"PHASER HIT ON":P
RINT@3Ø3,"RELIANT, SIR!"
265Ø PLAY S1$
266Ø IF SH$="U" THEN IS(Ø,1)=IS(
Ø,1)-45Ø ELSE IS(Ø,1)=IS(Ø,1)-35
Ø
267Ø PRINT@466,STRING$(5,191);:P
RINT@466,IS(Ø,1);
268Ø IF IS(Ø,1)<Ø THEN PRINT@36
7,"RELIANT DESTROYED";:ME=3:GOSU
B 468Ø:GOTO 482Ø
269Ø PL(3)=PL(3)-1:GA(T1,T2)=Ø
27ØØ PRINT@335,"planet destroyed
!";
271Ø GOSUB 468Ø:RETURN
272Ø IF GA(T1,T2)=191 THEN 273Ø
ELSE 285Ø
273Ø GA(Ø,2)=GA(Ø,2)-GA(Ø,3):P LA
Y S1$
274Ø FLAG=1:BS=BS-GA(Ø,3)
275Ø GA(Ø,5)=GA(Ø,5)+5Ø
276Ø R=RND(1Ø):IF R<=4 THEN 277Ø
ELSE 282Ø
277Ø PRINT@271,"TORPEDO HIT ON":
PRINT@3Ø3,"RELIANT, SIR!"
278Ø PLAY S2$
279Ø IF SH$="U" THEN IS(Ø,1)=IS(
Ø,1)-4ØØ ELSE IS(Ø,1)=IS(Ø,1)-5Ø
Ø
28ØØ PRINT@466,STRING$(5,191);:P
RINT@466,IS(Ø,1);
281Ø IF IS(Ø,1)<Ø THEN PRINT@33
5,"RELIANT DESTROYED";:ME=3:GOSU
B 468Ø:GOTO 482Ø
282Ø IF BS<Ø THEN PRINT@335,"BA

```

```

SE DESTROYED":PL(4)=PL(4)-1:GA(T
1,T2)=Ø:GA(Ø,5)=GA(Ø,5)+4ØØ
283Ø IF BS>1 THEN PRINT@335,"BAS
E @":BS:PRINT@367,"ENERGY UNITS."
284Ø GOSUB 468Ø:RETURN
285Ø IF GA(T1,T2)>64 AND GA(T1,T
2)<69 THEN 286Ø ELSE 296Ø
286Ø IF GA(T1,T2)=67 THEN K1=3
287Ø IF GA(T1,T2)=65 THEN K1=4
288Ø IF GA(T1,T2)=68 THEN K1=5
289Ø IS(K1,1)=IS(K1,1)-GA(Ø,3):P
LAY S1$
29ØØ IF IS(K1,1)<Ø THEN 291Ø EL
SE 293Ø
291Ø PRINT@271,CHR$(GA(T1,T2)):"
destroyed!":GA(T1,T2)=Ø:GA(Ø,5)
=GA(Ø,5)+4ØØ
292Ø PL(6)=PL(6)-1:GA(Ø,2)=GA(Ø,
2)-GA(Ø,3):GOSUB 468Ø:RETURN
293Ø PRINT@271,CHR$(GA(T1,T2)):"
@":T1:T2
294Ø PRINT@3Ø3,"STRENGTH" IS(K1,
1)
295Ø GA(Ø,5)=GA(Ø,5)+5Ø:GA(Ø,2)=
GA(Ø,2)-GA(Ø,3)
296Ø GOSUB 468Ø:RETURN
297Ø REM capture
298Ø PRINT@49,""
299Ø GOSUB 464Ø
3ØØØ PRINT@49,"CAPTURE"
3Ø1Ø PRINT@143,"TRANSPORTER ROOM
"
3Ø2Ø PRINT@175,"STANDING BY."
3Ø3Ø GOSUB 465Ø
3Ø4Ø IF IS(Ø,2)-T1>1 OR IS(Ø,2)-

```

