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COLOR COMPUTER NEWS

THE COLOR COMPUTER MAGAZINE FOR 6809 USERS
Issue #15
December 1982

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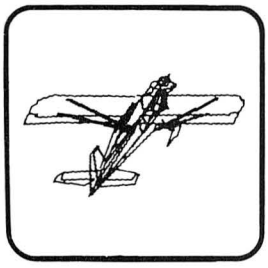

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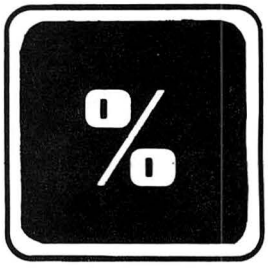

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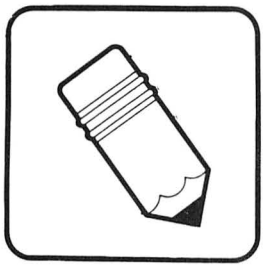

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Your computer's keyboard or joystick draws in 8 colors with semi alpha graphics 8, 12, 24. You can do animation and dump your screen's picture to a printer (Line Printer VII or VIII, NEC 8023A). From 6 years and up!
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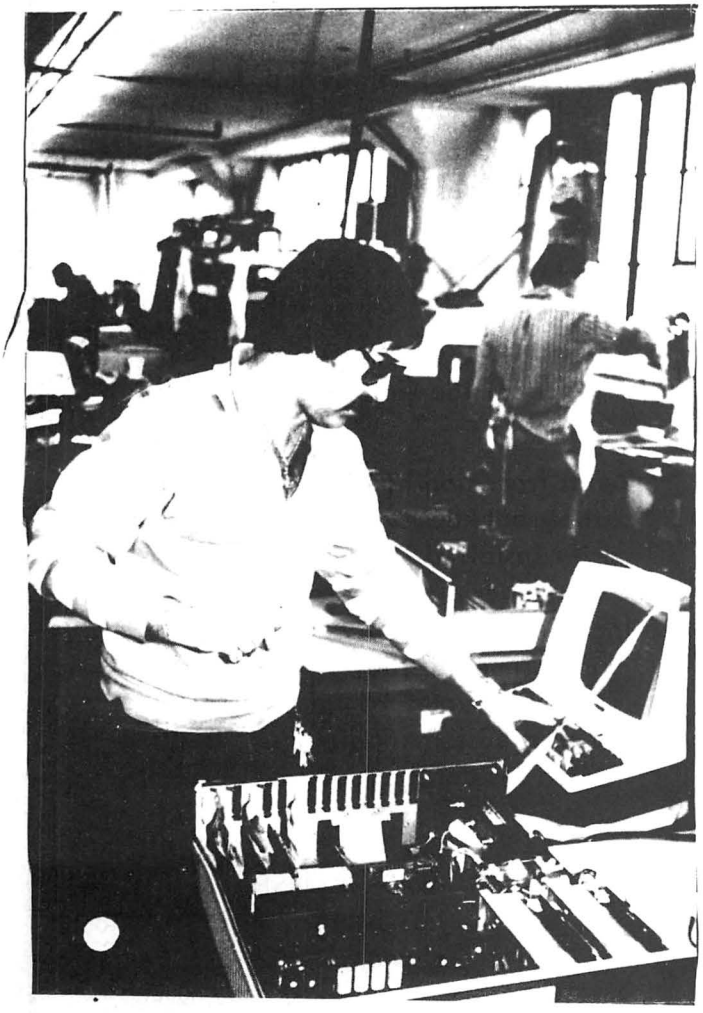
REMarks
by Bill Sias

The anticipation of a new year is aways an exciting thing for me. This year is even more exciting than ever before. Everything is ready for some exciting changes in January. I can't tell you any more than just wait and see, I think you'll like the changes.

All year long this editorial is written well ahead of the dates it appears. Since, with printing and mailing times, we are always far in advance of the calendar (at least that's the theory) it's frequently difficult to predict dates. Last month was one of those times. I stated that OS9 would be released by Radio Shack around November 1 and it now appears that the release will be after January 1. I still stand behind my prediction but with the revised date. However, the revision F board should be available in a few days. The procedure for upgrading to 64k on the revision F board is as follows:

1) change 4 jumpers to their 64k positions,
2) replace RAMs
3) cut one lead of capacitors C58, 60, 62, 64, 66, 68, 70, 72

Rumors Rumors.

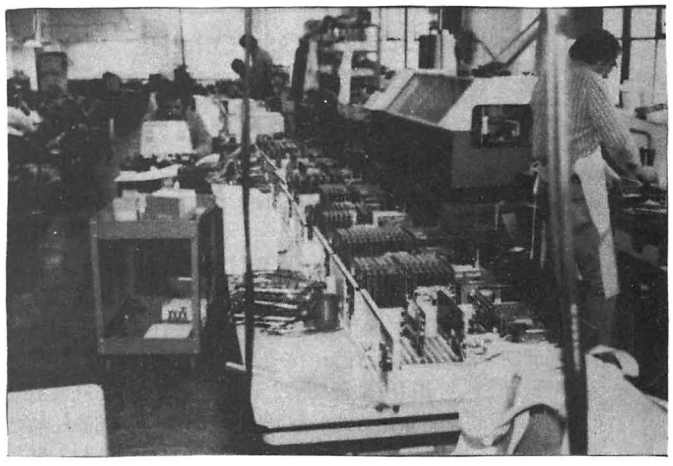


After spending several months now with the GIMIX I'd like to give you that long promised tour through the machine and the GIMIX factory.

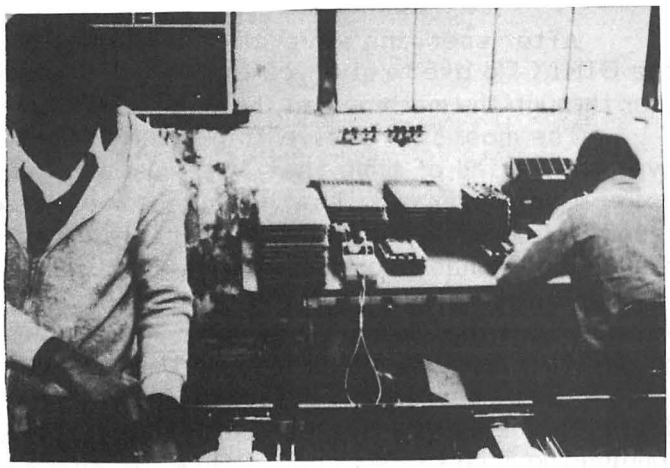
The most impressive thing to me is that over the period of time that I've owned it I've never seen it crash. That fact becomes more remarkable when you consider the fact that in our old office we had two occasions when the people in the front office shut off the electricity without warning. On both occasions we lost files on the other computers but never on the GIMIX.

Robert Phillips is the fellow that designed the GIMIX system and is shown above running the final tests on my GIMIX.

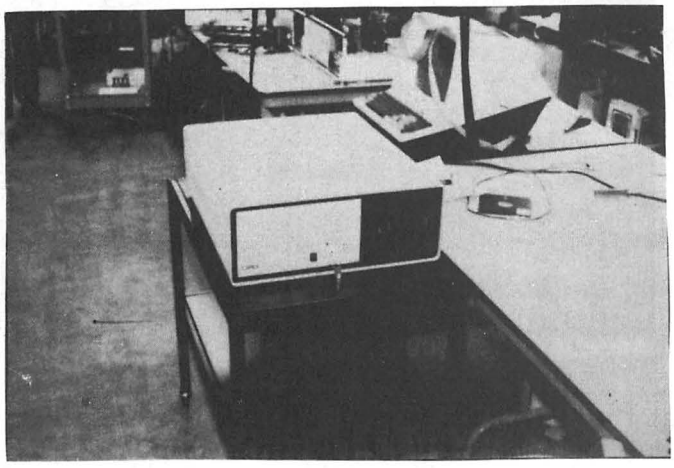
All assembly of GIMIX computers is done at the GIMIX factory, unlike many manufacturers I've visited where they have all the boards made elsewhere and then put together the final version inhouse.



Every GIMIX board goes through three tests. The first is a visual inspection after the chips are installed. Second, after the first burn-in period the boards are tested and those that pass are placed in inventory.



The last test occurs after the board is installed in a customer's computer and the whole system burned in as a unit.



Here's my GIMIX ready to go home.

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FLEX is the world's most popular operating system for the 6809 and with over 100 programs, we are the largest supplier of software for FLEX. These programs are NOT games but serious programs for your Color Computer. They range from word processors thru business applications to software development tools. Many Fortune 500 companies use our software.
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- NO additional hardware required
- We have supported FLEX with more software than anyone else in the world for more than 2 years!

SPECIAL

1. DBASIC, RS Disk Basic under FLEX with a utility to copy RS to FLEX disk $30.
2. ED/ASM line and screen editor and macro assembler, both more powerful than TSC's, and at the same cost, only $100.
3. UTILITIES, a set of 12 utilities especially designed for FHL Color FLEX $50.
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Software Catalog

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FLEX for the Color Computer: All the power and capabilities of the FLEX operating system for the RS Color Computer.
For 64K Color Computer

LANGUAGES

D/BASIC — with FHL Color FLEX $30.00; later $40.00

Radio Shack DISK BASIC for FHL FLEX. D/BASIC allows the use of the standard Disk Extended Color Basic under FHL Color FLEX. All disk input and output operations are done through FLEX and are completely compatible with the normal FLEX utilities.
For FHL Color FLEX only.

TSC BASIC for 6800-6809 — $75.00

Supports all of the standard BASIC statements and functions as well as many extended capabilities. For FLEX.

TSC EXTENDED BASIC FOR 6800-6809 — $100.00

Ideal for business or advanced scientific applications where extended math precision and formatting capabilities are essential. For FLEX

TSC PASCAL for 6809 — $200.00

A true native code compiler which produces assembly language mnemonics. For FLEX.

TSC FORTRAN '77: — $275.00

Just released for FLEX - Requires Relocating assembler. $350 with relocating assembler and linking loader. For FLEX.

MW BASICO9 — $200.00

Acclaimed as the most powerful and friendly high-level language available for any microcomputer. For OS-9.

A/BASIC Compiler: — Object only $150.00

Generates pure, fast, efficient 6809 machine code from easy to write BASIC source programs.
Written for 6809 OS-9 or FLEX

X-FORTH — Object only $149.95

An enhanced and extended version of Fig-Forth that runs under FLEX.
For 6800 or 6809 FLEX.

CC-FORTH — $99.95

For the Color Computer DOS, a language that is 5 to 10 times faster than BASIC.

DYNASOFT PASCAL — Object only $69.95; w/source $99.95

A fast integer only P-Code compiler ideal for ROMable applications. Powerful enough for the DynaStar word processor.
Written for 6809 OS-9 ($10 less for FLEX)

MW OS-9 PASCAL COMPILER — $400.00

A comprehensive implementation of PASCAL, it has ability to generate either highly optimized assembly language source code or P-code for interpretive execution while debugging.
For OS-9.

MW CIS COBOL COMPILER — $895.00

The "CIS" stands for compact, interactive, and standard, making COBOL ideal for microcomputer business applications. For OS-9.

MW FORMS 2 FOR CIS COBOL — $200.00

A COBOL program generator which facilitates fast and convenient development of interactive screen oriented applications.

WORD PROCESSING

DYNASTAR — Object only $149.95

Screen Editor: A powerful menu-driven screen editor equally suited to the tasks of program preparation and document processing. Simular to WORDSTAR (tm).
Written for 6809 OS-9 and FLEX.

DYNAFORM — Object only $149.95; With DynaStar, both only $275.00

Text Formatter: Provides all the standard features such as pagination, headers and footers with page numbers, single space, double space, bold-face, double strike and more.
Written for 6809 OS-9 and FLEX.

DYNASPELL — Object only $199.00; w/source $299.00

The most versatile 68XX spelling checker available. Fast and easy to use.
Written in assembler for 6809 OS-9 or FLEX

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SPECIAL NOW FOR FHL COLOR FLEX ONLY — $195.00

A very powerful, yet easy to use text processing system. This system is cursor-oriented with dynamic screen formatting.
For 6809 FLEX and OS-9.

STYLOGRAPH MAILMERGE — $125.00

For use with Stylograph Word Processing System, will fulfill three different needs.
For 6809 FLEX and OS-9.

STYLOGRAPH SPELLING CHECKER — $145.00

A fast and very easy to use tool that allows even an inexperienced user to eliminate spelling errors from text!
For 6809 FLEX and OS-9.

READTEST — Object only $54.95; w/source $74.95

A must for all writers and instructors, it reads your text and tells you how well it was written.
Written in assembler for 6800 or 6809 FLEX

TSC TEXT PROCESSING SYSTEM — $75.00

This system allows the use of over 50 commands for special text formatting applications.
Post processor for FLEX.

SOFTWARE DEVELOPMENT TOOLS

CRASMB — FLEX $139.95; OS-9 $200.00

CPM's (CPU Modules) — FLEX $25.00; OS-9 $35.00

Source or binary for the following; 6800, 6801, 6809, 6502, 1802, Z80, and Z8. OS-9 includes 6809 binary.
Will cross assemble source code into object code. (runs on 6809 systems.)
Written for 6809 FLEX and OS-9.

OSM — $125.00

OS-9/FLEX MACRO ASSEMBLER: A fast and versatile macro assembler with ability to define macros, with substantial parameters, conditional assembly directives and ability to change value of a label or symbol. Create OS-9 binary files in FLEX and vice versa!
Written for 6809 OS-9 or FLEX

SUPER SLEUTH — 6800/6809 w/source $99.00; Z80 w/source $99.00

A set of programs which will enable the user to examine and/or modify binary program files on disk or in memory.
Both written for FLEX, UniFLEX and OS-9.

6502 TRANSLATOR w/source — FLEX $75.00; UniFLEX $80.00; OS-9 $85.00

Enables the user to translate 6502 assembler code into 6809 assembler code.
Written for 6809 FLEX, UniFLEX and OS-9.

DEBUGGING SIMULATORS 6805 or 6502: w/source — FLEX $75.00; UniFLEX $80.00

Programs which enable user to simulate, examine and/or modify object 6805 and 6502 program files on 6800 and 6809 systems under FLEX.
Written for 6809 FLEX and UniFLEX.

PIC/PID 6800 Translator: — FLEX $50.00; UniFLEX $60.00; OS-9 $75.00

Translates 6800 assembler programs to 6809 mnemonics and converts 6809 programs to position independent code and data (Pic/Pid)
Written in assembler for the 6809.

CROSS ASSEMBLER MACROS: — FLEX $50 ea - 3/$100; UniFLEX $60 ea - 5/$120

6800/1, 6502, 6805, 8080/5 and Z80: For use with the TSC Assembler.
A macro text file.

OSM - OS-9/FLEX MACRO ASSEMBLER — $125.00

For FLEX or OS-9, Create FLEX or OS-9 binary files from either FLEX or OS-9. OSM is a MACRO assembler like CRASMB. It is simular to TSC's Assembler, but it has more powerful MACROS. OSM makes it easy to move FLEX programs to OS-9. In OS-9 it gives MACRO capability like TSC's assembler and is compatible with TSC source files. OSM was used by the author to move CRASMB to OS-9.
For OS-9 or FLEX.

EDitor — $50.00

ED has all the features of TSC's editor with the addition of screen type editing, MACRO capability, and a math package. Works with files larger than memory. It has many additional features.
For 6809 FLEX.

ASM - assembler — $50.00

ASM is compatible with TSC's assembler. But with more powerful MACROS and conditionals, than TSC's.
For 6809 FLEX.

MW MACRO TEXT EDITO — $125.00

Combines a minimum keystroke text editor with a macro-driven string processing language. A powerful tool for creation, conversion, or reformatting.
For OS-9.

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Software Catalog

MW OS-9 ASSEMBLER $125.00

A 6809 assembler specially designed for the OS-9 environment using Motorola standard instruction mnemonics.
For OS-9.

MW INTERACTIVE DEBUGGER $50.00

A useful tool for testing and debugging machine language programs or testing hardware.
For OS-9

TSC 6809 CROSS ASSEMBLER $100.00

This assembler runs on 6800 FLEX system with all the features of the 6809 assembler.
For FLEX.

TSC 68000 CROSS ASSEMBLER on 6809 $250.00

An assembler which runs on a 6809 FLEX system and supports full 32 bit math, macros, and conditional assembly.
For FLEX.

TSC DEBUG PACKAGE $75.00

This package is a complete assembler language program debugging tool capable of simulating the functions of the MPU.
For FLEX.

TSC RELOCATING ASSEMBLER/LINKING LOADER:
Just released for FLEX! $150.00

BUSINESS APPLICATIONS

INFOMAG Data Base Manangement $295.00

INFOrmation MAnaGement system designed for any specific application for use by the non-computer expert. Capable of handling almost any collection of data.
Requires TSC XBASIC and FLEX.

RMS RECORD MANAGEMENT SYSTEM $200.00

Complete DMS in machine language. Uses include accounting, customer or personnel records, and situations which require data entry, data retrieval and update.

BILLPAYER w/source $169.95

A series of programs that were designed to fill the need of a household financial system or of a very small business.
In TSC XBASIC for FLEX.

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Enables the user to define and maintain mailing list oriented data bases.
Written for 6809 FLEX and TSC XBASIC.

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Written for 6809 FLEX and UniFLEX ($395.00)

TABULA RASA FLEX $100.00
UniFLEX $110.00

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In TSC XBASIC for 6809 FLEX

INVENTORY W/MATERIAL REQUIREMENT: FLEX $100.00
UniFLEX $150.00

These programs enable the user to define and maintain inventories and include hierarchial materials requirements planning.
Written in 6809 for FLEX.

OSBORNE A/R FLEX $295.00

An open invoice system, will print ageing reports, statements etc.
For FLEX and TSC XBASIC.

OSBORNE A/P FLEX $295.00

An invoice oriented system, will keep track of your vendors and even print checks for you.
For FLEX and TSC XBASIC.

OSBORNE G/L FLEX $295.00

Uses double-entry posting to reduce off-balance situations. Can post to your accounts from A/P, A/R and the Cash Journal.
For FLEX and TSC XBASIC.

UTILITIES

AUTOTASK w/source $129.95

Consists of a set of memory resident commands that are aids in the design of user oriented applications programs.
Written in assembler for 6809 FLEX

TOOLKIT #1 Object only $49.95
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Add EDIT to TSC BASIC's, along with DECOMPIL and cross reference.
Written in assembler for 6809 FLEX

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A package of utilities and programs developed to extend the capabilities of the FLEX operating system.
Written in assembler for 6809 FLEX

EXTENDED UTILITIES: Object only $49.95
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A set of 12 utilities that add the final touch to your utilities for FLEX.
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PLOT: w/source $49.95

Designed to give you neatly formatted plot with the best resolution possible. Will plot histograms, bargraphs, XY plot and others.
Written in TSC XBASIC for 6809 FLEX.

SOME COMMON BASIC PROBLEMS: w/source $69.95

SCBP will allow you to figure income tax, tax depreciation, amortization schedules and more. From the Osborne book by the same name.
Written in TSC XBASIC for FLEX

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SPBP like the above is from the Osborne book. The work of conversion is done for you.
Written in TSC XBASIC for FLEX.

PASSWORD Object only $69.95
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Will enable you to create a system disk that cannot be booted without knowing the built in password.
Written in assembler for 6809 FLEX

UNIFLEX SIMULATOR FLEX $100.00
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Debug Uniflex assembler programs using TSC Debug and other facilities of FLEX.
For 6809 FLEX.

OS-9 SIMULATOR for FLEX: FLEX $100.00

Debug OS-9 assembler programs using TSC Debug and other facilities of FLEX. Requires OSM.
For 6809 FLEX.

HELP Object only $29.95
w/source $49.95

A data retrieve utility designed to save you time digging through manuals looking for info about computer language commands and statements.
Written in assembler for 6800 or 6809 FLEX

JOB CONTROL PROGRAM Object only $49.95
w/source $89.95

Allows you to enhance every other program you own.
Written for 6800 or 6809 FLEX

TSC BASIC: PRECOMPILER FOR 6800-6809 $50.00

Allows the user to write BASIC programs in a non-standard BASIC source format.
For FLEX.

TSC FLEX UTILITIES $75.00

A package of additional FLEX utility commands which includes memory dump, prompting delete to name a couple.

TSC FLEX DIAGNOSTICS $75.00

These utilities are designed for FLEX. Included in the memory diagnostics portion are zeroes and ones test, randon pattern test and more. Disk examine, modify and test are also included.

TSC SORT/MERGE PACKAGE $75.00

A full-disk sort/merge which allows the contents of any size file to be sorted, including random files.
For FLEX.

READTAPE w/source $54.95
Requires a PIA

Will read TRS-80 Level II BASIC tapes and convert programs to TSC BASIC.
Written for 6809 FLEX.

FULL SCREEN FORMS DISPLAY FLEX $50.00
UniFLEX $75.00

This package substantially extends the screen input/output capabilities by providing a table driven method of describing and using full-screen displays.
Written for 6809 FLEX.

GAMES FOR FLEX

ESTHER Object only $39.95
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An enhanced game of Eliza in fast machine language. Artificial intelligence in pure 68XX code.
Written in assembler for 6800 or 6809 FLEX

NEW for OS-9!!

DISK/EDIT: $79.95

Examine and modify OS-9 DISKS with this screen oriented editor.
Written for OS-9.

For FREE Catalog
send legal size SASE with $.40 stamps.

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SPECIFY 5 OR 8 INCH DISKS - 6800 or 6809

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STYLOGRAPH

6809 WORD PROCESSING SYSTEM

AVAILABLE FOR FLEX,™ UniFLEX,™ and OS-9™

The STYLOGRAPH text processing system is a very easy to use but powerful method of creating and printing text. It allows the operator to type text on the CoCo, modifying and correcting it as it's typed, and then print it out. The STYLOGRAPH SYSTEM is cursor-oriented with dynamic screen formating. Cursor based editing means that any portion of the text may be worked on by moving the cursor to that point. Dynamic screen formating means that the text is formated on the screen in the same way it will appear on the printed copy. The display is continuously updated to show how the text will appear. This is a very important feature and is normally available only on very expensive commercial word processing systems. It significantly reduces the time required to produce a finished copy.

FULL FEATURED TEXT EDITING

A full array of commands help in the creation and modification of text. The text displayed on the screen may be moved up, down, left or right. The cursor can be moved to any page or to any specified series of letters or words. The cursor itself can be moved left, right, up, down, to any tab position, or to the extreme left or right. Any block of text can be moved, copied or deleted. The operator may also do a **global replace** so that all occurrences of a given string will be replaced with or without a "prompt" asking if the item should be replaced.

OPERATOR CONVENIENCE

Files longer than memory can be edited. The operator can move forward through a long text file by selectively dumping text to the disk or filling from the disk.

The supervisor mode is **menu driven** and self prompting so that the operator does not have to remember the syntax of commands. This makes it easier for new operators to use the system.

An "assist" or **"help" function** makes it easy to learn the system since it is normally not necessary to consult the manual to learn the commands. This function is menu driven and lists all of the keyboard functions and the formating commands.

At the beginning of the text the operator normally types in a few simple commands indicating the line length, left margin, and so forth, and then enters the header and footer as they should appear. After that the operator need not worry about formating since it is taken care of automatically. Words that extend beyond the end of the line are automatically removed and placed on the next line. **Headers** and **footers** are automatically inserted so that the operator always knows what portion of the page is being worked on. **Ghost hyphens** can be entered so that if the word falls at the end of a line, and a ghost hyphen has been inserted, the hyphen will automatically be added.

FLEXIBLE DISPLAY

Lines longer than the screen width are allowed. STYLOGRAPH can scroll right and left on the screen so that tables can be constructed and appear on the screen exactly as they will appear on the print out.

A command allows viewing of the formating commands on the screen. Another command allows the operator to see which characters will be modified at print out by underlining, superscripting or boldface. A page status command shows the current format values and other useful information.

COMPLETE FORMATING CONTROL

The text of individual lines may be centered, left justified, right justified, or right and left justified. **Tabs** can be set or cleared at any point. Spacing of the lines on the page is under complete operator control with end of page, spacing and vertical tab commands.

While entering text, it may be specified that the characters have some kind of modification when they are printed, such as underlining, superscript, boldface, overline, or subscript. These character modifications are done with "control" key strokes. For example, to start underlining characters, simply hold down the "CTRL" key, hit the "U" key and continue entering text. To stop underlining, hit the "DEL" or "RUB" key.

POWERFUL PRINTING OPTIONS

Underlining is supported on TTY type printers. For those people who have specialty printers there are a variety of additional capabilities including:

1.5 line spacing
BOLDFACE
superscript^{1}
subscript$_{2}$
underline, overline,
or any combination

Right and left justification of text is accomplished by incremental printing on TTY type printers. True proportional spacing is supported on the specialty printers.

Control codes may be embedded in the text for special applications. For example, some printers require special control sequences for double width, graphics or boldface. These sequences may be embedded in the text for those users that have these printers. In conjunction with this, it is possible to cause the printer to stop in the middle of a print out for changing printwheels. A backspace feature allows overstriking.

OPERATING SYSTEM COMPATIBILITY

STYLOGRAPH is compatible with the FLEX, *UniFlex, and OS-9 disk* operating systems. Text files prepared using STYLOGRAPH are directly usable by other software such as BASIC and the assembler. (This significantly aids software development since cursor-based editing allows full viewing of the text being worked on, thereby reducing errors and decreasing programming time). File size is limited only by the capacity of the disk system. Files may be loaded into the text at any point making it possible to rapidly create "boiler plate" documents using portions of text that have been previously saved to a text file. Any portion of a text may be saved to a text file for use at a later point. The printer output may be directed to a disk file for later print spooling. Most operating system commands are directly accessible without leaving STYLOGRAPH.

FULLY ADAPTABLE TO MOST PRINTERS

STYLOGRAPH is easily configured by the user for most terminals so there is no need to send for updates as equipment changes are made. Source code of the terminal interface is supplied so that users with unusual equipment configurations may adapt it to their systems. The source code for all of the "prompts" is also supplied so that foreign language versions may be easily constructed.

Printers currently included as standard are: Diablo, Qume, Starwriter, NEC 5515/25, NEC 5510/20; CENTRONICS 737/739; TTY type printer with backspace function; TTY type printer without backspace function.

COMPLETE INSTRUCTIONS

A special tutorial section is included in the manual so that people with little or no computer experience can easily learn to use STYLOGRAPH in a few hours. A text file is included which demonstrates most of the features of STYLOGRAPH and allows the operator to practice most of the functions. The logical arrangement of the commands and the immediate display of the results greatly simplifies the learning process. In addition there is an "assistance" command which helps the new operator learn the commands.

STYLOGRAPH MAIL MERGE

A major option of STYLOGRAPH is the related MAIL MERGE program. This program adds "form letter" capability to STYLOGRAPH. Variables such as names addresses, dates, may be taken from a disk file or the keyboard at print out time and inserted into the text. Successive letters may be printed out without operator intervention.

The second important capability of the MAIL MERGE program allows many STYLOGRAPH text files to be appended at print out time. This allows files to be edited in smaller, more convenient blocks and then appended at *print out time* so that the page numbers will remain consecutive and the headers and footers will automatically be retained through all of the print out.

STYLOGRAPH SPELLING CHECKER

Another major option of STYLOGRAPH is the related SPELLING CHECKER program. This program reads through a text file and compares the words in the file with a dictionary. Words that are not found in the dictionary may be marked in the text for later editing, corrected on the spot, skipped, or added to the dictionary. Words may be added to or deleted from the dictionary to create unique vocabularies for particular applications.

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Dear Bill;

A couple of questions have me stumped. First off, I've done quite a bit of reading lately about the Flex system in yours and other publications. In all of them they talk about the necessity of upgrading to 64K RAM in this context always refer to the E-Series PC board. Having busted my "warranty" seal of my computer a long time ago I know that my board is stamped with a big D. The computer was upgraded to 32K about a month ago so I assume it now has the 1.1 ROM (though it still says Microsoft Basic Version 1.0 when I power up). Question is, are those of us like myself, who have the D-Series board out of luck should we want to make the switch to either 64K, a Flex Operating System or both?

Second, I use my system in my business. I own a LP VII which at the time I bought it was the only printer available for the CC-80. It has been very reliable considering the abuse, however its slow print and line delay drives me crazy. Is there any way to increase the baud or decrease the line delay time via software or hardware modification? I tried a POKE 150,0 as suggested in the Microcomputer Newsletter for the LP VIII and it got so fast it didn't print at all.

Lastly, how do you go about disabling a key such as the break key during program execution? My attempts have turned out to be total flops. If you could give me a clue it would be greatly appreciated.

Sincerely,
John Livernash
Reno, NV

* We have an article in the works about upgrading the D revision to 64K, I don't believe it's much more difficult than the E board. The 1.0 you see on power-up is the Extended BASIC sign-on message, once you have Extended BASIC the old messages doesn't show. I'm not aware of a way to run the LP VII at a higher baud rate, although I could be wrong since we don't have an LP VII in house. The following program will disable the break key:

```
10 FOR X=&HF8 TO &HFE
20 READ A: POKE X,A
30 NEXT X
40 FOR X=&H19A TO &H19C
50 READ A: POKE X,A
60 NEXT X
70 DATA 50,98,28,175,126,173,165
80 DATA 126,0,248
```

Dear Persons

Not to tie up your time I have to ask some basic questions about the COLOR COMPUTER.

1) What kind of endurance does the COLOR COMPUTER keyboard have in terms of mean time failure.

2) Does the color computer have to be protected by an external device for voltage spikes or is the protection built in.

3) I bought RADIO SHACK'S new "EDITOR ASSEMBLER" which is totally useless to a beginner in machine language. Although Tandy has committed themselves to putting out a book on machine language for the "COLOR COMPUTER" I suspect it will be a while, or late like some other items they have put out lately. Does anyone know of a good book I could buy NOW for EDITOR ASSEMBLER on the COLOR COMPUTER, or the 6809E microprocessor.

All answers appreciated!!!
Thank you
Scott Kitzerow
Lake Villa, IL

* 1. Failure of the keyboard appears to be an early problem with most CCs since the keys do seem to get sticky.
2. I strongly recommend spike protection for any computer regardless of any built-in protection.
3. The book I have often recommended is 6809 Assembly Language Programming by Lance Leventhal which is available from several of our advertisers.

Dear Bill,

How can I load data stored to tape from R.S. Color File and Person Finance ROM pacs into another program for formatting and manipulating?

Also, I know what ASCII is, but what about the save in ASCII option in Basic? What do you save in if you don't use ASCII? I've never seen anyone try to clarify this issue before, maybe you can help.

Regards
Jim Mathews
Midlothian, VA

* I'm not sure about the format used by Color File but some reader may be able to help. When you don't use the ,A option on CSAVE you write the program to cassette in tokenized or compressed form. The tokens are the codes the BASIC interpreter recognizes as the commands we type as programs.

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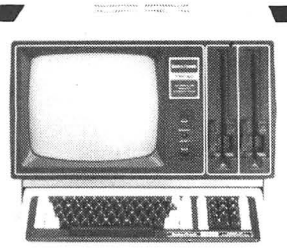

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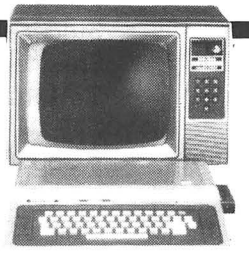

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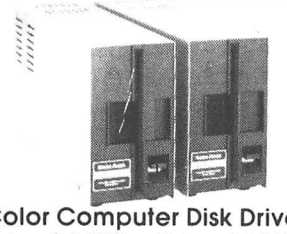

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Dear Editor:

Although I bitterly resent your publication giving short shrift to the newcomer to Co Co, I must admit that there are many nuggets of gold to be mined from your publication.

Advice to the beginner:

Flip over the advanced material but pore over the articles that are at your level or a bit above. You will find bits of information that will prove invaluable. Read the reviews of new products to get both an evaluation by the competent reviewers and to find out what is available. Finally, read the letters to the Editor. You'll be surprised at what solid information you will be able to glean from the contributors' input.

A final note to the beginner. Never disgard the back issues of CCN. Save them and as sure as Hitler was a Nazi, as you become more friendly with your Co Co, you will be reaching for the back issues for aid and comfort.

Sincerely,
Joseph Kolar
Inverness, FL

NOTE TO EDITOR: You could insert in the above message, if your dare, that there is a good, generalized publication for the beginner. It is The Rainbow, P.O. Box 209, Prospect, KY, 40059. Taken together, CCN and the Rainbow make good medicine for what ails the Co Co addict.

Letter to the Editor:

I want to share with your readers my delight in a peripheral I just added to my Color system. It is the MBS-8K Microbuffer serial printer interface from Practical peripherals ($159). It installs inside the Epson MX-80 printer, and allows the use of a 3-wire cable from the computer's RS-232 port. After one has been using a 600 baud interface with no buffer, it's fantastic to be able to dump 8K of text at 9600 baud (POKE 150,1), and then continue computing while the printer does its thing.

Sincerely,
Lane P. Lester, PH.D.
Lynchburg, VA

Dear Color Computer News:

As a responsible, consumer-oriented publishing company, you and your fellow magazine publishers can solve the "protected software" problem by refusing to accept ads for companys with protected software, unless you receive with such as an unlock routine and permission to publish same in the event of the demise of the company or its inability to furnish service to owners of said software.

Answer to W.R. Vance September Mailcall
For Dec to Hex ?HEX$(DEC#)<ENTER>
Sincerely,
Spencer Trimble
Tallahassee, FL

* Sounds like a reasonable idea.

Dear Bill

I was reading Mail Call and I happened to come across a very interesting letter pertaining to the Radio Shack DOS. I found it most interesting because it contained a peculiar problem that paralleled my experience exactly. The problem consists of the NEW DOS that I just purchased to the tune of $650.00 crashes the directory and at least half the tracks on the disk. Of course only after the disk is half full of important programs and files.