```

T1<-1 OR IS(Ø,3)-T2>1 OR IS(Ø,3)
-T2<-1 THEN PRINT@3Ø3,"OUT OF CA
PTURE":PRINT@335,"RANGE, SIR!":P
RINT@367,"capture aborted.":GOSU
B 468Ø:RETURN
3Ø5Ø IF GA(T1,T2)=129 OR GA(T1,T
2)=177 OR GA(T1,T2)=191 THEN 3Ø6
Ø ELSE 317Ø
3Ø6Ø R=RND(1Ø)
3Ø7Ø IF R<4 THEN PRINT@3Ø3,"atta
ck repelled!":GA(Ø,5)=GA(Ø,5)-5Ø
:GA(Ø,2)=GA(Ø,2)-1ØØ
3Ø8Ø IF GA(Ø,2)<Ø THEN PRINT@36
7,"RELIANT DESTROYED";:ME=3:GOSU
B 468Ø:GOTO 482Ø
3Ø9Ø IF R<4 THEN GOSUB 468Ø:RETU
RN
31ØØ IF R=>4 THEN PRINT@3Ø3,"pla
net captured!":GA(Ø,5)=GA(Ø,5)+3
ØØ
311Ø IF GA(T1,T2)=129 THEN PL(5)
=PL(5)-1:PL(1)=PL(1)+1
312Ø IF GA(T1,T2)=177 THEN PL(1)
=PL(1)+1:PL(3)=PL(3)-1
313Ø IF GA(T1,T2)=191 THEN PL(1)
=PL(1)+1:PL(4)=PL(4)-1
314Ø GA(T1,T2)=241
315Ø GA(Ø,2)=GA(Ø,2)-1ØØ:IF GA(Ø
,2)<Ø THEN PRINT@367,"RELIANT D
ESTROYED";:ME=1:GOSUB 468Ø:GOTO
482Ø
316Ø GOSUB 468Ø:RETURN
317Ø PRINT@3Ø3,"CAPTURE THAT?"
318Ø PRINT@335,"ARE YOU FEELING"
319Ø PRINT@367,"WELL, SIR?"

```

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Typical System Configuration*:

- Terminal
- Letter Quality Printer
- Modem
- High-speed Printer

*NOTE: The configuration shown above is only one of the several possible configurations with a **single** COMM-4 unit. Virtually any serial device compatible with the CoCo can be used with COMM-4.

The COMM-4 unit comes **completely assembled** in a plug-in cartridge. The cartridge plugs into any slot of a buffered, powered expansion device (not provided). The commercially available expansion devices (such as Multi-Pak) are required for COMM-4 operation.

Each of the four (4) serial channels is controlled by an **independent** serial controller. These serial controllers are part of the unit hardware and allow multi-tasking and/or simultaneous I/O applications **without** the use of software timing loops.

Communications are **interrupt-driven**. Standard communication baud rates from 50 to 19,200 are supported by COMM-4. The COMM-4 unit provides for the use of a "break key" (keyboard interrupt system). Connections to COMM-4 are made via DB-25 plugs for any RS-232 compatible serial device.

With the COMM-4 unit installed in the expansion device slot, COMM-4 is **always** enabled regardless of hardware/software slot selection methods. The COMM-4 unit will not interfere with existing device(s) in any other expansion slot.

The COMM-4 unit is configured so that **two (2) COMM-4 units can be installed on the same expansion device**. In the dual COMM-4 configuration, the available, interrupt-driven serial communications channels become eight (8). In order to operate properly, the two COMM-4 units must be interconnected with a jumper cable which is provided when ordered in the dual COMM-4 configuration. In the COMM-8 configuration, all features of the COMM-4 are available (but for all 8 channels).

Items supplied with a COMM-4 unit:

- 1) COMM-4 cartridge
- 2) Users Manual
- 3) Interrupt cable (and jumper cable if ordered as COMM-8)

Installation of COMM-4 is accomplished in two phases as follows:

- 1) Hardware installation
 - a. Power down on CoCo and expansion device
 - b. Plug COMM-4 into any slot on expansion device
 - c. Plug interrupt cable into COMM-4 cartridge
 - d. Plug other end of interrupt cable into serial I/O port on CoCo
 - e. Plug user serial cables into DB-25 connectors on COMM-4
 - f. Power up entire system
- 2) Software installation (the following installation instructions are general and will vary with some systems due to user configuration)
 - a. Install COMM-4 disk (35 track, single-sided, double density)
 - b. Load device descriptors and drivers

OR

- Merge device descriptors and drivers into boot files using OS-9 procedure files
- c. Note: Disk contains commented course code **and** object code **and** procedure files
 - d. For basic users, a sample basic program will be provided in users manual (not on disk) (Note: Color basic will **not** support multi-tasking)

The documentation included with COMM-4 provides:

1. Hardware theory of operation
2. Software theory of operation
3. Installation instructions
4. Applications examples
5. Commented program listings
6. Schematic diagrams
7. Parts lists
8. Assembly drawings

If dual COMM-4 (COMM-8) units are to be installed, it will be necessary to specify, with order of second COMM-4, in order for necessary jumper cables to be supplied (no extra charge).

CoCo COMM-4**Price.....\$108.00****Don't Forget Our Full Character Set Board:**

Easy to install board adds:

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PRICE.....\$38.00
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CoCo Devices
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713-474-3232



```

3200 PRINT@399,"CAPTURE aborted.
"
3210 GOSUB 4680:RETURN
3220 REM list
3230 PRINT@49,"LIST"
3240 GOSUB 4640
3250 PRINT@143,"FED. PLANETS"PL(
1)
3260 PRINT@175,"FED. BASES.."PL(
2)
3270 PRINT@207,"ENB. PLANETS"PL(
3)
3280 PRINT@239,"ENB. BASES.."PL(
4)
3290 PRINT@271,"NU. PLANETS."PL(
5)
3300 PRINT@303,"ENB. SHIPS.."PL(
6)
3310 PRINT@335,"FED. SHIPS.."PL(
7)
3320 PRINT@367,"points="GA(0,5)
3330 IF PL(1)=0 AND PL(2)=0 AND
PL(5)=0 THEN PRINT@399,"you have
lost!":GOSUB 4680:ME=5:GOTO 482
0
3340 IF PL(3)=0 AND PL(4)=0 AND
PL(5)=0 THEN PRINT@399,"you have
won!":GOSUB 4680:ME=4:GOTO 4820
3350 RETURN
3360 REM dock
3370 PRINT@49,"DOCK"
3380 GOSUB 4640
3390 PRINT@143,"DOCK SHIP"
3400 GOSUB 4650
3410 IF IS(0,2)-T1>1 OR IS(0,2)-
T1<-1 OR IS(0,3)-T2>1 OR IS(0,3)-
T2<-1 THEN PRINT@303,"OUT OF DO
CKING":PRINT@335,"RANGE, SIR!":P
RINT@367,"docking aborted.":GOSU
B 4680:RETURN
3420 IF GA(T1,T2)=241 OR GA(T1,T
2)=255 THEN 3430 ELSE 3560
3430 IF GA(T1,T2)=241 THEN AM=12
00
3440 IF GA(T1,T2)=255 THEN AM=15
00
3450 GA(0,2)=GA(0,2)+AM
3460 IS(0,1)=IS(0,1)+AM
3470 GA(0,4)=GA(0,4)+4
3480 FOR X3=1 TO 28
3490 IF GA(X3,0)=RK THEN 3500 EL
SE 3530
3500 IF GA(0,2)>GA(X3+2,0) THEN
GA(0,2)=GA(X3+2,0)
3510 IF IS(0,1)>GA(X3+3,0) THEN
IS(0,1)=GA(X3+3,0)
3520 IF GA(0,4)>GA(X3+5,0) THEN
GA(0,4)=GA(X3+5,0)
3530 NEXT X3
3540 PRINT@271,"DOCKING . . ."
3550 GOSUB 4680:RETURN
3560 PRINT@271,"WHAT? DOCK WITH"
3570 PRINT@303,"THAT? NO WAY!"
3580 PRINT@335,"docking aborted!"
"
3590 GOSUB 4680:RETURN
3600 REM build
3610 PRINT@49,"BUILD"
3620 GOSUB 4640
3630 PRINT@143,"TRANSPORTER ROOM
"
3640 PRINT@175,"STANDING BY."
3650 GOSUB 4650
3660 IF IS(0,2)-T1>1 OR IS(0,2)-
T1<-1 OR IS(0,3)-T2>1 OR IS(0,3)-
T2<-1 THEN PRINT@303,"OUT OF BU
ILDING":PRINT@335,"RANGE, SIR!":
PRINT@367,"build aborted!":GOSUB
4680:RETURN
3670 IF GA(T1,T2)= 241 THEN 3680
ELSE 3740
3680 IF PL(2)=6 THEN PRINT@303,"
ALL BASES STILL":PRINT@335,"FUNC
TIONAL, SIR.":PRINT@367,"build a
borted!":GOSUB 4680:RETURN
3690 GA(T1,T2)=255:PL(2)=PL(2)+1
:PL(1)=PL(1)-1
3700 GA(0,2)=GA(0,2)-300:IF GA(0
,2)<0 THEN PRINT@335,"RELIANT R
UNS":PRINT@367,"OUT OF ENERGY!":
ME=1:GOSUB 4680:GOTO 4820
3710 GA(0,5)=GA(0,5)+600
3720 PRINT@303,"NEW BASE BUILT":
PRINT@335,"@T1;T2
3730 GOSUB 4680:RETURN
3740 PRINT@303,"IMPOSSIBLE TO":P
RINT@335,"BUILD THAT, SIR!":PRIN
T@367,"build aborted!":GOSUB 468
0:RETURN
3750 REM other ships
3760 A=0
3770 FOR X=143 TO 399 STEP 32:PR
INT@X,STRING$(17,223);:NEXT X
3780 A=A+1:LB=0:LP=0:LC=0:LQ=0
3790 PRINT@49,"ship "CHR$(IS(A,0
))
3800 IF IS(A,1)<=0 THEN 3810 ELS
E 3910
3810 GA(IS(A,2),IS(A,3))=0
3820 S1=RND(44):S2=RND(44)
3830 IF GA(S1,S2)>0 THEN 3820
3840 GA(S1,S2)=IS(A,0)
3850 IS(A,2)=S1:IS(A,3)=S2
3860 IF IS(A,0)>70 THEN PL(7)=PL
(7)+1 ELSE PL(6)=PL(6)+1
3870 IF A=1 OR A=4 THEN IS(A,1)=
3000
3880 IF A=2 OR A=5 THEN IS(A,1)=
3500
3890 IF A=3 THEN IS(A,1)=2500
3900 GOTO 4590
3910 FOR LB=IS(A,2)-5 TO (IS(A,2
)-5)+10
3920 FOR LP=IS(A,3)-5 TO (IS(A,3
)-5)+10
3930 IF LB<1 OR LB>44 OR LP<1 OR
LP>44 THEN 4190
3940 IF GA(LB,LP)=0 THEN 4190
3950 IF GA(LB,LP)=193 THEN 4190
3960 IF GA(LB,LP)>0 AND GA(LB,LP
)<100 THEN 3970 ELSE 4120
3970 IF IS(A,0)>70 AND GA(LB,LP)
<70 THEN 3990
3980 IF IS(A,0)<70 AND GA(LB,LP)
>70 THEN 3990 ELSE 4120
3990 FOR X1=0 TO 5
4000 IF GA(LB,LP)=IS(X1,0) THEN
IS(X1,1)=IS(X1,1)-500:GOTO 4030
4010 IF X1=5 THEN 4030
4020 NEXT X1
4030 PRINT@143,CHR$(GA(LB,LP))"
hit @LB;LP:PLAY S2$
4040 IF IS(X1,1)<=0 THEN PRINT@1
75,CHR$(GA(LB,LP))" destroyed!"
4050 IF IS(X1,1)<=0 AND IS(X1,0)
=82 THEN ME=6:GOSUB 4680:GOTO 48
20
4060 IF IS(X1,1)<=0 THEN GA(LB,L
P)=0
4070 IF IS(X1,1)<=0 THEN IS(X1,2
)=0:IS(X1,3)=0
4080 IF IS(X1,0)>70 AND IS(X1,1)
<=0 THEN PL(7)=PL(7)-1
4090 IF IS(X1,0)<70 AND IS(X1,1)
<=0 THEN PL(6)=PL(6)-1