The original letter that let me understand that it was not a personal problem and is probably inherent in the DOS itself was written by Ken Knecht of Yuma Arizona, April 1982. I appreciate Ken bringing the matter to public attention because originally I felt it must have been my programming that caused the crashes. Now I feel that the problem is the DOS itself. I must admit that Radio Shack has been extremely generous and I have no complaint with them, as I am on my third Disk Drive.

I would like to express to Ken that other people have this problem and he is not alone. I solved it by swapping disks at Radio Shack until I now have a disk that seems to work properly. For what reason I do not know, but it does. I can only suggest that Ken try to swap disks as I did until he finds one that is compatible with his system. I know that doesn't make much sense but the facts sustain this theory.

When the disk is operating properly it is an extremely useful and pleasant experience. It should arbitrairily crash and if it does, I would take it back until I had one that worked correctly.

Yours Sincerely,
Robert Carr
Lake Park, FL

Sirs:

I have a 16K Extended Basic Color Computer which I program in Assembly language. I have been writing programs recently which demand random number generation. Can you give me a ROM subroutine call to generate random numbers?

Any help you can give me will be greatly appreciated.

Leon Madin
Bayville, NY

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MAKING <CLEAR> A BIT CLEARER?

by Old Father William+

If you are as new to programing as I am, I'd almost bet you have been crying for some solid *information* about the command <CLEAR 1000>. What does the command mean? What does it do? How do you know how much memory to <CLEAR> for a particular program? etc., etc....

This question is like a lot of other questions we ask as we begin to get serious about programing. The only people who seem to be around who know the answers know too much, and the answers are more perplexing than the question was. By the time some of those "helpful types" get through, I'm so confused I don't even remember the question, and I'm not at all sure they do either.

Every once in a while, though, something clicks, and we get our own little "Aha!" moments. Suddenly, one small part of all that technical jargon takes on meaning, and we actually have learned something.

I spent a very frustrating day-off recently. The program I was working on was quite long in itself, and was designed to create sizeable datafiles on tape. The problem was that I wanted as many separate sets of data (they happened to be name and address listings) as possible. I kept trying larger and larger <CLEAR> statements, and found myself bouncing back and forth between <?OS ERROR> and <?OM ERROR>.

Into the midst of all this confusion came three hints of order. First, was Wm. Barden's article "Machine Language Sort", in the May, 1982, issue of TRS-80 Microcomputer News. Second was Andy Phelps' "Comment Corner", from the May, '82, issue of Color Computer News. The third was something to make all of you envious -- one of my frequent visits to Bill Sias' office, to pick his brain. Bill is truly a helpful person. One of his most impressive characteristics is his restraint in responding to questions. Since he is not putting on a show about how much he knows, he can gear his responses to my knowledge level and not overwhelm me.

The upshot of all this is that I think I have a rough idea where to go with the <CLEAR> statement from now on, and I think I can make some of it make sense to my fellow newcomers to programing (I hope!). I am not all sure this explanation will satify the experts, but it should be useful to many readers.

To begin with, every location in Random Access Memory (RAM) can hold one number, from 0 to 255. For string storage, we are primarilly interested in the numbers 32 to 127, which are the CHR$ numbers for punctuation and upper - and lower-case alphabet characters. We will also use CHR$(13), which is the carriage return character. When we enter something like:

A$="Mr. and Mrs. John Jones"

the computer has to store that information somewhere.

What the CC does, as Bill Sias explained it to me, is to go to the very end of RAM and work back. With my 32K CC, as Wm. Barden pictures it, that means ending with location 32766. It would look something like this, if we viewed the CHR$ numbers stored in each location:

Location	CHR$	C'TER
32766	115	s
32765	101	e
32764	110	n
32763	110	o
32762	74	J
32761	32	Space
32760	110	n
32759	104	h
32758	111	o
32757	74	J
32756	32	Space
32755	46	.
32754	115	s
32753	144	r
32752	77	M
32751	32	Space
32750	100	d
32749	110	n
32748	97	a
32747	32	Space
32746	46	.
32745	144	r
32744	77	M

Now that that information is stored there, the CC is ready to store the next string, which will end at 32743. This brings us to the <CLEAR> statement.

Every time we turn on our CC's, the top 200 locations in memory are CLEARed automatically for string storage. If we have a program that uses absolutely no string storage, then entering <CLEAR0> will release that 200 bytes for general memory usage. That release can be seen in a 200 increase in the answer *returned* to the <?MEM> <ENTER> query.

The automatic 200 bytes is arbitrary. It obviously won't stretch very far with the type of program I want to use. We used up 23 locations for the letters, numbers and puctuation in just one name. If that is an average requirement, then I could enter <CLEAR 6900> and have enough

string space reserved for 300 names.

However! (Have you ever noticed that just when you have something figured out, someone always comes up with that deadly word?) Just having thousands of letters and puctuation marks neatly stored in high RAM would do no good at all if the CC couldn't find them, and find them at just the right time and in just the right sequence. For this purpose the CC uses what are called pointers.

Back down in low RAM, the CC is setting aside some locations which tell it where to look in the <CLEAR>ed area when it needs A$ for the screen, the printer, or whatever. So, hang on, here we go into two-byte locations.

As we noted above, 256 is the maximum that one location can hold (remember, count the 0 in the 0-255 range). When the CC needs a number larger than 256, it uses a pair of locations. The first location holds the number of full 256's in the count, and the second location holds the surplus over even-multiples of 256. This makes the following sequences in two-location counts:

COUNT	LOC.#1	LOC.#2
1	0	1
2	0	2
3	0	3
4	0	4
-	-	-
254	0	254
255	0	255
256	1	0
257	1	1
258	1	2
259	1	3
-	-	-
510	1	254
511	1	255
512	2	0
513	2	1
514	2	2
515	2	3
-	-	-
32765	127	253
32766	127	254
32767	127	255
32768	128	0
32769	128	1
-	-	-
65278	254	254
65279	254	255
65280	255	0
65281	255	1
-	-	-
65534	255	254
65535	255	255

Now, if we want to describe the location of A$, which starts at 32744, we divide by 256. The result is 127, with a remainder of 232. Therefore, if we poke 127 into one location and 232 into the next, we will have a pointer that the CC could recognize as the place to look, every time we ask it to find A$.

Fortunately, we don't have to do all that ourselves. The CC does all that (and more) when we type in

A$="Mr. and Mrs. John Jones"

Yes, "and more". Part of the information which the CC needs when we ask it to find A$ is the length of the string. There is a 1-byte location near the 2-byte string pointer where the CC stores the string length. Since that location cannot hold a number larger than 256, it is a bit easier to understand why the CC gives us <?LS ERROR> when we try to enter strings longer than 256 bytes. I never understood that limitation until all this began to go together.

Where does the CC put the address and length of A$? As I said, it goes into low memory. What goes into that low memory location is called a "string descriptor block". The CC uses 5 locations for one of these blocks. The first location holds the length of A$, and locations 3 and 4 hold the pointer.

Did you just hear that dull thud? That was my head bumping hard against that wall of what I don't know about all of this. Why 5 bytes, when only 3 are doing identifiable work? I just don't know. It's no crime to admit that. We don't have to stop here, though. There's a lot we can do with the information we do have now.

Suppose we are trying to get 300 names into the CC's memory at once. We need 300 23-byte spaces CLEARed down from the tip of memory, and we need 300 5-byte spaces DIMensioned up from the bottom of memory. Do you get the picture of two freight trains rushing madly toward each other? The crashing of these two reserved areas is what kept me bouncing back and forth between <?OS ERROR> and <?OM ERROR> that day.

Unfortunately, we have to get a bit more complicated to CLEAR up all this.

I used the word DIMensioned a few lines ago. The CC does automatically some reserving of space for the descriptor blocks every time we enter a string name. Just as 200 bytes are CLEARed on power up, 55 bytes are reserved for string descriptors every time the CC encounters an input like A$. Yes, 55 bytes. That's enough for eleven 5-byte descriptors, so we could enter eleven full names and the CC could happily store

them and almost instantly find where to start in high memory (pointer) and how many bytes to retrieve (length) when we summon A$(0) - the Jones name, A$(1) - the Smith name, A$(2) - the Johnson name, etc., down to the Millers at A$(10). In effect, the CC automatically enters a DIM A$(10). (There's that extra number again - the 0-10 range is eleven items.) To get the use of all eleven, you must start with A$(0). You can't just go from A$(1) to A$(11). The CC has specifically provided for the subscript numbers 0 to 10.

That 55 bytes is an absolute limit. The instant we are asked for an input called A$(11) for the Adams family, we get <?BS ERROR>, and we lose everything we have put into memory, unless we can do a <GOTO> to a line which will pick up where we were at A$(10). Those names are all still recorded there in high RAM after the error message, but the command <RUN> will reset all the descriptor blocks, and we lose our access to the strings.

That 55 is arbitrary and absolute, though, only until we change it. When we put an early line into the program, such as:

30 DIM A$(299)

the CC gives us, you guessed it, 300*5 bytes, or 1500 bytes reserved for string descriptor blocks, from A$(0) to A$(299). Yes, there is still a <?BS ERROR> lurking there, but not until we try to enter an A$(300).

Actually, DIM A$(299) gives us 1507 bytes of reserved memory. It takes 7 bytes to get started. Bytes 1 and 2 hold the string name. (Does that make it any easier to understand why we can use any one or two letters or a letter and a numeral for string names?) Bytes 3 and 4 tell the computer how far to jump (1505 locations in this case) to look at the next variable name, in case it is searching for T$ or whatever. Byte 5 is the number of dimensions in the array. Bytes 6 and 7 hold the number of entries we have made of A$'s.

OK, back up again. "Byte 5 is the number of dimensions in the array." I slipped another one by you! Suppose we want to input all the elements of a name and address listing. And suppose we want to be able to change the elements around, such as last name first for alphabetical lists, or leaving out the phone number on the mailing label. We can do that with a two-dimension string array, set up by the statement DIM A$(299,4). This gives us 300 sets, 5 elements in each set. A$(0,0) can be "Mr. and Mrs. John"; A$(0,1) can be "Jones"; A$(0,2)=1529 Main Street"; A$(0,3)="Muskegon, MI 49441"; A$(0,4)="(615) 555-6371". At this point we have used 70 bytes for the Jones listing, and would require <CLEAR 21000> for 300 similar listings.

I pay for this flexibility in memory capacity, although not in the CLEARed area in high memory. There we CLEAR one byte for each input character, however we choose to organize the labeling. But I pay dearly in the string descriptor blocks in low memory. I still have the 7 bytes to identify A$, the displacement to the next array, the number of dimensions in this aray (now 2), and the number of entries. But now I have five 5-byte descriptor blocks for each one I had before. One for A$(0,0), one for A$(0,1), etc. Yes that's 5*5*300, or 7500 bytes of memory gobbled up by string descriptors. I'm sure you have noticed that with 21000 bytes CLEARed, and 7500 reserved, the program itself will have to be very short, or it starts raining error messages!

I have to choose between the flexibility of moving elements of the addresses around and the advantages of having the entire mailing list in memory at one time. Before I began to understand all this, my original program had DIMensioned A$(300,8)! I had "Muskegon" as one element, "MI" as another, and "49441" as another. Now I see how to be much more frugal with available memory.

However! (there's that word, again!) I don't really know, yet, whether the Joneses are "average" or not. At least, I don't know whether their name and address is of average length for our mailing list. For 300 names, do I need that <CLEAR 21000>, or is it only 15000 -- or, horror of horrors, is it more like 25000?

Is there a way to tell how much string space I have used during data input? Yes, there is, and here again is where Andy Phelps and Bill Sias came through for me.

Here is the beginning of Andy's list form the July, '82, CCN:

Addr.	Comments
0007	FLAG IF GARBAGE COLLECTED
001B	START OF VARIABLES
001D	START OF ARRAYS
001F	END OF ARRAYS
0021	START OF STRING POOL
0023	START OF USED AREA OF STRING POOL
0025	POINTER TO STRING
0027	END OF STRING POOL
0041	TEMPORARY POINTER
0047	HIGHEST STRING FOUND
004B	ADDRESS DESCRIPTOR OF HIGHEST STRING FOUND

After I got over my first thought that that is all a "garbage collection", a couple of things began to stand out. "0027 - END OF STRING POOL" - actually, that is *27 and *28 (the * indicates a hexadecimal number), a 2-byte location, so:

```
PRINT PEEK (&H27);PEEK (&H28)
```

ANSWER RETURNED: 127 254

multiply the first result by 256 and then add the second - try it. You'll get 32766 on a 32K CC (63 and 254, or 16382, I think, on a 16K CC). Familiar number? Yes, that's the top end of RAM, or the "End of String Pool". Surprise, Andy is not writing in Swahili!

Next, another one begins to make sense: "0021 - START OF STRING POOL". You don't suppose that PRINT PEEK (&H21)*256+PEEK (&H22) would give 32566 on power up, do you? Yep, the automatic 200-byte <CLEAR> is there.

Now, the real goodie! --

"0023 - START OF USED AREA OF STRING POOL"

Check it out. Watch it happen on your CC. Every byte of A$ input reduces the combined total of PEEK (&H23)*256+PEEK (&H24) by one. It starts at 32766 on power up, then goes to 32765 when you input A$="A", goes to 32764 if A$ is "AB", etc. ...

If I decide to <CLEAR 21000> for my program, and I am busily entering addresses into a FOR/NEXT loop:

```
100 FOR X=1 TO 300
110 INPUT A$(X)
130 NEXT X
```

if I have inserted this line and routine*

```
120 IF INT(X/10)=X/10 THEN GOSUB 1000
1000 M=PEEK (&H23)*256+PEEK (&H24)
1010 N=PEEK (&H21)*256+PEEK (&H22)
1020 O=PEEK (&H27)*256+PEEK (&H28)
1030 P=M-N:Q=O-M
1040 CLS:PRINT"YOU HAVE ENTERED "X" ADDRESSES."
1050 PRINT"YOU HAVE USED "Q" BYTES OF STRING SPACE, OR AN AVERAGE OF "Q/X" BYTES PER ADDRESS."
1060 PRINT"YOU HAVE "P" BYTES LEFT TO USE, OR A CAPACITY OF "P/(Q/X)" MORE ADDRESSES, IF YOUR AVERAGE HOLDS."
1090 PRINT"PRESS <ENTER> TO CONTINUE":INPUT E$:RETURN
```

then after every 10th address I'll get an update on my string space. If I am running low, I can pick a time to quit loading and make a tape file of the addresses I've entered before an error message destroys everything I've entered.

Now that you've got all that, I'll tell you why it is not totally reliable. No, don't despair, this is good news! Remember that "Garbage Collection" line? Those words can make sense also.

As we are storing A$'s, byte by byte, working back from the top of RAM, accasionally (or frequently, for Old Father Fumblefingers) we make a typographical error. If the program is built for editing, we enter the correct version of the line, and A$(15,2), for instance, has a new value. The CC dutifully puts into string storage, byte by byte, the new input, and changes the pointer for A$(15,2) to the new location and string length. The wrong one is still there, however, taking up string space, with no pointer giving access to it.

The moment of truth arrives. We have 23 characters to enter, and we have just found out that we have used all but 15 bytes of our CLEARed string space. We hit <ENTER> and the CC takes it! We soon find out that we somehow have 1500 bytes of string space still unused. Sheer magic? No, garbage collection.

During a brief pause, the CC found the location and length of every abandoned or corrected string, and moved the next lower labeled string up past all the unused spaces to just under the next higher labeled string. The garbage is gone, without even a trip to the landfill. Now all remaining string space is collected at the bottom of the CLEARed area, where it belongs, and where it can be filled from the top down, as usual.

The <?OS ERROR> is held at bay until we finally enter so much string data that, even with one last garbage collection routine, there just is not room for all of that final string.

When the garbage collection is needed, location *07 is set to 255, and the current string is stored, if there is now room. As soon as we input the next string successfully, location *07 is reset to 0.

The next item to CLEAR up is one I am just beginning to understand, but I can help you look where I am looking for complete understanding. Some utility programs are loaded into high memory after we power up, and they are used with whatever programs we may write or load. I'm thinking of "Master Control", from Soft Sector Marketing, or the routines for using the CC with non-intelligent printers. What we need to do is to find out how long the program is and its starting location in high RAM. Then we start our CLEARed area below that.

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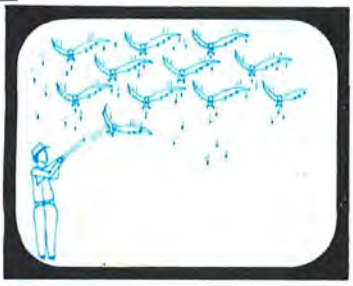

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If we have loaded a 58-byte program into 32709-32766, we can:

CLEAR 21000,32708

and not interfere with anything. The 32708 tells the CC to start there, count back (or down) 21000 spaces, and reserve that area for string storage. The "End of String Pool", locations *27 and *28, would be set to read 32708, and the utility program lies undisturbed.

One more thing which may help someone someday. Page 203 of my "Getting Started" manual from Radio Shack shows a DIM A(7) line and says it is not necessary, but "a good idea". Now that I see how the automatic 55+7-byte reserving works for every variable name the program comes across, I can see that DIM X(1),Y(1), etc. could be used to cover every single-value variable in a long program. At a dividend of 45 freed bytes of low memory each, this could soon add up to a lot.

I have this picture of all those readers who really know what they are talking about groaning at whatever inaccuracies I have now perpetrated on unsuspecting fellow newcomers in this article. I trust the Mail Call columns will get your corrections of my efforts, so no one is permanently misled. A lot of this does help me, anyhow, to understand what used to be meaningless jargon.

If you want to experiment a bit with some of this, you might want to try typing in the program below. It helped me sort out a few of the pieces.

If you load it in on power up and run it, you can actually see the storage of B's, C's and D's in high RAM (Of course, you will find them as 66's, 67's, and 68's.)

If you follow through the garbage collections, you will see pointers change as storage is compacted. You will get a lot of material to study before it reaches the planned <?OS ERROR> on final loop. Maybe one of you can tell me why a bunch of garbage is stored between the first three simple strings and the assembled string each time. -More stuff I don't know.

Try the sample program again, with CCN's PCLEAR 0 routine (POKE25,6:NEW) before loading, and watch how much more usable distance there is between pointers and storage.

Finally, run it after entering <CLEAR 300>, and see it able to complete the entire program.

Lines 10 and 20 are instructions to my printer, which I left in to remind you to insert the ones you need.

```
10 PRINT#-2,CHR$(29):PRINT#-2,CH
R$(27);CHR$(56)
20 POKE 153,12:POKE 155,120
30 '"MEMSTUDY" - ROUTINE FOR STU
DYING <CLEAR>, <VARPTR>, VARIABL
E POINTERS, AND STRING AND VARIA
BLE STORAGE, INCLUDING GARBAGE C
OLLECTION IN CLEARED SPACE
40 FOR X=32766 TO 32550 STEP -1:
PRINT#-2,X;PEEK(X),:NEXT X:PRINT
#-2,CHR$(13),CHR$(10)
50 DIM A$(8,4),P(1),R(5)
60 FOR I=1 TO 8:FOR L=1 TO 3
70 PRINT#-2,PEEK(&H7),:A$(I,L)=S
TRING$(4,65+L*I):PRINT#-2,A$(I,L
),PEEK(&H7),
80 P=PEEK(&H25)*256+PEEK(&H26):P
RINT#-2,P,
90 Q=VARPTR(A$(I,L)):PRINT#-2,Q,
PEEK(Q),PEEK(Q+2),PEEK(Q+3),:R=P
EEK(Q+2)*256+PEEK(Q+3):PRINT#-2,
R,PEEK(R)
100 NEXT L
110 PRINT#-2,PEEK(&H7),"",:A$(I,
4)=A$(I,1)+CHR$(13)+A$(I,2)+CHR$
(13)+A$(I,3):PRINT#-2,PEEK(&H7):
PRINT#-2,A$(I,4);
120 P=PEEK(&H25)*256+PEEK(&H26):
PRINT#-2,TAB(36) P,:Q=VARPTR(A$(
I,4)):PRINT#-2,Q,PEEK(Q),
130 PRINT#-2,PEEK(Q+2),PEEK(Q+3)
,:R=PEEK(Q+2)*256+PEEK(Q+3):PRIN
T#-2,R,PEEK(R):PRINT#-2,CHR$(13)
;CHR$(10)
140 FOR X=32766 TO 32550 STEP-1:
PRINT#-2,X;PEEK(X),:NEXT X:PRINT
#-2,CHR$(13);CHR$(10)
150 D=VARPTR(P):E=VARPTR(Q):F=VA
RPTR(R):PRINT#-2,D,E,F
160 IF I>6 THEN GOSUB 180
170 NEXT I:END
180 FOR Z=D-2 TO F+4:PRINT#-2,Z;
PEEK(Z),:NEXT Z:PRINT#-2,CHR$(13
);CHR$(10)
190 FOR W=1 TO 4:FOR L=1 TO I:PR
INT#-2,VARPTR(A$(L,W)),:NEXT L:P
RINT#-2,CHR$(10):NEXT W:PRINT#-2
,CHR$(13),CHR$(10)
200 IF I<>7 THEN I=8
210 J=VARPTR(A$(1,1)):K=VARPTR(A
$(I,4)):FOR Z=J-10 TO K+20:PRINT
#-2,Z;PEEK(Z),:NEXT Z:PRINT#-2,C
HR$(13),CHR$(10):RETURN
```

VERTPLOT

by Joseph A. Ryan, WB5LLM
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Well, this is a long one. If you're not into amatuer radio, or shortwave listening (SWL), then there isn't much reason to read on (unless it will get you interested in one of the above). However, some of the techniques used might interest you. I ran across the original of this program in the May 1980 issue of 73 Magazine, it's author being Dennis Mitchell, K8UR. It had been written for the Tandy Corp. TRS-80 MODEL I and to use it with the TRS-80(C), "CO-CO", I found that I had to extensively revise and modify it. Eventually, I wound up re-doing the graphics completely in order to take advantage of the 'CO-CO's hi-resolution capabilities. Along the way, I added several options, like an Output-to-Printer and measurement calculating capability for converting degrees of wavelength to feet for any frequency.

The program, as presented, requires the full 32K Extended Basic version of the Tandy Corp. TRS-80(C) Color Computer (known to many, unofficially, as CO-CO), with the Tandy Corp. LINE PRINTER VII (or equivalent), and the modified SCRPRT program (see references). By removing the printer option and the rather long program operating instructions (roughly, lines 1780 thru 2820) and several other lines (see REM statements in the program listing), you can squeeze this into a 16K Extended Basic CO-CO.

The program is ideal for those wishing to experiment with the disign of Quarter-Wave Vertical Antenna arrays (multi-element). In the past, unless you had the facilities of an antenna testing laboratory available, you had to literally, 'build-and-try'. Now, with this program (and your trusty CO-CO), you can design these arrays in 'armchair' comfort, and only build the final result. With simplified SMITH Chart display, you can see, at a glance, what the particular arrangement of elements, spacing, etc., will deliver in power gain, front-to-back (F/B) ratio, db. gain, etc. Note, however, that this program will only calculate and display the arrays horizontal angle. The vertical angle of any antenna is determined by your effective ground (see references) and no provision is included herein for calculating this as it would drastically increase the program (probably beyond the memory size capability of the CO-CO, that is, up to 32K).

A little about the program operation. Briefly, the various inputs requested are:

1. NUMBER OF ELEMENTS: Anywhere from 2 to 10 (this can be increased by changing the '10' in line 280).

2. INPUT RELATIVE PHASE: (in degrees from 0 to 360) "+" for leading and "-" for lagging.

3. INPUT ANGLE OF EL.: the direction, in degrees, from the reference element.

4. REL.AMPLITUDE OF EL. the power, in watts, going to the element in question (if equal to that going to the ref. element, then the answer is '1').

5. INPUT SPACING OF EL.: This is the distance from the Ref. Element, in degrees (ie. 90=1/4 wave).

Finally, you're asked at each element step if the data you have input is correct. If not, you can answer 'N' and re-enter the data for that element again. If you answer to the final Element Input is 'Y', than the program will go into the calculate mode.

While calculating, the program will go into the PMODE 4,1 graphics mode and display the simplified SMITH Chart with the elements, as you had called for them to be assembled into an array, shown. The view is "Birdseye", that is, from above. Be PATIENT - Basic takes taime and a full array of 10 elements could take 10-12 minutes to calculate (of course, you can insert a 'Vitamin E' POKE at the beginning - BUT - if you're using the printer cutput, insert a POKE 65494,0 at line 1199. This will speed up operation about 25 to 30%).

When calculating is complete, the screen will erase the screen and re-play the SMITH Chart with the elements displayed and then PLOT the radiation pattern before your very eyes (sound included). When finished, you can then call for the Power Gain and F/B Ratio figures, followed by the MENU of optional functions.

NOTE: In the MENU, if you select the OUTPUT TO PRINTER option, and you are using the LINE PRINTER VII and modified SCRPRT program, you will get the SMITH Chart display (slightly elongated - you know the 'perfect circle' problem with the PMODE and your tv screen display), followed by a summary of GAIN DATA, the ELEMENT DATA you originally entered, and you will then be asked for DISTANCE CALCULATIONS which you can enter and which will be printed out as they are calculated. You have the option of leaving this OPTION after each calculation and returning to the MENU. Of course, none of this is lost if you do not enter the PRINTER listings, it's merely sent to the screen instead and you can still get the calculations, only with a screen output. All options in the MENU are available without the

printer subroutines, except, of course, the printout itself.

Now, for some definitions for those not acquainted with technical terminology relating to antenna theory, etc.

a) WAVELENGTH = In this case, the distance in degrees (0 to 360, as in a circle) from the beginning of a wave of r.f. (radio frequency) radiation, to the end. A wave (full) is measured, normally, in meters (metric system) as is the size of the electromagnetic wave from the start to the end, at any given frequency. The higher the frequency in meters (or megahertz), the shorter the metric distance. In this program, the measurements have been converted into feet for ease of use. An Option allows you to calculate the linear distance between elements, and length of feedline between elements, in feet, for any particular frequency.

b) SMITH CHART = as used in this program, is a simple 'compass rose' (circle) with north, east, south & west designated as 0, 90, 100 & 270 DEGREES, with a cross hair in the middle designating the center of the antenna array, and the location of the REFERENCE ELEMENT in the multi-element array. As stated before, you, the observer, have a 'birdseye' view of the antenna field.

c) ANGLE OF ELEMENT = In this case, the location of the element in question (2 to 10), with reference to the center of the Chart and the REFERENCE ELEMENT, in degrees around the compass (ie. 45 degrees would be northeast).

d) RELATIVE PHASE = Refers to the measurements, again, as described in a) above, except here it refers to the length of the feedline (BETWEEN the REFERENCE ELEMENT and the element in question, and/or the distance between elements.

e) RELATIVE AMPLITUDE OF ELEMENT = Refers to the amount of power this element receives (in the transmit mode), with respect to the REFERENCE ELEMENT. If the power to the element in question is the same as that of the REFERENCE ELEMENT, then the answer would be '1'. If twice as much, the answer would be '2', if three times, '3', and so on. (NOTE: In receiving only situations, the answer will always be '1', unless, as in the transmitting mode, some type of attenuating device is inserted in the feedline.) Since the REFERENCE ELEMENT is normally that element that would receive the least power, the answer is not given with a '-' number.

g) F/B RATIO = Front-to-Back Ratio is the ratio of forward gain to the lesser (or negative) gain in other directions than the electrical 'front' of the antenna array.

NOTE: If you're using the R.S. L.P. VII and the modified R.S. SCRPRT program, and you CSAVE this VERTPLOT in ASCII, then you must first CLEAR 200, 32127 (ENTER) and then CLOAD "VERTPLOT". DON'T ENTER IT YET! Next, CLOADM the SCRPRT program and EXEC same. Now, type RUN and the program will run. If you don't CSAVE this program in ASCII, then you can load the SCRPRT program first, followed by VERTPLOT. If you are running some other brand of printer, you'll have to figure out the proper way of getting the graphics to print out following the printout of the F/B Ratio and GAIN data, and preceeding the SYNOPSIS of GAIN DATA, etc.

REFERENCES:

MITCHELL, Dennis, K8UR; ANTENNA ENGINEER, 73 magazine; May 1980, Page 96.

ESPOSITO, Richard & RAMHOFF, Ralph; COLOR COMPTER UPDATE; Color Computer News; April 1982, page 47 (re. Modification of the Tandy Corp. SCRPRT software for use in the 32K Extended Basic TRS-80(C).)

HYPNAROWSKI, Joe, WA6VNR; EFFECTIVE GROUNDS; CQ Magazine; August 1982, page 34.

TYPE CAREFULLY! Especially the area around lines 1500 to 1740. Good Luck!

```
20 CLS
30 GOSUB 1780
180 CLEAR 300
200 DIM GN(360),GM(360):AA=1:BB=
2:RD=.0174533:CV=58:CH=45
220 VI=1038:ZL=10:F$="###.##":F1
=0:KY$=STRING$(80,"-")
240 HY$=STRING$(32,"-"):BL$=STRI
NG$(32," "):B$=LEFT$(BL$,7)
260 PRINT@224,"INPUT NO. OF ELEM
.(MAX.10)";:INPUT NI
280 IF NI=0 OR NI>10 THEN 260
300 CU=(NI+3)*32: GOSUB1440
320 FOR N=2 TO NI
340 PRINT@CU,"INP.REL.PHASE OF E
LE.#";N;
360 INPUT A(N):GOSUB 1500:PRINT@
(N+1)*32+7,A(N);
380 PRINT@CU,"INPUT ANGLE OF ELE
MENT #";N;
400 INPUTO(N):GOSUB 1500:PRINT@(
N+1)*32+14,O(N);
420 PRINT@CU,"? REL.AMPL.OF ELEM
ENT#";N;
440 INPUT K(N):GOSUB 1500:PRINT@
(N+1)*32+21,K(N);
460 PRINT@CU,"INPUT SPACING OF E
LE. #";N;
```

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```
480 INPUT B(N):GOSUB 1500:PRINT@
(N+1)*32+28,B(N);
500 PRINT@CU,"";:INPUT" DATA COR
RECT?<Y OR N>";AN$
520 IF AN$=""THEN NEXT N
521 IF LEFT$(AN$,1)="Y" THEN NEX
T N ELSE 340
540 GOSUB 1500:GOSUB1680
560 ZM=0
600 FOR J=0 TO 360STEP 2
640 FOR N=2 TO NI
660 C=(B(N)*COS((O(N)-J)*RD)+A(N
))*RD
680 HO=COS(C)*K(N)+HO:VT=SIN(C)+
VT
700 GN(J)=SQR((AA+HO)^BB+(VT^BB)
)
720 IFGN(J)>ZM THEN ZM=GN(J):P1=
J
740 IFGN(J)<ZL THEN ZL=GN(J):P2=
J
760 NEXT N
780 VT=0:HO=0
800 NEXT J
820 IFP1>=180THENP3=P1-180ELSEP3
=P1+180
880 PCLS:PMODE4,1:SCREEN1,0
881 GOSUB2000
882 GOSUB2050
883 GOSUB1680
890 LINE(128,15)-(128,178),PSET
895 LINE(30,96)-(229,96),PSET
920 FOR M=0 TO 360 STEP 2
930 SOUND140,1
940 IF F1=0 THEN GM(M)=GN(M)
960 GN(M)=(46/ZM)*GN(M)
1000 X=COS(M*RD)*GN(M)*2.5:IFX<-
128 THENX=-128:IFX>128 THENX=128

1020 Y=SIN(M*RD)*GN(M)*2.00:IFY<
-96 THENY=-96:IFY>96 THENY=96
1040 PSET(128+X,96+Y,5)
1059 NEXTM
1060 DRAW"BM12,152;U3NU3R4NU3D3B
M+3,0":DRAW"BM19,152;R1NR1U6NL1R
1BM+4,+6":DRAW"BM26,152;U6NL2R2B
M+3,+6"
1061 DRAW"BM12,162;NR4U3NR2U3R4B
M+3,+6":DRAW"BM19,162;U6F1D1F2D1
F1NU6BM+3,0":DRAW"BM28,162;U6NL2
R2BM+3,+6":DRAW"BM32,162;NR4U3NR
2U3R4BM+3,+6":DRAW"BM40,162;U6R3
F1D1G1L2NL1F3BM+3,0"
1063 DRAW"BM12,172;U3NR2U3R4BM+3
,+6":DRAW"BM19,172;H1U4E1R2F1D4G
1L2BM+6,0":DRAW"BM26,172;U6R3F1D
1G1L2NL1F3BM+3,0"
1064 DRAW"BM12,182;H1U4E1R2F1BM+
0,+2NL1D2G1L2BM+6,0":DRAW"BM19,1
82;U4E2F2D2NL4D2BM+3,0":DRAW"BM2
6,182;R1NR1U6NL1R1BM+4,+6":DRAW"
BM32,182;U6F1D1F2D1F1NU6BM+3,0"
1065 DRAW"BM46,182;U6R3F1D4G1L3B
M+7,0":DRAW"BM52,182;U4E2F2D2NL4
D2BM+3,0":DRAW"BM59,182;U6NL2R2B
M+3,+6":DRAW"BM64,182;U4E2F2D2NL
4D2BM+3,0"
1070 IF INKEY$=""GOTO1070 ELSE G
OTO1080
1080 CLS:DB=10*(LOG(ZM)/LOG(10))
:FB=10*(LOG(GM(P1)/GM(P3))/LOG(1
0))
1100 IF F1=0 THEN DC=DB
1120 PRINT@10,"NO. ELEMENT'S:";N
I;:PRINT@42,"GAIN: ";:PRINTUSING
F$;DC;:PRINT"DB";:PRINT@68,"F/B
RATIO:";:PRINT@82, USINGF$;FB;:P
RINT"DB";
1130 PRINT:PRINT
1140 F1=1
1160 PRINT@480,"HIT ANY KEY FOR
OPTIONS LIST";
1180 IF INKEY$=""THEN GOTO 1180
1200 CLS:PRINT@7,"MENU OF OPTION
S";:PRINT@32,HY$;:PRINT@64,"1) P
LOT PATTERN";:PRINT@96,"2) GAIN
EVERY 30 DEG.";:PRINT@128,"3) GA
IN EVERY 2 DEG.";:PRINT@192,"4)
NEW START";:PRINT@224,"5) ELEMEN
T PLACEMENT";:PRINT@256,"6) DIST
ANCE  CALCULATIONS."
1210 PRINT@288,"7) ELEMENT DATA"
:PRINT@352,"8) OUTPUT TO PRINTER
 OF CHART &    GAIN, ETC.":'DELE
TE PRINT@352 STATEMENT IF NO PRI
NTER OPTION
1220 X=0:Y=0:INPUT"SELECTION";LL
:IFLL=1 THENZM=46ELSE IFLL=3 THE
N J=2
1240 ON LL GOTO 883,1280,1320,15
40,1560,2500,1260
1250 T=1:GOSUB2600:'DELETE IF NO
 PRINTER OPTION USED
1260 GOSUB 1440:GOTO1160
1280 CLS:PRINTTAB(4)"SYNOPSIS OF
 GAIN DATA" :PRINTHY$;
1300 J=30:REMDEGREE STEP
1320 PRINT"DEGREE";TAB(8);"PWR.G
AIN";TAB(20);"DB(I)GAIN"
1340 FORI=0TO360 STEP J
1360 PRINTTAB(2);I;TAB(8);:PRINT
USINGF$;GM(I);:IFGM(I)>=0THENPRI
NTTAB(21);:PRINTUSINGF$;10*(LOG(
GM(I))/LOG(10))
```