4100 GOTO 4590
4110 REM planet or base
4120 IF GA(LB,LP)=241 OR GA(LB,L
P)=255 OR GA(LB,LP)=177 OR GA(LB
,LP)=191 THEN 4130 ELSE 4190
4130 IF IS(A,0)>70 AND IS(A,0)<8
5 THEN 4140 ELSE 4160
4140 IF GA(LB,LP)=177 THEN GA(LB
,LP)=0:PL(3)=PL(3)-1:PRINT@207,C
HR$(177);CHR$(128);"DESTROYED!":
SOUND 25,1:GOTO 4590
4150 IF GA(LB,LP)=191 THEN GA(LB
,LP)=0:PL(4)=PL(4)-1:PRINT@239,C
HR$(191);CHR$(128);"DESTROYED!":
SOUND 25,1:GOTO 4590
4160 IF IS(A,0)<70 AND IS(A,0)>6
0 THEN 4170 ELSE 4190
4170 IF GA(LB,LP)=241 THEN GA(LB
,LP)=0:PL(1)=PL(1)-1:PRINT@271,C
HR$(241);CHR$(128);"destroyed!":
SOUND 225,1:GOTO 4590
4180 IF GA(LB,LP)=255 THEN GA(LB
,LP)=0:PL(2)=PL(2)-1:PRINT@303,C
HR$(255);CHR$(128);"destroyed!":
SOUND 225,1:GOTO 4590
4190 NEXT LB,LP
4200 REM neutral planet
4210 FOR LC=IS(A,2)-5 TO (IS(A,2
)-5)+10
4220 FOR LQ=IS(A,3)-5 TO (IS(A,3
)-5)+10
4230 IF LC<1 OR LC>44 OR LQ<1 OR
LQ>44 THEN 4480
4240 IF GA(LC,LQ)=129 THEN 4250
ELSE 4480
4250 SM=0:SR=0
4260 FOR SM=LC-1 TO LC+1
4270 FOR SR=LQ-1 TO LQ+1
4280 IF SM<1 OR SM>44 OR SR<1 OR
SR>44 THEN 4300
4290 IF GA(SM,SR)=0 THEN GA(SM,S
R)=IS(A,0):GA(IS(A,2),IS(A,3))=0
:IS(A,2)=SM:IS(A,3)=SR
4300 NEXT SR
4310 NEXT SM
4320 IF IS(A,0)>70 THEN 4330 ELS
E 4420
4330 IF PL(2)=6 THEN GA(LC,LQ)=2
41 ELSE GA(LC,LQ)=255
4340 PL(5)=PL(5)-1
4350 IF GA(LC,LQ)=241 THEN PL(1)
=PL(1)+1 ELSE PL(2)=PL(2)+1
4360 IF GA(LC,LQ)=241 THEN PRINT
@335,CHR$(241);CHR$(128);"built@
";LC;LQ:SOUND 200,1
4370 IF GA(LC,LQ)=255 THEN PRINT
@335,CHR$(255);CHR$(128);"built@
";LC;LQ:SOUND 200,1
4380 IF A=3 THEN IS(A,1)=2500
4390 IF A=1 OR A=4 THEN IS(A,1)=
3000
4400 IF A=2 OR A=5 THEN IS(A,1)=
3500
4410 GOTO 4590
4420 IF PL(4)=6 THEN GA(LC,LQ)=1
77 ELSE GA(LC,LQ)=191
4430 PL(5)=PL(5)-1
4440 IF GA(LC,LQ)=177 THEN PL(3)
=PL(3)+1 ELSE PL(4)=PL(4)+1
4450 IF GA(LC,LQ)=177 THEN PRINT
@367,CHR$(177);CHR$(128);"BUILT@
";LC;LQ:SOUND 50,2
4460 IF GA(LC,LQ)=191 THEN PRINT
@367,CHR$(191);CHR$(128);"BUILT@
";LC;LQ:SOUND 50,2
4470 GOTO 4590

```



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4480 NEXT LQ,LC
4490 REM move ship
4500 R1=RND(2):R2=RND(2)
4510 IF R1=1 THEN R3=-RND(6) ELSE
R3=RND(8)
4520 IF R2=1 THEN R4=-RND(6) ELSE
R4=RND(8)
4530 IF IS(A,2)+R3<1 OR IS(A,2)+
R3>44 OR IS(A,3)+R4<1 OR IS(A,3)
+R4>44 THEN 4500
4540 IF GA(IS(A,2)+R3,IS(A,3)+R4
)>0 THEN 4500
4550 GA(IS(A,2)+R3,IS(A,3)+R4)=I
S(A,0)
4560 GA(IS(A,2),IS(A,3))=0
4570 IS(A,2)=IS(A,2)+R3:IS(A,3)=
IS(A,3)+R4
4580 PRINT@399,CHR$(IS(A,0))" @"
;IS(A,2);IS(A,3):SOUND 150,1
4590 IF A<5 THEN 3780
4600 GOSUB 4680
4610 FOR X=143 TO 399 STEP 32:PR
INT@X,STRING$(17,159);:NEXT X
4620 PRINT@49,"READY"
4630 RETURN
4640 R$="":FOR X=143 TO 399 STEP
32:PRINT@X,STRING$(17,159);:NEX
T X:RETURN
4650 PRINT@175,"COORDINATE 1";:I
NPUT T1
4660 PRINT@207,"COORDINATE 2";:I
NPUT T2
4670 RETURN
4680 FOR TX=1 TO 999:NEXT TX:RET
URN
4690 REM help
4700 PRINT@49,"COMPUTER HELP"
4710 R$=""
4720 PRINT@143,"<S> SCANNER"
4730 PRINT@175,"<M> MOVE RELIANT
"
4740 PRINT@207,"<F> FORCE FIELD
"
4750 PRINT@239,"<T> FIRE TORPEDO
"
4760 PRINT@271,"<P> FIRE PHASERS
"
4770 PRINT@303,"<C> CAPTURE"
4780 PRINT@335,"<B> BUILD"
4790 PRINT@367,"<D> DOCK SHIP"
4800 PRINT@399,"<L> LIST <x> SAV
E";
4810 RETURN
4820 CLS
4830 PRINT@0,STRING$(32,255);
4840 PRINT@10,"final report";
4850 IF ME=1 THEN MS$="RELIANT R
UNS OUT OF ENERGY!"
4860 IF ME=2 THEN MS$="RELIANT B
LOWN UP BY A STAR!"
4870 IF ME=3 THEN MS$="RELIANT D
ESTROYED BY A PLANET!"
4880 IF ME=4 THEN MS$="YOU HAVE
WON THE WAR!"
4890 IF ME=5 THEN MS$="YOU HAVE
LOST THE WAR!"
4900 IF ME=6 THEN MS$="RELIANT D
ESTROYED BY ENEMY FIRE!"
4910 IF ME=7 THEN MS$="RELIANT Q
UITS BATTLE."
4920 PRINT@64,MS$;:IF ME=4 THEN
GA(0,5)=GA(0,5)+10000 ELSE GA(0,5
)=GA(0,5)-10000
4930 PRINT@128,"FEDERATION PLANE
TS."PL(1)
4940 PRINT@160,"FEDERATION BASES
..."PL(2)

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4950 PRINT@192,"ENBOT PLANETS...
..."PL(3)
4960 PRINT@224,"ENBOT BASES....
..."PL(4)
4970 PRINT@256,"NEUTRAL PLANETS.
..."PL(5)
4980 PRINT@320,NA$;" POINTS = ";
GA(0,5)
4990 IF GA(0,5)<GA(14,0) THEN RK
=1:RL$="CADET"
5000 IF GA(0,5)=GA(14,0) AND GA
(0,5)<GA(21,0) THEN RK=2:RL$="LI
EUTENANT"
5010 IF GA(0,5)=GA(21,0) AND GA
(0,5)<GA(28,0) THEN RK=3:RL$="CO
MMANDER"
5020 IF GA(0,5)=GA(28,0) THEN R
K=4:RL$="ADMIRAL"
5030 PRINT@352,"RANK: ";RL$
5040 PRINT@416,STRING$(32,255)
5050 PRINT@480,"SAVE SCORE <Y OR
N>";:INPUT SC$
5060 IF SC$="Y" THEN 5150
5070 IF SC$="N" THEN 5080 ELSE 5
050
5080 CLS
5090 PRINT@0,STRING$(32,239);
5100 PRINT@64,"PLAY AGAIN <Y OR
N>";:INPUT PL$
5110 IF PL$="Y" THEN RUN
5120 IF PL$="N" THEN CLS:END
5130 GOTO 5080
5140 REM save file
5150 CLS
5160 PRINT@0,STRING$(32,207);
5170 PRINT@5,"save on tape";
5180 PRINT@64,"NAME OF FILE";:IN
PUT F1$
5190 PRINT@128,"PRESS <ENTER> WH
EN READY";:INPUT EN$
5200 PRINT@192,STRING$(32,207);
5210 PRINT@256,"SAVING FILE "F1$
5220 OPEN"O",#-1,F1$
5230 PRINT#-1,NA$
5240 PRINT#-1,RK
5250 PRINT#-1,GA(0,5)
5260 CLOSE#-1
5270 PRINT@320,"BACKUP FILE <Y O
R N>";:INPUT BU$
5280 IF BU$="Y" THEN 5150
5290 IF BU$="N" THEN 5310
5300 GOTO 5280
5310 CLS
5320 PRINT@0,STRING$(32,159);
5330 PRINT@64,"WOULD YOU LIKE TO
PLAY AGAIN"
5340 PRINT@96,"<Y OR N>";:INPUT
PA$
5350 IF PA$="Y" THEN RUN
5360 IF PA$="N" THEN CLS:END
5370 GOTO 5340
5380 REM load file
5390 CLS:PRINT@0,STRING$(32,191)
;
5400 PRINT@3,"load";
5410 PRINT@64,"TYPE FILE NAME AN
D <ENTER>"
5420 PRINT:INPUT"FILE NAME";F1$
5430 PRINT@192,STRING$(32,191);
5440 INPUT"PRESS <ENTER> WHEN RE
ADY";EN$
5450 PRINT@256,STRING$(32,191);
5460 PRINT@320,"SEARCHING FOR "F
1$
5470 OPEN"I",#-1,F1$
5480 PRINT@384,"loading file"
5490 INPUT#-1,NA$

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5500 INPUT#-1,RK
5510 INPUT#-1,GA(0,5)
5520 IF EOF(-1) THEN 5540
5530 GOTO 5520
5540 CLOSE#-1
5550 PRINT@384,"file loaded"
5560 FOR T=1 TO 1000:NEXT T
5570 CLS
5580 PRINT@0,STRING$(32,175);
5590 PRINT@64,"WELCOME BACK TO T
HE GALACTIC"
5600 IF RK=1 THEN RL$="CADET"
5610 IF RK=2 THEN RL$="LIEUTENAN
T"
5620 IF RK=3 THEN RL$="COMMANDER
"
5630 IF RK=4 THEN RL$="ADMIRAL"
5640 PRINT@96,"WARS, ";RL$;" ";N
A$;".
"
5650 PRINT@160,"POINT TOTAL:";GA
(0,5);
5660 PRINT@224,STRING$(32,175);
5670 PRINT@288,"PRESS <ENTER> WH
EN READY";:INPUT EN$:GOTO 600
5680 REM title page
5690 CLS(0)
5700 S2$="L255;12;11;10;9;8;7;6;
5;4;3;2;1"
5710 S1$="L255;12;11;10;9;12;11;
10;9;12;11;10;9"
5720 G2=RND(7)+9:G2=(G2*16)-1:M1
=1023:M2=1536
5730 M1=M1+1:M2=M2-1
5740 G1=RND(7)+9
5750 G1=(G1*16)-10
5760 IF M1<1184 THEN POKE M1,G1
ELSE POKE M1,G2
5770 IF M1<1184 THEN POKE M2,G1
ELSE POKE M2,G2
5780 IF M1<1279 THEN 5730
5790 FOR T=1 TO 500:NEXT T
5800 PRINT@199,"the";:PRINT@203,
"galactic";:PRINT@212,"wars";
5810 FOR T=1 TO 500:NEXT T
5820 PRINT@296,"by";:POKE1322,58
:PRINT@301,"lynn";:PRINT@306,"da
vis";
5830 FOR T=1 TO 2000:NEXT T:RETU
RN
5840 REM pre-load
5850 CLS
5860 PRINT@0,STRING$(32,255);
5870 PRINT@3,"load";
5880 PRINT@64,"LOAD PREVIOUS SCO
RE <Y OR N>";:INPUT PR$
5890 IF PR$="Y" THEN GOSUB 5390
5900 IF PR$="N" THEN 5910 ELSE 5
850
5910 PRINT@128,STRING$(32,255);
5920 PRINT@192,"FOR THE RECORD,
PLEASE TYPE IN"
5930 INPUT"YOUR NAME..";NA$
5940 CLS
5950 RK=1:PRINT@0,STRING$(32,255
);
5960 PRINT@64,"WELCOME TO THE GA
LACTIC WARS,"
5970 PRINT@96,"CADET "NA$;".
"
5980 PRINT@160,"SHOULD YOU NEED
ASSISTANCE"
5990 PRINT@192,"DURING THE BATTL
E, PRESS THE"
6000 PRINT@224,"<H> KEY -- FOR H
ELP."
6010 PRINT@288,STRING$(32,255);
6020 PRINT@352,"PRESS <ENTER> WH
EN READY";:INPUT EN$
6030 GOTO 600