```
1380 NEXT I
1400 GOTO1160
1420 END
1440 CLS:PRINTHY$;:PRINT"EL.#";T
AB(6);"PHASE";TAB(13);"ANGLE";TA
B(20);"AMPL.";TAB(26);"SPACE":PR
INTHY$;
1460 FOR I=2TONI:PRINTI;TAB(6);A
(I);TAB(14);O(I);TAB(20);K(I);TA
B(27);B(I):NEXT:PRINTHY$
1500 PRINT@CU,BL$;:RETURN
1520 FOR I=CU TO 869STEP64:PRINT
@I,BL$;:NEXT:RETURN
1540 CLS:CLEAR: RUN180
1560 PMODE4,1:PCLS:SCREEN1,1:FOR
 PL=2 TO NI+1:IF B(PL)>BG THENBG
=B(PL):NEXT
1570 GOSUB2000
1571 GOSUB2050
1580 FOR RL=2 TO NI:XX=COS(O(RL)
*RD)
1600 XX=XX*B(RL) /BG*28+128
1620 YY=SIN(O(RL)*RD)*B(RL)/BG*1
8+96:PSET(XX,YY,3):PSET(XX+1,YY+
1,3):PSET(XX-1,YY-1,3):PSET(XX+1
,YY-1,3):PSET(XX-1,YY+1,3)
1640 NEXT RL
1660 FOR V=1TO20:PSET(128,96,3):
PSET(129,97,3):PSET(127,94,3):PS
ET(129,94,3):PSET(127,96,3):NEXT
:FOR VV=1TO20:PRESET(129,97):PRE
SET(127,94):PRESET(129,14):PRESE
T(127,94):NEXT:GOTO1670
1670 GOTO1060
1680 FOR PL=2TONI+1:IF B(PL)>BG
THEN BG=B(PL):NEXT
1720 PMODE4,1:PCLS:SCREEN1,1
1730 GOSUB2000
1731 GOSUB2050
1740 FOR RL=2TONI:XX=COS(O(RL)*R
D):XX=XX*B(RL)/BG*28+128:YY=SIN(
O(RL)*RD)*B(RL)/BG*18+96:C=3:PSE
T(XX,YY,3):PSET(XX+1,YY+1,3):PSE
T(XX-1,YY-1,3):PSET(XX+1,YY-1,3)
:PSET(XX-1,YY+1,3):PSET(128,96,3
):NEXT
1760 RETURN
1780 CLS:PRINTCHR$(23):PRINT@74,
"VERT";:FORI=1TO150:NEXT:PRINT@7
4,B$:PRINT@78,"PLOT":FORI=1TO150
: NEXT:PRINT@76,B$:PRINT@74,"VER
T";:FORI=1TO150:NEXT:PRINT@78,"P
LOT";:PRINT@85 ,"";:FORJ=1TO8:PR
INT:FORI=1TO100:NEXT:NEXT:GOTO18
00
1800 PRINT@ 68,"POLAR PLOTTING P
ROGRAM":PRINT@102,"FOR DRIVEN AR
RAYS":GOTO1820
1820 PRINT@163,"1979 - D.C.MITCH
ELL - K8UR";:PRINT@229,"AS MODIF
IED FOR USE ON";:PRINT@260,"A TR
S-80 'COLOR COMPUTER'";:PRINT@33
4,"-BY-";:PRINT@387,"1981-  J.A.
 RYAN - WB5LLM ";:FORI=1TO5000:N
EXT:CLS:PRINTCHR$(28)
1830 PRINT"  THIS PROGRAM LETS T
HE USER DESIGN HIS OWN PHASED AN
TENNA ARRAYS UP TO 10 ELEMENTS.
MORE ELEMENTS MAY BE USED BY CHA
NGING THE '10' IN LINE 280 TO TH
E DESIRED NUMBER OF ELEMENTS."
1832 PRINT"NOTE: PLOTTING TIME I
S ABOUT 1.5 MINUTES"
1833 PRINT"FOR 2 ELEMENTS & ABOU
T 45 SEC. LONGER PER"
1834 PRINT"EACH ADDITIONAL ELEME
NT."
1835 PRINT@448,"HIT ENTER TO CON
TINUE";:INPUTUU$:CLS
1840 PRINT"  TO DESIGN AN ARRAY,
 PLACE THE ELEMENTS OUT AS DESIR
ED USING A 'BIRDS EYE' VIEW OF T
HE ARRAY AND AN X-Y COORDINATE S
YSTEM WITH 0-DEGREES AT THE RIGH
T, 270 AT TOP, 180 AT LEFT AND 9
0 DEGREES AT THE BOTTOM."
1850 PRINT "THE PROGRAM WILL ASK
 YOU PHASE, ANGLE, AMPLITUDE AND
 SPACING, PHASE IS(-) FOR LAGGIN
G AND (+) FOR LEADING PHASE. PHA
SE IS IN DEGREES FROM THE REFERE
NCE ELEMENT.  CHOOSE ONE ELEMENT
 OF THE ARRAY AS A REFERENCE."
1851 PRINT@448,"HIT ENTER TO CON
TINUE";:INPUTUU$:CLS
1860 PRINT" (ALL MEASUREMENTS FO
R THE OTHER ELEMENTS WILL BE TAK
EN FROM THE REFERENCE ELEMENT CH
OSEN).  ANY ELEMENT WILL DO.  TH
E ANGLE IS THE ANGLE BETWEEN THE
 (0)DEGREE HEADING OF YOU X-Y CO
ORDINATE,"
1861 PRINT" THE REFERENCE ELEMEN
T WHICH IS ALWAYS AT THE CENTER
OF THE X-Y COORDINATE, AND THE E
LEMENT IN QUESTION."
1869 PRINT@448,"HIT ENTER TO CON
TINUE";:INPUTUU$:CLS
1870 PRINT"   THE AMPLITUDE IS T
HE AMOUNT OF POWER WHICH THE ELE
```

```
MENT IN QUESTION RECEIVES COMPAR
ED TO YOUR REFERENCE.  IT IS EXP
RESSED AS A RATIO.  THE REFERENC
E ELEMENT ALWAYS GETS 1:1 POWER
SO IF"
1875 PRINT" ELEMENT 2 WERE TO GE
T TWICE AS MUCH POWER, YOUR INPU
T WOULD BE (2) FOR AMPLITUDE. TH
E SPACING IS HOW FAR THE ELEMENT
 IN QUESTION IS FROM THE REFEREN
CE IN DEGREES."
1890 PRINT@448,"HIT ENTER TO CON
TINUE";:INPUTUU$:CLS
1900 GOTO180
1999 'DON'T REMOVE LINES 2000 TO
 2050
2000 DRAW"BM120,12;NR4U1E1R1E2U1
H1L2G1BM+7,+5":DRAW"BM129,12;U1E
4U1L4BM+7,+6":DRAW"BM138,12;H1U4
E1R2F1D4G1L2BM+6,0"
2005 DRAW"BM242,96;H1U4E1R2F1D4G
1L2BM+6,0":DRAW"BM122,185;F1R2E1
U4H1L2G1D1F1R2BM+4,+3":DRAW"BM13
0,186;H1U4E1R2F1D4G1L2BM+6,0"
2010 DRAW"BM6,96;R1NR1U6G1BM+6,+
5":DRAW"BM12,96;H1U1E1H1U1E1R2F1
D1G1NL2F1D1G1L2BM+6,0":DRAW"BM20
,96;H1U4E1R2F1D4G1L2BM+6,0"
2017 RETURN
2050 CIRCLE(128,96),100,,.825:CI
RCLE(128,96),3,,1:RETURN
2500 CLS:PRINT"DISTANCE BETWEEN
ELEMENTS CALCULATIONS":PRINT:PRI
NT:PRINT"FREQ. IN MHZ.(TO NEARES
T .00)"
2505 INPUTR
2510 INPUT"HOW MANY DEGREES";K
2520 XX=936/R:YY=XX/360:ZZ=YY*K
2540 PRINT:PRINT
2545 X$="###.##"
2546 IF T=1 THEN GOTO 2570 ELSE
GOTO 2550
2550 PRINT "DIST. IN FT. BETWEEN
 ELEM.AT ":PRINT USING X$;R;:PRI
NT"MHZ.  IS":PRINT USING X$;ZZ;:
PRINT"FT."
2555 PRINT:PRINT
2560 INPUT"DO YOU WANT ANOTHER C*
ALCULATION     (Y=YES, N=NO)";C$
2565 IF C$="Y" THEN GOTO 2500 EL
SE IF C$=<>"Y" THEN GOTO 1200
2570 CLS:PRINT@130,"PRINTOUT OF
DISTANCE CALCULATION":PRINT#-2,"
 ":PRINT#-2," ":PRINT#-2,"DISTAN
CE IN FEET BETWEEN ELEMENTS AT";
:PRINT#-2,USINGX$;R;:PRINT#-2,"
MHZ. IS";:PRINT#-2,USINGX$;ZZ;:P
RINT#-2," FT.":GOTO2560
2600 CLS:PRINT@132,"SENDING TO P
RINTER":GOSUB 2650
2610 DEFUSR0=32169:Y=USR(0):CLS:
GOTO2700
2650 PRINT#-2," ":PRINT#-2,"NO.
OF ELEMENTS= ";NI;:PRINT#-2,TAB(
64);"GAIN= ";:PRINT#-2,USINGF$;D
C;:PRINT#-2,"DB.":PRINT#-2,TAB(5
9);"F/B RATIO= ";:PRINT#-2,USING
F$;FB;:PRINT#-2,"D/B";:PRINT#-2,
" ":RETURN
2700 CLS:PRINT@132,"PRINTOUT OF
GAIN DATA":PRINT#-2," ":PRINT#-2
," "
2710 PRINT#-2,CHR$(31);TAB(10);"
SYNOPSIS OF GAIN DATA":PRINT#-2,
KY$
2720 PRINT#-2,CHR$(30);:PRINT#-2
,TAB(10);"DEGREE";:PRINT#-2,TAB(
38);"POWER GAIN";:PRINT#-2,TAB(6
6);"DB(I) GAIN":PRINT#-2,KY$:PRI
NT#-2," "
2740 J=30:FOR I=0 TO 360 STEP J
2760 PRINT#-2,TAB(10);I;TAB(39);
:PRINT#-2,USINGF$;GM(I);:IFGM(I)
>=0THENPRINT#-2,TAB(68);:PRINT#-
2,USINGF$;10*(LOG(GM(I))/LOG(10)
)
2780 NEXT I
2790 CLS
2800 CLS:PRINT@130,"PRINTOUT OF
ELEMENT DATA":PRINT#-2," ":PRINT
#-2," ":PRINT#-2,KY$
2810 PRINT#-2,TAB(10);"ELEMENT #
";:PRINT#-2,TAB(30);"PHASE";:PRI
NT#-2,TAB(50);"ANGLE";:PRINT#-2,
TAB(60);"AMPL";:PRINT#-2,TAB(70)
;"SPACING"
2820 FOR I=2TONI:PRINT#-2,TAB(12
);I;:PRINT#-2,TAB(31);A(I);:PRIN
T#-2,TAB(50);O(I);:PRINT#-2,TAB(
62);K(I);:PRINT#-2,TAB(72);B(I):
NEXTI:PRINT#-2,KY$:GOTO2500
5002 END
```

FLEX CORNER

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ADVANTAGES OF A DOS

Last month I tried to define what a DOS is. As with most concepts, if you don't already know what it means, then the definition may be hard to understand. If last month's article cleared up some things for you then good. Otherwise, hang in there because we are going to keep trying.

Expandability

Last month we left off with the concept that a DOS's realm of commands was much limited when compared to ROM BASIC's. This is because the DOS's commands are a subset of ROM BASIC's. However, as we are going to see very shortly, a DOS's command repertoire may be expanded at will. That is to say that you may add any new commands to the system that you find useful. And, you may add as many as you like. You can't do this with ROM BASIC because you can't alter the contents of the ROMs.

Here are a couple more definitions we need to get under our belts before we continue. I'm going to define them here just to establish the ground that FLEX stands on -- not because we will be using these terms often in this column. With the OS-9 operating system just around the corner for the Color Computer you do need to understand the following terms to be able to understand the difference between it and FLEX.

1) Single/Multi Tasking: Any computer that consists of a single CPU (Centeral Processor Unit) can only execute one program at any given time. However, it is possible to have more than one program loaded into memory at the same time and to have the CPU alternate between these programs, dedicating small periods of time to each of them. If these periods of time are small enough, say one tenth of a second for each program before going on to the next, then it appears to you, the user, that the CPU is actually executing several programs at the same time. In reality, of course, it is not. It is executing first one program, then another, and another, until it finally returns to the first again to continue where it left off.

This would allow you to, for example, run the assembler, which requires the disk and the line printer, while simultaneously using the editor, which requires the disk and the CRT, to create another source file. The ability for a computer to do this comes from the software within the operating system (of DOS) -- not from the computer hardware itself, as most computers can support this type of program execution. If a DOS allows this type of program execution then it is known as Multi-Tasking. If a DOS allows only a single program to execute at a time, and to continue to execute until it completes it's purpose, then the DOS is known as Single-Tasking. Except for line printer spooling (which we will discuss at a later date) FLEX is a Single-Tasking DOS. OS-9 on the other hand, is Multi-Tasking.

2) Single/Multi User: If this term brings to your mind the question, "How many people can use one computer at the same time?", then you have the right idea. A Single User system will allow only one person to use the computer at a time. A Single User system may, however, be Multi-Tasking -- allowing the single user to run several different program concurrently. A Multi User system allows two or more people to use one computer at the same time. Since each user will probably want to run a different program, Multi User systems are also Multi-Tasking to allow each user his independence from the other users. The FLEX operating system is Single User while OS-9 is Multi User.

Now, let's get on with our discussion of a DOS's advantages. I mentioned earlier that it is a simple matter to expand a DOS's command repertoire. Why is this so? If you will recall from last month's discussion of 'utility program' I gave an example of the COPY command. When you enter the command "COPY file1,file2" a program which would perform the actual file copying was loaded from the disk and executed. This program was called "COPY.CMD".

To be a little more general, any time you enter a command to FLEX it must be in the following format:

+++cmnd [,filespec ,...] [+options]

The three plus signs at the beginning of the line (+++) are FLEX's prompt telling you that you may enter a command, much the same as the ROM BASIC prompt is the word "OK". The term "cmnd" is to be replaced with the actual command you want performed, such as COPY. The square brackets [and] are used to identify optional items. Words which follow the command name are typically file names. Elipses (...) indicate that more than one filespec may be entered if required. And last, the "+options" may be used to alter the oepration of the specified command. They too are optional and need only be specified

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DISK: Text space	N/A	5.5K	21.5K	N/A	0.5K	16.5K
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Don't think for a minute that the **Super "Color" Writer II** won't work with your letter quality printer. There's no reason you can't give H_2O its proper name or have footnotes.[1] As for bold print, underlining, proportional spacing, **super bold** or any other printer-controlled function - if your printer has it, the **Super "Color" Writer II** can do it! You can also freely exchange thimbles or daisy wheels to change to italics, or to a totally different typeface with the pause print feature.

And the ***Super "Color" Writer II*** has the exclusive **WINDOW** to make your formatting pleasant and perfect. Enter the window to view your whole text as it will be sent to the printer, **whatever your margins, from 1 to 200 or more!** No longer will you be tied to seeing only 32, 51, 64 or whatever number of characters on a line. You can see that your text is centered, headers and footers are always properly placed, and your columns are correct.

With the ***Super "Color" Writer II*** screen editing is a snap; the commands are powerful and hard to forget. You can edit all your BASIC PROGRAMS TOO! With all these features, you must surely agree that this is the **"ROLLS ROYCE"** of word processors. To learn more, refer to the Nelson Software Systems ad in this magazine. And don't forget that the ***Super "Color" Writer II*** is only one important part of the ***Super "Color" Library***, which includes the ***Super "Color" Terminal***, the ***Super "Color" Mailer***, the ***Super "Color" Disk-ZAP*** and the soon to be released ***Super "Color" Calc*** and ***Super "Color" Database.*** No other company gives you such outstanding products and support. **You can buy theirs now and ours later, OR you can save your money and get the best from the very start!**

This document was prepared using a ***TRS-80(TM) Color Computer,*** the ***Super "Color" Writer II,*** an ***Epson MX-80 Graftrax Plus (TM),*** and an ***NEC Spinwriter 3510 (TM)*** to illustrate the great flexibility in formatting allowed by the ***Super "Color" Writer II.***

when necessary. We will discuss these options at a later date.

The important thing about entering a command is that the command name must be the first word you type on the command line. (Later we will discuss the P, I, and O commands which may appear to be contradictory to this rule). As I pointed out last month, a DOS cannot carry out your command alone. Hence, it loads a program into RAM from the disk which can perform your request.

But, how does the DOS know which program to load? The word you enter as the command name is used by the DOS as a file name. FLEX adds to this name an extension (we will discuss extensions shortly) of ".CMD". The file that is loaded is therefore "cmnd.CMD", where "cmnd" is replaced by the command name you specified. That is why our COPY example last month loaded a program called "COPY.CMD".

Now, let's assume that we decide it would be nice to have a command to perform some new function. For instance, suppose we found it necessary to convert all the lower case letter (a thru z) in our source files (source files are files which contain text exactly as you type it on the keyboard) into upper case letter (A thru Z) so that we can print these files on a line printer which cannot print lower case letters. We would simply write a program to perform this function and store this program on our disk with an extension of ".CMD". If we wanted to call the command UPCASE then the complete file name would be "UPCASE.CMD". The format for using this new command would be filespec", where 'filespec' would be replaced with the name of the file in which we wanted to convert lower case letters into upper case.

We just added a new command to our DOS. This new command may be used whenever desired since it is stored on our disk and is always ready for use. The actual details of adding a new command may be simple or complex, depending upon the function of the command. Several months down the road we will be looking at how to create these new commands.

Before we get too far along here, let's examine the rules for file names in FLEX. As with Disk ROM BASIC, file names must be at least one character long and may be as long as eight, must begin with a letter, and may contain letters, numbers, the hyphen character (-) or the underscore (which appears as the left arrow on the Color Computer). File names must also contain an extension which may consist of one to three of the characters mentioned above. It is entered following the file name, but, separated from the file name by a period (.). Extensions are used to tell files apart, such as identifying CoManDs, BASic programs, or BINary files. Examples are:

```
COPY.CMD
STARTREK.BAS
TEST.BIN
```

Many extensions are already defined by the FLEX system as defaults for the sake of consistency. However, you may define any extensions you like as an aid for keeping track of your files. Further examples are:

```
STORY.OLD
STORY.NEW
PROGRAM.V1
PROGRAM.V2
```

The predefined extensions are as follows:

```
.BIN Binary
.TXT Text
.CMD Command
.BAS BASIC language program
.SYS System program or file
.BAK Backup text
.SCR Scratch
.DAT Data
.BAC Compile BASIC language program
.OUT Output listing
.DIR
.PRT
```

Now let's get back to the subject at hand. As you can see, it can be relatively easy to add new commands to a DOS. Of course, you may not have to write the program yourself. There are thousands of people using the FLEX oerating system, and hence, there are thousands of programs available to buy. This large software base if one of the big advantages of using a DOS rather than only using ROM BASIC.

It would not be uncommon for you to end up with more than a hundred different commands at your disposal. So, now this rather limited realm of a DOS we thought we were seeing earlier is beginning to open up. And what good are all these commands, you ask? Having a lot of commands gives you versatility -- there's not much that you'll ever need to do that can't be done simply with a single command.

High-Level Languages

With the ROM BASIC system you have only BASIC. It is, I'm glad to say, a very good BASIC. There are now several other languages which you can buy to run on the Color Computer. But, with FLEX there are a great many more. This is of

course due to the widespread use of FLEX. Another reason is the amount of available RAM in a FLEX system, which is a subject we are about to discuss. An interpreter or a compiler exists for just about every langauge you can think of: BASIC, FORTH, PASCAL, C, COBOL, etc., etc. Plus, since FLEX is the same from one system to the next, all the programs that run under FLEX on the Color Computer can also be run on the larger SS-50-bus machines should you choose to upgrade in the future. But, not so with regular Color Computer programs. Thus, with FLEX, your investment in software is better protected.

More Memory

The 6809 microprocessor itself can only address 64K bytes of memory. Larger computer systems add memory mapping hardware to expand this to mega-byte or more. Unforturnately, the Color Computer does not contain this type of hardware, so the figure of 64K is our base with which to work.

Radio Shack now sells the Color Computer with up to 32K of RAM installed. The rest of the 64K is taken up by the BASIC ROMs, I/O ports, etc. In fact, a Color Computer with a Raio Shack disk controller consists of three ROMs -- COLOR BASIC, EXTENDED COLOR BASIC, and DISK BASIC. Each of these ROMs requires 8K bytes for a total of 24K. The presence of these ROMs if what limits the Color Computer to 32K or RAM.

Yet we know from reading the "64K Korner" by Frank Hogg that it is possible to utilize the full 64K or RAM. The FLEX oeprating system requires only 8K bytes of RAM at address $C000 ($ means hexidecimal). All the RAM below this address (which is 48K bytes worth) is available for user programs. That's 16K more than ROM BASIC allows, which is a 50% increase. (Note however, that running FLEX on an Exatron disk controller allows only 32K of user RAM from $0000 thru $7FFF.) Hence, user programs may be much larger under FLEX, which, in a very loose way, means more powerful.

Structure

Figure 1 in last month's column is a diagram showing the realtionships between various programs in the normal ROM BASIC system and in a typical FLEX system. Because of the structure of the FLEX system it is much simpler with FLEX to change from one program to another than with the ROM BASIC system. This is true for three reasons:

1) With FLEX, whenever a program completes it's execution, it returns control to FLEX. With ROM BASIC, many of the programs written to run on the Color Computer take over ocntrol of the computer and refuse to give control back to BASIC even if the Reset button is pressed. The computer must be powered off and back on again.

2) With FLEX it is only necessary to type the program's name in order for the program to be executed. With ROM BASIC you must first type 'LOADM "program"', and then type 'EXEC'. The single command required by FLEX is simpler than the two required by ROM BASIC. Also, any time you refer to a file with ROM BASIC you must use the double quote character (") at least at the beginning of the file name. (If the file name is the last word on the command line before the ENTER key is pressed, then the trailing quote may be omitted.) I realize that this statement is entirely a personal opinion, but, when compared with the operation of a DOS, I find the mandatory use of the quote characters extremely bothersome.

3) With FLEX the names of the files upon which you want your requested command to operate may be specified on the command line. With ROM BASIC the file names must be specified at a later time. Consider the following example of using an Editor to create a source file for an assembly language program and an Assembler to assemble the source code into executable object code.

With ROM BASIC:

```
OK
      LOADM "EDITOR"
      EXEC
EDT: LOAD "filename"
      .
      . editing commands
      .
      END
OK
      LOADM "ASMB"
      EXEC
ASM: LOAD "filename"
OK
```

With FLEX:

```
+++EDIT filename
      .
      . editing commands
```

```
*
      END
+++ASMB filename
+++
```

As you can see, the structure of FLEX makes the series of steps much simpler.

There is a different 'feel' to a DOS than there is to ROM BASIC. If you have never used a DOS then you may think of some of these advantages as questionable at best. However, with familiarity and experience come understanding and praise for the realm of a DOS.

Next Month

Next month we will look at a few more advantages of FLEX over ROM BASIC, plus a couple of disadvantages as well. (How could it be perfect, right?) If you find any of this interesting I would appreciate hearing from you. 'Til next month.....

New Releases & Best Sellers For The TRS-80 Color Computer

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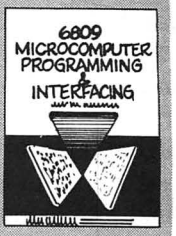
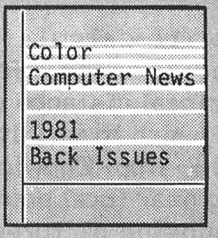
6809 Microcomputer Programming and Interfacing with Experiments



Ed. by Staugaard from Howard W. Sams
This book offers a complete description of how to program and interface the 6809 microprocessor. Topics include: chip structure and basic 6809 concepts; addressing modes; registers and data movement instructions; arithmetic, logic and test instructions; branching; input and output signals; interfacing and applications. Review questions and answers for each chapter, plus 4 appendices.
Softcover, $14.95

Color Computer News 1981 Back Issues



This is the complete collection of articles appearing in the first 4 issues of Color Computer News (May to December of '81). 37 different topics are covered, plus continuing features like "REMarks", Kid's Page, and New Products.
Softcover, $9.95

6809 Assembly Language Programming

By Lance Leventhal from McGraw Hill
This comprehensive book covers 6809 assembly language programming in detail. The entire instruction set is presented and fully explained. The book contains many fully debugged, practical programming examples with solutions in both object code and source code. Discussion of assembler conventions, I/O devices, and interfacing methods is also included. If you've never before programmed in assembly language, this book will teach you how. If you're an experienced programmer, you'll find this book an invaluable reference to the 6809 instruction set and programming techniques.
Softcover, $16.95

TRS-80 Programs and Applications for the Color Computer

By Alfred Baker from Reston
Handy guide to your Color Computer: how to play games, balance your checkbook, use your computer as a teacher, etc. With chapters on color and sound, art and music. Helpful for beginning or experienced computer users.
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TRS-80 Color Basic

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CC AS A PHOTOGRAPHY AND DARKROOM AID

by Jeffrey D. Sterling
235 Maple Street
Franklin, PA 16323

My 16K Extended BASIC Color Computer and I are finally becoming more than strangers. I determined before I bought the thing that I would not be a slave to the prepared software market but that I would learn to talk to the beast in its BASIC language. I also promised my wife that I would put CC to work. That I did for the first month or so, defending major cities and protecting our house from plummeting asteroids. But now down to business...

Photography has always been my first love as far as hobbies are concerned. Shortly after the gaming novelty of CC began to wear off, I began to explore ways that he could assist in the taking and printing of images. So far I have come up with three simple programs that mainly perform calculations, however, ones that are useful in the field and in the darkroom, and that can save you time and money.

The first program will calculate hyperfocal distance and near point of focus for any given lens and f-stop. Hyperfocal distance is defined as the distance, half of which to infinity is in focus for a certain lens and f-stop. Knowing this value and its accompanying near focal point is important when you are composing pictures, especially scenes, where exact depth of field is crucial. Let's say I'm preparing to take a picture of a gleaming sunlit snowcap, framed in foreground pine branches. The mountain is at infinity, the branches just 150 feet away. The good photographer wants to make sure that both are in sharp focus. You can of course stop the lens down and hope as most do, but with this program you can be sure of the results. Run the program and it will give you some simple instructions. First it will ask for the focal length of the lens you are using. In our snowcap example, let's say we are using a 135mm telephoto on a 35mm camera. Next, the program asks for the f-stop selected. Being an intelligent photographer, we have selected f-16 for maximum depth of field. The program quickly reads out hyperfocal distance - 147.1 feet, and near focal point - 73.6 feet. Our mountain and the pine branches at 150 feet will both be in sharp focus. If you had chosen a 300mm lens or a 250mm zoom, the program would show that the pine branches would not be in focus. I have found many uses for this information when composing outdoor photographs. Using this hyperfocal distance program, I have made a complete list of near focal points for all of my lenses at each available f-stop. I keep this list on hand at all times.

The second and third programs are for you darkroom dwellers. Over the past few years, Kodak's Polycontrast II Rapid RC photo paper has become the choice of many a home printer. It allows wide ranges of contrast selection by simply choosing a different polycontrast filter, graded 1 - 4. The filters do vary the "speed" of the paper, however, and this can make for extra work. If you have just made a well exposed print with a No. 2 filter, but desire more contrast, say with a No. 3.5 filter, the print exposure time must be augmented to compensate for the decreased relative paper speed. This program will produce the new exposure time, accurate to one tenth of a second, given old filter, old exposure time, and new filter. It's a lot quicker than making another test print, and cheaper too.

The third program does about the same thing, only it gives you new exposure time required after you have changed the paper to negative distance by raising or lowering the enlarger head. If you have just made a well exposed 8 x 10 print and now wish to make another, only this time an 11 x 14, the exposure time must be altered based on the inverse-squared property of light *volume*. This simple program will do it for you, given old enlarger scale setting, new scale setting, and old exposure time. If your enlarger doesn't have a scale, give it one using an old tape measure affixed to the column. It's quite slick, and will again save time and money by giving you a properly exposed print without another test strip.

If these programs work out for you as well as they have for me, you will soon be carting CC off to the darkroom with you. Better get the kids an Atari to play with in the meantime.

```
10 CLS
20 REM ###HYPERFOCAL DISTANCE###

30 ' BY JEFFREY STERLING
40 '    FRANKLIN,PA 16323
50 'THIS PROGRAM WILL CALCULATE
60 'THE HYPERFOCAL DISTANCE AND
70 'NEAR FOCUS POINT FOR ANY
80 'LENS AND F-STOP CHOSEN
90 'BY THE USER.
100 'PROGRAM VARIABLES:
110 'H = HYPERFOCAL DISTANCE
120 'F = FOCAL LENGTH
130 'S = F-STOP
140 'N = NEAR FOCAL POINT
```

```
150 PRINT"THIS PROGRAM WILL ALLO
W YOU"
160 PRINT"TO INPUT THE FOCAL LEN
GTH OF"
170 PRINT"A LENS, AND THE F-STOP
 YOU"
180 PRINT"WOULD LIKE TO USE, AND
 IT WILL"
190 PRINT"TELL YOU THE HYPERFOCA
L DISTANCE"
200 PRINT"OF THE LENS AT THAT F-
STOP, AND"
210 PRINT"WILL TELL YOU THE NEAR
EST POINT"
220 PRINT"IN FOCUS WHEN SHOOTING
 A SCENE"
230 PRINT"AT INFINITY"
240 PRINT
250 INPUT "PRESS <ENTER> TO CONT
INUE";Z
260 CLS:PRINT"THE PROGRAM WILL P
ROMPT YOU"
270 PRINT"TO ENTER FOCAL LENGTH
AND"
280 PRINT"F-STOP. IT WILL THEN R
EAD OUT"
290 PRINT"HYPERFOCAL DISTANCE AN
D "
300 PRINT"NEAR FOCUS FOR THAT LE
NS"
310 PRINT"AND STOP."
320 INPUT "PRESS <ENTER> WHEN RE
ADY.";Z
330 CLS
340 INPUT"YOUR LENSE'S FOCAL LEN
GTH-";F
350 INPUT "F-STOP USED-";S
360 LET H=((F/25.4)^2)/(S*.001*1
2)
370 LET N=H/2
380 CLS
390 PRINT"HYPERFOCAL DISTANCE IS
...":PRINT USING"####.#";H:PRINT
"   FEET"
400 PRINT
410 PRINT"NEAR FOCUS POINT IS...
":PRINT USING"####.#";N:PRINT"
  FEET"
420 PRINT
430 PRINT"ANOTHER LENS AND/OR F-
STOP?"
440 INPUT X$
450 IF X$="YES"THEN 330
460 PRINT
470 PRINT"HAPPY EXPOSING...BYE."
480 STOP
```

```
5 CLS
10 REM +++POLYCONTRAST FILTER FA
CTOR PROGRAM
20 ' BY J.D. STERLING, FRANKLIN,
 PA 16323
30 ' THIS PROGRAM WILL CALCULATE
 NEW
40 ' EXPOSURE VALUES FOR USER SE
LECTED
50 ' CHANGES IN KODAK POLYCONTRA
ST
60 ' FILTERS IN THE DARKROOM.
70 '
80 ' PROGRAM VARIABLES:
90 ' A  -  OLD FILTER
100 ' B  -  PRESENT EXPOSURE TIM
E
110 ' C  -  NEW FILTER
120 ' A1 -  OLD FILTER SPEED
130 ' C1 -  NEW FILTER SPEED
140 ' E  -  NEW EXPOSURE TIME
150 '
155 PRINT"THIS PROGRAM WILL ASK
YOU WHAT"
160 PRINT"POLYCONTRAST FILTER YO
U HAVE"
165 PRINT"JUST USED, AND THE ENL
ARGER"
170 PRINT"EXPOSURE TIME. IT WILL
 THEN ASK"
175 PRINT"WHAT FILTER YOU WOULD
LIKE"
180 PRINT"TO CHANGE TO. NEW EXPO
SURE"
190 PRINT"TIME WILL BE DISPLAYED
 IN SEC."
195 PRINT
200 INPUT "PRESS <ENTER>WHEN REA
DY";A$
205 CLS
210 INPUT"PRESENT FILTER";A
215 IF A<0 OR A>4 THEN GOSUB 100
0
220 PRINT
230 INPUT"PRESENT EXPOSURE TIME"
;B
240 PRINT
250 INPUT"CHANGE TO FILTER..";C
255 IF C<0 OR C>4 THEN GOSUB 200
0
260 IF A=0 THEN A1=500
270 IF A=1 OR A=3 THEN A1=250
280 IF A=1.5 THEN A1=400
290 IF A=2 OR A=2.5 THEN A1=320
300 IF A=3.5 THEN A1=100
310 IF A=4 THEN A1=80
```

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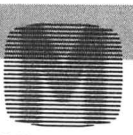

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```
320 IF C=0 THEN C1=500
330 IF C=1 OR C=3 THEN C1=250
340 IF C=1.5 THEN C1 =400
350 IF C=2 OR C=2.5 THEN C1=320
360 IF C=3.5 THEN C1=100
370 IF C=4 THEN C1=80
380 LET E=B*(A1/C1)
390 CLS:PRINT "NEW EXPOSURE TIME
 FOR FILTER"
400 PRINT "NUMBER";C;"IS..."
410 PRINT USING"###.#";E
415 PRINT"SECONDS"
420 PRINT
430 INPUT"TRY ANOTHER?";B$
440 IF B$="YES" THEN 205
445 PRINT
450 PRINT"GOOD LUCK. BYE"
900 STOP
1000 PRINT "REDO"
1010 GOTO 210
2000 PRINT"REDO"
2010 GOTO 250
```

```
10 CLS:REM ENLARGER EXPOSURE CON
VERSION PROGRAM
20 ' BY J.D. STERLING, FRANKLIN,
PA 16323
30 ' THIS PROGRAM WILL FIGURE NE
W EXPOSURE TIME FOR ANY CHANGE
40 ' IN ENLARGER-TO-EASEL DISTAN
CE, GIVEN OLD SCALE MARKING,
50 'NEW SCALE MARKING, AND OLD E
XPOSURE TIME.
60 '
70 'PROGRAM VARIABLES:
80 'A....OLD SCALE READING
90 'D....NEW SCALE READING
100 'E....OLD EXPOSURE TIME
110 'E1...NEW EXPOSURE TIME
120 '
130 PRINT"THIS PROGRAM WILL CALC
ULATE NEW"
140 PRINT"PRINT EXPOSURE TIME AF
TER YOU"
150 PRINT"HAVE MOVED THE ENLARGE
R HEAD"
160 PRINT"UP OR DOWN, THUS CHANG
ING THE"
170 PRINT"VOLUME OF LIGHT REACHI
NG THE "
180 PRINT"PAPER."
190 PRINT
200 PRINT"WHEN PROMPTED, ENTER O
LD SCALE"
210 PRINT"READING, NEW SCALE REA
DING, AND"
220 PRINT"OLD EXPOSURE TIME."
230 PRINT
240 INPUT"PRESS <ENTER> WHEN REA
DY.";A$
250 CLS:INPUT"OLD SCALE READING"
;A
260 INPUT "NEW SCALE READING";D
270 INPUT "OLD EXPOSURE TIME";E
280 LET E1=(D/A)^2*E
290 PRINT
300 PRINT"NEW EXPOSURE TIME IS..
."
310 PRINT USING"###.#";E1
320 PRINT"   SECONDS"
330 PRINT
340 INPUT"ANOTHER ONE";B$
350 IF B$="YES" THEN 250
360 PRINT"HAPPY PRINTING...BYE"
```

DRAW A CIRCUIT

by Mark E. Wilson
Box 743
401 Van Buren St.
Syracuse, NY 13210

This program is an extended version of Lectro-Sketch by E.C. Field. I have used Mr. Field's set of symbols (with some minor modifications). However, I have added some features. With my program, it is possible to label all the components in the diagram and to place various comments. I used the ASCII character set by M.H. Endres, published in the May 1982 Rainbow. It is also possible to enter and/or display a parts list for your circuit.

There are twelve commands in my program. They are:

D-Draw a line
E-Erase a line
B-Erase a block
C-Place a component
L-Place a label
P-Enter/display a parts list
S-Save to tape
T-Load from tape
H-Help
K-Clear screen
Q-Quit
.-Junction symbol

Eight other keys are used in the program. The four arrows move the blinking cursor in increments of five. 1,2,3, and 4 move the cursor up, right, down, and left, respectively, one space. The keyboard is scanned with PEEK, so holding a key down will continuously move the cursor. Also, you can move diagonally by holding two keys at once (for instance: holding the left and up arrows moves the cursor up and to the left). There is also a wrap around feature. When one edge of the screen is crossed, the cursor will appear on the other edge.

Drawing and Erasing a line: Move the cursor to the first point of a line. Hit ENTER (a tone will sound to tell you that you have entered your first point); then move the cursor to the second point and hit either D or E. D will draw a green line between the two points. E will will draw a black line between the two points you chose.

Erasing a block: Do just as you did with D and E, but instead of choosing the endpoints of a line, pick the corners of a block and hit B. Whatever is within those two corners will be erased.

Placing a Component: Move the cursor to where you want the component and hit C. A list of components will appear. Enter a part number. Then 'PRESS COMPONENT DIRECTION' will appear. Hit one of the arrow keys (hit right arrow if you want the component to point to the right). The program will return to the graphics screen and draw the component.

Placing a Label: Move the cursor to where you want your label and hit L. Enter a label (no longer than the length indicated by the computer) and hit enter. The program will return to the graphics screen and print the label.

To Enter/Display a Parts List: Hit P and then enter E to enter your parts list or *D to* display it.

Saving to Tape: Hit S to *save both* your diagram and parts list on tape. Be sure the recorder is in the record mode. The computer saves the screen by executing CSAVEM 1536,7680,1536. This process takes about a minute or so; then the parts list is saved by opening a file and printing the list to tape.

Loading from Tape: Hit T to load a diagram and parts list into the computer. Be sure the recorder is in the play mode. The computer loads the screen with CLOADM and then inputs the parts list from tape.

Help: Hitting H gives you a display of available commands.

Clear Screen: When you hit K, the computer will make sure you really want to clear the screen; if you're sure, the computer will PCLS.

Quit: Hit or enter Q at any time to quit the immediate function you are in.

Junction: . places a dot with cursor position as its center.

I know that there are many improvements that could be made to my program, such as a hardcopy output and using a disk to save the information. I would welcome any suggestions for improvement. Write to me at: Box 743/401 Van Buren St./Syracuse, NY 13210.

```
10 PCLEAR4:DIMAS$(59),P$(30)
20 FORI=1TO59:READAS$(I):NEXT
30 X=128:Y=96:A=0:C=0:PP=0
40 CLS:PMODE4,1:PCLS:SCREEN1,0
50 IFPP=0THENPRESET(X,Y)ELSEPSET
(X,Y,1)
60 IFPEEK(341)=247THENPP=PPOINT(
X,Y-5):Y=Y-5
70 IFPEEK(342)=247THENPP=PPOINT(
X,Y+5):Y=Y+5
80 IFPEEK(343)=247THENPP=PPOINT(
X-5,Y):X=X-5
90 IFPEEK(344)=247THENPP=PPOINT(
X+5,Y):X=X+5
```

```
100 IFPEEK(339)=239THENPP=PPOINT
(X,Y-1):Y=Y-1
110 IFPEEK(341)=239THENPP=PPOINT
(X,Y+1):Y=Y+1
120 IFPEEK(342)=239THENPP=PPOINT
(X-1,Y):X=X-1
130 IFPEEK(340)=239THENPP=PPOINT
(X+1,Y):X=X+1
140 IFY<5THENY=186ELSEIFY>186THE
NY=5
150 IFX<5THENX=249ELSEIFX>249THE
NX=5
160 PSET(X,Y,1):FORTD=0TO50:NEXT

170 IFC=1THEN200
180 I$=INKEY$:IFI$=CHR$(13)THENS
OUND50,1:C=C+1:X1=X:Y1=Y
190 GOTO260
200 I$=INKEY$
210 IFI$="D"THENGOSUB350
220 IFI$="E"THENGOSUB360
230 IFI$="B"THENGOSUB370
240 IFI$="Q"THENC=0:GOTO1240
250 GOTO50
260 IFI$="C"THENGOSUB380
270 IFI$="L"THENGOSUB710
280 IFI$="P"THENGOSUB770
290 IFI$="S"THENGOSUB880
300 IFI$="T"THENGOSUB1020
310 IFI$="K"THENGOSUB1140
320 IFI$="."THENGOSUB1170
330 IFI$="H"THENGOSUB1180
340 GOTO50
350 SOUND50,1:LINE(X1,Y1)-(X,Y),
PSET:C=0:RETURN
360 SOUND50,1:LINE(X1,Y1)-(X,Y),
PRESET:C=0:RETURN
370 SOUND50,1:LINE(X1,Y1)-(X,Y),
PRESET,BF:C=0:RETURN
380 CLS:PRINT@11,"PARTS LIST":PR
INT"1=PNP TRANSISTOR, 2=NPN TRAN
SIS-TOR,";:PRINT" 3=RESISTOR, 4=
POTENTIOMETER";
390 PRINT"5=CAPACITOR, 6=VARIABL
E CAPACI-TOR, 7=DIODE,";
400 PRINT" 8=LED, 9=N.O. PUSH-BU
TTON,";
410 PRINT" 10=N.C.PUSHBUTTON, 11
="
420 PRINT"MICROPHONE, 12=SPEAKER
,";
430 PRINT" 13=COIL,";:PRINT"14=C
RSTAL, 15=METER, 16=SOLAR":PRINT
"CELL, 17=GROUND"
440 PRINT:INPUT"WHICH COMPONENT"
;NC$
450 IFNC$="Q"THEN1240
460 CLS:PRINT@66,"PRESS COMPONEN
T DIRECTION"
470 IFPEEK(341)=247THENA=2:GOTO5
20
480 IFPEEK(342)=247THENA=0:GOTO5
20
490 IFPEEK(343)=247THENA=1:GOTO5
20
500 IFPEEK(344)=247THENA=3:GOTO5
20
510 GOTO470
520 DRAW"A"+STR$(A)+"BM"+STR$(X)
+","+STR$(Y):NC=VAL(NC$):SCREEN1
,0
530 IFNC=1THENDRAW"DG4NU2NR2GU2D
8U2F5D"
540 IFNC=2THENDRAW"DG5U2D8U2F4NU
2NL2FD"
550 IFNC=3THENDRAW"DG2F3G3F3G3F2
D"
560 IFNC=4THENDRAW"DF2G2F2NENR5N
FG2F2G2D"
570 IFNC=5THENDRAW"BR3R4L2NU2ND2
BL5D4NL5NR5BD2L3NG2R6NF2L3D6"
580 IFNC=6THENDRAW"D4NL5R2E6NL3N
D3G6R3L5BD2L3NG2R6NF2L3DNG4D6"
590 IFNC=7THENDRAW"DNL3R3G3NH3DN
L3NR3D"
600 IFNC=8THENDRAW"DNL3R3G3NH3DN
L3NR3D4NDBR7R2NU2H4BU4F4NU2NL2BR
BD6BL12"
610 IFNC=9THENDRAW"D3G2F2E2NH2BR
3NU2D3NR3D3ND2BL3NG2H2G2F2D3"
620 IFNC=10THENDRAW"D3NF2G2F2E2B
R3NU2D3NL3D3ND2BL3NG2H2G2F2D3"
630 IFNC=11THENDRAW"DR3F3D4G3L5U
10R3BD10D"
640 IFNC=12THENDRAW"D3R2D4F3L18E
3U4R2NR11U3"
650 IFNC=13THENDRAW"DF2D3G4H4E4F
4D4G4H4E4F4D4G4H4E4F4D4G3D"
660 IFNC=14THENDRAW"DL5R10BD3D3L
10U3R10D3BD3L10R5D"
670 IFNC=15THENDRAW"R3U3E4R8F4D3
NR3D4G4NU4L8H4NU4F4U4R4NH5R4BR8B
U4"
680 IFNC=16THENDRAW"DR4F4D8G4L8H
4U8E4R4D5BR2R2NU2NR2ND2BL4D5NR4N
L4BD2NR3NL3D5"
690 IFNC=17THENDRAW"D3NL5NR5BD3N
L3NR3BD3NLNRBD4"
700 DRAW"AO":C=0:RETURN
710 CLS:POKE200,X:POKE202,Y:M=IN
T((254-X)/8):PRINT"ROOM FOR";M;"
CHARACTERS.":PRINT
```

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```
720 LINEINPUT"ENTER LABEL. ";L$:
M=(254-X)/9:IF LEN(L$)>M THENPRI
NT"TOO LONG.":FORTD=0TO500:NEXT:
GOTO710
730 IFL$="Q"THEN1240
740 PRESET(X,Y):SCREEN1,0
750 FORI=1TOLEN(L$):M$=MID$(L$,I
,1):DRAWAS$(ASC(M$)-31)+AS$(1):N
EXT
760 Y=Y+1:RETURN
770 CLS
780 INPUT"ENTER, DISPLAY, OR RET
URN";L$
790 IFL$="Q"THEN1240
800 IFL$="D"THEN860
810 CLS:INPUT"HOW MANY PARTS";NP

820 IFNP>30THEN810
830 CLS:FORI=1TONP
840 PRINT"ENTER PART #";I:LINEIN
PUTP$(I):NEXT
850 GOTO780
860 CLS:FORI=1TONP:PRINTP$(I):NE
XT
870 GOTO780
880 CLS:PRINT@230,"ENTER FILE NA
ME.";:LINEINPUTF$
890 IFLEN(F$)>8THENPRINT@265,"NA
ME TOO LONG.";:FORTD=0TO1000:NEX
T:GOTO880
900 CLS:PRINT@1,"PUT TAPE PLAYER
 ON record AND";:PRINT@38,"HIT e
nter TO SAVE.";
910 PRINT@71,"HIT q TO RETURN.";

920 I$=INKEY$:IFI$=""THEN920
930 IFI$="Q"THEN1240
940 IFI$<>CHR$(13)THEN900
950 PRESET(X,Y)
960 PRINT@136,"SAVING SCREEN";
970 CSAVEMF$,1536,7680,1536
980 PRINT@200,"SAVING PARTS LIST
";:OPEN"O",-1,F$
990 PRINT#-1,NP:FORI=1TONP:PRINT
#-1,P$(I):NEXT:CLOSE-1
1000 PRINT@264,"FINSIHED";
1010 IFPEEK(339)=251THEN1240ELSE
1010
1020 CLS:PRINT@230,"ENTER FILE N
AME.";:LINEINPUTF$
1030 CLS:PRINT@3,"PUT TAPE PLAYE
R ON play AND";:PRINT@38,"HIT en
ter TO LOAD.";
1040 PRINT@71,"HIT q TO RETURN."
;
1050 I$=INKEY$:IFI$=""THEN1050
1060 IFI$="Q"THEN1240
1070 IFI$<>CHR$(13)THEN1050
1080 PRESET(X,Y)
1090 SCREEN1,0:CLOADMF$
1100 OPEN"I",-1,F$:INPUT#-1,NP
1110 FORI=1TONP:INPUT#-1,P$(I):N
EXT
1120 CLOSE-1
1130 GOTO1240
1140 CLS:INPUT"ARE YOU SURE (Y/N
)";L$
1150 IFL$="Y"THEN40
1160 IFL$="N"THEN1240ELSE1140
1170 CIRCLE(X,Y),2,1:RETURN
1180 CLS:PRINT"D-DRAW LINE":PRIN
T"E-ERASE LINE":PRINT"B-ERASE BL
OCK"
1190 PRINT"C-PLACE COMPONENT":PR
INT"L-PLACE LABEL":PRINT"P-ENTER
/DISPLAY PARTS LIST"
1200 PRINT"S-SAVE TO TAPE":PRINT
"T-LOAD FROM TAPE":PRINT"H-HELP"

1210 PRINT"K-KLEAR SCREEN":PRINT
"Q-QUIT":PRINT".-JUNCTION SYMBOL
"
1220 PRINT"HIT enter"
1230 I$=INKEY$:IFI$=CHR$(13)THEN
1240ELSE1230
1240 SOUND50,1:SOUND100,1:SCREEN
1,0:GOTO50
1250 DATA"BR3","BR2U0BU2U4BM+2,6
","BRBU6D2BR2U2BEBD6","BRU2LR4LD
2BL3BU4RU2D2R2U2D2RBD4"
1260 DATA"BUR2DUREHL2HERUDR2BD5"
,"BUE4BL3LURDBR3BD5URDL","BR4BU2
G2LHE3UHLGDF4","BR2BU6D2BR2BD5"
1270 DATA"BR4BU6LGD4FR","REU4HLB
R4BD6","BUE4G2U2D4U2L2R4L2H2F4BD
","BU3R4L2U2D4BR2BD"
1280 DATA"BR3BULURD2GBR2BU","BRB
U3R2BRBD3","BR2LURDBR2","UE4UBD6
"
1290 DATA"BUU4ER2FD4GL2HBR4BD","
BRBU5ED6LR2BR","BU5ER2FDG4R4","B
U5ER2FDGLRFDGL2HBR4BD"
1300 DATA"BR3U6G3R4BD3","BUFR2EU
HL3U3R4BD6","BU3R3FDGL2HU3E2RBRB
D6","BU6R4G3D3BR3","BR4BU2DGL2HU
ER2L2HUER2FDGFBD2","BUFR2EU4HL2G
DFR2BRBD3"
1310 DATA"BRBURULDBU3RULDBR3BD4"
,"BR2BULURD2GBRBU5LURDBR2BD4","B
R4BU6G3F3","BRBU4R2BL2BD2R2BR3BD
2"
```

```
1320 DATA"E3H3BR4BD6","BU5ER2FDG
2BD2UBR2BD","BU5ER2FD4GL2HUER3BD
3","U4E2F2D2L4R4D2"
1330 DATA"RU6LR3FDGL2R2FDGL3BR4"
,"BR4BUGL2HU4ER2FDBD4","RU6LR3FD
4GL2BR3","U3R4L4U3R4BD6L4R4"
1340 DATA"U3R4L4U3R4BD6","BR2BU3
R2D2GL2HU4ER2FBD5","U6D3R4U3D6",
"BRR2LU6LR2BRBD6"
1350 DATA"BU2DFR2EU5BD6","U6BR4G
3F3","R4L4U6BR4BD6","U6F2E2D6"
1360 DATA"U6DF4U5D6","R4L4U6R4D6
","U6R3FDGL3BR4BD3","BUU4ER2FD4G
L2HBR2BUF2"
1370 DATA"U6R3FDGL3RF3","BUFR2EU
HL2HUER2FBD5","BU6R4L2D6BR2","U6
D6R4U6D6"
1380 DATA"BU6D4F2E2U4BD6","U6D6E
2F2U6D6","UE2H2UDF2E2UDG2F2D","B
U6DF2E2UDG2D3BR2","BU6R4DG2LR2LG
2DR4"
```

64K KORNER

BBSs - 64K & ROM

By Frank Hogg

Here is a discussion on using high RAM as display memory. It comes to us from Kent Meyers who got it from one of the BBS's that he has been contacting. I haven't tried it yet but here it is for your use.

Using 64K CC w/ROM BASAC

Author unknown

With the 64K mod installed and running BASIC in ROM, the upper 32K is available for display memory. This would give you an additional five 6K HI-RES graphics pages, 63 pages of text, etc. This area could be used to hide pictures, menus, "HELP" screens and free up most of low memory for program storage. The uploading of this material to the high memory could be done by a slight variation of the routine used to upload the BASIC ROMS. The program that follows illustrates one method of changing display pages from BASIC. It uses six bytes of machine code and two BASIC statements to set the address offset in the SAM, allowing the user to get the base address of the display through high memory from $8000 to $FE00. Lines 20-40 can be used in any BASIC program to POKE machine code without converting to decimal. It is nothing original, but I would like to see it widely used. I hate having to convert someone else's decimal POKES to HEX in order to see what they're trying to do or to check for typos. Line 60 POKEs the desired offset into the second byte of an LDA# instruction and EXECs the machine language program:

```
                        ORG     $7FFA
7FFA 86 00              LDA     #$00
7FFC 44                 LSRA
7FFD 7E 96 0F           JMP     $960F
```

The program then waits for a keypress. If it is "E", it ends. Otherwise, you see the next page. Before it quits, it EXECs $95AC to restore the normal screen. Load BASIC into RAM and reset the CC to get back into ROM before running the program.

To keep Extended BASIC from returning to the normal text screen after entering graphics commands from the keyboard, do POKE &H167 back, do SCREEN 0. To restore to normal operation, POKE &H167 ,&H7E.

The display changing program follows...

```
 5 ' PAGE THRU UPPER 32K
10 CLEAR 200, &H7FF9:H$="&H"
15 READ A$,B$
20 FOR A=VAL(H$+A$) TO VAL(H$+B$)
25   READ A$:POKE A, VAL(H$+A$)
30 NEXT A
35 FOR A=&H80 TO &HFE STEP 2
40   POKE &H7FFB, A: EXEC &H7FFA
45   A$=INKEY$
50   IF A$="" THEN 45
     ELSE IF A$="E" THEN 60
55 NEXT A
60 EXEC &H95AC:END
65 DATA 7FFA,7FFF
70 DATA 86,00
75 DATA 44
80 DATA 7E,96,0F
```

END

This is a good example of the interesting things that you can get from the BBS's. Here, also from Kent, is a list of several BBS's that cater to the CoCo and the 6809.

COCO BBS's

212-441-3755 Bob Rosen Woodhaven NY on a III
212-441-3766 " " " " on a CoCo
512-285-5028 Peter Banz Elgin TX on a III
404-378-4410 Lee Blitch in Alanta GA on CoCo
(NOTE 6PM/6AM EDT)
312-260-0640 Terry Haas Wheaton IL on a III
408-733-6809 Shawn Jipp Sunnyvale CA on CoCo

68XX BBS's NON-CoCo

404-633-9761 Randy Jarrett and Chris DeCastro, Alanta GA. Written in XBASIC for SWTPC FLEX9.

405-722-6809 Rodger Walton and R. L. Hilbun in Okla. City, OK. FLEX like system, great HELP files, binary file up & download.

312-397-8308 George Dorner and Troy Monaghen in Palatine, Il. OS-9 Users Group, runs on a Hewlett-Packard Mini.

Thanks Kent for the information, I'm sure that many will get good use from it.

AGAIN!

Many new people have gotten involved in the CoCo since our article appeared 10 months ago. Here is a partial reprint to bring those of you up to date.

[][][][][][][][][][]

USING THE FULL 64K RAM.

None of the versions of radio shack color basic know how to use the other 32k. As a matter of fact, this memory is not available to the cpu at all in an unmodified color computer. This is due to an omission, which can easily be corrected in the design of the computer.(see Feb 82 CCN or contact FHL)

The dynamic memory in the color computer is controlled by a chip known as the SAM, or synchronous address multiplexer. The SAM takes care of refreshing the rams and interlaces the access cycles of the cpu and the video display so that no "specks" occur on the screen. The SAM must be programmed differently for 4k, and 16k, and 64k rams. (this is why color basic 1.1 was written - version 1.0 didn't know about 64ks.) The SAM also provides address decoding for the three roms, as well as the i/o hardware.

As the SAM was being designed, Motorola considered the possibility that it might be useful in systems which did not use rom, but might want to use 64k of ram (minus 256 bytes for I/O, etc.) For this reason the selection of rom in the SAM is programmable. If you whisper the right thing to the SAM (POKE &HFFDF,anything), the roms will go away, at least in theory, leaving behind nearly 32k of clean, untouched ram.

Well, we need a more sophisticated theory, because it doesn't quite work. The SAM will still try to select the roms if the cpu writes to those addresses, regardless of how it is programmed. I guess Motorola must have thought that this decoding might be used for something - clearly it wouldn't hurt, since the system designer would have to provide logic to prevent the roms from being turned on in a write cycle anyway. (the rams are "selected" for write purposes all the time.)

Radio Shack, on the other hand, didn't see things the same way; they figured they would avoid writing to that area, so no problems would result. As a matter of fact, the first thing color basic does (after programming the SAM) is to test the memory from zero until it finds a byte that won't write. When this test hits address &H8000, the cpu tries to write the roms with exactly the opposite data they contain, and at the same time the roms are reading - resulting in two different chips trying to put different data onto the same bus at the same time.

The real tragedy is that a few unused nor gates exist on the color computer circuit board. You only need one of these to solve this problem. (Radio Shack designers - take note.)

[][][][][][][][][][]

This last paragraph refers to the now famous FHL 64K mod to give your CoCo 32K for Free. See the Feb 82 CCN or send a SASE with 40 cents stamps for a reprint and a catalog to FHL. (see ad in this issue)

FLEX or OS9 or FLEX or OS9 or FLEX

Which way to go?

So now you've got 64K and it seems the only way to really use it is to buy FLEX or OS9. What do you do? This is one of the most frequently asked questions from our customers. The answer is easier than you might think.

If you want to work with a newer system, and you do not need prepackaged software, in other words, you're a pioneer, then OS9 is the system for you.

However, if you want a system that has a tremendous amount of support, a very large base of existing software, hundreds of prepackaged software, then FLEX is the answer. Also, FLEX software usually costs about HALF as much as the equivalent OS9 software. Also, there are two licensed versions of FLEX for the CoCo,(FHL and Spectral) and one overlay system (DC). The reason FLEX is so popular is that it was there first with OS9 coming several years later. OS9 is probably more powerful than FLEX, but without the support that FLEX has, OS9 falls short. Lastly, FLEX has several thousand CoCo users in the year it has been on the market and OS9 is yet to come.

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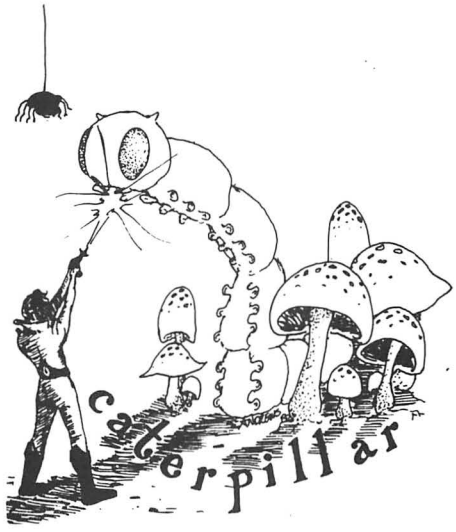

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FRIENDLY FLEX

Many users of the CoCo are used to programs that prompt you for each item that is needed. For example, if you were using an assembler, you might see something like this:

```
FILENAME TO ASSEMBLE ?
DO YOU WISH TO CREATE A BINARY FILE ?
```

and so on. The thing here is that you have to answer everything the program needs to run. This is fine for programs that you only run once in awhile, but what about a program you use every day? In FLEX there is a thing referred to as the command line. This refers to the instructions that you type in to FLEX at the '+++' prompt, on the 'command line'. This line can be up to 128 characters long. Let's use the example of assembling a program called TEST.TXT on the disk. In this first assembly, we don't want to create a binary file because we just want to test for syntax errors, and we don't want a listing or symbol table either. The command line would look like this:

```
+++ASM TEST +BLS
```

This is what happens. First, FLEX gets the file ASM from the disk and executes it, ASM looks on the command line of FLEX and gets the file TEST from the disk to assemble. Also, ASM gets the options (the +BLS) which tells ASM not to create a binary file (+B), or list the file (L) or provide a symbol table (S).

We will assume that the program TEST did not have any bugs. Now we can create the binary file and at the same time send a listing with line numbers to the printer, and we want to name the binary file TEST1.CMD. This is how that would look:

```
+++P,ASM,TEST,TEST1.CMD,+N
```

This is what happens. The 'P' in the front of the line tells FLEX to divert output of this command to the printer. (this works with ANY FLEX command) ASM and TEST are the same as before, but the TEST1.CMD tells ASM to create the binary file with that name. The '+N' tells ASM to put line numbers in the output lines. Finally you may be wondering why in this example there are commas, and in the last example there were spaces. FLEX treats both the same. It doesn't matter whether you use spaces or commas. As a matter of fact, the line could have looked like this:

```
+++    P,ASM       TEST  TEST1.CMD,    +N
```

and it would have worked just as well!

FLEX is just that, FLEXible. By doing everything on the command line, you can save a lot of time.

Other things that you can do on the command line include:

```
+++P ASM TEST +BLS:ED TEST
```

In this case we just know that there are going to be errors, and a lot of them. The first part of the line is the same as the first example above, but the error messages will go to the printer. The ':' is a separater just like in BASIC. After the assembly is done, FLEX will call the ED editor and be ready for you to edit the file TEST when you return from the john or wherever.

You can put as many commands on the line that will fit within 128 characters. Suppose you wanted more? What do you do?

EXEC

EXEC is one of the FLEX commands. It is unlike EXEC in RS BASIC. EXEC will take a text file as input, instead of commands from the keyboard. If you need to do a very complex task or are doing something very often, then you should create a text file that you can EXEC when you need to do this task. For example, you want to create a new system disk for FLEX. You first create a text file with the BUILD command or an Editor like ED. The file would look like this:

```
NEWDISK,1
PUTBOOT.LDR,1
COPY,0,1
LINK,1.FLEX.SYS
```

We will call the file MAKEFLEX. Whenever you wanted to make a new system disk all you need to do is:

```
+++EXEC,MAKEDISK
```

The first line formats the disk, then the boot is installed in the second line. The third line copies all the files from drive 0 to drive 1 and the last line links the boot to the FLEX system file on the new disk.

This last item, the linking of FLEX, needs some explanation. The file FLEX.SYS can reside anywhere on the disk and it can be named anything! Also, you can link the boot to something besides FLEX. You can use the boot to run a program of your own besides FLEX. I won't go into the ramifications of that, but suffice it to say that it is possible. The linking process tells the boot where to find FLEX on the disk.

In future columns I will touch on some of the tricks that you can do with FLEX. But as always, I need your help. I need to know what areas you would like to see covered. Several people have called or sent in things for me to go over and this is the type of thing that keeps this column alive. I thank all of you who have helped.

See ya next month.

Frank

OS9 Delayed

OS9 for the CoCo has been delayed. An unforseen problem has caused a complete rewrite that will take several months. We cannot say at this time just how long this will take and have removed OS9 from our ads. We apologize to everyone for this and hope to be able to get OS9 to you as soon as possible. FHL

ADDITION OF A SOFTWARE BASED TIME/DAY CLOCK TO THE COLOR COMPUTER

by John Button
216 Frog Hollow Rd.
Poughquag, NY 12570

One of the Extended Basic Color Computer's limitations as it is delivered to a user is the lack of a time/day clock which is accessible to Basic. The existing TIMER function which is available limits you to timing events which are relatively short in duration. TIMER provides a counter which can take on values between 0 and 65,535 corresponding to a maximum time of 18.2 minutes (or 1092.25 seconds). You can of course use a counter variable in Basic to extend timing functions to any desirable limit. This approach has limits in that it can only maintain correct timing when the program is running and that additional code will be necessary in the program to provide this function (with a corresponding use of computational time not available to the program). A method of remedying this situation is to provide additional counters hooked into the interpreter's existing code used to generate TIMER values.

Code, as shown is figure 1, will provide such a service. In addition, it will as desired display the current time to the screen regardless of whether or not a program is running. Counters have been added for seconds, minutes, hours and days in addition to TIMER's 1/60 second counter. The code was written on my machine and is therefore designed for a 16K unit, however; it is position independant and can be loaded anyplace in RAM. If you have a 32K machine all the address I refer to should be changed accordingly (eg. &H3FFF should be &H7FFF in 32K).

Two methods are included to get this capability into your machine, either type in the Basic program as it appears in figure 2 of enter the code from figure 1. If you use the Basic program it will consider the size of your machine (32K or 16K only), link into existing TIMER routine and prompt for values to set the current time. For those of you who use the machine code directly, EXEC &H3F4B must be done to link into TIMER. Also, do not forget to use the CLEAR command to reserve space.

Now that you have everything all set you should see the time displayed in the upper right of the screen. Well almost. The system will start at 0 hours, 0 minutes and 0 seconds, so to be useful there is a method of setting the time. To set the desired hour POKE &H3FFD,<hour> for minute POKE &H3FFE,<min> and for second POKE &H3FFF,<sec>. In turn by PEEK(&H3FFF) the current second can be retrieved and likewise with the other values. If you're using the Basic program (as in figure 2) all this has been done for you. The clock is based on 24 hours so zero hour is midnight, 12 is noon and 23 is 11 p.m. Should you wish to turn off the screen dislay execute the following DEFUSR0=&H3F6D: X=USR0(0) or EXEC &H3F6D and to turn it back on DEFUSR1=&H3F5C: X=USR1(0) or EXEC &H3F5C. The TIMER function no longer performs the same functions it previously did. It now holds both the current day and 1/60 seconds values. These are in the following format : # of 256's = # days and remainder is # 1/60 seconds. That must seem confusing so consider this example : # days = INT(TIMER/256) and # 1/60's = TIMER - INT(TIMER/256)*256. The number of days is incremented by one each time the hour counter is set to 0 (at midnight). To set to a particular number of days : TIMER = <# days> * 256. This will also set the 1/60's counter to zero. Because there is a seconds counter, the 1/60 counter portion of TIMER will never be greater than 59. You can also reach the day and 1/60 second values through the use of PEEK and POKE. Day counter is at &H112 and 1/60 second at &H113. Thus, PEEK(&H112) would return the current day count.

Some of the details of this code may interest you, particularly if you do some machine language coding. Essentially, I have used the existing field sync interrupt that Estended Basic uses to time the 1/60 second intervals. I use the existing iterrupt handler to count 1/60th's counter (located at $0112 & $0113) at decimal 59, I only need one byte to hold it. This frees up the byte at $0112, which Basic uses, to hold a day count. One other feature which was thrust upon me was a need to adjust for the field sync interrupt not being EXACTLY 1/60 of a second (it was a little less). I determined from initial tests that one 1/60th count in every 120 would provide "adequate" accuracy in my machine. Therefore every other second I decrement the 1/60 counter by one. Should this not be the case in your machine timing will be inaccurate. It should be possible to adjust the field sync timing to solve this problem however, I have not attempted it. To remove this "adjustor" portion of software, replace $3F94 to $3F9E with $12 NOP's.

You will also find that time will "stand still" when you use the cassette interface. This, as in TIMER command, is because the interpreter's cassette software disables all interrupts so it can execute its own timing loops.

I hope you find this added feature useful in your programming.

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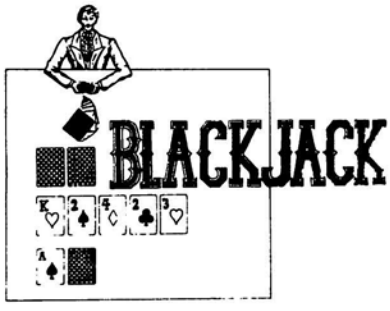

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DCBUG is a machine language monitor which allows examining and altering of memory, setting break points, etc.

The editor, assembler and monitor — as well as sample programs — come on one Radio Shack compatible disk. Extensive documentation included. MACRO-80C **Price: $99.95**

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- Forth executes in less time than Basic

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```
10 REM TIME CLOCK PROGRAM
20 REM LOAD AND SET TIME
30 REM BY JOHN BUTTON
40 REM
50 CLS
60 PRINT "PRESS A 1 FOR 16K MACH
INE"
70 PRINT "OR A 3 FOR 32K"
80 X$=INKEY$
90 IF X$="" THEN 80
100 IF X$="1" THEN 150
110 IF X$<>"3" THEN 80
120 CLEAR 200,&H7F4A
130 A=&H7F4B
140 GOTO 170
150 CLEAR 200,&H3F4A
160 A=&H3F4B
170 PRINT
180 PRINT "LOADING PROGRAM"
190 PRINT "STAND BY FOR A MIN"
200 FOR L=A TO A+&HB4
210 READ V$
220 POKE L,VAL("&H"+V$)
230 NEXT L
240 CLS
250 EXEC A
260 PRINT
270 INPUT "DAY COUNT (0-255)";C
280 C=ABS(INT(C))
290 IF C>255 THEN 270 ELSE POKE
&H112,C
300 INPUT "SET DESIRED HOUR (0-2
3)";H
310 H=ABS(INT(H))
320 IF H=24 THEN H=0
330 IF H>23 THEN 220 ELSE POKE A
+&HB2,H
340 INPUT "SET DESIRED MIN (0-59
)";M
350 M=ABS(INT(M))
360 IF M=60 THEN M=0
370 IF M>59 THEN 340 ELSE POKE A
+&HB3,M
380 INPUT "SET DESIRED SEC (0-59
)";S
390 S=ABS(INT(S))
400 IF S=60 THEN S=0
410 IF S=59 THEN 380 ELSE POKE A
+&HB4,S
420 CLS
430 END
440 DATA 1A,50
450 DATA 7F,01,12
460 DATA 7F,01,13
470 DATA 30,8C,28
480 DATA BF,01,0D
490 DATA 1C,AF
500 DATA 39
510 DATA 1A,50
520 DATA CC,10,8E
530 DATA ED,8C,56
540 DATA CC,04,18
550 DATA ED,8C,52
560 DATA 1C,AF
570 DATA 39
580 DATA 1A,50
590 DATA CC,7E,89
600 DATA ED,8C,45
610 DATA CC,55,12
620 DATA ED,8C,41
630 DATA 1C,AF
640 DATA 39
650 DATA B6,FF,03
660 DATA 2B,01
670 DATA 3B
680 DATA B6,FF,02
690 DATA 86,3B
700 DATA B1,01,13
710 DATA 22,2C
720 DATA 7F,01,13
730 DATA 30,8C,6B
740 DATA E6,84
750 DATA 54
760 DATA 25,06
770 DATA 7A,01,12
780 DATA 7A,01,13
790 DATA A1,84
800 DATA 22,15
810 DATA 6F,84
820 DATA A1,82
830 DATA 22,0F
840 DATA 6F,84
850 DATA 86,17
860 DATA A1,82
870 DATA 22,07
880 DATA 6F,84
890 DATA 7C,01,12
900 DATA 20,02
910 DATA 6C,84
920 DATA 10,8E,04,18
930 DATA 30,8C,3C
940 DATA CC,05,32
950 DATA E1,84
960 DATA 23,05
970 DATA 4A
980 DATA C0,0A
990 DATA 26,F7
1000 DATA E0,80
1010 DATA 50
1020 DATA 8B,30
1030 DATA CB,30
1040 DATA ED,A4
```

```
1050 DATA 31,23
1060 DATA 10,8C,04,21
1070 DATA 26,E3
1080 DATA 86,3A
1090 DATA B7,04,1A
1100 DATA B7,04,1D
1110 DATA 9E,88
1120 DATA 8C,04,18
1130 DATA 26,04
1140 DATA 30,08
1150 DATA 20,07
1160 DATA 8C,04,1F
1170 DATA 26,04
1180 DATA 30,18
1190 DATA 9F,88
1200 DATA 7E,89,55
1210 DATA 00,00,00
```

HOMEWORK HELPER--FACTORS

by: Regena
120 South 350 East
North Salt Lake, UT 84054

"Factors" is another program in the Homework Helper series which is designed to help a student quickly check the answers to an assignment with problems involving factoring. The student is encouraged to do the class assignment in the usual way on paper, writing the problem down and working the problem step by step. Homework Helper--Factors is then used to check only the answers. This program gives answers to problems involving factoring. There are four sections.

1. ALL FACTORS. The student enters a number and all possible factors or divisors of that number are listed from largest to smallest. The list of factors includes the number itself and the number 1. The student's answer may be in a different order, but as long as all factors are included the answer is correct. To return to the menu screen, the student enters zero.

2. PRIME FACTORS. Finding the prime factors is also called complete factorization or using the prime factor tree. The student enters a number, and the prime factors of the number are listed from smallest to largest. The student's answer does not have to list the factors in exact order to be correct. If only the prime factors are desired, the student would still choose this option of the program and his answer would consist of the list of factors not including duplicated numbers.

An example of "all Factors" of 12 would be 12, 6, 4, 3, 2, 1, and an example of "Prime Factors" of 12 would be 2, 2, 3. The prime factors only would be 2 and 3.

3. GREATEST COMMON FACTOR. The student enters two numbers. The program lists the greatest common factor, which is the largest number that can be divided evenly into both the input numbers. If both numbers are prime, or if they have no common factors, then the greatest common factor is the number 1.

4. LEAST COMMON MULTIPLE. The student first presses 0, 2, or 3 for the number of given numbers. Zero will return to the menu screen. Two or three indicates the student will input two or three given numbers. (This is adequate for fifth or sixth grade mathematics.) The program will list the least common multiple, or the lowest number that the given numbers may be divided into without remainders. For example, the least common multiple of two given numbers, 4 and 12, is 12. The least common multiple of 5, 7, and 2 is 70.

50	Dimension the array M for three numbers.
60	Specifies middle resolution graphics and clears screen.
70-230	Draws title screen graphics of a prime factor tree.
240-300	Draws the title, "FACTORS".
310	Plays music.
320	Clears screen; returns to text screen.
330-380	Prints menu screen of choices.
390-440	Draws border around menu screen.
450-470	Waits for student to press number of choice then branches appropriately.
480-540	Prints instructions and graphics for "All
550-580	Factors".
590-670	Receives student's given number.
680-700	Calculates and prints all possible factors of given number.
710-760	Waits for student to press any key to continue.
770-800	Prints instructions and graphics for "Prime Factors".
810-890	Receives student's given number.
900-920	Calculates and prints all prime numbers of complete factorization of given number.
930-1020	Waits for student to press any key to continue.
1030-1140	Prints instructions and graphics for "Greatest Common Factor".
1150-1260	Receives student's two given numbers; must be between 1 and 10000.
1270-1290	Calculates and prints greatest common factor.
1300-1370	Prints instructions and graphics for "Least Common Multiple".
1380-1420	Asks how many numbers are given and branches accordingly. If student enters "0", the program returns to the menu.
1430-1500	Receives student's given numbers; must be between 1 and 100.
1510-1590	Calculation for two numbers.
1600-1660	For three numbers sorts numbers in order.
1670-1770	Calculates and prints least common multiple.
1780-1800	Waits for student to press any key to continue.
1810	Ends.

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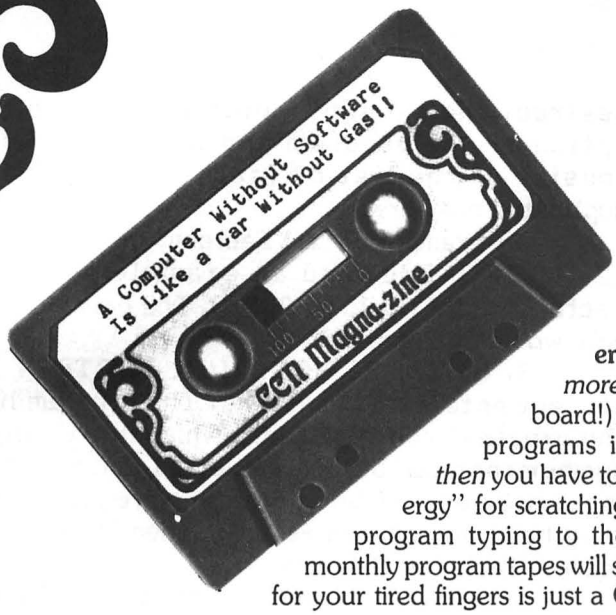

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```
10 REM HOMEWORK HELPER--FACTORS
20 REM BY REGENA
30 REM 120 SOUTH 350 EAST
40 REM NORTH SALT LAKE,UT 84054
50 DIM M(3)
60 PMODE 3,1:SCREEN 1,1:PCLS
70 COLOR 4,1
80 LINE(108,20)-(146,35),PSET,BF

90 LINE(128,36)-(96,79),PSET
100 LINE(128,36)-(162,79),PSET
110 COLOR 3,1
120 LINE(84,80)-(106,95),PSET,BF

130 LINE(152,80)-(174,95),PSET,B
F
140 COLOR 4,1
150 LINE(96,96)-(72,127),PSET
160 LINE(96,96)-(120,127),PSET
170 LINE(164,96)-(146,127),PSET
180 LINE(164,96)-(186,127),PSET
190 COLOR 3,1
200 LINE(68,128)-(74,139),PSET,B
F
210 LINE(116,128)-(126,139),PSET
,BF
220 LINE(140,128)-(150,139),PSET
,BF
230 LINE(176,128)-(194,139),PSET
,BF
240 DRAW "BM50,160;L16D13R8L8D15
"
250 LINE(66,160)-(56,187),PSET:L
INE(66,160)-(76,187),PSET:LINE(6
0,179)-(72,179),PSET
260 DRAW "BM108,165;U2H3L10G6D16
F6R10E6U2"
270 DRAW "BM118,160;R20L10D27"
280 DRAW "BM166,160;L10G6D16F6R1
0E6U16H6"
290 DRAW "BM182,187;U27R12F5D3G5
L10R9F5D9"
300 DRAW "BM226,164;U1H4L8G4D4F4
R8F5D7G4L8H4U2"
310 PLAY "L8O2FGA;O3C;O2AGFG;L4.
A;O3L8C;L4.F;L8A;L4.G;L8DFEDC;L4
C;L2F"
320 PCLS:SCREEN 0,0
330 CLS:PRINT @66,"HOMEWORK HELP
ER--FACTORS"
340 PRINT @132,"1 FIND ALL FACTO
RS
350 PRINT @196,"2 PRIME FACTORS"

360 PRINT @260,"3 GREATEST COMMO
N FACTOR"
370 PRINT @324,"4 LEAST COMMON M
ULTIPLE"
380 PRINT @388,"5 END PROGRAM"
390 FOR I=0 TO 63:SET(I,0,3)
400 SET(I,1,3):SET(I,30,3)
410 SET(I,31,3):NEXT I
420 FOR I=2 TO 29:SET(0,I,3)
430 SET(1,I,3):SET(63,I,3)
440 SET(62,I,3):NEXT I
450 A$=INKEY$:IF A$="" THEN 450
460 IF ASC(A$)<49 OR ASC(A$)>53
THEN 450
470 CLS:ON VAL(A$) GOTO 480,710,
930,1300,1810
480 CLS:PRINT @35,"FINDING ALL T
HE FACTORS"
490 B$=CHR$(191)+CHR$(191)+CHR$(
191)+CHR$(191):C$=CHR$(172)+CHR$
(172)+CHR$(172)+CHR$(172)
500 PRINT @135,B$+"  =  "+C$
510 B$=B$+"     "+C$
520 PRINT @103,B$
530 PRINT @167,B$:PRINT @199,B$
540 PRINT @288,"ENTER '0' TO STO
P.
550 PRINT @352,"WHAT IS THE NUMB
ER TO FACTOR?"
560 INPUT N:IF N=0 THEN 330
570 IF N>1 THEN 590
580 PRINT @416,"PLEASE ENTER A N
UMBER > 1.";:GOTO 560
590 PRINT "FACTORS OF ";N;"ARE "
:PRINT N;
600 L2=INT(N/2+1)
610 FOR T=2 TO L2
620 IF N/T<>INT(N/T) THEN 660
630 L2=N/T:PRINT L2;
640 IF L2=1 THEN 680
650 IF L2=2 THEN 670
660 NEXT T
670 PRINT " 1"
680 PRINT:PRINT "PRESS ANY KEY T
O CONTINUE."
690 A$=INKEY$:IF A$="" THEN 690
700 GOTO 480
710 CLS:PRINT @8,"PRIME FACTORS
OR"
720 PRINT @69,"COMPLETE FACTORIZ
ATION"
730 FOR I=14 TO 25:FOR J=8 TO 11

740 SET(I,J,3):NEXT J,I
750 PRINT @176,"=  "+CHR$(191)+"
 * "+CHR$(191)+CHR$(191)+" * "+C
HR$(191)+CHR$(191)
```

```
760 PRINT @256,"ENTER '0' TO STO
P."
770 PRINT @320,"WHAT IS THE NUMB
ER TO FACTOR?"
780 INPUT N:IF N=0 THEN 330
790 IF N>1 THEN 810
800 PRINT "PLEASE ENTER A NUMBER
 > 1.":GOTO 780
810 PRINT:PRINT "THE PRIME FACTO
RS ARE: "
820 L2=INT(N/2)
830 FOR T=2 TO L2
840 IF N/T<>INT(N/T) THEN 870
850 N=N/T:L2=N:PRINT T;
860 GOTO 830
870 NEXT T
880 IF N=1 THEN 900
890 PRINT N
900 PRINT:PRINT:PRINT "PRESS ANY
 KEY TO CONTINUE."
910 A$=INKEY$:IF A$="" THEN 910
920 GOTO 710
930 CLS:PRINT @2,"GREATEST COMMO
N FACTOR"
940 PRINT @34,"OF TWO NUMBERS"
950 A$=CHR$(191)+CHR$(191)+CHR$(
191)
960 B$=A$+CHR$(191)+CHR$(175)+"
 "+A$
970 A$=CHR$(175)+CHR$(175)+CHR$(
175)
980 PRINT @99,B$
990 PRINT @131,B$
1000 PRINT @163,B$
1010 PRINT @138,A$+"  ...  "+A$
1020 PRINT @256,"ENTER '0' TO ST
OP."
1030 PRINT @320,"FIRST NUMBER ";

1040 INPUT A:IF A=0 THEN 330
1050 IF A>1 THEN 1070
1060 PRINT "SORRY, ENTER NUMBERS
 > 1.":GOTO 1040
1070 IF A<10000 THEN 1090
1080 PRINT "SORRY, MUST BE LESS
THAN 10000.":GOTO 1040
1090 PRINT:PRINT "SECOND NUMBER"
;
1100 INPUT B:IF B=0 THEN 330
1110 IF B>1 THEN 1130
1120 PRINT "SORRY, ENTER NUMBER
> 1.":GOTO 1100
1130 IF B<10000 THEN 1150
1140 PRINT "SORRY, MUST BE LESS
THAN 10000.":GOTO 1100
1150 PRINT:PRINT "GREATEST COMMO
N FACTOR =";
1160 IF A=B THEN GC=A:GOTO 1260
1170 IF A<B THEN 1190
1180 D=A:A=B:B=D
1190 FOR T=1 TO A
1200 IF (A/T)<>INT(A/T) THEN 124
0
1210 L2=A/T
1220 IF B/L2<>INT(B/L2) THEN 124
0
1230 GC=L2:GOTO 1260
1240 NEXT T
1250 GC=1
1260 PRINT GC
1270 PRINT:PRINT "PRESS ANY KEY
TO CONTINUE."
1280 A$=INKEY$:IF A$="" THEN 128
0
1290 GOTO 930
1300 CLS:PRINT @4,"LEAST COMMON
MULTIPLE"
1310 PRINT @36,"OF 2 OR 3 GIVEN
NUMBERS"
1320 A$=CHR$(191)+CHR$(191)
1330 B$=A$+"   "+A$+A$+"    "+A$
+A$+A$+A$+A$
1340 PRINT @101,B$
1350 PRINT @133,A$+"   "+A$+A$+"
 >> "+A$+A$+A$+A$
1360 PRINT @165,B$
1370 PRINT @202,A$+A$+"    "+A$+
A$+A$+A$+A$
1380 PRINT @288,"HOW MANY NUMBER
S--0, 2, OR 3?";
1390 A$=INKEY$:IF A$=""THEN 1390
1400 IF A$="0" THEN 330
1410 IF ASC(A$)<50 OR ASC(A$)>51
 THEN 1390
1420 PRINT @318,A$
1430 FOR I=1 TO VAL(A$)
1440 PRINT "NUMBER";I;
1450 INPUT M(I)
1460 IF M(I)>1 THEN 1480
1470 PRINT "SORRY, NUMBER MUST B
E > 1.":GOTO 1450
1480 IF M(I)<1000 THEN 1500
1490 PRINT "SORRY, NUMBER MUST B
E < 1000.":GOTO 1450
1500 NEXT I
1510 I=VAL(A$):IF I=3 THEN 1600
1520 IF M(1)<>M(2) THEN 1540
1530 LC=M(1):GOTO 1770
1540 IF M(1)<M(2) THEN 1560
1550 D=M(1):M(1)=M(2):M(2)=D
1560 FOR J=1 TO M(1)
1570 IF J*M(2)/M(1)=INT(J*M(2)/M
(1)) THEN LC=J*M(2):GOTO 1770
1580 NEXT J
1590 LC=M(1)*M(2):GOTO 1770
1600 IF M(1)=M(2) AND M(2)=M(3)
```

```
THEN 1530
1610 SW=0
1620 FOR J=1 TO 2
1630 IF M(J)<=M(J+1) THEN 1650
1640 D=M(J):M(J)=M(J+1):M(J+1)=D
:SW=1
1650 NEXT J
1660 IF SW=1 THEN 1610
1670 FOR J=1 TO M(2)
1680 T=J*M(3)
1690 IF (T/M(1)=INT(T/M(1))) AND
 (T/M(2)=INT(T/M(2))) THEN LC=T:
GOTO 1770
1700 NEXT J
1710 LM=M(2)*M(3)
1720 FOR J=1 TO M(1)
1730 T=J*LM
1740 IF T/M(1)=INT(T/M(1)) THEN
LC=T:GOTO 1770
1750 NEXT J
1760 LC=LM*M(1)
1770 PRINT:PRINT "LEAST COMMON M
ULTIPLE IS";LC
1780 PRINT:PRINT "PRESS ANY KEY
TO CONTINUE."
1790 A$=INKEY$:IF A$="" THEN 179
0
1800 GOTO 1300
1810 END
```

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TEXT SCREEN GRAPHICS USING POKE & PEEK

By: James Ventling
2400 Cornwall Drive
Xenia, OH 45385

This article will help you make the most of your text screen. I'll explain the POKE and PEEK functions, the ASCII codes, character values for poking, and 32 characters you may not know about. I'll then show how they can be used in a game.

Often a mystery to beginners, the POKE command can be faster, easier, and more efficient than PRINT. Although POKE can be used to change the value in any memory location, we will be using POKE to place characters on the text screen. The POKE command is used in the form:

POKE L,V

where L is the number of a specific memory location and V is a value between 0 and 255. For our purposes, we will be using the memory locations for the text screen (1024 to 1535).

A particular screen memory location can be calculated by using the PRINT @ locations. If you add 1024 to a PRINT @ location, you will have the corresponding memory location for that spot on the screen. Thus, screen PRINT @ location 32, the left-most spot of the second line, is controlled by memory location 1056.

Memory Location = PRINT @ Location + 1024

You cannot, however, POKE an alphanumeric character, (a string), into a memory location. You must use the numeric value for the character you want. The numeric value of a capital letter is the same as its ASCII code. For example:

POKE 1263, ASC("A") or POKE 1263,65

will place the letter "A" in the center of the screen, (memory location 1263). Don't try to POKE the ASC code for anything other than capitals and graphics. I will explain why in a minute. Try this program to place "A"s at other locations:

PROGRAM #1

```
10 CLS
20 PRINT @ 0, "POKE LOCATION (1024-1535)";:
INPUT L
30 IF L<1024 OR L>1535 then 20
40 POKE L,65
50 GOTO 20
```

Line 20 has you choose one of the memory locations for the text screen. Line 30 tests to make sure the value of L is within the text screen memory. Line 40 POKEs the letter "A" into that location.

You may have noticed that you cannot PRINT anything, (graphics included), in the lower right-hand corner of the screen without having the screen scroll. A "carriage return" is automatically performed. This could be disastrous in a graphics program. You can safely POKE a character there, though. Try location 1535 with the program you just typed in and you'll see what I mean.

So far, we've been putting only "A"s all over the screen. To discover the ASC code for other capital letters, you can:

PRINT ASC ("A")

replacing the letter "A" with the capital you want. However, there are 96 characters which have a value different from the ASC code. 32 of these characters are not even in the ASC code! They can only be obtained by poking their values into memory.

You know that by pressing the shift key and zero together, the alphabet will be printed in a reversed, green on black manner, (this is the way lower case is displayed). From the keyboard, or the ASC code, only the alphabet is available in reversed color. Have you ever wanted to have other characters, such as numbers, in a reversed form? You can! Actually, all text characters are possible in reverse. There is even a "secret" character, a backward divide sign, slanting from left to right instead of right to left. Type this program to see all possible characters.

PROGRAM #2

```
10 CLS
20 FOR I=0 TO 255
30 POKE 1024+I,I
40 NEXT I
50 PRINT @ 256,""
```

In this program, we are poking the values 0 to 255 into the screen memory 1024 to 1279. Values 0 to 31 are the reversed alphabet, 32 to 63 are the reversed numbers and signs, 64 to 127 are the "normal" characters and 128 to 255 are the color graphic characters. Of course, you don't have to use POKE in order to make use of the ASC code. To see this, change line 30 of program #2 to:

```
30 PRINT @ I, CHR$(I);
```

CHR$(I), I being an ASC value, will PRINT most of the characters. They are in a different order because the values are different, and the reversed numbers and signs are missing. To see how POKE can be used for graphics, try this program:

PROGRAM #3

```
10 CLS
20 FOR L=1024 TO 1055
30 POKE L,35: POKE L+480,35
40 NEXT
```

```
50 FOR L=1056 TO 1472 STEP 32
60 POKE L,35: POKE L+31,35
70 NEXT
80 GOTO 80
```

This places a border of reversed color #'s around the screen. You should now be capable of poking any character to any spot on the text screen.

Another valuable function for text screen games and graphics is PEEK. PEEK looks at a specific memory location, (the same ones we've been poking), and tells you the value stored there. If you were using SET-RESET graphics, you could use the POINT(X,Y) function to determine the color of a particular pixel. Now, using character graphics, you can use the PEEK(L) function to determine the character at any particular screen location. For example, say there is an unknown character in the top left-hand corner of the screen. This spot, as you should recall, is controlled by the memory location 1024. Peeking at location 1024 will give us the value for the unknown character. If PEEK(1024) gave the value of 65, we would know that the letter "A" was there. If, however, the value of 96 was given, we would know that no letter was there, only a blank green space.

Let's say that you are poking characters to the screen and you want to be sure you don't POKE a location you have already used. You could keep track of all used locations in an array, but this would be slow, clumsy, redundant and completely unnecessary. PEEK can easily be used for the same purpose. Add this line to program #1:

```
35 IF PEEK (L)<>96 THEN SOUND 1,2:GOTO 20
```

This line PEEKs at the chosen location. If it doesn't equal a blank space, the program goes to line 20 to input a new location.

Now, Let's take a look at how POKE and PEEK can be used in a game. Tank is a simple game that's lots of fun. You use the arrow keys to control a tank that looks like the letter "H". Your mission is to capture 5 enemy positions that look like "X"s. To make things more interesting, obstacles are scattered all over the screen, often blocking your path. If you run into an obstacle or are forced to eliminate one, you will lose that tank and a new one will be started at a random spot on the screen.

LINE 10 EN=Number of enemy positions
YR=Number of your tanks
TG=Value for "X"
TK=Value for "H"
OB=Value for obstacle

LINE 20 INPUT difficulty level.
LINE 70-100 Picks random screen memory location. Tests to see if it has already been used. Pokes an obstacle character to screen.
LINE 110-130 Picks random screen memory location. Tests to see if it has already been used. Pokes an enemy "X" to screen.
LINE 140-160 Picks random screen location. If it is a blank space, flashes "H". Repeats 10 times.
LINE 170 POKE "H" to screen.
LINE 180 Prints status update.
LINE 190-250 Uses INKEY$ to test for the arrow keys. F=The old tank position. H=The new tank position.
LINE 260-270 Sees if you have tried to go off the top or bottom boundaries.
LINE 280 If the new position is an empty space goto 320.
LINE 290 If the new position is an enemy position goto 330.
*If the new position is not an empty space and is not an enemy position then it must be an obstacle, so the program goes on to line 300.
LINE 300-310 Flashes tank at new position, erases it, goes to line 140 to start a new tank.
LINE 320 Moves tank onto blank space.
LINE 330-340 Captures enemy position.
LINE 350 If you run out of tanks, (checked in line 310), you lose.
LINE 360 If you have captured all the enemy positions, (checked in line 340), you win!

TANK PROGRAM LISTING

```
10 EN=5: YR=5: TG=88: TK=72: OB=191
20 CLS: INPUT "1-EASY 2-MEDIUM 3-HARD";
Q:CLS
30 IF Q<1 OR Q>3 THEN 20
40 IF Q=1 THEN DF=130
50 IF Q=2 THEN DF=160
60 IF Q=3 THEN DF=200
70 FOR I=1 TO DF
80 LO = RND(480)+1023
90 IF PEEK(LO)<>96 THEN 80
100 POKE LO,OB:NEXT
110 FOR I=1 TO EN
120 X=RND(480)+1023: IF PEEK(X)<>96 THEN 120
130 POKE X,TG:NEXT
140 FOR I=1 TO 10
150 H=RND(480)+1023: IF PEEK(H)<>96 THEN 150
160 POKE H,TK:SOUND1,1: FOR II=1 TO 50:
NEXT II: POKE H,96: NEXT I
170 POKE H,TK
180 PRINT@480, "ENEMY" EN;: PRINT@500,
"YOU" YR;: SOUND100,1: M$=INKEY$
190 M$=INKEY$: IF M$="" THEN 190
200 F=H:X=ASC(M$)
210 IF X=94 THEN H=H-32: GOTO 260
```

POKE & PEEK

```
220 IF X=10 THEN H=H+32: GOTO 260
230 IF X=9 THEN H=H+1: GOTO 260
240 IF X=8 THEN H+H-1: GOTO 260
250 GOTO 190
260 IF H<1024 THEN H=F: GOTO 300
270 IF H>1503 THEN H=F: GOTO 300
280 IF PEEK(H)=96 THEN 320
290 IF PEEK(H)=TG THEN 330
300 POKE F,96: FOR I=1 TO 20: POKE H,96: POKE
H,255: SOUND 50,1: NEXT: POKE H,96
310 YR=YR-1: IF YR=0 THEN 350 ELSE 140
320 POKE F,96: POKE H,TK: GOTO 180
330 POKE F,96: FOR I=1 TO 25: POKE H,96:
SOUND 250,1: POKE H,TK: NEXT
340 EN=EN-1: IF EN=0 THEN 360 ELSE 180
350 SOUND 1,5: PRINT@480, "SORRY, YOU
LOSE";: END
360 FOR I=1 TO 150 STEP 10: SOUND I,1: NEXT:
PRINT@480, "I SURRENDER, YOU WIN!!";
```

TIC-TAC-TOE

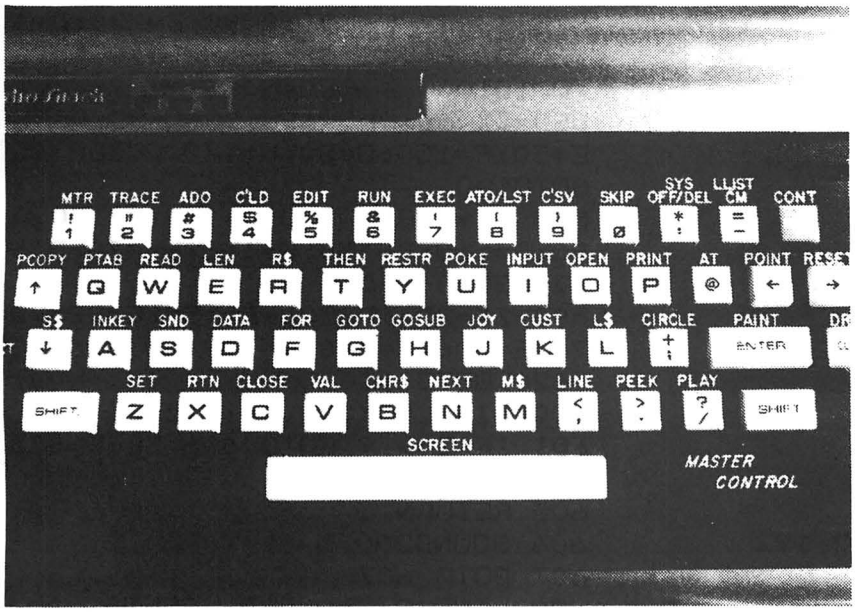
by Joseph Kelly
1922 E Clementine St.
Philadelphia, PA 19134

TIC-TAC-TOE is a game in a player 0 against computer X format. I am not a proffesional programmer as you will see as soon as you look at the listing. If I had a stronger math background I am sure it would have been better. It was the fun of debugging that I enjoyed. There are still some uncovered moves that could be implemented by your readers if you publish the program. It has nice display, good respsonse and the player can beat the computer. Try 5 - 9 - 7 to see. This is the first basic program that I did on the Color Computer. I did not copy any of it from any other program and tried to learn something as I moved along. The program is just for fun and I have no other thought than sharing it with others. If you need this statement. I give full permission to anyone to use, change, copy and have fun with this program.
Thank you