```

END

6809 on Line

by Bobby Ballard

Up to Date

During the past year and a half I've tried to bring you useful information on telecommunicating with your Color Computer. Together we've covered information utilities, communications software, starting a BBS, and a host of other topics related to being on line. I've received a lot of mail, and I appreciate it all. This month I would like to try to answer some of the most-asked questions and share a few personal views on telecommunicating in general.

The question I hear most often is: "What software should I buy to get started?" I hesitate to recommend one product over another because there is no best product—it depends upon your needs. But I do have advice on how to go about buying software, and several useful and important features come to mind that you might want to consider.

When you purchase software, you should start by familiarizing yourself with information about available products. You might start by reading the reviews in back issues of *HOT CoCo* and other publications. If you don't have these, ask a friend or check at the library. *HOT CoCo* has printed some excellent reviews of cassette- and disk-based telecommunications software that are well worth tracking down. (Eds. note—See p. 6 for information on ordering back issues of *HOT CoCo*.) You should also ask around about what others are using, what they like and dislike about their telecommunications software, and why. You might be able to network yourself with others who are already using the program you plan to buy. This could be invaluable to you if you need help down the road.

While you're making up your mind, consider the following factors. What size files can a potential program download? Which protocols does it support? How does the manufacturer handle upgrades when new versions are released? I recommend software that supports xmodem protocol and saves files to the buffer. Many people like programs that support direct transfer to disk, but I find such software to be slower, which increases connect time and, therefore, cost. However, if you plan to be on CompuServe a great deal, you might want to consider the Vidtex program sold by the information utility. It handles the CompuServe B protocol, which is slower but ensures a good copy at download time.

Mikeyterm, by Mike Ward, is another terminal program to think about. You can't beat the price; it's free as part of the public domain and you can download it from CompuServe. It handles xmodem protocol, has disk and tape I/O, and is easy to use. It even lets you make various copies of differently configured Mikeyterms so that you can be ready for several specific applications. For

example, you can configure one copy for BBS activity and another for CompuServe, and so on. Later, if you find you need or want features not supported by Mikeyterm, you can purchase a program that has them and not be out money for a program that you no longer need. Mikeyterm is a good way to get started.

BBS Update

Since beginning this column, I've written several articles on using and starting a BBS. I've also put up a BBS in New York running on a Color Computer 2. There are a few developments on this subject on which I want to bring readers up to date.

Following the series that appeared here on starting a BBS, I was informed of many new and exciting products soon to be released. If you own OS-9, you might want to look in the OS-9 SIG on CompuServe. There's a public-domain BBS there that runs under Basic-09 with documentation and lots of on-line help. I haven't looked at it, but if you are interested, I suggest that you download and read the documentation before you download the rest of the files. There are a lot of people working on their own versions of BBS software, which will probably be released into the public domain. There are also some exciting commercial developments on the way. One product that may soon be released is an OS-9 BBS that handles two phone calls at once. Four Star Software has released a new BBS package, and there's even one that

should be coming over from Australia.

On the hardware front, there are some intriguing new products for use on a BBS or a terminal. CoCo Devices has released a communications serial port called COMM-4. It supports four channels of serial I/O and can be expanded to eight. Running under OS-9, this would make for a very interesting eight-channel BBS. (I don't even want to think about the installation fees for eight new phone lines!) Spectrum Projects is distributing a new memory upgrade called Thunder RAM. It is a 256K memory add-on board that shows a lot of promise for reducing disk I/O under OS-9, which would make a multitasking timesharing BBS more feasible than before. The possibilities for this product seem to be about as many as the bytes it adds.

Hackers and Crackers

A final thought on running a BBS. It seems that the so-called "hackers" are forever gaining attention in the popular press for breaking codes and accessing classified or private computer systems. But it really doesn't take a lot of talent or genius to break into a system. The real talent and ingenuity is found in the hundreds of sysops around the country who keep their systems up and running, in many cases 24 hours a day, seven days a week. My hat is off to these hardworking individuals; they spend literally thousands of hours running and improving their BBSes, verifying users, providing answers to hundreds of questions, helping many people make better use of their computers, and sharing information on a multitude of topics.

The term hacker was originally applied to innovators of hardware and is not deserved by those who crack systems or try to access computers where access is prohibited. Those who participate in such activities are often not the computer whizzes they are cracked up to be. In fact, they often work with programs written by others and equipment they know little about; they crack into a system by banging away at it until they hit upon something, anything. Such a person is better termed a "cracker."

Don't hesitate to write me, send me email, or contact me on line. I'd like to continue hearing from you. If you have the chance, call my BBS at the number below. See you "on line." ■

Vendors Mentioned In 6809 On Line

CoCo Devices
Box 677
Seabrook, TX 77586
713-474-3232

CompuServe
P.O. Box 20212
Columbus, OH 43220
800-848-8990

Four Star Software
P.O. Box 730
Streetsville, Ontario
L5M 2C2, Canada
416-858-7827

Spectrum Projects
P.O. Box 21272
93-15 86th Drive
Woodhaven, NY 11421
718-441-2807

Address correspondence to Bobby Ballard, 1207 Eighth Ave., 4 R, Brooklyn, NY 11215. You can also reach him on line through CompuServe (#72746,2373 or #73135,255), The Source (#BCT173), and MCI Mail (#172-3476). Bobby's BBS number is 718-499-1633.

GREAT COCO PRODUCTS

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Just in time for the holiday season!

SHOCK TROOPER SUPER ACTION!

The Greatest Hi-Res Graphic Arcade Game Ever Written for Your CoCo

By Rob Shaw, Author of Tut's Tomb

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Reader's Forum

Automatic Menu Generator

Here's one for all you Color Basic hackers who enjoy building bigger and better programs with as few bytes of RAM as possible. It's an automatic menu generator that will create as many different menus as you want within a program with only one line of code for a call.

Put these preliminary lines early in the program:

```
10 PT$="* YOUR PROGRAM TITLE *
":PT=16-(LEN(PT$)/2):REM YOUR PR
OGRAM TITLE
20 RE$=" * M - RETURN TO MAIN M
ENU **:EN$=" * ENTER # OF YOU
R CHOICE **
30 FOR X=1TO30:LI$=LI$+"*":NEXT:
LI$=" "+LI$:FORX=1TO28:BL$=BL$+"
":NEXT:BL$="**"+BL$+"**"
40 GOTO1000
```

Then insert the automatic menu generator subroutine, early in the program as well:

```
1000 REM AUTO MENU GENERATOR ROUT
INE
110 IF NU=1 THEN A=3 ELSE IF NU>1
AND NU<5 THEN A=2 ELSE IF NU>4 T
HEN A=1
120 CLS:FORX=1TOA:PRINT:NEXT:PRI
NT TAB(PT)PT$,LI$
130 PRINT TAB(1)"*":TAB(16-(LEN(
MT$)/2))MT$:TAB(30)"**",BL$
140 FOR X=1TO NU:PRINT" *":TAB(3
)X;"- ";MI$(X):TAB(30)"*":NEXT:P
RINT RE$,BL$,EN$,LI$:RETURN
150 CH$=INKEY$:IF CH$=" " THEN 150E
LSE IF CH$="M" THEN *** ELSE 155
155 CH=VAL(CH$):IF CH<1 OR CH>V
THEN 150 ELSE RETURN
```

The *** in line 150 will normally be the line number of your main menu call or some other safe haven within your program.