```
1 SCREEN0,1:CLS
2 PRINT@0,"***TIC-TAC-TOE BY JOE
 KELLY***"
3 PRINT@32,"******0=PLAYER-X=COM
PUTER******"
6 PRINT@70,"1 2 3 ":PRINT@102,"4
 5 6  "
7 PRINT@134,"7 8 9 ":PRINT@164,"
BOARD LAYOUT "
8 FOR N=1 TO 4000:NEXT N
9 Z=0:Q=0:A1=0:A2=0:A3=0:A4=0:A5
=0
10 PMODE 4,1
20 PCLS
25 CLS(3)
30 SCREEN1,1
40 LINE(3,3)-(250,188),PSET,B
50 LINE(3,64)-(250,64),PSET
60 LINE(3,128)-(250,128),PSET
70 DRAW"BM80,96;N;U94;N;D90;"
80 DRAW"BM172,96;N;U94;N;D90;"
90 C1$="1":C2$="2":C3$="3":C4$="
4":C5$="5":C6$="6":C7$="7":C8$="
8":C9$="9"
100 A$=INKEY$
102 RESTORE
105 IFA$=C1$ THEN500ELSE110
110 IFA$=C2$THEN505 ELSE115
115 IF A$=C3$ THEN510 ELSE120
120 IF A$=C4$ THEN515 ELSE125
125 IF A$=C5$ THEN520 ELSE130
130 IF A$=C6$ THEN525 ELSE135
135 IF A$=C7$ THEN530 ELSE140
140 IF A$=C8$ THEN535 ELSE145
145 IF A$=C9$ THEN540ELSE GOTO 1
00
150 A=VAL (A$):Z=Z+1
152 IF A=1 THEN A=1
154 IF A=2 THEN A=2
156 IF A=3 THEN A=4:GOTO170
158 IF A=4 THEN A=8:GOTO170
160 IF A=5 THEN A=16
162 IF A=6 THEN A=32
164 IF A=7 THEN A=64
166 IF A=8 THEN A=128
170 IF A=9 THEN A=256
175 Q=Q+1
176 IF Q=1 THEN AX=A
177 IF Q=2 THEN A1=A
178 IF Q=3 THEN A2=A
179 IF Q=4 THEN A3=A
180 IF Q=5 THEN A4=A
181 IF Q=6 THEN A5=A
182 T=AX+A1+A2+A3+A4+A5
200 FOR C0=1TO11
210 READ J0
215 IF J0=T GOTO 550
220 NEXT C0
225 DATA 270, 6,72,16,354,40,396
,10,12,68,96
230 FOR C2 =1TO10
240 READ J2
250 IF J2=T GOTO 555
260 NEXT C2
261 DATA144,156,336,324,208,101,
5,261,321,284
270 FOR C3=1TO16
272 READ J3
274 IF J3=T GOTO 560
276 NEXT C3
278 DATA 3,288,80,11,33,322,330,
258,272,225,34,296,131,266,416,3
85
290 FOR C4=1TO14
292 READ J4
294 IF J4=T GOTO 565
296 NEXT C4
298 DATA50, 52,390,306,65,46,48,
267,133,276,81,67,278,193
305 FOR C5=1TO8
307 READ J5
309 IF J5=T GOTO 570
311 NEXT C5
313 DATA 256,128,32,1,64,8,4,2
320 FOR C6=1TO13
322 READ J6
324 IF J6=T GOTO 575
```

For Your Color Computer

MASTER CONTROL



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Tape 1		
Keys	4k	NE
Bagels	4k	NE
Find	16k	NE
Darts	4k	NE
Motor	4k	NE
Bomber	4k	NE
Football	16k	EXT
Kapow	4k	NE
Dodge	4k	NE
Tape 2		
Bounce	16k	EXT
Tank	32k	EXT
One Arm	4k	NE
Chute	16k	EXT
Where is it	16k	EXT
Lunar Lander	16k	EXT
Stock Market	4k	NE
Tape 3		
Multiply	16k	EXT
Divide	16k	EXT
Add Sub	16k	EXT
Simple Simon	4k	NE
Hangman	16k	NE
Beast	16k	NE
Count Down	4k	NE
Acey	16k	NE
Genie	16k	NE
Protect	16k	EXT
Tape 4		
Graphics	16k	EXT
Songs	16k	EXT
Joy	16k	EXT
Mortgage	16k	EXT
Checkbook	16k	EXT
Draw 1	16k	EXT
Morris	16k	EXT
Sound	16k	EXT
Tape 5		
Ram	16k	MA
Trace	16k	MA
MMaster	16k	MA
Demo	16k	NE
Disassembler	16k	NE
Basbug	16k	NE
Ohmlaw	4k	NE
Convert	4k	NE
Drawer 2	32k	EXT
Degrees	4k	NE
Tape 6		
Hurdler	32k	EXT
Entrap	16k	EXT
Search	16k	NE
Flip Flop*	16k	EXT
Lost Atom	16k	EXT
Attack	16k	EXT
Cartel*	32k	EXT

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```
326 NEXT C6
328 DATA 323,195,338,389,26,28,2
82,24,260,25,262,388
335 FOR C7=1TO14
337 READ J7
340 IF J7=T GOTO 580
342 NEXT C7
344 DATA269, 384,9,20,257,29,22,
268,259,270,274,129,289,298
350 FOR C8=1TO12
352 READ J8
354 IF J8=T GOTO585
356 NEXT C8
358 DATA 114,37,325,353,30,320,1
8,13,328,69,99,352
365 FOR C9=1TO 19
367 READ J9
369 IF J9=T GOTO 590
371 NEXT C9
373 DATA 17,36,49,165,30,112,192
,97,141,132,82,35
375 DATA148, 74,38,104,100,196,1
30
380 FOR C10=1TO22
382 READ J10
384 IF J10=T GOTO 850
386 NEXT C10
388 DATA 103,167, 331 , 293,448,
 421,300,273,7,292,
389 DATA210, 73,146,86,452,356,1
5,94,158,39
390 DATA 105,178
495 GOTO 100
500 X=35:Y=30:GOSUB600:GOTO150
505 X=120:Y=30:GOSUB600:GOTO150
510 X=210:Y=30:GOSUB600:GOTO150
515 X=40:Y=90:GOSUB600:GOTO150
520 X=120:Y=90:GOSUB600:GOTO150
525 X=210:Y=90:GOSUB600:GOTO150
530 X=35:Y=160:GOSUB600:GOTO150
535 X=120:Y=160:GOSUB600:GOTO150

540 X=210:Y=160:GOSUB600:GOTO150

550 ZX=1:P=30:B=30:C=50:D=50:E=3
0:F=50:G=50:H=30:GOSUB 620:GOTO
100
555 ZX=2:P=110:B=30:C=130:D=50:E
=130:F=30:G=110:H=50:GOSUB620:GO
TO 100
560 ZX=4:P=206:B=30:C=226:D=50:E
=206:F=50:G=226:H=30:GOSUB 620:G
OTO 100
565 ZX=8:P=30:B=110:C=50:D=90:E=
30:F=90:G=50:H=110:GOSUB620:GOTO
 100
570 ZX=16:P=110:B=90:C=130:D=110
:E=130:F=90:G=110:H=110:GOSUB620
:GOTO100
575 ZX=32:P=206:B=90:C=226:D=110
:E=206:F=110:G=226:H=90:GOSUB620
:GOTO100
580 ZX=64:P=30:B=170:C=50:D=150:
E=30:F=150:G=50:H=170:GOSUB 620:
GOTO100
585 ZX=128:P=110:B=170:C=130:D=1
50:E=110:F=150:G=130:H=170:GOSUB
620:GOTO 100
590 ZX=256:P=206:B=150:C=226:D=1
70:E=206:F=170:G=226:H=150:GOSUB
 620:GOTO 100
600 CIRCLE(X,Y),14:Z=Z+1
601 IF Z=> 9 GOTO 606 ELSE 603
603 SOUND 200,5
605 RETURN
606 SOUND200,5
607 GOTO 607
620 LINE(P,B)-(C,D),PSET
625 LINE(E,F)-(G,H),PSET
627 SOUND 100,5
630 IF ZX=1 THEN ZA=1
632 IF ZX=2 THEN ZB=2
634 IF ZX=4 THEN ZC=4
636 IF ZX=8 THEN ZD=8
638 IF ZX=16 THEN ZE=16
640 IF ZX=32 THEN ZF=32
642 IF ZX=64 THEN ZG=64
644 IF ZX=128 THEN ZH=128
646 IF ZX=256 THEN ZI=256
647 XX=ZA+ZB+ZC+ZD+ZE+ZF+ZG+ZH+Z
I
648 IF XX=167 GOTO 680
649 IF XX=331 GOTO 680
650 IF XX=7 GOTO 680
651 IF XX=293 GOTO 680
652 IF XX=448 GOTO 680
653 IF XX=421 GOTO 680
654 IF XX=300 GOTO 680
655 IF XX=273 GOTO 680
656 IF XX=292 GOTO 680
657 IF XX=73 GOTO 680
658 IF XX=146 GOTO 680
659 IF XX=86 GOTO 680
660 IF XX=452 GOTO 680
661 IF XX=356 GOTO 680
662 IF XX=15 GOTO 680
663 IF XX=94 GOTO 680
664 IF XX=158 GOTO 680
665 IF XX=39 GOTO 680
666 IF XX= 103 GOTO 680
667 IF XX=178 GOTO 680
675 RETURN
```

```
680 FOR DD=1TO400:NEXT DD
685 CLS(8):PRINT@224,"YOU HAVE J
UST BEEN BEAT BY "
686 PRINT@269,"A DUMB MACHINE"
690 SOUND80,30:SOUND 159,30:SOUN
D 190,40
695 GOTO 607
850 SOUND50,40
851 PRINT@226,"Y":FOR N=1TO400:N
EXTN
852 PRINT@228,"O":FOR N=1TO400:N
EXTN
853 PRINT@230,"U":FORN=1TO400:NE
XTN
855 PRINT@234,"B":FORN=1TO400:NE
XTN
856 PRINT@236,"E":FORN=1TO400:NE
XTN
857 PRINT@238,"A":FORN=1TO400:NE
XTN
858 PRINT@240,"T":FORN=1TO400:NE
XTN
859 PRINT@244,"M":FORN=1TO400:NE
XTN
860 PRINT@246,"E":FORN=1TO400:NE
XTN
870 FOR K=1TO2000:NEXTK
875 GOTO 1
890 END
```

REVIEW - POLARIS

by Steven Craig Wegert
629 Forest Avenue
Ferguson, MO 63135

There is so little software available for the Radio Shack Color Computer in comparison with what is available for the Model I/III it is always exciting when something new comes along. Even more so when it is Tandy marketing the product.

POLARIS, by the Big Boys in Fort Worth, has to be one of the better game program packs available to date. Earlier cartridges left much to be desired after five or so minutes of play. However, the longer you survive POLARIS the more addicted you become to the game. And survive you must.

In this one or two player battle against an unseen enemy you have three submarines each armed with nine roundsof ammunition protecting six islands from raining waves of destructive missles. The object is to score the most points by destroying the enemy before they destroy your islands and submarines.

Game control invloves a bit of hand-eye coordination as the joysticks as well as the keyboard is required for play. The stick positions the crosshairs within the limitations of the screen for aiming purposes and the "z", "x", "c" or the comma, period and slash keys determine which of the three subs will fire. (PROGRAM QUIRK: In the 1.0 version of the color computer the right joystick firing button will fire the third (right most) submarine. I suspect this is caused by the generation of the last letters of the alphabet when depressing the fire button--a problem solved by 1.1).

As you survive each wave of missles they get progressibly harder, increasing in speed and point value. Scores in excess of 10,000 can be obtained after a few hours of practive. The screen as well as the missles change color making it difficult to see some onslaught of missles; what I like to call "night manuvers". On the sixth set an added annoyance crops up--smart bombs. Early in their appearance these smart bombs are pretty dumb but as your skill increases and you progress to the move difficult levels these turkeys will deal you fits as they avoid your attacks.

Each enemy missle destroyed is worth five points and a smart bomb wiped out will get you twenty points. Both scores are adjusted by the point multiplier (a value between 1 and 6) assigned to the current level of play. For example: a smart bomb destroyed during the 6X level will net 120 points. Careful aim and strategic placement of shots work to your advantage as additional points are awarded for each of your missles not fired as well as each island saved. Again these points are adjusted by the point multiplier. For each multiple of 2000 points scored you will receive a bonus island to replace any lost. The bonus islands are held in reserve until the need for one arises.

After playing POLARIS a while a few tactical ploys become obvious. Take advantage of the slow speed in the first three or so screens to allow the enemies missles to split into multiple warhead as additional points can be gained. Judge the rate of desent and aim well ahead for the incoming missels or its warhead will continue on its path of destruction. There is no need to wait for each of your assults to find its mark. Aim and shoot! Aim and shoot! In the higher levels of play don't be shook by the onslaught of incoming missels. Concentrate only on those that appear to be heading towards an island or sub. Let the others fall harmlessly to the surface. I have lost many 120 point island in seach of 30 point missles.

In comparing this game with ones similar for the Atari and Apple I find POLARIS to be surperior. The Shack's use of color is more effective (night maneuvers), sound effects, while elementary, are quite sufficient to get across the fell of battle and joystick movement is smooth and accurate. This is not the perfect game however. There are some rough spots that could have been delt with. It looks as if somebody just got lazy.

In the effort to make this game compatable with both Color Basic as well as Extended Basic high resolution graphics were left by the wayside. A good marketing maneuver but the visual quality of the game does suffer a bit. Also conspicuous by its absence is a "high game in series" indicator. While not a necessity, certainly a nice touch. The score board and gaming information is placed at the top of the screen, within the live boundries of the battle, just waiting for a misguided missle to munch a few pixels of information. Radio Shack would have you believe this was done on purpose. According to the documentation (excellent, I might add) a deliberate shot to your opponent's score display could deal a devestating psycological blow to his concentration. In as much as players alternate turns with plenty of time between to analyze what is happening on the screen I seriously doubt that advantage would out-way the lost point potential. Placing the

Continued on page 69

Telewriter-64™

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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 (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, 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.

...truly a state of the art word processor... outstanding in every respect.
— The RAINBOW, Jan. 1982

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COPTER

By: John Crager
147 Anchorage Drive
West Islip, NY 11795

(16K Extended BASIC Color Computer with joysticks)

Ever want to fly a helicopter and get as close to the ground as you can? Well, 'COPTER' is the game for you. The object of the game is to fly a helicopter with a joystick over 5 different screens (2 city, 2 mountain, 1 village) as low as you can. The lower you fly the more points you get. You'll say that you will just fly on the first 2 vertical tiers but you don't get points up there.

There is a wind option but it is actually a draft. When you hear a high pitched noise, that means there was a sudden downward or upward draft. I used the speed up function by POKEing at 65495 with 0. If your computer is an older model it will probably lock up; take out all the POKE statements. The game will be slower but it will still be fun. My high score is 1878 points. See if you can beat it.

```
5 REM BY JOHN CRAGER
6 REM 147 ANCHORAGE DRIVE
7 REM WEST ISLIP,N.Y. 11795
10 PMODE 3,1:SCREEN 1,0:PCLS
20 T$="R10L10U20R10BD20BR10R10L1
0U20R10D20BR10U20R10D10L10R10BD1
0BR17U20L7R15L8BD20BR17R10L10U10
R7L7U10R10BD20BR10U20R10D10L10R1
0D2F2D2F2D2"
30 FOR G=1 TO 4
40 DRAW"S4BM60,90;XT$;":PLAY"O1L
150ABBBCCDDEEFFFG":PCLS
50 DRAW"BM20,60;S8;XT$;"
60 POKE 65494,0
70 PLAY"L150ABBBCCDDEEFFFG"
80 POKE 65495,0
90 PCLS:NEXT
100 DRAW"S4"
110 FOR Q=1 TO 1500:NEXT
120 CLS:PRINT@204,"COPTER"
130 PRINT"FLY YOUR HELICOPTER OV
ER THE    TERRAIN.THE LOWER YOU
FLY THE   MORE POINTS YOU GET."
140 INPUT"DO YOU WANT WINDS";U$
150 IF LEFT$(U$,1)="Y" THEN W=1
160 E$="C4BR10H5;N;F5;N;U5;N;D5;
N;E5;N;G5;N;L5;N;R5"
170 H$="E4R3D5L7R7U5E3R2U3L7R15L
7D3R2F3R6F2G2L5G4L11H3"
180 DIM A(4,9,12)
190 S$(1)="BM0,192;C4U45R25U75R2
5D60R25U45R25U15R50D15R25U45R25D
15R25D30R25D105
200 S$(2)="BM0,192;C4U90R50D30R2
5D15R25U45R25D60R50D15R25U45R50D
60
210 S$(3)="BM0,192;C2M 25,147;M5
0,132;M75,72;M 125,132;R12M150,1
47;R25M200,87;M250,117"
220 S$(4)="BM0,192;C2M25,132;M75
,87;R25;M125,42;M175,102;M225,14
7;M250,132;
230 S$(5)="BM0,192;C2R25U30M37,1
47;M50,162;D30R125U30M200,147;M2
25,162;D30R25"
240 FOR A=0 TO 3:FOR C=0TO 9:FOR
 B=1TO 12:READ A(A,C,B):NEXT B,C
,A
250 P=0:PL=PL+1:H1=9:V1=12
260 POKE 65494,0
270 PLAY"L55O1CCCO2DDDO3EEEO3FFF
O4FFFO5GGG"
280 POKE 65495,0
290 S=RND(5)-1
300 PMODE 3,1:SCREEN 1,0:PCLS
310 A(4,1,1)=1:A(4,1,2)=1:A(4,1,
3)=1:A(4,7,1)=1:A(4,7,2)=1:A(4,7
,3)=1:A(4,8,1)=1:A(4,8,2)=1:A(4,
8,3)=1
320 DRAW S$(S+1)
330 H=JOYSTK(0):V=JOYSTK(1)
340 IF H<29 THEN X=.5 ELSE IF H>
33 THEN X=1
350 H1=H1-X
360 IF V<10THENV1=V1+X
370 IF V>53 THEN V1=V1-X
380 POKE 65494,0
390 IF W=1 AND RND(15)=1 THEN PL
AY"O5L255ABC":GOSUB 630
400 POKE 65495,0
410 IF V1>12THEN V1=12
420 IF H1<0 THEN H1=9:GOTO 290
430 DRAW"BM "+STR$(INT(H1*25))+"
,"+STR$(INT(15*(13-V1)))+";C3"+H
$
440 IF A(S,H1,V1)=1 THEN520
450 POKE 65494,0
460 PLAY"O2L255;ABC"
470 POKE 65495,0
480 DRAW"BM"+STR$(INT(H1*25))+",
"+STR$(INT((13-V1)*15))+";C1"+H$

490 IF V1=11 OR V2=12 THEN 330
500 P=P+INT(13/(13-V1))
510 GOTO 330
520 DRAW"BM"+STR$(INT(H1*25))+",
"+STR$(INT((13-V1)*15))+";C4;XE$
;"
```

COPTER

```
530 PLAY"O1L255V30ABCDL250V27ABC
DL240V26ABCDL220V22ABCDL180V18AB
CDL100V15ABCD"
540 CLS:PRINT@266,"YOU CRASHED"
550 PRINT@296,"YOU GOT "P"POINTS
"
560 IF PL=1 THEN HI=P
570 IF P>HI THEN HI=P
580 PRINT@327,"HIGH SCORE :"HI
590 PRINT"HIT ENTER TO PLAY AGAI
N;TO END  HIT E"
600 R$=INKEY$
610 IF R$="" THEN 600
620 IF R$="E" THEN END ELSE 250
630 IF RND(2)=1 THEN V1=V1+.5 EL
SE V1=V1-.5
640 RETURN
650 DATA 1,1,1,,,,,,,,,1,1,1,1,
1,1,1,1,,,,,1,1,1,1,,,,,,,,,1,1,
1,1,1,1,1,,,,,,1,1,1,1,1,1,1,1,,
,,,1,1,1,1,1,1,1,1,,,,,1,1,1,1,1
,1,1,,,,,,1,1,1,1,1,1,1,1,1,1,,,
1,1,1,1,1,1,1,1,1,,,,1,1,1,1,1,1
,1,,,,,0
660 DATA 1,1,1,1,1,1,,,,,,,1,1,1
,1,1,1,,,,,,,1,1,1,1,,,,,,,,,1,1
,1,,,,,,,,,,1,1,1,1,1,1,,,,,,,1,
1,,,,,,,,,,,1,1,,,,,,,,,,1,,,,,
,,,,,,,1,1,1,1,,,,,,,,,1,1,1,1,,
,,,,,,
670 DATA 1,1,1,,,,,,,,,,1,1,1,1,
,,,,,,,,1,1,1,1,1,1,1,1,,,,,1,1,
1,1,1,1,1,1,,,,,1,1,1,1,1,1,,,,,
,,1,1,1,1,,,,,,,,,1,1,1,,,,,,,,,
,1,1,1,1,1,1,1,,,,,,1,1,1,1,1,1,
1,,,,,,,1,1,1,1,1,1,,,,,,
680 DATA 1,1,1,1,,,,,,,,,1,1,1,1
,1,1,,,,,,,,1,1,1,1,1,1,1,,,,,,1,
1,1,1,1,1,1,,,,,,1,1,1,1,1,1,1,1
,1,1,,,,1,1,1,1,1,1,1,1,1,,,1,1,1
,1,1,1,1,1,1,,,,,1,1,1,1,1,1,,,,
,,,1,1,1,1,1,,,,,,,,1,1,1,1,1,1,
1,1,,,,,
```

Continued from page 66

scoring information at the bottom of the screen would have been more appropriate.

Even with these minor rough spots, I found POLARIS to be challenging as well as entertaining. The random generation of missle patterns help keep the game from wearing thin after you've saved the world for the 100th time.

POLARIS is available from RADIO SHACK, 1300 ONE TANDY CENTER, FORT WORTH, TEXAS 76102

ADVERTISERS INDEX

A WEEK IN THE LIFE OF A NOVICE ASSEMBLY LANGUAGE PROGRAMMER

by Dick Sykes
245 Princeton Drive
Costa Mesa, CA 92626

I have noticed several pleas for more details on assembly language in letters to CCN. Your readers might find the following helpful or, possibly, amusing.

I am a total novice as far as assembly language is concerned, largely as a result of reading about it in CCN, I purchased SIGMON (a mini-assembler, disassembler) from Data Soft. Flushed with success, since I was easily able to move programs about in RAM, I decided to assemble something-anything. Naturally I returned to the pages of CCN and picked listing #1 - 12 lines pertaining to interrupts - from the January 82 article by Kenneth Kalisk. At about the same time I purchased 6809 Assembly Language Programming by Leventhal. Here is what happened.

1. I started to type in listing #1 (no need to read any of Leventhal). I wonder what the word "BEGIN" is for, all alone on the left? I'll just leave it out. Sure enough, the remainder of the line "LDX #INTSRV" assembled. It seemed likely that "SET JUMP VECTOR" was some sort of comment and not needed - I was right. I got by the "LDA" and "STA" lines with dispatch - somewhere I had read about "$" meaning hex.

2. I did not get by "ANDCC #%11101111". I searched the SIGMON documentation to determine what the percent sign meant. No luck. I finally determined from the SIGMON source code that the percent sign indicates binary. How clever, I thought, SIGMON understands at least three number systems! After fooling around, I determined that SIGMON only likes four letter Op Codes - the last "C" bit the dust. Finally got past that one.

3. Naturally I omitted "LOOP" from the next line. the "JSR" went splendidly, but what about "($A000)"? Once again the source code bailed me out - I noticed a square bracket as opposed to a round one. Fooling around a bit more, I found that shifted arrows on my computer would give square brackets. Another line of code for posterity.

4. I forgot what problems I had with "BEG LOOP".

5. Raced past "ORCC" and "SWI" - this stuff isn't so tough after all.

6. Of course, I omitted "INTSRV". What worked in the past is good for the present. I typed in the "1234", hoping it was decimal.

7. "LDA" and "RTI" were childs play.....the big moment was at hand!!!! I typed in STEP $0000 and after a few futile pecks at the space bar found out that I had the computer hopelessly hung up in some horrendous graphics thing that would not respond to any solution short of pulling the plug. I re-examined listing #1, perhaps I was hasty omitting the occasional left-hand words. Out came Leventhal and I discovered that Labels cannot be arbitrarily omitted.

At about this time, I sort of had some small idea of what should happen. I re-read the CCN review of SIGMON and found clearly stated that SIGMON (no frills) does not provide for labels. I noticed the SIGMON assigned line numbers, starting with $0000 and incrementing in a manner relating to the number of bytes required by the operand. A friend suggested that I could get around the lack of Labels by modifying the addresses. See Listing #2.

The second not-so-big moment was only an hour ago. I worked! lots of numbers and graphics flickering on the screen.

POSTSCRIPT

Since I determined that I need Labels to accomplish my current needs keying in short utility programs from CCN and elsewhere, I purchased from Eigen Systems CCEAD for the extremely low price of $6.95. I first called to make certain the CCEAD does indeed handle Labels. It does. CCEAD is slow (written in BASIC), but it does the job and is certainly adequate for my present needs.

```
*LISTING #1
BEGIN  LDX #INTSRV
       STX $010D  SET JUMP VECTOR
       LDA #$35
       STA $FF03  ENABLE 60HZ INT
       ANDCC #%11101111 IRQ ON
LOOP   JSR ($A000) TO POLCAT
       BEQ  LOOP    LOOP UNTIL ANY KEY
PRESSED
       ORCC #%00010000 IRQ OFF
       SWI    EXIT TO MONITOR

INTSRV INC  1234 CLOCK COUNTER
       LDA  $FF02 CLEAR STATUS BIT#7
       RTI
```

```
*LISTING #2
0000 LDX #$0016
0003 STX $010D
0006 LDA #$35
0008 STA $FF03
000B ANDC #%11101111
000D JSR  $A000
0011 BEQ $000D
0013 ORCC #%00010000
0015 SWI
0016 INC 1234
0019 LDA $FF02
001C RTI
```

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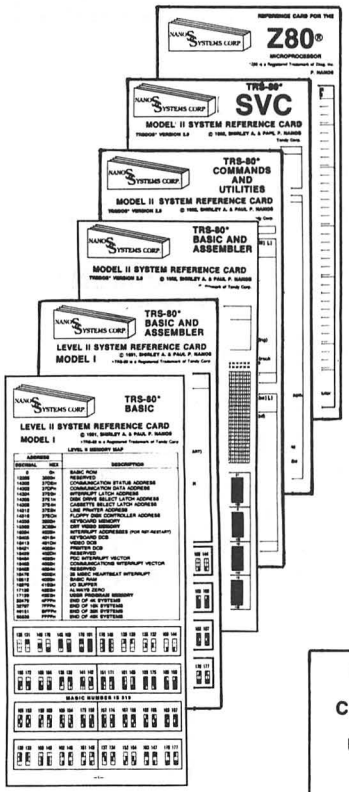

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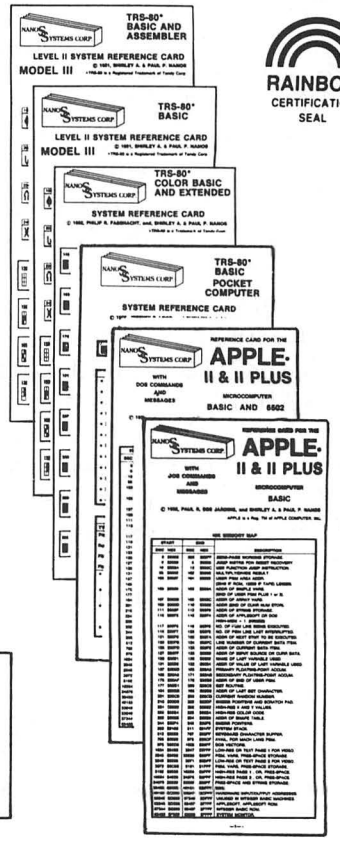

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SOUND EFFECTS GENERATOR

by Charles H. Santee
7516 Country Ln.
Darien, Il. 60559

The purpose of this program is to explore sound effects which can be produced by the "PLAY" statement in the Radio Shack Color Computer. There are several programs which can be used to produce music. However, sound effects require a slightly different approach. Often, you can not tell what is a good sound effect until you actually hear the sound. To use the program, complete the following steps:

1. LOAD AND RUN THE PROGRAM

2. GENERATE A SOUND - you have two options:

<R> Random Note Selection - a set of random notes is selected and repeated for a random number of repititions.

<S> Sequential Note Selection - notes are selected in ascending or decending sequence. The length, direction and step of the sequence are randomly selected.

When you press <R> or <S> a red box appears in front of your selection. In a few seconds, the sound effect is played. The string which would be used in a "PLAY" statement appears on the screen. This is followed by further options for the next step.

3. MODIFY OR SAVE SOUND EFFECTS - you have five options:

<S> If the sound effect is interesting or useful you can save the sound effect in a string array in memory. You can then try a new effect.

<C> If a sound effect has potential but needs modification, you can change the sound. You have two options:

<L> You may change the general pitch or level of the sound effect. After pressing <L> select a value from -5 to +5. Negative number lower the level and positive numbers raise the pitch.

<S> You can change the general speed of the sound effect. Numbers below 8 create a slower sound effect. Numbers greater than 8 are faster than the original sound effect (too much slowing produces separate notes as aposed to a sound effect). Therefore, the capabilities have been geared towards speeding up the sound effect)

<N> Generate a New sound effect. Go back to step two.

<R> If you are uncertain you may listen to the sound effect again by pressing <R>.

<E> When you have generated and saved a few sound effects, press <E> to End this step and go on to the next step.

4. REVIEW AND STORE SOUND EFFECTS - This step alllows you to select a storage medium for the strings needed to play your sound effects. You have four options:

<R> Review and/or name sound effects. You have two options.

<Y> name or rename the sound effect.

<N> go on to review the next sound effect.

It is suggested that you always choose this option and identify each sound effect with a name.

<T> The string array of sound effects may be output to tape. The name of the sound effect and the string used in a "PLAY" statement are saved to the tape.

<P> The array may be output to Printer. The name of the sound effect and the string used in a "PLAY" statement are printed.

<E> This ends the program. Make sure you do not use this option until you have used all the other options you desire (Saved to tape or printer).

```
4 CLEAR 5000
5 DIM TN$(20)
6 CLS:PRINT"  press <R> for rand
om notes      selection":PRINT:P
RINT"  press <S> for sequential
note   selection"
7 X$=INKEY$:IF X$="S" THEN 10
8 IF X$="R" THEN 200 ELSE 7
10 L=RND(20):PRINT@97,CHR$(191);

20 FOR R=1 TO L
25 T=RND(255):NT$=NT$+"T"+RIGHT$
(STR$(T),LEN(STR$(T))-1)+";"
26 S1=RND(10)-5:S2=RND(12)-6
38 A=5:B=1
39 IF S1>0 THEN A=1:B=5
40 FOR O=A TO B STEP S1
45 NT$=NT$+"O"+RIGHT$(STR$(O),1)
+";"
48 C=12:D=1
49 IF S2>0 THEN C=1:D=12
50 FOR N=C TO D STEP S2
55 NT$=NT$+RIGHT$(STR$(N),LEN(ST
R$(N))-1)+";"
56 IF LEN(NT$)>240 THEN 61
60 NEXT N,O,R
61 K$="L8"
65 PRINT@160,K$;NT$
70 PLAY K$+NT$
80 GOSUB 1000:GOTO 6
200 PRINT@1,CHR$(191);:G=RND(10)

210 FOR A=1 TO G
```

```
220 L=RND(255):O=RND(5)
230 NT$=NT$+"T"+RIGHT$(STR$(L),L
EN(STR$(L))-1)+"O"+RIGHT$(STR$(O
),1)+";"
240 N=RND(10)
250 FOR B=1 TO N
260 N$=STR$(RND(12))
270 N$(B)=RIGHT$(N$,LEN(N$)-1)+"
;"
280 NEXT B
290 R=RND(10)
300 FOR C=1 TO R
310 FOR B=1 TO N
320 NT$=NT$+N$(B)
325 IF LEN(NT$)>240 THEN 340
330 NEXT B,C,A
340 GOTO 61
1000 PRINT"press <S> to save <C>
 to change <N> for new sound <R>
 to repeat or <E> to end";
1010 X$=INKEY$:IF X$="S" THEN 20
00
1020 IF X$="C" THEN 3000
1030 IF X$="N" THEN NT$="":GOTO
6
1040 IF X$="R" THEN PLAY K$+NT$
1050 IF X$="E" THEN 5000
1060 GOTO 1010
2000 ZZ=ZZ+1:TN$(ZZ)=K$+NT$:PRIN
T@496,CHR$(175);"SOUND SAVED";CH
R$(175);:GOTO 1010
3000 CLS:PRINTK$+NT$:PRINT:PRINT
"press <L> to change level
 or <S> to change speed"
3010 X$=INKEY$:IF X$="L" THEN 40
00
3020 IF X$="S" THEN 3040
3030 GOTO 3010
3040 PRINT:INPUT"DEFGREE OF SPEE
D (1-255)";L:K$="L"+STR$(L):GOTO
 70
4000 PRINT:INPUT"DIRECTION AND D
EGREE OF          CHANGE IN LEVEL
 (-5 TO +5)";G
4005 Z=1
4010 Z=INSTR(Z,NT$,"O"):IF Z=0 T
HEN 70
4020 Z=Z+1
4030 O=VAL(MID$(NT$,Z,1))+G:IF O
>5 THEN O=5
4040 IF O<1 THEN O=1
4050 MID$(NT$,Z,1)=RIGHT$(STR$(O
),1)
4060 GOTO 4010
5000 CLS:PRINT"press <R> to revi
ew all the      sounds you have s
aved":PRINT:PRINT"press <T> to s
ave those sounds  on tape":PRINT
:PRINT"press <P> to print the PL
AY      statements required to pr
oduce  the sounds":PRINT:PRINT"p
ress <E> to end"
5010 X$=INKEY$:IF X$="R" THEN 60
00
5020 IF X$="T" THEN 7000
5030 IF X$="P" THEN 8000
5035 IF X$="E" THEN END
5040 GOTO 5010
6000 FOR A=1 TO ZZ
6010 CLS:PRINT"present name";NN$
(A)
6020 PRINTTN$(A)
6030 PRINT"do you want to name o
r rename   this sound?"
6040 PLAY TN$(A)
6050 X$=INKEY$:IF X$="Y" THEN IN
PUT"NEW NAME";NN$(A):GOTO 6010
6060 IF X$="N" THEN 6080
6070 GOTO 6050
6080 NEXT A
6090 GOTO 5000
7000 CLS:PRINT"PREPARE A BLANK T
APE FOR RECODING":PRINT:PRINT"pr
ess <ENTER> when ready"
7010 OPEN"O",-1,"SOUNDS"
7020 FOR A=1 TO ZZ
7030 PRINT#-1,NN$(A):PRINT#-1,TN
$(A)
7040 NEXT
7050 CLOSE:GOTO 5000
8000 CLS:PRINT"prepare printer":
PRINT:INPUT"press enter when rea
dy";Q$
8005 FOR A=1 TO ZZ
8010 PRINT#-2,NN$(A):PRINT#-2,TN
$(A):PRINT#-2
8020 NEXT A
8030 PRINT#-2:GOTO 5000
```

CCN TIP

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ELEMENTARY MATH

by Randall Smith
124 Norris Avenue
North Vernon, IN 47265

The following program requires 16K Extended BASIC, and is designed to drill the preschool and primary grade child in the BASIC math functions addition, subtraction, and multiplication. It uses both sound and graphics to varying degrees as a reward for both test completion and correct responses.

The program design is documented through remark statements. These of course, may be deleted after the program has been debugged. The program is menu driven with a main menu to select the math function desired and sub-menus to select from three levels of difficulty for each function.

The PRINT@ function has been used to format the screen. I selected the vertical alignment of problems instead of the horozontal to make the screen look more like a school work sheet. Experience with our six year old showed this to be a more acceptable format.

Input is taken as strings instead of variables in order to make the program more "BOMB" resistant. The program will not accept any string with a value of zero except zero itself. The use of strings also keeps away "REDO?" prompts which would mess up the screen format.

The program prompts the child to each problem with the sound function. Sound is used immediately after each answer to cue the child as to whether the answer was correct or incorrect. The child is given three tries at each problem before moving on to the next. If any problem is not answered correctly the first time through, the program will loop back through and present those problems again.

The random function is used to generate the problems at three varying skill levels: easy, not so easy, and harder. There is an overlap between the different skill levels to help the child keep from being frustrated when he or she moves up a skill level.

Because the program was written with the 16K user in mind, the graphics display at the completion of the problems is the weakest part of the program. I've used three different levels of graphics reward. The first level is for a correct answers to all the problems, no matter how many tries it took. The second level is for correct answers within three tries for each problem. The final, most extensive display is for correct answers for all problems the first try.