Finally, place the call anywhere in the program:

```
10000 NU=5:MT$="TITLE OF YOUR MEN
U":MI$(1)="YOUR FIRST MENU CHOIC
E":MI$(2)="YOUR NEXT MENU CHOICE
":MI$(3)="YOUR NEXT MENU CHOICE"
:MI$(4)="YOUR NEXT MENU CHOICE"
MI$(5)="YOUR NEXT MENU CHOICE"
1010 GOSUB1000:V=5:GOSUB150
1015 ON CH GOTO ***,***,***,***,
***
```

The ***'s represent the line numbers of your various routines.

This routine gives you one to five menu choices plus an automatic option of escaping to a safe or logical program line (usually the main menu) should you not want any of the menu's other choices.

Duncan F. Dempster
Kaneoke, HI

On Error GOTO

The following program serves the same purpose as the ON ERROR GOTO command. It loads into low memory a machine-language program that transfers control to a line number given in line 2. The program then POKEs that line number into the two zero bytes of the

machine-language program shown in line 6. If you already know your line number, delete lines 2-4 and put the hexadecimal equivalent of that line number in place of the two zeros in line 6. If you specify an unidentified line number, the computer will hang up. This program will work on all CoCos.

```
1 FOR X=0TO17:READA$:POKEX+550,V
AL("&H"+A$):NEXT X
2 Y=100 'LINE NUMBER
3 POKE551,INT(Y/256)
4 POKE552,Y-INT(Y/256)*256
5 POKE&H18F,2:POKE&H190,38
6 DATA8E,0,0,9F,2B,10,DE,21,CC,A
D,C4,34,06,0F,6F,7E,AE,A9
```

John Stewart
West Liberty, KY

Work Out More Efficiently

You can get the maximum benefit from your aerobic exercises by working out at the right intensity. Your target intensity range is based on your age and resting heart rate. Remember, your goal is to attain but not exceed this range in your aerobic activities.

To determine your estimated maximum heart rate, subtract your age from 220. For example, a 30-year-old adult's maximum heart rate is 190. To determine your resting heart rate, take your pulse when you first awake in the morning. I'll use 70 for this example.

Type in and run the following program. If you don't have a printer, delete the #-2s. Enter the numbers from the previous paragraph at the prompts. The program tells you that this 30-year-old should exercise at a heart rate between 142 (called the threshold intensity) and 160 beats per minute (called the peak intensity), and gives the threshold and peak number of heartbeats in a 10-second period.

```
35 PRINT#-2, "NAME"
36 PRINT#-2
37 PRINT#-2, "MONTH"
38 PRINT#-2
40 PRINT"WHAT IS YOUR AGE";:INPU
T AG
45 PRINT"WHAT IS YOUR RESTING PU
LSE RATE";:INPUT RR
50 X=220
55 Y=X-AG
60 Z=.60
65 W=.75
70 TI=((Y-RR)*Z)+RR
75 PRINT#-2,"YOUR 60 SECOND THRE
SHOLD IS";TI
80 PRINT#-2:PI=((Y-RR)*W)+RR
85 PRINT#-2, "YOUR 60 SECEND PEA
K IS";PI
86 PRINT#-2
90 SZ=TI/6
95 SW=PI/6
96 PRINT#-2,"YOUR 10 SECOND THRE
SHOLD IS";SZ
97 PRINT#-2
98 PRINT#-2,"YOUR 10 SECOND PEAK
IS";SW
```

Larry Williams
Bentonville, AR

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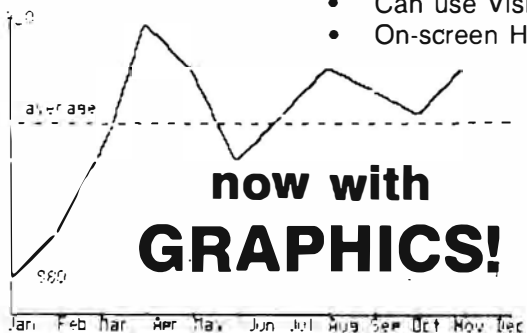
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Product News

by J. Scot Finnie

Trends in Software, DeskMate, The Tandy 600, C.E.O., One-On-One, Pegasus, Trading Post, King Chip, Logoworlds, and More

Information related in the Product News section is supplied by manufacturers. HOT CoCo has not tested or reviewed the products discussed here and cannot guarantee manufacturers' claims.

Color Computer software is changing as a result of better use of old ideas and perhaps in anticipation of new ones. Largely unfounded rumors were bandied about for two years concerning a new "super CoCo," which was described with widely varying characteristics. Recently, the rumors about a new Color Computer have started taking on uniformity. The new machine is reported to be targeted for release in the latter part of the year. Some third-party industry insiders claim that it will have 512K, downward compatibility with the CoCo 2, a new 80-column video chip for increased resolution, and an integral disk drive. Vague rumors place the price of the new computer near the same range as the Atari 520 ST, suggesting that Tandy might take on Atari's ST and Commodore's higher-priced Amiga.

Back in the here and now, the trend in Color Computer software is to make better use of an old idea by using OS-9 to take advantage of the full 64K offered by the CoCo. Several programs on the market use OS-9 but offer an easy-to-use interface or a shell. To boot up a program, typically all you do is type the word DOS. The computer takes care of the rest, and no knowledge of OS-9 is required. Some programs use other means to address the CoCo's second bank of 32K. The fact is, the majority of new programs on the market require or can make use of 64K. Most of

Tandy's latest Color Computer software releases use 64K, many with an OS-9 shell.

Several software manufacturers are thinking along these lines. Bigger is better, and that includes more options, more graphics, and more applications. Four Star Software's **PenPal**, Tandy's **DeskMate** (see below for more on this), and Computerware's **C.E.O.** (Complete Electronic Organizer) all offer multiple applications in a single 64K package. They represent an emerging trend toward integrated software. C.E.O. is the latest from Computerware, a program that combines calendar, note keeper, memo pad, calculator, and phone directory. It sells for \$49.95.

What's Handy at Tandy

There are several new products available in your local Radio Shack store of late. Some were announced quite some time ago and are just finding their way onto the shelf; others, like the new **Tandy 600** MS-DOS-compatible portable computer with

32K RAM expandable to 224K and on-board 3.5-inch disk drive were just announced as this was written (in November). The Tandy 600 (catalog no. 26-3901) sells for \$1,599, by the way.

Perhaps most notable for Color Computer fans is Tandy's introduction of **DeskMate** (catalog no. 26-3259) to the Color Computer. This software, first designed and released for the Tandy 1000, shares the concept and title with its MS-DOS cousin, but little else. The integrated package of seven commonly used applications includes Text, Ledger, Index Cards, Paint, Telecom, Calendar, and Calculator. It requires 64K, comes on disk, and sells for \$99.95.

Other new and available products from Tandy include the following. **Childpace** (catalog no. 26-3248) is a 64K program that tracks a child's early development from three months to five years by evaluating dexterity, language, and personal and social skills. It's based on a national survey and a university study. **Childpace** comes on disk and sells for \$39.95.

Tandy has picked up the beat in the music area. They are offering **Pan** (catalog no. 26-3279), a program that lets you write your own songs. It requires the Sound/Speech Cartridge (catalog no. 26-3144) and 64K and sells for \$29.95. **Orchestra-90 CC** (catalog no. 26-3143) is a ROM-pack-based music and sound-effects generator selling for \$79.95.

The popular **One-On-One** Larry Bird and Dr. J basketball program heads up the list of new games for the Color Computer. **One-On-One** (catalog no. 26-3288) comes on disk, requires 64K, and sells for \$39.95. But there are other new entries as well. **Pegasus** (catalog no. 26-3281) is similar to the popular arcade-game called **Joust**. **Varloc** (catalog no. 26-3291) is similar to Electronic Art's **Archon** available for other brands of computers. Both of these disk games require 64K and sell for \$29.95.

Color Connection III (catalog no. 90-0348, an Express Order Software product) is a communications program that supports the Color Computer's serial port or the Deluxe RS-232 Port Pak (catalog no. 26-2226). It also supports xmodem protocol and CompuServe's B protocol. **Color Connection III** requires a minimum of 32K and sells for \$49.95. Check your nearest Radio Shack store for more information.

Games, Diversions, and Education

So, you thought you were pretty nifty because you could play a trivia game on your computer. But can you bring up trivia questions on the computer—without a computer? You can if you have **King Chip**. It's a new trivia board game that bases its questions on the world of high technology and the computer,



King Chip from XYLYX is the computer-sans-computer game.

and its answers are accompanied by explanations designed to inform and educate players. King Chip's six categories are data communications, history and current events, hardware, jargon and acronyms, potpourri, and software. The game can be played by two to six players and sells for \$39.95 from XYLYX Computer Entertainment Ltd.

After reading *The Million Dollar Strategy of a Lottery Jackpot Winner*, by Rodney T. Hard, Professor Jones decided to add a module to their **Lotto** program that will achieve a similar analysis. With the new module, the same input will be required but additional permutations and result screens will be available. Customers who have Professor Jones' "automatic update" package will receive the new module for free. A \$25 update charge will be in effect for other Lotto owners. Contact the company for more information.

Software Exchange has released two new programs, the **Greyhound Racing Analysis Package** and the **Enhanced Greyhound Racing Analysis Package**, selling for \$29.95 and \$49.95 respectively. The two packages facilitate handicapping of greyhound races by using past-performance information taken from racing programs. Also included is **Bet Return Analysis** for calculating winning percentages. Both programs come on cassette or disk and include instructions. Contact the manufacturer for more information.

Sunburst Communications, makers of several well-received educational computer programs, has released a new program that runs on the IBM, Apple II, Tandy 1000, and Color Computer. **Trading Post** is a two-player strategy game that helps teach students to organize their thinking as they try through trade and sound planning to be first to collect commodities toward a specific goal. The new educational game is designed for third-through seventh-grade level players. It requires 32K and comes on disk with a backup copy and teacher's guide for \$59.

Logoworlds, by Rachele S. Heller, C. Dianne Martin, and June L. Wright is a new book published by Computer Science Press to help teachers and parents learn Logo quickly and easily so that they can teach children. **The Computer and the Child: A Montessori Approach**, by Dr. Peter G. Gebhardt-Steele is also available from the publisher. It focuses on the needs of children six and older when interacting with computers. Each of these books sells for \$19.95. ■

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The Corner Office

by Jeff DeTray, Publisher

The Great Merger

If you are a regular subscriber to HOT CoCo, then you've heard the news. This is the last month HOT CoCo will be published as a separate magazine. Next month we merge with our sister publication, 80 Micro. You'll begin receiving the combined magazine starting with the March issue. Look for 80 Micro and its new Color Computer section next month.

When you consider it, our merger with 80 Micro is highly appropriate. Old-timers will remember that HOT CoCo spun out of 80 Micro back in June, 1983, after a flood of Color Computer articles threatened to overwhelm our older sibling. So in a sense, merging with 80 Micro is like going home again.

The combined magazine will have its own, distinct Color Computer section. The features of HOT CoCo you have indicated you like best will be carried over into 80 Micro, so you'll be seeing old friends like Doctor ASCII and Scott Norman. The CoCo section will focus on productivity, making existing software more functional, and applications you can really use. There is plenty of interesting material on tap.

An Institution

Among Tandy computer users, 80 Micro is something of an institution. It was first published in 1980, and we can't think of an older, more respected manufacturer-specific computer magazine. There's a strong tradition of editorial excellence and independence at 80 Micro. You always get the straight scoop from 80, with no punches pulled, so be prepared for its feisty, often irreverent outlook. We think you will enjoy it.

And when you start reading 80 Micro, be sure to look beyond the special CoCo section. You will be surprised at how many of the non-CoCo articles turn out to contain information you can use. Articles on programming, news about Tandy—these are things that apply to you and your CoCo as well as to Model 4 and Tandy 1000 owners. Besides, you have to love a magazine that once bound a pair of 3-D glasses into each copy.

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