There are two ways graphics could be made more sophisticated: the most obvious is to have 32K, so you have more memory available. The second would be to use Arnold Pouch's MPP program and use subroutines to drive the graphics displays.

For example, if you had more than one child using the program, you could have an input at the start of the program asking the child's name and use that string to drive individualized graphics displays. As an aside, let me thank Mr. Pouch for sharing MPP with us. I've had a lot of fun and improved my programs with minimal cost in memory usage. Thanks Arnold!!!

I, myself, find it instructive to key in programs out of CCN, but I realize there are many people who don't have the time to do so. If this is your case, and you have not yet subscribed to Magnazine, I'll be glad to send you a copy of the program on tape, first class mail for $5.00 if you'll write me at the following address: Randsall Smith 124 Norris Avenue. North Vernon, IN. 47265. I'd also welcome any comments or suggestions any reader might have. We live in a smaller community and there aren't any other Color Computer users nearby for me to interact with.

In conclusion, let me say that I hope this program can be as instructive and rewarding to your family as it has been to mine. I'd also like to thank Bill Sias for bringing CCN to me with all the inherent rewards one gets from a good, well edited magazine devoted to the Color Computer.

```
1 '*******ELEMETARY MATH*******'

2 '******BY RANDALL SMITH******'

10 '*******INITIALIZATION*******

20 TM=RND(TIMER):CLEAR500:PCLEAR
4:DIMX$(12),Y$(12),T(12),WX$(12)
,WY$(12),WT(12),C(42),S(105)
30 PL$=CHR$(140)+CHR$(140)+CHR$(
140):CC$="   ":B$=CHR$(128)
40 CLS0:PRINT@236,"math"B$"fun";

50 GOSUB7000
100 '***********MENU***********'

110 CLS:PRINT@138,B$"main"B$+B$"
menu"B$
120 PRINT@196,"WHAT DO YOU WANT
TO DO?"
130 PRINT@228,"1. ADDITION (+)"
140 PRINT@260,"2. SUBTRACTION (-
)"
```

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.MEM	.BYE	.BLOC	.ECON	.ECOF	.MADD	.FNIN	.HELP	.GBL	.(next)		

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```
150 PRINT@292,"3. MULTIPLICATION
 (X)"
160 PRINT@324,"4. QUIT"
170 PRINT@389,"";:INPUT "NUMBER
OF CHOICE";I$
180 IF VAL(I$)<1THEN190ELSE ON V
AL(I$) GOTO 1010,2010,3010,200
190 GOSUB910:GOTO110
200 END
800 '***SUB-MENU SUBROUTINE***'
810 PRINT@196,"WHAT KIND OF PROB
LEMS?"
820 PRINT@228,"1. EASY"
830 PRINT@260,"2. NOT SO EASY"
840 PRINT@292,"3. HARDER"
850 PRINT@324,"4. RETURN TO MAIN
 MENU"
860 PRINT@389,"";:INPUT"NUMBER O
F CHOICE";I$
870 RETURN
900 '*MENU ENTRY ERROR HANDLING*

910 CLS:SOUND100,3:PRINT@321,"EN
TER NUMBER BETWEEN 1-4 ONLY"
920 FORX=1TO1000:NEXT
930 RETURN
1000 '***ADDITION SUBROUTINE***'

1010 CLS:PRINT@136,B$"addition"B
$+B$"menu"B$
1020 K=1:GOSUB810
1030 IF VAL(I$)<1THEN1040ELSE ON
 VAL(I$) GOTO1110,1210,1310,110
1040 GOSUB910:GOTO1010
1100 '**EASY ADDITION PROBLEMS*'

1110 FOR P=1TO12:X$(P)=STR$(RND(
5)):NEXT
1120 FOR P=1TO12:Y$(P)=STR$(RND(
5)):NEXT
1130 FOR P=1TO12:T(P)=VAL(X$(P))
+VAL(Y$(P)):NEXT
1140 GOTO1400
1200 '*******NOT SO EASY*******'
     '****ADDITION PROBLEMS****'

1210 FOR P=1TO12:X$(P)=STR$(RND(
5)+5):NEXT
1220 FOR P=1TO12:Y$(P)=STR$(RND(
5)):NEXT
1230 FOR P=1TO12:T(P)=VAL(X$(P))
+VAL(Y$(P)):NEXT
1240 GOTO1400
1300 '*HARDER ADDITION PROBLEMS*

1310 FOR P=1TO12:X$(P)=STR$(RND(
5)+5):NEXT
1320 FOR P=1TO12:Y$(P)=STR$(RND(
5)+5):NEXT
1330 FOR P=1TO12:T(P)=VAL(X$(P))
+VAL(Y$(P)):NEXT
1400 S$="+":GOTO4010
2000 '**SUBTRACTION SUBROUTINE**

2010 CLS:PRINT@135,B$"subtractio
n"B$"menu"B$
2020 K=2:GOSUB810
2030 IF  VAL(I$)<1THEN 2040ELSE
ON VAL(I$) GOTO2110,2210,2310,11
0
2040 GOSUB910:GOTO2010
2100 '*****EASY SUBTRACTION****'
     '*********PROBLEMS********'

2110 FORP=1TO12:X$(P)=STR$(RND(3
)+3):NEXT
2120 FOR P=1TO12:Y$(P)=STR$(RND(
3)):NEXT
2130 FOR P=1TO12:T(P)=VAL(X$(P))
-VAL(Y$(P)):NEXT
2140 GOTO2400
2200 '*******NOT SO EASY*******'
     '**SUBTRACTION PROBLEMS***'

2210 FOR P=1TO12:X$(P)=STR$(RND(
5)+5):NEXT
2220 FOR P=1TO12:Y$(P)=STR$(RND(
5)):NEXT
2230 FOR P=1TO12:T(P)=VAL(X$(P))
-VAL(Y$(P)):NEXT
2240 GOTO2400
2300 '*********HARDER**********'
     '***SUBTRACTION PROBLEMS**'

2310 FOR P=1TO12:X$(P)=STR$(RND(
10)+10):NEXT
2320 FOR P=1TO12:Y$(P)=STR$(RND(
10)):NEXT
2330 FOR P=1TO12:T(P)=VAL(X$(P))
-VAL(Y$(P)):NEXT
2400 S$="-":GOTO4010
3000 'MULTIPLICATION SUBROUTINE'

3010 CLS:PRINT@133,B$"multiplica
tion"B$+B$"menu"B$
3020 K=3:GOSUB810
3030 IF VAL(I$)<1THEN3040ELSEON
VAL(I$) GOTO3110,3210,3310,110
3040 GOSUB910:GOTO3010
3100 '***EASY MULTIPLICATION***'
```

```
3110 FOR P=1TO12:X$(P)=STR$(RND(
6)):NEXT
3120 FOR P=1TO12:Y$(P)=STR$(RND(
6)):NEXT
3130 FOR P=1TO12:T(P)=VAL(X$(P))
*VAL(Y$(P)):NEXT
3140 GOTO3400
3200 '*******NOT SO EASY*******'
     '*****MULTIPLICATION******'
3300 '**HARDER MULTIPLICATION**'

3210 FOR P=1TO12:X$(P)=STR$(RND(
6)+6):NEXT
3220 FOR P=1TO12:Y$(P)=STR$(RND(
6)):NEXT
3230 FOR P=1TO12:T(P)=VAL(X$(P))
*VAL(Y$(P)):NEXT
3240 GOTO3400
3310 FOR P=1TO12:X$(P)=STR$(RND(
3)+9):NEXT
3320 FOR P=1TO12:Y$(P)=STR$(RND(
6)+6):NEXT
3330 FOR P=1TO12:T(P)=VAL(X$(P))
*VAL(Y$(P)):NEXT
3400 S$="X":GOTO4010
4000 '**SET UP SCREEN DISPLAY**'

4010 'PP=INITIAL PRINT POINT'
     'PX=POSITION OF UPPER #'
     'PY=POSITION OF LOWER #'
     'PL=POSITION OF LINE   '
     'PT=POSITION OF ANSWER '
4020 PP=1:PX=-5:PY=26:PL=58:PT=9
0
4030 CLS:GOSUB4110
4040 GOSUB4210
4050 GOSUB4110
4060 GOSUB4210
4070 GOSUB4110
4080 GOTO4310
4100 '**SETUP ROW OF PROBLEMS**'

4110 FOR P=PP TO PP+3:PX=PX+8:PY
=PY+8:PL=PL+8
4120 PRINT@PX,RIGHT$(X$(P),2)
4130 PRINT@PY,S$;RIGHT$(Y$(P),2)

4140 PRINT@PL,PL$
4150 NEXT P:RETURN
4200 '***MOVE ON TO NEXT ROW***'

4210 PP=PP+4:PX=PX+128:PY=PY+128
:PL=PL+128:RETURN
4300 '*****GETTING ANSWERS*****'
4310 PP=1
4320 FORP=PP TO PP+3:PT=PT+8
4330 PRINT@PT,"";:INPUT T$
4340 IF VAL(T$)=T(P) THEN GOSUB4
510
4350 IF VAL(T$)=0 THEN PRINT@PT,
"":PRINT:GOTO4330
4360 IF VAL(T$)<>T(P) THEN GOSUB
4610:IF T>0 THEN GOTO4330
4370 IF P=12 THEN 5010
4380 NEXT P
4390 PP=PP+4:PT=PT+128:GOTO4320
4500 '*****CORRECT ANSWERS*****'

4510 FORS=50 TO 160 STEP10:SOUND
S,1:NEXT
4530 PRINT@PT-(LEN(T$)-1),CC$;T$

4540 T=0:RETURN
4600 '******WRONG ANSWERS******'

4610 T=T+1:IF T=1 THEN W=W+1
4620 SOUND10,5
4630 IF T<3 THEN PRINT@PT-2,STRI
NG$(5,32):RETURN
4640 T=0:WW=WW+1
4650 PRINT@PT-2,STRING$(5,32)
4660 PRINT@PT+2,"x"
4670 WX$(WW)=X$(P)
4680 WY$(WW)=Y$(P)
4690 WT(WW)=T(P)
4700 RETURN
5000 '*****CHECK THE SCORE*****'

5010 IF WW>0 THEN5200 ELSE6000
5020 CLS:PRINT@133,"***CONGRATUL
ATIONS***"
5030 PRINT@196,"YOU GOT THEM ALL
 RIGHT!!"
5040 PRINT:INPUT"DO YOU WANT TO
GO AGAIN (Y/N)";I$
5050 IF LEFT$(I$,1)="Y"THEN ON K
 GOTO1010,2010,3010
5060 END
5100 CLS:PRINT@200,"YOU MISSED"W
:W=0:WW=0:W2=0
5110 PRINT:PRINT"YOU CAN DO BETT
ER THAN THAT!!"
5120 PRINT:INPUT"DO YOU WANT TO
TRY AGAIN (Y/N)";I$
5130 IF LEFT$(I$,1)="Y"THEN ON K
 GOTO 1010,2010,3010
5140 END
5200 '***RIGHTING THE WRONGS***'
```

```
5210 CLS:IF W2>0 THEN5100 ELSE P
RINT@195,"LET'S TRY THESE OVER A
GAIN"
5220 FORX=1TO1000:NEXT:CLS
5230 PP=1:PX=-5:PY=26:PL=58:PT=9
0
5240 FORP=PP TO PP+3:PX=PX+8:PY=
PY+8:PL=PL+8
5250 PRINT@PX,RIGHT$(WX$(P),2)
5260 PRINT@PY,S$;RIGHT$(WY$(P),2
)
5270 PRINT@PL,PL$
5280 IF P=WW THEN5400
5290 NEXT P
5300 GOSUB4210:GOTO5240
5400 W2=WW:WW=0
5410 PP=1
5420 FORP=PP TO PP+3:PT=PT+8
5430 PRINT@PT,"";:INPUT T$
5440 IF VAL(T$)=WT(P) THEN GOSUB
4510
5450 IF VAL(T$)=0 THEN PRINT@PT,
"":PRINT:GOTO5430
5460 IF VAL(T$)<>WT(P) THEN GOSU
B4610:IF T>0 THEN5430
5470 IF P=W2 THEN 5010
5480 NEXT P
5490 PP=PP+4:PT=PT+128:GOTO5420
6000 '****HERE'S THE REWARD****'

6010 PMODE3,1:PCLS:SCREEN1,1
6020 IF WW>0 OR W2>0 THEN6110
6030 R$="T255;V20;O5;12;12;11;11
;10;10;9;9;8;8;7;7;6;6;5;5;4;4;3
;3;2;2;1;1;04;12;12;11;10;10;9;9
;8;8;7;7;6;6;5;5;4;4;3;3;2;2;1;1
;"
6040 E$="T255;V31;O1;1;10;1;3;4;
2;5;5;6;3;5;6;4;9;8;V25;7;8;1;2;
2;6;9;6;7;5;1;2;1;6;6;9;3;4;8;9;
6;5;4;8;5;1;9;2;5;5;V20;4;6;7;5;
5;8;9;1;4;5;4;3;4;7;5;3;4;9;1;2;
1;5;9;2;1;2;9;1;2;V10;1;1;2;1;9;
4"
6045 FORT=1TO2+RND(3)
6050 X=RND(210):Y=RND(20):PLAYR$
:PUT(X,Y)-(X+40,Y+40),C,PSET:PLA
Y E$
6060 FORX=1TO100:NEXT:PCLS
6070 X=RND(190):Y=RND(50):PLAY R
$:PUT(X,Y)-(X+64,Y+64),S,PSET:PL
AY E$
6080 FORX=1TO100:NEXT:PCLS
6090 NEXT T:COLOR8,5
6100 FORT=1TO200:PSET(RND(255),R
ND(191)):PLAY"12;O5;L1;T255;V31;
P2":NEXT
6110 CIRCLE(90,52),30:PAINT(90,5
2),7,8
6620 READ G$,O$,D$,J$,BB$,P$
6630 DRAW"BM68,50;C5"+G$+O$+O$+D
$
6640 DRAW"BM68,62;C5"+J$+O$+BB$+
P$
6650 FORX=1TO2000:NEXT
6660 IF W>0 THEN RESTORE:GOTO510
0
6670 READ Y$,U$,EE$,T$,A$,N$,PP$

6680 DRAW"BM79,180;C7"+Y$+O$+U$
6690 DRAW"BM+8,+O"+G$+EE$+T$
6700 DRAW"BM+8,+O"+A$+N$
6710 DRAW"BM+8,+O"+A$+PP$
6720 FORX=1TO2000:NEXT
6740 FORX=4TO152 STEP4:CIRCLE(12
8,96),X,8:PLAY"12":NEXT
6750 FORX=1TO2000:NEXT:PLAY E$:R
ESTORE:PCLS:FORX=1TO100:NEXT:GOT
O5020
7000 '*****DRAW THE REWARD*****'

7010 PMODE3,1:PCLS
7020 CIRCLE(25,25),20:PAINT(25,2
5),8,8
7030 FOR X=1TO20:PRESET(25+RND(1
0),25+RND(10)):PRESET(25+RND(10)
,25-RND(10)):PRESET(25-RND(10),2
5+RND(10)):PRESET(25-RND(10),25-
RND(10)):NEXT X
7040 GET(5,5)-(45,45),C,G
7050 PCLS:DRAW"BM32,32;N;E20;N;R
20;N;F20;N;D20;N;G20;N;L20;N;H20
"
7060 FORX=4TO32 STEP4:CIRCLE(32,
32),X:NEXT
7070 GET(0,0)-(64,64),S,G
7080 RETURN
8000 DATA U8;R8;BD4;L4;BR4;D4;L8
;BR12,U8;R8;D8;L8;BR12,U8;R6;F2;
D4;G2;L6;BR12,U4;BU4;BR8;D8;L8;B
R12,U8;R6;F2;D2;L8;BR8;D2;G2;L6;
BR12,BU8;BR4;D5;BD2;D1;BR8
8010 DATA BU8;F4;E4;BG4;D4;BR8,U
8;BR8;D8;L8;BR12,U8;R8;BD4;L8;BD
4;R8;BR4,BU8;R8;BL4;D8;BR8,U8;R8
;D4;L8;BR8;D4;BR4,U8;F8;U8;BD8;B
R4,BU8;BR4;D8;BU4;BL4;R8;BD4;BR4
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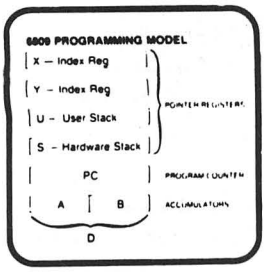

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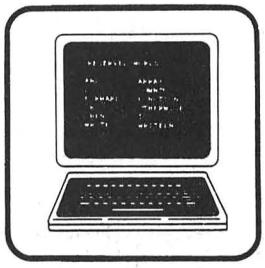

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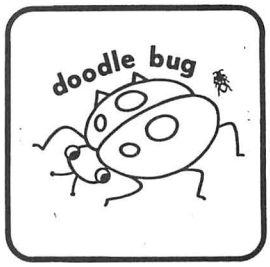

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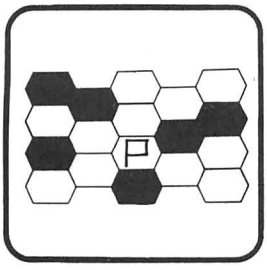

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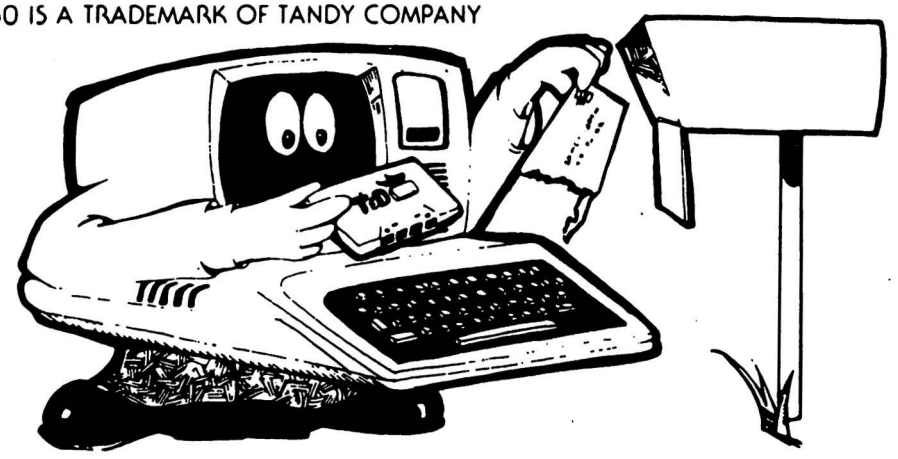

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PROGRAM RELOCATION II

by Ken Morrow
202 Saxe Rd.
Mogadore, OH 44260

In the August issue of CCN, I described a method of moving the Radio Shack Project Nebula cartridge code to RAM and performing the required changes for execution. The Basic program that accompanied the article was rather inefficeint and not general enough to use with other code. (I might add it also wasn't a complete listing. Only 22 of the 48 program lines were published. Hopefully, by the time you read this the omission will have been corrected.) In attempting to move another Radio Shack cartridge to RAM for execution (it's habit forming) I developed a new Relocator program which steps through the code by instructions. The program also checks over fifty instruction types as candidates for relocation. The old program only checked the six op-codes required for the relocation of Project Nebula. This article will explain the use of the new program and detail the procedure for relocating the Polaris cartridge.

I mentioned in the last article that the Project Nebula code was conviently arranged for relocation with text and data areas clustered at the end of the program. This made it quite easy to blindly step through the code changing any suspicious looking byte. This is not the case with most of the programs we wish to relocate, such as the Polaris cartridge.

Stepping through the machine code by instructions allows us to identify bad op-codes (text or data areas). The Relocator program is designed to stop and display the address when it encounters a bad op-code. This gives you the opportunity to examine a disassembly of the program you are trying to relocate in order to determine where to restart the relocation processor.

I have included an outline which summarizes the information related to addressing modes that's contained in the logic of the Relocator program. It uses this information to determine which operands to change, where to look for the next operation code and when a bad op-code is encounterd.

I will illustrate the use of this program by explaining the steps required to relocate the Polaris cartridge for execution at HEX(4000) in RAM on a 32K Color Computer.

Unlike the 8K Project Nebula cartridge, Polaris is only a 4K ROM pack. Enter 'POKE 65515,54' to disable the auto-execute. Insert the Polaris cartridge and enter:
'CSAVEM"POLARIS",&HC000,&HCFFF,&HC000'.
To load the ROM pack code at HEX(4000) on a 32K system specify an offset of '&HFFFF-&H7FFF'. That is, enter:
'CLOADM"POLARIS",&HFFFF-&H7FFF7'.
Now you can load the Basic Relocator program. Remember to enter:
'CLEAR 200,&H3FFF'.
If you need more information to get this far I refer you to my previous article on program relocation in the August issue of CCN.

When you run the new Relocator program the first prompt asks for printer or screen output. If you have a printer ready and you wish hard copy of the relocation changes enter 'Y'; if not enter 'N'.

The next prompt asks for the HEX value of the start address. This refers to where the code currently resides in RAM, so enter HEX(4000). Next you specify the end address which is HEX(4DC9). I determined this end address by examining a disasembly of the Polaris code. You could enter HEX(4000), the end of the copied 4K ROM area, but only changes to address constants are required after HEX(4DC9) and we will handle these separately.

Enter the orginal start address for the ROM pack code which is HEX(C000). Finally, enter the relocation address which in this case will be HEX(4000).

The program will display the following line at the top of the screen;
CURRENT OP-CODE ADDR = XXXX
where XXXX is incremented as the Relocator program steps through the code.

The next display will either go to the screen or the printer depending on how you answered the first prompt.
ADDR =
OLD OPER =
OP-CODE =
NEW OPER =
This display lists the addres of a change, the operation code of the instruction changed and the byte of the operand that was changed.

When a bad op-code is encountered you will see;
BAD OP-CODE ADDR = XXXX
where XXXX is the address of byte in question. If you are relocating Polaris HEX (4C6A) should be displayed at this time. Below the bad op-code address is displayed the following;
HEX VALUE OF NEXT GOOD
OP-CODE ADDR =
The restart address for Polaris is HEX(4CCB). This can only be determined by examining a

disassembly of the code in the area of the bad op-code.

After entering the restart address the Relocator will continue until another bad op-code or the end address is encountered. In the case of Polaris the Relocator ends if you specified an end address of HEX(4DC9). If you specified an end address of HEX(4FFF) another bad op-code will be encountered at HEX(4DD4). On examining the disassembly at this point you will find there is no further restart address required. Only address constants remain to change. You can terminate the Relocator program at this point with the break key.

A table of address constants for Polaris is included with this article. The following is a short Basic program that will make the required address constant changes for Polaris. Just type it in after you run the Relocator program. After you have entered and ran the code you should have a working copy of Polaris starting at HEX(4000). Keep in mind that unlike the Relocator program this Basic program only works for Polaris.

```
10 ' PROGRAM TO CHANGE ADDRESS
20 ' CONSTANTS FOR RELOCATING
30 ' POLARIS TO HEX(4000)
40 For I=&H4F10 TO &H4F7A STEP 2
50 M=PEEK(I)
60 IF M > 0 THEN GO TO 70 ELSE GO TO 100
70 DI=M-&HC0
80 NW=DI+&H40
90 POKE I,NW
100 NEXT I
110 END
```

```
10 'POSITION DEPENDENT CODE
20 'RELOCATOR
30 'BY KEN MORROW
40 'COPYRIGHT (C) 1982
50 CLS:PRINT" ** POSITION DEPEND
ENT CODE  **"
60 PRINT" **          RELOCATOR
      **"
70 PRINT" **        BY KEN MORROW
      **"
80 PRINT:INPUT"  OUTPUT TO PRINT
ER (Y OR N)";A$
90 IF A$="Y" THEN SW=2 ELSE SW=0

100 IF SW = 0 OR SW = 2 THEN GOT
O 110 ELSE GOTO 80
110 PRINT
120 PRINT "  HEX VALUE OF"
130 INPUT "  START ADDRESS = ";S
R$
140 PRINT
150 PRINT "  HEX VALUE OF"
160 INPUT "  END ADDRESS   = ";E
N$
170 PRINT
180 PRINT "  HEX VALUE OF ORIGIN
AL"
190 INPUT "  START ADDRESS = ";O
G$
200 PRINT
210 PRINT "  HEX VALUE OF RELOCA
TION"
220 INPUT "  ADDRESS       = ";R
L$
230 SR=VAL("&H"+SR$):EN=VAL("&H"
+EN$):OG=VAL("&H"+OG$):RL=VAL("&
H"+RL$)
235 ' ** STEP BY OP-CODE **
240 I = SR
241 MOG=INT(OG/256)
242 MRL=INT(RL/256)
245 CLS:PRINT:PRINT "CURRENT OP-
CODE ADDR = "
250 IF I > EN THEN END
252 L=PEEK(I)
255 PRINT @ 57 ,HEX$(I)
260 ' ** OP-CODE 00-0F     **
261 ' ** BASE PAGE DIRECT **
270 IF L=>0 AND L<16 THEN GOTO 1
002
280 ' ** OP-CODE 10XX-11XX **
290 IF L=16 OR L=17 THEN M=PEEK(
I+1) ELSE GOTO 440
300 MM=INT(M/16):LM=M-16*MM
305 ' ** 16 BIT RELATIVE **
310 IF L=16 AND MM=2 AND LM>0 TH
EN GOTO 1004
320 ' ** INHERENT **
330 IF MM=3 AND LM=15 THEN GOTO
1002
340 ' ** 16 BIT IMMEDIATE **
350 IF MM=8 AND (LM=3 OR LM=12 O
R LM=14) THEN GOTO 2000
355 ' ** BASE PAGE DIRECT **
360 IF MM=9 AND (LM=3 OR LM=12 O
R LM=14 OR LM=15) THEN GOTO 1003

370 ' ** INDEXED/INDIRECT **
380 IF (MM=10 OR MM=14)AND(LM=3
OR LM=12 OR LM=14 OR LM=15) THEN
 GOTO 4000
390 ' ** EXTENDED/DIRECT **
400 IF (MM=11 OR MM=15)AND (LM=3
 OR LM=12 OR LM=14 OR LM=15) THE
N GOTO 2000
410 ' ** IMMEDIATE **
```

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```
420 IF L=16 AND M=206 THEN GOTO
2000
425 ' ** BASE PAGE DIRECT **
430 IF L=16 AND (M=222 OR M=223)
 THEN GOTO 1003
435 GOTO 5000:' BAD OP-CODE
440 ML=INT(L/16):LL=L-ML*16
445 IF ML=1 THEN ON LL GOTO 5000
,1001,1001,5000,5000,1003,1003,5
000,1001,1002,5000,1002,1001,100
2,1002
450 IF ML=2 THEN GOTO 1002
455 IF ML=3 THEN ON LL+1 GOTO 40
00,4000,4000,4000,1002,1002,1002
,1002,5000,1001,1001,1001,1002,1
001,5000,1001
460 IF ML < 4 OR ML > 5 THEN GOT
O 470
465 IF LL=1 OR LL=2 OR LL=5 OR L
L=11 OR LL=14 THEN GOTO 5000 ELS
E GOTO 1001
470 IF ML=6 AND (LL=1 OR LL=2 OR
 LL=5 OR LL=11) THEN GOTO 5000
475 IF ML=6 GOTO 4000
480 IF ML=7 AND (LL=1 OR LL=2 OR
 LL=5 OR LL=11) THEN GOTO 5000
485 IF ML=7 THEN GOTO 2020
490 IF ML=8 AND (LL=7 OR LL=15)
THEN GOTO 5000
495 IF ML=8 AND (LL=3 OR LL=12 O
R LL=14) THEN GOTO 2020
496 IF ML=8 THEN GOTO 1002
500 IF ML=9 THEN GOTO 1002
510 IF ML=10 THEN GOTO 4000
520 IF ML=11 THEN GOTO 2020
530 IF ML=12 AND(LL=7 OR LL=13 O
R LL=15) THEN GOTO 5000
535 IF ML=12 AND (LL=3 OR LL=12
OR LL=14) THEN GOTO 2020
536 IF ML=12 THEN GOTO 1002
540 IF ML=13 THEN GOTO 1002
550 IF ML=14 THEN GOTO 4000
560 IF ML=15 THEN GOTO 2020
570 GOTO 5000
1001 I=I+1:GOTO 250
1002 I=I+2:GOTO 250
1003 I=I+3:GOTO 250
1004 I=I+4:GOTO 250
2000 Y=I+2:Z=PEEK(Y):GOSUB3000
2010 I=I+4:GOTO 250
2020 Y=I+1:Z=PEEK(Y):GOSUB3000
2030 I=I+3:GOTO 250
3000 IF Z>=MOG AND Z< (MOG+16) T
HEN GOTO 3030
3010 IF Z>= (MOG+16) AND Z < (MO
G+32) THEN GOTO 3100
3020 RETURN
3030 DI=Z-MOG
3040 NW=DI+MRL
3045 POKE Y,NW
3050 PRINT #-SW,"ADDR = ";HEX$(I
);"  OP-CODE = ";HEX$(L)
3051 PRINT #-SW,"    OLD OPER = "
;HEX$(Z);"  NEW OPER = ";HEX$(NW
)
3060 RETURN
3100 DI=Z-(MOG+16)
3110 NW=DI+MRL+16
3120 POKE Y,NW
3130 GOTO 3050
4000 N=PEEK(I+1)
4001 ' ** ANALYZE POST BYTE **
4005 IF L=16 OR L=17 THEN N=PEEK
(I+2)
4010 IF N=> 128 THEN GOTO 4030
4020 IF L=16 OR L=17 THEN I=I+3
ELSE I=I+2:GOTO 250
4030 J=15 AND N
4035 IF L=16 OR L=17 THEN I=I+1
4040 IF J < 7 OR J=11 THEN I=I+2

4050 IF J=8 OR J=12 THEN I=I+3
4060 IF J=9 OR J=13 OR J=15 THEN
 I=I+4
4070 GOTO 250
5000 ' ** BAD OP-CODE ROUTINE **

5010 CLS:PRINT:PRINT "BAD OP-COD
E ADDR      = "
5020 PRINT @ 57 ,HEX$(I)
5030 PRINT:PRINT "  HEX VALUE OF
 NEXT GOOD"
5040 INPUT "  OP-CODE ADDR = ";S
R$
5050 I=VAL("&H"+SR$):GOTO 245
```

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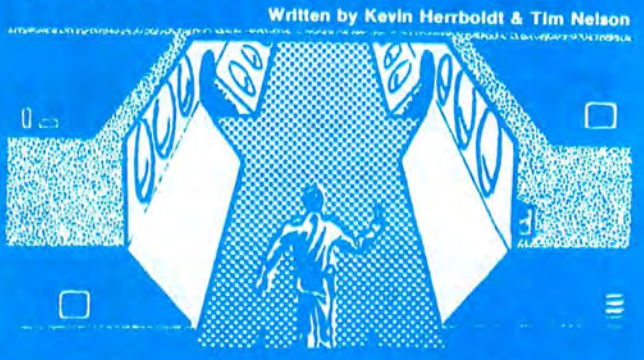

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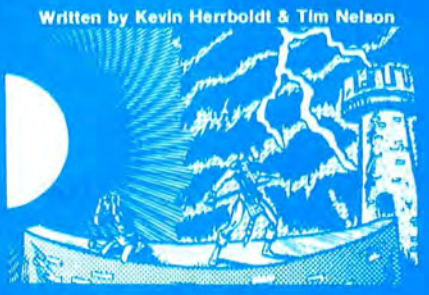

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```
0 CLS
1 GOTO9000
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T., FAIRFIELD, OH, 45014.
15 'COPY-RIGHT 1981. REVISED ADD
ING PRINTER AND CLASS AVERAGES D
EC.1981
20 DIMG$(61),SN$(41)
40 CLS:PRINT"ENTER YOUR CHOICE
BY TYPING    THE SELECTION NUMBE
R.":PRINT@109,"MENU":PRINT
50 PRINT"   1. PROGRAM DESCRIPTI
ON","   2. LOAD PREVIOUS FILE FR
OM          TAPE.",,"   3. ENTER
GRADES- NO PREVIOUS         FILE."

60 PRINT:PRINT:PRINT:PRINT"DO NO
T ENTER MORE THAN 60 GRADESPER S
TUDENT OR MORE THAN 40     STUDE
NTS.";
70 GOSUB110:EY=IK:IFIK=1 THEN 12
30
75 CLS:PRINT:PRINT:PRINT"DO YOU
WANT TO PRINT RESULTS?":GOSUB110
:IFIK$="Y"THENPOKE150,41:GOSUB13
00ELSEPT=0
90 GOTO140
100 PRINT"-----PRESS ANY KEY TO P
ROCEED-----";
110 IK$=INKEY$:IK=VAL(IK$):IFIK$
="" THEN 110
120 RETURN
140 CLS:PRINT:PRINT:INPUT"ENTER
SUBJECT AS WRITTEN IN     GRADEB
OOK";SJ$:SB$=LEFT$(SJ$,8)
145 TG=0:NT=0
150 IFPT=0THEN170ELSEPRINT#-2,""
:PRINT#-2,"":PRINT#-2,TAB(5)"SUB
JECT",SJ$:PRINT#-2,""
155 PRINT#-2,TAB(5)"NAME"TAB(25)
"NATURAL"TAB(35)"NUMBER"TAB(45)"
NUMBER"TAB(55)"LOWEST"
160 PRINT#-2,TAB(25)"AVERAGE"TAB
(37)"OF"TAB(47)"OF"TAB(55)"GRADE
"
165 PRINT#-2,TAB(35)"GRADES"TAB(
45)"GRADES":PRINT#-2,TAB(46)"> 7
0":PRINT#-2,"":PL=1
170 SO=0:PN=0:IFEY=2THEN880ELSE8
20
190 FOR K=1 TO 40:G$(K)="0":NEXT
:G=0:LO=100:NZ=0:NL=0:NH=0:GT=0:
N=0:NM=0:G1=0:RETURN
230 CLS:PRINTSN$:PRINT:PRINT"TYP
E IN GRADE AND PRESS ENTER.  AFT
ER LAST GRADE PRESS ENTER    TWI
CE."
240 K=K+1:READPO:PRINT@PO,"";
250 LINEINPUTG$(K):IF G$(K)="" T
HEN 300
260 IFVAL(G$(K))=0ANDG$(K)<>"0"
THEN PRINT@PO,"   ":PRINT@PO,"";
:GOTO250
270 N=N+1:IFPO=474 THEN PRINT"60
 GRADES ENTERED":GOTO300
280 IFPO=480 THEN PRINT@0,SN$
290 GOTO240
300 POKE65495,0:RESTORE:FOR K=1
TO N:G=VAL(G$(K)):IF G=0 THEN NZ
=NZ+1
330 IFG<70 THEN NL=NL+1
340 IFG>70 THEN NH=NH+1
350 IF G<LO THEN LO=G
380 GT=GT+G:NEXT
400 IFLO<=50THENLW=50ELSELW=LO
410 GD=GT-LO:ND=N-1:GOTO530
420 GOTO530
430 CLS:FORK=1 TO N:READPO:PRINT
@PO,VAL(G$(K));:IFPO=480 THEN PR
INT""
460 NEXT:RESTORE:PRINT:PRINT"GRA
DES ARE NUMBERED 1-6 1ST ROW,7-1
2 2ND ROW ETC. TO-","CHANGE OR A
DD ENTER #,NEW- 5,70 DELETE ";
470 PRINT"ENTER #,D-   5,D"
480 INPUT M,G$(M):IF M>N THEN N=
N+1
500 IF G$(M)="D" THEN G$(M)=G$(N
):N=N-1
510 G=0:LO=100:NZ=0:NH=0:GT=0:NL
=0:IF M=0 THEN 300 ELSE 480
530 CLS:PRINTUSING"%        %";S
J$;:PRINT"  "+SN$;:PRINT"NUMBER
OF GRADES = "N:PRINT"NUMBER OF G
RADES ABOVE 70 ="NH
540 POKE65494,0:IF N*ND=0 THEN 1
140
560 PRINT "   THIS IS "INT(NH*10
0/N+.5)"%":PRINT"NUMBER OF ZEROS
 = "NZ:PRINT"LOWEST GRADE = "LO:
PRINT TAB(17)"ALL";TAB(24)"LOWES
T"
570 PRINT TAB(17)"GRADES";TAB(24
)"DELETED":PRINT:PRINT"RAW AVERA
GE";TAB(17)INT(GT/N+.5);TAB(24)I
NT(GD/ND+.5):PRINT
640 PRINT"1. CHANGE, ADD OR DELE
TE GRADES.2. START NEW SUBJECT O
```

```
R END.    3. START NEXT STUDENT.
";
645 GOSUB110:IF(IK-1)*(IK-2)*(IK
-3)<>0 THEN 645
650 EZ=IK:IFIK=1 THEN 430
652 IFPT=1THENPRINT#-2,TAB(27)IN
T(GT/N+.5)TAB(37)N TAB(47)NH TAB
(57)LO
653 IFPT=1THENPL=PL+1:IFPL=4THEN
PL=1:PRINT#-2,""
655 TG=TG+GT:NT=NT+N
660 POKE65495,0:FORK=1TON:G$(K)=
HEX$(VAL(G$(K))):IF 1=LEN(G$(K))
 THEN G$(K)="0"+G$(K)
680 SN$(SO)=SN$(SO)+G$(K):NEXT:N
$=STR$(N):IF N<10 THEN N$="0"+N$

690 N$=STR$(N):IF N<10 THEN N$="
0"+N$
700 SN$(SO)=SN$(SO)+N$:POKE65494
,0:IFIK=3THENCLS:GOTO810ELSE1040

710 CLOSE-1:CLS:PRINT"IF YOU WAN
T TO SAVE THE LAST    GRADES TO
CASETTE FILE TYPE 'Y'":GOSUB110:
IFIK$="Y" THEN PN=0ELSE40
720 GOSUB1400
730 PRINT"SET TO RECORD ":PRINT:
GOSUB1420:AUDIOON
735 PRINT"RECORDING FILE TWICE"
750 OPEN"O",-1,SB$
760 PRINT#-1,SO:FORK=1 TO SO:PRI
NT#-1,SN$(K):NEXT
770 CLOSE-1:IFPN=1 THEN PN=0:CLS
:PRINT:PRINT"PRESS <Y> TO SAVE F
ILE TO A","BACKUP CASETTE.":GOSU
B110:IFIK$="Y" THEN 720:PN=0ELSE
40
780 TIMER=0:MOTORON:PN=1
790 IF TIMER<120 THEN 790
800 GOTO750
810 IFEY=2 THEN 1030
820 PRINT:PRINT:PRINT:LINE INPUT
"ENTER STUDENT IDENTIFICATION AS
 IT APPEARS IN GRADE BOOK.
 ";SN$
830 IFPT=1THENPRINT#-2,TAB(5)SN$
;
840 LS=LEN(SN$):IFLS<20 THEN SN$
=SN$+" " ELSE 860
850 GOTO840
860 IFLS>20 THEN SN$=LEFT$(SN$,2
0)
870 SO=SO+1:SN$(SO)=SN$:GOSUB190
:K=0:GOSUB230:GOTO820
880 CLS:PRINT@98,"KEY IN FUNCTIO
N NUMBER ",,,"  <1> LOAD FILE WI
TH GRADES",,,"  <2> LOAD names O
NLY":GOSUB110:IFIK<1ORIK>2THEN88
0
885 F2=IK
890 GOSUB1400:PRINT:INPUT"SET TO
 PLAY AND PRESS enter";I$
900 OPEN"I",-1,SB$:INPUT#-1,SI:K
J=0
910 KJ=KJ+1:SO=KJ:IFEOF(-1) THEN
 KJ=SI:GOTO1040990
930 INPUT#-1,SN$(KJ):POKE65495,0
:SN$=LEFT$(SN$(KJ),20):IFF2=2THE
NCLS:SN$(KJ)=SN$:PRINT:PRINTSN$:
PRINT:GOSUB190:GOTO1000
940 CLS:NO=VAL(RIGHT$(SN$(KJ),2)
):PRINT:PRINT"GRADES IN THE FILE
 FOR","SN$" ARE "
950 GOSUB190:FORJ=1TONO:L=19+2*J
:G$(J)=MID$(SN$(KJ),L,2)
970 G$(J)="&H"+G$(J):G$(J)=STR$(
VAL(G$(J))):PRINT" "G$(J);:N=N+1
:IF POS(0)>28 THEN A$=CHR$(13):P
RINTA$;
990 NEXT
1000 POKE65494,0:SN$(KJ)=SN$:PRI
NT:PRINT:PRINT:INPUT"ENTER 'W' I
F STUDENT IS WITH-    DRAWN";W$
1005 IF W$="W" THEN SO=SO-1:KJ=K
J-1:SI=SI-1:GOTO1030
1010 IFPT=1THENPRINT#-2,TAB(5)SN
$;
1020 K=N:GOTO230
1030 IFKJ<SI THEN 910
1040 EY=0:CLOSE-1
1050 CLS:LINEINPUT"ENTER 'Y' TO
ENTER NEW STUDENTS";IK$:IF IK$="
Y" THEN 810
1054 IFPT<>1THEN710
1055 PRINT#-2,"":PRINT#-2,"":PRI
NT#-2,TAB(9)"NATURAL CLASS AVERA
GE = "INT(10*TG/NT)/10
1056 GOTO710
1060 IK=2:EZ=2:GOTO660
1140 CLS:PRINT"/0 ERROR TRAPPED.
 TWO GRADES    MUST BE ENTERED F
OR PROGRAM TO  WORK.":SO=SO-1:GO
TO810
1150 DATA192,197,202,207,212,217
,224,229,234,239,244,249,256,261
,266,271,276,281
1160 DATA288,293,298,303,308,313
,320,325,330,335,340,345,352,357
,362,367,372,377
```

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1170 DATA384,389,394,399,404,409
,416,421,426,431,436,441,448,453
,458,463,468,473
1180 DATA480,453,458,463,468,474

1230 CLS:PRINT"THIS PROGRAM CALC
ULATES GRADE   AVERAGES TWO WAYS
."
1240 PRINT:PRINT"  1. STRAIGHT N
UMERICAL AVERAGE   2. THE  AVERA
GE AFTER THE          LOWEST GRA
DE HAS BEEN","     DELETED."
1250 PRINT:PRINT"BOTH AVERAGES A
RE SHOWN GIVING  THE GRADER A CO
MPARISON  AND A  CHOICE.":GOSUB1
00
1260 CLS:PRINT"THE PROGRAM HAS C
APACITY FOR 60 GRADES FOR EACH O
F 40 STUDENTS. THE PROGRAM MAY B
E CHANGED TO"
1265 PRINT"TO PROVIDE FOR MORE G
RADES AND  FEWER STUDENTS OR VIC
E-VERSA."
1270 PRINT:PRINT"THE PROGRAM ALS
O INCLUDES CAPA- BILITY TO STORE
 GRADES TO CAS-  ETTE FILE AND L
OAD THE FILE"
1275 PRINT"LATER FOR ADDITION OF
 MORE       GRADES. TWO FILE COPI
ES WILL BE MADE TO PROVIDE BACKU
P.":GOSUB100
1280 CLS:PRINT@64,"in the event
of error, break or reset- the fo
llowing options to save data are
 available."
1284 PRINT"     1 TO RESUME INPUT
 FROM TAPE      WITH NEXT STUDENT
 type ","    GOTO910 AND ENTER."
,"    2 TO SAVE FILE TO CASETTE"

1288 PRINT"     type GOTO710 AND
ENTER.","    3 TO RESUME DATA EN
TRY","    without tape input typ
e","    CLOSE:GOTO 820 AND ENTER
."
1295 GOSUB100:CLS:GOTO40
1300 PRINT"PREPARE PRINTER AND P
APER","TURN PRINTER ON AND PUT O
NLINE":GOSUB100
1305 IFPEEK(65314)/2=INT(PEEK(65
314)/2)THENPT=1:RETURNELSEPT=0
1310 PRINT:PRINT"      PRINTER IS
 NOT READY":PRINT:GOSUB100:GOTO7
5
1400 CLS:PRINT:PRINT"LOAD CASETT
E WITH FILE INTO      RECORDER. I
F YOU NEED TO REWIND CASETTE PRE
SS <Y>.":GOSUB110
1405 :IFIK$<>"Y" THENRETURN
1410 PRINT:INPUT"PRESS <ENTER> F
OR MOTORON.";E:MOTORON:AUDIOON:I
NPUT"PRESS <ENTER> FOR MOTOROFF.
";E:MOTOROFF:RETURN
1420 INPUT"WANT TO RUN PAST LEAD
ER";I$:IFI$="Y"THENMOTORON:FORX=
1TO6000:NEXT
1430 RETURN
9000 PCLEAR1:CLEAR(0):CLEAR(MEM-
1700):PRINTMEM:FORX=1TO600:NEXT:
GOTO10
10000 AUDIOON:GOSUB1400:GOSUB142
0
10010 FORX=1TO2:CSAVE"GRADES":MO
TORON:FORY=1TO800:NEXT:NEXT:MOTO
ROFF
```

Dear Bill,

Some errors appeared in the listing of my COLOR DATA FILE program in the October issue. What apparently happend is that the listing was output on a Color Computer with Extended Color Basic. The original program was written on a system running Disk Extended Color Basic.

Since Disk Basic is just an addition to Extended Basic, most of the listing is OK. But the 'disk' commands cannot be untokenized by Extended Basic. The commands to exclaimation marks ("!"). I have listed below all the lines which were changed. Only the first three line numbers need to be updated for use by Extended Color Basic users. All the line changes will need to be made for those people who are running Disk Extended Color Basic.

9240 change "!#(CD)" to "PRINT#(CD)"
9261 change "!#(CD)" TO "PRINT#(CD)"
9263 change "!#(CD)" to "PRINT#(CD)"
(Disk users use "WRITE" in place of "PRINT")
(the following are necessary for disk users only)
3073 change both "!#2" to "WRITE#2"
3191 change the first "!" to "KILL" and the second "!" to "RENAME"
5010 change "!" to "DIR"
9300 change "!#2" to "WRITE#2"

I hope these problems have not caused anyone too much grief.

Regards,
Roger Kilpatrick
107 Forest Place
Stockbridge, GA 30281

EXPANSION INTERFACE FOR THE TRS-80 COLOR COMPUTER

Color Computer users can now have power rivaling the Apple-II. This new Expansion Interface provides a Centronics compatible parallel I/O port, a 64K memory access circuit, and I/O expansion capability for up to 7 additional peripheral cards. An impressive array of specialized I/O cards will soon be available - speech, 12-bit A/D, TV digitizer, and more!

The General Automation interface requires NO modification whatever to the Color Computer. The existing 24K Basic ROM, as well as the cassette, serial, and joystick ports remain available. The Expansion Interface is compatible with the Radio Shack Disk System. The 64K memory access circuit allows 32K Rev-E Color Computers to double their available RAM.

In addition, an aluminum chassis is available. The chassis, also ideal for stand alone use, provides support for a television and is the system enclosure for the interface electronics.

The CX-2001A Expansion Interface and the CX-3001A Chassis may be purchased separately. A special introductory package, the CX-P1, includes both and retails for $189.95.

For more information call or write Paul Gochin at General Automation, 9600 Roosevelt Blvd., Suite 100-LL, Philadelphia, PA 19115. (215) 934-3758.

Computerware introduces DOODLE BUG, a graphics arcade game for the Radio Shack Color Computer or TDP System 100.

Mama always said Lady Bugs were good and other bugs were bad. This fun arcade game agrees with her! In high resolution graphics, your lady bugs hussle through an intricate maze of barriers and turnstyles, trying to earn points by eating all the dots, letters, and hearts. Enemy bugs buzz after you! And watch out for the poison skulls! There are lots of extra rewards along the way to keep the points adding up. There are exquisite sounds to add to the excitement as well. This game is an absolute must for all Color Computer owners who enjoy fun and challenge. Several levels of play give a fun time for all ages. And everyone will appreciate the fine graphics and sound.

DOODLE BUG is available from Computerware dealers or directly from Computerware at Box 668, Encinitas, CA 92024 (714) 436-3512. It is availabe on cassette for $24.95 or disk for $29.95 plus $2.00 shipping and handling.

This is the first announcement for four Network Design and Analysis program written in Microsoft BASIC for use on the TRS Color Computer. Most of the programs will play on a 16K machine with extended BASIC. They are available for $25.00 each on cassette or 5 1/4 inch diskette. If more than one program is ordered on the same cassette or diskette they are $20.00 for each program.

Program 1 "SHACTIVE" -16k- printer optional

Design Butterworth, Chebychev, or Bessel Low-Pass, High-Pass, or Band-Pass Active Filters. The input is in the form of break frequency, band width and filter order.

Program 2 "ACTIVE" -32k- printer optional

The design portion is the same as "SHACTIVE". A number of special features have been added to permit screen plotting and outputting frequency response data to the printer.

Program 3 "FILTER" -16k- printer optional

Design Butterworth or Chebychev Low-Pass, High-Pass, or Band-Pass Passive Electrical Filters. The input is in the form of attenuation, break frequencies and input and output impedances.

Program 4 "LADDER" -16k- printer optional

The program calculates the frequency response of general networks which are in the ladder topology. This form includes most passive filters. Some latitude is taken in the definition of ladder because of the large number of different elements permitted. This program is an excellent addition to be used with "FILTER" in the design and analysis of passive R-L-C electrical filters.

For more information contact Donald J. Sommer, 3931 South Burns Street, Seattle, WA 98118.

AURORA SOFTWARE annouces that they will soon be putting MR. COPY on the market. This is a very fine copier that needs to be loaded only once and it will copy any or all of your tapes. Or, it can be used by people starting out in software sales as a multicopier! MR. COPY can make up to 99 copies of a single file with only one loading! It will show the count on the screen and when you are finished it will be ready to make 99 copies of another file! This is truly a Once Load copier. For more information write to AURORA SOFTWARE, 49 Brookland Avenue, Aurora, Ontario, Canada L4G 2H6.

THE 1248—EP EPROM PROGRAMMER

The 1248-EP EPROM PROGRAMMER is a full function, stand alone unit that is compatible with virtually all popular 1K, 2K, 4K & 8K-by-8, 24 pin, 5 volt EMPROMS (2508's, 2758-0/1's, 2516's 2716's, 2532's, 68732-0/1's, 68764's, 68766's to mention a few). The programmer is totally MENU DRIVEN by resident, on-board, position independent firmware in EPROM, which makes it suitable for experienced computer operators and novices alike.

In addition to the fact that the 1248-EP is compatible with a large number of devices, it also performs a broad range of user selected functions as well. The 1248-EP verifies EPROM erasure, compares EPROM contents to contents of RAM or ROM, programs blocks or individual bytes of EPROM memory, and copies EPROM contents to user specified location in RAM. At specified times, EPROM's can be inserted or removed from the programmer without having to "power down" the computer.

Hardware features of the 1248-EP programmer are significant. It contains its own on-board programming power supply, plugs into the cartridge slot of the Color Computer, has a quality "zero insertion force" socket and provisions for decoding the firmware driver to any 2K byte boundry within the cartridges memory map for efficient memory map utilization when used with other non-position independent hardware or software that must be executed at $C000.

The combination of the TRS-80 Color Computer, an editor/assembler/monitor such as the Micro Works SDS80C**, and the 1248-EP EPROM programmer makes a high performance, cost effective software development station for MC-6800/6809 microprocessor based systems. Use the system to write and store your own games or utility programs in EPROM's for execution from the cartridge slot using the CK4 PROM/RAM card described below.

The cost of the unit, including easy to understand instructions is just $94.95.

THE CK4 PROM/RAM CARD

The CK4 is a cartridge slot compatible circuit board that can be populated with either ROM's, EPROM's or static RAM's as the user so desires. Each of the four on-board sockets can be decoded starting at any 2K block boundry of the memory map from $C000 through $F800 of the Color Computer. In addition, each socket can be configured to respond to address blocks from 2K to 8K bytes in length, accommodating therefore, 2K, 4K or 8K-by-8 ROM's, EPROM's or RAM's. One can mix ROM and RAM on the same card in various amounts and sizes. One can also "write protect" RAM's via dip switches on the CK4.

The unit comes complete with instructions for setting up the decoding features as desired. The unit works with 2K, 4K or 8K-by-8 ROM's or EPROM's of the 5 volt only variety in 24 pin packages, or may be used with 4 static RAM's such as 4016's to expand the computers memory work space by 16K.

The CK4 PROM/RAM card is available from stock, with instructions for $29.95 each.

"COCO" GETS A BREADBOARD

The COCO BREADBOARD is a circuit board that plugs directly into the cartridge slot of the Color Computer and provides the user with 16 square inches of predrilled breadboarding area for circuit development, interfacing experiments, motherboard implementation, or whatever your imagination conjures up. The holes in the breadboarding area of the circuit board are on 0.10 inch centers as found on other popular but more expensive boards. The COCO BREAD BOARD brings all of the data, address and control signals available at the cartridge slot outside of the body of the computer and the signal lines are appropriately labeled to facilitate error free wiring of breadboards. A ground plane is provided on the top side of the board and solder pads are provided on the bottom of the board, thus facilitating circuit grounding and point-to-point wiring. In short, the COCO BREADBOARD was designed with the experimenter in mind.

The COCO BREADBOARD is attractively priced to justify its use for even the lowest budget projects. It is an ideal vehicle for learning interfacing techniques. Buy extras to have on hand for those rainy weekends.

The COCO BREADBOARD costs just $19.95. Price for two (2) or more is $16.95 each. Include $3.00 to cover shipping and handling for quantities through ten (10).

MORSE ENCODER/DECODER KIT

The MEDK80 Morse En/Decoder kit consists of a machine code software driver on tape, a schematic diagram of the interface circuitry, component parts, a printed circuit board (PCB), packaging suggestions and complete instructions for building a Morse code transmission and reception system that is compatible with 4K RAM and up models of the TRS-80 Color Computer.

The transmitter/receiver interface circuitry is totally optically isolated and is, therefore, compatible with all receivers and transmitters. The specific keying method employed in the users transmitter, however, may require minor modification of the interface, e.g., the addition of an external transistor inverter for proper phasing and voltage level matching. Specific examples are given in the instructions to aid in transmitter interfacing. Transmitter and receiver both connect to the interface unit and to the Color Computer via the RS-232 port.

The MEDK80 Morse En/Decoder kit operates at speeds up to 70 words per minute (fastest speed found so far to test receiving capability), and when receiving, automatically adapts to speed variations of the sender.

In the transmit mode, transmission speeds are user selectable from a list of ten (10) speeds that may be user programmed. Words are transmitted only when fully formed and visual management of the 512 character text buffer provides overwrite protection.

Potential purchasers of this product should have previous kit building experience. However, this is not a kit of great complexity, however, and is well within the abilities of those actively involved in amateur radio or electronic hobbiest to construct. To reduce the chance of wiring errors, component placement is indicated on the PCB and detailed assembly instructions are included.

The cost of the MEDK80 software, parts and instructions is $39.95.

ALIEN ENCOUNTER

This action packed "shoot-em-up" is one of the most challenging games of its kind. These ALIENS are smart, they aim back at you anticipating your every move, and are unrelenting in their attack. Play it at any one of 10 degrees of difficulty, but beware, they become desperate as you approach victory, after all, they are "ALIENS"!!

Program available on tape, is compatible with all machines with more than 16K of RAM and does not need joysticks to play. ALIEN ENCOUNTER costs $9.95. Add $1.00 for postage and handling.

CAPTURE

This multiple strategy (10 levels of play) "SURROUND and CAPTURE" game will give hours of thought provoking, stimulating challenge. The computer is your opponent, and you'll be delighted with the level of play that "COCO" has achieved. Chess and Checkers enthusiast will especially enjoy "CAPTURE". Joysticks not required.

"CAPTURE" is supplied on tape for just $9.95. Add $1.00 for postage and handling.

Ordering Information
COMPUTER ACCESSORIES OF ARIZONA
5801 E. VOLTAIRE DRIVE
SCOTTSDALE, ARIZONA 85254
(602) 996-7569

Make checks payable to: COMPUTER ACCESSORIES OF ARIZONA
Arizona residents add 5% sales tax.
* TRS-80 is a trademark of TANDY CORP.
** SDS80C is a trademark of the MICRO WORKS.
Prices subject to change without notice.

Computerware introduces FOXYGRAF, a gaphics software package for the Radio Shack Color Computer and TDP System 100.

FOXYGRAF is a complete graphics development package for the assembly langauge programmer. The very comprehensive manual covers the history of graphics, how the Color Computer graphics work, details Radio Shack and Motorola would not tell, and is written in an enjoyable style. FOXYGRAF allows you to program with any mode and in any color combination. If the Color Computer can do it, so can you with FOXYGRAF!

FOXYGRAF requires only 16K; it is only 4K itself! And FOXYGRAF is totally relocatable and includes some very useful subroutines you can call from standard BASIC, (e.g. circles, shapes, etc.) If you are serious about learning graphics programming, FOXYGRAF is both a tutorial and a tool!

FOXYGRAF is available from Computerware dealers or directly from Computerware at Box 668, Encinitas, CA 92024. (714) 436-3512. It is available on disks only and costs $29.95 plus $2.00 shipping and handling.

Computerware introduced THE COLOR CONNECTION, a complete modem software package for the radio Shack color Computer or TDP System 100.

THE COLOR CONNECTION is the easiest and most complete modem software package available on the Color Computer. It is so easy to use that you will save valuable on-line time. And take a look at the features and specifications!

* Supports both full and half duplex
* You designate the required parity
* MACROs for quick log-on and auto dial modems
* Big buffer allows downloading from other computers and uploading to another computer - (The buffer is 25K on a 32K machine.)
* The display does not break words when wrapping a line
* 300 baud

Though you would expect to pay much more for all of these features, Computerware has priced THE COLOR CONNECTION affordably so you too can try the new wave of electronic communication.

THE COLOR CONNECTION is available from Computerware dealers or directly from Computerware at Box 668, Encinitas, CA 92024, or (714) 436-3512. It is available on cassette for $29.95 or disk for $34.95 plus $2.00 shiping and handling.

DIALOG ANNOUNCES FIVE DATABASES AVAILABLE FOR ONLINE INFORMATION RETRIEVAL IN OCTOBER

PALO ALTO, Calif. -- Five databases for online access have been added to the more than 150 files already available from Dialog Information Services, Inc., the world's largest online information retrieval system.

Available to DIALOG subscribers in October, the databases include references to literature on books, mathematics, chemistry, engineering and service agencies.

An aid to locating books or doing bibliographic verification, REMARC (Retrospective Machine Readable Cataloging) is the online version of the U.S. Library of Congress Catalog, containing all entries made from 1897 through 1978 except those listed in LC MARC. Made up of five consecutive files, the first segment of the REMARC database includes over 500,000 records. The database is produced by Carrollton Press.

MATHFILE, corresponding to the print publication Mathematical Reviews, includes records dating from 1973 to the present. Produced by the American Mathematical Society, the file contains approximately 350,000 records offering worldwide coverage of both pure and applied mathematics literature.

CHEMLAW, jointly produced by the Bureau of National Affairs, Inc., and Fein Marquert Associates, Inc., is a file of U.S. federal chemical regulations. The database contains the full text of those regulations as published in the U.S. Code of Federal Regulations (CFR), and updates from the Federal Register, totalling approximately 14,000 records.

TEXTILE TECHNOLOGY DIGEST begins with 45,000 records (1978 to present) covering the literature of textiles and related subjects. The file is produced by the Institute of Textile Technology and contains information from more than 650 periodicals, books, reports, theses and the like.

A new addition to the ELECTRONIC YELLOW PAGES, the SERVICES DIRECTORY is a guide to almost two million records on all types of services (e.g., financial, business, office and recreational). Corresponding to the yellow pages of more than 4,800 telephone directories throughout the U.S., the file is produced by Market Data Retrieval.

A wholly-owned subsidiary of Lockheed Corporation, Dialog Information Services, Inc., developed the pioneer online information

retrieval system. Formed in 1969 with a single database, DIALOG now has more than 150 databases containing more than 60 million records, making it the largest system of its kind in the world.

Literature describing all DIALOG databases, as well as information on becoming a DIALOG user, is available by calling (800) 227-1927; (800) 982-5838 in California; or by writing to Dialog Information Services, Inc., 3460 Hillview Avenue, Palo Alto, CA 94304.

MICRO SCHOOL PROGRAMS has announced a new program, COLORTEXT, for use on *TRS-80, 32K Color Computers, with one disk drive. COLORTEXT is an easy-to-use high-resolution text driver which displays a variety of character fonts and graphics on the screen simultaneously, including the use of all features of Extended Basic. It permits the intermixing of upper-lower case text and graphics in various sizes and colors.

Other features include non-destructive overwrite for animation, variable screen scrolling speed, a BREAK key lock-up option, and ADDCHR-a program for creating and editing all characters, (including graphics, alpha-numeric etc.). ADDCHR can be used to create character sets of up to 200 characters. The defined character sets may be for foreign languages such as Greek, Hebrew, Russian, or various other print types. Special characters may also be defined which can then be displayed within standard print statements.

The TRS-80 Model III graphics character set is included in COLORTEXT. This permits the user to enter and use programs written for Model I and III very quickly, using the same graphics character set numbers used in the other programs. This character set may be changed by the user if desired.

This program is intended for use by Curriculum Authors, Teachers, Game Designers, or anyone who wishes to prepare programs which involve the simultaneous use text, graphics, and color.

User programs (up to 16K) will run with COLORTEXT on 32K machines.

The fifty-plus page user's manual provides complete instructions on the use of the program. The user is led through a practice program which introduces the user to the various features of COLORTEXT. A demonstration program is also included on the disk to illustrate character sets, colors, display techniques, and animation. Two reference sections are also included, one for COLORTEXT and one for the ADDCHR Program.

COLORTEXT comes on disk with manual.
AVAILABLE: AUGUST 15, 1982
PRICE: $79.80

For more information write Bertamax, Inc., 101 Nickerson, Suite 202, Seattle, WA 98109 or call (206) 282-6249.

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THE GRAPH ZAPPER is priced at $15.95 for the 16K tape version and $19.95 for the 32K disk version plus $1.00 for shipping. Both require Extended Color BASIC and are provided on cassette for safe delivery.

THE GRAPH ZAPPER is available with a 14 day money back guarantee from:

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UNIVERSAL PROGRAM (UP-1)

UP-1 is a program designed to assist in the operation and development of Color Computer Programs. It has several basic subprograms for

handling data to and from a cassette, several memory related programs including Word Processing, Vector programs plus general purpose programs.

UP-1 is first loaded into the computer and new programs are written or loaded until the memory is filled. You can easily jump from one program to another. This program jump feature is a tremendous time saver when it is desireable to retain short programs for frequent access. Because of the program jump feature, the features of UP-1 do not have to be included in other programs.

To allow programs to quickly be located on a cassette, UP-1 allows the cassette motor and audio to be turned ON and OFF with only one keyboard key.

The memory features allow scanning of memory and displaying the memory location, value stored, and the ASCII character for each location. This helps in troubleshooting a program that has bombed out. Also data or characters can be stored in memory, and blocks of data can be moved from one memory location to another.

UP-1 also allows word processing by allowing text to be directly stored in memory. The memory relocation feature allows editing and the text can be printed on a printer with or without Auto Line Feed.

The software to store data and read data from a cassette is included. The memory location, decimal value, and ASCII character is printed on the screen as data is transfered to or read from a cassette.

Additional features of UP-1 include a keyboard to ASCII program and one key escape from UP-1 to the program loaded in the normal operating location. Note UP-1 is usually loaded into higher memory locations.

UP-1 CASSETTE $14.95
UP-1 EPROM $24.95*
* When ordering indicate the memory location for UP-1 EPROM.

COLOR COMPUTER DISASSEMBLER-ASSEMBLER (DISASM)

DISASM is designed to assemble and disassemble Color Computer Machine codes. To eliminate confusion all entries are made in simple, easy to learn mnemonics with memory locations and branch values in Decimal rather than Hexadecimal notation.

To assemble machine language programs or USR Subroutines, the memory location of the program is first entered in decimal. Next the computer asks for the instruction. Then it looks up the machine code for the given instruction and then asks for additional data such as values and branch instructions. This data is entered in decimal notation. The computer calculates the appropriate values and stores them into the next memory locations. It is then ready for the next instruction.

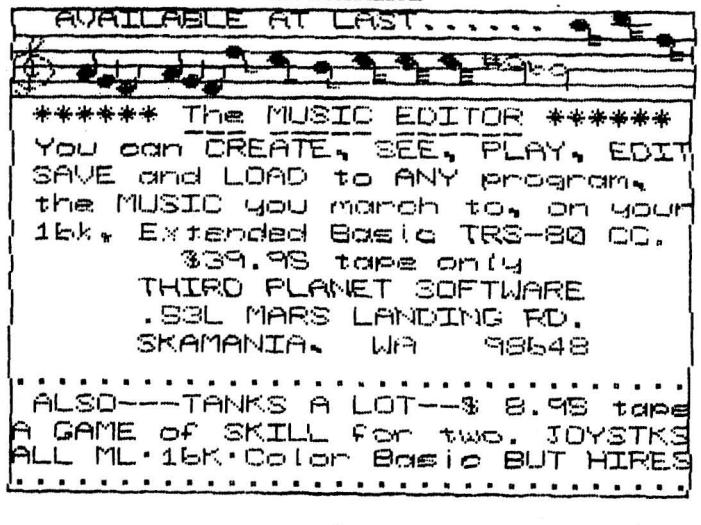
For disassembling machine langauge programs, the location of the program is entered from the keyboard in decimal. The Computer then starts converting the machine codes into understandable mnemonics. The memory location is first printed, then the instruction, and finally the value or branch location depending on the type of instruction.

A very useful feature of DISASM is the ability to jump from Assembler to Disassembler or Disassembler to Assembler by depressing only one keyboard key. This allows assembling a few instructions and then letting the computer display them by using the disassembler. Also either the Assembler or Disassembler can jump to another memory location by depressing only one keyboard key.

Applications for DISASM include quickly writting USR Subroutines for use with basic programs, writing complete machine langauge programs, and disassembling machine language subroutines and programs. When used on the Color Computer's basic or extended ROMs, the disassembler gives a complete description of the Color Computer's operation.

DISASM supports all 6809 machine codes and instructions and occupies approximately 8K of memory. Extended Basic is not required.

DISASM Cassette $19.95
DISASM EPROM $49.95*
* INDICATE MEMORY LOCATION WHEN ORDERING



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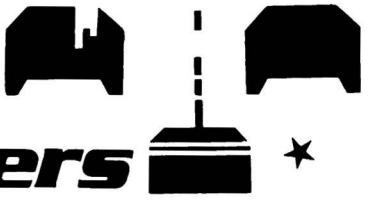

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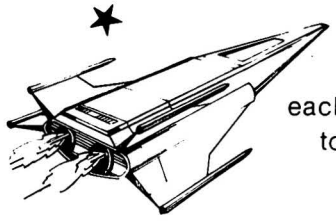

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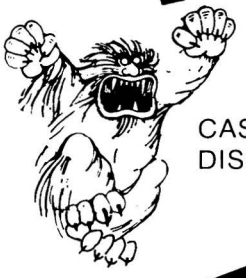

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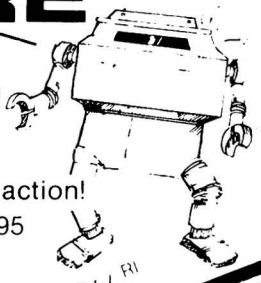

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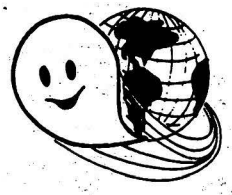

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